



Public Health Assessment for

**REDSTONE ARMY GARRISON/MARSHALL
SPACE FLIGHT CENTER
HUNTSVILLE, MADISON COUNTY, ALABAMA
EPA FACILITY ID: AL7210020742
JULY 12, 2005**

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE**

Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Redstone Army Garrison/Marshall
Space Flight Center

Final Release

PUBLIC HEALTH ASSESSMENT

REDSTONE ARMY GARRISON/MARSHALL
SPACE FLIGHT CENTER
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EPA FACILITY ID: AL7210020742

Prepared by:

Alabama Department of Public Health
under a cooperative agreement with the
Agency for Toxic Substances and Disease Registry

FOREWORD

In 1980 Congress established the Agency for Toxic Substances and Disease Registry (ATSDR), as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also called the “Superfund” law. This law established a fund to pay for identifying and cleaning up our country’s hazardous waste sites. The United States Environmental Protection Agency (USEPA) and state environmental agencies oversee the site investigation and clean up actions. Historically, public health assessments are conducted by environmental and health scientists from ATSDR. In 1993, the Alabama Department of Public Health (ADPH) entered into a cooperative agreement with ATSDR, the goal of which was that ADPH would develop the capacity to perform this function for ATSDR.

In 1986, the Superfund Amendments and Re-authorization Act (SARA Title III) required ATSDR to conduct a public health assessment at each site on the USEPA National Priorities List (NPL). Public health assessments seek to discover whether people are being exposed to hazardous substances. If people are exposed or have the potential to be exposed, ATSDR decides whether the exposure is harmful and at what level health effects might occur. From these data, ATSDR decides whether the exposure should be stopped or reduced.

Exposure: ADPH health assessors review environmental data to assess the contamination at a site, determine where it is, and how people might be exposed to it. ADPH does not collect and analyze environmental samples, but instead reviews sampling data provided by USEPA, other government agencies, businesses or the public. If insufficient environmental information is available, the assessment will indicate that further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ADPH scientists evaluate whether that exposure may result in harmful effects. ADPH, as well as ATSDR, recognizes that children, because of their play activities and their growing bodies, may be most susceptible to these effects. As a policy, unless data are available to suggest otherwise, ADPH health professionals responsible for assessing effects in populations consider children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to children is considered first when evaluating the health threat to a community. The health impact to other high risk groups within the community (i.e., elderly, those with compromised immune systems, chronically ill, people engaging in high risk practices) also receive special attention during the evaluation.

ADPH uses existing scientific information that can include the results of medical, toxicologic, and epidemiologic studies and disease registry data to determine the health effects that may result from exposure. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances may not be available. In such cases, the report will document the need for further data collection activities.

Conclusions: The report assigns a public health hazard category and describes any hazards at the site. It contains a public health action plan that recommends ways to stop or reduce exposure. Because ATSDR is an advisory agency, the report identifies actions that are appropriate for USEPA, other responsible parties, or the research or education divisions of ATSDR to conduct. However, if there is an urgent public health hazard, ATSDR can issue a public health advisory to warn people of the danger. When appropriate, ATSDR also authorizes health education or pilot studies of health effects, full-scale epidemiology studies, diseases registries, surveillance studies, or research on specific hazardous substances.

Interactive Process: The development of a health assessment is an interactive process. The approach requires accumulation of information from many sources, including, but not limited to: ATSDR, many city, state, and federal agencies; the companies responsible for cleaning up the site, the principle responsible party (PRP), and the community. Once an assessment has been completed the conclusions are shared with all interested parties. They are asked to comment on an early draft of the report to make sure the data they provided is presented correctly and responsibly. Sometimes agencies will begin to carry out recommendations when they read the draft conclusions and recommendations.

Community: ADPH must determine what people in the area know about the site and what health concerns they may have about the site. Therefore, ADPH gathers information and comments from the public. The public is broadly defined to include people who live or work nearby, property owners, business owners, civic leaders, health professionals, community groups, and anyone else who is interested or concerned. The public is asked to comment on a draft of the report to ensure that the report addresses their health concerns. The final report contains a written response to public comments.

Comments: If you have questions or comments after reading this report, please send them to the Alabama Department of Public Health, Division of Epidemiology, 201 Monroe Street, Suite 1450, Montgomery, Alabama 36104.

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LIST OF ACRONYMS AND ABBREVIATIONS

ADEM	Alabama Department of Environmental Management
ADPH	Alabama Department of Public Health
AMCOM	U.S. Army Aviation and Missile Command
ATSDR	The Agency for Toxic Substances and Disease Registry
CVs	Comparison Values
DDT	Dichlorodiphenyltrichloroethane
USEPA	U.S. Environmental Protection Agency
FS	Feasibility Study
HMX	High melting explosive (cyclotetramethylenetetranitramine)
ISP	International Specialty Products
IRA	Interim Remedial Action
MCL	Maximum Contaminant Level
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NPL	National Priority List
OU	Operable Unit
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbons
Parsons	Parsons Engineering-Science, Incorporated
PCB	Polychlorinated Biphenyls
PETN	(Pentaerythritol Tetranitrate)
RSA	Redstone Army Garrison
RCRA	Resource Conservation and Recovery Act
RDX	"Royal Dutch Explosive" ordnance compound, (cyclotrimethylenetrinitramine)
RFI	RCRA Facility Investigation
RI	Remedial investigation
ROD	Record of Decision
RSA	Redstone Arsenal
RUST	Rust Environmental & Infrastructure, Incorporated
SAIC	Science Applications International Corporation
SVOC	Semi-volatile organic compound
SWMU	Solid waste management units
TCE	Trichloroethylene
TVA	Tennessee Valley Authority
USACE	United States Army Corps of Engineers
USAAMC	United States Army Aviation & Missile Command
USATHAMA	United States Army Toxic and Hazardous Materials Agency
VOC	Volatile organic compound
WNWR	Wheeler National Wildlife Refuge
WWII	World War II

INTRODUCTION

The Agency for Toxic Substances and Disease Registry (ATSDR) was established under the mandate of the Comprehensive Environment Response, Compensation and Liability Act (CERCLA) of 1980. This act, also known as the “superfund” law, authorized the United States Environmental Protection Agency (USEPA) to conduct cleanup activities at hazardous waste sites. USEPA was directed to compile a list of sites considered hazardous to public health. This list is termed the National Priorities List (NPL). The 1986 Superfund Amendments and re-authorization Act (SARA) directed ATSDR to prepare a Public Health Assessment (PHA) for each NPL site. In Alabama, much of the ATSDR requirement is performed by the Alabama Department of Public Health (ADPH).

In conducting the PHA, three types of information are used: (1) environmental data, (2) community health concerns, and (3) health outcome data. The environmental data are reviewed to determine whether people in the community have been or could become exposed to hazardous material from the NPL facility. If people have been exposed to these chemicals, health agencies will determine whether the exposure is at levels which might cause harm. Community health concerns are collected to determine whether health concerns expressed by the community members could be related to the exposure to chemicals released from the NPL facility. If the community raises concerns about specific diseases in the community, health outcome data (information from the state and local databases or health care providers) can be used to address the community concerns. Also, if ATSDR finds that harmful exposures have occurred, health outcome data can be used to determine if illnesses are occurring which could be associated with the hazardous chemicals released from the NPL facility.

In accordance with the interagency cooperative agreement between ATSDR and the Alabama Department of Public Health (ADPH), ADPH has prepared this public health assessment (PHA) for the Redstone Army Garrison, formerly Redstone Arsenal, and Marshall Space Flight Center NPL sites. This PHA presents conclusions about whether exposures are occurring and whether a threat to public health exists. In some cases, it is possible to determine whether exposures occurred in the past, but often the appropriate historical data are not available to quantify the exposures. If it is determined that the threat to the public health exists, recommendations are made to stop or reduce the threat to public health.

This document was submitted for public comment which ended November 20, 2003. These comments are located in Appendix E, page 104.

EXECUTIVE SUMMARY

Redstone Army Garrison is a United States Army facility located in southern Madison County, Alabama. Formerly named Redstone Arsenal (RSA), the garrison comprises approximately 38,300 acres. The Department of the Army controls 36,459 acres and the remaining 1,841 acres, located in the central part of RSA, are leased to the National Aeronautics and Space Administration (NASA), George C. Marshall Space Flight Center (MSFC). This area now leased to NASA was used for Army operations from approximately 1943 until 1960. During this time, various products ranging from propellants used by NASA, chemical warfare agents such as mustard and lewisite (a chemical agent containing arsenic), and commercial chemicals and pesticides including DDT were manufactured on the installation. RSA and MSFC were placed on the NPL on May 31, 1994, based on hazard ranking scores associated with environmental conditions.

The ADPH, under a cooperative agreement with ATSDR, reviewed available environmental information for the site and evaluated the primary pathways through which the public might come in contact with contaminants from the site. These exposure pathways include groundwater, soil, sediment, surface water and air. Based on the available information, ADPH concluded that, at present, none of these pathways present a public health hazard. This document covers the data through August 1, 2002. A brief review of the exposure pathways that were considered is presented below.

Groundwater Pathway

Contaminants such as TCE, PCE and perchlorate from the site were identified in the groundwater, and a TCE groundwater plume from OU-10 extends southeastward toward public residential developments. However, groundwater is not utilized for drinking, bathing or household use. A local Huntsville ordinance prohibits the use of private off-site wells. The residential developments and the city of Huntsville use municipal water from the Tennessee River and several springs located in the city to provide water to residents. **Contaminants in groundwater pose no public health hazard.**

Soil and Sediment Exposure Pathway

Sediment samples collected from the different sites on the installation contained contaminants, (e.g., arsenic) but the contaminants are located at a sufficient depth below ground level where humans would not come in contact with them. Additionally, the installation maintains controls to prevent excavation of these substances thereby reducing exposures. Most of these contaminants were generated during the various commercial production processes, and manufacturing of chemical warfare agents. **Contaminants in soil and sediment pose no public health hazard, and will degrade by attenuation.**

Surface Water Pathway

Surface water samples collected from sites on the installation contained various heavy metals that could pose a public health hazard if exposures were to occur. Ponds and other bodies of standing water have signs posted and are fenced to prevent exposure. The only contact with these areas would be to trespassers. Trespassing is discouraged by military police patrols.

Sediments in surface water bodies at Redstone Arsenal are contaminated with DDT and PCBs. Earlier public health evaluations of the contamination at Redstone and the Wheeler National Wildlife Refuge have addressed consumption of DDT contaminated fish. However, ADPH maintains the state fish consumption advisors and lists those water bodies where fish tissue data reveal levels of contaminants above FDA consumption levels. When contaminants are found in fish tissue above the FDA guidance levels, a “no consumption” or “limited consumption” advisory is assigned to the affected water body and fish specie(s). Non-consumption of fish precludes ingestion as an exposure route. It has been observed that most citizens in Alabama follow the guidance contained in these advisories. **Therefore, contaminants in surface water pose no public health hazard.**

Air Pathway

Air sampling data were not available for evaluation in this report. However, ADPH found areas on the installation where excavation of the soil could potentially aerosolize contaminants. When such areas are identified, they are posted accordingly, fenced and patrolled to discourage trespassing and the potential for future exposures.

Various buildings on the installation were utilized by commercial interests to manufacture non-persistent chemical agents. Some of these buildings have served as office space for Marshall Space Flight Center employees for 4 or more decades. After the chemical company vacated the building, it was decontaminated by the most effective means at that time. When cleared, the building was released for occupancy.

Contaminants that may pose hazards are located at a depth beneath the soil and the Redstone land use controls establish the protocol necessary to prevent exposures. There are no concerns for vapor intrusion at this time.

Due to controls in place, ADPH has determined that the air pathway poses no public health hazard.

ATSDR PUBLIC HEALTH CONCLUSION CATEGORIES

CATEGORY A. URGENT PUBLIC HEALTH HAZARD ¹	CATEGORY B. PUBLIC HEALTH HAZARD ¹	CATEGORY C. INDETERMINATE PUBLIC HEALTH HAZARD	CATEGORY D. NO APPARENT PUBLIC HEALTH HAZARD ¹	CATEGORY E. NO PUBLIC HEALTH HAZARD
<p>This category is used for sites where short-term exposures (<one yr) to hazardous substances or conditions could result in adverse health effects that require rapid intervention.</p> <p>Criteria: Evaluation of available information² indicates that site-specific conditions or likely exposures have had, are having, or are likely to have in the future, an adverse impact on human health that requires immediate action or intervention. Such site-specific conditions or exposures may include the presence of serious physical or safety hazards, such as open mine shafts, poorly stored or maintained flammable/explosive substances, or medical devices which, upon rupture, could release radioactive materials.</p>	<p>This category is used for sites that pose a public health hazard due to the existence of long-term exposures (>one yr) to hazardous substances or conditions that could result in adverse health effects.</p> <p>Criteria: Evaluation of available relevant information suggests that, under site-specific conditions of exposure, long-term exposures to site-specific contaminants (including radionuclides) have had, are having, or are likely to have in the future, an adverse impact on human health that requires one or more public health interventions. Such site-specific exposures may include the presence of serious physical hazards, such as open mine shafts, poorly stored or maintained flammable/explosive substances, or medical devices which, upon rupture, could release radioactive materials.</p>	<p>This category is used for sites in which “critical” data are <i>insufficient</i> with regard to extent exposure and/or toxicologic properties at estimated exposure levels.</p> <p>Criteria: The health assessor must determine, using professional judgment, the “criticality” of such data and the likelihood that the data can be obtained in a timely manner. Where some data are available, even limited data, the health assessor is encouraged to the extent possible to select other hazard categories and to support their decision with clear narrative that explains the limits of the data and the rationale for the decision.</p>	<p>This category is used for sites where human exposure to contaminated media may be occurring, may have occurred in the past, and/or may occur in the future, but the exposure is not expected to cause any adverse health effects.</p> <p>Criteria: Evaluation of available information² indicates that, under site-specific conditions of exposure, exposures to site-specific contaminants in the past, present or future are not likely to result in any adverse impact on human health.</p>	<p>This category is used for sites that, because of the absence of exposure, do NOT pose a public health hazard.</p> <p>Criteria: Sufficient evidence indicates that no human exposures to contaminated media have occurred, none are now occurring, and none are likely to occur in the future.</p>

¹ This determination represents a professional judgment based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made

² Such as environmental and demographic data; health outcome data; exposure data; community health concerns information; toxicologic, medical, and epidemiologic data.

BACKGROUND

Site Description and Operational History

Redstone Arsenal (RSA), renamed the Redstone Army Garrison (RSA), is a United States Army facility located in southern Madison County, Alabama. RSA comprises approximately 38,300 acres. The Department of the Army controls 36,459 acres and the remaining 1,841 acres, located in the central part of RSA, are leased to the National Aeronautics and Space Administration (NASA), George C. Marshall Space Flight Center (MSFC). This area, now leased to NASA, was used for Army operations from approximately 1943 until 1960. International Specialty Products (ISP) leases approximately ten acres of land in the central portion of the facility for production of iron carbonyl. Located in the southeast portion of RSA is an area previously used by the Thiokol Chemical Corporation to develop solid rocket propellant. The area was formerly referred to as the Redstone Arsenal Rocket Engine Facility (RARE). Also located within RSA's boundaries is the Wheeler National Wildlife Refuge (WNWR). The WNWR encompasses 4,005 acres owned in part by Tennessee Valley Authority (TVA) and by the U.S. Department of the Interior. In addition to the acreage used for the WNWR, TVA owns a total of 2,990 acres along the southern boundary of RSA.

Of the 38,300 acres that comprise RSA, approximately 15,500 acres are woodlands and 9,200 acres are leased for agricultural use. More than 10,200 acres include maintained grassy areas, buildings, roads, and Army facilities. The area surrounding RSA includes light industrial, residential, commercial, and agricultural areas. RSA is bounded on the north and east by the City of Huntsville, on the south by the WNWR and the Tennessee River, and on the west by agricultural, residential, and light industrial areas. Much of the area immediately adjacent to RSA is urban-industrial and includes single and multi-family residences, as well as commercial and industrialized areas.

The land area of the present RSA originally consisted of three military facilities established in 1941: the Redstone Ordnance Plant (later Redstone Arsenal), the Huntsville Arsenal, and the Gulf Chemical Warfare Depot (Science Applications International Corporation, [SAIC]). These three facilities worked together to produce chemical agents and munitions for use during World War II (SAIC). Past operations at the installation included the production of a mustard agent, lewisite (a chemical agent containing arsenic), other chemical munitions, commercial chemicals, and pesticides (including DDT). (USAAMC 1998; CH2M Hill 1998a). For several years after WWII, these facilities served as centers for processing and storage of Allied and Axis chemical munitions and agents (SAIC). Surplus munitions were demilitarized by state of the art technologies at the time and buried in various locations throughout the installation (USAAMC 1998).

In 1949, RSA's mission changed to research and development of rocketry and guided missile systems (SAIC). In 1960, the civilian missile development activities conducted by the Army were transferred to MSFC (CH2M Hill 1998b). Since then, the area known as MSFC has been used to develop, test, and manufacture space vehicles and components (CH2M Hill 1998b).

The current mission of the RSA is to conduct military research and development, manage procurement, and support the Army's missile and rocket weapons system. Large areas at the installation continue to be used for testing missiles, propellants, explosives and ordnance, as well as for troop training.

Regulatory and Remedial History

On May 31, 1994, USEPA placed RSA and MSFC on the NPL. As of October 1999, 298 solid waste management units (SWMUs) and areas of concern (AOCs) were identified (See Figures 1 and 2, Appendix C).

As of July 1, 2002:

- two sites are under RCRA Facility Investigation (RFI);
- 81 sites require no further action;
- 22 sites require confirmatory sampling;
- 91 sites are being regulated by CERCLA; and,
- 9 sites are being regulated by part I-IV of the ADEM permit.

Sites include past disposal sites, landfills, open burn and open detonation (OB/OD) areas, chemical munitions disposal sites, and solvent spill sites. Contaminants exceeding health-based comparison values include metals, solvents, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), pesticides, and chemical agents.

The Army has implemented seven interim remedial actions (IRAs):

- the capping of three surface impoundment areas (RSA-139, RSA-56 and RSA-49)
- the installation of a soil vapor extraction system (RSA-14)
- the installation of three groundwater pump-and-treat systems (RSA-10, RSA-13 and RSA-142)

The three surface impoundment areas were capped to control the source of contamination and prevent further migration of contaminants. The soil vapor extraction system was installed to remove trichloroethylene (TCE) from the soil and control further migration of contaminants. The three pump-and-treatment systems were installed to (1) control the spread of groundwater contaminated with TCE at concentrations above USEPA's maximum contaminant level (MCL), (2) to treat the contaminated groundwater using state of the art injection systems which neutralize contaminants, and (3) to monitor the effectiveness of the treatment system. The pump-and-treat systems are interim remedial actions. Since the installation of the pump-and-treat systems, additional water sampling revealed the presence of ammonium perchlorate. Perchlorate is a contaminant of concern, but it does not pose an immediate health concern because the public gets its drinking water from a different source.

In addition to the IRAs, the Army has completed one on-site removal action. In September 1997, the Army removed the inactive septic tank and surrounding sediment and soils due to the presence of elevated concentrations of metals in the area.

MSFC has implemented IRAs at three sites: (1) the West Test Area deluge pond (MSFC-004), (2) the East Test Area Liquid Waste Pond (MSFC-009), and (3) the Uncontained Drainage Pathways-Southeast Section of the East Test Area (MSFC-063). MSFC stabilized the sediment in the West Test Area deluge pond, installed a liner and an air stripper for treatment and removal of VOCs from the pond surface water and from the groundwater pumped from the test stand basements, and posted “No Fishing” signs around the pond. MSFC has also removed sediment from the uncontained drainage pathways - southeast section of the East Test Area, and installed a liner and posted “No Fishing” signs around the East Test Area liquid waste pond. In addition, MSFC has also posted “No Fishing” signs around the industrial sewer outfall area and Indian Creek (MSFC-052) and removed PCB-contaminated soils at the industrial sewer outfall. ADPH has issued fish consumption advisories on Indian Creek and Huntsville Spring Branch since 1996 due to the presence of DDT which exceeded FDA guidance levels.

In 1996, the 84 sites designated as the Army’s responsibility for cleanup were reorganized into eighteen Operable Units (OUs) based on watersheds, critical and sensitive ecological habitats, soil types and land use. The 67 MSFC sites were also divided into 12 OUs based on similar industrial uses or comparable contamination. Tables 12-13 in Appendix B summarizes the waste disposal history, investigation results, current status, and the ADPH’s evaluation of public health hazards for each site.

ATSDR and ADPH Involvement

In December of 1994 ATSDR prepared a site summary based on an earlier site visit to RSA and a preliminary survey of the available data (ATSDR, 1994). ATSDR did not identify any completed exposure pathways; there were no public health hazards. ATSDR determined that additional data were needed to more fully evaluate the potential for exposure to contaminants in on-site surface water via ingestion of fish and dermal contact with the water. ATSDR also determined that the extent of off-site migration of contaminated groundwater needed further evaluation to determine the potential impact on public health. As a continuation of ATSDR’s assessment process, ADPH reviewed environmental data collected at the 91 CERCLA sites on RSA and prepared this PHA to address any potential health hazards.

Site Visit

ADPH toured the site on several occasions in August 2002. The RSA property is a U.S. military installation located off Interstate 565. The MSFC is centrally located on RSA. The entire installation is fenced and access is restricted and enforced. There are nine gates located around RSA that are manned by military police. Most of the property accessed via Gate 9 along the main thoroughfare is pasture and golf course. Much of the remaining property is wooded.

Demographics

ADPH examines demographic information to identify the presence of sensitive populations (such as young children and the elderly) in the vicinity of the site. Demographics also provide details on residential history in a particular area. This information helps ADPH determine the time frames of potential human exposure to contaminants.

RSA's northeast boundary is adjacent to the City of Huntsville, Alabama. The 2001 census approximates Huntsville's population at 281,931. An estimated 71,102 people (including 7,780 children under the age of 7 and 5,079 adults over the age of 64) reside within the 5 mile buffer zone. Approximately 1,000 military families reside in government quarters on RSA and approximately 21,500 government workers and contractors work at RSA (USACE 1998). MSFC employs approximately 3,075 civil service workers and 4,100 private contractors (CH2M Hill 1998a).

RSA operates separate domestic and industrial water systems for Arsenal and MSFC use. The main source of water for MSFC and RSA is the Wheeler Reservoir of the Tennessee River, which forms the southern boundary of RSA. RSA currently utilizes two intakes along the Tennessee River and operates one permitted treatment plant that supplies water to RSA and MSFC. RSA also has the capability of obtaining potable water from the City of Huntsville on an emergency or negotiated basis. Approximately 35% of Huntsville residents receive their water from the Huntsville Utilities and the Madison County Water Works. The county gets water from the Tennessee River and from groundwater sources throughout the city. About 65,000 persons are served by the Huntsville Utilities; other Huntsville residents are served by various other public water supply systems (i.e., Madison County Waterworks, Owens Crossroads, or Harvest Monrovia).

Geology

The majority of RSA is underlain by the Tusculumbia Limestone (bedrock) and associated overburden residual soils. The Tusculumbia Limestone has an average thickness of 150 feet and contains enlarged openings that have developed along joints, fractures, bedding planes, and faults. Dissolution of limestone has formed caves and cavities contributing to the formation of sinkholes and depressions in the land surface. Sinkholes are evident from the topographic maps of the area, and are still actively forming (Geraghty & Miller 1991; GSA 1996).

The karst topography at RSA makes groundwater flow difficult to predict. The hydrogeology at RSA is classified into three principal units: (1) the Tusculumbia Limestone, (2) the Fort Payne Chert, and (3) the Chattanooga Shale. In most of that area, the Chattanooga Shale acts as a confining unit. The majority of water in the limestone aquifer is stored and transmitted through the openings along the bedding planes, fractures, and solution-enlarged openings. The deeper overburden zones appear hydraulically connected with the top of the limestone, but the overall relationship between water-bearing units in the overburden and the bedrock is complex and varies with location (Geraghty & Miller 1991).

The Tennessee River marks the southern boundary of RSA and flows west. Huntsville Spring Branch, McDonald Creek, and Indian Creek are major tributaries that flow generally southward through the RSA boundary, emptying into the Tennessee River. All surface drainage leaving RSA empties into the Tennessee River. Approximately 90 percent of the drainage passes through Wheeler Reservoir, located in the central and southwest portion of RSA, before entering the Tennessee River. Wetlands are associated with the creeks and tributaries as well as the Tennessee River (Geraghty & Miller 1991).

Community Health Concerns

The community surrounding RSA has voiced concerns regarding three issues: (1) the presence of off-facility solvent and perchlorate contamination in groundwater beyond the eastern boundary of Redstone, (2) whether exposures to the off-facility contamination are occurring, and (3) whether exposures to off-facility contamination are related to the occurrence of three reported leukemia cases in their communities.

Local residents have expressed their concerns through phone calls and in-person meetings with the Alabama Department of Environmental Management (ADEM), the Alabama Department of Public Health (ADPH), and Redstone Arsenal personnel. In response to these concerns, Redstone and ADPH have performed significant public outreach efforts in the residential areas east of the facility. These efforts include personal visits with residents in their homes, fact sheets, and public meetings. During one of the first public meetings hosted by Redstone, in October 2001, the ADPH Health Educator and State Toxicologist staffed an information table and answered many questions to quell fears and establish a working relationship with community members. Residents soon learned what risk existed and how the Redstone environmental office was actively testing and remediating areas so that risks to individuals for illnesses such as leukemia from off-site groundwater contamination were minimized.

Data from two dye tracer studies evaluated in 2001 did not reveal contamination in the subdivisions east of Redstone. These indicated that the plume of contamination was contained on the installation. Redstone conducts periodic groundwater monitoring to ensure that the plume remains on site.

Data evaluated in this report did not reveal exposures to off site contamination. Regarding cancer cases reported by community members, the Alabama Statewide Cancer Registry analyzed leukemia data for Huntsville and Madison County and reported that the incidence of leukemia cases was consistent with expected rates for any city and county in the United States with similar demographics. Further investigation revealed that individuals with leukemia did not work on the installation, nor did they have occasion for exposure to site-related contaminants.

Any data developed and evaluated after this report will be disseminated to the residents.

ENVIRONMENTAL CONTAMINATION AND POTENTIAL EXPOSURE PATHWAYS

Introduction

ADPH evaluated environmental data to determine whether any contamination poses a present hazard to persons having access to, or living near, the RSA/MSFC site. For each environmental medium, ADPH examined the types and concentrations of contaminants in that medium. ADPH uses health-based comparison values both for screening contaminant concentrations in an environmental medium and to select contaminants for further evaluation. Data tables in this document list contaminants in each medium (i.e., groundwater, soil, surface water, air, sediment) present in the environment at levels greater than, or equal to, health-based comparison values. Contaminant levels below comparison values are normally regarded as unlikely to affect public health. Contaminants at or above comparison values would not automatically produce adverse health effects, but would warrant further scrutiny. ADPH strongly emphasizes that comparison values are not thresholds of toxicity. Rather, comparison values are set far below levels at which adverse health effects have been observed in experimental animal or human health studies. As a prudent measure, ADPH uses the highly conservative comparison values to recognize and resolve potential health problems before they are realized. Comparison values used in this document include ATSDR's:

- health-based environmental media evaluation guides (EMEGs);
- reference dose media evaluation guides (RMEGs); and,
- cancer risk evaluation guides (CREGs).

Comparison values also include USEPA's:

- maximum contaminant levels (MCLs);
- maximum contaminant level goals (MCLGs);
- risk-based concentrations (RBCs); and,
- lifetime health advisories (LTHAs).

A description of the comparison values used in this health assessment is provided in Appendix A.

Again, it cannot be overemphasized that, regardless of the level of contamination, a public health hazard exists only if people come in contact with or are otherwise exposed to the contaminated media. Therefore, ADPH first considers how people might come into contact with, or be exposed to, contaminated media. Then, in evaluating exposure, ADPH determines whether the exposure occurred through ingestion, dermal (skin) contact with contaminated media or inhalation of vapors. ADPH also considers exposure variables (e.g., duration and frequency) and the toxicology of the contaminant to determine whether the site poses any public health hazards. The conclusion categories and the bases for these conclusions are described on page 4.

Exposure Pathways

After the initial review of potential health hazards at the RSA/ MSFC sites and as a continuation of the public health process, ADPH identified the following potential exposure pathways as requiring further evaluation:

- evaluation of on-site groundwater contamination
- evaluation of on-site soil and sediment contamination
- evaluation of surface water contamination
- evaluation of air contaminants

These potential exposure pathways have been evaluated in more detail utilizing data gathered and remedial activities conducted since ATSDR's initial 1994 involvement. The objective was to determine whether these pathways represented, and under site-specific conditions, posed a threat to human health. Appendix B summarizes the potential exposure pathways discussed in this section of this document. Appendix A lists the concentrations found at each site. For a definition of terms, see the Glossary in Appendix D.

Evaluation of On-Site Groundwater Contamination

The nature and extent of groundwater contamination has not been fully defined at the Arsenal. However, groundwater under the Arsenal is not used for drinking. The following is ADPH's evaluation of the extent of contamination in on-site groundwater and examination of potential exposure pathways of concern.

The Nature and Extent of Contamination at Army-Controlled Sites

The Army has detected contaminants in groundwater in various operational units (OUs), including: OU-1, OU-2, OU-3, OU-5, OU-6, OU-7, OU-8, OU-10, OU-11, OU-12, OU-13, OU-14, OU-15, OU-17, and OU-18. The contaminants of concern include metals, pesticides, PCBs, PAHs, VOCs, SVOCs, explosives, chemical munitions, and chemical agents. Table 1, Appendix A identifies (for the Army- controlled sites) the maximum concentration of contaminants detected above applicable health-based comparison values, as well as those chemicals lacking comparison values.

The Army initially installed and ran three pump-and-treat systems (RSA-10, RSA-13, and RSA-142). Currently, only RSA-142 is operational. These systems were designed to (1) control the spread of groundwater contaminated with concentrations of TCE above USEPA's MCL, (2) treat the TCE-contaminated groundwater, and (3) monitor contaminant response to remediation. Data collected through the RI process indicate that the pump-and-treat system at RSA-142 (OU-10) is not adequately reducing the level of TCE in groundwater. Additionally, perchlorate has been detected in the water samples. The Army is considering additional groundwater treatment to meet their clean-up goals.

The Nature and Extent of Contamination at MSFC-Controlled Sites

MSFC has identified five major groundwater plumes in the rubble zone beneath MSFC. Contaminants include various metals, VOCs, and SVOCs. Groundwater data for MSFC is listed in Appendix A, Table 2. Table 2 provides the maximum concentration of contaminants detected above applicable health-based comparison values together with the OU at which the contaminant was detected.

MSFC installed an air stripper for treatment and removal of VOC's in the southwest plume located at OU-11, but has been removed from operation at EPA's request because the sample data demonstrated the engineering technology was no longer required.

The overall groundwater contamination strategy at MSFC includes two principal aims: (1) relatively short-term source controls for mass removal of subsurface contamination, and (2) long-term monitoring to demonstrate the beneficial effects of natural attenuation on groundwater quality. The groundwater assessment and remediation strategy involves the assessment of groundwater plumes, implementation of pilot studies to evaluate the effectiveness of innovative technologies on source areas, and long-term monitoring for natural attenuation.

The Army will continue to provide its residents and employees with safe drinking water from RSA's water system. The Safe Drinking Water Act requires RSA to test its drinking water regularly for organics (which include pesticides, VOCs, SVOCs, and PCBs) and inorganics (which include metals and radiologic components). Since groundwater is not currently used as a water supply source, direct contact (ingestion and dermal contact) with groundwater is not likely. **There is no public health hazard associated with the contaminants in the on-site groundwater at RSA.**

Evaluation of Off-Site Groundwater Contamination

Due to the nature of the aquifer underlying RSA and the surrounding area, sampling evidence indicates that groundwater from RSA is migrating toward the installation boundary. MSFC has conducted dye trace studies as part of their RI process to assess the bedrock groundwater flow patterns. The study has indicated that MSFC's Northeast plume extends beyond the boundary of MSFC and beneath the RSA OU-5. In addition, in 1996 MSFC conducted a water use survey both to identify water use within a 5-mile radius of the MSFC boundary and to determine if groundwater beneath MSFC could contaminate neighboring wells. The 1996 water use survey, in conjunction with the 1975 Geological Survey of Alabama study, indicates that no potable water supply wells are hydraulically recharged from groundwater beneath MSFC.

The Army has not fully characterized the path and extent of groundwater contamination migrating from Army sites southeast of OU-10. In 1994, the Army conducted dye tracer studies and has several ongoing studies to track the flow of groundwater at the Arsenal. This study suggested that groundwater flows in multiple directions, the general flow being in a southerly direction. The Army conducted a thermal infrared flyover in February 1999 to aid in the

characterization of the hydrogeology of the area. The flyover indicated that on-site groundwater may be discharging into an unnamed creek located between OU-10 and a housing development known as English Village. To determine if site-related contaminants have migrated offsite, the Army has collected surface water samples and sediment samples from the creek, and has installed several off-site groundwater monitoring wells in and outside of OU-10 and collected soil samples from the neighboring residential properties. No samples collected outside the unnamed creek have detected contaminants above baseline values.

The majority of residents surrounding RSA receive their drinking water from municipal water supply systems, such as the Huntsville Utilities or Madison County Water Works. The City of Huntsville and the County of Madison have passed ordinances that prohibit the installation of private wells within the city limits. While no direct evidence suggested that residents are receiving their drinking water from private wells, ADPH evaluated the data for both scenarios.

The Safe Drinking Water Act requires public suppliers to test their water regularly for organics (which includes pesticides, VOCs, SVOCs, and PCBs), inorganics (which includes metals), and radiologic components. All of the public water suppliers in Madison County test their production wells or springs either on a quarterly or annual basis. Should a contaminant be detected above its MCL, the supplier is required to switch to an alternative drinking water source or purify the contaminated water and to notify its customers. Madison County public water supplies are tested and meet safe drinking water standards. **Based on the available data, there is no public health hazard associated with the contaminants in the groundwater off-site the RSA because there are no exposures to contaminated groundwater.**

Evaluation of On-site Soil Contamination

The Nature and Extent of On-Site Soil Contamination at Army-Controlled Sites

The Army has collected surface soil and subsurface soil samples from OU-1, OU-2, OU-3, OU-5, OU-6a, OU-6b, OU-6d, OU-7, OU-8, OU-10, OU-15, and OU-18, at a total of 65 sites. Elevated levels of metals were detected in soil and sediment in the area. Data from the surface soil and subsurface soil samples indicate that various metals, solvents, VOCs, SVOCs, PAHs, PCBs, and pesticides exceed health-based comparison values. In addition, the samples were analyzed for a number of chemicals that lack applicable health-based comparison values. Appendix A, Tables 3 and 4 identify, for the Army controlled sites, those chemicals detected above health-based comparison values and those chemicals lacking applicable comparison values.

The Army has completed one Removal Action (RSA-130) addressing soil contamination. The purpose of the removal action was to remove contaminated soil and sediment surrounding an inactive septic tank. The septic tank and related sediment and soil were removed in September 1997.

The Nature and Extent of On-Site Soil Contamination at MSFC-Controlled Sites

MSFC has collected surface soil and subsurface soil samples from OU-1, OU-2, OU-5, OU-6, OU-7, OU-8, OU- 9, OU-10, at a total of 68 sites. Data from the surface soil and subsurface soil samples indicate that various metals, solvents, VOCs, SVOCs, PAHs, PCBs, and pesticides exceeded health-based comparison values. In addition, the samples were analyzed for a number of chemicals that lack applicable health-based comparison values. Appendix A, Tables 5 and 6 identify, for MSFC-controlled sites, those chemicals detected above health-based comparison values and those chemicals lacking applicable comparison values.

Exposure to contaminants in soil usually occurs in the top several inches (0-3"). It is unlikely that people would come into contact with contaminants located at greater depths. Worker exposure or exposure by on-site residents (e.g., military personnel and their family members) to contaminated subsurface soil at the Army or MSFC sites is not likely. Even if adults or children access the areas with contaminated surface soils, they are likely to have only brief and/or infrequent contact with surface soil. Adverse non-cancerous or cancerous health effects would not be expected from such exposures. **A readily accessible pathway of exposure between the public and contaminated subsurface soils does not exist at RSA. ADPH presently considers the contaminants in the soils to pose no public health hazard.**

Evaluation of On-Site Surface Water Contamination

The Nature and Extent of Contamination at Army-Controlled Sites

The Army has collected surface water and sediment samples from OU-2, OU-3, OU-4, OU-5, OU-6a, OU-6b, OU-6d, OU-7, OU-10, OU-11, OU-12, OU-15, OU-17, and OU-18, at a total of 41 sites. MSFC has collected surface water and sediment samples from OU-1, OU-2, OU-5, OU-6, OU-7, OU-8, and OU-10, at a total of 29 sites. Data from the surface water and sediment samples indicate that various metals, VOCs, SVOCs, PAHs, and pesticides exceed health-based comparison values. In addition, the samples were analyzed for a number of chemicals that lack applicable health-based comparison values. Appendix A, Tables 7 and 8 identify, for the Army controlled sites, those chemicals detected above health-based comparison values and those chemicals lacking applicable comparison values.

The Army has implemented IRSs at three sites with contaminated surface water and sediment: the closed arsenic waste pond-north (OU-6b, RSA-139), the closed arsenic waste ponds-south (OU-6b, RSA-56), and the closed arsenic waste lagoons-area F (OU-5, RSA-49). In 1995 clay caps were placed on the closed arsenic waste pond-north and the closed arsenic waste pond-south. A clay cap was placed over the closed arsenic waste lagoons-area F (OU-5, RSA-49) in 1997. In addition, the Army has completed a removal action at the inactive radiographic lab septic tank at building 7345 (RSA-130). The purpose of the removal action was to remove contaminated soil and sediment surrounding an inactive septic tank. In September 1997 the septic tank and related sediment and soil were removed.

The Nature and Extent of Contamination at MSFC-Controlled Sites

MSFC has collected surface water and sediment samples from OU-1, OU-2, OU-5, OU-6, OU-7, OU-8, and OU-10, at a total of 29 sites. Data from the surface water and sediment samples indicate that various metals, VOCs, SVOCs, PAHs, and pesticides exceeded health-based comparison values. In addition, the samples were analyzed for a number of chemicals that lack applicable health-based comparison values. Appendix A, Tables 9 and 10 identify those chemicals detected above health-based comparison values, and those chemicals lacking applicable comparison values for the MSFC-controlled sites.

In OU-1, MSFC has implemented the following IRAs: the west test area deluge pond (MSFC-004), the east area liquid waste pond (MSFC-009), and the uncontained drainage pathways-southeast section of the east test area (MSFC-063). MSFC has also implemented actions in OU-2, the industrial sewer site (MSFC-052). In OU-3 a groundwater air stripper has been installed, but it was turned off at the request of the EPA. The MSFC-004 pond has been lined and the area is posted “No Fishing.” MSFC has removed PCB-contaminated sediment from the uncontained drainage pathways-southeast section of the test area and completed a fish harvest of PCB-contaminated fish. They have posted “No Fishing” signs around the industrial sewer outfall area and Indian Creek (MSFC-052). They also have removed PCB-contaminated soils at the industrial sewer outfall ditch and PCB-contaminated sediment from the industrial sewer.

Regardless of the level of contamination in surface water and sediment, a pathway of exposure would exist only if people were exposed to surface water and sediment at the areas of concern. None of the sites with contaminated surface water and or sediment are located near military housing or recreational areas. The majority of the Army and MSFC controlled sites with contaminated surface water sediment have restricted access, thereby limiting human contact. Worker exposure or exposure by on-site residents (military personnel and their family members) to contaminated surface water and/or sediment at the Army or MSFC sites is not likely. Even if adults or children access the areas with contaminated surface water and/or sediment, they are likely to have only brief and/or infrequent contact. Such exposures would not be expected to result in adverse health effects. Future land use for sites that are un-remediated would need to be evaluated based on specific conditions present at that time. **Because of the limited potential for exposure, ADPH considers the contaminants in the surface water to pose no public health hazard.**

Evaluation of Air Contamination

Air sampling data were not available for evaluation for this report. There are areas on the installation that have the potential to pose a public health hazard if disturbed by excavation or construction that would damage the soil and aerosolize some contaminants. The RSA Environmental Office has implemented land use control measures that minimize exposure to the public and maintenance personnel. **ADPH considers that no public health hazard is posed via air pathways.**

Evaluation of On-Site Physical Hazards

Investigations have been conducted at various Army-controlled and MSFC-controlled sites to identify the presence of unexploded ordnance. Buried ordnance from World War II has been identified on both MSFC-controlled and Redstone controlled property. A field screen for buried ordnance is conducted in areas where known or potential ordnance activities occurred before work begins in these areas.

In 1994, a non-intrusive survey was conducted at the inactive Madkin Mountain Rock Quarry (OU-4), a large inactive water-filled limestone rock quarry located on the south side of Madkin Mountain. This quarry received tons of waste materials after World War II. The survey identified sealed drums, inert Navy MK6 mines, unexploded ordnance, and household debris at the quarry bottom. Two discrete piles of debris are also located along the southeastern side of the quarry. The larger of the two piles, which is visible above the water line, consists of discarded gas mask canisters. The smaller of the two large piles, visible only during periods of low water, consists of large charcoal canisters. Both canister piles are thought to have been discarded from a former mustard facility at RSA. The inactive Madkin Mountain Rock Quarry (RSA 114) is closed to fishing and personnel. The U.S. Army has installed a fence completely surrounding the quarry and posted signs to warn the public (fishermen, swimmers and divers) of the presence of physical hazards. RSA plans to drain and remove the ordnance and drums of vesicant as part of their site management plan as funds are made available.

In 1990 metal waste and buried ordnance (a canister, a bomb, rockets, shells, warheads, a projectile, chemical munitions, and metal containers for storage of chemicals) were discovered during test pit excavations in the central portion of the Inactive Toxic Chemical Disposal Area (OU-15). The majority of chemicals were reportedly disposed of in trenches and open pits in the central portion of the site and along the eastern, southern, and western margins of the site.

The Army has installed a fence completely surrounding the Inactive Toxic Chemical Disposal Area and posted signs on the fence to warn trespassers (people who may walk through or recreate in these areas) of the presence of unexploded ordnance which could pose a physical hazard.

Health Outcome Data

Health outcome data (HOD) record certain health conditions that occur in populations. These data can provide information on the general health of communities living near a hazardous waste site. They can also provide information on patterns of specified health conditions. Some examples of health outcome databases are tumor registries, birth defects registries, and vital statistics. Information from local hospitals and other health care providers also may be used to investigate patterns of disease in a specific population. ADPH and ATSDR evaluate appropriate and available health outcome data when there is a completed exposure pathway or community concern. The ADPH reviewed Alabama Statetwide Cancer Registry data in response to

community concerns. However, due to the lack of completed exposure pathways, further review of health outcome data has not been required.

CHILD HEALTH CONSIDERATIONS

ADPH recognizes that infants and children may experience greater exposure, and sensitivity, to environmental contaminants or hazards than adults in communities faced with contamination of their water, soil, air, or food. Reasons for this include (1) children are more likely to be exposed to certain media (e.g., soil or surface water) because they play and eat outdoors (2) children are shorter than adults, which means that they can breathe dust, soil, and vapors closer to the ground (3) children are smaller than adults, thus childhood exposure results in higher doses of chemical exposure per body weight. Children can sustain permanent damage if they are exposed to toxic substances during critical growth stages. ADPH is committed to evaluating children's special interests at sites such as Redstone Army Garrison.

ADPH evaluated the likelihood that children living on Redstone Army Garrison could have been, or could be, exposed to contaminants at levels of health concern. ADPH did not identify any situations in which children have been, or were likely to be, exposed to chemical contaminants at levels posing a health concern. It is unlikely that the children would have come in contact with other on-site contaminated media because these sites are not in close proximity to RSA residential housing and access to sites is restricted.

CONCLUSION

Based on available environmental data, ADPH has identified no completed exposure pathways through which people would likely come in contact with site contaminants and therefore concludes that Redstone Army Garrison poses no public health hazard.

PUBLIC HEALTH ACTION PLAN

The PHAP is designed to ensure that this public health assessment not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from potential exposure to hazardous substances associated with the site. The public health actions for the RSA are as follows:

Completed Actions

- The Army has implemented several actions at various sites. Three surface impoundment areas (RSA-139, RSA-56, and RSA-49) were capped to control the source of contamination and prevent further migration of contaminants. A soil vapor extraction system was installed to remove trichloroethylene (TCE) from the soil and control further migration of contaminants (RSA-14). Three pump-and-treat systems were installed to control the spread of groundwater contaminated

with TCE at concentrations above the MCL, to treat the contaminated groundwater, and to monitor contaminant response to remediation (RSA-10, RSA-13, and RSA-142). In addition, the Army removed an inactive septic tank and the surrounding contaminated soil and sediment in 1997 (RSA-130).

- NASA has installed a liner at MSFC-004. PCB contaminated fish were removed from MSFC-009. PCB contaminated sediment was removed from MSFC-063 and MSFC-052. NASA conducted tests of groundwater remediation technologies.
- RSA has consulted with the state fish and game office and revised their hunting and fishing maps to restrict access to areas where physical hazards exist. These areas are posted and monitored by military police.
- ADPH will continue to issue fish consumption advisories to ensure that the public remains alert to the hazards of eating fish from the installation or in areas possibly affected by runoff from the installation. Currently, several of the water bodies are on the fish consumption advisory list. ADPH will advise the public if new fish tissue data are evaluated.

Ongoing Actions

- RSA and MSFC are currently conducting remedial actions as part of their solid waste management plans. Both entities will continue to collect and analyze samples to ensure the safety of residents on and surrounding the Arsenal. The ADPH will continue to monitor and assist as necessary.

Planned Actions

- RSA will continue to monitor surface water and ground water samples between OU-10 (English Village and Whitesburg Estates) and the unnamed creek to determine the extent of contamination offsite. Additionally, the Army plans to install more off-site groundwater monitoring wells near OU-10 and collect soil samples from the neighboring residential properties in order to evaluate the groundwater and possibly exclude vapor intrusion as an exposure pathway.
- NASA plans to monitor PCB levels in the sediment at MSFC-052 and in the fish at MSFC-009. NASA plans to test technologies from groundwater cleanup.
- Due to the presence of unexploded ordinance (UXO), the Army plans to drain the Madkin Mountain Rock Quarry (RSA-114) and remove UXO and debris from the Inactive Toxic Chemical Disposal Area (RSA-070).
- The Army plans to retrofit the pump-and-treat systems to remove perchlorate from the groundwater in OU-10.

- ADPH, will review data generated by the off-site environmental studies conducted by the Army and modify or recommend public health actions as needed.

Actions Recommended

The ADPH recommends RSA and MSFC continue with their work plan. ADPH will continue to visit the installation and assist as necessary, and evaluate all new data developed.

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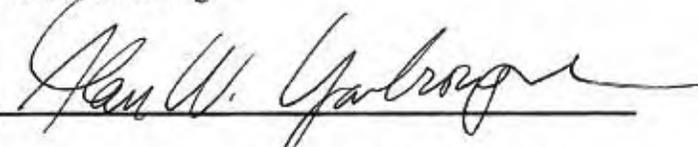
CERTIFICATION

This Public Health Assessment for Redstone Army Garrison/Marshal Space Flight Center Square Public Health Assessment was prepared by the Alabama Department of Public Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodologies and procedures existing at the time the health consultation was initiated.



Technical Project Officer, CAT, SPAB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.



Team Lead, CAT, SPAB, DHAC, ATSDR

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APPENDIX A: TABLES 1-11

Table 1 - Groundwater Contamination Detected at Army-Controlled Sites

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-1	Benzene	79	1 5	CREG MCL
	Lead	40	15	EPA Action Level
OU-2	Antimony	7.8	3 6	LTHA MCL
	Arsenic	77	0.02 50	CREG MCL
	bis(2-Ethylhexyl)phthalate	43.4	4.8	RBC
	Bromodichloromethane	2.8	0.6	CREG
	Cadmium	70	7 5	Chronic EMEG Adult MCL
	Chromium	626	100 100	LTHA MCL
	Dibromochloromethane	1.1	0.13	RBC
	Lead	117	15	EPA Action Level
	Manganese	1300	200	RMEG Adult
	Mercury	4.3	2	MCL
	Nickel	190	100 100	LTHA MCL
	Thallium	38.3	0.4 2	LTHA MCL
Vanadium	3040	100	Intermediate EMEG Adult	
OU-5	Arsenic	620	0.02 50	CREG MCL
	Bromodichloromethane	1	0.6	CREG
	Cadmium	60	7 5	Chronic EMEG Adult MCL
	Carbon Tetrachloride	18	0.3 5	CREG MCL
	alpha-Chlordane	0.055	None	
	gamma-Chlordane	0.055	0.03 2	CREG MCL
	Chloroform	7	6	CREG
	Chromium	360	100 100	LTHA MCL
	Dibromochloromethane	1	0.13	RBC

Table 1 - Groundwater Contamination Detected at Army-Controlled Sites, (Cont).

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-5	1,2,-Dichloroethane	1	0.4 5	CREG MCL
	1,1-Dichloroethene	13	0.6 7	CREG MCL
	1,2-Dichloroethene	1100	55	RBC
	Lead	160	15	EPA Action Level
	Manganese	1650	200	RMEG Adult
	Mercury	2800	2	MCL
	Methylene chloride	41	5 5	CREG MCL
	Napthalene	29	20	LTHA
	Nickel	345	100 100	LTHA MCL
	Tetrachloroethene	13	0.7 5	CREG MCL
	1,1,2-Trichloroethane	1	0.6 5	CREG MCL
	Trichloroethene	18	3 5	CREG MCL
	Vinyl Chloride	1	0.7 2	Chronic EMEG Adult MCL
OU-6a	Aldrin	5.4	0.002	CREG
	Arsenic	151	0.02 50	CREG MCL
	Benzene	199	1 5	CREG MCL
	Beryllium	250	70 4	RMEG Adult MCL
	alpha-BHC	32	0.006	CREG
	beta-BHC	0.78	0.2	CREG
	delta-BHC	0.16	None	
	bis(2-Chloroethoxy)methane	5	None	
	bis(2-Chloroethyl)ether	5	0.03	CREG
	bis(2-Ethylhexyl)phthalate	9	4.8	RBC
	Bromodichloromethane	23	0.6	CREG
	4-Bromophenyl phenyl ether	5	None	

Table 1 - Groundwater Contamination Detected at Army-Controlled Sites, (Cont).

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-6a (continued)	Cadmium	180	7 5	Chronic EMEG Adult MCL
	Carbon tetrachloride	520	0.3 5	CREG MCL
	Chlordane, Technical	0.21	None	
	Chloride	8900	None	
	Chlorobenzene	40400	100 100	LTHA MCL
	Chloroethane	48	3.6	RBC
	2-Chloroethyl vinyl ether	1	None	
	Chloroform	132000	6	CREG
	4-Chloro-3-methylphenol	10	None	
	2-Chlorophenol	404	40	LTHA
	4-Chlorophenyl phenyl ether	5	None	
	Chromium	940	100 100	LTHA MCL
	Chrysene	160	0	MCLG
	Copper	1600	1300	MCLG
	4,4'-DDD	300	0.1	CREG
	4,4'-DDE	250	0.1	CREG
	4,4'-DDT	1800	0.1	CREG
	Dibromochloromethane	1	0.13	RBC
	3,3'-Dichlorobenzidine	5	0.08	CREG
	1,2-Dichloroethane	36	0.4 5	CREG MCL
	1,1-Dichloroethene	49	0.06 7	CREG MCL
	cis-1,2-Dichloroethene	9.7	7 7	LTHA MCL
	cis-1,3-Dichloropropene	23	None	
	Dieldrin	0.1	0.002	CREG
	4,6-Dinitro-2-methylphenol	10	3.7	RBC
	1,2-Diphenylhydrazine	5	0.04	CREG

Table 1 - Groundwater Contamination Detected at Army-Controlled Sites, (Cont).

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-6a	Heptachlor	0.5	0.008 0.4	CREG MCL
	Heptachlor Epoxide	0.03	0.004 0.02	CREG MCL
	Hexachlorobenzene	5	0.02 1	CREG MCL
	Hexachlorobutadiene	5	0.4	CREG
	Hexachloroethane	5	3	CREG
	Lead	1200	15	EPA Action Level
	Lindane	11	0.2 0.2	LTHA MCL
	Manganese	8980	200	RMEG Adult
	Mercury	131	2	MCL
	Methylene chloride	89	5 5	CREG MCL
	Nickel	3500	100 100	LTHA MCL
	n-Nitrosodimethylamine	5	0.0007	CREG
	2-Nitrophenol	10	None	
	Pentachlorophenol	10	0.3 1	CREG MCL
	Sulfate	9000	100 100	LTHA MCL
	2,3,7,8-TCDD	5	None	
	1,1,2,2-Tetrachloroethane	19	1	CREG
	Tetrachloroethene	23	0.7 5	CREG MCL
	Thallium	8.6	0.4 2	LTHA MCL
	1,1,2-Trichloroethane	62	0.6 5	CREG MCL
Trichloroethene	251	3 5	CREG MCL	

Table 1 - Groundwater Contamination Detected at Army-Controlled Sites, (Cont).

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-6a (continued)	2,4,6-Trichlorophenol	10	3	CREG
	Vinyl chloride	9.9	0.7 2	Chronic EMEG Adult MCL
	Zinc	24000	2000	LTHA
OU-6b	Arsenic	913	0.02 50	CREG MCL
	Benzene	8.6	1 5	CREG MCL
	Benzo(a)pyrene equivalent concentration	1.26	0.005 0.2	CREG MCL
	bis(2-Ethylhexyl)phthalate	9	4.8	RBC
	Bromodichloromethane	1	0.6	CREG
	Cadmium	8.4	7 5	Chronic EMEG Adult MCL
	Carbon tetrachloride	1.6	0.3 5	CREG MCL
	2-Chloroethyl vinyl ether	1	None	
	Chloroform	8.3	6	CREG
	Chromium	264	100 100	LTHA MCL
	Dibromochloromethane	1	0.13	RBC
	1,2-Dichloroethane	2.9	0.4 5	CREG MCL
	1,1-Dichloroethene	3.2	0.06 7	CREG MCL
	Lead	76.7	15	EPA Action Level
	Manganese	1580	200	RMEG Adult
	Methylene chloride	22	5 5	CREG MCL
	1,1,2-Tetrachloroethane	0.27	1	CREG
1,1,2,2-Tetrachloroethane	4.3	1	CREG	

Table 1 - Groundwater Contamination Detected at Army-Controlled Sites, (Cont).

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-6b (continued)	Trichloroethene	52	3 5	CREG MCL
	Vanadium	305	100	Intermediate EMEG Adult
	Vinyl chloride	660	0.7 2	Chronic EMEG Adult MCL
OU-6c	Arsenic	244	0.02 50	CREG MCL
	Benzene	47	1 5	CREG MCL
	Bromoform	54	4	CREG
	Cadmium	170	7 5	Chronic EMEG Adult MCL
	Chlorobenzene	1100	100 100	LTHA MCL
	Chromium	1690	100 100	LTHA MCL
	Dibromochloromethane	146	0.13	RBC
	1,2-Dichloroethane	994	0.4 5	CREG MCL
	1,1-Dichloroethene	30	0.6 7	CREG MCL
	trans-1,3-Dichloropropene	5	None	
	Lead	269	15	EPA Action Level
	Napthalene	60	20	LTHA
	Tetrachloroethene	3	0.7 5	CREG MCL
	Trichloroethene	11	3 5	CREG MCL
	Vinyl Chloride	46	0.7 2	Chronic EMEG Adult MCL

Table 1 - Groundwater Contamination Detected at Army-Controlled Sites, (Cont).

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-6d	Arsenic	460	0.02 50	CREG MCL
	bis(2-Ethylhexyl)phthalate	67	None	
	Cadmium	40	7 5	Chronic EMEG Adult MCL
	Chloroform	39	6	CREG
	Chromium	990	100 100	LTHA MCL
	1,1-Dichloroethene	0.52	0.06 7	CREG MCL
	Lead	600	15	EPA Action Level
	Mercury	30	2	MCL
	Manganese	3120	200	RMEG Adult
	Nickel	360	100 100	LTHA MCL
	Trichloroethene	9.9	3 5	CREG MCL
	Vanadium	606	100	Intermediate EMEG Adult
	Zinc	2200	2000	LTHA
OU-7	Aldrin	0.06	0.002	CREG
	Arsenic	62.8	0.02 50	CREG MCL
	alpha-BHC	0.14	0.006	CREG
	beta-BHC	7.1	0.02	CREG
	delta-BHC	0.073	None	
	bis(2-Chloroethyl)ether	6.9	0.03	CREG
	bis(2-Ethylhexyl)phthalate	9.7	4.8	RBC
	Bromodichloromethane	6.7	0.6	CREG
	Cadmium	8.25	7 5	Chronic EMEG Adult MCL
	Carbon tetrachloride	13	0.3 5	CREG MCL
	Chloroform	17	6	CREG

Table 1 - Groundwater Contamination Detected at Army-Controlled Sites, (Cont).

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-7 (continued)	1-Chloro-3-nitrobenzene	14	None	
	2-Chlorophenol	74	40	LTHA
	Chromium	396	100 100	LTHA MCL
	4,4'-DDD	0.43	0.1	CREG
	4,4'-DDE	14	0.1	CREG
	4,4'-DDT	29	0.1	CREG
	Dibromochloromethane	2.1	0.13	RBC
	1,2-Dichloroethane	1.4	0.4 5	CREG MCL
	1,1-Dichloroethene	2.3	0.06 7	CREG MCL
	cis-1,2-Dichloroethene	140	7 7	LTHA MCL
	Dieldrin	0.019	0.002	CREG
	Heptachlor epoxide	0.28	0.004 0.2	CREG MCL
	Lead	7000	15	EPA Action Level
	Manganese	9620	200	RMEG Adult
	Methylene Chloride	57	5 5	CREG MCL
	Nickel	334	100 100	LTHA MCL
	RDX	1.2	0.16	RBC
	Tetrachloroethene	3.6	0.7 5	CREG MCL
	Thallium	7.2	0.4 2	LTHA MCL
	Thiodiglycol	0.03	None	
1,1,2-Trichloroethane	0.93	0.6 5	CREG MCL	
Trichloroethene	1400	3 5	CREG MCL	
Vanadium	820	100	Intermediate EMEG Adult	
Vinyl Chloride	3	0.7 2	Chronic EMEG Adult MCL	

Table 1 - Groundwater Contamination Detected at Army-Controlled Sites, (Cont).

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-8	2-Amino-4,6-dinitrotoluene	0.28	None	
	Arsenic	94.8	0.02 50	CREG MCL
	Benzene	34	1 5	CREG MCL
	bis(2-Ethylhexyl)phthalate	19	4.8	RBC
	Cadmium	8.4	7 5	Chronic EMEG Adult MCL
	Chloromethane	6.8	3	LTHA
	Chloroform	310	6	CREG
	1-Chloro-3-nitrobenzene	9.8	None	
	Chromium	265	100 100	LTHA MCL
	1,2-Dichloroethane	0.82	0.4 5	CREG MCL
	1,1-Dichloroethene	0.1	0.06 7	CREG MCL
	Hexachloroethane	5.7	3	CREG
	Lead	95.2	15	EPA Action Level
	Manganese	4840	200	RMEG Adult
	Mercury	9.16	2	MCL
	Nickel	242	100 100	LTHA MCL
	1,4-Oxathiane	8	None	
	Tetrachloroethene	16	0.7 5	CREG MCL
	Thallium	1.8	0.4 2	LTHA MCL
	Trichloroethene	27	3 2	CREG MCL
Vanadium	304	100	Intermediate EMEG Adult	
Vinyl Chloride	3.2	0.7 2	Chronic EMEG Adult MCL	
White Phosphorus	6000	0.1	LTHA	

Table 1 - Groundwater Contamination Detected at Army-Controlled Sites, (Cont).

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-10	Antimony	61	3 6	LTHA MCL
	Arsenic	410	0.02 50	CREG MCL
	Benzene	500	1 5	CREG MCL
	Beryllium	440	70 4	RMEG Adult MCL
	bis(2-Ethylhexyl)phthalate	210	4.8	RBC
	Bromodichloromethane	6	0.6	CREG
	Bromoform	500	4	CREG
	Bromomethane	1000	10	LTHA
	Cadmium	360	7 5	Chronic EMEG Adult MCL
	Carbon tetrachloride	56	0.3 5	CREG MCL
	Chlorobenzene	500	100 100	LTHA MCL
	Chloroform	41	6	CREG
	Chloromethane	1000	3	LTHA
	Chromium	8100	100 100	LTHA MCL
	Copper	2000	1300	MCLG
	Dibromochloromethane	500	0.13	RBC
	1,1,-Dichloroethene	9500	0.06 7	CREG MCL
	1,2,-Dichloroethene	1100	55	RBC
	cis-1,2-Dichloroethene	350	70 70	LTHA MCL
	trans-1,2-Dichloroethene	1300	100 100	LTHA MCL
	cis-1,3-Dichloropropene	5	None	
Heptachlor	0.028	0.008 0.4	CREG MCL	
Lead	2300	15	EPA Action Level	
Manganese	80700	200	RMEG Adult	
Mercury	18	2	MCL	

Table 1 - Groundwater Contamination Detected at Army-Controlled Sites, (Cont).

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-10	Methylene Chloride	7500	5 5	CREG MCL
	Nickel	3900	100 100	LTHA MCL
	2-Nitrophenol	5.4	None	
	Styrene	500	100 100	LTHA MCL
	Tetrachloroethene	500	0.7 5	CREG MCL
	Thallium	29	0.4 2	LTHA MCL
	1,1,1-Trichloroethane	59000	200 200	LTHA MCL
	1,1,2-Trichloroethane	1.8	0.6 5	CREG MCL
	Trichloroethene	770000	3 5	CREG MCL
	2,4,6-Trinitrotoluene	1.7	1	CREG
	Vanadium	9620	100	Intermediate EMEG Adult
	Vinyl Chloride	61	0.7	Chronic EMEG Adult
	Zinc	9000	2000	LTHA
	OU-11	Aldrin	0.052	0.002
Arsenic		32.2	0.5 50	CREG MCL
beta-BHC		0.58	0.02	CREG
gamma-Chlordane		0.092	0.03 2	CREG MCL
Chloroform		4100	6	CREG
Chromium		451	100 100	LTHA MCL
1,2-Dichloroethane		190	0.4 5	CREG MCL
1,1-Dichloroethene		0.77	0.06 7	CREG MCL
Dieldrin		0.064	0.002	CREG
Lead		66.3	15	EPA Action Level
Manganese		7720	200	RMEG Adult

Table 1 - Groundwater Contamination Detected at Army-Controlled Sites, (Cont).

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-11 (continued)	Methylene Chloride	1300	5 5	CREG MCL
	Tetrachloroethene	8	0.7 5	CREG MCL
	Trichloroethene	4.8	3 5	CREG MCL
	Thallium	4.6	0.4 2	LTHA MCL
	Vanadium	964	100	Intermediate EMEG Adult
	Vinyl Chloride	10	0.7 2	Chronic EMEG Adult MCL
OU-12	Antimony	27	3 6	LTHA MCL
	Arsenic	1.4	0.5 50	CREG MCL
	Bromodichloromethane	2.2	0.6	CREG
	Chloroform	7.9	6	CREG
	Dibromochloromethane	0.46	0.13	RBC
	1,2,-Dichloroethane	3.1	0.4 5	CREG MCL
	1,1,2,2-Tetrachloroethane	2	1	CREG
	Trichloroethene	10	3 5	CREG MCL
	White Phosphorus	890	0.1	LTHA
OU-13	Arsenic	1.8	0.5 50	CREG MCL
	bis(2-Ethylhexyl)phthalate	8	4.8	RBC
	2-Chloroethyl vinyl ether	5	None	
	Trichloroethene	9	3 5	CREG MCL
	Vinyl chloride	3.3	0.7 2	Chronic EMEG Adult MCL

Table 1 - Groundwater Contamination Detected at Army-Controlled Sites, (Cont).

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-14	Antimony	9.8	3 6	LTHA MCL
	Arsenic	53	0.5 50	CREG MCL
	Benzene	576	1 5	CREG MCL
	bis(2-Chloroethoxy)methane	7	None	
	bis(2-Ethylhexyl)phthalate	9	4.8	RBC
	Bromomethane	1900	10	LTHA
	Cadmium	42.6	7 5	Chronic EMEG Adult MCL
	Carbon Tetrachloride	18	0.3 5	CREG MCL
	Chloride	4300	None	
	Chlorobenzene	159	100	LTHA
	Chloroform	5290	6	CREG
	Chloromethane	7	3	LTHA
	Chromium	240	100 100	LTHA MCL
	1,2-Dichloroethane	38	0.4 5	CREG MCL
	1,1-Dichloroethene	3420	0.06 7	CREG MCL
	1,2-Dichloroethene	15000	55	RBC
	Lead	175	15	EPA Action Level
	Manganese	18200	200	RMEG Adult
	Methylene Chloride	1260	5 5	CREG MCL
	Sulfate	14000	100 100	LTHA MCL
1,1,2,2-Tetrachloroethane	160	1	CREG	
Tetrachloroethene	860	0.7 5	CREG MCL	
Thallium	6.7	0.4 2	LTHA MCL	

Table 1 - Groundwater Contamination Detected at Army-Controlled Sites, (Cont).

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-14	1,1,1-Trichloroethane	1930	200 200	LTHA MCL
	1,1,2-Trichloroethane	68	0.6 5	CREG MCL
	Trichloroethene	98600	3 5	CREG MCL
	2,4,6-Trichlorophenol	121	3	CREG
	Vanadium	293	100	Intermediate EMEG Adult
	Vinyl chloride	1010	0.7 2	Chronic EMEG Adult MCL
OU-15	Aldrin	0.2	0.002	CREG
	Antimony	50	3 6	LTHA MCL
	Arsenic	330	0.02 50	CREG MCL
	Barium	2200	2000 2000	LTHA MCL
	Benzene	13	1 5	CREG MCL
	Cadmium	180	7 5	Chronic EMEG Adult MCL
	Carbon Tetrachloride	6000	0.3 5	CREG MCL
	Chloroform	315	6	CREG
	Chromium	640	100 100	LTHA MCL
	4,4'-DDT	1.01	0.1	CREG
	Dibromochloromethane	255	0.13	RBC
	1,2-Dichloroethane	6.2	0.4 5	CREG MCL
	1,1-Dichloroethene	80	0.06 7	CREG MCL
	1,2-Dichloroethene	840	55	RBC
	Dieldrin	0.46	0.002	CREG
	Lead	388	15	EPA Action Level
	Lindane	0.22	0.2 0.2	LTHA MCL
	Manganese	6600	200	RMEG Adult

Table 1 - Groundwater Contamination Detected at Army-Controlled Sites, (Cont).

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-15	Mercury	8.1	2	MCL
	Methylene Chloride	89	5 5	CREG MCL
	Nickel	430	100 100	LTHA MCL
	1,4-Oxathiane	37	None	
	1,1,2,2-Tetrachloroethane	5000	1	CREG
	Tetrachloroethene	630	0.7 5	CREG MCL
	1,1,2-Trichloroethane	314	0.6 5	CREG MCL
	Trichloroethene	8600	3 5	CREG MCL
	Vanadium	730	100	Intermediate EMEG Adult
	Vinyl Chloride	5	0.7 2	Chronic EMEG Adult MCL
OU-17	Arsenic	35	0.02 50	CREG MCL
	bis(2-Ethylhexyl)phthalate	5.6	4.8	RBC
	Benzene	270	1 5	CREG MCL
	1-Chloro-3-nitrobenzene	16	None	
	1,2-Dichloroethane	0.49	0.4 5	CREG MCL
	Manganese	443	200	RMEG Adult
	1,1,2-Trichloroethane	0.65	0.6 5	CREG MCL
	Trichloroethene	180	3 5	CREG MCL
White Phosphorus	1.37	0.1	LTHA	

Table 1 - Groundwater Contamination Detected at Army-Controlled Sites, (Cont).

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-18	Antimony	40.6	3 6	LTHA MCL
	Arsenic	370	0.02 50	CREG MCL
	bis(2-Ethylhexyl)phthalate	3.5	4.8	RBC
	Bromodichloromethane	0.64	0.6	CREG
	Cadmium	80.8	7 5	Chronic EMEG Adult MCL
	Chromium	914	100 100	LTHA MCL
	1,2-Dichloroethane	2.2	0.4 5	CREG MCL
	Lead	756	15	EPA Action Level
	Manganese	43700	200	RMEG Adult
	Mercury	73.1	2	MCL
	Methylene Chloride	6.4	5 5	CREG MCL
	Mustard Gas	0.07	None	
	Nickel	3870	100 100	LTHA MCL
	Silver	1190	100	LTHA
	Tetrachloroethene	2	0.7 5	CREG MCL
	Thallium	5.4	0.4 2	LTHA MCL
	Thiodiglycol	0.31	None	
	Vanadium	2280	100	Intermediate EMEG Adult
Zinc	10900	0.7 5	CREG MCL	

CREG: Cancer Risk Evaluation Guide

MCL: EPA's Maximum Contaminant Level

RBC: EPA Region III Risk-Based Concentrations for tap water

Chronic EMEG Adult: ATSDR's Chronic Environmental Media Evaluation Guide for adults

Intermediate EMEG Adult: ATSDR's Intermediate Environmental Media Evaluation Guide for adults

LTHA: EPA's Lifetime Health Advisory for drinking water

RMEG Adult: Reference Dose Media Evaluation Guide for adults

Table 2 - Groundwater Contamination Detected at MSFC-Controlled Sites

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-3	Acetone	5200	4000	RMEG Adult
	1,1-Dichloroethene	432	0.06 7	CREG MCL
	cis-1,2-Dichloroethene	4900	70 70	LTHA MCL
	Dieldrin	0.04	0.002	CREG
	Lead	17.2	15	
	Manganese	5110	200	RMEG Adult
	Methylene Chloride	510	5 5	CREG MCL
	Nickel	233	100 100	LTHA MCL
	1,1,1,2-Tetrachloroethane	2.5	0.2	CREG
	Tetrachloroethene	21200	0.7 5	CREG MCL
	Trichloroethene	65000	3 5	CREG MCL
	Vinyl Chloride	73	0.7 2	Chronic EMEG Adult MCL
OU-3	Benzene	530	1 5	CREG MCL
	Bromodichloromethane	3.5	0.6	CREG
	Cadmium	13.9	7 5	Chronic EMEG Adult MCL
	Carbon Tetrachloride	79600	0.3 5	CREG MCL
	Chloroform	7380	6	CREG
	Chloromethane	3.7	3	LTHA
	1,1-Dichloroethene	13.5	0.06 7	CREG MCL
	1,2-Dichloroethene (total)	958	55	RBC
	cis-1,2-Dichloroethene	220	70 70	LTHA MCL

Table 2 - Groundwater Contamination Detected at MSFC-Controlled Sites, (Cont).

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-3	Dibromochloromethane	13	0.13	RBC
	Lead	62.8	15	EPA Action Level
	Manganese	8050	200	RMEG Adult
	Manganese (Dissolved)	1280	200	RMEG Adult
	Methylene Chloride	6	5 5	CREG MCL
	Nickel	348	100 100	LTHA MCL
	tert-Butyl methyl ether	3.2	None	
	1,1,2,2-Tetrachloroethane	2680	0.2	CREG
	Tetrachloroethene	6	0.7 5	CREG MCL
	Trichloroethene	3800	3 5	CREG MCL
	Vinyl Chloride	11.8	0.7 2	Chronic EMEG Adult MCL
	OU-3	Antimony	17.8	3 6
Arsenic		4.4	0.02 50	CREG MCL
Bromodichloromethane		1	0.6	CREG
Carbon Tetrachloride		16	0.3 5	CREG MCL
Chloride		11700	None	
Chloroethane		380	3.6	RBC
Chloroform		19.2	6	CREG
Chromium		142	100 100	LTHA MCL
1,1-Dichloroethene		47	0.06 7	CREG MCL

Table 2 - Groundwater Contamination Detected at MSFC-Controlled Sites, (Cont).

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-3	1,2-Dichloroethene (total)	3900	55	RBC
	cis-1,2-Dichloroethene	3900	70 70	LTHA MCL
	Ethane	1476670000	None	
	Ethene	4546800	None	
	Lead	51.3	15	EPA Action Level
	Manganese	8190	200	RMEG Adult
	Manganese (Dissolved)	9950	200	RMEG Adult
	Methylene Chloride	43	5 5	CREG MCL
	Nitrite	1410	1000	MCL
	Sulfide	140	None	
	1,1,2,2-Tetrachloroethane	38.5	0.2	CREG
	Tetrachloroethene	28	0.7 5	CREG MCL
	Trichlorethene	44000	3 5	CREG MCL
	Vinyl Chloride	609	0.7 2	Chronic EMEG Adult MCL

CREG: Cancer Risk Evaluation Guide

MCL: EPA's Maximum Contaminant Level

RBC: EPA Region III Risk-Based Concentrations for tap water

Chronic EMEG Adult: ATSDR's Chronic Environmental Media Evaluation Guide for adults

Intermediate EMEG Adult: ATSDR's Intermediate Environmental Media Evaluation Guide for adults

LTHA: EPA's Lifetime Health Advisory for drinking water

RMEG Adult: Reference Dose Media Evaluation Guide for adults

Table 3 - Subsurface Soil Contamination Detected at Army-Controlled Sites

Operable Unit	Contaminant	Maximum Concentration (ppm)	Comparison Value	
			Concentration (ppm)	Reference
OU-2	Mercury	1.8	None	
	1,1,2,2-Tetrachloroethane	72.7	4	CREG
OU-5	Benzo(a)pyrene equivalent concentration	28.54	0.1	CREG
	Mercury	3.7	None	
OU-6a	Benzo(a)pyrene equivalent concentration	17.41	0.1	CREG
	Bromoform	96	90	CREG
	4-Chloro-3-methylphenol	2.6	None	
	2-Chloroethyl vinyl ether	1.68	None	
	4,4'-DDD	40	3	CREG
	4,4'-DDE	17	2	CREG
	4,4'-DDT	750	2	CREG
	Dibromodichloromethane	70	7.6	RBC (Residential Soil)
	3,3'-Dichlorobenzidine	2.4	2	CREG
	Endosulfan sulfate	0.19	None	
	Mercury	2.8	None	
	2-Methylnaphthalene	9	None	
	n-Nitroso-di-n-propylamine	1.6	0.091	RBC (Residential Soil)
	1,1,2,2,-Tetrachloroethane	72.7	4	CREG
	OU-6b	Arsenic	89.1	0.5
1,1,2,2,-Tetrachloroethane		4.3	4	CREG
OU-6c	Benzo(a)pyrene equivalent concentration	5.39	0.1	CREG
	Mercury	4	None	
	1,1,2,2-Tetrachloroethane	4.83	4	CREG
OU-6d	Benzo(a)pyrene equivalent concentration	37.67	0.1	CREG
	Mercury	2.9	None	
OU-7	Benzo(a)pyrene equivalent concentration	61.36	0.1	CREG
	1-Chloro-3-nitrobenzene	14	None	
	4,4'-DDD	9.1	None	
	4,4'-DDT	8.3	None	
	Endrin aldehyde	0.0045	None	
	Endosulfan sulfate	0.0022	None	

Table 3 - Subsurface Soil Contamination Detected at Army-Controlled Sites (Cont.)

Operable Unit	Contaminant	Maximum Concentration (ppm)	Comparison Value	
			Concentration (ppm)	Reference
OU-7	Mercury	9.4	None	
	Tetryl	0.044	0.032	RBC (Residential Soil)
	Thiodiglycol	0.26	None	
OU-8	1-Chloro-3-nitrobenzene	13	None	
	Mercury	3.7	None	
	1,1,2,2-Tetrachloroethane	79	4	CREG
OU-10	Endosulfan sulfate	0.017	None	
OU-12	Endosulfan sulfate	0.0039	None	
	Mercury	1.2	None	
	n-Nitroso-di-n-propylamine	2.1	0.1	CREG
OU-13	Arsenic	93	0.5	CREG
OU-14	Arsenic	80	0.5	CREG
	1,1-Dichloroethene	16	1	CREG
	Methylene chloride	1100	85	RBC (Residential Soil)
	PETN	22.3	None	
OU-15	Mercury	1.7	None	
OU-17	1-Chloro-3-nitrobenzene	12	None	
OU-18	Thiodiglycol	0.17	None	

CREG: Cancer Risk Evaluation Guide

RBC: EPA Region III Risk-Based Concentrations for residential soil

Table 4 - Surface Soil (0-12") Contamination Detected at Army-Controlled Sites

Operable Unit	Contaminant	Maximum Concentration (ppm)	Comparison Value	
			Concentration (ppm)	Reference
OU-2	Endosulfan sulfate	0.0099	None	
	Endrin ketone	0.0047	None	
OU-5	Aroclor 1260	9.2	0.32	RBC (Residential Soil)
	Arsenic	90.5	0.5	CREG
	Benzo(a)pyrene equivalent concentration	1.75	0.1	CREG
	4,4'-DDD	8.9	3	CREG
	4,4'-DDE	8.7	2	CREG
	4,4'-DDT	87	2	CREG
	Mercury	15.1	None	
OU-6a	Aldrin	0.06	0.04	CREG
	Arsenic	23.1	0.5	CREG
	Benzo(a)pyrene equivalent concentration	0.72	0.1	CREG
	4,4'-DDD	4.9	3	CREG
	4,4'-DDE	3.9	2	CREG
	4,4'-DDT	4.7	2	CREG
	Dieldrin	0.05	0.04	CREG
	Endosulfan sulfate	0.00158	None	
	Mercury	300	None	
	2-Methylnaphthalene	24	None	
OU-6b	Benzo(a)pyrene equivalent concentration	1.85	0.1	CREG
	Mercury	1770	None	
OU-6d	Aroclor 1254	62	10	Chronic EMEG adult
	Mercury	2.9	None	
OU-7	4-Chloro-3-methylphenol	0.45	None	
	1-Chloro-3-nitrobenzene	13	None	
	Mercury	0.2	None	
	n-Nitroso-di-n-propylamine	0.25	0.1	CREG

Table 4 - Surface Soil (0-12") Contamination Detected at Army-Controlled Sites (Cont.)

Operable Unit	Contaminant	Maximum Concentration (ppm)	Comparison Value	
			Concentration (ppm)	Reference
OU-8	1-Chloro-3-nitrobenzene	9.4	None	
	Endosulfan sulfate	0.0014	None	
	Lead	958	400	IEUBK
	Mercury	17.7	None	
	Thiodiglycol	0.005	None	
OU-10	Benzo(a)pyrene equivalent concentration	0.14	0.1	CREG
	Endosulfan sulfate	0.00089	None	
	Mercury	52.7	None	
OU-12	Endrin aldehyde	0.0034	None	
	Endosulfan sulfate	0.0012	None	
OU-14	4-Amino-2,6-dinitrotoluene	1.9	None	
	4-Chloro-3-methylphenol	0.034	None	
OU-15	Benzo(a)pyrene equivalent concentration	1.88	0.1	CREG
	1-Chloro-3-nitrobenzene	12	None	
	Mercury	1.06	None	
	PETN	18	None	
OU-17	1-Chloro-3-nitrobenzene	12	None	
	Endrin aldehyde	0.0029	None	
OU-18	4,4'-DDT	3.3	2	CREG
	Mercury	3.9	None	

CREG: Cancer Risk Evaluation Guide

RBC: EPA Region III Risk-Based Concentrations for residential soil

IEUBK: Integrated Exposure-Uptake Biokinetic Model

Table 5 - Subsurface Soil Contamination Detected at MSFC-Controlled Sites

Operable Unit	Contaminant	Maximum Concentration (ppm)	Comparison Value	
			Concentration (ppm)	Reference
OU-1	Aroclor 1260	18	0.32	RBC (Residential Soil)
	4-Chloro-3-methylphenol	0.094	None	
OU-2	Arsenic	85.4	0.5	CREG
	Carbon Tetrachloride	200	5	CREG
	Lead	1650	400	IEUBK
	Mercury	1.3	None	
	1,1,2,2-Tetrachloroethane	76	4	CREG
	Trichloroethene degraders	1192	None	
OU-10	Methapyrilene	0.13	None	

CREG: Cancer Risk Evaluation Guide

RBC: EPA Region III Risk-Based Concentrations for residential soil

IEUBK: Integrated Exposure-Uptake Biokinetic Model

Table 6 - Surface Soil (0-12") Contamination Detected at MSFC-Controlled Sites

Operable Unit	Contaminant	Maximum Concentration (ppm)	Comparison Value	
			Concentration (ppm)	Reference
OU-1	Aroclor 1260	28	0.32	RBC (Residential Soil)
OU-2	Aroclor 1260	3.3	0.32	RBC (Residential Soil)
OU-6	alpha-Chlordane	0.34	None	
	Aroclor 1260	0.33	0.32	RBC (Residential Soil)
	Chlordane	4.8	0.5	CREG
OU-8	Aroclor 1260	34	0.32	RBC (Residential Soil)
OU-10	Chloride	46.5	None	

CREG: Cancer Risk Evaluation Guide

RBC: EPA Region III Risk-Based Concentrations for residential soil

IEUBK: Integrated Exposure-Uptake Biokinetic Model

Table 7 - Surface Water Contamination Detected at Army-Controlled Sites

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-5	Arsenic	5.2	0.02 50	CREG MCL
	bis(2-Ethylhexyl)phthalate	27	4.8	RBC
OU-6b	Arsenic	41.7	0.02 50	CREG MCL
	Bromodichloromethane	2.4	0.6	CREG
	Cadmium	7.1	7 5	Chronic EMEG Adult MCL
	Dibromochloromethane	0.62	0.13	RBC
	Thallium	12.4	0.4 2	LTHA MCL
OU-6d	Arsenic	1.9	0.02 50	CREG MCL
	Manganese	968	200	RMEG Adult
	Thallium	3.47	0.4 2	LTHA MCL
OU-8	Arsenic	3.6	0.02 50	CREG MCL
	Carbon Tetrachloride	0.41	0.3	CREG
	Thallium	4.2	0.4 2	LTHA MCL
OU-10	Arsenic	14	0.02 50	CREG MCL
	bis(2-Ethylhexyl)phthalate	3.9	4.8	RBC
	Cadmium	7.1	7 5	Chronic EMEG Adult MCL
	1,1,-Dichloroethene	110	0.06 7	CREG MCL
	1,2,-Dichloroethene	490	55	RBC
	Manganese	395	200	RMEG Adult
	Tetrachloroethene	1.4	0.7 5	CREG MCL
	1,1,1-Trichloroethane	380	200 200	LTHA MCL
	Trichloroethene	4600	3 5	CREG MCL
	Thallium	8.69	0.4 2	LTHA MCL
	Vinyl Chloride	3.1	0.7	Chronic EMEG Adult

Table 7 - Surface Water Contamination Detected at Army-Controlled Sites (Cont.)

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-11	Arsenic	7.7	0.5 50	CREG MCL
	Bromodichloromethane	1.1	0.6	CREG
	Dibromochloromethane	0.25	0.13	RBC
	1,2,-Dichloroethane	7.1	0.4 5	CREG MCL
	Dieldrin	0.1	0.002	CREG
	Manganese	3390	200	RMEG Adult
	Thallium	8.69	0.4 2	LTHA MCL
OU-12	Manganese	351	200	RMEG Adult
OU-15	4,4'-DDT	0.19	0.1	CREG
	Heptachlor	0.07	0.008 0.04	CREG MCL
	Manganese	924	200	RMEG Adult
	Methylene Chloride	7	5 5	CREG MCL
OU-18	Arsenic	3.8	0.02 50	CREG MCL
	Bromodichloromethane	4.1	0.6	CREG
	Cadmium	6.1	7 5	Chronic EMEG Adult MCL
	Chloroform	7.9	6	CREG
	Dibromochloromethane	3.1	0.13	RBC
	Thallium	6.4	0.4 2	LTHA MCL

CREG: Cancer Risk Evaluation Guide

MCL: EPA's Maximum Contaminant Level

RBC: EPA Region III Risk-Based Concentrations for tap water

Chronic EMEG Adult: ATSDR's Chronic Environmental Media Evaluation Guide for adults

LTHA: EPA's Lifetime Health Advisory for drinking water

RMEG Adult: Reference Dose Media Evaluation Guide for adults

Table 8 - Sediment Contamination Detected at Army-Controlled Sites

Operable Unit	Contaminant	Maximum Concentration (ppm)	Comparison Value	
			Concentration (ppm)	Reference
OU-2	Aroclor 1260	0.382	0.32	RBC (Soil Residential)
	Benzo(a)pyrene equivalent concentration	60.5	0.1	CREG
	4,4'-DDT	2.07	2	CREG
	delta-BHC	0.0038	None	
	Mercury	5.5	None	
OU-4	Mercury	0.56	None	
OU-5	Benzo(a)pyrene equivalent concentration	0.25	0.1	CREG
	Mercury	0.13	None	
OU-6a	Mercury	0.207	None	
OU-6b	Mercury	3	None	
OU-6d	Benzo(a)pyrene equivalent concentration	0.25	0.1	CREG
	1-Chloro-3-nitrobenzene	11	None	
	Mercury	0.2	None	
OU-7	1-Chloro-3-nitrobenzene	11	None	
	Enosulfan Sulfate	0.0013	None	
	Mercury	1.5	None	
OU-10	Aroclor 1248	0.79	None	
	Mercury	0.21	None	
OU-12	Thallium	3.5	None	
OU-15	Mercury	0.15	None	
OU-17	Mercury	0.088	None	
OU-18	Arsenic	9.5	0.5	CREG
	Benzo(a)pyrene equivalent concentration	122.73	0.1	CREG
	Mercury	0.12	None	

CREG: Cancer Risk Evaluation Guide

RBC: EPA Region III Risk-Based Concentrations for residential soil

Table 9 - Surface Water Contamination Detected at MSFC-Controlled Sites

Operable Unit	Contaminant	Maximum Concentration (ppb)	Comparison Value	
			Concentration (ppb)	Reference
OU-1	Carbon Tetrachloride	5	0.3	CREG
	Dibromochloromethane	3	0.13	RBC
	Manganese	671	200	RMEG Adult
	1,1,2,2-Tetrachloroethane	1	0.2	CREG
	Thallium	3.4	0.4 2	LTHA MCL
	Trichloroethene	55	3 5	CREG MCL
	Vinyl Chloride	3	0.7	Chronic EMEG Adult
OU-2	Aroclor 1260	1.9	0.033	RBC
OU-6	Bromodichloromethane	3	0.6	CREG
	Cadmium	11.4	7 5	Chronic EMEG Adult MCL
	Dibromochloromethane	1	0.13	RBC
	Lead	119	15	EPA Action Level
OU-7	Dibromochloromethane	2	0.13	RBC
	Lead	38.5	15	EPA Action Level
OU-8	Aroclor 1260	3.5	0.033	RBC
	Bromodichloromethane	12	0.6	CREG
	Tetrachloroethene	3	0.7 5	CREG MCL

CREG: Cancer Risk Evaluation Guide

MCL: EPA's Maximum Contaminant Level

MCLG: EPA's Maximum Contaminant Level Goal for drinking water

RBC: EPA Region III Risk-Based Concentrations for tap water

Chronic EMEG Adult: ATSDR's Chronic Environmental Media Evaluation Guide for adults

LTHA: EPA's Lifetime Health Advisory for drinking water

RMEG Adult: Reference Dose Media Evaluation Guide for adults

Table 10 - Sediment Contamination Detected at MSFC-Controlled Sites

Operable Unit	Contaminant	Maximum Concentration (ppm)	Comparison Value	
			Concentration (ppm)	Reference
OU-1	Aroclor 1260	0.44	0.32	RBC (Residential Soil)
	Chloride	200	None	
	Lead	3820	400	IEUBK
	2,2'-oxybis(1-Chloropropane)	0.059	None	
OU-2	Aroclor 1260	380	0.32	RBC (Residential Soil)
OU-5	Mercury	14.4	None	
OU-6	Aroclor 1260	0.14	0.32	RBC (Residential Soil)
	alpha-Chlordane	0.022	None	
OU-8	Aroclor 1260	49	0.32	RBC (Residential Soil)
	Arsenic	174	0.5	CREG
	Lead	488	400	IEUBK

CREG: Cancer Risk Evaluation Guide

RBC: EPA Region III Risk-Based Concentrations for residential soil

IEUBK: Integrated Exposure-Uptake Biokinetic Model

Table 11 - Fish Contamination Detected at MSFC-Controlled Sites

Operable Unit	Contaminant	Maximum Concentration (ppm)	Comparison Value	
			Concentration (ppm)	Reference
OU-1	Aroclor 1254	7.6	3	FDA
OU-2	Aroclor 1260	7	3	FDA

FDA: Food and Drug Administration

APPENDIX B: TABLES 12-13

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
Operable Unit 1			
RSA-143 Petroleum-Contaminated Soil Site - South of Building 3240	This site was an area designated for the expansion of a service station.	Groundwater: Benzene and lead were detected at concentrations above CVs.	Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.
Operable Unit 2			
RSA-5 Inactive Waste Accumulation Area, RSA Motor Pool	This site stored drums for 10 years on the bare ground. The drums were filled with lube oils, paints, thinners, antifreeze, used oil filters, and RSAs. Usage was discontinued in 1989.	Surface Soil: Endosulfan sulfate and endrin ketone were detected and lack applicable CVs. Groundwater: Various metals were detected at concentrations above CVs (or were detected and lack applicable CVs).	Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and the area is inaccessible to the public. Exposure is unlikely. Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.
RSA-8 Inactive Sewage Treatment Plant 4	This site was Sewage Treatment Plant 4. The plant treated sewage and wastewater (floor wash water from some of the research labs and motor pools, and water separated by the oil/water separators located in the area) from the northern portion of RSA. Specific wastes handled here were organic- and metal-contaminated liquids and sludge. There were two underground diesel storage tanks on site which have been removed.	Sediment: Various PAHs, mercury, gamma-chlordane, and delta-BHC were detected at concentrations above CVs (or were detected and lack applicable CVs). Surface Soil: Mercury was detected and lacks an applicable CV. Groundwater: Various metals, VOCs, SVOCs were detected at concentrations above CVs (or were detected and lack applicable CVs).	Sediment: <i>No public health hazard</i> exists. The area is inaccessible to the public. Exposure is unlikely. Surface Soil: <i>No public health hazard</i> exists. The area is inaccessible to the public. Exposure is unlikely. Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>RSA-45 Removed Underground Storage Tank at Building 3775</p>	<p>This was an underground waste oil storage tank at Building 3775. The tank was there from 1971 to 1990. It had a capacity of 8,000 gallons and was used for temporary storage of waste lubrication and fuel oil generated during maintenance activities at and in the vicinity of Building 3775. Specific types of waste managed at the site included flammable as well as organic- and metal-contaminated liquids. Upon removal, stick tests indicated minor leakage occurred and the soil was excavated.</p>	<p>Sediment: Aroclor 1260, mercury, and various PAHs were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various metals and SVOCs were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Sediment: <i>No public health hazard</i> exists. The site is no longer in use and the area is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>RSA-48 Inactive Closed Sanitary Landfill</p>	<p>From 1947 to the early 1950s, this site was a sanitary landfill and rubble fill. The fill is currently covered with a thin layer of soil, grasses, small trees, and thick briars.</p>	<p>Subsurface Soil: Mercury, 1,1,2,2-tetrachloroethane and various PAHs were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Surface Soil: Mercury was detected and lack an applicable CV.</p> <p>Groundwater: Various metals were detected at concentrations above CVs or were detected and lack applicable CVs.</p>	<p>Subsurface Soil: <i>No public health hazard</i> exists. No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and the area is inaccessible to the public. Exposure to contaminated surface soil is unlikely.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>RSA-D Paint Shed (3547)/Paint Storage Shed (TS6)</p>	<p>The facility is fenced, locked, and secure. The paint shed is approximately 12 feet by 20 feet with a concrete floor and is used for spray painting. The paint storage shed (TS-6) is approximately 8 feet by 8 feet and was used for storing paint, Freon, acetone, and aerosols.</p>	<p>Sediment: Various PAHs and pesticides were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Sediment: <i>No public health hazard</i> exists. The area is inaccessible to the public. Exposure by workers is likely to be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
Operable Unit 3			
<p>RSA-47 Former Chemical Training Facility</p>	<p>This site was a chemical training facility. Live agents, including mustard and nerve agents were used until 1985. Training was conducted at the end of the gravel strips inside cement catch basins, which contained nested (multiple) impermeable liners. The site is currently being used as a chemical training area and live agents are no longer used.</p>	<p>Surface Water: Various metals and SVOCs were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Surface Water: <i>No public health hazard</i> exists. Exposure to contaminants in surface water is unlikely. Any exposure to surface water would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p>
Operable Unit 4			
<p>RSA-114 Inactive Madkin Mountain Rock Quarry</p>	<p>This is the inactive Madkin Mountain limestone rock quarry. After the quarry was closed in the mid-1940s, tons of surplus materials (e.g., soldier gas mask canisters, mustard gas chemical production plant filters) were dumped in the quarry. Large piles of debris are visible above the surface of the water. There are two big visible piles: one pile consists of gas mask canisters, and the other of large industrial charcoal canisters. The site is fenced, posted and patrolled.</p> <p>These measures deter most individuals from gaining access to the site.</p>	<p>Sediment: 1-Chloro-3-nitrobenzene and mercury were detected and lack applicable CVs.</p>	<p>Surface Soil: <i>No public health hazard</i> exists. The area is not accessible to the public. Exposure is likely to be infrequent if any. Such exposure would not be expected to result in adverse health effects.</p> <p>However, the presence of unexploded ordnance could pose a physical hazard to people who may swim, dive, or scuba dive in the quarry. The Army installed a fence completely surrounding the Quarry and posted signs on the fence warning of the presence of unexploded ordnance in the area.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
Operable Unit 5			
<p>RSA-49 Closed Arsenic Waste Lagoons</p>	<p>RSA-49 consists of three closed and capped unlined industrial waste lagoons, formerly used for the disposal of arsenic-contaminated waste generated from lewisite manufacturing operations during the early 1940s. Two manufacturing lines were located in the area south of RSA-49. This area is presently used as a parking lot for a temporary building (permanent trailer). The lagoons were covered and re-vegetated in 1977. The site underwent interim remedial actions to correct drainage and to install a RCRA cap concurrently with the feasibility study. The cap extends beyond the lagoon berms, and the existing groundwater will be grouted in place. The site was cleared of vegetation. The interface of the stream and cap was impermeably lined with heavy gauge geotextile fabric and rip-rapped.</p>	<p>Sediment: Various PAHs were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Subsurface Soil: Mercury and various PAHs were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Surface soil: Mercury and various PAHs were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Surface Water: Various metals and SVOCs were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various VOCs, SVOCs, pesticides, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Sediment: <i>No public health hazard</i> exists. The site has been remediated and is currently used as a parking lot.</p> <p>Subsurface Soil: <i>No public health hazard</i> exists. The site has been remediated and is currently used as a parking lot.</p> <p>Surface Soil: <i>No public health hazard</i> exists. The site has been remediated and is currently used as a parking lot.</p> <p>Surface Water: <i>No public health hazard</i> exists. The site has been remediated.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>MSFC-27 Former M-1 Waste Accumulation Area</p>	<p>MSFC-27 was a waste accumulation area. Prior to 1959, the unit included several large above-ground storage tanks (60,000 + gallon). The tanks were removed before 1959. During the period between 1960 and 1987 this site was used for storage of scrap metals, waste oils, solvents, and sludges.</p>	<p>Surface Soil: Mercury, 4,4-DDD, 4,4-DDE, and 4,4-DDT were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various VOCs and metals were detected at concentrations above their applicable CVs.</p>	<p>Surface Soil: <i>No public health hazard</i> exists. The area is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
Operable Unit 6a			
<p>RSA-10 Closed Sanitary Landfill</p>	<p>RSA-10 is the closed unlined sanitary landfill. The closed sections of RSA-10 include the sanitary waste disposal trenches to the south and southeast, and a 1-acre closed used oil pits area to the north. The closed sanitary landfill occupies approximately 30 acres and is comprised of unlined covered trenches. The landfill operated from 1973 to 1991. It received household and administrative wastes. In separate areas from the sanitary waste, friable asbestos, dried wastewater sludge, hospital infectious waste, construction debris, rubble, and incineration ash from RSA-13 and RSA-14 were placed in trenches and covered. The sanitary landfill was closed in the early 1990s. The used oil pits were closed in 1982.</p>	<p>Sediment: Various pesticides were detected and lack applicable CVs.</p> <p>Subsurface soil: Various VOCs, SVOCs, and PAHs were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Surface soil: Mercury and various PAHs and pesticides were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various VOCs, SVOCs, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Sediment: <i>No public health hazard</i> exists. The site is no longer in use and the area is inaccessible to the public. Exposure is unlikely.</p> <p>Subsurface Soil: <i>No public health hazard</i> exists. No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and the area is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
RSA-53 inactive Sanitary & Industrial Landfill	This is an inactive sanitary and industrial waste unlined landfill. The landfill was active from 1963 to 1973 and received household, administrative, sanitary, and industrial wastes. In the northern area of the site are several closed waste oil pits, and a closed acid pit. Refuse in the trenches was covered by a soil layer less than five feet thick.	<p>Subsurface soil: Mercury and various VOCs, SVOCs, and pesticides were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various VOCs, SVOCs, pesticides, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Subsurface Soil: <i>No public health hazard</i> exists. No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
RSA-60 Inactive Sanitary & Industrial Landfill	RSA-60 is a closed unlined landfill, sometimes referred to as "the old sanitary landfill." It is characterized by several covered disposal trenches, running northeast-southwest, and a closed used oil disposal pit. It is down gradient of the former pesticide manufacturing plant. The landfill was active from 1963 to 1968, and received household, administrative, sanitary, and industrial wastes. Used oil was disposed into unlined clay pits south of the trenches. Pesticide was also buried throughout the site.	<p>Subsurface soil: Mercury and various VOCs and pesticides were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Surface soil: Mercury, arsenic, aldrin, 4,4-DDD, 4,4-DDE, and 4,4-DDT were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various VOCs, SVOCs, pesticides, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Subsurface Soil: <i>No public health hazard</i> exists. No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and the area is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
MSFC-74 Inactive Disposal Site - East Test Area	MSFC-74 is a former disposal area probably used from approximately 1949 to 1954. The area was presumably used for disposal of construction debris. Storm water runoff would likely drain to the east toward the active sanitary landfill (RSA-10). Currently, the unit is approximately 2 acres and is covered with trees and vegetation.	<p>Groundwater: Various VOCs, SVOCs, and metals were detected at concentrations above their applicable CVs.</p>	<p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>RSA-57 Former Lewisite Drum Storage Yard</p>	<p>This was the former lewisite drum storage yard. Lewisite, a chemical warfare agent, was produced at the site of RSA-122, and was stored at RSA-57 either as a manufactured product or as lewisite raw material in aboveground drums inside a bermed area during the early 1940s. The lagoon was partially filled in. The site is approximately 250 feet long and 75 feet wide, and sustains a growth of small pine trees and thick briars.</p>	<p>Subsurface Soil: 1,1,2,2-tetrachloroethane was detected at a concentration above its applicable CV.</p> <p>Surface soil: Mercury was detected and lacks an applicable CV.</p> <p>Groundwater: Various VOCs, SVOCs, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Subsurface Soil: <i>No public health hazard</i> exists. No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>RSA-122 Dismantled Lewisite Manufacturing Plant</p>	<p>RSA-122 is a dismantled lewisite manufacturing plant site. The plant operated during the 1940s. Currently, the area is vegetated with grass and small pine trees in the former northern plant area, and the former southern plant area is used as an active asphalt parking lot.</p>	<p>Sediment: Mercury was detected and lacks an applicable CV.</p> <p>Surface soil: Various PAHs were detected at concentrations above their applicable CV.</p> <p>Surface Water: Various VOCs were detected at concentrations above CVs (or were detected and lack applicable CVs)</p> <p>Groundwater: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Sediment: <i>No public health hazard</i> exists. Exposure to contaminants in sediment is unlikely. Any exposure to sediment would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Surface Soil: <i>No public health hazard</i> exists. Exposure to contaminants in surface soil is unlikely. Any exposure to surface soil would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Surface Water: <i>No public health hazard</i> exists. Exposure to contaminants in surface water is unlikely. Any exposure to surface water would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>RSA-126 Inactive Open Burn Trench</p>	<p>RSA-126 was the inactive open burn trench, about 400 feet long, 5 feet wide, and 2 feet deep. This site is an open narrow trench located in a utility easement with some standing water. No information is available on use or period of operation.</p>	<p>Have not received any sampling data.</p>	<p>None</p>
<p>Operable Unit 6c</p>			
<p>RSA-54/55 Closed Sanitary & Industrial Landfill</p>	<p>These adjacent sites are inactive sanitary and industrial waste landfills. The landfills are comprised of trenches which were used to dispose of wastes. The waste lies buried in shallow covered trenches and the area is grassed. Between 1968 and 1973, pesticides and pesticide-contaminated soil and debris were disposed of at the site.</p>	<p>Subsurface Soil: Mercury, 1,1,2,2-tetrachloroethane, and various PAHs were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various VOCs, SVOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Subsurface Soil: <i>No public health hazard</i> exists. No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
Operable Unit 6d			
<p>RSA-59 Inactive Closed Construction Rubble Fill</p>	<p>This site is a closed unlined landfill previously used for disposal of rubble, construction debris, and industrial waste. The site was active from the 1940s to the mid-1970s. Originally, the site was a fill borrow area for early construction activities (e.g. roads, railroads, buildings). Later, RSA-59 received construction rubble, metal debris, railroad ties, and concrete slabs from demolitions. The site is adjacent to the dismantled liquid caustic manufacturing plant (RSA-117) and 1950s-era aerial photographs indicate that RSA-59 may have been used as an industrial wastewater discharge basin.</p>	<p>Subsurface soil: Mercury, bis(2-ethylhexyl)phthalate, and various PAHs and pesticides were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Surface soil: Mercury was detected and lacks an applicable CV.</p> <p>Surface Water: Various metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Subsurface Soil: <i>No public health hazard exists.</i> No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Surface Soil: <i>No public health hazard exists.</i> The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Surface Water: <i>No public health hazard exists.</i> The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>RSA-104 Inactive ISP Wastewater Discharge Ditch</p>	<p>RSA-104 was a wastewater drainage ditch used from approximately 1949 to 1978. The unit was used for the diversion of industrial wastewater containing iron from iron carbonyl manufacturing process away from the ISP facility. Soluble wastes have drained from the ditch; insoluble wastes and some higher concentrations of soluble wastes may still be in place throughout the drainage system. Currently, the area is covered with grass.</p>	<p>Soil: Soil samples collected were analyzed for VOCs and metals. None were detected above CVs.</p>	<p>Soil: <i>No public health hazard exists.</i></p>
<p>RSA-118 Inactive ISP Industrial Discharge Lagoon</p>	<p>RSA-118 was a former holding pond for discharges of wastewater containing ammonia generated by ISP, Inc. operations from approximately 1949 to the mid-1980s. Soluble wastes have drained from the lagoon to Huntsville Spring Branch. This unit ceased operation in the mid-1980s.</p>	<p>Groundwater: Various VOCs, SVOCs, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>RSA-E No. 2 Fuel Oil Spill-TK 5693, Fuel Farm</p>	<p>RSA-E resulted from a major no. 2 fuel oil spill that occurred in 1985 at a fuel tank farm (see location below). On July 16, 1985, an open, possibly malfunctioning valve, allowed 58,584 gallons of no. 2 fuel oil to leak from an aboveground storage tank. The fuel leaked into a containment basin formed by an earthen berm built around the tank, and approximately 30,000 gallons seeped into the ground. An intercept trench, approximately 300 feet long, 6 to 8 feet wide, and 14 feet deep was excavated to the water table down gradient of the spill. Within eight days, 366,000 gallons of oil/water mixture had been removed. According to facility representative, no fuel was ever detected in the nearby surface water or is down gradient of monitoring wells. It is not know whether or not all of the fuel was recovered.</p>	<p>Groundwater: Oil and grease were detected and lack applicable CVs.</p>	<p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>RSA-F Fenced Open Storage/ laydown Yard 54-1</p>	<p>RSA-F is an open storage area for transformers, stacked empty drums, drums of raw materials including resins and lubricants, scrap metal, scrap appliances, light fixtures, cylinders of gas and oxygen, and miscellaneous equipment. The storage area is fenced and locked. According to facility representatives, scrap materials and equipment are stored for disposition by DRMO. The materials are not considered a “waste” until DRMO has determined the items cannot be sold or recycled. Soil staining was observed on the gravel inside of the fence and on the grass outside of the fence in areas where drums were stored.</p>	<p>Surface Water: Various metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Surface Water: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
Operable Unit 7			
<p>RSA-58 Inactive Rubble Fill & Waste Pile</p>	<p>RSA-58 is an inactive rubble fill and waste pile. The site was used as a disposal area for ashes from demolition operations from 1940 to 1950 and a rubble fill in the 1960s and 1970s. This landfill received incineration ash from demilitarization operations, and rubble (e.g., concrete blocks and slabs, tires, 55-gallon drums, 5-gallon cans, metal debris). It is also suspected that storm-damaged PCB transformers were disposed of at this site.</p>	<p>Sediment: Endosulfan sulfate was detected and lacks an applicable CV.</p> <p>Subsurface soil: Mercury and various PAHs and pesticides were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Surface soil: Arsenic was detected at a concentration above its applicable CV.</p> <p>Groundwater: Various VOCs, SVOCs, pesticides, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Sediment: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Subsurface Soil: <i>No public health hazard</i> exists. No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Surface soil: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>RSA-112 Suspected Former Demilitarization & Disposal Area</p>	<p>RSA-112 is a suspected former demilitarization and disposal site. The center of the area is maintained and vegetated for the power line right-of-way. The northern boundary appears to be a chain link fence in the wooded area beside (and at right angles to) the power line ROW. On the west side of the ROW, there is a long, shallow depression which may have been used as a disposal trench, and on the east side of the ROW, there is a long, elevated (two to three feet) area which may have been used for disposal purposes. The site was active in the 1950s. RSA-112 is believed to have been used for demilitarization and disposal of chemical or conventional ordnance.</p>	<p>Sediment: Arsenic was detected at a concentration above its applicable CV.</p> <p>Subsurface soil: 1-Chloro-3-nitrobenzene was detected and lacks an applicable CV.</p> <p>Surface soil: Mercury, 1-Chloro-3-nitrobenzene, and PETN were detected and lack applicable CVs.</p> <p>Groundwater: Various VOCs, pesticides, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Sediment: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Subsurface Soil: <i>No public health hazard</i> exists. No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>RSA-128 Inactive Mustard Gas Demilitarization Area</p>	<p>RSA-128 is an inactive mustard gas demilitarization site. The site is currently forested and partially under water. It is suspected to have been used for mustard gas munitions demilitarization during the mid to late 1940s.</p>	<p>Sediment: Mercury was detected and lacks an applicable CV.</p> <p>Subsurface soil: Mercury was detected and lacks an applicable CV.</p> <p>Surface soil: Mercury was detected and lacks an applicable CV.</p> <p>Groundwater: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Sediment: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Subsurface Soil: <i>No public health hazard</i> exists. No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>RSA-129 Thiokol Burning Pit/Rocket Washout Area</p>	<p>RSA-129 is an inactive Thiokol burning pit and rocket motor washout pad. The site consists of an unlined concrete pit, unlined earthen settling pond, and an open field with various abandoned structures used to support testing. RSA-129 has been used for a variety of programs, primarily propellant R&D, and has been intermittently active from the late 1950s through 1995. It was originally used as an underwater rocket motor burnout pit. Rocket motors were loaded and bolted in the concrete pit. The pit was filled with water, and the motors were ignited. The water and waste residues were pumped out after each operation. In the 1960s and early 1970s, the site was used for cleaning out defective rocket motor casings. In 1973, the clean out operation ended, and in 1974, the concrete pit was filled and capped with concrete. The pond sediment has never been dredged. The property was turned back to the Army in 1974 and the site was not used. In 1988, Thiokol Corporation re-acquired access for use as an explosives test grounds. It was used to batch-test the detonation and stability properties of manufactured propellant and explosives for safe handling and transporting the final product. By 1995, all production had ceased. Thiokol Corporation vacated the premises in 1996. Access to RSA-129 is by a locked gate. The area is fenced and secured.</p>	<p>Sediment: Endosulfan sulfate was detected and lacks an applicable CV.</p> <p>Subsurface soil: Tetryl was detected at a concentration above its applicable CV.</p> <p>Groundwater: Various VOCs, SVOCs, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Sediment: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Subsurface Soil: <i>No public health hazard</i> exists. No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
RSA-134 Inactive Disposal Trench & Burn Pit	RSA-134 in an inactive disposal trench/open burning pit. Currently, the trench is filled with water, leaves, and floating vegetation. A small earthen berm surrounds the ditch with an opening and surface drainage to the south.	Soil, sediment, surface water, and groundwater samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	<p>Soil: <i>No public health hazard exists.</i></p> <p>Sediment: <i>No public health hazard exists.</i></p> <p>Surface Water: <i>No public health hazard exists.</i></p> <p>Groundwater: <i>No public health hazard exists.</i></p>
Operable Unit 8			
RSA-52 Inactive Munitions Demilitarization & Disposal Area	RSA-52 is an inactive munitions demilitarization and chemical disposal site. It was used in the 1940s and 1950s as a disposal site for chemical munitions, including mustard components and lewisite agents. Disposal operations were conducted in the trenches and on the land surface. The site is fenced and marked with "Keep Out" signs along the northeast portion with the MSFC boundary. The portion within RSA is not fenced. The unit is forested by pines and hardwoods. Trenches are well defined. Metal fragments are evident at the surface in places.	<p>Subsurface Soil: 1-Chloro-3-nitrobenzene was detected and lacks an applicable CV.</p> <p>Surface Soil: 1-Chloro-3-nitrobenzene was detected and lacks an applicable CV.</p> <p>Surface Water: Various metals and VOCs were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various VOCs, SVOCs, explosives, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Subsurface Soil: <i>No public health hazard exists.</i> No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Surface Soil: <i>No public health hazard exists.</i> The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Surface Water: <i>No public health hazard exists.</i> The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>RSA-61 Inactive Munitions Demilitarization & Disposal Area</p>	<p>RSA-61 is an inactive white phosphorus and mustard munitions demilitarization and disposal site used in the 1940s and 1950s. The materials were incinerated in disposal trenches, covered, and the residues remain in place. The trenches were marked with vertical railroad ties and concrete posts and appear devoid of undergrowth. The area appears to have been surface cleared. Vague outlines of covered trenches are visible. The area has been re-vegetated with pine trees.</p>	<p>Subsurface soil: 1-Chloro-3-nitrobenzene and mercury were detected and lack applicable CVs</p> <p>Surface soil: 1-Chloro-3-nitrobenzene, endosulfan sulfate, lead, mercury, tetryl, and thiodiglycol were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various VOCs, explosives, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Subsurface Soil: <i>No public health hazard</i> exists. No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>RSA-62 Inactive Munitions Demilitarization & Disposal Area</p>	<p>RSA-62 is an inactive munitions demilitarization and disposal site used in the 1940s and 1950s. The site was used as a demilitarization and disposal site for white phosphorus and mustard munitions. The materials were incinerated in disposal trenches, covered, and the residues remain in place. The trenches were marked with vertical railroad ties and concrete posts and appear devoid of undergrowth. Vague outlines of covered trenches are visible. The area has been re-vegetated with pine trees.</p>	<p>Subsurface soil: 1-Chloro-3-nitrobenzene was detected and lacks an applicable CV.</p> <p>Surface soil: 1-Chloro-3-nitrobenzene was detected and lacks an applicable CV.</p> <p>Groundwater: Various VOCs, SVOCs, explosives, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Subsurface Soil: <i>No public health hazard</i> exists. No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>RSA-109 Former Chemical Munitions Staging Area</p>	<p>RSA-109 is a former chemical munitions staging area. Aerial photographs, the location of the site, and the visible construction debris present at the site, indicate that RSA-109 may have once been used as a staging area for mustard gas production during the early 1940s, and as a building demolition dump in the late 1940s. Rubble and ceramic charcoal columns from mustard gas operations remain in piles on-site.</p>	<p>Groundwater: Arsenic was detected at a concentration above its applicable CV.</p>	<p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>Operable Unit 9</p>			
<p>RSA-130 Inactive Radiographic Lab Septic Tank at Building 7345</p>	<p>RSA-130 is an inactive radiographic lab septic tank and leach field at building 7345. The septic tank received chemical wash down from film developing including developer, fixers, and treatment solutions from the radiographic lab and x-ray facility.</p>	<p>Soil, sediment and groundwater samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.</p>	<p>Soil: <i>No public health hazard</i> exists. Sediment: <i>No public health hazard</i> exists. Groundwater: <i>No public health hazard</i> exists.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
Operable Unit 10			
RSA-11 Closed Sewage Treatment Plant 1	RSA-11 is the inactive Sewage Treatment Plant Number 1. The site consists of a sewage and wastewater treatment plant. This unit received domestic sewage as well as treated wash water from the RDX/HMX Filtration Units (RSA-76 and RSA-77) in the Thiokol area.	<p>Sediment: Aroclor 1248 was detected and lacks an applicable CV.</p> <p>Surface soil: Mercury was detected and lacks an applicable CV.</p> <p>Surface Water: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Sediment: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Surface Water: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
RSA-83 Paint Spray Booth Sump, Building 7344	The function of the sump was to control excess paint mist emissions from missile spray painting operations. A failing water curtain was utilized to trap excess latex paint during spray painting applications. The water was recirculated through the sump and paint that was collected on the surface of the sump was periodically removed and stored in drums until removal. Drums were transferred to the temporary storage area at Building 7340 and later removed to the hazardous waste storage igloos. Water was subsequently discharged directly to a septic tank and field system.	<p>Groundwater: Various VOCs, SVOCs, pesticides, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
RSA-87/88/89 Inactive Propellant Wastes Storage Pad	RSA-87, 88, and 89 provided temporary waste storage locations near waste generation points either on concrete pads, in sheds, or as designated spaces on asphalt throughout the North and South Plants for 1.1 and 1.3 waste propellants. These units were active from approximately 1981 to early 1990. They are no longer in use and have been replaced or renovated.	<p>Groundwater: Various VOCs were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>RSA-94/95/96/97/98 Chlorinated-Solvent Distillation Units 1-5</p>	<p>These sites are dismantled chlorinated-solvent distillation units 1, 2, 3, 4, and 5. The units were solvent stills used for distillation and recovery of solvent from vapor degreasers located in the Thiokol areas. These units were active trichloroethylene (TCE) solvent stills from 1984 to 1989. In 1989, all but one of the 7 to 8 active vapor degreasers were converted from using TCE to using 1,1,1-(TCA). These units are each approximately five feet tall, three feet wide, three feet deep, and made of steel. These units distilled silicon-contaminated TCE and TCA. They distilled TCE from one degreaser and TCA from the rest of the degreasers. Still bottoms were removed once per year.</p>	<p>Surface soil: Various PAHs were detected at concentrations above their applicable CV.</p> <p>Surface Water: Various metals and VOCs were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various VOCs, SVOCs, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Surface Soil: <i>No public health hazard exists.</i> The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Surface Water: <i>No public health hazard exists.</i> The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>RSA-99 Abandoned Plating Shop Tanks/Sumps (Building 7614)</p>	<p>This site consists of a single story building approximately 30 feet by 15 feet. The building formerly contained plating tanks and two sumps and operated as a small-scale plating shop at the Thiokol Complex. Operations ceased in 1985. The unit was used for plating of rocket motor casings. Several vats are still on-site inside the building. During operation, wastes were discharged to the sumps, one indoors and one outdoors. The outdoor sump, on the east side of the building, drains to the sanitary sewer. The inside sump, located on the east side of the building, was not equipped with a drain and was periodically pumped out.</p>	<p>Surface soil: Mercury was detected and lacks an applicable CV.</p> <p>Groundwater: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Surface Soil: <i>No public health hazard exists.</i> The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>RSA-142 TCE Spill By Thiokol Degreasing Process</p>	<p>RSA-142 is a TCE spill by Thiokol degreasing process. In 1989, Thiokol Corporation representatives reported a valve malfunction on the solvent reclamation still of the degreaser at building 7664. The malfunction resulted in an overflow of chlorinated solvent to a sanitary sewer manhole. According to Thiokol representatives, up to 30 gallons of trichloroethylene were reportedly discharged to the sewer system. Subsequent to the spill, trichloroethylene was detected in the down gradient sanitary sewer line and the sewage treatment plant. In order to clean up the spill, a portable air stripper was installed and operated to treat the residual trichloroethylene in the contaminated sanitary sewer line. The air stripper operated for six months; however, trichloroethylene continued to be intermittently detected at high levels at the sewage treatment plant. In order to isolate the trichloroethylene source, Thiokol abandoned the contaminated sewer line and re-routed all sanitary lines from building 7664. In 1994, the Army initiated an Interim Remedial Action (IRA) to construct a groundwater pump and treat system.</p>	<p>Subsurface soil: Endosulfan sulfate was detected and lacks an applicable CV.</p> <p>Surface soil: Endosulfan sulfate was detected and lacks an applicable CV.</p> <p>Groundwater: Various VOCs, SVOCs, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Subsurface Soil: <i>No public health hazard</i> exists. No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>Operable Unit 11</p>			
<p>RSA-82 Former Sparging Unit Site (Building 7595)</p>	<p>RSA-82 was a propellant sparging tank with a mist eliminator, two condensers, and a condenser receiving tank at Building 7595. The former Sparge Unit was active from 1985 to 1990. This unit was originally located in Building 7595 in the South Plant. Since then, the sparge unit has been relocated to Building 7354 of the North Plant. Building 7595 now serves as a 1.1 pre-mix building.</p>	<p>Groundwater: Various metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>RSA-A Inactive Propellant Storage Wells, South</p>	<p>RSA-A are the inactive propellant storage wells. The propellant storage wells consist of steel, 4-inch diameter pipes, reportedly 30 feet below ground level which are capped on the bottom. The wells extend above the ground approximately one foot and are open. The propellant storage wells were part of Rohm & Haas operations in the 1960s. Experimental explosives or motors were loaded into the 4-inch wells for safety, or were stored until desensitized. The wells still exist and are mostly uncapped; they are now presumably empty.</p>	<p>Sediment: Mercury was detected and lacks an applicable CV.</p> <p>Surface soil: Mercury was detected and lacks an applicable CV.</p> <p>Surface Water: Various VOCs, pesticides, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various VOCs, pesticides, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Sediment: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Surface Water: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>RSA-C Abandoned Army Propellant Mixer (Building 7596)</p>	<p>RSA-C is an abandoned army propellant mixer building (Building # 7596). One area of the building appears to have been used for production/assembly line operations. Wastewater discharge was apparently via an industrial sewer which discharged to the wetlands associated with Huntsville Spring Branch to the east.</p>	<p>Surface Water: Various metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Surface Water: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>Operable Unit 12</p>			

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>RSA-46 Inactive Chemical Munitions Test Site</p>	<p>RSA-46 is an inactive chemical munitions test site. This area was used during the 1940s and 1950s for the demilitarization of chemical weapons. Chemical munitions were exploded on bare ground and unburned residues (e.g., white phosphorus) were left in place or cleared. Mustard gas and lewisite may have been disposed here. It was also an impact and demilitarization area for white phosphorus artillery rounds. Currently the land is used for pasture and is leased to local ranchers for cattle grazing and hay. UXO and scrap metal has been removed. The installation has institutional controls that prevent unauthorized access to the site and excavation is strictly prohibited and enforced.</p>	<p>Sediment: Barium was detected above its applicable CV.</p> <p>Surface Water: Various metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various VOCs, explosives, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Sediment: <i>No public health hazard</i> exists. The site is currently used as pasture land. When barium is ingested, it is removed in feces and urine. It is unlikely that persons who ingested meat from cattle grazing from this area would experience adverse health effects. The site is inaccessible to the public. The likelihood for direct exposure to sediment in the area is unlikely for workers or the general public.</p> <p>Surface Water: <i>No public health hazard</i> exists. The site is currently used as pasture land. It is unlikely that persons who ingested meat from cattle grazing from this area would experience adverse health effects. The site is inaccessible to the public. The likelihood for direct exposure to surface water in the area is unlikely for workers or the general public.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>RSA-64 Inactive Munitions Demilitarization & Disposal Area</p>	<p>RSA-64 is an inactive munitions demilitarization and disposal site. RSA-64 consists of an inactive mustard gas disposal site. It was active in 1955 and 1956. Three hundred to three hundred fifty mustard gas shells were reported to have been demilitarized at the site. Currently, this unit is covered with vegetation, including small trees. The area is fenced, posted, and restricted.</p>	<p>Groundwater: 1,2-Dichloroethane was detected at a concentration above its applicable CV.</p>	<p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>RSA-140 Inactive Disposal Area Near Target/Seeker Tower</p>	<p>RSA-140 is an inactive disposal area near the target/seeker tower. It consists of trench disposal sites over an area approximately 200 square feet. The disposal area was discovered in 1991. Construction debris consisting of miscellaneous metallic objects, cement blocks, glass, and insulation were found within buried trenches. In April 1992, it was discovered that additional trenches had been filled approximately 100 feet into the woods to the northwest of the site. Parallel piles of debris extended approximately 250 feet into the woods, reaching a maximum height of nearly seven feet, and a maximum width of approximately 250 feet. No waste history is known about past disposal practices in the area; however, it is suspected that the area was an old DRMO disposal area. It is suspected that the disposal trenches were used to dispose of materials that could not be salvaged. It is thought that the site was active during the late 1960s and early 1970s.</p>	<p>Subsurface soil: n-Nitroso-di-n-propylamine was detected at a concentration above its CV.</p> <p>Surface soil: Endosulfan sulfate was detected and lacks an applicable CV.</p> <p>Groundwater: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Subsurface Soil: <i>No public health hazard exists.</i> No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Surface Soil: <i>No public health hazard exists.</i> The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
Operable Unit 13			
<p>RSA-115 Inactive East Side Blow down Lagoon, Test Area 5</p>	<p>RSA-115 is an inactive east side blow down lagoon, test area 5. The site is a blow down lagoon for an inactive rocket test stand. The site is an unlined holding basin that contained discharged cooling water during test firings of rocket motors from the adjacent Attitude Test Stand 8887. It was active during the 1960s and 1970s. The waste water was held in the lagoon until it evaporated and/or percolated through the soil. The lagoon has an earthen berm and is surrounded by small pine trees.</p>	<p>Surface soil and groundwater samples were collected and analyzed for VOCs, SVOCs, and metals. None were detected above CVs.</p>	<p>Surface Soil: <i>No public health hazard exists.</i></p> <p>Groundwater: <i>No public health hazard exists.</i></p>
<p>RSA-116 South Side Blow down Lagoon, Test Area 5</p>	<p>RSA-116 is a south side blow down lagoon for Test Stand 8879, test area 5. The site is a holding basin for containment of spent cooling water discharged during test firings of rocket motors from Test Stand 8879. It has been in operation from the 1970s to the present. Prior to 1993, it consisted of a concrete-lined sluiceway and an earthen lagoon. The spent cooling water was held in the lagoon as it evaporated and/or percolated through the soil. In 1993, the lagoon was upgraded and lined with a heavy gauge HDPE, and an 8-foot tall chain-link fence was installed. The investigation is limited to the lagoon's use during its unlined operation from 1970 through 1992.</p>	<p>Groundwater: Various VOCs, SVOCs, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
Operable Unit 14			
<p>RSA-13 Unlined Inactive Open Burn Pads</p>	<p>RSA-13 consists of inactive, unlined, earthen, and open burn pads. The site consists of an open burn area with two unlined open burn pads where chlorinated solvents, solvent-contaminated materials, waste rocket motor propellant, and scrap metal were incinerated on the ground surface. This site was used from the early 1950s to 1986. The resulting ash was disposed of at RSA 14 ash field, and RSA-66 and the flashed metal was salvaged.</p>	<p>Subsurface soil: 2,4,6-Trinitrotoluene was detected at concentrations above its CV.</p> <p>Surface soil: 4-Amino-2, 6-dinitrotoluene and 4-Chloro-3-methylphenol were detected and lack applicable CVs.</p> <p>Groundwater: Various VOCs, SVOCs, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Subsurface Soil: <i>No public health hazard exists.</i> No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Surface Soil: <i>No public health hazard exists.</i> The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>RSA-14 Unlined Inactive Burn Trenches</p>	<p>RSA-14 consists of inactive, unlined, earthen, and open burn trenches. Two open trenches with identical dimensions of 300 feet by 75 feet by 10 feet were used to incinerate solid materials contaminated with rocket propellant. Even though this was the primary purpose of the trenches, it is suspected that the trenches were also used to incinerate waste solvents and solvent-contaminated materials. The trenches were constructed in the 1940s when the Gulf Chemical Warfare Depot used them for incinerating wood pallets and inert packing materials as a result of munitions shipments. They have been used from the early 1940s until 1986. The trenches are open on the east end. The resulting ash was disposed onto the field directly to the east of RSA-14, and the flashed metal was salvaged.</p>	<p>Subsurface soil: 1,1-Dichloroethene, PETN, and methylene chloride were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various VOCs, SVOCs, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Subsurface Soil: <i>No public health hazard exists.</i> No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p> <p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>RSA-132 Dismantled & Removed Popping Furnace</p>	<p>RSA-132 is the dismantled popping furnace. It was active during the 1940s when the Redstone Ordnance Plant was testing charges and manufacturing small arms ordnance. After WWII, RSA-132 was used to demilitarize captured and off-spec ordnance. RSA-132 was dismantled and removed in 1970.</p>	<p>Groundwater: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
RSA-133 Inactive Rocket Washout Rack & Sump	RSA-133 was an inactive rocket motor wash rack and concrete captive sump. The site served as an area to clean residual propellant from rocket motors using chlorinated solvents, typically trichloroethylene.	Groundwater: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).	Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.
Operable Unit 15			
RSA-32 Inactive Scrap Metal Storage Area	RSA-32 is an inactive scrap metal storage area. The site is within a large gravel area with a chain link fence on four sides. 100 feet by 250 feet secure area within RSA-32 existed at one time to store 55 gallon drums. It is thought that this area may have contained toxic or hazardous wastes. The date of active operation at this site is not known; however, it would seem reasonable to assume it was originally used during the mid to late 1940s because the area was part of the Gulf Chemical Warfare Depot. All of the scrap metal and 55 gallon drums were removed in 1985. In 1986, the site was formally closed.	Surface soil: Mercury and various PAHs were detected at concentrations above CVs (or were detected and lack applicable CVs).	Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.
RSA-65 Former Chemical Drum Storage Area	RSA-65 is a former chemical drum storage site. RSA-65 was used for above-ground drum storage during the 1940s and 1950s. Chemical warfare agents, including lewisite and mustard gas, were stored in distinct cells. The chemical materials were shipped off-post for disposal, or were demilitarized at the site. The site is generally flat with numerous rectangular storage cells, with each cell occupying approximately 200 square feet. Storage cell berms, railcar tracks, and/or trails are clearly discernable on aerial photographs taken in 1956. Where drainage ways occur, water has been impounded by beavers resulting in the development of small ponds and swampy areas.	Groundwater: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).	Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.
RSA-66 Inactive Ash Disposal Site & Demolition Area	RSA-66 is an inactive ash disposal site. The site is a closed, unlined waste disposal and demolition area. The landfill portion of the site was active from the 1950s to the late 1970s. It was used as a disposal area for incineration ash, residue, and un-salvageable metal debris (e.g., rocket motor parts, crushed drums) from the open burning operations at the OB/OD grounds (RSA-13 and 14). Detonation lines and small bunkers indicate that about six acres of the site was used for demilitarization and demolition of munitions.	Subsurface soil: Mercury and bis(2-ethylhexyl)phthalate were detected at concentrations above CVs (or were detected and lack applicable CVs). Groundwater: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).	Subsurface Soil: <i>No public health hazard</i> exists. No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3"). Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
RSA-67 Former Chemical Drum Storage Area	RSA-67 is a former chemical drum storage site, Area AA, which was used in the 1940s and 1950s. The chemical warfare agent mustard gas was stored above-ground in drums at this unit. Originally, the site was separated into storage cells by earthen berms, railcar tracks, and/or trails. Most of the northern part of this area is wooded. The majority of the unit is covered with water.	Groundwater: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).	Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.
Operable Unit 16			
RSA-68 Inactive Toxic Chemical Disposal Area	RSA-68 is an inactive toxic chemical disposal area. A large variety of wastes were demilitarized, treated and disposed of at this site. This area was formerly known as Toxic Area 4 within the Gulf Chemical Warfare Depot during the 1940s. Presently, the site is covered with grass, briars, and pine trees. The vegetation is sparse and stressed. The site was used as a demilitarization area for explosives during the mid- to late-1940s. During the 1950s to 1980, the site was active as a disposal area for toxic waste and laboratory chemicals. Portions of the site along the north and west boundaries are submerged and marshy. Toxic chemicals including, beryllium, red fuming nitric acid, chlorine trifluoride, laboratory wastes, high explosives, and various other chemicals were disposed of at this unit. High explosives were detonated and burned on bare ground; nitric acid was neutralized in open pits lined with crushed limestone; and, other wastes were disposed of in trenches located in this area.	Surface Water: Various pesticides, VOCs, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs). Groundwater: Various VOCs, SVOCs, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).	Surface Water: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely. Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.
RSA-69 Former Chemical Drum Storage Area	RSA-69 is a former chemical drum storage site, Area Y. This unit consists of an inactive mustard gas storage area located in the southern portion of the facility. The eastern boundary of Area Y is the ditch which drains south of the Igloo Ponds. It was used for the storage of mustard gas canisters during the 1940s and 1950s. The mustard gas was removed and shipped off-site and/or demilitarized at the Arsenal. Canisters were stored on bare ground at this unit. This site is wooded. Berms for the storage cells are still visible, and the areas of the unit are covered with water.	Groundwater: Various VOCs, pesticides, and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).	Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
RSA-70 Inactive Toxic Chemical Disposal Area	RSA-70 is an inactive toxic chemical disposal site. RSA-70 cannot be distinguished from Area Y (RSA-69). RSA-70 consists of an abandoned chemical storage/disposal area, estimated at 2 to 5 acres. The unit is located immediately east of Area Y (RSA-69). RSA-70 was used for the storage/disposal of chemical and mustard agent. A large portion of the unit is covered with water.	Groundwater: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).	Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.
RSA-110 Former Drum Storage Construction Debris	RSA-110 is a former drum storage and construction debris disposal site. A slight earthen berm is apparent on the south and east sides of the site. Drums of chemical warfare materials are suspected to have been stored at this operable unit. An active drum storage area was defined at this site on a 1943 aerial photograph. By 1950, the drums had been removed. The outline of the storage area is discernable in a 1988 aerial photograph. It is believed that RSA-110 was active during the 1940s and 1950s. The storage area is no longer in existence; however, small amounts of construction debris remain on site. In 1989, RSA personnel removed most of the building bricks and fire bricks from the site and dismantled several incinerators/ovens.	Groundwater: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).	Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.
Operable Unit 17			
RSA-50 Inactive Munitions Demilitarization & Disposal Area	RSA-50 is one of several inactive munitions demilitarization and chemical disposal site. RSA-50 was used for the demilitarization of high explosives, white phosphorus, and mustard gas. It was active in the 1940s and 1950s. Surface water runoff flows from the site to a wetland area. It is currently covered with small trees, grass, and brush. Some metal debris is present on the land surface.	Subsurface soil: 1-Chloro-3-nitrobenzene was detected and lacks an applicable CV. Surface soil: 1-Chloro-3-nitrobenzene was detected and lacks an applicable CV. Groundwater: 1-Chloro-3-nitrobenzene, bis(2-ethylhexyl)phthalate, and white phosphorus were detected at concentrations above CVs (or were detected and lack applicable CVs).	Subsurface Soil: <i>No public health hazard</i> exists. No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3"). Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely. Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
RSA-51 Inactive Munitions Demilitarization & Disposal Area	RSA-51 is an inactive munitions demilitarization/disposal area. It consists of an area used for demilitarizing munitions and explosives. Explosives and munitions were demilitarized by open burning in this area in the 1950's. The area is within an active missile test range and is used for military exercises.	Groundwater: Various chemicals were detected at concentrations above CVs (or were detected and lack applicable CVs).	Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.
RSA-63 Inactive Chemical Munitions Disposal Area	RSA-63 is an inactive chemical disposal site that was active in the 1950s. This area was used for the disposal of munitions contaminated with mustard gas and lewisite. In the early 1950s, Redstone Arsenal received mustard gas containers stored in 800-pound cement coffins. The cement coffins were buried at Area M in 2 to 3 large trenches. The area was then covered with 2 to 4 feet of backfill.	Surface soil: 1-Chloro-3-nitrobenzene and endrin aldehyde were detected and lack applicable CVs. Groundwater: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).	Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely. Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.
Operable Unit 18			
MSFC-2 Inactive Abandoned Drum Disposal Site	MSFC-2 is a waste pile in the 100-year flood plain that operated in the 1960s. Disposal of 55 gallon drums, paint cans, and construction debris (asphalt, concrete piping, concrete slabs, clay bricks, and clay piping). Construction debris from the demolition and cleanup at the former Beryllium Metal Machining Facility (MSFC-54) was reportedly disposed here. Rusty and deformed drums were observed in the northern section of this site. Waste material was not observed in any of the drums. Large pieces of construction debris were piled indiscriminately along the length of the site. The site is adjacent to an area of former gravel mining. The former gravel pits are now filled with water.	Surface soil: 4,4-DDT was detected at a concentration above its applicable CV. Surface Water: Various metals were detected at concentrations above CVs (or were detected and lack applicable CVs). Groundwater: Chromium, lead, mercury, and nickel were detected at concentrations above their applicable CV.	Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely. Surface Water: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely. Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
MSFC-3 Inactive “Old Bone Yard” Disposal Site	MSFC-3 was used as a disposal site in the 1940s and early 1950s, and possibly in the 1960s; it is currently inactive. This unit was used for disposal of chemical munitions, toxic materials, and chemical wastes by the U.S. Army. It includes an approximate 1.5-acre area shown on early maps as the “Permanent Toxic Storage Area,” and several burn pits. In 1960, MSFC-3 was partially decontaminated. This decontamination consisted of clearing and burning vegetation and screening and rinsing the top six inches of topsoil with bleach. All the metal found was incinerated in burn pits. Chemical munitions, toxic materials, and chemical wastes were disposed at this site. There is evidence that the waste placed in the pits has been removed.	Groundwater: Various VOCs and metals were detected at concentrations above their applicable CVs.	Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.
MSFC-34 Inactive Mechanical Room Sump (Building 4481)	MSFC-34 is a concrete-lined sump that was operational in the 1940s until the mid to late 1950s. During World War II, building 4481 was used as a mustard gas projectile filling station. This building was the source of waste for the sump. Waste management practices during the active life of the sump are uncertain. MSFC-34 is concrete-lined; however, the integrity of the liner is unknown.	Groundwater: Mustard gas was detected and lacks an applicable CV.	Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.
MSFC-53 Former Propellant Storage/Test stand Site	MSFC-53 was once a propellant storage and test site consisting of a series of concrete-lined test stands and cells. The liquid propellant test facility was constructed in 1951. A high-altitude test facility was constructed in 1955. Test Cell A was built in 1959. Test Cell C and other structures were built in 1961. All the units were demolished in 1974.	Surface Water: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).	Surface Water: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.
MSFC-55 Dismantled Stauffer Chemical Manufacturing Plant Site	MSFC-55 was a chemical manufacturing plant. The plant was originally built in 1943 as a chemical manufacturing plant for the production of mustard gas. In 1946, a division of Allied Chemical operated a portion of the plant for five years. Most of the site was demolished in 1965. Currently, the area is primarily open grass and small pines. Concrete foundations are evident. Industrial man-ways and broken concrete drainage ditches intersect the site. An overgrown gravel road leads eastward to a former drum/tank storage area. At present, there is a small pit area with stressed vegetation and salt crystals evident on the ground surface; this area was likely associated with the brine treating facility.	Surface Soil: Mercury was detected and lacks an applicable CV. Groundwater: Arsenic, chromium, and lead were detected at concentrations above their applicable CVs.	Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely. Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
MSFC-60 Inactive Deluge Water Surface Drain System	MSFC-60 is a surface drainage system. The drainage originates at the test stand on the northeast and west sides. The northeast drainage extends approximately 500 ft to the north, then 300 ft west where it meets the drainage to the west. The western drainage extends north approximately 650 ft and intersects the northwest drainage. Portions of the unit on either side of the test stand are concrete-lined drainage areas.	Subsurface soil samples were collected and analyzed for metals. None were detected above CVs.	Subsurface Soil: <i>No public health hazard</i> exists.
MSFC-65 1800-Foot Surface Drainage Ditch Area (This is now a MSFC controlled site)	MSFC-65 is an approximately 1800-foot unconfined surface drainage area with related buried shallow drainage pathways. Surface water and storm water drainage from around building 4241 enter the ditch where it is routed southwest then underground and ultimately discharged to an unnamed creek which connects to Indian Creek. Building 4241 was used for pesticide storage.	<p>Sediment: Various PAHs were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Surface Soil: Lead was detected at a concentration above its applicable CV.</p> <p>Surface Water: Various metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Antimony, arsenic, thallium and bromodichloromethane were detected at concentrations above their applicable CVs.</p>	<p>Sediment: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Surface Soil: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Surface Water: <i>No public health hazard</i> exists. The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
MSFC-77 Inactive Open Burning/Disposal Pits	MSFC-77 consists of two former burning pits, each approximately 50 ft in diameter. Currently, the unit is not readily discernible; the area has been filled and vegetated with grass and small pine trees. An earthen berm surrounds the general area on two sides.	Subsurface soil samples were collected and analyzed for metals. None were detected above CVs.	Subsurface Soil: <i>No public health hazard</i> exists.
MSFC-82 Inactive Chemical Munitions Demilitarization/Disposal Trenches	MSFC-82 was a demilitarization site and disposal area and was utilized in the mid-1940s. There are an estimated 18 trenches. Judging from the file photos, each trench appears to be 400 to 600 feet long, 5 to 10 feet wide, and 5 to 6 feet deep. The trenches were used to dispose of unused mustard gas shells after World War II. File photos show men in gas masks placing shells in the trenches.	Groundwater: Mustard gas and thiodiglycol were detected and lack applicable CVs.	Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.

Table 12. Evaluation of Potential Public Health Hazards Associated with the Army-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
MSFC-D Fuel Oil Storage Tanks Containment Berm	MSFC-D is the bermed area designed to contain spills around three galvanized steel 100,000 gallon fuel oil storage tanks installed in the 1940's. In 1988, a leak of 20,000 gallons occurred from one of the tanks. The valve which releases accumulated water to nearby drainage had been left open and the oil migrated to a nearby channel. The discharge was stopped immediately and cleaned up.	Soil, sediment and groundwater samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	<p>Soil: <i>No public health hazard exists.</i></p> <p>Sediment: <i>No public health hazard exists.</i></p> <p>Groundwater: <i>No public health hazard exists.</i></p>
RSA-9 Inactive Sewage Treatment Plant 3	RSA-9 is the inactive sewage treatment plant No. 3 and a wastewater treatment plant. This treatment plant was constructed in 1942 and provided primary and secondary treatment to sewage generated in the central portion of the facility. It also received floor wash water and water separated by the oil/water separators. A privatized, centralized wastewater treatment plant was contracted at RSA and came on line in 1991, thereby eliminating the usage of Sewage Treatment Plant 3.	<p>Surface Soil: Mercury was detected and lacks an applicable CV.</p> <p>Surface Water: Various metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Various VOCs and metals were detected at concentrations above CVs (or were detected and lack applicable CVs).</p>	<p>Surface Soil: <i>No public health hazard exists.</i> The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Surface Water: <i>No public health hazard exists.</i> The site is no longer in use and is inaccessible to the public. Exposure is unlikely.</p> <p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
Operable Unit 1			
<p>MSFC-4 Deluge Pond, West Test Area</p>	<p>MSFC-4 is a clay-lined detention pond that captures cooling water from rocket engine tests conducted at the Advanced Engine Test Facility (Building 4670) and F-1 Static Test Stand (Building 4696). The pond is about 8 acres and has an approximate 6-foot berm on the western, eastern, and northern sides. Two test stand activities are responsible for discharging water to the eastern side of the pond. The first activity includes cooling water from engine testing. During a 3-minute engine test, approximately 1 million gallons of cooling water were discharged into the pond. The test stands are currently inactive. The second activity includes continuously pumping approximately 1.5 million gallons per day of groundwater from the basements of the test stands. During the summer of 1997, the sediments in the pond were stabilized and a pond liner was installed. MSFC has implemented an IRA at this site. MSFC stabilized the sediment in the deluge pond. They installed a liner and an air stripper for treatment and removal of VOCs from the pond surface water and from the groundwater pumped from the test stand basements. The air stripper has been removed from operation. MSFC has also posted "No Fishing" signs around the pond.</p>	<p>Sediment: Chloride, 2, 2-oxybis(1-chloropropane), and Aroclor 1260 were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Surface Water: Trichloroethene, 1,1,2,2-tetrachloroethane, and carbon tetrachloride were detected at concentrations above their applicable CVs.</p> <p>Fish: Aroclor 1254 was detected at a concentration above its applicable CV.</p> <p>Groundwater: Northeast Area. (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information.)</p>	<p>Sediment: <i>No public health hazard</i> exists. MSFC has stabilized the sediment in the deluge pond. Past exposure to contaminants in sediment is unlikely. The site is inaccessible to the public. Any exposure by workers to sediment was likely brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Surface Water: <i>No public health hazard</i> exists. MSFC installed a liner and an air stripper for treatment and removal of VOCs from the pond surface water. Past exposure to contaminants in surface water is unlikely. The site is inaccessible to the public. Any exposure by workers to surface water was likely brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Fish: <i>No public health hazard</i> exists. MSFC has posted "No Fishing" signs around the pond. The site is inaccessible to the public and it is unlikely that workers eat/ate fish from the deluge pond.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>MSFC-5 Holding Pond-Test Complex 300 Area</p>	<p>MSFC-5 is a surface impoundment located near Test Complex 300 (Building 4530), which was operational for approximately a decade between the 1960s and the late 1970s. Currently, the pond is used to detain cooling and compressor water used for Test Complex 300 operations. The unit received discharge from the test Complex 300 Area in the East Test Area, where liquid oxygen (LOX)/RP-1 gas generator combustors, heat exchangers, exhaust ducts, gas pressurization systems, cryogenic valves and pumps, and pneumatic-hydraulic equipment were tested.</p>	<p>Sediment: Lead was detected at a concentration above its applicable CV.</p> <p>Surface Water: Dibromochloromethane was detected at a concentration above its applicable CV.</p> <p>Groundwater: Groundwater at this site is being addressed as part of OU-3: Northwest Area and OU-4 Northeast Area. (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information.)</p>	<p>Sediment: <i>No public health hazard exists.</i> Exposure to contaminants in sediment is unlikely. The site is inaccessible to the public. Any exposure by workers to sediment would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Surface Water: <i>No public health hazard exists.</i> Exposure to contaminants in surface water is unlikely. The site is inaccessible to the public. Any exposure by workers to surface water would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>MSFC-8 Old Holding Pond-Test Complex 500 Area</p>	<p>MSFC-8, which was constructed in 1966, is a clay-lined surface impoundment located immediately south of Building 4525 in the test Complex 500 area of the East Test Area. This surface impoundment has an associated drainage system that receives discharges from dual position tests of LOX-LH2 components and vehicle subsystems. The location of the pond is such that liquids from a variety of test facilities enter it en route to the main liquid disposal pond (MSFC-010) north of the 500 Area Test Stand. An unknown quantity of both fuel and sodium dichromate-bearing water has entered the pond, as well as unknown amounts of flushed water containing organic solvents and hydrocarbon-based fuels. During the RI/FS field investigation, the pond was drained.</p>	<p>Groundwater: Groundwater at this site is being addressed as part of OU-3: Northwest Area and OU-4: Northeast Area. (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information.)</p>	<p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>MSFC-9 Liquid Waste Pond (SE)-East Test Area</p>	<p>MSFC-9 is a clay-lined liquid waste surface impoundment that was operated between 1953 and 1965 as a waste disposal pond. The pond is approximately 300 ft x 450 ft and has a clay-lined, grassy berm about 6 ft high. The water level in the pond averages 2 to 3 ft deep. The LOX/RP-1 H-1 engine tests were conducted at the adjacent to building 4515, the Saturn IV-B stand through the end of 1965. At the end of each test, approximately 6 to 7 gallons of RP-1 fuel were discharged from this test stand to the liquid waste disposal unit. Other components were flushed with 2 to 3 gallons of TCE. The unit also received flushings from test complex 116. MSFC has posted “No Fishing” signs around the East Test Area Liquid Waste Pond.</p>	<p>Subsurface soil: 4-Chloro-3-methylphenol and Aroclor 1260 were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Surface soil: Aroclor 1260 was detected at a concentration above its applicable CV.</p> <p>Fish: Aroclor 1254 was detected at a concentration above its applicable CV.</p> <p>Groundwater: Groundwater at this site is being addressed as part of OU-3: Northwest Area and OU-4 Northeast Area. (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information.)</p>	<p>Subsurface Soil: <i>No public health hazard</i> exists. No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3”).</p> <p>Surface Soil: <i>No public health hazard</i> exists. Exposure to contaminants in surface soil is unlikely. The site is inaccessible to the public. Any exposure by workers to surface soil would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Fish: <i>No public health hazard</i> exists. MSFC has posted “No Fishing” signs around the pond. The site is inaccessible to the public and it is unlikely that workers eat/ate fish from the deluge pond.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>MSFC-10 Liquid Waste Pond (NC)-East Test Area</p>	<p>MSFC-10 is a clay-lined liquid waste surface impoundment that began operation in 1953. It is located in the north-central part of the East Test Area, approximately 500 ft northwest of Test Complex 500. The unit is approximately a half-acre in size and has a 3- to 6-foot high berm. The water level in the pond averages 2 to 3 ft deep. It is situated in a topographic depression. It receives runoff from Test Complex 500, Test Complex 300. Solvents, including TCE and CTC, hexavalent chromium, hydrocarbon-based fuels, and PCBs, were discharged to this unit.</p>	<p>Surface Water: Manganese, trichloroethene, and vinyl chloride were detected at concentrations above their applicable CVs.</p> <p>Groundwater: Groundwater at this site is being addressed as part of OU-11: Northwest Area and OU-4: Northeast Area. (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information.)</p>	<p>Surface Water: <i>No public health hazard</i> exists. Exposure to contaminants in surface water is unlikely. The site is inaccessible to the public. Any exposure by workers to surface water would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>MSFC-61 Surface Drainage System for Disposal Pond 4586</p>	<p>MSFC-61, which discharges into MSFC-008, is an inactive surface drainage system for a Disposal Pond which began operating in the late 1950s. It is located immediately northwest of the current Test and Data Recording Facility of the East Test Area. It extends west to northwest from the Disposal Pond. The clay-lined unit is partially underground and extends underneath a concrete paved area into the pond, and then out of the pond into a ditch by way of a regulated outlet. Four large concrete drains run along the unit's pathway. The unit provided drainage of post-test flushing wastewater to Disposal Pond 4586 (MSFC-006) from activities in and around Building 4583, including routine discharges of dilute concentrations of fuel and organic solvents.</p>	<p>Groundwater: Groundwater at this site is being addressed as part of OU-3: Northwest Area and OU-4: Northeast Area. (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information.)</p>	<p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>MSFC-63 Uncontained Drainage Pathways-SE Section of East Test Area</p>	<p>MSFC-63 is a series of four surface drainage pathways in the southeastern section of the East Test Site area. The southern ditch collects storm water runoff from the area west of the "T" Test Stand (Building 4572). A second water source that leads to the site is from the "T" Test Stand activities, and possibly from groundwater seepage into the stand's basement. The clay-lined ditch, which is 2 ft wide and 3 ft deep, is partially lined with concrete. Two drainage ways flow south through a heavily wooded area toward MSFC-9 on its northern side. One drainage pathway is used by Test Areas 115 and 116 and the hot gas facility. The discharge from these test facilities flows through MSFC-63 and discharges into MSFC-9. The second drainage pathway originates along the western side of Test Area 116 and channels water toward MSFC-9. The flow diverts around the eastern side of MSFC-9 and flows offsite. This flow is only storm water, and therefore, does not enter MSFC-9. The final drainage way associated with this unit originates northeast of Building 4583. Flow in this drainage way migrates in a northeastern direction and connects with a natural drainage area. The contents of the drainage way are then transported offsite toward the southeast. MSFC has removed sediment from the uncontained Drainage Pathways.</p>	<p>Sediment: Lead was detected at a concentration above its applicable CV.</p> <p>Groundwater: Groundwater at this site is being addressed as part of OU-3: Northwest Area and OU-4: Northeast Area. (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information.)</p>	<p>Sediment: <i>No public health hazard</i> exists. MSFC has removed sediment from the area and has installed a liner. Past exposure to contaminants in sediment is unlikely. The site is inaccessible to the public. Any exposure by workers to sediment was likely brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
MSFC-64 Buried Pipeline at Building 4572	MSFC-64 is a 24-inch vitrified clay liquid waste pipeline that extends from Building 4514 southeast toward the southern side of Building 4572, where it turns northeast and finally discharges into MSFC-9, the Liquid Waste Pond. The pipeline ranges in depth from 20 ft near Building 4514 to ground surface at the discharge point. This pipeline transfers water related to test stand activities, which historically included TCE, CTC, kerosene-based fuel, and hexavalent chromium. The quantity of flow through the pipe is unknown.	<p>Sediment: Aroclor 1260 and lead were detected at concentrations above their applicable CVs.</p> <p>Surface Water: Trichloroethene and thallium were detected at concentrations above their applicable CVs.</p> <p>Groundwater: Groundwater at this site is being addressed as part of OU-11: Northwest Area and OU-4: Northeast Area. (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information.)</p>	<p>Sediment: <i>No public health hazard exists.</i> Exposure to contaminants in sediment is unlikely. The site is inaccessible to the public. Any exposure by workers to sediment would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Surface Water: <i>No public health hazard exists.</i> Exposure to contaminants in surface water is unlikely. The site is inaccessible to the public. Any exposure by workers to surface water would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
MSFC-78 NASA Storage Area South of the MSFC West Test Area	MSFC-78 is located in the southern section of MSFC, south of the intersection of Dodd and Saturn Roads and south of the MSFC West Test Area. The unit is approximately 3 acres and is used for the storage of equipment such as storage tanks, stainless-steel parts, and pipes from operations at MSFC. The release history is unknown. The surface of the storage yard is overlain with gravel. The ditch channeling the flow is approximately 3 ft wide and 2 ft deep.	<p>Groundwater: Groundwater at this site is being addressed as part of OU-3: Northwest Area and OU-4: Northeast Area. (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information.)</p>	<p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
Operable Unit 2			

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>MSFC-52 Industrial Wastewater Sewer Pipeline</p>	<p>MSFC-52 is an industrial wastewater sewer pipeline that received wastes from throughout the facility. Some of the lines were installed during WWII. Prior to 1988, the sewer system collected wastewater from various MSFC processes. Electroplating waste from Building 4760 was discharged to the line. In addition, chemicals and solvents from laboratory sinks and floor drains from other buildings were discharged into the line as well. The line formerly discharged to the tributary of Indian Creek without treatment. The discharge is currently treated with an aeration basin and sodium bi-sulfate to control chlorine. MSFC has posted “No Fishing” signs around the Industrial Sewer outfall area (MSFC-052) and Indian Creek and has removed PCB-contaminated sediments from the outfall and the sewer pipe.</p>	<p>Sediment: Aroclor 1260 was detected at a concentration above its applicable CV.</p> <p>Subsurface soil: Arsenic, 1,1,2,2-tetrachloroethane, carbon tetrachloride, lead, mercury, and trichloroethene degraders were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Surface soil: Aroclor 1260 was detected at a concentration above its applicable CV.</p> <p>Surface Water: Aroclor 1260 was detected at a concentration above its applicable CV.</p> <p>Fish: Aroclor 1260 was detected at a concentration above its applicable CV.</p> <p>Groundwater: Groundwater at this site is being addressed as part of OU-3: Northwest Area and OU-4: Northeast Area. (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information.)</p>	<p>Sediment: <i>No public health hazard</i> exists. Exposure to contaminants in sediment is unlikely. The site is inaccessible to the public. Any exposure by workers to sediment would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Subsurface Soil: <i>No public health hazard</i> exists. No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3”).</p> <p>Surface Soil: <i>No public health hazard</i> exists. Exposure to contaminants in surface soil is unlikely. The site is inaccessible to the public. Any exposure by workers to surface soil would likely be brief and infrequent.</p> <p>Surface Water: <i>No public health hazard</i> exists. Exposure to contaminants in surface water is unlikely. The site is inaccessible to the public. Any exposure by workers to surface water would likely be brief and infrequent.</p> <p>Fish: <i>No public health hazard</i> exists. MSFC has posted “No Fishing” signs around Indian Creek. The site is inaccessible to the public and it is unlikely that workers eat/ate fish from the creek.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
Operable Unit 5			
MSFC-36 Sump in South Addition of Building 4708	MSFC-36 is an active sump in the basement of Building 4708 that has been operational since 1960. Flow into the unit, which is approximately 4 ft long by 4 ft wide by 8 ft deep, is through two pipes approximately 2 inches in diameter. The sump is served by two pumps that discharge to the sanitary sewer system. The sump was connected to laboratory sinks in Building 4708 when it was first installed. Currently, flow from the floor drains and bathroom sinks located inside the building enters the sump. The quantity of liquids entering the sump is unknown. Also, the date when flow from the laboratory sinks to the sump was terminated is unknown. Additionally, activities that were conducted in the laboratories of Building 4708 are unknown. There are no reported releases from this waste management unit.	<p>Sediment: Mercury was detected and lacks an applicable CV.</p> <p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Sediment: <i>No public health hazard exists.</i> Exposure to contaminants in sediment is unlikely. The site is inaccessible to the public. Any exposure by workers to sediment would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
MSFC-87 Cyanide Waste site at 4768	This unit, an inactive cyanide disposal pit, is approximately 30 ft long, 30 ft wide and 3 ft deep. The pit has an HPDE liner that's covered with crushed limestone. The pit was covered with a roof and the area was fenced. It is not known when this unit was operational. The site is located in a heavily wooded area with only an un-maintained dirt road for access. There are no buildings within the area and no routine MSFC activities in this area.	<p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>MSFC-88/89 Building 4760 Ventilation Trench and Cyanide Waste Tank at Building 4760</p>	<p>Concrete ventilation trenches (MSFC-88) originally were intended to convey air pulled from the top of the cleaning and plating baths in Building 4760 to the atmosphere. The trenches are sloped to drain from the central portion of Building 4760 towards the south. Along the southern edge of the building, the trenches contain sumps that overflow to manholes connected to the industrial sewer (MSFC-52). The concrete in the base of the sumps has been degraded so that the underlying soil is exposed. The cylindrical, 520-gallon cyanide waste tank (MSFC-89) was installed beneath the pavement south of building 4760 in 1971 and currently is inactive and empty. The tank, 8 ft tall and 3 ft in diameter, is supported by a 4-foot by 4-foot, 1-foot 9-inch-thick concrete containment structure. The contents were removed, treated and released under NPDES permit. The tank is empty and inactive. The quantity of waste stored and frequency of tank content disposals while it was active are unknown. There are no records of releases from this tank.</p>	<p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>Operable Unit 6</p>			
<p>MSFC-66 Building 4347 Surface Drainage</p>	<p>Building 4347, which is an observatory, has two clay-lined drainage swales approximately 2 ft wide and 2 ft deep. The wet weather swales are on the eastern and western sides of the building. The two ditches combine on the southeastern side of the building and flow south into two circular depressions. The depressions are approximately 100 ft in diameter and 3 to 5 ft deep. Storm water flows from the basin through a concrete pipe and into a second drainage way. The water then flows south near the groundskeeper area (MSFC-83) and into a ditch near MSFC-29, which flows south through a buried culvert under the photographic lab. The unit probably has been in existence since the 1940s.</p>	<p>Surface Water: Cadmium and lead were detected at concentrations above their applicable CVs.</p> <p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Surface Water: <i>No public health hazard</i> exists. Exposure to contaminants in surface water is unlikely. The site is inaccessible to the public. Any exposure by workers to surface water would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>MSFC-67 Building 4618 Surface Drainage</p>	<p>MSFC-67 is a surface drainage area that has probably existed since the 1960s. Water flows east in a clay-lined ditch located on the southern side of Building 4618. The water flows under Fowler Road through a culvert toward the south. MSFC-67 is approximately 10 ft wide, and the grassy, clay-lined banks are 10 ft in height. Surface water continuously flows in the ditch toward the WNWR. Along its southern to southwestern route, the unit accumulates surface runoff from the adjacent areas and directs it to the southwest. According to the 1988 PA/SI report, in 1974 or 1975, a spill of hydraulic fluid occurred south of Building 4619, in the immediate vicinity of Building 4618 around two hydraulic fluid storage tanks. Reportedly, the spill was cleaned up with absorbent material and the contaminated soil was removed and disposed offsite.</p>	<p>Surface Water: Bromodichloromethane and dibromochloromethane were detected at concentrations above their applicable CVs.</p> <p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Surface Water: <i>No public health hazard</i> exists. Exposure to contaminants in surface water is unlikely. The site is inaccessible to the public. Any exposure by workers to surface water would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>MSFC-81 Paint Spray Booth at the M-1 Storage Area</p>	<p>MSFC-81 is an active sandblasting and paint spray booth located in the M-1 Storage Area near Observatory Road. The frequency of sandblasting events is unknown. The unit is approximately 50 ft by 50 ft and is based on a concrete slab. Sandblasting residue known as “black beauty” (iron oxide grit) was observed on the concrete around the paint spray booth. The area surrounding the booth is covered with a compacted aggregate base. Storm water runoff is estimated to flow north, west, and south, discharging into a grassy ditch 30 ft wide and 6 ft deep. The drainage way is dry except during rain events. The northern, eastern, and southern sides of the M-1 storage area are heavily wooded. Aerial photographs taken in May 1943 and in February 1956 reveal eight bermed storage tanks where the M-1 storage area is currently located. The tanks held fuel oil and alcohol.</p>	<p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>MSFC-83 Groundskeeper/Future Area 4348</p>	<p>The current groundskeeper area is located north of Digney Road and east of Morris Road. This is a storage area for equipment and chemicals for grounds maintenance. Waste oil from equipment maintenance is stored indoors at Building 4348, along with pesticides. Herbicides are stored in a small building on the southwestern corner of Building 4348. Sidewalk deicer is stored in a pole barn on the northern side. Small batches of pesticides, 5 to 10 gallons, are dispensed over a sink located inside Building 4348 into hand-carried containers. Larger batches of pesticides and herbicides, of more than 20 gallons, are mixed daily. The pesticide batches are then dispensed into 25-, 50-, and 300-gallon containers on trailers which are distributed onto fields and grassy areas throughout MSFC. Depending on the season, anywhere from 100 to 300 gallons of herbicide and pesticide are store at the facility. The future area is a fenced, graveled area currently called the "Special Purpose Equipment Pool." The area stores heavy equipment, trailers, and construction equipment. Storm water runoff from this area appears to flow south into an east-west aligned ditch north of Building 4353. Aerial photographs taken in May 1943 and February 1956 reveal three bermed storage tanks in the vicinity of the groundskeeper/ future storage area. The tanks appear to have stored petroleum products; however, the contents of the tanks are unknown.</p>	<p>Sediment: alpha-Chlordane was detected and lacks an applicable CV.</p> <p>Surface soil: Aroclor 1260, alpha-chlordane, and chlordane were detected at concentrations above CVs (or were detected and lack applicable CVs).</p> <p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Sediment: <i>No public health hazard exists.</i> Exposure to contaminants in sediment is unlikely. The site is inaccessible to the public. Any exposure by workers to sediment would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Surface Soil: <i>No public health hazard exists.</i> Exposure to contaminants in surface soil is unlikely. The site is inaccessible to the public. Any exposure by workers to surface soil would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>MSFC-84 Auto Paint Shop 4480</p>	<p>MSFC-84, located in Building 4480 east of Morris Road and south of Mercury Road, is an inactive indoor auto paint shop. A 2-foot-wide, 6-inch-deep concrete channel is located along the northern and western sides of the building. The channel contains grass and weeds. Apparently overflow from the concrete channel migrates southeast across the pavement and on to the grass lawn. The area, approximately 225 ft long by 25 ft wide, is the most susceptible to contamination because it receives storm water runoff from the paved areas. Currently, 55-gallon drums of waste paint cans, paint, and solvents are stored in the building. However, past practices at the paint shop included the storage of the drums on the asphalt pad on the western side of the building adjacent to the doors. One 55-gallon drum of waste solvent is filled every 6 months, including paint thinners, reducers, and retarders. On average, 90 gallons of paint and 20 gallons of solvents are stored at the site.</p>	<p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>MSFC-F Storage Area West of Building 4650</p>	<p>MSFC-F, located west of Building 4650 near the intersection of Fowler Road and Morris Road, is an equipment storage yard. The yard is a half-paved and half-gravel area underlain with compacted gravel and clay. The extreme western side of the storage pad consists of a 5-foot-wide grassy area that extends in a north-south direction adjacent to the western fence line. Storm water apparently flows west off of the gravel pad onto the grassy area. The storm water then appears to flow south through a grassy area and exits the southwestern corner of the storage area. The southwestern corner of this grassy area is heavily eroded and vegetative stress is apparent. The storm water continues to flow in a southwesterly direction after exiting the site to a ditch connected to MSFC-67.</p>	<p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>Operable Unit 7</p>			
<p>MSFC-14 Satellite Waste Accumulation Area</p>	<p>MSFC-14, located southwest of Building 4707, is an inactive satellite waste accumulation area that was used for less-than-90-day storage of wastes. It consists of an outdoor 20-foot by 100-foot concrete pad for the storage of electroplating wastes from Building 4760 and machine shop wastes from Buildings 4707. Activity at this location ceased in 1985; the area currently is used to store “returnable usable empties.” Approximately 100 gallons per month of electroplating waste were managed at this unit in 55-gallon drums (GeRSAhty and Miller, 1991). The waste drums were collected and taken to the Defense Reutilization and Marketing Office (DRMO) yard. The waste included chlorinated solvents, VOCs, SVOCs, and waste hydroblast. There is no record of any past spills in the area. Storm water flows south toward the southern fence line that surrounds the area and is adjacent to Tiros Street. The asphalt pavement terminates a few feet before the fence line and flow continues into a grassy ditch.</p>	<p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
MSFC-15 Satellite Waste Accumulation Area	MSFC-15, located near the south wall of Building 4707, is an inactive waste satellite accumulation area used for less-than-90-day storage of isocyanate, Freon polyol (reactive foam), and urea formaldehyde wastes. It consists of an outdoor 25-foot by 25-foot asphalt area for storage of wastes generated by machine shop operations at Building 4707. The site was inspected by EPA and ADEM during July 1986. Observations recorded during the inspection included drums stored with open bungs that had “obviously spilled over the rim and down the sides” (GeRSAhty and Miller, 1991). Storm water in the area drains south to Tيروس Street into a grassy area at the southern fence line of Building 4707. There is a storm drain located east of the area. Currently, there are four storage tanks on the western side of the pad.	Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).	Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.
SFC-16 Satellite Waste Accumulation Area	MSFC-16 is located on the eastern side of Building 4707. The area was used as a satellite waste accumulation area for wastes generated in Building 4707. It consisted of an outdoor 10-foot by 10-foot asphalt area upon which drums containing waste were stored. The storage area has been used intermittently since the 1960s. Stored wastes included hydro blast, methylene chloride, isocyanate, Freon polyol, dichloromethane, CTC, TCA, and phenolic residue. During the EPA’s expanded site investigation, several oily black stains were observed on the cracked pavement. The Army DRMO collected the waste drums until 1985 for contracted offsite disposal. Currently, the waste drums are stored temporarily inside Building 4707 and routinely collected by MSFC’s hazardous waste contractor. Storm water from the area flows east toward the eastern fence line of Building 4707. The asphalt pavement terminates approximately 10 ft before reaching the fence line. The terrain adjacent to the pavement is a sandy gravel area underlain with red clay. One storm drain is located southeast of MSFC-16, which collects some of the storm water runoff from the site.	Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information). SFC-16 Satellite Waste Accumulation Area	Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
MSFC-19 Former Satellite Waste Accumulation Area	<p>MSFC-19, which was in operation from the 1960s to 1985, is an inactive satellite accumulation area for Building 4755. The unit is located outside the fabrication operations (Building 4755) near the northern entrance. The unit is approximately 10 ft by 10 ft and is based with gravel underlain by a weathered asphalt and gravel mixture. Waste brine concentrate solution, waste sulfuric acid, and waste ammonium hydroxides from fabrication operations were managed at the unit. The quantity of waste that was accumulated at MSFC-19 is unknown. Before 1985, wastes were collected by the Army DRMO for offsite disposal. No releases were identified in the available file material or observed during the VSI. Storm waste in the area flows toward the north across a road and into a grassy drainage swale, or into two storm water drains located adjacent to the site, one approximately 20 ft to the east and one approximately 5 ft to the west.</p>	<p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
MSFC-20 Former Satellite Waste Accumulation Area	<p>MSFC-20 is a satellite waste accumulation area that has been in operation since 1985. The unit is located in an approximately 10-foot by 10-ft area near the northwestern corner of the Fabrication Operations Buildings (Building 4755). The surface is gravel underlain with a weathered asphalt and gravel mixture. The same wastes (brine concentrate solution, sulfuric acid, and ammonium hydroxide) were managed at MSFC-20 as at MSFC-19. Before 1985, wastes were collected by the Army DRMO for offsite disposal. During the VSI, two drums were observed on a wooden pallet over the gravel; three other drums were placed directly on the gravel surface. Storm water in the area flows either toward the north across a road and into a grassy drainage swale or, to two storm water drains located adjacent to the site, one approximately 5 ft to the east and one approximately 30 ft to the west.</p>	<p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
MSFC-21 Satellite Waste Accumulation Area for Building 4744	MSFC-21 is located immediately south of Building 4744 and is an active satellite waste accumulation area that has been operating since the late 1960s. It consists of a large concrete pad approximately 150 ft by 1200 ft and 2- to 3-ft thick. Storm water flows off the pad on the eastern, western, and southern sides, and into a drainage ditch that flows on the southern side of the building. This drainage ditch transports water toward the west. The site serves as a waste collection area for waste oils and hydraulic fluids generated in Building 4744. The wastes are stored in 55-gallon drums and placed horizontally on three drum storage racks that are capable of holding up to 24 drums. During the VSI, it was observed that a drainage area running parallel to the concrete pad on the southern side of the unit had dark stains from an oily substance. During a March 1995 site visit, two drums of waste oil were on the western side of the concrete pad. There were no visible stains on the concrete or the grassy area that surrounds the pad.	<p>Surface Water: Dibromochloromethane was detected at a concentration above its applicable CV.</p> <p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Surface Water: <i>No public health hazard</i> exists. Exposure to contaminants in surface water is unlikely. The site is inaccessible to the public. Any exposure by workers to surface water would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
MSFC-29 Photograph Lab Satellite Waste Accumulation Area	MSFC-29 is a satellite waste accumulation area for the photographic laboratory. The unit is located outside the photography lab near the northern side of Building 4353. The surface at the former waste storage area is paved with asphalt, which extends 45 ft to the north. Surface runoff flows north to a grassy area, then to a grassy, clay-lined ditch in which water flows to the east, then to a culvert that flows south beneath the building. Storm water runoff from north of this area also flows into the ditch. The drainage ditch is joined by other ditches that lead from MSFC-66 and 83. The unit has been operating since the late 1960s. Current waste accumulation and silver removal from fixer solution occur indoors. The wastes managed indoors consist of waste fixer solution and acetic acid, waste sodium dichromate sulfuric acid, ammonium thiosulfate, and TCA. No releases were identified in the available file material or observed during the VSI.	<p>Surface Water: Chrysene and lead were detected at concentrations above their applicable CVs.</p> <p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Surface Water: <i>No public health hazard</i> exists. Exposure to contaminants in surface water is unlikely. The site is inaccessible to the public. Any exposure by workers to surface water would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
MSFC-33 Satellite Waste Accumulation Area for Building 4815	MSFC-33 serves as a waste accumulation area for wastes generated at the NASA Maintenance Supply Operations at the RSA Airfield Buildings 4815, 4816, and 4817. The unit, which has been in operation for about 10 to 15 years, is located on the eastern side of Building 4815 and consists of an approximately 3-ft by 16-ft concrete apron. Wastes are collected and transferred to the MSFC Hazardous Waste Container Storage Area before offsite disposal. Wastes include waste JP-4 fuel, mineral spirits, EMC-13 cleaner, Formula 512 M mixture, and sandblast residue (including metals). No releases were identified in the available file material; however, during the VSI, some light staining was observed on the nearby grass. During a March 1995 site visit, there were no apparent stains on the concrete pad or the support drums stored at the unit. The storm water runoff pathway appears to be along a concrete 3 to 5-inch curb located on the eastern side of the apron. The curb is sloped toward the south. Storm water flows toward the east to MSFC-68.	Surface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Surface Soil: <i>No public health hazard exists.</i>
MSFC-76 Satellite Waste Accumulation Area	MSFC-76 is an inactive product/waste storage area. The asphalt pad is sloped toward the south and terminates in a grassy area along the southern fence line adjacent to Tiros Street. Signs on the wall label three sections of the accumulation area as "Methylene Chloride," "Alcohol," and "Acetone." The source of waste was presumably from past laboratory operations at Building 4707. No information was available regarding past releases.	Surface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	<p>Surface Water: <i>No public health hazard exists.</i> Exposure to contaminants in surface water is unlikely. The site is inaccessible to the public. Any exposure by workers to surface water would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>MSFC-38 Building 4656 Oil Trap and Drainage Area</p>	<p>MSFC-38 is the site of a removed oil trap for wastewater and surface water drainage at Building 4656. The unit, which had been operational since 1965, was located on the southwestern side of Building 4656. The drainage area runs south and curves around toward the west, where it combines with a major drainage swale. The oil trap (UST) had an approximate 250-gallon volume. The unit received waste oil and water from compressor drainage and other activities at the Hydraulic Equipment Development Facility (Building 4656). During the VSI, oil residue was observed on the soil surrounding the oil trap and along the drainage swale. The trap and contaminated soil in the surrounding area were removed in 1994. During a March 1995 site visit, there were no apparent stains in the drainage ditch on the western side of Building 4656. The trap and contaminated soil in the surrounding area of MSFC-38 were removed in 1994.</p>	<p>Surface Water: Tetrachloroethene was detected at a concentration above its applicable CV.</p> <p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Surface Water: <i>No public health hazard</i> exists. Exposure to contaminants in surface water is unlikely. The site is inaccessible to the public. Any exposure by workers to surface water would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
<p>MSFC-41 Waste Anderol Storage Tank for Building 4744</p>	<p>MSFC-41 is located west of Building 4744 and has been operational since the late 1960s. The unit is a 20,000-gallon AST surrounded by a concrete secondary containment structure approximately 47 ft long, 20 ft wide, and 3 ft deep. There is a small 2-ft by 2-ft by 2-ft sump inside the containment area on the southern side. A ditch flows south underneath a road that leads to Building 4744. The water then flows west and offsite. Storm water in the surrounding area will flow south into the drainage ditch. The unit collects waste anderol that has been drained from compressor units in the Compressed Air Facility (Building 4744).</p>	<p>Surface soil: Aroclor 1260 was detected at a concentration above its applicable CV.</p> <p>Surface Water: Bromodichloromethane was detected at a concentration above its applicable CV.</p> <p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Surface Soil: <i>No public health hazard</i> exists. Exposure to contaminants in surface soil is unlikely. The site is inaccessible to the public. Any exposure by workers to surface soil would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Surface Water: <i>No public health hazard</i> exists. Exposure to contaminants in surface water is unlikely. The site is inaccessible to the public. Any exposure by workers to surface water would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Groundwater: <i>No public health hazard</i> exists. No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
MSFC-42 Waste Oil Trap for Fuel Oil Tanks	<p>This unit, located northeast of Building 4596 in the East Test Area, is a concrete oil trap or sump for leaks or spills from the adjacent ASTs. The unit is approximately 3 ft by 64 ft, and 4 ft deep. The sump is connected to a 4-foot-diameter iron pipe that extends in an eastern direction to a ditch approximately 5 ft wide and 5 ft deep. The ditch drains to MSFC-63. An AST containing No. 2 fuel oil is adjacent to the site. The sump was an oil trap and storm drain for liquid oxygen/nitrogen tanks. During the VSI, the unit was full of soil and weeds and was not functioning. There is no evidence that wastes have been removed from the unit. No releases were identified in the available file material. During a March 1995 site visit, the sump was full of clay and weeds. The iron oxide grit "Black Beauty" was on the gravel and clay surrounding the sump.</p>	<p>Surface soil, sediment, and subsurface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.</p>	<p>Surface Soil: <i>No public health hazard exists.</i></p> <p>Sediment: <i>No public health hazard exists.</i></p> <p>Subsurface Soil: <i>No public health hazard exists.</i></p>
MSFC-43 Waste Oil Trap for Building 4816	<p>This unit, a former waste oil trap and separator, was in operation from the late 1960s until 1991. It was located north of Building 4817, near Building 4816 at the RSA airfield. The unit, 3 ft in diameter, accumulated waste oil at Building 4816 and 4817. The location of the tank is marked by an indentation in the grassy ground surface. Storm water flow from MSFC-43 is toward the east. The water flows across Hale Road to a surface drainage ditch and into MSFC-68. This tank from the site has been closed under the Alabama Underground Storage Tank Program. The site also consists of other areas associated with airfield activities.</p>	<p>Surface soil and subsurface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.</p>	<p>Surface Soil: <i>No public health hazard exists.</i></p> <p>Subsurface Soil: <i>No public health hazard exists.</i></p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
<p>MSFC-58 Waste Anderol UST and Unloading Area for Building 4747</p>	<p>MSFC-58 is an inactive unloading area containing a 2,000-gallon, steel UST for waste anderol oil. The unit, which has been in operation since the mid-1970s, is located on the northwestern side of Building 4747. The unloading area is a 3-inch-thick concrete platform approximately 3 ft by 3 ft. The unloading area is surrounded by an asphalt parking area. The parking area is sloped toward the north, and storm water flows into a small depression at the pavement's edge. The concrete depression transports the water approximately 84 ft west to a grassy ditch, which then transports the water north offsite. The UST stores waste anderol from the compressor facility in Building 4747. In the past waste hydraulic (heavy compressor oil) was managed at this unit. The unloading area serves as a transfer point from the UST to tanker trucks for disposal or reuse. No releases were identified in the available file material; however, a dark oily stain leading from the unloading area across the asphalt parking area to the street was observed during the VSI. During a March 1995 site visit, dark oily stains were apparent in the parking lot and in the drainage ditches.</p>	<p>Sediment: Aroclor 1260 and arsenic were detected at concentrations above their applicable CVs.</p> <p>Surface soil: Aroclor 1260 was detected at a concentration above its applicable CV.</p> <p>Surface Water: Aroclor 1260 was detected at a concentration above its applicable CV.</p> <p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Sediment: <i>No public health hazard exists.</i> Exposure to contaminants in sediment is unlikely. The site is inaccessible to the public. Any exposure by workers to sediment would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Surface soil: <i>No public health hazard exists.</i> Exposure to contaminants in surface soil is unlikely. The site is inaccessible to the public. Any exposure by workers to surface soil would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Surface Water: <i>No public health hazard exists.</i> Exposure to contaminants in surface water is unlikely. The site is inaccessible to the public. Any exposure by workers to surface water would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
MSFC-59 Waste Anderol UST and Unloading Area for Building 4647	MSFC-59, located adjacent to the eastern side of Building 4647, is an inactive waste UST and unloading area that began operation in the mid-1970s. The steel UST has an approximate 4,000-gallon volume. The UST stores waste anderol (in the past, waste hydraulic) from the compressor facility in Building 4647. Storm water from the area flows over grassy terrain toward the east to a clay-lined, 1-foot-wide, 1-foot-deep ditch. The ditch then transports the water south. The unloading area is located on a 3-inch-thick concrete platform approximately 6 ft by 3 ft. This area serves as a transfer point from the UST to tank trucks for disposal or reuse. No record of a release was identified in the available file material. However, an oily stain was observed on the concrete pad at the unloading area and on the surrounding asphalt and gravel areas. During a March 1995 site visit, the oily stain mentioned above was observed. Additionally, twelve 55-gallon drums and eight 500-gallon liquid storage containers filled with waste anderol were placed on the ground surface at the southeastern corner of Building 4647. Oily stains were present on the clay and grass surrounding this storage area.	<p>Sediment: Lead was detected at a concentration above its applicable CV.</p> <p>Groundwater: Groundwater at this site is being addressed as part of OU-3 (MSFC groundwater data is being evaluated under an OU-wide basis, see Table 11 for more information).</p>	<p>Sediment: <i>No public health hazard exists.</i> Exposure to contaminants in sediment is unlikely. The site is inaccessible to the public. Any exposure by workers to sediment would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.</p> <p>Groundwater: <i>No public health hazard exists.</i> No pathway of exposure exists to groundwater. There are no drinking water wells on RSA and residents surrounding RSA receive their drinking water from municipal water supplies.</p>
MSFC-68 Building 4815 Surface Drainage	MSFC-68 is a drainage way located east of Building 4815 and the Satellite Waste Accumulation Area for Building 4815 (MSFC-33) at the Redstone Army Airfield. The dates of use are unknown, but the unit was in existence in the 1960s. This surface drainage system extends southeast, where it meets a large channel that extends southwest and ultimately discharges into Indian Creek. The unit is approximately 30 ft wide by 3 ft deep. An aerial photograph dated February 1950 delineates the drainage pathway adjacent to Hale Road. The unit accumulates surface drainage from runoff in the vicinity of the Redstone Army Airfield and the Satellite Waste Accumulation Areas for MSFC-33 and 80 waste oil traps, MSFC-43, and two fuel USTs (recently removed). Surface runoff from these sources going into this unit may contain waste oil and fuel. Although no releases were identified in the available file material, dark stains were observed on the bottom of the drainage area.	Surface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Surface Soil: <i>No public health hazard exists.</i>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
MSFC-45/MSFC-46 Concentrate Receiving Tank and Transfer Tank	The concentrate receiving tank was operational from 1969 to 1984. The unit is located in the southwestern part of the facility. The tank collected wastewater from operations in Building 4760. The wastewater consisted of pickling and plating liquors, and dilutes rinse waters. The transfer tank is an inactive in-ground tank that was operational from 1969 to 1984. This tank received the neutralized wastewater from the concrete receiving tank and transferred it to the evaporator building. Some metal hydroxide sludge accumulated in this tank.	Surface soil and subsurface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Surface Soil: <i>No public health hazard exists.</i> Subsurface Soil: <i>No public health hazard exists.</i>
MSFC-47 Hydrostatic Dump Lagoon	The hydrostatic dump lagoon is an inactive clay-lined settling lagoon. The rinse water and spray paint booth wastewater from Building 4760 were discharged to the mix tank before being discharged into the lagoon. The water in the unit was allowed to evaporate, and was not discharged to any receiving streams or other treatment units.	Surface soil and subsurface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Surface Soil: <i>No public health hazard exists.</i> Subsurface Soil: <i>No public health hazard exists.</i>
MSFC-48 Mix Tank	The concrete mixing tank is an inactive tank located on the northeastern corner of the hydrostatic dump lagoon. After plating wastes were transferred to the Industrial Waste Treatment Facility from Building 4760, industrial rinse water was used to clean out the plating waste residue left in the pipes. This unit received the rinse water along with waste associated with the spray paint booth located in Building 4760.	Surface soil and subsurface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Surface Soil: <i>No public health hazard exists.</i> Subsurface Soil: <i>No public health hazard exists.</i>
MSFC-A Caustic Storage Tank	The storage tank was a sodium hydroxide (caustic) storage tank used from 1969 to 1984. Though inactive, the tank is still in place.	Surface soil and subsurface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Surface Soil: <i>No public health hazard exists.</i> Subsurface Soil: <i>No public health hazard exists.</i>
MSFC-001 Driller's Mud Disposal	Driller's mud disposal is located about 1,000 ft south of Building 4619. It is an inactive holding pond in which more than 1 million gallons of hydrostatic test fluids containing sodium dichromate were disposed. The unit was active from 1965 to 1980, when 235,000 gallons of barite-based driller's mud were poured into the pond to close the unit.	Subsurface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Subsurface Soil: <i>No public health hazard exists.</i>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
MSFC-006 Disposal Pond	The disposal pond is located immediately northwest of Building 4583. It is an inactive surface impoundment that received minor discharges of fuel and organic solvents from activities associated with the testing of model engines. It was in service from the late 1950s and is currently backfilled.	Surface soil and subsurface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Surface Soil: <i>No public health hazard exists.</i> Subsurface Soil: <i>No public health hazard exists.</i>
MSFC-007 Holding/Disposal Pond - Cold Calibration Test Stand Site	This concrete-lined unit, located 50 ft east of the Structure 4548 Test Stand in the East Test Area, received routine discharges from the Cold Calibration Test Stand Site as well as test stand 4548, the hot gas facility. The discharges contained fuel, organic solvents, and sodium dichromate. Fluids enter the pond on the west side via a concrete-lined spillway. A second inlet is located on the northwest side where fluids enter via a concrete-lined channel. Fluids exit the pond on the southeast side via a valved concrete channel into a clay-lined grassy ditch. This unit was operated from the 1960s until the 1970s. Although the unit is still physically present, it no longer receives dichromate or solvent flushings.	Surface soil and surface water samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Surface Soil: <i>No public health hazard exists.</i> Surface Water: <i>No public health hazard exists.</i>
MSFC-012 Detention Pond for Building 4572	MSFC-012 is an unlined earthen detention pond believed to have been constructed in the 1960s. The pond receives wastewater from the test stand at Structure 4572 by a stainless steel pipe. Wastes are generated from activities at the test stand. The unit no longer contains water and is entirely covered with grass.	Surface soil and subsurface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Surface Soil: <i>No public health hazard exists.</i> Subsurface Soil: <i>No public health hazard exists.</i>
MSFC-013 Old Soil/Rubble Dump Site	The unit served as a construction debris disposal area containing gravel, soils, asphalt, bricks, and concrete. There is no evidence of hazardous waste at this unit.	Subsurface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Subsurface Soil: <i>No public health hazard exists.</i>
MSFC-022/MSFC-E Satellite Waste Accumulation Area for Buildings 4241 and 4244 and 4244 Product Storage Area	MSFC-022 is an inactive satellite waste accumulation area for buildings 4241 and 4244. The unit began operation in 1984, but activities have since been relocated. This unit consisted of a covered asphalt/gravel area surrounded by a chain link fence. Chlorinated solvents, compressor oil, waste freon, product oil, and miscellaneous debris and paint cans were stored at this unit. MSFC-E is a product storage area located west of Buildings 4241 and 4244, and south of the associated MSFC-022. The area was in operation during the 1960s, but is now inactive. Product oil drums have been observed in this area.	Surface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Surface Soil: <i>No public health hazard exists.</i>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
MSFC-031 Hazardous Waste Container Storage Area	This unit is the temporary container storage area for all hazardous wastes generated at MSFC. It has been in operation since 1985 and is located in a fenced area in the south-central portion of the facility at the west end of Ranger Street. Three large structures are housed at this site. Building 4640 is the central office for contractors. Building or Storage 4635 is a large, covered concrete structure with six concrete curbed bays. Each bay contains its own sump. A third structure just northwest of Building 4640 houses five large bays. Four of the bays hold 2,000 gallon storage tanks for storage of caustic waste. Waste oil is stored in a large tank to the west of this area. A small covered area is also used to store ignitable wastes. Smaller areas on the concrete paved portion of the site store waste batteries, used drums, and waste containers. The entire area is surrounded by a chain link fence. Citric acid, ammonium hydroxide, and waste corrosive liquids are stored in aboveground tanks. Trichloroethane, ignitables, and corrosives are stored in drums. This unit is surrounded by a drainage system that discharges into a nearby creek.	Surface soil: Chloride was detected and lacks an applicable CV.	Surface Soil: <i>No public health hazard exists.</i> Exposure to contaminants in surface soil is unlikely. The site is inaccessible to the public. Any exposure by workers to surface soil would likely be brief and infrequent. Such exposure would not be expected to result in adverse health effects.
MSFC-037 Building 4767 Holding Tanks	This unit consists of two inactive in-ground and covered holding tanks. According to sit plan maps, the approximately 50,000 gallon tanks were constructed in 1965. MSFC-037 is adjacent to the old Heat Treatment Facility that now houses the Hazardous Spray Coating Facility. Surface water from the area apparently drains toward the southeast into a lined ditch.	Subsurface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Subsurface Soil: <i>No public health hazard exists.</i>
MSFC-054 Site of Former Beryllium Metal Machining Facility	This unit is an inactive beryllium machining facility. It was in operation from the mid-1940s to the late 1970s. The site of the old facility is now a vacant area along the west side of Rideout Road. Currently, a building is being constructed over a portion of the site.	Subsurface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Subsurface Soil: <i>No public health hazard exists.</i>
MSFC-056 Fuel Oil Loading Area for Tanks at Pump Station 4673	This unit is an active fuel-loading area that has been used since the installation of the pump station in 1965. It consists of a long concrete pad adjacent to the covered pump station. The pump station is underlain with clay and gravel, and a drainage ditch is located on the east side. This ditch leads to a permitted pond. Along the west side of the pad is a 3-inch containment curb.	Surface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Surface Soil: <i>No public health hazard exists.</i>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
MSFC-057/MSFC-C Unleaded Gasoline Loading Area for Tanks 4632, 4633, and 4636 and Containment Area for Tank 4636	MSFC-057 is an active fuel-loading area that has been in use since 1965 when the gasoline station at Building 4611 was constructed. It is used as a transfer station from fuel tanker trucks to Tanks 4632, 4633, and 4636. MSFC-C is a bermed area designed to contain spills from a 15,000 gallon tank (Tank 4636) containing unleaded fuel. In previous years, the tank contained aviation gasoline. If there were an overflow from the bermed area, it would flow into a nearby stream and eventually into Indian Creek.	Surface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Surface Soil: <i>No public health hazard exists.</i>
MSFC-062 Uncontained Pathways-North Section of East Tank Area	A series of grassy, clay-lined surface drainage pathways in the north section of the East Test Site Area are designated as MSFC-062. The exact dates of operation for this unit are unknown. However, activities in this area were greatest during the 1960s and 1970s. This unit includes drainage pathways that eventually feed into the MSFC-010 retention pond.	Surface soil and subsurface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Surface Soil: <i>No public health hazard exists.</i> Subsurface Soil: <i>No public health hazard exists.</i>
MSFC-069 Drainage Accumulation Areas near Building 4630	This clay-lined unit accumulates surface runoff from the adjacent areas, discharges from two detention ponds, and runoff from the test stand that may contain oil, hydrazine, and fuel.	Surface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Surface Soil: <i>No public health hazard exists.</i>
MSFC-070 Vehicle Wash Rack and Oil/Water Separator	This unit is an oil/water separator associated with a vehicle wash rack, and has been operational since the early 1960s. The separator received wastewater from vehicle and machine part cleaning operations at the vehicle maintenance shop. The wastewater contains oil and grease and may contain solvents.	Subsurface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Subsurface Soil: <i>No public health hazard exists.</i>
MSFC-073 Construction/Rubble Fill in MSFC East Test Area	This unit is an inactive construction rubble dump site located on the eastern boundary of the East Test Area. The unit is approximately 3/4 of an acre in size, and is heavily forested.	Surface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Subsurface Soil: <i>No public health hazard exists.</i>
MSFC-075 and MSFC-085 Product Storage and Waste Accumulation Area Near Building 4677 and Paint Shop 4682	MSFC-075 is an active product and waste storage area. Barrels of propylene glycol are currently managed there. Past uses may have included storage of waste paint and solvents, waste paint cans, and contained asbestos. MSFC-085 lies directly south of MSFC-075 at Building 4682. This unit is a storage area for waste paint and solvents. Building 4682 contains flammable chemicals products (paints and solvents). Drums are located at both sites and are stored on wooden pallets underlain with concrete or gravel.	Surface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	Surface Soil: <i>No public health hazard exists.</i>

Table 13. Evaluation of Potential Public Health Hazards Associated with the MSFC-Controlled Sites at Redstone Arsenal (Cont.)

Site	Description	Previous Investigation/Remediation	Evaluation of Public Health Hazard
MSFC-079 Drainage and Retention Pond for Building 4564	MSFC-79 was a retention pond for activities conducted at Building 4564. The purpose of the unit was to carry and contain cooling water generated during rocket engine testing at Building 4564.	Surface soil and subsurface soil samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. None were detected above CVs.	<p>Surface Soil: <i>No public health hazard exists.</i></p> <p>Subsurface Soil: <i>No public health hazard exists.</i></p>
MSFC-086 Hydraulic Fluid Area Building 4618	This unit is a hydraulic fluid reservoir area for structural stress-testing activities in Building 4619. The area is underlain with clay and grass. A spill of hydraulic fluid that occurred in this area during the mid-1970s was reportedly cleaned up with absorbent and contaminated soils were removed.	Subsurface soil: Methapyrilene was detected at a concentration above its applicable CV.	<p>Subsurface Soil: <i>No public health hazard exists.</i></p> <p>No pathway of exposure exists to contaminated subsurface soil. Exposure to contaminants in soil usually occurs in the top several inches (0-3").</p>
MSFC-B Containment Area for Old Storage Propellant Building 4677	This unit received spills from the Old Storage Propellant Building. At the north end of the building are three equally spaced drains that were used to dispose of spill cleanup flush water. The unit eventually discharged to the Deluge Pond via a drainage ditch that is partially concrete lined and partially clay lined.	Sampling completed, with additional sampling planned.	<p>Surface Soil: <i>No public health hazard exists.</i></p> <p>Subsurface Soil: <i>No public health hazard exists.</i></p>

APPENDIX C: FIGURES

Figure 1. Army-Controlled Sites

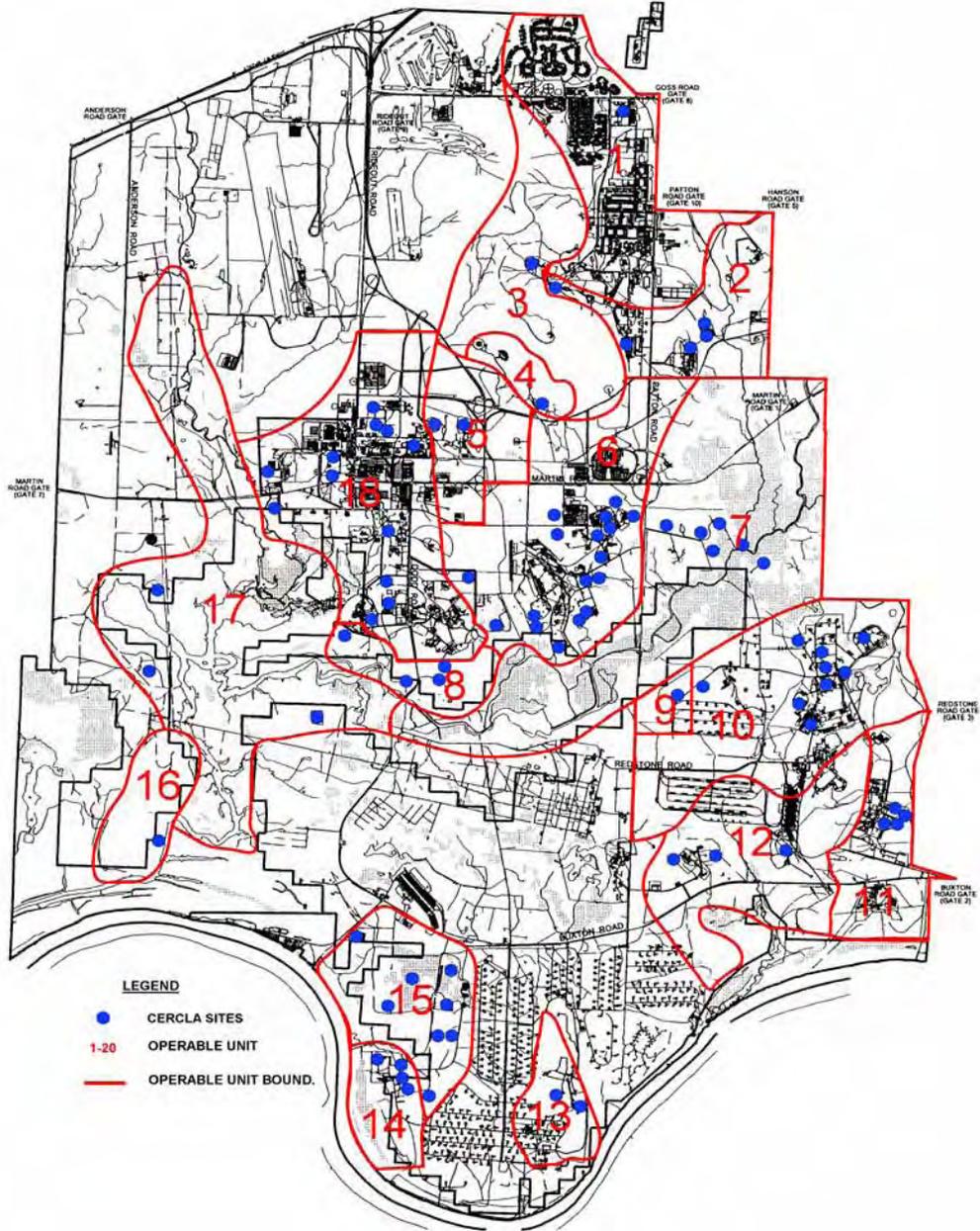


Figure 2. MSFC-Controlled Sites

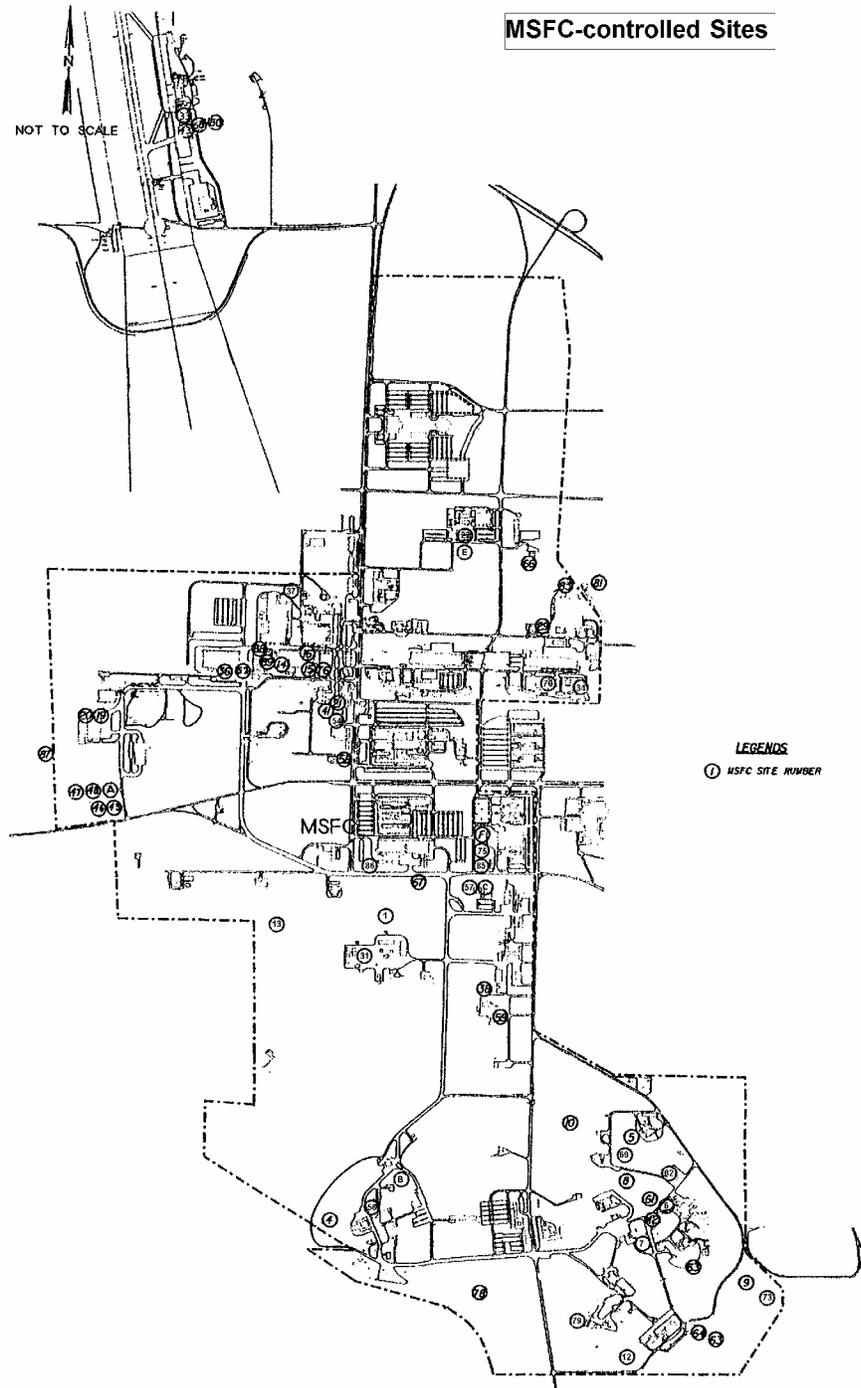
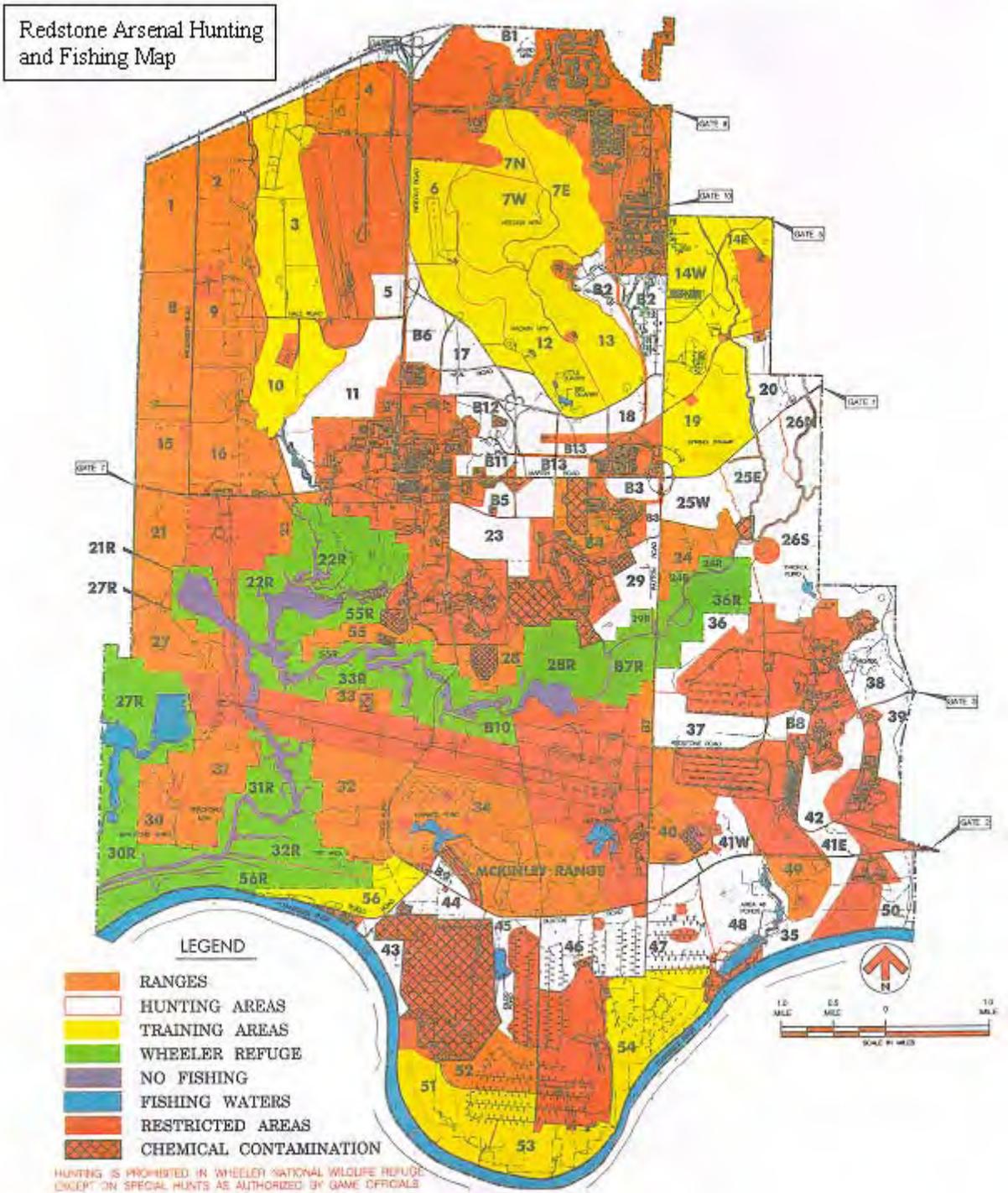


Figure 3. RSA Hunting and Fishing Map



APPENDIX D: GLOSSARY

Cancer Risk Evaluation Guides (CREGs)

Estimated contaminant concentrations that would be expected to cause no more than one excess cancer in a million (10^{-6}) persons exposed over a 70-year life span. ATSDR's CREGs are calculated from EPA's cancer potency factors.

CERCLA

The Comprehensive Environmental Response Compensation and Liability Act of 1980 also known as the Superfund. This is the legislation that created ATSDR.

Comparison Values

Estimated contaminant concentrations in specific media that are not likely to cause adverse health effects, given a standard daily ingestion rate and standard body weight. The comparison values are calculated from the scientific literature available on exposure and health effects. The conclusion that a contaminant exceeds the comparison value does not mean that it will cause adverse health effects. Comparison values represent media-specific contaminant concentrations that are used to select contaminants for further evaluation to determine the possibility of adverse public health effects.

Concentration

The amount of one substance dissolved or contained in a given amount of another. For example, sea water contains a higher concentration of salt than fresh water.

Contaminant

Any substance or material that enters a system where it is not normally found, or that is found in greater concentrations than background levels.

EPA Action Level

Represent levels at which the agency (EPA) must take additional action under its control to reduce the levels of the contaminant, and inform residents about the action they can take to lower exposure.

Environmental Contamination

The presence of hazardous substances in the environment from the public health perspective, environmental contamination is addressed when it potentially affects the health and quality of life of people living and working near the contamination.

Environmental Media Evaluation Guides (EMEGs)

EMEGs are based on ATSDR minimal risk levels (MRLs) and factors in body weight and ingestion rates. An EMEG is an estimate of daily human exposure to a chemical (in mg/kg/day) that is likely to be without non-carcinogenic health effects over a specified duration of exposure.

Exposure

Contact with a chemical by swallowing, by breathing, or by direct contact (such as through the skin or eyes). Exposure may be short term (acute) or long term (chronic).

Hazard

Risk which may cause adverse consequences to human health when there is an exposure pathway.

Lifetime Health Advisory (LTHA)

LTHAs represent contaminant concentrations that EPA deems protective of public health over a lifetime (70 years) at an ingestion rate of two liters of water per day. LTHAs are not legally enforceable standards.

Maximum Contaminant Level (MCL)

The MCL is the drinking water standard established by EPA. It is the maximum permissible level of a contaminant in water that is delivered to the free-flowing outlet. MCLs are considered protective of public health over a lifetime (70 years) for people consuming 2 liters of water per day.

Maximum Contaminant Level Goal (MCLG)

MCLGs are drinking water health goals. MCLGs are set at a level at which no known or anticipated adverse human health effects occur. MCLGs are not enforceable standards.

Media

Any part of the environment that can contain contaminants, e.g., soil, water, air, plants or animals

Potentially Exposed

Valid information indicates the presence of contaminants of a public health concern in one or more environmental media contacting humans (e.g., air, drinking water, soil, food chain or surface water). There is evidence that some of those persons may have an identified route(s) of exposure (e.g., drinking contaminated water, breathing contaminated air, having contact with contaminated soil, or eating contaminated food).

Public Health Assessment

The evaluation of data and information on the release of hazardous substances into the environment in order to assess any current or future impact on public health, develop health advisories or other recommendations, and identify studies or actions needed to evaluate and mitigate or prevent human health effects; also, the document resulting from that evaluation.

Reference Media Evaluation Guides (RMEGs)

ATSDR derives RMEGs from EPA's oral reference doses. The RMEG represents the concentration in water or soil at which daily human exposure is unlikely to result in adverse noncarcinogenic effects.

Route of Exposure

The path in which a person may contact a chemical substance, For example, swallowing (ingestion) and touching (direct contact) are two different routes of exposure to contaminants that may be found in soil.

Semi-Volatile Organic Compounds (SVOCs)

Organic compounds which are easily extracted with an organic solvent. Polycyclic aromatic hydrocarbons, such as naphthalene, phenanthrene, benzo(a)pyrene, and chrysene, comprise one category of SVOCs. The term SVOCs is used synonymously with base/neutral and acid extractable compounds (BNAs).

Volatile organic compound (VOC)

Substance containing carbon and different proportions of other elements such as hydrogen, oxygen, fluorine, chlorine, bromine, sulfur, or nitrogen; these substances easily become vapors or gases. A significant number of the VOCs are commonly used as solvents (e.g., paint thinners, lacquer thinners, degreasers, dry cleaning fluids).

APPENDIX E: PUBLIC COMMENTS

The Public Comment period ended November 20th 2003. Listed below are the comments provided to the ADPH.

Is it safe for children to go barefooted and play in the yards east of the Redstone boundary?

The TCE in groundwater is at least 15 feet deep and does not percolate to the surface in the residential areas. Children and adults in residential yards are not a risk for TCE exposure.

Older individuals could potentially venture into streams near the Redstone boundary where very low levels of TCE have been found. Even though the TCE levels in the streams are lower than the levels allowed by water standards, Redstone will continue to monitor them under the oversight of the Alabama Department of Environmental Management and the U.S. Environmental Protection Agency.

A rare type of cancer, Acute Myelogenous Leukemia (AML), has been diagnosed in residents near the eastern border of Redstone. Could this be caused by Redstone contamination?

Any cancer diagnosis causes concern and can lead to questions of why or how the cancer occurred. AML is no different. There are several reasons that the AML cases were not caused by contamination at Redstone. First, although AML has been associated with worker exposure to benzene, benzene is not a contaminant near the residential area. TCE is the contaminant near the residential area, and it is not associated with AML. Second, the AML cases occurred in people of different ages, and childhood risk factors for AML are different than adult risk factors for AML. If exposure to environmental contaminants was causing cancer, an unusual number of individuals having similar, relevant risk factors would be affected. Third, even though a single case of AML is grievous to the patient and loved ones, the number of cases near Redstone is not unusual. Both worldwide and nationwide, AML occurs most frequently in industrialized countries and metropolitan areas. The number and distribution of AML cases within both Madison County and Huntsville are consistent with this finding and are not unexpected for the area.

The desire to clearly identify the exact cause(s) of a particular individual's cancer is rarely fulfilled. Knowing the risk factors for a particular type of cancer does not eradicate cancers that have already been diagnosed; however, such knowledge can eliminate some questions and concerns. Also, such knowledge can equip others to avoid those risk factors that can be controlled. For example, workers who may be exposed to benzene may take steps to cease or reduce benzene exposure. Additional information about AML is available at [Official site for Acute Myelogenous Leukemia AML cancer information](#).

Numerous employees of a school north of Redstone have been diagnosed with cancer. Could these cancers be caused by contamination at Redstone?

As stated above, cancer diagnoses cause concern and can lead to questions of why or how the cancer occurred. The only Redstone contamination off the post/garrison is at the eastern border; therefore, ADPH does not suspect that exposure to Redstone contaminants has occurred north of the installation.

If exposure to some environmental contaminant at the school has caused cancer, ADPH would expect to see several significant events. First, evidence of individuals diagnosed with the same type of cancers. (Common risk factor exposure to substance X, would lead to multiple cases of the same illness.) Second, an unexpected number of cases in individuals who are younger than those commonly diagnosed with that particular cancer. Third, an unexpected number of cases of a type of cancer that is toxicologically associated with exposure to some contaminant. For example, various types of lung cancer may be associated with exposure to tobacco smoke, certain asbestos fibers, radon, etc.

If the cases of cancer among school employees meet the descriptions listed above, the school system may be interested in further examining the cancer incidence among employees to determine whether they are occupationally related. ADPH encourages the school system to contact agencies having jurisdiction over occupational health and safety for assistance. The National Institute of Safety and Health can be contacted at 1-800- 356-4674. The Occupational Safety and Health Agency can be contacted at 1-800- 321-6742.

Employees at the Thiokol plant worked with chemical substances and many employees have developed health problems. Someone should study the workers to find out if their illnesses were from exposure to contamination.

Companies who know their employees work in the presence of chemical substances are responsible to the National Institute of Safety and Health (NIOSH) and the Occupational Safety and Health Agency (OSHA) for compliance with worker safety regulations. Some of these regulations mandate safety training and monitoring of worker compliance, exposure and health. If Thiokol cannot produce evidence that it has complied with all necessary regulations, concerned workers may consult these agencies for advice and assistance. The National Institute of Safety and Health can be contacted at 1-800-356-4674. The Occupational Safety and Health Agency can be contacted at 1-800-321-6742.

Environmental personnel observed a private vehicle at mid-day parked in an isolated section of a restricted area. The inhabitants were not assigned there for work-related purposes, but had seemingly selected the location for lunch.

ADPH encourages Redstone to limit all access into restricted areas to official, work-related purposes only and to monitor compliance to all applicable worker safety procedures while therein.