

**APPENDIX G**

**VARIANCE REPORTS**



**INTERNATIONAL  
TECHNOLOGY  
CORPORATION**

Variance No: PARCEL75JAN99.VR1

Linked w/NC No: X

Date of Issue: 1/30/99

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Project Name: **Fort McClellan - CK05**

Project Number: **774645**

## -Variance Report -

I. Description: (by the person identifying the change)

**FORMER ORDNANCE MOTOR REPAIR AREA PARCEL 75(7)**

Temporary well FTA-75-GP39 was not installed because bedrock was encountered during drilling operations and groundwater was not present.

Identified by: **Jeffrey Tarr, PG - IT Site Manager**

Date: **1-30-99**

II. Justification for Variance:

Temporary well FTA-75-GP39 was not installed because competent bedrock was encountered during drilling operations and groundwater was not present. Therefore, the well was offset three times but all three attempts to install the temporary well were unsuccessful. Drilling using air rotary methods may produce enough groundwater so that a well can be installed and groundwater samples collected for chemical analysis.

III. Applicable Document/Work Plan: (by the person identifying the change)

Final Site-Specific Field Sampling Plan, Former Ordnance Motor Repair Area Parcel 75(7) December 1998.

Distribution List:

1. Jeanne Yacoub, IT Project Manager
2. Steve Moran, IT Technical Lead
3. Jeffrey Tarr, IT Site Manager
4. Randy McBride, IT QA Officer
5. Mr. Ellis Pope, US Army Corps of Engineers
6. Mr. Ross McCollum, US Army Corps of Engineers

- Signatures -

Requested by: *Jeffrey Tarr*  
Jeffrey Tarr, PG - IT Site Manager **2/19/99** Date

Approved by: *Ellis C. Pope*  
Ellis C. Pope **1/5/99** Date

Project Manager Approval: *Jeanne Yacoub*  
Jeanne Yacoub **3/18/99** Date

QA Approval: *Randy McBride*  
Randy McBride **2/28/99** Date



Variance No: PARCEL75JAN99.VR2

Linked w/NC No: X

Date of Issue: 1/30/99

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Project Name: Fort McClellan - CK05

Project Number: 774645

### -Variance Report -

I. Description: (by the person identifying the change)

#### FORMER ORDNANCE MOTOR REPAIR AREA PARCEL 75(7)

The Final Site-Specific Field Sampling Plan proposed one subsurface soil sample at sample location PPMP-75-GP25. One additional subsurface soil sample was collected at sample location PPMP-75-GP25.

Identified by: Jeffrey Tarr, PG - IT Site Manager

Date: 1-30-99

II. Justification for Variance:

One additional subsurface soil sample was collected from 15 to 17 feet below land surface at sample location PPMP-75-GP25. The subsurface soil sample was collected and submitted for laboratory analysis because photoionization (PID) soil screening results exceeded background concentrations. The additional soil sample will more accurately determine the presence or absence of contamination at the site.

III. Applicable Document/Work Plan: (by the person identifying the change)

Final Site-Specific Field Sampling Plan, Former Ordnance Motor Repair Area Parcel 75(7) December 1998.

#### Distribution List:

1. Jeanne Yacoub, IT Project Manager
2. Steve Moran, IT Technical Lead
3. Jeffrey Tarr, IT Site Manager
4. Randy McBride, IT QA Officer
5. Mr. Ellis Pope, US Army Corps of Engineers
6. Mr. Ross McCollum, US Army Corps of Engineers

#### - Signatures -

Requested by: Jeffrey Tarr, PG - IT Site Manager *Jeffrey J. Tarr* 2/19/99  
Date

Approved by: *Ellis C. Pope* 1/5/99  
Date

Project Manager Approval: *Jeanne Yacoub* 3/18/99  
Date

QA Approval: *Randy McBride* 2/28/99  
Date



Variance No: PARCEL75JAN99.VR3

Linked w/NC No: X

Date of Issue: 1/30/99

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Project Name: Fort McClellan - CK05

Project Number: 774645

### -Variance Report -

#### I. Description: (by the person identifying the change)

#### FORMER ORDNANCE MOTOR REPAIR AREA PARCEL 75(7)

Surface water and sediment sample location PPMP-75-SWSD10 was moved upstream approximately 150 feet northeast of its proposed location.

Identified by: Jeffrey Tarr, PG - IT Site Manager

Date: 1-30-99

#### II. Justification for Variance:

Surface water and sediment sample location PPMP-75-SWSD10 was moved upstream approximately 150 feet northeast of its proposed location. The sample was moved because surface water and sediment were not present in the drainage creek at the time of sample collection. Therefore, the sample location was moved approximately 150 feet northeast and samples were successfully collected for chemical analysis.

#### III. Applicable Document/Work Plan: (by the person identifying the change)

Final Site-Specific Field Sampling Plan, Former Ordnance Motor Repair Area Parcel 75(7) December 1998.

#### Distribution List:

1. Jeanne Yacoub, IT Project Manager
2. Steve Moran, IT Technical Lead
3. Jeffrey Tarr, IT Site Manager
4. Randy McBride, IT QA Officer
5. Mr. Ellis Pope, US Army Corps of Engineers
6. Mr. Ross McCollum, US Army Corps of Engineers

#### - Signatures -

Requested by: *Jeffrey Tarr* Jeffrey Tarr, PG - IT Site Manager 2/19/99 Date

Approved by: *Ellis C. Pope* Ellis C. Pope 11/5/99 Date

Project Manager Approval: *Jeanne Yacoub* Jeanne Yacoub 3/18/99 Date

QA Approval: *Randy McBride* Randy McBride 2/28/99 Date



Variance No: PARCEL75JAN99.VR4

Linked w/NC No: X

Date of Issue: 1/30/99

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Project Name: Fort McClellan - CK05

Project Number: 774645

### - Variance Report -

I. Description: (by the person identifying the change)

#### FORMER ORDNANCE MOTOR REPAIR AREA PARCEL 75(7)

Due to ambiguity in the Site-Specific Field Sampling Plan (SSFSP), a temporary well was inadvertently installed at sample location PPMP-75-GP69. Figure 4-6 in the SSFSP proposed one surface soil sample, one subsurface soil sample, and one groundwater sample for chemical analysis. However, the rational section of table 4-1 and table 4-3 in the SSFSP does not propose a groundwater sample.

Identified by: Jeffrey Tarr, PG - IT Site Manager

Date: 1-30-99

II. Justification for Variance:

Temporary well PPMP-75-GP69 was inadvertently installed due to conflicting information in the SSFSP. The temporary well was developed and a groundwater sample collected for chemical analysis. Temporary well PPMP-75-GP69 will be used for depth to water level measurements so that an accurate groundwater flow map can be generated.

III. Applicable Document/Work Plan: (by the person identifying the change)

Final Site-Specific Field Sampling Plan, Former Ordnance Motor Repair Area Parcel 75(7), December 1998.

#### Distribution List:

1. Jeanne Yacoub, IT Project Manager
2. Steve Moran, IT Technical Lead
3. Jeffrey Tarr, IT Site Manager
4. Randy McBride, IT QA Officer
5. Mr. Ellis Pope, US Army Corps of Engineers
6. Mr. Ross McCollum, US Army Corps of Engineers

#### - Signatures -

Requested by: *Jeffrey Tarr* Jeffrey Tarr, PG - IT Site Manager 2/19/99 Date

Approved by: *Ellis Pope* Ellis Pope 11/5/99 Date

Project Manager Approval: *Jeanne Yacoub* Jeanne Yacoub 3/18/99 Date

QA Approval: *[Signature]* 2/28/99 Date

## **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	Total	Frequency of Detection	NonDetects		Detects		Arithmetic Mean <sup>a</sup>	Standard Deviation <sup>a</sup>	Distribution <sup>b</sup>	95% UCL of	Exposure	2x Arithmetic Mean <sup>a</sup>
		Number of Samples	Number of Detects		Min CRL	Max CRL	Minimum	Maximum				Arith. Mean <sup>a</sup>	Point Concentration <sup>c</sup>	
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	17,076.88	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

<sup>a</sup>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.

<sup>b</sup>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.

<sup>c</sup>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		Total	Total	Frequency	NonDetects		Detects		Arithmetic	Standard		95% UCL of	Exposure	2x Arithmetic
Parameter	Units	Number of Samples	Number of Detects	of Detection	Min CRL	Max CRL	Minimum	Maximum	Mean <sup>a</sup>	Deviation <sup>a</sup>	Distribution <sup>b</sup>	Arith. Mean <sup>a</sup>	Point Concentration <sup>c</sup>	Mean <sup>a</sup>
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

<sup>a</sup>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.

<sup>b</sup>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.

<sup>c</sup>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**

Parameter	Units	Total Number of Samples	Total Number of Detects	Frequency of Detection	NonDetects		Detects		Arithmetic Mean <sup>a</sup>	Standard Deviation <sup>a</sup>	Distribution <sup>b</sup>	Exposure			
					Min CRL	Max CRL	Minimum	Maximum				95% UCL of Arith. Mean <sup>a</sup>	Point Concentration <sup>c</sup>	2x Arithmetic Mean <sup>a</sup>	
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	860,230	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

<sup>a</sup>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.

<sup>b</sup>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.

<sup>c</sup>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 4-10. Summary Statistics for Background Surface Water  
Fort McClellan, Alabama**

Parameter	Units	Total Number of Samples	Total Number of Detects	Frequency of Detection	NonDetects		Detects		Arithmetic Mean <sup>a</sup>	Standard Deviation <sup>a</sup>	Distribution <sup>b</sup>	Exposure		2x Arithmetic Mean <sup>a</sup>
					Min CRL	Max CRL	Minimum	Maximum				95% UCL of Arith. Mean <sup>a</sup>	Point Concentration <sup>c</sup>	
Aluminum	µg/L	67	57	85%	50	141	65	47,800	2,629.59	7,921	Lognormal	17,831	17,831	5,259
Arsenic	µg/L	65	9	14%	1.1	2.4	1.4	11	1.08	1.5	Lognormal	1.5	1.5	2.17
Barium	µg/L	67	67	100%	--	--	11	200	37.68	35	Lognormal	55	55	75.36
Beryllium	µg/L	56	9	16%	0.20	0.20	0.20	3.2	0.19	0.43	Lognormal	0.22	0.22	0.39
Bicarbonate	µg/L	56	40	71%	5,000	5,000	6,000	172,000	53,178.57	57,480	Lognormal	449,171	172,000	# 106,357
Cadmium	µg/L	67	10	15%	0.20	6.8	0.20	15	0.57	0.91	Lognormal	1.4	1.4	1.13
Calcium	µg/L	67	67	100%	--	--	179	64,100	12,583.19	13,701	Lognormal	218,721	64,100	# 25,166
Chloride	µg/L	56	56	100%	--	--	467	10,100	1,943.05	1,815	Lognormal	2,656	2,656	3,886
Chromium	µg/L	64	1	2%	6.0	17	14	14	5.56	1.7	Undetermined	6.3	6.3	11.13
Copper	µg/L	56	8	14%	5.0	8.1	7.1	72	6.35	13	Lognormal	8.1	8.1	12.70
Fluoride	µg/L	56	6	11%	100	200	128	579	107.86	85	Lognormal	139	139	215.71
Iron	µg/L	67	64	96%	45	78	74	232,000	9,814.08	37,961	Lognormal	46,205	46,205	19,628
Lead	µg/L	66	34	52%	0.60	4.5	0.60	47	4.33	8.3	Lognormal	19	19	8.67
Magnesium	µg/L	67	67	100%	--	--	171	24,400	5,486.16	5,916	Lognormal	34,551	24,400	# 10,972
Manganese	µg/L	67	64	96%	5.0	9.7	5.5	6,060	282.42	840	Lognormal	1,153	1,153	564.85
Nickel	µg/L	67	3	4%	15	34	40	70	11.23	11	Lognormal	14	14	22.46
Nitrate,Nitrite	µg/L	56	44	79%	10.0	10.0	11	838	106.09	181	Lognormal	507	507	212.18
Potassium	µg/L	67	61	91%	1,240	1,240	330	7,120	1,281.85	1,157	Lognormal	1,940	1,940	2,564
Sodium	µg/L	66	66	100%	--	--	296	15,200	1,718.44	2,043	Lognormal	2,401	2,401	3,437
Sulfate	µg/L	56	56	100%	--	--	1,060	62,400	4,313.57	8,203	Lognormal	5,784	5,784	8,627
Thallium	µg/L	59	1	2%	0.100	125	4.2	4.2	1.24	8.1	Undetermined	0.56	0.56	2.49
Total Alkalinity	µg/L	56	40	71%	5,000	5,000	6,000	172,000	53,178.57	57,480	Lognormal	449,171	172,000	# 106,357
Total Phosphorous	µg/L	56	24	43%	10.0	14	11	655	38.82	99	Lognormal	87	87	77.64
Vanadium	µg/L	63	5	8%	10.0	28	13	36	7.60	5.7	Lognormal	9.8	9.8	15.21
Zinc	µg/L	66	6	9%	18	30	27	182	20.17	26	Lognormal	24	24	40.35

<sup>a</sup>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.

<sup>b</sup>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.

<sup>c</sup>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 4-11. Summary Statistics for Background Sediment  
Fort McClellan, Alabama**

Run Time: 5:01:01 PM														
Run Date: 7/9/98														
Exposure Unit: DS														
Parameter	Units	Total	Total	Frequency of Detection	NonDetects		Detects		Arithmetic Mean <sup>a</sup>	Standard Deviation <sup>a</sup>	Distribution <sup>b</sup>	95% UCL of Arith. Mean <sup>a</sup>	Exposure	2x Arithmetic Mean <sup>a</sup>
		Number of Samples	Number of Detects		Min CRL	Max CRL	Minimum	Maximum					Point Concentration <sup>c</sup>	
Aluminum	ug/g	65	65	100%	--	--	657	17,400	4,296.32	3,138	Lognormal	6,591	6,590.77	8,593
Antimony	ug/g	59	40	68%	0.11	1.00	0.12	1.2	0.36	0.25	Lognormal	0.77	0.77	0.73
Arsenic	ug/g	58	58	100%	--	--	0.21	20	5.67	5.0	Lognormal	13	13.34	11.33
Barium	ug/g	65	65	100%	--	--	5.4	272	49.46	44	Lognormal	86	85.64	98.91
Beryllium	ug/g	55	55	100%	--	--	0.069	1.2	0.49	0.30	Lognormal	0.83	0.83	0.97
Cadmium	ug/g	65	47	72%	0.020	1.2	0.020	2.4	0.22	0.39	Lognormal	0.67	0.67	0.43
Calcium	ug/g	65	61	94%	60	99	88	2,810	555.76	557	Lognormal	1,370	1,369.94	1,111.51
Chromium	ug/g	65	65	100%	--	--	1.1	63	15.57	14	Lognormal	30	29.80	31.15
Cobalt	ug/g	64	59	92%	0.24	2.5	0.40	22	5.51	4.5	Lognormal	15	14.80	11.01
Copper	ug/g	61	60	98%	2.8	2.8	0.73	59	8.56	8.8	Lognormal	16	15.75	17.12
Iron	ug/g	65	65	100%	--	--	683	57,500	17,633.26	12,838	Lognormal	36,392	36,391.61	35,267
Lead	ug/g	62	61	98%	7.4	7.4	1.7	110	18.91	20	Lognormal	35	35.40	37.82
Magnesium	ug/g	65	65	100%	--	--	30	3,270	452.97	686	Lognormal	952	952.13	905.94
Manganese	ug/g	64	62	97%	4.2	5.0	8.7	2,050	356.15	385	Lognormal	1,735	1,735.37	712.31
Mercury	ug/g	65	37	57%	0.024	0.061	0.047	0.28	0.06	0.042	Lognormal	0.087	0.09	0.11
Nickel	ug/g	65	43	66%	2.1	5.3	2.4	33	6.51	6.9	Lognormal	14	14.02	13.02
Potassium	ug/g	65	46	71%	100	151	118	4,810	506.74	842	Lognormal	1,273	1,272.69	1,013.48
Selenium	ug/g	65	4	6%	0.25	1.2	0.72	1.9	0.36	0.29	Lognormal	0.44	0.44	0.72
Silver	ug/g	65	37	57%	0.018	0.80	0.021	1.1	0.16	0.21	Lognormal	0.73	0.73	0.32
Sodium	ug/g	65	57	88%	39	60	173	738	346.14	152	Lognormal	942	738.00	# 692.29
Thallium	ug/g	58	56	100%	--	--	0.012	0.22	0.06	0.047	Lognormal	0.098	0.10	0.13
Vanadium	ug/g	65	65	100%	--	--	2.6	67	20.44	13	Lognormal	34	33.66	40.87
Zinc	ug/g	65	58	89%	5.3	6.9	6.0	111	26.37	24	Lognormal	56	55.67	52.74

<sup>a</sup>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.

<sup>b</sup>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.

<sup>c</sup>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**

### **GROUNDWATER RESAMPLING RESULTS**



IT-MC-CK05-0392  
Project No. 774645

August 7, 2000

**IT Corporation**

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*A Member of The IT Group*

Mr. Ellis Pope  
U.S. Army Corps of Engineers, Mobile District  
Attn: CESAM-EN-GE (Pope)  
109 St. Joseph Street  
Mobile, Alabama 36602

Contract: Contract No. DACA21-96-D-0018/CK05  
Fort McClellan, Alabama

Subject: Groundwater Resampling Results

Dear Mr. Pope:

This letter report summarizes the results of the resampling effort conducted by IT Corporation to evaluate the effect of turbidity on metals concentrations in groundwater at Fort McClellan (FTMC).

At approximately 20 percent of the wells installed by IT at FTMC, the turbidity of the groundwater at the time of sample collection could not be reduced below 20 NTUs. In accordance with the installation-wide sampling and analysis plan (SAP), groundwater samples were collected for chemical analysis after five well volumes were removed from the well, regardless of the turbidity of the water. High turbidity is believed to have caused artificially high metals results in these groundwater samples due to suspended particulates. To determine whether high turbidity caused the elevated metals results, IT resampled five wells (four temporary wells and one permanent well) that previously had high turbidity at the time the original samples were collected. As shown in Table 1, the turbidities of the five wells originally sampled ranged from 211.4 nephelometric turbidity units (NTU) to greater than 1000 NTUs.

For the resampling effort, IT sampled the wells in accordance with procedures outlined in the SAP, however, at purge rates of between 0.1 and 0.5 liters per minute (i.e., low flow). IT used a peristaltic pump at three well locations and a Fultz in-line pump at two locations. The wells were purged until field parameters (pH, temperature, conductivity, and dissolved oxygen) stabilized and turbidity readings were below 10 NTUs.

The results of the low-flow resampling study are presented in Table 1. As shown in Table 1, the low turbidity samples had fewer metals detected and lower metals concentrations overall than the high turbidity groundwater samples. For most metals (except calcium, magnesium, potassium, sodium, and thallium), the concentrations in the low turbidity samples were significantly lower (1-2 orders of magnitude) than in the high turbidity samples. Several metals (beryllium, cadmium, chromium, lead, mercury, and selenium) that were detected in one or more of the high turbidity samples were not detected in the low turbidity samples. Certain metals (i.e., calcium, magnesium, potassium, and sodium), with a few exceptions, showed a slight decrease in the low turbidity samples; however, these metals results were generally within the same order of magnitude as the high turbidity samples.

The low-flow sampling method resulted in fewer detected metals and overall lower metals concentrations. Most metals concentrations decreased significantly using the low-flow procedure. The

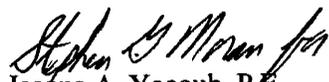
study demonstrates that high turbidity at the time of sample collection results in elevated metals concentrations. With the exception of barium (one sample), manganese (one sample), and thallium (two samples), the metals concentrations in the resamples were below SSSLs and/or background concentrations. The barium and manganese results were within the range of background values. IT will discuss the results of this study in the SI reports to strengthen the assertion that high turbidity causes elevated metals results.

In the future, IT will attempt to reduce turbidity below 10 NTUs using the groundwater sampling procedure specified in the SAP. However, if field parameters have not stabilized and turbidity is not less than 10 NTUs after five well volumes have been removed, then the following procedures will be implemented:

- Purging will continue if a decreasing trend is observed in the turbidity readings. The groundwater sample will be collected if turbidity is below 10 NTUs.
- If turbidity is not less than 10 NTUs, then low-flow purging will commence. Purging will continue and water quality parameters will be recorded for a maximum of one well volume.
- If stabilization has not been achieved and/or turbidity remains greater than 10 NTUs, IT will stop purging. IT will allow the well to equilibrate and samples will be collected within 24 hours using a Teflon bailer.

If you have questions, or need further information, please contact me at (770) 663-1429 or Steve Moran at (865) 694-7361.

Sincerely,



Jeanne A. Yacoub, P.E.  
Project Manager

Attachments

Distribution: Lisa Kingsbury, FTMC  
Bart Reedy, EPA Region IV  
Dennis Druck, CHPPM

Philip Stroud, ADEM  
Hugh Vick, Gannett Fleming

Table 1

**Metals Concentrations in Groundwater  
High Turbidity Samples vs. Low Turbidity Samples  
Fort McClellan, Calhoun County, Alabama**

Parcel	FTA-145	FTA-145	FTA-145	FTA-145	FTA-151	FTA-151	GSBP-501	GSBP-501	PPMP-173	PPMP-173											
Sample Location	FTA-145-GP06	FTA-145-GP06	FTA-145-GP12	FTA-145-GP12	FTA-151-GP05	FTA-151-GP05	GSBP-501-MW02	GSBP-501-MW02	PPMP-173-GP03	PPMP-173-GP03											
Sample Number	CY3005	CY3005R	CY3012	CY3012R	BJ3005	BJ3005R	BX3004	BX3004R	KF3004	KF3004R											
Sample Date	12-Jan-99	6-Jul-00	18-Dec-98	6-Jul-00	2-Dec-98	5-Jul-00	5-Jan-00	7-Jul-00	17-Feb-99	5-Jul-00											
Turbidity	>1000	3.72	612.40	5.42	309.00	2.82	>1000	8.47	211.40	8.64											
Metal	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual				
Aluminum	mg/L	5.33E+01	J	1.09E-01		6.81E+01	J	2.95E-01		3.64E+01		1.17E-01		4.93E+01		6.24E-01		1.98E+01		3.08E-01	
Antimony	mg/L	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Arsenic	mg/L	1.06E-02	J	3.20E-03		1.12E-02		ND		1.12E-02		ND		4.51E-02		ND		5.09E-02		ND	
Barium	mg/L	4.15E-01	J	7.50E-02		5.13E-01		4.39E-02		5.16E-01		3.64E-01		2.40E-01		1.76E-02		2.08E-01		3.34E-02	
Beryllium	mg/L	2.80E-03	J	ND		2.90E-03	B	ND		2.20E-03	J	ND		9.20E-03		ND		5.80E-03		ND	
Cadmium	mg/L	ND		ND		ND		ND		ND		ND		1.00E-03	J	ND		7.50E-03		ND	
Calcium	mg/L	1.12E+02	J	7.85E+01		1.86E+01		1.32E+01		6.87E+01		5.04E+01		4.97E+01		4.01E+01		3.61E+01		4.28E+01	
Chromium	mg/L	1.27E-01	J	ND		8.71E-02		ND		7.70E-02		ND		6.70E-02		ND		1.98E-02		ND	
Cobalt	mg/L	1.63E-02	J	2.70E-03		5.18E-02		4.40E-03		3.18E-02	J	ND		2.35E-02	J	ND		6.84E-02		ND	
Copper	mg/L	7.93E-02	J	2.40E-03		9.99E-02		ND		6.52E-02		ND		5.82E-02	J	9.50E-03		4.31E-02		ND	
Iron	mg/L	7.20E+01	J	3.99E+00		9.25E+01	J	1.47E-01		5.64E+01		3.59E-01		7.23E+01		5.62E-01		8.49E+01		6.42E-01	
Lead	mg/L	3.33E-02	J	ND		4.71E-02		ND		3.27E-02		ND		1.87E-01		ND		4.22E-02		ND	
Magnesium	mg/L	6.23E+01	J	3.80E+01		3.42E+01		1.25E+01		3.62E+01		1.47E+01		3.13E+01		2.28E+01		9.14E+00		7.30E+00	
Manganese	mg/L	1.34E+00	J	1.56E+00		1.62E+00		7.55E-01		7.10E-01		1.55E-01		3.67E+00		9.82E-02		1.78E+00		1.09E-02	
Mercury	mg/L	2.50E-04	J	ND		1.40E-04	B	ND		9.30E-05	J	ND		1.30E-03		ND		1.10E-04	J	ND	
Nickel	mg/L	1.08E-01	J	4.70E-03		1.29E-01		2.76E-02		8.12E-02		ND		5.34E-02		5.70E-03		4.37E-01		6.20E-03	
Potassium	mg/L	1.51E+01	J	1.87E+00		1.32E+01		2.45E+00		1.03E+01		1.93E+00		4.65E+00	J	4.72E-01		4.13E+00	J	3.70E-01	
Selenium	mg/L	ND		ND		5.40E-03		ND		ND		ND		ND		ND		ND		ND	
Silver	mg/L	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sodium	mg/L	1.28E+01		1.16E+01		7.33E+00		6.58E+00		3.37E+01		2.93E+01		2.72E+00	J	2.75E+00		4.29E+00	J	3.48E+00	
Thallium	mg/L	5.00E-03	J	8.80E-03		6.50E-03	B	5.40E-03		ND		ND		ND		ND		ND		ND	
Vanadium	mg/L	9.26E-02	J	ND		4.11E-02	J	ND		5.20E-02		ND		3.06E-01		3.90E-03		3.98E-02	J	ND	
Zinc	mg/L	2.03E-01	J	1.46E-02		3.12E-01		1.36E-02		1.25E-01		ND		2.90E-01		2.03E-02		1.06E+00		1.76E-02	
# of detected metals		19		14		20		12		18		8		19		12		19		10	

Shaded = resample results

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).

J - Result is greater than stated method detection limit but less than or equal to specified reporting limit.

mg/L - Milligrams per liter

ND - Not detected

Qual - Data validation qualifier