

APPENDIX I
PRELIMINARY RISK ASSESSMENT

Technical Memorandum

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To: Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7), Fort McClellan, Calhoun County, Alabama
Preliminary Risk Assessment File

Date: March 11, 2002

Subject: **PRELIMINARY RISK ASSESSMENT FOR SUBJECT SITE**

This memorandum provides a preliminary risk assessment (PRA) for the Former Shell Tapping Area, Parcel 208(7), located in the south-central Pelham Range at Fort McClellan (FTMC), herein referred to as Parcel 208(7). The purpose of the PRA is to support a recommendation for no further action proposed by the Relative Risk Site Evaluation Summary. The PRA approach is a shortened version of the streamlined risk assessment (SRA) protocol developed as a uniform and economical approach to evaluating hundreds of similar sites at FTMC. It is assumed that the reader is familiar with FTMC and the fundamentals of the SRA protocol. The reader is referred to the installation-wide work plan (IT, 2002) for more detail. All the comparison and computational operations of the PRA are performed within EXCEL[®] spread sheet tables. The results of each step are described below. The PRA was performed in two iterations, a first iteration and a refined assessment, depending on where refinement was required in the selection of site-related chemicals, as explained below.

Media of Interest and Data Selection. Media of interest are surface soil, subsurface soil, groundwater, surface water, and sediment. Data consist of three surface soil samples taken from 0 to 2 ft below ground surface (ft bgs), three subsurface soil samples (4 to 12 feet below ground surface), two groundwater samples, one surface water sample, and one sediment sample. All samples were analyzed for chemical warfare agent breakdown products, metals, nitroaromatic explosives, semivolatile organic compounds, and volatile organic compounds (VOC). All the analytical data were validated.

Site-Related Chemical Selection. Site-related chemicals are those presumed to have been released by the Army during operation of FTMC. Site-related chemicals were selected for the first iteration of the risk assessment by comparing the maximum detected concentration (MDC) of each chemical with its background screening criterion (BSC), computed as two times the mean of the background data set, consistent with guidance of the U.S. Environmental Protection Agency (EPA), Region IV (EPA, 2002). Chemicals whose MDCs exceeded their BSCs were selected as site-related chemicals and were subjected to chemicals of potential concern (COPC) selection (described below) for inclusion in the first iteration of the risk assessment. The site-related chemicals chosen in this manner are identified in Tables 1, 2, and 3 for surface soil, Tables 4, 5, and 6 for subsurface soil, Tables 7 and 8 for groundwater, Table 9 for surface water, and Table 10 for sediment. BSCs were taken from Science Applications International

Corporation (SAIC) (1998).

Upper tolerance limits (UTL), the highest metal concentrations reasonably considered to be within background, are also included in Tables 1 through 10 for information but were not used to select site-related chemicals for the first iteration of risk estimates. The UTL provides a more refined statistical approach than the BSC for comparing site and background data and was used where needed for the second iteration to refine the risk estimates. UTLs were developed for the entire FTMC facility, combining data from the Main Post and Pelham Range (IT, 2002).

Chemical of Potential Concern Selection. COPCs are site-related chemicals whose MDCs exceed their site-specific screening levels (SSSL), and which may contribute significantly to risk. The SSSLs are receptor-, medium-, and chemical-specific risk-based concentrations that capture all the exposure assumptions and toxicity assessment of a full-blown baseline risk assessment. COPCs were selected for both cancer risk and noncancer effects when the data permitted (Tables 1 through 10).

Receptor Scenario Selection. The Relative Risk Site Evaluation Summary states that the site will be used for military training. Lacking more specific information, it is reasonable to select the National Guardsperson as the most plausible receptor scenario for military training. The National Guardsperson scenario was developed for sites on FTMC expected to be used in this manner. The recreational site user is included as an equally plausible receptor for a large, mostly wooded site. An on-site resident is also included as the upper-bound evaluation of exposure and risk for any land-use scenario and to provide additional perspective. SSSLs for all three receptor scenarios were used to select COPCs for surface and subsurface soil. The National Guardsperson and the resident, but not the recreational site user, are assumed to be exposed to groundwater developed as a source of potable water. The assumptions for residential and recreational site user exposure to surface water and sediment are identical, and the National Guardsperson is not expected to be regularly exposed to these media. Therefore, only recreational site user SSSLs were used for COPC selection for surface water and sediment.

Risk Characterization. Risk characterization combines the exposure assumptions and toxicity assessment (incorporated in the SSSLs) with the exposure-point concentration (EPC) to quantify the incremental lifetime cancer risk (ILCR) and noncancer hazard index (HI). ILCR and HI estimates are computed for each COPC in each medium and are summed across media to yield a total ILCR and total HI for each receptor scenario. The PRA differs from an SRA in that ordinarily no attempt is made to estimate an EPC that reflects a conservative estimate of average concentration for use in risk assessment. The 95 percent upper confidence limit on the mean is usually used for this purpose. Instead, the MDC is adopted as the EPC, which imparts a conservative bias to the PRA.

EPA (1990) considers ILCR estimates below $1E-6$ to be negligible, ILCR estimates from $1E-6$ to $1E-4$ to fall within a risk management range, and ILCR estimates above $1E-4$ to be generally unacceptable. Risk values are rounded to one significant figure to reflect the uncertainty about their estimation (EPA, 1989, 2002). For example, a calculated ILCR of $9.50E-7$ would be rounded to $1E-6$ and interpreted as falling within the risk management range. Similarly, a

calculated ILCR of $1.49\text{E-}4$ would be rounded to $1\text{E-}4$ and interpreted as falling within, but not exceeding, the risk management range. Also, an HI of $1.49\text{E+}0$ would be rounded to 1 and interpreted as not exceeding the threshold level of 1. Risk estimates in this document are presented in scientific notation with two places to the right of the decimal to facilitate checking calculations. Rounding is done only if needed to simplify interpretation.

The National Guardsperson is potentially exposed to soil and groundwater at Parcel 208(7). COPCs selected for exposure to surface soil for the first iteration of the risk assessment are limited to arsenic, based on cancer risk (Table 1). The total ILCR for exposure to surface soil was $4.92\text{E-}6$, which is within the risk management range. No chemicals were selected as COPCs for noncancer effects, and an HI was not estimated. Exposure to surface soil poses no unacceptable risk or hazard to the National Guardsperson; therefore, a refined evaluation was not performed.

The on-site resident is potentially exposed to soil and groundwater at Parcel 208(7). COPCs selected for exposure to surface soil for the first iteration of the risk assessment are limited to arsenic, based on cancer risk and noncancer effects (Table 2). The total ILCR for exposure to surface soil was $4.27\text{E-}5$, which is within the risk management range. The total HI for surface soil was $7.76\text{E-}1$, which is below the threshold level of 1. Exposure to surface soil poses no unacceptable risk or hazard to the on-site resident; therefore, a refined evaluation was not performed.

The recreational site user is potentially exposed to soil, surface water, and sediment at Parcel 208(7). No chemicals were selected as COPCs for exposure to surface soil (Table 3). Therefore, neither an ILCR nor an HI were estimated. Exposure to surface soil poses no unacceptable risk or hazard to the recreational site user.

COPCs selected for the National Guardsperson for exposure to subsurface soil for the first iteration are limited to arsenic, based on cancer risk (Table 4). The total ILCR for exposure to subsurface soil was $1.37\text{E-}5$, which is within the acceptable range. No chemicals were selected as COPCs for noncancer effects, and an HI was not estimated. Exposure to subsurface soil poses no unacceptable risk or hazard to the National Guardsperson; therefore, a refined evaluation was not performed.

COPCs selected for the on-site resident for exposure to subsurface soil for the first iteration are arsenic and 2,4-dinitrotoluene (Table 5). The total ILCR for exposure to subsurface soil was $1.20\text{E-}4$, which exceeds the risk management range. Both arsenic and 2,4-dinitrotoluene contributed to the ILCR, but arsenic was the only significant contributor. The total HI for exposure to subsurface soil, due to arsenic alone, was $2.17\text{E+}0$, which exceeds the threshold level of 1. The MDC for arsenic in subsurface soil fell below its UTL and within the range of background (data not shown) (SAIC, 1998). It was judged that arsenic is present at concentrations comparable to background, and arsenic was dropped from the refined assessment. The refined ILCR, estimated for 2,4-dinitrotoluene alone, is $1.01\text{E-}6$, which is at the low end of the risk management range. No chemicals were selected as COPCs for noncancer effects for the

refined assessment. It is concluded that exposure to subsurface soil poses no unacceptable risk or hazard to the on-site resident.

COPCs selected for the recreational site user for exposure to subsurface soil for the first iteration are limited to arsenic, based on cancer risk (Table 6). The total ILCR for exposure to subsurface soil was $1.73\text{E-}5$, which is within the acceptable range. No chemicals were selected as COPCs for noncancer effects, and an HI was not estimated. Exposure to subsurface soil poses no unacceptable risk or hazard to the recreational site user; therefore, a refined evaluation was not performed.

bis(2-Ethylhexyl)phthalate was selected as the only COPC for National Guardsperson exposure to groundwater (Table 7). The total ILCR of $1.97\text{E-}6$ for exposure to groundwater is within the risk management range. No noncancer COPCs were selected, so no HI was calculated. Exposure to groundwater poses no unacceptable risk or hazard to the National Guardsperson; therefore, a refined evaluation was not performed.

bis(2-Ethylhexyl)phthalate was selected as the only COPC for on-site residential exposure to groundwater (Table 8). The total ILCR of $1.49\text{E-}5$ for exposure to groundwater is within the risk management range. The total HI of $2.24\text{E-}1$ is below the threshold level of 1. Exposure to groundwater poses no unacceptable risk or hazard to the on-site resident; therefore, a refined evaluation was not performed.

As noted above, both the recreational site user and on-site resident are assumed to be exposed to surface water and sediment to the same extent; therefore, surface water and sediment evaluation were limited to the recreational site user. No COPCs were selected for recreational site user exposure to surface water (Table 9) or sediment (Table 10). It is judged that exposure to these media poses no threat to recreational site user or residential receptors, and these media are not considered further in this evaluation.

The National Guardsperson was evaluated for exposure to surface soil, subsurface soil, and groundwater. The ILCR values and HI values were summed across media to account for simultaneous exposure to multiple media. The total ILCR of $2.06\text{E-}5$ for National Guardsperson exposure to all media falls within the risk management range. No COPCs were selected for noncancer effects for the National Guardsperson, and no HI was estimated. It is concluded that exposure to surface soil, subsurface soil, and groundwater poses no unacceptable cancer risk or threat of noncancer health effects to the National Guardsperson.

The recreational site user was evaluated for exposure to surface soil and subsurface soil. As noted above, COPCs were not selected for surface water and sediment, the other media to which this receptor may be exposed. The only COPC selected for the recreational site use was arsenic in subsurface soil. The total ILCR of $1.73\text{E-}6$ for the recreational site user falls within the risk management range. No COPCs were selected for noncancer effects for this receptor, and no HI was estimated. It is concluded that exposure to surface soil, subsurface soil, surface water and

sediment poses no unacceptable cancer risk or threat of noncancer health effects to the recreational site user.

The on-site resident was evaluated as the upper bound on exposure and risk and to provide additional perspective. The on-site resident is potentially exposed to surface soil, subsurface soil, groundwater, surface soil, and sediment. The ILCR summed across all media (using the refined assessment for subsurface soil) of 5.86E-5 is within the risk management range. The HI summed across all media of 1.00E+0 is equal to the threshold level of 1. It was concluded that exposure to surface soil, subsurface soil, groundwater, surface water, and sediment poses no unacceptable risk for the resident.

References

IT Corporation (IT), 2002, *Installation-Wide Work Plan*, Revision 2, Draft, Fort McClellan, Calhoun County, Alabama, Prepared for U.S. Army Corps of Engineers, Mobile District, February.

Science Applications International Corporation (SAIC), 1998, *Final Background Metals Survey Report*, prepared for U.S. Army Corps of Engineers, Mobile District, July.

U.S. Environmental Protection Agency (EPA), 2002, *Region 4 Human Health Risk Assessment Bulletins – Supplement to RAGS, Interim Human Health Risk Assessment Bulletins*, Waste Management Division, EPA Region 4, Atlanta, GA, on line.

U.S. Environmental Protection Agency (EPA), 1990, “National Oil and Hazardous Substances Pollution Contingency Plan,” *Federal Register* 55(46): 8666-8865.

U.S. Environmental Protection Agency (EPA), 1989, *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A)*, Interim Final, Office of Emergency and Remedial Response, Washington, DC, EPA/540/1-89/002, December.

Table 1

**Preliminary Risk Evaluation for the National Guardsperson Exposure to Surface Soil
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama**

Chemical	MDC	BSC	UTL	Site-Related Chemical? ^a	National Guardsperson Soil SSSL-c ^b	National Guardsperson Soil SSSL-n ^c	National Guardsperson Cancer COPC? ^d	National Guardsperson Noncancer COPC? ^e	National Guardsperson ILCR ^f	National Guardsperson HI ^g
Metals										
Aluminum	8.40E+03	1.63E+04	2.29E+04		NA	1.47E+04				
Arsenic	1.82E+01	1.37E+01	2.54E+01	1.82E+01	3.70E+00	7.96E+01	1.82E+01		4.92E-06	
Barium	1.06E+02	1.24E+02	1.94E+02			NA	1.43E+03			
Beryllium	7.80E-01	8.00E-01	1.19E+00		3.42E+01	4.42E+01				
Calcium	6.16E+02	1.72E+03	3.55E+03		NA	NA				
Chromium ^h	1.13E+01	3.70E+01	6.44E+01		6.85E+00	2.26E+02				
Cobalt	1.17E+01	1.52E+01	3.25E+01		NA	6.30E+01				
Copper	1.19E+01	1.27E+01	2.25E+01		NA	2.25E+01			1.06E+04	
Iron	1.84E+04	3.42E+04	5.54E+04		NA	7.96E+04				
Lead	1.41E+01	4.01E+01	6.38E+01		NA	8.80E+02				
Magnesium	2.17E+02	1.03E+03	2.16E+03		NA	NA				
Manganese	1.24E+03	1.58E+03	4.66E+03		NA	1.53E+02				
Mercury	6.80E-02	8.00E-02	1.25E-01		NA	7.12E+01				
Nickel	1.45E+01	1.03E+01	2.00E+01	1.45E+01	3.42E+02	5.00E+03				
Potassium	1.05E+02	8.00E+02	1.83E+03		NA	NA				
Thallium	5.90E-01	3.43E+00	6.62E+00		NA	1.73E+01				
Vanadium	2.07E+01	5.88E+01	9.94E+01		NA	1.65E+03				
Zinc	3.35E+01	4.06E+01	7.37E+01		NA	7.90E+04				
NITROAROMATICS										
2,4-Dinitrotoluene	8.20E-01			8.20E-01	9.89E+00	5.19E+02				
2,6-Dinitrotoluene	4.80E-01			4.80E-01	9.89E+00	2.59E+02				
2-Nitrotoluene	6.40E+00			6.40E+00	NA	2.59E+03				
3-Nitrotoluene	5.70E-01			5.70E-01	NA	2.59E+03				
p-Nitrotoluene	5.80E+00			5.80E+00	NA	2.59E+03				
SEMIVOLATILES										
bis(2-Ethylhexyl)phthalate	9.70E-02			9.70E-02	4.72E+02	5.21E+03				
VOLATILES										
Acetone	5.40E-02			5.40E-02	NA	2.58E+04				
Methylene chloride	4.60E-03			4.60E-03	8.92E+02	1.55E+04				
Total ILCR, HI									4.92E-06	--

All concentrations expressed as mg/kg.

MDC = maximum detected concentration; BSC = background screening criterion; UTL = 95% Upper Tolerance Limit.

NA = Not Available

^a MDC presented only if it exceeds BSC, or no BSC is available.

^b Site-specific screening level (SSSL) based on cancer risk for the National Guardsperson exposure to soil.

^c Site-specific screening level based on noncancer hazard for the National Guardsperson exposure to soil.

^d MDC presented only if it exceeds SSSL-c.

^e MDC presented only if it exceeds SSSL-n.

^f Incremental lifetime cancer risk for the National Guardsperson exposed to chemical in surface soil.

^g Hazard index for noncancer effects for the National Guardsperson exposed to chemical in surface soil.

^h SSSL based on chromium VI.

Table 2

**Preliminary Risk Evaluation for the On-Site Resident Exposure to Surface Soil
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama**

Chemical	MDC	BSC	UTL	Site-Related Chemical? ^a	On-Site Resident Soil SSSL-c ^b	On-Site Resident Soil SSSL-n ^c	On-Site Resident Cancer COPC? ^d	On-Site Resident Noncancer COPC? ^e	On-Site Resident ILCR ^f	On-Site Resident HI ^g
Metals										
Aluminum	8.40E+03	1.63E+04	2.29E+04		NA	7.80E+03				
Arsenic	1.82E+01	1.37E+01	2.54E+01	1.82E+01	4.26E-01	2.34E+00	1.82E+01	1.82E+01	4.27E-05	7.76E-01
Barium	1.06E+02	1.24E+02	1.94E+02		NA	5.47E+02				
Beryllium	7.80E-01	8.00E-01	1.19E+00		NA	9.60E+00				
Calcium	6.16E+02	1.72E+03	3.55E+03		NA	NA				
Chromium ^h	1.13E+01	3.70E+01	6.44E+01		NA	2.32E+01				
Cobalt	1.17E+01	1.52E+01	3.25E+01		NA	4.68E+02				
Copper	1.19E+01	1.27E+01	2.25E+01		NA	3.13E+02				
Iron	1.84E+04	3.42E+04	5.54E+04		NA	2.34E+03				
Lead	1.41E+01	4.01E+01	6.38E+01		NA	4.00E+02				
Magnesium	2.17E+02	1.03E+03	2.16E+03		NA	NA				
Manganese	1.24E+03	1.58E+03	4.66E+03		NA	3.63E+02				
Mercury	6.80E-02	8.00E-02	1.25E-01		NA	2.33E+00				
Nickel	1.45E+01	1.03E+01	2.00E+01	1.45E+01	NA	1.54E+02				
Potassium	1.05E+02	8.00E+02	1.83E+03		NA	NA				
Thallium	5.90E-01	3.43E+00	6.62E+00		NA	5.08E-01				
Vanadium	2.07E+01	5.88E+01	9.94E+01		NA	5.31E+01				
Zinc	3.35E+01	4.06E+01	7.37E+01		NA	2.34E+03				
NITROAROMATICS										
2,4-Dinitrotoluene	8.20E-01			8.20E-01	9.27E-01	1.55E+01				
2,6-Dinitrotoluene	4.80E-01			4.80E-01	9.27E-01	7.77E+00				
2-Nitrotoluene	6.40E+00			6.40E+00	NA	7.77E+01				
3-Nitrotoluene	5.70E-01			5.70E-01	NA	7.77E+01				
p-Nitrotoluene	5.80E+00			5.80E+00	NA	7.77E+01				
SEMIVOLATILES										
bis(2-Ethylhexyl)phthalate	9.70E-02			9.70E-02	4.52E+01	1.56E+02				
VOLATILES										
Acetone	5.40E-02			5.40E-02	NA	7.76E+02				
Methylene chloride	4.60E-03			4.60E-03	8.41E+01	4.66E+02				
Total ILCR, HI									4.27E-05	7.76E-01

All concentrations expressed as mg/kg.

MDC = maximum detected concentration; BSC = background screening criterion; UTL = 95% Upper Tolerance Limit.

NA = Not Available

^a MDC presented only if it exceeds BSC, or no BSC is available.

^b Site-specific screening level (SSSL) based on cancer risk for the on-site resident exposure to soil.

^c Site-specific screening level based on noncancer hazard for the on-site resident exposure to soil.

^d MDC presented only if it exceeds SSSL-c.

^e MDC presented only if it exceeds SSSL-n.

^f Incremental lifetime cancer risk for the on-site resident exposed to chemical in surface soil.

^g Hazard index for noncancer effects for the on-site resident exposed to chemical in surface soil.

^h SSSL based on chromium VI.

Table 3

**Preliminary Risk Evaluation for the Recreational Site User Exposure to Surface Soil
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama**

Chemical	MDC	BSC	UTL	Site-Related Chemical? ^a	Recreational Site User Soil SSSL-c ^b	Recreational Site User Soil SSSL-n ^c	Recreational Site User Cancer COPC? ^d	Recreational Site User Noncancer COPC? ^e	Recreational Site User ILCR ^f	Recreational Site User HI ^g
Metals										
Aluminum	8.40E+03	1.63E+04	2.29E+04		NA	6.27E+05				
Arsenic	1.82E+01	1.37E+01	2.54E+01	1.82E+01	2.94E+01	1.89E+02				
Barium	1.06E+02	1.24E+02	1.94E+02		NA	4.41E+04				
Beryllium	7.80E-01	8.00E-01	1.19E+00		NA	4.08E+02				
Calcium	6.16E+02	1.72E+03	3.55E+03		NA	NA				
Chromium ^h	1.13E+01	3.70E+01	6.44E+01		NA	1.82E+03				
Cobalt	1.17E+01	1.52E+01	3.25E+01		NA	3.75E+04				
Copper	1.19E+01	1.27E+01	2.25E+01		NA	2.52E+04				
Iron	1.84E+04	3.42E+04	5.54E+04		NA	1.89E+05				
Lead	1.41E+01	4.01E+01	6.38E+01		NA	4.00E+02				
Magnesium	2.17E+02	1.03E+03	2.16E+03		NA	NA				
Manganese	1.24E+03	1.58E+03	4.66E+03		NA	2.85E+04				
Mercury	6.80E-02	8.00E-02	1.25E-01		NA	1.84E+02				
Nickel	1.45E+01	1.03E+01		1.45E+01	NA	1.20E+04				
Potassium	1.05E+02	8.00E+02	1.83E+03		NA	NA				
Thallium	5.90E-01	3.43E+00	6.62E+00		NA	4.10E+01				
Vanadium	2.07E+01	5.88E+01	9.94E+01		NA	4.00E+03				
Zinc	3.35E+01	4.06E+01	7.37E+01		NA	1.88E+05				
NITROAROMATICS										
2,4-Dinitrotoluene	8.20E-01			8.20E-01	6.37E+01	1.24E+03				
2,6-Dinitrotoluene	4.80E-01			4.80E-01	6.37E+01	6.19E+02				
2-Nitrotoluene	6.40E+00			6.40E+00	NA	6.17E+03				
3-Nitrotoluene	5.70E-01			5.70E-01	NA	6.17E+03				
p-Nitrotoluene	5.80E+00			5.80E+00	NA	6.17E+03				
SEMIVOLATILES										
bis(2-Ethylhexyl)phthalate	9.70E-02			9.70E-02	3.11E+03	1.24E+04				
VOLATILES										
Acetone	5.40E-02			5.40E-02	NA	6.16E+04				
Methylene chloride	4.60E-03			4.60E-03	5.77E+03	3.71E+04				
Total ILCR, HI									--	--

All concentrations expressed as mg/kg.

MDC = maximum detected concentration; BSC = background screening criterion; UTL = 95% Upper Tolerance Limit.

NA = Not Available

^a MDC presented only if it exceeds BSC, or no BSC is available.

^b Site-specific screening level (SSSL) based on cancer risk for the recreational site user exposure to soil.

^c Site-specific screening level based on noncancer hazard for the recreational site user exposure to soil.

^d MDC presented only if it exceeds SSSL-c.

^e MDC presented only if it exceeds SSSL-n.

^f Incremental lifetime cancer risk for the recreational site user exposed to chemical in surface soil.

^g Hazard index for noncancer effects for the recreational site user exposed to chemical in surface soil.

^h SSSL based on chromium VI.

Table 4

**Preliminary Risk Evaluation for the National Guardsperson Exposure to Subsurface Soil
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama**

Chemical	MDC	BSC	UTL	Site-Related Chemical? ^a	National Guardsperson Soil SSSL-c ^b	National Guardsperson Soil SSSL-n ^c	National Guardsperson Cancer COPC? ^d	National Guardsperson Noncancer COPC? ^e	National Guardsperson ILCR ^f	National Guardsperson HI ^g
Metals										
Aluminum	5.59E+03	1.36E+04	1.66E+04		NA	1.47E+04				
Antimony	9.10E-01	1.31E+00	7.14E+00		NA	1.04E+02				
Arsenic	5.08E+01	1.83E+01	5.49E+01	5.08E+01	3.70E+00	7.96E+01	5.08E+01		1.37E-05	
Barium	4.50E+00	2.34E+02	3.20E+02		NA	1.43E+03				
Beryllium	4.00E-01	8.60E-01	2.19E+00		3.42E+01	4.42E+01				
Chromium ^h	3.05E+01	3.83E+01	5.34E+01		6.85E+00	2.26E+02				
Cobalt	6.60E+00	1.75E+01	5.47E+01		NA	6.30E+01				
Copper	2.95E+01	1.94E+01	3.42E+01	2.95E+01	NA	3.42E+01	2.95E+01		1.06E+04	
Iron	3.60E+04	4.48E+04	4.18E+04		NA	7.96E+04				
Lead	1.78E+01	3.85E+01	2.88E+01		NA	8.80E+02				
Magnesium	1.11E+02	7.66E+02	2.27E+03		NA	NA				
Manganese	1.07E+02	1.36E+03	3.79E+03		NA	1.53E+02				
Mercury	3.20E-02	7.00E-02	9.40E-02		NA	7.12E+01				
Nickel	1.68E+01	1.29E+01	2.92E+01	1.68E+01	3.42E+02	5.00E+03				
Potassium	2.71E+02	7.11E+02	1.42E+03		NA	NA				
Thallium	5.60E-01	1.40E+00	6.62E+00		NA	1.73E+01				
Vanadium	6.27E+01	6.49E+01	9.17E+01		NA	1.65E+03				
Zinc	5.22E+01	3.49E+01	8.50E+01	5.22E+01	NA	7.90E+04				
Nitroaromatics										
2,4-Dinitrotoluene	9.40E-01			9.40E-01	9.89E+00	5.19E+02				
2,6-Dinitrotoluene	6.50E-01			6.50E-01	9.89E+00	2.59E+02				
2-Nitrotoluene	1.70E+01			1.70E+01	NA	2.59E+03				
3-Nitrotoluene	1.70E+00			1.70E+00	NA	2.59E+03				
p-Nitrotoluene	1.50E+01			1.50E+01	NA	2.59E+03				
Semivolatiles										
bis(2-Ethylhexyl)phthalate	9.60E-02			9.60E-02	4.72E+02	5.21E+03				
Volatiles										
Acetone	1.30E-02			1.30E-02	NA	2.58E+04				
Methylene chloride	4.80E-03			4.80E-03	8.92E+02	1.55E+04				
Total ILCR, HI									1.37E-05	--

All concentrations expressed as mg/kg.

MDC = maximum detected concentration; BSC = background screening criterion; UTL = 95% Upper Tolerance Limit.

NA = Not Available

^a MDC presented only if it exceeds BSC, or no BSC is available.

^b Site-specific screening level (SSSL) based on cancer risk for the National Guardsperson exposure to soil.

^c Site-specific screening level based on noncancer hazard for the National Guardsperson exposure to soil.

^d MDC presented only if it exceeds SSSL-c.

^e MDC presented only if it exceeds SSSL-n.

^f Incremental lifetime cancer risk for the National Guardsperson exposed to chemical in subsurface soil.

^g Hazard index for noncancer effects for the National Guardsperson exposed to chemical in subsurface soil.

^h SSSL based on chromium VI.

Table 5

**Preliminary Risk Evaluation for the On-Site Resident Exposure to Subsurface Soil
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama**

Chemical	MDC	BSC	UTL	Site-Related Chemical? ^a	On-Site Resident Soil SSSL-c ^b	On-Site Resident Soil SSSL-n ^c	On-Site Resident Cancer COPC? ^d	On-Site Resident Noncancer COPC? ^e	On-Site Resident ILCR ^f	On-Site Resident HI ^g
Metals										
Aluminum	5.59E+03	1.36E+04	1.66E+04		NA	7.80E+03				
Antimony	9.10E-01	1.31E+00	7.14E+00		NA	3.11E+00				
Arsenic	5.08E+01	1.83E+01	5.49E+01	5.08E+01	4.26E-01	2.34E+00	5.08E+01	5.08E+01	1.19E-04	2.17E+00
Barium	4.50E+00	2.34E+02	3.20E+02		NA	5.47E+02				
Beryllium	4.00E-01	8.60E-01	2.19E+00		NA	9.60E+00				
Chromium ^h	3.05E+01	3.83E+01	5.34E+01		NA	2.32E+01				
Cobalt	6.60E+00	1.75E+01	5.47E+01		NA	4.68E+02				
Copper	2.95E+01	1.94E+01	3.42E+01	2.95E+01	NA	3.13E+02				
Iron	3.60E+04	4.48E+04	4.18E+04		NA	2.34E+03				
Lead	1.78E+01	3.85E+01	2.88E+01		NA	4.00E+02				
Magnesium	1.11E+02	7.66E+02	2.27E+03		NA	NA				
Manganese	1.07E+02	1.36E+03	3.79E+03		NA	3.63E+02				
Mercury	3.20E-02	7.00E-02	9.40E-02		NA	2.33E+00				
Nickel	1.68E+01	1.29E+01	2.92E+01	1.68E+01	NA	1.54E+02				
Potassium	2.71E+02	7.11E+02	1.42E+03		NA	NA				
Thallium	5.60E-01	1.40E+00	6.62E+00		NA	5.08E-01				
Vanadium	6.27E+01	6.49E+01	9.17E+01		NA	5.31E+01				
Zinc	5.22E+01	3.49E+01	8.50E+01	5.22E+01	NA	2.34E+03				
Nitroaromatics										
2,4-Dinitrotoluene	9.40E-01			9.40E-01	9.27E-01	1.55E+01	9.40E-01		1.01E-06	
2,6-Dinitrotoluene	6.50E-01			6.50E-01	9.27E-01	7.77E+00				
2-Nitrotoluene	1.70E+01			1.70E+01	NA	7.77E+01				
3-Nitrotoluene	1.70E+00			1.70E+00	NA	7.77E+01				
p-Nitrotoluene	1.50E+01			1.50E+01	NA	7.77E+01				
Semivolatiles										
bis(2-Ethylhexyl)phthalate	9.60E-02			9.60E-02	4.52E+01	1.56E+02				
Volatiles										
Acetone	1.30E-02			1.30E-02	NA	7.76E+02				
Methylene chloride	4.80E-03			4.80E-03	8.41E+01	4.66E+02				
Total ILCR, HI									1.20E-04	2.17E+00

All concentrations expressed as mg/kg.

MDC = maximum detected concentration; BSC = background screening criterion; UTL = 95% Upper Tolerance Limit.

NA = Not Available

^a MDC presented only if it exceeds BSC, or no BSC is available.

^b Site-specific screening level (SSSL) based on cancer risk for the on-site resident exposure to soil.

^c Site-specific screening level based on noncancer hazard for the on-site resident exposure to soil.

^d MDC presented only if it exceeds SSSL-c.

^e MDC presented only if it exceeds SSSL-n.

^f Incremental lifetime cancer risk for the on-site resident exposed to chemical in subsurface soil.

^g Hazard index for noncancer effects for the on-site resident exposed to chemical in subsurface soil.

^h SSSL based on chromium VI.

Table 6

**Preliminary Risk Evaluation for the Recreational Site User Exposure to Subsurface Soil
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama**

Chemical	MDC	BSC	UTL	Site-Related Chemical? ^a	Recreational Site User Soil SSSL-c ^b	Recreational Site User Soil SSSL-n ^c	Recreational Site User Cancer COPC? ^d	Recreational Site User Noncancer COPC? ^e	Recreational Site User ILCR ^f	Recreational Site User HI ^g
Metals										
Aluminum	5.59E+03	1.36E+04	1.66E+04		NA	6.27E+05				
Antimony	9.10E-01	1.31E+00	7.14E+00		NA	2.47E+02				
Arsenic	5.08E+01	1.83E+01	5.49E+01	5.08E+01	2.94E+01	1.89E+02	5.08E+01		1.73E-06	
Barium	4.50E+00	2.34E+02	3.20E+02		NA	4.41E+04				
Beryllium	4.00E-01	8.60E-01	2.19E+00		NA	4.08E+02				
Chromium ^h	3.05E+01	3.83E+01	5.34E+01		NA	1.82E+03				
Cobalt	6.60E+00	1.75E+01	5.47E+01		NA	3.75E+04				
Copper	2.95E+01	1.94E+01	3.42E+01	2.95E+01	NA	2.52E+04				
Iron	3.60E+04	4.48E+04	4.18E+04		NA	1.89E+05				
Lead	1.78E+01	3.85E+01	2.88E+01		NA	4.00E+02				
Magnesium	1.11E+02	7.66E+02	2.27E+03		NA	NA				
Manganese	1.07E+02	1.36E+03	3.79E+03		NA	2.85E+04				
Mercury	3.20E-02	7.00E-02	9.40E-02		NA	1.84E+02				
Nickel	1.68E+01	1.29E+01	2.92E+01	1.68E+01	NA	1.20E+04				
Potassium	2.71E+02	7.11E+02	1.42E+03		NA	NA				
Thallium	5.60E-01	1.40E+00	6.62E+00		NA	4.10E+01				
Vanadium	6.27E+01	6.49E+01	9.17E+01		NA	4.00E+03				
Zinc	5.22E+01	3.49E+01	8.50E+01	5.22E+01	NA	1.88E+05				
Nitroaromatics										
2,4-Dinitrotoluene	9.40E-01			9.40E-01	6.37E+01	1.24E+03				
2,6-Dinitrotoluene	6.50E-01			6.50E-01	6.37E+01	6.19E+02				
2-Nitrotoluene	1.70E+01			1.70E+01	NA	6.17E+03				
3-Nitrotoluene	1.70E+00			1.70E+00	NA	6.17E+03				
p-Nitrotoluene	1.50E+01			1.50E+01	NA	6.17E+03				
Semivolatiles										
bis(2-Ethylhexyl)phthalate	9.60E-02			9.60E-02	3.11E+03	1.24E+04				
Volatiles										
Acetone	1.30E-02			1.30E-02	NA	6.16E+04				
Methylene chloride	4.80E-03			4.80E-03	5.77E+03	3.71E+04				
Total ILCR, HI									1.73E-06	--

All concentrations expressed as mg/kg.

MDC = maximum detected concentration; BSC = background screening criterion; UTL = 95% Upper Tolerance Limit.

NA = Not Available

^a MDC presented only if it exceeds BSC, or no BSC is available.

^b Site-specific screening level (SSSL) based on cancer risk for the recreational site user exposure to soil.

^c Site-specific screening level based on noncancer hazard for the recreational site user exposure to soil.

^d MDC presented only if it exceeds SSSL-c.

^e MDC presented only if it exceeds SSSL-n.

^f Incremental lifetime cancer risk for the recreational site user exposed to chemical in subsurface soil.

^g Hazard index for noncancer effects for the recreational site user exposed to chemical in subsurface soil.

^h SSSL based on chromium VI.

Table 7

**Preliminary Risk Evaluation for the National Guardsperson Exposure to Groundwater
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama**

Chemical	MDC	BSC	UTL	Site-Related Chemical? ^a	National Guardsperson GW SSSL-c ^b	National Guardsperson GW SSSL-n ^c	National Guardsperson Cancer COPC? ^d	National Guardsperson Noncancer COPC? ^e	National Guardsperson ILCR ^f	National Guardsperson HI ^g
Metals										
Aluminum	7.87E-01	2.34E+00	5.95E+00		NA	1.90E+01				
Arsenic	2.60E-03	1.78E-02	1.17E-01		3.29E-04	5.70E-03				
Barium	1.59E-02	1.27E-01	4.72E-01		NA	1.33E+00				
Calcium	2.88E+01	5.65E+01	7.14E+01		NA	NA				
Chromium ^h	2.80E-03		1.68E-02	2.80E-03	NA	5.70E-02				
Cobalt	3.20E-03	2.34E-02	2.02E-02		NA	1.14E+00				
Iron	9.30E-01	7.04E+00	2.20E+01		NA	5.70E+00				
Magnesium	1.56E+01	2.13E+01	2.20E+01		NA	NA				
Manganese	3.42E-01	5.81E-01	4.13E+00		NA	8.93E-01				
Nickel	4.90E-03		3.43E-02	4.90E-03	NA	3.80E-01				
Potassium	9.64E-01	7.20E+00	1.60E+01		NA	NA				
Sodium	5.01E+00	1.48E+01	4.90E+01		NA	NA				
Vanadium	2.30E-03	1.70E-02	2.76E-02		NA	1.33E-01				
Zinc	5.50E-03	2.20E-01	1.16E+00		NA	5.70E+00				
Semivolatiles										
bis(2-Ethylhexyl)phthalate	6.40E-02			6.40E-02	3.24E-02	3.50E-01	6.40E-02		1.97E-06	
Volatiles										
Chloromethane	1.70E-04			1.70E-04	2.82E-02	7.36E-02				
Total ILCR, HI									1.97E-06	--

All concentrations expressed as mg/L.

MDC = maximum detected concentration; BSC = background screening criterion; UTL = 95% Upper Tolerance Limit.

NA = Not Available

^a MDC presented only if it exceeds BSC, or no BSC is available.

^b Site-specific screening level (SSSL) based on cancer risk for the National Guardsperson exposure to groundwater.

^c Site-specific screening level based on noncancer hazard for the National Guardsperson exposure to groundwater.

^d MDC presented only if it exceeds SSSL-c.

^e MDC presented only if it exceeds SSSL-n.

^f Incremental lifetime cancer risk for the National Guardsperson exposed to chemical in groundwater.

^g Hazard index for noncancer effects for the National Guardsperson exposed to chemical in groundwater.

^h SSSL based on chromium VI.

Table 8

**Preliminary Risk Evaluation for the On-Site Resident Exposure to Groundwater
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama**

Chemical	MDC	BSC	UTL	Site-Related Chemical? ^a	On-Site Resident GW SSSL-c ^b	On-Site Resident GW SSSL-n ^c	On-Site Resident Cancer COPC? ^d	On-Site Resident Noncancer COPC? ^e	On-Site Resident ILCR ^f	On-Site Resident HI ^g
Metals										
Aluminum	7.87E-01	2.34E+00	5.95E+00		NA	1.56E+00				
Arsenic	2.60E-03	1.78E-02	1.17E-01		4.46E-05	4.69E-04				
Barium	1.59E-02	1.27E-01	4.72E-01		NA	1.10E-01				
Calcium	2.88E+01	5.65E+01	7.14E+01		NA	NA				
Chromium ^h	2.80E-03		1.68E-02	2.80E-03	NA	4.69E-03				
Cobalt	3.20E-03	2.34E-02	2.02E-02		NA	9.39E-02				
Iron	9.30E-01	7.04E+00	2.20E+01		NA	4.69E-01				
Magnesium	1.56E+01	2.13E+01	2.20E+01		NA	NA				
Manganese	3.42E-01	5.81E-01	4.13E+00		NA	7.35E-02				
Nickel	4.90E-03		3.43E-02	4.90E-03	NA	3.13E-02				
Potassium	9.64E-01	7.20E+00	1.60E+01		NA	NA				
Sodium	5.01E+00	1.48E+01	4.90E+01		NA	NA				
Vanadium	2.30E-03	1.70E-02	2.76E-02		NA	1.10E-02				
Zinc	5.50E-03	2.20E-01	1.16E+00		NA	4.69E-01				
Semivolatiles										
bis(2-Ethylhexyl)phthalate	6.40E-02			6.40E-02	4.31E-03	2.85E-02	6.40E-02	6.40E-02	1.49E-05	2.24E-01
Volatiles										
Chloromethane	1.70E-04			1.70E-04	3.93E-03	6.22E-03				
Total ILCR, HI									1.49E-05	2.24E-01

All concentrations expressed as mg/L.

MDC = maximum detected concentration; BSC = background screening criterion; UTL = 95% Upper Tolerance Limit.

NA = Not Available

^a MDC presented only if it exceeds BSC, or no BSC is available.

^b Site-specific screening level (SSSL) based on cancer risk for the on-site resident exposure to groundwater.

^c Site-specific screening level based on noncancer hazard for the on-site resident exposure to groundwater.

^d MDC presented only if it exceeds SSSL-c.

^e MDC presented only if it exceeds SSSL-n.

^f Incremental lifetime cancer risk for the on-site resident exposed to chemical in groundwater.

^g Hazard index for noncancer effects for the on-site resident exposed to chemical in groundwater.

^h SSSL based on chromium VI.

Table 9

**Preliminary Risk Evaluation for the Recreational Site User Exposure to Surface Water
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama**

Chemical	MDC	BSC	UTL	Site-Related Chemical? ^a	Recreational Site User SW SSSL-c ^b	Recreational Site User SW SSSL-n ^c	Recreational Site User Cancer COPC? ^d	Recreational Site User Noncancer COPC? ^e	Recreational Site User ILCR ^f	Recreational Site User HI ^g
Metals										
Aluminum	2.25E-01	5.26E+00	1.37E+01		NA	1.53E+01				
Barium	1.96E-02	7.54E-02	1.15E-01		NA	1.10E+00				
Calcium	1.11E+01	2.52E+01	3.78E+01		NA	NA				
Iron	4.92E-01	1.96E+01	1.18E+02		NA	4.70E+00				
Magnesium	5.79E+00	1.10E+01	5.05E+01		NA	NA				
Manganese	8.29E-02	5.65E-01	1.83E+00		NA	6.40E-01				
Potassium	5.08E-01	2.56E+00	4.25E+00		NA	NA				
Sodium	6.97E-01	3.44E+00	5.58E+00		NA	NA				
Zinc	4.50E-03	4.04E-02	4.56E-02		NA	4.65E+00				
Total ILCR, HI									--	--

All concentrations expressed as mg/L.

MDC = maximum detected concentration; BSC = background screening criterion; UTL = 95% Upper Tolerance Limit.

NA = Not Available

^a MDC presented only if it exceeds BSC, or no BSC is available.

^b Site-specific screening level (SSSL) based on cancer risk for the recreational site user exposure to surface water.

^c Site-specific screening level based on noncancer hazard for the recreational site user exposure to surface water.

^d MDC presented only if it exceeds SSSL-c.

^e MDC presented only if it exceeds SSSL-n.

^f Incremental lifetime cancer risk for the recreational site user exposed to chemical in surface water.

^g Hazard index for noncancer effects for the recreational site user exposed to chemical in surface water.

Table 10

**Preliminary Risk Evaluation for the Recreational Site User Exposure to Sediment
Anniston Army Depot, Former Shell Tapping Area, Parcel 208(7)
Fort McClellan, Calhoun County, Alabama**

Chemical	MDC	BSC	UTL	Site-Related Chemical? ^a	Recreational Site User Sediment SSSL-c ^b	Recreational Site User Sediment SSSL-n ^c	Recreational Site User Cancer COPC? ^d	Recreational Site User Noncancer COPC? ^e	Recreational Site User ILCR ^f	Recreational Site User HI ^g
Metals										
Aluminum	8.00E+03	8.59E+03	1.43E+04		NA	1.15E+06				
Arsenic	1.71E+01	1.13E+01	2.84E+01	1.71E+01	5.58E+01	3.59E+02				
Barium	5.64E+01	9.89E+01	1.91E+02		NA	8.36E+04				
Beryllium	5.80E-01	9.70E-01	1.83E+00		NA	1.50E+02				
Calcium	9.26E+02	1.11E+03	2.86E+03		NA	NA				
Chromium	1.05E+01	3.12E+01	6.33E+01		NA	2.79E+03				
Cobalt	8.70E+00	1.10E+01	2.91E+01		NA	6.72E+04				
Copper	1.17E+01	1.71E+01	3.68E+01		NA	4.74E+04				
Iron	1.65E+04	3.53E+04	7.08E+04		NA	3.59E+05				
Lead	1.97E+01	3.78E+01	7.64E+01		NA	4.00E+02				
Magnesium	4.52E+02	9.06E+02	2.44E+03		NA	NA				
Manganese	4.74E+02	7.12E+02	2.61E+03		NA	4.38E+04				
Mercury	5.70E-02	1.10E-01	1.37E-01		NA	2.99E+02				
Nickel	1.00E+01	1.30E+01	2.58E+01		NA	1.76E+04				
Potassium	1.69E+02	1.01E+03	2.30E+03		NA	NA				
Thallium	9.00E-01	1.30E-01	2.11E-01	9.00E-01	NA	7.78E+01				
Vanadium	2.67E+01	4.09E+01	6.77E+01		NA	4.83E+03				
Zinc	3.87E+01	5.27E+01	1.23E+02		NA	3.44E+05				
Semivolatiles										
bis(2-Ethylhexyl)phthalate	3.60E-01			3.60E-01	5.41E+03	2.17E+04				
Volatiles										
Acetone	2.50E-02			2.50E-02	NA	1.03E+05				
Methylene chloride	4.60E-03			4.60E-03	9.84E+03	6.33E+04				
Trichlorofluoromethane	2.60E-03			2.60E-03	NA	3.06E+05				
Total ILCR, HI									--	--

All concentrations expressed as mg/kg.

MDC = maximum detected concentration; BSC = background screening criterion; UTL = 95% Upper Tolerance Limit.

NA = Not Available

^a MDC presented only if it exceeds BSC, or no BSC is available.

^b Site-specific screening level (SSSL) based on cancer risk for the recreational site user exposure to sediment.

^c Site-specific screening level based on noncancer hazard for the recreational site user exposure to sediment.

^d MDC presented only if it exceeds SSSL-c.

^e MDC presented only if it exceeds SSSL-n.

^f Incremental lifetime cancer risk for the recreational site user exposed to chemical in sediment.

^g Hazard index for noncancer effects for the recreational site user exposed to chemical in sediment.