APPENDIX H

SUMMARY STATISTICS FOR BACKGROUND MEDIA, FORT McCLELLAN, ALABAMA

Table 4-12. Summary Statistics for Surface Soil (0 -1 BLS)
Fort McClellan, Alabama

Run Time: 8:18:07 AM
Run Date: 7/10/98
Exposure Unit: SS

Parameter	Units	Total Number of Samples	Total Number of Detects	Frequency of Detection	NonDetects Min CRL	NonDetects Max CRL	Detects Minimum	Detects Maximum	Arithmetic Mean[a]	Standard Deviation[a]	Distribution[b]	95% UCL of Arith. Mean[a]	Exposure Point Concentration[c]		2x Arithmetic Mean[a]
Aluminum	ug/g	70	70	100%	- -	- -	2,400	39,900	8,153.00	6,095	Lognormal	11,187	11,187		16,306
Antimony	ug/g	69	47	68%	0.082	7.1	0.11	2.6	0.99	1.3	Lognormal	3.4	2.6	#	1.99
Arsenic	ug/g	66	66	100%	- -	- -	0.82	49	6.86	8.0	Lognormal	13	13		13.73
Barium	ug/g	70	70	100%	- -	- -	11	288	61.97	54	Lognormal	99	99		123.94
Beryllium	ug/g	54	54	100%	- -	- -	0.062	0.87	0.40	0.22	Lognormal	0.61	0.61		0.80
Cadmium	ug/g	70	45	64%	0.016	1.2	0.024	0.21	0.14	0.16	Lognormal	0.36	0.21	#	0.29
Calcium	ug/g	70	66	94%	75	100	63	17,900	861.37	2,265	Lognormal	1,942	1,942		1,723
Chromium	ug/g	70	70	100%	- -	- -	2.0	134	18.52	20	Lognormal	31	31		37.04
Cobalt	ug/g	70	68	97%	1.4	1.4	0.39	71	7.57	12	Lognormal	18	18		15.15
Copper	ug/g	70	69	99%	0.50	0.50	1.3	24	6.36	4.4	Lognormal	11	11		12.71
Iron	ug/g	70	70	100%	- -	- -	2,510	56,300	17,076.86	11,577	Lognormal	27,000	27,000		34,154
Lead	ug/g	70	70	100%	- -	- -	2.9	83	20.02	15	Lognormal	33	33		40.05
Magnesium	ug/g	70	70	100%	- -	- -	60	9,600	516.49	1,266	Lognormal	768	768		1,033
Manganese	ug/g	70	70	100%	- -	- -	8.0	6,850	789.46	1,192	Lognormal	3,183	3,183		1,579
Mercury	ug/g	70	23	33%	0.023	0.050	0.031	0.32	0.04	0.046	Lognormal	0.058	0.058		0.08
Nickel	ug/g	70	56	80%	1.6	2.3	1.8	22	5.17	4.2	Lognormal	9.7	9.7		10.33
Potassium	ug/g	70	60	86%	82	116	104	6,010	399.88	946	Lognormal	607	607		799.76
Selenium	ug/g	70	1	1%	0.25	0.58	1.3	1.3	0.24	0.14	Lognormal	0.29	0.29		0.48
Silver	ug/g	70	42	60%	0.016	0.80	0.019	1.9	0.18	0.34	Lognormal	0.70	0.70		0.36
Sodium	ug/g	70	66	94%	39	39	76	563	317.14	98	Lognormal	562	562		634.28
Thallium	ug/g	68	55	81%	6.6	6.6	0.015	34	1.71	5.9	Lognormal	12	12		3.43
Vanadium	ug/g	70	70	100%	- -	- -	4.7	158	29.42	26	Lognormal	48	48		58.84
Zinc	ug/g	70	64	91%	4.9	11	4.6	209	20.32	26	Lognormal	35	35		40.64

[a]Results of duplicate analyses were averaged and nondetects were treated as one-half the detection limit in the calculation of the arithmetic mean, standard deviation, and 95% UCL.

[b]For the calculation of exposure point concentrations (EPCs):

If fewer than four samples are available, or the standard deviation of the data set is zero, the distribution is undetermined.

If the probability plot correlation coefficient of the untransformed data is > or = to the critical value, the distribution is normal.

In all other cases, the distribution assumed for the EPC calculation was lognormal.

[c]The exposure point concentration (EPC) is the 95% upper confidence (UCL) of the arithmetic mean, unless the 95% UCL exceeds the maximum detected value. If the latter is true, the maximum detected value is substituted as the EPC(denoted by a "#" next to the EPC).

- - Parameter detected in all samples.

Table 4-13. Summary Statistics for Subsurface Soil (>1-10 feet BLS)
Fort McClellan, Alabama

Run Time: 8:18:07 AM
Run Date: 7/10/98
Exposure Unit: SD

Parameter	Units	Total Number of Samples	Total Number of Detects	Frequency of Detection	NonDetects Min CRL	NonDetects Max CRL	Detects Minimum	Detects Maximum	Arithmetic Mean[a]	Standard Deviation[a]	Distribution[b]	95% UCL of Arith. Mean[a]	Exposure Point Concentration[c]		2x Arithmetic Mean[a]
Aluminum	ug/g	64	64	100%	- -	- -	1,690	24,600	6,795.47	3,552	Lognormal	9,068	9,068		13,591
Antimony	ug/g	63	46	73%	0.079	7.1	0.082	0.99	0.65	0.98	Lognormal	1.8	0.99	#	1.31
Arsenic	ug/g	64	61	95%	0.25	0.45	0.77	38	9.15	9.7	Lognormal	36	36		18.30
Barium	ug/g	64	64	100%	- -	- -	4.1	4,500	116.81	562	Lognormal	161	161		233.62
Beryllium	ug/g	59	57	97%	0.051	0.053	0.041	2.0	0.43	0.43	Lognormal	0.94	0.94		0.86
Cadmium	ug/g	64	35	55%	0.015	1.2	0.020	1.3	0.11	0.21	Lognormal	0.30	0.30		0.22
Calcium	ug/g	64	44	69%	57	200	67	3,650	318.58	606	Lognormal	772	772		637.17
Chromium	ug/g	64	64	100%	- -	- -	5.5	55	19.13	11	Lognormal	27	27		38.25
Cobalt	ug/g	64	60	94%	0.23	1.4	0.26	96	8.77	16	Lognormal	34	34		17.54
Copper	ug/g	64	64	100%	- -	- -	1.3	61	9.72	9.1	Lognormal	16	16		19.43
Iron	ug/g	64	64	100%	- -	- -	4,840	48,000	22,408.44	10,436	Normal	24,586	24,586		44,817
Lead	ug/g	64	64	100%	- -	- -	0.96	500	19.27	61	Lognormal	27	27		38.53
Magnesium	ug/g	64	60	94%	100	200	35	5,940	383.12	885	Lognormal	638	638		766.24
Manganese	ug/g	64	63	98%	4.1	4.1	7.3	19,000	677.67	2,417	Lognormal	3,864	3,864		1,355
Mercury	ug/g	64	31	48%	0.022	0.050	0.022	0.12	0.03	0.025	Lognormal	0.053	0.053		0.07
Nickel	ug/g	64	51	80%	1.6	2.2	2.2	38	6.45	7.8	Lognormal	13	13		12.89
Potassium	ug/g	64	52	81%	75	110	98	6,150	355.37	774	Lognormal	660	660		710.74
Selenium	ug/g	64	1	2%	0.25	0.58	0.55	0.55	0.24	0.060	Lognormal	0.27	0.27		0.47
Silver	ug/g	64	40	63%	0.016	1.2	0.021	0.66	0.12	0.15	Lognormal	0.47	0.47		0.24
Sodium	ug/g	64	63	98%	39	39	203	643	351.05	118	Lognormal	471	471		702.10
Thallium	ug/g	63	55	87%	0.0090	6.6	0.0090	24	0.70	3.0	Lognormal	2.0	2.0		1.40
Vanadium	ug/g	64	64	100%	- -	- -	8.7	99	32.45	20	Lognormal	47	47		64.89
Zinc	ug/g	64	50	78%	4.0	8.0	5.6	89	17.43	17	Lognormal	39	39		34.86

[a]Results of duplicate analyses were averaged and nondetects were treated as one-half the detection limit in the calculation of the arithmetic mean, standard deviation, and 95% UCL.

[b]For the calculation of exposure point concentrations (EPCs):

If fewer than four samples are available, or the standard deviation of the data set is zero, the distribution is undetermined.

If the probability plot correlation coefficient of the untransformed data is > or = to the critical value, the distribution is normal.

In all other cases, the distribution assumed for the EPC calculation was lognormal.

[c]The exposure point concentration (EPC) is the 95% upper confidence (UCL) of the arithmetic mean, unless the 95% UCL exceeds the maximum detected value.

If the latter is true, the maximum detected value is substituted as the EPC(denoted by a "#" next to the EPC).

- - Parameter detected in all samples.

Table 4-9. Summary Statistics for Background Groundwater
Fort McClellan, Alabama

Run Time: 4:50:27 PM
Run Date: 7/9/98
Exposure Unit: WD

Parameter	Units	Total Number of Samples	Total Number of Detects	Frequency of Detection	NonDetects Min CRL	NonDetects Max CRL	Detects Minimum	Detects Maximum	Arithmetic Mean[a]	Standard Deviation[a]	Distribution[b]	95% UCL of Arith. Mean[a]	Exposure Point Concentration[c]		2x Arithmetic Mean[a]
Alkalinity-phenolphthalein	µg/L	33	2	6%	5,000	5,000	104,000	132,000	9,500.00	28,204	Lognormal	9,763	9,763		19,000
Aluminum	µg/L	57	34	60%	50	141	59	9,600	1,167.66	2,030	Lognormal	19,988	9,600	#	2,335
Antimony	µg/L	57	2	4%	0.60	10.0	0.70	0.80	1.60	1.7	Lognormal	4.4	0.80	#	3.191
Arsenic	µg/L	57	10	18%	1.1	2.5	1.5	224	8.88	41	Lognormal	6.1	6.1		17.764
Barium	µg/L	57	53	93%	6.5	18	5.5	401	63.73	88	Lognormal	144	144		127.458
Beryllium	µg/L	57	15	26%	0.20	5.0	0.20	2.4	0.62	0.74	Lognormal	1.8	1.8		1.247
Bicarbonate	µg/L	33	22	67%	5,000	172,000	9,000	392,000	100,818.18	93,836	Lognormal	831,264	392,000	#	201,636
Bromide	µg/L	33	4	12%	200	200	278	715	138.03	121	Lognormal	171	171		276.06
Cadmium	µg/L	57	22	39%	0.100	5.0	0.100	5.3	1.26	1.2	Lognormal	10	5.3	#	2.51
Calcium	µg/L	57	48	84%	231	33,900	217	452,000	28,246.44	60,264	Lognormal	580,060	452,000	#	56,493
Chloride	µg/L	33	24	73%	923	2,640	1,080	11,000	2,446.06	2,363	Lognormal	4,347	4,347		4,892
Cobalt	µg/L	57	3	5%	20	25	20	25	11.68	2.8	Lognormal	13	13		23.36
Copper	µg/L	57	10	18%	5.0	19	5.3	235	12.74	32	Lognormal	21	21		25.48
Fluoride	µg/L	33	6	18%	200	200	202	646	146.24	124	Lognormal	185	185		292.48
Iron	µg/L	57	44	77%	45	78	2.5	25,800	3,520.25	5,364	Lognormal	590,286	25,800	#	7,040
Lead	µg/L	57	25	44%	0.60	4.5	0.60	27	4.00	6.1	Lognormal	13	13		7.998
Magnesium	µg/L	57	47	82%	100	18,400	176	149,000	10,640.88	19,972	Lognormal	146,372	146,372		21,282
Manganese	µg/L	57	42	74%	5.0	9.7	9.8	5,820	290.25	809	Lognormal	7,221	5,820	#	580.5
Nitrate.Nitrite	µg/L	33	4	12%	10.0	1,110	430	771	141.26	219	Lognormal	1,192	771	#	282.5
Potassium	µg/L	57	43	75%	270	1,240	1.0	68,500	3,597.54	9,508	Lognormal	18,602	18,602		7,195
Silver	µg/L	57	1	2%	0.100	10.0	0.40	0.40	2.00	2.4	Lognormal	141	0.40	#	4.00
Sodium	µg/L	57	52	91%	892	1,180	555	64,700	7,423.18	11,765	Lognormal	23,173	23,173		14,846
Sulfate	µg/L	33	25	76%	1000	3,680	1,650	1.4E+06	51,628.33	242,827	Lognormal	88,195	88,195		103,257
Thallium	µg/L	54	7	13%	0.100	10.0	0.100	5.3	0.73	1.2	Lognormal	5.3	5.3		1.455
Total Alkalinity	µg/L	33	22	67%	5,000	172,000	9,000	392,000	103,424.24	93,707	Lognormal	880,230	392,000	#	206,848
Total Phosphorous	µg/L	33	21	64%	10.0	10.0	10.0	282	44.30	70	Lognormal	140	140		88.594
Vanadium	µg/L	57	2	4%	10.0	28	11	11	8.49	4.3	Lognormal	11	11		16.975
Zinc	µg/L	57	25	44%	18	30	22	1,160	109.98	249	Lognormal	273	273		219.97

[a]Results of duplicate analyses were averaged and nondetects were treated as one-half the detection limit in the calculation of the arithmetic mean, standard deviation, and 95% UCL.

[b]For the calculation of exposure point concentrations (EPCs):

If fewer than four samples are available, or the standard deviation of the data set is zero, the distribution is undetermined.

If the probability plot correlation coefficient of the untransformed data is > or = to the critical value, the distribution is normal.

In all other cases, the distribution assumed for the EPC calculation was lognormal.

[c]The exposure point concentration (EPC) is the 95% upper confidence (UCL) of the arithmetic mean, unless the 95% UCL exceeds the maximum detected value.

If the latter is true, the maximum detected value is substituted as the EPC(denoted by a "#" next to the EPC).

- - Parameter detected in all samples.

APPENDIX I

PRELIMINARY RISK ASSESSMENT

Technical Memorandum

From: Paul F. Goetchius, DVM

To: Area North of MOUT, Fort McClellan, Calhoun County, Alabama
Preliminary Risk Assessment File

Date: 17 May 2002

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

This memorandum provides a Preliminary Risk Assessment (PRA) for the Area North of the Military-Operations-in-Urban-Terrain (MOUT) Site, herein referred to as Area North of MOUT. The Area North of MOUT consists of approximately 47.6 acres formerly used for military live-fire training maneuvers. The area is characterized as hilly, and slopes from the south to the north. Surface water is present only accompanying storm events. When present, surface water drains to the north. The area partially overlaps the range fans of Parcels 88Q, 100Q, 101Q, 102Q and 107Q, but does not appear to include either the firing lines or the impact areas of these ranges.

A borrow area is located in the northeast corner of the site. Small piles of wood and scrap metal are present north of the borrow area. Two deep ground scars are present in the southern portion of the site. One is designated the southern ground scar and the other is designated the southwestern ground scar. The southwestern ground scar contains a small amount of construction debris consisting of broken chunks of concrete, polyvinyl chloride pipe and unlabeled 5-gallon cans. Several lead bullets were observed on the surface of the southern ground scar. The bullets may have been fired from a line of several fox holes along or near the southwestern boundary of the site. Several 55-gallon drums that appear to have been used as targets, as well as several small-arms casings, were scattered over the surface of the site.

The purpose of the PRA is to support a recommendation for no further action and unrestricted site use proposed by the Site Investigation (SI). 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 Fort McClellan (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 – to more precisely evaluate the potential for noncancer effects, as explained below.

Media of Interest and Data Selection. It was originally proposed to collect 22 surface soil samples, 22 subsurface soil samples, 2 surface water and 2 sediment samples, and 3 groundwater samples. Surface water, as noted above, is intermittent in nature, and was not available when sampling was done. The absence of surface water is not considered an important source of

uncertainty in this PRA, because surface water is not a feature of the site that would be attractive or consistently available to any of the receptors evaluated herein, and exposure is unlikely to be significant. However, two depositional soil samples were taken from a dry drainage way and included in the surface soil data set. Therefore, the surface soil data set consists of a total of 24 samples taken from 0 to 1 foot below ground surface (ft bgs), as summarized in Table 5-1 of the SI. All surface soil samples were analyzed for metals and nitroaromatic explosives; 5 were also analyzed for volatile organic compounds (VOC), semivolatile organic compounds (SVOC), chlorinated herbicides and organochlorine pesticides.

The subsurface soil data set consists of 24 samples taken from 22 sampling locations, ranging from 0.5 to 4 ft bgs as summarized in Table 5-2 of the SI. All subsurface soil samples were analyzed for metals and nitroaromatic explosives; 4 were also analyzed for VOCs, SVOCs, chlorinated herbicides and organochlorine pesticides.

An attempt was made to install three monitoring wells on the Area North of MOUT. Two wells were advanced to 100 feet, but were abandoned, upon consultation with BCT, ADEM, EPA and FTMC, when neither groundwater nor bedrock were reached. A third well screened at 35 to 55 ft bgs yielded one groundwater sample that was analyzed for metals and nitroaromatic explosives.

All the analytical data from all media were validated.

It should be noted that several surface and subsurface soil samples were taken from the ground scars, borrow areas or a severely eroded drainage swale. The use of these samples in the PRA is described below for each receptor scenario.

Site-Related Chemical Selection. Site-related chemicals are those presumed to be released by the army during operation of FTMC. Site-related chemicals were selected 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 EPA (2002) Region IV guidance. BSCs were taken from IT (2000). Chemicals whose MDCs exceeded their BSCs were selected as site-related chemicals and were subjected to chemical 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 and 2 for surface soil, Tables 3 and 4 for total soil, and Tables 5 and 6 for groundwater. Site-related chemicals in soil include all but a few of the metals, and the few nitroaromatics, VOCs, herbicides and pesticides that were detected. Site-related chemicals in groundwater are limited to three of the eight metals detected.

Upper tolerance limits (UTL), the highest metal concentrations reasonably considered to be within background, are also included in Tables 1 through 6 for information, but were not used to select site-related chemicals for the first iteration of the PRA. The UTL provides a more refined statistical approach than the BSC for comparing site and background data.

Receptor Scenario Selection. The SI Summary states that the Area North of MOUT will be used in the future for passive recreation. Lacking more specific information, it is reasonable to select the recreational site user as the most plausible receptor for this proposed site reuse. The recreational site user is assumed to be exposed to surface soil. An on-site resident is also included, although development for residential use is unlikely, to provide additional perspective. Also, sites that "pass" a residential risk evaluation generally can be released for unrestricted use with no further action. The on-site resident is evaluated for exposure to surface soil, and a second time for exposure to total soil, assuming that construction is required to render the site fit for residential use. A construction worker is included as a plausible receptor for short-term exposure, because construction activity is likely to be required for development for residential use. Construction would probably include excavation and earth-moving (e.g., filling in ground scars and fox holes); therefore, the construction worker is assumed to be exposed to total soil rather than only surface soil.

Groundwater is evaluated as if it were developed as a source of potable water. It is assumed that the on-site resident and construction worker would be exposed to groundwater.

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 were sufficient (Tables 1 through 6). COPCs in soil and groundwater are limited to metals.

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 COPCs and 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, at least not in the first iteration. The 95 percent upper confidence limit on the mean (UCL) is usually used for this purpose. Instead, the MDC is adopted as the EPC, at least for the first iteration, 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. EPA (1989) considers HI values below the threshold level of 1 to indicate that the occurrence of adverse noncancer health effects is unlikely. Summing HI values across chemicals, however, is considered to impart a conservative bias to the assessment, because only those chemicals that share a mechanism of toxicity are likely to interact in an additive manner. Since data regarding mechanism of toxicity are generally insufficient, target organ or critical effect is used as a surrogate. In other words, chemicals that act upon the same target organ or that have the same critical effect are considered to act by the same mechanism of toxicity. Therefore, when HI values summed across chemicals and media exceed the threshold level of 1,

the HI values may be re-summed by target organ to refine the assessment.

Risk values may be 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 1.49E-4 would be rounded to 1E-4 and interpreted as falling within, but not exceeding, the risk management range. Also, an HI of 1.49E+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 recreational site user is potentially exposed to surface soil at the Area North of MOUT. It is assumed that the site could be used for passive recreation in its present state without remediation of modification of any kind, and that any feature of its topography, including fox holes, ground scars and borrow areas, may be equally attractive to this receptor. Therefore, the entire surface soil data set from all 24 samples is included in the recreational site-user evaluation (Table 1). However, no chemicals were selected as COPCs for the recreational site user, and neither an ILCR nor an HI were calculated. It is concluded that exposure to surface soil on the Area North of MOUT is unlikely to pose unacceptable cancer risk or risk of adverse noncancer health effects to a recreational site user.

The on-site resident was included in the PRA for the additional information and perspective provided by evaluation of the most highly exposed receptor, although residential development is not included in the plans for this site. Should the residential scenario "pass" the PRA, the site can be released for unrestricted use with no further action. The on-site resident was evaluated for exposure to surface soil and groundwater, and for exposure to total soil and groundwater. Certain topographic features such as fox holes, ground scars, borrow areas and drainage swales would not make satisfactory residential sites, at least not without considerable earth-moving and grading. Therefore, 10 samples associated with these features are not included in the surface soil evaluation for the on-site resident. COPCs selected for on-site residential exposure to surface soil include aluminum, antimony, iron and manganese – all based on noncancer effects (Table 2). No ILCR was estimated because no chemicals were selected as cancer-based COPCs. The total HI for exposure to surface soil is 3.75E+0, which exceeds the threshold level of 1.

The on-site resident is assumed to be exposed also to groundwater (Table 6). COPCs selected for residential exposure to groundwater are limited to barium and thallium – both based on noncancer effects. No ILCR was estimated because no chemicals were selected as cancer-based COPCs. The total HI for exposure to groundwater of 4.39E+0 exceeds the threshold value of 1, due almost entirely to thallium. The total HI summed across surface soil and groundwater of 8.14E+0 exceeds the threshold level of 1.

A second iteration of the PRA was performed for the on-site resident exposed to surface soil and groundwater because the total HI summed across surface soil and groundwater exceeds the threshold level of 1. Chemicals of concern (COC) for surface soil include aluminum, antimony, iron and manganese (Table 2). All were selected as site-related chemicals because their MDCs

exceed their respective BSCs. It should be noted, however, that the MDCs for antimony and manganese fall below their respective UTLs. Therefore, it is concluded that antimony and manganese are present in surface soil at levels comparable to background, and these naturally occurring metals are deleted from the second iteration of the PRA. The MDC for iron exceeds its UTL, and iron is retained as a site-related chemical. EPA (2002), however, considers the toxicity value for iron to be unsuitable for use in quantitative risk assessment because it is based on average dietary consumption rather than toxicological properties. In other words, it is likely that the SSSL for iron, and the toxicity value on which it is based, overstate the toxicity of iron. It is concluded that exposure to iron in surface soil does not represent a threat to human health.

COCs for exposure to groundwater include barium and thallium (Table 6). However, the MDCs for both metals in groundwater fall below their respective UTLs, and it is concluded that both are present at concentrations comparable to background. Therefore, barium and thallium in groundwater are deleted from the second iteration of the PRA. In summary, the second iteration of the PRA for on-site residential exposure to surface soil and groundwater is limited to aluminum in surface soil. The HI for aluminum in surface soil of 4.31E-1 (Table 2) is below the threshold level of 1. It is concluded that exposure to surface soil and groundwater on the Area North of MOUT is unlikely to pose unacceptable cancer risk or risk of adverse noncancer health effects to an on-site resident.

The construction worker is potentially exposed to total soil and groundwater at the Area North of MOUT. Data from two sample locations within a deep ground scar are not included in the total soil data set because they are sufficiently below grade so that significant contact is unlikely. Development of the site for residential use would more likely involve filling the ground scar with borrow soil rather than deeper excavation. COPCs selected for construction worker exposure to total soil for the first iteration of the PRA include arsenic and chromium, based on cancer risk, and aluminum, arsenic, barium, chromium, cobalt, iron and manganese, based on noncancer effects (Table 3). The total ILCR for exposure to total soil of 2.50E-6 is near the low end of the risk management range. It is concluded that exposure to total soil is unlikely to pose an unacceptable cancer risk for a construction worker. The total HI for exposure to total soil of 8.97E+0 exceeds the threshold value of 1.

The construction worker is assumed to be exposed also to groundwater (Table 5). COPCs selected for construction worker exposure to groundwater are limited to thallium, based on noncancer effects. No ILCR was estimated because no chemicals were selected as cancer-based COPCs. The total HI for exposure to groundwater of 6.17E-1 falls below threshold value of 1. The total HI summed across total soil and groundwater of 9.58E+0 exceeds the threshold level of 1.

A second iteration of the PRA was performed for the construction worker exposed to total soil and groundwater because the total HI summed across total soil and groundwater exceeds the threshold level of 1. Chemicals of concern (COC) for total soil include aluminum, arsenic, chromium, cobalt, iron and manganese (Table 3). All were selected as site-related chemicals because their MDCs exceed their respective BSCs. It should be noted, however, that the MDCs for arsenic and manganese fall below their respective UTLs. Therefore, it is concluded that

arsenic and manganese are present in surface soil at levels comparable to background, and these naturally occurring metals are deleted from the second iteration of the PRA. The MDCs for aluminum, chromium, cobalt and iron exceeds their UTLs, and these metals are retained as site-related chemicals. EPA (2002), however, considers the toxicity value for iron to be unsuitable for use in quantitative risk assessment as discussed above. In other words, it is likely that the SSSL for iron, and the toxicity value on which it is based, overstate the toxicity of iron. It is concluded that exposure to iron in surface soil does not represent a threat to human health.

COCs for exposure to groundwater are limited to thallium (Table 5). However, the MDC for thallium in groundwater falls below its UTL, as noted above. Therefore, thallium in groundwater is deleted from the second iteration of the PRA. In summary, the second iteration of the PRA for construction worker exposure to total soil and groundwater includes aluminum, chromium and cobalt in total soil. The total HI these metals in total soil is 1.40E+0.

The total HI (unrounded) exceeding the threshold level of 1 prompted a further refinement in the construction worker assessment, based on segregating HI by target organ. Target organs or critical effect and HI values (in parentheses) for chemicals identified as COPCs in total soil (Table 3) include:

Aluminum: nervous system (1.02E+0)
Chromium: GI tract, fetus/reproductive system, bone marrow and liver (1.20E-1)
Cobalt: heart, erythropoiesis and thyroid (2.55E-1).

(Target organs or critical effects associated with each chemical are documented in the toxicity profiles appended to IT [2000].) As shown, the COPCs in total soil do not share a target organ, other than chromium and cobalt may both have an impact on erythropoiesis. Therefore, the HI value for aluminum should not be summed with those for chromium and cobalt. The summed HI value for chromium and cobalt (3.75E-1) clearly falls below the threshold level of 1; these metals are considered not to represent a threat of adverse noncancer effects. The HI for aluminum, rounded to one significant figure, does not exceed the threshold level of 1. It is concluded that exposure to total soil and groundwater on the Area North of MOUT is unlikely to pose unacceptable cancer risk or risk of adverse noncancer health effects to a construction worker.

The on-site resident was also evaluated for exposure to total soil and groundwater. COPCs selected for exposure to total soil for the first iteration of the risk assessment are limited to arsenic for cancer risk, and aluminum, antimony, arsenic, chromium, iron and manganese for noncancer effects (Table 4). COPCs selected for exposure to groundwater for the first iteration include barium and thallium, based on noncancer effects (Table 6), the same as noted for exposure to surface soil and groundwater. No groundwater chemicals were selected as COPCs for cancer risk. The total ILCR for the on-site resident exposed to total soil and groundwater was 5.19E-5, which is within the risk management range. The total HI summed across total soil and groundwater was 9.43E+0, which exceeds the threshold level of 1.

A second iteration of the PRA was performed for the on-site resident exposed to total soil and groundwater because the total HI summed across total soil and groundwater exceeds the

threshold level of 1. Chemicals of concern (COC) for total soil include aluminum, antimony, arsenic, chromium, iron and manganese (Table 4). All were selected as site-related chemicals because their MDCs exceed their respective BSCs. It should be noted, however, that the MDCs for antimony, arsenic and manganese fall below their respective UTLs. Therefore, it is concluded that antimony, arsenic and manganese are present in total soil at levels comparable to background, and these naturally occurring metals are deleted from the second iteration of the PRA. The MDCs for aluminum, chromium and iron exceeds their UTLs, and these metals are retained as site-related chemicals. EPA (2002), however, considers the toxicity value for iron to be unsuitable for use in quantitative risk assessment as discussed above. In other words, it is likely that the SSSL for iron, and the toxicity value on which it is based, overstate the toxicity of iron. It is concluded that exposure to iron in surface soil does not represent a threat to human health.

COCs for exposure to groundwater are limited to barium and thallium (Table 6). However, the MDCs for these metals in groundwater fall below their respective UTLs, as noted above. Therefore, barium and thallium in groundwater are deleted from the second iteration of the PRA. In summary, the second iteration of the PRA for on-site resident exposure to total soil and groundwater includes aluminum and chromium in total soil. The total HI these metals in total soil is 6.92E-1. It is concluded that exposure to total soil and groundwater on the Area North of MOUT is unlikely to pose unacceptable cancer risk or risk of adverse noncancer health effects to an on-site resident.

In conclusion, the PRA suggests that soil is lightly contaminated with metals. However, several metals selected as site-related COPCs for the first iteration, upon further evaluation appear to be present at levels comparable to background. It is concluded that exposure to soil and groundwater at the Area North of MOUT does not pose an unacceptable cancer risk or a threat of noncancer effects to any of the receptors evaluated herein. The Area North of MOUT can be released for unrestricted use requiring no further action.

References

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Table 1

Preliminary Risk Assessment for the Recreational Site-User Exposure to Surface Soil
Area North of MOUT
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	3.36E+04	1.63E+04	2.29E+04	3.36E+04	NA	6.27E+05				
Antimony	8.63E+00	1.99E+00	7.14E+00	8.63E+00	NA	2.47E+02				
Arsenic	2.21E+01	1.37E+01	2.54E+01	2.21E+01	2.94E+01	1.89E+02				
Barium	5.69E+02	1.24E+02	1.94E+02	5.69E+02	NA	4.41E+04				
Beryllium	4.31E+00	8.00E-01	1.19E+00	4.31E+00	NA	4.08E+02				
Calcium	6.24E+02	1.72E+03	3.55E+03		NA	NA				
Chromium[h]	4.11E+01	3.70E+01	6.44E+01	4.11E+01	NA	1.82E+03				
Cobalt	4.41E+01	1.52E+01	3.25E+01	4.41E+01	NA	3.75E+04				
Copper	3.74E+01	1.27E+01	2.25E+01	3.74E+01	NA	2.52E+04				
Iron	1.17E+05	3.42E+04	5.54E+04	1.17E+05	NA	1.89E+05				
Lead	3.05E+02	4.01E+01	6.38E+01	3.05E+02	NA	4.00E+02				
Magnesium	9.91E+02	1.03E+03	2.16E+03		NA	NA				
Manganese	1.69E+04	1.58E+03	4.66E+03	1.69E+04	NA	2.85E+04				
Mercury	1.47E-01	8.00E-02	1.25E-01	1.47E-01	NA	1.84E+02				
Nickel	2.20E+01	1.03E+01	2.00E+01	2.20E+01	NA	1.20E+04				
Potassium	1.29E+03	8.00E+02	1.83E+03	1.29E+03	NA	NA				
Selenium	1.71E+00	4.80E-01	5.63E-01	1.71E+00	NA	3.15E+03				
Silver	2.64E+00	3.60E-01	7.74E-01	2.64E+00	NA	3.16E+03				
Sodium	6.85E+01	6.34E+02	4.51E+02		NA	NA				
Vanadium	5.74E+01	5.88E+01	9.94E+01		NA	4.00E+03				
Zinc	1.40E+02	4.06E+01	7.37E+01	1.40E+02	NA	1.88E+05				
NITROAROMATICS										
2-Nitrotoluene	1.30E-01	NA		1.30E-01	NA	6.17E+03				
VOLATILE ORGANIC COMPOUNDS										
Acetone	1.10E-01	NA		1.10E-01	NA	6.16E+04				
Trichloroethene	2.40E-03	NA		2.40E-03	3.93E+03	3.70E+03				
p-Cymene	1.30E-03	NA		1.30E-03	NA	1.23E+05				
HERBICIDES										
MCPP	3.80E+00	NA		3.80E+00	NA	6.18E+02				
PESTICIDES										
beta-BHC	1.50E-03	NA		1.50E-03	2.40E+01	NA				
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 2

Preliminary Risk Assessment for the Resident Exposure to Surface Soil[a]
Area North of MOUT
Fort McClellan, Calhoun County, Alabama

Chemical	MDC	BSC	UTL	Site-Related Chemical?[b]	Resident Soil SSSL-c[c]	Resident Soil SSSL-n[d]	Resident Cancer COPC?[e]	Resident Noncancer COPC?[f]	Resident ILCR[g]	Resident HI[h]
METALS										
Aluminum	3.36E+04	1.63E+04	2.29E+04	3.36E+04	NA	7.80E+03		3.36E+04		4.31E-01
Antimony	5.48E+00	1.99E+00	7.14E+00	5.48E+00	NA	3.11E+00		5.48E+00		1.76E-01
Arsenic	1.20E+01	1.37E+01	2.54E+01		4.26E-01	2.34E+00				
Barium	1.50E+02	1.24E+02	1.94E+02	1.50E+02	NA	5.47E+02				
Beryllium	1.30E+00	8.00E-01	1.19E+00	1.30E+00	NA	9.60E+00				
Calcium	6.24E+02	1.72E+03	3.55E+03		NA	NA				
Chromium[i]	3.14E+01	3.70E+01	6.44E+01		NA	2.32E+01				
Cobalt	1.16E+01	1.52E+01	3.25E+01		NA	4.68E+02				
Copper	3.74E+01	1.27E+01	2.25E+01	3.74E+01	NA	3.13E+02				
Iron	5.78E+04	3.42E+04	5.54E+04	5.78E+04	NA	2.34E+03		5.78E+04		2.46E+00
Lead	1.18E+02	4.01E+01	6.38E+01	1.18E+02	NA	4.00E+02				
Magnesium	9.91E+02	1.03E+03	2.16E+03		NA	NA				
Manganese	2.48E+03	1.58E+03	4.66E+03	2.48E+03	NA	3.63E+02		2.48E+03		6.83E-01
Mercury	1.16E-01	8.00E-02	1.25E-01	1.16E-01	NA	2.33E+00				
Nickel	1.68E+01	1.03E+01	2.00E+01	1.68E+01	NA	1.54E+02				
Potassium	1.29E+03	8.00E+02	1.83E+03	1.29E+03	NA	NA				
Selenium	1.41E+00	4.80E-01	5.63E-01	1.41E+00	NA	3.91E+01				
Silver	2.64E+00	3.60E-01	7.74E-01	2.64E+00	NA	3.91E+01				
Sodium	6.85E+01	6.34E+02	4.51E+02		NA	NA				
Vanadium	5.74E+01	5.88E+01	9.94E+01		NA	5.31E+01				
Zinc	5.01E+01	4.06E+01	7.37E+01	5.01E+01	NA	2.34E+03				
VOLATILE ORGANIC COMPOUNDS										
Acetone	1.10E-01	NA		1.10E-01	NA	7.76E+02				
Trichloroethene	2.40E-03	NA		2.40E-03	5.72E+01	4.66E+01				
p-Cymene	1.30E-03	NA		1.30E-03	NA	1.55E+03				
HERBICIDES										
MCPP	3.80E+00	NA		3.80E+00	NA	7.77E+00				
PESTICIDES										
beta-BHC	1.50E-03	NA		1.50E-03	3.50E-01	NA				
Total ILCR, HI									–	**3.75E+00**

All concentrations expressed as mg/kg.
MDC = maximum detected concentration; BSC = background screening criterion; UTL = 95% Upper Tolerance Limit.
NA = Not Available

[a] Surface soil for the resident includes only those samples taken where the resident is likely to be exposed; see text.
[b] MDC presented only if it exceeds BSC, or no BSC is available.
[c] Site-specific screening level (SSSL) based on cancer risk for the resident exposure to soil.
[d] Site-specific screening level based on noncancer hazard for the resident exposure to soil.
[e] MDC presented only if it exceeds SSSL-c.
[f] MDC presented only if it exceeds SSSL-n.
[g] Incremental lifetime cancer risk for the resident exposed to chemical in surface soil.
[h] Hazard index for noncancer effects for the resident exposed to chemical in surface soil.
[i] SSSL based on chromium VI.

Table 3

Preliminary Risk Assessment for the Construction Worker Exposure to Total Soil
Area North of MOUT
Fort McClellan, Calhoun County, Alabama

Chemical	MDC	BSC	UTL	Site-Related Chemical?[a]	Construction Worker Soil SSSL-c[b]	Construction Worker Soil SSSL-n[c]	Construction Worker Cancer COPC?[d]	Construction Worker Noncancer COPC?[e]	Construction Worker ILCR[f]	Construction Worker HI[g]
METALS										
Aluminum	3.42E+04	1.50E+04	1.80E+04	3.42E+04	NA	3.34E+03		3.42E+04		1.02E+00
Antimony	6.66E+00	1.66E+00	7.14E+00	6.66E+00	NA	1.99E+01				
Arsenic	2.21E+01	1.60E+01	3.24E+01	2.21E+01	1.98E+01	1.53E+01	2.21E+01	2.21E+01	1.11E-06	1.45E-01
Barium	2.51E+02	1.76E+02	2.42E+02	2.51E+02	NA	3.25E+02				
Beryllium	1.48E+00	8.31E-01	1.50E+00	1.48E+00	2.13E+02	9.60E+00				
Calcium	6.24E+02	1.20E+03	2.27E+03		NA	NA				
Chromium[h]	5.89E+01	3.76E+01	5.63E+01	5.89E+01	4.26E+01	4.91E+01	5.89E+01	5.89E+01	1.38E-06	1.20E-01
Cobalt	3.69E+01	1.63E+01	3.63E+01	3.69E+01	NA	1.45E+01		3.69E+01		2.55E-01
Copper	3.86E+01	1.59E+01	2.59E+01	3.86E+01	NA	2.04E+03				
Iron	5.88E+04	3.92E+04	5.63E+04	5.88E+04	NA	1.53E+04		5.88E+04		3.85E-01
Lead	3.05E+02	3.93E+01	6.05E+01	3.05E+02	NA	8.80E+02				
Magnesium	1.06E+03	9.06E+02	2.16E+03	1.06E+03	NA	NA				
Manganese	2.48E+03	1.47E+03	4.12E+03	2.48E+03	NA	3.52E+01		2.48E+03		7.04E+00
Mercury	1.16E-01	7.04E-02	9.40E-02	1.16E-01	NA	1.38E+01				
Nickel	2.20E+01	1.16E+01	1.69E+01	2.20E+01	2.13E+03	9.59E+02				
Potassium	3.78E+03	7.57E+02	8.31E+02	3.78E+03	NA	NA				
Selenium	1.85E+00	4.80E-01	5.71E-01	1.85E+00	NA	2.55E+02				
Silver	2.64E+00	3.03E-01	8.03E-01	2.64E+00	NA	2.56E+02				
Sodium	1.40E+03	6.67E+02	5.60E+02	1.40E+03	NA	NA				
Vanadium	5.74E+01	6.17E+01	9.05E+01		NA	3.16E+02				
Zinc	5.97E+01	3.79E+01	7.13E+01	5.97E+01	NA	1.52E+04				
NITROAROMATICS										
2-Nitrotoluene	1.30E-01			1.30E-01	NA	4.97E+02				
VOLATILE ORGANIC COMPOUNDS										
2-Butanone	7.70E-03			7.70E-03	NA	2.86E+04				
Acetone	1.60E-01			1.60E-01	NA	4.95E+03				
Trichlorofluoromethane	2.40E-03			2.40E-03	NA	1.44E+04				
p-Cymene	1.30E-03			1.30E-03	NA	9.93E+03				
HERBICIDES										
MCPP	3.80E+00			3.80E+00	NA	4.97E+01				
PESTICIDES										
beta-BHC	1.50E-03			1.50E-03	1.89E+01	NA				
Heptachlor	3.70E-04			3.70E-04	7.56E+00	2.48E+01				
Total ILCR, HI									**2.50E-06**	**8.97E+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 construction worker exposure to soil.
[c] Site-specific screening level based on noncancer hazard for the construction worker exposure to soil.

Table 3

Preliminary Risk Assessment for the Construction Worker Exposure to Total Soil
Area North of MOUT
Fort McClellan, Calhoun County, Alabama

[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 construction worker exposed to chemical in total soil.
[g] Hazard index for noncancer effects for the construction worker exposed to chemical in total soil.
[h] SSSL based on chromium VI.

Table 4

Preliminary Risk Assessment for the Resident Exposure to Total Soil
Area North of MOUT
Fort McClellan, Calhoun County, Alabama

Chemical	MDC	BSC	UTL	Site-Related Chemical?[a]	Resident Soil SSSL-c[b]	Resident Soil SSSL-n[c]	Resident Cancer COPC?[d]	Resident Noncancer COPC?[e]	Resident ILCR[f]	Resident HI[g]
METALS										
Aluminum	3.42E+04	1.50E+04	1.80E+04	3.42E+04	NA	7.80E+03		3.42E+04		4.38E-01
Antimony	6.66E+00	1.66E+00	7.14E+00	6.66E+00	NA	3.11E+00		6.66E+00		2.14E-01
Arsenic	2.21E+01	1.60E+01	3.24E+01	2.21E+01	4.26E-01	2.34E+00	2.21E+01	2.21E+01	5.19E-05	9.42E-01
Barium	2.51E+02	1.76E+02	2.42E+02	2.51E+02	NA	5.47E+02				
Beryllium	1.48E+00	8.31E-01	1.50E+00	1.48E+00	NA	9.60E+00				
Calcium	6.24E+02	1.20E+03	2.27E+03		NA	NA				
Chromium[h]	5.89E+01	3.76E+01	5.63E+01	5.89E+01	NA	2.32E+01		5.89E+01		2.54E-01
Cobalt	3.69E+01	1.63E+01	3.63E+01	3.69E+01	NA	4.68E+02				
Copper	3.86E+01	1.59E+01	2.59E+01	3.86E+01	NA	3.13E+02				
Iron	5.88E+04	3.92E+04	5.63E+04	5.88E+04	NA	2.34E+03		5.88E+04		2.51E+00
Lead	3.05E+02	3.93E+01	6.05E+01	3.05E+02	NA	4.00E+02				
Magnesium	1.06E+03	9.06E+02	2.16E+03	1.06E+03	NA	NA				
Manganese	2.48E+03	1.47E+03	4.12E+03	2.48E+03	NA	3.63E+02		2.48E+03		6.83E-01
Mercury	1.16E-01	7.04E-02	9.40E-02	1.16E-01	NA	2.33E+00				
Nickel	2.20E+01	1.16E+01	1.69E+01	2.20E+01	NA	1.54E+02				
Potassium	3.78E+03	7.57E+02	8.31E+02	3.78E+03	NA	NA				
Selenium	1.85E+00	4.80E-01	5.71E-01	1.85E+00	NA	3.91E+01				
Silver	2.64E+00	3.03E-01	8.03E-01	2.64E+00	NA	3.91E+01				
Sodium	1.40E+03	6.67E+02	5.60E+02	1.40E+03	NA	NA				
Vanadium	5.74E+01	6.17E+01	9.05E+01		NA	5.31E+01				
Zinc	5.97E+01	3.79E+01	7.13E+01	5.97E+01	NA	2.34E+03				
NITROAROMATICS										
2-Nitrotoluene	1.30E-01			1.30E-01	NA	7.77E+01				
VOLATILE ORGANIC COMPOUNDS										
2-Butanone	7.70E-03			7.70E-03	NA	4.66E+03				
Acetone	1.60E-01			1.60E-01	NA	7.76E+02				
Trichlorofluoromethane	2.40E-03			2.40E-03	NA	2.33E+03				
p-Cymene	1.30E-03			1.30E-03	NA	1.55E+03				
HERBICIDES										
MCPP	3.80E+00			3.80E+00	NA	7.77E+00				
PESTICIDES										
beta-BHC	1.50E-03			1.50E-03	3.50E-01	NA				
Heptachlor	3.70E-04			3.70E-04	1.40E-01	3.88E+00				
Total ILCR, HI									**5.19E-05**	**5.04E+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 resident exposure to soil.
[c] Site-specific screening level based on noncancer hazard for the resident exposure to soil.

Table 4

Preliminary Risk Assessment for the Resident Exposure to Total Soil
Area North of MOUT
Fort McClellan, Calhoun County, Alabama

[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 resident exposed to chemical in total soil.
[g] Hazard index for noncancer effects for the resident exposed to chemical in total soil.
[h] SSSL based on chromium VI.

Table 5

Preliminary Risk Assessment for the Construction Worker Exposure to Groundwater
Area North of MOUT
Fort McClellan, Calhoun County, Alabama

Chemical	MDC	BSC	UTL	Site-Related Chemical?[a]	Construction Worker GW SSSL-c[b]	Construction Worker GW SSSL-n[c]	Construction Worker Cancer COPC?[d]	Construction Worker Noncancer COPC?[e]	Construction Worker ILCR[f]	Construction Worker HI[g]
METALS										
Barium	4.09E-01	1.27E-01	4.72E-01	4.09E-01	NA	7.12E-01				
Calcium	2.65E+01	5.65E+01	7.14E+01		NA	NA				
Iron	1.04E-01	7.04E+00	2.20E+01		NA	3.05E+00				
Magnesium	6.01E-01	2.13E+01	2.20E+01		NA	NA				
Manganese	1.24E-01	5.81E-01	4.13E+00		NA	4.44E-01				
Potassium	8.91E+00	7.20E+00	1.60E+01	8.91E+00	NA	NA				
Sodium	3.85E+00	1.48E+01	4.90E+01		NA	NA				
Thallium	4.08E-03	1.46E-03	1.00E-02	4.08E-03	NA	6.62E-04		4.08E-03		6.17E-01
Total ILCR, HI									–	**6.17E-01**

All concentrations expressed as mg/L.
MDC = maximum detected concentration; BSC = background screening criterion; UTL = 95% Upper Tolerance Limit.
-- = No ILCR or HI calculated
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 construction worker exposure to groundwater.
[c] Site-specific screening level based on noncancer hazard for the construction worker 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 construction worker exposed to chemical in groundwater.
[g] Hazard index for noncancer effects for the construction worker exposed to chemical in groundwater.

Table 6

Preliminary Risk Assessment for the Resident Exposure to Groundwater
Area North of MOUT
Fort McClellan, Calhoun County, Alabama

Chemical	MDC	BSC	UTL	Site-Related Chemical?[a]	Resident Groundwater SSSL-c[b]	Resident Groundwater SSSL-n[c]	Resident Cancer COPC?[d]	Resident Noncancer COPC?[e]	Resident ILCR[f]	Resident HI[g]
METALS										
Barium	4.09E-01	1.27E-01	4.72E-01	4.09E-01	NA	1.10E-01		4.09E-01		3.74E-01
Calcium	2.65E+01	5.65E+01	7.14E+01		NA	NA				
Iron	1.04E-01	7.04E+00	2.20E+01		NA	4.69E-01				
Magnesium	6.01E-01	2.13E+01	2.20E+01		NA	NA				
Manganese	1.24E-01	5.81E-01	4.13E+00		NA	7.35E-02				
Potassium	8.91E+00	7.20E+00	1.60E+01	8.91E+00	NA	NA				
Sodium	3.85E+00	1.48E+01	4.90E+01		NA	NA				
Thallium	4.08E-03	1.46E-03	1.00E-02	4.08E-03	NA	1.02E-04		4.08E-03		4.01E+00
Total ILCR, HI									--	**4.39E+00**

All concentrations expressed as mg/L.
MDC = maximum detected concentration; BSC = background screening criterion; UTL = 95% Upper Tolerance Limit.
-- = No ILCR or HI calculated
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 resident exposure to groundwater.
[c] Site-specific screening level based on noncancer hazard for the 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 resident exposed to chemical in groundwater.
[g] Hazard index for noncancer effects for the resident exposed to chemical in groundwater.