LONGHORN ARMY AMMUNITION PLANT

KARNACK, TEXAS

ADMINISTRATIVE RECORD

VOLUME 1 of 1

1984

Bate Stamp Numbers
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Prepared for:

Department of the Army
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Marshall, Texas 75671-1059

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LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
ADMINISTRATIVE RECORD - CHRONOLOGICAL INDEX

VOLUME 1 of 1

1984

A. **Title:** Final Analysis Report - Contamination Analysis Report for Environmental Contamination Survey of the Longhorn Army Ammunition Plant, Marshall, Texas
Group(s): 1 (Partial), 2 (Partial)
Site(s): LHAAP-11 Suspected TNT Burial Site At Avenues P & Q
LHAAP-16 Old Land Fill
LHAAP-17 No. 2 Flashing Area / Burning Ground
LHAAP-18 & LHAAP-24 Burning Ground / Washout Pond & Evaporation Pond
LHAAP-29 Former TNT Production Area
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Company: Environmental Protection Systems, Inc
Author(s): Environmental Protection Systems, Inc
Recipient: Thiokol Corporation / Longhorn Division For Submission To U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Grounds, MD. 21010
Date: March 14, 1983 - Revised May 3, 1984
Bate Stamp: 000197 - 000505

B. **Title:** Closure Documents - Closure Of Unlined Evaporation Pond
Group(s): 2 (Partial)
Site(s): LHAAP-18 & LHAAP-24 Burning Ground / Washout Pond & Evaporation Pond
Location: Longhorn Army Ammunition Plant, Marshall, Texas
Company: Kindle, Stone & Associates, Inc.
Author(s): Kindle, Stone & Associates, Inc.
Recipient: U.S. Army Corps Of Engineers, Huntsville Division
Date: July 15, 1984
Bate Stamp: 000506 - 000880

000197

Contamination Analysis Report for Environmental Contamination Survey of the Longhorn Army Ammunition Plant, Mashall, Texas

Prepared For

Thiokol Corporation/Longhorn Division
Marshall, Texas

For Submission To

U.S. Army Toxic and Hazardous Materials Agency
Aberdeen Proving Grounds, MD 21010

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Submitted

March 14, 1983
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1. Introduction

The main purpose of this interim report is the transference of analytical data to Thiokol Corporation and the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) to allow for in-process review and focusing of the remaining geotechnical and analytical effort on those areas found to be of continued concern.

At the outset of this project, nine sites within Longhorn Army Ammunition Plant were designated as potential areas of concern. These areas have been investigated geotechnically and analytically through the logging of existing soil conditions, as well as the sampling of groundwaters, surface waters, sediments, and soils at each of the study areas. The technical results associated with the geotechnical investigation have been submitted under separate cover in November 1982 as Interim Technical Report No. 1. This document contains the analytical data and field sampling methodology used for this survey.

The following sections of this interim report will rely heavily on other documents previously prepared by Environmental Protection Systems, Inc. (EPS) and already submitted to Thiokol and USATHAMA.

2. Sampling and Analysis

A. Sampling Methods

Sampling methods used during this study are presented in detail in Appendix G of this document. The manual which constitutes appendix G was issued to all field personnel, and the field sampling protocol established in this manual was strictly adhered to. Of notable exception to the methods prescribed in our field sampling protocol manual would be the method used by EPS to collect soil samples. Due to site-specific field conditions encountered during the survey, soil samples were routinely collected from each study area with a very narrow, long-nosed shovel. Specifically, a hole 1 foot deep was dug, and then a slice

approximately 5 inches wide and 1 inch thick was removed from the side of the hole using the shovel.

All other sampling procedures outlined in Appendix G were strictly adhered to. EPS collected all water and sediment samples during a one-week period from November 16-21, 1982. Ninety-seven percent of all samples collected at LHAAP were collected in a three-day period from November 17-20, 1982.

B. Parameters and Analytical Methods

A list of all parameters for which EPS was certified for the Longhorn AAP Contamination Survey is presented as Table 1A in Appendix G.

Prior to the inititiation of all sampling, EPS underwent a rigorous certification process which was administered by USATHAMA. Before the first samples were collected at LHAAP, EPS achieved certification for the parameters listed in table 1A in Appendix G and all matrices to be tested. Table I provides a list of all paramaters for which EPS was specifically certified for this survey, and the associated assigned method numbers and detection limits.

A detailed description of each of the analytical procedures used during this survey can be found in EPS's quality assurance document previously submitted to Thiokol and USATHAMA.

3. Quality Control

A detailed description of the quality control plan established for the Longhorn Army Ammunition Plant Contamination Survey is presented in EPS's quality assurance document. All data generated during this survey, unless otherwise noted, met the rigid analytical requirements presented in EPS's quality assurance document. A data summary sheet for each batch of samples (water, soil, and sediment) and analytes which did not meet quality control requirements, including the rationale used by the

Table I

LONGHORN AAP
EPS CERTIFIED METHODS

Analyte	Test Name	Matrix	Cert Level	Method Number	Tested Range	Detection Limit
Mercury	HG	WA	QN	1D	0.5-10 ugl	1.3 ugl
Copper	CU	WA	QN	1M	10-200 ugl	23.9 ugl
Zinc	ZN	WA	QN	1M	10-200 ugl	27.1 ugl
Beryllium	BE	WA	SQ	1M	10-200 ugl	10 ugl
Nickel	NI	WA	SQ	1M	10-200 ugl	30 ugl
Silver	AG	WA	SQ	1M	10-200 ugl	10 ugl
Manganese	MN	WA	QN	1M	10-200 ugl	12.1 ugl
Strontium	SR	WA	QN	1M	25-500 ugl	25 ugl
Aluminum	AL	WA	QN	1M	10-200 ugl	10 ugl
Thallium	TL	WA	SQ	1M	50-1000 ugl	50 ugl
Lead	PB	WA	QN	1B	5-100 ugl	7.49 ugl
Chromium	CR	WA	QN	1B	5-100 ugl	6.64 ugl
Cadmium	CD	WA	QN	1B	0.25-5 ugl	0.28 ugl
Antimony	SB	WA	QN	1B	10-200 ugl	10.2 ugl
Arsenic	AS	WA	SQ	1B	5-100 ugl	6 ugl
Barium	BA	WA	QN	1B	10-200 ugl	11.4 ugl
Selenium	SE	WA	SQ	1B	5-100 ugl	6 ugl
Mercury	HG	SO	QN	2D	0.5-10 ugg	2.7 ugg
Chromium	CR	SO	QN	1N	0.5-10 ugg	0.6 ugg
Cadmium	CD	SO	QN	1N	0.5-10 ugg	0.5 ugg
Copper	CU	SO	QN	1N	0.5-10 ugg	0.5 ugg
Zinc	ZN	SO	QN	1N	0.5-10 ugg	0.5 ugg
Beryllium	BE	SO	SQ	1N	0.5-10 ugg	0.5 ugg

Analyte	Test Name	Matrix	Cert Level	Method Number	Tested Range	Detection Limit
Nickel	NI	SO	SQ	1N	0.5-10 ugg	0.5 ugg
Silver	AG	SO	SQ	1N	0.5-10 ugg	0.5 ugg
Manganese	MN	SO	QN	1N	0.25-5 ugg	0.25 ugg
Aluminum	AL	SO	QN	1N	0.25-5 ugg	0.36 ugg
Strontium	SR	SO	QN	1N	0.5-10 ugg	0.5 ugg
Thallium	TL	SO	SQ	1N	2.5-50 ugg	3 ugg
Lead	PB	SO	QN	1J	0.5-10 ugg	0.89 ugg
Arsenic	AS	SO	SQ	1J	0.25-10 ugg	0.3 ugg
Barium	BA	SO	QN	1J	0.5-10 ugg	0.99 ugg
Antimony	SB	SO	QN	1J	0.5-10 ugg	0.76 ugg
Selenium	SE	SO	SQ	1J	0.5-10 ugg	0.5 ugg
Nitrate	NO3	WA	QN	2P	500-10000 ugl	500 ugl
Nitrite	NO2	WA	QN	2P	250-5000 ugl	250 ugl
Phosphate	PO4	WA	QN	2P	125-2500 ugl	125 ugl
Sulfate	SO4	WA	QN	2P	500-10000 ugl	580 ugl
Chloride	CL	WA	SQ	2P	500-10000 ugl	500 ugl
Fluoride	F	WA	SQ	2P	500-10000 ugl	500 ugl
Chromate	CRO4	WA	SQ	2P	500-10000 ugl	500 ugl
Thiocyanate	SCN	WA	SQ	2P	500-10000 ugl	500 ugl
Cyanide	CYN	WA	SQ	2P	500-10000 ugl	600 ugl
Nitrate	NO3	SO	SQ	7U	5-100 ugg	5 ugg
Nitrite	NO2	SO	QN	7U	5-100 ugg	5 ugg
Sulfate	SO4	SO	QN	7U	25-500 ugg	25 ugg
Chloride	CL	SO	SQ	7U	5-100 ugg	7 ugg
Fluoride	F	SO	SQ	7U	5-100 ugg	5 ugg
Chromate	CRO4	SO	SQ	7U	5-100 ugg	5 ugg

Analyte	Test Name	Matrix	Cert Level	Method Number	Tested Range	Detection Limit
Thiocyanate	SCN	SO	SQ	7U	5-100 ugg	10 ugg
Cyanide	CYN	SO	SQ	7U	5-100 ugg	5 ugg
1,3-Dinitro-benzene	13DNB	WA	QN	7V	0.5-10 ugl	1.68 ugl
2,4,6-Trini-toluene	246TNT	WA	QN	7V	0.5-10 ugl	1.46 ugl
1,3,5-Trini-trobenzene	135TNB	WA	QN	7V	0.5-10 ugl	1.08 ugl
2,4-Dinitrotoluene	24DNT	WA	QN	7V	0.5-10 ugl	0.89 ugl
2,6-Dinitro-toluene	26DNT	WA	QN	7V	0.5-10 ugl	1.20 ugl
Nitrobenzene	NB	WA	QN	7V	0.5-10 ugl	0.76 ugl
1,3-Dinitro-benzene	13DNB	SO	QN	7W	0.5-10 ugg	0.75 ugg
2,4,6-Trini-trotoluene	246TNT	SO	QN	7W	0.5-10 ugg	0.73 ugg
1,3,5-Trini-trobenzene	135TNB	SO	QN	7W	0.5-10 ugg	0.71 ugg
2,4-Dinitro-toluene	24DNT	SO	QN	7W	0.5-10 ugg	0.5 ugg
2,6-Dinitro-toluene	26DNT	SO	QN	7W	0.5-10 ugg	0.61 ugg
Nitrobenzene	NB	SO	QN	7W	0.5-10 ugg	1.15 ugg
p,p-DDT	PPDDT	WA	SQ	2F	0.05-1 ugl	0.05 ugl
Dieldrin	DLDRN	WA	SQ	2F	0.05-1 ugl	0.09 ugl
ABHC	ABHC	WA	SQ	2F	0.05-1 ugl	0.09 ugl
Heptachlor	HPCL	WA	SQ	2F	0.05-1 ugl	0.05 ugl
Lindane	LIN	WA	SQ	2F	0.05-1 ugl	0.09 ugl
Toxaphene	TXPHEN	WA	SQ	2F	2.5-50 ugl	4 ugl
PCB 1016	PCB016	WA	SQ	2F	0.52-11 ugl	0.6 ugl
PCB 1260	PCB260	WA	SQ	2F	0.52-11 ugl	1 ugl

Analyte	Test Name	Matrix	Cert Level	Method Number	Tested Range	Detection Limit
p,p'-DDT	PPDDT	SO	SQ	6V	0.05-1 ugg	0.09 ugl
Dieldrin	DLDRN	SO	SQ	6V	0.05-1 ugg	0.05 ugg
ABHC	ABHC	SO	SQ	6V	0.05-1 ugg	0.05 ugg
Heptachlor	HPCL	SO	SQ	6V	0.05-1 ugg	0.05 ugg
Lindane	LIN	SO	SQ	6V	0.05-1 ugg	0.05 ugg
Toxaphene	TXPHEN	SO	SQ	6V	2.5-50 ugg	4 ugg
PCB 1016	PCB016	SO	SQ	6V	0.52-11 ugg	0.6 ugg
PCB 1260	PCB260	SO	SQ	6V	0.52-11 ugg	0.7 ugg
Benzene	C6H6	WA	SQ	2J	0.5-10.4 ugl	1 ugl
Chloroform	CHCL3	WA	SQ	2J	0.5-10 ugl	1 ugl
Trichloro-ethene	TRCLE	WA	SQ	2J	0.5-10.4 ugl	1 ugl
Trichloro-fluoromethane	CCL3F	WA	SQ	2J	0.5-10 ugl	2 ugl
Pentachloro-phenol	PCP	WA	SQ	1X	0.43-22.4 ugl	2 ugl
2-Chlorophenol	2CLP	WA	SQ	1X	0.46-20.6 ugl	0.7 ugl
2,4-Dichloro-phenol	24DCLP	WA	SQ	1X	0.46-22.2 ugl	1 ugl
2-Fluorophenol	2FP	WA	SQ	1X	1.02-20.4 ugl	6 ugl
Pentafluoro-phenol	PFP	WA	SQ	1X	1.15-23 ugl	4 ugl
Phenol-D6	PHEND6	WA	SQ	1X	1.07-21.4 ugl	2 ugl
Di-N-Butyl-phthalate	DNBP	WA	SQ	1Z	0.502-20.4 ugl	2 ugl
Diethylphthalate	DEP	WA	SQ	1Z	0.53-20.4 ugl	2 ugl
Nitrobenzene	NB	WA	SQ	1Z	0.49-20.2 ugl	1 ugl
1-Fluoro-naphthalene	1FNAP	WA	SQ	1Z	1.07-21.4 ugl	2 ugl

Analyte	Test Name	Matrix	Cert Level	Method Number	Tested Range	Detection Limit
2-FluoroLiphenyl	2FBP	WA	SQ	1Z	1.09-21.8 ugl	2 ugl
Pentachloro-phenol	PCP	SO	SQ	1Y	0.43-11.2 ugg	1 ugg
2-Chlorophenol	2CLP	SO	SQ	1Y	0.46-10.3 ugg	0.7 ugg
2,4-Dichloro-phenol	24DLCP	SO	SQ	1Y	0.45-11.1 ugg	1 ugg
2-Fluorophenol	2FP	SO	SQ	1Y	0.51-10.7 ugg	3 ugg
Pentafluoro-phenol	PFP	SO	SQ	1Y	0.575-11.5 ugg	3 ugg
Phenol-D6	PHEND6	SO	SQ	1Y	0.535-10.7 ugg	3 ugg
Di-N-Butyl-phthalate	DNBP	SO	SQ	2A	0.51-10.4 ugg	0.7 ugg
Diethyl-phthalate	DEP	SO	SQ	2A	0.51-10.6 ugg	1 ugg
Nitrobenzene	NB	SO	SQ	2A	0.49-10.1 ugg	0.6 ugg
1-Fluoro-naphthalene	1FNAP	SO	SQ	2A	0.535-10.7 ugg	2 ugg
2-Fluorobi-phenyl	2FBP	SO	SQ	2A	1.09-21.8 ugg	2 ugg

FQAC to override the system, is presented in Appendix E. All results generated during the analytical portion of the survey for explosives, anions, GC/MS, and GC/EC parameters met the quality control requirements established in EPS's quality control program.

However, considerable problems were encountered in the analysis of metals in natural samples of water and soil collected at LHAAP. All water samples collected during the survey were analyzed in four groups of 17 batches each, or 68 discrete batches (AAX through ADM). The quality control for each batch included a duplicate and two spikes at different levels. the duplicates analyzed for all four batches of water samples had at least 2 of the 17 parameters being tested out of specifications with respect to precision. Most, if not all, of these problems were caused by the high concentration of a particular element encountered in natural samples, along with the resulting impact of numerous dilutions on the analytical scheme. The quality control for the spikes indicated several conditions under which our analytical process would be considered out of control; however, upon closer examination, it was determined that these problems occurred with the parameters for which EPS was certified semiquantitatively. The body of data which was used in the preparation of the quality control charts was rather limited for these parameters, and after review by the field quality control coordinator, it was determined that a re-calculation of the existing tables was in order. Accordingly, results for all spikes for batches presented in this report for atomic absorption water samples fell within reasonable and expected quality control ranges.

All soil and sediment samples collected at LHAAP were analyzed by EPS in three groups of 17 batches each, or 51 discrete batches (AEU through AGS). Here, too, results for several parameters in certain batches were found to be outside of the pre-established quality control limits set for this project. On closer analysis it was found that these quality control anomalies were all associated with high background levels in the blanks and spiked matrices, and the associated need for several dilutions, as well as, for many of the semiquantitative analytical parameters, an

unrealistic accuracy target range based on limited analytical data generated during the quality assurance certification.

4. Analytical Results

A. Data Reports

All analytical results generated during this survey are presented in Appendices A, B, C, D, and F. Appendix A contains all analytical results generated for goundwater sampling sites. Appendix B contains analytical results for samples collected at all surface water sites. Appendix C contains all analytical results for sediment sampling sites. Appendix D contains analytical results for samples collected at soil sampling sites. Appendix F contains results for all compounds isolated during the screening analyses (HPLC, GC/EC, and GC/MS) which have either been identified, or are being reported as unidentified compounds at this time. All results are presented by analytical category according to each station sample.

B. Detection Limits

The detection limits established for this project are presented in Table I. These detection limits were generated during the certification process which EPS underwent for both the Longhorn and Lone Star Army Ammunition Plants, and generally represent a composite detection limit for all analyses conducted by EPS for USATHAMA.

5. Preliminary Conclusions

Of the nine areas studied in-depth during this survey, only two have been demonstrated as having the potential for being a source of contamination which might conceivably migrate off-post.

The first area of continued concern is the TNT area. Wells 114 through 119 do not indicate the existence of any groundwater contamination in

this area. The geotechnical results to date indicate that this area has soils of relatively low permeablility, and, therefore, it is not surprising that, although soil contamination does exist at this site, the explosive contaminants present have not penetrated into the groundwater. Our analyses indicated relatively widespread and locally heavy contamination of sites within the TNT area for several of the explosive compounds tested.

Our sampling effort for this project took place during a period of very heavy rainfall. The rainfall (exact meteorological data will be presented in the final report) caused flash flooding in the small creeks and bayous which run through LHAAP just prior to the sampling of the surrounding surface waters associated with the TNT area. Even though the area was subjected to a tremendous flushing from the heavy rainfall, traces of 2,4,6-TNT (0.78 ug/l) were still found in surface water at Station SW006, as well as a relatively high level (206.90 ug/l) of 2,4,6-TNT. Also detected at this station were 2,4-DNT (23.40 ug/l) and 2,6-DNT (13.65 ug/l). Inasmuch as these concentrations of explosive compounds were detected at this site immediately downstream from the TNT area, and additionally considering that traces of 2,4,6-TNT (2.27 ug/l) and nitrobenzene (6.27 ug/l) were found at Station SW002, which is further downstream from the TNT area, this potential source of contamination warrants additional investigation.

During this survey one other site, which had been preliminarily identified as an area of concern, has been tentatively confirmed as a potential contamination source based on the analytical data presented. This area is the current and active burning grounds and associated rocket motor casing washout pond. Many of the wells surrounding the pond have high concentrations of several halogenated organic compounds.

Other sites within the initial nine general areas of concern have been determined to have localized low levels of contamination; however, data gathered to date would not support the imminent potential for migration off LHAAP.

6. Recommendations

A detailed review of the analytical and geotechnical data thus far produced for this survey is now in progress. However, some preliminary recommendations are evident from an initial review of the existing data. These recommendations pertain to those areas found to be of significant continuing concern with respect to their potential for having hazardous substances which might migrate off LHAAP.

1. It is recommended that, since major groundwater contamination was found in one area (active burning grounds), the majority of the additional geotechnical investigation be centered on the wells at the active burning grounds, with specific emphasis on those wells surrounding the rocket motor washout pond.

2. It is recommended that additional wells be installed in the wooded area between the rocket motor washout pond and the Harrison Bayou floodplain. This recommendation is based on the fact that many of the wells surrounding the pond were highly contaminated with halogenated organic compounds and that this contamination was not uniformly distributed from the apparent source of the contamination. The data indicates that there are major differences in the amount of contamination in wells that were equally distant from the apparant contamination source (rocket motor washout pond). Because of the fact that this area's soils have relatively higher permeability than other sites within LHAAP, and because the initial geotechnical report indicates that this area is probably underlain by discontinuous layers of material, it is very possible that the contamination from the rocket motor washout pond follows a very specific and localized pathway into the goundwater. The wells presently installed around the pond are too close to the pond for us to establish with any prescision the extent of groundwater contamination in this area. Since it is predicted that the general groundwater flow from this site is towards Harrison Bayou, we recommend that at least six to eight wells be established at

distances of approximately 300 feet and 500 feet from the northeastern and northwestern edges of the rocket motor washout pond.

3. It is recommended that additional water and sediment samples be collected along the entire length of the main drainage course leaving the TNT area at Stations SW001, SW002, and SW006. Additionally, another sampling station should be established in the drainage course leaving the TNT area just prior to its confluence with the north bayou inlet to Caddo Lake. It is suggested that additional samples be collected during a period of normal rainfall at all sediment sampling points. It is further suggested that water samples be collected at surface water Station SW006 every 30 minutes during a storm water hydrograph. Samples collected during the rising and falling hydrograph periods should be analyzed for the presence of explosive compounds. This additional data will be vital in determining whether or not the concentrations previously observed in the surface waters at these sites were an anomaly caused by the very heavy rains in the area, or simply a fraction of the concentrations normally found in the system prior to major flushing.

4. It is further recommended that tissue samples from bottom-feeding fishes in the area of the north bayou inlet to Caddo Lake be analyzed for the presence of explosive compounds and their degradation products.

5. It is suggested that several additional borings be made in area 080 (the suspected TNT burial site) for analysis of explosive compounds. Since traces of explosives were found in bottom soil from one bore hole in this area, and considering that the sampling at this site was totally random, it is suggested that additional historical information be gathered, if possible, and that more specific, and possibly deeper, bore holes be dug for analysis of sediment samples.

APPENDIX A

ANALYTICAL RESULTS FOR GROUNDWATER SAMPLING SITES

(WELL 101 - WELL 53)

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 101

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	3.35
2,4,6 - TNT	<
1,3,5 - TNB	15.00
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	1600.
Nitrite	<
Phosphates	<
Sulfate	36500.
Chloride	2000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	168.00
Antimony	<
Barium	279.00
Cadmium	<
Chromium	56.30
Lead	93.60
Manganese	452.00
Strontium	260.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	330.00
Arsenic	50.
Beryllium	<
Nickel	81.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutyiphthiate	<
Diethylphthiate	<
Nitrobenzene	<
Organics (GC/EC)	<
p.p'-DDT	<
Dieldrin	<
Alpha BHC	<
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	

< less than established detection limit.

* Analyte or category not tested as per project

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 102

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	5.74
2,4,6 - TNT	<
1,3,5 - TNB	53.95
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	4980.
Nitrite	<
Phosphates	<
Sulfate	9690.
Chloride	3000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	382.00
Antimony	<
Barium	365.00
Cadmium	0.66
Chromium	84.10
Lead	67.40
Manganese	476.00
Strontium	444.00
Mercury	<

ANALYTES	CON. ug/l
Copper	54.00
Zinc	270.00
Arsenic	160.
Beryllium	<
Nickel	232.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	<
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.(limited sample)

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 103

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Anions:	
Nitrate	0910.
Nitrite	<
Phosphates	<
Sulfate	69920.
Chloride	41000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	361.00
Antimony	<
Barium	32.00
Cadmium	11.52
Chromium	13.50
Lead	15.80
Manganese	169.00
Strontium	398.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	<
Selenium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	<
p.p'-DDT	<
Dieldrin	<
Alpha BHC	<
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 104

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	9.74
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	1.82
Anions:	
Nitrate	3500.
Nitrite	<
Phosphates	<
Sulfate	5710.
Chloride	8000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	372.00
Antimony	<
Barium	67.00
Cadmium	0.97
Chromium	45.70
Lead	34.30
Manganese	85.00
Strontium	96.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	21.
Beryllium	<
Nickel	57.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	<
Dieldrin	<
Alpha BHC	<
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 105

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	<	Beryllium	<
2,4 - DNT	<	Nickel	137.
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	60.
Anions:		**Organics (GC/MS):**	
Nitrate	24000.	Benzene	*
Nitrite	<	Chloroform	*
Phosphates	<	Trichlorethylene	*
Sulfate	1846600.	Pentachlorophenol	*
Chloride	820000.	O-chlorophenol	*
Fluoride	<	2,4-dichlorophenol	*
Chromate	<	Dibutylphthlate	*
Thiocyanate	<	Diethylphthlate	*
Cyanide	<	Nitrobenzene	*
Metals:			
Aluminum	377.00	**Organics (GC/EC)**	
Antimony	<	p.p'-DDT	*
Barium	32.50	Dieldrin	*
Cadmium	9.72	Alpha BHC	*
Chromium	11.90	Heptachlor	*
Lead	<	Lindane	*
Manganese	3340.00	Toxaphene	*
Strontium	6920.00	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 106

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	4.38
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	73300.
Chloride	137000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	249.00
Antimony	<
Barium	13.30
Cadmium	3.92
Chromium	9.50
Lead	15.10
Manganese	652.00
Strontium	272.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	41.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	<
Dieldrin	<
Alpha BHC	<
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 107

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	54650.
Chloride	145000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	154.00
Antimony	<
Barium	<
Cadmium	4.68
Chromium	10.30
Lead	10.00
Manganese	187.00
Strontium	260.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	<
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	1.
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 108

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	1378000.
Chloride	2734000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	147.00
Antimony	<
Barium	31.60
Cadmium	15.38
Chromium	12.00
Lead	<
Manganese	11800.00
Strontium	8200.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	234.
Selenium	19.
Silver	<
Thallium	00.
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	<
Dieldrin	<
Alpha BHC	1.
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 109

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	14000.
Nitrite	<
Phosphates	<
Sulfate	66000.
Chloride	2037000.
Fluoride	1000.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	184.00
Antimony	<
Barium	960.00
Cadmium	6.78
Chromium	10.40
Lead	<
Manganese	15.00
Strontium	80.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	<
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 110

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	<	Beryllium	<
2,4 - DNT	<	Nickel	64.
2,6 - DNT	<	Selenium	28.
Nitrobenzene	<	Silver	<
		Thallium	<
Anions:		Organics (GC/MS):	
Nitrate	<	Benzene	<
Nitrite	<	Chloroform	<
Phosphates	<	Trichlorethylene	<
Sulfate	2407100.	Pentachlorophenol	<
Chloride	1414000.	O-chlorophenol	<
Fluoride	<	2,4-dichlorophenol	<
Chromate	<	Dibutylphthlate	<
Thiocyanate	<	Diethylphthlate	<
Cyanide	<	Nitrobenzene	<
Metals:			
Aluminum	100.00	Organics (GC/EC)	
Antimony	<	p.p'-DDT	<
Barium	32.00	Dieldrin	<
Cadmium	1.44	Alpha BHC	<
Chromium	10.00	Heptachlor	<
Lead	<	Lindane	<
Manganese	1570.00	Toxaphene	<
Strontium	3920.00	Aroclor 1016	<
Mercury	<	Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 111

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	4350.
Nitrite	<
Phosphates	<
Sulfate	54500.
Chloride	41000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	172.00
Antimony	<
Barium	15.60
Cadmium	13.00
Chromium	7.00
Lead	13.00
Manganese	116.00
Strontium	190.00
Mercury	<
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	<
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	<
Dieldrin	<
Alpha BHC	<
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 112

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	9.00	Beryllium	<
2,4 - DNT	<	Nickel	<
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	<
Anions:		Organics (GC/MS):	
Nitrate	67500.	Benzene	<
Nitrite	<	Chloroform	<
Phosphates	<	Trichlorethylene	<
Sulfate	951000.	Pentachlorophenol	<
Chloride	820000.	O-chlorophenol	<
Fluoride	2000.	2,4-dichlorophenol	<
Chromate	<	Dibutyiphthiate	<
Thiocyanate	<	Diethyiphthiate	<
Cyanide	<	Nitrobenzene	<
Metals:			
Aluminum	247.00	Organics (GC/EC)	
Antimony	<	p.p'-DDT	<
Barium	17.10	Dieldrin	<
Cadmium	16.27	Alpha BHC	<
Chromium	10.10	Heptachlor	<
Lead	<	Lindane	<
Manganese	3300.00	Toxaphene	<
Strontium	90.00	Aroclor 1016	<
Mercury	<	Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 113

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Phosphates	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*
Copper	<
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 114

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Phosphates	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*
Copper	<
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 115

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Phosphates	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*
Copper	<
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 116

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Phosphates	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*

ANALYTES	CON. ug/l
Copper	<
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 117

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Phosphates	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*
Copper	<
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 118

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Phosphates	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*

ANALYTES	CON. ug/l
Copper	<
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthiate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 119

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Phosphates	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*

ANALYTES	CON. ug/l
Copper	<
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 120

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	1170000.
Nitrite	<
Phosphates	<
Sulfate	122000.
Chloride	1375000.
Fluoride	1000.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	192.00
Antimony	<
Barium	44.20
Cadmium	5.44
Chromium	10.20
Lead	<
Manganese	604.00
Strontium	412.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	64.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	<
Dieldrin	<
Alpha BHC	<
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 121

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	63700.
Chloride	82000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	215.00
Antimony	<
Barium	75.10
Cadmium	5.91
Chromium	27.70
Lead	15.70
Manganese	126.00
Strontium	180.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	<
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	<
Dieldrin	<
Alpha BHC	<
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 122

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	<	Beryllium	<
2,4 - DNT	<	Nickel	<
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	<
Anions:		Organics (GC/MS):	
Nitrate	<	Benzene	<
Nitrite	<	Chloroform	<
Phosphates	<	Trichlorethylene	<
Sulfate	122000.	Pentachlorophenol	<
Chloride	320000.	O-chlorophenol	<
Fluoride	1000.	2,4-dichlorophenol	<
Chromate	<	Dibutylphthlate	<
Thiocyanate	<	Diethylphthlate	<
Cyanide	<	Nitrobenzene	<
Metals:			
Aluminum	362.00	Organics (GC/EC)	
Antimony	<	p,p'-DDT	<
Barium	217.00	Dieldrin	<
Cadmium	6.84	Alpha BHC	<
Chromium	8.70	Heptachlor	<
Lead	<	Lindane	<
Manganese	4460.00	Toxaphene	<
Strontium	1112.00	Aroclor 1016	<
Mercury	<	Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 123

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	<	Beryllium	<
2,4 - DNT	<	Nickel	44.
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	<
Anions:		**Organics (GC/MS):**	
Nitrate	20500.	Benzene	*
Nitrite	<	Chloroform	*
Phosphates	<	Trichlorethylene	*
Sulfate	35600.	Pentachlorophenol	*
Chloride	24000.	O-chlorophenol	*
Fluoride	<	2,4-dichlorophenol	*
Chromate	<	Dibutylphthiate	*
Thiocyanate	<	Diethylphthiate	*
Cyanide	<	Nitrobenzene	*
Metals:			
Aluminum	161.00	**Organics (GC/EC)**	
Antimony	<	p,p'-DDT	<
Barium	58.30	Dieldrin	<
Cadmium	5.87	Alpha BHC	<
Chromium	40.0	Heptachlor	<
Lead	<	Lindane	<
Manganese	72.00	Toxaphene	<
Strontium	72.00	Aroclor 1016	<
Mercury	<	Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 124

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	7.31
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	1030.
Nitrite	<
Phosphates	<
Sulfate	4700.
Chloride	29000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	408.00
Antimony	<
Barium	160.00
Cadmium	7.77
Chromium	11.20
Lead	<
Manganese	83.00
Strontium	72.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	78.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	<
Dieldrin	<
Alpha BHC	<
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 125

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	2.58
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	6570.
Nitrite	<
Phosphates	<
Sulfate	4000.
Chloride	2345000.
Fluoride	1000.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	21.40
Antimony	<
Barium	2210.00
Cadmium	14.28
Chromium	10.50
Lead	<
Manganese	1340.00
Strontium	7440.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	122.00
Arsenic	<
Beryllium	<
Nickel	377.
Selenium	<
Silver	<
Thallium	140.
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	<
Dieldrin	<
Alpha BHC	<
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 125

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	3200.
Nitrite	<
Phosphates	<
Sulfate	4000.
Chloride	2725000.
Fluoride	1000.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	300.00
Antimony	<
Barium	333.00
Cadmium	3.54
Chromium	12.10
Lead	<
Manganese	1320.00
Strontium	7760.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	114.
Selenium	<
Silver	<
Thallium	120.
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	<
Dieldrin	<
Alpha BHC	<
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 127

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	1622000.
Chloride	832000.
Fluoride	1000.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	36.00
Antimony	<
Barium	46.00
Cadmium	0.99
Chromium	11.60
Lead	<
Manganese	1860.00
Strontium	3360.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	157.
Selenium	<
Silver	<
Thallium	140.
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 128

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	550000.
Chloride	1000000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	353.00
Antimony	<
Barium	51.50
Cadmium	4.39
Chromium	<
Lead	<
Manganese	1088.00
Strontium	4120.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	82.
Selenium	<
Silver	<
Thallium	110.
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 129

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	99200.
Nitrite	<
Phosphates	<
Sulfate	13400.
Chloride	2592000.
Fluoride	1000.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	272.00
Antimony	<
Barium	431.00
Cadmium	9.67
Chromium	11.40
Lead	<
Manganese	780.00
Strontium	1060.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	100.
Selenium	<
Silver	<
Thallium	130.
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
[illegible]-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	73.
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 130

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	152200.
Chloride	2348000.
Fluoride	1000.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	125.00
Antimony	<
Barium	105.00
Cadmium	2.22
Chromium	<
Lead	<
Manganese	<
Strontium	1160.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	91.
Selenium	<
Silver	<
Thallium	100.
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 131

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	<	Beryllium	<
2,4 - DNT	<	Nickel	53.
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	80.
Anions:		**Organics (GC/MS):**	
Nitrate	<	Benzene	<
Nitrite	<	Chloroform	<
Phosphates	<	Trichlorethylene	<
Sulfate	216600.	Pentachlorophenol	<
Chloride	27850000.	O-chlorophenol	<
Fluoride	1000.	2,4-dichlorophenol	<
Chromate	<	Dibutylphthlate	<
Thiocyanate	<	Diethylphthlate	52.
Cyanide	<	Nitrobenzene	<
Metals:			
Aluminum	222.00	**Organics (GC/EC)**	
Antimony	<	p,p'-DDT	*
Barium	47.80	Dieldrin	*
Cadmium	0.93	Alpha BHC	*
Chromium	<	Heptachlor	*
Lead	<	Lindane	*
Manganese	<	Toxaphene	*
Strontium	1340.00	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 132

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	337000.
Chloride	10330000.
Fluoride	1000.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	232.00
Antimony	<
Barium	53.40
Cadmium	9.24
Chromium	14.50
Lead	16.30
Manganese	1448.00
Strontium	2640.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	102.
Selenium	<
Silver	<
Thallium	100.
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

ao per EPA SW-846 eval Jan 86 Table 1

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LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 33 BH-20

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	<	Beryllium	<
2,4 - DNT	<	Nickel	50.
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	90.
Anions:		Organics (GC/MS):	
Nitrate	<	Benzene	<
Nitrite	<	Chloroform	<
Phosphates	<	Trichlorethylene	<
Sulfate	90500.	Pentachlorophenol	<
Chloride	227000.	O-chlorophenol	<
Fluoride	1000.	2,4-dichlorophenol	<
Chromate	<	Dibutylphthlate	<
Thiocyanate	<	Diethylphthlate	2.
Cyanide	<	Nitrobenzene	<
Metals:			
Aluminum	132.00	Organics (GC/EC)	
Antimony	<	p,p'-DDT	<
Barium	49.70	Dieldrin	<
Cadmium	3.59	Alpha BHC	<
Chromium	8.10	Heptachlor	<
Lead	<	Lindane	<
Manganese	193.00	Toxaphene	<
Strontium	920.00	Aroclor 1016	<
Mercury	<	Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 34 BH-19

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	153400.
Chloride	2725000.
Fluoride	1000.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	36.60
Antimony	<
Barium	20.20
Cadmium	1.26
Chromium	<
Lead	54.40
Manganese	16.00
Strontium	1160.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	62.
Selenium	<
Silver	<
Thallium	100.
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	<
Dieldrin	<
Alpha BHC	<
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONCHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 35
BH-18

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	2.25	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	<	Beryllium	<
2,4 - DNT	<	Nickel	71.
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	110.
Anions:		Organics (GC/MS):	
Nitrate	<	Benzene	*
Nitrite	<	Chloroform	*
Phosphates	<	Trichlorethylene	*
Sulfate	235000.	Pentachlorophenol	*
Chloride	200000.	O-chlorophenol	*
Fluoride	1000.	2,4-dichlorophenol	*
Chromate	<	Dibutylphthlate	*
Thiocyanate	<	Diethylphthlate	*
Cyanide	<	Nitrobenzene	*
Metals:			
Aluminum	29.80	Organics (GC/EC)	
Antimony	<	p.p'-DDT	<
Barium	14.70	Dieldrin	<
Cadmium	1.99	Alpha BHC	<
Chromium	<	Heptachlor	<
Lead	44.00	Lindane	<
Manganese	36.00	Toxaphene	<
Strontium	960.00	Aroclor 1016	<
Mercury	<	Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 36

BH-16

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	<	Beryllium	<
2,4 - DNT	<	Nickel	165.
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	160.
Anions:		**Organics (GC/MS):**	
Nitrate	<	Benzene	*
Nitrite	<	Chloroform	*
Phosphates	<	Trichlorethylene	*
Sulfate	67000.	Pentachlorophenol	*
Chloride	878000.	O-chlorophenol	*
Fluoride	1000.	2,4-dichlorophenol	*
Chromate	<	Dibutylphthiate	*
Thiocyanate	<	Diethylphthlate	*
Cyanide	<	Nitrobenzene	*
Metals:			
Aluminum	236.00	**Organics (GC/EC)**	
Antimony	<	p.p'-DDT	<
Barium	156.60	Dieldrin	<
Cadmium	0.91	Alpha BHC	<
Chromium	9.00	Heptachlor	<
Lead	<	Lindane	<
Manganese	360.00	Toxaphene	<
Strontium	2020.00	Aroclor 1016	<
Mercury	<	Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 37

BH-14

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	<	Beryllium	<
2,4 - DNT	<	Nickel	73.
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	140.
Anions:		Organics (GC/MS):	
Nitrate	<	Benzene	<
Nitrite	<	Chloroform	<
Phosphates	<	Trichlorethylene	<
Sulfate	67000.	Pentachlorophenol	<
Chloride	826000.	O-chlorophenol	<
Fluoride	2000.	2,4-dichlorophenol	<
Chromate	<	Dibutylphthlate	<
Thiocyanate	<	Diethylphthlate	<
Cyanide	<	Nitrobenzene	<
Metals:			
Aluminum	227.00	Organics (GC/EC)	
Antimony	<	p.p'-DDT	<
Barium	95.50	Dieldrin	<
Cadmium	2.97	Alpha BHC	<
Chromium	7.60	Heptachlor	<
Lead	80.00	Lindane	<
Manganese	312.00	Toxaphene	<
Strontium	1560.00	Aroclor 1016	<
Mercury	<	Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 38

BH-22

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	<	Beryllium	<
2,4 - DNT	<	Nickel	74.
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	140.
Anions:		Organics (GC/MS):	
Nitrate	<	Benzene	*
Nitrite	<	Chloroform	*
Phosphates	<	Trichlorethylene	*
Sulfate	6150.	Pentachlorophenol	*
Chloride	728000.	O-chlorophenol	*
Fluoride	1000.	2,4-dichlorophenol	*
Chromate	<	Dibutylphthlate	*
Thiocyanate	<	Diethylphthlate	*
Cyanide	<	Nitrobenzene	*
Metals:			
Aluminum	229.00	Organics (GC/EC)	
Antimony	<	p.p'-DDT	*
Barium	963.00	Dieldrin	*
Cadmium	6.81	Alpha BHC	*
Chromium	7.10	Heptachlor	*
Lead	8.90	Lindane	*
Manganese	596.00	Toxaphene	*
Strontium	1520.00	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 39

BH-5

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	1327.00
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	1790.
Chloride	653000.
Fluoride	5000.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	94.3
Antimony	<
Barium	797.00
Cadmium	3.78
Chromium	<
Lead	<
Manganese	196.00
Strontium	1220.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	60.
Selenium	<
Silver	<
Thallium	150.
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 40

BH-7

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	<	Beryllium	<
2,4 - DNT	<	Nickel	<
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	60.
Anions:		Organics (GC/MS):	
Nitrate	2230.	Benzene	*
Nitrite	<	Chloroform	*
Phosphates	<	Trichlorethylene	*
Sulfate	3300.	Pentachlorophenol	*
Chloride	264000.	O-chlorophenol	*
Fluoride	1000.	2,4-dichlorophenol	*
Chromate	<	Dibutylphthlate	*
Thiocyanate	<	Diethylphthlate	*
Cyanide	<	Nitrobenzene	*
Metals:			
Aluminum	50.9	Organics (GC/EC)	
Antimony	<	p.p'-DDT	*
Barium	<	Dieldrin	*
Cadmium	0.99	Alpha BHC	*
Chromium	11.70	Heptachlor	*
Lead	9.30	Lindane	*
Manganese	632.00	Toxaphene	*
Strontium	1420.00	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 40

BH-7

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	<	Beryllium	<
2,4 - DNT	<	Nickel	<
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	60.
Anions:		Organics (GC/MS):	
Nitrate	2230.	Benzene	*
Nitrite	<	Chloroform	*
Phosphates	<	Trichlorethylene	*
Sulfate	3300.	Pentachlorophenol	*
Chloride	264000.	O-chlorophenol	*
Fluoride	1000.	2,4-dichlorophenol	*
Chromate	<	Dibutylphthlate	*
Thiocyanate	<	Diethylphthlate	*
Cyanide	<	Nitrobenzene	*
Metals:			
Aluminum	50.9	Organics (GC/EC)	
Antimony	<	p.p'-DDT	*
Barium	<	Dieldrin	*
Cadmium	0.99	Alpha BHC	*
Chromium	11.70	Heptachlor	*
Lead	9.30	Lindane	*
Manganese	632.00	Toxaphene	*
Strontium	1420.00	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 42 BH-1

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	7700.
Nitrite	<
Phosphates	<
Sulfate	4950.
Chloride	981000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	40.10
Antimony	<
Barium	624.00
Cadmium	4.22
Chromium	8.20
Lead	17.40
Manganese	460.00
Strontium	2240.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	38.
Selenium	<
Silver	<
Thallium	90.
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GROUNDWATER SAMPLING SITE
WELL 43

BH-8

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	<	Beryllium	<
2,4 - DNT	<	Nickel	39.
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	70.
Anions:		**Organics (GC/MS):**	
Nitrate	720.	Benzene	<
Nitrite	<	Chloroform	<
Phosphates	2460.	Trichlorethylene	<
Sulfate	6800.	Pentachlorophenol	<
Chloride	1126000.	O-chlorophenol	<
Fluoride	1000.	2,4-dichlorophenol	<
Chromate	<	Dibutylphthlate	<
Thiocyanate	<	Diethylphthlate	330.
Cyanide	<	Nitrobenzene	<
Metals:			
Aluminum	103.70	**Organics (GC/EC)**	
Antimony	<	p,p'-DDT	*
Barium	609.00	Dieldrin	*
Cadmium	7.20	Alpha BHC	*
Chromium	8.90	Heptachlor	*
Lead	<	Lindane	*
Manganese	660.00	Toxaphene	*
Strontium	1240.00	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 44

BH-9

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	44.00
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	<	Beryllium	<
2,4 - DNT	<	Nickel	85.
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	90.
Anions:		**Organics (GC/MS):**	
Nitrate	22360.	Benzene	<
Nitrite	<	Chloroform	<
Phosphates	<	Trichlorethylene	<
Sulfate	1390.	Pentachlorophenol	<
Chloride	702000.	O-chlorophenol	<
Fluoride	<	2,4-dichlorophenol	<
Chromate	<	Dibutylphthlate	<
Thiocyanate	<	Diethylphthlate	200.
Cyanide	<	Nitrobenzene	<
Metals:			
Aluminum	10.80	**Organics (CC/EC)**	
Antimony	<	p.p'-DDT	*
Barium	32.50	Dieldrin	*
Cadmium	7.40	Alpha BHC	*
Chromium	<	Heptachlor	*
Lead	<	Lindane	*
Manganese	140.00	Toxaphene	*
Strontium	1320.00	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 45

BH-10

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	16700.
Nitrite	<
Phosphates	<
Sulfate	4470.
Chloride	545000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	112.00
Antimony	<
Barium	18.40
Cadmium	6.20
Chromium	9.60
Lead	<
Manganese	520.00
Strontium	1700.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	41.00
Arsenic	<
Beryllium	<
Nickel	40.
Selenium	<
Silver	<
Thallium	70.
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	16.
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 46

BH-4

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	<	Beryllium	<
2,4 - DNT	<	Nickel	<
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	80.
Anions:		Organics (GC/MS):	
Nitrate	<	Benzene	<
Nitrite	<	Chloroform	<
Phosphates	<	Trichlorethylene	<
Sulfate	4470.	Pentachlorophenol	<
Chloride	545000.	O-chlorophenol	<
Fluoride	<	2,4-dichlorophenol	<
Chromate	<	Dibutylphthlate	<
Thiocyanate	<	Diethylphthlate	<
Cyanide	<	Nitrobenzene	<
Metals:			
Aluminum	68.00	Organics (GC/EC)	
Antimony	<	p.p'-DDT	*
Barium	534.00	Dieldrin	<
Cadmium	0.87	Alpha BHC	<
Chromium	<	Heptachlor	<
Lead	<	Lindane	<
Manganese	204.00	Toxaphene	<
Strontium	1592.00	Aroclor 1016	<
Mercury	<	Aroclor 1260	<

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 47

BH-2

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	1990.
Chloride	441000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	36.70
Antimony	<
Barium	639.00
Cadmium	<
Chromium	9.00
Lead	<
Manganese	684.00
Strontium	1090.00
Mercury	2.70

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	41.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	5.
Diethylphthlate	243.
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 48

BH-6

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	29.47	Beryllium	<
2,4 - DNT	<	Nickel	55.
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	75.
Anions:		**Organics (GC/MS):**	
Nitrate	<	Benzene	<
Nitrite	<	Chloroform	<
Phosphates	105000.	Trichlorethylene	<
Sulfate	2900.	Pentachlorophenol	<
Chloride	554000.	O-chlorophenol	<
Fluoride	1000.	2,4-dichlorophenol	<
Chromate	<	Dibutylphthlate	8.
Thiocyanate	<	Diethylphthlate	3.
Cyanide	<	Nitrobenzene	<
Metals:			
Aluminum	33.70	**Organics (GC/EC)**	
Antimony	<	p.p'-DDT	*
Barium	648.00	Dieldrin	*
Cadmium	<	Alpha BHC	*
Chromium	12.40	Heptachlor	*
Lead	13.40	Lindane	*
Manganese	576.00	Toxaphene	*
Strontium	1500.00	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 49 UNKNOWN

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	9.59
1,3,5 - TNB	106.39
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	2900.
Nitrite	<
Phosphates	<
Sulfate	2540.
Chloride	580000.
Fluoride	1000.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	98.50
Antimony	<
Barium	83.00
Cadmium	<
Chromium	<
Lead	<
Manganese	468.00
Strontium	1246.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	<
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 50 BH-21

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	5.37	Arsenic	<
1,3,5 - TNB	34.20	Beryllium	<
2,4 - DNT	<	Nickel	<
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	<
Anions:		**Organics (GC/MS):**	
Nitrate	10910.	Benzene	<
Nitrite	<	Chloroform	<
Phosphates	<	Trichlorethylene	<
Sulfate	4270.	Pentachlorophenol	<
Chloride	580000.	O-chlorophenol	<
Fluoride	980.	2,4-dichlorophenol	<
Chromate	<	Dibutylphthlate	<
Thiocyanate	<	Diethylphthlate	<
Cyanide	<	Nitrobenzene	<
Metals:			
Aluminum	520.00	**Organics (GC/EC)**	
Antimony	<	p.p'-DDT	*
Barium	66.70	Dieldrin	*
Cadmium	7.90	Alpha BHC	*
Chromium	9.90	Heptachlor	*
Lead	<	Lindane	*
Manganese	150.00	Toxaphene	*
Strontium	900.00	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 51

BH-12

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	6.09	Peryllium	<
2,4 - DNT	<	Nickel	40.
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	<
Anions:		Organics (GC/MS):	
Nitrate	1230.	Benzene	<
Nitrite	<	Chloroform	<
Phosphates	<	Trichlorethylene	<
Sulfate	2110	Pentachlorophenol	<
Chloride	5000.	O-chlorophenol	<
Fluoride	<	2,4-dichlorophenol	<
Chromate	<	Dibutylphthlate	<
Thiocyanate	<	Diethylphthlate	<
Cyanide	<	Nitrobenzene	<
Metals:			
Aluminum	67.70	Organics (GC/EC)	
Antimony	<	p.p'-DDT	*
Barium	42.40	Dieldrin	*
Cadmium	<	Alpha BHC	*
Chromium	55.80	Heptachlor	*
Lead	49.60	Lindane	*
Manganese	151.00	Toxaphene	*
Strontium	62.00	Aroclor 1016	*
Mercury	3.20	Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 52

BH-13

ANALYTES	CON. ug/l	ANALYTES	CON. ug/l
Explosives:		Copper	<
1,3-DNB	<	Zinc	<
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	<	Beryllium	<
2,4 - DNT	<	Nickel	34.
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	<
Anions:		**Organics (GC/MS):**	
Nitrate	700.	Benzene	<
Nitrite	<	Chloroform	<
Phosphates	3930.	Trichlorethylene	<
Sulfate	1340.	Pentachlorophenol	<
Chloride	1056000.	O-chlorophenol	<
Fluoride	2000.	2,4-dichlorophenol	<
Chromate	<	Dibutylphthlate	7.
Thiocyanate	<	Diethylphthlate	<
Cyanide	<	Nitrobenzene	<
Metals:			
Aluminum	24.20	**Organics (GC/EC)**	
Antimony	<	p.p'-DDT	*
Barium	60.50	Dieldrin	*
Cadmium	<	Alpha BHC	*
Chromium	13.30	Heptachlor	*
Lead	<	Lindane	*
Manganese	127.00	Toxaphene	*
Strontium	930.00	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR GOUNDWATER SAMPLING SITE
WELL 53

BH-17

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	1120.
Nitrite	<
Phosphates	1890.
Sulfate	8570.
Chloride	319000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	22.90
Antimony	<
Barium	<
Cadmium	3.20
Chromium	10.40
Lead	18.90
Manganese	1990.00
Strontium	1100.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Perylium	<
Nickel	<
Selenium	<
Silver	<
Thallium	70.
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	5.
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.
* Analyte or category not tested as per project scope.

APPENDIX B

ANALYTICAL RESULTS FOR

SURFACEWATER SAMPLING SITES

(SW001 - SW021)

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE SW 001

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	500.
Nitrite	<
Phosphates	<
Sulfate	7120.
Chloride	3000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	87.50
Antimony	<
Barium	14.70
Cadmium	<
Chromium	10.40
Lead	11.30
Manganese	43.00
Strontium	<
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	<
Selenium	<
Silver	<
Thallium	60.
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	<
Dieldrin	<
Alpha BHC	.06
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 002

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	2.27
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	6.27
Anions:	
Nitrate	4660.
Nitrite	<
Phosphates	<
Sulfate	21320.
Chloride	7630.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	<
Antimony	<
Barium	<
Cadmium	<
Chromium	8.70
Lead	9.50
Manganese	99.00
Strontium	100.
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	72.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 003

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Phosphates	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*

ANALYTES	CON. ug/l
Copper	<
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 004

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	1220.
Chloride	1000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	47.70
Antimony	<
Barium	<
Cadmium	<
Chromium	34.20
Lead	52.40
Manganese	34.00
Strontium	<
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	77.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 005

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	5410.
Chloride	8000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	<
Antimony	<
Barium	127.00
Cadmium	<
Chromium	<
Lead	8.00
Manganese	30.00
Strontium	46.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	62.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 006

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	206.90
1,3,5 - TNB	<
2,4 - DNT	23.40
2,6 - DNT	13.65
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Phosphates	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 607

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNP	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Phosphates	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*

ANALYTES	CON. ug/l
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Arocior 1016	*
Arocior 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 008

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Phosphates	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*

ANALYTES	CON. ug/l
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chiorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 009

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	2000.
Nitrite	<
Phosphates	<
Sulfate	5100.
Chloride	8000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	235.00
Antimony	<
Barium	54.10
Cadmium	<
Chromium	<
Lead	<
Manganese	34.00
Strontium	150.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	32.00
Arsenic	<
Beryllium	<
Nickel	37.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	<
Dieldrin	<
Alpha BHC	0.06
Heptachlor	<
Lindane	<
Toxaphene	<
Arocior 1016	<
Aroclor 1260	<

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 010

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	980.
Nitrite	<
Phosphates	<
Sulfate	113800.
Chloride	30000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	236.00
Antimony	<
Barium	30.00
Cadmium	<
Chromium	<
Lead	7.30
Manganese	28.00
Strontium	60.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	43.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW C11

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	19000.
Chloride	8000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	252.00
Antimony	<
Barium	28.80
Cadmium	<
Chromium	<
Lead	11.10
Manganese	39.00
Strontium	66.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	41.00
Arsenic	<
Beryllium	<
Nickel	36.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	<
Dieldrin	<
Alpha BHC	<
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 012

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	2075.
Chloride	8000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	240.00
Antimony	<
Barium	28.00
Cadmium	0.37
Chromium	<
Lead	10.20
Manganese	50.00
Strontium	70.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	44.00
Arsenic	<
Beryllium	<
Nickel	47.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	<
Dieldrin	<
Alpha BHC	0.1
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONCHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 013

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	1000.
Sulfate	17240.
Chloride	9000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	323.00
Antimony	<
Barium	24.00
Cadmium	<
Chromium	<
Lead	<
Manganese	85.00
Strontium	74.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	37.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthiate	<
Diethylphthiate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	<
Dieldrin	<
Alpha BHC	<
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 014

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	4.83
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	165500.
Nitrite	<
Phosphates	<
Sulfate	12960.
Chloride	14000.
Fluoride	66000.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	251.00
Antimony	<
Barium	1620.00
Cadmium	<
Chromium	<
Lead	8.80
Manganese	26.00
Strontium	14,400.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	57.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 015

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	12860.
Chloride	14000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	126.00
Antimony	<
Barium	750.00
Cadmium	3.00
Chromium	7.30
Lead	<
Manganese	31.00
Strontium	132.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	52.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	<
Dieldrin	<
Alpha BHC	0.07
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 016

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	940.
Nitrite	<
Phosphates	<
Sulfate	10500.
Chloride	4000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	110.00
Antimony	<
Barium	<
Cadmium	<
Chromium	34.50
Lead	<
Manganese	33.00
Strontium	74.00
Mercury	1.60

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	58.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 017

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	8170.
Chloride	8000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	337.00
Antimony	<
Barium	<
Cadmium	<
Chromium	8.40
Lead	20.10
Manganese	49.00
Strontium	80.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	82.
Selenium	<
Silver	<
Thallium	40.
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	<
Dieldrin	<
Alpha BHC	0.06
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 018

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	680.
Nitrite	<
Phosphates	<
Sulfate	8460.
Chloride	8000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	407.00
Antimony	<
Barium	<
Cadmium	<
Chromium	10.50
Lead	23.90
Manganese	26.00
Strontium	100.00
Mercury	1.60

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	50.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 019

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	590.
Nitrite	<
Phosphates	<
Sulfate	6410.
Chloride	8000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	340.00
Antimony	<
Barium	<
Cadmium	<
Chromium	<
Lead	8.10
Manganese	36.00
Strontium	92.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	47.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	<
Dieldrin	<
Alpha BHC	<
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 020

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	6410.
Chloride	8000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	226.00
Antimony	<
Barium	<
Cadmium	<
Chromium	8.20
Lead	32.50
Manganese	38.00
Strontium	44.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	60.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	<
Chloroform	<
Trichlorethylene	<
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SURFACEWATER SAMPLING SITE
SW 021

ANALYTES	CON. ug/l
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Phosphates	<
Sulfate	9340.
Chloride	6000.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	355.00
Antimony	<
Barium	404.00
Cadmium	<
Chromium	83.70
Lead	<
Manganese	115.00
Strontium	40.00
Mercury	<

ANALYTES	CON. ug/l
Copper	<
Zinc	<
Arsenic	<
Beryllium	<
Nickel	71.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Benzene	*
Chloroform	*
Trichlorethylene	*
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthiate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

APPENDIX C

ANALYTICAL RESULTS FOR

SEDIMENT SAMPLING SITES

(Sed001 - Sed003, Sed005 - Sed021)

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 001

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Sulfate	400.40
Chloride	79.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	643.6
Antimony	<
Barium	92.2
Cadmium	<
Chromium	6.8
Lead	15.5
Manganese	83.8
Strontium	11.2
Mercury	<

ANALYTES	CON. ug/g
Copper	8.2
Zinc	36.8
Arsenic	<
Beryllium	<
Nickel	7.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	<
Dieldrin	<
Alpha BHC	<
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 002

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Sulfate	212.89
Chloride	34.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	2116.4
Antimony	<
Barium	62.8
Cadmium	<
Chromium	9.3
Lead	14.6
Manganese	130.0
Strontium	6.4
Mercury	<

ANALYTES	CON. ug/g
Copper	8.8
Zinc	42.3
Arsenic	<
Beryllium	<
Nickel	5.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

000290

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 003

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 005

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Sulfate	152.91
Chloride	14.
Fluoride	5.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	1007.9
Antimony	<
Barium	66.7
Cadmium	<
Chromium	23.4
Lead	21.4
Manganese	95.5
Strontium	7.0
Mercury	<

ANALYTES	CON. ug/g
Copper	5.1
Zinc	29.5
Arsenic	<
Beryllium	<
Nickel	7.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 006

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	0.78
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*

ANALYTES	CON. ug/g
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 007

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 008

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 009

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Sulfate	129.19
Chloride	7.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	1872.2
Antimony	<
Barium	255.0
Cadmium	<
Chromium	7.8
Lead	17.0
Manganese	177.1
Strontium	17.5
Mercury	<

ANALYTES	CON. ug/g
Copper	3.6
Zinc	19.2
Arsenic	<
Beryllium	<
Nickel	8.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	<
O-chlorophenol	
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 010

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Sulfate	34.78
Chloride	9.
Fluoride	60.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	1408.0
Antimony	<
Barium	91.4
Cadmium	<
Chromium	16.2
Lead	13.3
Manganese	210.7
Strontium	14.8
Mercury	<

ANALYTES	CON. ug/g
Copper	9.1
Zinc	36.5
Arsenic	<
Beryllium	<
Nickel	8.1
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 011

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Sulfate	162.17
Chloride	8.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	1134.6
Antimony	<
Barium	67.1
Cadmium	<
Chromium	7.4
Lead	12.3
Manganese	120.5
Strontium	13.6
Mercury	<

ANALYTES	CON. ug/g
Copper	<
Zinc	5.0
Arsenic	28.4
Beryllium	<
Nickel	6.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED C12

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	11.7
2,4,6 - TNT	<	Zinc	53.
1,3,5 - TNB	<	Arsenic	<
2,4 - DNT	<	Beryllium	1.
2,6 - DNT	<	Nickel	14.
Nitrobenzene	<	Selenium	<
		Silver	<
		Thallium	<
Anions:		Organics (GC/MS):	
Nitrate	<	Pentachlorophenol	<
Nitrite	<	O-chlorophenol	<
Sulfate	405.93	2,4-dichlorophenol	<
Chloride	120.	Dibutyiphthlate	<
Fluoride	<	Diethyiphthlate	<
Chromate	<	Nitrobenzene	<
Thiocyanate	<		
Cyanide	<		
Metals:			
Aluminum	1229.6	Organics (GC/EC)	
Antimony	<	p.p'-DDT	<
Barium	<	Dieldrin	<
Cadmium	<	Alpha BHC	<
Chromium	9.8	Heptachlor	<
Lead	42.7	Lindane	<
Manganese	151.6	Toxaphene	<
Strontium	18.3	Aroclor 1016	<
Mercury	<	Aroclor 1260	<

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 013

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Sulfate	2078.9
Chloride	87.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	2154.7
Antimony	<
Barium	<
Cadmium	<
Chromium	16.5
Lead	32.9
Manganese	5.9
Strontium	42.2
Mercury	<

ANALYTES	CON. ug/g
Copper	24.8
Zinc	105.0
Arsenic	<
Beryllium	1.
Nickel	24.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p.p'-DDT	<
Dieldrin	<
Alpha BHC	<
Heptachlor	<
Lindane	<
Toxaphene	<
Aroclor 1016	<
Aroclor 1260	<

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 014

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Sulfate	75.1
Chloride	372.
Fluoride	12.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	1142.4
Antimony	<
Barium	1031.4
Cadmium	<
Chromium	130.6
Lead	72.2
Manganese	119.7
Strontium	373.2
Mercury	<

ANALYTES	CON. ug/g
Copper	69.6
Zinc	3.3
Arsenic	<
Beryllium	<
Nickel	6.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	2.
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 015

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Sulfate	64.8
Chloride	11.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	1347.3
Antimony	<
Barium	130.7
Cadmium	<
Chromium	6.7
Lead	10.1
Manganese	63.8
Strontium	10.5
Mercury	<

ANALYTES	CON. ug/g
Copper	4.2
Zinc	19.3
Arsenic	<
Beryllium	<
Nickel	4.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 016

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	19.62
Nitrite	<
Sulfate	414.40
Chloride	55.
Fluoride	6.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	1281.4
Antimony	<
Barium	122.0
Cadmium	<
Chromium	7.1
Lead	9.9
Manganese	73.2
Strontium	13.9
Mercury	<

ANALYTES	CON. ug/g
Copper	3.4
Zinc	19.3
Arsenic	<
Beryllium	<
Nickel	3.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 017

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	12.25
Nitrite	<
Sulfate	84.92
Chloride	41.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	1520.7
Antimony	<
Barium	333.
Cadmium	<
Chromium	9.1
Lead	32.1
Manganese	1032.3
Strontium	29.6
Mercury	<

ANALYTES	CON. ug/g
Copper	12.2
Zinc	3.9
Arsenic	<
Beryllium	<
Nickel	15.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 018

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	3.7
2,4,6 - TNT	<	Zinc	101.5
1,3,5 - TNB	<	Arsenic	<
2,4 - DNT	<	Beryllium	<
2,6 - DNT	<	Nickel	6.
Nitrobenzene	<	Selenium	<
		Silver	<
		Thallium	<
Anions:		Organics (GC/MS):	
Nitrate	<	Pentachlorophenol	*
Nitrite	<	O-chlorophenol	*
Sulfate	113.36	2,4-dichlorophenol	*
Chloride	7.	Dibutylphthlate	*
Fluoride	<	Diethylphthlate	*
Chromate	<	Nitrobenzene	*
Thiocyanate	<		
Cyanide	<		
Metals:			
Aluminum	1502.2	Organics (GC/EC)	
Antimony	<	p,p'-DDT	*
Barium	133.8	Dieldrin	*
Cadmium	<	Alpha BHC	*
Chromium	5.0	Heptachlor	*
Lead	11.3	Lindane	*
Manganese	426.3	Toxaphene	*
Strontium	18.2	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 019

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Sulfate	92.54
Chloride	20.
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	967.2
Antimony	<
Barium	175.8
Cadmium	<
Chromium	11.4
Lead	22.6
Manganese	239.2
Strontium	26.7
Mercury	<

ANALYTES	CON. ug/g
Copper	8.3
Zinc	25.0
Arsenic	<
Beryllium	<
Nickel	6.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 020

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Sulfate	27.1
Chloride	73.
Fluoride	6.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	1496.0
Antimony	<
Barium	42.1
Cadmium	<
Chromium	4.3
Lead	30.7
Manganese	139.6
Strontium	3.1
Mercury	<

ANALYTES	CON. ug/g
Copper	1.6
Zinc	3.0
Arsenic	<
Beryilium	<
Nickel	2.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING SITE
SED 021

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	9.3
2,4,6 - TNT	<	Zinc	37.2
1,3,5 - TNB	<	Arsenic	<
2,4 - DNT	<	Beryllium	<
2,6 - DNT	<	Nickel	6.
Nitrobenzene	<	Selenium	<
		Silver	<
		Thallium	<
Anions:		**Organics (GC/MS):**	
Nitrate	<	Pentachlorophenol	*
Nitrite	<	O-chlorophenol	*
Sulfate	550.2	2,4-dichlorophenol	*
Chloride	24.	Dibutylphthlate	*
Fluoride	6.	Diethylphthlate	*
Chromate	<	Nitrobenzene	*
Thiocyanate	<		
Cyanide	<		
Metals:			
Aluminum	702.	**Organics (GC/EC)**	
Antimony	<	p,p'-DDT	<
Barium	169.2	Dieldrin	<
Cadmium	<	Alpha BHC	<
Chromium	8.8	Heptachlor	<
Lead	30.3	Lindane	<
Manganese	143.4	Toxaphene	<
Strontium	20.0	Aroclor 1016	<
Mercury	<	Aroclor 1260	<

< less than established detection limit.

* Analyte or category not tested as per project scope.

APPENDIX D

ANALYTICAL RESULTS FOR SOIL SAMPLING SITES

SOIL SAMPLING SITES

(AREAS 010 - 080)

LONCHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL[10]

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Sulfate	40.0
Chloride	6.
Fluoride	7.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	1361.4
Antimony	<
Barium	102.6
Cadmium	<
Chromium	11.2
Lead	20.4
Manganese	40.8
Strontium	10.1
Mercury	<

ANALYTES	CON. ug/g
Copper	8.1
Zinc	25.4
Arsenic	<
Beryllium	<
Nickel	6.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL012

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Sulfate	29.7
Chloride	5.
Fluoride	8.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	1435.
Antimony	<
Barium	106.6
Cadmium	<
Chromium	12.3
Lead	26.1
Manganese	99.4
Strontium	9.5
Mercury	<

ANALYTES	CON. ug/g
Copper	17.4
Zinc	56.4
Arsenic	<
Beryllium	<
Nickel	5.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0103

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	15.4
2,4,6 - TNT	<	Zinc	47.2
1,3,5 - TNB	<	Arsenic	<
2,4 - DNT	<	Beryllium	<
2,6 - DNT	<	Nickel	5.
Nitrobenzene	<	Selenium	<
		Silver	<
		Thallium	<
Anions:		**Organics (GC/MS):**	
Nitrate	8.33	Pentachlorophenol	*
Nitrite	<	O-chlorophenol	*
Sulfate	40.48	2,4-dichlorophenol	*
Chloride	7.	Dibutylphthlate	*
Fluoride	0.	Diethylphthlate	*
Chromate	<	Nitrobenzene	*
Thiocyanate	<		
Cyanide	<		
Metals:			
Aluminum	1128.6	**Organics (GC/EC)**	
Antimony	<	p,p'-DDT	*
Barium	98.4	Dieldrin	*
Cadmium	<	Alpha BHC	*
Chromium	14.4	Heptachlor	*
Lead	28.4	Lindane	*
Manganese	122.1	Toxaphene	*
Strontium	9.4	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL016C

000312

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	**
2,4,6 - TNT	**
1,3,5 - TNB	**
2,4 - DNT	**
2,6 - DNT	**
Nitrobenzene	**
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*

ANALYTES	CON. ug/g
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

** Samples 0101, 0102 and 0103 each screened individually for organics by HPLC.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL#201

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	*
2,4,6 - TNT	<	Zinc	*
1,3,5 - TNB	<	Arsenic	*
2,4 - DNT	<	Beryllium	*
2,6 - DNT	<	Nickel	*
Nitrobenzene	<	Selenium	*
		Silver	*
		Thallium	*
Anions:		**Organics (GC/MS):**	
Nitrate	*	Pentachlorophenol	*
Nitrite	*	O-chlorophenol	*
Sulfate	*	2,4-dichlorophenol	*
Chloride	*	Dibutylphthlate	*
Fluorid	*	Diethylphthlate	*
Chromate	*	Nitrobenzene	*
Thiocyanate	*		
Cyanide	*		
Metals:			
Aluminum	*	**Organics (GC/EC)**	
Antimony	*	P,P'-DDT	*
Barium	*	Dieldrin	*
Cadmium	*	Alpha BHC	*
Chromium	*	Heptachlor	*
Lead	*	Lindane	*
Manganese	*	Toxaphene	*
Strontium	*	Aroclor 1016	*
Mercury	*	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOILS202

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*

ANALYTES	CON. ug/g
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

000315

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0203

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	*
2,4,6 - TNT	<	Zinc	*
1,3,5 - TNB	<	Arsenic	*
2,4 - DNT	<	Beryllium	*
2,6 - DNT	<	Nickel	*
Nitrobenzene	<	Selenium	*
		Silver	*
		Thallium	*
Anions:		**Organics (GC/MS):**	
Nitrate	*	Pentachlorophenol	*
Nitrite	*	O-chlorophenol	*
Sulfate	*	2,4-dichlorophenol	*
Chloride	*	Dibutylphthlate	*
Fluoride	*	Diethylphthlate	*
Chromate	*	Nitrobenzene	*
Thiocyanate	*		
Cyanide	*		
Metals:			
Aluminum	*	**Organics (GC/EC)**	
Antimony	*	p,p'-DDT	*
Barium	*	Dieldrin	*
Cadmium	*	Alpha BHC	*
Chromium	*	Heptachlor	*
Lead	*	Lindane	*
Manganese	*	Toxaphene	*
Strontium	*	Aroclor 1016	*
Mercury	*	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0301

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	328.76
1,3,5 - TNB	10.35
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*

ANALYTES	CON. ug/g
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p.p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0302

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	7645.69
1,3,5 - TNB	64.65
2,4 - DNT	13.50
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*

ANALYTES	CON. ug/g
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

000318

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0303

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	*
2,4,6 - TNT	42.44	Zinc	*
1,3,5 - TNB	<	Arsenic	*
2,4 - DNT	<	Beryllium	*
2,6 - DNT	<	Nickel	*
Nitrobenzene	<	Selenium	*
		Silver	*
		Thallium	*
Anions:		**Organics (GC/MS):**	
Nitrate	*	Pentachlorophenol	*
Nitrite	*	O-chlorophenol	*
Sulfate	*	2,4-dichlorophenol	*
Chloride	*	Dibutylphthlate	*
Fluoride	*	Diethylphthlate	*
Chromate	*	Nitrobenzene	*
Thiocyanate	*		
Cyanide	*		
Metals:			
Aluminum	*	**Organics (GC/EC)**	
Antimony	*	p,p'-DDT	*
Barium	*	Dieldrin	*
Cadmium	*	Alpha BHC	*
Chromium	*	Heptachlor	*
Lead	*	Lindane	*
Manganese	*	Toxaphene	*
Strontium	*	Aroclor 1016	*
Mercury	*	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0304

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	*
2,4,6 - TNT	0.90	Zinc	*
1,3,5 - TNB	<	Arsenic	*
2,4 - DNT	<	Beryilium	*
2,6 - DNT	<	Nickel	*
Nitrobenzene	<	Selenium	*
		Silver	*
		Thallium	*
Anions:		**Organics (GC/MS):**	
Nitrate	*	Pentachlorophenol	*
Nitrite	*	O-chlorophenol	*
Sulfate	*	2,4-dichlorophenol	*
Chloride	*	Dibutylphthlate	*
Fluoride	*	Diethylphthlate	*
Chromate	*	Nitrobenzene	*
Thiocyanate	*		
Cyanide	*		
Metals:			
Aluminum	*	**Organics (GC/EC)**	
Antimony	*	p.p'-DDT	*
Barium	*	Dieldrin	*
Cadmium	*	Alpha BHC	*
Chromium	*	Heptachlor	*
Lead	*	Lindane	*
Manganese	*	Toxaphene	*
Strontium	*	Aroclor 1016	*
Mercury	*	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0305

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	6.03
1,3,5 - TNB	2.82
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*

ANALYTES	CON. ug/g
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL030S

000321

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL007

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	20.77
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*

ANALYTES	CON. ug/g
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0308

000323

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	5588.82
1,3,5 - TNB	17.55
2,4 - DNT	16.88
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL401

000324

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	2.7
2,4,6 - TNT	10.15	Zinc	8.1
1,3,5 - TNB	<	Arsenic	<
2,4 - DNT	<	Beryllium	<
2,6 - DNT	<	Nickel	1.
Nitrobenzene	<	Selenium	<
		Silver	<
		Thallium	<
Anions:		**Organics (GC/MS):**	
Nitrate	15.9	Pentachlorophenol	*
Nitrite	<	O-chlorophenol	*
Sulfate	38.2	2,4-dichlorophenol	*
Chloride	<	Dibutylphthlate	*
Fluoride	6.	Diethylphthlate	*
Chromate	<	Nitrobenzene	*
Thiocyanate	<		
Cyanide	<		
Metals:			
Aluminum	1099.8	**Organics (GC/EC)**	
Antimony	<	p,p'-DDT	*
Barium	87.0	Dieldrin	*
Cadmium	<	Alpha BHC	*
Chromium	16.3	Heptachlor	*
Lead	25.5	Lindane	*
Manganese	90.0	Toxaphene	*
Strontium	5.0	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0402

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	41.1
2,4,6 - TNT	4.61	Zinc	17.4
1,3,5 - TNB	<	Arsenic	<
2,4 - DNT	<	Beryllium	<
2,6 - DNT	<	Nickel	4.
Nitrobenzene	<	Selenium	<
		Silver	<
		Thallium	<
Anions:		**Organics (GC/MS):**	
Nitrate	22.3	Pentachlorophenol	*
Nitrite	<	O-chlorophenol	*
Sulfate	37.5	2,4-dichlorophenol	*
Chloride	<	Dibutylphthlate	*
Fluoride	5.	Diethylphthlate	*
Chromate	<	Nitrobenzene	*
Thiocyanate	<		
Cyanide	<		
Metals:			
Aluminum	1386.4	**Organics (GC/EC)**	
Antimony	<	p,p'-DDT	*
Barium	136.6	Dieldrin	*
Cadmium	<	Alpha BHC	*
Chromium	12.3	Heptachlor	*
Lead	26.3	Lindane	*
Manganese	199.2	Toxaphene	*
Strontium	9.8	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0403

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	2.96
Nitrite	<
Sulfate	33.25
Chloride	<
Fluoride	6.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	1426.1
Antimony	<
Barium	57.2
Cadmium	<
Chromium	10.3
Lead	24.6
Manganese	137.5
Strontium	4.3
Mercury	<

ANALYTES	CON. ug/g
Copper	2.8
Zinc	9.2
Arsenic	<
Beryllium	<
Nickel	2.2
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL040C

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	**	Copper	*
2,4,6 - TNT	**	Zinc	*
1,3,5 - TNB	**	Arsenic	*
2,4 - DNT	**	Beryllium	*
2,6 - DNT	**	Nickel	*
Nitrobenzene	**	Selenium	*
		Silver	*
		Thallium	*
Anions:		**Organics (GC/MS):**	
Nitrate	*	Pentachlorophenol	<
Nitrite	*	O-chlorophenol	<
Sulfate	*	2,4-dichlorophenol	<
Chloride	*	Dibutylphthlate	<
Fluoride	*	Diethylphthlate	<
Chromate	*	Nitrobenzene	<
Thiocyanate	*		
Cyanide	*		
Metals:			
Aluminum	*	**Organics (GC/EC)**	
Antimony	*	p,p'-DDT	*
Barium	*	Dieldrin	*
Cadmium	*	Alpha BHC	*
Chromium	*	Heptachlor	*
Lead	*	Lindane	*
Manganese	*	Toxaphene	*
Strontium	*	Aroclor 1016	*
Mercury	*	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0501

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:		Copper	3.3
1,3-DNB	<	Zinc	6.3
2,4,6 - TNT	<	Arsenic	<
1,3,5 - TNB	<	Beryllium	<
2,4 - DNT	<	Nickel	4.
2,6 - DNT	<	Selenium	<
Nitrobenzene	<	Silver	<
		Thallium	<
Anions:		**Organics (GC/MS):**	
Nitrate	8.00	Pentachlorophenol	*
Nitrite	<	O-chlorophenol	*
Sulfate	61.93	2,4-dichlorophenol	*
Chloride	5.	Dibutylphthlate	*
Fluoride	6.	Diethylphthlate	*
Chromate	<	Nitrobenzene	*
Thiocyanate	<		
Cyanide	<		
Metals:			
Aluminum	1128.6	**Organics (GC/EC)**	
Antimony	<	p,p'-DDT	*
Barium	227.8	Dieldrin	*
Cadmium	<	Alpha BHC	*
Chromium	8.4	Heptachlor	*
Lead	27.6	Lindane	*
Manganese	742.0	Toxaphene	*
Strontium	9.4	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0502

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	2.7
2,4,6 - TNT	<	Zinc	10.1
1,3,5 - TNB	<	Arsenic	<
2,4 - DNT	<	Beryllium	<
2,6 - DNT	<	Nickel	5.
Nitrobenzene	<	Selenium	<
		Silver	<
		Thallium	<
Anions:		**Organics (GC/MS):**	
Nitrate	7.41	Pentachlorophenol	*
Nitrite	<	O-chlorophenol	*
Sulfate	22.23	2,4-dichlorophenol	*
Chloride	<	Dibutylphthlate	*
Fluoride	6.	Diethyiphthlate	*
Chromate	<	Nitrobenzene	*
Thiocyanate	<		
Cyanide	<		
Metals:			
Aluminum	1165.5	**Organics (GC/EC)**	
Antimony	<	p,p'-DDT	*
Barium	135.8	Dieldrin	*
Cadmium	<	Alpha BHC	*
Chromium	9.2	Heptachlor	*
Lead	26.5	Lindane	*
Manganese	499.5	Toxaphene	*
Strontium	11.8	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0503

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Sulfate	41.04
Chloride	<
Fluoride	<
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	3.6
Antimony	<
Barium	61.0
Cadmium	<
Chromium	9.4
Lead	26.6
Manganese	140.8
Strontium	3.9
Mercury	<

ANALYTES	CON. ug/g
Copper	2.0
Zinc	11.1
Arsenic	<
Beryllium	<
Nickel	4.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL05GC

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	**
2,4,6 - TNT	**
1,3,5 - TNB	**
2,4 - DNT	**
2,6 - DNT	**
Nitrobenzene	**
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL050[illegible]

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	23.8
2,4,6 - TNT	<	Zinc	26.9
1,3,5 - TNB	<	Arsenic	<
2,4 - DNT	<	Beryllium	<
2,6 - DNT	<	Nickel	8.
Nitrobenzene	<	Selenium	<
		Silver	<
		Thallium	<
Anions:		**Organics (GC/MS):**	
Nitrate	<	Pentachlorophenol	*
Nitrite	<	O-chlorophenol	*
Sulfate	70.00	2,4-dichlorophenol	*
Chloride	21.	Dibutylphthlate	*
Fluoride	11.	Diethylphthlate	*
Chromate	<	Nitrobenzene	*
Thiocyanate	<		
Cyanide	<		
Metals:			
Aluminum	3.7	**Organics (GC/EC)**	
Antimony	<	p,p'-DDT	*
Barium	126.2	Dieldrin	*
Cadmium	<	Alpha BHC	*
Chromium	9.8	Heptachlor	*
Lead	27.0	Lindane	*
Manganese	141.6	Toxaphene	*
Strontium	14.5	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0602

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	4.2
2,4,6 - TNT	<	Zinc	52.9
1,3,5 - TNB	<	Arsenic	<
2,4 - DNT	<	Beryllium	<
2,6 - DNT	<	Nickel	3.
Nitrobenzene	<	Selenium	<
		Silver	<
		Thallium	<
Anions:		Organics (GC/MS):	
Nitrate	14.94	Pentachlorophenol	*
Nitrite	<	O-chlorophenol	*
Sulfate	411.05	2,4-dichlorophenol	*
Chloride	1224.	Dibutylphthlate	*
Fluoride	<	Diethylphthlate	*
Chromate	<	Nitrobenzene	*
Thiocyanate	<		
Cyanide	<		
Metals:			
Aluminum	1276.7	Organics (GC/EC)	
Antimony	<	p,p'-DDT	*
Barium	83.8	Dieldrin	*
Cadmium	<	Alpha BHC	*
Chromium	6.0	Heptachlor	*
Lead	27.3	Lindane	*
Manganese	61.2	Toxaphene	*
Strontium	6.6	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0603

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	12.23
Nitrite	<
Sulfate	148.72
Chloride	89.
Fluoride	0.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	1195.6
Antimony	<
Barium	196.1
Cadmium	<
Chromium	8.8
Lead	27.4
Manganese	162.2
Strontium	10.8
Mercury	<

ANALYTES	CON. ug/g
Copper	9.4
Zinc	40.9
Arsenic	<
Beryllium	<
Nickel	7.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthiate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL030C

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	**	Copper	*
2,4,6 - TNT	**	Zinc	*
1,3,5 - TNB	**	Arsenic	*
2,4 - DNT	**	Beryllium	*
2,6 - DNT	**	Nickel	*
Nitrobenzene	**	Selenium	*
		Silver	*
		Thallium	*
Anions:		**Organics (GC/MS):**	
Nitrate	*	Pentachlorophenol	<
Nitrite	*	O-chlorophenol	<
Sulfate	*	2,4-dichlorophenol	<
Chloride	*	Dibutylphthlate	<
Fluoride	*	Diethylphthlate	<
Chromate	*	Nitrobenzene	<
Thiocyanate	*		
Cyanide	*		
Metals:			
Aluminum	*	**Organics (GC/EC)**	
Antimony	*	p,p'-DDT	*
Barium	*	Dieldrin	*
Cadmium	*	Alpha BHC	*
Chromium	*	Heptachlor	*
Lead	*	Lindane	*
Manganese	*	Toxaphene	*
Strontium	*	Aroclor 1016	*
Mercury	*	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0701T

000336

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	155.1
2,4,6 - TNT	<	Zinc	19.6
1,3,5 - TNB	<	Arsenic	<
2,4 - DNT	<	Beryllium	<
2,6 - DNT	<	Nickel	7.
Nitrobenzene	<	Selenium	<
		Silver	<
		Thallium	<
Anions:		**Organics (GC/MS):**	
Nitrate	<	Pentachlorophenol	*
Nitrite	<	O-chlorophenol	*
Sulfate	244.02	2,4-dichlorophenol	*
Chloride	72.	Dibutylphthlate	*
Fluoride	11.	Diethylphthlate	*
Chromate	<	Nitrobenzene	*
Thiocyanate	<		
Cyanide	<		
Metals:			
Aluminum	1954.3	**Organics (GC/EC)**	
Antimony	<	p,p'-DDT	*
Barium	557.3	Dieldrin	*
Cadmium	2.3	Alpha BHC	*
Chromium	14.5	Heptachlor	*
Lead	27.2	Lindane	*
Manganese	121.0	Toxaphene	*
Strontium	153.0	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL07G1B

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Sulfate	53.44
Chloride	14.
Fluoride	9.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	1067.0
Antimony	<
Barium	206.4
Cadmium	5.2
Chromium	22.6
Lead	<
Manganese	3.1
Strontium	232.9
Mercury	<

ANALYTES	CON. ug/g
Mercury	<
Copper	153.9
Zinc	472.0
Arsenic	<
Beryllium	<
Nickel	18.
Selenium	<
Silver	<
Thallium	<
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOILC702T

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	5.1
2,4,6 - TNT	<	Zinc	37.9
1,3,5 - TNB	<	Arsenic	<
2,4 - DNT	<	Beryllium	<
2,6 - DNT	<	Nickel	5.
Nitrobenzene	<	Selenium	<
		Silver	<
		Thallium	<
Anions:		Organics (GC/MS):	
Nitrate	7.00	Pentachlorophenol	*
Nitrite	<	O-chlorophenol	*
Sulfate	236.00	2,4-dichlorophenol	*
Chloride	120.	Dibutylphthlate	*
Fluoride	2.	Diethylphthlate	*
Chromate	<	Nitrobenzene	*
Thiocyanate	<		
Cyanide	<		
Metals:			
Aluminum	1461.5	Organics (GC/EC)	
Antimony	<	p,p'-DDT	*
Barium	208.5	Dieldrin	*
Cadmium	<	Alpha BHC	*
Chromium	9.0	Heptachlor	*
Lead	<	Lindane	*
Manganese	396.4	Toxaphene	*
Strontium	25.9	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0702B

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	53.6
2,4,6 - TNT	<	Zinc	133.0
1,3,5 - TNB	<	Arsenic	<
2,4 - DNT	<	Beryllium	<
2,6 - DNT	<	Nickel	6.
Nitrobenzene	<	Selenium	<
		Silver	<
		Thallium	5.
Anions:		**Organics (GC/MS):**	
Nitrate	<	Pentachlorophenol	*
Nitrite	<	O-chlorophenol	*
Sulfate	469.17	2,4-dichlorophenol	*
Chloride	236.	Dibutylphthlate	*
Fluoride	10.	Diethylphthlate	*
Chromate	<	Nitrobenzene	*
Thiocyanate	<		
Cyanide	<		
Metals:			
Aluminum	1462.6	**Organics (GC/EC)**	
Antimony	<	p,p'-DDT	*
Barium	201.0	Dieldrin	*
Cadmium	1.2	Alpha BHC	*
Chromium	16.5	Heptachlor	*
Lead	<	Lindane	*
Manganese	352.3	Toxaphene	*
Strontium	340.0	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0703T

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	23.9
2,4,6 - TNT	<	Zinc	169.6
1,3,5 - TNB	<	Arsenic	<
2,4 - DNT	<	Beryllium	<
2,6 - DNT	<	Nickel	8.
Nitrobenzene	<	Selenium	<
		Silver	<
		Thallium	5.
Anions:		**Organics (GC/MS):**	
Nitrate	24.46	Pentachlorophenol	*
Nitrite	<	O-chlorophenol	*
Sulfate	1323.00	2,4-dichlorophenol	*
Chloride	102.	Dibutylphthlate	*
Fluoride	78.	Diethylphthlate	*
Chromate	<	Nitrobenzene	*
Thiocyanate	<		
Cyanide	<		
Metals:			
Aluminum	304.2	**Organics (GC/EC)**	
Antimony	<	p,p'-DDT	*
Barium	991.1	Dieldrin	*
Cadmium	<	Alpha BHC	*
Chromium	95.4	Heptachlor	*
Lead	<	Lindane	*
Manganese	234.3	Toxaphene	*
Strontium	91.2	Aroclor 1016	*
Mercury	6.00	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0703B

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	23.5
2,4,6 - TNT	<	Zinc	132.6
1,3,5 - TNB	<	Arsenic	<
2,4 - DNT	<	Beryllium	<
2,6 - DNT	<	Nickel	9.
Nitrobenzene	<	Selenium	<
		Silver	<
		Thallium	5.
Anions:		**Organics (GC/MS):**	
Nitrate	<	Pentachlorophenol	*
Nitrite	<	O-chlorophenol	*
Sulfate	446.25	2,4-dichlorophenol	*
Chloride	100.	Dibutylphthlate	*
Fluoride	10.	Diethyiphthlate	*
Chromate	<	Nitrobenzene	*
Thiocyanate	<		
Cyanide	<		
Metals:			
Aluminum	1162.8	**Organics (GC/EC)**	
Antimony	<	p,p'-DDT	*
Barium	42.3	Dieldrin	*
Cadmium	<	Alpha BHC	*
Chromium	47.9	Heptachlor	*
Lead	<	Lindane	*
Manganese	194.6	Toxaphene	*
Strontium	116.3	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0704T

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	66.6
2,4,6 - TNT	13.6	Zinc	759.2
1,3,5 - TNB	<	Arsenic	<
2,4 - DNT	<	Beryllium	<
2,6 - DNT	<	Nickel	16.
Nitrobenzene	<	Selenium	<
		Silver	<
		Thallium	5.
Anions:		**Organics (GC/MS):**	
Nitrate	<	Pentachlorophenol	*
Nitrite	<	O-chlorophenol	*
Sulfate	197.26	2,4-dichlorophenol	*
Chloride	426.	Dibutylphthlate	*
Fluoride	17.	Diethylphthlate	*
Chromate	<	Nitrobenzene	*
Thiocyanate	<		
Cyanide	<		
Metals:			
Aluminum	1799.2	**Organics (GC/EC)**	
Antimony	<	p,p'-DDT	*
Barium	151.8	Dieldrin	*
Cadmium	31.2	Alpha BHC	*
Chromium	76.7	Heptachlor	*
Lead	<	Lindane	*
Manganese	5.2	Toxaphene	*
Strontium	1071.2	Aroclor 1016	*
Mercury	<	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0704B

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	<
Nitrite	<
Sulfate	239.56
Chloride	810.
Fluoride	10.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	2024.6
Antimony	<
Barium	178.1
Cadmium	15.9
Chromium	58.3
Lead	<
Manganese	2.
Strontium	1378.
Mercury	<

ANALYTES	CON. ug/g
Copper	33.6
Zinc	773.8
Arsenic	<
Beryllium	<
Nickel	10.
Selenium	<
Silver	<
Thallium	5.
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0705T

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	5.00
Nitrite	<
Sulfate	54.46
Chloride	5.
Fluoride	7.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	2230.1
Antimony	<
Barium	200.5
Cadmium	<
Chromium	10.0
Lead	12.8
Manganese	325.3
Strontium	32.8
Mercury	<

ANALYTES	CON. ug/g
Copper	8.2
Zinc	52.2
Arsenic	<
Beryllium	<
Nickel	5.
Selenium	<
Silver	<
Thallium	5.
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0705B

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	10.43
Nitrite	<
Sulfate	152.76
Chloride	6.
Fluoride	0.
Chromate	<
Thiocyanate	<
Cyanide	<
Metals:	
Aluminum	1501.2
Antimony	<
Barium	188.2
Cadmium	2.7
Chromium	15.6
Lead	4.0
Manganese	40.9
Strontium	137.3
Mercury	<

ANALYTES	CON. ug/g
Copper	26.3
Zinc	23.0
Arsenic	<
Beryllium	<
Nickel	7.
Selenium	<
Silver	<
Thallium	5.
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL870CT

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	**
2,4,6 - TNT	**
1,3,5 - TNB	**
2,4 - DNT	**
2,6 - DNT	**
Nitrobenzene	**
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Pentachlorophenol	<
O-chlorophenol	<
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL007CCB

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	**
2,4,6 - TNT	**
1,3,5 - TNB	**
2,4 - DNT	**
2,6 - DNT	**
Nitrobenzene	**
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*

ANALYTES	CON. ug/g
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Pentachlorophenol	<
O-chlorophenol	
2,4-dichlorophenol	<
Dibutylphthlate	<
Diethylphthlate	<
Nitrobenzene	<
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0801T

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	*
2,4,6 - TNT	<	Zinc	*
1,3,5 - TNB	<	Arsenic	*
2,4 - DNT	<	Beryllium	*
2,6 - DNT	<	Nickel	*
Nitrobenzene	<	Selenium	*
		Silver	*
		Thallium	*
Anions:		**Organics (GC/MS):**	
Nitrate	*	Pentachlorophenol	*
Nitrite	*	O-chlorophenol	*
Sulfate	*	2,4-dichlorophenol	*
Chloride	*	Dibutylphthlate	*
Fluoride	*	Diethylphthlate	*
Chromate	*	Nitrobenzene	*
Thiocyanate	*		
Cyanide	*		
Metals:			
Aluminum	*	**Organics (GC/EC)**	
Antimony	*	p,p'-DDT	*
Barium	*	Dieldrin	*
Cadmium	*	Alpha BHC	*
Chromium	*	Heptachlor	*
Lead	*	Lindane	*
Manganese	*	Toxaphene	*
Strontium	*	Aroclor 1016	*
Mercury	*	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL08C1P

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	1.86
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL002T

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	*
2,4,6 - TNT	<	Zinc	*
1,3,5 - TNP	<	Arsenic	*
2,4 - DNT	<	Beryllium	*
2,6 - DNT	<	Nickel	*
Nitrobenzene	<	Selenium	*
		Silver	*
		Thallium	*
Anions:		**Organics (GC/MS):**	
Nitrate	*	Pentachlorophenol	*
Nitrite	*	O-chlorophenol	*
Sulfate	*	2,4-dichlorophenol	*
Chloride	*	Dibutylphthlate	*
Fluoride	*	Diethylphthlate	*
Chromate	*	Nitrobenzene	*
Thiocyanate	*		
Cyanide	*		
Metals:			
Aluminum	*	**Organics (GC/EC)**	
Antimony	*	p,p'-DDT	*
Barium	*	Dieldrin	*
Cadmium	*	Alpha BHC	*
Chromium	*	Heptachlor	*
Lead	*	Lindane	*
Manganese	*	Toxaphene	*
Strontium	*	Aroclor 1016	*
Mercury	*	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL0202R

ANALYTES	CON. ug/g	ANALYTES	CON. ug/g
Explosives:			
1,3-DNB	<	Copper	*
2,4,6 - TNT	<	Zinc	*
1,3,5 - TNB	<	Arsenic	*
2,4 - DNT	<	Beryllium	*
2,6 - DNT	<	Nickel	*
Nitrobenzene	<	Selenium	*
		Silver	*
		Thallium	*
Anions:		**Organics (GC/MS):**	
Nitrate	*	Pentachlorophenol	*
Nitrite	*	O-chlorophenol	*
Sulfate	*	2,4-dichlorophenol	*
Chloride	*	Dibutylphthlate	*
Fluoride	*	Diethylphthlate	*
Chromate	*	Nitrobenzene	*
Thiocyanate	*		
Cyanide	*		
Metals:			
Aluminum	*	**Organics (GC/EC)**	
Antimony	*	p,p'-DDT	*
Barium	*	Dieldrin	*
Cadmium	*	Alpha BHC	*
Chromium	*	Heptachlor	*
Lead	*	Lindane	*
Manganese	*	Toxaphene	*
Strontium	*	Aroclor 1016	*
Mercury	*	Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOIL08C3T

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*

ANALYTES	CON. ug/g
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
ANALYTICAL RESULTS FOR SOIL SAMPLING SITE
SOILC883B

ANALYTES	CON. ug/g
Explosives:	
1,3-DNB	<
2,4,6 - TNT	<
1,3,5 - TNB	<
2,4 - DNT	<
2,6 - DNT	<
Nitrobenzene	<
Anions:	
Nitrate	*
Nitrite	*
Sulfate	*
Chloride	*
Fluoride	*
Chromate	*
Thiocyanate	*
Cyanide	*
Metals:	
Aluminum	*
Antimony	*
Barium	*
Cadmium	*
Chromium	*
Lead	*
Manganese	*
Strontium	*
Mercury	*
Copper	*
Zinc	*
Arsenic	*
Beryllium	*
Nickel	*
Selenium	*
Silver	*
Thallium	*
Organics (GC/MS):	
Pentachlorophenol	*
O-chlorophenol	*
2,4-dichlorophenol	*
Dibutylphthlate	*
Diethylphthlate	*
Nitrobenzene	*
Organics (GC/EC)	
p,p'-DDT	*
Dieldrin	*
Alpha BHC	*
Heptachlor	*
Lindane	*
Toxaphene	*
Aroclor 1016	*
Aroclor 1260	*

< less than established detection limit.

* Analyte or category not tested as per project scope.

APPENDIX E

DATA MANAGEMENT FORMS ON BATCHES OF METAL ANALYTES FOR WHICH FQAC HAD TO OVERRIDE ESTABLISHED QA/QC SYSTEM

DATA SHEET # 82 588 A DATA SHEET SERIES (A-C) 7 OF 17 000355

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

MANAGEMENT DATA:
Analyst(s) Name(s) Dorothea Dinsmore
Date Samples Analyzed 12-6-82 Time 11:30 P.M.
Parameter (Metals) MANGANESE USATHAMA Method # IM
Matrix 1 Category 3 Batch 1
Systems Calibration: (X) Passed ( ) Failed
Instrument # ID#
NOTES:

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 11, Page # 1
File # .
NOTES: units are in µg/l

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	50	49	50	
2.0X$_D$	125	124	124	
10.0X$_D$	250	256	253	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: n/a Slope: n/a
Y-intercept: n/a

DATA:

Batch	Sample Point #	Lab I.D. # (ABD)	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration (+01)	Analytical FOAC # Note (.580)
ABC	2XD Spike	1-3-1	46		46	001
	101	1-3-2	113	4	452	002
	102	1-3-3	119	4	476	003
	104	1-3-4	85		85	004
Dup.	103	1-3-5	169		169	005
	105	1-3-6	33.4	100	3340	006
	103	1-3-7	90	4	360	007
	106	1-3-8	163	4	652	008
	107	1-3-9	187		187	009
	108	1-3-10	118	100	11800	010
	109	1-3-11	15		15	011
	110	1-3-12	157	10	1570	012
	111	1-3-13	29	4	116	013
	112	1-3-14	330	100	3300	014
	120	1-3-15	151	4	604	015
	121	1-3-16	126		126	016
	122	1-3-17	44.6	100	4460	017
	123	1-3-18	72		72	018
	5XD Spike	1-3-19	129		129	019
		- -				

SUPPLEMENTARY DATA SHEET USED .

DATA SHEET # 82 586 B

000356

Accuracy (Spikes)

	Found Value	Background Value	Recovered Concentration	Expected Concentration Of Spike	% Recovery	WL 2σ	CL 3σ
Analyst Spike>	191	142	49	50	98		
Blind Spike FQAC>	46 / 129	0 / 0	46 / 129	50 / 125	92% / 103.2%	107.2 / 96.8	104.3 / 95.7

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	146	142	4.0	6.54
Blind Replicate FQAC>	169	360		

Analyst's Report to Departmental Supervisor: passes Analytical Q.C.

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: None noted

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: All Samples between 10-200 µg/L

DS check accuracy: (X) Passed ( ) Failed

NOTES:

DS check precision: (X) Passed ( ) Failed

NOTES:

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES:

Department Supervisor Data:

NAME Sammy Warren DATE 12-10-82 TIME 4:15 pm

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed Sammy Warren

DATA SHEET # 82 588 C

FQAC DATA REVIEW:

000357

FQAC check blind replicates (precision): ( ) Passed (X) Failed

NOTES: FQAC checked Analysist Replicates precision ok Replicates were treated differently / FQAC will override standard Q.C.! one diluted.

FQAC check blind spike (30 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____
with overide

Certification/Authorization: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (X) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed Richard D. Langley

DATA SHEET # 82 589 A DATA SHEET SERIES (A-C) 8 OF 17

000358

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

MANAGEMENT DATA:
Analyst(s) Name(s) Donald
Date Samples Analyzed 12-9-82 Time
Parameter (Metals) Strontium USATHAMA Method # 181
Matrix 1 Category 3 Batch 1
Systems Calibration: (X) Passed ( ) Failed
Instrument # ID#
NOTES:

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 1, Page # 5
File #.
NOTES: UNITS ARE ug/l

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	50	52	50	
2.0X$_D$	1[illegible]	[illegible]	[illegible]	
10.0X$_D$	[illegible]	[illegible]	[illegible]	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: N/A Slope: N/A Y-intercept: N/A

DATA:

Batch ~~XXX~~ ABE

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor =	Actual Concentration	Analytical QAC Note
2ND Spike	1-3-1	47		47	001
101	1-3-2	260		[illegible]	002
102	1-3-3	[illegible]		[illegible]	003
104	1-3-4	[illegible]		[illegible]	004
103 (Dup)	1-3-5	[illegible]			005
105	1-3-6	173	40	[illegible]	006
103	1-3-7	[illegible]		[illegible]	007
106	1-3-8	[illegible]		[illegible]	008
107	1-3-9	260		[illegible]	009
108	1-3-10	[illegible]		[illegible]	010
109	1-3-11	80		80	011
110	1-3-12	98	[illegible]	[illegible]	012
111	1-3-13	[illegible]		[illegible]	013
112	1-3-14	[illegible]		[illegible]	014
120	1-3-15	[illegible]		[illegible]	015
121	1-3-16	180		[illegible]	016
122	1-3-17	[illegible]	4	1112	017
123	1-3-18	112		112	018
5TH Spike	1-3-19	126		126	019
	- -				

SUPPLEMENTARY DATA SHEET USED

DATA SHEET # 82 069 B

000359

Accuracy (Spikes)

	Found Value		Background Value		Recovered Concentration		Expected Concentration Of Spike		% Recovery	WL 2σ	CL 3σ
Analyst Spike>	274	-	221	=	53	÷	50	x 100	106		
Blind Spike FQAC>	47 / 126	-	0 / 0	=	97 / 126	÷	50 / 125	x 100	94 / 1008		

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	221	199	22	24.2
Blind Replicate FQAC>	398	454	56	

Analyst's Report to Departmental Supervisor: Poss. duplicate QC.

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: None noted

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: All Spikes between 25-200 ng/L

DS check accuracy: (X) Passed ( ) Failed

NOTES:

DS check precision: (X) Passed ( ) Failed

NOTES:

DS check rejection trend criteria: (✓) Passed ( ) Warning ( ) Failed

NOTES:

Department Supervisor Data:

NAME Sammy Wallace DATE 12-13-82 TIME 8:45

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed Sammy Wallace

DATA SHEET # 82 589 C

FQAC DATA REVIEW:

000360

FQAC check blind replicates (precision): (X) Passed ( ) Failed Results accepted by FQAC

NOTES: Limited Data base for precision As within Reason.

FQAC check blind spike (30 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____ (date).

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (X) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed Rill D Sanfl

DATA SHEET # 82 599 A DATA SHEET SERIES (A-C) 1 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000361

MANAGEMENT DATA:
Analyst(s) Name(s) Duncan Dinsmore
Date Samples Analyzed 12-16-92 Time 1425
Parameter (Metals) Aluminum USATHAMA Method # 1B
Matrix 1 Category 3 Batch 2
Systems Calibration: (X) Passed ( ) Failed
Instrument # _____ ID# _____
NOTES: _____

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 5, Page # 43,
File # _____.
NOTES: All data in file

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
$0.5X_D$	10	8.9	10.6	
$2.0X_D$	50	53.8	48.2	
$10.0X_D$	100	98.3	93.6	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: 0.9993 Slope: 0.0180
Y-intercept: 0.000001

DATA:

ABO

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Notes
001 125	1-3-20	21.4		21.4	
002 124	1-3-21	40.8	10	408	
003 126	1-3-22	30.8	10	308	
004 124D	1-3-23	200		200	
005 127	1-3-24	36.9		36.9	
006 128	1-3-25	35.3	10	353	
007 129	1-3-26	24.2	10	242	
008 130	1-3-27	125		125	
009 131	1-3-28	22.2		22.2	
010 Spike 2XD	1-3-29	97.5		97.5	
011 132	1-3-30	23.2	10	232	
012 Spike 5XD	1-3-31	27.2	10	272	
013 33	1-3-32	13.2		13.2	
014 34	1-3-33	36.6		36.6	
015 35	1-3-34	24.8		24.8	
016 36	1-3-35	23.6	10	236	
017 37	1-3-36	22.4	10	224	
018 38	1-3-37	10.1	10	101	
019 39	1-3-38	9.3		9.3	
	- -				

SUPPLEMENTARY DATA SHEET USED _____

DATA SHEET # 82 599 B

000362

Accuracy (Spikes)

	Found Value	Background Value	Recovered Concentration	Expected Concentration Of Spike		% Recovery	WL 2σ	CL 3σ
Analyst Spike>	188.7	- 87.6	= 101.1	[illegible]	x 100	101.1	114.1	121.0
Blind Spike FQAC>	97.5 / 272.0	- 0 / 0	= 97.5 / 272.	100 / 250	x 100	97.5 / 108.8	80.5	76.6

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	93.3	87.6	5.70	6.40
Blind Replicate FQAC>	408	200		

Analyst's Report to Departmental Supervisor: Passed Analytical QC.

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: Not Noted

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: All [illegible]

DS check accuracy: (X) Passed ( ) Failed

NOTES:

DS check precision: (X) Passed ( ) Failed

NOTES:

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES:

Department Supervisor Data:

NAME [illegible] DATE [illegible] TIME [illegible]

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed [illegible]

DATA SHEET # 82 033 C

000363

FQAC DATA REVIEW:

FQAC check blind replicates (precision): (Y) Passed ( ) Failed

NOTES: Out of RANGE ANALYSIST PRECISION out of SAMPLE bottle FQAC override based on all other data
OK field duplicates MAY indicate wide VARIATION IN SAMPLE quality.

FQAC check blind spike (30 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (Y) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (Y) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (Y) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed [signature]

DATA SHEET # 82 601 A DATA SHEET SERIES (A-C) 3 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM 000364

MANAGEMENT DATA:
Analyst(s) Name(s) [illegible]
Date Samples Analyzed [illegible] Time
Parameter (Metals) BARium USATHAMA Method # 13
Matrix 1 Category 3 Batch 2
Systems Calibration: (X) Passed ( ) Failed
Instrument # ID#
NOTES:

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 6, Page # 1
File #.
NOTES:

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	[illegible]	[illegible]	[illegible]	
2.0X$_D$	[illegible]	[illegible]	[illegible]	
10.0X$_D$	[illegible]	[illegible]	[illegible]	
Blank	[illegible]	0		

Standard Curve Data
Corr. Coff.: [illegible] Slope: [illegible]
Y-intercept: [illegible]

DATA:

ABQ Action	Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X	Dilution Factor	=	Actual Concentration	FOAC Note
001	125	1-3-20	[illegible]		[illegible]		[illegible]	
002	125 Dup	1-3-21	[illegible]		[illegible]		[illegible]	
003	126	1-3-22	[illegible]		10		[illegible]	
004	124	1-3-23	[illegible]					
005	127	1-3-24	[illegible]				[illegible]	
006	128	1-3-25	[illegible]				[illegible]	
007	129	1-3-26	[illegible]		10		[illegible]	
008	130	1-3-27	[illegible]					
009	131	1-3-28	[illegible]					
010	Spike 2XD	1-3-29	[illegible]		[illegible]		[illegible]	
011	132	1-3-30	[illegible]				[illegible]	
012	Spike 5XD	1-3-31	[illegible]		[illegible]		[illegible]	
013	133	1-3-32	[illegible]				[illegible]	
014	34	1-3-33	[illegible]				[illegible]	
015	35	1-3-34	[illegible]				[illegible]	
016	36	1-3-35	[illegible]				[illegible]	
017	37	1-3-36	[illegible]				[illegible]	
018	38	1-3-37	[illegible]				[illegible]	
019	39	1-3-38	[illegible]				[illegible]	
		- -						

SUPPLEMENTARY DATA SHEET USED

DATA SHEET # 82 601 B

000365

Accuracy (Spikes)

	Found Value		Background Value		Recovered Concentration	Expected Concentration Of Spike		% Recovery	WL 2σ	CL 3σ
Analyst Spike>		-		=			X 100			
Blind Spike FQAC>		-		=	203 / 488	200 / 500	x 100	101.5 / 97.6		

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>				
Blind Replicate FQAC>	169	92.1		

Analyst's Report to Departmental Supervisor: _____

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (✓) Passed ( ) Failed

NOTES: _____

DS check on uncorrected concentrations for range requirement:
(✓) Passed ( ) Failed

NOTES: _____

DS check accuracy: (✓) Passed ( ) Failed

NOTES: _____

DS check precision: (✓) Passed ( ) Failed

NOTES: _____

DS check rejection trend criteria: (✓) Passed ( ) Warning ( ) Failed

NOTES: _____

Department Supervisor Data:

NAME _____ DATE _____ TIME _____

CERTIFICATION: I (✓) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed _____

DATA SHEET # 82 601 C

000366

FQAC DATA REVIEW:

FQAC check blind replicates (precision): (Y) Passed ( ) Failed

NOTES: 4 of 5 Q.C. checks within 10 precision problem only on field duplicates.

FQAC check blind spike (30 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: ( ) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I ( ) can (Y) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (Y) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 602 A DATA SHEET SERIES (A-C) 4 OF 17

000367

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

MANAGEMENT DATA:
Analyst(s) Name(s) [illegible]
Date Samples Analyzed [illegible] Time [illegible]
Parameter (Metals) Cadmium USATHAMA Method # 12
Matrix 1 Category 3 Batch 2
Systems Calibration: (X) Passed ( ) Failed
Instrument # _____ ID# _____
NOTES: _____

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 6, Page # 19
File # _____.
NOTES: _____

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
$0.5X_D$	[illegible]	[illegible]	[illegible]	
$2.0X_D$	[illegible]	[illegible]	[illegible]	
$10.0X_D$	[illegible]	[illegible]	[illegible]	
Blank	0	[illegible]	[illegible]	

Standard Curve Data
Corr. Coff.: 0.9981 Slope: -0.0235 Y-intercept: -0.0055

DATA:

ABR	Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	PQAC Note
001	125	1-3-20	[illegible]	10	[illegible]	
002	124	1-3-21	[illegible]	10	[illegible]	
003	126	1-3-22	[illegible]		[illegible]	
004	123	1-3-23	3.050		3.05	
005	127	1-3-24	[illegible]		[illegible]	
006	128	1-3-25	[illegible]		[illegible]	
007	129	1-3-26	[illegible]		[illegible]	
008	130	1-3-27	[illegible]		[illegible]	
009	131	1-3-28	[illegible]		[illegible]	
010	Spike 2X0	1-3-29	[illegible]	10	12.35	
011	132	1-3-30	[illegible]	10	[illegible]	
012	Spike 5X0	1-3-31	[illegible]		[illegible]	
013	33	1-3-32	[illegible]		[illegible]	
014	34	1-3-33	[illegible]		[illegible]	
015	35	1-3-34	[illegible]		[illegible]	
016	36	1-3-35	[illegible]		[illegible]	
017	37	1-3-36	[illegible]		[illegible]	
018	38	1-3-37	[illegible]	10	[illegible]	1
019	39	1-3-38	[illegible]		[illegible]	
		- -				

SUPPLEMENTARY DATA SHEET USED _____

DATA SHEET # 82 602 B

000368

Accuracy (Spikes)

	Found Value	Background Value	Recovered Concentration	Expected Concentration Of Spike	% Recovery	WL 2σ	CL 3σ
Analyst Spike>	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Blind Spike FQAC>	____	____	12.35 / 24.64	10.00 / 25.[illegible]	123.5 / 98.56	[illegible]	[illegible]

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	[illegible]	[illegible]	0.31	[illegible]
Blind Replicate FQAC>	7.77	3.54	____	____

Analyst's Report to Department Supervisor: [illegible]

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (✓) Passed ( ) Failed

NOTES: [illegible]

DS check on uncorrected concentrations for range requirement:
(✓) Passed ( ) Failed

NOTES: [illegible]

DS check accuracy: (✓) Passed ( ) Failed

NOTES: ____

DS check precision: (✓) Passed ( ) Failed

NOTES: ____

DS check rejection trend criteria: (✓) Passed ( ) Warning ( ) Failed

NOTES: ____

Department Supervisor Data:

NAME [illegible] DATE [illegible] TIME [illegible]

CERTIFICATION: I (✓) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed [illegible]

DATA SHEET # 82 602 C

000369

FQAC DATA REVIEW:

FQAC check blind replicates (precision): ( ) Passed ( ) Failed

NOTES: Apparent sample error in Replicate shows up in a Number of records.

FQAC check blind spike (30 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (X) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 603 A DATA SHEET SERIES (A-C) 5 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000370

MANAGEMENT DATA:
Analyst(s) Name(s) Bowden Dismuke
Date Samples Analyzed 12-18-87 Time 2 PM
Parameter (Metals) Chromium USATHAMA Method # 1B
Matrix 1 Category 3 Batch 2
Systems Calibration: (X) Passed ( ) Failed
Instrument # _____ ID# _____
NOTES: _____

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 5, Page # 45
File # _____.
NOTES: [illegible]

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
$0.5X_D$	5.0	5.0	4.9	
$2.0X_D$	10.1	9.9	10.1	
$10.0X_D$	99.0	99.1	98.0	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: 0.9999 Slope: 0.10152 Y-intercept: 0.0003

DATA:

Analytical No.	Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Note
~~ABS~~ ABS						
001	125	1-3-20	10.5		10.5	
002	125 Dup	1-3-21	11.2		11.2	
003	126	1-3-22	12.1		12.1	
004	124	1-3-23	<6.6		<6.6	
005	127	1-3-24	11.6		11.6	
006	128	1-3-25	<6.6		<6.6	
007	129	1-3-26	11.4		11.4	
008	130	1-3-27	<6.6		<6.6	
009	131	1-3-28	<6.6		<6.6	
010	Spike 2^{XD}	1-3-29	99.2		99.2	
011	132	1-3-30	14.5		14.5	
012	Spike 5^{XD}	1-3-31	48.0		48.0	
013	33	1-3-32	8.1		8.1	
014	34	1-3-33	<6.6		<6.6	
015	35	1-3-34	<6.6		<6.6	
016	36	1-3-35	9.0		9.0	
017	37	1-3-36	9.6		9.6	
018	38	1-3-37	9.1		9.1	1
019	39	1-3-38	<6.6		<6.6	
		- -				

SUPPLEMENTARY DATA SHEET USED _____

DATA SHEET # 82 603 B

000371

Accuracy (Spikes)

	Found Value		Background Value		Recovered Concentration		Expected Concentration Of Spike		% Recovery	WL 2σ	CL 3σ
Analyst Spike>	22.0	-	[illegible]	=	[illegible]		[illegible]	X 100	[illegible]		
Blind Spike FQAC>	____	-	____	=	20.2 / 48.0		20 / 50	X 100	101 / 96.0	109 / [illegible]	113 / [illegible]

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	22.[illegible]	[illegible]	[illegible]	____
Blind Replicate FQAC>	11.0	< 6.6	____	____

Analyst's Report to Departmental Supervisor: ____

[illegible]

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: [illegible]

DS check on uncorrected concentrations for range requirement:
(✓) Passed ( ) Failed

NOTES: [illegible]

DS check accuracy: (✓) Passed ( ) Failed

NOTES: ____

DS check precision: (✓) Passed ( ) Failed

NOTES: ____

DS check rejection trend criteria: (✓) Passed ( ) Warning ( ) Failed

NOTES: ____

Department Supervisor Data:

NAME [illegible] DATE 12-22-82 TIME [illegible]

CERTIFICATION: I (✓) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed [illegible]

DATA SHEET # 82 603 C

000372

FQAC DATA REVIEW:

FQAC check blind replicates (precision): (X) Passed ( ) Failed

NOTES: Quality of Field sample has caused precision to be poor on this sample

FQAC check blind spike (30 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (X) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 604 A DATA SHEET SERIES (A-C) 6 OF 17

000373

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

MANAGEMENT DATA:
Analyst(s) Name(s) [illegible]
Date Samples Analyzed [illegible] Time [illegible]
Parameter (Metals) Lead USATHAMA Method # [illegible]
Matrix 1 Category 3 Batch 2
Systems Calibration: (X) Passed ( ) Failed
Instrument # _____ ID# _____
NOTES: _____

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 5, Page # 13
File # _____.
NOTES: [illegible]

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	10	10.0	11.2	
2.0X$_D$	[illegible]	[illegible]	[illegible]	
10.0X$_D$	[illegible]	[illegible]	[illegible]	
Blank	[illegible]	0	0	

Standard Curve Data
Corr. Coff.: [illegible] Slope: [illegible]
Y-intercept: [illegible]

DATA:

Analytical No.	Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Note
~~ABT~~						
001	125	1-3-20	<4.49		[illegible]	
002	124 Dup	1-3-21	[illegible]		<4.49	
003	126	1-3-22	[illegible]		[illegible]	
004	124	1-3-23	36.2		36.2	
005	127	1-3-24	<4.49		[illegible]	
006	128	1-3-25	[illegible]		[illegible]	
007	129	1-3-26	<4.49		<4.49	
008	130	1-3-27	[illegible]		[illegible]	
009	131	1-3-28	[illegible]		[illegible]	
010	~~32~~ 32K 2LD	1-3-29	21.2		[illegible]	
011	132	1-3-30	16.3		16.3	
012	~~32~~ 32K 5LD	1-3-31	53.8		[illegible]	
013	33	1-3-32	[illegible]		<4.49	
014	34	1-3-33	[illegible]		[illegible]	
015	35	1-3-34	44.0		44.0	
016	36	1-3-35	[illegible]		[illegible]	
017	37	1-3-36	8.9		8.9	
018	38	1-3-37	8.8		8.8	
019	39	1-3-38	[illegible]		[illegible]	
		- -				

SUPPLEMENTARY DATA SHEET USED _____

DATA SHEET # 82 604 B

000374

Accuracy (Spikes)

	Found Value	Background Value	Recovered Concentration	Expected Concentration Of Spike		% Recovery	WL 2σ	CL 3σ
Analyst Spike>	23.2	< 0.49	23.2	20	x 100	116	125.1 / 107.4	143.2 / 96.4
Blind Spike FQAC>	____	____	21.2 / 53.8	20 / 50	x 100	106 / 107.6		

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	< 0.49	< 0.49	0	2.17
Blind Replicate FQAC>	< 7.49	36.2	____	____

Analyst's Report to Departmental Supervisor: ____

[illegible]

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: None Noted

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: All Spikes > 5 × MDC

DS check accuracy: (X) Passed ( ) Failed

NOTES: ____

DS check precision: (X) Passed ( ) Failed

NOTES: ____

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: ____

Department Supervisor Data:

NAME [illegible] DATE 12-23-92 TIME [illegible]

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed ____

DATA SHEET # 82 604 C

000375

FQAC DATA REVIEW:

FQAC check blind replicates (precision): ( ) Passed ( ) Failed

NOTES: poor field duplicate sample has cause problems with a number of metals

FQAC check blind spike (30 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (Y) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (Y) can ( ) cannot) authorize i : releas· for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 639 A DATA SHEET SERIES (A-C) 7 OF 17

000376

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

MANAGEMENT DATA:
Analyst(s) Name(s) _____
Date Samples Analyzed _____ Time 12
Parameter (Metals) MANGANESE USATHAMA Method # 101
Matrix 2 Category 3 Batch 4
Systems Calibration: (X) Passed ( ) Failed
Instrument # _____ ID# _____
NOTES: _____

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 11, Page # 4,
File # _____.
NOTES: _____

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	50	61	53	
2.0X$_D$	200	124	120	
10.0X$_D$	1000	254		
Blank		0		

Standard Curve Data
Corr. Coff.: NA Slope: 1.0
Y-intercept: 0

DATA:

ADC

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Notes
009	2-3-58	64		64	
010	2-3-59	28		28	
011	2-3-60	39		39	
012 D	2-3-61 ✓	50		50	
013	2-3-62	83		83	
012	2-3-63 ✓	93		93	
014	2-3-64	96		96	
015	2-3-65	31		31	
016	2-3-66	33		33	
Spike 2XD	2-3-67 ✓	71		71	
017	2-3-68	117		117	
Spike 5XD	2-3-69 ✓	247		247	
018	2-3-70	26		26	
019	2-3-71	36		36	
020	2-3-72	28		28	
021	2-3-73	11		11	
005	2-3-74	31		31	
002	2-3-75	99		99	
	- -				
	- -				

SUPPLEMENTARY DATA SHEET USED _____

DATA SHEET # 82 639 B

000377

Accuracy (Spikes)

	Found Value		Background Value		Recovered Concentration		Expected Concentration Of Spike		% Recovery	WL 2σ	CL 3σ
Analyst Spike>	79	-	24	=	52	÷	50	x 100	104	105.2	104.3
Blind Spike FQAC>	52/127	-		=			50/125	x 100	104/101.6	96.8	97.1

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	27	24	3	6.54
Blind Replicate FQAC>	50	35	15	

Analyst's Report to Departmental Supervisor: [illegible]

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: [illegible]

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: [illegible]

DS check accuracy: (X) Passed ( ) Failed

NOTES:

DS check precision: (X) Passed ( ) Failed

NOTES:

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES:

Department Supervisor Data:

NAME [illegible] DATE 12-10-82 TIME [illegible]

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed [illegible]

DATA SHEET # 82 639 C

000378

FQAC DATA REVIEW:

FQAC check blind replicates (precision): ( ) Passed (Y) Failed

NOTES: Sample variability override system

FQAC check blind spike (30 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (Y) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (X) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 643 A DATA SHEET SERIES (A-C) 11 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM 000379

MANAGEMENT DATA:
Analyst(s) Name(s) Sammy Wilson
Date Samples Analyzed 12-6-82 Time 8:30 PM
Parameter (Metals) Zinc USATHAMA Method # AM
Matrix 2 Category 3 Batch 4
Systems Calibration: (X) Passed ( ) Failed
Instrument # ID#
NOTES:

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 12, Page # 12, File #.
NOTES:

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	41	42	41	
2.0X$_D$	82	101	96	
10.0X$_D$	350	339	351	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: 1/r Slope: 1/r Y-intercept: 1/A

DATA:

ADG

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Notes
009	2-3-58	32		32	
010	2-3-59	<27.1		<27.1	
011	2-3-60	41		41	
012 D	2-3-61	44		44	
013 D	2-3-62	<27.1		<27.1	
012	2-3-63				
014	2-3-64				
015	2-3-65				
016	2-3-66	<27.1		<27.1	
Spike 2XD	2-3-67 ✓	41		41	
017	2-3-68	<27.1		<27.1	
Spike 5XD	2-3-69 ✓	98		98	
018	2-3-70	<27.1		<27.1	
019	2-3-71				
020	2-3-72				
021	2-3-73				
005	- -				
002	- -				
	- -				
	- -				

SUPPLEMENTARY DATA SHEET USED

DATA SHEET # 82 643 B

000380

Accuracy (Spikes)

	Found Value	- Background Value	= Recovered Concentration	÷ Expected Concentration Of Spike	x 100	% Recovery	WL 2σ	CL 3σ
Analyst Spike>	41	0	41	40		102.5	152.1 / 61.5	176.3 / 38.7
Blind Spike FQAC>	41 / 98			40 / 100		102.5 / 98.0		

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	<27.1	<27.1	0	13.7
Blind Replicate FQAC>	<27.1	44	16.9	

Analyst's Report to Departmental Supervisor: Passes duplicate QC.

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: None noted

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES:

DS check accuracy: (X) Passed ( ) Failed

NOTES:

DS check precision: (X) Passed ( ) Failed

NOTES:

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES:

Department Supervisor Data:

NAME Sammy Lupica DATE 12-12-82 TIME 8:00 AM

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed Sammy Lupica

DATA SHEET # 82 048 C

000381

FQAC DATA REVIEW:

FQAC check blind replicates (precision): ( ) Passed ( ) Failed

NOTES: One sample fell below detection limit which may be set to low for Actual field samples.

FQAC check blind spike (30 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (Y) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (Y) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 754 A DATA SHEET SERIES (A-C) 1 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000382

MANAGEMENT DATA:
Analyst(s) Name(s) S. [illegible] Wallace
Date Samples Analyzed [illegible] Time 12:30
Parameter Aluminum (Metals) USATHAMA Method # IN
Matrix S Category 3 Batch 1
Systems Calibration: (X) Passed ( ) Failed
Instrument # _____ ID# _____
NOTES: _____

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 1, Page # 64,
File # _____.
NOTES: UV-1S ATO Al/g

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	0.80	1.64	0.75	
2.0X$_D$	2.00	1.92	3.08	
10.0X$_D$	4.00	4.02	3.94	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: 0.9990 Slope: 0.0371
Y-intercept: [illegible]

DATA:

AEU

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Notes
001	3-3-1	0.63	1000	630	
001D	3-3-2	1.36	1000	[illegible]	
002	3-3-3	[illegible]	[illegible]	[illegible]	
005	3-3-4	0.99	[illegible]	990	
009	3-3-5	1.65	1000	1650	
010	3-3-6	1.59	[illegible]	[illegible]	
011	3-3-7	[illegible]	[illegible]	[illegible]	
011D	3-3-8	[illegible]	[illegible]	[illegible]	
012	3-3-9	1.16	1000	1160	
013	3-3-10	1.82	1000	[illegible]	
Blank	3-3-11	1.39	1000	1390	
014	3-3-12	[illegible]	[illegible]	[illegible]	
Spike	3-3-13	1.42	1000	1420	
015	3-3-14	1.33	1000	1330	
Spike	3-3-15	1.40	1000	[illegible]	
016	3-3-16	1.26	[illegible]	[illegible]	
017	3-3-17	1.37	1000	1370	
018	3-3-18	1.48	1000	1480	

SUPPLEMENTARY DATA SHEET USED _____

DATA SHEET # 82 754 B DATA SHEET SERIES (A-C) 1 of 11

Accuracy (Spikes)

000383

	Found Value		Background Value		Recovered Concentration	Expected Concentration Of Spike		% Recovery	WL 20	CL 30
Analyst Spike>	1280	-	1210	=	70	0.00	x 100	87.5		
Blind Spike FQAC>	1420 / 1460	-	1390	=	30 / 70	40 / 80	x 100	75% / 87.5%		

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	1210	1280	70	
Blind Replicate FQAC>	1350 / 630	1160 / ~~1350~~ / 1360	~~720~~	

Analyst's Report to Departmental Supervisor: Does not meet criteria

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (✓) Passed ( ) Failed

NOTES: None required

DS check on uncorrected concentrations for range requirement:
(✓) Passed ( ) Failed

NOTES: All samples between 0.3 and 500 ng/g

DS check accuracy: ( ) Passed (✓) Failed

NOTES: Yes

DS check precision: (✓) Passed ( ) Failed

NOTES:

DS check rejection trend criteria: (✓) Passed ( ) Warning ( ) Failed

NOTES:

Department Supervisor Data:

NAME Sammy Warren DATE 2 9 12 TIME 11.30

CERTIFICATION: I (✓) can (✓) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed Sammy Warren

DATA SHEET # 82 754 C DATA SHEET SERIES (A-C) 3 of 17

FQAC DATA REVIEW:

000384

FQAC check blind replicates (precision): (X) Passed ( ) Failed

NOTES: Dilution Factor caused imprecision ~~Very close~~ UCL N/A for RANGE

FQAC check blind spike (30 accuracy): (X) Passed ( ) Failed

NOTES: One spike slightly out of RANGE but great considering background

FQAC check blind spike (20 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I ( ) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, ( ) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 756 A DATA SHEET SERIES (A-C) 3 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000385

...NAGEMENT DATA:
Analyst(s) Name(s) Dwight Vinsmore
Date Samples Analyzed 2/13/83 Time 9:00 AM
Parameter Barium (Metals) USATHAMA Method # 13
Matrix 33 Category 3 Batch 1
Systems Calibration: (X) Passed ( ) Failed
Instrument # _____ ID# _____
NOTES: _____

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 7, Page # 32,
File # _____.
NOTES: Units mg/l

Standard Levels		Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	mg/l	0.40	0.42	0.42	
2.0X$_D$	mg/l	1.00	0.98	1.05	
10.0X$_D$	mg/l	2.00	1.89	1.98	
Blank		0	0	0	

Standard Curve Data
Corr. Coff.: 0.9915 Slope: 0.1500 Y-intercept: 0.0756

DATA:
AEW

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Notes
	3-3-1	9.02	10	90.2	
	3-3-2	<0.99		<0.99	
	3-3-3	6.15	10	61.5	
	3-3-4	6.53	10	65.5	
	3-3-5	8.52	100	852.0	
	3-3-6	9.02	10	90.2	
	3-3-7	6.62	10	66.2	
	3-3-8	5.62	10	56.2	
	3-3-9	<0.99		<0.99	
	3-3-10	<0.99		<0.99	
	3-3-11	5.82	10	58.2	
	3-3-12	9.48	100	948.0	
	3-3-13	6.52	10	65.2	
	3-3-14	1.29	100	129.0	
	3-3-15	7.08	10	70.8	
	3-3-16	1.20	10	12.0	
	3-3-17	3.00	100	300.0	
	3-3-18	1.33	100	133.0	
	- -				
	- -				

SUPPLEMENTARY DATA SHEET USED _____

DATA SHEET # 82 756 B DATA SHEET SERIES (A-C) _____ of _____

000386

Accuracy (Spikes)

	Found Value	Background Value	Recovered Concentration	Expected Concentration Of Spike		% Recovery	WL 2σ	CL 3σ
Analyst Spike>	130.0	- 120.0	= 10.0	10.0	x 100	100.0		
Blind Spike FQAC>	65.2 / 70.8	- 58.2	= 7 / 12.6	5.0 / 10.0	x 100	140% / 126%	118.7 / 82.9	129 / 73.9

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	80.0	46.1	34	8.44
Blind Replicate FQAC>	66.2	56.2	10	

Analyst's Report to Departmental Supervisor: _____

Poor Analytical Q.C.

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: None Noted

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: All Spikes Within 0.5 to 10 ✓

DS check accuracy: (X) Passed ( ) Failed

NOTES: _____

DS check precision: (X) Passed ( ) Failed

NOTES: _____

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

Department Supervisor Data:

NAME Sammy Lynch DATE 2/14/83 TIME 4:31

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed Sammy Lynch

DATA SHEET # 82 756 C DATA SHEET SERIES (A-C) _____ of _____

000387

FQAC DATA REVIEW:

FQAC check blind replicates (precision): (X) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (30 accuracy): (X) Passed ( ) Failed

NOTES: Spike only 1/10th of total CON. Recovery good

FQAC check blind spike (20 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (X Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I ( ) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, ( ) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

FEB 8 1983

DATA SHEET # 82 760 A DATA SHEET SERIES (A-C) 7 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000388

MANAGEMENT DATA:
Analyst(s) Name(s) [illegible]
Date Samples Analyzed [illegible] Time [illegible]
Parameter Manganese (Metals) USATHAMA Method # IN
Matrix 3 Category 3 Batch [illegible]
Systems Calibration: (X) Passed ( ) Failed
Instrument # _____ ID# _____
NOTES: _____

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 13, Page # 17, File # _____.
NOTES: UNITS ppm

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	[illegible]	[illegible]	[illegible]	
2.0X$_D$	[illegible]	[illegible]	[illegible]	
10.0X$_D$	[illegible]	[illegible]	[illegible]	
Blank		0	0	

Standard Curve Data Slope: N/A
Corr. Coff.: N/A Y-intercept: N/A

DATA: AFA

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Notes
	3-3-1	0.82	100	82	
	3-3-2	1.08	100	108	
	3-3-3	1.24	100	124	
	3-3-4	0.84	100	84	
	3-3-5	1.75	100	175	
	3-3-6	2.08	100	208	
	3-3-7	1.19	100	119	
	3-3-8	0.58	100	58	
	3-3-9	1.43	100	143	
	3-3-10	5.0		5.0	
	3-3-11	2.89	100	289	
	3-3-12	1.10	100	110	
	3-3-13	2.90	100	290	
	3-3-14	0.63	100	63	
	3-3-15	2.92	100	292	
	3-3-16	0.72	100	72	
	3-3-17	0.93	1000	930	
	3-3-18	0.42	1000	420	
	- -				
	- -				

SUPPLEMENTARY DATA SHEET USED _____

DATA SHEET # 82 760 B DATA SHEET SERIES (A-C) _____ of _____

000389

Accuracy (Spikes)

	Found Value		Background Value	=	Recovered Concentration	÷	Expected Concentration Of Spike	X 100	% Recovery	WL 20	CL 30
Analyst Spike>	10.0	-	9.6	=	0.40	÷	0.50	X 100	80		
Blind Spike FQAC>	290/292	-	289	=	1/3		2/4	X 100	50%/75%		

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	[illegible]	[illegible]	3.0	40
Blind Replicate FQAC>	82	108	26	

Analyst's Report to Departmental Supervisor: _____

[illegible]

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: [illegible]

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: [illegible]

DS check accuracy: (✓) Passed ( ) Failed

NOTES: [illegible]

DS check precision: (X) Passed ( ) Failed

NOTES: _____

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

Department Supervisor Data:

NAME [illegible] DATE 9-3-82 TIME 5:40 PM

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed [illegible]

DATA SHEET # 82 760 C DATA SHEET SERIES (A-C) _____ of _____

000390

FQAC DATA REVIEW:

FQAC check blind replicates (precision): (X) Passed ( ) Failed

NOTES: UCL established for lower RANGE, clup. Samples not great quality

FQAC check blind spike (30 accuracy): (Y) Passed ( ) Failed

NOTES: Spike FAR to low to obtain good Recovery in NATURAL MATERIAL

FQAC check blind spike (20 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (Y) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME_____ DATE_____ TIME_____

Certification/Authorization: I ( ) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, ( ) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed Ralph D. Jack

FEB 15 1983

DATA SHEET # 82 771 A DATA SHEET SERIES (A-C) 1 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000391

MANAGEMENT DATA:
Analyst(s) Name(s) [illegible] WHITE
Date Samples Analyzed 2-6-83 Time [illegible]
Parameter Aluminum (Metals) USATHAMA Method # [illegible]
Matrix 3 AND 4 Category 3 Batch 2
Systems Calibration: (X) Passed ( ) Failed
Instrument # ID#
NOTES:

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 7, Page # 70, File #.
NOTES: UNITS ARE MG/G

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	0.80	0.84	0.75	
2.0X$_D$	2.00	1.93	2.05	
10.0X$_D$	10.00	9.60	9.74	
Blank	0	0	0	

Standard Curve Data
Slope: 0.0941
Corr. Coff.: 0.9911 Y-intercept: 0.0116

DATA: AFL

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Notes
019	3-3-19	1.23	1000	930	
019D	3-3-20	1.66	1000	[illegible]	
020	3-3-21	1.48	1000	1480	
021	3-3-22	0.62	1000	620	
0101	4-3-23	1.34	1000	1340	
0102	4-3-24	1.40	1000	1400	
0103	4-3-25	[illegible]	[illegible]	[illegible]	
0401	4-3-26	1.07	1000	[illegible]	
0401D	4-3-27	1.26	1000	1360	
0402	4-3-28	1.35	1000	[illegible]	
0403	4-3-29	1.39	1000	1390	
0501	4-3-30	1.0[illegible]	1000	[illegible]	
Spike	4-3-31	1.14	100	[illegible]	
0502	4-3-32	1.10	1000	1100	
Blank	4-3-33	1.01	1000	[illegible]	
0503	4-3-34	3.60		3.6	
Spike	4-3-35	1.10	1000	1100	
0601	4-3-36	3.60		3.6	
	- -				
	- -				

SUPPLEMENTARY DATA SHEET USED

DATA SHEET # 82 771 B DATA SHEET SERIES (A-C) _____ of _____

000392

Accuracy (Spikes)

	Found Value		Background Value		Recovered Concentration		Expected Concentration Of Spike		% Recovery	WL 20	CL 30
Analyst Spike>	1380	-	1350	=	30.0		0.80	X 100	375		
Blind Spike FQAC>	1400	-	1080	=	320.0		20	X 100		11-1	17

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	1350	1330	20.0	6-1
Blind Replicate FQAC>	1090	1260	170	

Analyst's Report to Departmental Supervisor: _____

[illegible] — Sample

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (✓) Passed ( ) Failed

NOTES: None voted

DS check on uncorrected concentrations for range requirement:
(✓) Passed ( ) Failed

NOTES: All Samples between 1.25 to 4 times

DS check accuracy: ( ) Passed (X) Failed

NOTES: _____

DS check precision: ( ) Passed (X) Failed

NOTES: _____

DS check rejection trend criteria: ( ) Passed ( ) Warning (X) Failed

NOTES: _____

Department Supervisor Data:

NAME [illegible] DATE 2-9-93 TIME [illegible]

CERTIFICATION: I ( ) can (X) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed [illegible]

DATA-SHEET # 82 771 C DATA SHEET SERIES (A-C) _____ of _____

FQAC DATA REVIEW:

000393

FQAC check blind replicates (precision): (X) Passed ( ) Failed

NOTES: Overide due to sample concentration

FQAC check blind spike (30 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I ( ) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, ( ) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 773 A DATA SHEET SERIES (A-C) 3 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000394

MANAGEMENT DATA:
Analyst(s) Name(s) Dunlop Dismuke
Date Samples Analyzed 2/8/83 Time 8:45
Parameter Barium (Metals) USATHAMA Method # 10
Matrix 3 AND 4 Category 3 Batch 2
Systems Calibration: (X) Passed ( ) Failed
Instrument # _____ ID# _____
NOTES: _____

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 1, Page # 24.
File # _____.
NOTES: 1/21/83 AIR M/S

Standard Levels		Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	0.4x	0.40	0.42	0.42	
2.0X$_D$	x1	1.00	0.98	1.05	
10.0X$_D$	2x1	2.00	1.81	1.98	
Blank		0	0	0	

Standard Curve Data Slope: 0.1500
Corr. Coff.: 0.9915 Y-intercept: 0.0756

DATA: AFN

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X	Dilution Factor	=	Actual Concentration	FQAC Notes
	3-3-19	1.69		100		169.0	
	3-3-20	1.23		100		123.0	
	3-3-21	4.19		10		41.9	
	3-3-22	1.63		100		163.0	
	4-3-23	1.01		100		101.0	
	4-3-24	1.04		100		104.0	
	4-3-25	9.59		10		95.9	
	4-3-26	8.62		10		86.2	
	4-3-27	6.44		10		64.4	
	4-3-28	1.35		100		135.0	
	4-3-29	5.58		10		55.8	
	4-3-30	2.18		100		218.0	
	4-3-31	7.77		10		77.7	
	4-3-32	1.62		100		162.0	
	4-3-33	7.27		10		72.7	
	4-3-34	6.06		10		60.6	
	4-3-35	1.53		10		15.3	
	4-3-36	1.22		100		122.0	
	- -						
	- -						

SUPPLEMENTARY DATA SHEET USED _____

. DATA SHEET # 82 773 B DATA SHEET SERIES (A-C) _____ of _____

Accuracy (Spikes)

000395

	Found Value		Background Value	=	Recovered Concentration	Expected Concentration Of Spike		% Recovery	WL 2σ	CL 3σ
Analyst Spike>	137.1	-	127.0	=	10.1	10.0	x 100	101		
Blind Spike FQAC>	77.7 / 75.2	-	72.9	=	4.8 / 2.4	5 / 2.5	x 100	96 / 96	118.7 / 121.1	124 / 126.1

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	130.9	127.0	3.9	8.44
Blind Replicate FQAC>	86.2	64.4	21.8	

Analyst's Report to Departmental Supervisor: Process Duplicate

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: None Noted

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: All samples between 2.5 and 100 ppb

DS check accuracy: (/) Passed ( ) Failed

NOTES:

DS check precision: (/) Passed ( ) Failed

NOTES:

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES:

Department Supervisor Data:

NAME Sandy Watson DATE 2/14/83 TIME 5:00

CERTIFICATION: I (/) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed Sandy Watson

DATA SHEET # 82 773 C DATA SHEET SERIES (A-C) _____ of _____

FQAC DATA REVIEW:

000396

FQAC check blind replicates (precision): (Y) Passed ( ) Failed
NOTES: Override due to poor sample quality and ICC not evident.

FQAC check blind spike (30 accuracy): (Y) Passed ( ) Failed
NOTES: _____

FQAC check blind spike (20 accuracy): (Y) Passed ( ) Failed
NOTES: _____

FQAC check trend rejection criteria: (Y) Passed ( ) Warning ( ) Failed
NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (Y) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (Y) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

FEB 8 1983

DATA SHEET # 82 781 A DATA SHEET SERIES (A-C) 11 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000397

MANAGEMENT DATA:
Analyst(s) Name(s) David Winsmore
Date Samples Analyzed 1-24-83 Time 4:55
Parameter Zinc (Metals) USATHAMA Method #
Matrix 3 AND 4 Category 3 Batch 2
Systems Calibration: (X) Passed ( ) Failed
Instrument # ID#
NOTES:

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 13, Page # 17
File #.
NOTES: Units are ug/g

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	0.50	0.60	0.40	
2.0X$_D$	1.00	1.10	1.00	
10.0X$_D$	5.00	5.00	5.20	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: N/A Slope: N/A
Y-intercept: N/A

DATA: AFV

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Notes
	3-3-19	2.4	10	24.0	
	3-3-20	2.1	10	21.0	
	3-3-21	3.0		3.0	
	3-3-22	3.6	10	36.0	
	3-3-23	2.5	10	25.0	
	3-3-24	5.5	10	55.0	
	3-3-25	11.6	10	46.0	
	3-3-26	8.0		8.0	
	3-3-27	8.0		8.0	
	3-3-28	1.2	10	12.0	
	3-3-29	9.0		9.0	
	3-3-30	6.0		6.0	
	3-3-31	1.3	10	13.0	
	3-3-32	10.0		10.0	
	3-3-33	10.0		10.0	
	3-3-34	11.0	10	11.0	
	3-3-35	11.0	10	11.0	
	3-3-36	2.6	10	26.0	
	- -				
	- -				

SUPPLEMENTARY DATA SHEET USED

DATA SHEET # 82 781 B DATA SHEET SERIES (A-C) _____ of _____

000398

Accuracy (Spikes)

	Found Value	Background Value	Recovered Concentration	Expected Concentration Of Spike		% Recovery	WL 20	CL 30
Analyst Spike>	21.0	- 20.0	= 1.00	1.00	X 100	100%		
Blind Spike FQAC>	13.0 / 11.0	- 10.0	= 3. / 1	5 / 2	X 100	60% / 54%	108 / 88	68 / 52

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	8.0	8.0	0.0	0.10
Blind Replicate FQAC>	24.0	21.0	3	

Analyst's Report to Departmental Supervisor: _____

No Anomalies Noted.

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (✓) Passed ( ) Failed

NOTES: None Noted

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: All samples between 0.5 and 100 µg/l

DS check accuracy: (X) Passed ( ) Failed

NOTES: _____

DS check precision: (X) Passed ( ) Failed

NOTES: _____

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

Department Supervisor Data:

NAME [illegible] DATE 2-2-83 TIME 10:--

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed [signature]

DATA SHEET # 82 781 C DATA SHEET SERIES (A-C) _____ of _____

000399

FQAC DATA REVIEW:

FQAC check blind replicates (precision): (X) Passed ( ) Failed

NOTES: Sample concentration and variablity account for non compliance

FQAC check blind spike (30 accuracy): (Y) Passed ( ) Failed

NOTES: Con. of sample to high for spike

FQAC check blind spike (20 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (Y) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME_____ DATE_____ TIME_____

Certification/Authorization: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (Y) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 790 A DATA SHEET SERIES (A-C) 3 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000400

MANAGEMENT DATA:
Analyst(s) Name(s) Doug Lee Division
Date Samples Analyzed 2-8-83 Time 11:00
Parameter Barium (Metals) USATHAMA Method # 13
Matrix 4 Category 3 Batch 3
Systems Calibration: (X) Passed ( ) Failed
Instrument # ID#
NOTES:

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 7, Page # 36.
File #.
NOTES: Units ug/g

Standard Levels		Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	(.4X)	0.40	0.40	0.41	
2.0X$_D$	X1	1.00	1.00	1.01	
10.0X$_D$	2xd	2.00	1.71	1.99	
Blank		0	0	0	

Standard Curve Data
Corr. Coff.: 0.9999 Slope: 0.2056
Y-intercept: 0.0010

DATA: AGE

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Notes
	4-3-37	8.07	10	80.7	
	4-3-38	1.02	100	102.0	
	4-3-39	6.91	10	69.1	
	4-3-40	5.39	100	521.0	
	4-3-41	7.34	10	73.4	
	4-3-42	2.83	100	283.0	
	4-3-43	2.04	100	204.0	
	4-3-44	1.96	100	196.0	
	4-3-45	9.35	100	93.0	
	4-3-46	4.18	10	41.8	
	4-3-47	1.46	100	146.0	
	4-3-48	1.68	100	168.0	
	4-3-49	1.96	100	196.0	
	4-3-50	1.81	100	181.0	
	4-3-51	9.92	10	99.2	
	4-3-52	6.11	10	61.1	
	4-3-53	1.98	100	198.0	
	- -				
	- -				
	- -				

SUPPLEMENTARY DATA SHEET USED

DATA SHEET # 82 790 B DATA SHEET SERIES (A-C) _____ of _____

000401

Accuracy (Spikes)

	Found Value		Background Value		Recovered Concentration	Expected Concentration Of Spike		% Recovery	WL 20	CL 30
Analyst Spike>	176.0	-	168.0	=	8.0	10.0	X 100	80		
Blind Spike FQAC>	69.1 / 73.4	-	64.1	=	5.0 / 9.3	5 / 10	X 100	100% / 93%		

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	192	168	4.0	
Blind Replicate FQAC>	181	99.2		

Analyst's Report to Departmental Supervisor: _____

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: None Noted

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: All Samples between 0.5-10 100 [illegible]

DS check accuracy: (X) Passed ( ) Failed

NOTES: All [illegible]

DS check precision: (X) Passed ( ) Failed

NOTES: _____

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

Department Supervisor Data:

NAME Shirley Upton DATE 2/15/88 TIME 8:30 a.m.

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed Shirley Upton

DATA SHEET # 82 790 C DATA SHEET SERIES (A-C) _____ f _____

000402

FQAC DATA REVIEW:

FQAC check blind replicates (precision): (Y) Passed ( ) Failed
NOTES: Analyst Rep. Fail Sample [redacted] not CONSISTANT betwen battle

FQAC check blind spike (30 accuracy): (Y) Passed ( ) Failed
NOTES: _____

FQAC check blind spike (20 accuracy): (Y) Passed ( ) Failed
NOTES: _____

FQAC check trend rejection criteria: (Y) Passed ( ) Warning ( ) Failed
NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I ( ) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, ( ) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 792 A FEB 8 1983 DATA SHEET SERIES (A-C) 5 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000403

MANAGEMENT DATA:
Analyst(s) Name(s) [illegible]
Date Samples Analyzed 1-29-83 Time [illegible]
Parameter Chromium (Metals) USATHAMA Method # [illegible]
Matrix 4 Category 3 Batch 3
Systems Calibration: ⊠ Passed ( ) Failed
Instrument # _____ ID# _____
NOTES: _____

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 13, Page # 03.
File # _____.
NOTES: UNITS ARE ug/g

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	0.60	0.60	0.50	
2.0X$_D$	1.20	1.30	1.10	
10.0X$_D$	6.00	2.10	6.00	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: N/A Slope: N/A
Y-intercept: N/A

DATA: AGG

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Notes
	4-3-37	5.8		5.8	
	4-3-38	8.5		8.5	
	4-3-39	9.6		9.6	
	4-3-40	1.4	10	14.0	
	4-3-41	1.3	10	13.0	
	4-3-42	2.2	10	22.0	
	4-3-43	5.8		5.8	
	4-3-44	4.6	10	46.0	
	4-3-45	4.0	10	40.0	
	4-3-46	4.7	10	47.0	
	4-3-47	6.[illegible]	10	[illegible]	
	4-3-48	5.5	10	55.0	
	4-3-49	9.8		9.8	
	4-3-50	1.5	10	15.0	
	4-3-51	2.0	10	20.0	
	4-3-52	6.8		6.8	
	4-3-53	1.4		1.4	
	- -				
	- -				
	- -				

SUPPLEMENTARY DATA SHEET USED _____

DATA SHEET # 82 792 B DATA SHEET SERIES (A-C) _____ of _____

Accuracy (Spikes)

000404

	Found Value		Background Value		Recovered Concentration		Expected Concentration Of Spike		% Recovery	WL 20	CL 30
Analyst Spike>	55.2	-	53.9	=	1.30	÷	1.20	x 100	108		
Blind Spike FQAC>	9.6 ~~13.0~~	-	6.8	=	1.4 ~~6.2~~		1.20	x 100	116 ~~517~~	11x	

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	1.4	1.4	0.0	0.56
Blind Replicate FQAC>	15	20	5	

Analyst's Report to Departmental Supervisor: Phos. analytical Q.C.

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: None Noted

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: All [illegible] are between 0.5 to 10.0 mg/l

DS check accuracy: (X) Passed ( ) Failed

NOTES:

DS check precision: (X) Passed ( ) Failed

NOTES:

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES:

Department Supervisor Data:

NAME [illegible] DATE 2/2/83 TIME 2:30

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed [illegible]

DATA SHEET # 82 792 C DATA SHEET SERIES (A-C) _____ of _____

FQAC DATA REVIEW:

FQAC check blind replicates (precision): (Y) Passed ( ) Failed 000405

NOTES: Sample quality for Replicates poor

FQAC check blind spike (30 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (Y) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (Y) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 793 A DATA SHEET SERIES (A-C) 6 OF 17

000406

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

MANAGEMENT DATA:
Analyst(s) Name(s) [illegible]
Date Samples Analyzed 2/22/82 Time
Parameter Lead (Metals) USATHAMA Method # 13
Matrix 4 Category 3 Batch 3
Systems Calibration: (X) Passed ( ) Failed
Instrument # ID#
NOTES:

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 7, Page # 12
File #.
NOTES: Units are ug/l

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	[illegible]	0.45	0.42	
2.0X$_D$	[illegible]	[illegible]	1.00	
10.0X$_D$	[illegible]	[illegible]	1.91	
Blank				

Standard Curve Data
Corr. Coff.: [illegible] Slope: [illegible]
Y-intercept: [illegible]

DATA: AG-H

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X	Dilution Factor	=	Actual Concentration	FQAC Notes
	4-3-37	2.63		10		[illegible]	
	4-3-38	[illegible]		10		26.4	
	4-3-39	[illegible]		10		[illegible]	
	4-3-40	2.63		10		[illegible]	
	4-3-41	3.25		10		[illegible]	
	4-3-42	<0.99				<0.99	
	4-3-43	0.91				<0.99	
	4-3-44	<0.99				[illegible]	
	4-3-45	<0.99				[illegible]	
	4-3-46	[illegible]				[illegible]	
	4-3-47	[illegible]				<0.99	
	4-3-48	<0.99				<0.99	
	4-3-49	[illegible]				<0.99	
	4-3-50	4.40				12.5	
	4-3-51	1.58		10		4.40	
	4-3-52	[illegible]		[illegible]		[illegible]	
	4-3-53	3.45		10		[illegible]	
	- -						
	- -						
	- -						

SUPPLEMENTARY DATA SHEET USED

DATA SHEET # 82 793 B DATA SHEET SERIES (A-C) _____ of _____

Accuracy (Spikes)

000407

	Found Value		Background Value		Recovered Concentration		Expected Concentration Of Spike		% Recovery	WL 20	CL 30
Analyst Spike>	2.02	-	<0.99	=	2.02	÷	2.00	x 100	101		
Blind Spike FQAC>	26.1 / 32.5	-	19.4	=	6.7 / 13.1		5 / 10	x 100	134 / 131	113.1	

Precision (Replicates)

	Found Value I		Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	<0.99	-	<0.99	0.00	1.41
Blind Replicate FQAC>	4.7		15.2		

Analyst's Report to Departmental Supervisor: Passes Analytical Q.C.

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: None Noted

DS check on uncorrected concentrations for range requirement: (X) Passed ( ) Failed

NOTES: All samples [illegible]

DS check accuracy: (X) Passed ( ) Failed

NOTES: _____

DS check precision: (X) Passed ( ) Failed

NOTES: _____

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

Department Supervisor Data:

NAME [illegible] DATE 2/11/92 TIME [illegible]

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed [illegible]

DATA SHEET # 82 793 C DATA SHEET SERIES (A-C) _____ of _____

FQAC DATA REVIEW:

000408

FQAC check blind replicates (precision): (Y) Passed ( ) Failed

NOTES: Replicate poor MANY ~~Meth~~ metals do not check

FQAC check blind spike (30 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): Y Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (Y) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (Y) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (Y) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

FEB 8 1983

DATA SHEET # 82 794 A DATA SHEET SERIES (A-C) 7 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000409

MANAGEMENT DATA:
Analyst(s) Name(s) Sandy Warren
Date Samples Analyzed 11/[illegible] Time [illegible]
Parameter Manganese (Metals) USATHAMA Method # N
Matrix 4 Category 3 Batch 3
Systems Calibration: (X) Passed ( ) Failed
Instrument # _____ ID# _____
NOTES: _____

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 13, Page # _____.
File # _____.
NOTES: N/A

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	0.25	0.24	0.23	
2.0X$_D$	1.00	1.02	1.03	
10.0X$_D$	5.00	5.01	5.01	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: N/A Slope: N/A Y-intercept: N/A

DATA: A&I

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Notes
	4-3-37	0.59	100	59	
	4-3-38	1.56	100	156	
	4-3-39	3.07	100	307	
	4-3-40	1.14	100	114	
	4-3-41	3.08	100	308	
	4-3-42	3.03	100	303	
	4-3-43	3.12	100	312	
	4-3-44	2.03	100	203	
	4-3-46	2.21	100	221	
	4-3-46	1.81	100	181	
	4-3-47	0.10	100	10	
	4-3-48	0.20	100	20	
	4-3-49	0.18	100	18	
	4-3-50	0.00	100	0	
	4-3-51	2.98	100	298	
	4-3-52	3.05	100	305	
	4-3-53	1.79	1000	790	
	- -				
	- -				
	- -				

SUPPLEMENTARY DATA SHEET USED _____

DATA SHEET # 82 794 B DATA SHEET SERIES (A-C) _____ of _____

000410

Accuracy (Spikes)

	Found Value		Background Value		Recovered Concentration		Expected Concentration Of Spike		% Recovery	WL 20	CL 30
Analyst Spike>	3.20	-	2.[illegible]	=	[illegible]	-	1.25	X 100	96		
Blind Spike FQAC>	307/308	-	305	=	2/3			X 100		[illegible]	12.2

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	2.0	2.0	0.0	0.0[illegible]
Blind Replicate FQAC>	48	298		

Analyst's Report to Department Supervisor: [illegible]

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: [illegible]

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: [illegible]

DS check accuracy: (X) Passed ( ) Failed

NOTES: _____

DS check precision: (X) Passed ( ) Failed

NOTES: _____

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

Department Supervisor Data:

NAME [illegible] DATE 2/3/83 TIME [illegible]

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed [illegible]

DATA SHEET # 82 794 C DATA SHEET SERIES (A-C) _____ of _____

FQAC DATA REVIEW:

FQAC check blind replicates (precision): (X) Passed ( ) Failed 000411

NOTES: Disregard this Replicate

FQAC check blind spike (30 accuracy): (X) Passed ( ) Failed

NOTES: Spike far to SMALL

FQAC check blind spike (20 accuracy): ( ) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: ( ) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I ( ) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, ( ) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

FEB 8 1983

DATA SHEET # 82 795 A DATA SHEET SERIES (A-C) 8 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000412

MANAGEMENT DATA:
Analyst(s) Name(s) Chaplin Dickson-e
Date Samples Analyzed 1-31-83 Time 8:15
Parameter Strontium (Metals) USATHAMA Method # IN
Matrix 4 Category 3 Patch 3
Systems Calibration: (X) Passed ( ) Failed
Instrument # ID#
NOTES:

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 13, Page # 31.
File #.
NOTES: Metals AGJ

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	0.50	0.60	0.50	
2.0X$_D$	1.00	1.00	1.00	
10.0X$_D$	5.00	5.03	5.10	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: 1/r Slope: 1/m
Y-intercept: b

DATA: AGJ

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Notes
	4-3-37	0.64	10	6.4	
	4-3-38	1.04	10	10.4	
	4-3-39	0.85	10	8.5	
	4-3-40	1.48	100	148	
	4-3-41	1.15	10	11.5	
	4-3-42	2.34	100	234	
	4-3-43	2.52	10	25.2	
	4-3-44	2.31	100	231	
	4-3-45	0.56	10	5.6	
	4-3-46	1.14	10	11.4	
	4-3-47	1.003	1000	1030	
	4-3-48	1.30	1000	1300	
	4-3-49	3.21	10	32.1	
	4-3-50	1.32	100	132	
	4-3-51	1.04	100	104	
	4-3-52	0.62	10	6.2	
	4-3-53	1.10	10	11.0	
	- -				
	- -				
	- -				

SUPPLEMENTARY DATA SHEET USED

DATA SHEET # 82 795 B DATA SHEET SERIES (A-C) _____ of _____

Accuracy (Spikes)

000413

	Found Value	Background Value	Recovered Concentration	Expected Concentration Of Spike	% Recovery	WL 20	CL 30
Analyst Spike>	1309	1299	1	1.11	0		
Blind Spike FQAC>	8.5 / 11.5	6.2	2.3 / 5.3	2.5 / 5	92 / 106	109 / 87	114 / 82

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	1.21	1.27	0.02	0150
Blind Replicate FQAC>	132	104		N/A

Analyst's Report to Departmental Supervisor:

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: Were voided

DS check on uncorrected concentrations for range requirement:
( ) Passed ( ) Failed

NOTES:

DS check accuracy: ( ) Passed (X) Failed

NOTES:

DS check precision: (X) Passed ( ) Failed

NOTES:

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES:

Department Supervisor Data:

NAME _____ DATE 2/3/83 TIME _____

CERTIFICATION: I ( ) can (X) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed _____

DATA SHEET # 82 795 C DATA SHEET SERIES (A-C) _____ of _____

000414

FQAC DATA REVIEW:

FQAC check blind replicates (precision): (Y) Passed ( ) Failed

NOTES: RANGE N/A Poor Replicate quality

FQAC check blind spike (30 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (Y) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (Y) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (Y) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 797 A DATA SHEET SERIES (A-C) FEB 8 1983 10 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000415

MANAGEMENT DATA:
Analyst(s) Name(s) Purdue Division
Date Samples Analyzed 1/25/83 Time 1-7
Parameter Copper (Metals) USATHAMA Method # IN
Matrix 4 Category 3 Batch 3
Systems Calibration: (X) Passed ( ) Failed
Instrument # _____ ID# _____
NOTES: _____

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 11, Page # 47
File # _____.
NOTES: Water and Soils

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	0.50	0.50	0.50	
2.0X$_D$	1.00	1.00	1.00	
10.0X$_D$	5.00	5.10	5.10	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: N/A Slope: N/A
Y-intercept: N/A

DATA: AGL

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X	Dilution Factor	=	Actual Concentration	FQAC Notes
	4-3-37	4.0				4.0	
	4-3-38	9.0				9.0	
	4-3-39	8.0				8.0	
	4-3-40	1.5		10.0		15.0	
	4-3-41	1.1		10		11.0	
	4-3-42	1.5		100		150.0	
	4-3-43	5.0				5.0	
	4-3-44	5.2		10		52.0	
	4-3-45	9.2		10		92.0	
	4-3-46	2.2		10		22.0	
	4-3-47	3.4		10		34.0	
	4-3-48	6.0		10		60.0	
	4-3-49	2.0		10		20.0	
	4-3-50	8.3		10		83.0	
	4-3-51	4.0		10		40.0	
	4-3-52	5.0				5.0	
	4-3-53	3.0				3.0	
	- -						
	- -						
	- -						

SUPPLEMENTARY DATA SHEET USED _____

DATA SHEET # 82 797 B DATA SHEET SERIES (A-C) _____ of _____

000416

Accuracy (Spikes)

	Found Value		Background Value		Recovered Concentration		Expected Concentration Of Spike		% Recovery	WL 20	CL 30
Analyst Spike>	7.0	-	6.0	=	1.0	÷	1.0	x 100	[illegible]		
Blind Spike FQAC>	8.0 / 11.0	-	6.0	=	3 / 6		2.5 / 5	x 100	120 / 100	[illegible]	[illegible]

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	1.5	1.5	0.0	[illegible]
Blind Replicate FQAC>	83	40	_____	_____

Analyst's Report to Departmental Supervisor: _____

Monitor [illegible]

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: None Noted

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: All [illegible]

DS check accuracy: (X) Passed ( ) Failed

NOTES: _____

DS check precision: (X) Passed ( ) Failed

NOTES: _____

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

Department Supervisor Data:

NAME [illegible] DATE 1/21/83 TIME [illegible]

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed [illegible]

DATA SHEET # 82 797 C DATA SHEET SERIES (A-C) _____ of _____

000417

FQAC DATA REVIEW:

FQAC check blind replicates (precision): (Y) Passed ( ) Failed

NOTES: Poor Replicate

FQAC check blind spike (30 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (Y) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (Y) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (Y) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed Rick D Jr

DATA SHEET # 82 798 A DATA SHEET SERIES (A-C) 11 OF 17

FEB 8 1987

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000418

MANAGEMENT DATA:
Analyst(s) Name(s) Dowler Division C
Date Samples Analyzed 1-29-83 Time 4:10
Parameter Zinc (Metals) USATHAMA Method # IN
Matrix 4 Category 3 Batch 3
Systems Calibration: (X) Passed ( ) Failed
Instrument # ID#
NOTES:

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 13, Page # 14.
File #
NOTES: Units are µg/g

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	0.50	0.50	0.50	
2.0X$_D$	1.00	1.00	1.10	
10.0X$_D$	5.00	4.90	5.00	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: N/A Slope: N/A Y-intercept: N/A

DATA: AGM

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X	Dilution Factor	=	Actual Concentration	FQAC Notes
	4-3-37	5.1		10		51.0	
	4-3-38	4.8		10		48.0	
	4-3-39	2.2		10		22.0	
	4-3-40	1.8		10		18.0	
	4-3-41	2.5		10		25.0	
	4-3-42	4.6		100		460.0	
	4-3-43	3.7		10		37.0	
	4-3-44	1.3		100		130.0	
	4-3-45	1.6		100		160.0	
	4-3-46	1.3		100		130.0	
	4-3-47	1.3		100		130.0	
	4-3-48	1.3		100		130.0	
	4-3-49	5.2		10		52.0	
	4-3-50	2.3		10		23.0	
	4-3-51	1.4		10		14.0	
	4-3-52	1.0		10		10.0	
	4-3-53	1.1		10		11.0	
	- -						
	- -						
	- -						

SUPPLEMENTARY DATA SHEET USED

DATA SHEET # 82 798 B DATA SHEET SERIES (A-C) _____ of _____

Accuracy (Spikes)

000419

	Found Value	Background Value	Recovered Concentration	Expected Concentration Of Spike		% Recovery	WL 20	CL 30
Analyst Spike>	74.0	- 23.1	= 0.9	1.00	x 100	90		
Blind Spike FQAC>	22.0 / 25.0	- 20.0	= 2 / 5	2.5 / 5	x 100	80 / 100		

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	18	17	0.1	1.10
Blind Replicate FQAC>	23.0	16.0		

Analyst's Report to Departmental Supervisor: _____

Above Background O.C.

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: None Noted

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: All samples between 0.1 and 10.0 mg/g and 1 ...

DS check accuracy: (X) Passed ( ) Failed

NOTES: _____

DS check precision: (X) Passed ( ) Failed

NOTES: _____

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

Department Supervisor Data:

NAME [illegible] DATE 2/2/83 TIME 11:15

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed [signature]

DATA SHEET # 82 798 C DATA SHEET SERIES (A-C) _____ of _____

000420

FQAC DATA REVIEW:

FQAC check blind replicates (precision): (Y) Passed ( ) Failed

NOTES: Poor Replicate UCL N/A

FQAC check blind spike (30 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (Y) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (Y) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (Y) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 605 A DATA SHEET SERIES (A-C) 7 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM 000421

MANAGEMENT DATA:
Analyst(s) Name(s) Dorsha Rivera
Date Samples Analyzed 12-6-82 Time 11:30 a.m.
Parameter (Metals) MANGANESE USATHAMA Method # 1.11
Matrix 1 Category 3 Batch 2
Systems Calibration: (X) Passed ( ) Failed
Instrument # _____ ID# _____
NOTES: _____

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 11, Page # 2
File # _____.
NOTES: Units are in µg/L

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X	50	49	50	
2.0X D	125	124	124	
10.0X D	250	256	253	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: N/P Slope: N/P
Y-intercept: N/P

DATA:

Analytical No.	Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Note
001	125	1-3-20	134	10	1340	
002	124 Dup	1-3-21	83		83	
003	126	1-3-22	132	10	1320	
004	124	1-3-23	83		83	
005	127	1-3-24	186	10	1860	
006	128	1-3-25	27.2	40	1088	
007	129	1-3-26	195	4	780	
008	130	1-3-27	<12.1		<12.1	
009	131	1-3-28	<12.1		<12.1	
010	20K 2xD	1-3-29 ✓	49.5		49.5	
011	132	1-3-30	36.2	40	1448	
012	50K 5xD	1-3-31 ✓	127		127	
013	33	1-3-32	193		193	
014	34	1-3-33	16		16	
015	35	1-3-34	36		36	
016	36	1-3-35	90	4	360	
017	37	1-3-36	78	4	312	
018	38	1-3-37	149	4	596	1
019	39	1-3-38	196		196	
		- -				

SUPPLEMENTARY DATA SHEET USED _____

DATA SHEET # 82 605 B

000422

Accuracy (Spikes)

	Found Value	Background Value	Recovered Concentration	Expected Concentration Of Spike		% Recovery	WL 2σ	CL 3σ
Analyst Spike>	191	- 142	= 49	50	x 100	98	105.2	101.3
Blind Spike FQAC>	49.5 / 127.6	-	= 49.5 / 127.	50 / 125	x 100	99 / 101.6	96.8	94.1

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	146	142	4.0	6.54
Blind Replicate FQAC>	83	63		

Analyst's Report to Departmental Supervisor: Passes Analytical QC.

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: None voted

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: all samples between 10-200 mg/L

DS check accuracy: (X) Passed ( ) Failed

NOTES:

DS check precision: (X) Passed ( ) Failed

NOTES:

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES:

Department Supervisor Data:

NAME Sammy Warren DATE 12-10-82 TIME 4:20 P.M.

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed Sammy Warren

DATA SHEET # 82 605 C

FQAC DATA REVIEW:

FQAC check blind replicates (precision): (✓) Passed ( ) Failed 000423

NOTES: Field sample precision quality poor.

FQAC check blind spike (30 accuracy): (✓) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (✓) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (✓) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (✓) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (✓) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed Richard D Stanley

DATA SHEET # 82 611 A DATA SHEET SERIES (A-C) 13 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000424

MANAGEMENT DATA:
Analyst(s) Name(s) Sunny Nguyen
Date Samples Analyzed 12-6-12 Time
Parameter (Metals) Beryllium USATHAMA Method # 1M
Matrix 1 Category 3 Batch 2
Systems Calibration: (X) Passed ( ) Failed
Instrument # ID#
NOTES:

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 12, Page # 2
File #.
NOTES: Units are in µg/l

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	10	10	12	
2.0X$_D$	20	23	24	
10.0X$_D$	50	50	71	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: N/A Slope: N/A
Y-intercept: N/A

DATA:

Analytical No. ACA	Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor =	Actual Concentration	FQAC Note
001	125	1-3-20	<10		<10	
002	124	1-3-21				
003	126 Dup	1-3-22				
004	124C	1-3-23				
005	127	1-3-24				
006	129	1-3-25				
007	129	1-3-26				
008	130	1-3-27				
009	131	1-3-28	<10		<10	
010	5pike 2xD	1-3-29	18		18	
011	132	1-3-30	10		10	
012	20Ke 5xD	1-3-31	48		48	
013	133	1-3-32	<10		<10	
014	34	1-3-33				
015	35	1-3-34				
016	36	1-3-35				
017	37	1-3-36				
018	38	1-3-37				1
019	39	1-3-38	<10		<10	
		- -				

SUPPLEMENTARY DATA SHEET USED

DATA SHEET # 82 611 B

Accuracy (Spikes)

000425

	Found Value		Background Value		Recovered Concentration		Expected Concentration Of Spike		% Recovery	WL 2σ	CL 3σ
Analyst Spike>	19	-	0	=	19	÷	20	x 100	95		
Blind Spike FQAC>	19 / 48	-		=	18 / 48.		20 / 50	x 100	90 / 96%	103.1 / 96.3	104 X / 94.6

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	<10	<10	0	1.64
Blind Replicate FQAC>	<10	<10		

Analyst's Report to Departmental Supervisor: [illegible]

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES:

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: All samples [illegible]

DS check accuracy: (X) Passed ( ) Failed

NOTES: All [illegible] level

DS check precision: (X) Passed ( ) Failed

NOTES:

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES:

Department Supervisor Data:

NAME [illegible] DATE 12-13-[illegible] TIME 9:30 a/m

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed [illegible]

DATA SHEET # 82 611 C

FQAC DATA REVIEW:

FQAC check blind replicates (precision): (X) Passed ( ) Failed 000426

NOTES: _____

FQAC check blind spike (30 accuracy): (X) Passed ( ) Failed

NOTES: One spike does not check out, but our control chart was very narrow and based on limited data Override P/F

FQAC check blind spike (20 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (X) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed Bill D Lamb

DATA SHEET # 82 612 A DATA SHEET SERIES (A-C) 14 OF 007427

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

MANAGEMENT DATA:
Analyst(s) Name(s) [illegible]
Date Samples Analyzed 12-11-82 Time [illegible]
Parameter (Metals) Nickel USATHAMA Method # 111
Matrix 1 Category 3 Batch 2
Systems Calibration: (X) Passed ( ) Failed
Instrument # _____ ID# _____
NOTES: _____

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 11, Page # 18
File # _____.
NOTES: _____

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	20	43	[illegible]	
2.0X$_D$	80	92		
10.0X$_D$	200	226	214	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: 0.12 Slope: [illegible]
Y-intercept: [illegible]

DATA:

Analytical No.	Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FOAC Note
~~001~~ ACB						
001	125	1-3-20	24.1	10	241	
002	124	1-3-21	78		78	
003	126	1-3-22	114		114	
004	124	1-3-23	61		61	
005	127	1-3-24	134		134	
006	128	1-3-25	82		82	
007	129	1-3-26	109		109	
008	130	1-3-27	81		81	
009	131	1-3-28	[illegible]		[illegible]	
010	36.2 2XD	1-3-29 ✓	38		38	
011	132	1-3-30	102		102	
012	30.5 5XD	1-3-31 ✓	152		152	
013	33	1-3-32	59		59	
014	34	1-3-33	62		62	
015	35	1-3-34	111		111	
016	36	1-3-35	165		165	
017	37	1-3-36	73		73	
018	38	1-3-37	111		111	
019	39	1-3-38	66		66	1
		- -				

SUPPLEMENTARY DATA SHEET USED _____

DATA SHEET # 82 612 B

000428

Accuracy (Spikes)

	Found Value		Background Value	=	Recovered Concentration	÷	Expected Concentration Of Spike		% Recovery	WL 2σ	CL 3σ
Analyst Spike>	101	-	60	=	41	÷	40	x 100	102.5	109.9	112.2
Blind Spike FQAC>	38/102	-		=			40/100	x 100	95.0/102	89.1	84.4

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	38	44	6.0	6.5
Blind Replicate FQAC>	78	61		

Analyst's Report to Departmental Supervisor: Passes Graphical QC

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: None Noted

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: All Samples between 10-200 ug/l

DS check accuracy: (X) Passed ( ) Failed

NOTES:

DS check precision: (X) Passed ( ) Failed

NOTES:

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES:

Department Supervisor Data:

NAME Sammy Lyttrion DATE 12-13-82 TIME 5:15

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed Sammy Lyttrion

DATA SHEET # 82 612 C

000429

FQAC DATA REVIEW:

FQAC check blind replicates (precision): (Y) Passed ( ) Failed

NOTES: Slightly out of precision range poor field Replicate

FQAC check blind spike (30 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (Y) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (Y) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (Y) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (Y) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 615 A DATA SHEET SERIES (A-C) 17 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM 000430

MANAGEMENT DATA:
Analyst(s) Name(s) Dorsha Dixon
Date Samples Analyzed 12-4-92 Time
Parameter (Metals) Thallium USATHAMA Method # 111
Matrix 1 Category 3 Batch 2
Systems Calibration: (X) Passed ( ) Failed
Instrument # ID#
NOTES:

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 11, Page # 14
File # .
NOTES: UV-15 ICP w 1:1

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	100	100	100	
2.0X$_D$	250	250	250	
10.0X$_D$		490	500	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: N/A Slope: N/A
Y-intercept: N/A

DATA: ACE

Analytical Sample No.	Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X	Dilution Factor	=	Actual Concentration	FQAC Note
001	125	1-3-20	140				140	
002	124	1-3-21	<50				<50	
003	126	1-3-22	120				120	
004	124	1-3-23	<50				<50	
005	127	1-3-24	140				140	
006	128	1-3-25	110				110	
007	129	1-3-26	130				130	
008	130	1-3-27	100				100	
009	131	1-3-28	80				80	
010	30 Ka 2xD	1-3-29	106				106	
011	132	1-3-30	130				130	
012	32 Ka 5xD	1-3-31	270				270	
013	33	1-3-32	90				90	
014	34	1-3-33	100				100	
015	35	1-3-34	110				110	
016	36	1-3-35	160				160	
017	37	1-3-36	140				140	
018	38	1-3-37	140				140	
019	39	1-3-38	150				150	

SUPPLEMENTARY DATA SHEET USED

DATA SHEET # 82 615 B

000431

Accuracy (Spikes)

	Found Value		Background Value		Recovered Concentration		Expected Concentration Of Spike		% Recovery	WL 2σ	CL 3σ
Analyst Spike>	250	-	150	=	100	÷	100	x 100	100		
Blind Spike FQAC>	106 (230)	-		=			100 / 250	x 100	106.0 / (92.0)	103.2 / 98.4	104.4 / 94.2

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	150	150	0	4.6
Blind Replicate FQAC>	<50	<50		

Analyst's Report to Departmental Supervisor: Passed Duplicate QC.

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: None Noted

DS check on uncorrected concentrations for range requirement:
(X) Pasned ( ) Failed

NOTES: All samples between 50 100 Ag/L

DS check accuracy: (X) Passed ( ) Failed

NOTES:

DS check precision: (X) Passed ( ) Failed

NOTES:

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES:

Department Supervisor Data:

NAME Sammy Vinson DATE 12-13-82 TIME 8:15

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed Sammy Vinson

DATA SHEET # 82 615 C

FQAC DATA REVIEW:

000432

FQAC check blind replicates (precision): (X) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (30 accuracy): ( ) Passed ( ) Failed

NOTES: Results are within 10% but because of limited Data for thallium our control limits were very narrow.

FQAC check blind spike (20 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME_____ DATE_____ TIME_____

Certification/Authorization: I ( ) can (X) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (X) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 616 A DATA SHEET SERIES (A-C) 1 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM 000433

MANAGEMENT DATA:
Analyst(s) Name(s) Sunny Uppal
Date Samples Analyzed 12-16-82 Time 6:00 PM
Parameter (Metals) Aluminum USATHAMA Method # IB
Matrix 1+2 Category 3 Batch 3
Systems Calibration: (X) Passed ( ) Failed
Instrument # ID#
NOTES:

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 5, Page # 63,
File #.
NOTES: Units are ug/L

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	10	11.4	9.5	
2.0X$_D$	50	[illegible]	44.6	
10.0X$_D$	100	[illegible]	96.3	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: .9987 Slope: 0.0006
Y-intercept: 0.0001

DATA:

ACF

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Notes
40	1-3-39	50.9		50.9	
41	1-3-40	30.5		30.5	
42	1-3-41	40.1		40.1	
43	1-3-42	103.7		103.7	
44	1-3-43	19.8		19.8	
45	1-3-44	112		112	
46	1-3-45	68.1		68.1	
48	1-3-46	33.7		33.7	
47 ↑	1-3-47 ✓	-> 36.7		36.7	
49	1-3-48	98.5		98.5	
47 OK	1-3-49 ✓	=> <10		<10	
50	1-3-50	52.0	10	520	
51	1-3-51	68.7		68.7	
52	1-3-52	24.2		24.2	
53	1-3-53	22.9	10	229	
001	2-3-54	84.5		84.5	
Spike 2X	2-3-55	93.6		93.6	
064	2-3-56	42.7		42.7	
Spike 5X	2-3-57	24.2	10	242	
	- -				

SUPPLEMENTARY DATA SHEET USED

DATA SHEET # 82 616 B

000434

Accuracy (Spikes)

	Found Value	Background Value	Recovered Concentration	Expected Concentration Of Spike	% Recovery	WL 2σ	CL 3σ
Analyst Spike>	140.6	33.7	106.9	100	106.9		
Blind Spike FQAC>			93.6	100	93.6	86.5	77.6
			242	250	96.8		

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	33.7	32.6	1.10	
Blind Replicate FQAC>	36.7	<10		

Analyst's Report to Departmental Supervisor: [illegible]

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (✓) Passed ( ) Failed

NOTES: None noted

DS check on uncorrected concentrations for range requirement:
(✓) Passed ( ) Failed

NOTES: All [illegible] between 10-200 [illegible] 1/[illegible]

DS check accuracy: (✓) Passed ( ) Failed

NOTES:

DS check precision: (✓) Passed ( ) Failed

NOTES:

DS check rejection trend criteria: (✓) Passed ( ) Warning ( ) Failed

NOTES:

Department Supervisor Data:

NAME [illegible] DATE 12-27-82 TIME 4:15 PM

CERTIFICATION: I (✓) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed [illegible]

DATA SHEET # 82 616 C

FQAC DATA REVIEW:

000435

FQAC check blind replicates (precision): ( ) Passed (X) Failed

NOTES: FQAC override, analysist precision very good.

FQAC check blind spike (30 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (X) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 622 A DATA SHEET SERIES (A-C) 7 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000436

MANAGEMENT DATA:
Analyst(s) Name(s) Warren Dionne
Date Samples Analyzed 12-6-82 Time 12:00 noon
Parameter (Metals) MANGANESE USATHAMA Method # AA
Matrix 1+2 Category 3 Batch 3
Systems Calibration: (X) Passed ( ) Failed
Instrument # ID#
NOTES:

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 11, Page # 3
File #.
NOTES: Units mg/l

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	50	49	53	
2.0X$_D$	125	127	130	
10.0X$_D$	250	254	260	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: N/A Slope: N/A
Y-intercept: N/A

DATA:

ACL

	Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor =	Actual Concentration	FQAC Note
001	40	1-3-39	158	4	632	
002	41	1-3-40	185	4	740	
003	42	1-3-41	115	4	460	
004	43	1-3-42	165	4	660	
005	44	1-3-43	140		140	
006	45	1-3-44	130	4	520	
007	46	1-3-45	234		234	
008	48	1-3-46	[illegible]		[illegible]	
009	47	1-3-47 ✓	171	4	684	
010	49	1-3-48	117	4	[illegible]	
011	47	1-3-49 ✓	155	4	620	
012	50	1-3-50	150		150	
013	51	1-3-51	151		151	
014	52	1-3-52	127		127	
015	53	1-3-53	194		[illegible]	
016	001	2-3-54	[illegible]	10	[illegible]	
017	Spike 2ND	2-3-55 ✓	[illegible]		[illegible]	
018	004	2-3-56	[illegible]		[illegible]	
019	Spike 5TH	2-3-57 ✓	135		[illegible]	
		- -				

SUPPLEMENTARY DATA SHEET USED

DATA SHEET # 82 622 B

000437

Accuracy (Spikes)

	Found Value		Background Value		Recovered Concentration		Expected Concentration Of Spike			% Recovery	WL 2σ	CL 3σ
Analyst Spike>	606	-	555	=	51	÷	50	X 100		102	105.2	107.3
Blind Spike FQAC>	66 / 125	-		=		÷	50 / 125	X 100		132 / 100	96.8	94.7

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	147	144	3.0	6.54
Blind Replicate FQAC>	620	684	64	

Analyst's Report to Departmental Supervisor: None noted WC

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: None Noted

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: All samples between 10-200 MG/L

DS check accuracy: (X) Passed ( ) Failed

NOTES:

DS check precision: (X) Passed ( ) Failed

NOTES:

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES:

Department Supervisor Data:

NAME Sammy Warren DATE 12-10-82 TIME 4:25 P/L

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed Sammy Warren

DATA SHEET # 82 622 C

000438

FQAC DATA REVIEW:

FQAC check blind replicates (precision): (✓) Passed ( ) Failed

NOTES: Out of RANGE of cal precision ≈10% of PPB

FQAC check blind spike (3Ø accuracy): (✓) Passed ( ) Failed

NOTES: ONE spike did NOT PASS however 75% Meth did PASS

FQAC check blind spike (2Ø accuracy): (✓) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (✓) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____ date.

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (✓) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (✓) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 632 A DATA SHEET SERIES (A-C) 17 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000439

MANAGEMENT DATA:
Analyst(s) Name(s) Donna Dinsmore
Date Samples Analyzed 12-7-82 Time 1130 hrs
Parameter (Metals) Thallium USATHAMA Method # 141
Matrix 1+2 Category 3 Batch 3
Systems Calibration: (X) Passed ( ) Failed
Instrument # _____ ID# _____
NOTES: _____

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 11, Page # 15
File # _____.
NOTES: _____

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	100	100	90	
2.0X$_D$	[illegible]	240	[illegible]	
10.0X$_D$	[illegible]	[illegible]	[illegible]	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: _____ Slope: N/A
Y-intercept: _____

DATA: ACV

	Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Note
001	40	1-3-39	60		60	
002	41	1-3-40	[illegible]		[illegible]	
003	42	1-3-41	90		90	
004	43	1-3-42	76		76	
005	44	1-3-43	60		60	
006	45	1-3-44	[illegible]		[illegible]	
007	46	1-3-45	[illegible]		[illegible]	
008	48	1-3-46	[illegible]		[illegible]	
009	47	1-3-47 ✓	75		75	
010	49	1-3-48	<50		<50	
011	47	1-3-49 ✓	<50		[illegible]	
012	50	1-3-50	[illegible]		[illegible]	
013	51	1-3-51	[illegible]		[illegible]	
014	52	1-3-52	[illegible]		[illegible]	
015	53	1-3-53	70		[illegible]	
016	001	2-3-54	60		[illegible]	
017	Spike 2X	2-3-55	90		90	
018	004	2-3-56	[illegible]		[illegible]	
019	Spike 5X	2-3-57	[illegible]		[illegible]	
		- -				

SUPPLEMENTARY DATA SHEET USED _____

DATA SHEET # 82 632 B

000440

Accuracy (Spikes)

	Found Value	Background Value	Recovered Concentration	Expected Concentration Of Spike		% Recovery	WL 2σ	CL 3σ
Analyst Spike>	177	- 75	= 102	÷ 100	x 100	102	103.2	104.4
Blind Spike FQAC>	90/250	-	=	100/250	x 100	98%	98.4	94.2

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	70	70	0	4.6
Blind Replicate FQAC>	<50	<50		

Analyst's Report to Departmental Supervisor: Passes Analytical Q.C.

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: None Noted

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: All Samples between 50- [illegible]

DS check accuracy: (X) Passed ( ) Failed

NOTES:

DS check precision: (X) Passed ( ) Failed

NOTES:

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES:

Department Supervisor Data:

NAME Sammy Watson DATE 12-13-82 TIME 8:25

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed Sammy Watson

DATA SHEET # 82 632 C

000441

FQAC DATA REVIEW:

FQAC check blind replicates (precision): (X) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (30 accuracy): (X) Passed ( ) Failed

NOTES: One spike did not pass 3σ test however Accuracy lines for Thallium is based on limited data + 75% of spikes passed.

FQAC check blind spike (20 accuracy): ( ) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (X) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed Richard Daniel

DATA SHEET # 82 633 A DATA SHEET SERIES (A-C) 1 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000442

MANAGEMENT DATA:
Analyst(s) Name(s) [illegible] ✓
Date Samples Analyzed 12-21-82 Time [illegible]
Parameter (Metals) Aluminum USATHAMA Method # 13
Matrix 2 Category 3 Batch 4
Systems Calibration: (/) Passed ( ) Failed
Instrument # ID#
NOTES:

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 5, Page # 65,
File # .
NOTES:

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	50	49.5	49.7	
2.0X$_D$	100	[illegible]	98.9	
10.0X$_D$	200	199.7	21.0	
Blank	0	0	0	

Standard Curve Data
Corr. Coff.: 0.9999 Slope: 0.0220
Y-intercept: [illegible]

DATA:

ACW

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor =	Actual Concentration	FQAC Notes
009	2-3-58	23.5	10	235	
010	2-3-59	23.6	10	236	
011	2-3-60	25.3	10	253	
012	2-3-61 ✓	24.0	10	240 ✓	
013	2-3-62	32.3	10	323	
0129	2-3-63 ✓	17.8		17.8 ✓	
014	2-3-64	25.1	10	251	
015	2-3-65	10.6		10.6	
016	2-3-66	11.0		11.0	
Spike	2-3-67 ✓	100		100	
017	2-3-68	33.7	10	337	
Spike	2-3-69 ✓	24.4	10	244	
018	2-3-70	40.7	10	407	
019	2-3-71	34.0	10	340	
020	2-3-72	33.0	10	330	
021	2-3-73	22.6	10	226	
005	2-3-74	<10		<10	
002	2-3-75	<10		<10	
	- -				
	- -				

SUPPLEMENTARY DATA SHEET USED

DATA SHEET # 82 633 B

000443

Accuracy (Spikes)

	Found Value		Background Value	=	Recovered Concentration	÷	Expected Concentration Of Spike		% Recovery	WL 2σ	CL 3σ
Analyst Spike>	360	-	250	=	110	÷	100	X 100	110	144.1	121.0
Blind Spike FQAC>	____	-	____	=	100 / 244		100 / 250	X 100	100% / 97.6%	86.5	79.6

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	251	249	2.0	6.40
Blind Replicate FQAC>	240	178	62	____

Analyst's Report to Departmental Supervisor: Passes Minimum QC

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: None noted

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: All samples within 10-200 ug/L MDL

DS check accuracy: (X) Passed ( ) Failed

NOTES: ____

DS check precision: (X) Passed ( ) Failed

NOTES: ____

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: ____

Department Supervisor Data:

NAME Sammy Williams DATE 12-24-92 TIME 4:30

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed Sammy Williams

DATA SHEET # 82 633 C

000444

FQAC DATA REVIEW:

FQAC check blind replicates (precision): ( ) Passed ( ) Failed

NOTES: Analyst check of Replicates from one sample of Blind check out of RANGE Sampling problem

FQAC check blind spike (30 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I ( ) can (X) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (X) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

DATA SHEET # 82 635 A DATA SHEET SERIES (A-C) 3 OF 17

LONGHORN ARMY AMMUNITION PLANT
CONTAMINATION STUDY DATA MANAGEMENT FORM

000445

MANAGEMENT DATA:
Analyst(s) Name(s) [illegible]
Date Samples Analyzed _____ Time _____
Parameter (Metals) Barium USATHAMA Method # _____
Matrix 2 Category 3 Batch 4
Systems Calibration: (X) Passed ( ) Failed
Instrument # _____ ID# _____
NOTES: _____

ANALYTICAL RESULTS:
Designated Location of Permanent Lab Records: Book # 6, Page # 13,
File # _____.
NOTES: [illegible]

Standard Levels	Expected Concentration	Found Value #1	Found Value #2	Found Value #3
0.5X$_D$	[illegible]	[illegible]		
2.0X$_D$	[illegible]			
10.0X$_D$		197.6	1310	
Blank			0	

Standard Curve Data
Corr. Coff.: [illegible] Slope: [illegible]
Y-intercept: [illegible]

DATA:

ACY

Sample Point #	Lab I.D. #	Calculated Concentration Uncorrected For Dilution Factor	X Dilution Factor	= Actual Concentration	FQAC Notes
009	2-3-58			[illegible]	
010	2-3-59	30.0		30.0	
011	2-3-60	[illegible]			
012	2-3-61 ✓				
013	2-3-62	24.0		[illegible]	
012 D	2-3-63 ✓	[illegible]			
014	2-3-64	[illegible]		[illegible]	
015	2-3-65				
016	2-3-66				
Spike 2XD	2-3-67 ✓	180		180	
017	2-3-68	[illegible]		[illegible]	
Spike 5XD	2-3-69 ✓	[illegible]	10	543	
018	2-3-70	[illegible]		[illegible]	
019	2-3-71	[illegible]		[illegible]	
020	2-3-72	11.4		[illegible]	
021	2-3-73	[illegible]		[illegible]	
005	[illegible]	197.0		[illegible]	
002	[illegible]	[illegible]		[illegible]	
	- -				
	- -				

SUPPLEMENTARY DATA SHEET USED _____

DATA SHEET # 82 635 B

000446

Accuracy (Spikes)

	Found Value	- Background Value	= Recovered Concentration	Expected Concentration Of Spike	x 100	% Recovery	WL 2σ	CL 3σ
Analyst Spike>	[illegible]	[illegible]	[illegible]					
Blind Spike FQAC>	____	____	180	200	x 100	90%		
			543	500		108.6		

Precision (Replicates)

	Found Value I	Found Value II	Calculated Range	Established UCL For Found Range
Analyst Replicate>	[illegible]	[illegible]	[illegible]	
Blind Replicate FQAC>	28.1	139.5		

Analyst's Report to Departmental Supervisor: [illegible]

DEPARTMENTAL DATA REVIEW:

DS check calculations on samples noted by FQAC: (X) Passed ( ) Failed

NOTES: [illegible]

DS check on uncorrected concentrations for range requirement:
(X) Passed ( ) Failed

NOTES: [illegible]

DS check accuracy: (X) Passed ( ) Failed

NOTES: [illegible]

DS check precision: (X) Passed ( ) Failed

NOTES: [illegible]

DS check rejection trend criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: [illegible]

Department Supervisor Data:

NAME [illegible] DATE [illegible] TIME [illegible]

CERTIFICATION: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey.

Signed [illegible]

DATA SHEET # 82 635 C

000447

FQAC DATA REVIEW:

FQAC check blind replicates (precision): ( ) Passed (X) Failed

NOTES: Large d.frame must be Simple Replicate Problem all other Q.C. check out ANALYT PRECISION good overide PM

FQAC check blind spike (30 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check blind spike (20 accuracy): (X) Passed ( ) Failed

NOTES: _____

FQAC check trend rejection criteria: (X) Passed ( ) Warning ( ) Failed

NOTES: _____

FQAC sent memo report # _____ to Principle Investigator on _____.
date

FQAC DATA: NAME _____ DATE _____ TIME _____

Certification/Authorization: I (X) can ( ) cannot certify this data as being in compliance with the EPS quality assurance program established for the LSAAP Contamination Survey. I, furthermore, (X) can ( ) cannot) authorize its release for incorporation into USATHAMA DATA SYSTEM.

Signed _____

APPENDIX F

LISTING OF ALL COMPOUNDS (IDENTIFIED AND UNIDENTIFIED) IN SCREENING ANALYSIS OF WELL AND SURFACE WATERS

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
LISTING OF OTHER IDENTIFIED AND UNIDENTIFIED COMPOUNDS FOUND DURING HPLC SCREENING OF GROUNDWATER AND SURFACEWATER SAMPLES

Site ID	Analytical No.	Compound Name	Con. ug/l
Well 39	AADC09	UKNC26	45.
Well 39	AADC09	UKNC19	23.
Well 39	AADC09	UKNC20	18.
Well 39	AADC09	UKNC21	18.
Well 39	AADC09	UKNC25	77.
Well 39	AADC09	UKNC22	24.
Well 39	AADC09	UKNC23	16.
Well 39	AADC09	UKNC24	11.
Well 44	AAEC02	UKNC18	12.
Well 44	AAEC02	UKNC02	6.
Well 44	AAEC02	UKNC17	3.
Well 44	AAEC02	UKNC12	5.
Well 44	AAEC02	UKNC11	3.
Well 46	AAEC04	UKNC18	20.
Well 46	AAEC04	UKNC02	5.
Well 46	AAEC04	UKNC17	3.
Well 46	AAEC04	UKNC12	9.
Well 46	AAEC04	UKNC10	2.
Well 47	AAEC05	UKNC18	36.
Well 47	AAEC05	UKNC02	13.
Well 47	AAEC05	UKNC04	50.
Well 47	AAEC05	UKNC16	12.
Well 47	AAEC05	UKNC06	10.
Well 47	AAEC05	UKNC12	21.
Well 47	AAEC05	UKNC10	5.
Well 48	AAEC06	UKNC06	24.
Well 48	AAEC06	UKNC07	13.
Well 48	AAEC06	UKNC15	14.
Well 48	AAEC06	UKNC10	7.
Well 49	AAEC08	UKNC01	20.
Well 49	AAEC08	UKNC02	14.
Well 49	AAEC08	UKNC04	60.
Well 49	AAEC08	UKNC05	44.
Well 49	AAEC08	UKNC07	45.
Well 49	AAEC08	UKNC08	54.
Well 49	AAEC08	UKNC09	4.
Well 49	AAEC08	UKNC10	7.
Well 49	AAEC08	UKNC11	10.

Site ID	Analytical No.	Compound Name	Con. ug/l
Well 50	AAE009	UKN002	5.
Well 50	AAE009	UKN006	16.
Well 50	AAE009	UKN007	13.
Well 50	AAE009	UKN008	3.
Well 50	AAE009	UKN010	2.
Well 51	AAE010	UKN007	1.
Well 51	AAE010	UKN012	2.
Well 51	AAE010	UKN013	3.
Well 51	AAE010	UKN014	6.
Well 51	AAE010	UKN016	12.
SW014	AAG005	UKN006	11.

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
LISTING OF OTHER IDENTIFIED AND UNIDENTIFIED COMPOUNDS
FOUND DURING GC/EC SCREENING OF
GROUNDWATER AND SURFACE WATER SAMPLES

Site ID	Analytical No.	Test Name	CON ug/l
Well 101	AEF001	Beta-BHC	0.05
Well 109	AEF006	Aldrin	0.16
		Endosulfan I	0.07
Well 121	AEG002	Delta-BHC	0.11
		Endrin	0.11
Well 122	AEG001	Delta-BHC	0.06
		Endosulfan I	0.11
		p,p-DDE	0.07
		endrin	0.10
Well 123	AEG004	Endosulfan I	0.07
		p,p-DDE	0.17
		endrin	0.19
Well 33	AEH001	DDT	0.27
Well 35	AEH004	DDT	0.24
Well 37	AEH006	gamma-BHC	0.05
		beta-BHC	0.07
SW 001	AEH007	gamma-BHC	0.05
SW 011	AEI002	p,p-DDE	0.63
SW 012	AEI001	gamma-BHC	0.07
		delta-BHC	0.06
		beta-BHC	0.1
		p,p-DDE	0.38
SW 013	AEI004	p,p-DDE	0.56
SW 015	AEI006	beta-BHC	0.11
SW 017	AEI008	gamma-BHC	0.08
		beta-BHC	0.17
		p,p-DDE	0.35

LONGHORN ARMY AMMUNITION PLANT CONTAMINATION SURVEY
LISTING OF OTHER IDENTIFIED AND UNIDENTIFIED COMPOUNDS FOUND DURING GC/MS SCREENING OF GROUNDWATER AND SURFACEWATER SAMPLES

Site ID	Analytical No.	Test Name	CON ug/l
Well 101	ADN001	Dichloromethane	123.
Well 101	ADN001	Pentane	24.
Well 101	ADN001	Trichlorethene	28.
Well 101	ADN001	Hexane	2.
Well 101	ADO001	di-N-butylphenol	2.
Well 101	ADP001	phthalic acid	78.
Well 102	ADR001	4-decene,2,2-dimethyl	12.
Well 102	ADR001	2-pentanone,4-hydroxy-4-methyl	5.
Well 102	ADR001	3,4-hexanedione,2,2,5,5-tetramethyl-monooxime	7.
Well 102	ADR001	cyclohexane,chloro	5.
Well 102	ADS001	ethanol,2-(1,1-diethylethoxy)	12.
Well 102	ADS001	phenol	2.
Well 103	ADN003	Dichloromethane	45.
Well 103	ADN003	Pentane	3.
Well 104	ADN002	Dichloromethane	4.
Well 107	ADN004	Dichloromethane	2.
Well 107	ADN004	Pentane	1.
Well 107	ADN004	Trichloroethane	9.
Well 107	ADN004	Trichloromethane	1.
Well 107	ADN004	Trichloroethene	1.
Well 107	ADN004	Benzene	1.

Site ID	Analytical No.	Test Name	CON. ug/l
Well 107	ADO004	Glycine,N-acetyl-N-(trifluoroacetyl)-,methylester	4.
Well 107	ADO004	Cyclopentane,1-bromo-2-methoxy	2.
Well 107	ADO004	diethylphthalate	3.
Well 107	ADO004	di-N-butylphthalate	1.
Well 108	ADQ003	Dichloromethane	2.
Well 108	ADQ003	Toluene	24.
Well 108	ADR003	ethanol,2-(1,1 dimethylethoxy)	2.
Well 109	ADQ011	Dichloromethane	12.
Well 109	ADQ011	1,2-dichlorethane	1.
Well 109	ADQ011	Tetrahydrofuran	3.
Well 109	ADQ011	1,2-dichlorotehene	3.
Well 109	ADQ011	1,1,2-trichloroethane	45.
Well 109	ADQ011	Trichloroethene	29.
Well 109	ADR010	1,1'-bicyclohexyl	4.
Well 109	ADR010	ethanol,2-(1,1-dimethylethoxy)	4.
Well 110	ADN008	Dichloromethane	13.
Well 110	ADN008	1,1'-oxybisethane	2.
Well 110	ADN008	Pentane	1.
Well 110	ADN008	Trichloroethene	31.
Well 111	ADO006	butyric acid ester with p-hydroxybenzonitrile	3.
Well 112	ADN010	Dichloromethane	14.
Well 112	ADN010	1,1'oxybisethane	11.
Well 112	ADN010	Pentane	20.
Well 120	ADN007	Dichloromethane	108.
Well 120	ADO007	methanamine,N-methoxy	3.
Well 120	ADP007	Phosphoric acid	18.

Site ID	Analytical No.	Test Name	CON. ug/l
Well 122	ADQ002	Dichloromethane	1.
Well 122	ADQ002	1,1'-oxybisethane	2.
Well 122	ADQ002	Pentane	1.
Well 122	ADR002	4-decene,2,2-dimethyl	12.
Well 122	ADR002	2 pentanone,4-hydroxy-4-methyl	5.
Well 122	ADR002	3,4-hexanedione,2,2,5,5-tetramethyl-monooxime	7.
Well 122	ADR002	cyclohexane,chloro	5.
Well 122	ADR002	ethanol,2-(1,1-dimethylethoxy)	12.
Well 122	ADS002	phenol	2.
Well 124	ADQ004	Dichloromethane	7.
Well 124	ADQ004	Trichloromethane	212.
Well 124	ADQ004	Pentane	1.
Well 124	ADQ004	Methylcyclopentane	24.
Well 124	ADQ004	2-chlorobutane	5.
Well 124	ADQ004	Tetrachloroethene	4.
Well 124	ADR004	ethanol,2-(1,1-dimethylethoxy)	2.
Well 125	ADQ009	Dichloromethane	7.
Well 125	ADQ009	1,2-dichloroethane	2.
Well 125	ADQ009	2,2-dichloroethane	8.
Well 125	ADQ009	1,1,2-trichloroethane	354.
Well 125	ADQ009	Toluene	55.
Well 125	ADR009	1,1'bicyclohexyl	4.
Well 125	ADS009	cyclohexane,1,3-dichloro	18.
Well 125	ADS009	2-propanone,1,3-dichloro	38.
Well 125	ADS009	2H-pyran-4-ol,tetrahydro-2-(iodomethyl)-6-methoxy	5.

Site ID	Analytical No.	Test Name	CON. ug/l
Well 126	ADQ007	Dichloromethane	4.
Well 126	ADQ007	Trichloromethane	1.
Well 126	ADR007	1,1'-bicyclohexyl	9.
Well 126	ADR007	ethanol,2-(1,1-dimethylethoxy)	16.
Well 126	ADS007	2-dibenzofuranol	3.
Well 129	ADU006	1,1'-bicyclohexyl	5.
Well 129	ADU006	di-N-butylphthalate	2.
Well 129	ADV006	ethanol,2-(1,1-dimethylethoxy)	12.
Well 129	ADU006	diethylphthalate	73.
Well 130	ADT010	Dichloromethane	153.
Well 130	ADT010	Tetrahydrofuran	46.
Well 130	ADT010	Trichloroethene	9.
Well 130	ADV009	ethanol,2-(1,1-dimethylethoxy)	9.
Well 131	ADU004	1,1'bicyclohexyl	9.
Well 131	ADV004	ethanol,2-(1,1-dimethylethoxy)	24.
Well 131	ADU004	diethylphthalate	52.
Well 33	ADU001	diethylphthalate	2.
Well 34	ADU003	1,1'-bicyclohexyl	11.
Well 39	ADT009	Dichloromethane	95,960.
Well 39	ADT009	Trichloroethane	1120.
Well 39	ADU008	ethanol,2-(1,1-dimethylethoxy)	9.
Well 43	ADW001	Dichloromethane	30.
Well 43	ADW001	1,2-dichloroethene	3.
Well 43	ADW001	1,2-dichloroethane	12.
Well 43	ADW001	1,1,2-trichloroethane	2.
Well 43	ADW001	Trichloroethene	63.
Well 43	ADY001	cyclohexanol,2-bromo	5.
Well 43	ADY001	diethylphthalate	330.

Site ID	Analytical No.	Test Name	CON. ug/l
Well 44	ADW003	Dichloromethane	251.
Well 44	ADW003	1,2-dichloroethane	2.
Well 44	ADW003	Pentane	9.
Well 44	ADW003	Trichloroethene	36.
Well 44	ADW003	Hexane	1.
Well 44	ADY003	diethylphthalate	200.
Well 45	ADW005	Dichloromethane	206.
Well 45	ADW005	1,2-dichloroethene	1.
Well 45	ADW005	1,2-dichloroethane	5.
Well 45	ADW005	Tetrahydrofuran	53.
Well 45	ADW005	Pentane	7.
Well 45	ADW005	Trichloroethene	63.
Well 45	ADX005	di-N-butylphthalate	16.
Well 46	ADW007	Dichloromethane	7.
Well 46	ADX006	di-N-butylphthalate	12.
Well 46	ADY006	naphtalene,5-ethyl-1,2,3,4-tetrahydro	4.
Well 47	ADW002	Dichloromethane	712.
Well 47	ADW002	1,2-dichloroethene	45.
Well 47	ADW002	1,2-dichloroethane	17.
Well 47	ADW002	Pentane	5.
Well 47	ADW002	Cyclohexane	8.
Well 47	ADW002	Trichloroethene	198.
Well 47	ADX002	benzene,1,2,3-trimethyl	2.
Well 47	ADX002	benzothiazole,2-butyl	6.
Well 47	ADY002	diethylphthalate	3.
Well 47	ADX002	di-N-butylphthalate	5.
Well 47	ADY002	cyclohexane,3-(2-propynyl)	5.
Well 47	ADY002	diethylphthalate	240.

Site ID	Analytical No.	Test Name	CON. ug/l
Well 48	ADW011	1,2-dichloroethene	56.
Well 48	ADW011	Trichloromethane	24.
Well 48	ADW011	1,1,2-trichloroethane	72.
Well 48	ADW011	Trichloroethene	1232.
Well 48	ADW011	Tetrachloroethene	72.
Well 48	ADY010	diethylphthalate	3.
Well 48	ADX010	di-N-butylphthalate	8.
Well 49	ADZ002	1,2-dichloroethene	126.
Well 49	ADZ002	1,2-dichloroethane	800.
Well 49	ADZ002	1,1,2-trichloroethane	2150.
Well 49	ADZ002	Trichloroethene	7200.
Well 49	AEA002	benzene,1-ethyl-4-methyl	12.
Well 49	AEA002	1-hexanol,2-ethyl	19.
Well 49	AEA002	benzaldehyde	30.
Well 49	AEA002	benxenemethanol	17.
Well 49	AEA002	ethanone,1-phenyl	68.
Well 49	AEA002	heptadecane	34.
Well 49	AEA002	phosphoric acid, triethylester	84.
Well 49	AEA002	hydroxylamine, O-decyl	52.
Well 49	AEA002	naphthalene,1-methyl	31.
Well 49	AEA002	dimethylphthalate	52.
Well 49	AEA002	decane,2-methyl	6.
Well 49	AEA002	benzene,1,2,3-trimethyl	13.
Well 49	AEA002	diethylphthalate	35.
Well 49	AEB002	pentanoic acid	4.
Well 49	AEB002	tetradecanoic acid	4.
Well 49	AEB002	butanoic acid,4 chloro	2.
Well 49	AEB002	4-methylphenol	3.
Well 49	AEB002	phthalic acid,monomethyl ester	8.
Well 49	AEB002	benzoic acid	32.
Well 49	AEB002	benzene acetic acid	215.

Site ID	Analytical No.	Test Name	CON. ug/l
Well 50	ADZ003	Dichloromethane	86.
Well 50	ADZ003	Tetrahydrofuran	21.
Well 50	ADZ003	1,2-dichloroethene	118.
Well 50	ADZ003	Trichloromethane	94.
Well 50	ADZ003	1,1,2-trichloroethane	2295.
Well 50	AEA003	heptadecane,2-methyl	50.
Well 50	AEA003	naphthalene	22.
Well 50	AEA003	dodecane,2,6,11-trimethyl	24.
Well 50	AEA003	naphthalene,1-methyl	30.
Well 50	AEA003	undecane,4,6-dimethyl	2.
Well 50	AEA003	tetradecane,2-methyl	5.
Well 50	AEA003	eicosane,10-methyl	8.
Well 51	ADZ001	Pentane	1.
Well 52	ADW009	Dichloromethane	24.
Well 52	ADW009	Tetrahydrofuran	10.
Well 52	ADW009	Trichloromethane	10.
Well 52	ADX008	di-N-butylphthalate	7.
Well 53	ADW008	Dichloromethane	48.
Well 53	ADW008	Pentane	3.
Well 53	ADX008	di-N-butylphthalate	6.
SW001	ADZ007	Dichloromethane	7.
SW001	AEB006	4-methylphenol	3.
SW009	ADZ011	Trichloroethene	2.
SW011	AEA004	2-hexanone,5-bromo	6000.
SW012	ADZ010	Dichloromethane	9.
SW013	ADZ008	Dichloromethane	6.

Site ID	Analytical No.	Test Name	CON. ug/l
SWC14	AEC001	Dichloromethane	87.
SWC14	AEC001	2-pentanone	23.
SWC14	AEC001	Pentane	2.
SWC14	AEC001	Trichloroethene	45.
SWC14	AEC001	Tetrachloroethene	35.
SWC14	AED001	ethanol,2-(1,1-dimethylethoxy)	46.
SWC14	AED001	phosphoric acid,triethylester	345.
SWC14	AED001	ethanol,2-(1,1-dimethylethoxy)	3.
SWC14	AEE001	phosphoric acid	4.
SWC14	AEE001	2-nitrophenol	5.
SWC15	AED008	1,1'bicyclohexyl	32.
SWC15	AEE008	phenol	12.
SWC15	AEE008	tetradecanoic acid	35.
SWC16	AEE007	phenol	14.
SWC17	AEC003	pentane	1.
SWC17	AED003	1,1'-bicyclohexyl	17.
SWC17	AED003	2-quinolinecarboxaldehyde, 8-hydroxy,oxime	10.
SWC17	AEE003	phenol	10.
SWC19	AED005	2-hexanone,6-bromo	346.
SWC19	AED005	cyclohexane,(cyclopentylmethyl)	27.
SWC19	AED005	phenol	8.
SWC20	AEE002	phenol	12.

APPENDIX G

MANUAL FIELD SAMPLING PROTOCOL

AND SAMPLE LOG BOOK

Manual

000461

Field Sampling Protocol and Sample Log Book for Environmental Contamination Survey of the Longhorn Army Ammunition Plant, Marshall, Texas

Prepared For

Thiokol Corporation/Longhorn Division
Marshall, Texas

For Submission To

U.S. Army Toxic and Hazardous Materials Agency
Aberdeen Proving Grounds, MD 21010

Prepared By

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Submitted
November 10, 1982

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INTRODUCTION

The importance of a well-planned, well executed and documented sampling program cannot be overstated. It is the foundation on which the analyses and, ultimately, all decisions are based. Because of this fact, EPS has developed the following document to provide in one book all of the information which should be needed by the field sampling crew to comply with the LHAAP contamination survey Sope of Work and, additionally, to insure a specific predetermined protocol is regorously implemented. This document contains the sampling plan which will be used. Deviation from this plan cannot be accepted except under the most unusual of circumstances and then only with the approval of the FQAC and the proper documentation.

General Sampling Sites and Required Sample and Analytical Categories

The monitoring station locations, parameter coverage, and sampling frequency have been specified by USATHAMA in a manner suitable to meet all objectives of this study. The design has taken into consideration past and existing ambient monitoring programs which may have been conducted, as well as the existing environmental conditions and past history associated with the utilization of the different sampling site locations.

Table 1A provides a list of analytical categories being investigated during this study. Tables 2A-4A provide a brief sampling point description and listing of stations to be sampled and analytical categories to be tested associated with well water, surface water/sediments and soils respectively. Figures 1A-6A provide the general location of well water, surface water/sediment and soil sampling points as well as site specific locations for selected monitoring well sites.

Table 1A

Analytes Determined for the Longhorn Army Ammunition Plant Survey

Analytical Category	Analyte	Matrix
1	1,3 Dinitrobenzene (1,3 DNB)	All
	2,4,6-Trinitrotoluene (2,4,6 TNT)	All
	1,3,5-Trinitrobenzene (1,3,5,-TNB)	All
	2,4-Dinitrotoluene (2,4 DNT)	All
	2,6-Dinitrotoluene (2,6-DNT)	All
	Nitrobenzene (NB)	All
2	Nitrates	All
	Nitrites	All
	Phosphates	All
	Sulfates	All
	Chloride*	All
	Fluoride*	All
	Chromate*	All
	Thiocyanate*	All
	Acetate*	All
	Cyanide*	All
3	Aluminum	All
	Antimony	All
	Barium	All
	Cadmium	All
	Chromium	All
	Lead	All
	Manganese	All
	Strontium	All
	Mercury*	All
	Copper*	All
	Zinc*	All
	Arsenic*	All
	Beryllium*	All
	Nickel*	All
	Selenium*	All
	Silver*	All
	Thallium*	All
4	GC-MS (Volatiles)	W
	GC-MS (Acid fraction)	All
	GC-MS (Base/neutral fraction)	All
5	HPLC (Screen of general organic compounds)	All
6	GC-EC (Screen for pesticides, organochlorines, PCB's, and related compounds)	All

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*Semi-Quantitative Determination
W=Surface/Well water
S = Sediment and Soil

Table 2A

Groundwater Sampling Points and Analytical Requirements

Sample Point	Analytical Category	Approximate Location
101	123456	N Boundary, NW of Plant 2
102	123456	N Boundary, N of Plant 3
103	123456	E of Magazine Area, near Starr Ranch Rd
104	123456	E of Inert Burning Ground
105	123	E of Plant 3, near Independence Ave.
106	1236	NW of Igniter Area
107	12345	E of Static Test Area
108	123456	SSE of Harrison Bayou inlet into Coddo Lake
109	12345	E Boundary, N of Long Point Rd.
110	123456	S Boundary, E of Harrison Bayou
111	123456	SW Boundary, W of Ave. P
112	123456	W Boundary, W of Classification Yard
113	1	NE of TNT Waste Disposal Plant
114	1	WNW of TNT Area, Near 1st Street
115	1	TNT Area, Near Ave K
116	1	NE of TNT Area, Near Ave D
117	1	ENE of TNT Area, Near Ave D and 18th St
118	1	SE of TNT Area, Near 18th St
119	1	SSW of TNT Area, Near 18th St
120	123456	NE of Intersection, Ave P and Ave Q
121	1236	SSW of Current Landfill
122	123456	E of Old Landfill
[illegible]	1236	WNW of Burning Ground
124	123456	NNW of Burning Ground
125	123456	NNE of Burning Ground
126	123456	SE of Burning Ground
127	123	WNW of Ground Signal Test Area
128	12345	NE of Ground Signal Test Area
129	12345	SSE of Ground Signal Test Area
130	12345	WNW of South Test Area
131	12345	NE of South Test Area
132	123	SE of South Test Area

Table 2A (Continued)

Sample Point	Analytical Category	Approximate Location	AEHA Desig.
33	123456	Existing 2" well at Current Landfill	BH20
34	123456	Existing 2" well at Current Landfill	BH19
35	1236	Existing 2" well at Current Landfill	BH18
36	1236	Existing 2" well at Old Landfill	BH16
37	123456	Existing 2" well at Old Landfill	BH14
38	123	Existing 2" well at Burning Ground	BH22
39	12345	Existing 2" well at Burning Ground	BH 5
40	123	Existing 2" well at Burning Ground	BH 7
41	123	Existing 2" well at Burning Ground	BH 3
42	123	Existing 2" well at Burning Ground	BH 1
43	12345	Existing 2" well at Burning Ground	BH 8
44	12345	Existing 2" well at Burning Ground	BH 9
45	12345	Existing 2" well at Burning Ground	BH10
46	12345	Existing 2" well at Burning Ground	BH 4
47	12345	Existing 2" well at Burning Ground	BH 2
48	12345	Existing 2" well at Burning Ground	BH 6
49	12345	Existing 2" well at Burning Ground	BH11
50	12345	Existing 2" well at Burning Ground	BH21
51	12345	Existing 2" well at Old Landfill	BH12
52	12345	Existing 2" well at Old Landfill	BH13
53	12345	Existing 2" well at Current Landfill	BH17

TABLE 3A

Surface Water/Sediment Sampling Points and Analytical Requirements

Sample Point	Water Analyses	Sediment Analysis	Approximate Location
001	123456	12345	North Bayou inlet into Caddo Lake
002	123	123	North Bayou, E of Plant 3
003	16	1	North Bayou, W of Plant 3
004	123	-	Foundation of TNT Waste Disposal Plant
005	123	123	Pumphouse Pond in TNT Area
006	1	1	NE of TNT Area
007	1	1	S of TNT Area, Near Avenue N
008	1	1	S of TNT Area, Near Avenue E
009	123456	12345	At W Boundary, S of Admin. Area
010	123	123	Central Creek, E of Avenue P
011	123456	12345	NW of Current Landfill
012	123456	12345	Central Creek Inlet into Caddo Lake
013	123456	12345	Harrison Bayou Inlet into Caddo Lake
014	12345	12345	Rocket Motor Casing Washout Pond
015	123456	12345	NW of Burning Ground
016	12345	12345	NW of Flashing Area
017	123456	12345	E of Old Landfill
018	123	123	Harrison Bayou, S of Avenue Q
019	123456	12345	At S Boundary, Harrison Bayou
020	12345	12345	Saunders Branch inlet into Caddo Lake
021	123	123	Saunders Branch, S of Longpoint Rd.

TABLE 4A

Soil Sampling Points and Analytical Requirements

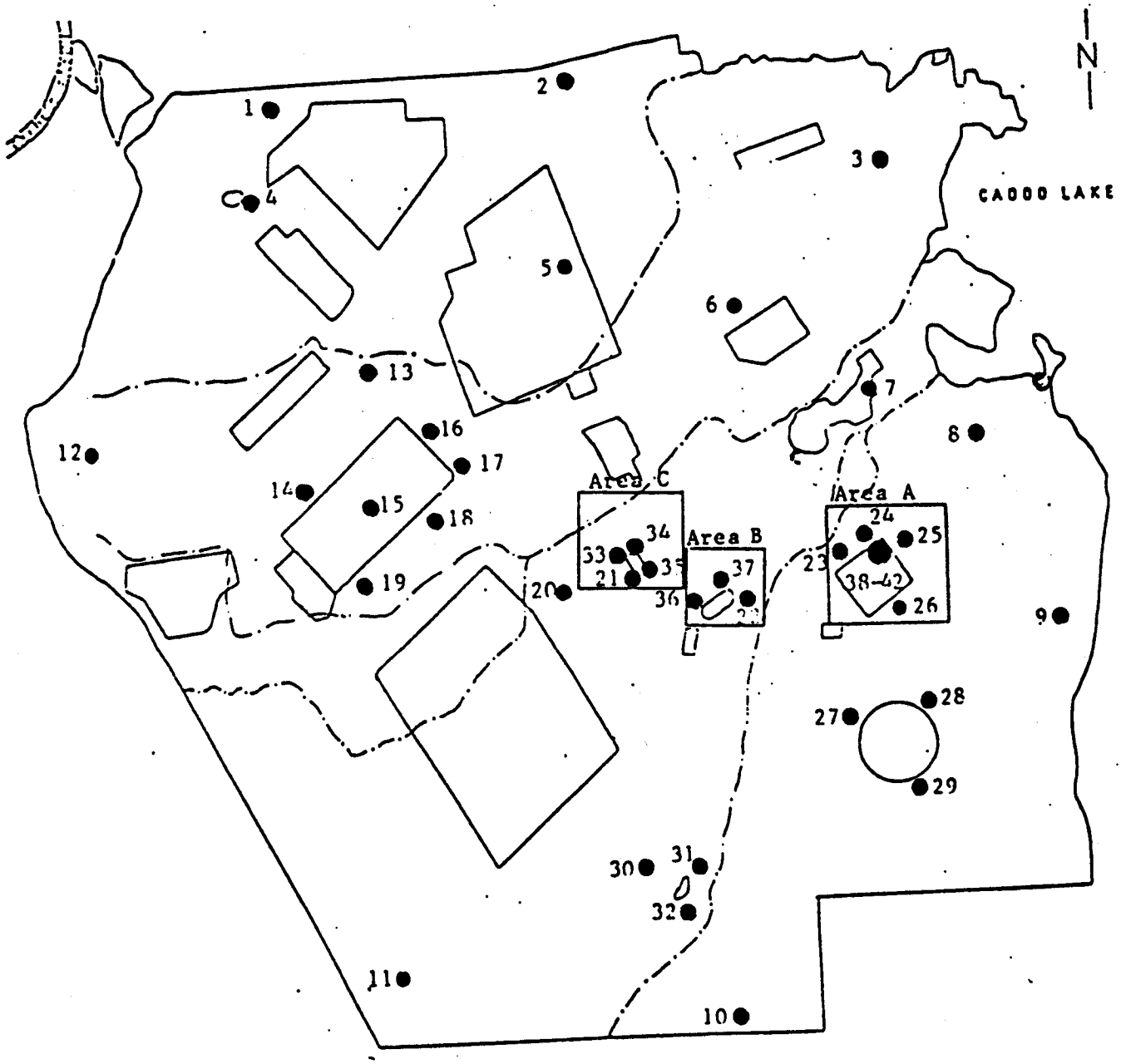
Area #	Sample Type	# Sample Points*	Analytical Category	Area Description
010	1' Cores	3	123(45)**	Inert Burning Ground
020	1' Cores	3	1	TNT Waste Disposal Plant
030	1' Cores	8	1	TNT Area
040	1' Cores	3	123(45)**	South Test Area
050	1' Cores	3	123(45)**	Ground Signal Test Area
060	1' Cores	3	123(45)**	Static Test Area
070	5' Cores	5	123(45)**	Old Landfill
080	5' Cores	3	1	Suspect TNT Burial Site

* Each area will have the number of sample points specified above and identified, for example, as 0101, 0102, and 0103, or 0701T, 0701B, 0702T, 0702B, etc.

** GC/MS and HPLC will be performed only on the composite sample (identified for example as 010C) made up of equal portions taken from each of the sample points in an area. For area 070 a composite sample will be made up of equal portions taken from each of the upper sections of the five-foot cores and one made from the lower sections (identified as 070CT and 070CB, respectively).

FIGURE 1A

LONGHORN ARMY AMMUNITION PLANT
MONITORING WELL LOCATIONS *

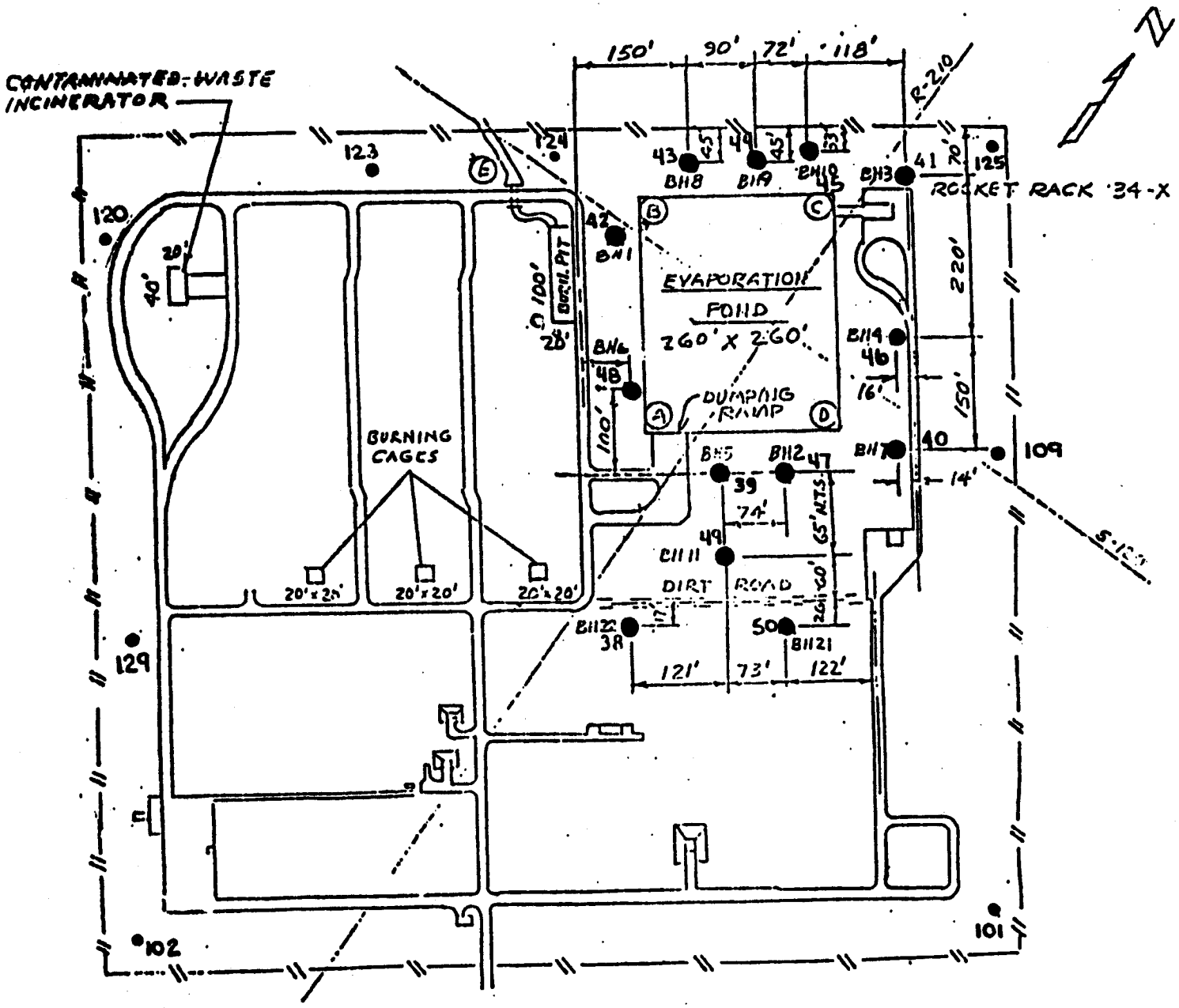


* SPECIFIC LOCATIONS OF EXISTING AEHA WELLS DEPICTED ON FIGURES 4A-6A

FIGURE 4A

000471

LONGHORN ARMY AMMUNITION PLANT
EXISTING AEHA WELLS NEAR EVAPORATION
POND IN THE BURNING GROUNDS



The Preparation and Selection of Specific Sampling Sites

No. 1: Monitoring well sampling site preparation. Upon arrival at the monitoring well sampling site, the upper well casing shall be cleaned using approved water and wiped dry befor unplugging. A clean piece of polyethylene plastic sheet shall be placed on the ground to protect against possible contaminants caused by sampling equipment touching the ground. The height of the water column shall be determined and a calculation done to determine the standing volume of water in the well casing. Five times this calculated volume of standing water shall be removed prior to the extraction of any well water samples for analysis. Table 5A contains a list of standing water heights with associated water volumes for 2" monitoring wells. The purged water shall be bailed out into a calibrated pail in order to determine volume removed. The pail shall be attached via a hook to the existing well protection pipes and the bailing pipe shall be coiled into the pail as the bailer is removed from the well. Before dumping the contents of the pail, the conductivity of the water which has been purged out will be determined. If the well recharge rate is very slow, i.e., six hours or more required to achieve 90% recovery an alternate purging method may be used. This method will involve the bailing of the well twice to remove all standing water, allowing a minimum of 16 hours between the bailing cycles and after the final cycle before the sample is collected. Once the appropriate volume has been bailed from the test well, the well water sample can be collected as outlined in the subsequent section.

No. 2: Surface Water Sampling Site Selection. The surface water sampling sites have been generally located on Figure 2B. The exact location of the surface water sampling sites shall be determined at the time of sampling. The determination shall be jointly agreed to by representatives of EPS and the LHAAP representative. The site should be chosen for their ease of sampling and for their representativeness of the water course under investigation. Attempts should be made to select the site which has relatively calm or slow moving water. Sampling sites

TABLE 5A

Standing Water Volumes in a Two-Inch Monitoring Well

Height of Water Column (ft)	Standing Volume of Water (gal)	Required Purge Volume (gal)
10	1.63	8.15
11	1.79	8.96
12	1.96	9.78
13	2.12	10.50
14	2.28	11.41
15	2.44	12.22
16	2.61	13.04
17	2.77	13.86
18	2.93	14.67
19	3.10	15.48
20	3.26	16.30
21	3.42	17.12
22	3.59	17.93
23	3.75	18.74
24	3.91	19.56
25	4.08	20.38
26	4.24	21.19
27	4.40	22.00
28	4.56	22.82
29	4.72	23.64
30	4.89	24.45
31	5.05	25.26
32	5.22	26.08
33	5.38	26.89
34	5.54	27.71
35	5.70	28.52
36	5.87	29.34
37	6.03	30.15
38	6.19	30.97
39	6.36	31.78
40	6.52	32.60
41	6.68	33.42
42	6.85	34.23
43	7.01	35.04
44	7.17	35.86
45	7.34	36.70
46	7.49	37.49
47	7.66	38.30
48	7.82	39.12
49	7.99	39.94
50	8.15	40.75

should be located, if at all possible, upstream from manmade water course obstructions such as bridges and roadway culverts. Prior to the sampling at any of these points, the contractor will be responsible for providing a means of marking the sampling point to insure that a reoccupation of the sampling site can be accomplished within a reasonable period of time (3/4 iron pipe with Station # inscribed). The contractor will also make a permanent record of these sampling points on an installation map which will be provided by the LHAAP representative.

No. 3. Sediment Sampling Point: The sediment sampling points will be at the same location as the surface water sampling points. The specific selection criteria outlined above takes into consideration the requirements for identification of a specific sampling point for sediment analyses.

No. 4: Soil Sampling Point Selection and Preparation. The general areas of soil sampling have been indicated on Figure 3A. Within each of these areas the exact sampling points remain to be selected. This process will take place by a joint inspection with a representative of EPS, USATHAMA and a representative of LSAAP. The contractor will mark each of the specific five sampling points within each sampling area, which will be sampled for surface soils. The contractor will be responsible for developing a sketch of each area and the location of the representative sampling sites. Prior to the collection of any sample at any one of the points within the eight identified areas, the sampling crew will carefully remove all surface vegetation, rocks, leaves, and other organic debris. An area of approximately four feet square should be prepared in this way in order to insure no contamination from surface organic material.

The Collection of Samples

No. 1: Well Water. After the well has been prepared as outlined above, well water samples can be drawn for the variety of analyses to be conducted. The field sampling crew should consult the LHAAP, groundwater sampling log sheet (Matrix 1) to determine the exact type and number of specific samples which are

required at the particular well being sampled. The log book will indicate the sampling site identification number for each bottle as well as the specific categories being tested and whether or not duplicate samples will be required for this particular station. Each log sheet will contain data on the ground water status and volumes which need to be removed from each well. Prior to filling the bottles both the bottles and their caps will be thoroughly rinsed with the well water being sampled. The field technicians will take every precaution to insure that the sample bottles and well samples are not contaminated by surrounding soil or wind-blown material. After the bottles have been rinsed they are to be filled quickly and capped. In order to insure that no cross contamination takes place during sampling of ground water for the Longhorn Army Amunition Plant Contamination Survey, EPS Laboratories will install a discrete PVC Bailer in each of the 53 monitoring wells. This bailer will pre-cleaned at EPS's Laboratory and will be used only in this pre-designated well site. For those monitoring wells which require modified or protracted bailing operations, the sampling equipment will be temporarily left hanging inside the wells throughout the sampling period.

No. 2: Surface Water Sampling. Surface water samples will be collected directly in the bottles provided for use by EPS. The field sampling technician will wade into the creek or stream at the pre-designated location and will hold the sample bottle upstream from his location at a depth equal to approximately one half of the total depth of the sampling point. Alternately samples may be taken in the sample bottles with a hand held apparatus which can be used from a boat off a bridge. The technician will remove the cap from the bottle and allow the bottle to be filled at the appropriate depth. The first sample taken in each bottle will be discarded and used to rinse the field sampling container. The field sampling technician will repeat this process to collect his field sample. The field sample will be immediately capped after collection. The field sampler will take every precaution to insure that bottom sediments are not disturbed to the point where they are collected

in the water sample. It should be noted that bottom sampling may be taking at the same time as the collection of water samples (immediately after water samples).

No. 3: Sediment Sampling. Sediment samples will be taken at each of the 20 sites listed in Table 3A. The sampling at each station will consist of the collection of at least five (5) two inch cores of surface sediment, which will be taken across the stream profile. These cores will be taken with a one foot long, two inch inside diameter stainless steel coring device with lexan core liners. The cores will be placed in a one gallon glass container. Enough material will be collected to fill a one gallon glass container with sedimentary deposits. The field technician should collect extra cores at various locations across the stream profile in order to insure that one full gallon of sedimentary material is collected at each site. As in the case with water samples, all of the coring devices shall be thoroughly washed with deionized water after the collection of samples from each individual station and the pre-cleaned lexan liner changed to avoid any cross contamination of future sampling sites.

No. 4: Soil Samples. Soil samples will be taken from each of the eight areas indicated in Figure 3A and described on Table 4A. Within each of these eight areas, several discreet one gallon samples will be collected. Each of these discreet samples will be made up of several cores taken in a four foot square area. The samples will be collected with a one foot long, one and one half inch inside diameter stainless steel coring tube or a small hand held auger. Approximately eight to 12 cores will be collected to fill the one gallon bottle in each of the five sampling points associated with each of the eight areas designated in Figure 3A. A total of 31 specific sampling sites will be sampled. The field sampling technicians will be collecting one duplicate sample in every one of the six general sampling areas (as designated in the soil sampling log book Matrix 4). In those cases where duplicate samples are being taken, they should be done simultaneously and every other core removed from the sampling site should be placed in an alternate one gallon sample container. All sampling equipment should be thoroughly rinsed with deionized water between each specific sampling site to avoid any possible cross contamination. At

several locations, five foot deep cores will be taken and these cores split in an upper and lower half to determine the potential location of specific contaminants. This will be accomplished by driving a two inch core one foot into the ground and removing the material for analysis and then by augering down one foot and taking an additional one foot core from this location and so on down to the five foot level. This methodology will elliminate the potential for cross contamination of a single five foot core driven from the surface down to the five foot level.

Treatment in the Field

A great deal of the sample treatment will be accomplished once the samples are received at the analytical laboratory. However, we will review each analytical category being sampled for and any special treatment which is necessary for water samples being taken for each of these samples. Soil Samples will not require any special sampling treatment. Samples being taken for analytical category one and five, which will be analyzed by high performance liquid chromatography (HPLC), will not have any field preservative added to them. These samples will be collected in a one gallon amber bottle. They should be filled to the top of the bottle and sealed as tightly as possible. These samples should be stored from the point of collection at 4 ^{o}C until they are delivered to the laboratory.

Samples being collected for analytical category number two from wells and surface water sites will also not be preserved in the field in any way. These samples will be collected in one quart amber bottles which have been stored with deionized water in them. The deionized water will be poured out, the sample collected and filled to the top of the bottle, and the cap immediately placed on the bottle. These samples will also be stored at 4 ^{o}C until their arrival at the main laboratory.

Samples collected for analytical category number three from well waters will not be preserved in any way. They will be stored at 4 ^{o}C after collection and after arrival at the main

laboratory they will be filtered and then preserved with nitric acid to a pH of less than two.

Samples collected for analytical category number three from surface waters will be preserved in the field, using nitric acid. One half of a millimeter of Ultrix Nitric Acid will be added to each of these samples before they are capped and stored at 4 ^{o}C.

Samples collected for analytical category number four will require the collection of a one gallon water sample as well as a small 40 ml water sample (collected in duplicate). Neither of these two samples will be preserved; however, care should be taken to insure that the 40 ml sample collected in the specially provided vial is filled to the very top and that no air space exist prior to the placement of the vial cap back on the sample. Both the 40 ml sample and the one gallon sample destined for analysis in category four will be stored at 4 ^{o}C.

Samples collected for analytical category number six will require the collection of samples in one gallon amber bottles. Once again these samples will not be preserved in the field; however, they should be stored at 4 ^{o}C prior to reaching the main analytical laboratory.

Labeling and Logging-in of Field Samples

The positive identification of field samples requires that a systematic approach be taken to the labeling and recording of collection data at each specific sampling site. Therefore, a log book system has been developed and incorporated into this document for use during this survey.

There are four specific log books provided, one for each matrix type. These log books are located on the pages listed below.

Matrix/Sampling Site	Log Book Pages
1/Groundwater	30-135
2/Surface Water	136-142
3/Sediments	143-146
4/Soils	147-152

In association with the sampling log books provided, a complete set of stick-on labels and tie-on tags have been prepared for each sample bottle to be collected. These labels are contained within individual packets which have been identified for each station. The field sampling technician should consult the appropriate log book to check on the number and kind of samples to be collected at each site. Once he has collected all of the samples, the bottles should be thoroughly wiped dry, then the packet of labels associated with each sampling site should be removed from its box and each label affixed to the appropriate bottle. Additionally, each tag should be tied or wired to the appropriate bottle as well. The field sampling technician should not leave a particular sampling site until all of the labels provided are attached to the appropriate bottle which now contains the sample. In those cases where duplicate sets of samples are being taken as designated on the field sampling sheets, two packets of labels are provided for the duplicate bottles which will need to be collected. The labels provided in the individual packets have already had the sampling station number, the matrix number, and the analytical category number affixed to them. It will be the responsible of the field sampling technician to put the sampling time and sampling date, as well as checking the appropriate field preparation notes and signing each tag with his initials. Once all of the samples have been collected, labeled, and tagged, the field technician will be responsible for checking the appropriate boxes on the field log book and writing down the date and time of the field sampling and any other pertinent notes in the boxes provided. Once all of the samples have been collected and checked in the manner outlined above, the field sampling technician will initial in the box provided in each line, or on each sheet of the log book. The initialling in this box indicates that all of the samples have been collected and checked and are now ready for storage for ultimate transportation to the laboratory. All of the different size and type bottles used in the collection of field water samples should be placed back into their original shipping containers. Once each container has been filled with bottles, a sample manifest will be prepared as discussed in a subsequent section.

Soil and sediment samples will be labeled and logged in in their respective log books. A complete set of tags has been provided for all soil and sediment samples just as was done with the water samples. In the case of soils and sediment samples, however, only one sample (two samples in case of duplicate stations) will be collected at each site. Although this will be simpler than the water sampling, because of the fact that only one sample will exist from each site, the importance associated with that sample will be much greater for there will be no chance for utilization of alternate samples should a sample be found to be nonexistant. Therefore, upon collection of a particular soil sample, the bottle should be wiped clean and the stick-on label should be affixed immediately. The appropriate information which should be provided by the field technician should be added on to the already partially completed label. Additionally, the tag provided should be wired onto the neck of the bottle in a secure fashion and the same information should be added onto the tag. The appropriate boxes should be checked and filled in on the sediment and soil log book, and once the sample has been labeled and secured, the field sampling technician should sign the particular line of the log book indicating that a complete sample had been taken and identified for future use.

The Preparation of the CDIR Form 13-2.1, 1 September, 1978

The chief of the field sampling crew will be responsible for making an entry on the CDIR Form 13-2.1, 1 September, 1978, for each sample bottle taken during this survey. A copy of this form is included as Figure 7A. In the upper left hand corner of this form there are seven slots under the title of Gang Punch. Slots 1 and 2 should be filled in with the initials LS. Slot 3 and 4 should have the initials SA. Slot 5 should have the initials C. Slot 6 and 7 will vary depending on the type of sample being collected. For our use the following initials will be placed in slots 6 and 7 as is needed:

1. GW -- Groundwater
2. SW -- Surface Water
3. SE -- Sediments
4. SO -- Soils

INSTALLATION RESTORATION

SAMPLING AND ANALYSIS - CHEMICAL

CARD PUNCH

1	3	5	7
INS	FA	T	FIL
	SAC		

1	8	13	16	20	30	34	40	42	48	54	56	58	68	66	70	74	76	78	80
	SAMPLE DATE	SMPL PRGRM	SITE TYPE	SITE IDENTIFICATION	SAMPLE DEPTH	S C	ANALYSIS DATE	LAB	SAMPLE NUMBER	TEST NAME	MTH	MEA BOO	MEA MANTISSA	MEA EXPON	UNITS	ACCUR	PRE	INS TR	ANA-LYST
				SAMPLE									SAMPLE						

INS = INSTALLATION
FA = FUNCTIONAL AREA
T = DATA TYPE
FIL = DATA FILE

SC = SAMPLING TECHN. CODE
MTH = METHOD
MEA = MEASUREMENT
BOO = BOOLEAN

PRE = PRECISION
INSTR = INSTRUMENT
EXPON = EXPONENT
ACCUR = ACCURACY

REVISED 1-78

FIGURE 7A

000481

Columns number eight through 12 need to be filled in with the Julian date for sample collection. For the purposes of this project, the Julian date will be construed as meaning the numerical day of the year preceded by the year date. Therefore, January 1, 1982, will be 82001 and November 16, 1982, will be 82320. Columns 13-15 should be filled in with the initials PRI (Preliminary Sruvey Phase I). Column 16-19 should be filled in with the site type which will be a four letter abbreviation for the particular types of areas to be sampled and will provide you with the following list which may be used during the study:

1. Creek -- (CREK)
2. Ditch or Drainage -- (DTCH)
3. Lake -- (LAKE)
4. Pond -- (POND)
5. River -- (RVER)
6. Spring -- (SPRG)
7. Stream -- (STRM)
8. Standing Water -- (STWA)
9. Sump -- (SUMP)
10. Soil Surface -- (SURF)
11. Well -- (WELL)

Columns 20-29 should be filled in with the site identification which should be left justified and should be listed as LHAAP and the Station number. Sampling depth should be listed in centimeters in columns 30-33. The sample technicque should be listed in column 34 and the following is a list of letters which will be used for the types of sample which will be conducted:

B = Bailer
G = Single graph sampler
T = Tube core sampling

Columns number 35-39 should be left blank by the field sampling crew as well as columns 40 and 41. Columns number 42-47 should be filled in with the sample number code on each label. The code will consist of the sample number up to three digits, a one digit matrix code, and a one digit category code. The rest of the CDIR form can be left blank until a later date.

The Preparation of a Sample Manifest

After samples have been collected and logged in and the CDIR Form 13-2.1 has been completed, the samples should be placed in their shipping cases for transport to EPS Laboratory. This process should take place at the sample collection site if at all possible, and as different types of samples are placed back into their respective cases, certain specific information about each of them needs to be recorded on the sample manifest form . A copy of this sample manifest has been included as Figure 8A of this document. The chief field sampling technician will log each sample bottle in; he will write in the site number, matrix code and analytical code (these three pieces of information make up the sample identification). He will also put the date and time of the log-in down and he will then put the number of the shipping case in its appropriate spot and also include any notes about the sample condition or any other pertinent information. Once all of this information has been logged in;, the chief sampling technician will initial the second to the last column on the manifest indicating that the sample has been secured in an appropriate case and has been logged in for shipment. The sample manifest has been designed to hold information on 20 discreet samples and, in many cases, this will mean that one manifest will hold information about bottles contained in up to five different shipping cases. The manifest will be maintained by the chief of the field sampling crew and will be transmitted along with the samples at the time of shipping to the laboratory facility.

LONGHORN AAP, CONTAMINATION SURVEY SAMPLE SHIPPING AND TRANSFER MANIFEST

(Sheet ___ of ___)

ITEM NO.	SAMPLE I.D.			LOG IN		NOTES	SHIPPING CASE NO.	SAMPLES LOGGED IN BY	
	SITE	MATRIX	ANAL. CODE	DATE	TIME			(Field)	(Lab)
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Figure 8A

000484

Maintenance of Chain of Custody of Samples

The chief of the field sampling crew will be responsible for the maintenance of a clear chain of custody of each of the samples taken during the LHAAP Contamination Survey. The field sampling crew chief will see that once samples are logged in on the manifest and in the sample collection book that they are secured in a location which only he has direct access to (an example of this would be a locked refrigeration unit, room or a locked and refrigerated vehicle). The samples should be maintained either in direct site of the field sampling chief or under a locked condition until such time as they are transfered to an employee of EPS to transport the samples to the designated EPS laboratory. On the back of each sample manifest sheet is a certification statement which will allow for the documentable transfer of samples from the custody of the chief of the field sampling crew to the individual assigned with the responsibility of transporting the samples to the analytical laboratory. The appropriate information needs to be commpleted on each manifest at the time of transference of the samples for transport. An example of the certification statement for transference of samples is included as Figure 9A.

Transportation of Samples to the Laboratory

Water samples will be transported to EPS under refrigeration either using large insolated ice chest or a refrigerated truck. Samples which are destine for analysis in the laboratory should be transported as soon as possible to limit the holding time for those analytes particularly prone to degradation after collection. All water and soil samples collected should be maintained at approximately 4 ^{o}C until they are received at EPS's Jackson and Pensacola facilities.

Figure 9A

000486

CERTIFICATIONS:

Field technician checked samples against collection log books:

_____ _____
Name Date

Samples transfered to _____
Name

by _____ on _____
Name Date

_____ for transport to EPS Lab. Samples delivered to
Time

EPS Lab on _____ by _____
Date Name

Received by _____ _____
Name Time

Samples checked against manifest and certified in order by

_____ _____ _____
Name Date Time

COMMENTS

The Transference of Sample Custody

The sample custody transference document has been incorporated into the certification statement on the back of each manifest sheet. See Figure 9A. At the time samples are delivered to EPS's Jackson and Pensacola facility, they will be checked in by the FQAC and he will initial each line indicating that each sample has been received. Additionally, he will sign the certification document in the appropriate spot certifying the receipt, time and date.

LOG BOOK 1

GROUNDWATER

LONGHORN AAP GROUNDWATER SAMPLING LOG SHEET
(MATRIX 1)

PART I: WELL NO. _____ (STATION)

Date: _____ Time: _____ (Hours)

Established *Depth to Bottom of Well _____(ft) - *Distance to Top of Water _____(ft)

= Length of Water Column _____(ft) X Ø.815 =

Volume To Be Removed Before Sampling _____

- -

PART II: Water Removal Begun: Date: _____ Time: _____(Hrs.)

Volume of Water Removed: _____(gal) Sampler: _____

Conductivity _____(umho's)

Well Dry or Removal Complete Time: _____(hours)

Remaining Volume To Be Bailed (if any) _____(gal)

If Volume of Water Removed Equals That Required, Proceed to Part IV.

- -

PART III: After at Least 16 Hours From First Attempt to Purge Well, Proceed to Bail Well and Remove Remaining Required Volume.

Date: _____ Time: _____(Hours) Sampler_____

*Distance to Top of Water: _____(ft)

Volume of Water Removed _____ + Previous Volume Removed

_____ = _____
Total Volume Removed

Conductivity _____(umho's)

If Total Volume Removed Is Equal to Required Removal Volume, Proceed Immediately to Part IV. If Not, Wait Sixteen Hours-then proceed with Part IV.

- -

(CONTINUED ON BACK)

LOG BOOK 2

SURFACEWATER

000490

LHAAP, SURFACEWATER SAMPLING

Sample Point	Description of Site	Explosive Comp. Quantitative Analysis & Gen Org HPLC Screen (Analytical Category 1 & 5)		Anion Quantitative Analysis & Screening (Analytical Category No. 2)		Metal Quantitative Analysis & Screening (Analytical Category No. 3)	
		Sample 1 Gal. Amber Bt	Dup. Sample 1 Gal Amb Bt	Sample 1 Qt. Amber Bt	Dup. Sample 1 Qt Amber Bt	Sample Qt. Amber Bt	Dup. Sample Qt. Amber Bt
001		ID 001-2-1&5	ID 001-2-1&5	ID 001-2-2	ID 001-2-2	ID 001-2-3	ID 001-2-3
002		ID 002-2-1		ID 002-2-2		ID 002-2-3	
003		ID 003-2-1					
004		ID 004-2-1		ID 004-2-2		ID 004-2-3	
005		ID 005-2-1		ID 005-2-2		ID 005-2-3	
006		ID 006-2-1					
007		ID 007-2-1					
008		ID 008-2-1					

000491

LOG SHEET (MATRIX 2)

GC/MS Organic Screening Analysis (Analytical Category No. 4)				GC/EC Pesticides & Related Compounds Screening Analysis (Analytical Category No. 6)		Sampl. Date and Time	Sampler's Notes and Initials
Sample 1 Gal Amb Bt	Dup. Sample 1 Gal Amb Bt	40 ml Sample Vial/2 ea	40 ml Dup. Vial/2 ea	Sample 1 Gal Amber Bt	Dup. Sample 1 Gal Amber Bt		
ID 001-2-4	ID 001-2-4	ID 001-2-4V	ID 001-2-4V	ID 001-2-6	ID 001-2-6		

000492

LHAAP, SURFACEWATER SAMPLING

Sample Point	Description of Site	Expl. Comp. Quantitative Analysis & Gen Org HPLC SCR (Analytical Category 1 & 5)		Anion Quantitative Analysis & Screening (Analytical Category No. 2)		Metal Quantitative Analysis & Screening (Analytical Category No. 3)	
		Sample 1 Gal. Amb Bt	Dup. Sample 1 Gal Amb Bt	Sample 1 Qt Amb Bt	Dup. Sample 1 Qt Amb Bt	Sample 1 Qt Amb Bt	Dup. Sample 1 Qt Amb Bt
009		ID 009-2-1&5		ID 009-2-2		ID-009-2-3	
010		ID 010-2-1		ID 010-2-2		ID 010-2-3	
011		ID 011-2-1&5		ID 011-2-2		ID 011-2-3	
012		ID 012-2-1&5	ID 012-2-1&5	ID 012-2-2	ID 012-2-2	ID 012-2-3	ID 012-2-3
013		ID 013-2-1&5		ID 013-2-2		ID 013-2-3	
014		ID 014-2-1&5		ID 014-2-2		ID 014-2-3	
015		ID 015-2-1&5		ID 015-2-2		ID 015-2-3	
016		ID 016-2-1&5		ID 016-2-2		ID 016-2-3	

000493

LOG SHEET (MATRIX 2)

GC/MS ORGANIC SCREENING ANALYSIS (Analytical Category No. 4)				GC/EC PESTICIDES & RELATED Compounds Screening Analysis (Analytical Category No. 6)		Sampl. Date and Time	Sampler's Notes and Initials
Sample 1 Gal Amb Bt	Dup. Sample 1 Ga Am Bt	40 ml Sample Vial/2ea	40 ml Dup. Vial/2ea	Sample 1 Gal Amber Bt	Dup. Sample 1 Gal Amber Bt		
ID009-2-4		ID009-2-4V		ID009-2-6			
ID011-2-4		ID011-2-4V		ID011-2-6			
ID012-2-4	ID012-2-4	ID012-2-4V	ID012-2-4	ID012-2-6	ID012-2-6		
ID013-2-4		ID013-2-4V		ID013-2-6			
ID014-2-4		ID014-2-4V					
ID015-2-4		ID015-2-4V		ID015-2-6			
ID-16-2-4		ID016-2-4V					

Sample Point	Description of Site	Explosive Comp. Quantitative Analysis & Gen Org HPLC Screen (Analytical Category 1 & 5)		Anion Quantitative Analysis & Screening (Analytical Category No. 2)		Metal Quantitative Analysis & Screening (Analytical Category No. 3)	
		Sample 1 Gal Amb Bt.	Dup. Sample 1 Gal Amb Bt	Sample 1 Qt Amb Bt	Dup. Sample 1 Qt Amb Bt	Sample 1 Qt Amb Bt	Dup. Sample 1 Qt Amb Bt
017		ID017-2-1&5		ID017-2-2		ID017-2-3	
018		ID018-2-1		ID018-2-2		ID018-2-3	
019		ID019-2-1&5		ID019-2-2		ID019-2-2	
020		ID020-2-1&5	ID020-2-1&5	ID020-2-2	ID020-2-2	ID020-2-3	ID020-2-3
021		ID021-2-1		ID021-2-2		ID021-2-3	

000495

LOG SHEET (MATRIX 2)

GC/MS Organic Screening Analysis (Analytical Category No. 4)				GC/EC Pesticides & Related Compounds Screening Analysis (Analytical Category No. 6)		Sampl. Date and Time	Sampler's Notes and Initials
Sample 1 Gal Amb Bt	Dup. Sample 1 Gal Amb Bt	40 ml Samp. Vial/2ea	40 ml Dup. Vial/2ea	Sample 1 Gal Amb Bt	Dup. Sample Gal Amb Bt		
ID017-2-4		ID017-2-4V		ID017-2-6			
ID019-2-4		ID019-2-4V		ID019-2-6			
ID020-2-4	ID020-2-4	ID020-2-4V	ID020-2-4V				

000496

LOG BOOK 3

SEDIMENTS

LHAAP, SEDIMENT SAMPLING LOG SHEET (MATRIX 3)

Sampl.	Description of Site	Sediment Sample for Uses in all Analytical Categories		Sampl.	Sampler's Notes and Initials
		Sample 1 Gal. Clear Jar	Dup. Sample 1 Gal. Clear Jar		
001		ID001-3-A11 _____	ID001-3-A11 _____		
002		ID002-3-A11 _____			
003		ID003-3-A11			
005		ID005-3-A11 _____			
006		ID006-3-A11 _____			
007		ID007-3-A11 _____			
008		ID008-3-A11 _____			
009		ID009-3-A11 _____			

000498

LHAAP, SEDIMENT SAMPLING LOG SHEET (MATRIX 3)

Sampl Point	Description of Site	Sediment Sample for Uses in all Analytical Categories		Sampl. Date and Time	Sampler's Notes and Initials
		Sample 1 Gal Clear Jar	Dup. Sample 1 Gal Clear Jar		
010		ID010-3-A11 _____			
011		ID011-3-A11 _____	ID 011-3-A11		
012		ID012-3-A11 _____			
013		ID013-3-A11_____			
014		ID014-3-A11_____			
015		ID015-3-A11_____			
016		ID016-3-A11 _____			
017		ID017-3-A11_____			

000489

LHAAP, SEDIMENT SAMPL. LOG SHEET (MATRIX 3)

Samp. Point	Description of Site	Sediment Sample for Uses in all Analytical Categories		Sampl. Date and Time	Sampler's Notes and Initials
		Sample 1 Gal. Clear Jar	Dup. Sample 1 Gal. Clear Jar		
018		ID018-3-A11 _____			
019		ID019-3-A11 _____	ID 019-3-A11 _____		
020		ID020-3-A11 _____			
021		ID021-3-A11 _____			

005500

LOG BOOK 4

SOILS

LHAAP, SOIL SAMPLING LOG SHEET (MATRIX 4)

Sample Point	Description of Site	Soil Sample for Uses in all Analytical Categories		Samp. Date and Time	Sampler's Notes and Initials
		Sample 1 Gal. Clear Jar	Dup. Sample 1 Gal. Clear Jar		
0101		ID 0101-4-All_____			
0102		ID 0102-4-All_____			
0103		ID 0103-4-All_____			
0201		ID 0201-4-All_____			
0202		ID 0202-4-All_____			
0203		ID 0203-4-All_____			
0301		ID 0301-4-All_____			
0302		ID 0302-4-All_____			

000501

LHAAP, SOIL SAMPLING LOG SHEET (MATRIX 4)

Sample Point	Description of Site	Soil Sample for Uses in all Analytical Categories		Sampl. Date and Time	Sampler's Notes and Initials
		Sample 1 Gal. Clear Jar	Dup. Sample 1 Gal. Clear Jar		
0303		ID 0303-4-All _____			
0304		ID 0304-4-All _____			
0305		ID 0305-4-All _____			
0306		ID 0306-4-All _____			
0307		ID 0307-4-All _____			
0308		ID 0308-4-All _____			
0401		ID 0401-4-All _____	ID 0401-4-All _____		
0402		ID 0402-4-All _____			

205002

Sample Point	Description of Site	Soil Sample for Uses in all Analytical Categories		Sampl. Date and Time	Sampler's Notes and Initials
		Sample 1 Gal. Clear Jar	Dup. Sample 1 Gal. Clear Jar		
0403		ID 0403-4-A11 _____			
0501		ID 0501-4-A11 _____	ID 0501-4-A11 _____		
0502		ID 0502-4-A11 _____			
0503		ID 0503-4-A11 _____			
0601		ID 0601-4-A11 _____			
0602		ID 0602-4-A11 _____			
0603		ID 0603-4-A11 _____			
0701T		ID 0701T-4-A11 _____			

000503

Sample Point	Description of Site	Soil Sample for Uses in all Analytical Categories		Sampl. Date and Time	Sampler's Notes and Initials
		Sample 1 Gal. Clear Jar	Dup. Sample 1 Gal. Clear Jar		
0701B		ID 0701B-4-A11 _____			
0702T		ID 0702T-4-A11 _____			
0702B		ID 0702B-4-A11 _____			
0703T		ID 0703T-4-A11 _____			
0703B		ID 0703B-4-A11 _____			
0704T		ID 0704T-4-A11 _____			
0705B		ID 0705B-4-A11 _____	ID 0705B-4-A11 _____		
0801T		ID 0801T-4-A11 _____			

000504

Sample Point	Description of Site	Soil Sample for Uses in all Analytical Categories		Sampl. Date and Time	Sampler's Notes and Initials
		Sample 1 Gal. Clear Jar	Sample 1 Gal. Clear Jar		
0801B		ID 0801B-4-All _____			
0802T		ID 0802T-4-All _____			
0802B		ID 0802B-4-All _____			
0803T		ID 0803T-4-All _____			
0803B		ID 0803B-4-All _____			

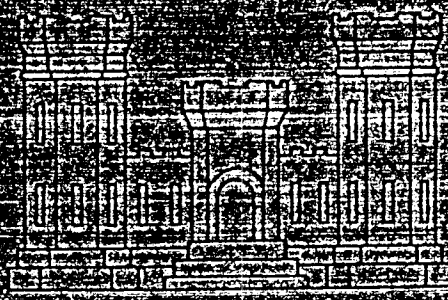
005000

CLOSURE DOCUMENTS

CLOSURE OF UNLINED EVAPORATION POND

LONGHORN ARMY AMMUNITION PLANT

MARSHALL, TEXAS



SUBMITTED TO:

U.S. ARMY ENGINEER DIVISION, HUNTSVILLE
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BY:

KINDLE, STONE & ASSOCIATES, INC.
ENGINEERS - PLANNERS
LONGVIEW, TEXAS

CLOSURE DOCUMENTS

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PART 1 - PROJECT SUMMARY

PROJECT SUMMARY

LHAAP - CLOSURE OF UNLINED EVAPORATION POND

1. Introduction

Longhorn Army Ammunitions Plant (LHAAP) has been disposing of wastewater from the munitions and pyrotechnics manufacturing processes in an unlined evaporation pond (UEP). Use of the pond has now been discontinued and it is necessary to make provisions for permanent closure. Closure will consist of removal of impounded water, excavation and disposal of sediment, disassembly of a rocket motor washout facility, fill with common material, placement of a clay cap to prevent infiltration, a sand filter to drain the clay surface and topsoil to provide a bed for permanent vegetative cover. Each of these components of the closure process will be described in the following paragraphs.

2. Removal of Water

Various options for removal and disposal of water from the UEP are currently being investigated by the Fort Worth District Corps of Engineers. Included as options are: 1) a one-time untreated discharge to Harrison Bayou; 2) treatment of the water using physical/chemical and possibly biological treatment prior to discharge; and 3) contract disposal to a deep injection well. The results of that investigation are not available for inclusion in this plan.

3. Disposal of Sludge

The sludge which has accumulated in the bottom of the UEP has appreciable concentrations of heavy metals including barium, chromium, copper, lead, magnesium, and zinc. Although the sludge does not qualify as a hazardous waste under EP toxicity criteria, it will be removed from the pond and disposed at a Hazardous Waste disposal landfill. Drying of the sludge to a truckable cake will be assisted by addition of approximately 10 percent by weight cement. The cement will be hauled to the site in hopper-bottom trailers, then deposited on the surface of the sludge layer through hoses using the pneumatic conveying systems on the trailers. The cement will then be spread using a crawler tractor with provisions for low ground pressure. Incorporation of the cement into the sludge will be by disking, mixing with a dragline bucket, or blading. After the cement has had time to hydrate, the sludge should be dry enough to pick up with a front-end loader and load into an open top dump truck which will be lined and covered to prevent loss of material during transport. The truck will then transport the sludge to a landfill for disposal. It will be necessary to manifest the transportation of the sludge in accordance with Environmental Protection Agency (EPA) and TDWR requirements for hazardous wastes.

4. Disassembly of Rocket Motor Washout Facility

An existing steel structure that was used for high pressure hydraulic removal of rocket fuel from solid fuel motors will be disassembled, coded

for future assembly and stored. A control building associated with the washout facility will also be disassembled and stored. Above ground piping from the control building to the structure will be salvaged. Concrete foundations for the structure and the above ground piping will be removed and disposed. The concrete foundation for the control building and the underground piping, conduit and wiring will remain.

5. Common Fill & Clay Cap

Two borrow areas on the LHAAP site have been designated for obtaining material to fill and cap the UEP. First, material existing on the pond site in dikes and other features will be used to the maximum extent possible to fill the pond. Then common fill material will be excavated from the borrow area, transported to the pond site and placed in the pond. The common fill will serve as a stable base for a 48" thick clay cap over the pond. The clay for the cap will also be excavated from the other borrow area and transported to the pond site for placement. Both the fill and the clay cap will require compaction during placement. The fill will be compacted to from 90 to 95% of maximum density as measured by method CE-55. The clay cap will be compacted to from 95 to 100% of CE-55 maximum density. Surfaces of the fill and clay cap will be sloped at 3% on the top of the pond and a slope of 1 vertical:4 horizontal on the sides.

6. Sand Filter

A twelve inch thick compacted layer of sand will be installed to collect percolated rainfall from the top of the clay cap. A french drain will be placed around the edge of the cap to gather water from the sand filter. The drain will be composed of a perforated 6" polyvinyl chloride (PVC) pipe encapsulated by a 1 foot thick bed of gravel which will be wrapped in filter fabric. Four 6" PVC drain pipes will be installed at the corners of the pond to convey water from the french drain to the adjacent ditches.

7. Topsoil & Turfing

Topsoil from the borrow areas will be processed to remove sticks, stumps and other debris, then stockpiled for use on the pond. The topsoil layer will be placed in one lift with minimal compaction effort. Then the surface will be seeded, fertilized, limed and mulched using the hydromulch process. Additional blown hay mulch will also be applied to prevent erosion. Turfing will be irrigated and reseeded as necessary to establish a permanent vegetative covering for the site.

PART 2 - CLOSURE TECHNICAL PLAN

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CLOSURE TECHNICAL PLAN
LONGHORN ARMY AMMUNITION PLANT
UNLINED EVAPORATION POND CLOSURE

1.0 INTRODUCTION

1.1 Background

Longhorn Army Ammunition Plant (LHAAP) is a Government-owned, contractor-operated industrial installation under the jurisdiction of the U.S. Army Armament, Munitions, and Chemical Command, with the primary mission of loading, assembly, and packing of pyrotechnics, illuminating/signal ammunition, and solid rocket propellant motors. The Longhorn Division of the Morton-Thiokol Corporation is the operating contractor.

Wastewater generated from the various manufacturing processes has been disposed over the history of the plant in an unlined evaporation pond (UEP) located on the burning grounds of the plant site. Extensive testing by the government has revealed that water from the UEP has been introduced to the groundwater in the area through percolation. Certain contaminants indigenous to the wastewater have migrated into the groundwater table as a result of this percolation. Use of the pond for disposal of waste was terminated on June 1, 1984.

1.2 Purpose

The purpose of this document is to outline a procedure for closure of the UEP in accordance with

state and federal requirements and in keeping with good engineering practice. The report includes a description of the characteristics of the contaminants, the design analysis used to define the closure procedure, construction methods proposed for closure, project management, and post-closure procedures. Detailed plans and specifications have been written for use by a construction contractor in closure of the pond. These are not included as a part of this closure plan but are available for review.

2.0 CHARACTERISTICS OF CONTAMINANTS

In the fall of 1982 the U.S. Army Environmental Hygiene Agency (AEHA) of Aberdene Proving Ground, Maryland, conducted a special study to characterize the waste contained in the UEP. A copy of the report published by that agency is included as Appendix 1. The characteristics of the aqueous layer of the UEP are described in Tables 1 through 4. The tables also include data reported in previous studies by AEHA that were published in 1981 and 1976. A comparison of the levels of UEP contaminants to maximum contaminant levels (MCL) as specified by the National Interim Primary Drinking Water Regulations (NIPDWR) and the National Secondary Drinking Water Regulations (NSDWR) show that approximately half of the contaminants in the UEP aqueous layer exceed drinking water standards.

Analyses for organic constituents reveal levels that were below detection limits with the exception of di-n-butyl phthalate, tetrachloroethylene, and trichloroethylene.

Samples of sludge from the bottom of the pond (sediment) were characterized for extraction procedure (EP), toxicity, selected standard inorganic parameters, and a limited number of organic compounds. Of the 16 grid point samples taken, none leached detectable amounts of heavy metals, arsenic, cadmium, mercury, silineum, or silver. Chromium and lead were leached out in quantities well below the EP toxicity MCL. While barium was leached out in all the samples, only one approached the MCL of 100 milligrams per liter (mg/l) with a value of 94 mg/l. All of the grid point sediment samples were considered nonhazardous with respect to EP toxicity. A composite sample of floating materials leached out 100 mg/l of barium. It was recommended that this sample be considered hazardous with respect to EP toxicity. All other parameters for the floating material were not detected or were well below the MCL. A sample taken from a sediment mound immediately adjacent to the point where transport trucks deposit the wastewater material into the pond was also nonhazardous with respect to EP toxicity. Barium leached out at 82 mg/l which is below the MCL of 100 mg/l. Results of the various analyses are summarized in Table 5 of the report.

Among the parameters with higher values were chemical oxygen demand, nitrates, elemental phosphorus, aluminum, barium, chromium, iron, lead, magnesium, and sodium. Of the organics that were analyzed none were found consistently in all samples. The only organic compounds that appeared in measurable quantities were phenanthrene, hexachlorobenzene,

benzylbutylphthalate, bisphthalate, and diethylphthlate. Other compounds were below detection limits or appeared only at trace levels. Soil samples were also taken below the sludge in the UEP. The samples were characterized for EP toxicity, selected inorganic standard parameters, and a limited number of organic compounds. None of the soil samples were found to be hazardous with respect to EP toxicity. Results of the analyses are shown in Table 6 of the report.

As with the sediment samples, parameters that had high values included chemical oxygen demand, nitrates, aluminum, iron, magnesium, and sodium. Among the organic compounds analyzed, only hexachlorobenzene, bisphthalate, and di-n-butylphthalate were found above trace levels in some of the samples. Other compounds were below detection limits or appeared occasionally at trace levels.

3.0 DESIGN ANALYSIS TO DEFINE CLOSURE PROCEDURE

Prior to preparation of this closure plan an agreement was reached between the U.S. Army Corps of Engineers (COE) and the Texas Department of Water Resources (TDWR) concerning the procedure for closure of the UEP. The procedure was to entail removal of the aqueous layer (water), removal of the sludge layer on the bottom of the pond, and other soils which may have been contaminated due to repeated contact with the aqueous layer, disposal of the removed soil and sludge at a hazardous waste landfill, installation of an impermeable clay cap with a filter drain system to prevent ponding of water on top of the clay layer,

and covering with topsoil and turfing to provide vegetative cover.

3.1 Removal of Water

Alternatives for removal of water for the pond are currently being investigated by the Fort Worth District of the COE. These alternatives include a one-time discharge to Harrison Bayou without treatment, treatment using physical, chemical, and possibly biological treatment methods, and contract disposal offsite in a deep injection well.

The Fort Worth District is in correspondence with the TDWR concerning the acceptability of each alternative and will issue a report on the selected alternative in the near future. The report is not available for inclusion in this plan at this time.

3.2 Removal of Sludge

Sludge and soil removed from the UEP will be hauled to a hazardous waste disposal facility for ultimate disposal. The procedure for removal of these materials must consider the costs associated with each operation during the process. Considerations for ultimate disposal, hauling, and sludge removal are discussed in the following paragraphs:

3.2.1 Ultimate Disposal - Although the characteristics of the soil and sludge to be disposed do not call for inclusion in the strict classification of hazardous waste, the high levels of various heavy metals concentrations

dictate that the materials be disposed in a landfill designed to accept hazardous waste under current state and federal regulations. Material disposed by landfill must be in an essentially "dry" state so that it can be handled with landfilling equipment, compacted, and covered. Any wet material that is brought to the landfill for disposal must be processed to remove moisture or treated with a "drying agent" to render it to a handleable state. According to discussions with representatives of disposal firms, the cost for disposal of wet sludge is approximately twice that for disposal of dry material. Hazardous waste disposal locations for the sludge and soil material that have been identified to date are as follows:

(a) Chemical Waste Management; Port Arthur, Texas

(b) Rollins Environmental Services, Inc.; Deer Park, Texas

(c) Chemical and Environmental Conservation Systems; Livingston, Louisiana

(d) Texas Ecologists, Inc.; Corpus Christi, Texas

3.2.2 Hauling - If the material removed from the UEP is in a liquid form, it must be hauled in tank trucks specifically designed to

transport waste materials. Materials that are removed from the UEP in a dry state may be hauled in conventional dump trailers which are lined and covered to prevent loss of material during transport. The amount of sludge hauled by either the tank truck or the dump truck will be limited by the maximum gross vehicle weight allowed on the roadways out of the site. A maximum of H15 loading will be allowed on the LHAAP roadways. Based on an 18-wheel transport, the gross vehicle weight allowed under this loading is 60,000 pounds. The dump trailers may be able to transport slightly more waste material on a weight basis because the dump trailers are usually slightly lighter than the tank truck trailers. However, for the purposes of this analysis, the costs of transportation on a per pound basis are considered essentially equal for wet or dry hauling.

3.2.3 Removal Alternatives - The sludge and soil material may be removed from the UEP in a wet state by pumping or in a dry state by standard earth moving vehicles. Wet removal will entail addition of water to lower the viscosity of the material to a pumpable condition. The amount of water that must be added to achieve wet removal could vary

significantly based on the moisture already available in the sludge. Definition of the amounts of water required have not been attempted for the purposes of this study. Any water that was added during the removal process would require removal either prior to hauling or prior to disposal at the landfill. Any processing of the waste on site would entail additional care in prevention of spillage and contamination of the surrounding area.

Dry removal of the waste material could be achieved by extended weathering or by addition of a "drying agent" in a manner similar to that which would be used at the disposal site. This method would entail distribution of the drying agent over the area of the pond, incorporation using disking, blade mixing, or handling with a dragline bucket, then removal of the dry material using a front loader or other earth moving equipment. The dry removal method offers the advantage of confining the waste materials within the UEP to prevent contamination of the surrounding area.

3.2.4 Selected Removal Alternative - Dry removal of the waste materials was selected as the best alternative on the basis of minimizing the

number of times the material is handled due to either processing or loading and unloading. This consideration will minimize the possibility of spillage and associated contamination and cleanup and, therefore, decrease the risk of handling the material. It is anticipated that the removal procedure will be conducted over a period which is too short to allow use of weathering as the primary drying method. Thus, it will be necessary to use a "drying agent" to produce a material that is dry enough for handling with conventional equipment.

Various "drying agents" were evaluated in the laboratory by East Texas Testing Laboratory, Inc. to determine their suitability for use on this project. Included in the investigation were lime, cement, bentonite, fly ash, and kiln dust. A 10 gallon composite sample of sludge from the bottom of the pond was composited from grab samples collected at 12 different locations utilizing an Ekman dredge. The results of the laboratory testing are included as Appendix 2. A least cost evaluation was used to determine the best drying agent for use on the project. The evaluation is summarized in Table 3-1. As shown in the table the

evaluation considered delivered material costs, cost of application of the material, and costs of excavation, hauling, and disposal. Kiln dust showed the lowest material cost. Bentonite showed the lowest application and the lowest excavation, hauling, and disposal cost. However, the lowest total cost was exhibited by cement. Cement was, therefore, selected as the best "drying agent" for use on the project.

3.3 Monitoring of Sludge Removal

The purpose of removal of the sludge layer for disposal is to eliminate the major remaining source of contaminants that could, over a period of time, continue to leach into the groundwater. Testing will be performed to assure that all of the sludge layer has been removed.

Testing that was performed by the U.S. Army AEHA for the sediment layer (sludge) and the soil below the sediment layer was discussed previously in Section 2.0. The testing revealed three parameters, as shown in Tables 5 and 6 of Appendix 1, were consistently different in the sludge and the soil as follows: chemical oxygen demand (COD), barium and chromium. Thus, any of these three parameters could be monitored as indicator pollutants to confirm that the sludge layer has been removed. Levels that could be used as indicative are: COD, 10,000 micrograms per gram

(mg/g); barium, 800 ug/g; and chromium, 16 ug/g. Since analytical procedures for COD are simplest and can be performed over the shortest period, use of COD at a level of 10,000 ug/g as the controlling parameter for removal of sludge is recommended.

3.4 Installation of Cap

3.4.1 Preparation of Base - After removal of the sludge and contaminated soil, it will be necessary to perform a significant amount of earthwork on the site to prepare a uniform base for application of the clay cap. Material located on the site of the UEP in dikes and other raised areas will be used to the greatest extent possible for fill material. The characteristics of the material on site are shown in boring logs prepared by the U.S. Army Environmental Hygiene Agency for monitoring wells in the area of the UEP. These logs are included as Appendix 3.

The quantity of material available on site will not be adequate to provide the entire base for the cap. Thus, it will be necessary to haul in additional fill material from a borrow area located on the LHAAP site remote from the UEP. The location for the borrow area has been selected and soil boring logs and analytical results from the area

provided by the Fort Worth District COE are included in Appendix 4.

The material will be placed in lifts not to exceed 8" in uncompacted thickness. Each lift shall be compacted to a density of not less than 90% nor more than 95% as determined in accordance with ASTM D1556, MIL-STD-621, Method 106, or ASTM D2922. The surface of the base shall be sloped at 3% as shown in Drawing No. 1.

3.4.2 Cap Material - Clay material from a borrow area located remote from the UEP on the LHAAP site will be used for the impermeable cap. The location of the borrow area has been selected and soil boring logs and analytical results for borings taken in that area are included in Appendix 4. As shown in the appendix liquid limits for the impervious materials range from 28 to 70. The minimum acceptable liquid limit for use in the cap shall be 38. Values for plasticity index range from 13 to 49. Sieve analysis of the impervious samples showed a range of 59 to 89% finer than number 200 sieve. Falling head permeability analyses for the impermeable samples revealed permeabilities ranging from 1.9×10^{-9} centimeters per second to 4.76×10^{-9} centimeters per second.

A 48" thickness cap of this material should provide a barrier which is highly resistent to permeation by rainfall. The material will be placed in lifts not to exceed 6" in compacted thickness and compacted to not less than 95% and not more than 100% maximum density as determined by the test procedures specified for preparation of base above.

3.4.3 Filter Drain System - Previous correspondence between the COE and TDWR had resolved that a 1 ft. thick layer of filter sand would be placed on top of the impervious cap to prevent ponding of rainwater. Water collected in the sand filter was to be conveyed to the surface drainage using a system of french drains located on the outer rim of the impermeable cap. A conventional french drain would be composed of a bed of well graded gravel with a minimum dimension of 2 ft. wide by 2 ft. deep surrounding a perforated pipe.

An alternate system composed mostly of synthetic materials was evaluated for substitution for the filter drain system previously addressed. In substitution for the filter sand, soil drainage mats composed of a plastic material similar to excelsior or shaped with various types of corrugation and

sandwiched between two layers of synthetic filter fabric were evaluated. A comparison of installed costs for two types of soil drainage mats and a conventional sand filter is shown in Table 3-2. As shown in the table, filter sand has a slightly lower materials cost than the synthetic materials but has a slightly higher installation cost. The total installed cost is lowest for the filter sand. There is also some doubt as to whether the drainage mats could support the loads imparted by the heavy equipment used to distribute topsoil on top of the filter. In view of the cost comparison and the possibility of permanent deformation of the mats, use of the conventional filter sand is recommended.

An alternate design for the french drain employing ungraded gravel in a 1 ft. wide by 1 ft. thick trench surrounding perforated pipe was compared to the conventional trench. A cost comparison of the two types of french drain is shown in Table 3-3. The alternate fabric lined drain is the least cost alternative.

3.4.4 Topsoil and Turfing - Each of the borrow areas that will be required for providing common fill and impermeable clay will be

cleared of existing vegetation, and the topsoil will be stored for use as the final layer over the clay cap. The surface will be lime treated, fertilized, and seeded to establish a permanent vegetative cover.

4.0 CONSTRUCTION METHODS

4.1 Removal of Water

Construction methods for the removal of water will be defined by the Fort Worth District COE in a separate document.

4.2 Removal of Sludge

4.2.1 Cement, as discussed previously, will be used as the "drying agent" for the sludge. It will be transported to the site in closed hopper-bottom pneumatic trucks. Cement will be blown from the trucks through hoses and distributed over the surface of the pond. It may also be necessary to use a low ground pressure crawler tractor with blade to distribute properly. The cement may be incorporated into the sludge by blade mixing, disking, or using a dragline bucket. After the drying agent has been incorporated and the sludge has attained a suitable consistency, it may be removed using a dragline bucket or a front-end loader. The sludge will be loaded into open-top dump trailers which have been lined to prevent

leakage and covered to prevent loss of material during transport.

4.2.2 Decontamination of Equipment - It is imperative that all construction equipment be cleaned of the sludge material before it leaves the project site. Maximum use of dry cleaning should be employed. However, a hose washdown station at the edge of the UEP will also be provided. Water generated by the washdown procedure will be collected in the UEP and hauled away for contract disposal at a licensed and bonded disposal facility.

4.2.3 Quality Control - The sludge will be removed in 6" increments. After each increment has been removed, samples will be taken at intervals not to exceed 2500 s.f. and analyses run for chemical oxygen demand using procedures outlined in Technical Report EPA/CE-81-1, "Procedures for Handling and Chemical Analysis of Sediment and Water Samples", published by the U.S. Army Engineers Waterways Experiment Station, Vicksburg, Mississippi. Sludge will be removed in 6" layers until all areas of the pond exhibit COD values less than 10,000 ug/l.

4.3 Removal of Groundwater and Precipitation from the UEP

Water collected in the UEP due to migration of groundwater or precipitation will be removed for disposal by contract at a licensed and bonded disposal location in a manner similar to that used for removal of washwater as discussed above.

4.4 Preparation of Base

4.4.1 Equipment - A crawler tractor with blade will be used to perform excavation on the UEP site associated with use of on site material for common fill. The material will be distributed using the crawler tractor, then compacted using a grid roller or sheeps-foot roller to attain the densities discussed previously in Section 3.0. Excavation of materials at the borrow area for common fill will probably be performed using a front-end loader, either of the tract or wheel mounted type. This material will be transported to the UEP site in open-top dump trailers. Then it will be distributed and compacted in the same manner as the on site material.

4.4.2 Quality Control - Each compacted lift of base material will be tested for density using the methods specified in Section 3.0 at intervals not to exceed 5000 sq. ft. in area. Additional lifts will not be placed until the

lift being tested has been compacted to specifications.

4.5 Installation of Cap

4.5.1 Equipment - In a manner similar to that used for the common borrow material, the impermeable borrow material will probably be excavated using front-end loaders, then hauled to the UEP site in open-top dump trailers. It will then be distributed using a crawler tractor and compacted using a grid roller, a sheeps-foot roller, or a pneumatic-tired roller.

4.5.2 Quality Control - Samples of clay material will be taken on 500 cu. yd. intervals and tested for liquid limit and plasticity index before transfer to the UEP site. Density analyses will be performed for each lift of in-place material on minimum 5000 sq. ft. increments.

4.6 Installation of Filter Drain System

4.6.1 Equipment - Filter sand will be hauled to the UEP site in open-top dump trailers which are equipped with covers to prevent loss of material during transport. On the UEP site the sand will be distributed using a crawler tractor and compacted using a grid roller. A backhoe will be used for excavation of the trench for installation of the french drain

around the perimeter of the cap. Filter fabric and perforated pipe for the french drain will be placed by hand, and gravel will be placed using a front-end loader.

4.6.2 Quality Control - Samples of the filter sand will be taken on 60 cu. yd. intervals and sieve analyses performed to ensure that the material is in conformance with the specifications. Each lift of material will be tested for density for minimum 5000 sq. ft. increments.

4.7 Application of Topsoil and Turfing

4.7.1 Equipment - Topsoil removed from the borrow areas will be transported to the UEP site in open-top dump trailers. It will distributed using a crawler tractor and finish graded using a farm tractor mounted box blade or motor grader. Lime, fertilizer, and seed will be distributed using a rotary dispenser.

4.7.2 Quality Control - Marking labels for lime, fertilizer, and seed will be reviewed for conformance with specifications prior to application to the site. The seeded areas will be irrigated and reseeded as necessary to establish complete vegetative cover.

5.0 PROJECT MANAGEMENT

5.1 Organization

The project will be performed under the jurisdiction of the Fort Worth District U.S. Army COE. A Contracting Officer located at the Fort Worth District Office will have central responsibility for performance of the project. A designated representative of the Contracting Officer will have day-to-day responsibility for conduct of the project. He will be the central point of communication for a contractor to be employed to do the actual construction work. The services of a consulting Design Engineer may also be used to monitor progress on the project and to attest that the project was performed in accordance with this closure plan. A COE Construction Inspector will make frequent visits to the site to assure that the Contractor is performing the project in accordance with the plans and specifications.

5.2 Data Management

5.2.1 Contractor's Submittals - The Contractor will be required to submit samples of all materials used on the project to the designated representative of the Contracting Officer for approval.

5.2.2 Quality Control Reports - Each of the quality control procedures outlined in Section 4.0 will be documented by Quality Control Reports. Although quality control decisions

will be made based on verbal reports given by the quality control personnel on site, the results of each investigation will be documented in the Quality Control Reports which will be submitted to the designated representative of the Contracting Officer for his review and files.

5.3.3 Inspection Reports - The COE Construction Inspector will make daily logs of his visits to the project site recording progress of the project as well as pertinent information regarding the quality of work and conformance with plans and specifications.

6.0 POST-CLOSURE

6.1 Certification of Closure

After completion of the closure procedure, the Contracting Officer or the consulting Design Engineer will certify that the site has been closed in accordance with this closure plan.

6.2 Groundwater Monitoring

Existing monitoring wells in the area of the UEP site will be sampled annually for a period of at least five years to monitor the quality of the surrounding groundwater. Increases in levels of critical contaminants will be reported and appropriate action taken. Copies of each groundwater monitoring report and documents describing appropriate action will be forwarded to the TDWR and the Fort Worth District COE.

6.3 Security

The existing UEP site is located within the burning grounds for the LHAAP. The burning ground site is surrounded by a 6 ft. chain link security fence, and access through the gate is controlled by security personnel.

6.4 Future Use

No future use for the closed UEP site is planned.

6.5 Deed Record

The deed for the LHAAP site will be amended with a legal description of the boundaries of the UEP site permanently documenting its previous use. The amended deed will be filed in the deed records of Harrison County, Texas. The boundaries of the UEP site will be marked on the ground using permanent concrete monuments at each corner described in a legal description.

TABLE 3-1

LEAST-COST EVALUATION OF DRYING AGENTS

Drying Agent[1]	Estimated Dosage (% by Weight)	Unit Weight (lb/c.f.)	Quantity Required[1] (tons)	Quantity Required[1] (c.y.)	Combined Material Generated (c.y.)	Delivered Material Cost ($/ton)	Delivered Material Cost ($)	Application Cost ($) [2]	Excavation, Hauling & Disposal Cost ($) [3]	Total Cost ($)
Lime	20	35	1,060	2,243	6,169	75	79,500	121,122	370,140	570,762
Cement	10	94	530	418	4,344	63	33,390	22,572	260,640	316,602
Bentonite	10	110	530	357	4,283	138	73,140	19,278	256,980	349,398
Fly Ash	40	88	2,120	1,784	5,710	27	57,240	96,336	342,600	496,176
Kiln Dust	27	45	1,431	2,356	6,282	19	27,189	127,224	376,920	531,333

(23)

1 - Quanitity of Drying Agent based on treatment of 3,926 c.y. of sludge at a unit weight of 100 lb/c.f. or 5,300 tons.

2 - Based on application cost of $54.00/c.y.

3 - Based on excavation cost of $1.00/c.y., hauling cost of $34.00/c.y. and disposal cost of $25.00/c.y.

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TABLE 3-2

COST COMPARISON OF FILTER SYSTEMS

	Estimated Cost ($/sf.)		
	Materials[1]	Installation	Total
Thick Drainage Mat (5/8"):			1.03
Corrugated or Excelsior Plastic	0.60	0.05	
2 Layers of Fabric	0.28	0.10	
Thin Drainage Mat (3/8"):			0.82
Corrugated or Excelsior Plastic	0.39	0.05	
2 Layers of Fabric	0.28	0.10	
Filter Sand (12"-ASTM C33)	0.57	0.17	0.74

1 - Materials costs shown include delivery to site

(24)

000531

TABLE 3-3

COST COMPARISON OF FRENCH DRAINS

	Estimated Cost ($/ft.)		
	Materials[1]	Installation	Total
Conventional Drain:			6.18
Graded Gravel (2' x 2' Trench)	1.88	0.31	
Perforated Pipe	2.70	1.29	
Fabric Lined Drain:			4.97
Filter Fabric	0.50	0.05	
Ungraded Gravel (1' x 1' Trench)	0.35	0.08	
Perforated Pipe	2.70	1.29	

1 - Materials costs shown include delivery to site

005038

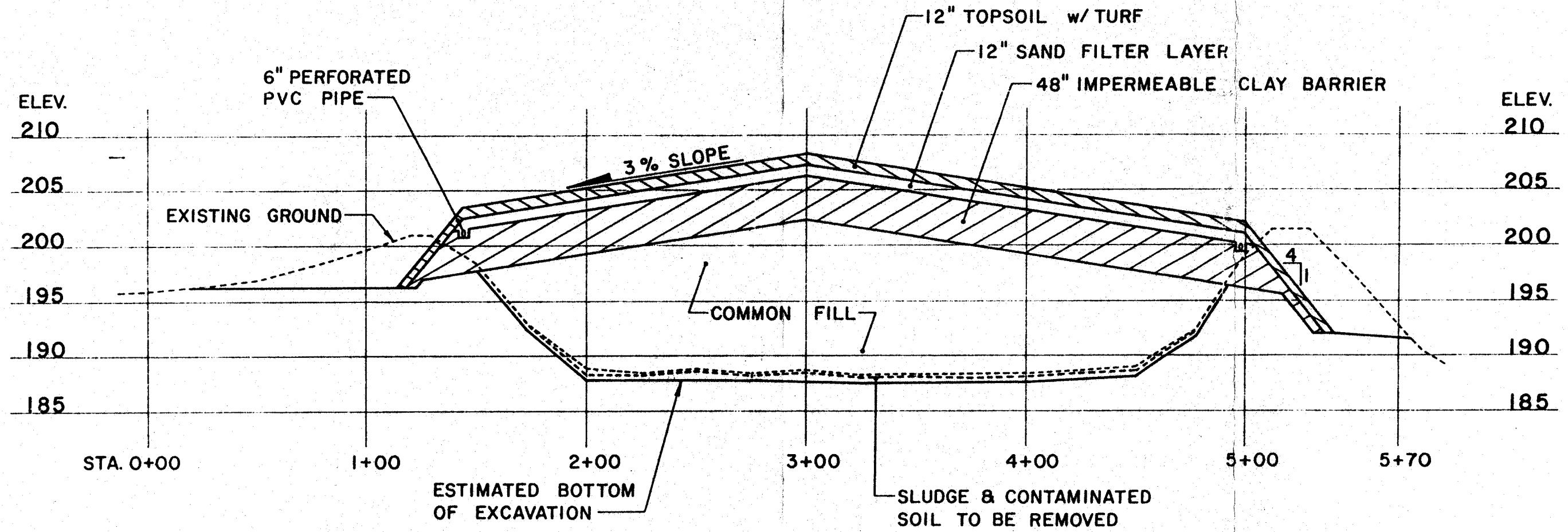
APPENDICES

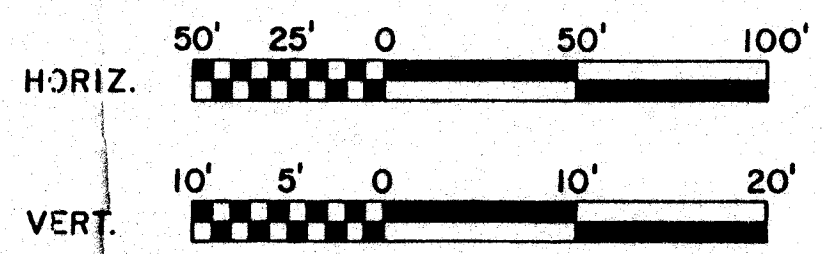
APPENDIX 1

U.S. ARMY ENVIRONMENTAL
HYGIENE AGENCY

SPECIAL STUDY

000541





DRAWING NO. 1
BASELINE SECTION
CLOSURE OF UNLINED
EVAPORATION POND

GEOTECH.

000542

UNITED STATES ARMY ENVIRONMENTAL HYGIENE AGENCY

ABERDEEN PROVING GROUND, MD 21010

HAZARDOUS WASTE SPECIAL STUDY NO. 37-26-0291-84
LONGHORN ARMY AMMUNITION PLANT
MARSHALL, TEXAS
29 OCTOBER - 2 NOVEMBER 1982

Distribution limited to US Government agencies only; protection of privileged information evaluating another command; Dec 83. Other requests for this document must be referred to Commander, Longhorn Army Ammunition Plant, Marshall, TX 75670.

This study was originally assigned 39-26-0291-83; however, due to the incompletion of the project as of 1 October 1983, this study was renumbered 37-26-0291-84.

DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010

CPT Wiggans/csp/AUTOVON 584-4211

000544

REPLY TO ATTENTION OF
HSHB-ES/WP

3 JAN 1984

SUBJECT: Hazardous Waste Special Study No. 37-26-0291-84, Longhorn Army Ammunition Plant, Marshall, Texas, 29 October - 2 November 1982

Commander
US Army Materiel Development
and Readiness Command
ATTN: DRCSG
5001 Eisenhower Avenue
Alexandria, VA 22333

1. Twenty copies of subject report with Executive Summary are inclosed.

2. Additional copies of this report are inclosed for mailing to HQDA (DAEN-ZCF-U), HQDA (DAEN-ZCE), and Commandant, Academy of Health Sciences (HSHA-IPM).

FOR THE COMMANDER:

NELSON H. LUND, P.E.
Colonel, MSC
Director, Environmental Quality

1 Incl
as (20 cy)

CF:
HQDA (DASG-PSP) wo incl
Cdr, AMCCOM [DRSMC-SG(R)]
Cdr, HSC (HSPA-P)
Cdr, LHAAP (2 cy)
Cdr, BAMC (PVNTMED Actv)
Cdr, MEDDAC, Ft Hood (PVNTMED Actv)(2 cy)
C, USAEHA-Rgn Div South

DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010

000545

REPLY TO ATTENTION OF
HSHB-ES/WP

EXECUTIVE SUMMARY
HAZARDOUS WASTE SPECIAL STUDY NO. 37-26-0291-84
LONGHORN ARMY AMMUNITION PLANT
MARSHALL, TEXAS
29 OCTOBER - 2 NOVEMBER 1982

1. PURPOSE. To sample and characterize the liquid and solid wastes contained in the hazardous industrial waste surface impoundment and to evaluate treatment and disposal alternatives for the characterized wastes in support of the eventual closure of the unlined evaporation pond (UEP).

2. ESSENTIAL FINDINGS.

a. Based on analytical data, the UEP aqueous layer is amenable to treatment by the physical/chemical/biological treatment system under design for the treatment of wastes currently discharged into the UEP.

b. There is a good correlation between high concentrations of certain contaminants found in the UEP sediment and soil and the same contaminants found in ground-water samples from the UEP area.

c. The UEP sediment, although not hazardous by definition, should either be treated in place to preclude leaching of contaminants or removed for disposal at a permitted disposal facility as part of the closure operation.

d. The composite floating material sample from the UEP may be considered hazardous with respect to EP (extraction procedure) toxicity for the heavy metal barium.

e. Coordination with appropriate state and Federal regulatory agencies will be necessary to determine any additional requirements for the investigation of the extent of soil contamination.

3. MAJOR RECOMMENDATIONS.

a. Utilize information and data contained in this report to modify the existing UEP closure plan.

b. Treat the aqueous layer of UEP in the physical/chemical/biological treatment system when completed or in an equivalent temporary system if required sooner.

c. Include treatment or removal procedures for the UEP sediment layer and floating material in the UEP closure plan.

d. Coordinate with appropriate state and Federal regulatory agencies with respect to any additional UEP subsurface soil investigation requirements.

DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010

000546

REPLY TO ATTENTION OF
HSHB-ES/WP

HAZARDOUS WASTE SPECIAL STUDY NO. 37-26-0291-84
LONGHORN ARMY AMMUNITION PLANT
MARSHALL, TEXAS
29 OCTOBER - 2 NOVEMBER 1982

1. AUTHORITY. Message, HQ DARCOM, DRCIS-A, 031623Z Feb 82, subject: Request for Assistance, Installation Wastewater Evaporation Lagoon, Longhorn AAP.

2. REFERENCES. See Appendix A for a listing of references.

3. PURPOSE.

a. To sample and characterize the liquid and solid wastes contained in the hazardous industrial waste surface impoundment.

b. To evaluate treatment and disposal alternatives for the characterized wastes in support of the eventual closing of the unlined evaporation pond (UEP).

4. GENERAL.

a. Background.

(1) Longhorn Army Ammunition Plant (LHAAP) is a Government-owned, contractor-operated industrial installation under the jurisdiction of the US Army Armament, Munitions and Chemical Command, with the primary mission of load, assemble, and pack of pyrotechnics, illuminating/signal ammunition, and solid rocket propellant motors. The Longhorn Division of the Thiokol Corporation is the operating contractor.

(2) This study constitutes the second phase of this Agency's effort to assist in the development of an alternate treatment and disposal system for wastes entering the hazardous industrial waste surface impoundment. The first phase consisted of Hazardous Waste Special Study No. 39-26-0215-83 (reference 12), which was conducted for the purpose of characterizing and determining the generation rate of hazardous wastes collected in the sumps servicing active installation industrial operations. The data have been utilized in the current selection and design of a physical/chemical/biological waste treatment system, primarily for heavy metal, nitrate, and organic removal, being performed by the AWARE Corporation. Data resulting from this particular study of the surface impoundment will assist in the treatment and disposal of wastes when the eventual closure of the surface impoundment occurs.

b. USAEHA Personnel Conducting the Study.

(1) CPT Kenneth E. Wiggans, Project Officer, Sanitary Engineer, Waste Disposal Engineering Division (WDED).

(2) Mr. David A. Rosak, Assistant Project Officer, Environmental Scientist, WDED.

(3) CPT Robert C. Williams, Sanitary Engineer, USAEHA Regional Division-South.

(4) Mr. Keith B. Hoddinott, Soil Scientist, WDED.

(5) Mr. William P. Smithson, Chemical Engineering Technician, WDED.

c. Personnel Contacted.

(1) Mr. D. Maley, DAC, Chief Engineer, LHAAP.

(2) Mr. A. B. Childress, Occupational and Environmental Health Coordinator, Thiokol Corporation.

(3) Mr. A. Morgan, Burning Ground Operator, Thiokol Corporation.

d. Field Procedures.

(1) General. Prior to sampling, the hazardous industrial waste surface impoundment, also known as the UEP, was measured and a sampling grid utilizing US Environmental Protection Agency (EPA) sampling methodology was established. The sampling grid contained 16 sample points (see Figure B-1, Appendix B).

(2) Sample Collection.

(a) Aqueous, sediment, and soil samples were collected at each point. In addition, a composite sample of floating material from various locations in the UEP and a sample from an exposed sediment mound near the truck discharge point (point 17 on Figure B-1) were also taken.

(b) A modified composite liquid waste sampler was used to collect the aqueous samples from the UEP in an effort to obtain a column of liquid representing the entire depth of the pond. The object was to include subsurface waste layers in the sample in the event they existed. Turbid conditions prevented visual confirmation of any layering. Sediment samples were collected at each point using a clamshell dredge. Soil samples were obtained by manually hammering in 2-inch Shelby tubes and extracting the sample from the tubes. The depth of penetration into soil varied from 12 to 15 inches, depending on the type of soil encountered.

(3) Field Measurements. The UEP dimensions, water depth, sediment depth, pH, and conductivity were measured at each grid point.

e. Sample Analyses. Analyses of aqueous sediment and soil samples were performed by the Directorate of Laboratory Services, this Agency. Due to problems involving laboratory methodology for several purgeable organic parameters, only partial results were received from the laboratory on the sediment and soil samples. A listing of the chemical laboratory procedures is included in Appendix C.

5. FINDINGS AND DISCUSSION.

a. General. The UEP received wash water containing solvent residues and solids collected from buildings involved in pyrotechnic material preparation and mixing. In addition, water, essentially from precipitation, pumped from sumps of inactive buildings was discharged into the UEP.

b. Field Measurements.

(1) The UEP was approximately 300 feet by 260 feet in plan view and 12 feet from the top of the berm to the bottom of the pond. The water averaged 6 1/4 feet in depth. Due to less than normal rainfall at the time of the field study, the water level of the UEP was approximately 2 feet lower than usual for that time of year. The liquid layer was slightly turbid and greenish-yellow. The sediment layer ranged from 2 to 12 inches in depth at the sampled locations and was typically medium soft, gelatinous and grayish-black. Some sediment samples had an anaerobic-type odor though most exhibited no characteristic odor. Diagrams, based on limited measurements and estimates, showing the approximate UEP bottom contour and sediment layer contour, are provided in Figures B-2 and B-3, Appendix B, respectively.

(2) Field measurements of pH in the aqueous layer averaged 10.75, while the conductivity ranged from 2,250 to 2,500 umhos/cm. The pH measured on the sediment samples averaged 9.5.

(3) The soils found in sample points 1 through 8 were typically grayish clays, while points 9 through 16 consisted of brownish-gray sandy silt soils. Many of the samples were streaked with other colors, reds, browns, and purples, indicating localized metal concentration.

c. Analyses of the Aqueous Layer.

(1) The average results of the characterization of the UEP aqueous layer are listed in Tables 1 and 2 juxtaposed with the averaged data from identical analyses as reported in Wastewater Engineering Special Study No. 32-62-0182-82, December 1981 (reference 15) and Water Quality Special Study No. 24-0586-77, August 1976 (reference 17). As can be seen from Tables 1 and

2, changes have occurred in various parameters during the period 1976 to 1982. The waste has become more alkaline, with the pH increasing from 4.1 in 1976 to 10.75 in 1982 and alkalinity from 5 mg/L as calcium carbonate ($CaCO_3$) in 1976 to 840 mg/L in 1982.

(2) Contaminants which have steadily increased include fluoride, methylene blue active substances (MBAS) (foaming agents), grease and oil, chemical oxygen demand, nitrite, nitrate, phosphate, iron, and potassium. Levels of other pollutants have varied over the years. The gradual increase of some parameters while others fluctuate is not surprising due to the fact that wastes discharged into the UEP change in type and quantity directly with the production schedule for pyrotechnic ammunition (see reference 12). Changes in the UEP waste characteristics are to be expected as long as LHAAP continues with a fluctuating production schedule.

TABLE 1. COMPARISON OF AQUEOUS LAYER STANDARD ANALYSES, 1982, 1980, AND 1976 (AVERAGE RESULTS)

Parameter*	1982†	1980†	1976§
pH	10.75	9.43	4.1
Conductivity	2372	2150	2923
Total Solids	1962	1327	2733
Total Dissolved Solids	1565	1231	2711
Chlorides	407	368	817
Sulfate	53	<0.5	23
Fluoride	0.20	0.18	0.11
MBAS	1.29	0.35	ND
Total Phenols	ND	0.05	0.22
Grease and Oil	10.2	12.5	1.0
Total Alkalinity	840	392	5
Total Acidity	0	--	19
Chemical Oxygen Demand	454	147	45
Ammonia-N	2.6	0.61	6.4
Total Kjeldahl Nitrogen (TKN)	9.8	4.68	8.0
Nitrite-N	18.1	0.23	ND
Nitrate-N	204	138	ND
Total Phosphate-P	1.79	0.39	0.08

* All values expressed in mg/L except pH in standard units and conductivity in umhos/cm.
† Average of 16 values
‡ Average of 2 values
§ Average of 3 values
-- = not determined
ND = not detected

TABLE 2. COMPARISON OF AQUEOUS LAYER METALS ANALYSES 1982, 1980, AND 1976 (AVERAGE RESULTS)

Parameter*	1982†	1980†	1976§
Aluminum	6.8	ND	ND
Arsenic	0.002	ND	ND
Barium	39.5	9.9	20.2
Boron	0.56	ND	0.22
Calcium	8.4	15.2	17.0
Cadmium	0.0013	ND	0.011
Chromium	0.398	ND	ND
Copper	0.09	ND	ND
Iron	4.8	0.21	0.51
Lead	0.17	ND	0.09
Magnesium	133	108	140
Manganese	0.11	0.076	0.145
Mercury	0.0005	0.004	0.00014
Molybdenum	3.43	ND	ND
Potassium	44	34	21.1
Selenium	ND	ND	ND
Silicon	1.79	2.56	ND
Silver	0.028	ND	ND
Sodium	275	--	--
Zinc	0.619	0.036	0.046

* All values expressed in mg/L
† Average of 16 values
† Average of 2 values
§ Average of 3 values
-- = not determined
ND = not detected

(3) A comparison of the levels of UEP contaminants to maximum contaminant levels (MCL) as specified by the National Interim Primary Drinking Water Regulations (NIPDWR) and the National Secondary Drinking Water Regulations (NSDWR) (see references 1 and 2), is provided in Table 3 merely to show that approximately half of the contaminants in the UEP aqueous layer exceed drinking water standards.

TABLE 3. COMPARISON OF NIPDWR AND NSDWR LIMITS WITH UEP SUPERNATANT

Parameter*	1982 Average†	NIPDWR/NSDWR Standard
Arsenic	0.002	0.05
Barium	39.5	1.0
Cadmium	0.0013	0.010
Chromium	0.398	0.05
Fluoride (70.7-79.2°F)	0.20	1.60
Lead	0.17	0.05
Mercury	0.0005	0.002
Nitrates (as N)	204	10.0
Selenium	ND	0.01
Silver	0.028	0.05
Chloride	407	250
Copper	0.09	1.0
pH	10.75	6.5-8.5
Sulfates	53	250
Zinc	0.619	5.0
Iron	4.8	0.3
Manganese	0.11	0.05‡
Total Dissolved Solids	1,565	500
MBAS	1.29	0.5

* All values expressed in mg/L except pH in standard units
† Average of 16 values
‡ The health standard is 10.0 mg/L
ND = not detected

(4) Table 4 compares organic analyses during the 1982 and 1980 studies. The majority of organics were below detection limits or at trace levels with the exception of Di-n-butyl phthalate, tetrachloroethylene, and trichloroethylene.

TABLE 4. COMPARISON OF AQUEOUS LAYER ORGANICS ANALYSES 1982 AND 1980 (AVERAGE RESULTS)

Parameter*	1982†	1980‡
Acetone	Trace	--
Benzene	<0.04	<0.002
Cresols	--	<0.025
1,2-Dichloroethene (Trans)	0.09	--
Di-n-butyl phthalate	12.5	--
Ethyl Benzene	0.005	--
Hexachloroethane	<0.01	<0.01
Methylene Chloride	<0.01	0.037
Napthalene	<0.01	<0.01
Tetrachloroethylene	0.033	0.58
1,1,1-Trichloroethane	0.011	0.019
Trichloroethylene	0.025	0.023
Toluene	<0.01	0.005

* All values expressed in mg/L
† Average of 16 values
‡ Average of 2 values
-- = not determined

(5) Complete data on aqueous layer analyses are provided in Table D-1 and D-2, Appendix D.

d. Analyses of the Sediment Layer.

(1) Sediment samples from the UEP were characterized for Extraction Procedure (EP) Toxicity, selected standard inorganic parameters, and a limited number of organic compounds.

(2) None of the 16 grid point samples leached detectable amounts of the heavy metals arsenic, cadmium, mercury, selenium, or silver. Chromium and lead were leached out in quantities well below the EP Toxicity MCL. While barium was leached out in all the samples, only one approached the MCL of 100 mg/L with a value of 94 mg/L. All of the grid point sediment samples are considered nonhazardous with respect to EP Toxicity.

(3) The sample from the sediment mound (Sample No. 17 [illegible] nonhazardous with respect to EP Toxicity. Barium was leached out at 82 mg/L, but this is below the MCL of 100 mg/L.

(4) The composite sample of floating material leached out 100 mg/L of barium. While this does not exceed the MCL of 100 mg/L, it is a borderline case so close to the MCL that the sample should be considered as hazardous with respect to EP Toxicity. All other parameters were not detected or were well below the MCL.

(5) Table 5 contains the low, high, and average/values of selected parameters for the 16 grid points, the sediment mound value, and the composite floating material. Among the parameters with the higher values were chemical oxygen demand, nitrates, elemental phosphorus, aluminum, barium, chromium, iron, lead, magnesium, and sodium.

TABLE 5. SELECTED SEDIMENT LAYER ANALYTICAL RESULTS

Parameter*	Value Range	Averaged Value†	Sediment Mound	Floating Material
pH	9.0-10.0	9.5	10.6	--
Total solids	16-38	25	58	--
Chemical Oxygen Demand	70,000-280,000	137,000	98,000	--
Nitrate-N	420-2,400	999	2,200	--
Total Phosphate-P	520-1,720	1,033	640	--
Phosphorus-elemental	450-1,560	953	600	--
Aluminum	14,000-32,000	24,200	5,400	--
Barium	3,000-7,400	4,980	6,500	6,300
Chromium	85- 2,800	539	670	640
Copper	57-850	237	400	--
Iron	5,200-6,700	5,919	5,200	--
Lead	60-930	328	480	290
Magnesium	2,900-8,300	3,813	280,000	--
Manganese	44-1,000	132	257	--
Mercury	ND-2.9	1.5	1.0	ND
Potassium	900-2,200	1,594	540	--
Sodium	890-2,400	1,593	2,300	--
Zinc	100-1,000	245	1,000	--
Phenanthrene	ND-20	2.3	<2.0	<2.0
Hexachlorobenzene	ND-110	9.7	65.0	5.0
Benzyl butyl phthalate	ND-12	2.7	<10	5.0
Bis(2-ethylhexyl)phthalate	5-100	40.1‡	60.0	25.0
Diethyl phthalate	ND-80	9.5	<10	4

* Units expressed in ug/g except for pH in standard units and total solids as percent
† Average of 16 samples except for organics average of 15 samples
‡ Average of 14 samples
-- = not determined
ND = not detected

(6) Of the organics that were analyzed, none were found consistently in all samples. The only organic compounds that appeared in measurable quantities were phenanthrene, hexachlorobenzene, benzyl butyl phthalate, Bis(2-ethythexyl)phthalate, and diethyl phthalate. Other compounds were below detection limits or appeared only at trace levels.

(7) Complete data on the sediment layer analyses are provided in Tables D-3, D-4, and D-5, Appendix D.

e. Analyses of the Soil Layer.

(1) Soil samples from the UEP were characterized for EP Toxicity, selected inorganic standard parameters, and a limited number of organic compounds.

(2) None of the soil samples were found to be hazardous with respect to EP Toxicity.

(3) Low, high, and average values for selected parameters are provided in Table 6. As with the sediment samples, although lower in concentration, similar parameters had high values to include chemical oxygen demand, nitrates, aluminum, iron, magnesium, and sodium.

TABLE 6. SELECTED SOIL LAYER ANALYTICAL RESULTS

Parameter*	Value Range	Averagedt Value
Total Solids	77-85	83
Chemical Oxygen Demand	5,300-10,000	7,719
Nitrate-N	ND-820	184
Total Phosphate-P	12-164	67
Phosphorus-clemental	ND-150	41
Aluminum	4,800-29,000	11,900
Barium	60-800	169
Chromium	5-16	11
Copper	5-38	12
Iron	3,400-6,800	5,231
Lead	14-50	25
Magnesium	660-2,700	1,530
Manganese	15-680	213
Potassium	280-1,200	644
Sodium	910-1,600	1,282
Zinc	27-61	44
Hexachlorobenzene	ND-0.9	0.4
Bis(2-ethylhexyl)phthalate	ND-2.0	0.5
Di-n-butyl phthalate	ND-0.6	0.5

* Units expressed in ug/g except for total solids as percent
† Average of 16 samples

(4) Among the organic compounds analyzed, only hexachlorobenzene, Bis(2-ethylhexyl)phthalate, and Di-n-butyl phthalate were found above trace levels in several, but never all, of the samples. Other compounds were below detection limits or appeared occasionally at trace levels.

(5) Complete data on soil layer analyses are provided in Tables D-6, D-7, and D-8, Appendix D.

f. Treatment Considerations.

(1) Aqueous Layer. Results of the characterization of the UEP aqueous layer indicate that this liquid waste would be amenable to the physical/chemical/biological treatment scheme being developed by the AWARE Corporation for wastes being discharged into the UEP. Not unexpectedly, the average values of the UEP aqueous layer parameters fall within the range of values for sump truck discharges into the UEP (see reference 12). Since the treatment facility under development will be designed to handle essentially the same wastes that are currently contained in the UEP, the aqueous layer may be treated in the new facility when it is completed. Should it be necessary to treat the UEP contents prior to completion of the new facility, a similar treatment scheme to the one finally selected for LHAAP should be used by a temporary onsite system or at a permitted offsite disposal facility.

(2) Sediment Layer. With the exception of the composite sample of floating material, which should be considered as hazardous (EP Toxic), sediment samples were found to be nonhazardous wtih respect to EP Toxicity for heavy metals content. In addition, the sediment did not exhibit the descriptive Resource Conservation and Recovery Act (RCRA) characteristics of ignitability or reactivity for nonliquids (see reference 5). The descriptive properties must be used in the absence of well-defined tests for ignitability and reactivity for RCRA nonliquid wastes. Although the sediment may not fall into the descriptive categories of a hazardous waste, it still contained relatively high concentrations of some heavy metals as shown in Table 5. While they appear to be relatively insoluble with respect to the EPA Toxic Extraction Procedure, they are soluble enough to pose a definite threat to the groundwater. Monitoring well data on the UEP area from the current RCRA ground-water monitoring program (reference 14) as well as USAEHA Land Disposal Study No. 38-26-0104-81 (reference 16) support this conclusion. Barium, as an example, was found in ground-water samples in excess of the NIPDWR MCL for barium in both the 1980 Land Disposal Study and the more recent ground-water monitoring program data. In addition, other drinking water parameters such as manganese, nitrates, chlorides, and iron have also been found to exceed the standards. These are the same parameters that were found in relatively high concentrations in the sediment. In light of the evidence which appears to correlate sediment contaminant concentrations directly to presence of the same contaminants in the ground water, the

sediment should either be treated in place (e.g., stabilization) to preclude further leaching action or removed to a permitted disposal facility as part of the closure procedure.

(3) Soil Layer. While none of the soil samples were found to be hazardous due to the characteristic of EP Toxicity, most of the contaminants found in the sediment were present in the soil, although most were at lower concentrations. Soil samples were collected only to a maximum depth of 15 inches. Through the many years of use of the UEP, the subsurface soil must now contain a certain percentage of contaminants as a result of migration. It may be necessary to sample soil at greater depths once the UEP has been emptied of the aqueous layer in order to satisfy state and Federal regulatory agencies. Coordination with the appropriate state and Federal officials is necessary in order to determine what additional investigation, if any, will be required with respect to the UEP subsurface soil.

6. SUMMARY AND CONCLUSIONS.

a. Based on analyses the UEP aqueous layer is amenable to treatment by the physical/chemical/biological treatment system under design for the treatment of wastes currently discharged into the UEP.

b. There is a good correlation between high concentrations of contaminants found in the UEP sediment and soil and the same contaminants found in ground-water samples from the UEP area.

c. The composite floating material sample from the UEP may be considered hazardous with respect to EP Toxicity for the heavy metal barium.

d. Coordination with appropriate state and Federal regulatory agencies will be necessary to determine any additional requirements for the investigation of the extent of the UEP subsurface soil contamination.

7. RECOMMENDATIONS. The following recommendations are based on good engineering practice.

a. Utilize information and data contained in this report to modify the existing UEP closure plan.

b. Treat the aqueous layer of UEP in the physical/chemical/biological hazardous industrial waste treatment system when completed or in an equivalent temporary system if required sooner.

c. Include treatment or removal procedures for the UEP sediment layer and floating material in the UEP closure plan.

d. Coordinate with appropriate state and Federal regulatory agencies with respect to any additional UEP subsurface soil investigation requirements.

8. TECHNICAL ASSISTANCE. Requests for services should be directed through appropriate channels of the requesting activity to Commander, US Army Environmental Hygiene Agency, ATTN: HSHB-EW, Aberdeen Proving Ground, MD 21010, with an information copy furnished the Commander, US Army Health Services Command, ATTN: HSPA-P, Fort Sam Houston, TX 78234. If further technical advice or assistance is required regarding this report, contact the Chief, Waste Disposal Engineering Division, this Agency, AUTOVON 584-2024.

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APPENDIX A

REFERENCES

1. Title 40, Code of Federal Regulations (CFR), 1983 rev, Part 141, National Interim Primary Drinking Water Regulations.

2. Title 40 CFR, 1983 rev, Part 143, National Secondary Drinking Water Regulations.

3. Title 40, CFR, 1983 rev, Part 257, Criteria for Classification of Solid Waste Disposal Facilities and Practices.

4. Title 40, CFR, 1983 rev, Part 260, Hazardous Waste Management System: General.

5. Title 40, CFR, 1983 rev, Part 261, Identification and Listing of Hazardous Waste.

6. Title 40, CFR, 1983 rev, Part 262, Standards Applicable to Generators of Hazardous Waste.

7. Title 40, CFR, 1983 rev, Part 263, Standards Applicable to Transporters of Hazardous Waste.

8. Title 40, CFR 1983 rev, Part 264, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.

9. Title 40, CFR, 1983 rev, Part 265, Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.

10. Texas Municipal Solid Waste Management Regulations, Including Hazardous Waste, 19 November 1980.

11. US Environmental Protection Agency, Quality Criteria for Water, Office of Water and Hazardous Materials, Document Number EPA-440/9-76-023, 1976.

12. Letter, HSHB-ES/WP, this Agency, 13 April 1983, subject: Hazardous Waste Special Study No. 39-26-0215-83, Longhorn Army Ammunition Plant, Marshall, TX 16-27 July 1982.

13. Letter, HSHB-ES-T, this Agency, 6 January 1983, subject: Preliminary Report, Hazardous Waste Special Study No. 39-26-0291-83, Longhorn Army Ammunition Plant, Marshall, TX, 29 Oct - 3 Nov 1982.

14. Letter, HSHB-ES-G, this Agency, 25 June 1982, subject: Ground-water Monitoring Results for Longhorn AAP, TX.

15. Letter, HSE-MS, this Agency, 18 December 1981, subject: Wastewater Engineering Special Study No. 32-62-0182-82, Longhorn Army Ammunition Plant, Marshall, TX, 15 March - 30 September 1981.

16. Letter, HSE-ES/WP, this Agency, 26 May 1981, subject: Land Disposal Study No. 38-26-0104-81, Longhorn Army Ammunition Plant, Marshall, TX, 23 January - 8 February 1980.

17. Letter, HSE-EW-S, this Agency, 23 August 1977, subject: Water Quality Special Study No. 24-0586-77, Longhorn Army Ammunition Plant, Marshall, Texas, 2-10 August 1976.

APPENDIX B

UEP DIAGRAMS

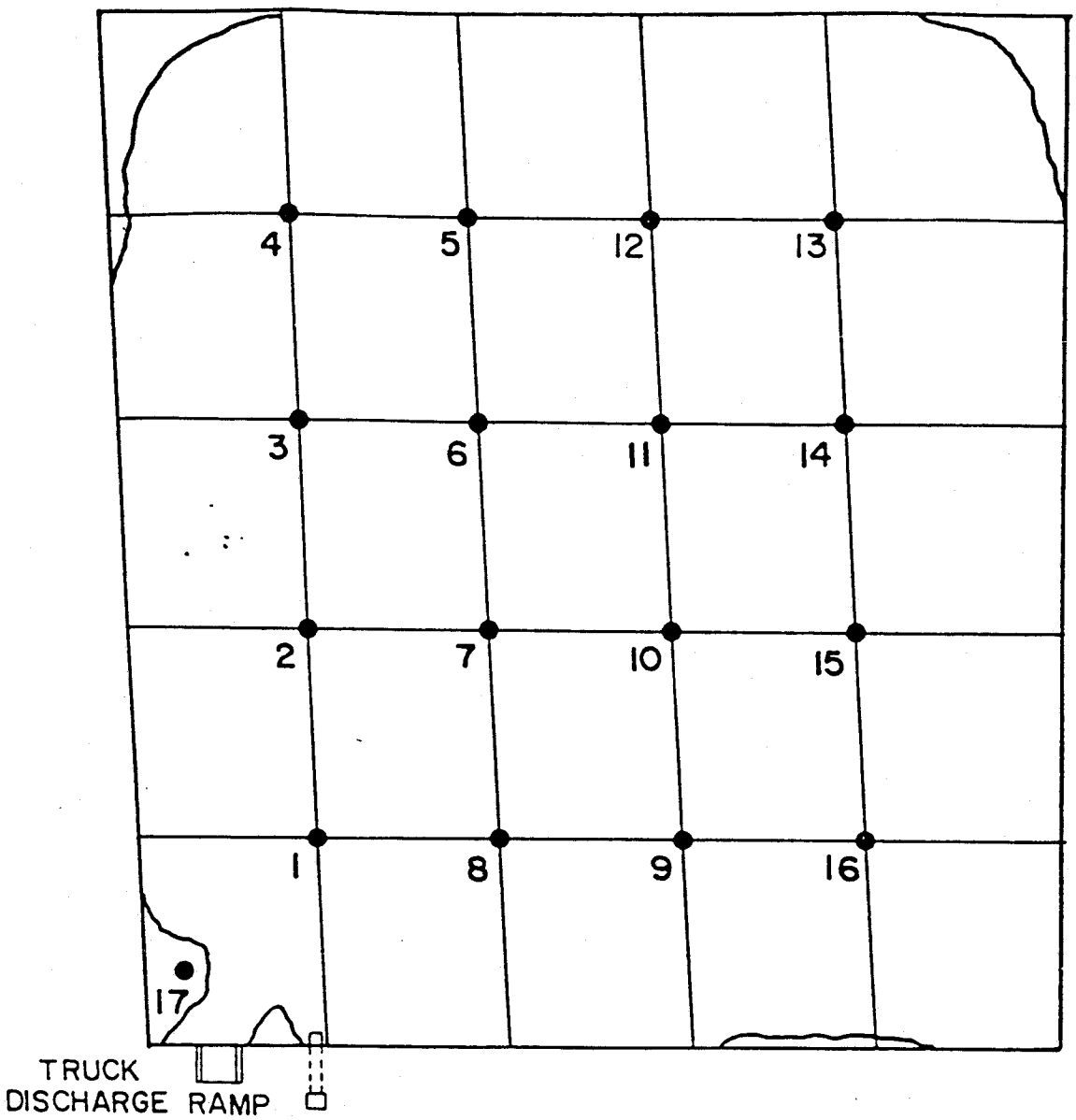

Figure B-1. UEP SAMPLING GRID

U.S. ARMY ENVIRONMENTAL HYGIENE AGENCY

WASTE DISPOSAL ENGINEERING DIVISION

DATE 12-20-82
DRAWN JRB
APPROVED KEW

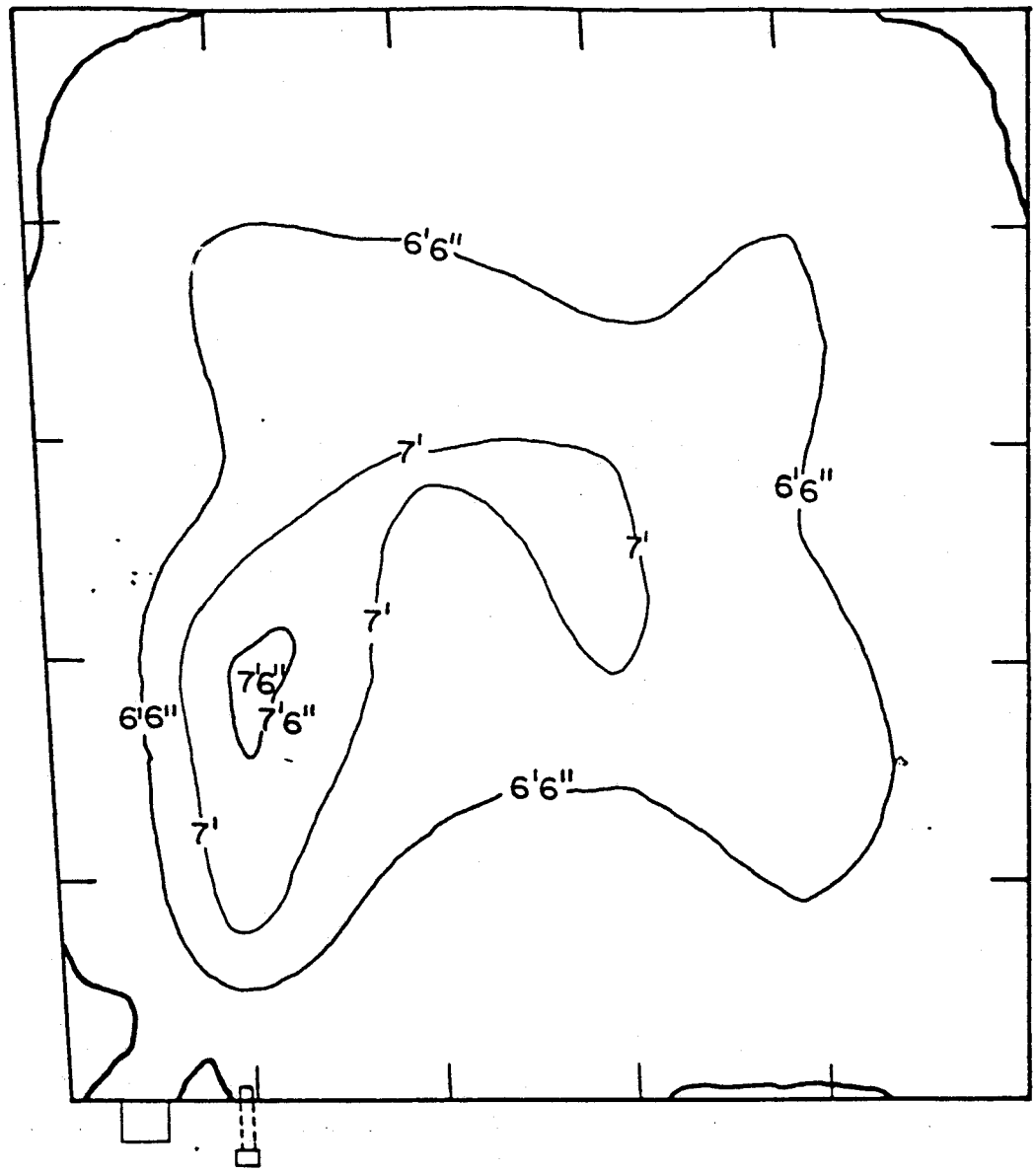

Figure B-2. UEP BOTTOM CONTOUR

U.S. ARMY ENVIRONMENTAL HYGIENE AGENCY

WASTE DISPOSAL ENGINEERING DIVISION

DATE 12-20-82
DRAWN CRB
APPR. KEW

Figure B-3. UEP SEDIMENT DEPTH CONTOUR

U.S. ARMY ENVIRONMENTAL HYGIENE AGENCY

WASTE DISPOSAL ENGINEERING DIVISION

DATE 12-20-82
DRAWN CPB
APPR. KEW

APPENDIX C

CHEMICAL LABORATORY PROCEDURES

Parameter	Method	Identification
pH	Standard Methods*, Electrochemical	423
Conductivity	Standard Methods*, Wheatstone bridge	205
Total Solids	Standard Methods*, Gravimetric, 103-105°C	209A
Total Dissolved Solids	Standard Methods*, Gravimetric, 180°C	209B
Total Volatile Solids	Standard Methods*, Gravimetric, 550°C	209E
Chloride	EPA†, Titrimetric, mercuric nitrate	325.3 STORET No. 00940
Sulfate	Standard Methods*, Automated methythymol blue	426D
Fluoride	Standard Methods*, SPADNS	413C
Methylene Blue Active Substances	Standard Methods*, Colorimetric, methylene blue	512A
Total Phenols	Standard Methods*, Manual distillation and 4-AAP	510 A and C
Grease and Oil	Standard Methods*, Liquid/liquid extraction with freon	503A
Total Alkalinity	Standard Methods*, Titration, potentiometric	403
Total Acidity	Standard Methods*, Titration, potentiometric	402
Chemical Oxygen Demand	EPA†, Sealed tubes, Hach, colorimetric	410.4 STORET No. 00340
Total Organic Carbon	Standard Methods*, Combustion, IR, OIC ampule	505
Ammonia Nitrogen	Standard Methods*, Manual distillation followed by nesslerization	417 A and B
Total Kjeldahl Nitrogen	Standard Methods*, Manual digestion followed by nesslerization	420A and 417B
Nitrate/Nitrite Nitrogen	EPA†, Automated colorimetric, cadmium reduction	353.2 STORET No. 00630
Total Phosphate Phosphorus	Standard Methods*, Manual digestion followed by colorimetric ascorbic acid	424CIII & 424F

*, †, See footnotes on page C-4

590000

000566

Parameter	Method	Identification
Elemental Phosphorus	EPA†, Semi-automated block digestor, strong acid followed by colorimetric ascorbic acid Total phosphorus value is subtracted from result	365.4 STORET No. 00665
Nitrate/Nitrite Nitrogen on sediment samples	Standard Methods*, Salt - leaching followed by cadmium reduction	418C
Total Kjeldahl Nitrogen on sediment samples	Standard Methods*, Digestion followed by ammonia selective electrode	420B and 417E
Metals	(Total aluminum, barium, cadmium, chromium, sodium, copper, iron, lead, magnesium, manganese, potassium, zinc, silver, molybdenum, and calcium), EPA†, Atomic Absorption via direct aspiration following Section Section 4.13 for total metals. The liquid samples for aluminum, chromium, lead, and silver were analyzed by the atomic absorption furance techniques following Section 4.13 for total metals	STORET's No. 01105,01007, 01027, 01034, 00929, 01042, 01045, 01051, 00927,01055, 00937,01092, 01077, 00916,01062
Metals	(Total arsenic and selenium), EPA†, Atomic Absorption via furnace technique following Section 4.13	STORET's No. 01002 and 01147
Mercury	EPA†, Atomic Absorption via cold vapor technique	245.1 STORET No. 71900
Silicon	(Sediment samples), Standard Methods*, Addition of hydrofluoric acid where necessary followed by atomic absorption flame technique	303C
Silicon	(Liquid samples), EPA†, Colorimetric	370.1 STORET No. 00955
Boron	Standard Methods*, Curcumin following hot water leaching	404A
Perchlorates	(Total) Ion Chromatography Systems‡	
Nitrocellulose	USAEHA Method, Acetone/Basic Dissociation to nitrites and subsequent analysis via Diazotization	
Solvents (Purgeable Organics)	EPA§, gas chromatographic and HPLC Methods Methods - Method 601 through 612	

*, †, ‡, See footnotes on page C-4

000567

Parameter	Method	Identification
Solvents (Acid Extractable and Base/Neutral Extractable Organics)	EPA§, gas chromatographic/mass spectrometric methods: method 625	
TEP Metals	(arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) Extraction in accordance to 40 CFR 261. Analysis by atomic absorption techniques as listed earlier.	

* American Public Health Association, Standard Methods for the Examination of Water and Wastewater, 15th ed, 1980.
† US Environmental Protection Agency, Manual of Methods for Chemical Analysis of Water and Wastes, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio, 1979.
‡ "Determination for Perchlorate," Dionex Corporation, Sunnyvale, CA 94086, November 1980
§ Proposed Rules Guidelines Establishing Test Procedures for the Analysis of Pollutants, Appendices I and II, 44 Federal Register (FR) 69468 and 69526, 3 December 1979.

APPENDIX D

LABORATORY ANALYSES

TABLE D-1. STANDARD ANALYSES/METAL ANALYSES - UEP AQUEOUS LAYER

Parameter*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Limit of Detection
pH† (field) (standard units)	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	1-14
Conductivity (umhos/cm)	2,500	2,450	2,550	2,350	2,300	2,500	2,350	2,250	2,400	2,350	2,300	2,250	2,300	2,300	2,400	2,400	1
Total Solids	2,060	1,880	2,230	1,990	2,330	1,750	1,830	1,650	1,720	1,650	1,650	2,050	1,700	1,620	1,640	1,640	10
Total Dissolved Solids	1,572	1,548	1,580	1,474	1,451	1,611	1,631	1,589	1,580	1,581	1,590	1,596	1,588	1,536	1,555	1,560	10
Chloride	410	355	410	410	375	375	420	425	370	420	425	475	470	395	390	390	1
Sulfate	65	72	55	73	73	48	52	46	47	48	20	60	47	48	46	49	1
Fluoride	0.28	0.31	0.28	0.22	0.32	0.20	0.18	0.16	0.19	0.15	0.17	0.16	0.14	0.14	0.17	0.15	0.10
Methylene Blue-active substances	7.1	1.0	1.3	1.3	0.5	0.7	0.9	0.8	1.2	1.2	0.7	0.8	0.8	0.8	0.8	0.8	0.1
Total Phenols	ND	ND	ND	ND	0.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02
Grease and Oil	76	6	7	3	9	7	7	6	3	4	4	5	6	8	7	5	1
Total Alkalinity as $CaCO_3$	785	755	847	836	938	826	887	877	765	898	867	877	949	785	775	785	1
Total Acidity as $CaCO_3$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chemical Oxygen Demand	810	1,040	400	430	540	480	690	280	250	140	470	580	300	300	320	240	25
Total Organic Carbon	170	370	340	330	200	300	310	330	330	330	350	340	330	300	300	340	1.0
Ammonia-N	5.1	8.9	3.6	2.6	2.5	2.0	3.6	1.3	1.7	1.1	1.0	3.3	1.4	1.2	1.3	1.4	0.10
Total Kjeldahl-N	10	11	3.8	5.0	58	2.5	13	8.0	2.5	9.0	9.0	3.5	7.0	8.0	3.5	3.3	0.5
Nitrite-N	21	20	19	18	0.03	20	20	18	20	14	20	21	20	20	19	20	0.01
Nitrate-N	250	250	250	150	10	190	170	150	240	180	240	220	230	280	170	290	0.01
Total Phosphate-P	14	1.9	1.1	1.2	1.2	1.7	2.7	1.3	1.0	0.3	ND	2.3	ND	ND	ND	ND	0.2
Phosphorus-Elemental	12	1.0	0.6	0.6	0.6	1.0	1.4	0.4	0.4	ND	ND	1.6	ND	ND	ND	ND	0.2
Nitrocellulose	0.9	ND	ND	0.6	ND	0.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Aluminum	8.8	4.5	14	15	49	3.3	3.2	0.8	1.6	0.2	0.2	6.8	1.2	0.2	0.3	0.2	0.2
Arsenic	ND	ND	ND	0.018	0.016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Barium	36	40	42	38	51	43	39	37	40	41	40	35	36	40	35	39	0.5
Boron	0.55	0.53	0.55	0.58	0.61	0.57	0.54	0.54	0.57	0.58	0.55	0.61	0.55	0.52	0.54	0.59	0.10
Cadmium	0.003	ND	ND	0.002	0.006	ND	0.002	ND	ND	0.005	ND	0.003	ND	ND	ND	ND	0.002
Calcium	8.8	8.6	6.4	5.0	3.3	7.1	9.3	12	8.9	10	10	7.4	9.7	10	7.1	11	1.0
Chromium	1.1	0.19	0.32	0.38	3.0	0.20	0.26	0.11	0.12	0.03	0.02	0.57	0.07	ND	ND	ND	0.02
Copper	0.18	0.09	0.09	0.12	0.54	0.05	0.06	0.03	0.04	0.02	0.02	0.17	0.03	0.02	0.02	0.02	0.01
Iron	10	3.7	9.5	12	26	2.3	2.9	07.	1.1	0.2	0.1	7.9	1.0	0.1	0.2	0.1	0.05
Lead	0.40	0.21	0.22	0.22	0.88	0.12	0.15	0.10	0.11	0.06	0.04	0.09	0.03	0.05	0.04	0.03	0.01
Magnesium	126	137	144	130	150	138	140	133	126	128	134	139	133	130	108	133	0.1
Manganese	0.76	0.12	0.24	0.08	0.26	0.04	0.11	ND	0.02	ND	ND	0.09	0.02	ND	ND	ND	0.02
Mercury	0.0013	0.0016	0.0015	0.0011	0.0021	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001
Molybdenum	3.2	4.8	4.5	5.5	8.9	3.6	3.7	2.4	2.9	2.0	2.3	2.3	2.9	2.0	1.8	2.1	0.5
Potassium	45	45	47	43	48	46	46	43	41	45	44	45	44	44	36	44	0.5
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005
Silicon	2.1	1.9	3.0	1.3	1.6	3.6	1.7	1.5	1.6	1.3	1.4	1.2	2.2	1.0	1.9	1.4	0.5
Silver	0.02	0.05	ND	0.03	0.03	0.03	0.02	0.05	0.05	0.03	ND	ND	0.04	0.02	0.06	0.03	0.02
Sodium	293	282	288	256	279	291	299	277	259	277	277	234	274	272	228	275	1.0
Zinc	0.94	0.66	0.52	0.41	1.28	0.36	0.82	0.87	1.21	0.51	0.36	0.44	0.70	0.29	0.32	0.22	0.01
Total Perchlorates as ClO_4	ND	139	26	24	‡	30	11	17	8	17	11	15	16	16	15	15	0.3

See page D-9 for footnotes

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Regional Division West

000569

TABLE D-2. ORGANIC ANALYSES - UEP AQUEOUS LAYER

000570

Parameter*§	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Limit of Detection
Purgeables																	
Benzene	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.04
Bromomethane	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Bromodichloromethane	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Bromoform	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Carbon Tetrachloride	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Chlorobenzene	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Chloroethane	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
2-Chloroethylvinyl Ether	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Chloroform	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Chloromethane	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Dibromochloromethane	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
1,2-Dichlorobenzene	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
1,3-Dichlorobenzene	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
1,4-Dichlorobenzene	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
1,1-Dichloroethane	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
1,2-Dichloroethane	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
1,1-Dichloroethene	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.019	ND	0.01
1,2-Dichloroethene (Trans)	1.40	0.005	0.007	ND	ND	0.007	0.006	ND	ND	ND	ND	0.013	ND	ND	0.005	0.007*	0.01
1,2-Dichloropropane	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
1,3-Dichloropropene (Cis)	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
1,3-Dichloropropene (Trans)	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Ethyl Benzene	0.050	0.025	0.003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Methylene Chloride	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
1,1,2,2-Tetrachloroethane	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Tetrachloroethylene	0.070	0.040	0.029	0.027	0.025	0.045	0.053	0.034	0.025	0.025	0.023	0.022	0.022	0.021	0.028	0.027	0.01
1,1,1-Trichloroethane	<0.050	0.008	0.011	0.008	0.008	0.014	0.013	0.010	0.009	0.008	0.009	ND	0.009	0.008	0.009	0.009	0.01
1,1,2-Trichloroethane	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Trichloroethylene	0.190	0.015	0.016	0.014	0.013	0.022	0.020	0.015	0.014	0.012	0.012	0.008	0.011	0.011	0.015	0.016	0.01
Trichlorofluoromethane	<0.050	ND	ND	ND	ND	X		ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Toluene	<0.050	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Vinyl Chloride	0.120	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Acetone	ND	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR	ND	ND	ND	TR	qualitative
Other Hydrocarbons**	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	qualitative
Extractables																	
Acenaphthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Acenaphthylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Benzo(a)anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Benzo(a)fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Benzo(ghi)perylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025
Benzo(k)fluoroanthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Cyrysene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025
Fluoanthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Fluorene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Indenol (1,2,3-c,d) pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025
Naphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Phenanthrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Hexachlorocyclopentadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Hexachlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Hexachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
2-Chloronaphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Benzidine	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
3,3-Dichlorobenzidine	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Benzyl butyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Bis(2-ethylhexyl)phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Di-n-butyl phthalate	35	30	35	ND	ND	35	35	ND	30	ND	ND	ND	ND	ND	ND	ND	0.01
Di-n-octyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Diethyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Dimethyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
N-nitrosodimethylamine	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
N-nitrosodiphenylamine	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
N-nitrosodi-N-propylamine	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Isophorone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Nitrobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
2,4-Dinitrotoluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
2,6-Dinitrotoluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Bis(2-chloroethyl)ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Bis(2-chloroethoxy)methane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Bis(2-chloroisopropyl)ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
4-Bromophenyl phenyl ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
4-Chlorophenyl phenyl ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
4-Chloro-3-methyl phenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025
2-Chlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025
2,4-Dichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025
2,4-Dimethylphenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025
2,4-Dinitrophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.250
2-Methyl-4,6-dinitrophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.250
2-Nitrophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025
4-Nitrophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025
Pentachlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025
Phenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025
Phosphoric acid triethyl ether**	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	qualitative
Hexanedioic acid dioctyl ester**	ND	ND	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	qualitative
Heptadecane**	ND	ND	ND	ND	ND	ND	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	qualitative

See page D-9 for footnotes

TABLE D-3. STANDARD ANALYSES/METAL ANALYSES - UEP SEDIMENT LAYER

Parameter*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Floating Material	Limit of Detection
pH (field) (standard units)	10.0	9.7	9.8	9.3	9.6	9.3	9.2	9.7	9.5	9.6	9.3	9.1	9.0	9.6	9.7	9.2	10.6	††	††
Total Solids (percent)	25	28	30	32	30	22	23	19	26	21	20	35	38	22	16	25	58	††	0.2
[illegible]	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.2	ND	0.2	ND	ND	††	0.2
[illegible] Oil (percent)	††	††	††	††	††	††	††	††	††	††	††	††	††	††	12	2	††	††	0.01
[illegible] Oxygen Demand	260,000	130,000	110,000	100,000	70,000	110,000	120,000	280,000	180,000	88,000	130,000	41,000	92,000	150,000	210,000	120,000	98,000	††	100
[illegible] Kjeldahl - N	350	330	750	800	750	950	1,150	1,100	870	1,050	1,150	850	620	1,200	1,100	1,050	280	††	100
[illegible]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.8	††	0.5
[illegible]	2,400	980	920	720	780	920	850	1,200	1,800	600	600	1,000	420	900	900	1,000	2,200	††	30
Total Phosphate-P	1,600	880	700	520	600	1,290	1,450	720	1,040	1,240	940	590	810	1,210	1,720	1,210	640	††	10
[illegible] Sedimental	1,500	810	630	450	520	1,200	1,360	640	980	1,180	860	540	760	1,120	1,560	1,140	600	††	10
[illegible] Solutes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	††	500
[illegible]	17,000	20,000	17,000	18,000	23,000	25,000	22,000	14,000	21,000	23,000	20,000	32,000	24,000	22,000	19,000	16,000	5,400	††	10
[illegible]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	1
[illegible]	6,400	5,500	4,900	5,800	7,400	4,800	3,600	3,000	4,600	5,200	5,100	3,900	6,100	6,300	3,400	3,700	6,500	6,300	10
[illegible]	33	11	6.1	3.0	4.0	5.6	14	28	10	7.2	6.1	1.4	3.0	8.8	16	8.2	ND	††	1
[illegible]	16	ND	ND	ND	ND	ND	ND	11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
[illegible]	1,200	370	490	330	260	490	350	850	340	370	400	360	340	310	500	300	1,300	††	10
[illegible]	2,800	1,100	500	250	300	510	1,500	2,600	1,400	540	480	85	230	600	1,400	180	670	640	1
[illegible]	850	140	130	74	110	190	230	560	200	130	160	57	100	230	480	160	400	††	1
[illegible]	6,500	5,800	5,500	5,900	6,100	6,200	5,800	5,700	5,900	6,000	5,700	6,700	6,200	5,900	5,600	5,200	5,200	††	100
[illegible]	930	280	190	200	220	200	470	840	270	290	240	60	130	310	330	280	480	290	10
[illegible]	8,300	3,400	3,300	3,200	3,500	3,600	3,700	4,000	3,600	3,600	3,500	3,400	2,900	3,800	4,000	3,200	280,000	††	10
[illegible]	1,000	86	120	57	46	110	76	170	59	77	62	55	45	58	53	44	257	††	10
[illegible]	1.0	ND	ND	1.0	2.6	ND	2.2	2.9	1.0	ND	ND	ND	ND	ND	2.2	1.0	1.0	ND	1.0
[illegible]	890	470	300	300	420	640	1,000	1,200	400	290	390	120	200	680	1,200	520	120	††	30
[illegible]	900	1,800	1,400	1,400	1,700	1,800	1,600	1,000	1,700	1,900	1,600	2,200	1,700	1,900	1,600	1,300	540	††	10
[illegible]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
[illegible]	13,160	15,510	16,450	17,390	15,040	14,570	15,040	2,690	15,980	15,040	12,690	16,920	15,980	13,630	14,570	11,280	10,340	††	10
[illegible]	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
[illegible]	1,800	1,200	1,200	1,300	890	1,500	1,500	1,900	1,800	2,200	1,400	1,600	1,400	1,800	2,400	1,600	2,300	††	10
[illegible]	1,000	210	130	120	150	180	250	500	190	150	160	100	120	190	300	170	1,000	††	1
Total Perchlorates	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	††	2

*See page D-5 for footnotes

[illegible]

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[redacted]

TABLE D-5. ORGANIC ANALYSES - UEP SEDIMENT LAYER

Parameter*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17[11]	Floating Material	Limit of Detection
Extractables																			
Acenaphthene	ND	ND	ND	‡	ND	ND	ND	ND	ND	TR	TR	TR	ND	ND	TR	ND	<10	ND	2
Acenaphthylene	8	ND	TR	‡	TR	TR	2	TR	TR	ND	TR	ND	ND	TR	TR	TR	TR	TR	2
Anthracene	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
Benzo(a)anthracene	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
Benzo(a)pyrene	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
Benzo(b)fluoranthene	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
Benzo(ghi)perylene	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<20	ND	5
Benzo(k)fluoroanthene	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
Cyrysene	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
Dibenzo(a,h)anthracene	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<20	ND	5
Fluoanthene	ND	ND	TR	‡	ND	TR	ND	ND	TR	ND	TR	ND	ND	ND	TR	ND	TR	TR	2
Fluorene	ND	ND	TR	‡	ND	TR	ND	ND	TR	ND	TR	ND	ND	ND	TR	ND	<10	ND	2
Indenol(1,2,3-c,d)pyrene	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<20	ND	5
Naphthalene	12	TR	TR	‡	TR	TR	2	ND	TR	ND	TR	2	ND	ND	ND	ND	<10	ND	2
Phenanthrene	20	4	TR	‡	ND	TR	4	ND	TR	TR	2	TR	ND	ND	2	3	TR	TR	2
Pyrene	ND	ND	TR	‡	ND	TR	ND	ND	TR	TR	TR	ND	ND	ND	TR	ND	TR	TR	2
Hexachlorocyclopentadiene	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
Hexachlorobenzene	110	4	ND	‡	ND	ND	8	16	TR	2	3	ND	TR	TR	2	TR	65	5	2
Hexachlorobutadiene	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
Hexachloroethane	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
1,2-Dichlorobenzene	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
1,2,4-Trichlorobenzene	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
1,3-Dichlorobenzene	ND	ND	TR	‡	TR	TR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
1,4-Dichlorobenzene	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
2-Chloronaphthalene	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
Benzidine	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
3,3-Dichlorobenzidine	ND	ND	ND	‡	3	TR	12	ND	TR	3	5	6	3	2	2	4	<10	5	2
Benzyl butyl phthalate	ND	ND	ND	‡	ND	4	5	ND	TR	5	ND	12	ND	ND	ND	ND	<10	25	2
Bis(2-ethylhexyl)phthalate	50	10	5	‡	30	6	70	70	45	60	70	100	10	10	‡	25	60	ND	2
Di-n-butyl phthalate	ND	ND	TR	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
Di-n-octyl phthalate	ND	ND	ND	‡	ND	TR	11	4	9	10	20	30	4	4	ND	TR	<10	4	2
Diethyl phthalate	ND	ND	TR	‡	ND	TR	ND	TR	TR	ND	TR	ND	ND	ND	ND	ND	<10	ND	2
Dimethyl phthalate	TR	ND	ND	‡	ND	TR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
N-nitrosodimethylamine	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
N-nitrosodi-n-propylamine	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
Isophorone	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
Nitrobenzene	TR	ND	TR	‡	ND	ND	ND	ND	ND	TR	TR	TR	ND	TR	TR	ND	<10	ND	2
2,4-Dinitrotoluene	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
2,6-Dinitrotoluene	ND	ND	ND	‡	ND	ND	TR	ND	ND	ND	ND	ND	ND	ND	TR	TR	<10	ND	2
Bis(2-chloroethyl)ether	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
Bis(2-chloroethoxy)methane	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
Bis(2-chloroisopropyl)ether	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
4-Bromophenyl phenyl ether	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	ND	2
4-Chlorophenyl phenyl ether	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<20	ND	5
4-Chloro-3-methyl phenol	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<20	ND	5
2-Chlorophenol	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<20	ND	5
2,4-Dichlorophenol	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<20	ND	5
2,4-Dimethylphenol	ND	ND	ND	‡	ND	ND	ND	ND	TR	ND	TR	ND	ND	ND	TR	ND	<200	ND	50
2,4-Dinitrophenol	ND	ND	ND	‡	ND	ND	ND	ND	TR	ND	TR	ND	ND	ND	ND	ND	<200	ND	50
2-Methyl-4,6-dinitrophenol	ND	ND	ND	‡	ND	TR	TR	TR	TR	TR	TR	TR	TR	ND	ND	ND	<20	ND	5
2-Nitrophenol	ND	ND	ND	‡	TR	TR	TR	ND	ND	ND	ND	ND	ND	ND	ND	ND	<20	ND	5
4-Nitrophenol	ND	ND	ND	‡	ND	ND	TR	TR	ND	ND	ND	ND	ND	ND	ND	TR	<20	ND	5
Phenol	ND	TR	TR	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<20	ND	5
2,4,6-Trichlorophenol	ND	ND	ND	‡	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	ND	qualitative
Hydrocarbons**																			

See page D-9 for footnotes

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TABLE D-2. STANDARD ANALYTICAL METAL ANALYSES

Parameter*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Limit of Detection
Total Solids (percent)	77	92	92	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ND	6	0.2
Total Phenols	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.2
Chemical Oxygen Demand	8,800	7,600	7,400	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7,000	100
Total Kjeldahl-N	480	630	620	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	350	100
Nitrite-N	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Nitrate-N	1.0	ND	0.5	ND	ND	ND	2.0	2.0	ND	ND	ND	0.5	ND	1	ND	0.2	0.1
Total Phosphate-P	21	23	22	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ND	280	73	10
Phosphorus-Elemental	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Nitrocellulose	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Aluminum	12,000	4,200	10,000	4,[illegible]	[illegible]	[illegible]	9,000	20,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	14,000	7,200	10,000	10
Arsenic	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Barium	420	130	130	40	40	[illegible]	170	70	60	50	50	50	50	300	60	170	10
Boron	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Calcium	320	230	490	44	230	1,100	1,50	110	90	50	200	50	14	190	5	13	1
Chromium	16	9	10	2	7	14	11	12	5	5	12	5	14	15	5	9	1
Copper	12	6	12	27	7	10	5	35	5	5	11	5	10	10	5	9	1
Iron	5,700	4,600	5,100	[illegible]	[illegible]	5,900	[illegible]	[illegible]	4,600	4,000	4,000	[illegible]	[illegible]	[illegible]	[illegible]	5,300	100
Lead	24	14	20	[illegible]	[illegible]	[illegible]	25	22	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	36	10
Magnesium	2,600	1,300	1,500	[illegible]	1,[illegible]	[illegible]	[illegible]	1,700	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,800	10
Manganese	57	72	680	[illegible]	[illegible]	44	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	43	10
Mercury	ND	2.6	ND	ND	ND	1.0	ND	ND	ND	ND	ND	1.0	ND	ND	ND	ND	1.0
Molybdenum	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	30
Potassium	710	650	670	260	[illegible]	[illegible]	410	1,100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	740	10
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
Sodium	1,000	190	1,200	1,200	1,100	1,300	1,200	1,200	1,100	1,400	1,400	1,300	1,600	1,400	1,400	1,500	0
Zinc	61	38	62	40	43	50	27	92	0	4	4	0	40	48	27	42	1

See page D-9 for footnotes

[illegible]
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Regional Division West

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TABLE D-7. TOXIC EXTRACTION PROCEDURE ANALYSES - UEP SOIL LAYER

Sample Point	Arsenic*	Barium*	Cadmium*	Chromium*	Lead*	Mercury*	Selenium*	Silver*
1	ND	2.3	ND	ND	0.038	0.007	ND	ND
2	ND	4.2	ND	ND	0.043	ND	ND	ND
3	0.016	2.3	ND	ND	0.037	ND	ND	ND
4	ND	3.4	ND	ND	0.045	ND	ND	ND
5	ND	2.6	ND	ND	0.032	ND	ND	ND
6	ND	2.4	ND	ND	0.081	0.006	ND	ND
7	ND	6.1	ND	ND	0.022	ND	ND	ND
8	ND	3.2	ND	ND	0.031	ND	ND	ND
9	ND	2.8	ND	ND	0.014	ND	ND	ND
10	ND	2.1	ND	ND	0.022	ND	ND	ND
11	ND	2.6	ND	ND	0.079	ND	ND	ND
12	ND	2.8	ND	ND	ND	ND	ND	ND
13	ND	1.4	ND	ND	0.025	ND	ND	ND
14	ND	2.3	ND	ND	0.020	ND	ND	ND
15	ND	2.0	ND	ND	0.062	ND	ND	ND
16	ND	2.4	ND	ND	0.054	ND	ND	ND
RCRA MCL	5.0	100	1.0	5.0	5.0	0.2	1.0	5.0
Limit of Detection	0.010	1.0	0.1	0.05	0.010	0.005	0.01	0.1

See page D-9 for footnotes

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TABLE D-8. ORGANIC ANALYSES - UEP SOIL LAYER

Parameter*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Limit of Detection
Extractables																	
Acenaphthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Acenaphthylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Benzo(a)anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0
Benzo(ghi)perylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Benzo(k)fluoroanthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Cyrysene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Fluoanthene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Fluorene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0
Indenol(1,2,3-c,d)pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Naphthalene	ND	ND	TR	ND	TR	ND	ND	TR	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Phenanthrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	TR	ND	0.5
Pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Hexachlorocyclopentadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Hexachlorobenzene	0.9	0.9	0.9	0.9	0.9	0.9	0.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Hexachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	TR	ND	ND	ND	ND	0.5
2-Chloronaphthalene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Benzidine	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
3,3-Dichlorobenzidine	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Benzyl butyl phthalate	ND	TR	TR	ND	TR	ND	ND	TR	TR	TR	TR	TR	0.6	TR	ND	TR	0.5
Bis(2-ethylhexyl)phthalate	ND	0.5	TR	0.5	TR	TR	TR	TR	2.0	0.5	0.5	0.8	1.0	1.0	0.6	TR	0.5
Di-n-butyl phthalate	ND	0.6	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR	0.5	TR	TR	0.5
Di-n-octyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Diethyl phthalate	ND	ND	ND	ND	TR	ND	TR	TR	1.5	TR	ND	1.5	ND	TR	TR	TR	0.5
Dimethyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	TR	ND	ND	ND	TR	0.5
N-nitrosodimethylamine	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
N-nitrosodiphenylamine	ND	TR	TR	TR	TR	ND	ND	TR	TR	TR	TR	TR	TR	TR	1.0	TR	0.5
N-nitrosodi-n-propylamine	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	TR	ND	ND	ND	ND	ND	0.5
Isophorone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Nitrobenzene	ND	ND	ND	ND	ND	ND	ND	ND	TR	ND	TR	ND	ND	ND	ND	ND	0.5
2,4-Dinitrotoluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
2,6-Dinitrotoluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Bis(2-chloroethyl)ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
Bis(2-chloroethoxy)methane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	TR	TR	ND	ND	ND	0.5
Bis(2-chloroisopropyl)ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
4-Bromophenyl phenyl ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
4-Chlorophenyl phenyl ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0
4-Chloro-3-methylphenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0
2-Chlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0
2,4-Dichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0
2,4-Dimethylphenol	ND	ND	ND	ND	ND	ND	ND	ND	TR	ND	ND	ND	ND	ND	ND	ND	10.0
2,4-Dinitrophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0
2-Methyl-4,6-dinitrophenol	ND	ND	ND	ND	ND	ND	ND	TR	ND	ND	ND	ND	ND	ND	ND	ND	1.0
2-Nitrophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	TR	ND	ND	ND	ND	1.0
4-Nitrophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0
Pentachlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0
Phenol	ND	ND	TR	ND	TR	ND	ND	TR	ND	TR	TR	TR	TR	TR	TR	TR	1.0
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0
Aromatic Disulfides**	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	qualitative

* Units on liquid samples in mg/L unless otherwise noted; units on sediment samples in ug/g on dry weight basis unless otherwise noted
† pH can change as a function of time
‡ Insufficient sample was available to perform analysis
§ Organic parameters, whether purgeables or extractables, were performed by a combination of gas chromatography mass spectrometry or high performance liquid chromatography. These analyses helped in identifying some of the constituents included in the wet chemistry total organic carbon and phenol results
// The detection limits for parameters for this sample are different than those of other similar samples. They are indicated with a less than symbol (<)
** Indicates qualitative parameter
†† Indicates analyses for that sample was not done
NOTES:
ND - not detected
TR - possible detection of trace quantity for that compound below the recent detection limit
X - compound present

WALTER J. CRATZ, PH.D.
CPT, MSC
Chief, Special Analysis Branch
Organic Environmental Chemistry Division

APPENDIX 2

EAST TEXAS TESTING LABORATORY, INC.

SLUDGE TREATABILITY EVALUATION

East Texas Testing Laboratory Inc.

GEOTECHNICAL • MATERIALS • ENVIRONMENTAL

ENGINEERS • CHEMISTS • CONSULTANTS

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Tyler, Texas 75702
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(214)758-0402

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2012 North Timberland
Lufkin, Texas 75901
(409)634-5777

HUNTSVILLE
1790 Highway 19
Huntsville, Texas 77340
(409)295-5431

SOCIETY MEMBERSHIPS
A.S.T.M.
A.C.I.L.
T.C.E.L.
A.S.C.E.
T.S.P.E.
A.I.C.H.E.
N.S.P.E.
A.I.C.E.
A.S.F.E.
A.C.S.
A.C.I.

June 15, 1984

Kindle Stone & Associates
P.O. Box 1552
Longview, Texas 75606

Attention: Mr. Terry Winn

RE: UEP Sludge Evaluation
Longhorn Army Ammunition Plant
Marshall, Texas
ETTL Job No. 448-84

Dear Terry:

Submitted herein is our report relative to the UEP Sludge Evaluation.

If you have any questions relative to this report please do not hesitate to call me at 214-595-6402.

Sincerely,

EAST TEXAS TESTING LABORATORY, INC.

R. L. Garrett, CPC
Director of Analytical and
Environmental Services

SLUDGE TREATIBILITY EVALUATION

UNLINED EVAPORATION PIT (UEP)

LONGHORN AMMUNITION PLANT

MARSHALL, TEXAS

INTRODUCTION

Pursuant to a request from Kindle Stone and Associates, EAST TEXAS TESTING LABORATORY, INC. was retained to perform certain tests relative to the bottom sediments of the hazardous waste surface impoundment (also known as Unlined Evaporation Pond) located at the Longhorn Army Ammunition Plant, Marshall, Texas. The primary objective of these tests was to determine if chemical treatment would be required to stabilize the sludge prior to removing. In order to accomplish this task it would be necessary to determine the moisture content, the drying rate, and the solidification potential of a representative sample of sludge.

FIELD PROCEDURES

A ten (10) gallon composite sample was composited from grab samples collected at twelve (12) sample stations as noted in Figure I. These samples were collected utilizing a flat bottom boat (Jon Boat) and an Ekman Dredge. The sample locations noted on Figure I were determined visually by aligning the boat with stationary objects along the shore line. Considering the general nature of the information needed, this would be entirely appropriate.

RESULTS OF ANALYSIS

The analytical objective of this evaluation was to determine whether the sludge from the UEP would require chemical treatment in order to produce solids of sufficient consistency for removal and disposal. A second objective was to determine monitor parameters to be utilized to indicate when the hazardous sludge was adequately removed.

To accomplish the first objective, weighed quantities of untreated sludge and chemically treated sludge were prepared and monitored under laboratory conditions. These tests were conducted

at 74°F and no wind conditions. The chemical combinations evaluated were (expressed as percent by dry weight):

1. Untreated sludge;
2. Sludge plus 10 percent cement;
3. Sludge plus 20% lime;
4. Sludge plus 40% fly ash;
5. Sludge plus 10% bentonite;
6. Sludge plus 20% bentonite and
7. Sludge plus 30% bentonite.

All of the sludge samples were examined at regular intervals for moisture content and consistency. The initial water content of the sludge was determined to be 72% by weight. Due to this high moisture content the sludge was "very liquid". The free water associated with the sludge (water which separated on standing), was determined to be ten (10) percent by weight. The untreated sludge and the sludge treated with forty (40) percent fly ash were still very soft after two hundred and twelve (212) hours. The untreated sludge continued to lose moisture, but slowed considerably after 212 hours due to the formation of a surface crust. The sample treated with forty (40) percent fly ash lost eleven (11) percent after forty eight (48) hours, but then essentially stabilized at a moisture content of fifty six (56) percent. Even with the added bulk of the fly ash, this sample was very soft and pliable having almost the consistency of a liquid. The sample treated with twenty (20) percent lime was soft and pliable at mixing, but began to harden within minutes, and after two (2) hours had become quite rigid. In addition there was noticeable heat of hydration produced. Of all of the chemical treatment combinations, the twenty (20) percent lime produced the most rigid solid in the shortest time interval. The sludge treated with lime continued to lose moisture throughout the entire test period (212 hours), even though a significant quantity of water was involved in hydration of the lime. The sludge treated with cement solidified similarly to the lime treated sludge, but there was no significant heat of hydration. The cement treated sludge exhibited a much slower rate of water loss (see Figure II). The sludge samples treated with bentonite solidified rapidly, but moisture loss decreased significantly with increased dosages of bentonite. The solidification process appeared to be due primarily to the reaction of water with bentonite, but the added bulk of bentonite was obviously a factor.

In order to determine Objective II relative to monitor parameters, information contained in Hazardous Waste Study No. 37-26-0291-84, October 29, 1982, was reviewed. Based on information contained in this report, and results of the analysis shown on Table I, the best monitor perimeters in order of preference would be chemical oxygen demand, barium, and chromium.

CONCLUSIONS & RECOMMENDATIONS

It is obvious that untreated UEP sludge will require a substantial amount of time to dry and to solidify adequately. Even considering the effect of wind and higher temperatures to which the UEP sludge would be exposed during the summer months, there probably would not be sufficient time between rains for the sludge to dry. Complete drying would be further hampered by the formation of any surface crust which would prevent adequate drying of the underlying layers of sludge. Turning the sludge over by mechanical means might effect more complete drying, but it would appear that the addition of lime would be the most effective method to achieve maximum drying and solidification. Obviously, there are cost factors to be considered. Since the quantities of chemicals required cannot be determined without knowing the actual quantities of sludge, cost estimates were beyond the scope of this study. The table attached relative to the prices of chemicals on a per ton basis is provided for your reference. These prices were provided by Gifford & Hill, Inc.. Flue dust is another chemical that might be considered for this project. However, due to time constraints and difficulties in obtaining flue dust no laboratory evaluation could be conducted.

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East Texas Testing Laboratory Inc.

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LUFKIN
2012 North Timberland
Lufkin, Texas 75901
(713) 634-5777

Date 6/15/84

Job No. 448-84

Report No. 6-1

TABLE I

SEDIMENT ANALYSIS

Client: Kindle Stone & Associates, P.O Box 1552, Longview, Texas

Date Sampled: 5/18/84

Type of Sample: Composite by ETTL

Identification or Sample No.: 84-2798

ANALYSIS

ANALYSIS	RESULTS
Total Moisture	72% by weight
Total Barium	1290 mg/kg
Total Chromium	144 mg/kg
Hexavalent Chromium	<.2 mg/kg

Submitted by:

EAST TEXAS TESTING LABORATORY, INC.

R L Garrett

R. L. Garrett, CPC
Director of Analytical and
Environmental Services

sj

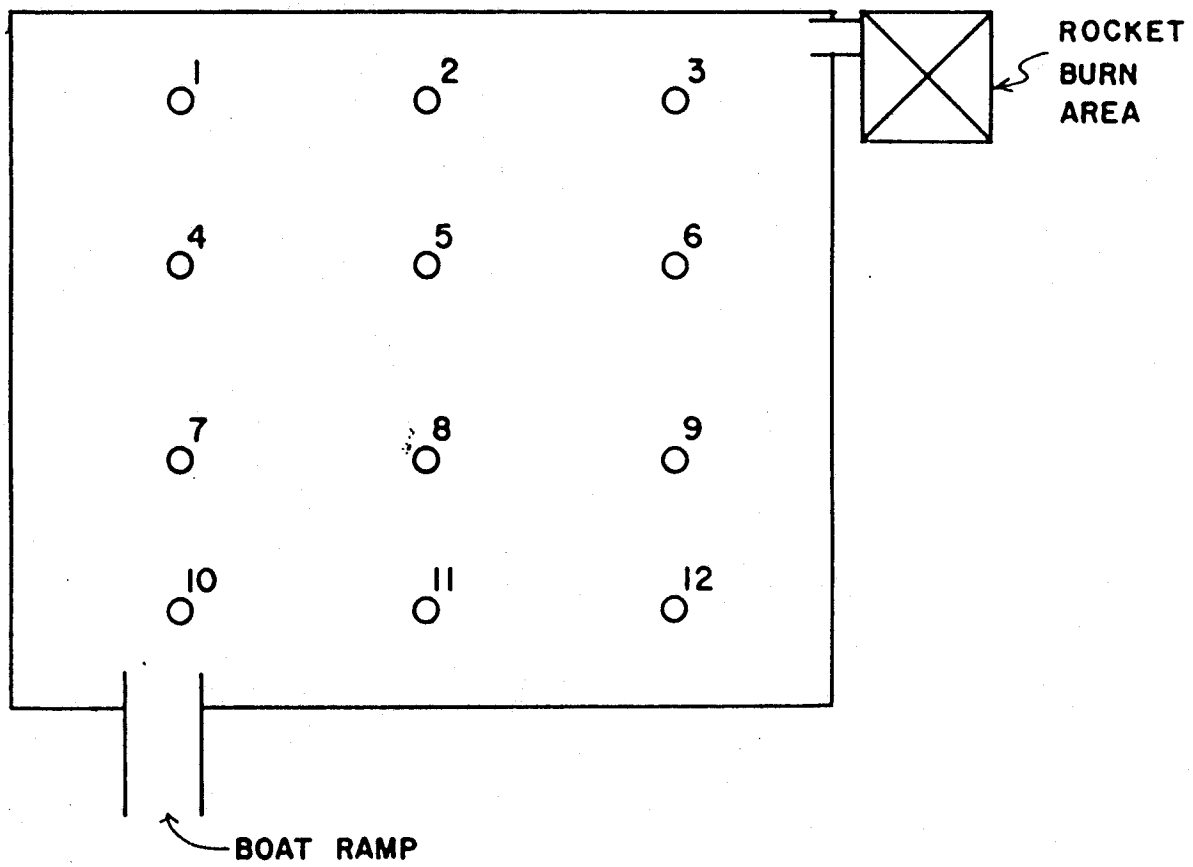
TABLE II

ESTIMATED CHEMICAL COST

PER TON

1.	Lime	$75.00
2.	Cement	$57.00
3.	Fly Ash	$28.00
4.	Bentonite	$138.00
5.	Flue Dust	$22.00

FIGURE 1
LONGHORN ARMY AMMUNITION PLANT
MASHALL, TEXAS
UNLINED EVAPORATION POND

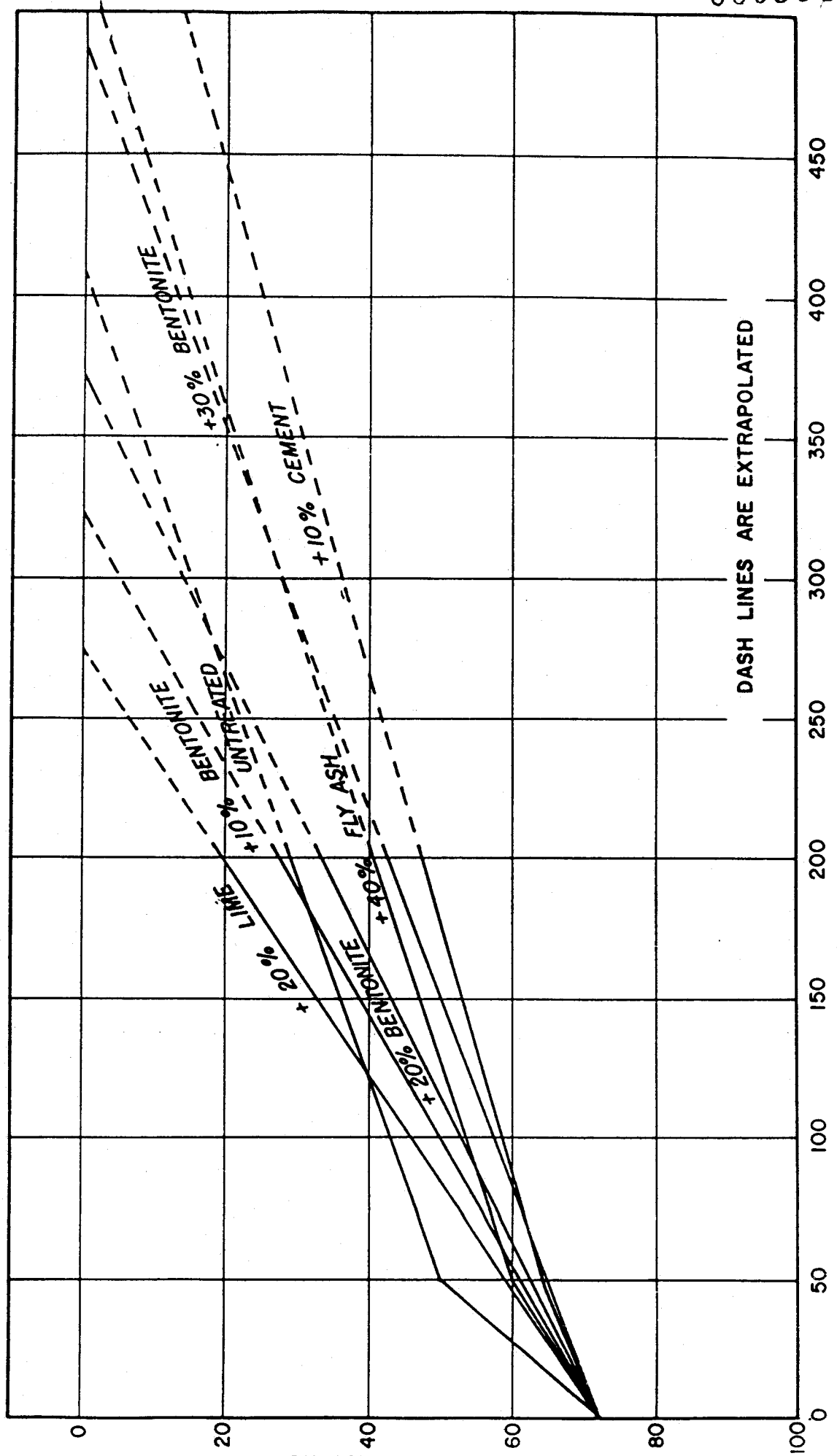


NOT TO SCALE
Job No. 448-84

000583

JOB NO. 448-E

FIGURE 2
EXTRAPOLATED DRYING TIME
TREATED AND UNTREATED SLUDGE



APPENDIX 3

U.S. ARMY ENVIRONMENTAL HYGIENE AGENCY

MONITORING WELL BORING LOGS

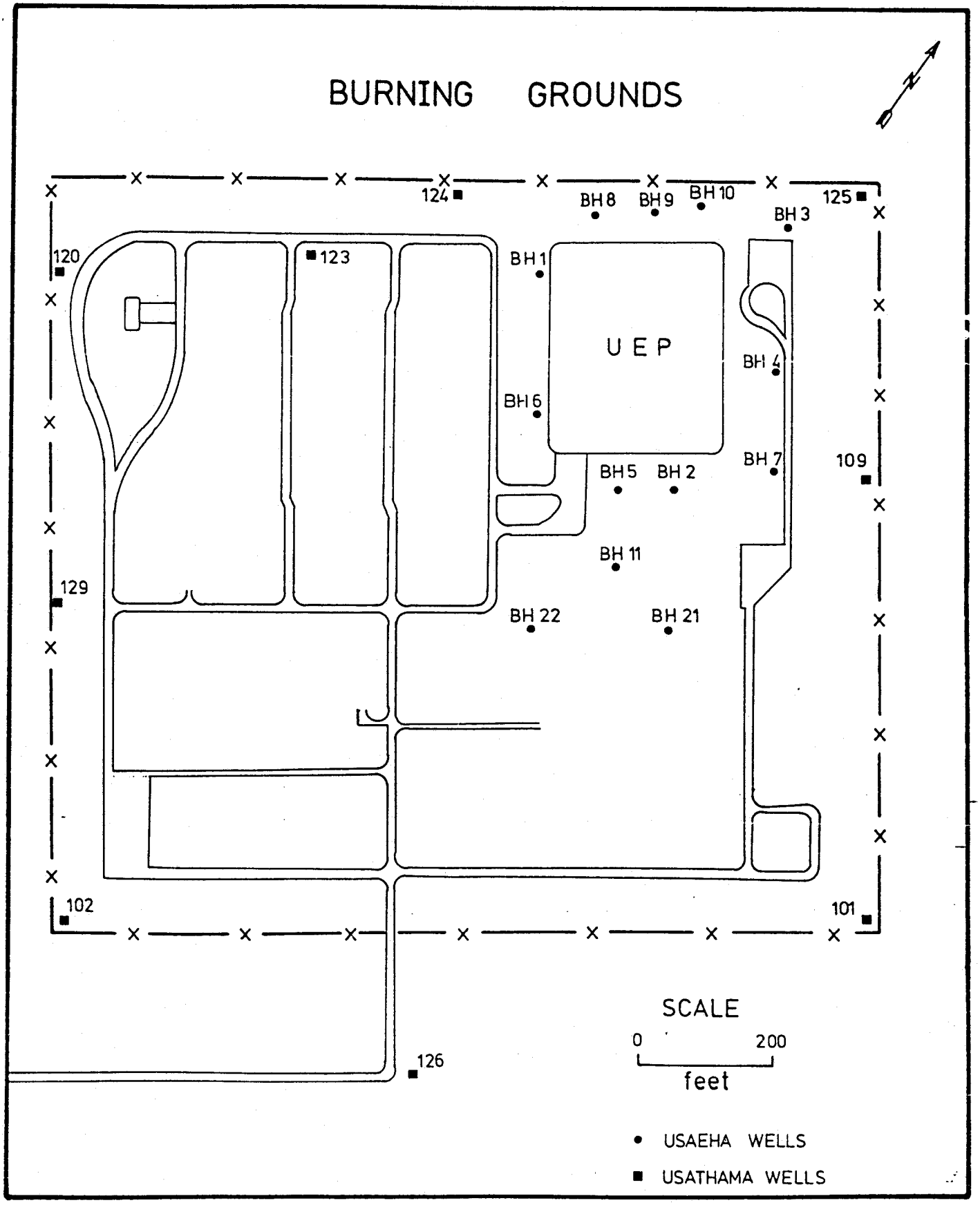
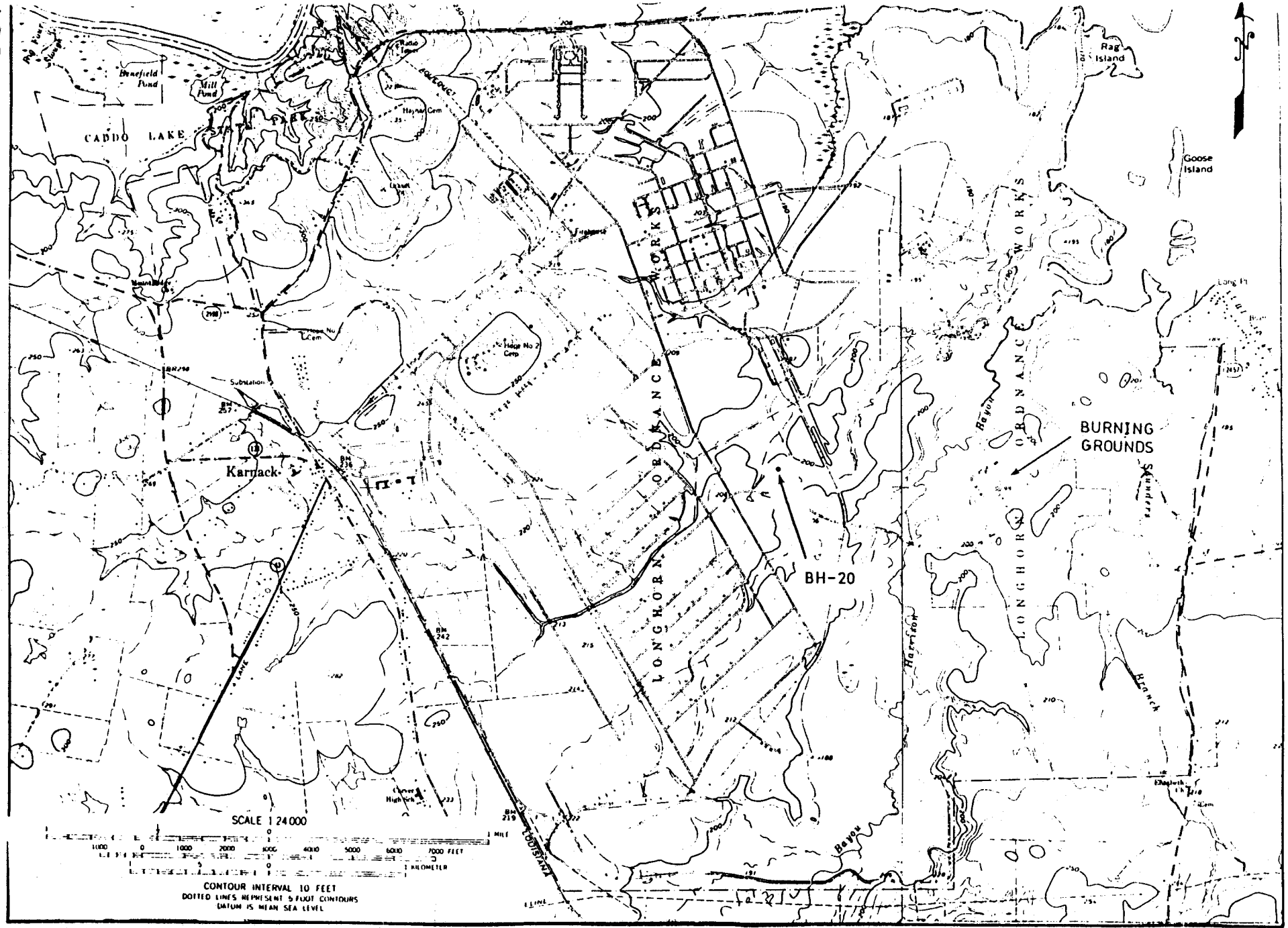


FIGURE 1. MONITORING WELL LOCATIONS



FIGU 2. TOPOGRAPHIC MAP OF LHAAP

US ARMY ENVIRONMENTAL HYGIENE AGENCY

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DRILLING LOG

PROJECT 38-26-0104 DATE 24 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II BORE HOLE 1

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
	BS	Medium brown silty sand, fine in grain size.	Hit stone.
		Stone	Possible backfill for berm of pond.
5	ST	Medium brown fine silty sand with some clay	Very, moist
10		Tan fine silty sand with some clay	Wet - auger sat for 2 days before finishing.
	BS		
15		Medium brown silty sand with clay	Damp

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000589

DRILLING LOG

PROJECT 38-26-0104 DATE 24 Jan 80

LOCATION Longhorn AAP DRILLERS 1LT Corbitt
Mr. Kestner

DRILL RIG Acker II BORE HOLE 1

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
		Med brown silty sand with clay	WT
20			
25			
30			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000590

DRILLING LOG

PROJECT 38-26-0104 DATE 24 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II BORE HOLE 1

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Medium brown silty sand with clay	
35			
40	MB		
45			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 24 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II BORE HOLE 1

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
		Medium brown silty sand with clay	
		Gray clay mixed with sand	
	MB		
50		Bottom of hole	

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000592

DRILLING LOG

PROJECT 38-26-0104 DATE 24 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II BORE HOLE 2

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Medium brown fine silty sand.	Fairly dry.
5	BS		
10	BS	Brick red fine silty sand with some clay	Fairly dry
		Tan fine silty sand with some clay	Getting wet
15			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000593

DRILLING LOG

PROJECT 38-26-0104 DATE 24 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II BORE HOLE 2

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand with some clay	Getting wet
20			
25			WT
		Light tan silty sand with very little clay	Wet
30			

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000594

DRILLING LOG

PROJECT 38-26-0104 DATE 24 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II BORE HOLE 2

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Light tan silty sand, with very little clay	
35			
40			
45			

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000595

DRILLING LOG

PROJECT 38-26-0104 DATE 24 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II BORE HOLE 2

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Light tan silty sand with very little clay	
50			Well 52' deep
55		Tan clay, medium plastic	
		Bottom of hole	

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000596

DRILLING LOG

PROJECT 38-26-0104 DATE 25 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

North side of rocket. Wash rock.
Surface disturbed

DRILL RIG Acker II BORE HOLE 3

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Medium brown fine silty sand.	Damp
5		Tan fine silty sand with some clay.	
	BS		
			Wet
10			
	BS		
			Water running out of hole.
15			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000597

DRILLING LOG

PROJECT 38-26-0104 DATE 25 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

North side of rocket. Wash rock.

Surface disturbed.

DRILL RIG Acker II BORE HOLE 3

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand with some clay	
20			
25			
30			

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000598

DRILLING LOG

PROJECT 38-26-0104 DATE 25 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

North side of Rocket. Wash rack.

Surface disturbed

DRILL RIG Acker II BORE HOLE 3

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand with some clay	
35			
40			
45			

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000599

DRILLING LOG

PROJECT 38-26-0104 DATE 25 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

North side of Rocket. Wash rack.

Surface disturbed

DRILL RIG Acker II BORE HOLE 3

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
45		Medium brown silty clay.	Hangs to auger
50			WT
		Bottom of hole	

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000600

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

10 feet to east side of road

DRILL RIG Acker II BORE HOLE 4

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand with some clay	
			Water
			WT
20			
25			
30			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000601

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

10 feet to east side of road

DRILL RIG Acker II BORE HOLE 4

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand with some clay	
35	MB		
40			
45			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY

000602

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

10 feet to east side of road

DRILL RIG Acker II BORE HOLE 4

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand with some clay	
		Medium brown silty clay.	Hangs to auger
50		Bottom of hole	
55			
60			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY

000603

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II BORE HOLE 5

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
		Gravel, reddish in color	
		Medium brown, silty sand	
5	MB	Tan silty sand with some clay	
	MB	Brown fine sand silt	
	MB	Brick red fine silty sand with some clay.	Fairly dry
10			
15	MB 14-16'	Tan silty fine sane with clay.	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

000604

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II BORE HOLE 5

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
		Tan silty fine sand with clay	
20			
25			WT
30			Wet

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY

000605

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II BORE HOLE 5

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
35		Tan silty fine sand with clay	
40			
45			

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000606

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II BORE HOLE 5

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
45		Medium brown silty clay.	Hangs to auger.
50			
55			
60		Bottom of hole	Well depth 60 feet

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY

000607

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II BORE HOLE 6

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
		Medium brown silty sand.	Moist
		Brown silty sand	
5	BS		
10	BS	Brick red silty clay with fine sand	
		Light tan silty fine sand with some clay.	Moist
	BS		
15			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

000608

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II BORE HOLE 6

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
		Light tan silty fine sand with some clay.	
20			Water
25			
		Light tan sandy silt	
30	BS 29-31 ft		Water

US ARMY ENVIRONMENTAL HYGIENE AGENCY

000609

DRILLING LOG

PROJECT 28-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II BORE HOLE 6

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
	BS	Light tan sandy silt	
35			
40		Medium brown silty clay	
45			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY

010610

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II BORE HOLE 6

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
50		Gray fine sandy clay	Well depth
60		BOTTOM OF HOLE	

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

000611

PROJECT 38-26-0104 DATE 27 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Edge of Road

DRILL RIG Acker II BORE HOLE 7

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Medium brown silty sand	
		Tan silty sand, fine	Moist Moist
5	BS		
10	BS		Water
15			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY

000612

DRILLING LOG

PROJECT 38-26-0104 DATE 27 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Edge of Road

DRILL RIG Acker II BORE HOLE 7

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
	BS	Tan silty sand, fine	Moist
20			
			Water
30			
35			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY

000613

DRILLING LOG

PROJECT 38-26-0104 DATE 27 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Edge of Road

DRILL RIG Acker II BORE HOLE 7

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan silty sand, fine	Moist
40		Tan fine silty sand w clay	
45		Gray fine sandy clay	
50		BOTTOM OF HOLE	

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000614

DRILLING LOG

PROJECT 38-26-0104 DATE 27 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Edge of Road

DRILL RIG Acker II BORE HOLE 7

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
55			
60			Well depth

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY

000615

DRILLING LOG

PROJECT 38-26-0104 DATE 27 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 8

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
5	MB	Medium Brown silty sand; some clay	Moist
10	MB	Brown fine silty sand	
15		Tan fine silty sand w some clay	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

000616

PROJECT 38-26-0104 DATE 27 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 8

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
	MB	Tan fine silty sand w some clay	
			Wet
20			
	MB		
25		Medium to fine sandy silt	Wet
			Water
30			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY

000617

DRILLING LOG

PROJECT 38-26-0104 DATE 27 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 8

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
40			
45		Tan silty clay	
	MB		
50			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY

000618

DRILLING LOG

PROJECT 38-26-0104 DATE 27 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 8

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan silty clay –	
55		Gray sandy clay	Well depth
60		BOTTOM OF HOLE	

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000619

DRILLING LOG

PROJECT 38-26-0104 DATE 28 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 9

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand	
	MB		
5		Brown fine silty sand	
	MB		
10			
		Tan fine silty sand w some clay	
	MB		
15			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000620

DRILLING LOG

PROJECT 38-26-0104 DATE 28 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 9

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand w some clay	
	MB		
20			Wet
25			Water level
30			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

000621

PROJECT 38-26-0104 DATE 28 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 9

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
		Tan fine silty sand w some clay	
35			
40			
45			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000622

DRILLING LOG

PROJECT 38-26-0104 DATE 28 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 9

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand w some clay	
		Brick red & gray silty clay	Wet
50			
			Well depth
55		Brown fine silty sand w clay	Dry
60		BOTTOM OF HOLE	

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000623

DRILLING LOG

PROJECT 38-26-0104 DATE 28 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 10

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
		Brown silty sand	Moist
10		Tan fine silty sand w some clay	Moist
15			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY 29000

DRILLING LOG

PROJECT 38-26-0104 DATE 28 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 10

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand w some clay	Moist
20			Water
			Water level
25			
	MB		
30			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000625

DRILLING LOG

PROJECT 38-26-0104 DATE 28 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 10

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
35			
40		Medium brown clay	
45			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000626

DRILLING LOG

PROJECT 38-26-0104 DATE 28 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 10

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
	PB	Medium brown clay	
			Well depth
50			
55		BOTTOM OF HOLE	

USAEHA Form 95, 12 Aug 74

APPENDIX 4

FT. WORTH DISTRICT COE

BORROW AREAS
SOIL BORING LOGS
& ANALYTICAL RESULTS

AUG 1 1984 Hole No. 8A-812

DRILLING LOG

DIVISION: SWD
INSTALLATION: FWD
SHEET 1 OF 1 SHEETS

1. PROJECT: LONGHORN AAP
2. LOCATION (Coordinates or Station): Common Borrow
3. DRILLING AGENCY: USCE
4. HOLE NO. (As shown on drawing title and file number): 8A-812
5. NAME OF DRILLER: WILLIAMS
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 10.0
10. SIZE AND TYPE OF BIT: 8" Push
11. DATUM FOR ELEVATION SHOWN (MSL or MSL): MSL
12. MANUFACTURER'S DESIGNATION OF DRILL: TEXOMA
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3 JAR; UNDISTURBED None
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: NOT ENCOUNTERED
16. DATE HOLE: STARTED 3/29/83; COMPLETED 3/29/83
17. ELEVATION TOP OF HOLE: 199.7
18. TOTAL CORE RECOVERY FOR BORING
19. SIGNATURE OF INSPECTOR: Raymond T. Hayes

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 - 2.5 CLAY, SOFT, WET, TAN, SANDY.			JAR SAMPLES: A. 0.0 - 2.5
			2.5 - 5.0 CLAY, SANDY, STIFF, MOIST, LOW PLAS.			B. 2.5 - 5.0
			5.0 - 10.0 CLAY, SILTY, STIFF, MOIST, YELLOW-BRN & LT. GRAY, LOW - MED PLAS.			C 5.0 - 10.0
			T.D @ 10.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT: LONGHORN AAP
HOLE NO.: 8A-812

Hole No. SA-813

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET 1 OF 1 SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 8" Push	
2. LOCATION (Coordinates or Station) Common Borrow		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number) SA-813		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 4 JAR; UNDISTURBED 3 BAGS	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
		16. DATE HOLE STARTED 3/29/84; COMPLETED 3/29/84	
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE 200.0	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING 0 %	
9. TOTAL DEPTH OF HOLE 10.0		19. SIGNATURE OF INSPECTOR Raymond L. T. Nguyen	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-4.0 CLAY, SANDY, GRAY. 0.0-2.0 SOFT, WET 2.0-4.0 V. STIFF, MOIST. 4.0-8.0 CLAY, SILTY, SANDY, LT. GRAY & YELLOW-BRN, MED-LOW PLAS. 8.0-10.0 CLAY, LT. GRAY & YELLOW-BRN, MED-HI PLAS T.D. @ 10.0'			JAR SAMPLES: A. 0.0 - 2.0 B. 2.0 - 4.0 C. 4.0 - 8.0 D. 8.0 - 10.0 BAG SAMPLES: THREE BAGS OBTAINED FROM 2.0 - 5.0

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT LONGHORN AAP | HOLE NO. SA-813

000630

Hole No. 8A-814

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 8" PUSH	
2. LOCATION (Coordinates or Station) COMMON BORROW		11. DATUM FOR ELEVATION SHOWN (TBM – MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number) 8A-814		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER 8.5	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 3/29/84; COMPLETED 3/29/84	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 200.5	
9. TOTAL DEPTH OF HOLE 10.0		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR Raymond T. Hagan	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-0.5			JAR SAMPLES:
			CLAY, V. SANDY, SOFT, WET.			A. 0.5-4.0
			0.5-4.0			B. 4.0-6.0
			CLAY, SOFT-MED. STIFF, WET, YELLOW-BRN & LT. GRAY, MED. PLAS.			C. 6.0-8.5
			4.0-6.0			
			CLAY, STIFF, MOIST, LT. GRAY & RUST, MED-H, PLAS			
			6.0-8.5			
			CLAY, SANDY, MED. STIFF, MOIST, YELLOW-BROWN & LT. GRAY. MED. PLAS			
			8.5-10.0			
			SAND, CLAYEY, TAN, SATD, FINE			
			T.D. @ 10.0'			

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE | PROJECT | HOLE NO.

000631

Hole No. 8A-815

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 8" PUSH	
2. LOCATION (Coordinates or Station) COMMON BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number) 8A-815		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 4 JARS; UNDISTURBED NONE	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER 8.5	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 3/29/84; COMPLETED 3/29/84	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 200.4	
9. TOTAL DEPTH OF HOLE 10.0		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR Raymond T. Hayes	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 - 3.5			
			CLAY, SANDY, SOFT, MOIST, YELLOW-BRN & RUST			JAR SAMPLES:
			3.5 - 6.0			A. 0.0 - 3.5
			CLAY, STIFF, MOIST, LT. GRAY & RED-BROWN, HI PLAS			B. 3.5 - 6.0
			6.0 - 8.5			C. 6.0 - 8.5
			CLAY, V. SANDY, MED. STIFF, WET, TAN			D. 8.5 - 10.0
			8.5 - 10.0			
			SAND, CLAYEY, SAT'D, TAN, FINE			
			T.D. @ 10.0'			

000632

Hole No. 8A-816

DRILLING LOG	DIVISION: SWD	INSTALLATION: FWD	SHEET 1 OF SHEETS
1. PROJECT: LONGHORN AAP		10. SIZE AND TYPE OF BIT: 8" PUSH	
2. LOCATION (Coordinates or Station): COMMON BORROW		11. DATUM FOR ELEVATION SHOWN (MSL or USC):	
3. DRILLING AGENCY: USCE		12. MANUFACTURER'S DESIGNATION OF DRILL: TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number): 8A-816		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER: WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER: NOT ENCOUNTERED	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED 3/30/84; COMPLETED 3/30/84	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE: 199.8	
9. TOTAL DEPTH OF HOLE: 10.0		18. TOTAL CORE RECOVERY FOR BORING: %	
		19. SIGNATURE OF INSPECTOR: Raymond T. Hayes	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-3.0			JAR SAMPLES:
			CLAY, SANDY, SOFT, WET TAN, MED. PLAS.			A. 0.0 - 3.0
			3.0-6.0			B - 3.0 - 6.0
			CLAY SANDY, STIFF, MOIST, LT. GRAY, MED-HI PLAS.			C. 6.0 - 10.0
			6.0-10.0			
			CLAY, V. SANDY, STIFF, WET, TAN, LOW PLAS			
			T.D. @ 10.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT: LONGHORN AAP | HOLE NO.: 8A-816

000633 Hole No. 8A-817

DRILLING LOG	DIVISION SWD	INSTALLATION FWJ	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 8" PUSH	
2. LOCATION (Coordinates or Station) Common Borrow		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number) 8A-817		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3 JAR; UNDISTURBED 3 BAGS	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
		16. DATE HOLE: STARTED 3/30/84; COMPLETED 3/30/84	
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE 199.8	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING %	
9. TOTAL DEPTH OF HOLE 10.0		19. SIGNATURE OF INSPECTOR Raymond T. Haynes	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-2.5 CLAY, SANDY, SOFT, WET, TAN, MED. PLAS.			JAR SAMPLES: A. 0.0-2.5 B. 2.5-5.5 C. 5.5-10.0
			2.5-5.5 CLAY, MED. STIFF, MOIST, LT. GRAY MOTTLED RUST, HI. PLAS.			BAG SAMPLES: THREE BAGS OBTAINED FROM 2.0-5.0.
			5.5-10.0 CLAY, V. SANDY, MED DENSE, MOIST-WET, LT. GRAY MOTTLED RUST, MED-LOW PLAS			
			T.D. @ 10.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT LONGHORN AAP | HOLE NO. 8A-817

000634 Hole No. 8A-818

DRILLING LOG	DIVISION SWD	INSTALLATION FWO	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 8" PUSH	
2. LOCATION (Coordinates or Station) IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXOMA	
4. HOLE NO. (As shown on drawing title and file number) 8A-818		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3 JAR; UNDISTURBED 3 BAGS	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 4/2/84 COMPLETED 4/2/84	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 299.4	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR Raymond T. Hagen	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-6.5 CLAY, STIFF, MOIST, LT. GRAY & RUST, HI. PLAS.			JAR SAMPLES A. 0.0-6.5 B. 6.5-8.5 C. 8.5-10.0
			6.5-8.5 CLAY, SANDY, STIFF, MOIST, LT. GRAY & RUST LOW-MED. PLAS.			BAG SAMPLES: THREE BAGS OBTAINED FROM 2.0'-4.0'
			8.5-10.0 SAND, CLAYEY, MED. DENSE, FINE; LOW PLAS.			
			T. D. @ 10.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT LONGHORN AAP HOLE NO. 8A-818

000635

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT	
2. LOCATION (Coordinates or Station) E IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number) 8A-819		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
		16. DATE HOLE STARTED 4/2/84 COMPLETED 4/2/84	
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE 298.3	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING %	
9. TOTAL DEPTH OF HOLE 10.0		19. SIGNATURE OF INSPECTOR Raymond T. Hagen	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 - 3.0 CLAY STIFF, MOIST, RED-BROWN, HI PLAS. 3.0 - 6.0 SAND, V. CLAYEY, MED. DENSE, MOIST, RED-BROWN, LOW PLAS. 6.0 - 10.0 CLAY, SANDY, STIFF, MOIST, RED-BROWN, MED. PLAS. T.D. @ 10.0'			JAR SAMPLES: A. 0.0 - 3.0 B. 3.0 - 6.0 C. 6.0 - 10.0

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT LONGHORN AAP HOLE NO. 8A-819

000636

DRILLING LOG	DIVISION SWD	INSTALLATION FWS	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 8" PUSH	
2. LOCATION (Coordinates or Station) IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number) 8A-820		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2 JARS; UNDISTURBED 3 BAGS	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 4/2/84 COMPLETED 4/2/84	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 301.5	
9. TOTAL DEPTH OF HOLE 10.0		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR Raymond F. Nugent	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-5.5			
			CLAY, MED. STIFF, MOIST, RED-BROWN & LT. GRAY, HI PLAS.			JAR SAMPLES:
			5.5-10.0			A. 0.0-5.5
			SAND, SILTY, CLAYEY, MED. DENSE, MOIST, TAN, LOW PLAS.			B. 5.5-10.0
						BAG SAMPLES:
			T.D. @ 10.0			THREE BAGS OBTAINED FROM 2.0-5.0

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT LONGHORN AAP | HOLE NO. 8A-820

000637

DRILLING LOG	DIVISION SWD	INSTALLATION FWJ	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 5" RUSH	
2. LOCATION (Coordinates or Station) IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number) 8A-821		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2 JAR; UNDISTURBED 3 BAGS	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
		16. DATE HOLE: STARTED 4/2/84; COMPLETED 4/2/84	
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE 279.1	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING %	
9. TOTAL DEPTH OF HOLE 10.0		19. SIGNATURE OF INSPECTOR Raymond T. Kayser	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-5.0 CLAY, SANDY, MED. STIFF, MOIST, TAN & RED-BROWN, MED. PLAS.			JAR SAMPLES: A. 0.0-5.0 B. 5.0-10.0
			5.0-10.0 CLAY SANDY, MED. STIFF, MOIST, TAN & RUST, MED. PLAS.			BAG SAMPLES: THREE BAGS OBTAINED FROM 2.0-5.0'
			T.D. @ 10.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT LONGHORN AAP | HOLE NO. 8A-821

000638

DRILLING LOG	DIVISION SWD	INSTALLATION FWV	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 8" PUSH	
2. LOCATION (Coordinates or Station) IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number) 8A-822		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 4/2/84; COMPLETED 4/2/84	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 281.7	
9. TOTAL DEPTH OF HOLE 10.0		18. TOTAL CORE RECOVERY FOR BORING	
		19. SIGNATURE OF INSPECTOR Raymond T. Hagan	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-6.0			
			CLAY SANDY, MED. STIFF, MOIST, TAN & RUST, MED. PLAST.			JAR SAMPLES:
			6.0-10.0			A. 0.0-6.0
			CLAY V. SANDY, MED. STIFF, MOIST, TAN & RUST, MED. PLAS.			B. 6.0-10.0
			T.D. @ 10.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT LONGHORN AAP | HOLE NO. 8A-822

000639

DRILLING LOG	DIVISION SWD	INSTALLATION FWW	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 8" PUSH	
2. LOCATION (Coordinates or Station) IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number) 8A-823		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
		16. DATE HOLE: STARTED 4/2/84; COMPLETED 4/2/84	
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE 287.3	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING	
9. TOTAL DEPTH OF HOLE 10.0		19. SIGNATURE OF INSPECTOR Raymond T. Hagan	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 - 10.0 CLAY SANDY, STIFF, MOIST, TAN & RUST, MED. PLAS.			JAR SAMPLES: A. 0.0 - 5.0 B. 5.0 - 10.0
			T.D. @ 10.0			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT LONGHORN AAP | HOLE NO. 8A-82_

770640

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 8" PUSH	
2. LOCATION (Coordinates or Station) IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA.	
4. HOLE NO. (As shown on drawing title and file number) 8A-824		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 4/2/84 COMPLETED 4/2/84	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 291.0	
9. TOTAL DEPTH OF HOLE 10.0		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR Raymond T. Hagen	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-10.0			
			CLAY, SANDY, STIFF, MOIST, RUST & LT. GRAY, MED. PLAS			JAR SAMPLES: A. 0.0-5.0 B. 5.0-10.0
			T.D. @ 10.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT LONGHORN AAP HOLE NO. 8A-824

000641

DRILLING LOG	DIVISION SWD	INSTALLATION FW.J	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 3" AUGER	
2. LOCATION (Coordinates or Station) COMMON BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL HAND AUGER	
4. HOLE NO. (As shown on drawing title and file number) 3A-825		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER HAGEN		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER 5.0'	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED 4/3/84; COMPLETED 4/3/84	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 201.0	
9. TOTAL DEPTH OF HOLE 6.0		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR Raymond T. Hagen	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 - 2.0			JAR SAMPLES
			CLAY, V. SANDY, SOFT, WET, TAN, LOW - MED PLAS.			A. 0.0 - 2.0
			2.0 - 5.0			B. 2.0 - 5.0
			CLAY, STIFF, MOIST, LT. GRAY & RED - BROWN, HI PLAS.			C. 5.0 - 6.0
			5.0 - 6.0			
			CLAY, STIFF, MOIST, RED - BROWN & LT. GRAY, INT. w/ SAT'D SAND SEAMS.			
			T.D. @ 6.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT LONG HORN AAP | HOLE NO. 3A-825

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 3" AUGER	
2. LOCATION (Coordinates or Station) Common Borrow		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL HAND AUGER	
4. HOLE NO. (As shown on drawing title and file number) 3A-826		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER 4.5	
		16. DATE HOLE: STARTED 4/3/84; COMPLETED 4/3/84	
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE 200.2	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING %	
9. TOTAL DEPTH OF HOLE 6.0		19. SIGNATURE OF INSPECTOR Raymond F. Hagen	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 - 1.5			JAR SAMPLES:
			CLAY, V. SANDY, SOFT, WET, TAN.			A. 0.0 - 1.5
			1.5 - 4.5			B. 1.5 - 4.5
			CLAY, SANDY, STIFF, MOIST, TAN & RED-BROWN, MED-H, PLAS.			C 4.5 - 6.0
			4.5 - 6.0			
			SAND, CLAYEY, DENSE, SAT'D, LT. GRAY MOTTLED RUST.			
			T.O. @ 6.0			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT LONGHORN AAP | HOLE NO. 3A-826

000643

DRILLING LOG	DIVISION SWD	INSTALLATION FWL	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 3" AUGER	
2. LOCATION (Coordinates or Station) IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL HAND AUGER	
4. HOLE NO. (As shown on drawing title and file number) 3A-827		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 2 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER HAGEN		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
		16. DATE HOLE STARTED 4/2/84 COMPLETED 4/2/84	
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE 301.4	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING	
9. TOTAL DEPTH OF HOLE 6.0		19. SIGNATURE OF INSPECTOR Raymond T. Hagen	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 - 0.5			JAR SAMPLES:
			SAND, CLAYEY, LOOSE, WET, TAN			A. 0.5 - 3.0
			0.5 - 3.0			B. 3.0 - 6.0
			CLAY SANDY, MED. STIFF, MOIST, RED-BROWN, MED. PLAS.			
			3.0 - 6.0			
			CLAY STIFF, MOIST, RED-BROWN MOTTLED TAN, MED-HI PLAS			
			T.D. @ 6.0			

000644

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 3" AUGER	
2. LOCATION (Coordinates or Station) IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL HAND AUGER	
4. HOLE NO. (As shown on drawing title and file number) 3A-828		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER HAGEN		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
		16. DATE HOLE: STARTED 4/3/84; COMPLETED 4/3/84	
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE 2942	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING	
9. TOTAL DEPTH OF HOLE 6.0		19. SIGNATURE OF INSPECTOR Raymond T. Hagen	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 - 0.5 SAND, CLAYEY, LOOSE, MOIST, TAN 0.5 - 4.0 CLAY, SANDY, STIFF, MOIST, RED-BROWN, MED. PLAS. 4.0 - 6.0 CLAY, STIFF, MOIST, RED-BROWN MOTTLED LT. GRAY, MED-H. PLAS. T.D. @ 6.0'			JAR SAMPLES: A. 0.5 - 4.0 B. 4.0 - 6.0

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT LONGHORN AAP | HOLE NO. 3A-828

000645

DRILLING LOG	DIVISION SWD	INSTALLATION Ft J	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT	
2. LOCATION (Coordinates or Station) IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and file number) TP-829		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED	UNDISTURBED
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED	COMPLETED
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 295.9	
9. TOTAL DEPTH OF HOLE		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-0.5 SAND, CLAYEY, LOOSE, MOIST, TAN. 0.5-3.0 CLAY, STIFF, MOIST, RED-BROWN, H, PLAS.			BAG SAMPLES THREE BAGS OBTAINED FROM 1.0-3.0

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT LONGHORN AAP | HOLE NO. TP-829

JOB No. 40109

TEST ASSIGNMENTS
UNDISTURBED SAMPLES

Project: LONGHORN ARMY AMMUNITION PLANT Assigned By: P. 1 OF 5 Date: 4-18-84

Boring No. BA-	Sample No.	Depth	Visual and Laboratory Classification	Sieve Analysis	Liquid Limit (Atterberg Limits)	Plasticity Index (Atterberg Limits)	Moisture Content	Dry Density	Specific Gravity	Unconfined Compression w/Stress-Strain Curve	Unconsolidated-Undrained Direct Shear Test(one point) w/Stress-Strain Curve	Consolidation Test	Consolidated-Drained Triaxial w/Pore Pressure Measurements and Stress-Strain Curves	Unconsolidated-Undrained Triaxial w/Pore Pressure Measurements and Stress-Strain Curves	Consolidated-Undrained Triaxial w/Pore Pressure Measurements and Stress-Strain Curves	COMPACTION CE-55	PERMEABILITY EM. 1110-2-1906	DESIGNATED BORROW AREA		
B12	A	0-2.5	CL				22.4											Common		
	B	2.5-5.0	CL		45	31	13.5													
	C	5-10																		
B13	BULK SAMPLE	2-5'	CL	(1)	40	25										(2)		Common		
	A	0-2					20.9													
	B	2-4	CL				13.4													
	C	4-8	CL																	
	D	8±10'																		
B14	A	0.5'-4.0'	CH				22.2											Common		
	B	4'-6'	CH		79	58	25.4													
	C	6-8.5																		
B15	A	0'-3.5'	CH				21.8											Common		
	B	3.5'-6'	CH	(1)			27.2													
	C	6-8.5																		

Remarks:

(1) THE SIEVE AND HYDROMETER DATA ARE SUMMARIZED ON P.5

(2) THE COMPACTION CURVES ARE ATTACHED

(3) THE FALLING HEAD PERMEABILITY DATA ARE TABULATED ON THE RESPECTIVE COMPACTION CURVES.

000646

JOB No. 40109

TEST ASSIGNMENTS
UNDISTURBED SAMPLES

Project: LONGHORN ARMY AMMUNITION PLANT Assigned By: P. 2 of 5 Date: 1-18-84

Boring No. BA-	Sample No.	Depth	Visual and Laboratory Classification	Sieve Analysis	Liquid Limit (Atterberg Limits)	Plasticity Index (Atterberg Limits)	Moisture Content	Dry Density	Specific Gravity	Unconfined Compression w/Stress-Strain Curve	Unconsolidated-Undrained Direct Shear Test(one point) w/Stress-Strain Curve	Consolidation Test	Consolidated-Drained Triaxial w/Pore Pressure Measurements and Stress-Strain Curves	Unconsolidated-Undrained Triaxial w/Pore Pressure Measurements and Stress-Strain Curves	Consolidated-Undrained Triaxial w/Pore Pressure Measurements and Stress-Strain Curves	COMPACTION CE 55	PERMEABILITY EM 1110-2-1906	DESIGNATED BORROW AREA
815	D	8.5-10'																Common
816	A	0'-3'	CL				24.5											Common
	B	3'-6'	CL		49	34	18.8											
	C	6'-10'																
817	BULK SAMPLE	2'-5'	CH	(1)	56	39										(2)		Common
	A	0-2.5					21.6											
	B	2.5-5.5	CH				26.4											
	C	5.5'-10'																
818	BULK SAMPLE	2'-4'	CL	(1)	33	16										(2)	(3)	Impervious
	A	0-6.5					31.9											
	B	6.5-8.5	CL				34.5											
	C	8.5-10																
819	A	0'-3'	CH		68	49	24.5											Impervious
	B	3'-6'	CL		28	13	15.3											

Remarks:

090647

JOB No. 40109

TEST ASSIGNMENTS
UNDISTURBED SAMPLES

Project: LONGHORN ARMY AMMUNITION PLANT Assigned By: P. 3 OF 5 Date: 1-18-84

Boring No. 8A-	Sample No.	Depth	Visual and Laboratory Classification	Sieve Analysis	Liquid Limit	Plasticity Index	Moisture Content	Dry Density	Specific Gravity	Unconfined Compression w/Stress-Strain Curve	Unconsolidated-Undrained Direct Shear Tests(one point) w/Stress-Strain Curve	Consolidation Test	Consolidated-Drained Triaxial w/Pore Pressure Measurements and Stress-Strain Curves	Unconsolidated-Undrained Triaxial w/Pore Pressure Measurements and Stress-Strain Curves	Consolidated-Undrained Triaxial w/Pore Pressure Measurements and Stress-Strain Curves	COMPACTION CE 55	PERMEABILITY EM-1110-2-1906	DESIGNATED BORROW AREA
819	C	6'-10'																
820	BULK SAMPLE	2'-5'	CH	(1)	61	37										(2)	(3)	Impervious
	A	0'-5.5'					36.9	This material should probably be classified CH in place of sample B below.										
	B	5.5-10	CH				37.0	This sample re-examined visually, found to be silty and clayey SAND. Error appears to be from taking moisture material from sample A (duplication).										
821	BULK SAMPLE	2'-5'	CL	(1)	43	28										(2)	(3)	Impervious
	A	0'-5'					19.4											
	B	5'-10'	CL				18.7											
822	A	0'-6'	CL		36	20	18.8											Impervious
	B	6'-10'			37	24	17.3											
823	A	0-5'	CL		47	31	20.0											Impervious
	B	5'-10'	CL		38	24	17.7											
824	A	0'-5'	CL		38	25	17.7											Impervious
	B	5'-10'			57	34	27.9											
3A-825	A	0'-2'																Common

Remarks:

000648

JOB No. 40109

TEST ASSIGNMENTS
UNDISTURBED SAMPLES

Project: LONGHORN ARMY AMMUNITION PLANT Assigned By: P. 4 of 5 Date: 4-18-84

Boring No. 3A-	Sample No.	Depth	Visual and Laboratory Classification	Sieve Analysis	Liquid Limit	Atterberg Limits Plasticity Index	Moisture Content	Dry Density	Specific Gravity	Unconfined Compression w/Stress-Strain Curve	Unconsolidated-Undrained Direct Shear Testions points w/Stress-Strain Curve	Consolidation Test	Consolidated-Drained Triaxial w/Pore Pressure Measurements and Stress-Strain Curves	Unconsolidated-Unrained Triaxial w/Pore Pressure Measurements and Stress-Strain Curves	Consolidated-Undrained Triaxial w/Pore Pressure Measurements and Stress-Strain Curves	COMPACTION CE 55	PERMEABILITY EM 1110-2-1906	DESIGNATED BORROW AREA
B25	B	2'-5'																Common
	C	5'-6'																
B26	A	0'-1.5'																Common
	B	1.5'-4.5'																
	C	4.5-6.0'																
B27	A	0.5-3'	CL				17.2											Impervious
	B	3-6'	CH		65	43	23.5											
B28	A	0.5-4'	CL	(1)	41	24	19.6											Impervious
	B	4'-6'	CH	(1)	70	49	26.0											
T.P. B29	BULK SAMPLE	1'-3'	CH	(1)	68	42	26.7									(2)	(3)	Impervious

Remarks:

67 0009

JOB No. 40109

TEST ASSIGNMENTS
UNDISTURBED SAMPLES

Project: LONGHORN ARMY AMMUNITION PLANT Assigned By: P.5 OF 5 Date: 4-18-84

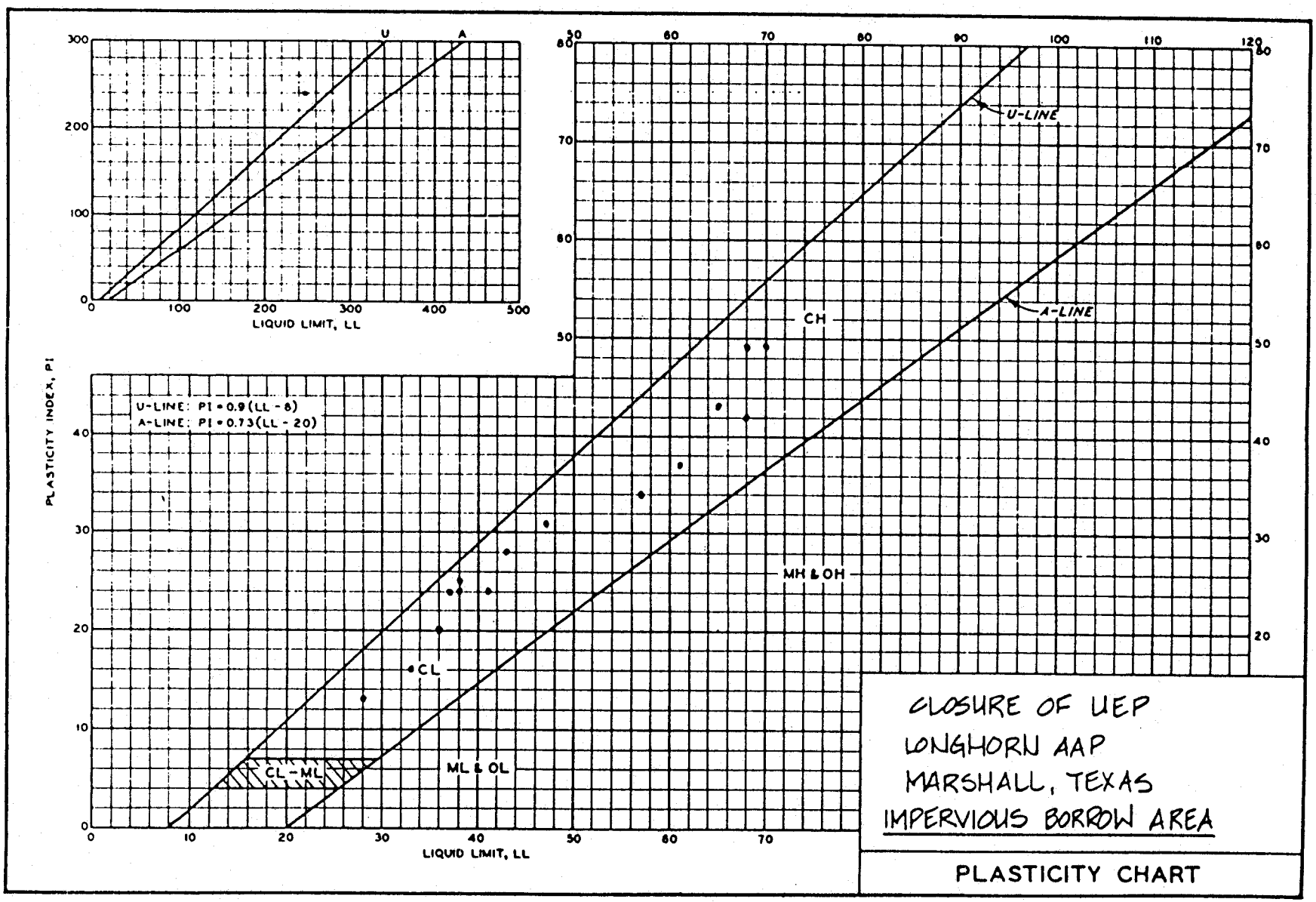
Boring No.	Sample No.	Depth	Visual and Laboratory Classification	Sieve Analysis	Atterberg Limit	Moisture Content	Dry Density	Specific Gravity	Unconfined Compression w/Stress-Strain Curve	Unconsolidated-Undrained Direct Shear Test(one point) w/Stress-Strain Curve	Consolidation Test	Consolidated-Drained Triaxial w/Pore Pressure Measurements and Stress-Strain Curves	Unconsolidated-Undrained Triaxial w/Pore Pressure Measurements and Stress-Strain Curves	Consolidated-Undrained Triaxial w/Pore Pressure Measurements and Stress-Strain Curves					Disposition Recommended *
						SUMMARY OF SIEVE AND HYDROMETER ANALYSIS													
									PERCENT FINER THAN:										
						SIEVE SIZE						GRAIN SIZE							
					#10	#20	#40	#60	#100	#200	.032 mm	.023 mm	.017 mm	.009 mm	.0068 mm	.0047 mm	.0032 mm	.0024 mm	
B8A-B13	BULK SAMPLE	2'-5'	CL		100	100	100	99	95	84	76	68	62	53	47	43	39	34	C
B8A-B15	B	3.5'-6.0'	CH		100	100	100	99	96	84	74	70	67	63	60	57	56	54	C
B8A B17	BULK SAMPLE	2'-5'	CH		98	97	97	96	91	82	69	66	59	50	47	45	41	38	C
B8A-B18	BULK SAMPLE	2'-4'	CL		100	100	100	99	87	68	58	52	49	44	40	38	36	35	I
B8A B20	BULK SAMPLE	2'-5'	CH		100	100	99	99	88	68	63	59	56	55	52	51	48	46	I
B8A B21	BULK SAMPLE	2'-5'	CL		100	100	100	99	91	73	62	56	52	47	44	41	38	36	I
B8A B28	A	0.5'-1.0'	CL		100	100	100	97	83	59	54	48	47	43	40	38	37	35	I
B3A-B28	B	4'-6'	CH		100	100	100	100	97	89	86	82	80	74	70	65	63	56	I
TP 829	BULK SAMPLE	1'-3'	CH		100	100	100	100	96	83	78	74	71	68	65	62	60	59	I

Remarks:

* C- Common.

I- Impervious

000650

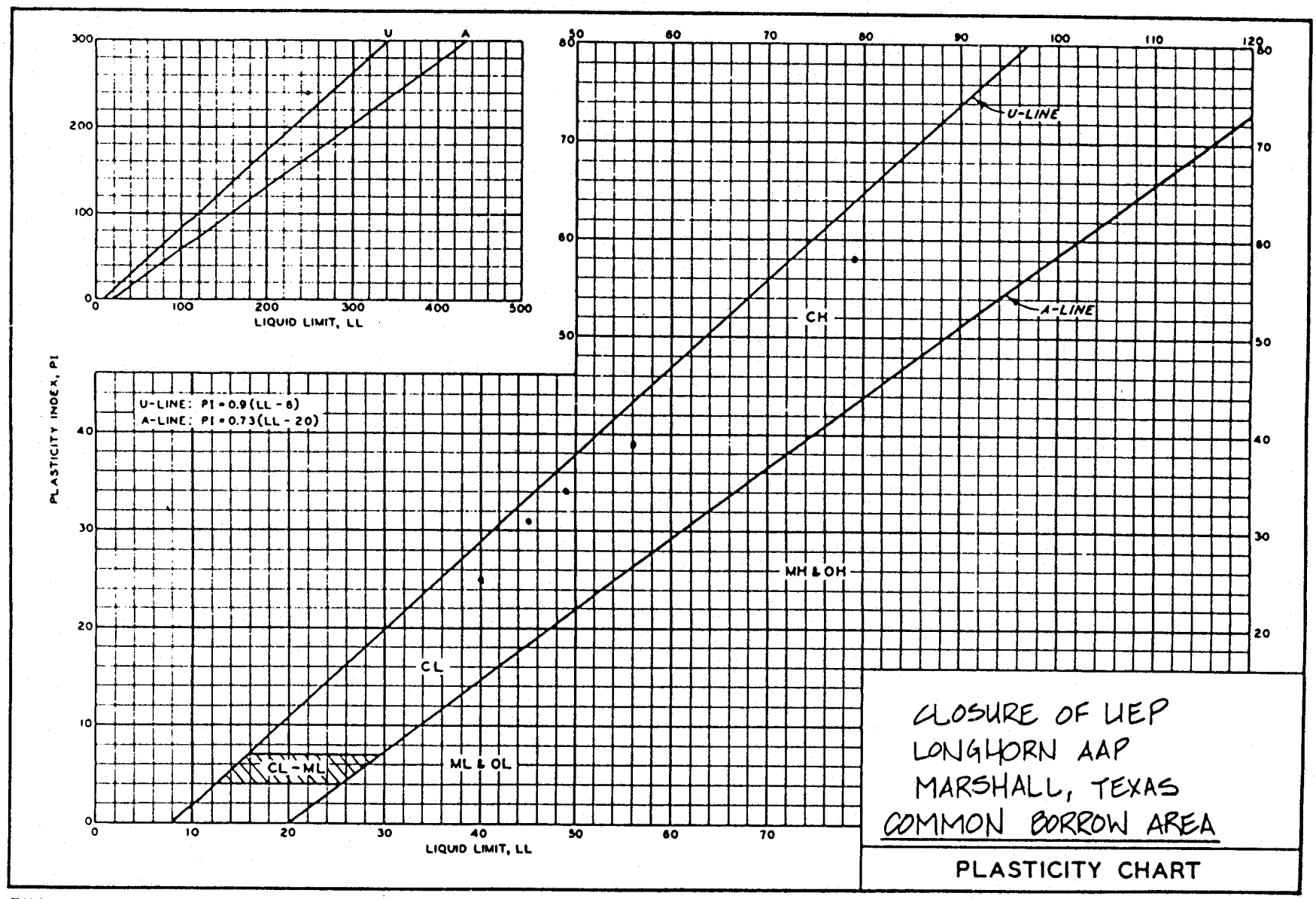


CLOSURE OF UEP
LONGHORN AAP
MARSHALL, TEXAS
IMPERVIOUS BORROW AREA

PLASTICITY CHART

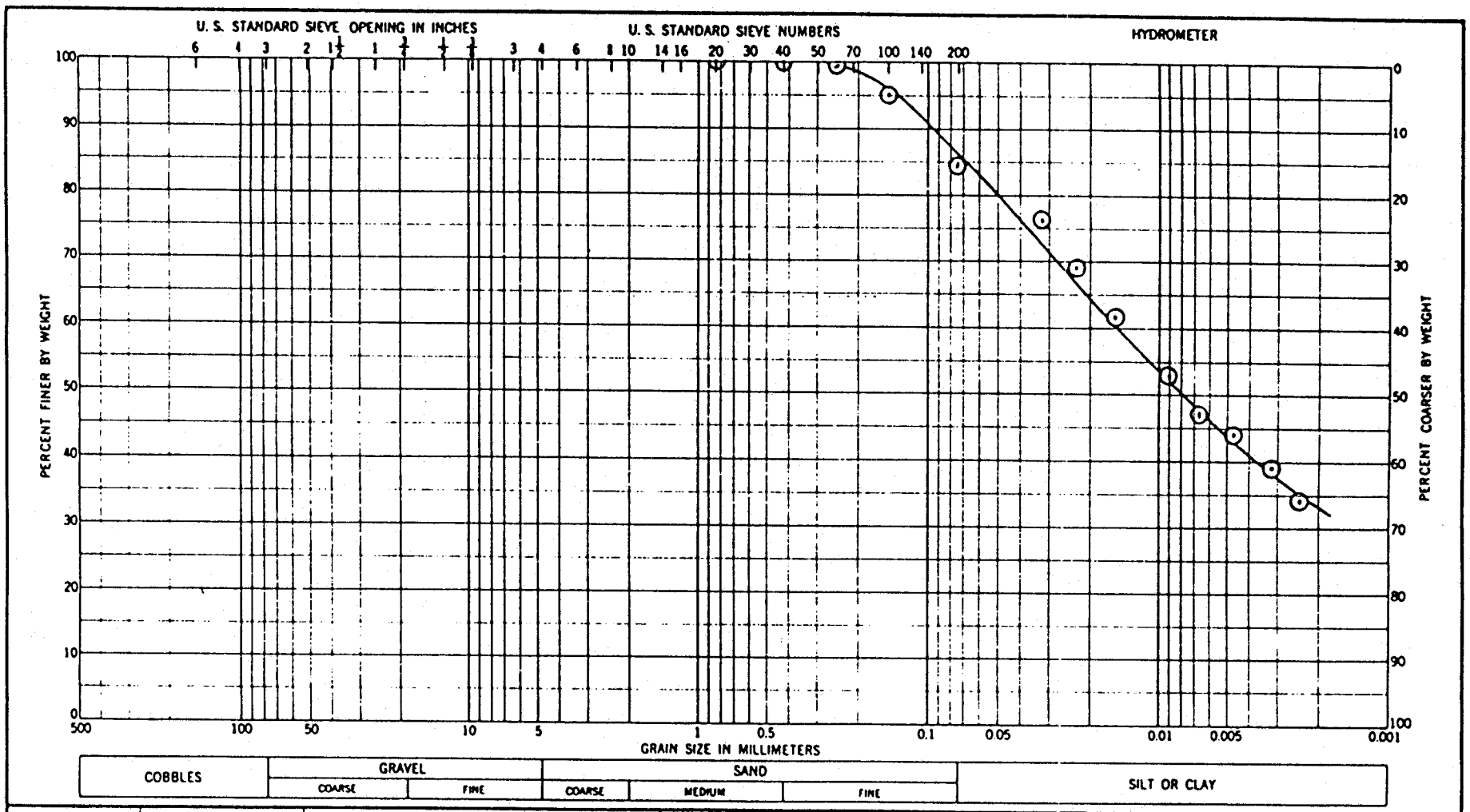
ENG FORM 4334 JUN 70 (EM 1110-2-1906) TRANSLUCENT

000651



ENG FORM 4334 JUN 70 (EM 1110-2-1906) TRANSLUCENT

000652



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
BAG	2.0' to 5.0'		13.4			

GRADATION CURVES

Project CLOSURE OF UNLINED EVAPORATION POND (UEP), LONGHORN AAP

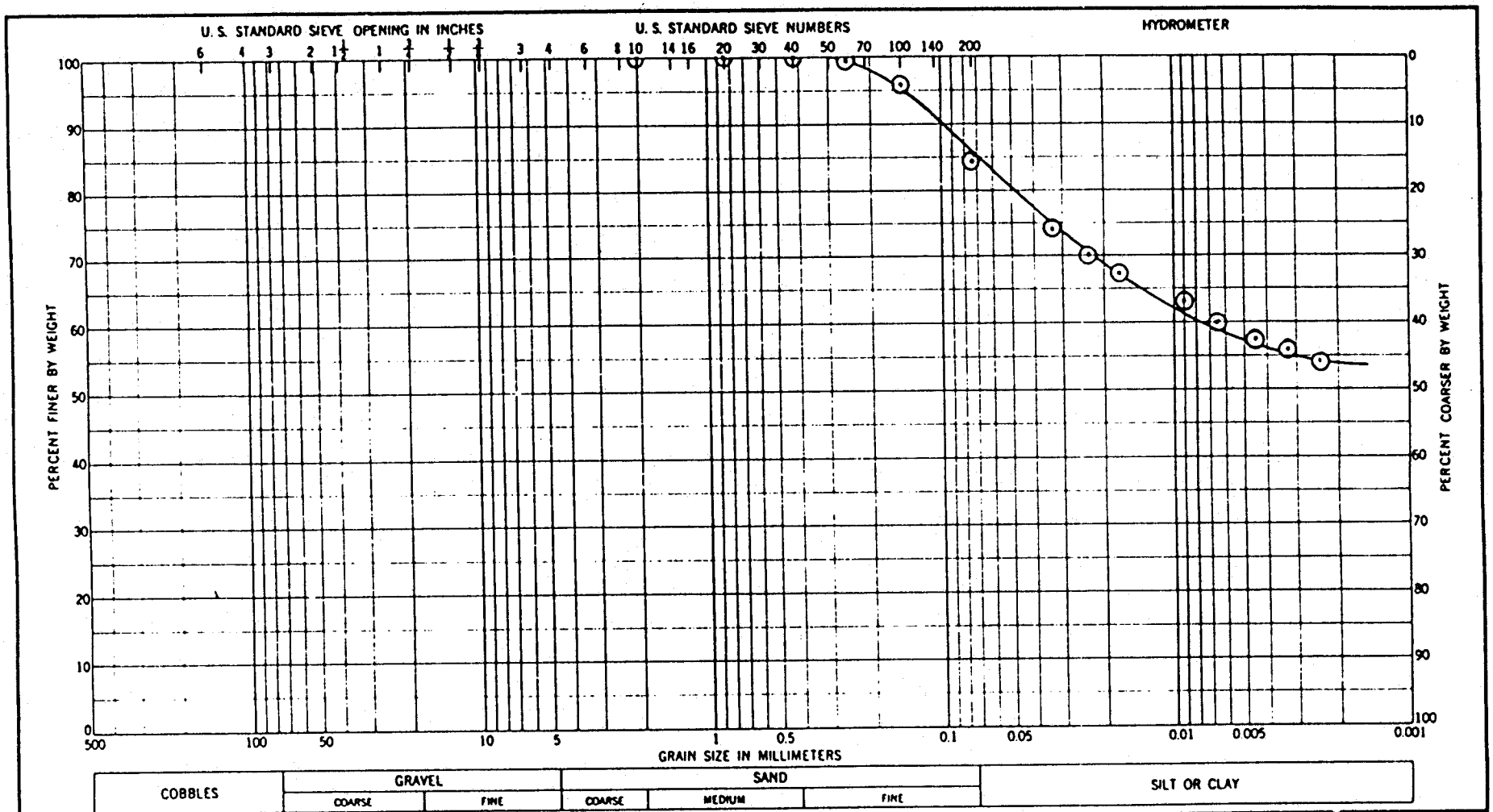
Area COMMON BORROW AREA

Boring No. BA-813

Date 18 APRIL, 1984

ENG FORM 1 MAY 63 2087

000653



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
B	3.5'-6.0'	CH	27.2			

GRADATION CURVES

Project CLOSURE OF UNLINED EVAPORATION POND, LONGHORN AAP

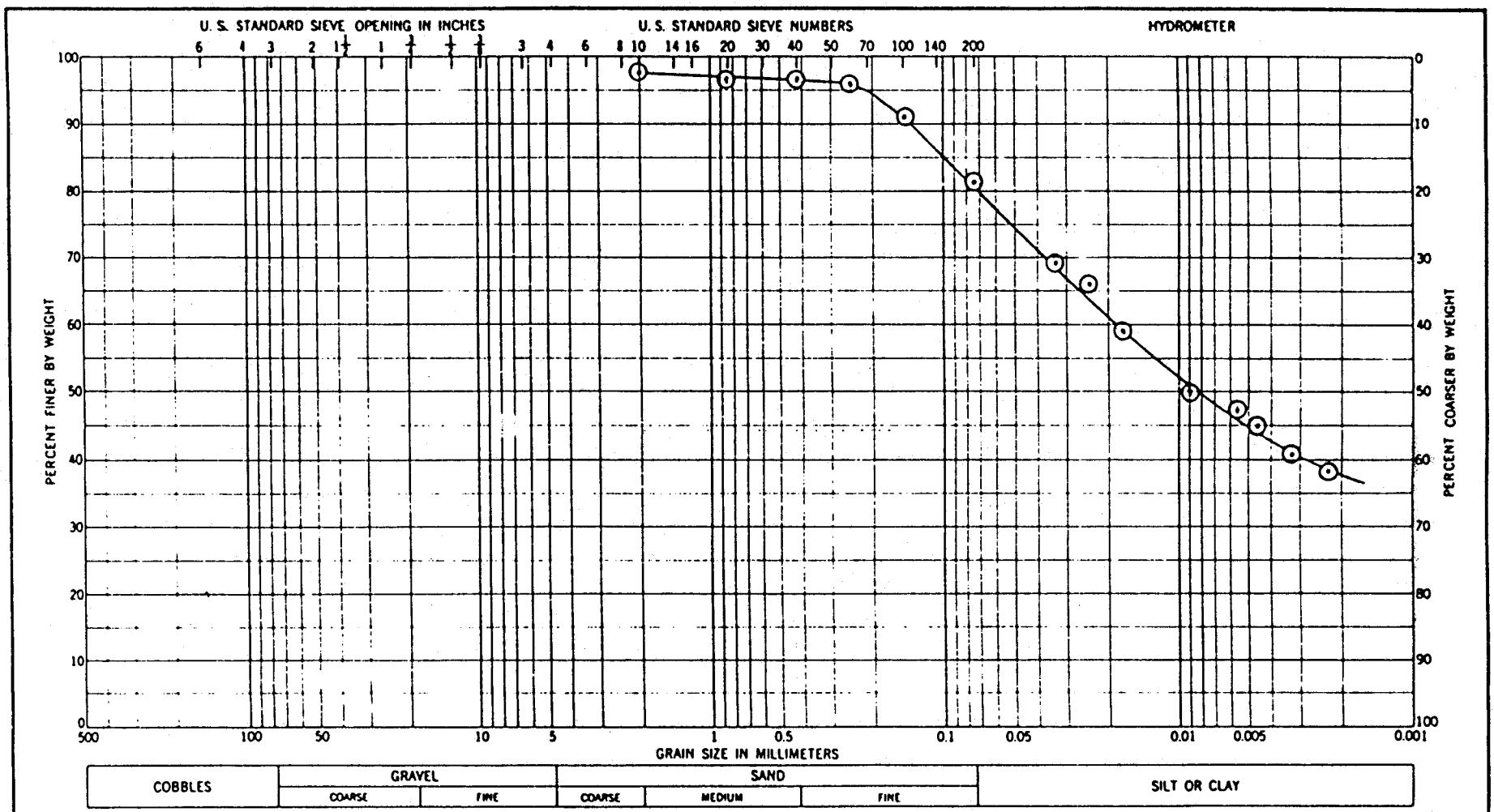
Area COMMON BORROW

Boring No. 8A-B15

Date 18 APRIL, 1984

ENG FORM 1 MAY 63 2087

000654



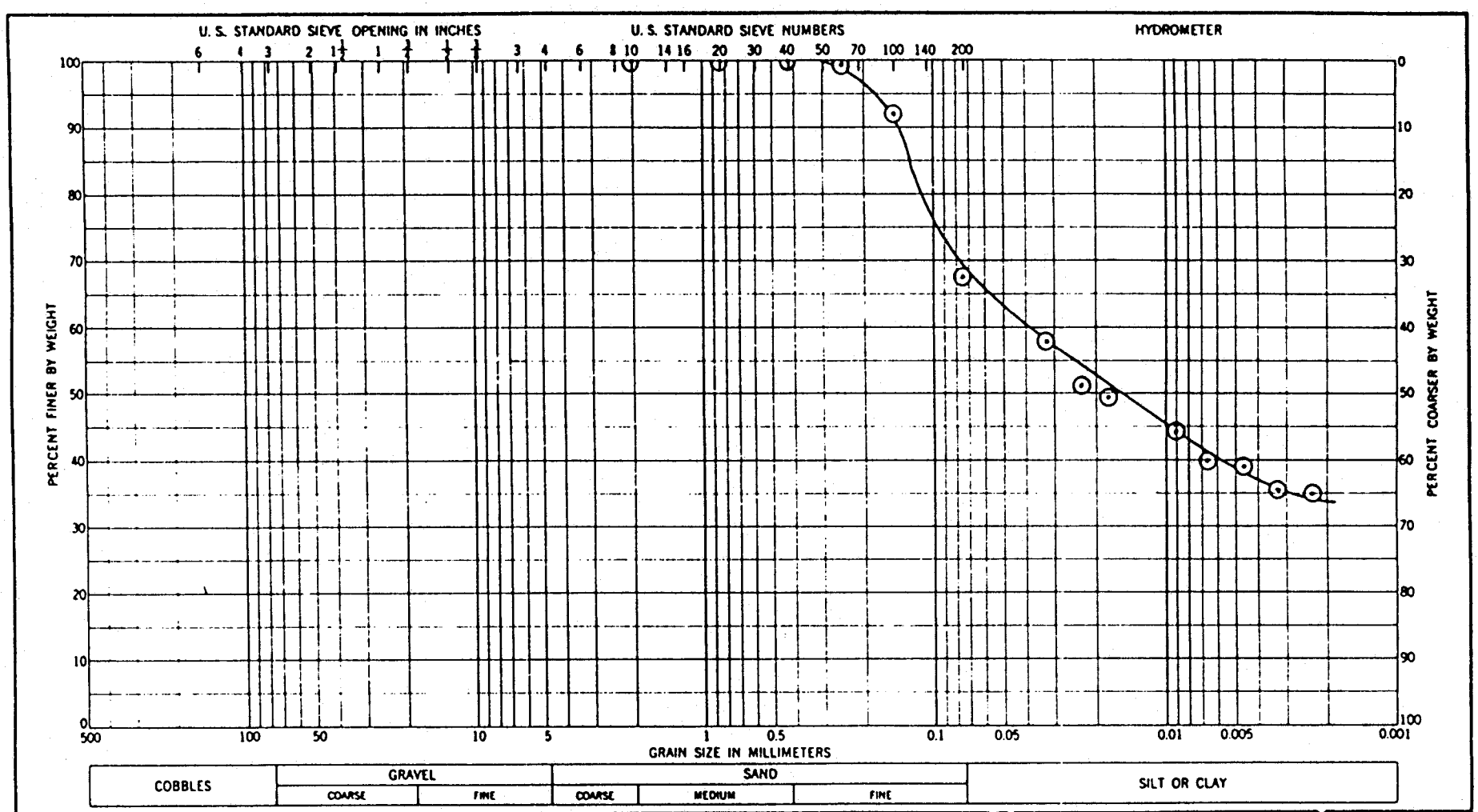
Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
BAG	2.0' – 5.0'	CH	26.4			

GRADATION CURVES

Project CLOSURE OF UNLINED EVAPORATION
P.C.I.D. LONGHORN AAP
Area COMMON BORROW
Boring No. 8A-B17
Date 18 APRIL, 1984

ENG FORM 1 MAY 63 2087

000655



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
BAG	2.0' - 4.0'	CL	32	33		16

GRADATION CURVES

Project CLOSURE OF UNLINED EVAPORATION POND, LONGHORN AAP

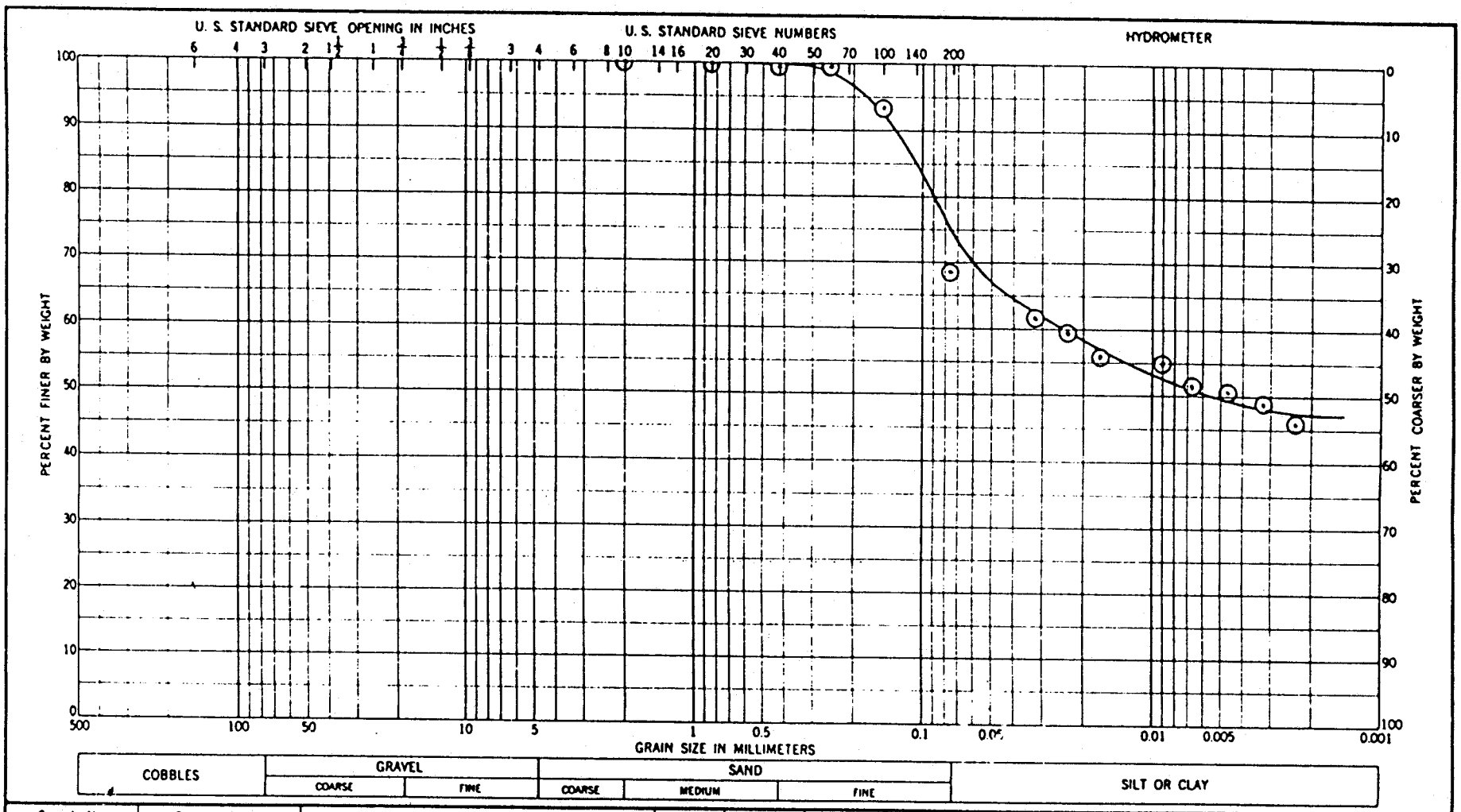
Area IMPERVIOUS BORROW

Boring No. BA-818

Date 18 APRIL, 1984

959000

ENG FORM 1 MAY 63 2087



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
BAG	2.0'-5.0'	CH	37	61		37

GRADATION CURVES

Project CLOSURE OF UNLINED EVAPORATION POND, LONGHORN AAP

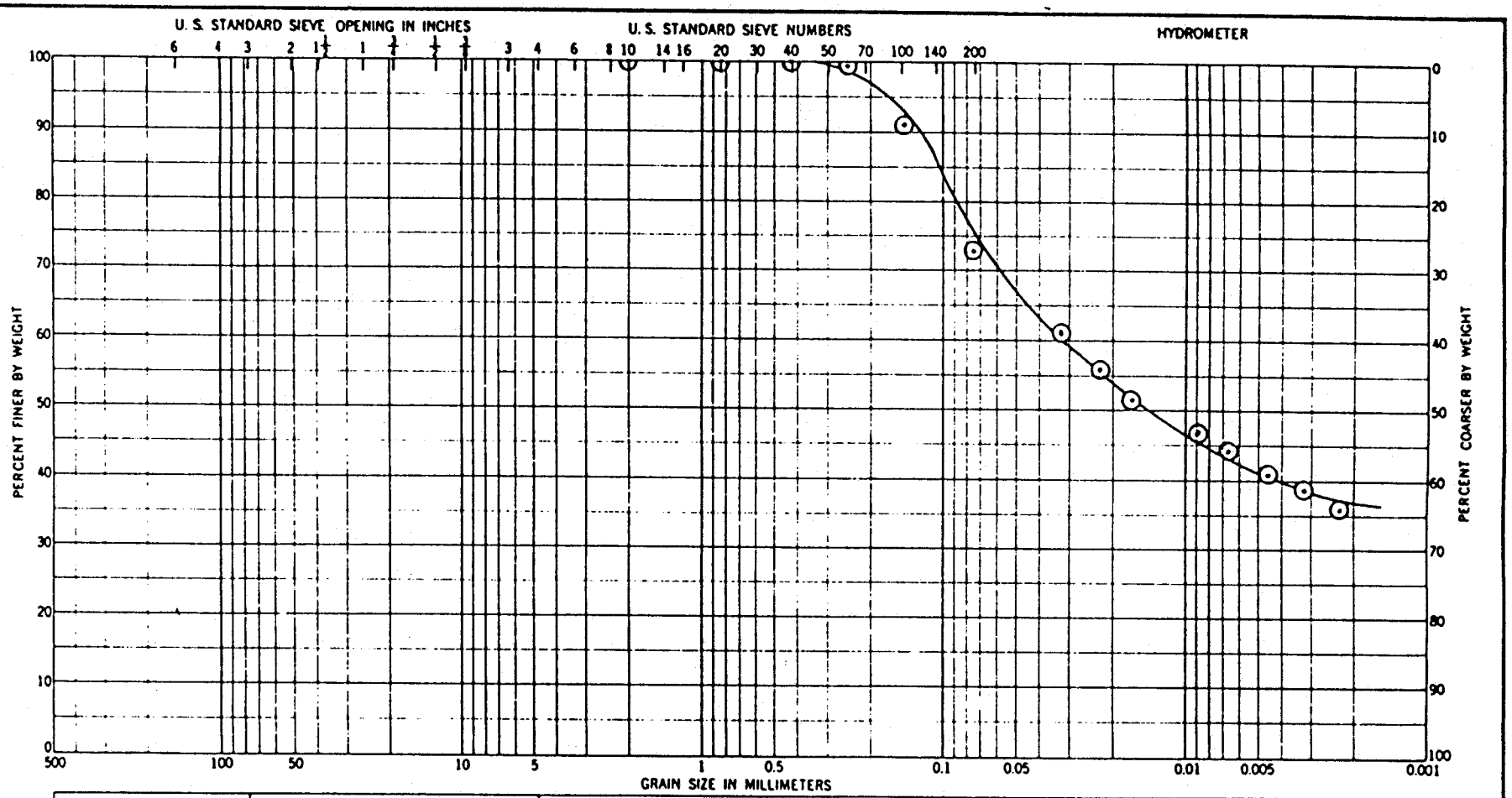
Area IMPERVIOUS BORROW

Boring No. BA-820

Date 18 APRIL, 1984

ENG FORM 1 MAY 63 2087

000657



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
BAG	2.0'-5.0'	CL	19	43		28

GRADATION CURVES

Project CLOSURE OF UNLINED EVAPORATION POND, LONGHORN AAP

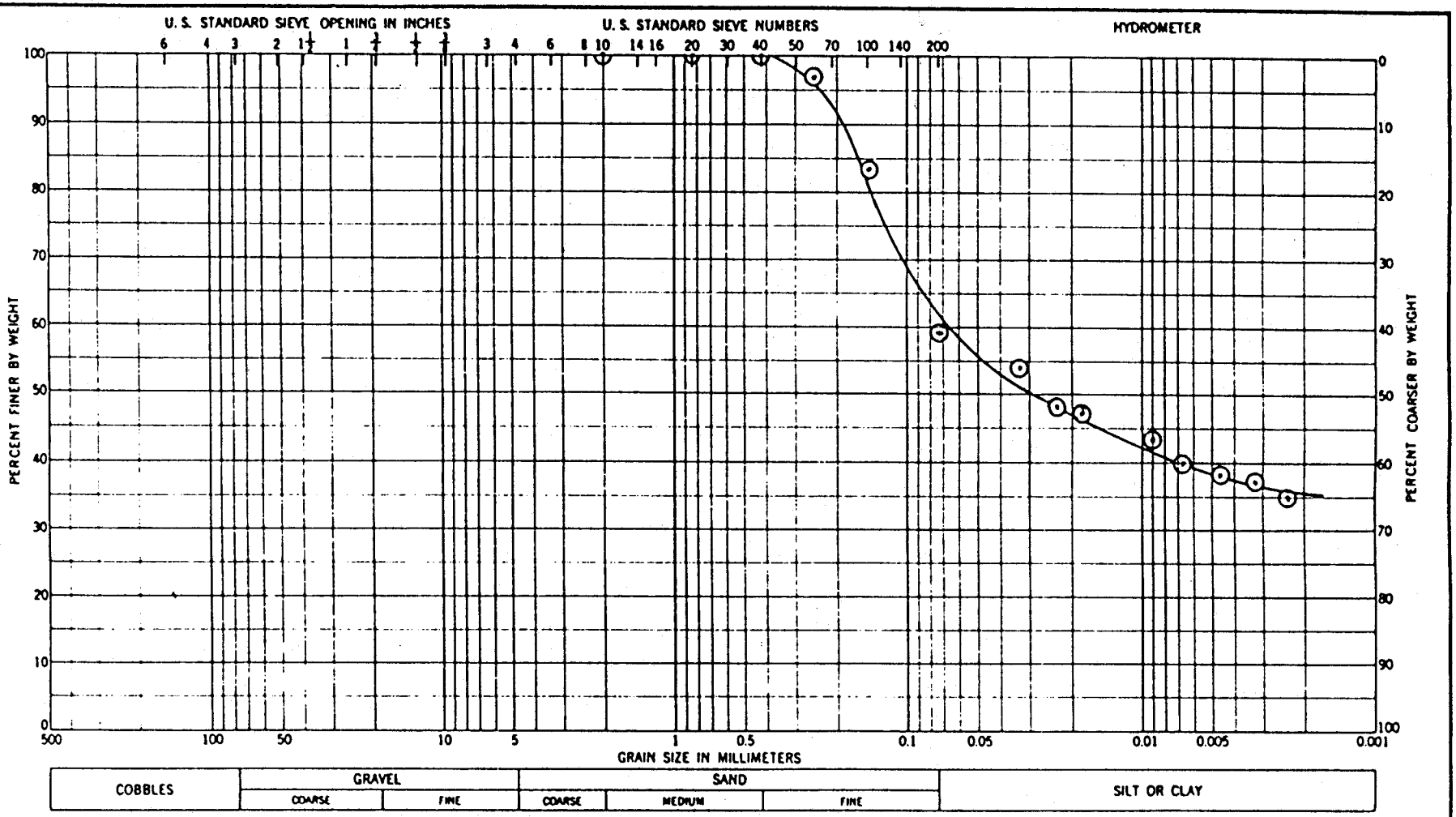
Area IMPERVIOUS BORROW

Boring No. BA-B21

Date 18 APRIL, 1984

ENG FORM 1 MAY 63 2087

000658



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
A	0.5' - 1.0'	CL	19.6	41		24

GRADATION CURVES

Project CLOSURE OF UNLINED EVAPORATION 2ND, LONGHORN AAP

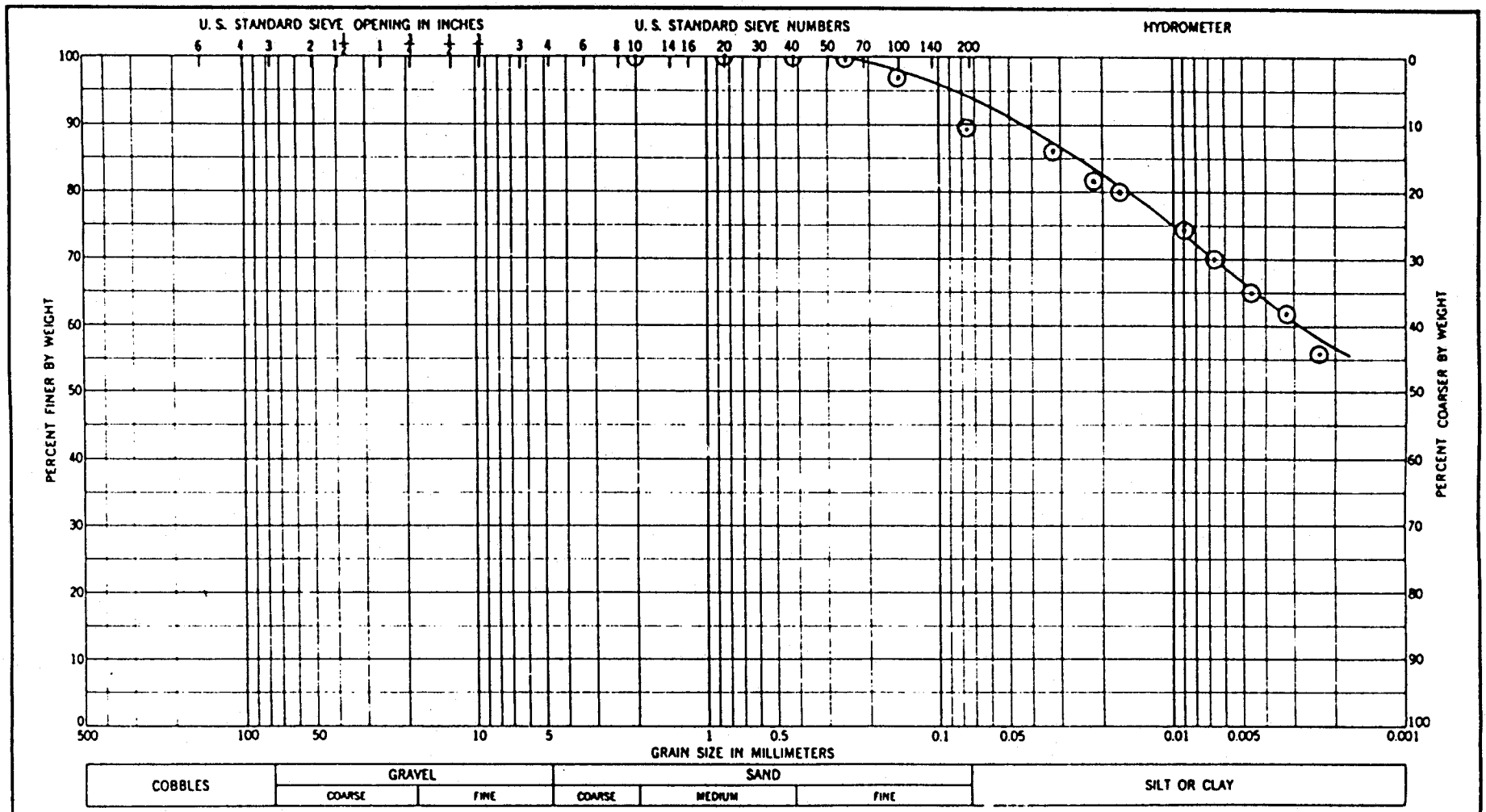
Area IMPERVIOUS BORROW

Boring No. 3A-828

Date 18 APRIL, 1984

ENG FORM 1 MAY 63 2087

659000



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
B	10'-6.0'	CH	26.0	70		49

GRADATION CURVES

Project CLOSURE OF UNLINED EVAPORATION POND, LONGHORN AAP

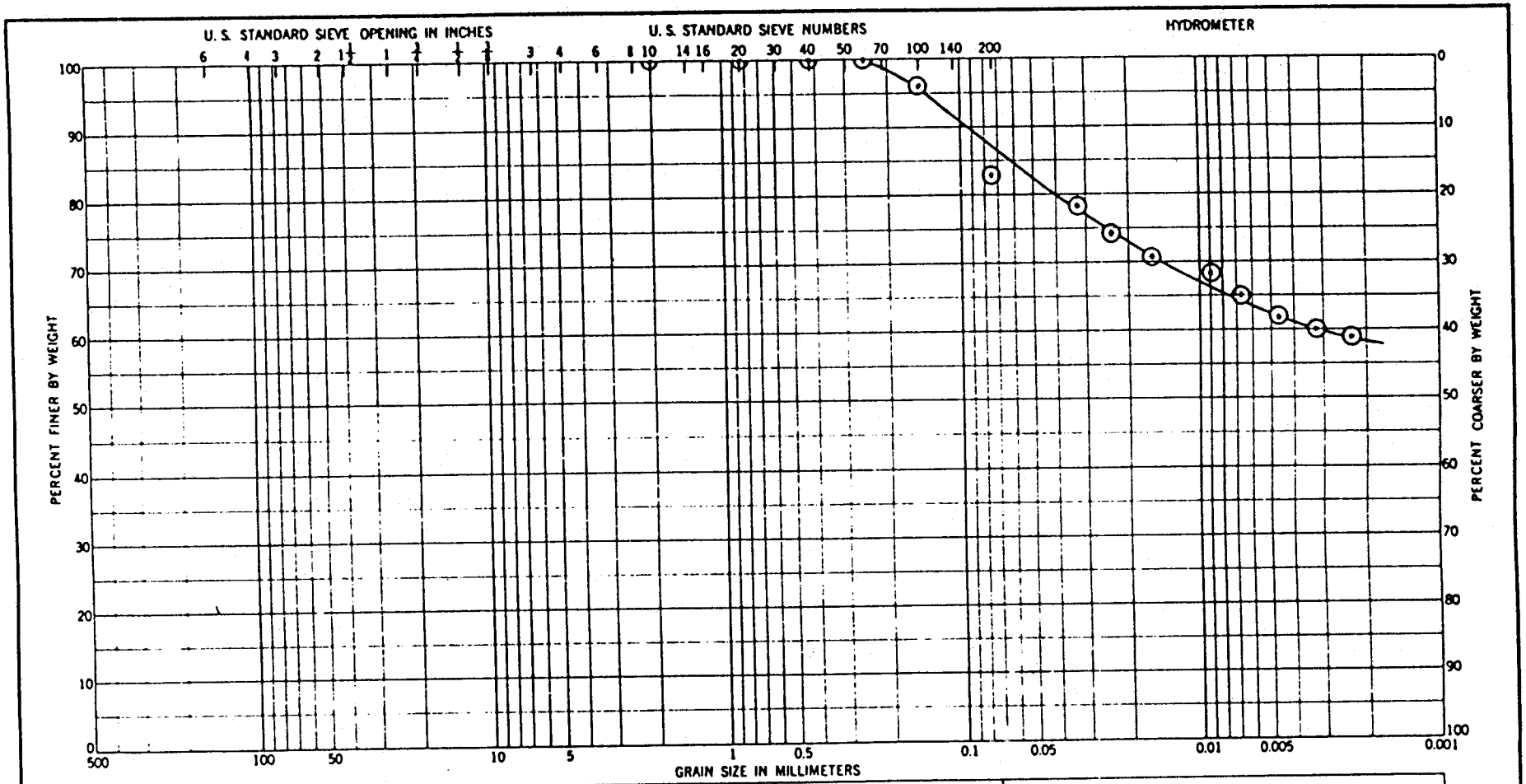
Area IMPERVIOUS BORROW

Boring No. 3A-82B

Date 18 APRIL, 1984

ENG FORM 1 MAY 63 2087

099000



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
BAG	1.0'-3.0'	CH	26.7	68		42

GRADATION CURVES

Project CLOSURE OF UNLINED EVAPORATION POND, LONGHORN AAP

Area IMPERVIOUS BORROW

Boring No. TP-829

Date 18 APRIL, 1984

ENG FORM 1 MAY 63 2087

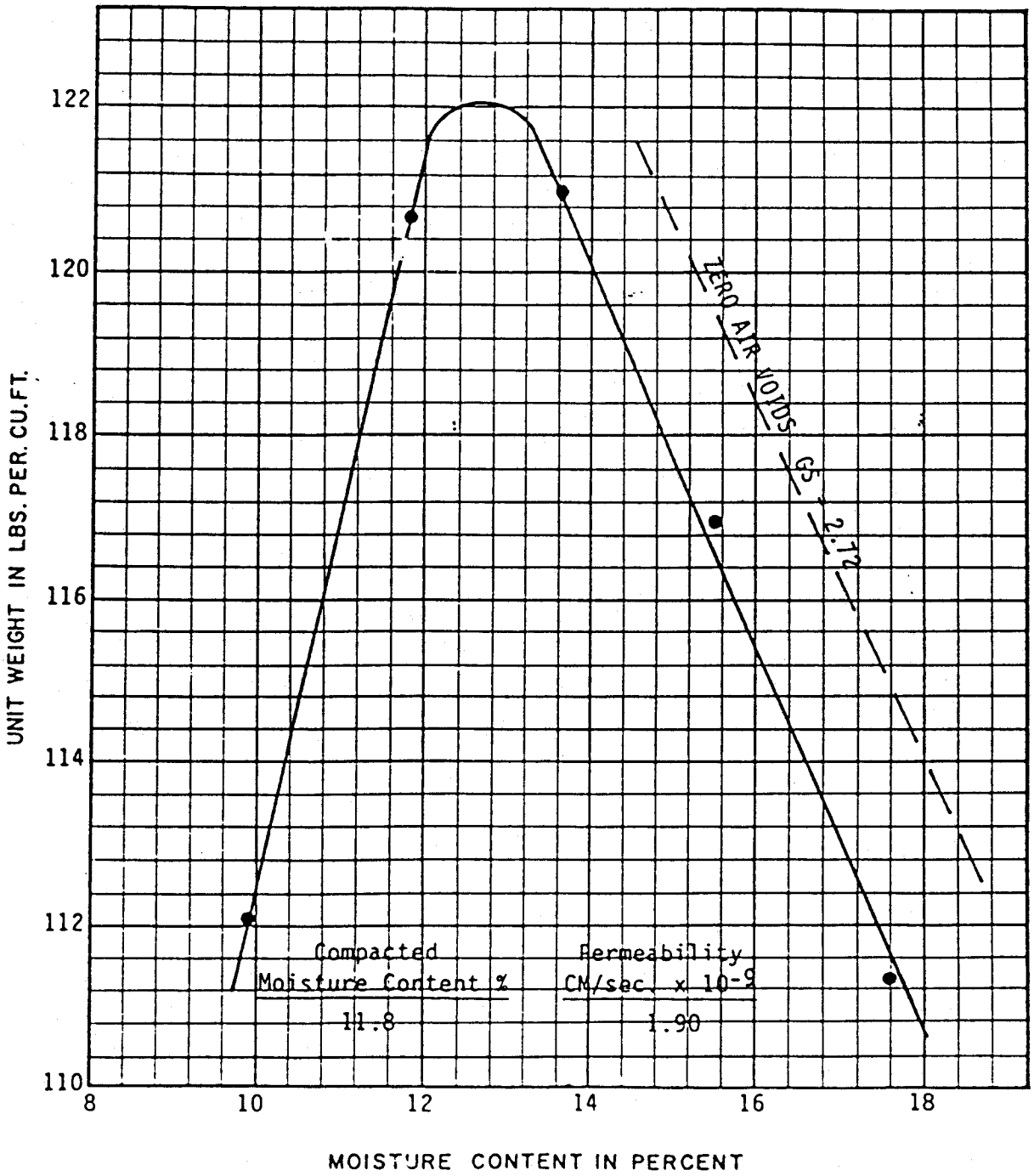
000961

000662

PROJECT: LongHorn AAP
TEST METHOD: CE-55
MOLD: 1/13 cu.ft.
HAMMER: 10.0 lbs.
DROP: 18"
BLOWS: 55
LAYERS: 5

SAMPLE: 8A-818 2' - 4'
DESCRIPTION: Reddish-tan sandy clay

LIQUID LIMIT: 33
PLASTICITY INDEX: 16
OPTIMUM MOISTURE: 12.7 %
MAX. UNIT DRY WT: 122.0 LBS./CU.FT.

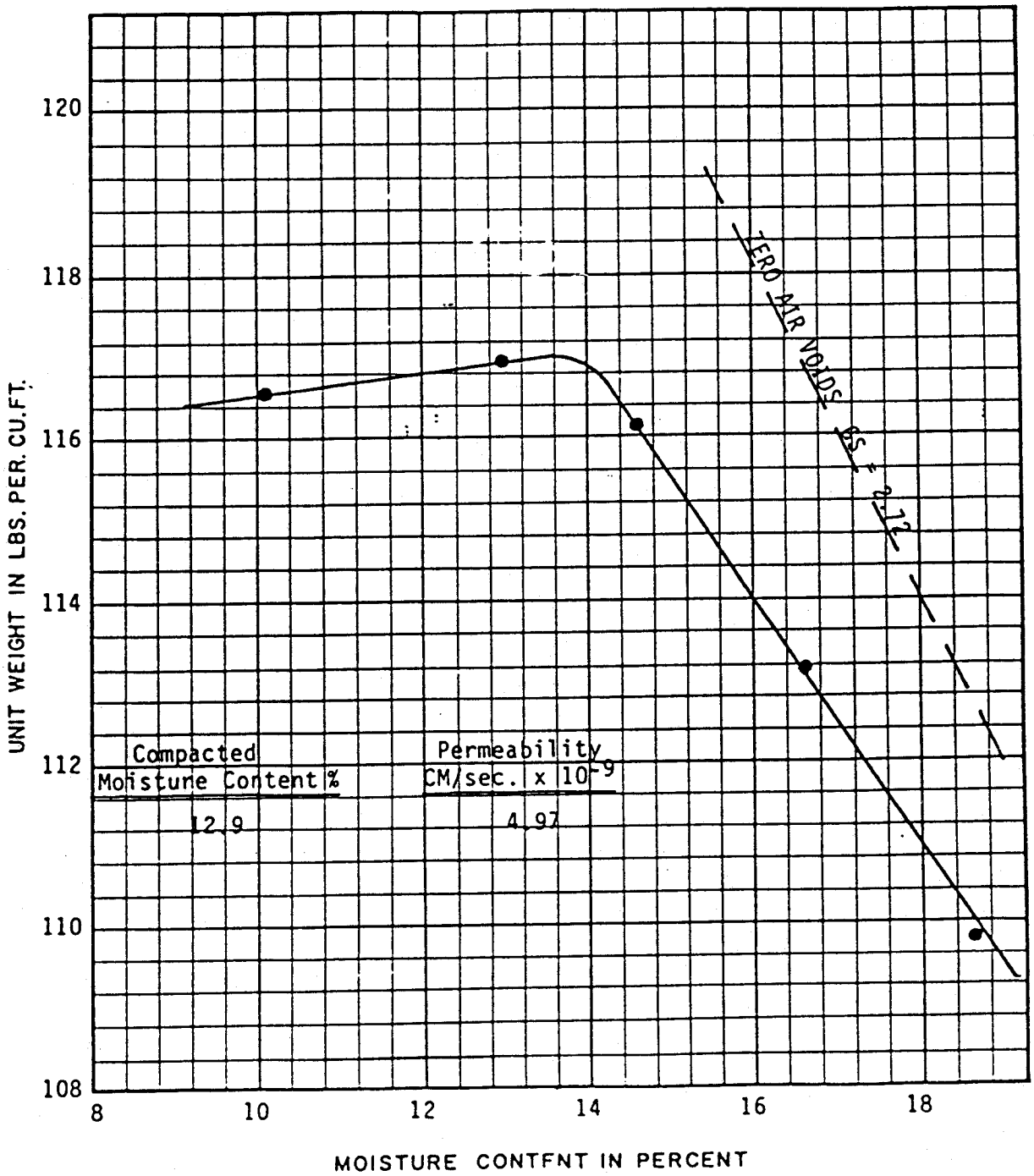


OPTIMUM MOISTURE TEST

PROJECT: LongHorn AAP
TEST METHOD: CE-55
MOLD: 1/13 cu.ft.
HAMMER: 10.0 lbs.
DROP: 18"
BLOWS: 55
LAYERS: 5

SAMPLE: 8A 820 2' -5'
DESCRIPTION: Reddish-tan sandy clay

LIQUID LIMIT: 61
PLASTICITY INDEX: 37
OPTIMUM MOISTURE: 13.7 %
MAX. UNIT DRY WT: 117.0 LBS./CU.FT.

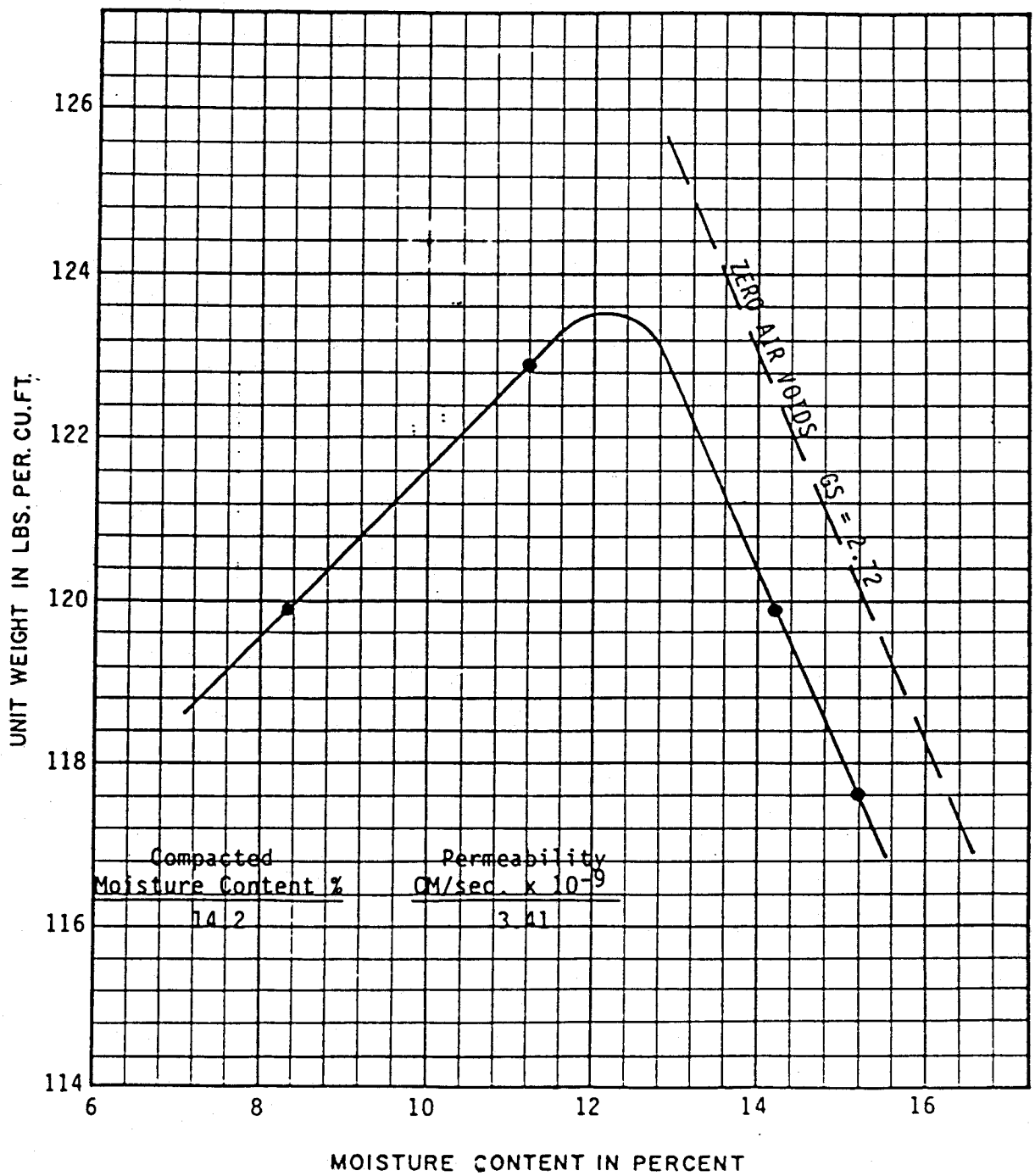


OPTIMUM MOISTURE TEST

PROJECT: LongHorn AAP
TEST METHOD: CE-55
MOLD: 1/13 cu. ft.
HAMMER: 10.0 lbs.
DROP: 18"
BLOWS: 55
LAYERS: 5

SAMPLE: 8A 821 2' - 5'
DESCRIPTION: Reddish-tan sandy clay

LIQUID LIMIT: 43
PLASTICITY INDEX: 28
OPTIMUM MOISTURE: 12.2 %
MAX. UNIT DRY WT: 123.5 LBS./CU.FT.

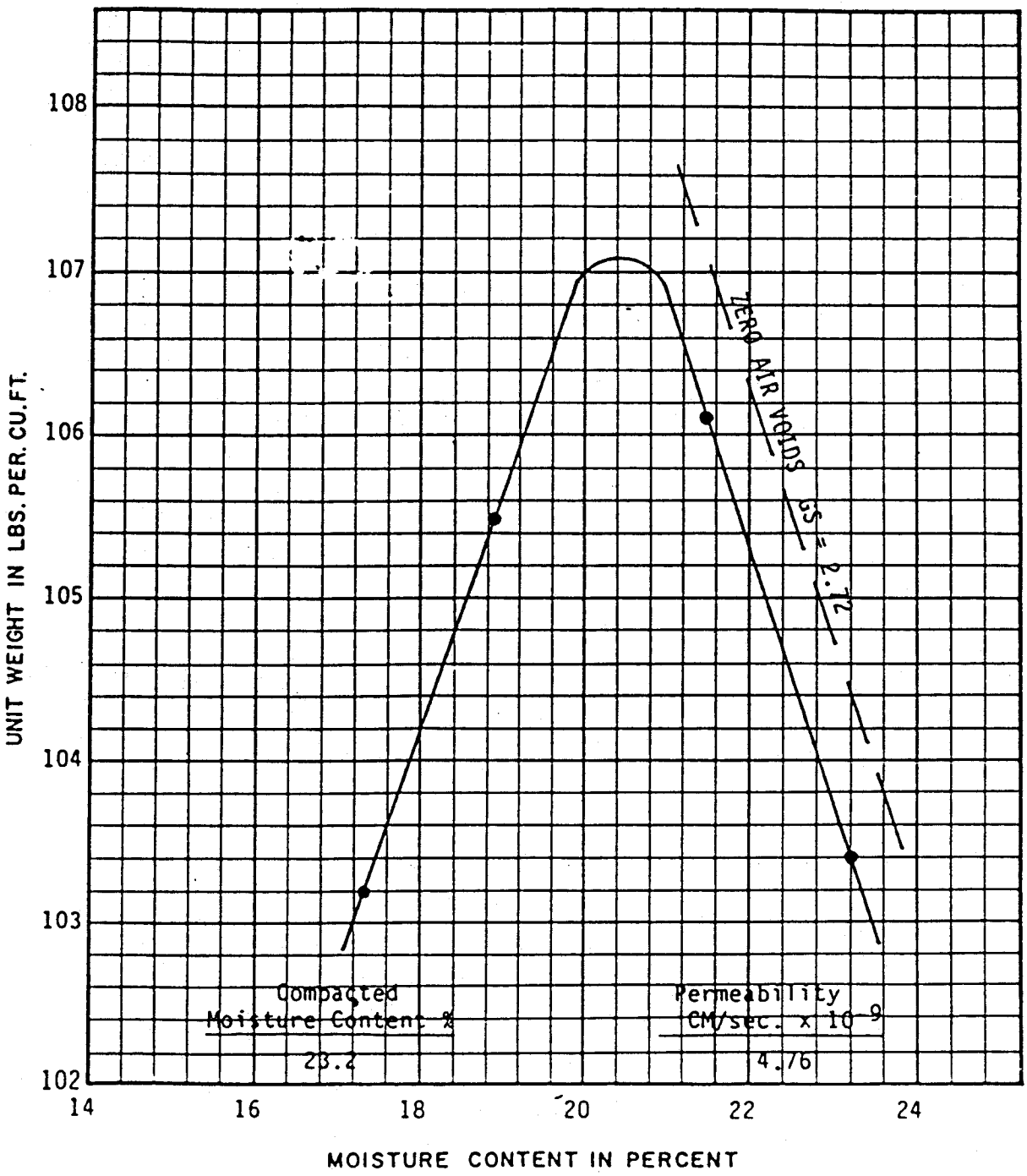


OPTIMUM MOISTURE TEST

PROJECT: Longhorn AAP
TEST METHOD: CE-55
MOLD: 1/13 cu. ft.
HAMMER: 10.0 lbs.
DROP: 18"
BLOWS: 55
LAYERS: 5

SAMPLE: TP 829 1' - 3'
DESCRIPTION: Reddish-tan sandy clay

LIQUID LIMIT: 68
PLASTICITY INDEX: 42
OPTIMUM MOISTURE: 20.3 %
MAX. UNIT DRY WT: 107.1 LBS./CU.FT.

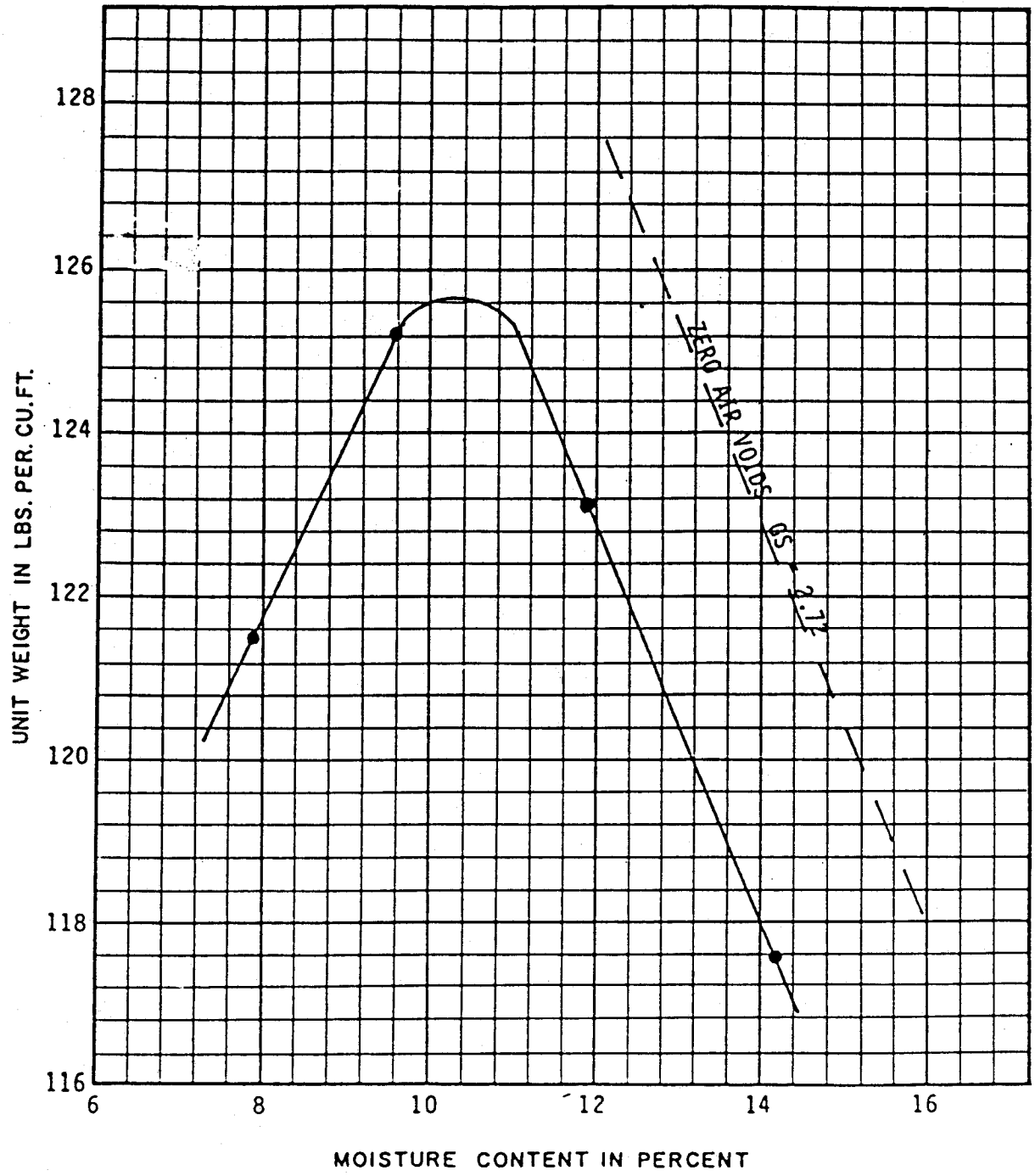


OPTIMUM MOISTURE TEST

PROJECT: LongHorn AAP
TEST METHOD: CE-55
MOLD: 1/13 cu. ft.
HAMMER: 10.0 lbs.
DROP: 18"
BLOWS: 55
LAYERS: 5

SAMPLE: Boring 8A-813 2' - 5'
DESCRIPTION: Brown sandy clay

LIQUID LIMIT: 40
PLASTICITY INDEX: 25
OPTIMUM MOISTURE: 10.3 %
MAX. UNIT DRY WT: 125.7 LBS./CU.FT.

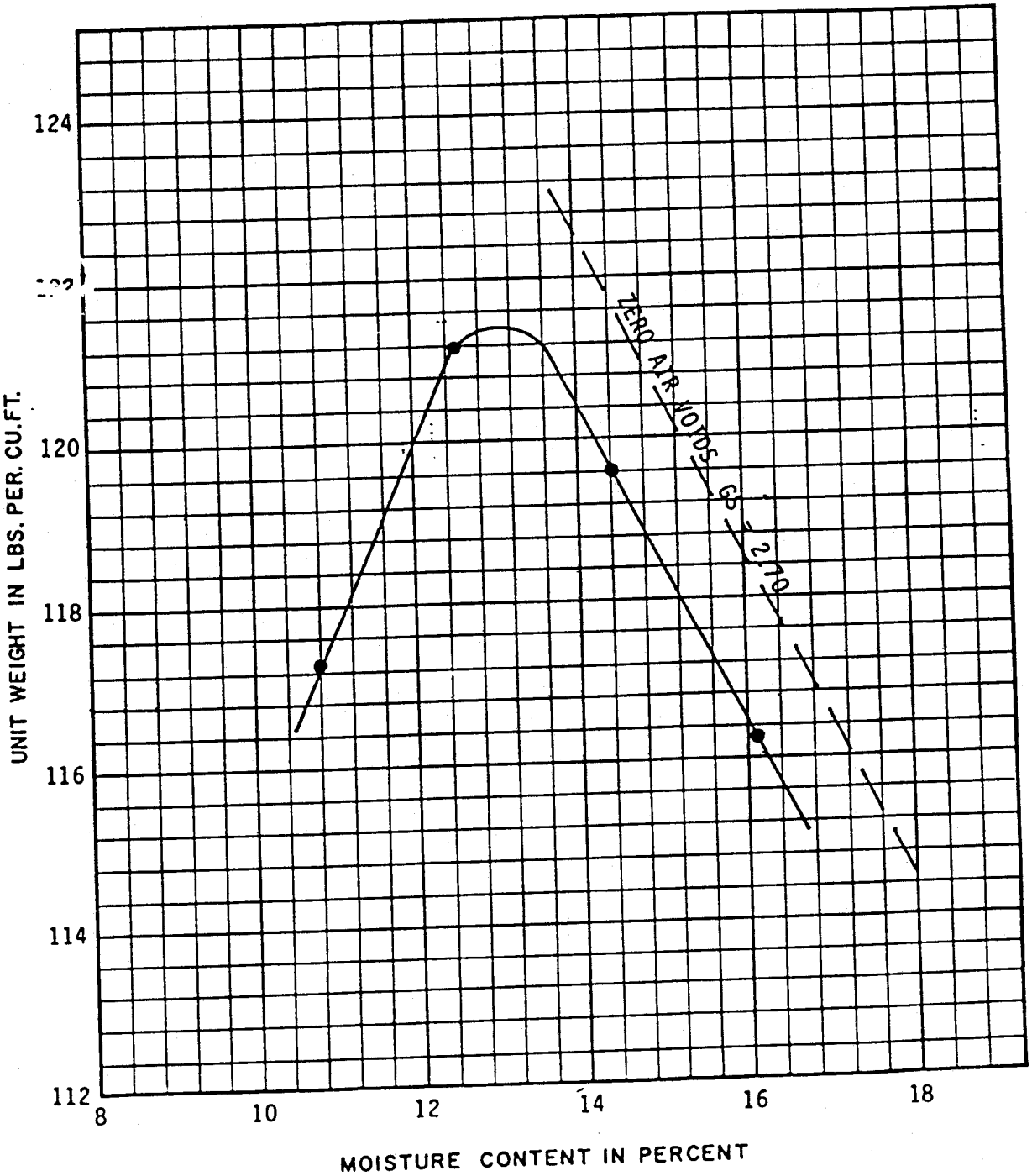


OPTIMUM MOISTURE TEST

PROJECT: LongHorn AAP
TEST METHOD: CE-55
MOLD: 1/13 cu. ft.
HAMMER: 10.0 lbs.
DROP: 18"
BLOWS: 55
LAYERS: 5

SAMPLE: Boring 8A-817 2' - 5'
DESCRIPTION: Reddish-tan sandy clay

LIQUID LIMIT: 56
PLASTICITY INDEX: 39
OPTIMUM MOISTURE: 13.0 %
MAX. UNIT DRY WT: 121.5 LBS./CU.FT.



OPTIMUM MOISTURE TEST

PART 3 - CONSTRUCTION SPECIFICATIONS

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CONSTRUCTION SPECIFICATIONS

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SECTION 1

GENERAL PROVISIONS
(Construction Contract)
(Edition of 29 July 1980)
Issued By: Department of the Army, Corps of Engineers

(General Provisions 1 through 29 and 30 through 38 are those prescribed by the General Services Administration in Standard Form 23-A, April 1975 edition and Standard Form 19-A, January 1979 edition, respectively, as amended pursuant to the latest revisions of the Defense Acquisition Regulation and Engineer Contract Instructions, ER 1180-1-1.)

1.1 DEFINITIONS
(The following clause is applicable if the procurement instrument identification number is prefixed by the letters "DACW")
(a) The term "head of the agency" or "Secretary" as used herein means the Secretary of the Army; and the term "his duly authorized representative" means the Chief of Engineers, Department of the Army, or an individual or board designated by him.
(b) The term "Contracting Officer" as used herein means the person executing this contract on behalf of the Government and includes a duly appointed successor or authorized representative. (DAR 7-602.1 & ECI 7-070)

1.2 DEFINITIONS (1964 JUN)
(The following clause is applicable if the procurement instrument identification number is prefixed by the letters "DACA")
(a) The term "head of the agency" or "Secretary" as used herein means the Secretary, the Under Secretary, any Assistant Secretary, or any other head or assistant head of the executive or military department or other Federal agency; and the term "his duly authorized representative" means any person or persons or board (other than the Contracting Officer) authorized to act for the head of the agency or the Secretary.
(b) The term "Contracting Officer" as used herein means the person executing this contract on behalf of the Government and includes a duly appointed successor or authorized representative. (DAR 7-602.1)

2. SPECIFICATIONS AND DRAWINGS (1964 JUN)
The Contractor shall keep on the work a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy either in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at his own risk and expense. The Contracting Officer shall furnish from time to time such detail drawings and other information as he may consider necessary, unless otherwise provided. (DAR 7-602.2)

3. CHANGES (1968 FEB)
(a) The Contracting Officer may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make any change in the work within the general scope of the contract, including but not limited to changes:

(i) in the specifications (including drawings and designs);
(ii) in the method or manner of performance of the work;
(iii) in the Government-furnished facilities, equipment, materials, services, or site; or
(iv) directing acceleration in the performance of the work.

(b) Any other written order or an oral order (which terms as used in this paragraph (b) shall include direction, instruction, interpretation or determination) from the Contracting Officer, which causes any such change, shall be treated as a change order under this clause, provided, that the Contractor gives the Contracting Officer written notice stating the date, circumstances, and source of the order and that the Contractor regards the order as a change order.

(c) Except as herein provided, no order, statement, or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment hereunder.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any order, an equitable adjustment shall be made and the contract modified in writing accordingly: Provided however, That except for claims based on defective specifications, no claim for any change under (b) above shall be allowed for any costs incurred more than 20 days before the Contractor gives written notice as therein required: And provided further, That in the case of defective specifications for which the Government is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with such defective specifications.

(e) If the Contractor intends to assert a claim for an equitable adjustment under this clause, he must, within 30 days after receipt of a written change order under (a) above or the furnishing of a written notice under (b) above, submit to the Contracting Officer a written statement setting forth the general nature and monetary extent of such claim, unless this period is extended by the Government. The statement of claim hereunder may be included in the notice under (b) above.

(f) No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this contract. (DAR 7-602.3)

4. DIFFERING SITE CONDITIONS (1968 FEB)

(a) The Contractor shall promptly, and before such conditions are disturbed, notify the Contracting Officer in writing of: (1) subsurface or latent physical conditions at the site differing materially from those indicated in this contract, or (2) unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in this contract. The Contracting Officer shall promptly investigate the conditions, and if he finds that such conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the work under this contract, whether or not changed as a result of such conditions, an equitable adjustment shall be made and the contract modified in writing accordingly.

(b) No claim of the Contractor under this clause shall be allowed unless the Contractor has given the notice required in (a) above; provided, however, the time prescribed therefor may be extended by the Government.

(c) No claim by the Contractor for an equitable adjustment hereunder

shall be allowed if asserted after final payment under this contract. (DAR 7-602.4)

5. TERMINATION FOR DEFAULT - DAMAGES FOR DELAY - TIME EXTENSIONS (1969 AUG)

(a) If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with such diligence as will insure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within such time, the Government may, by written notice to the Contractor, terminate his right to proceed with the work or such part of the work as to which there has been delay. In such event the Government may take over the work and prosecute the same to completion, by contract or otherwise, and may take possession of and utilize in completing the work such materials, appliances, and plant as may be on the site of the work and necessary therefor. Whether or not the Contractor's right to proceed with the work is terminated, he and his sureties shall be liable for any damage to the Government resulting from his refusal or failure to complete the work within the specified time.

(b) If fixed and agreed liquidated damages are provided in the contract and if the Government so terminates the Contractor's right to proceed, the resulting damage will consist of such liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the Government in completing the work.

(c) If fixed and agreed liquidated damages are provided in the contract and if the Government does not so terminate the Contractor's right to proceed, the resulting damage will consist of such liquidated damages until the work is completed or accepted.

(d) The Contractor's right to proceed shall not be so terminated nor the Contractor charged with resulting damage if:

(1) The delay in the completion of the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, acts of the public enemy, acts of the Government in either its sovereign or contractual capacity, acts of another contractor in the performance of a contract with the Government, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather, or delays of subcontractors or suppliers arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and such subcontractors or suppliers; and

(2) The Contractor, within 10 days from the beginning of any such delay (unless the Contracting Officer grants a further period of time before the date of final payment under the contract), notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of the delay and extend the time for completing the work when, in his judgment, the findings of fact justify such an extension, and his findings of fact shall be final and conclusive on the parties, subject only to appeal as provided in the "Disputes" clause of this contract.

(e) If, after notice of termination of the Contractor's right to proceed under the provisions of this clause, it is determined for any reason that the Contractor was not in default under the provisions of this clause, or that the delay was excusable under the provisions of this clause, the rights and obligations of the parties shall, if the contract contains a clause providing for termination for convenience of the Government, be the same as if the notice of termination had been issued pursuant to such clause. If, in the foregoing circumstances, this contract does not contain a clause providing for

termination for convenience of the Government, the contract shall be equitably adjusted to compensate for such termination and the contract modified accordingly; failure to agree to any such adjustment shall be a dispute concerning a question of fact within the meaning of the clause of this contract entitled "Disputes."

(f) The rights and remedies of the Government provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

(g) As used in paragraph (d)(1) of this clause, the term "subcontractors or suppliers" means subcontractors or suppliers at any tier. (DAR 7-602.5)

6. DISPUTES (1980 JUN)

(a) This contract is subject to the Contract Disputes Act of 1978 (P.L. 95-563).

(b) Except as provided in the Act, all disputes arising under or relating to this contract shall be resolved in accordance with this clause.

(c) (i) As used herein, "claim" means a written demand or assertion by one of the parties seeking, as a matter of right, the payment of money, adjustment or interpretation of contract terms, or other relief, arising under or relating to this contract. However, a written demand by the contractor seeking the payment of money in excess of $50,000 is not a claim until certified in accordance with (d) below.

(ii) A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim for the purposes of the Act. However, where such submission is subsequently disputed either as to liability or amount or not acted upon in a reasonable time, it may be converted to a claim pursuant to the Act by complying with the submission and certification requirements of this clause.

(iii) A claim by the contractor shall be made in writing and submitted to the contracting officer for decision. A claim by the Government against the contractor shall be subject to a decision by the Contracting Officer.

(d) For contractor claims of more than $50,000, the contractor shall submit with the claim a certification that the claim is made in good faith; the supporting data are accurate and complete to the best of the contractor's knowledge and belief; and the amount requested accurately reflects the contract adjustment for which the contractor believes the Government is liable. The certification shall be executed by the contractor if an individual. When the contractor is not an individual, the certification shall be executed by a senior company official in charge at the contractor's plant or location involved, or by an officer or general partner of the contractor having over-all responsibility for the conduct of the contractor's affairs.

(e) For contractor claims of $50,000 or less, the Contracting Officer must, if requested in writing by the contractor, render a decision within 60 days of the request. For contractor certified claims in excess of $50,000 the Contracting Officer must decide the claim within 60 days or notify the contractor of the date when the decision will be made.

(f) The Contracting Officer's decision shall be final unless the contractor appeals or files a suit as provided in the Act.

(g) Interest on the amount found due on a contractor claim shall be paid from the date the contracting officer receives the claim, or from the date payment otherwise would be due, if such date is later, until the date of payment.

(h) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal or action arising under the contract, and comply with any decision of the Contracting Officer. (DAR 7-103.12(a))

7. PAYMENTS TO CONTRACTOR (1979 MAR)

(a) The Government will pay the contract price as hereinafter provided.

(b) The Government will make progress payments monthly as the work proceeds, or at more frequent intervals as determined by the Contracting Officer, on estimates approved by the Contracting Officer. If requested by the Contracting Officer, the Contractor shall furnish a breakdown of the total contract price showing the amount included therein for each principal category of the work, in such detail as requested, to provide a basis for determining progress payments. In the preparation of estimates the Contracting Officer, at his discretion, may authorize material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the Contractor at locations other than the site may also be taken into consideration (1) if such consideration is specifically authorized by the contract and (2) if the Contractor furnishes satisfactory evidence that he has acquired title to such material and that it will be utilized on the work covered by this contract.

(c) In making such progress payments, there shall be retained 10 percent of the estimated amount until final completion and acceptance of the contract work. However, if the Contracting Officer finds that satisfactory progress was achieved during any period for which a progress payment is to be made, he may authorize such payment to be made in full without retention of a percentage. Also, whenever the work is substantially complete, the Contracting Officer shall retain an amount he considers adequate for the protection of the Government, and, at his discretion, may release to the Contractor all or a portion of any excess amount. Furthermore, on completion and acceptance of each separate building, public work, or other division of the contract, on which the price is stated separately in the contract, payment may be made therefor without retention of a percentage.

(d) All material and work covered by progress payments made shall thereupon become the sole property of the Government, but this provision shall not be construed as relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work, or as waiving the right of the Government to require the fulfillment of all of the terms of the contract.

(e) The Contractor shall, upon request, be reimbursed for the entire amount of premiums paid for performance and payment bonds (including coinsurance and reinsurance agreements, when applicable) after furnishing evidence of full payment to the surety.

(f) Upon completion and acceptance of all work, the amount due the Contractor under this contract shall be paid upon the presentation of a properly executed voucher and after the Contractor shall have furnished the Government with a release of all claims against the Government arising by virtue of this contract, other than claims in stated amounts as may be specifically excepted by the Contractor from the operation of the release. If the Contractor's claim to amounts payable under the contract has been assigned under the Assignment of Claims Act of 1940, as amended (31 U.S.C. 203, 41 U.S.C. 15), a release may also be required of the assignee. (DAR 7-602.7)

8. ASSIGNMENT OF CLAIMS (1976 OCT)

(a) Pursuant to the provisions of the Assignment of Claims Act of 1940, as amended (31 U.S.C. 203, 41 U.S.C. 15), if this contract provides for

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payments aggregating $1,000 or more, claims for moneys due or to become due the Contractor from the Government under this contract may be assigned to a bank, trust company, or other financing institution, including any Federal lending agency, and may thereafter be further assigned and reassigned to any such institution. Any such assignment or reassignment shall cover all amounts payable under this contract and not already paid, and shall not be made to more than one party, except that any such assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in such financing. Unless otherwise provided in this contract, payments to assignee of any moneys due or to become due under this contract shall not, to the extent provided in said Act, as amended, be subject to reduction or setoff. (The preceding sentence applies only if this contract is made in time of war or national emergency as defined in said Act and is with the Department of Defense, the General Services Administration, the Energy Research and Development Administration, the National Aeronautics and Space Administration, the Federal Aviation Administration, or any other department or agency of the United States designated by the President pursuant to Clause 4 of the provision of section 1 of the Assignment of Claims Act of 1940, as amended by the Act of May 15, 1951, 65 Stat. 41.)

(b) In no event shall copies of this contract or of any plans, specifications, or other similar documents relating to work under this contract, if marked "Top Secret," "Secret," or "Confidential," be furnished to any assignee of any claim arising under this contract or to any other person not entitled to receive the same. However, a copy of any part or all of this contract so marked may be furnished, or any information contained therein may be disclosed, to such assignee upon the prior written authorization of the Contracting Officer. (DAR 7-602.8)

9. MATERIAL AND WORKMANSHIP (1964 JUN)

(a) Unless otherwise specifically provided in this contract, all equipment, material, and articles incorporated in the work covered by this contract are to be new and of the most suitable grade for the purpose intended. Unless otherwise specifically provided in this contract, reference to any equipment, material, article, or patented process, by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition, and the Contractor may, at his option, use any equipment, material, article, or process which, in the judgment of the Contracting Officer, is equal to that named. The Contractor shall furnish to the Contracting Officer for his approval the name of the manufacturer, the model number, and other identifying data and information respecting the performance, capacity, nature, and rating of the machinery and mechanical and other equipment which the Contractor contemplates incorporating in the work. When required by this contract or when called for by the Contracting Officer, the Contractor shall furnish the Contracting Officer for approval full information concerning the material or articles which he contemplates incorporating in the work. When so directed, samples shall be submitted for approval at the Contractor's expense, with all shipping charges prepaid. Machinery, equipment, material, and articles installed or used without required approval shall be at the risk of subsequent rejection.

(b) All work under this contract shall be performed in a skillful and workmanlike manner. The Contracting Officer may, in writing, require the Contractor to remove from the work any employee the Contracting Officer deems incompetent, careless, or otherwise objectionable. (DAR 7-602.9)

10. INSPECTION AND ACCEPTANCE (1976 OCT)

(a) All work (which term includes but is not restricted to materials, workmanship, and manufacture and fabrication of components) shall be subject to inspection and test by the Government at all reasonable times and at all places prior to acceptance. Any such inspection and test is for the sole benefit of the Government and shall not relieve the Contractor of the responsibility of providing quality control measures to assure that the work strictly complies with the contract requirements. No inspection or test by the Government shall be construed as constituting or implying acceptance. Inspection or test shall not relieve the Contractor of responsibility for damage to or loss of the material prior to acceptance, nor in any way affect the continuing rights of the Government after acceptance of the completed work under the terms of paragraph (f) of this clause, except as hereinabove provided.

(b) The Contractor shall, without charge, replace any material or correct any workmanship found by the Government not to conform to the contract requirements, unless in the public interest the Government consents to accept such material or workmanship with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.

(c) If the Contractor does not promptly replace rejected material or correct rejected workmanship, the Government (1) may, by contract or otherwise, replace such material or correct such workmanship and charge the cost thereof to the Contractor, or (2) may terminate the Contractor's right to proceed in accordance with the clause of this contract entitled "Termination for Default - Damages for Delay - Time Extensions."

(d) The Contractor shall furnish promptly, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspection and test as may be required by the Contracting Officer. All inspection and test by the Government shall be performed in such manner as not unnecessarily to delay the work. Special, full size, and performance tests shall be performed as described in this contract. The Government reserves the right to charge to the Contractor any additional cost of inspection or test when material or workmanship is not ready at the time specified by the Contractor for inspection or test or when reinspection or retest is necessitated by prior rejection.

(e) Should it be considered necessary or advisable by the Government at any time before acceptance of the entire work to make an examination of work already completed, by removing or tearing out same, the Contractor shall, on request, promptly furnish all necessary facilities, labor and material. If such work is found to be defective or nonconforming in any material respect, due to the fault of the Contractor or his subcontractors, he shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, an equitable adjustment shall be made in the contract price to compensate the Contractor for the additional services involved in such examination and reconstruction and, if completion of the work has been delayed thereby, he shall, in addition, be granted a suitable extension of time.

(f) Unless otherwise provided in this contract, acceptance by the Government shall be made as promptly as practicable after completion and inspection of all work required by this contract, or that portion of the work that the Contracting Officer determines can be accepted separately. Acceptance shall be final and conclusive except as regards latent defects, fraud, or such gross mistakes as may amount to fraud or as regards the Government's rights under any warranty or guarantee. (DAR 7-602.11)

11. SUPERINTENDENCE BY CONTRACTOR (1976 OCT)

The Contractor, at all times during performance and until the work is completed and accepted, shall give his personal superintendence to the work or have on the work a competent superintendent, satisfactory to the Contracting Officer and with authority to act for the Contractor. (DAR 7-602.12)

12. PERMITS AND RESPONSIBILITIES (1964 JUN)

The Contractor shall, without additional expense to the Government, be responsible for obtaining any necessary licenses and permits, and for complying with any applicable Federal, State, and municipal laws, codes, and regulations, in connection with the prosecution of the work. He shall be similarly responsible for all damages to persons or property that occur as a result of his fault or negligence. He shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others. He shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire contruction work, except for any completed unit of construction thereof which theretofore may have been accepted. (DAR 7-602.13)

13. CONDITIONS AFFECTING THE WORK (1964 JUN)

The Contractor shall be responsible for having taken steps reasonably necessary to ascertain the nature and location of the work, and the general and local conditions which can affect the work or the cost thereof. Any failure by the Contractor to do so will not relieve him from responsibility for successfully performing the work without additional expense to the Government. The Government assumes no responsibility for any understanding or representations concerning conditions made by any of its officers or agents prior to the execution of this contract, unless such understanding or representations by the Government are expressly stated in the contract. (DAR 7-602.14)

14. OTHER CONTRACTS (1964 JUN)

The Government may undertake or award other contracts for additional work, and the Contractor shall fully cooperate with such other contractors and Government employees and carefully fit his own work to such additional work as may be directed by the Contracting Officer. The Contractor shall not commit or permit any act which will interfere with the performance of work by any other contractor or by Government employees. (DAR 7-602.15)

15. SHOP DRAWINGS (1976 OCT)

(a) The term, "shop drawings", includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data; and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the contract.

(b) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with contract requirements and shall indicate his approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate his approval or disapproval of the shop drawings and if not approved as submitted shall indicate his reasons therefor. Any work done prior to such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this

contract, except with respect to variations described and approved in accordance with (c) below.

(c) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Contracting Officer approves any such variation(s), he shall issue an appropriate contract modification, except that, if the variation is minor and does not involve a change in price or in time of performance, a modification need not be issued.

(d) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated herein) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated herein) of all shop drawings will be retained by the Contracting Officer and one set will be returned to the Contractor. (DAR 7-602.54(a))

16. USE AND POSSESSION PRIOR TO COMPLETION (1976 OCT)

The Government shall have the right to take possession of or use any completed or partially completed part of the work. Prior to such possession or use, the Contracting Officer shall furnish the Contractor an itemized list of work remaining to be performed or corrected on such portions of the project as are to be possessed or used by the Government, provided that failure to list any item of work shall not relieve the Contractor of responsibility for compliance with the terms of the contract. Such possession or use shall not be deemed an acceptance of any work under the contract. While the Government has such possession or use, the Contractor, notwithstanding the provisions of the clause of this contract entitled "Permits and Responsibilities," shall be relieved of the responsibility for the loss or damage to the work resulting from the Government's possession or use. If such prior possession or use by the Government delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment in the contract price or the time of completion will be made and the contract shall be modified in writing accordingly. (DAR 7-602.39)

17. SUSPENSION OF WORK (1968 FEB)

(a) The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as he may determine to be appropriate for the convenience of the Government.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted by an act of the Contracting Officer in the administration of this contract, or by his failure to act within the time specified in this contract (or if no time is specified, within a reasonable time), an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent (1) that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor or (2) for which an equitable adjustment is provided for or excluded under any other provision of this contract.

(c) No claim under this clause shall be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order),

and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of such suspension, delay, or interruption, but not later than the date of final payment under the contract. (DAR 7-602.46)

18. TERMINATION FOR CONVENIENCE OF THE GOVERNMENT-CONSTRUCTION (1974 APR)

(a) The performance of work under this contract may be terminated by the Government in accordance with this clause in whole, or from time to time in part, whenever the Contracting Officer shall determine that such termination is in the best interest of the Government. Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which performance of work under the contract is terminated, and the date upon which such termination becomes effective.

(b) After receipt of a Notice of Termination, and except as otherwise directed by the Contracting Officer, the Contractor shall:

(i) stop work under the contract on the date and to the extent specified in the Notice of Termination;

(ii) place no further orders or subcontracts for materials, services or facilities, except as may be necessary for completion of such portion of the work under the contract as is not terminated;

(iii) terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the Notice of Termination;

(iv) assign to the Government, in the manner, at the times, and to the extent directed by the Contracting Officer, all of the right, title, and interest of the Contractor under the orders and subcontracts so terminated, in which case the Government shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;

(v) settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, with the approval or ratification of the Contracting Officer, to the extent he may require, which approval or ratification shall be final for all the purposes of this clause;

(vi) transfer title and deliver to the Government, in the manner, at the times, and to the extent, if any, directed by the Contracting Officer, (A) the fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced as a part of, or acquired in connection with the performance of, the work terminated by the Notice of Termination, and (B) the completed or partially completed plans, drawings, information, and other property which, if the contract had been completed, would have been required to be furnished to the Government;

(vii) use his best efforts to sell, in the manner, at the times, to the extent, and at the price or prices directed or authorized by the Contracting Officer, any property of the types referred to in (vi) above; provided however, that the Contractor (A) shall not be required to extend credit to any purchaser, and (B) may acquire any such property under the conditions prescribed by and at a price or prices approved by the Contracting Officer; and provided further, that the proceeds of any such transfer or disposition shall be applied in

reduction of any payments to be made by the Government to the Contractor under this contract or shall otherwise be credited to the price or cost of the work covered by this contract or paid in such other manner as the Contracting Officer may direct;

(viii) complete performance of such part of the work as shall not have been terminated by the Notice of Termination; and

(ix) take such action as may be necessary, or as the Contracting Officer may direct, for the protection and preservation of the property related to this contract which is in the possession of the Contractor and in which the Government has or may acquire an interest.

At any time after expiration of the plant clearance period, as defined in Section VIII, Defense Acquisition Regulation, as it may be amended from time to time, the Contractor may submit to the Contracting Officer a list, certified as to quantity and quality, of any or all items of termination inventory not previously disposed of, exclusive of items the disposition of which has been directed or authorized by the Contracting Officer, and may request the Government to remove such items or enter into a storage agreement covering them. Not later than fifteen (15) days thereafter, the Government will accept title to such items and remove them or enter into a storage agreement covering the same; provided, that the list submitted shall be subject to verification by the Contracting Officer upon removal of the items, or if the items are stored, within forty-five (45) days from the date of submission of the list, and any necessary adjustment to correct the list as submitted shall be made prior to final settlement.

(c) After receipt of a Notice of Termination, the Contractor shall submit to the Contracting Officer his termination claim, in the form and with certification prescribed by the Contracting Officer. Such claim shall be submitted promptly but in no event later than one year from the effective date of termination, unless one or more extensions in writing are granted by the Contracting Officer, upon request of the Contractor made in writing within such one year period or authorized extension thereof. However, if the Contracting Officer determines that the facts justify such action, he may receive and act upon any such termination claim at any time after such one year period or any extension thereof. Upon failure of the Contractor to submit his termination claim within the time allowed, the Contracting Officer may determine, on the basis of information available to him, the amount, if any, due to the Contractor by reason of the termination and shall thereupon pay to the Contractor the amount so determined.

(d) Subject to the provisions of paragraph (c), the Contractor and the Contracting Officer may agree upon the whole or any part of the amount or amounts to be paid to the Contractor by reason of the total or partial termination of work pursuant to this clause, which amount or amounts may include a reasonable allowance for profit on work done; provided, that such agreed amount or amounts, exclusive of settlement costs, shall not exceed the total contract price as reduced by the amount of payments otherwise made and as further reduced by the contract price of work not terminated. The contract shall be amended accordingly, and the Contractor shall be paid the agreed amount. Nothing in paragraph (e) of this clause, prescribing the amount to be paid to the Contractor in the event of failure of the Contractor and the Contracting Officer to agree upon the whole amount to be paid to the Contractor by reason of the termination of work pursuant to this clause, shall be deemed to limit, restrict, or otherwise determine or affect the amount or amounts which may be agreed upon to be paid to the Contractor pursuant to this paragraph (d).

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(e) In the event of the failure of the Contractor and the Contracting Officer to agree, as provided in paragraph (d), upon the whole amount to be paid to the Contractor by reason of the termination of work pursuant to this clause, the Contracting Officer shall pay to the Contractor the amounts determined by the Contracting Officer as follows, but without duplication of any amounts agreed upon in accordance with paragraph (d):

(i) with respect to all contract work performed prior to the effective date of the Notice of Termination, the total (without duplication of any items) of:

(A) the cost of such work;

(B) the cost of settling and paying claims arising out of the termination of work under subcontracts or orders as provided in paragraph (b)(v) above, exclusive of the amounts paid or payable on account of supplies or materials delivered or services furnished by the subcontractor prior to the effective date of the Notice of Termination of Work under this contract, which amounts shall be included in the cost on account of which payment is made under (A) above; and

(C) a sum, as profit on (A) above, determined by the Contracting Officer pursuant to 8-303 of the Defense Acquisition Regulation, in effect as of the date of execution of this contract, to be fair and reasonable; provided, however, that if it appears that the Contractor would have sustained a loss on the entire contract had it been completed, no profit shall be included or allowed under this subdivision (C) and an appropriate adjustment shall be made reducing the amount of the settlement to reflect the indicated rate of loss; and

(ii) the reasonable cost of the preservation and protection of property incurred pursuant to paragraph (b)(ix); and any other reasonable cost incidental to termination of work under this contract, including expense incidental to the determination of the amount due to the Contractor as the result of the termination of work under this contract. The total sum to be paid to the Contractor under (i) above shall not exceed the total contract price as reduced by the amount of payments otherwise made and as further reduced by the contract price of work not terminated. Except for normal spoilage, and except to the extent that the Government shall have otherwise expressly assumed the risk of loss, there shall be excluded from the amounts payable to the Contractor under (i) above, the fair value, as determined by the Contracting Officer, of property which is destroyed, lost, stolen, or damaged so as to become undeliverable to the Government, or to a buyer pursuant to paragraph (b)(vii).

(f) Costs claimed, agreed to, or determined pursuant to (c), (d), (e), and (i) hereof shall be in accordance with Section XV of the Defense Acquisition Regulation as in effect on the date of this contract.

(g) The Contractor shall have the right of appeal, under the clause of this contract entitled "Disputes", from any determination made by the Contracting Officer under paragraph (c), (e), or (i) hereof, except that if the Contractor has failed to submit his claim within the time provided in paragraph (c) or (i) hereof, and has failed to request extension of such time,

he shall have no such right of appeal. In any case where the Contracting Officer has made a determination of the amount due under paragraph (c), (e) or (i) hereof, the Government shall pay to the Contractor the following: (i) if there is no right of appeal hereunder or if no timely appeal has been taken, the amount so determined by the Contracting Officer, or (ii) if an appeal has been taken, the amount finally determined on such appeal.

(h) In arriving at the amount due the Contractor under this clause there shall be deducted (i) all unliquidated advance or other payments on account theretofore made to the Contractor, applicable to the terminated portion of this contract, (ii) any claim which the Government may have against the Contractor in connection with this contract, and (iii) the agreed price for, or the proceeds of sale of, any materials, supplies, or other things acquired by the Contractor or sold, pursuant to the provisions of this clause, and not otherwise recovered by or credited to the Government.

(i) If the termination hereunder be partial, the Contractor may file with the Contracting Officer a claim for an equitable adjustment of the price or prices specified in the contract relating to the continued portion of the contract (the portion not terminated by the Notice of Termination), and such equitable adjustment as may be agreed upon shall be made in such price or prices. Any claim by the Contractor for an equitable adjustment under this clause must be asserted within ninety (90) days from the effective date of the termination notice, unless an extension is granted in writing by the Contracting Officer.

(j) The Government may from time to time, under such terms and conditions as it may prescribe, make partial payments and payments on account against costs incurred by the Contractor in connection with the terminated portion of this contract whenever in the opinion of the Contracting Officer the aggregate of such payments shall be within the amount to which the Contractor will be entitled hereunder. If the total of such payments is in excess of the amount finally agreed or determined to be due under this clause, such excess shall be payable by the Contractor to the Government upon demand, together with interest computed at the rate established by the Secretary of the Treasury pursuant to Public Law 92-41, 85 STAT 97 for the Renegotiation Board, for the period from the date such excess payment is received by the Contractor to the date on which such excess is repaid to the Government; provided, however, that no interest shall be charged with respect to any such excess payment attributable to a reduction in the Contractor's claim by reason of retention or other disposition of termination inventory until ten days after the date of such retention or disposition, or such later date as determined by the Contracting Officer by reason of the circumstances.

(k) Unless otherwise provided for in this contract, or by applicable statute, the Contractor shall - from the effective date of termination until the expiration of three years after final settlement under this contract - preserve and make available to the Government at all reasonable times at the office of the Contractor but without direct charge to the Government, all his books, records, documents and other evidence bearing on the costs and expenses of the Contractor under this contract and relating to the work terminated hereunder, or, to the extent approved by the Contracting Officer, photographs, microphotographs, or other authentic reproductions thereof. (DAR 7-602.29(a))

19. PRICING OF ADJUSTMENTS (1970 JUL)

When costs are a factor in any determination of a contract price adjustment pursuant to the "Changes" clause or any other provision of this contract, such costs shall be in accordance with Section XV of the Defense Acquisition Regulation as in effect on the date of this contract. (DAR 7-103.26)

20. PATENT INDEMNITY (1964 JUN)

Except as otherwise provided, the Contractor agrees to indemnify the Government and its officers, agents, and employees against liability, including costs and expenses, for infringement upon any Letters Patent of the United States (except Letters Patent issued upon an application which is now or may hereafter be, for reasons of national security, ordered by the Government to be kept secret or otherwise withheld from issue) arising out of the performance of this contract or out of the use or disposal by or for the account of the Government of supplies furnished or construction work performed hereunder. (DAR 7-602.16(a))

21. ADDITIONAL BOND SECURITY (1976 OCT)

If any surety upon any bond furnished in connection with this contract becomes unacceptable to the Government, or if any such surety fails to furnish reports as to his financial condition from time to time as requested by the Government, or if the contract price is increased to such an extent that the penal sum of any bond becomes inadequate in the opinion of the Contracting Officer, the Contractor shall promptly furnish such additional security as may be required from time to time to protect the interests of the Government and of persons supplying labor or materials in the prosecution of the work contemplated by this contract. (DAR 7-602.17)

22. EXAMINATION OF RECORDS BY COMPTROLLER GENERAL (1975 JUN)

(a) This clause is applicable if the amount of this contract exceeds $10,000 and was entered into by means of negotiation, including small business restricted advertising but is not applicable if this contract was entered into by means of formal advertising.

(b) The Contractor agrees that the Comptroller General of the United States or any of his duly authorized representatives shall, until the expiration of three years after final payment under this contract or such lesser time specified in either Appendix M of the Defense Acquisition Regulation or the Federal Procurement Regulations Part 1-20, as appropriate, have access to and the right to examine any directly pertinent books, documents, papers, and records of the Contractor involving transactions related to this contract.

(c) The Contractor further agrees to include in all his subcontracts hereunder a provision to the effect that the subcontractor agrees that the Comptroller General of the United States or any of his duly authorized representatives shall, until the expiration of three years after final payment under the subcontract or such lesser time specified in either Appendix M of the Defense Acquisition Regulation or the Federal Procurement Regulations Part 1-20, as appropriate, have access to and the right to examine any directly pertinent books, documents, papers, and records of such subcontractor, involving transactions related to the subcontract. The term "subcontract" as used in this clause excludes (i) purchase orders not exceeding $10,000 and (ii) subcontracts or purchase orders for public utility services at rates established for uniform applicability to the general public.

(d) The periods of access and examination described in (b) and (c) above for records which relate to (i) appeals under the "Disputes" clause of this contract, (ii) litigation or the settlement of claims arising out of the performance of this contract, or (iii) costs and expenses of this contract as to which exception has been taken by the Comptroller General or any of his duly authorized representatives, shall continue until such appeals, litigation, claims or exceptions have been disposed of. (DAR 7-104.15)

23. BUY AMERICAN ACT (1966 OCT)

(a) Agreement. In accordance with the Buy American Act (41 U.S.C. 10a-10d), the Contractor agrees that only domestic construction material will be used (by the Contractor, subcontractors, materialmen, and suppliers) in the performance of this contract, except for nondomestic construction material listed in the "Nondomestic Construction Materials" clause, if any, of this contract.

(b) Domestic construction material. "Construction material" means any article, material, or supply brought to the construction site for incorporation in the building or work. An unmanufactured construction material is a "domestic construction material" if it has been mined or produced in the United States. A manufactured construction material is a "domestic construction material" if it has been manufactured in the United States and if the cost of its components which have been mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. "Component" means any article, material, or supply directly incorporated in a construction material.

(c) Domestic component. A component shall be considered to have been "mined, produced, or manufactured in the United States" (regardless of its source in fact) if the article, material, or supply in which it is incorporated was manufactured in the United States and the component is of a class or kind determined by the Government to be not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities and of a satisfactory quality. (DAR 7-602.20)

24. EQUAL OPPORTUNITY (1978 SEP)

(If, during any twelve (12) month period (including the 12 months preceding the award of this contract), the Contractor has been or is awarded Federal contracts and/or subcontracts which have an aggregate value in excess of $10,000, the Contractor shall comply with (1) through (7) below. Upon request, the Contractor shall provide information necessary to determine the applicability of this clause.)

During the performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include but not be limited to the following: Employment, upgrading, demotion, or transfer, recruitment or recruitment advertising: layoff or termination, rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this Equal Opportunity clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(3) The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding a notice to be provided by the agency Contracting Officer, advising the labor union or workers' representative of the contractor's commitments under this Equal Opportunity clause and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, and by the rules, regulations, and orders of the Secretary of Labor or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations and orders.

(6) In the event of the Contractor's noncompliance with the Equal Opportunity clause of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated or suspended in whole or in part, and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Contractor will include the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States. (DAR 7-103.18(a))

25. COVENANT AGAINST CONTINGENT FEES (1958 JAN)

The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this warranty the Government shall have the right to annul this contract without liability or in its discretion, to deduct from the contract price or consideration, or otherwise recover, the full amount of such commissions, percentage, brokerage or contingent fee. (DAR 7-103.20)

26. OFFICIALS NOT TO BENEFIT (1949 JUL)

No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this contract, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit. (DAR 7-103.19)

27. CONVICT LABOR (1975 OCT)

In connection with the performance of work under this contract, the Contractor agrees not to employ any person undergoing sentence of imprisonment

except as provided by Public Law 89-176, September 10, 1965 (18 U.S.C. 4082(c)(2)) and Executive Order 11755, December 29, 1973. (DAR 7-104.17)

28. UTILIZATION OF SMALL BUSINESS AND SMALL DISADVANTAGED BUSINESS CONCERNS (1980 AUG)

(a) It is the policy of the United States that small business and small business concerns owned and controlled by socially and economically disadvantaged individuals shall have the maximum practicable opportunity to participate in the performance of contracts let by any Federal agency.

(b) The Contractor hereby agrees to carry out this policy in the awarding of subcontracts to the fullest extent consistent with the efficient performance of this contract. The term "subcontract" means any agreement (other than one involving an employer-employee relationship) to be entered into by a Federal Government prime contractor or subcontractor calling for supplies or services required for the performance of the original contract or subcontract. The Contractor further agrees to cooperate in any studies or surveys as may be conducted by the United States Small Business Administration or the awarding agency of the United States as may be necessary to determine the extent of the Contractor's compliance with this clause.

(c) As used in this contract, the term "small business concern" shall mean a small business as defined pursuant to Section 3 of the Small Business Act and relevant regulations promulgated pursuant thereto. The term "small business concern owned and controlled by socially and economically disadvantaged individuals," hereafter referred to as disadvantaged business, shall mean a small business concern -

(1) which is at least 51 per centum owned by one or more socially and economically disadvantaged individuals; or, in the case of any publicly owned business, at least 51 per centum of the stock of which is owned by one or more socially and economically disadvantaged individuals; and

(2) whose management and daily business operations are controlled by one or more of such individuals. The Contractor shall presume that socially and economically disadvantaged individuals include Black Americans, Hispanic Americans, Native Americans (i.e., American Indians, Eskimos, Aleuts and Native Hawaiians), Asian-Pacific Americans (i.e., U.S. citizens whose origins are from Japan, China, the Philippines, Vietnam, Korea, Samoa, Guam, the U.S. Trust Territories of the Pacific, Northern Marianas, Laos, Cambodia, and Taiwan, and other minorities, or any individuals found to be disadvantaged by the Administration pursuant to Section 8(a) of the Small Business Act.

(d) Contractors acting in good faith may rely on written representations by their subcontractors regarding their status as either a small business concern or a small business concern owned and controlled by socially and economically disadvantaged individuals. (DAR 7-104.14(a))

29. FEDERAL, STATE, AND LOCAL TAXES (1971 NOV)

(a) Except as may be otherwise provided in this contract, the contract price includes all applicable Federal, State, and local taxes and duties.

(b) Nevertheless, with respect to any Federal excise tax or duty on the transactions or property covered by this contract, if a statute, court decision, written ruling, or regulation takes effect after the contract date, and -

(1) results in the Contractor being required to pay or bear the burden of any such Federal excise tax or duty or increase in the rate thereof which would not otherwise have been payable on such transactions or property, the contract price shall be increased by the amount of such tax or duty or rate increase, provided the Contractor warrants in writing that no amount for

such newly imposed Federal excise tax or duty or rate increase was included in the contract price as a contingency reserve or otherwise; or

(2) results in the Contractor not being required to pay or bear the burden of, or in his obtaining a refund or drawback of, any such Federal excise tax or duty which would otherwise have been payable on such transactions or property or which was the basis of an increase in the contract price, the contract price shall be decreased by the amount of the relief, refund, or drawback, or that amount shall be paid to the Government, as directed by the Contracting Officer. The contract price shall be similarly decreased if the Contractor, through his fault or negligence or his failure to follow instructions of the Contracting Officer, is required to pay or bear the burden of, or does not obtain a refund or drawback of, any such Federal excise tax or duty.

(c) Paragraph (b) above shall not be applicable to social security taxes or to any other employment tax.

(d) No adjustment of less than $100 shall be made in the contract price pursuant to paragraph (b) above.

(e) As used in paragraph (b) above, the term "contract date" means the date set for bid opening, or if this is a negotiated contract, the contract date. As to additional supplies or services procured by modification to this contract, the term "contract date" means the date of such modification.

(f) Unless there does not exist any reasonable basis to sustain an exemption, the Government upon the request of the Contractor shall, without further liability, furnish evidence appropriate to establish exemption from any Federal, State, or local tax; provided that, evidence appropriate to establish exemption from any Federal excise tax or duty which may give rise to either an increase or decrease in the contract price will be furnished only at the discretion of the Government.

(g) The Contractor shall promptly notify the Contracting Officer of matters which will result in either an increase or decrease in the contract price and shall take action with respect thereto as directed by the Contracting Officer. (DAR 7-103.10(a))

30. DAVIS-BACON ACT (40 U.S.C. 276a to a-7) (1977 DEC)

(If this contract is with a State or political subdivision thereof, the Contractor agrees to comply with the requirements of the Contract Work Hours Standards Acts and to insert this clause in all subcontracts hereunder with private persons or firms)

(a) All mechanics and laborers, including apprentices and trainees, employed or working directly upon the site of the work shall be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Copeland Regulations (29 CFR, Part 3)), the full amounts due at time of payment computed at wage rates not less than the aggregate of the basic hourly rates and the rates of payments, contributions, or costs for any fringe benefits contained in the wage determination decision of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor or subcontractor and such laborers and mechanics. A copy of such wage determination decision shall be kept posted by the Contractor at the site of the work in a prominent place where it can be easily seen by the workers. The term mechanics and laborers shall be deemed to include apprentices and trainees not covered by an approved program as provided by the apprentice and trainee clause of the contract.

(b) The Contractor may discharge his obligation under this clause to workers in any classification for which the wage determination decision contains:

(1) Only a basic hourly rate of pay, by making payment at not less than such basic hourly rate, except as otherwise provided in the Copeland Regulations (29 CFR, Part 3); or

(2) Both a basic hourly rate of pay and fringe benefits payments, by making payment in cash, by irrevocably making contributions pursuant to a fund, plan, or program for, and or by assuming an enforceable commitment to bear the cost of, bona fide fringe benefits contemplated by the Davis-Bacon Act, or by any combination thereof. Contributions made, or costs assumed, on other than a weekly basis shall be considered as having been constructively made or assumed during a weekly period to the extent that they apply to such period. Where a fringe benefit is expressed in a wage determination in any manner other than as an hourly rate and the Contractor pays a cash equivalent or provides an alternative fringe benefit, he shall furnish information with his payrolls showing how he determined that the cost incurred to make the cash payment or to provide the alternative fringe benefit is equal to the cost of the wage determination fringe benefit. In any case where the Contractor provides a fringe benefit different from any contained in the wage determination, he shall similarly show how he arrived at the hourly rate shown therefor. In the event of disagreement between or among the interested parties as to an equivalent of any fringe benefit, the Contracting Officer shall submit the question, together with his recommendation, to the Secretary of Labor for final determination.

(c) The assumption of an enforceable commitment to bear the cost of fringe benefits, or the provision of any fringe benefits not expressly listed in section 1(b)(2) of the Davis-Bacon Act or in the wage determination decision forming a part of the contract, may be considered as payment of wages only with the approval of the Secretary of Labor pursuant to a written request by the Contractor. The Secretary of Labor may require the Contractor to set aside assets, in a separate account, to meet his obligations under any unfunded plan or program.

(d) The Contracting Officer shall require that any class of laborers or mechanics, including apprentices and trainees, which is not listed in the wage determination decision and which is to be employed under the contract shall be classified or reclassified conformably to the wage determination decision, and shall report the action taken to the Secretary of Labor. If the interested parties cannot agree on the proper classification or reclassification of a particular class of laborers or mechanics, including apprentices and trainees, to be used, the Contracting Officer shall submit the question, together with his recommendation, to the Secretary of Labor for final determination.

(e) In the event it is found by the Contracting Officer that any laborer or mechanic, including all apprentices and trainees, employed by the Contractor or any subcontractor directly on the site of the work covered by this contract has been or is being paid at a rate of wages less than the rate of wages required by paragraph (a) of this clause, or by the "Apprentices and Trainees" clause of this contract, the Contracting Officer may (i) by written notice to the Government Prime Contractor terminate his right to proceed with the work, or such part of the work as to which there has been a failure to pay said required wages, and (ii) prosecute the work to completion by contract or otherwise, whereupon such Contractor and his sureties shall be liable to the Government for any excess costs occasioned the Government thereby.

(f) Paragraphs (a) through (e) of the clause shall apply to this contract to the extent that it is (i) a prime contract with the Government subject to

the Davis-Bacon Act or (ii) a subcontract also subject to the Davis-Bacon Act under such prime contract. (DAR 7-602.23(a)(i))

31. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT - OVERTIME COMPENSATION (40 U.S.C. 327-333) (1977 DEC)

(If this contract is with a State or political subdivision thereof, the Contractor agrees to comply with the requirements of the Contract Work Hours Standards Act and to insert this clause in all subcontracts hereunder with private persons or firms)

This contract is subject to the Contract Work Hours and Safety Standards Act and to the applicable rules, regulations, and interpretations of the Secretary of Labor.

(a) The Contractor shall not require or permit any laborer or mechanic, including apprentices, trainees, watchmen, and guards in any workweek in which he is employed on any work under this contract to work in excess of eight (8) hours in any calendar day or in excess of forty (40) hours in such workweek on work subject to the provisions of the Contract Work Hours and Safety Standards Act unless such laborer or mechanic, including apprentices, trainees, watchmen, and guards, receives compensation at a rate not less than one and one-half times his basic rate of pay for all such hours worked in excess of eight (8) hours in any calendar day or in excess of forty (40) hours in such workweek, whichever is the greater number of overtime hours. The "basic rate of pay," as used in this clause, shall be the amount paid per hour, exclusive of the Contractor's contribution or cost for fringe benefits and any cash payment made in lieu of providing fringe benefits, or the basic hourly rate contained in the wage determination, whichever is greater.

(b) In the event of any violation of the provisions of paragraph (a), the Contractor shall be liable to any affected employee for any amounts due, and to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including an apprentice, trainee, watchman, or guard, employed in violation of the provisions of paragraph (a) in the sum of $10 for each calendar day on which such employee was required or permitted to be employed on such work in excess of eight (8) hours or in excess of the standard workweek of forty (40) hours without payment of the overtime wages required by paragraph (a). (DAR 7-602.23(a)(ii))

32. APPRENTICES AND TRAINEES (1977 DEC)

(If this contract is with a State or political subdivision thereof, the Contractor agrees to comply with the requirements of the Contract Work Hours Standards Act and to insert this clause in all subcontracts hereunder with private persons or firms)

(a) Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a state apprenticeship agency recognized by the Bureau, or if a person is employed in his first ninety (90) days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a state apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen in any craft classification employed on this contract shall not be greater than the ratio permitted to the Contractor as to his entire work force under the register

program. Any employee listed on a payroll at an apprentice wage rate, who is not a trainee as defined in paragraph (b) of this clause or is not registered or otherwise employed as stated above, shall be paid the wage rate determined by the Secretary of Labor for the classification of work he actually performed. The Contractor or subcontractor shall furnish to the Contracting Officer written evidence of the registration of his program and apprentices as well as the appropriate ratios and wage rates (expressed in percentages of the journeyman hourly rates), for the area of construction prior to using apprentices on the contract work. The wage rate paid apprentices shall be not less than the appropriate percentage of the journeyman's rate contained in the applicable wage determination.

(b) Trainees will be permitted to work at less than the predetermined rate for the work performed when they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification, by the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training. The ratio of trainees to journeymen on this contract shall not be greater than permitted under the plan approved by the Bureau of Apprenticeship and Training. Every trainee must be paid at not less than the rate specified in the approved program for his level of progress. Any employee listed on the payroll at a trainee rate who is not registered and not participating in a training plan approved by the Bureau of Apprenticeship and Training shall be paid not less than the wage rate determined by the Secretary of Labor for the classification of work he actually performed. The Contractor or subcontractor shall furnish the Contracting Officer written evidence of the certification of his program, the registration of the trainee, and the ratios and wage rates prescribed in that program. In the event the Bureau of Apprenticeship and Training withdraws the approval of a training program, the Contractor shall no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(c) The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of this contract. (DAR 7-602.23(a)(iii))

33. PAYROLLS AND BASIC RECORDS (1977 DEC)

(If this contract is with a State or political subdivision thereof, the Contractor agrees to comply with the requirements of the Contract Work Hours Standards Act and to insert this clause in all subcontracts hereunder with private persons or firms)

(a) The Contractor shall maintain payrolls and basic records relating thereto during the course of the work and shall preserve them for a period of three (3) years thereafter for all laborers and mechanics, including apprentices, trainees, watchmen, and guards, working at the site of the work. Such records shall contain the name and address of each such employee, his correct classification, rate of pay (including rates of contributions for, or costs assumed to provide, fringe benefits), daily and weekly number of hours worked, deductions made and actual wages paid. (NOTE: Watchmen and guards are reflected on payroll records for Contract Work Hours and Safety Standards Act purposes only.) Whenever the Contractor has obtained approval from the Secretary of Labor as provided in paragraph (c) of the clause entitled "Davis-Bacon Act," he shall maintain records which show the commitment, its approval, written communication of the plan or program to the laborers or mechanics affected, and the costs anticipated or incurred under the plan or program.

(b) The Contractor shall submit weekly a copy of all payrolls to the Contracting Officer. The Government Prime Contractor shall be responsible for the submission of copies of payrolls of all subcontractors. The copy shall be accompanied by a statement signed by the Contractor indicating that the payrolls are correct and complete, that the wage rates contained therein are not less than those determined by the Secretary of Labor, and that the classifications set forth for each laborer or mechanic, including apprentices and trainees, conform with the work he performed. Weekly submission of the "Statement of Compliance" required under this contract and the Copeland Regulations of the Secretary of Labor (29 CFR, Part 3) shall satisfy the requirement for submission of the above statement. The Contractor shall submit also a copy of any approval by the Secretary of Labor with respect to fringe benefits which is required by paragraph (c) of the clause entitled "Davis-Bacon Act."

(c) The Contractor shall make the records required under this clause available for inspection by authorized representatives of the Contracting Officer and the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. (DAR 7-602.23(a)(iv))

34. COMPLIANCE WITH COPELAND REGULATIONS (1964 JUN)

(If this contract is with a State or political subdivision thereof, the Contractor agrees to comply with the requirements of the Contract Work Hours Standards Act and to insert this clause in all subcontracts hereunder with private persons or firms)

The Contractor shall comply with the Copeland Regulations of the Secretary of Labor (29 CFR, Part 3) which are incorporated herein by reference. (DAR 7-602.23(a)(v))

35. WITHHOLDING OF FUNDS (1977 DEC)

(If this contract is with a State or political subdivision thereof, the Contractor agrees to comply with the requirements of the Contract Work Hours Standards Act and to insert this clause in all subcontracts hereunder with private persons or firms)

(a) The Contracting Officer may withhold or cause to be withheld from the Government Prime Contractor so much of the accrued payments or advances as may be considered necessary (i) to pay laborers and mechanics, including apprentices, trainees, watchmen, and guards, employed by the Contractor or any subcontractor on the work the full amount of wages required by the contract, and (ii) to satisfy any liability of the Contractor and any subcontractor for liquidated damages under paragraph (b) of the clause entitled "Contract Work Hours and Safety Standards Act-Overtime Compensation."

(b) If the Contractor or any subcontractor fails to pay any laborer, mechanic, apprentice, trainee, watchman, or guard employed or working on the site of the work, all or part of the wages required by the contract, the Contracting Officer may, after written notice to the Government Prime Contractor, take such action as may be necessary to cause suspension of any further payments or advances until such violations have ceased. (DAR 7-602.23(a)(vi))

36. SUBCONTRACTS (1972 FEB)

(If this contract is with a State or political subdivision thereof, the Contractor agrees to comply with the requirements of the Contract Work Hours Standards Act and to insert this clause in all subcontracts hereunder with private persons or firms)

The Contractor agrees to insert the clauses hereof entitled "Davis-Bacon Act," "Contract Work Hours and Safety Standards Act-Overtime Compensation," "Apprentices and Trainees," "Payrolls and Basic Records," "Compliance with Copeland Regulations," "Withholding of Funds," "Subcontracts," and "Contract Termination-Debarment" in all subcontracts. The term "Contractor" as used in such clauses in any subcontract shall be deemed to refer to the subcontractor except in the phrase "Government Prime Contractor." (DAR 7-602.23(a)(vii))

37. CONTRACT TERMINATION - DEBARMENT (1972 APR)

(If this contract is with a State or political subdivision thereof, the Contractor agrees to comply with the requirements of the Contract Work Hours Standards Act and to insert this clause in all subcontracts hereunder with private persons or firms)

A breach of the clauses hereof entitled "Davis-Bacon Act," Contract Work Hours and Safety Standards Act-Overtime Compensation," "Apprentices and Trainees," "Payrolls and Basic Records," "Compliance with Copeland Regulations," "Withholding of Funds," and "Subcontracts" may be grounds for termination of the contract, and for debarment as provided in 29 CFR 5.6. (DAR 7-602.23(a)(viii))

38. DISPUTES CONCERNING LABOR STANDARDS (1977 DEC)

(If this contract is with a State or political subdivision thereof, the Contractor agrees to comply with the requirements of the Contract Work Hours Standards Act and to insert this clause in all subcontracts hereunder with private persons or firms)

Disputes arising out of the labor standards provisions of this contract shall be subject to the Disputes clause except to the extent such disputes involve the meaning of classifications or wage rates contained in the wage determination decision of the Secretary of Labor or the applicability of the labor provisions of this contract which questions shall be referred to the Secretary of Labor in accordance with the procedures of the Department of Labor. (DAR 7-602.23(a)(ix))

39. CONTRACTOR INSPECTION SYSTEM (1964 NOV)

The Contractor shall (i) maintain an adequate inspection system and perform such inspections as will assure that the work performed under the contract conforms to contract requirements, and (ii) maintain and make available to the Government adequate records of such inspections. (DAR 7-602.10(a))

40. GRATUITIES (1952 MAR)

(a) The Government may, by written notice to the Contractor, terminate the right of the Contractor to proceed under this contract if it is found, after notice and hearing, by the Secretary or his duly authorized representative, that gratuities (in the form of entertainment, gifts, or otherwise) were offered or given by the Contractor, or any agent or representative of the Contractor, to any officer or employee of the Government with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending, or the making of any determinations with respect to the performing of such contract; provided, that the existence of the facts upon which the Secretary or his duly authorized representative makes such findings shall be in issue and may be reviewed in any competent court.

(b) In the event this contract is terminated as provided in paragraph (a) hereof, the Government shall be entitled (i) to pursue the same remedies against the Contractor as it could pursue in the event of a breach of the

contract by the Contractor, and (ii) as a penalty in addition to any other damages to which it may be entitled by law, to exemplary damages in an amount (as determined by the Secretary or his duly authorized representative) which shall be not less than three nor more than ten times the costs incurred by the Contractor in providing any such gratuities to any such officer or employee.

(c) The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract. (DAR 7-104.16)

41. SUBCONTRACTING PLAN FOR SMALL BUSINESS AND SMALL DISADVANTAGED BUSINESS CONCERNS (FORMALLY ADVERTISED) (1982 APR)

(The following clause is applicable if this contract (1) offers subcontracting possibilities, (2) is expected to exceed $500,000, or $1,000,000 in the case of construction of any public facility, and (3) is required to include the clause in DAR 7-104.14(a))

(a) This provision does not apply to small business concerns.

(b) The apparent low bidder, upon request by the Contracting Officer, shall submit a subcontracting plan which addresses separately subcontracting with small business concerns and small disadvantaged business concerns, and which shall be included in and made a material part of the resultant contract. The subcontracting plan shall be submitted within the time specified by the Contracting Officer. Failure to submit the subcontracting plan shall make the bidder ineligible for award of a contract. As a minimum, the subcontracting plan shall include -

(1) Separate percentage goals (expressed in terms of percentage of total planned subcontracting dollars) for the utilization as subcontractors of small business concerns and small business concerns owned and controlled by socially and economically disadvantaged individuals. For the purposes of the subcontracting plan, the Contractor shall include all subcontracts to be awarded for the specific purpose of performing this contract and may include a proportionate share of supplies and services whose costs are normally allocated as indirect or overhead costs when reasonably determined to be attributable to this contract.

a. A statement of: (i) total dollars planned to be subcontracted; (ii) total dollars planned to be subcontracted to small business; and (iii) total dollars planned to be subcontracted to small disadvantaged business.

b. A description of the principal supply and service areas to be subcontracted and an identification of those areas where it is planned to use (i) small business subcontractors, and (ii) small disadvantaged business subcontractors.

c. A statement of the method used in developing proposed subcontracting goals for small business and small disadvantaged business concerns.

d. If the offeror includes indirect and overhead costs as an element in establishing the goals in the subcontracting plan, the method used in determining the proportionate share of indirect and overhead costs incurred with (i) small business, and (ii) small disadvantaged business subcontractors shall be explained.

e. A statement of the method used for solicitation purposes (e.g., did the offeror use company source lists, the small business and disadvantaged small business source identification system provided by the Small Business Administration's Procurement Automated Source System, the National Minority Purchasing Council Vendor Information Service, or the services provided by the U.S. Department of Commerce Minority Business

Development Agency's Research and Information Division, and the facilities of small business and disadvantaged business trade associations?).

(2) The name of an individual within the employ of the bidder who will administer the subcontracting plan of the bidder and a description of the duties of such individual;

(3) A description of the efforts the bidder will make to assure that small business and small disadvantaged business concerns will have an equitable opportunity to compete for subcontracts;

(4) Assurances that the bidder will include the clause entitled "Utilization of Small Business and Small Disadvantaged Business Concerns" in all subcontracts which offer further subcontracting possibilities in the United States and that the bidder will require all subcontractors (except small business concerns) who receive subcontracts in excess of $1,000,000 in the case of a contract for the construction of any public facility, or in excess of $500,000 in the case of all other contracts, to adopt a plan in consonance with this clause;

(5) Assurances that the bidder will submit such periodic reports and cooperate in any studies or surveys as may be required by the contracting agency or the Small Business Administration in order to determine the extent of compliance by the bidder with the subcontracting plan; and

(6) A recitation of the types of records the successful bidder will maintain to demonstrate procedures which have been adopted to comply with the requirements and goals set forth in the plan, including the establishment of source lists of small business concerns and small disadvantaged business concerns; and efforts to identify and award subcontracts to such small business concerns. The records shall include at least the following (these records may be maintained on a plant-wide or company-wide basis unless otherwise indicated):

a. Small and small disadvantaged business source lists, guides, and other data identifying small and small disadvantaged business vendors.

b. Organizations contacted for small and small disadvantaged business sources.

c. On a contract-by-contract basis, records on all subcontract solicitations over $100,000, indicating on each solicitation (i) whether small business was solicited and if not, why not; (ii) whether small disadvantaged business was solicited and if not, why not; and (iii) reasons for the failure of responding small businesses or small disadvantaged businesses to receive the subcontract award.

d. Records to support such efforts as:

(i) contacts with disadvantaged and small business trade associations;

(ii) contacts with business development organizations; and

(iii) attendance at small and small disadvantaged business procurement conferences and trade fairs.

e. Records to support internal activities to guide and encourage buyers such as:

(i) workshops, seminars, training programs, etc.; and

(ii) monitoring activities to evaluate compliance.

f. On a contract-by-contract basis, records to support award data submitted to the Government to include name, address, and size status of subcontractor.

(c) In order to effectively implement this plan, the Contractor shall:

(1) Issue and promulgate company-wide policy statements in support of this effort, develop written procedures and work instructions, and assign specific responsibilities regarding the requirements of this clause.

(2) Demonstrate continuing management interest and involvement in support of these programs through such actions as regular reviews of progress and establishment of overall corporate and divisional goals and objectives.

(3) Train and motivate Contractor personnel in support of these programs.

(4) Assist small business and small disadvantaged business concerns by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation by such concerns. Where the Contractor's lists of potential small business and small disadvantaged subcontractors are excessively long, reasonable effort shall be made to give all such small business concerns an opportunity to compete over a period of time.

(5) Provide adequate and timely consideration of the potentialities of small business and small disadvantaged business concerns in all "make-or-buy" decisions.

(6) Counsel and discuss subcontracting opportunities with representatives of small and disadvantaged business firms as are referred by the Small and Disadvantaged Business Utilization Specialist responsible for monitoring performance under this program and representatives of the SBA.

(d) The Contractor shall submit SF 295 in accordance with instructions provided on the form.

(e) The bidder understands that:

(1) Prior compliance of the bidder with other such subcontracting plans under previous contracts will be considered by the Contracting Officer in determining the responsibility of the bidder for award of the contract.

(2) The failure of any Contractor or subcontractor to comply in good faith with (i) the clause entitled "Utilization of Small Business and Small Disadvantaged Business Concerns", or (ii) the terms of any subcontracting plan required by this "Small Business and Small Disadvantaged Business Subcontracting Plan (Advertised)" provision, will be a material breach of the contract or subcontract.

(f) In the acquisition of commercial products, the bidder further understands that:

(1) If a commercial product (defined below) is offered, the required subcontracting plan may cover the company's production generally, both for Government contracts and for regular commercial sales, rather than just this acquisition. In such cases, the Contractor may request approval from the Contracting Officer to submit one company-wide, or division-wide, annual plan. If such request is deemed appropriate, the offeror shall submit a proposed company-wide, or division-wide, annual plan for acceptance.

(2) Upon approval by the Contracting Officer, the plan will remain in effect for the company's entire fiscal year. During this period, Government contracts for commercial products of the affected company or division will not be required to contain individual subcontracting plans relating only to the supply or services being acquired, unless the Contracting Officer determines for a particular contract that there are unforeseen possibilities for small business and small disadvantaged business subcontracting.

(3) At least 60 days before the scheduled termination of the company or division-wide plan, the Contractor may submit to the Contracting Officer a proposed company or division-wide subcontracting plan for its commercial products for the succeeding fiscal year. If the plan would

otherwise terminate prior to approval of the succeeding fiscal year's plan, it will remain in effect until the succeeding plan is accepted or rejected, but no longer than 60 days after the end of the company's fiscal year.

(4) For the purpose of this program, the term "commercial product" means a product in regular production sold in substantial quantities to the general public and/or industry at established catalog or market prices. A product which, in the opinion of the Contracting Officer, differs only insignificantly from the Contractor's commercial product may be regarded for the purpose of this clause as a commercial product. (DAR 7-104.14(c))

42. NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT (1965 JAN)

(The provisions of this clause shall be applicable only if the amount of this contract exceeds $10,000.)

(a) The Contractor shall report to the Contracting Officer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this contract of which the Contractor has knowledge.

(b) In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this contract or out of the use of any supplies furnished or work or services performed hereunder, the Contractor shall furnish to the Government, when requested by the Contracting Officer, all evidence and information in possession of the Contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Contractor has agreed to indemnify the Government.

(c) This clause shall be included in all subcontracts. (DAR 7-103.23)

43. AUTHORIZATION AND CONSENT (1964 MAR)

The Government hereby gives its authorization and consent (without prejudice to any rights of indemnification) for all use and manufacture, in the performance of this contract or any part hereof or any amendment hereto or any subcontract hereunder (including any lower-tier subcontract), of any invention described in and covered by a patent of the United States (i) embodied in the structure or composition of any article the delivery of which is accepted by the Government under this contract, or (ii) utilized in the machinery, tools, or methods the use of which necessarily results from compliance by the Contractor or the using subcontractor with (a) specifications or written provisions now or hereafter forming a part of this contract, or (b) specific written instructions given by the Contracting Officer directing the manner of performance. The entire liability to the Government for infringement of a patent of the United States shall be determined solely be the provisions of the indemnity clauses, if any, included in this contract or any subcontract hereunder (including any lower-tier subcontract), and the Government assumes liability for all other infringement to the extent of the authorization and consent hereinabove granted. (DAR 7-103.22)

44. COMPOSITION OF CONTRACTOR (1965 JAN)

If the Contractor hereunder is comprised of more than one legal entity, each such entity shall be jointly and severally liable hereunder. (DAR 7-602.32)

45. SITE INVESTIGATION (1965 JAN)

The Contractor acknowledges that he has investigated and satisfied himself as to the conditions affecting the work, including but not restricted to those

bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, river stages, tides or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during prosecution of the work. The Contractor further acknowledges that he has satisfied himself as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Government, as well as from information presented by the drawings and specifications made a part of this contract. Any failure by the Contractor to acquaint himself with the available information will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the work. The Government assumes no responsibility for any conclusions or interpretations made by the Contractor on the basis or the information made available by the Government. (DAR 7-602.33)

46. PROTECTION OF EXISTING VEGETATION, STRUCTURES, UTILITIES, AND IMPROVEMENTS (1965 JAN)

(a) The Contractor will preserve and protect all existing vegetation such as trees, shrubs, and grass on or adjacent to the site of work which is not to be removed and which does not unreasonably interfere with the construction work. Care will be taken in removing trees authorized for removal to avoid damage to vegetation to remain in place. Any limbs or branches of trees broken during such operations or by the careless operation of equipment, or by workmen, shall be trimmed with a clean cut and painted with an approved tree pruning compound as directed by the Contracting Officer.

(b) The Contractor will protect from damage all existing improvements or utilities at or near the site of the work, the location of which is made known to him, and will repair or restore any damage to such facilities resulting from failure to comply with the requirements of this contract or the failure to exercise reasonable care in the performance of the work. If the Contractor fails or refuses to repair any such damage promptly, the Contracting Officer may have the necessary work performed and charge the cost thereof to the Contractor. (DAR 7-602.34)

47. OPERATIONS AND STORAGE AREAS (1965 JAN)

(a) All operations of the Contractor (including storage of materials) upon Government premises shall be confined to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by his operations.

(b) Temporary buildings (storage sheds, shops, offices, etc.) may be erected by the Contractor only with the approval of the Contracting Officer, and shall be built with labor and materials furnished by the Contractor without expense to the Government. Such temporary buildings and utilities shall remain the property of the Contractor and shall be removed by him at his expense upon the completion of the work. With the written consent of the Contracting Officer, such buildings and utilities may be abandoned and need not be removed.

(c) The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways or construct and use such temporary roadways as may be authorized by the Contracting Officer. Where materials are transported in the prosecution of the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or

prescribed by any Federal, State or local law or regulation. When it is necessary to cross curbings or sidewalks, protection against damage shall be provided by the Contractor and any damaged roads, curbings, or sidewalks shall be repaired by, or at the expense of the Contractor. (DAR 7-602.35)

48. MODIFICATION PROPOSALS - PRICE BREAKDOWN (1968 APR)

The Contractor, in connection with any proposal he makes for a contract modification, shall furnish a price breakdown, itemized as required by the Contracting Officer. Unless otherwise directed, the breakdown shall be in sufficient detail to permit an analysis of all material, labor, equipment, subcontract, and overhead costs, as well as profit, and shall cover all work involved in the modification, whether such work was deleted added or changed. Any amount claimed for subcontracts shall be supported by a similar price breakdown. In addition, if the proposal includes a time extension, a justification therefor shall also be furnished. The proposal, together with the price breakdown and time extension justification, shall be furnished by the date specified by the Contracting Officer. (DAR 7-602.36)

49. SUBCONTRACTORS (1979 MAR)

(In construction contracts to be performed in United States possessions (as defined in DAR 18-703.2) and in Puerto Rico, the second sentence is modified to refer only to the clauses required by DAR 18-703.2)

Within seven days after the award of any subcontract either by himself or a subcontractor, the Contractor shall deliver to the Contracting Officer a completed DD Form 1566. The form shall include the subcontractor's acknowledgement of the inclusion in his subcontract of the clauses of this contract entitled "Davis-Bacon Act," "Contract Work Hours and Safety Standards Act-Overtime Compensation," "Apprentices and Trainees," "Compliance with Copeland Regulations," "Withholding of Funds," "Subcontracts," "Contract Termination-Debarment," and "Payrolls and Basic Records." Nothing contained in this contract shall create any contractual relation between the subcontractor and the Government. (DAR 7-602.37)

50. CLEANING UP (1965 JAN)

The Contractor shall at all times keep the construction area, including storage areas used by him, free from accumulations of waste material or rubbish and prior to completion of the work remove any rubbish from the premises and all tools, scaffolding, equipment, and materials not the property of the Government. Upon completion of the construction the Contractor shall leave the work and premises in a clean, neat and workmanlike condition satisfactory to the Contracting Officer. (DAR 7-602.40)

51. ADDITIONAL DEFINITIONS (1965 JAN)

(a) Wherever in the specifications or upon the drawings the words "directed," "required," "ordered," "designated," "prescribed," or words of like import are used, it shall be understood that the "direction," "requirement," "ordered," "designation," or "prescription," of the Contracting Officer is intended and similarly the words "approved," "acceptable," "satisfactory" or words of like import shall mean "approved by" or "acceptable to," or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.

(b) Where "as shown," "as indicated," "as detailed," or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word

"provided" as used herein shall be understood to mean "provided complete in place," that is "furnished and installed." (DAR 7-602.41)

52. ACCIDENT PREVENTION (1981 AUG)

(a) In order to provide safety controls for protection to the life and health of employees and other persons; for prevention of damage to property, materials, supplies, and equipment; and for avoidance of work interruptions in the performance of this contract, the Contractor shall comply with all pertinent provisions of Corps of Engineers Manual, EM 385-1-1, dated 1 April 1981, entitled "Safety and Health Requirements Manual", and will also take or cause to be taken such additional measures as the Contracting Officer may determine to be reasonably necessary for the purpose.

(b) The Contractor will maintain an accurate record of, and will report to the Contracting Officer in the manner and on the forms prescribed by the Contracting Officer, exposure data and all accidents resulting in death, traumatic injury, occupational disease, and damage to property, materials, supplies and equipment incident to work performed under this contract.

(c) The Contracting Officer will notify the Contractor of any noncompliance with the foregoing provisions and the action to be taken. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

(d) Compliance with the provisions of this clause by subcontractors will be the responsibility of the Contractor.

(e) Prior to commencement of the work the Contractor will:

(1) submit in writing his proposals for effectuating this provision for accident prevention;

(2) meet in conference with representatives of the Contracting Officer to discuss and develop mutual understandings relative to administration of the over-all safety program. (DAR 7-602.42(a) & (b))

53. GOVERNMENT INSPECTORS (1965 JAN)

The work will be conducted under the general direction of the Contracting Officer and is subject to inspection by his appointed inspectors to insure strict compliance with the terms of the contract. No inspector is authorized to change any provision of the specifications without written authorization of the Contracting Officer, nor shall the presence or absence of an inspector relieve the Contractor from any requirements of the contract. (DAR 7-602.43)

54. RIGHTS IN SHOP DRAWINGS (1966 APR)

(Applicable to all contracts calling for the delivery of shop drawings)

(a) Shop drawings for construction means drawings, submitted to the Government by the Construction Contractor, subcontractor or any lower tier subcontractor pursuant to a construction contract, showing in detail (i) the proposed fabrication and assembly of structural elements and (ii) the installation (i.e., form, fit, and attachment details) of materials or equipment. The Government may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(b) This clause, including this paragraph (b), shall be included in all subcontracts hereunder at any tier. (DAR 7-602.47)

55. AFFIRMATIVE ACTION FOR DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA (1976 JUL)

(This clause is applicable pursuant to 41 C.F.R. 60-250, if this contract is for $10,000 or more.)

(a) The Contractor will not discriminate against any employee or applicant for employment because he or she is a disabled veteran or veteran of the Vietnam era in regard to any position for which the employee or applicant for employment is qualified. The Contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified disabled veterans and veterans of the Vietnam era without discrimination based upon their disability or veterans status in all employment practices such as the following: employment upgrading, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.

(b) The Contractor agrees that all suitable employment openings of the Contractor which exist at the time of the execution of this contract and those which occur during the performance of this contract, including those not generated by this contract and including those occurring at an establishment of the Contractor other than the one wherein the contract is being performed but excluding those of independently operated corporate affiliates, shall be listed at an appropriate local office of the State employment service system wherein the opening occurs. The Contractor further agrees to provide such reports to such local office regarding employment openings and hires as may be required.

State and local government agencies holding Federal contracts of $10,000 or more shall also list all their suitable openings with the appropriate office of the State employment service, but are not required to provide those reports set forth in paragraphs (d) and (e).

(c) Listing of employment openings with the employment service system pursuant to this clause shall be made at least concurrently with the use of any other recruitment source or effort and shall involve the normal obligations which attach to the placing of a bona fide job order, including the acceptance of referrals of veterans and nonveterans. The listing of employment openings does not require the hiring of any particular job applicant or from any particular group of job applicants, and nothing herein is intended to relieve the Contractor from any requirements in Executive Orders or regulations regarding nondiscrimination in employment.

(d) The reports required by paragraph (b) of this clause shall include, but not be limited to, periodic reports which shall be filed at least quarterly with the appropriate local office or, where the Contractor has more than one hiring location in a State, with the central office of that State employment service. Such reports shall indicate for each hiring location (1) the number of individuals hired during the reporting period, (2) the number of nondisabled veterans of the Vietnam era hired, (3) the number of disabled veterans of the Vietnam era hired, and (4) the total number of disabled veterans hired. The reports should include covered veterans hired for on-the-job training under 38 U.S.C. 1787. The Contractor shall submit a report within 30 days after the end of each reporting period wherein any performance is made on this contract identifying data for each hiring location. The Contractor shall maintain at each hiring location copies of the reports submitted until the expiration of one year after final payment under the contract, during which time these reports and related documentation shall

be made available, upon request, for examination by any authorized representatives of the Contracting Officer or of the Secretary of Labor. Documentation would include personnel records respecting job openings, recruitment and placement.

(e) Whenever the Contractor becomes contractually bound to the listing provisions of this clause, it shall advise the employment service system in each State where it has establishments of the name and location of each hiring location in the State. As long as the Contractor is contractually bound to these provisions and has so advised the State system, there is no need to advise the State system of subsequent contracts. The Contractor may advise the State system when it is no longer bound by this contract clause.

(f) This clause does not apply to the listing of employment openings which occur and are filled outside of the 50 States, the District of Columbia, Puerto Rico, Guam, and the Virgin Islands.

(g) The provisions of paragraphs (b), (c), (d) and (e) of this clause do not apply to openings which the Contractor proposes to fill from within his own organization or to fill pursuant to a customary and traditional employer-union hiring arrangement. This exclusion does not apply to a particular opening once an employer decides to consider applicants outside of his own organization or employer-union arrangement for that opening.

(h) As used in this clause:

(1) "All suitable employment openings" includes, but is not limited to, openings which occur in the following job categories: production and nonproduction; plant and office; laborers and mechanics; supervisory and nonsupervisory; technical; and executive, administrative, and professional openings as are compensated on a salary basis of less than $25,000 per year. This term includes full-time employment, temporary employment of more than three (3) days duration, and part-time employment. It does not include openings which the Contractor proposes to fill from within his own organization or to fill pursuant to a customary and traditional employer-union hiring arrangement nor openings in an educational institution which are restricted to students of that institution. Under the most compelling circumstances an employment opening may not be suitable for listing, including such situations where the needs of the Government cannot reasonably be otherwise supplied, where listing would be contrary to national security, or where the requirement of listing would otherwise not be for the best interest of the Government.

(2) "Appropriate office of the State employment service system" means the local office of the Federal-State national system of public employment offices with assigned responsibility for serving the area where the employment opening is to be filled, including the District of Columbia, Guam, Puerto Rico, and the Virgin Islands.

(3) "Openings which the Contractor proposes to fill from within his own organization" means employment openings for which no consideration will be given to persons outside the Contractor's organization (including any affiliates, subsidiaries, and the parent companies) and includes any openings which the Contractor proposes to fill from regularly established "recall" lists.

(4) "Openings which the Contractor proposes to fill pursuant to a customary and traditional employer-union hiring arrangement" means employment openings which the Contractor proposes to fill from union halls, which is part of the customary and traditional hiring relationship which exists between the Contractor and representatives of his employees.

(i) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Vietnam Era Veterans' Readjustment Assistance Act, hereinafter referred to as the "Act" (38 U.S.C. 2012).

(j) In the event of the Contractor's noncompliance with the requirements of this clause, actions for noncompliance may be taken in accordance with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

(k) The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form to be prescribed by the Director, Office of Federal Contract Compliance Programs, provided by or through the Contracting Officer. Such notice shall state the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified disabled veterans and veterans of the Vietnam era for employment, and the rights of applicants and employees.

(l) The Contractor will notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of the Act, and is committed to take affirmative action to employ and advance in employment qualified disabled veterans and veterans of the Vietnam era.

(m) The Contractor will include the provisions of this clause in every subcontract or purchase order of $10,000 or more unless exempted by rules, regulations, or orders of the Secretary issued pursuant to the Act, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the Director of the Office of Federal Contract Compliance Programs may direct to enforce such provisions, including action for noncompliance. (DAR 7-103.27)

56. VALUE ENGINEERING INCENTIVE--CONSTRUCTION (1980 DEC)

(The following clause is applicable if this contract is in excess of $10,000)

(a) Applicability. This clause applies to any Contractor developed, prepared, and submitted Value Engineering Change Proposal (VECP).

(b) Definitions.

(1) "Contractor's development and implementation costs" means those costs incurred on a VECP before Government acceptance and those costs the Contractor incurs specifically to make the changes required by Government acceptance of a VECP.

(2) "Government costs" means those agency costs that result directly from developing and implementing the VECP and any net increases in the cost of testing, operations, maintenance, and logistic support. They do not include the normal administrative costs of processing the VECP.

(3) "Instant contract savings" means the estimated reduction in Contractor cost of performance resulting from acceptance of the VECP, minus allowable Contractor's development and implementation costs (including subcontractor's development and implementation costs). (See paragraph (g).)

(4) "Value Engineering Change Proposal (VECP)" means a proposal that:

(i) requires a change to this, the instant contract, to implement; and

(ii) results in reducing the contract price or estimated cost without impairing essential functions or characteristics, provided that it does not involve a change in deliverable end-item quantities only.

(c) VECP Preparation. As a minimum, the Contractor shall include the information described in (1) through (6) in each VECP. If the proposed change affects contractually required configuration management procedures, the instructions in the procedures relating to format, identification, and priority assignment shall govern VECP preparation. The VECP shall include the following:

(1) A description of the difference between the existing contract requirement and that proposed, the comparative advantages and disadvantages of each, a justification when an item's function or characteristics are being altered, and the effect of the change on the end item's performance.

(2) A list of the contract requirements that must be changed if the VECP is accepted, including any suggested specification revisions.

(3) A separate, detailed cost estimate for both the affected portions of the existing contract requirement and the VECP. The cost reduction associated with the VECP shall take into account the Contractor's allowable development and implementation costs, including any amount attributable to subcontracts under paragraph (g). The Contractor shall also include a description and estimate of costs the Government may incur in implementing the VECP, such as test and evaluation and operating and support costs.

(4) A projection of any effects the proposed change would have on collateral costs to the agency.

(5) A statement of the time by which a contract modification accepting the VECP must be issued in order to achieve the maximum cost reduction, noting any effect on the contract completion time or delivery schedule.

(6) Identification of any previous submissions of the VECP, including the dates submitted, the agencies and contract numbers involved, and previous Government actions, if known.

(d) Submissions.

(1) The Contractor shall submit VECPs to the Resident Engineer at the worksite, with a copy to the Contracting Officer. The Contracting Officer shall notify the Contractor of the status of the VECP within 45 calendar days after the contracting office receives it. If additional time is required because of extenuating circumstances, the Contractor shall be notified within the 45-day period and provided the reason for the delay and the expected date of the Contracting Officer's decision. VECPs shall be processed expeditiously; however, the Government shall not be liable for any delay in acting upon a VECP.

(2) If the VECP is not accepted, the Contracting Officer shall provide the Contractor written notification fully explaining the reasons for rejection. The Contractor may withdraw, in whole or in part, any VECP not accepted by the Government within the period specified in the VECP. The Contracting Officer may require that the Contractor provide written notification before undertaking significant expenditures for VECP effort.

(e) Acceptance. Any VECP may be accepted in whole or in part by the Contracting Officer's award of a modification to this contract citing this clause. The Contracting Officer may accept the VECP, even though an agreement on price reduction has not be reached, by issuing the Contractor a notice to proceed with the change. Until a notice to proceed is issued or a contract modification applies a VECP to this contract, the Contractor shall perform in accordance with the existing contract. The Contracting Officer's decision to accept all or part of any VECP shall be final and not subject to the Disputes clause.

(f) Sharing.

(1) Rates. The Contractor's share of savings is determined by subtracting Government costs from instant contract savings and multiplying the result by 55 percent for fixed-price contracts and 25 percent for cost-reimbursement contracts.

(2) Payment. Payment of any share due the Contractor for use of a VECP on this contract shall be authorized by a modification to this contract to:

(i) accept the VECP;
(ii) reduce the contract price or estimated cost by the amount of instant contract savings; and
(iii) provide the Contractor's share of savings by adding the amount calculated in (f)(1) to the contract price or fee.

(g) Subcontract. The Contractor shall include appropriate VE clauses in an subcontract of $50,000 or more and may include them in subcontracts of lesser value. To compute any adjustment in the contract price under paragraph (f), the Contractor's VECP development and implementation costs shall include any subcontractor's development and implementation costs that clearly result from the VECP, but shall exclude any VE incentive payments to subcontractors. The Contractor may choose any arrangement for subcontractor VE incentive payments, provided that these payments are not made from the Government's share of the savings resulting from the VECP.

(h) Data. The Contractor may restrict the Government's right to use any part of a VECP or the supporting data by marking the following legend on the affected parts:

"These data, furnished under the Value Engineering Incentive--Construction clause of Contract _____, shall not be disclosed outside the Government or duplicated, used, or disclosed, in whole or in part, for any purpose other than to evaluate a VECP submitted under the clause. This restriction does not limit the Government's right to use information contained in these data if it has been obtained or is otherwise available from the Contractor or from another source without limitations."

If a VECP is accepted, the Contractor hereby grants the Government unlimited rights in the VECP and supporting data, except that, with respect to data qualifying and submitted as limited rights technical data, the Government shall have the rights specified in the contract modification implementing the VECP and shall appropriately mark the data. (DAR 7-602.50)

57. AFFIRMATIVE ACTION FOR HANDICAPPED WORKERS (1976 MAY)

(Contracts and subcontracts are exempt from the requirements of the following clause with regard to work performed outside the United States by employees who were not recruited within the United States.)

(a) The Contractor will not discriminate against any employee or applicant for employment because of physical or mental handicap in regard to any position for which the employee or applicant for employment is qualified. The Contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified handicapped individuals without discrimination based upon their physical or mental handicap in all employment practices such as the following: employment, upgrading, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.

(b) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

(c) In the event of the Contractor's noncompliance with the requirements of this clause, action for noncompliance may be taken in accordance with the rules, regulations and relevant orders of the Secretary of Labor issued pursuant to the Act.

(d) The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form to be prescribed by the Director, provided by or through the Contracting Officer. Such notices shall state the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified handicapped employees and applicants for employment, and the rights of applicants and employees.

(e) The Contractor will notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of section 503 of the Rehabilitation Act of 1973, and is committed to take affirmative action to employ and advance in employment physically and mentally handicapped individuals.

(f) The Contractor will include the provisions of this clause in every subcontract or purchase order of $2,500 or more unless exempted by rules, regulations, or orders of the Secretary issued pursuant to section 503 of the Act, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the Director of the Office of Federal Contract Compliance Programs may direct to enforce such provisions, including action for noncompliance. (DAR 7-103.28)

58. CLEAN AIR AND WATER (1975 OCT)

(Applicable only if the contract exceeds $100,000, or the contracting officer has determined that orders under an indefinite quantity contract in any one year will exceed $100,000, or a facility to be used has been the subject of a conviction under the Clean Air Act (42 U.S.C. 1857c-8(c)(1) or the Federal Water Pollution Control Act (33 U.S.C. 1319(c)) and is listed by EPA, or the contract is not otherwise exempt.)

(a) The Contractor agrees as follows:

(i) To comply with all the requirements of section 114 of the Clean Air Act, as amended (42 U.S.C. 1857, et seq., as amended by Public Law 91-604) and section 308 of the Federal Water Pollution Control Act (33 U.S.C. 1251, as amended by Public Law 92-500), respectively, relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, respectively, and all regulations and guidelines issued thereunder before the award of this contract;

(ii) That no portion of the work required by this prime contract will be performed in a facility listed on the Environmental Protection Agency List of Violating Facilities on the date this contract was awarded unless and until the EPA eliminates the name of such facility or facilities from such listing;

(iii) To use his best efforts to comply with clean air standards and clean water standards at the facilities in which the contract is being performed; and

(iv) To insert the substance of the provisions of this clause in any nonexempt subcontract, including this paragraph (iv).

(b) The terms used in this cluase have the following meanings.

(i) The term "Air Act" means the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Public Law 91-604).

(ii) The term "Water Act" means Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Public Law 92-500).

(iii) The term "clean air standards" means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted pursuant to the Air Act or Executive Order 11738, an applicable implementation plan as described in section 110(d) of the Clean Air Act (42 U.S.C. 1857c-5(d), an approved implementation procedure or plan under section 111(c) or section 111(d), respectively, of the Air Act (42 U.S.C. 1857c-6(c) or (d)), or an approved implementation procedure under section 112(d) of the Air Act (42 U.S.C. 1857c-7(d)).

(iv) The term "clean water standards" means any enforceable limitation, control, condition, prohibition, standard or other requirement which is promulgated pursuant to the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by a local government to ensure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. 1317)

(v) The term "compliance" means compliance with clean air or water standards. Compliance shall also mean compliance with a schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency or an air or water pollution control agency in accordance with the requirement of the Air Act or Water Act and regulations issued pursuant thereto.

(vi) The term "facility" means any building, plant, installation, structure, mine, vessel or other floating craft, location, or site of operations, owned, leased, or supervised by a contractor, subcontractor, to be utilized in the performance of a contract or subcontract. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location or site shall be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are colocated in one geographical area.

(vii) The term "nonexempt contract or subcontract" means a contract or subcontract of more than $100,000 which is not otherwise exempted pursuant to the EPA regulations implementing the Air Act and Water Act (40 CFR 15.5), as further implemented in DAR 1-2302.4 or in FPR 1-1.2302-4 (whichever is applicable) and the procedures of the Department awarding the contract. (DAR 7-103.29)

59. NOTICE TO THE GOVERNMENT OF LABOR DISPUTES (1958 SEP)

(a) Whenever the Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of this contract, the Contractor shall immediately give notice thereof, including all relevant information with respect thereto, to the Contracting Officer.

(b) The Contractor agrees to insert the substance of this clause, including this paragraph (b), in any subcontract hereunder as to which a labor dispute may delay the timely performance of this contract; except that each such subcontract shall provide that in the event its timely performance is delayed or threatened by delay by any actual or potential labor dispute, the subcontractor shall immediately notify his next higher tier subcontractor, or the prime contractor, as the case may be, of all relevant information with respect to such dispute. (DAR 7-104.4)

60. CONTRACT PRICES - BIDDING SCHEDULE (1968 APR)

(The following clause is applicable to contracts containing unit prices)

Payment for the various items listed in the Bidding Schedule shall constitute full compensation for furnishing all plant, labor, equipment, appliances, and materials, and for performing all operations required to complete the work in conformity with the drawings and specifications. All costs for work not specifically mentioned in the Bidding Schedule shall be included in the contract prices for the items listed. (DAR 7-603.5)

61. PRIORITIES, ALLOCATIONS, AND ALLOTMENTS (1975 OCT)

(The following clause is applicable to ratable contracts)

The Contractor shall follow the provisions of DMS Reg. 1 or DPS Reg. 1 and all other applicable regulations and orders of the Bureau of Domestic Commerce in obtaining controlled materials and other products and materials needed to fill this order. (DAR 7-104.18)

62. PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA - PRICE ADJUSTMENTS (1970 JAN)

(The following clause is applicable if this contract is in excess of $500,000)

(a) This clause shall become operative only with respect to any modification of this contract which involves aggregate increases and/or decreases in costs plus applicable profits in excess of $500,000 unless the modification is priced on the basis of adequate competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by law or regulation. The right to price reduction under this clause is limited to defects in data relating to such modification.

(b) If any price, including profit, or fee, negotiated in connection with any price adjustment under this contract was increased by any significant sums because:

(i) the Contractor furnished cost or pricing data which was not complete, accurate and current as certified in the Contractor's Certificate of Current Cost or Pricing Data;

(ii) a subcontractor, pursuant to the clause of this contract entitled "Subcontractor Cost or Pricing Data" or "Subcontractor Cost or Pricing Data - Price Adjustments" or any subcontract clause therein required, furnished cost or pricing data which was not complete, accurate and current as certified in the subcontractor.s Certificate of Current Cost or Pricing Data;

(iii) a subcontractor or prospective subcontractor furnished cost or pricing data which was required to be complete, accurate and current and to be submitted to support a subcontract cost estimate furnished by the Contractor but which was not complete, accurate and current as of the date certified in the Contractor's Certificate of Current Cost or Pricing Data; or

(iv) the Contractor or a subcontractor or prospective subcontractor furnished any data, not within (i), (ii) or (iii) above, which was not accurate, as submitted;

the price shall be reduced accordingly and the contract shall be modified in writing as may be necessary to reflect such reduction. However, any reduction in the contract price due to defective subcontract data of a prospective subcontractor, when the subcontract was not subsequently awarded to such subcontractor, will be limited to the amount (plus applicable overhead and profit markup) by which the actual subcontract, or actual cost to the

Contractor if there was no subcontract, was less than the prospective subcontract cost estimate submitted by the Contractor, provided the actual subcontract price was not affected by defective cost or pricing data.
Note: Since the contract is subject to reduction under this clause by reason of defective cost or pricing data submitted in connection with certain subcontracts, it is expected that the contractor may wish to include a clause in each such subcontract requiring the subcontractor to appropriately indemnify the contractor. However, the inclusion of such a clause and the terms thereof are matters for negotiation and agreement between the contractor and the subcontractor, provided that they are consistent with DAR 23-203 relating to Disputes provisions in subcontracts. It is also expected that any subcontractor subject to such indemnification will generally require substantially similar indemnification for defective cost or pricing data required to be submitted by his lower tier subcontractors. (DAR 7-104.29(b))

63. INTEREST (1972 MAY)
Notwithstanding any other provision of this contract, unless paid within thirty (30) days, all amounts that become payable by the Contractor to the Government under this contract (net of any applicable tax credit under the Internal Revenue Code) shall bear interest from the date due until paid and shall be subject to adjustments as provided by Part 6 of Appendix E of the Defense Acquisition Regulation, as in effect on the date of this contract. The interest rate per annum shall be the interest rate in effect which has been established by the Secretary of the Treasury pursuant to Public Law 92-41; 85 STAT 97 for the Renegotiation Board, as of the date the amount becomes due as herein provided. Amounts shall be due upon the earliest one of (i) the date fixed pursuant to this contract; (ii) the date of the first written demand for payment, consistent with this contract, including demand consequent upon default termination; (iii) the date of transmittal by the Government to the Contractor of a proposed supplemental agreement to confirm completed negotiations fixing the amount; or (iv) if this contract provides for revision of prices, the date of written notice to the Contractor stating the amount of refund payable in connection with a pricing proposal or in connection with a negotiated pricing agreement not confirmed by contract supplement. (DAR 7-104.39)

64. AUDIT BY DEPARTMENT OF DEFENSE (1978 AUG)
(The following clause is applicable unless this contract was entered into by formal advertising and is not in excess of $100,000)
(a) General. The Contracting Officer or his representatives shall have the audit and inspection rights described in the applicable paragraphs (b), (c) and (d) below.
(b) Examination of Costs. If this is a cost reimbursement type, incentive, time and materials, labor hour, or price redeterminable contract, or any combination thereof, the Contractor shall maintain, and the Contracting Officer or his representatives shall have the right to examine books, records, documents, and other evidence and accounting procedures and practices, sufficient to reflect properly all direct and indirect costs of whatever nature claimed to have been incurred and anticipated to be incurred for the performance of this contract. Such right of examination shall include inspection at all reasonable times of the Contractor's plants, or such parts thereof, as may be engaged in the performance of this contract.
(c) Cost or Pricing Data. If the Contractor submitted cost or pricing data in connection with the pricing of this contract or any change or modification thereto, unless such pricing was based on adequate price

competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by law or regulation, the Contracting Officer or his representatives who are employees of the United States Government shall have the right to examine all books, records, documents and other data of the Contractor related to the negotiation, pricing or performance of such contract, change or modification, for the purpose of evaluating the accuracy, completeness and currency of the cost or pricing data submitted. Additionally, in the case of pricing any change or modification exceeding $100,000 to formally advertised contracts, the Comptroller General of the United States or his representatives who are employees of the United States Government shall have such rights. The right of examination shall extend to all documents necessary to permit adequate evaluation of the cost or pricing data submitted, along with the computations and projections used therein.

(d) Reports. If the Contractor is required to furnish Contractor Cost Data Reports (CCDR), Contract Fund Status Reports (CFSR), or Cost Performance Reports (CPR) the Contracting Officer or his representatives shall have the right to examine books, records, other documents, and supporting materials, for the purpose of evaluating (i) the effectiveness of the Contractor's policies and procedures to produce data compatible with the objectives of these reports, and (ii) the data reported.

(e) Availability. The materials described in (b), (c) and (d) above shall be made available at the office of the Contractor, at all reasonable times, for inspection, audit, or reproduction, until the expiration of three years from the date of final payment under this contract or such lesser time specified in Appendix M of the Defense Acquisition Regulation, and for such longer period, if any, as is required by applicable statute, or by other clauses of this contract, or by (1) and (2) below:

(1) If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for a period of three years from the date of any resulting final settlement.

(2) Records which relate to appeals under the "Disputes" clause of this contract, or litigation or the settlement of claims arising out of the performance of this contract, shall be made available until such appeals, litigation, or claims have been disposed of.

(f) The Contractor shall insert a clause containing all the provisions of this clause, including this paragraph (f), in all subcontracts exceeding $10,000 hereunder, except altered as necessary for proper identification of the contracting parties and the Contracting Officer under the Government prime contract. (DAR 7-104.41(a))

65. SUBCONTRACTOR COST OR PRICING DATA - PRICE ADJUSTMENTS (1970 JAN)

(The following clause is applicable if this contract is in excess of $500,000)

(a) Paragraphs (b) and (c) of this clause shall become operative only with respect to any modification made pursuant to one or more provisions of this contract which involves aggregate increases and/or decreases in costs plus applicable profits expected to exceed $500,000. The requirements of this clause shall be limited to such modifications.

(b) The Contractor shall require subcontractors hereunder to submit cost or pricing data under the following circumstances: (i) prior to the award of any subcontract the amount of which is expected to exceed $500,000 when entered into; (ii) prior to the pricing of any subcontract modification which involves aggregate increases and/or decreases in costs plus applicable profits expected to exceed $500,000; except where the price is based on adequate price

competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by law or regulation.

(c) The Contractor shall require subcontractors to certify that to the best of their knowledge and belief the cost and pricing data submitted under (b) above is accurate, complete, and current as of the date of agreement on the negotiated price of the subcontract or subcontract change or modification.

(d) The Contractor shall insert the substance of this clause including this paragraph (d) in each subcontract which exceeds $500,000. (DAR 7-104.42(b))

66.1 GOVERNMENT-FURNISHED PROPERTY (SHORT FORM) (1964 NOV)

(The following clause is applicable when Government Property having an acquisition cost of $50,000 or less is furnished to or acquired by the Contractor)

(a) The Government shall deliver to the Contractor, for use only in connection with this contract, the property described in the schedule or specifications (hereinafter referred to as "Government-furnished property"), at the times and locations stated therein. If the Government-furnished property, suitable for its intended use, is not so delivered to the Contractor, the Contracting Officer shall, upon timely written request made by the Contractor, and if the facts warrant such action, equitably adjust any affected provision of this contract pursuant to the procedures of the "Changes" clause hereof.

(b) Title to Government-furnished property shall remain in the Government. The Contractor shall maintain adequate property control records of Government-furnished property in accordance with sound industrial practice.

(c) Unless otherwise provided in this contract, the Contractor, upon delivery to him of any Government-furnished property, assumes the risk of, and shall be responsible for, any loss thereof or damage thereto except for reasonable wear and tear, and except to the extent that such property is consumed in the performance of this contract.

(d) The Contractor shall, upon completion of this contract, prepare for shipment, deliver f.o.b. origin, or dispose of all Government-furnished property not consumed in the performance of this contract or not theretofore delivered to the Government, as may be directed or authorized by the Contracting Officer. The net proceeds of any such disposal shall be credited to the contract price or paid in such other manner as the Contracting Officer may direct. (DAR 7-104.24(f))

66.2 GOVERNMENT PROPERTY (FIXED PRICE) (1968 SEP)

(The following clause is applicable when Government Property having an acquisition cost in excess of $50,000 is furnished to or acquired by the Contractor)

(a) Government-Furnished Property. The Government shall deliver to the Contractor, for use in connection with and under the terms of this contract, the property described as Government-furnished property in the Schedule or specifications, together with such related data and information as the Contractor may request and as may reasonably be required for the intended use of such property (hereinafter referred to as "Government-furnished property"). The delivery or performance dates for the supplies or services to be furnished by the Contractor under this contract are based upon the expectation that Government-furnished property suitable for use (except for such property furnished "as is") will be delivered to the Contractor at the times stated in the Schedule or, if not so stated, in sufficient time to

enable the Contractor to meet such delivery or performance dates. In the event that Government-furnished property is not delivered to the Contractor by such time or times, the Contracting Officer shall, upon timely written request made by the Contractor, make a determination of the delay, if any, occasioned the Contractor thereby, and shall equitably adjust the delivery or performance dates or the contract price, or both, and any other contractual provision affected by any such delay, in accordance with the procedures provided for in the clause of this contract entitled "Changes." Except for Government-furnished property furnished "as is," in the event the Government-furnished property is received by the Contractor in a condition not suitable for the intended use the Contractor shall, upon receipt thereof, notify the Contracting Officer of such fact and, as directed by the Contracting Officer, either (i) return such property at the Government's expense or otherwise dispose of the property, or (ii) effect repairs or modifications. Upon the completion of (i) or (ii) above, the Contracting Officer upon written request of the Contractor shall equitably adjust the delivery or performance dates or the contract price, or both, and any other contractual provision affected by the rejection or disposition, or the repair or modification, in accordance with the procedures provided for in the clause of this contract entitled "Changes." The foregoing provisions for adjustment are exclusive and the Government shall not be liable to suit for breach of contract by reason of any delay in delivery of Government-furnished property or delivery of such property in a condition not suitable for its intended use.

(b) Changes in Government-furnished Property.

(1) By notice in writing, the Contracting Officer may (i) decrease the property provided or to be provided by the Government under this contract, or (ii) substitute other Government-owned property for property to be provided by the Government, or to be acquired by the Contractor for the Government, under this contract. The Contractor shall promptly take such action as the Contracting Officer may direct with respect to the removal and shipping of property covered by such notice.

(2) In the event of any decrease in or substitution of property pursuant to subparagraph (1) above, or any withdrawal of authority to use property provided under any other contract or lease, which property the Government had agreed in the Schedule to make available for the performance of this contract, the Contracting Officer, upon the written request of the Contractor (or, if the substitution of property causes a decrease in the cost of performance, on his own initiative), shall equitably adjust such contractual provisions as may be affected by the decrease, substitution, or withdrawal, in accordance with the procedures provided for in the "Changes" clause of this contract.

(c) Title. Title to all property furnished by the Government shall remain in the Government. In order to define the obligations of the parties under this clause, title to each item of facilities, special test equipment, and special tooling (other than that subject to a "Special Tooling" clause) acquired by the Contractor for the Government pursuant to this contract shall pass to and vest in the Government when its use in the performance of this contract commences, or upon payment therefor by the Government, whichever is earlier, whether or not title previously vested. All Government-furnished property, together with all property acquired by the Contractor title to which vests in the Government under this paragraph, is subject to the provisions of this clause and is hereinafter collectively referred to as "Government

property." Title to Government property shall not be affected by the incorporation or attachment thereof to any property not owned by the Government, nor shall such Government property, or any part thereof, be or become a fixture or lose its identity as personalty by reason of affixation to any realty.

(d) Property Administration. The Contractor shall comply with the provisions of Appendix B, Defense Acquisition Regulation, as in effect on the date of the contract, which is hereby incorporated by reference and made a part of this contract. Material to be furnished by the Government shall be ordered or returned by the Contractor, when required, in accordance with the "Manual for Military Standard Requisitioning and Issue Procedure (MILSTRIP) for Defense Contractors" (Appendix H, Defense Acquisition Regulation) as in effect on the date of this contract, which Manual is hereby incorporated by reference and made a part of this contract.

(e) Use of Government Property. The Government property shall, unless otherwise provided herein or approved by the Contracting Officer, be used only for the performance of this contract.

(f) Utilization, Maintenance and Repair of Government Property. The Contractor shall maintain and administer, in accordance with sound industrial practice, and in accordance with applicable provisions of Appendix B, a program for the utilization, maintenance, repair, protection, and preservation of Government property until disposed of by the Contractor in accordance with this clause. In the event that any damage occurs to Government property the risk of which has been assumed by the Government under this contract, the Government shall replace such items or the Contractor shall make such repair of the property as the Government directs; provided however, that if the Contractor cannot effect such repair within the time required, the Contractor shall dispose of such property in the manner directed by the Contracting Officer. The contract price includes no compensation to the Contractor for the performance of any repair or replacement for which the Government is responsible, and an equitable adjustment will be made in any contractual provisions affected by such repair or replacement of Government property made at the direction of the Government, in accordance with the procedures provided for in the "Changes" clause of this contract. Any repair or replacement for which the Contractor is responsible under the provisions of this contract shall be accomplished by the Contractor at his own expense.

(g) Risk of Loss. Unless otherwise provided in this contract, the Contractor assumes the risk of, and shall be responsible for, any loss of or damage to Government property provided under this contract upon its delivery to him or upon passage of title thereto to the Government as provided in paragraph (c) hereof, except for reasonable wear and tear and except to the extent that such property is consumed in the performance of this contract.

(h) Access. The Government, and any persons designated by it, shall at all reasonable times have access to the premises wherein any Government property is located, for the purpose of inspecting the Government property.

(i) Final Accounting and Disposition of Government Property. Upon the completion of this contract, or at such earlier dates as may be fixed by the Contracting Officer, the Contractor shall submit, in a form acceptable to the Contracting Officer, inventory schedules covering all items of Government property not consumed in the performance of this contract (including any resulting scrap) or not theretofore delivered to the Government, and shall prepare for shipment, deliver f.o.b. origin, or dispose of the Government property, as may be directed or authorized by the Contracting Officer. The net proceeds of any such disposal shall be credited to the contract price or shall be paid in such other manner as the Contracting Officer may direct.

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(j) Restoration of Contractor's Premises and Abandonment. Unless otherwise provided herein, the Government:

(i) may abandon any Government property in place, and thereupon all obligations of the Government regarding such abandoned property shall cease; and

(ii) has no obligation to the Contractor with regard to restoration or rehabilitation of the Contractor's premises, neither in case of abandonment (paragraph (j)(i) above), disposition on completion of need or of the contract (paragraph (i) above), nor otherwise, except for restoration or rehabilitation costs which are properly included in an equitable adjustment under paragraph (b) above.

(k) Communications. All communications issued pursuant to this clause shall be in writing or in accordance with the "Manual for Military Standard Requisitioning and Issue Procedure (MILSTRIP) for Defense Contractors" (Appendix H, Defense Acquisition Regulation). (DAR 7-104.24(a))

67. VARIATIONS IN ESTIMATED QUANTITIES (1968 APR)

(The following clause is not applicable to bid items listed in the "Variations in Estimated Quantities - Subdivided Items" clause, and also is not applicable to contracts for dredging work which contain the "Variations in Estimated Quantities - Dredging" clause.)

Where the quantity of a pay item in this contract is an estimated quantity and where the actual quantity of such pay item varies more than fifteen percent (15%) above or below the estimated quantity stated in this contract, an equitable adjustment in the contract price shall be made upon demand of either party. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above one hundred fifteen percent (115%) or below eighty-five percent (85%) of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the Contracting Officer shall, upon receipt of a written request for an extension of time within ten (10) days from the beginning of such delay, or within such further period of time which may be granted by the Contracting Officer prior to the date of final settlement of the contract, ascertain the facts and make such adjustment for extending the completion date as in his judgment the findings justify. (DAR 7-603.27)

68. PROGRESS CHARTS AND REQUIREMENTS FOR OVERTIME WORK (1965 JAN)

(a) The Contractor shall within 5 days or within such time as determined by the Contracting Officer, after date of commencement of work, prepare and submit to the Contracting Officer for approval a practicable schedule, showing the order in which the Contractor proposes to carry on the work, the date on which he will start the several salient features (including procurement of materials, plant and equipment) and the contemplated dates for completing the same. The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion at any time. The Contractor shall enter on the chart the actual progress at such intervals as directed by the Contracting Officer, and shall immediately deliver to the Contracting Officer three copies thereof. If the Contractor fails to submit a progress schedule within the time herein prescribed, the Contracting Officer may withhold approval of progress payment estimates until such time as the Contractor submits the required progress schedule.

(b) If, in the opinion of the Contracting Officer, the Contractor falls behind the progress schedule, the Contractor shall take such steps as may be necessary to improve his progress and the Contracting Officer may require him

to increase the number of shifts, or overtime operations, days of work, or the amount of construction plant, or all of them, and to submit for approval such supplementary schedule or schedules in chart form as may be deemed necessary to demonstrate the manner in which the agreed rate of progress will be regained, all without additional cost to the Government.

(c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this provision shall be grounds for determination by the Contracting Officer that the Contractor is not prosecuting the work with such diligence as will insure completion within the time specified. Upon such determination the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part thereof, in accordance with the clause of the contract entitled "Termination for Default - Damages for Delay - Time Extensions." (DAR 7-603.48)

69. CERTIFICATION OF REQUESTS FOR ADJUSTMENT OR RELIEF EXCEEDING $100,000 (1980 FEB)

(The following clause is applicable if this contract is expected to exceed $100,000 and the procurement instrument identification number is prefixed by the letters "DACA")

(a) Any contract claim, request for equitable adjustment to contract terms, request for relief under Public Law 85-804, or other similar request exceeding $100,000 shall bear, at the time of submission, the following certificate given by a senior company official in charge at the plant or location involved:

> I certify that the claim is made in good faith, that the supporting data are accurate and complete to the best of my knowledge and belief; and that the amount requested accurately reflects the contract adjustment for which the Contractor believes the Government is liable.
>
> _____
> (Official's Name)
>
> _____
> (Title)

(b) The certification in paragraph (a) requires full disclosure of all relevant facts, including cost and pricing data.

(c) The certification requirement in paragraph (a) does not apply to:

(i) requests for routine contract payments--for example, those for payment for accepted supplies and services, routine vouchers under cost reimbursement-type contracts and progress payment invoices;

(ii) final adjustments under incentive provisions of contracts;

(d) In those situations where no claim certification for the purposes of Section 813 has been submitted prior to the inception of a contract dispute, a single certification, using the language prescribed by the Contract Disputes Act but signed by a senior company official in charge at the plant or location involved, will be deemed to comply with both statutes. (DAR 7-104.102)

70. AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS FOR CONSTRUCTION (1982 FEB)

(a) As used in this clause:

(1) "Covered area" means the geographical area described in the solicitation from which this contract resulted;

(2) "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;

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(3) "Employer identification number" means the Federal social security number used on the employer's quarterly federal tax return, U.S. Treasury Department Form 941.

(4) "Minority" includes:

(i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

(ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);

(iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

(iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

(b) Whenever the Contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of this clause and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitation from which this contract resulted.

(c) If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan, in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals.

(d) The Contractor shall implement the specific affirmative action standards provided in subparagraphs (g)(1) through (16) of this clause. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. If the Contractor performs construction work (whether or not it is Federal or Federally assisted) in a geographical area located outside of the covered area, it shall apply the goals established for the geographical area where such work is actually performed. The Contractor is expected to make substantially uniform progress toward its goal in each craft.

(e) Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under this clause, Executive Order 11246, or the regulations promulgated pursuant thereto.

(f) In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

(g) The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with this clause shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

(1) Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

(2) Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

(3) Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.

(4) Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

(5) Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under (g)(2) above.

(6) Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority

and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

(7) Review, at least annually, the company's EEO policy and affirmative action obligations under this clause with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with onsite supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

(8) Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and subcontractors with whom the Contractor does or anticipates doing business.

(9) Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

(10) Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's workforce.

(11) Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

(12) Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

(13) Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under this clause are being carried out.

(14) Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

(15) Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

(16) Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

(h) Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations ((g)(1) through (16)). The efforts of a contractor association, joint contractor-union, contractor-community, or other

similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under (g)(1) through (16) of this clause provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractors noncompliance.

(i) A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

(j) The Contractor shall not use the goals or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

(k) The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

(l) The Contractor shall carry out such sanctions and penalties for violation of this clause and of the Equal Opportunity clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of this clause and Executive Order 11246, as amended.

(m) The Contractor, in fulfilling its obligations under this clause shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph (g) of this clause, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or this clause, the Director shall proceed in accordance with 41 CFR 60-4.8.

(n) The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

(o) Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program). (DAR 7-603.60)

71. UTILIZATION OF WOMEN-OWNED BUSINESS CONCERNS (OVER $10,000) (1980 AUG)

(a) It is the policy of the United States Government that women-owned businesses shall have the maximum practicable opportunity to participate in the performance of contracts awarded by any Federal agency.

(b) The Contractor agrees to use its best efforts to carry out this policy in the award of subcontracts to the fullest extent consistent with the efficient performance of this contract. As used in this contract, a "women-owned business" concern means a business that is at least 51 percent owned by a woman or women who are U.S. citizens and who also control and operate the business and that is a small business as defined pursuant to Section 3 of the Small Business Act and relevant regulations promulgated pursuant thereto. "Control" in this context means exercising the power to make policy decisions. "Operate" in this context means being actively involved in the day-to-day management.

(c) Contractors acting in good faith may rely on written representations by their subcontractors regarding their status as women-owned business concerns. (DAR 7-104.52)

72. PROPERTY RECORDS (1967 AUG)

The Government shall maintain the official contract records in connection with Government property under this contract. The "Government Property" clause is hereby modified by deleting so much thereof as requires that the Contractor maintain such records. (DAR 13-803/7-104.24(g)).

SECTION 1A

SPECIAL PROVISIONS

1. COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK

(a) The Contractor will be required to commence work under this contract within ten (10) calendar days after the date of receipt by him of notice to proceed unless otherwise noted, to prosecute said work diligently, and to complete the entire work ready for use not later than the dates or number of calendar days after the date of receipt by him of notice to proceed set forth in the schedule below:

SCHEDULE

	Item of Work	Completion of Work (calendar days)	Anticipated Weather Delays (calendar days)	Liquidated Damages per calendar day
(1)	All work except establishment of turf.	180	25	$230.00
(2)	Establishment of turf.	*	2	$ 60.00

*Establishment of turf. The planting season for turfing work shall be from 1 March to 1 May; planting shall be accomplished during the first planting season, or portion thereof (but not less than 15 days), following substantial completion of construction. Maintenance of turfing work shall commence immediately after completion of initial watering and shall continue for a period of not less than 45 calendar days.

(b) The time stated for completion shall include final cleanup of the premises. (DAR 7-602.44)

(c) The times stated for completion do not include those items such as as-built drawings, operation and maintenance manuals, testing of heating and air-conditioning systems, inventory of installed property, spare parts, spare parts data, etc., for which a different completion time is specified in the technical provisions. (SWFPS)

2. ANTICIPATED NORMAL WEATHER DELAYS

The time established in paragraph 1, Commencement, Prosecution, and Completion of Work, for completion of the entire work ready for use includes the number of calendar days set forth in the schedule in paragraph 1(a) above, for anticipated delays due to normal weather conditions not excusable under GP-5(d). No time extension for delays due to weather will be allowed until and unless such delays exceed the time included for normal weather delays, after which time extensions will be granted for all weather delays which are beyond the control and without the fault or negligence of the Contractor within the meaning of GP-5(d). (SWDCC)

3. CONTRACT DRAWINGS, MAPS AND SPECIFICATIONS (1965 JAN)

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(a) Two (2) sets of full-size contract drawings and maps (one blue-line and one reproducible), five (5) sets of half-size contract drawings and maps, and ten (10) sets of contract specifications will be furnished the Contractor without charge except applicable publications incorporated into the technical provisions by reference. One set of full-size reproducible drawings and one set of half-size prints will be furnished with each final modification. Additional sets will be furnished on request at the cost of reproduction. The work shall conform to the following contract drawings and maps, all of which form a part of these specifications and are available in the office of the Corps of Engineers, Department of the Army, at 819 Taylor, Fort Worth, Texas.

CONTRACT DRAWINGS
DACA 87-84-C-0087
LONGHORN ARMY AMMUNITION PLANT
MARSHALL, TEXAS

Sequence No.	Title	Drawing No.	Sheet No.
	The list of drawings and maps set out in the index on the drawings is hereby incorporated by reference into these specifications.		
	Schedules included in the drawings are for the purpose of defining requirements other than quantities.		

(b) Omissions from the drawings or specifications or the misdescription of details of work which are manifestly necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the work but they shall be performed as if fully and correctly set forth and described in the drawings and specifications.

(c) The Contractor shall check all drawings furnished him immediately upon their receipt and shall promptly notify the Contracting Officer of any discrepancies. Figures marked on drawings shall in general be followed in preference to scale measurements. Large scale drawings shall in general govern small scale drawings. The Contractor shall compare all drawings and verify the figures before laying out the work and will be responsible for any errors which might have been avoided thereby. (DAR 7-602.45)

4. REQUIRED INSURANCE (1977 JAN)

(a) The Contractor shall procure and maintain during the entire period of his performance under this contract the following minimum insurance.

(1) Workmen's compensation and employers' liability insurance in compliance with applicable state statutes, with a minimum employers' liability coverage of $100,000.

(2) Comprehensive general liability insurance for bodily injury in the minimum limits of $300,000 per occurrence. No property damage liability insurance is required.

(3) Comprehensive automobile liability insurance covering the operation of all automobiles used in connection with the performance of the contract in the minimum limits of $100,000 per person and $300,000 per occurrence for bodily injury and $10,000 per occurrence for property damage.

(b) Prior to the commencement of work hereunder, the Contractor shall furnish to the Contracting Officer a certificate or written statement of the above required insurance. The policies evidencing required insurance shall contain an endorsement to the effect that cancellation or any material change in the policies adversely affecting the interests of the Government in such insurance shall not be effective for such period as may be prescribed by the laws of the State in which this contract is to be performed and in no event less than thirty (30) days after written notice thereof to the Contracting Officer.

(c) The Contractor agrees to insert the substance of this clause, including this paragraph (c), in all subcontracts hereunder. (DAR 7-603.10)

5. PERFORMANCE OF WORK BY CONTRACTOR (1965 JAN)

The Contractor shall perform on the site, and with his own organization, work equivalent to at least twenty-five percent (25%) of the total amount of work to be performed under the contract. If, during the progress of the work hereunder, the Contractor requests a reduction in such percentage; and the Contracting Officer determines that it would be to the Government's advantage, the percentage of the work required to be performed by the Contractor may be reduced; provided, written approval of such reduction is obtained by the Contractor from the Contracting Officer. (DAR 7-603.15)

6. SHOP DRAWINGS

(a) Shop drawings shall be submitted in accordance with the procedures listed below and in the Technical Provisions Section titled Contractor Quality Control System.

(b) The following classifications of shop drawings are designated Category I and will be given priority in review; 1 set will be returned to the Contractor, with approval (or disapproval) action indicated.

(1) Extensions of design such as (a) structural steel members and connections not shown on the drawings, (b) steel joists other than standard J-, H-, LJ-, and LH-series, and (c) any items for which the drawings or specifications require submittal of design calculations.

(2) Deviations and/or departures from the contract drawings when deemed necessary by the Contractor.

(c) Shop drawings other than those in (b) above are designated Category II and will receive a cursory review, only, and may be subject to further review at any time during the course of the contract. One set will be returned to the Contractor with approval (or disapproval) action indicated. No adjustment for time or money will be allowed for corrections required as a result of non-compliance with contract plans and/or specifications.

(d) The Contractor shall certify that each submittal is correct and in strict conformance with the contract drawings and specifications. All proposed deviations requested by the Contractor shall be noted on the transmittal form ENG Form 4025. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the shop drawing. If these requirements are not met, the submittal shall be returned to the Contractor for corrective action. (ER 415-1-10)

7. PHYSICAL DATA (1065 JAN) (DAR 7-603.25)

Information and data furnished or referred to below are furnished for the Contractor's information. However, it is expressly understood that the Government will not be responsible for any interpretation or conclusion drawn therefrom by the Contractor.

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(a) The physical conditions indicated on the drawings and in the specifications are the result of site investigations by surveys and borings.,

(b) Weather conditions. The following information is for Longhorn AAP, Karnak, Texas, and from the U.S. Weather Bureau Station at Shreveport, Louisiana.

PRECIPITATION

Month	Normal (inches) (a)	Maximum of Record (inches) (b)	Minimum of Record (inches) (b)	24-Hour Maximum (inches) (b)	Average No. of Days w/0.01 Inch or More (d)
Jan	4.04	12.11	0.27	7.52	10
Feb	3.71	8.96	0.01	3.57	8
Mar	4.10	11.99	0.56	5.43	10
Apr	5.19	11.19	0.24	7.17	9
May	5.04	14.47	0.08	8.35	9
Jun	3.34	12.39	0.05	8.00	7
Jul	2.89	25.45	T	12.44	8
Aug	2.68	10.89	0.02	6.47	7
Sep	3.07	16.46	0.09	7.04	7
Oct	2.90	14.02	0.00	6.83	6
Nov	3.57	10.09	0.04	5.94	8
Dec	4.19	15.55	0.64	7.18	9
Annual or Extreme	44.72	67.23 (1957)	23.10 (1899)	12.44 (1933)	98

TEMPERATURE

Month	Normal (°F) (a)	Maximum of Record (°F) (c)	Minimum of Record (°F) (c)	Average No. of Days w/32°F or Below (d)
Jan	47.2	84	-2	13
Feb	50.5	89	-5	8
Mar	56.8	92	15	3
Apr	66.4	96	31	*
May	73.4	101	42	0
Jun	80.2	106	52	0
Jul	83.2	107	58	0
Aug	83.2	110	54	0
Sep	77.4	105	42	0
Oct	67.5	99	29	*
Nov	56.2	88	16	3
Dec	49.2	84	9	10
Annual or Extreme	65.9	110 (1909)	-5 (1899)	37

(a) Based on the record for the 1941-1979 period.
(b) Period of record 1872-1980.
(c) Period of record 1875-1980.

(d) Based on the record for the 1953-1980 period.
* Denotes less than ½ day.

(c) Ground water levels. It has been observed that ground water levels in heavily timbered or grassed areas quite often undergo a significant temporary rise when the area is cleared and/or stripped. This increase in water level can hinder traffic and construction progress in the affected areas. The duration of the ground water rise varies considerably, depending on prevailing weather and/or climatic conditions. Ref: Yearbook of Agriculture, 1957, copy available for inspection in Fort Worth District Office.

8. SALVAGE MATERIALS AND EQUIPMENT (1965 JAN)

The Contractor shall maintain adequate property control records for all materials or equipment specified to be salvaged. These records may be in accordance with the Contractor's system of property control, if approved by the property administrator. The Contractor shall be responsible for the adequate storage and protection of all salvaged materials and equipment and shall replace, at no cost to the Government, all salvage materials and equipment which are broken or damaged during salvage operations as the result of his negligence, or while in his care. (DAR 7-603.29)

9. AVAILABILITY AND USE OF UTILITY SERVICES (1967 APR)

(a) The Government will make available to the Contractor, from existing outlets and supplies, all reasonably required amounts of utilities as specified in the Schedule or specifications. Except as otherwise provided in the Schedule or specifications, each utility shall be charged to or paid for by the Contractor at prevailing rates charged to the Government or, where the utility is produced by the Government, at reasonable rates as determined by the Contracting Officer.

(b) The Contractor shall carefully conserve utilities furnished without charge. The Contractor, at his own expense and in a workmanlike manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines and, if necessary to determine charges, all meters required to measure the amount of each utility used; and he shall remove the same prior to final acceptance of the construction. (DAR 7-603.30)

10. PAYMENT FOR UTILITY SERVICES

Water, gas, and electricity are available from the Government-owned and operated systems and will be furnished without charge to the Contractor. (DAR 2-201(b))(xxxvi))

11. LAYOUT OF WORK (1965 JAN)

The Contractor shall lay out his work from Government established base lines and bench marks indicated on the drawings and shall be responsible for all measurements in connection therewith. The Contractor shall furnish, at his own expense, all stakes, templates, platforms, equipment, tools, and materials and labor as may be required in laying out any part of the work from the base lines and bench marks established by the Government. The Contractor will be held responsible for the execution of the work to such lines and grades as may be established or indicated by the Contracting Officer. It shall be the responsibility of the Contractor to maintain and preserve all stakes and other marks established by the Contracting Officer until authorized to remove them. If such marks are destroyed, by the Contractor or through his

negligence, prior to their authorized removal, they may be replaced by the Contracting Officer at his discretion. The expense of replacement will be deducted from any amounts due or to become due the Contractor. (DAR 7-604.3)

12. IDENTIFICATION OF EMPLOYEES (1965 JAN)

The Contractor shall be responsible for furnishing to each employee and for requiring each employee engaged on the work to display such identification as may be approved and directed by the Contracting Officer. All prescribed identification shall immediately be delivered to the Contracting Officer, for cancellation upon the release of any employee. When required by the Contracting Officer the Contractor shall obtain and submit fingerprints of all persons employed or to be employed on the project. (DAR 7-603.34)

13. TIME EXTENSIONS (1965 JAN)

Notwithstanding any other provisions of this contract it is mutually understood that the time extensions for changes in the work will depend upon the extent, if any, by which the changes cause delay in the completion of the various elements of construction. The change order granting the time extension may provide that the contract completion date will be extended only for those specific elements so delayed and that the remaining contract completion dates for all other portions of the work will not be altered and may further provide for an equitable readjustment of liquidated damages pursuant to the new completion schedule (DAR 7-603.36)

14. LIQUIDATED DAMAGES (1965 JAN)

In case of failure on the part of the Contractor to complete the work within the time fixed in the contract or any extensions thereof, the Contractor shall pay to the Government as liquidated damages, pursuant to the clause of this contract entitled "Termination for Default - Damages for Delay - Time Extensions," the sums for each day of delay as set forth in the Schedule in Paragraph 1(a) above. (DAR 7-603.39)

15. CERTIFICATES OF COMPLIANCE (1969 MAY OCE)

Any certificates required for demonstrating proof of compliance of materials with specification requirements shall be executed in the number of copies specified in Technical Provisions Section: Contractor Quality Control System. Each certificate shall be signed by an official authorized to certify in behalf of the manufacturing company and shall contain the name and address of the Contractor, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification shall not be construed as relieving the Contractor from furnishing satisfactory material, if, after tests are performed on selected samples, the material is found not to meet the specific requirements. (ECI 7-670.3)

16. SPECIAL RESTRICTIONS ON PERIOD OF SITE ACCESS

The site of the project is located immediately adjacent to an area used for burning of pyrotechnic materials. Burning usually occurs between 8:30 and 10:00 each week day morning. During the period of burning it will be necessary for the Contractor to limit his activities to the side of the site which is opposite the burning operation and exercise extreme care in location of equipment and materials on the side of the site that is adjacent to the burning grounds.

17. CONTRACTOR QUALITY CONTROL SYSTEM

Requirements for quality control by the Contractor are outlined in Section 1(c) of these specifications.

18. ACCIDENT PREVENTION PREPLANNING

Requirements in addition to those outlined in General Provision clause "Accident Prevention" are included in Section 2(a) of these specifications.

19. SCHEDULE FOR SUBMITTALS

A schedule shall be submitted to the Contracting Officer within 21 calendar days after the date of receipt of the notice to proceed. This schedule, submitted in quadruplicate, shall indicate, among other things, the Contractor's proposed schedule for submitting shop drawings, manufacturer's literature, certificates of compliance, material samples, computations, test results, design mixes, mill reports, layouts, guarantees, etc. Additionally, the schedule shall reflect the following information for each item:

(a) Description.

(b) Reference to the applicable paragraph in the contract specifications and/or plate number in chronological order of the contract drawings that requires the submittal.

(c) The dates he proposes to furnish the submittals.

(d) The dates the materials, equipment, etc., are needed at the jobsite.

(e) Designation of shop drawing category (Category I or II).

(f) The date that approval is needed by the Contractor. (A minimum of 30 days or more should be allowed for Government Review of Category I shop drawings.)

Upon request, the Contracting Officer will furnish forms on which the above information can be tabulated. In preparing the schedule, the Contractor shall coordinate it with the approved contract progress schedule and shall allow a minimum of 21 days for its review and approval by the Contracting Officer. Furnishing of the schedule shall not be interpreted as relieving the Contractor of his obligation to comply with all of the contract requirements for the items listed on the schedule. The Contractor's quality control representative shall review the listing at least every 30 days and take appropriate action to maintain an effective and updated system and a copy of the schedule shall be maintained at the jobsite. Revised and/or updated schedules shall be submitted to the Contracting Officer at least every 60 days in quadruplicate (complete register need not be provided, only those portions containing additions or changes). Payment will not be made for any material or equipment which does not comply with contract requirements. (SWFCD)

20. PROGRESS PAYMENTS

Material delivered to the Contractor at locations other than the site may be taken into consideration in making progress payments if the Contractor furnishes satisfactory evidence that he has acquired title to such material and that it will be utilized on the work covered by this contract. (SWFPS)

21. SECURITY OF PLANT

Special requirements for security of the plant are described in Section 1D of these specifications.

000727

APPENDIX A - BORING LOGS

GENERAL NOTES:

Boring logs on the following sheets shall not be copied or altered. Logs may show ground water depths on the dates measured. The water level may vary considerably from the levels shown depending on season, weather conditions and other factors. Absence of water surface data implies that no ground water data is available and should not be construed to mean that groundwater was not present or that groundwater will not be encountered at the locations of these borings. Any conclusions drawn by the Contractor regarding groundwater level shall be the Contractor's sole responsibility.

Boring logs are included for the following:

Borrow Areas:

8A-812	8A-821
8A-813	8A-822
8A-814	8A-823
8A-815	8A-824
8A-816	3A-825
8A-817	3A-826
8A-818	3A-827
8A-819	3A-828
8A-820	3A-829

Pond Site:

BH-1	BH-6
BH-2	BH-7
BH-3	BH-8
BH-4	BH-9
BH-5	BH-10

Locations of the borings listed above are shown on the plans.

000728

AUG 1984 Hole No. 8A-812

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 8" Push	
2. LOCATION (Coordinates or Station) Common Borrow		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number) 8A-812		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 3/29/83 COMPLETED 3/29/83	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 199.7	
9. TOTAL DEPTH OF HOLE 10.0		18. TOTAL CORE RECOVERY FOR BORING	
		19. SIGNATURE OF INSPECTOR Raymond T. Hayes	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 - 2.5			JAR SAMPLES:
			CLAY, SOFT, WET, TAN, SANDY.			A. 0.0 - 2.5
			2.5 - 5.0			B. 2.5 - 5.0
			CLAY, SANDY, STIFF, MOIST, LOW PLAS.			C 5.0 - 10.0
			5.0 - 10.0			
			CLAY, SILTY, STIFF, MOIST, YELLOW-BRN & LT. GRAY, LOW - MED PLAS.			
			T.D @ 10.0'			

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PROJECT LONGHORN AAP

HOLE NO. 8A-812

SWTUO
000729

Hole No. 8A-813

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET 1 OF 1 SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 8" HSA	
2. LOCATION (Coordinates or Station) Common Borrow		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number) 8A-813		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN: DISTURBED 4 JAR; UNDISTURBED 3 BAGS	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 3/29/84; COMPLETED 3/29/84	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 200.0	
9. TOTAL DEPTH OF HOLE 10.0		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR Raymond L. Hagen	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-4.0			JAR SAMPLES:
			CLAY, SANDY, GRAY.			A. 0.0-2.0
			0.0-2.0 SOFT, WET			B. 2.0-4.0
			2.0-4.0 V. STIFF, MOIST.			C. 4.0-8.0
			4.0-8.0			D. 8.0-10.0
			CLAY, SILTY, SANDY, LT. GRAY & YELLOW-BRN, MED-LOW PLAS.			BAG SAMPLES:
			8.0-10.0			THREE BAGS OBTAINED FROM 2.0-5.0
			CLAY, LT. GRAY & YELLOW-BRN, MED-HI PLAS			
			T.D. @ 10.0'			

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Hole No. SA-S14

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 8" PUSH	
2. LOCATION (Coordinates or Station) COMMON BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number) SA-S14		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER 8.5'	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 3/29/84; COMPLETED 3/29/84	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 200.5	
9. TOTAL DEPTH OF HOLE 10.0		18. TOTAL CORE RECOVERY FOR BORING	
		19. SIGNATURE OF INSPECTOR Raymond T. Hagen	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-0.5 CLAY, V. SANDY, SOFT, WET. 0.5-4.0 CLAY, SOFT-MED. STIFF, WET, YELLOW-BRN & LT. GRAY, MED. PLAS 4.0-6.0 CLAY, STIFF, MOIST, LT. GRAY & RUST. MED-H, PLAS 6.0-8.5 CLAY, SANDY, MED. STIFF, MOIST, YELLOW-BROWN & LT. GRAY. MED. PLAS 8.5-10.0 SAND, CLAYEY, TAN, SATD, FINE T.D. @ 10.0'			JAR SAMPLES A. 0.5-4.0 B. 4.0-6.0 C. 6.0-8.5

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PROJECT / HOLE NO

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Hole No. [illegible]

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 5" PUSH	
2. LOCATION (Coordinates or Station) COMMON BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number) 8A-815		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 4 JARS; UNDISTURBED NONE	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER 8.5	
		16. DATE HOLE STARTED 3/29/84 COMPLETED 3/29/84	
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE 200.4	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING %	
9. TOTAL DEPTH OF HOLE 10.0		19. SIGNATURE OF INSPECTOR Raymond T. Hagan	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 - 3.5			JAR SAMPLES:
			CLAY, SANDY, SOFT, MOIST, YELLOW-BRN & RUST			A. 0.0 - 3.5
			3.5 - 6.0			B. 3.5 - 6.0
			CLAY, STIFF, MOIST, LT. GRAY & RED-BROWN, HI PLAS			C. 6.0 - 8.5
			6.0 - 8.5			D. 8.5 - 10.0
			CLAY, V. SANDY, MED. STIFF, WET, TAN			
			8.5 - 10.0			
			SAND, CLAYEY, SAT'D, TAN, FINE			
			T.D. @ 10.0'			

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PROJECT LONGHORN AAP HOLE NO. 8A-81[illegible]

000732

Hole No. 83,000

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 5" Rush	
2. LOCATION (Coordinates or Station) Common Borrow		11. DATUM FOR ELEVATION SHOWN (TBM – MSL)	
3. DRILLING AGENCY USC.E.		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number) SA-816		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER Williams		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER Not Encountered	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 3/30/84; COMPLETED 3/30/84	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 199.8	
9. TOTAL DEPTH OF HOLE 10.0		18. TOTAL CORE RECOVERY FOR BORING //	
		19. SIGNATURE OF INSPECTOR Radwandt-Hogan	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-3.0			JAR SAMPLES
			CLAY, SANDY, SOFT, WET TAN, MED. PLAS.			A. 0.0-3.0
			3.0-6.0			B. 3.0-6.0
			CLAY SANDY, STIFF, MOIST, LT. GRAY, MED-HI PLAS.			C. 6.0-10.0
			6.0-10.0			
			CLAY, V. SANDY, STIFF, WET, TAN, LOW PLAS			
			T.D. @ 10.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT Longhorn AAP

HOLE NO. SA-8

SET 000

000733

Hole No. SA-817

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET 1 OF SHEETS

1. PROJECT: LONGHORN AAP
2. LOCATION (Coordinates or Station): COMMON BORROW
3. DRILLING AGENCY: USCE
4. HOLE NO. (As shown on drawing title and file number): SA-817
5. NAME OF DRILLER: WILLIAMS
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 10.0
10. SIZE AND TYPE OF BIT: 8" PUSH
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: TEXHOMA
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3 JAR; UNDISTURBED 3 BAGS
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER: NOT ENCOUNTERED
16. DATE HOLE: STARTED 3/30/84; COMPLETED 3/30/84
17. ELEVATION TOP OF HOLE: 199.8
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR: Richard T. Kleppe

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-2.5 CLAY, SANDY, SOFT, WET, TAN, MED. PLAS. 2.5-5.5 CLAY, MED. STIFF, MOIST, LT. GRAY MOTTLED RUST, HI. PLAS. 5.5-10.0 CLAY, V. SANDY, MED DENSE, MOIST-WET, LT-GRAY MOTTLED RUST, MED-LOW PLAS T.D. @ 10.0'			JAR SAMPLES: A. 0.0-2.5 B. 2.5-5.5 C. 5.5-10.0 BAG SAMPLES: THREE BAGS OBTAINED FROM 2.0-5.0.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE

PROJECT: LONGHORN AAP HOLE NO. SA-817

000734

Hole No. 318-8A-818

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 5" Rock	
2. LOCATION (Coordinates or Station) IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXOMA	
4. HOLE NO. (As shown on drawing title and file number) 8A-818		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3 JAR; UNDISTURBED 3 BAGS	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
		16. DATE HOLE STARTED 4/2/84 COMPLETED 4/2/84	
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE 299.4	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING	
9. TOTAL DEPTH OF HOLE		19. SIGNATURE OF INSPECTOR Raymond T. Hagan	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-6.5 CLAY, STIFF, MOIST, LT. GRAY & RUST, HI PLAS.			JAR SAMPLES A. 0.0 - 6.5 B. 6.5 - 8.5 C 8.5 - 10.0
			6.5 - 8.5 CLAY, SANDY, STIFF, MOIST, LT. GRAY & RUST LOW - MED. PLAS.			
			8.5-10.0 SAND, CLAYEY, MED. DENSE, FINE, LOW PLAS.			BAG SAMPLES: THREE BAGS OBTAINED FROM 2.0' - 4.0'
			T. D. @ 10.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT LONGHORN AAP HOLE NO. 8A-818

DE7060

000735

Hole No. SA-819

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET 1 OF 1 SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT	
2. LOCATION (Coordinates or Station) E IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number) SA-819		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED 3 JAR / UNDISTURBED NONE
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
		16. DATE HOLE	STARTED 4/2/84 / COMPLETED 4/2/84
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE 298.3	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING	%
9. TOTAL DEPTH OF HOLE 10.0		19. SIGNATURE OF INSPECTOR R. Raymond S. T. Hayes	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 - 3.0			
			CLAY STIFF, MOIST, RED-BROWN, HI PLAS.			JAR SAMPLES
			3.0 - 6.0			A. 0.0 - 3.0
			SAND, V. CLAYEY, MED. DENSE, MOIST, RED-BROWN. LOW PLAS.			B. 3.0 - 6.0
			6.0 - 10.0			C. 6.0 - 10.0
			CLAY, SANDY, STIFF, MOIST, RED-BROWN, MED. PLAS.			
			T.D. @ 10.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT LONGHORN AAP HOLE NO. SA-819

000736

Hole No. SA-820

DRILLING LOG	DIVISION SWD	INSTALLATION FW-J	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 5" PUSH	
2. LOCATION (Coordinates or Stations) IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number) SA-820		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2 JARS; UNDISTURBED 3 BAGS	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 9/2/84 COMPLETED 9/2/84	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 301.5	
9. TOTAL DEPTH OF HOLE 10.0		18. TOTAL CORE RECOVERY FOR BORING	
		19. SIGNATURE OF INSPECTOR Raymond F. Morgan	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-5.5			JAR SAMPLES:
			CLAY, MED. STIFF, MOIST, RED-BROWN & LT. GRAY, HI PLAS.			A. 0.0-5.5
			5.5-10.0			B. 5.5-10.0
			SAND, SILTY, CLAYEY, MED. DENSE, MOIST, TAN, LOW PLAS.			BAG SAMPLES:
						THREE BAGS OBTAINED FROM 2.0-5.0
			T.D. @ 10.0			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT LONGHORN AAP HOLE NO. SA-820

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Hole No. IVI SA-1

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET 1 OF 1 SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 5" PUSH	
2. LOCATION (Coordinates or Station) IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TUM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and file number) 8A-821		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2 JAR; UNDISTURBED 3 BAGS	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED 4/2/84; COMPLETED 4/2/84	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 279.1	
9. TOTAL DEPTH OF HOLE 10.0		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR Raymond F. Hagen	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-5.0 CLAY, SANDY, MED. STIFF, MOIST, TAN & RED-BROWN, MED. PLAS.			JAR SAMPLES: A. 0.0-5.0 B. 5.0-10.0
			5.0-10.0 CLAY SANDY, MED. STIFF, MOIST, TAN & RUST, MED. PLAS.			BAG SAMPLES: THREE BAGS OBTAINED FROM 2.0-5.0'
			T.D. @ 10.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT LONGHORN AAP HOLE NO. 8A-821

000738

Hole No. SA-822 (11)

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET 1 OF 1 SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 3" Push	
2. LOCATION (Coordinates or Station) IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TUM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TEXHOMA	
4. HOLE NO. (As shown on drawing title and title number) SA-822		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER Williams		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED 4/2/84; COMPLETED 4/2/84	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 281.7	
9. TOTAL DEPTH OF HOLE 10.0		18. TOTAL CORE RECOVERY FOR BORING	
		19. SIGNATURE OF INSPECTOR Raymond T. Rogers	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 - 6.0			
			CLAY SANDY, MED. STIFF, MOIST, TAN & RUST, MED. PLAS.			JAR SAMPLES
			6.0 - 10.0			A. 0.0 - 6.0
			CLAY V. SANDY, MED. STIFF, MOIST, TAN & RUST, MED. PLAS.			B. 6.0 - 10.0
			T.D. @ 10.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT LONGHORN AAP HOLE NO. SA-822

887000
000739

Hole No. SA-823

DRILLING LOG	DIVISION SWD	INSTALLATION Tulsa	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 3" PUSH	
2. LOCATION (Coordinates or Station) IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL TERRAMA	
4. HOLE NO. (As shown on drawing title and file number) SA-823		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
		16. DATE HOLE STARTED 4/2/84; COMPLETED 4/2/84	
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE 287.3	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING %	
9. TOTAL DEPTH OF HOLE 10.0		19. SIGNATURE OF INSPECTOR Raymond T. Nugent	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 - 10.0 CLAY SANDY, STIFF, MOIST, TAN & RUST, MED. PLAS.			JAR SAMPLES: A. 0.0 - 5.0 B. 5.0 - 10.0
			T.D. @ 10.0			

ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT LONGHORN AAP | HOLE NO. SA-823

000740

Hole No. SA-824

DRILLING LOG

DIVISION: SWD | INSTALLATION: FWD | SHEET 1 OF 1 SHEETS

1. PROJECT: LONGHORN AAP	10. SIZE AND TYPE OF BIT: 2" Pusi
2. LOCATION (Coordinates or Station): IMPERVIOUS BORROW	11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
3. DRILLING AGENCY: USCE	12. MANUFACTURER'S DESIGNATION OF DRILL: TEXHOMA.
4. HOLE NO. (As shown on drawing title and file number): SA-824	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2 JAR; UNDISTURBED NONE
5. NAME OF DRILLER: WILLIAMS	14. TOTAL NUMBER CORE BOXES:
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER: NOT ENCOUNTERED
7. THICKNESS OF OVERBURDEN:	16. DATE HOLE: STARTED 4/2/84; COMPLETED 4/2/84
8. DEPTH DRILLED INTO ROCK:	17. ELEVATION TOP OF HOLE: 291.0
9. TOTAL DEPTH OF HOLE: 10.0	18. TOTAL CORE RECOVERY FOR BORING:
	19. SIGNATURE OF INSPECTOR: Raymond T. Hayes

ELEVATION (a)	DEPTH (b)	LEGEND (c)	CLASSIFICATION OF MATERIALS (Description) (d)	% CORE RECOVERY (e)	BOX OR SAMPLE NO. (f)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) (g)
			0.0 - 10.0			
			CLAY, SANDY, STIFF, MOIST, RUST & LT. GRAY, MED. PLAS			JAR SAMPLES A. 0.0 - 5.0 B. 5.0 - 10.0
			T.D. @ 10.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT: LONGHORN AAP | HOLE NO. SA-824

05000
000741

Hole No. 3A-825-

DRILLING LOG	DIVISION SWD	INSTALLATION Fwd	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 3" AUGER	
2. LOCATION (Coordinates or Station) COMMON BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL HAND AUGER	
4. HOLE NO. (As shown on drawing title and file number) 3A-825-		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER HAGEN		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER 5.0'	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED 4/3/84; COMPLETED 4/3/84	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 201.0	
9. TOTAL DEPTH OF HOLE 6.0		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR Raymond T. Hagen	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 - 2.0			JAR SAMPLES
			CLAY, V. SANDY, SOFT, WET, TAN, LOW - MED PLAS.			A. 0.0 - 2.0
			2.0 - 5.0			B. 2.0 - 5.0
			CLAY, STIFF, MOIST, LT. GRAY & RED - BROWN, HI PLAS.			C. 5.0 - 6.0
			5.0 - 6.0			
			CLAY, STIFF, MOIST, RED - BROWN & LT. GRAY, INT. w/ SAT'D SAND SEAMS.			
			T.D. @ 6.0'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT LONG HORN AAP | HOLE NO. 3A-825-

000742

Hole No. 3A-826

DRILLING LOG	DIVISION SWD	INSTALLATION FWD	SHEET OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 3" AUGER	
2. LOCATION (Coordinates or Station) Common Borrow		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL HAND AUGER	
4. HOLE NO. (As shown on drawing title and file number) 3A-826		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 3 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER WILLIAMS		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER 4.5	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 4/3/54; COMPLETED 4/3/54	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 200.2	
9. TOTAL DEPTH OF HOLE 6.0		18. TOTAL CORE RECOVERY FOR BORING	
		19. SIGNATURE OF INSPECTOR Raymond F. Hagen	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV-ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 - 1.5			JAR SAMPLES:
			CLAY, V. SANDY, SOFT, WET, TAN.			A. 0.0 - 1.5
			1.5 - 4.5			B. 1.5 - 4.5
			CLAY, SANDY, STIFF, MOIST, TAN & RED-BROWN, MED-H, PLAS.			C 4.5 - 6.0
			4.5 - 6.0			
			SAND, CLAYEY, OCNSE, SAT'D, LT. GRAY MOTLED RUST.			
			T. O. @ 6.0			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT LONGHORN AAP HOLE NO. 3A-826

SA5000

000743

Hole No. W1 3A-1

DRILLING LOG	DIVISION SWD	INSTALLATION FWI,	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 3" AUGER	
2. LOCATION (Coordinates or Station) IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL HAND AUGER	
4. HOLE NO. (As shown on drawing title and file number) 3A-827		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER HAGEN		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 4/2/84 COMPLETED 4/2/84	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 301.4	
9. TOTAL DEPTH OF HOLE 6.0		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR Raymond T. Hagen	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 - 0.5 SAND, CLAYEY, LOOSE, WET, TAN			JAR SAMPLES:
			0.5 - 3.0 CLAY SANDY, MED. STIFF, MOIST, RED-BROWN, MED. PLAS.			A. 0.5 - 3.0
			3.0 - 6.0 CLAY STIFF, MOIST, RED-BROWN MOTTLED TAN, MED-HI PLAS			B. 3.0 - 6.0
			T.D. @ 6.0			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT LONGHORN AAP HOLE NO. 3A-827

000744

Hole No. GA5000

DRILLING LOG	DIVISION SWD	INSTALLATION TWD	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT 3" AUGER	
2. LOCATION (Coordinates or Station) IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL HAND AUGER	
4. HOLE NO. (As shown on drawing title and file number) 3A-828		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED 2 JAR; UNDISTURBED NONE	
5. NAME OF DRILLER HAGEN		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☒ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER NOT ENCOUNTERED	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE: STARTED 4/3/84; COMPLETED 4/3/84	
8. DEPTH DRILLED INTO ROCK		17. ELEVATION TOP OF HOLE 2942	
9. TOTAL DEPTH OF HOLE 6.0		18. TOTAL CORE RECOVERY FOR BORING	
		19. SIGNATURE OF INSPECTOR Raymond T Hagen	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0 - 0.5 SAND, CLAYEY, LOOSE, MOIST, TAN			TAR SAMPLES A 0.5 - 4.0 B 4.0 - 6.0
			0.5 - 4.0 CLAY, SANDY, STIFF, MOIST, RED-BROWN, MED. PLAS.			
			4.0 - 6.0 CLAY, STIFF, MOIST, RED-BROWN MOTTLED LT. GRAY, MED-H. PLAS.			
			T.D. @ 6.0			

ENG FORM 1836 MAP 7' PREVIOUS EDITIONS ARE OBSOLETE.

PROJECT LONGHORN AAP HOLE NO 3A-828

LA5000
000745

Hole No. 1. ... 1

DRILLING LOG	DIVISION SWD	INSTALLATION Ft J	SHEET 1 OF SHEETS
1. PROJECT LONGHORN AAP		10. SIZE AND TYPE OF BIT	
2. LOCATION (Coordinates or Station) IMPERVIOUS BORROW		11. DATUM FOR ELEVATION SHOWN (TSM or MSL)	
3. DRILLING AGENCY USCE		12. MANUFACTURER'S DESIGNATION OF DRILL	
4. HOLE NO. (As shown on drawing title and file number) TP-829		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED / UNDISTURBED
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.		15. ELEVATION GROUND WATER	
		16. DATE HOLE	STARTED / COMPLETED
7. THICKNESS OF OVERBURDEN		17. ELEVATION TOP OF HOLE 295.9	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING %	
9. TOTAL DEPTH OF HOLE		19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	ROX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			0.0-0.5 SAND, CLAYEY, LOOSE, MOIST, TAN.			BAG SAMPLES THREE BAGS OBTAINED FROM 1.0-3.0
			0.5-3.0 CLAY, STIFF, MOIST, RED-BROWN, H, PLAS.			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT LONGHORN AAP | HOLE NO. TP-829

000746

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 24 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II BORE HOLE 1

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
	BS	Medium brown silty sand, fine in grain size.	Hit stone.
		Stone	Possible backfill for berm of pond.
5		Medium brown fine silty sand with some clay	Very moist
	ST		
10			
		Tan fine silty sand with some clay	Wet - auger sat for 2 days before finishing.
	BS		
15		Medium brown silty sand with clay	Damp

000747

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 24 Jan 80

LOCATION Longhorn AAP DRILLERS 1LT Corbitt
Mr. Kestner

DRILL RIG Acker II BORE HOLE 1

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
		Med brown silty sand with clay	WT
20			
25			
30			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 24 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kostner

DRILL RIG Acker II BORE HOLE 1

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Medium brown silty sand with clay	
35			
40	MB		
45			

000749

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 24 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II BORE HOLE 1

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Medium brown silty sand with clay	
		Gray clay mixed with sand	
	MB		
50		Bottom of hole	

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY 1000750

DRILLING LOG

PROJECT 38-26-0104 DATE 24 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II BORE HOLE 2

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Medium brown fine silty sand.	Fairly dry.
5	BS		
	BS	Brick red fine silty sand with some clay	Fairly dry
10		Tan fine silty sand with some clay	Getting wet
15			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 24 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II BORE HOLE 2

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand with some clay	Getting wet
20			
25			WT
		Light tan silty sand with very little clay	Wet
30			

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000752

DRILLING LOG

PROJECT 38-26-0104 DATE 24 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II BORE HOLE 2

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
		Light tan silty sand with very little clay	
35			
40			
45			

000753

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 24 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II BORE HOLE 2

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Light tan silty sand with very little clay	
50			
			Well 52' deep
55		Tan clay, medium plastic	
		Bottom of hole	

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 25 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

North side of rocket. Wash rock.
Surface disturbed

DRILL RIG Acker II BORE HOLE 3

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Medium brown fine silty sand.	Damp
5		Tan fine silty sand with some clay.	
	BS		
			Wet
10			
	BS		
			Water running out of hole.
15			

000755

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 25 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

North side of rocket. Wash rock.

Surface disturbed.

DRILL RIG Acker II BORE HOLE 3

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand with some clay	
20			
25			
30			

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000756

DRILLING LOG

PROJECT 38-26-0104 DATE 25 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

North side of Rocket. Wash rack.

Surface disturbed

DRILL RIG Acker II BORE HOLE 3

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand with some clay	
35			
40			
45			

000757

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 25 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

North side of Rocket. Wash rack.

Surface disturbed

DRILL RIG Acker II BORE HOLE 3

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
45		Medium brown silty clay.	Hangs to auger
50			WT
		Bottom of hole	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

000758
827000

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

10 feet to east side of road

DRILL RIG Acker II BORE HOLE 4

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand with some clay	
			Water
			WT
20			
25			
30			

USAEHA Form 95, 12 Aug 74

85T000
000759

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

10 feet to east side of road

DRILL RIG Acker II BORE HOLE 4

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand with some clay	
35	MB		
40			
45			

000760

US ARMY ENVIRONMENTAL HYGIENE AGENCY

185006

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

10 feet to east side of road

DRILL RIG Acker II BORE HOLE 4

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand with some clay	
		Medium brown silty clay.	Hangs to auger
50		Bottom of hole	
55			
60			

085090

000761

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II BORE HOLE 5

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Gravel, reddish in color	
		Medium brown, silty sand	
5	MB	Tan silty sand with some clay	
	MB	Brown fine sand silt	
	MB	Brick red fine silty sand with some clay.	Fairly dry
10			
15	MB 14-16'	Tan silty fine sane with clay.	

000762
E85000

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II BORE HOLE 5

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan silty fine sand with clay	
20			
25			WT
30			Wet

USAEHA Form 95, 12 Aug 74

S85090
000763

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II BORE HOLE 5

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan silty fine sand..with clay	
35			
40			
45			

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000764

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II BORE HOLE 5

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
45		Medium brown silty clay.	Hangs to auger.
50			
55			
60		Bottom of hole	Well depth 60 feet

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US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II BORE HOLE 6

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Medium brown silty sand.	Moist
5	BS	Brown silty sand	
10	BS	Brick red silty clay with fine sand	
		Light tan silty fine sand with some clay.	Moist
15	BS		

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000766

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II BORE HOLE 6

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Light tan silty fine sand with some clay.	
20			Water
25			
		Light tan sandy silt	
30	BS 29-31 ft		Water

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US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 28-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of berm

DRILL RIG Acker II BORE HOLE 6

DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
	BS	Light tan sandy silt	
35			
40		Medium brown silty clay	
45			

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000768

DRILLING LOG

PROJECT 38-26-0104 DATE 26 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

DRILL RIG Acker II BORE HOLE 6

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
50		Gray fine sandy clay	Well depth
60		BOTTOM OF HOLE	

USAEHA Form 95, 12 Aug 74

000769

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 27 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Edge of Road

DRILL RIG Acker II BORE HOLE 7

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Medium brown silty sand	
			Moist
		Tan silty sand, fine	Moist
5	BS		
10	BS		
			Water
15			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY 000770

DRILLING LOG

PROJECT 38-26-0104 DATE 27 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Edge of Road

DRILL RIG Acker II BORE HOLE 7

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
	BS	Tan silty sand, fine	Moist
20			
			Water
30			
35			

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US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 27 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Edge of Road

DRILL RIG Acker II BORE HOLE 7

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan silty sand, fine	Moist
40		Tan fine silty sand w clay	
45		Gray fine sandy clay	
50		BOTTOM OF HOLE	

USAEHA Form 95, 12 Aug 74

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US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 27 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Edge of Road

DRILL RIG Acker II BORE HOLE 7

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
55			
60			Well depth

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US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 27 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 8

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
5	MB	Medium Brown silty sand; some clay	Moist
10	MB	Brown fine silty sand	
15		Tan fine silty sand w some clay	

US ARMY ENVIRONMENTAL HYGIENE AGENCY

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DRILLING LOG

PROJECT 38-26-0104 DATE 27 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 8

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
	MB	Tan fine silty sand w some clay	
			Wet
20			
	MB		
25		Medium to fine sandy silt	Wet
			Water
30			

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US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 27 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 8

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
40			
45		Tan silty clay	
	MB		
50			

USAEHA Form 95, 12 Aug 74

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 27 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 8

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan silty clay	
55		Gray sandy clay	Well depth
60		BOTTOM OF HOLE	

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US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 28 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 9

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
		Tan fine silty sand	
	MB		
5		Brown fine silty sand	
	MB		
10			
		Tan fine silty sand w some clay	
	MB		
15			

USAEHA Form 95, 12 Aug 74

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US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 28 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 9

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand w some clay	
	MB		
20			Wet
25			Water level
30			

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US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 28 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 9

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
		Tan fine silty sand w some clay	
35			
40			
45			

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US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 28 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 9

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
		Tan fine silty sand w some clay	
		Brick red & gray silty clay	Wet
50			
			Well depth
55			
		Brown fine silty sand w clay	Dry
60		BOTTOM OF HOLE	

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US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 28 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 10

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN.	DESCRIPTION	REMARKS
		Brown silty sand	Moist
10		Tan fine silty sand w some clay	Moist
15			

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US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 28 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 10

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
		Tan fine silty sand w some clay	Moist
20			Water
			Water level
25			
	MB		
30			

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

PROJECT 38-26-0104 DATE 28 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 10

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
35			
40		Medium brown clay	
45			

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US ARMY ENVIRONMENTAL HYGIENE AGENCY

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DRILLING LOG

PROJECT 38-26-0104 DATE 28 Jan 80

LOCATION Longhorn AAP DRILLERS LT Corbitt, Mr. Kestner

Top of Berm

DRILL RIG Acker II BORE HOLE 10

FEET DEPTH	SAMPLE TYPE / BLOWS PER 6 IN	DESCRIPTION	REMARKS
	PB	Medium brown clay	
			Well depth
50			
55		BOTTOM OF HOLE	

USAEHA Form 95, 12 Aug 74

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SECTION 1B

ENVIRONMENTAL PROTECTION

1. SCOPE: The work covered by this section consists of furnishing all labor, materials, and equipment and performing all work required for the prevention of environmental pollution during and as a result of construction operations under this contract except for those measures set forth in other Technical Provisions of these specifications. For the purpose of this specification, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and recreational purposes. The control of environmental pollution requires consideration of air, water, and land, and involves noise, solid waste-management, and management of radiant energy and radioactive materials, as well as other pollutants.

2. APPLICABLE REGULATIONS: In order to prevent, and to provide for abatement and control of, any environmental pollution arising from the construction activities of the Contractor and his subcontractors in the performance of this contract, they shall comply with all applicable Federal, State, and local laws, and regulations concerning environmental pollution control and abatement as well as the specific requirements stated in this section and elsewhere in the contract specifications.

3. NOTIFICATION: The Contracting Officer will notify the Contractor in writing of any observed non-compliance with the foregoing provisions. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to promptly take corrective action, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it was later determined that the Contractor was in compliance.

4. SUBCONTRACTORS: Compliance with the provisions of this section by subcontractors will be the responsibility of the Contractor.

5. IMPLEMENTATION: Prior to commencement of the work the Contractor will meet with representatives of the Contracting Officer to develop mutual understandings relative to compliance with these provisions and administration of the environmental control program.

6. PROTECTION OF LAND RESOURCES:

6.1 General: The land resources within the property of the Government but outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction that will appear to be natural and not detract from the appearance of the project. Insofar as possible, the Contractor shall confine his construction activities to areas defined by the plans or specifications, to areas to be cleared for other operations, or to quarry,

borrow or waste areas indicated on the plans. Waste and borrow areas shall be leveled or trimmed to regular lines and shaped to provide a neat appearance. In all instances the restored area shall be well drained, so as to prevent the accumulation of stagnant water if at all possible.

6.2 Prevention of Landscape Defacement: Except in areas shown on the plans or specified to be cleared, the Contractor shall not deface, injure, or destroy trees or shrubs, nor remove or cut them without special authority from the Contracting Officer. Trees designated to be saved shall be protected from either excavation or filling within the root zone closer than the normal drip line of the tree. No ropes, cables, or guys shall be fastened to or attached to any existing trees for anchorages unless specifically authorized by the Contracting Officer. Where such special emergency use is permitted, the Contractor shall first adequately wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The Contractor shall in any event be responsible for any damage resulting from such use. Where in the opinion of the Contracting Officer, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or by his blasting, dumping, or other operations, he may direct the Contractor to protect adequately such trees by placing boards, planks, or poles around them. When earthwork operations are liable, in the opinion of the Contracting Officer, to cause rock to roll or otherwise be displaced into uncleared areas, the Contractor shall construct barriers to protect the trees. Rocks that are displaced into uncleared areas shall be removed. Monuments, markers, and works of art shall be protected similarly before beginning operations near them.

6.3 Restoration of Landscape Damage: Any trees or other landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the Contractor's expense. The Contracting Officer will decide what method of restoration shall be used, and whether damaged trees shall be treated or removed and disposed of under requirements for clearing and grubbing. All scars made on trees (not designated on the plans to be removed) by equipment, construction operations, or by the removal of limbs larger than 1-inch in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted. Where tree climbing is necessary, the use of climbing spurs will not be permitted. The use of climbing ropes will be required by the Contracting Officer where deemed necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the Contractor and are beyond saving in the opinion of the Contracting Officer, shall be immediately removed and replaced with a nursery-grown tree of the same species and size approved by the Contracting Officer.

6.4 Location of Temporary Field Offices, Storage, and other Construction Buildings: The location on Government property of the Contractor's temporary field office, storage, and other construction buildings, required temporarily in the performance of the work, shall be upon cleared portions of the plant site as shown on the plans. The preservation of the landscape shall be an imperative consideration in the selection of all sites and in the construction of buildings. In the site designated for location of the

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construction office, it will be necessary to install a culvert and driveway to provide access. Plans showing the improvements required for location of the office shall be submitted for approval of the Contracting Officer. Available utilities at this site include telephone and electricity. Water and sewerage utilities are not available.

6.5 Temporary Excavation and Embankments: Contractor shall construct temporary dikes and trenches in areas of equipment washdown and loading so that spillage and runoff is contained in the UEP. Contractor shall submit to the Contracting Officer a layout of all temporary excavation and embankments and plans for restoration for approval at least 30 days prior to scheduled start of the work.

6.6 Post-Construction Cleanup or Obliteration: The Contractor shall obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other vestiges of construction as directed by the Contracting Officer. It is anticipated that excavation, filling, and plowing of roadways will be required to restore the area to near natural conditions which will permit the growth of vegetation thereon. The disturbed areas shall be graded and filled as required, sufficient topsoil shall be spread to provide a minimum depth of 4 inches of suitable soil for the growth of grass, and the entire area seeded. Restoration to original contours is not required.

7. RECORDING AND PRESERVING HISTORICAL AND ARCHEOLOGICAL FINDS: All items having any apparent historical or archeological interest which are discovered in the course of construction activities shall be carefully preserved. The Contractor shall leave the archeological find undisturbed and shall immediately report the find to the Contracting Officer so that the proper authorities may be notified. Any work required to preserve or protect these finds will be accomplished by change order.

8. PROTECTION OF WATER RESOURCES:

8.1 General: The Contractor shall not pollute streams, lakes, or reservoirs with fuels, oils, bitumens, calcium chloride, acids, construction wastes or other harmful materials. It is the responsibility of the Contractor to investigate and comply with all applicable Federal, State, County, and Municipal laws concerning pollution of rivers and streams. All work under this contract shall be performed in such a manner that objectionable conditions will not be created in lakes, reservoirs, or streams through or adjacent to the project areas.

8.2 Erosion Control: Prior to start of construction the Contractor shall submit a plan for approval of the Contracting Officer showing his scheme for controlling erosion and disposing of wastes. Surface drainage from cuts and fills within the construction limits, whether or not completed, and from borrow and waste disposal areas, shall, if turbidity producing materials are present, be held in suitable sedimentation ponds, or the areas shall be graded to control erosion within acceptable limits. Temporary erosion and sludge control measures such as berms, dikes, drains, or sedimentation basins, if required to meet the above standards, shall be provided and maintained until permanent drainage and erosion control facilities are completed and operative. The area of bare soil exposed at any one time by

construction operations shall be held to a minimum. Unless otherwise approved by the Contracting officer, the Contractor shall apply as soon as practicable an approved temporary mulch on denuded ground. This shall apply to all areas not subject to appreciable traffic during construction, including areas that are to receive some form of construction later, if ground is to be exposed 60 days or more. Stream crossings by fording with equipment shall be limited to control turbidity and in areas of frequent crossings temporary culverts or bridge structures shall be installed. Any temporary culverts or bridge structures shall be removed upon completion of the project. Fills and waste areas shall be constructed by selective placement to eliminate to the extent practicable silts or clays on the surface that will erode and contaminate adjacent streams or lakes.

8.3 Spillages: Special measures shall be taken to prevent fuels, oils, greases, bituminous materials, waste washings, and cement from entering streams, rivers, or lakes. Temporary dikes and trenches shall be used in areas of potential spillage as described previously in paragraph 6.5 of this section.

8.4 Disposal: Disposal of any materials, wastes, effluents, trash, garbage, oil, grease, chemicals, etc., in areas adjacent to streams shall be subject to the approval of the Contracting Officer. If any waste material is dumped in unauthorized areas the Contractor shall remove the material and restore the area to the condition of the adjacent undisturbed areas. If necessary, contaminated ground shall be excavated, disposed of as directed by the Contracting Officer, and replaced with suitable fill material, compacted and finished with topsoil all at the expense of the Contractor. Water from equipment washdown, rainfall runoff or groundwater that is collected in the unlined evaporation pond shall in no case be discharged to the surface water course. Such water shall be disposed in accordance with Section 2D.75 of these specifications.

9. PROTECTION OF FISH AND WILDLIFE: The Contractor shall at all times perform all work and take such steps required to prevent any interference or disturbance of fish and wildlife. The Contractor will not be permitted to alter water flows or otherwise disturb native habitat adjacent to the project area which, in the opinion of the Contracting Officer, are critical to fish and wildlife. Fouling or polluting of water will not be permitted.

10. JANITOR SERVICES: The Contractor shall furnish daily janitorial services for the temporary field office, storage, and other construction buildings on the project site and perform any required maintenance of facilities and grounds as deemed necessary, by the Contracting Officer during the entire life of the contract. Toilet facilities shall be kept clean and sanitary at all times. Services shall be performed at such a time and in such a manner to least interfere with the operations but will be accomplished only when the buildings are occupied. Services shall be accomplished to the satisfaction of the Contracting Officer. The Contractor shall also provide daily trash collection and cleanup of the buildings and adjacent outside areas, snow removal in season, and shall dispose of all discarded debris, aggregate samples, and concrete test samples in a manner approved by the Contracting Officer.

11. BURNING: No material shall be burned at the project site.

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12. DUST CONTROL: The Contractor will be required to maintain all excavations, embankments, stockpiles, haul roads, permanent access roads, plant sites, waste areas, borrow areas, and all other work areas within or without the project boundaries free from dust which would cause a hazard or nuisance to others. Approved temporary methods of stabilization consisting of sprinkling, chemical treatment, light bituminous treatment, or similar methods will be permitted to control dust. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor must have sufficient competent equipment on the job to accomplish this if sprinkling is used. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs.

13. MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION: During the life of this contract the Contractor shall maintain all facilities constructed for pollution control under this contract as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

14. CLEAN-UP OF CONTAMINATED EQUIPMENT: All equipment that has been contaminated by sludge from the pond shall be cleaned before leaving the site. An equipment washdown station shall be maintained at the site as located on the plans until all of the sludge has been removed. All water resulting from the clean-up operation shall be disposed in accordance with Section 2D.7.5 of these specifications.

SECTION 1C

CONTRACTOR QUALITY CONTROL

1. GENERAL: The Contractor shall establish and maintain an effective quality control system in compliance with this section. The quality control system shall assure performance of inspections and tests specified or required to verify compliance with contract requirements for materials, equipment, workmanship, fabrication techniques, construction, and operations. The system shall cover construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence. Inspections, tests, and other quality control operations not specifically specified to be performed by the Government shall be the responsibility of the Contractor.

2. COORDINATION MEETING: As soon as practicable after receipt of Notice to Proceed and before start of construction, the Contractor shall meet with the Contracting Officer and discuss the Contractor's quality control system. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the quality control operations, inspections, testing, administration of the system for both onsite and offsite, and the interrelationship of Contractor and Government inspection. Minutes of the meeting shall be prepared, signed by both the Contractor and the Contracting Officer and shall become a part of the contract file.

3. QUALITY CONTROL PLAN:

3.1 General: Not later than 14 days prior to start of construction, the Contractor shall furnish his quality control plan to the Contracting Officer for approval. Construction will be permitted only after approval of the quality control plan, or at least approval of that portion of the plan applicable to that particular feature of work. The quality control plan the Contractor proposes to implement shall identify the personnel, procedures, instructions, records, forms, and as a minimum, shall include the following:

a. A description of the quality control organization.

b. The number, classifications, qualifications, duties, and responsibilities of personnel.

c. Procedures for processing shop drawings, samples, certificates, and other submittals.

d. Performance of quality control inspections, including those for work of subcontractors and offsite fabricators.

e. Testing procedures.

f. Documentation methods for quality control operations, inspection, and testing.

g. A copy of a letter of direction to the Contractor's Quality Control System Manager for this project, outlining his duties and responsibilities and signed by an authorized official of the firm.

3.2 Notification of Changes: After approval of the quality control plan, the Contractor shall notify the Contracting Officer in writing of any proposed change to the Contractor's quality control system. No change shall be implemented without written authorization.

3.3 Corrective Actions: If deficiencies indicate that the quality control system, personnel, instruction, inspections, tests, or records are inadequate, corrective actions shall be taken as directed by the Contracting Officer.

4. QUALITY CONTROL ORGANIZATION:

4.1 System Manager: The Contractor shall identify an individual, within his organization at the site of the work, who shall be responsible for overall management of the quality control system with no other duties. The Quality Control System Manager shall report to the Contractor's management at a level not lower than the project manager, and shall have authority to fully discharge his responsibilities. The name of the Quality Control System Manager, with a resume of his qualifications and experience, shall be submitted to the Contracting Officer for approval.

4.2 Personnel: The number of personnel necessary to perform the quality control operations shall be determined and provided by the Contractor. The actual strength of the organization during any specific work period may vary to cover work phase needs, shifts, and rates of placement. The Quality Control System Manager shall be fully qualified by experience and technical training to perform the assigned responsibilities.

5. SUBMITTALS: Procedures for processing shop drawings, samples, certificates, and other submittals shall be developed. The procedures shall include scheduling, follow-up, review and approval methods, and responsibilities. Action shall be taken to assure that only approved materials and equipment are delivered to the jobsite or used in offsite fabrication. Each respective submittal shall be checked by the Quality Control System Manager who shall then stamp, date, initial, and certify on the submittal transmittal form that the accompanying submittal complies with the contract documents. On those items requiring Contractor approval, in addition to the above, each item on the transmittal form shall be identified as having a complete approval or partial approval subject to minor corrections as noted on the submittal items.

6. INSPECTION: The Contractor's quality control system shall include at least the following four phases of inspection for definable features of work:

6.1 Preparatory Inspection: This inspection shall be performed before beginning work on each separate feature of work. It shall include a review of contract requirements, as assurance that materials and equipment have been approved, and an assurance of providing for required control tests. This inspection shall also include examination of the work area for actual completion of preliminary work and physical check of materials and equipment for conformance to plans, specifications, and approved shop drawings or submitted data, and determination that required material are on hand and properly stored. The Contracting Officer shall be notified at least 245

hours in advance of each preparatory inspection. Preparatory inspection shall include, but not be limited to, the operations listed hereinafter.

6.1.1 The following items are general in nature and apply to all sections:

a. Review requirements of plans and specifications and check for special reports and tests to be made, material certificates and shop drawing requirements.

b. Submittal of all materials and shop drawings necessary for the accomplishment of the work.

c. Check all materials against approved samples and tests and assure they conform to requirements. When required, obtain approval of source of materials.

d. Check to verify that all approved equipment is maintained in satisfactory working order.

e. Discuss plans for application and erection of materials.

f. Check handling and storage of all materials and equipment.

g. Conditional approvals complied with.

h. Check to insure that work will be done under proper weather conditions.

i. Discuss safety precautions, especially in regard to building fires, if applicable.

j. Insure that personnel doing work understand contract requirements, including workmanship and techniques.

6.1.2 The following items apply to the sections indicated:

a. Earthwork:

(1) Discuss plan of action for chemical treatment of sludge, sludge removal, excavation, filling and backfilling.

(2) Discuss plan for control of sludge excavation using sampling and analysis for chemical oxygen demand.

(3) Discuss plan for control of fill using in-place densities and moisture determinations.

b. Subdrainage System:

(1) Check all pipe for conformance with specifications.

(2) Discuss and review pipe installation procedure.

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c. Turf: Discuss placement of topsoil, fertilizing and planting procedures.

6.2 Initial Inspection: This shall be performed as soon as a representative portion of the particular feature of work has been completed, and shall include an examination of workmanship quality, a review of the control tests results for contract compliance, and a notation as to defective or damaged materials, omissions, and compliance with dimensional requirements. The Contracting Officer shall be notified at least 24 hours in advance of each initial inspection. Initial inspection shall include, but not be limited to, the operations listed hereinafter.

6.2.1 The following items are general in nature and apply to all sections:

a. Insure that all test results conform to requirements.

b. Materials meet specified requirements.

c. Confirm that defective areas are repaired properly.

6.2.2 The following items are general in nature and apply to site work:

a. Verify that excavation or removal of topsoil is done to proper depth and that materials removed are disposed of properly.

b. Check excavation for proper width and depth.

c. Check to verify that excavated areas are properly maintained.

d. Check to verify that subgrade, embankments, and excavated areas are protected during construction.

e. Check preparation and compaction of backfill and embankments.

f. Confirm that material is placed and compacted for proper layer density, thickness, smoothness and overall thickness at the proper line, grade and cross-section.

6.2.3 The following items apply to the section indicated:

a. Earthwork:

(1) Take samples and perform analysis for chemical oxygen demand on soil remaining after sludge removal.

(2) Check in-place moisture and density for fill.

(3) Check liquid limit and plasticity index for impermeable clay material prior to placement.

b. Sand Filter:

(1) Check gradation by sieve analysis prior to placement.

(2) Check in-place moisture and density.

c. Riprap:

(1) Check uniformity of stone size and gradation prior to and after placement.

(2) Check equipment used and placement procedures.

d. Subdrainage System:

(1) Check for proper width, depth, grade, and bedding of trench for pipe.

(2) Check method of jointing of pipes.

(3) Check the pipe for proper alignment and all required inspection before backfilling.

(4) Check backfilling for proper layer thickness, compaction and density.

e. Turf:

(1) Check to verify that ground surface is prepared to a true and even condition free from improper vegetation.

(2) Check topsoil placing for even spreading and proper thickness.

(3) Confirm that fertilizer is distributed at proper rate and depth.

(4) Check seeding for proper coverage.

(5) Check mulch for even spreading and anchoring in place.

(6) Check for proper rate and even distribution of water, if watering is required.

6.3 Surveillance Inspections: Follow-up inspections shall be performed daily to assure continuous contract compliance, including control tests, throughout the work. Follow-up inspection shall include, but not be limited to, the operations listed hereinafter.

a. Check all items mentioned in preparatory and initial inspections.

b. Operational test of all functional equipment and devices, damage or defects.

6.4 Completion Inspection: At the completion of the work, the Quality Control System Manager shall conduct a joint completion inspection with the Contracting Officer. During this inspection, the work shall be inspected, quality control records shall be reviewed, and a list shall be developed of work not properly completed or not conforming to plans and specifications. This list shall be included in the quality control documentation with an estimated date for correction of each deficiency. A final inspection shall be made to verify that deficiencies have been corrected and the Contracting Officer notified prior to the specified completion date.

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6.5 Defective Work: The Contractor shall not build upon or conceal work features containing uncorrected defects. Payment will be withheld for defective or deficient features until they are satisfactorily corrected, except as otherwise provided in the GENERAL PROVISIONS paragraph INSPECTION AND ACCEPTANCE.

7. TESTS:

7.1 Testing Procedure: The Contractor shall perform tests specified or required to verify contract compliance of materials, equipment, and workmanship, except those tests which are specified to be Government performed. The Contractor shall procure the services of an industry-recognized testing laboratory or he may establish an approved testing laboratory at the project site. A list of tests with the Contractor understands he is to perform shall be furnished to the Contracting Officer. The list shall give the test name, specification paragraph containing the test requirements, and the personnel and laboratory responsible for each type of test. Before each test, the Contractor shall perform, record, and provide the following preparatory inspection and data:

a. Verify the completeness and contract compliance of test procedures.

b. Verify that facilities and testing equipment are available and comply with testing standards.

c. Check test instrument calibration data.

d. Verify that recording forms, including all of the test requirement documentation, have been prepared.

7.2 Testing:

7.2.1 Capability Check: The Contracting Officer reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques.

7.2.2 Capability Recheck: Should the selected laboratory fail the capability check, the Contractor will be assessed a charge of $350 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently-selected laboratory. Such cost will be deducted from the total amount due the Contractor.

7.2.3 Project Laboratory: The Contracting Officer reserves the right to utilize the Contractor's control testing laboratory and equipment to make spot tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

7.2.4 Control, Verification, and Acceptance Testing:

7.2.4.1 Control tests are those tests made by or for the Contractor under the quality control system. All tests required by the specifications are to be considered control tests unless otherwise specified.

7.2.4.2 Verification and acceptance tests are those tests made by the Government for the purpose of acceptance or rejection of a source of material or processed material, verifying tests results obtained by the Contractor, or acceptance or rejection of an item or equipment or increment of work.

7.2.4.3 The Contracting Officer will notify the Contractor of contract noncompliance noted by the Government. The Contractor shall act promptly to correct discrepancies, after receipt of the notice. If the Contractor fails to comply, the Contracting Officer may issue an order stopping all or part of the work affected until satisfactory action has been taken. The time lost due to any such stop orders shall not be the subject of claim by the Contractor for extension of time or for damages or increased payment.

8. MONITORING:

8.1 The Contractor shall monitor the subcontractor's or supplier's work to assure compliance with their quality control plan.

8.2 Materials and equipment shall be subject to Government surveillance at the point of production, manufacture, or shipment. The producer, manufacturer, vendor, or shipper shall maintain an adequate inspection system to insure contract conformance with respect to materials, workmanship, construction, finish, functional performance, and identification.

9. DOCUMENTATION: The Contractor shall maintain current records, on an appropriate approved form, of quality control operations, inspections, and tests performed including the work of suppliers and subcontractors. These records shall include factual evidence that the required inspections or tests have been performed, including but not limited to the following:

a. Type and number of inspections or tests involved.

b. Results of inspections or tests.

c. Nature of defects, causes for rejection, etc.

d. Proposed remedial action.

e. Corrective actions taken.

f. Other pertinent data.

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SECTION 1D

SECURITY REQUIREMENTS

1. GENERAL: Longhorn Army Ammunition Plant is engaged in activities related to the National Defence effort. Security measures are considered of utmost importance in operation of the plant. Morton Thiokol Corporation is the operating contractor for the plant and, as such, has responsibility for formulation and enforcement of regulations that will provide adequate security. The requirements included in this section were developed by Morton Thiokol for general use by all contractors working on the plant site. The requirements were developed in accordance with Department of Army Regulations, Industrial Security Procedures, Safety Regulations, and established practices, and apply to all contractor personnel. Security and Safety and other groups, as appropriate, shall administer the regulations and shall respectively assume responsibility for their enforcement. An agreement is included which must be completed by the Contractor and forwarded to the Morton Thiokol Security Chief in Building 720-A prior to initiation of on-site activity.

2. INSTRUCTIONS

2.1 Identification of Contractor's Employees: All personnel entering the installation shall be required to display an identification badge on their outer garment, in the left chest-high area of the person. Badges are authorized by the Industrial Security Manual and Army Regulations. The type authorized will be issued by the installation's Security Office. The prime contractor and all sub-contractor(s) employees, awarded contracts to perform work on Longhorn Army Ammunition Plant, must be U.S. Citizens.

a. An immigrant alien lawfully admitted to the U.S. under an immigrant visa for permanent residence are acceptable for admittance to the plant. Such persons are to produce an Alien Registration Receipt Card, Form No. 1-151 or 1-551, reflecting their lawful admittance to the United States. This registration receipt must be presented to the Security Chief for verification on the persons Form TLD 11-33, Non-Employee Badge Request.

b. Illegal aliens will not be admitted to the plant.

c. Contractor employees of Foreign Nationality whom the contractor management request admittance to the plant and who complete appropriate documents for admittance to the plant, may be subject to check for verification of their being a U.S. Citizen or that they are in this country legally.

2.2 Prime Contractors and their Sub-Contractors -- Corps of Engineers

a. Method of Obtaining Identification Badges and Passes

(1) Executive and Superintendent

(a) The construction superintendent and/or executive member of the contract firm shall report to Post 1 and request contact with the Security Chief.

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AGREEMENT

This is to certify that I am a duly appointed representative of

_____

(Company Name and Address)

and, as such, am authorized to sign an agreement binding upon the organization which I represent. I hereby acknowledge receipt of copies of instruction sheets to contractors which I understand to be Safety and Security regulations pertinent to the performance of Contract No. DACA 87-84-C-0087 at Longhorn Army Ammunition Plant. I agree that I will read and abide by these aforementioned regulations in the performance of this contract, and shall further require my employees and/or sub-contractor(s) to be governed strictly thereby.

I understand that Longhorn Army Ammunition Plant is engaged in activities related to the National Defense effort. It is further agreed that I, my employees, and/or sub-contractor(s) will not reveal to unauthorized persons any information concerning the National Defense or violate any of the laws of the United States thereto.

Signature _____ Title _____

Witness _____ Title _____

Date _____

This agreement, when completed, is to be detached from the instruction sheets and directed to the Security Chief.

(b) The Post 1 guard shall contact the Security Chief who shall confirm contract award and authorize the issuance of a badge to the superintendent and/or executive.

(c) The executive shall complete Form TLD 11-33 (Application for Non-Employee Badge) to support his request for the issuance of a picture badge to the construction superintendent or for himself and shall surrender the Form TLD 11-33 to the Security Chief for approval.

(d) On approval of the Security Chief the clerk shall prepare the appropriate badge as prescribed by the Security Chief.

(e) The clerk shall prepare the required badge insert and take the required photographs of the executive or superintendent, a minimum of two, one for the badge and the other to be attached to the application and filed in the security office.

(f) The superintendent shall read and sign the badge insert.

(g) Badges are authorized for supervisory retention and/or entry and exit of Post 1 or the work entry gate shall be specifically identified.

(h) The clerk shall prepare and issue the picture badge to the superintendent.

(i) The superintendent may be issued a supply of Form TLD 11-33 and shall distribute them to employees requiring a picture badge.

(j) The superintendent may request applications for vehicle passes as stated in 2.2 of these requirements.

(k) The superintendent and the executive shall then proceed to the Post 1 guard, turn in their visitor badges, and proceed as may be required for accomplishing their mission.

b. Permanent Employee Badges

(1) The superintendent shall supply each employee to be issued a picture badge a copy of Form TLD 11-33. When the forms are completed, he shall escort his employees to Post 1 or the other work entry gate.

(2) Construction employees shall submit TLD 11-33 to the guard for authorization to contact Security for badges. Security shall authorize entry to prepare the construction employee's badge(s).

(3) The guard shall issue temporary badges to employees for this entry.

(4) The clerk shall retain and file the completed Form TLD 11-33 along with picture(s) of the person.

(5) The superintendent shall then escort the employee(s) back to the Post 1 guard where they shall turn in their temporary badges and proceed to their work entrance.

(6) Should the clerk be unable to prepare the badges by the time the employee is to report to work, the clerk will issue a memo to the employee who shall surrender this memo to the guard at the entry post. The guard will honor this memo and issue a temporary badge and visitor's pass.

(7) At the end of the work day, the employee shall turn in the temporary badge and pass to the guard as he exits the installation through the designated work exit gate.

(8) Permanent identification badges and passes shall be available to employees at the time of entrance to the installation through the designated work entrance gate on the following work day.

c. Temporary Employees of the Construction Contractors

(1) A temporary employee is one that is needed for a certain job which will require his employment for a period of five (5) days or less.

(2) The construction superintendent will report to the designated guard post with this employee.

(3) The construction superintendent will inform the guard that the employee will be employed for only a few days and request the guard to issue a temporary construction badge and visitor's pass for the number of days required (not to exceed five days). These badges and passes will be returned to the post of entry at the end of each work day. The guard shall place the badge and pass in the badge rack.

(4) The guard will issue the badge and pass daily and shall register the employee's entry and exit.

(5) The detached visitor's pass shall be attached to the corresponding pass number retained by the guard when the pass expires.

2. Use of the Identification Badge

a. An employee entering the installation at the beginning of each work day shall be issued an identification badge by the guard.

b. Badges shall be worn conspicuously on an outer garment in the vicinity of the upper left chest area at all times while on the reservation.

c. Badges are not transferable and shall not be loaned, exchanged, mutilated or altered in any way.

d. An employee exiting the installation shall turn in his badge to the guard at the post on request of the guard.

e. Contractor and subcontractor personnel issued identification badges authorizing the entry to the installation shall use the designated routes of travel to and from their work sites, and while at the work site, personnel must confine their movement to the immediate work area, and shall not be permitted outside the work area except for entry and exit.

3. Surrender of Identification Badge and Pass

a. Badges and passes are the property of the U. S. Government and are issued by Morton Thiokol Corporation to the bearer. They shall be surrendered when connection with this installation is terminated. Unauthorized use of badges may result in prosecution.

b. Superintendents and/or executives shall be held accountable for all badges issued and shall return, to the Security clerk, the badge(s) of any employee terminated and/or badges of all employees (including himself) at the termination of the contract.

C. The superintendent of the prime construction contractor shall sign the subcontractor superintendent's Form TLD 11-33, or other subcontractor Forms TLD 11-33 requiring a badge which authorizes entry through Post 1 and work entry gate.

D. Entry and Exit of the Installation

1. Enter and exit the installation only at designated and attended guard posts. Entry and exit of the various areas of the installation shall also be through attended guard posts only.

a. Any employee found or determined to have entered or made exit of the installation or areas other than at attended entry points shall be subject to disciplinary action.

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2.2 Vehicle Permits - Contractor and Contractor Employees

A. All contractor vehicles, company-owned or private, entering this installation shall prominently display the vehicle permit, which is authorization to operate the vehicle on this installation. Movement of these vehicles is restricted to the prescribed routes between the point of entrance and the work areas and/or designated parking areas. Deviation from prescribed routes of travel may be cause for disciplinary action or prohibit future plant entrance of the vehicle and/or violator. Employees private vehicles are not normally permitted entry to the installation and are not permitted entry to restricted areas unless their vehicle is covered by the higher limits of liability insurance.

B. Requirements for Vehicle Permit

1. Contractor Owned, Leased or Hired Vehicles

Each vehicle for which a permit is issued must be covered by liability insurance in minimum amounts of:

a. Automobile Liability
Bodily Injury $100,000/$300,000

b. Automobile Liability
Property Damage $10,000

c. Certification of lease or hired vehicles must be completed and presented to the Security Chief for retention as proof of leasing or hire and insurance coverage by the contractor in the amounts listed above.

2. Contractor Employee Vehicles -- Minimum Automobile Insurance Limits

a. Liability Bodily Injury Per Person $10,000
b. Liability Bodily Injury Per Accident 20, 000
c. Property Damage Per Accident 5,000

d. Contractor employee's vehicles will be issued a vehicle pass only on request of the contractor superintendent or manager and on approval of the Security Chief. Contractors normally transport their employees by company transportation to and from the installation to avoid conjestion in their work areas. Should permits be approved and issued, the vehicles will not be permitted into restricted areas and only to the construction designated parking area.

3. Evidence of renewed insurance coverage must be presented to the offices of the Security Chief on or before the expiration date of the old policy.

4. Each vehicle must bear proof and meet the safety inspection standards of the state of license and other such standards as may be required to insure safe operation on the installation.

5. The owner or other employee designated as driver of a vehicle operated on the installation must have a valid state driver's license.

6. The operator of the vehicle must be physically qualified to safely operate the vehicle.

C. Application for Vehicle Permit

1. Contractor supervisors shall apply for vehicle permits for their vehicles as follows:

a. Obtain necessary supply of "Vehicle Registration", DA 3626, from the Security clerk, Building 720-A, at time of badge issuance.

b. Complete one copy for each vehicle, attach liability policy or certificate thereof, and submit to the Security clerk, Building 720-A.

2. Upon receipt of a properly completed request, DA Form 3626, the clerk shall complete a "Construction Contractors Vehicle Permit", Form T70-61, and forward to the guard at the appropriate work entrance.

3. The guard shall affix the permit to the lower left side of the windshield of the appropriate vehicle when it is presented at the work entrance by the contractor.

D. Permit Expiration

1. Contractor Vehicle Permits may be issued for the duration of the contract; however, all vehicle permits will be renewed when new license plates are placed on the vehicle. Requests from the supervisor for renewal of required permits must be submitted to the clerk one week prior to expiration. Permits previously issued and no longer required will be returned to Security for accountability.

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2. Vehicle permits expire on termination of the employee to whom the permit was issued and must be immediately surrendered to the office of the Security Chief for accountability.

3. Contractor superintendents are responsible to assure return and accountability of all vehicle permits.

E. Revocation or Suspension of Permit

1. A permit may be suspended or revoked for the following reasons:

a. Violation of regulations

b. Failure of vehicle to pass spot check safety inspections

c. Competency of the operator becomes questionable

d. Lapse of liability insurance coverage

e. Failure to comply with any part of the Contractor Regulations

F. Control of Permits

1. Permits must be removed and returned to the office of the Security Chief if vehicle is sold, traded, or transferred from this reservation by the contractor.

2. Permit shall not be transferred to another vehicle.

3. Employees shall not remove, tamper with, or transfer permit except as outlined in 1 above or G below.

G. Surrender of Permits

1. All permits shall be removed from the windshield in such a manner as to preserve the number, or number must be written elsewhere on permit and surrendered to the clerk upon termination of connection with the installation.

2. Superintendents shall be held accountable for all permits issued to their employees and shall assure their return on termination of employment or on expiration of the contract.

H. Vehicle permits may be issued on a temporary basis to vehicles leased or rented by the contractor provided the contractor's insurance policy provides for the required insurance coverage of the leased/rented vehicle, or the lessor shall supply certificates of sufficient liability coverage on the vehicle(s).

I. Delivery Vehicles (Commercial)

Material supply companies utilizing their company vehicles to make deliveries of materials previously purchased by construction companies will be handled as follows:

1. Construction contractors should notify Security of expected deliveries. When such delivery vehicles appear at the installation entry gate, the guard will notify the construction superintendent of the arrival of materials.

2. The superintendent shall authorize entry to the guard if such entry is desired and shall provide an escort for the driver and vehicle from the entry gate, while on the installation, and return to the exit gate.

3. Commercial vehicles making deliveries having partial loads for construction companies and Thiokol warehouse will be escorted by construction personnel from the Thiokol warehouse if the first part of the load is for Thiokol. Should the first unloading be with the construction contractor, then the contractor will escort the delivery on to the Thiokol warehouse.

4. The DARCOM Form 1615 is used as a personnel and vehicle register and pass. Item 10 will be completed by the contractor, i.e., destination time in (into the installation) time out (time of exit of the installation or relieved by the contractor as in item 3 above) and signature of the recipient or person visited.

This form (pass) will be returned to the guard at the point of issue on exit of the deliveryman.

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2.3 Material Pass - Contractor Property and Contractor Employee Personal Property:

a. Hard hats
b. Rain gear -- boots, raincoats, etc.
c. Rules (but not tapes)
d. Prescriptions, for medicinal purposes
e. Safety glasses, goggles, etc.
f. Transits, surveying rods and chains
g. Flashlights
h. First aid kits
i. Workmen's gloves
j. Snake bite kits

A. The resident engineer or his delegated representative may authorize the removal of the contractor's material from the installation.

B. The resident engineer or his delegated representative shall inspect all material to be removed to determine that it is the property of the contractor/subcontractor or personal property of their employees.

C. The engineer authorizing the removal of property shall complete the "Construction Forces Material Pass", Form TLD 11-31, in triplicate as follows:

a. All items to be removed except those listed in Section 4 below shall be listed on the form with the remaining space marked through to prevent the addition of items.

b. All copies shall be given to the person requesting the removal.

c. The bearer shall surrender all copies to the guard at the point of exit.

D. The following personal or construction company items may be removed from the installation without execution of the "Construction Forces Material Pass", Form TLD 11-31, when officially stenciled or marked as property of the contractor or employee.

E. Government property will not be removed unless accompanied by properly authorized Material Pass issued by the Morton Thiokol Property and Materials Manager.

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2.4 Prohibited Items

A. All personnel and vehicles entering or exiting the installation are subject to search by guards. Vehicles and personnel shall also be subject to spot searches performed by guards within confines of the reservation.

1. There is a condition of entry sign posted at the entrances to the installation and it is applicable to all persons entering.

2. Personnel objecting to search shall be denied entrance to the installation.

B. Army regulations prohibit the following items from being brought on the installation.

1. Firearms and/or ammunition
2. Alcoholic beverages
3. Narcotics
4. Cameras and/or film
5. "Strike anywhere" matches and/or fusees
6. Switchblade knives and/or knives with blades over three inches

Note: Safety matches, cigarette lighters (personal and vehicle) friction lighters or any sparking device will not be carried into restricted areas of the installation. Authorized sparking devices will be handled as described in Section 2.8 of these requirements.

C. Dangerous Weapons

Items that could be considered as dangerous weapons, i.e., hunting or long-blade knives, billy clubs, night sticks, short chains, pipes, hoses, etc., that are in effect a club, hatchets and similar items which are or may be considered as dangerous weapons are prohibited items. The placement of such items for availability of use will be a consideration in determining whether the items are considered as dangerous weapons.

D. Prohibited items found during search shall be confiscated by the guards, who shall obtain appropriate information and notify Security supervision immediately.

2.5 On-Post Demonstrations

A. Picketing, demonstrations, sit-ins, protest marches, political speeches and similar activities are prohibited and will not be conducted on this installation.

B. The Commanding Officer may grant exceptions to this policy. Applications for exceptions shall be submitted in writing to the Army Security Office, at least seven days prior to the date of the proposed demonstration or other activity.

C. No one shall enter or remain on this installation for any of the purposes prohibited by this regulation and such entry will constitute a violation of Title 18, U.S. Code, Section 1382, which provides in part that "Whoever, within the jurisdiction of the United States, goes upon any military reservation, post, fort, arsenal, yard, station or installation, for any purpose prohibited by law or lawful regulation...shall be fined not more than $500 or imprisoned not more than six months or both."

000811

2.6 Traffic Regulations

A. All contractor personnel shall observe and abide by the following traffic regulations:

1. Unless otherwise marked or indicated, the maximum speed within the installation shall be:

35 mph for passenger vehicles and trucks with a capacity of one ton or less
25 mph for all trucks with a capacity of over one ton

a. Speed limits are posted within restricted areas of the installation and shall apply to all vehicles.

b. Maximum speed within parking areas shall be 15 mph for all vehicles.

2. No motor vehicle shall be stopped, parked, or left standing, whether attended or unattended, upon the traveled portion of any road.

a. When conditions make it impossible to move vehicle from traveled portion of the road, every effort shall be made to leave all possible width opposite such vehicle for free passage of other vehicles, and care shall be taken to provide a clear view of the stopped vehicle as far as possible to the front and rear. At night (one-half hour after sunset to one-half hour before sunrise) vehicles which are stalled shall not be parked without the illumination of parking lights.

3. No motor vehicle shall be left unattended until after parking brake has been securely set and all other reasonable precautions have been taken to prevent its movement.

4. Parking of privately-owned vehicles closer than fifty (50) feet to any building or structure shall be prohibited.

5. Privately-owned vehicles shall be parked only in designated parking areas.

6. Passing of explosives laden trucks (when so marked) shall be prohibited unless a passing signal is given, and overtaking and passing can be accomplished with utmost safety.

7. Vehicles approaching railroad crossings shall be driven at speeds that will permit stopping, if necessary, and shall proceed only if the crossing is clear of railroad equipment.

8. Personnel involved in an accident that results in personal injury or damage to a Government vehicle shall report the incident immediately to his supervisor who shall notify Safety.

B. Any motor vehicle operator who drives at a speed greater than is reasonable and without due regard to inclement weather conditions, traffic, character of roadway, condition of vehicle, and any other obviously hazardous conditions shall be considered a reckless driver and in violation of the Contractor Regulations.

C. Guard personnel shall check for violations and enforce appropriate parts of these regulations. Traffic Ticket (DD Form 1408) will be issued to violators for violation of traffic rules and regulations. These tickets are completed in triplicate. The original and yellow copies are submitted to the Security Chief for further disposition.

1. The pink copy is issued to the employee when available.

2. Vehicles in violation and unattended - the traffic ticket shall be left on the vehicle windshield, with instructions for the driver to notify his supervisor and call Ext. 2327 advising the name of the violator and other pertinent information required.

D. Construction companies shall be held pecuniarily responsible for damages incurred as a result of a motor vehicle accident which occurred through negligence on the part of any of their drivers.

000813

2.7 Accident and Fire Reporting

A. Accidents Involving Property Damage Only

1. The person most directly responsible or having first knowledge of such accident shall immediately notify his supervisor. If a supervisor is not immediately available, the most responsible person at the location shall act in his stead.

2. The supervisor shall take action to see that nothing is moved or altered, unless necessary to prevent further damage or possible injury.

3. The supervisor, after securing area of the accident to prevent loss of evidence, shall immediately notify by telephone, the following:

   a. His own supervisor
   b. Safety
   c. Security

4. In case the accident occurs on an off-shift when Safety personnel are not available, the supervisor shall immediately notify, by telephone, the Guard Sergeant, phone 2327.

5. Immediate action shall then be taken by the individuals contacted to investigate the accident so that the equipment involved may be released and repairs started.

B. Accidents Involving Personal Injuries

1. All injuries, regardless of how minor in nature, shall be reported to the person in immediate charge of the operation.

2. It shall be the responsibility of the person in charge of the operation where the injury occurred to determine what immediate medical attention is needed by the injured.

3. If it is determined that the injury is of a nature that would preclude movement of the injured, the procedure outlined below shall be followed.

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a. The injured will be made as comfortable as possible.

b. A reliable person shall be immediately dispatched to the nearest telephone to call an ambulance.

c. The person placing the call shall tell the telephone operator that he is reporting an accident and needs the services of an ambulance and to notify the hospital and guards.

d. The telephone operator will then ring guard headquarters.

e. The person placing the call shall repeat his request for an ambulance and inform the guard of the scene of the accident by building number, occupancy, and/or location, and repeat the location to the guard. This is important to assure that the ambulance is dispatched to the proper location.

f. The telephone operator shall listen to this request and then inform the dispensary staff that an accident has occurred, that an ambulance is to be dispatched to the scene and give any other pertinent information regarding the accident that she may have received.

g. The person placing the call shall then return to the accident scene and assist in administering first aid, if required, to prevent further injury and await the arrival of the ambulance to direct it to the patient.

h. After the injured person has been attended, the person in charge shall then call, in order, the following:

(1) His supervisor
(2) Safety

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4. If it is determined that the injured can be safely transported to the hospital or dispensary by means other than the ambulance, the person in charge of the operation where the accident occurred shall immediately provide such transportation.

5. If the accident is of a nature that resulted in serious injury, potential serious injury, damage to or potential damage to equipment or facilities, the person in charge shall secure the area to prevent loss of evidence and call the following in order:

   a. His supervisor
   b. Safety
   c. Security

6. In case the accident occurs on an off-shift, when Safety personnel are not available, the supervisor shall immediately notify the guard sergeant who will in turn notify off-duty exempt Safety personnel.

7. An immediate joint investigation shall be made by the individuals concerned so that any equipment involved may be released for repair.

8. A written report of the investigation shall be made by the Safety personnel and distributed to interested parties.

C. Reporting Motor Vehicle Accidents

1. A motor vehicle accident is an occurrence involving the operation (whether moving or halted) of a vehicle that results in death, injury requiring medical treatment or care, destruction of or damage to any vehicle sufficient to normally require repair or replacement or destruction of or damage to any other property.

2. If injuries have occurred, the immediate efforts shall be directed at securing medical attention for the injured. If the driver is injured, the next most responsible person in the vehicle or anyone discovering the accident shall proceed as outlined below:

a. After securing the immediate vicinity to prevent further injury to persons or damage to property, the driver shall notify, in order, the following:

(1) His supervisor
(2) Safety
(3) Guard sergeant

b. The driver shall await the arrival of the guard and Safety representatives.

c. If the accident occurs on an off-shift, the guard sergeant shall be notified and the vehicle shall be secured until the day shift without moving unless such action would involve additional hazards.

D. Reporting Fires

1. All fires shall be reported immediately to the Fire Control Branch by telephone and/or fire alarm boxes.

Fires may be reported by the following means:

a. Telephone

Dial "O" and tell the operator "Fire." She shall connect you with the Fire Station. Tell the firefighter receiving the call that you wish to report a fire. Give him the building number, occupancy, and other information that will assist the firefighting. Give a clear and accurate report and do not break the connection until the firefighter has repeated the information including the correct building number.

b. Fire Alarm Boxes

The boxes are connected directly to the Fire Station alarm recording system. Fires may be reported on these boxes by pulling and releasing the trip mechanism.

2. In the event of a fire in any area near construction contractor's work site, the superintendent shall instruct all personnel to remain at their location until instructed to evacuate by Morton Thiokol officials.

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2.8 Flame Permit

A. When an open fire is to be created in any area, it is necessary to obtain a flame permit.

B. At any time the use of flame, heat or spark producing equipment is necessary in any operation area except the shops area, a written flame permit (TLD 11-7) shall be required to be issued.

1. In Controlled Areas this regulation is intended to include electric power tools, welding equipment, soldering irons, blow torches, tar kettles or asphalt heaters, or any device or piece of equipment capable of producing sparks, flame, fire, or heat.

C. It shall be the responsibility of the contractor performing the work to initiate the permit. This shall be accomplished by filling out all of the forms except the "Precautions to be taken" and advising the Fire Control Branch at the Fire Station, Extension 2315, and the location supervisor of the work to be performed. Forms may be obtained from the Fire Station.

D. These representatives shall inspect the work area and mutually determine and list precautions to be taken before and during the performance of work. Flame permits covering work to be performed on machines and equipment subject to contamination must be signed by all representatives signifying approval.

E. An original and two copies of the flame permit shall be completed. The original shall remain in view at the work site until the job has been completed, one copy shall be retained by the Fire Control Branch, and one copy sent to Safety Section. The flame permit is valid only for the location given and the time designated.

F. The signature on the permit of the construction superintendent in charge of the work indicates that he is fully informed of the hazards in the work area, of the details of safe performance, and all other requirements necessary for the work to be performed in the safest manner possible.

G. Signature of the supervisor of the location indicates that he has prepared the work site by removing all explosives and combustible materials possible, and that he has acquainted the work supervisor of all hazards in the area in which the work is to be performed. (In this connection, the "supervisor of the work location" is considered to be supervisor in charge of the building in which the work is to be performed. When work is to be performed outside a building, the "supervisor of the location" is considered in charge of the area in which the work site is located.)

H. Signature of a representative of Fire Control indicates approval for the performance of the work under the conditions set out on the flame permit. Approval by Fire Control shall be made only after an adequate inspection of the work site has been made and assurance that all hazards have been minimized and compliance with the conditions of the permit is feasible. The permit should not be signed until compliance with the safety requirements has been achieved.

I. The signed permit shall serve as authority for the flame or spark-producing equipment to be brought into the area and/or building. This prohibits such equipment from being brought into a restricted area or building until the above requirements have been fulfilled.

J. It shall be the responsibility of the construction superintendent to properly instruct his workmen in the hazards of the job and to carry out all precautions listed on the permit.

K. Deviation from the provisions of the flame permit shall be permitted only on the written approval of the Safety Section, who may also approve and issue flame permits in the absence of Fire Control members in accordance with paragraph H above.

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2.9 Safety Regulations

A. Housekeeping

1. Good housekeeping is essential to safe machine operations. Floor of work area should be kept dry, clean, and free from obstructions. Spilled oil, material, or liquids should be promptly cleaned up or removed. Accumulations of scrap waste, dust, and dirt will not be permitted.

2. Hand tools shall be kept in good repair and proper racks, boards, shelves, or tool boxes provided for tools not in use. Tools shall not be left scattered about the work area, and shall be cleaned after use if contaminated, oily, or dirty.

3. Protective equipment such as goggles, eye shields, respirators and the like shall be kept clean, in good condition, and properly stored in cabinets, boxes, or locations when not in use.

4. Waste and scrap shall be placed in designated containers or removed to specified locations.

5. Closets, lockers, bins, spaces under the tables and benches, conveyors, stairs and platforms shall be kept clean and orderly.

6. Volatile flammable liquids will not be permitted in open containers; instead, they shall be stored and dispensed in approved and properly marked containers.

7. No cigarette, tobacco, or match disposal will be permitted in combustible waste cans. Proper type ash trays or butt cans should be provided.

8. Dripping and spillage of oil and oil soaking floors should be avoided.

9. Combustible materials shall not be permitted to accumulate and must be placed in designated receptacles or storage places.

10. Hazardous materials shall not be allowed to collect on structural members, radiators, heaters, steam, air, water pipes, or electrical fixtures and devices.

11. Catch pans shall be provided beneath draw-off pipes, faucets, or where leakage or spillage of hazardous materials may occur.

12. Littering streets, roadways, or other plant areas is forbidden. Throwing litter, i.e., bottles, papers, or other trash from vehicles is expressly forbidden and violators of this regulation will be subject to appropriate disciplinary action.

13. Soft drink bottles, milk cartons, etc., will not be removed from the building in which sources of the items, i.e., vending machines, etc., are located.

14. A regular program of cleaning shall be carried on as frequently as conditions require; but general cleaning should not be conducted while hazardous operations are being performed.

15. Work sites shall be subject to periodic inspections by Safety Inspectors.

B. Safe Working Practices

1. The working practices established for this installation are essentially the same as those contained in the Safety manuals of the Associated General Contractors of America, Safety Council, American Standards Association, and Association of Casualty and Surety Companies and shall be abided by at all times. Areas for special attention are as follows:

   a. When in doubt concerning any operations, procedure, or risk, the Safety Section shall be contacted before proceeding.

   b. Safety personnel shall inspect and observe construction operations at frequent intervals and report discrepancies to the construction superintendent.

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c. Contractor personnel shall restrict their movements to the location specifically covered by their contract and shall not expose themselves to unnecessary hazards.

d. Contractors shall be required to furnish the safety equipment and personal protective devices necessary for their personnel, such as goggles, respirators, hand-type fire extinguishers, etc.

e. Smoking shall be permitted only within confines of established and approved areas.

(1) Cigarette butts, etc., must be placed in containers which are provided; and personnel using the areas are responsible for cleanliness of the area at all times.

(2) Smoking shall be prohibited when wearing clothing contaminated with flammable materials.

f. Contractors shall hold regular safety meetings with their employees to discuss safe working practices and accident prevention.

2.10 Labor Representatives

A. Admittance Permitted

1. Labor representatives desiring to contact a construction contractor shall report to the guard post at the entrance to this installation. The representatives shall state the nature of their business and who they desire to visit.

2. The guard shall contact the district engineer or his designated representative for approval of the visit to Corps of Engineers' contractors who shall advise the guard if the visit is approved.

3. If the visit is approved, the contractor shall provide transportation and escort for the time necessary to transact business.

4. The guard shall, if the visit is approved, issue visitor's badge and pass to the labor representative as prescribed in authorized procedures.

B. Regulatory

1. Irrespective of any other considerations construction superintendents shall consider that labor representatives will not be admitted to the installation under the following conditions:

   a. When the entry of such representatives will violate pertinent safety or security regulations.

   b. When the presence and activities of the labor representatives will interfere with the progress of the contract work involved.

2. Admittance Refusal

In every case where it is considered to be necessary to refuse admittance of a labor representative, the matter shall be brought to the attention of the Commanding Officer for final determination.

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2.11 Violations and Disciplinary Action

Rules and regulations contained herein are those used for guidance of employees or persons on this installation. Violators are subject to disciplinary action to prevent recurrence.

The Security Chief is to be informed of Security violations and the following sequence of actions will be taken:

A. The Security Chief shall notify the Provost Marshall immediately and forward a memorandum citing circumstances and, if appropriate, a copy of traffic violation ticket.

B. Action deemed necessary will be determined and, if appropriate, the Security Chief notified for information or action.

2.12 Security and Accountability of Explosives

The Contractor, on reviewing the specification requirements for the contract, shall give notice when there is reason to use explosives such as dynamite or any explosives that the Contractor may need in the performance of his contract at this installation. The Contractor will expressly advise the awarding firm, Morton Thiokol Corporation and the Corps of Engineers, of this need.

A. Prior to bringing such items on the installation the Contractor will notify the Army Security Officer and the Morton Thiokol Security Chief of the need to bring in explosives for work requirements. These officers will coordinate with the Contractor and, if possible, require that quantities for daily use be brought onto the installation rather than establishing a storage area.

B. Should it be necessary that the Contractor's explosives be stored on the installation, explosives will be rigidly accountable from the time of entrance to the installation. A record will be maintained of issue and purpose of use by date and time as authorized by the construction job superintendent and coordinated with the project engineer and the Security Chief prior to use.

C. Explosives, if necessary to be stored at this installation, will be stored in a container and location acceptable to Army and Morton Thiokol Security Officers and located as designated by Army and Morton Thiokol safety engineers. The door to this container will be secured with a high security lock and hasp or in a manner acceptable to Army and Morton Thiokol security officers. The Contractor will receipt to the Morton Thiokol Security Chief for keys to the lock.

D. Prior to use of explosives on the plant, a Standing Operating Procedure must be developed by the construction contractor. These procedures must be approved by representatives of Morton Thiokol and the Commanding Officer.

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SECTION 2A

ADDITIONAL SAFETY REQUIREMENTS

1. GENERAL SAFETY REQUIREMENTS

1.1 Employee Instruction and Training:

1.1.1 General:

1.1.1.1 The Contractor shall be responsible for initiating and maintaining a safety and health program which will comply with the Corps of Engineers' Safety and Health Requirements, Manual EM-385-1-1 and additional requirements contained herein.

1.1.1.2 Prior to commencement of work at a job site, an acceptable accident prevention program written by the prime contractor for the specific work and implementing in detail the pertinent requirements of EM-385-1-1, will be reviewed by designated Government personnel. The Contractor's program will include work to be performed by subcontractors, and measures to be taken by the Contractor to control hazards associated with materials, services, or equipment provided by suppliers.

1.1.1.3 The accident prevention program shall provide for frequent and regular safety inspections of the work sites, materials, and equipment by competent persons.

1.1.1.4 Prior to the start of a project or any major phase of work, a job hazards analysis developed by the prime contractor will be reviewed with designated Government personnel. The analysis will identify and evaluate the hazards and outline the proposed methods and techniques of accomplishing each phase of work in a safe manner.

1.2 Indoctrination:

1.2.1 Each employee shall be provided initial indoctrination and such continued training to enable him/her to perform his/her work in a safe manner.

1.2.2 Indoctrination and training shall be based on the safety program of the Contractor and shall include, but not be limited to, the following:

1.2.2.1 General safety policy and pertinent provisions of EM 385-1-1.

1.2.2.2 Requirements for employee and project safety.

1.2.2.3 Employee's responsibilities for property and the safety of others.

1.2.2.4 Employee's responsibilities for reporting all accidents.

1.2.2.5 Medical facilities and required treatment.

1.2.2.6 Procedures for reporting or correcting unsafe conditions or practices.

1.2.2.7 Safe Clearance Procedures.

1.2.2.8 Fire fighting and other emergency procedures.

1.2.2.9 Job hazard analysis.

1.3 On-the-Job:

1.3.1 Regularly scheduled safety meetings shall be held at least once a month for all supervisors on the project to review past activities, to plan ahead for new or changed operations, and establish safe working procedures for anticipated hazards. An outline report of each meeting shall be submitted to the designated authority.

1.3.2 At least one safety meeting shall be conducted weekly by field supervisors or foremen for all workers. An outline report of meeting giving date, time, attendance, subjects discussed and who conducted it shall be maintained and copies furnished the designated authority on request.

1.3.3 All persons required to enter into confined or enclosed spaces or atmospheres immediately dangerous to life shall be instructed at to the hazards involved and precautions to be taken. They shall be trained in the use and care of such emergency and protective equipment as self-contained breathing apparatus, hose line masks, and respirators. Training shall be by a qualified person. The employee shall comply with any regulations that apply to work in dangerous or potentially dangerous areas.

1.3.4 All persons required to handle or use poisons, caustics, or other harmful substances shall receive instruction regarding the safe handling, potential hazards, personal hygiene, protective equipment, disposal, and other protective measures involved or required.

1.3.5 All persons who may have to use rescue or lifesaving equipment shall be familiarized with the location of the equipment and shall be trained in its proper use.

1.3.6 All persons required to give or receive signals shall be instructed in and familiar with the proper use of the signal system.

1.3.7 All persons required to handle or use flammable liquids, gases, or toxic materials shall be instructed in the safe handling, storage, disposal, and use of these materials and specific requirements for protection.

1.3.8 The employer shall provide training in handling emergency situations that may arise in the use of any equipment on the project.

1.3.9 Heavy equipment operators shall receive instructions and shall demonstrate proficiency in the operation of the equipment.

1.3.10 When, in terms of time and distance, a medical facility, physician, or an employee qualified to administer first aid and CPR, is not reasonably accessible to a group of 2 or more employees for the treatment of

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injuries, at least one employee shall be qualified to administer first aid and CPR.

1.3.11 A "Competent" or "Qualified" person means one who can identify existing and predictable hazards in the working environment which are dangerous to personnel and has the authority to promptly eliminate them. This person is one who, by degree, certificate, professional standing, or extensive knowledge, training and experience has demonstrated his/her ability to resolve problems related to the work.

1.4 Accident Reporting and Recordkeeping:

1.4.1 General:

1.4.1.1 The prime contractor shall be responsible for recording and reporting all accident exposure and experience incident to the work. (This includes exposure and experience of the prime contractor and his sub-contractors.) As a minimum these records shall include exposure work-hours and a log of occupational injuries and illnesses (OSHA Form 100F or equivalent). All diagnosed occupational illnesses and injuries that result in a fatality or a lost work day shall be investigated and reported to the designated authority in accordance with the requirements of the agency having jurisdiction.

1.4.1.2 The prime contractor shall keep a record of employee exposure to toxic materials and harmful physical agents. Also, the prime contractor shall notify the designated authority and the employee of any excessive exposure and the hazard control measures that will be taken.

1.4.1.3 An accident with any of the consequences listed below shall be immediately reported to the designated authority. These accidents will be investigated in depth to identify all causes and to recommend hazard control measures. Except for rescue and emergency measures, the accident scene shall not be disturbed until it has been released by the investigating official. The consequences requiring an in depth investigation are:

a. Fatal injury.

b. Five or more persons admitted to a hospital.

c. Property damage in an amount specified by the designated authority.

1.4.1.4 A daily record of all first aid treatments not otherwise reportable shall be maintained on prescribed forms and furnished to the designated authority upon request.

1.4.1.5 Injured persons are responsible for reporting all injuries as soon as possible to their employer or immediate supervisor. No supervisor shall decline to accept a report of injury from a subordinate.

1.5 Loading, Transportation and Unloading of Hazardous Waste:

1.5.1 Loading:

1.5.1.1 The Contractor shall prepare and implement a specific site safety plan for loading of the hazardous waste material for transport to its final destination. The procedure shall address:

a. Personnel Safety (see Section 2, Specific Site Safety Plan, of these specifications).

b. Prevention of spills during the loading operation.

c. Containment within the vehicle during transport.

1.5.1.2 The procedure shall be submitted for review by the Contracting Officer before implementation.

1.5.2 Transportation:

1.5.2.1 The Contractor shall assure that the transport vehicles are in good repair and that the drivers are well qualified in the operation of the transport vehicles. The waste material shall be completely contained within the transport vehicle; i.e., dump truck beds shall be completely covered with a tight fitting tarpaulin. The utmost care shall be taken to avoid spills during the transportation process.

1.5.2.2 A spill is defined as an act or omission through which waste or other substances are deposited where, unless controlled or removed, they will drain, seep, run, or otherwise enter into the water.

1.5.2.3 Handling Spills: The Contractor shall be responsible for familiarizing him/her self with the requirements of the authority having jurisdiction in each state through which the waste is transported. The following procedure is suggested as a guide line and in no way shall relieve the Contractor from adhering to the requirements of the authority having jurisdiction concerning spills:

a. Discovery and Notification:

(1) Upon discovery of any amount of spilled hazardous waste, a telephone report shall be made to the local Department of Public Safety, the authority having jurisdiction, the Morton Thiokol Safety Department, and the National Response Center (800-424-8802 or 202-476-2675). Telephone reports shall contain as much of the information listed below as possible:

(a) Name and telephone number of reporter;

(b) where known, the name, address, and telephone number of the party in charge of, or responsible for, the activity or facility and of the party at the site of the spill r accidental discharge who is in charge of operations at the site;

(c) the exact location of the spill or discharge, including the name of the waters involved;

(d) Time and type of incident (e.g., fire, explosion, etc.);

(e) the type of material spilled or discharged;

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(f) an estimate of the quantity of material spilled or discharged;

(g) the extent of actual and potential water pollution;

(h) the extent of injuries if any;

(i) the steps being taken or proposed to contain and clean up the spilled or discharged material; and

(j) the possible hazards to human health or the environment.

b. Containment, Removal and/or Treatment:

(1) The Contractor shall be responsible for containment, treatment, and/or removal and disposal of all hazardous waste spills during the transportation phase of the contract. The clean-up shall be in accordance with the directions of the authority having jurisdiction.

(2) The Contractor shall take immediate action to contain, remove, or nullify the effects of the spill.

(3) Useful information regarding chemicals and methods by which spilled substances can be handled is available from the Chemical Transportation Emergency Center, telephone number 800-424-9300. It shall be the responsibility of the spiller to obtain such information and, where possible, to put the information to use as soon as possible but only after consultation with a representative of the authority having jurisdiction.

c. Written Reports: Within 15 days after an incident involving a spill of hazardous waste from a storage, processing or disposal facility, the responsible owner or operator must submit a written report on the incident to the authority having jurisdiction.

d. Prevention of Spills of Hazardous Wastes: Every effort must be made by the Contractor concerning the handling and transportation of hazardous wastes to provide for spill prevention, containment of accidental spills and a countermeasure plan to be used in the event of an accidental spill or discharge. Failure to provide for such a plan may, upon consideration of the circumstances under which a spill or accidental discharge occurs, be deemed as negligence and be the basis for appropriate legal action pursuant to the provisions of the authority having jurisdiction.

1.5.2.4 Unloading:

a. The Contractor shall comply with the unloading procedures of the facility at the final destination.

2. SPECIFIC SITE SAFETY PLAN

2.1 Background: A hazardous waste special study by the U.S. Army Environmental hygiene agency concluded that the sludge layer (sludge) in the UEP was nonhazardous with respect to extraction procedure (EP) toxicity for heavy metals. In addition, the sludge did not exhibit the descriptive resource conservation and recovery act (RCRA) characteristics of

ignitability or reactivity for nonliquids. The analysis of a composite floating material sample indicated that there existed a borderline test for EP toxicity for the heavy metal barium. The aqueous layer (water) in the UEP shall be removed by others before work on this contract is started. It cannot be determined as to whether or not the floating material will be removed with the water or left in the UEP with the other sludge. Therefore, the sludge must be considered as hazardous with EP toxicity for barium.

2.1.1 Soluble Barium Compounds: The general guidelines contained herein apply to all soluble barium compounds. Physical and chemical properties of several specific compounds are provided for illustrative purposes.

2.1.1.1 Substance Identification:

a. Barium Nitrate:

(1) Formula: $Ba(NO_3)_2$

(2) Synonyms: None

(3) Appearance and Odor: Odorless White Solid

b. Barium Oxide:

(1) Formula: BaO

(2) Synonyms: None

(3) Appearance and Odor: Odorless White Solid

c. Barium Carbonate:

(1) Formula: $BaCO_3$

(2) Synonyms: None

(3) Appearance and Odor: Odorless White Solid

d. Barium Chloride:

(1) Formula: $BaCl_2$

(2) Synonyms: None

(3) Appearance and Odor: Odorless White Solid

2.1.1.2 Permissible Exposure Limit (PEL): The current OSHA standard for soluble barium compounds is 0.5 milligram of soluble barium compounds per cubic meter of air (mg/m^3) averaged over an eight-hour work shift.

2.1.1.3 Health Hazard Information:

a. Routes of Exposure: Soluble barium compounds can affect the body if they are inhaled or if they come in contact with the eyes or skin. They can also affect the body if they are swallowed.

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b. Effects of Overexposure:

(1) Short-term Exposure: Soluble barium compounds may cause local irritation of the eyes, nose, throat, bronchial tubes, and skin. Soluble barium compounds may also cause severe stomach pains, slow pulse rate, irregular heart beat, ringing of the ears, dizziness, convulsions, and muscle spasms. Death may occur.

(2) Long-term Exposure: None known.

(3) Reporting Signs and Symptoms: A physician should be contacted is anyone develops any signs or symptoms and suspects that they are caused by exposure to soluble barium compounds.

c. Recommended Medical Surveillance: The following medical procedures should be made available to each employee who is exposed to soluble barium compounds at potentially hazardous levels:

(1) Initial Medical Examination:

(a) A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Examination of the heart, lungs, and nervous system should be stressed. The skin should be examined for evidence of chronic disorders.

(b) 14" x 17" chest roentgenogram: Soluble barium compounds cause human lung damage. Surveillance of the lungs is indicated.

(c) Soluble barium compounds are respiratory irritants. Persons with impaired pulmonary function may be at increased risk from exposure.

(d) Electrocardiogram: Barium compounds may cause cardiac arrhythmias and may have a direct effect on the cardiac muscle. Periodic surveillance of the heart is indicated.

(2) Periodic Medical Examination: The aforementioned medical examinations should be repeated on an annual basis, except that an x-ray is necessary only when indicated by the results of pulmonary function testing, or by signs and symptoms of respiratory disease.

d. Summary of Toxicology: Soluble barium salts cause severe gastroenteritis and systemic effects by ingestion. Intravenous injection of barium compounds in animals causes a strong, prolonged stimulation of muscle resulting in hyperperistalsis, bladder contraction, vasoconstriction, and irregular contraction of the heart followed by arrest in systole. Animals also exhibit stimulation of the central nervous system followed by paralysis. Ingestion of barium carbonate by humans causes gastroenteritis, muscular paralysis, slow pulse rate, extrasystoles, and hypokalemia. Heavy industrial exposure to dusts of barium sulfate or barium oxides may produce a benign pneumoconiosis, termed baritosis. It results in no impairment of ventilatory function, although signs of mild bronchial irritation may occur. Characteristic x-ray changes are those of small, dense, circumscribed nodules evenly distributed throughout the lung fields, reflecting the

radio-opacity of the barium dust. Bronchial irritation has been reported from the inhalation of barium carbonate dust. Barium hydroxide and barium oxide are strongly alkaline in aqueous solution, causing severe burns of the eye and irritation of the skin.

e. Reactivity:

(1) Conditions contributing to instability: For barium nitrate, elevated temperatures may cause melting and decomposition; for the other compounds, none hazardous.

(2) Incompatibilities: Contact of barium oxide with water, carbon dioxide, or hydrogen sulfide may cause fires and explosions. Contact of barium carbonate with acids causes formation of carbon dioxide gas that may cause suffocation in enclosed spaces. Contact of barium nitrate with organic matter and combustible materials may cause fires and explosions.

(3) Hazardous decomposition products: Toxic gases and vapors (such as oxides of nitrogen and carbon monoxide) may be released in a fire involving barium nitrate.

(4) Special precautions: None

f. Flammability:

(1) Flash Point: Not applicable

(2) Autoignition temperature: For barium nitrate, data not available; for the other compounds, not applicable.

(3) Flammable limits in air, % by volume: Not applicable

(4) Extinguishant: Large amounts of water should be used on adjacent fires.

g. Warning properties: Barium chloride causes considerable iritis, which subsides in a few days. Barium oxide is capable of causing severe alkali burns of the eye, similar to those produced by calcium hydroxide.

2.1.1.4 Monitoring and Measurement Procedures:

a. General: Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

b. Method: Sampling and analyses may be performed by collection on a cellulose membrane filter followed by leaching in hot water, solution of sample in acid, and analysis in an atomic absorption spectrophotometer. An analytical method for soluble barium compounds is in the NIOSH Manual of Analytical Methods, 2nd Ed., Vol. 3, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00261-4).

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2.1.1.5 Respirators:

a. Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

b. In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

2.1.1.6 Personal Protective Equipment:

a. Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with barium carbonate, barium chloride, barium nitrate, or liquids containing these compounds.

b. Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum) and other appropriate protective clothing necessary to prevent skin contact with barium oxide or liquids containing barium oxide, where skin contact may occur.

c. If employees' clothing has had any possibility of being contaminated with barium carbonate, barium chloride, barium nitrate, barium oxide, or liquids containing these compounds, employees should change into uncontaminated clothing before leaving the work premises.

d. Clothing contaminated with barium carbonate, barium chloride, barium nitrate, or barium oxide should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of contaminant from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the contaminant, the person performing the operation should be informed of contaminant's hazardous properties.

e. Where exposure of an employee's body to barium oxide or liquids containing barium oxide may occur, facilities for quick drenching of the body should be provided within the immediate work area for emergency use.

f. Non-impervious clothing which becomes contaminated with barium carbonate, barium chloride, barium nitrate, or barium oxide should be removed promptly and not reworn until the contaminant is removed from the clothing.

g. Employees should be provided with and required to use dust- and splash-proof goggles where there is any possibility of barium oxide or liquids containing barium oxide contacting the eyes.

h. Employees should be provided with and required to use dust- and splash-proof safety goggles where barium carbonate, barium chloride, barium nitrate, or liquids containing these compounds may contact the eyes.

i. Where there is any possibility that employees' eyes may be exposed to barium oxide or liquids containing barium oxide, an eye-wash fountain should be provided within the immediate work area for emergency use.

2.1.1.7 Sanitation:

a. Workers subject to skin contact with barium oxide or liquids containing barium oxide should wash any areas of the body which may have contacted barium oxide at the end of each work day.

b. Skin that becomes contaminated with barium carbonate, barium chloride, or barium nitrate should be promptly washed or showered to remove any contaminant. In the case of barium carbonate, employees should use soap or mild detergent and water for washing purposes.

c. Skin that becomes contaminated with barium oxide should be properly washed or showered to remove any barium oxide from the skin after all obvious amounts of barium oxide have been removed by other means (e.g., by use of oil or vaseline). Employees who are being burned by barium oxide should immediately utilize quick drenching facilities without first removing barium oxide by other means.

d. Eating and smoking should not be permitted in areas where solid barium carbonate, barium chloride, barium nitrate, or barium oxide, or liquids containing these compounds are handled, processed, or stored.

e. Employees who handle barium carbonate, barium chloride, barium nitrate, barium oxide, or liquids containing these compounds should wash their hands thoroughly before eating, smoking, or using toilet facilities. In the case of barium carbonate, employees should use soap or mild detergent and water for washing purposes.

2.1.1.8 Common Operations and Controls: The following list includes some common operations in which exposure to soluble barium compounds may occur and control methods which may be effective in each case:

Operation	Controls
Use in manufacture of photographic papers, dyes, and chemicals	Process enclosure; local exhaust ventilation
Use as pesticides, rodenticides, and disinfectants; use in manufacture of explosives, matches, and pyrotechnics as igniter compositions and fireworks	Process enclosure; local exhaust ventilation

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2.1.1.9 Emergency First Aid Procedures: In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

a. Eye Exposure: If solutions of barium compounds get into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. Get medical attention immediately. Contact lenses should not be worn when working with these chemicals.

b. Skin Exposure: If solutions of barium compounds get on the skin, immediately flush the contaminated skin with water. If solutions of barium compounds soak through the clothing, remove the clothing immediately and flush the skin with water. If irritation persists after washing, get medical attention.

c. Breathing: If a person breathes in large amounts of soluble barium compounds, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

d. Swallowing: When soluble barium compounds have been swallowed and the person is conscious, give the person large quantities of water immediately. After the water has been swallowed, try to get the person to vomit by having him touch the back of his throat with his finger. Do not make an unconscious person vomit. Get medical attention immediately.

e. Rescue: Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

2.1.1.10 Spill and Disposal Procedures:

a. Persons not wearing protective equipment and clothing should be restricted from areas of spills until cleanup has been completed.

b. If soluble barium compounds are spilled, the following steps should be taken:

(1) Ventilate area of spill.

(2) Collect spilled material in the most convenient and safe manner and deposit in sealed containers for reclamation or for disposal in a secured sanitary landfill. Liquids containing soluble barium compounds should be absorbed in vermiculite, dry sand, earth, or a similar material.

c. Waste disposal method: Soluble barium compounds may be disposed of in sealed containers in a secured sanitary landfill.

2.2 Site Location:

2.2.1 Refer to contract drawing sheet G-2 for vicinity map. See sheet G-3 for the project area perimeter identification and existing geographic features.

2.2.2 The UEP is contained inside a burning area which is fenced and has controlled access. The controlled access is administered by a staffed guard house that must be approached for permission to enter at all times. Certain clear distances must be maintained from burning sites, buildings, and structures within the burning area at all times. Also, entry to the burning area may be denied at certain times due to burning operations. It shall be the contractor's responsibility to familiarize himself with all safety and security requirements in the burning area and adjust his bid accordingly.

2.3 Site Layout: It shall be the Contractor's responsibility to prepare and submit for approval by the Contracting Officer a site map of the project work area. Every work site will have three basic areas - Exclusion, Contamination Reduction and Support. The Exclusion Area will be divided into up to four zones as determined by the degree of hazard present. When established standards or adequate site information are not available a minimum of Zone B will be established. All items listed in Paragraph 2.3.1 and 2.3.2 below will be displayed on the site map.

2.3.1 Determination of areas:

2.3.1.1 Exclusion Area: Criteria for determining zones are listed below. Protective equipment may be specified for workers in the Exclusion Area on the basis of location or operation or both.

a. Zone A: Maximum respiratory, skin, and eye protection is required.

(1) Where atmospheres have the potential to be immediately dangerous to life and health (IDLH)

(2) Atmospheric sampling indicates concentrations capable of being absorbed through the skin or eyes in toxic quantities or atmospheric concentrations of corrosives exist which could destroy skin.

(3) Skin contact with extremely hazardous substances (known or suspected to be on site) is possible.

b. Zone B: Maximum respiratory protection required and low probability of skin contact.

(1) Where atmospheric concentration of contaminant is know and the concentration of contaminants is greater than the protection factor for air purifying respirators or atmosphere is oxygen deficient (less than 19.5% oxygen).

(2) Contaminants absorbed through or toxic to skin are not present.

(3) Safeguards preclude splashing of contaminant on the skin or in eyes of individuals.

c. Zone C:

(1) Air contaminant levels are being monitored and do not exceed the protection factors of air purifying respirators.

(2) The contaminants have good warning properties.

(3) The contaminant is not known to be absorbed through or be toxic to skin.

(4) A reliable history of prior entry exists without acute or chronic effects on personnel.

d. Zone D: Can only be included inside the Exclusion Area if there is no Zone A or requirement for Level A protective equipment, and if there is no requirement for Zone B or Level B protection other than a restricted area with an oxygen deficient atmosphere.

(1) No known airborne hazards present and there is little or no potential for release of an airborne contaminant.

(2) Work function precludes splashing.

2.3.1.2 Contamination Reduction Area: Provides area to prevent the transfer of contaminants from the Exclusion Area to the Support Area, including personnel showers, change rooms, equipment decontamination.

2.3.1.3 Support Area: The outer area, considered to be clear of contamination, including vehicle parking, administrative areas, etc.

2.3.2 Access to existing roadways and any associated problems with access and egress to the site.

2.4 Personnel Protection:

2.4.1 The Contractor shall be responsible for determining and furnishing the necessary personnel protective equipment for each zone and area. Protective gloves, boots and suits shall be of material resistant to the chemicals present on the specific site. All respiratory protective equipment must be approved by NIOSH or MSHA.

2.4.1.1 Level A Protection. Required in Zone A

a. Positive-pressure demand type, air-supplied breathing apparatus

b. Fully encapsulating suit

c. Outer and inner gloves (both chemical-resistant)

d. Steel toe and shank boots

e. Hard Hat (under suit)

f. Options as required:

(1) Coveralls

(2) Long cotton underwear

(3) Disposable protective suit, gloves and boots, worn over fully encapsulating suit

2.4.1.2 Level B Protection: Required in Zone B

a. Positive pressure demand, air-supplied breathing apparatus

b. Chemical-resistant clothing, long sleeves, one or two pieces, requirement for hood to be determined

c. Outer and inner gloves (both chemical-resistant)

d. Steel toe and shank boots

e. Hard Hat

f. Options as required

(1) Coveralls

(2) Disposable outer boots

2.4.1.3 Level C Protection: Required in Zone C

a. Full-face piece, air-purifying, canister-equipped respirator

b. Chemical-resistant clothing, long sleeves, one or two pieces, requirements for hood to be determined.

c. Gloves

d. Steel toe and shank boots

e. Hard Hat

f. Options as required

(1) Coveralls

(2) Inner chemical-resistant gloves

(3) Disposable outer boots

(4) Escape mask

2.4.1.4 Level D Protection: Required in Zone D and in the Contamination Reduction Area

a. Coveralls

b. Leather or chemical-resistant boots or shoes, steel toe and shank

c. Hard Hat

d. Options as required

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(1) Gloves

(2) Disposable outer boots

(3) Safety glasses or chemical splash goggles

(4) Escape mask or respirator

2.4.2 Establishment of medical requirements and special tests for chemical exposure, if available. Frequency of exams and tests will be specified.

2.4.2.1 Preemployment medical examinations

2.4.2.2 Periodic medical examinations

2.4.2.3 Pretermination medical examinations

2.4.3 Work-rest schedules for each level of protective equipment considering the expected climate.

2.4.4 Heat or cold stress monitoring requirements and procedures.

2.4.5 Dependent upon the chemicals present or suspected to be present at the site, exclusion of female personnel with childbearing capabilities may be required. Concerning soluble barium compounds, the long-term exposure effect is not known and data relating exposure to child birth irregularities is inconclusive. Therefore, it is recommended that female personnel with childbearing capabilities be excluded from that part of the work force that will be exposed to working with the sludge removal. It shall be the Contractor's responsibility to make this determination.

2.5 Contaminant Monitoring: The Contractor shall devise and institute a procedure to monitor for contaminants taking into account specific methods, the frequency of testing, and the location for monitoring based on NIOSH approved methods where such procedures are available. Refer to 2.1.1.4 above for monitoring and measurement procedures for soluble barium compounds as an example. The monitoring program shall address the following:

2.5.1 Personnel Monitoring (Breathing Zone Samples):

2.5.1.1 High hazard operations

2.5.1.2 Hazardous site areas or zones

2.5.2 Area Monitoring

2.5.2.1 Atmospheric concentration of contaminants

2.5.2.2 Oxygen content

2.5.2.3 Explosive atmospheres

2.5.2.4 Radioactivity

2.6 Decontamination: As discussed above in Background, the sludge shall be considered as hazardous for soluble barium compounds. The fact that the sludge is highly akaline is also important from a personnel decontamination standpoint.

2.6.1 Personnel Decontamination Procedures:

2.6.1.1 The discussion under 2.1.1.6, 2.1.1.7, and 2.1.1.9 covers the applicable personnel decontamination procedures.

2.6.2 Equipment Decontamination Procedures:

2.6.2.1 Provisions for equipment and machinery clean-up and washdown are covered under other provisions of these specifications.

2.6.3 "Scrap" Decontamination Procedures:

2.6.3.1 Any "scrap" generated by the UEP closure process shall be considered as hazardous waste and shall be transported with the sludge to its final destination.

2.7 Prevention of Contamination Spread: The Contractor shall monitor using applicable EPA procedures to prevent the spread of contamination as follows:

2.7.1 Wastewater: All wastewater generated by the Contractor (equipment washdown, etc.) during the UEP closure process shall be contained in the UEP and disposed in accordance with these specifications. Monitoring of the wastewater shall not be required.

2.7.2 Soil: Other provisions of these specifications require the removal of a certain amount of soil outside of the UEP and testing to determine the extent of the removal. Further monitoring is not required by this specification.

2.7.3 Groundwater: Various groundwater test wells are in place and are being monitored by others. No further monitoring is required by this particular specification. Any rainwater and/or groundwater that enters the UEP during the closure procedure shall be treated the same as the wastewater discussed in 2.7.1 above. It shall be disposed of at the expense of the Contractor.

2.7.4 Meterological Monitoring: Meterological monitoring shall not be required.

2.8 Communications: The Contractor shall provide and maintain communications as follows:

2.8.1 Communications on site compatible with protective equipment used.

2.8.2 Communications with on call emergency equipment.

2.9 Emergency Procedures: Establish a system of protocols and equipment necessary for emergency response procedures for occurrence of 2.9.1 through 2.9.5 below in each of the site areas and zones outlined in 2.3 above.

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2.9.1 Chemical Exposure

2.9.2 Personal Injury

2.9.3 Potential or actual fire or explosion (including criteria for determining a hazard exists)

2.9.4 Environmental accident:

2.9.4.1 Spill control procedures

2.9.4.2 Information resources for emergency response

2.9.4.3 Reporting requirements

2.9.5 Radiation:

2.9.5.1 Criteria for determing hazard

2.9.5.2 Regulatory agency requirements

2.9.6 Identification of local and state emergency response personnel required on standby to support activities on site (fire department, police, hospital emergency room, others).

2.9.6.1 Level of expertise available

2.9.6.2 Emergency and personal protective equipment available

2.9.6.3 Training required for emergency personnel supporting site operations

2.9.7 Definition of interfaces between the Contractor, Corps representative, Morton Thiokol representative, and EPA On-Scene Coordinator for implementation of the EPA Community Protection Plan. The Community in this instance is Longhorn AAP and the EPA Community Protection Plan as such does not exist. The standing procedures of the Longhorn AAP security and safety offices of Morton Thiokol shall suffice. The Community Protection Plan (or its equivalent) is necessary to insure that adequate contingency planning has been done by all federal, state, and local agencies involved.

2.10 Training: The Contractor shall see that personnel will have either formal training or prior on-the-job training for those tasks they are assigned to perform. All unfamiliar operations will be rehearsed prior to performing the actual procedure. Additionally, an on-site orientation session must be developed covering the following subjects as a minimum:

2.10.1 Health effects and hazards of the chemicals identified or suspected to be on site. The basis for this discussion will be the background information and fact sheet prepared under Section 1.

2.10.2 Personnel Protection:

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2.10.2.1 Use, care and fitting of personnel protective equipment

2.10.2.2 Necessity for personnel protection, effectiveness and limitations of equipment

2.10.3 Decontamination Procedures

2.10.4 Prohibitions in areas and zones

2.10.4.1 Site Layout

2.10.4.2 Procedures for entry and exit of areas and zones

2.10.4.3 Use of lunch, break and shower facilities

2.10.5 Emergency procedures as identified in Section 2.9

2.10.6 Medical Requirements

3. ELECTRICAL WORK: Electrical work will not be performed on or near energized lines or equipment unless specified in the plans and specifications.

3.1 Electrical Tools: Hand held electric tools shall be used only on circuits protected by ground fault circuit interrupters for protection of personnel.

3.2 Extension Cords: All general use extension cords will be of a type listed by Underwriters' Laboratories and will be classified as Type S, SO, ST, STO, STW, SE, SEO, or SEW, as described in Table 400-=4 of the 1981 edition of the National Electric Code.

3.3 Grounding Generators and Arc Welders: Non-current carrying metal parts of all generators and arc welders shall be grounded.

4. ROLLOVER PROTECTIVE STRUCTURES:

4.1 ROPS for rollers and compactors will be certified to meet SAE requirement J1040C.

4.2 ROPS, as required by paragraph 18.B.20, EM 385-1-1, with Change 1, dated 1 Dec 81, includes self-propelled pulverizers.

5. RADIATION PERMITS OR AUTHORIZATIONS:

5.1 Contractors contemplating the use of radioactive materials or radiation producing equipment while performing work on this contract must obtain written authorization from the Department of the Army or Department of the Air Force, as applicable.

5.2 A 45-day lead time should be programmed for obtaining this written authorization.

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5.3 When requested, the Contracting Officer's Authorized Representative will assist the Contractor in obtaining the required permit or authorization.

6. SELF-PROPELLED ELEVATING WORK PLATFORMS: All self-propelled elevating work platforms will be designed, constructed, maintained, used, and operated in accordance with the guidance provided in American National Standard for Self-Propelled Elevating Work Platforms (ANSI A92.6-1979) together with any amendments which may be in force at the time the contract is awarded.

7. LANGUAGE: For each work group that has employees that do not speak English, the Contractor will provide a bilingual foreman that is fluent in the language of the workers. The Contractor will implement the requirements of EM 385-1-1, paragraph 01.B.01, 01.B.02, and 01.C.02 through these foremen.

SECTION 2B

DEMOLITION

1. GENERAL:

1.1 Submittals: The procedures proposed for the accomplishment of salvage and demolition work shall be submitted for approval. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations.

1.2 General Requirements: The work includes demolition or removal of all construction indicated or specified. All materials resulting from demolition work, except as indicated or specified otherwise, shall become the property of the Contractor and shall be removed from the limits of Government property. Rubbish and debris shall be removed from Government property daily unless otherwise directed so as to not allow accumulation inside or outside the building. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer.

1.3 Dust Control: The amount of dust resulting from demolition shall be controlled to prevent the spread of dust to occupied portions of the building and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.

1.4 Protection:

1.4.1 Protection of Existing Work: Before beginning any cutting or demolition work, the Contractor shall carefully survey the existing work and examine the drawings and specifications to determine the extent of the work. The Contractor shall take all necessary precautions to insure against damage to existing work to remain in place, to be reused, or to remain the property of the Government, and any damage to such work shall be repaired or replaced as approved by the Contracting Officer at no additional cost to the Government. The Contractor shall carefully coordinate the work of this section with all other work and construct and maintain shoring, bracing, and supports, as required. The Contractor shall insure that structural elements are not overloaded and be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under any part of this contract.

1.4.2 Protection of Building from the Weather: The interior of the building and all materials and equipment shall be protected from the weather at all times.

1.4.3 Protection of Trees: Trees within the project site which might be damaged during demolition and which are indicated to be left in place shall be protected by a 6-foot high fence. The fence shall be securely erected a minimum f 5-feet from the trunk of individual trees or follow the outer

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perimeter of branches or clumps of trees. Any tree designated to remain that is damaged during the work under this contract shall be replaced.

1.4.4 Environmental Protection: All work and Contractor operations shall comply with the requirements of SECTION: ENVIRONMENTAL PROTECTION.

1.5 Burning: The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.6 Use of Explosives: Use of explosives will be permitted.

1.7 Availability of Work Areas: Areas in which salvage and demolition work is to be accomplished will be available during normal working hours except for restrictions due to burning of pyrotechnics outlined in the Special Provisions and Section 2A of these specifications.

2. EXECUTION:

2.1 Existing Facilities:

2.1.1 Structures, Walls, and Partitions: Existing structures indicated shall be removed as shown on the plans.

2.1.1.1 Building 34-X: Remove column bases to top of pier, entire concrete support structure and sluiceway.

2.1.1.2 Building 36-X: Existing structures shall be removed to top of concrete slab on ground. Steel base supports for truck and compressor hook-ups are to be removed to concrete and salvaged. Concrete piers and pipe sleepers are to be removed to full depth of concrete.

2.1.2 Utilities:

2.1.2.1 Utility Services: Disconnections of utility services shall be included for all structures.

2.1.2.2 Removal of Utilities: Existing utilities shall be removed as indicated. When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified.

2.2 Filling: Holes, open basements and other hazardous openings shall be filled in accordance with SECTION: EARTHWORK.

2.3 Disposition of Material:

2.3.1 Title to Materials: Title to all salvageable materials and equipment to be demolished shall remain the property of the Government. The Government will not be responsible for the condition, loss or damage to such property after notice to proceed.

2.3.2 Unsalvageable Materials: Concrete, masonry, and other noncombustible materials other than concrete permitted to remain in place, shall be disposed in the disposal area located on the plant site as designated by the Contracting Officer.

2.3.3 Materials for Government Salvage:

2.3.3.1 Property of the Government: Salvaged items shall be removed in a manner to prevent damage and packed or crated to protect the items from damage while in storage or during shipment. Containers shall be properly identified as to contents. The following items shall be delivered to the areas designated, reserved as property of the Government at no additional cost to the Government: Rocket motor washout structure, control building, and associated piping.

2.3.3.2 Damaged Items: Items damaged during removal or storage shall be repaired or replaced to match existing.

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SECTION 2C

REMOVAL AND DISPOSAL OF SLUDGE
AND CONTAMINATED SOIL

1. GENERAL: The method for removal of the sludge from the bottom of the pond and contaminated soil is as follows:

1.1 Liquid shall be removed from pond by others prior to performance of this project. It is possible that a few inches of water may exist in the pond after initial removal. This water shall be removed by the Contractor and disposed in accordance with Section 2D.7.5 of these specifications.

1.2 A chemical drying agent, cement, shall be distributed onto and incorporated into the sludge. A cement dosage of approximately 10 percent by weight is required to produce a truckable cake.

1.3 The dried sludge shall be loaded into lined and covered dump trailer transports and shipped to a suitable disposal site.

1.4 Disposal shall be at a licensed and bonded Hazardous Waste Disposal Site.

The method described above may be altered by the Contractor on written approval of the Contracting Officer if the procedure is considered equal in all respects to the original method. If use of a different drying agent increases the quantity of sludge to be disposed, the contract unit price for removal and disposal will be reduced in proportion with the increased volume.

2. APPLICABLE PUBLICATIONS: Technical Report EPA/CE-81-1, "Procedures for Handling and Chemical Analysis of Sediment and Water Samples", published by the U.S. Army Engineers Waterways Experiment Station, Vicksburg, Mississippi.

3. SUBMITTALS: The procedures proposed for accomplishment of the work shall be submitted for approval. The procedures shall include a detailed description of the methods and equipment to be used for each operation and the sequence of operations.

4. DISTRIBUTION OF DRYING AGENT: The drying agent will be delivered to the job site in hopper-bottom transport trailers with pneumatic conveyance equipment. The pneumatic conveyors will be used to deposit the drying agent onto the sludge in the bottom of the pond. Then a low earth pressure crawler tractor will be used to spread the drying agent over the surface of the sludge. The agent will be incorporated by disking, blading, or with a dragline bucket. As discussed in paragraph 1. above, the Contractor may use an alternate procedure to the approach suggested on approval of the Contracting Officer.

5. EXCAVATION AND TRANSPORT: The dried sludge will be removed from the pond with a front-end loader or dragline, then loaded into a lined and covered dump truck for transportation to the point of disposal. Removal of the sludge shall be as necessary to remove all sludge, with a Chemical Oxygen

Demand (COD) above a level of 10,000 ug/g. It will be necessary to perform routine analyses for COD to determine the extent of excavation that is required. Sampling and analysis shall be performed in accordance with EPA/CE-81-1. Initial excavation will consist of a 6" thick cut on the entire inside surface of the UEP. After the initial cut, samples will be taken on maximum 2500 s.f. intervals to determine if additional removal is required. Areas that exceed the COD limit will be excavated in subsequent 6" cuts and retested until the limit is reached. The quantity of sludge removed will be measured based on percentage of transport trailer volume and recorded for the purpose of payment by the Contractor and the Area Engineer. The grades for excavation shown on the plans were estimated based on probing and sampling information developed by the Government and may not be verified during sludge removal. However, quantities for sludge disposal included in the proposal forms were calculated from the grades shown on the plans. The Contractor shall provide hazardous wastes shipping manifests approved by EPA for each shipment. Copies executed by the generator, shipper, and disposer shall be forwarded to the Contracting Officer and appropriate state and Federal agencies.

6. DISPOSAL: Disposal shall be at a licensed and bonded Hazardous Waste Disposal landfill selected by the Contractor. Documentation of the proof of the disposal landfill's capability to dispose of the sludge within applicable State, Federal, and local requirements must be approved by the Contracting Officer prior to excavation of the sludge. Candidate landfills that have been identified as capable of accepting this waste are as follows:

a. Chemical Waste Management; Port Arthur, Texas

b. Rollins Environmental Services, Inc; Deer Park, Texas

c. Chemical and Environmental Conservation Systems; Livingston, Louisiana

d. Texas Ecologists, Inc.; Corpus Christi, Texas

Identification of the landfills shown above is for information only and shall in no way be considered restrictive on the Contractor for his selection process. Other landfills may be equally well qualified to receive the waste.

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SECTION 2D

EARTHWORK

1. APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 Military Standards (Mil. Std.):

MIL-STD-619B	Unified Soil Classification System for Roads, Airfields, Embankments and Foundations
MIL-STD-621A & Notices 1 & 2	Test Methods for Pavement Subgrade, Subbase Base-Course Materials

1.2 American Society for Testing and Materials (ASTM) Publications:

C 33-81	Concrete Aggregates
C 117-80	Materials Finer Than 75 um (No. 200) Sieve in Mineral Aggregates by Washing
C 136-83	Sieve Analysis of Fine and Coarse Aggregates
D1140-54 (R 1971)	Amount of Material in Soils Finer Than the No. 200 (75-um) Sieve
D 1556-82	Density of Soil in Place by the Sand-Cone Method
D 2922-81	Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D 3017-78	Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
E 548-79	Generic Criteria for Use in Evaluation of Testing and Inspection Agencies

2. DEFINITIONS:

2.1 Classification of Materials: Testing and classifications of materials shall be in accordance with the publications referenced hereinbefore.

2.2 Satisfactory Materials: Satisfactory materials for use as fill or backfill shall be materials classified in MIL-STD-619, as GW, GP, SW, GC, GM, SP, CL, CH, SM, SC, and free from roots and other organic matter, trash, debris, frozen materials, and stones larger than 3 inches in any dimension. Additionally, any material classified as SM shall have not more than 25 percent by weight passing the No. 200 sieve. The material shall be obtained

from the borrow areas shown or from approved sources outside the limits of Government-controlled land at the Contractor's responsibility.

2.3 Material to be used in constructing the 48 inch compacted clay layer shall be classified in MIL-STD-619 as CL or CH, and shall be obtained from the impervious borrow pit. This material shall have a minimum liquid limit of 38 and a minimum plasticity index of 13. Material to be used as common fill shall be satisfactory fill obtained from the common fill borrow pit.

2.4 Filter materials shall be washed sand, composed of hard, tough, durable particles free from adherent coatings. Filter materials shall be uniformly graded between the limits specified hereinafter. Points on the individual grading curves obtained from representative samples of filter materials not only shall lie between smooth curves drawn through a plot of the tabulated grading limits specified, but also shall exhibit no abrupt changes in slope denoting skip grading, scalping of certain sizes, or other irregularities that would be detrimental to the proper functioning of the filter.

Sand filter material shall be a uniformly graded material conforming to ASTM C33 for fine aggregate for use in concrete production and to the following gradation:

Sieve Size	Percent by Weight Passing
3/8 inch	100
No. 4	95 - 100
No. 10	80 - 100
No. 20	50 - 85
No. 40	25 - 60
No. 100	10 - 30
No. 200	2 - 10

2.5 Unsatisfactory materials shall be materials that do not comply with the requirements for satisfactory materials. Unsatisfactory materials include but are not limited to those materials containing roots and other organic matter, trash, debris frozen materials, stones larger than 3 inches, and materials classified in MIL-STD-619 as Pt, OH, OL, MH, and ML. Unsatisfactory materials also include manmade fills, refuse or backfills for previous construction. Clay shale, although classified as a CL or CH, is not a satisfactory material for fills or backfills.

2.6 Cohesionless and Cohesive Materials: Cohesionless materials include materials classified in MIL-STD-619 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines have a plasticity index of zero.

2.7 Density required by compaction is expressed as a percentage of the maximum density obtained in the laboratory by the test procedure presented in MIL-STD-621, Method 100, compaction effort designation CE 55, abbreviated hereinafter as percent CE 55 maximum density.

2.8 Topsoil shall be the top 6 inches of material designated for stripping as described in paragraph STRIPPING of this section, and which has

been processed to remove brush, stones larger than 2 inches, litter, stumps, roots, and other material that would interfere with planting and maintenance operations.

2.9 Bedding material for riprap shall be a ~~non-woven~~ filter fabric in accordance with Section 2F of these specifications.

2.10 Riprap: Riprap ~~without grout~~ shall consist of sound and durable stone, cobbles or spalls. The material shall have a maximum size of 6 inches and be reasonably well-graded between the maximum size stone permitted and 3-inch stone, with not more than 5 percent by weight smaller than the 3-inch size. The least dimension of a stone shall be considered its size.

2.11 Washed Gravel: Gravel for use in subdrainage system shall be gravel or stone composed of hard, tough, durable particles, free from adherent coatings, with a maximum size of 2-1/2 inches and a minimum size of 1/2-inch. The material shall be washed to remove fines prior to being placed in the trench.

3. SUBSURFACE DATA: The locations of borings are shown on the drawings. Boring profiles are shown in Appendix A of the SPECIAL PROVISIONS. Information available for examination or included in the plans and specifications pertinent to subsurface exploration, borings, samples, test pits, and other preliminary investigations, represents only the best knowledge of the Government as to the location, character, or quantity of materials encountered. While the borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, localized variations characteristic of the subsurface materials of this region are anticipated and, if encountered, such variations will not be considered as differing materially within the purview of paragraph DIFFERING SITE CONDITIONS of the GENERAL CONDITIONS.

4. CLEARING AND GRUBBING:

4.1 General: The areas requiring excavation shall be cleared and grubbed of trees, stumps, roots, brush and other vegetation, debris, existing foundations, pavements, utility lines, structures, fences, and other items that would interfere with construction operations. Stumps, logs, roots, and other organic matter shall be completely removed. The resulting depressions shall be completely filled with satisfactory material placed and compacted as specified unless further excavation is required.

4.2 Disposal of Cleared and Grubbed Materials: Materials removed and not designated as merchantable timber or salvage materials shall be disposed of in designated waste disposal areas as directed.

5. STRIPPING OF BORROW AREAS: Soil shall be stripped to a depth of 6 inches within the designated excavations and grading lines. Stripping depths shall be measured from the existing contours, as shown on the drawings. Stripped materials, regardless of classification, shall not be used for fill or backfill without prior approval of the Contracting Officer. Topsoil shall be kept free from subsoil, clay lumps, brush, objectionable weed growth, litter, stones larger than 2 inches in diameter, stumps, roots, and other material that would interfere with planting and maintenance

operations. Topsoil shall be transported and deposited in storage piles convenient to areas that are to receive applications of topsoil later. Excess topsoil, unsatisfactory material and all stripped material shall be disposed of in designated waste disposal areas as directed.

6. CONSTRUCTION PLANS:

6.1 Grading and Excavation Plan: Prior to commencement of excavation, the Contractor shall submit in writing, for the Contracting Officer's information, a Grading and Excavation Plan for earthwork to be accomplished. The plans shall show: The proposed sequence of operations the type, rated capacity, and quantity of equipment to be used in the excavation phase or sequence; plans showing locations and configuration of proposed temporary stockpiles and waste areas; and the drainage and dewatering plans which show the control and removal of surface water and ground water flowing toward and tending to collect in excavations. Excavations shall be made and maintained in accordance with the Grading and Excavation Plan submitted and, if the required results are not obtained, the Contractor shall revise his plans in writing before changing the work procedures. Submission of the plan shall not relieve the Contractor of his responsibilities for excavation.

6.2 Filling and Backfilling Plan: Prior to placement of fill or backfill, the Contractor shall submit in writing, for the Contracting Officer's information, a Filling and Backfilling Plan for work to be accomplished. The plans shall show: The sequence and timing of the proposed backfill operation; the earthmoving and compaction equipment to be used; and the personnel, procedures and equipment to be used for the quality control testing and certification. Filling and backfilling shall be done and maintained in accordance with the Filling and Backfilling Plan submitted and, if required results are not obtained, the Contractor shall halt the filling and backfilling work and revise his plans, in writing, before changing the work procedures. Submission of the plan will not relieve the Contractor of his responsibilities for filling and backfilling.

7. DRAINAGE AND DEWATERING:

7.1 General: Drainage and dewatering shall consist of the control of surface and ground water, regardless of origin, nature, or quantity, flowing toward and tending to collect in, fills, backfills, or excavations. This water shall be controlled in a manner providing effective, continual drainage of excavations, fills and surrounding area. Control measures shall be taken by the time the excavation reaches the ground water level in order to maintain the integrity of the in-situ material. During the excavation, the level of the water shall be maintained continuously below the working level. The Contractor shall provide qualified personnel and equipment, including standby power and pumping equipment, to operate and maintain continuously, water control facilities as required to divert or remove water, from whatever the source, until backfilling is completed.

7.2 Surface Water Control: Diversion ditches, dikes, and grading shall be provided and maintained as necessary during construction to prevent external surface water from entering excavated areas. Precipitation on the slopes and base of excavations shall be controlled in the manner indicated in paragraph Ground Water Control. Surface water shall be directed away from excavation and construction sites so as to prevent erosion and

undercutting of foundations. Excavation slopes and backfill surfaces shall be protected so as to prevent erosion and sloughing.

7.3 Ground Water Control: Ground water flowing toward or into excavations shall be controlled to prevent, sloughing of excavation slopes and walls, boils, uplift and heave in the excavation, and to eliminate interference with orderly progress of construction.

7.4 Exploration: The Contractor may, at his option, perform exploratory work in advance of excavation to provide a basis for selection of appropriate dewatering methods.

7.5 Disposal of Ground and Surface Water: Disposal water shall not pollute lake, stream, pond or other water sources and shall not silt, clog or otherwise damage natural or manmade drainage systems either above or below grade. Water removed from the pond shall be disposed at a licensed and bonded Hazardous Waste disposal facility or absorbed using cement. Transportation and disposal shall be manifested in accordance with EPA requirements with copies sent to the Contracting Officer and appropriate State and Federal agencies.

8. SHEETING, SHORING, BRACING AND PROTECTION: The Contractor bears full responsibility for maintaining the stability of excavated faces, including prevention of sloughing of material from excavated faces, and shall design and provide such sheeting, shoring, and bracing as may be required. The design shall be based on calculation of pressures exerted by and at the condition and nature of the materials to be retained, including hydrostatic pressure and any surcharge imparted to the sides of the excavation. Untreated wood shall not be left in place. Wood left in place shall be treated with oil borne preservatives in accordance with the requirements of Fed. Spec. TT-W-571. The provisions of adequate sheeting, bracing, shoring, sheet piling, cribbing, bulkheads, liner plates, lagging and other protective means shall be considered a subsidiary obligation of the Contractor and no additional payment shall be made therefore. Shoring, bracing, and sheeting shall be removed in a manner to prevent caving as excavations are backfilled.

9. CLASSIFICATION OF EXCAVATION: No consideration will be given to the nature of the soil materials and all excavation will be designated as unclassified excavation. No rock excavation is required.

10. EXCAVATION:

10.1 General: Excavation of every description shall conform to the lines, grades, dimensions and elevations indicated. Excavation below indicated depths will not be permitted except to remove wet, unstable, or otherwise unsatisfactory material. When unsatisfactory material is encountered below the grades shown, the Contracting Officer shall be notified and the material shall be removed as directed and replaced with satisfactory material; payment therefor will be made in conformance with the CHANGES clause of the GENERAL PROVISIONS. Satisfactory material removed below the depths indicated, without specific direction of the Contracting Officer, shall be replaced at no additional cost to the Government to the indicated excavation grade, with satisfactory materials. Satisfactory material shall be placed and compacted as specified. Determination of

elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer.

10.2 Excavation for Drainage Trenches: Trenches for underground drain lines shall be excavated to the required alignments, depths, grades, and necessary widths for proper laying of pipe, cables, or ducts. The banks of pipe trenches shall be as nearly vertical as practicable within safety requirements. Care shall be taken not to overexcavate. Excavated materials not required or not suitable for backfill shall be removed and wasted as indicated or as directed. Unless otherwise indicated, excavation shall be by open cut. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for the portions of the pipe sections where it is necessary to excavate for bell holes and the proper sealing of pipe joints, and as hereinafter specified. Bell holes and depressions for joints shall be dug after the trench bottom has been graded, and, in order that the pipe rest on the prepared bottom for as nearly its full length as practicable, bell holes and depressions shall be only of such length, depth, and width as required for properly making the particular type of joint. Stones shall be removed as necessary to avoid point bearing. Except as specified for wet, unstable, or otherwise unsatisfactory material, overdepths shall be backfilled as and with materials specified for backfilling the lower portion of trenches. Whenever wet, unstable, or otherwise unsatisfactory material that is incapable of properly supporting the pipe, is encountered in the bottom of the trench, such material shall be overexcavated to the depth directed to allow for construction of a stable bearing surface for pipe. The trench shall be backfilled to the proper grade with satisfactory materials. Care shall be exercised to minimize disturbance to the underlying layers during trench excavation.

10.3 Ditches, Gutters, Swales and Channel Changes: Ditches, gutters, swales, and channel changes shall be cut accurately to the cross sections and grades indicated. Roots, stumps, rock, and foreign matter in the sides and bottom of ditches, gutters, swales, and channel changes shall be trimmed and dressed or removed and the finished grades shall conform to the slope, grade, and shape of the section indicated. Care shall be taken not to excavate below the grades indicated. Excessive excavation shall be backfilled to grade either with satisfactory material, compacted as specified, or with suitable stone or cobble to form an adequate gutter paving, as directed. Permanent excavated features shall be maintained until final acceptance of the work. Excavated material shall be disposed of in accordance with paragraph DISPOSITION OF EXCAVATED MATERIALS. No excavated material shall be deposited closer to the edges of the ditches than 3 feet.

11. DISPOSITION OF EXCAVATED MATERIALS: Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required under this section of shall be separately stockpiled if it cannot be readily placed. Materials required to be excavated below the designated depth of stripping and meeting the requirements specified for satisfactory fill or backfill material may be used for fill or backfill with the Contracting Officer's approval. Satisfactory excavated material in excess of that required for the work under this section shall be made available for use in other portions of the permanent site work required

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under this contract. Satisfactory material shall be disposed of in designated waste disposal areas. Areas on Government-controlled land not previously used as waste disposal areas shall be cleared and grubbed before disposal of waste material thereon. No satisfactory material shall be wasted or used for the convenience of the Contractor unless so authorized.

12. STOCKPILES: Stockpiles of satisfactory and unsatisfactory material shall be placed and graded as specified herein. Stockpiling of contaminated soil or sludge shall be strictly prohibited. Stockpiles shall be kept in a neat and well-drained condition at all times, giving due consideration to drainage from adjacent properties and the surface shall be sealed by rubber-tired equipment. Excavated satisfactory and unsatisfactory materials shall be separately stockpiled. Areas on Government-controlled land not previously used as stockpile areas shall be cleared and grubbed prior to stockpiling material thereon. Excavated satisfactory material shall be stockpiled in such a manner as to provide free access to the work and to prevent damage to the sides of the excavations. Locations of stockpiles of satisfactory materials shall be subject to prior approval of the Contracting Officer.

13. BORROW: Where satisfactory materials are not available in sufficient quantity from required excavations, approved satisfactory materials shall be obtained from the borrow areas shown. The necessary clearing and grubbing of borrow areas, disposal and, where permitted, burning of debris therefrom, the developing of sources, including any access roads for hauling and the necessary right-of-way, and the satisfactory drainage of the borrow areas, shall be considered as incidental items to borrow excavation. Borrow pits shall be excavated in such manner as will afford adequate drainage. Borrow pits shall be neatly trimmed and left in such shape as will facilitate accurate measurements after the excavation is completed.

14. PROTECTION OR REMOVAL OF UTILITY LINES: Existing utility lines that are shown on the plans or the locations of which are made known to the Contractor prior to excavation and that are to be retained, as well as utility lines constructed during excavation operations, shall be protected from damage during excavation and backfilling and, if damaged, shall be repaired by the Contractor at no expense to the Government. In the event that the Contractor damages existing utility lines that are not shown on the plans or the locations of which have not been made known to the Contractor, report of such damage shall be made immediately to the Contracting Officer. If the Contracting Officer determines that the repairs shall be made by the Contractor, such repairs will be ordered in conformance with the CHANGES clause of the GENERAL PROVISIONS. When utility lines that are to be removed are encountered within the area of operations, the Contractor shall notify the Contracting Officer in ample time for the necessary measures to be taken to prevent interruption of the services.

15. BLASTING: Blasting will not be permitted.

16. GROUND SURFACE PREPARATION:

16.1 For Fills and Embankments: No stripping will be allowed in the pond area except in the area shown. All native materials designated for cut on the plans and not part of the sludge layer shall be used for pond fill prior to using other material.

16.2 For Backfills: The excavation shall be cleaned of trash, debris and loose soil materials. Surfaces shall be trimmed to dense undisturbed or well compacted materials.

16.3 For Riprap and Bedding Material: Areas on which bedding material and riprap are to be placed shall be trimmed and dressed to conform to the slope lines and grades indicated.

17. PLACING:

17.1 Earth Embankments and Fills: Satisfactory materials shall be used in the construction of earth embankments and in bringing fills to the lines and grades indicated, and for replacing unsatisfactory material. Satisfactory material shall be placed in horizontal layers as specified hereinafter. Oversize material shall be removed prior to placing satisfactory materials in fill and embankment areas. The moisture content of the material to be used for fill and embankment shall be adjusted in the stockpile, borrow areas, or other approved areas to obtain a uniform moisture content as required to obtain the density specified. Uniform distribution of moisture shall be obtained by mixing with disc harrow pulverizers or otherwise manipulating the soil prior to compaction. Material having a moisture content in excess of that which will permit compaction to the density specified shall be dried prior to placing. The surface of each lift shall be scarified before the next lift is placed. When compaction is to be accomplished by use of hand or hand-operated machine compactors, the layer thickness of each lift shall not exceed 6 inches in uncompacted thickness. When compaction is to be accomplished other than by hand or use of hand-operated machine compaction, the layer thickness of each lift shall not exceed 8 inches in uncompacted thickness or as specified hereinafter. ~~The first lift of the pond fill shall be placed in a 2-foot thick layer.~~

17.2 Riprap: Riprap shall be placed in such a manner as to produce a reasonably well-graded mass of rock with the minimum practicable percentage of voids, to the lines and grades indicated. A reasonable deviation as determined by the Contracting Officer from the slope lines and grades shown will be allowed in the finished surface of the riprap, except that either extreme of such deviation shall not be continuous over an area greater than 200 square feet. Riprap shall be placed to its full course thickness at one operation and in such manner as to avoid displacing the bedding material. The larger stones shall be well distributed and the entire mass of stones in their final position shall be roughly graded to conform to the gradation specified. The finished riprap shall be free from objectionable pockets of small stones and clusters of larger stones. Placing riprap in layers will not be permitted. Placing riprap by dumping into chutes or by similar methods likely to cause segregation of the various sizes will not be permitted. The desired distribution of the various sizes of stones throughout the mass shall be obtained by selective loading of the material at the quarry or other source; by controlled dumping of successive loads during final placing, or by other methods of placement which will produce the specified results. Rearranging of individual stones by mechanical equipment or by hand will be required to the extent necessary to obtain a reasonably well graded distribution of stone sizes as specified above. The Contractor shall maintain the riprap protection until accepted and any

material displaced by any cause shall be replaced at the Contractor's expense to the lines and grades indicated.

17.3 Backfills: Backfill shall not begin until construction below finish grade has been approved. Backfill shall be brought to indicated finish grade. Backfill shall not be placed in wet or frozen areas. Backfill shall be of satisfactory materials placed and compacted as specified. Movement of construction machinery over pipe shall be at the Contractor's risk. Pipe damaged thereby shall be repaired or replaced at the expense of the Contractor. The Contractor shall be responsible for preventing damage during backfilling.

18. COMPACTION:

18.1 Density: Field inplace density shall be determined in accordance with ASTM D 1556, MIL-STD-621, Method 106 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556 or MIL-STD-621, Method 106. ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gages shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gages shall be made at the beginning of a job, on each different type of material encountered, at intervals as directed by the Contracting Officer, and as specified in paragraph TESTING.

18.2 Earth Embankments, Fills and Backfills: Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired roller, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to provide ~~the~~ moisture content ~~that will readily facilitate obtaining the specified compaction without pumping or rutting with the equipment used.~~ Each layer shall be compacted to not less than the percentage of maximum density specified below:

Fills, earth embankments, and backfill	Percent CE 55 Maximum Density	
	Cohesive Material	Cohesionless Material
Under turfed areas	85	90
Common fill	Compacted to not less than 90% nor more than 95%	
Sand filter material	--	95
Gravel for subdrainage system	--	90
Compacted clay infiltration barrier	Compacted to not less than 95% nor more than 100%.	

19. PROTECTION: Newly graded areas shall be protected from traffic and erosion. Settlement or washing away that may occur from any cause, prior to acceptance, shall be repaired and grades reestablished to the required

elevations and slopes at no addition cost to the Government. The storage or stockpiling of materials on the finished subgrade will not be permitted. Work shall be conducted in accordance with the environmental protection requirements of the contract. The finished subgrade shall not be disturbed by traffic or other operations and shall be protected and maintained by the Contractor in a satisfactory condition until road or railroad materials are placed. Road or railroad materials shall not be laid until the subgrade has been checked and approved, and in no case shall road or railroad materials be placed on a muddy, spongy, or frozen subgrade. Excavations, fill and backfill, embankments, and foundations shall be protected from frost damage. Displacement damage that occurs from frost action, including the loss of strength or thawing, shall be repaired or replaced as approved at no additional cost to the Government.

20. FINISHING: The surface of excavations, embankments, fills and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The surfaces of embankments or other areas on which a filter course is located shall vary not more than 0.05 foot from the established grade and cross section shown. The surface of other areas shall be within 0.1 foot of the grades and elevations indicated. Surface of the finished subgrade shall not show deviation greater than 1/2 inch when tested with a 16-foot straightedge applied both parallel and at right angles to the centerline of the area. Gutters and drainage channels shall be finished in such a manner that will result in effective drainage. Surface of areas to be turfed shall be finished to a smoothness suitable for application of turfing materials.

21. TOPSOILING: Areas above the filter course shall be topsoiled. The surface shall be free of materials that would hinder planting or maintenance operations. Topsoil shall then be uniformly spread, graded, and compacted to the thickness, elevations, and slopes shown, and free of surface irregularities. Topsoil shall be compacted by one pass of a culti-packer, roller, or other approved equipment weighing 100 to 160 pounds per linear foot of roller. Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to seeding, planting, or proper grading.

22. TESTING:

22.1 Earthwork Testing: Field tests for density and moisture content shall be performed in sufficient numbers to assure that the specified densities are being obtained. Field tests and laboratory tests to determine moisture-density relations for the same materials, shall be made as specified. Testing shall be the responsibility of the Contractor and shall be performed by an approved independent commercial testing laboratory qualified to conduct and experienced in testing operations of the type required or by the Contractor, subject to approval. Approval of testing facilities shall be based on compliance with ASTM E 548 and no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved by the Contracting Officer. The first inspection shall be at the expense of the Government and the cost of any subsequent inspections required because of failure of the first inspection will be paid by the Contractor. Acceptability of qualifications and experience will be as determined by the Contracting Officer. Three copies of test results, including calibration curves and results of calibration

tests, shall be furnished to the Contracting Officer within 24 hours of conclusion of physical tests. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the materials shall be removed, replaced and recompacted to meet specification requirements, and retested as specified, at no additional expense to the Government. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

22.1.1 Impermeable Clay Material Liquid Limit and Plastic Limit: One representative test per 500 cubic yards stockpile or inplace source material.

22.1.2 In-Place Densities: Density tests will be spread out over the area to be tested to assure adequate coverage of the entire area. Tests shall not be taken at the same location on succeeding lifts.

22.1.2.1 One test for every 5,000 square feet, of fraction thereof, of each lift of fill or backfill.

22.1.2.2 One test every lift for each 5,000 square feet of areas to be turfed.

22.1.2.3 One test for every lift of backfill of unstable areas requiring over-excavation and backfill.

22.1.3 Check tests on In-Place Densities: If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 or MIL-STD-621, Method 106, as follows:

22.1.3.1 Two tests for every lift of fill or backfill.

22.1.4 Moisture Contents: In the stockpile, excavation or borrow areas, a minimum of two tests per day per type of material or source of material being placed during stable weather conditions. During unstable weather, tests shall be made as directed by local conditions and approved by the Contracting Officer.

22.1.5 Optimum Moisture and CE 55 Maximum Density: Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and CE 55 maximum density values. One representative test for each 1500 cubic yards of fill and backfill, or when a change in material occurs which may affect the optimum moisture content or CE 55 maximum density.

22.1.6 Tolerance Tests for Subgrades: Continuous checks on the degree of finish specified in paragraph FINISHING shall be made during construction of the subgrades.

SECTION 2E

TURF

1. APPLICABLE PUBLICATIONS: The following publications of the issues listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1 U.S. Department of Agriculture Federal Seed Act of August 9, 1939:

Federal Seed Act of August 9, 1939 (53 Stat. 1275) Rule and Regulations

1.2 American Society for Testing and Materials (ASTM) Publications:

D 977-80	Emulsified Asphalt
D 2028 -76 (R 1981)	Cutback Asphalt (Rapid-Curing Type)

1.3 Association of Official Analytical Chemists (AOAC) Publications:

Official Methods of Analysis (12 Edition, 1975, Supplements 1 through 3)

2. MATERIALS:

2.1 Fertilizer of 13-13-13 grade, uniform of composition, free-flowing, and suitable for application with approved equipment, shall be provided. The fertilizer shall be delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable state fertilizer laws, and bearing the name, trade name or trademark, and warranty of the producer.

2.2 Limestone: Agricultural grade limestone, ground to pass an 8 mesh sieve with 25 percent passing a 100 mesh sieve shall be furnished. In addition, calcareous limestone shall contain not less than 50 percent calcium oxide, and dolomitic limestone shall contain not less than 40 percent magnesium oxide. Coarser materials will be acceptable provided the specified rates of application are increased proportionately, on the basis of quantities passing the 8 and 100 mesh sieves, but no additional payment will be made for the increased quantity.

2.3 Mulch: Threshed straw of cereal grain such as oats, wheat, barley, rye rice, or grass hay, pine needles, or wood fiber shall be furnished. Materials that contain objectionable weed seeds or other species that might be detrimental to the planting being established or to adjacent farmland will not be acceptable.

2.4 Seed: Seed labeled in accordance with the U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act shall be furnished. Seed shall be furnished in sealed, standard containers, unless written exception is granted. Seed that is wet or moldy or that has been otherwise damaged in transit or storage will not be acceptable. For the

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unlined evaporation pond, Kentucky 31 Tall Fescue seed shall be used if turf is to be established in late summer or early fall. Common Hulled Bermuda Grass seed shall be used if turf is to be established in spring or early summer.

2.5 Wood cellulose fiber mulch, for use with the hydraulic application of seed, fertilizer, shall consist of specially prepared wood cellulose fiber processed to contain no growth or germination inhibiting factors, and dyed an appropriate color to facilitate visual metering of application of the materials. The mulch material shall be supplied in packages having a gross weight not in excess of 100 pounds. The wood cellulose fiber shall contain not in excess of 10 percent moisture, air dry weight basis. The wood cellulose fiber shall be manufactured so that after addition and agitation in slurry tanks with fertilizers, grass seeds, water, and any other approved additives, the fibers in the material will become uniformly suspended to form a homogeneous slurry; and that when hydraulically sprayed on the ground, the material will form a blotter-like ground cover impregnated uniformly with grass seed; and which, after application, will allow the absorption of moisture and allow rainfall or mechanical watering to percolate to the underlying soil. Suppliers shall be prepared to certify that laboratory and field testing of their produce has been accomplished, and that their product meets all the foregoing requirements based upon such testing.

2.6 Asphalt adhesive shall be liquid asphalt conforming to ASTM D 2028, designation RC-70, or emulsified asphalt conforming to ASTM D 977, grade SS-1.

2.7 Topsoil:

2.7.1 Topsoil shall be surface soil stripped from the designated borrow pits and stockpiled on the borrow pit site.

2.7.2 If additional topsoil is required, it shall be furnished by the Contractor and shall be a natural, friable solid representative of productive soils in the vicinity. It shall be obtained from well-drained areas and shall be free of admixtures of subsoil and foreign matter or objects larger than 1 inch in any dimension, toxic substances, and any material or substance that may be harmful to plant growth.

3. SAMPLING AND TESTING shall be the responsibility of the Contractor and performed at no additional cost to the Government. Sampling and testing shall be performed in sufficient number to insure that materials meet the specified requirements. Copies of the test results shall be furnished to the Contracting Officer.

3.1 Fertilizer and Limestone: Duplicate copies of invoices shall be furnished. Invoices shall show quantities of each grade of fertilizer; percentage of calcium oxide or magnesium oxide, as applicable; and the percentages of limestone that pass the No. 8 and No. 100 mesh sieves. Samples of each lot of fertilizer and limestone shall be tested in accordance with AOAC publication, Official Methods of Analysis. Upon completion of the project, a final check of total quantities of fertilizer and limestone used will be made against total area treated, and if minimum rates of application have not been met, additional quantities of these

materials to make up the minimum application specified shall be distributed as directed.

3.2 Seed: The Contracting Officer shall be furnished duplicate signed copies of vendor statement, certifying that each container of seed delivered is labeled in accordance with the Federal Seed Act and is at least equal to requirements specified. This certification shall be obtained from the vendor and shall be furnished on or with all copies of seed invoices.

3.3 Asphalt Adhesive: The Contractor shall demonstrate before starting the work that the application of asphalt will be made at specified rates and that method of application is satisfactory. The Contracting Officer shall be furnished copies of manufacturer's specification for asphalt adhesive and certification of conformance with the requirements of the manufacturer with respect to residue, solubility, dehydration, settlement, miscibility, and mixing properties.

4. SPECIAL SEEDING AND MULCHING EQUIPMENT:

4.1 Hydraulic Seeder: Equipment to be used for applying a seed-fertilizer mix over prepared areas shall be a hydraulic seeder designed to pump and discharge a waterborne homogeneous slurry of seed, fertilizer, and wood cellulose fiber at the desired specified rates. The seeder shall be equipped with a power driven agitator, and shall be capable of discharging up to 200 gpm at 100 pounds pressure from a nozzle with clearance for ½-inch solids.

4.2 Mulch spreader to be used for applying straw or hay shall be trailer mounted, and equipped with a blower that is dynamically balanced for at least 2000 rpm operation and that will discharge hay or straw mulch material through a discharge boom with spout at speeds up to 200 fps. The discharge spout shall be capable of 360 degree horizontal rotation and a minimum of 60 degree range of elevation and depression. The mulch spreader shall be equipped with an asphalt adhesive supply and application system near the discharge end of the boom spout that will apply an asphalt adhesive in atomized form to the mulch material at a predetermined rate. The spreader shall be capable of blowing the adhesive coated mulch, with a high velocity airstream, over the surface of a graded or otherwise prepared slope at a uniform rate, forming a porous, stable, erosion resisting cover at a distance of not less than 80 feet.

4.3 Wood Cellulose Fiber Mulch Spreader: Hydraulic equipment used for the application of fertilizer, seed, and slurry or prepared wood pulp shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry containing up to 40 pounds of fiber plus a combine total of 70 pounds of fertilizer solids for each 100 gallons of water. The slurry distribution lines shall be large enough to prevent stopped. The discharge line shall be equipped with a set of hydraulic spray nozzles that will provide even distribution of the slurry on the various slopes to be mulched. The slurry tank shall have a minimum capacity of 1000 gallons and shall be mounted on a traveling unit which may be either self-propelled or drawn by a separate unit that will place the Slurry tank and spray nozzles near the areas to be mulched so as to provide uniform distribution without waste.

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5. PREPARATION OF GROUND SURFACE:

5.1 General: The surface area of the embankment and the areas of stripping shall be topsoiled and seeded. Equipment in good condition shall be provided for handling and placing all materials. Equipment shall be approved before work is started.

5.2 Clearing: The surface shall be cleared of stumps, roots, cable, wire, and other materials that might hinder the work or subsequent maintenance.

5.3 Grading: Previously established grades shall be maintained on the areas to be treated in a true and even condition; necessary repairs shall be made to previously graded areas. All surfaces shall be left in an even condition to prevent formation of depressions.

6. APPLICATION OF FERTILIZER AND LIMESTONE:

6.1 Fertilization: Fertilizer shall be broadcase uniformly at a rate of 600 pounds per acre over areas to be seeded or may be hydraulicly applies as specified in paragraph Seeding.

6.2 Liming: Limestone shall be distributed uniformly at a rate of 4400 pounds per acre. Limestone may be broadcast simultaneously with application of fertilizer when fertilizer is applied prior to seeding operations, or limestone may be broadcast as a separate operation prior to fertilization.

7. PLANTING SEED:

7.1 General: When conditions are such by reason of drought, high winds, excessive moisture, or other factors that satisfactory results are not likely to be obtained, work shall be halted as directed and resumed only when conditions are favorable or when approved alternate of corrective measures and procedures have been effected. If inspection during seeding operations, or after there is show of green, indicates areas skipped, additional seed shall be sown if so directed, at no expense to the Government. Seeding limits shall include, but not be limited to, all disturbed ground surfaces, such as the scraping areas, temporary roads, borrow pits, and the closure cap.

7.2 Seeding: Seed shall be broadcast either by hand or with approved hydraulic seeding equipment, as specified, in combination with fertilizer, or with the approved hydraulic equipment in combination with wood cellulose fiber mulch and fertilizer, as specified, or with other approved sowing equipment. Seed shall be sown at the rates conforming to the season shown in the following table:

Season(a)	Seed	Broadcast Rate(b) Pounds Per 1000 Square Feet
1 March to 15 August	Common Hulled Bermuda Grass	5
16 August to 31 October	Common Hulled Bermuda Grass	2

NOTES

a. If seeding cannot be accomplished in the above seasons, a temporary cover of Annual Rye grass shall be applied at the rate of 3 pounds per 1000 square feet. Permanent cover shall be applied during the next regular season with the appropriate seed at the specified rate at no additional expense to the Government.

b. Hydraulic slurries shall consist of seed, fertilizer, and mulch having a dry weight application rate of 14 pounds per 1000 square feet of fertilizer and 28 pounds per 1000 square feet of wood cellulose fiber.

8. APPLYING AND ANCHORING MULCH: Mulch shall be spread uniformly in a continuous blanket, using 2 tons per acre. Mulch shall be spread be hand, a blower-type mulch spreader, or a blower-type mulch spreader so equipped that straw or hay will be ejected simultaneously with asphalt adhesive, or other suitable equipment. Mulching shall be started at the windward side of relatively flat areas, or at the upper part of a steep slope, and continued uniformly until the area is covered. The mulch shall not be bunched. Immediately following spreading, the mulch shall be anchored to the soil by suitable equipment, or by applying an asphalt adhesive. When asphalt adhesive is to be applied to a previously placed mulch or on slopes and embankments, application shall be by spraying at the rate of 10 to 13 gallons per 1000 square feet. When applying straw and asphalt simultaneously, using equipment as specified, SS-1 emulsion with penetration between 150-200 shall be used; and shall be applied with the straw at the rate of 150 gallons of emulsion per ton of straw. If the emulsion is further diluted at the ratio of 60 parts of emulsion to 40 parts of water, the diluted emulsion shall be applied with the straw at the rate of 250 gallons of emulsion per ton of straw. The adhesive coated mulch shall be applied evenly over the surface so that the depth and thickness of the mulch will be uniform throughout the treated area and sunlight will not be completely excluded from penetration to the ground surface. The adhesive coated mulch shall be applied at the rate of 1½ tons per acre.

9. PROTECTION OF SEEDED AREAS: Immediately after seeding, the area shall be protected against traffic or other use by erecting barricades, as required, and placing approved signs at appropriate intervals until final acceptance.

10. RESTORATION AND CLEAN-UP: Excess and waste material shall be removed daily to designated areas within the disposal site shown. Prior approval shall be obtained before any waste materials are deposited. When turfing in an area has been complete, the area shall be cleaned of all debris and excess material. Where existing turf areas have been damaged during turfing operations, the Contractor shall restore the areas to their original condition at his expense.

11. TURF ESTABLISHMENT PERIOD:

11.1 Length of Period: The turf establishment period will be in effect for 3 months or until the turf has been mowed 3 times, whichever is longer.

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11.2 Proper Stand of Turf: A stand of turf is defined as a minimum of 25 grass plants per square foot.

11.3 Responsibility of Care: The Contractor shall be responsible for the establishment and proper care of a stand of turf over the entire seeded area.

11.4 Maintenance During the Establishment Period: The Contractor shall provide the following maintenance:

11.4.1 The seeded areas shall be mowed to a height of 3 inches whenever the average height becomes 4 inches. The clippings shall be removed. Mowing shall be done with sharp equipment on dry grass and firm soil.

11.4.2 The turf shall be watered at such intervals and at such a rate that wilting, puddling, and runoff do not occur.

11.4.3 The turf shall be fertilized when the turfgrass seedlings are 1 to 1½ inches tall, applying 0.50 pounds of available nitrogen per 1000 square feet, and again at intervals of 3 weeks using the same mix.

11.4.4 The Contractor shall provide any additional operations necessary to promote the growth of the turf.

12. FINAL ACCEPTANCE:

12.1 General: Final inspection and acceptance will be at the end of the turf establishment period. Acceptance will be based upon a satisfactory stand of turf as defined in paragraph TURF ESTABLISHMENT PERIOD. Prior to final acceptance and after the third mowing, the Contractor shall apply 0.5 pounds per 1000 square feet of a slow release nitrogen fertilizer.

12.2 Replacement: If a proper stand of turf, as defined above, is not established, the area shall be replanted. Rejected areas of turf shall be replanted within acceptable planting dates as directed by the Contracting Officer.

SECTION 2F

SUBDRAINAGE SYSTEM

1. APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 American Society for Testing and Materials (ASTM) Publications:

D 3034-80	Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
D 3212-76	Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

2. DELIVERY, STORAGE, AND HANDLING OF MATERIALS:

2.1 Delivery and Storage: Materials delivered to site shall be inspected for damage, unloaded, and stored with the minimum of handling. Do not store materials directly on the ground. Inside of pipes and fittings shall be kept free of dirt and debris. During shipment and storage, filter fabric shall be wrapped in burlap or similar protective covering. The storage area should be such that the fabric is protected from mud, soil, dust, and debris.

2.2 Handling: Materials shall be handled in such a manner as to insure delivery to the trench in sound undamaged condition. Pipe shall be carried to the trench not dragged. Plastic materials that are not to be installed immediately shall not be stored in the direct sunlight.

3. SUBMITTALS:

3.1 Samples: Samples of filter fabric, pipe and fittings shall be submitted and approved before work is started.

3.2 Certificates:

3.2.1 Filter Fabric: The Contractor shall furnish the Contracting Officer, in duplicate, a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the fabric, certifying that the fabric meets the chemical, physical, and manufacturing requirements stated in this specification.

3.2.2 Pipe: Certified copies of test reports demonstrating conformance to applicable pipe specifications shall be submitted before any drain pipe is installed.

4. TESTS FOR PIPE: Certified copies of test reports demonstrating conformance to applicable pipe specifications shall be delivered to the Contracting Officer before pipe is installed.

5. PIPE JOINTS AND FITTINGS: Pipe shall conform to requirements of ASTM 3034, Type PSM, SDR 35, with flexible elastomeric seal joints. Joints shall

conform to ASTM D 3212. Fittings shall conform to ASTM D 2467. Perforations in pipe shall be circular, not more than 3/8 inch or less than 3/16 inch in diameter, and arranged in rows parallel to the longitudinal axis of the pipe. Perforations shall be spaced at approximately 3 inch center-to-center along rows. The rows shall be approximately 1½ inch apart and arranged in a staggered pattern so that all perforations lie at the mid-point between perforations in adjacent rows. The rows shall be spaced over not more than 90 degrees of circumference.

6. SAND FILTER MATERIAL: Sand filter material shall be furnished in accordance with Section 2D 2.4 of these specifications.

7. WASHED GRAVEL: Washed gravel shall be furnished in accordance with Section 2D 2.11 of these specifications.

8. FILTER FABRIC: Filter fabric shall be a pervious sheet of polyester, nylon, or polypropylene filaments woven or otherwise formed into a uniform pattern with distinct and measurable openings. The filter fabric shall provide an Equivalent Opening Size (EOS) no finer than U.S. Standard Sieve No. 100 and no coarser than Sieve No. 70. EOS is defined as the number of the U.S. Standard Sieve having openings closest in size to the filter fabric openings.

9. PLACING PIPE: Each pipe shall be carefully examined before being laid, and defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alignment indicated. Trenching for drainage pipe shall be in accordance with SECTION: EARTHWORK. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. All pipe in place shall be inspected before backfilling, and those damaged during placement shall be removed and replaced at no additional cost to the Government.

10. BACKFILLING, COMPACTION, AND TESTING: Backfilling, compaction, and testing shall be in accordance with SECTION 2D - EARTHWORK.

SECTION 2G

DISASSEMBLY

PART 1 - GENERAL

1. GENERAL:

1.1 General Requirements: The work includes the disassembly of Building 34-X and 36-X as indicated on the drawings and as herein specified. All materials and equipment which are part of the disassembly shall remain the property of the Government. All disassembled items are to be marked and stored in the immediate area as designated by the Contracting Officer, unless otherwise directed to be moved and stored at a location on Longhorn AAP. All scheduled items are to be crated.

1.2 Protection: Before beginning any cutting, disassembly, or demolition work, the Contractor shall carefully survey the existing work and examine the drawings and specifications to determine the extent of the work. The Contractor shall take all necessary precautions to insure against damage to existing work to remain in place, to be reused, or to remain the property of the Government. In no case will the free fall of any member or equipment be permitted. Any damage to such work shall be repaired or replaced as approved by the contracting officer at no additional cost to the Government.

PART 2 - EXECUTION

2. EXISTING FACILITIES:

2.1 Utilities:

2.1.1 Utility Services: Disconnection of electrical and water service shall be done prior to any disassembly or demolition work. Refer to the drawings for locations of service termination. The Government shall provide for termination of electrical service to power poles upon notification of the Contractor.

2.1.2 Removal of Utilities: Existing utilities shall be removed as indicated and as herein specified. When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified.

2.1.2.1 Building 34-X:

a. Electrical:

(1) Disconnect all electrical power and remove drop service line from Power Pole 7/261 to Panel Box "B" attached to the rocket motor washout facility.

(2) Disconnect all wires to light fixtures at junction boxes and remove all (18) fixtures and junction boxes. Store for re-use.

(3) Disconnect electrical lines to ¼ Hp rotating motor and to 1 Hp transverse motor. Remove both motors.

(4) Disconnect all electrical lines to meter panel.

(5) Disconnect all electrical lines at pull box. Remove wire from pull box to meter panel.

(6) Disconnect electrical lines at hand hole. Remove lines from hand hole to pull box.

(7) Disconnect electrical lines at J-box in Building 36-X. Remove wire to hand hole.

(8) Cut 3-inch conduits at ground level and detach from meter panel.

(9) Detach and remove meter panel from structure.

(10) Disconnect all conduit or electrical lines between beams and columns and remove. All lines attached to either beams or columns are to remain attached.

(11) Disconnect underground service to Panel Box "B" at panel box.

(12) Disconnect 1-inch conduits to panel box, cut conduit at ground level. Remove panel Box "B".

(13) Disconnect speaker from column. Remove and store for reuse.

b. Piping:

(1) Loosen set screws on pillow block connecting main shaft at trolley.

(2) Disconnect trolley assembly from main shaft and 2-inch diameter XXHVY-API-5L pipe. Remove trolley from monorail.

(3) Disconnect 2-inch diameter line at reducer. Remove and store 2-inch diameter swivel pipe assembly.

(4) Cut 3-inch diameter XXHVY-API-5L pipe where shown. Remove for re-use.

(5) Remove 3-inch 2500# ASA R.T.J. W.N FL6 & VA. from Line A7 high pressure hook-up at truck bay. Store for re-use.

(6) Cut balance of 3-inch diameter XXHVY-API-5L pipe into 40'-0" lengths. Collect for salvage.

(7) Cut 3-inch Schedule 40 pipe into 40'-0" lengths. Collect for salvage.

(8) At valve box, remove 6-inch wedge gate valve and 6" x 6" x 3" flanged reducing tee. Store for re-use.

(9) Disconnect 1¼-inch diameter Schedule 40 air line from drip leg at base of column and at end of 1-inch Type Y strainer. Retain strainer and regulator as one assembly. Store for re-use.

(10) Remove 2 - 3-inch wedge gate valve from air line. Store for re-use.

(11) Disassemble air lines in maximum 40'-0" lengths. Collect for salvage.

(12) Remove 3-inch wedge gate valve assembly from compressor hook-up and store for re-use.

(13) Salvage 8-inch channel pipe supports at truck and compressor hook-ups.

c. Equipment: Remove the following equipment as complete units and store as directed by the Contracting Officer.

(1) Strainer

(2) Strainer Dolly

(3) Harness Assemblies TX174, TX175, and XM-53

(4) Spreader Bars (2)

(5) Five Ton Hoists (2)

(6) Ten Ton Crane

(7) Nozzles (located in Building 36-X)

(8) Strainer Dolly Steel Runway Channels (2)

(9) Varedyne Unit (Building 36-X)

(10) High Pressure Pump (Building 36-X)

d. Crating: The following items are to be tagged and marked prior to crating. The crate is to be tagged and marked with the inventory it contains:

(1) Light Fixtures (18)

(2) ½ Hp Rotating Motor

(3) 1 Hp Transverse Motor

(4) Meter Panel

(5) Panel Box "B"

(6) Speaker

(7) Monorail Trolley

(8) 6" Wedge Valve

(9) Airline Strainer and Regulator

(10) 3" Wedge Gate Valves (3)

(11) Five TDW Hoists (2)

(12) Nozzles

(13) Varidyne Unit

(14) High Pressure Pump

e. Rocket Motor Washout Structure: All bolted members are to be disassembled by the removal of the connecting bolts. No bolted connections are to be disassembled by burning with torches. Braces attached by welded connections are to be flame cut three (3) inches from their point of attachment. Prior to disassembly, each member is to be identified with a painted yellow circled number as shown on the drawings along the middle of the member. The ends of each member are to be painted with the number corresponding to the circled number of the member to which it was connected. All bolts, washers, and nuts removed during the disconnection are to be reattached to the disconnected member. Nuts and washers removed from column bases are to be reattached to the holes in the base plate with number 9 wire. Braces, connection angles, and spacers are to remain attached to members where shown on the drawing.

(1) Disconnect 1½-inch angles (4) from 6-inch monorail I-beam. Disconnect monorail beam from rear column and from two overhead 6-inch beams. Remove monorail beam. Do not remove spacer.

(2) Disconnect and remove 2-inch angle bracing to rear monorail support column.

(3) Cut 2-inch pipe bracing supporting rear column at base of deck. Remove bolts securing column and remove column with pipe braces and upper outrigger beams.

(4) Remove 4-inch "T" braces from 6-inch columns and 6-inch monorail beam. Remove two 6-inch beams supporting monorail beam from columns. Do not remove braces.

(5) Remove X braces between 6 and 8-inch columns.

(6) Remove two (2) 6-inch columns.

(7) To remove pipe cage assembly, remove 1-inch bolts securing assembly to base at "TW-B", "A-R", A-FWD", "A-AFT", and "C-FWD". Remove as one unit including motors.

(8) Remove 4 - 3/8-inch bolts securing 3-inch pipe guide to seal on outlet collector. Remove outlet collector and 3-inch guide pipe.

(9) Railings: All railings are to be removed in sections by cutting welds at connection of rails and posts to structure. Sections are not to be further disassembled.

(10) Remove 16 - 1-inch nuts retaining two (2) - 6-inch WF sections to concrete base. Cut weld at base of spacer at end of beam and remove beams. Do not remove spacers from beams.

(11) Grating: Remove 10 sections of grating from upper deck. Remove 8 sections of grating from lower deck. Remove 4 section below lower deck.

(12) Stairs from lower to upper deck are to be removed in two sections each. Outer 10-inch channel stringers are to be unbolted from columns and lower deck. Inner stringer is to be cut opposite center supporting column. Cut weld securing tread to column. Remove stair sections.

(13) Remove bolts securing lower deck stairs to lower platform and concrete base and remove stairs.

(14) Remove 6-inch channels separating 6-inch beams. Disconnect 6-inch beams from deck stringers.

(15) Remove two braces supporting cantilevered lower deck from column. Disconnect 8-inch channel stringers from column and remove section of deck framing as one unit assembly.

(16) Remove 3/4-inch bolts securing 2½-inch bracing angles supporting rear of lower deck from concrete pier. Remove 3/4-inch bolts securing 6-inch channel stringer from concrete pier. Remove rear section of lower deck as one unit.

(17) Remove 3/4-inch diagonal bracing.

(18) Remove three 8-inch beams on upper deck.

(19) Remove four - 4-inch braces from columns to upper deck framing.

(20) Remove four - 12-inch framing deck beams. Do not remove 3-inch angles secured to top of beams.

(21) Remove two - 6-inch beams between 8-inch columns.

(22) Remove 1-inch nuts retaining columns to footing and remove four - 8-inch column.

(23) Remove hook bolts anchoring 40 pound crane rails to 16-inch beams. Remove rails.

(24) To remove upper 10-inch beams from craneway, cut weld on lower beam plate at connection to column. Cut weld along upper plate connecting plate to beam. Remove bolts securing beam clip angles to column. Do not remove clip angles from beam. Remove four (4) beams.

(25) Cut 3-inch angle knee braces from 16-inch upper craneway beams. Remove bolts securing beams to column haunch and lower six (6) beams.

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(26) Remove bolts connecting intermediate 8-inch beams to columns. Do not remove clip angles from beams. Remove six (6) beams.

(27) Remove 1-inch nuts from columns and remove eight (8) - 10-inch columns.

f. Concrete Removal: Reference section on Demolition.

(1) Remove all concrete to sluiceway.

(2) Remove all concrete column footings to top of drilled pier.

(3) Remove entire concrete support structure.

2.1.2.2 Building 36-X:

a. Electrical:

(1) Disconnect all electrical power and remove drop service line from Power Pole 7/258 to Panel Box "A".

(2) Remove all electrical lines and conduit used between light fixtures, outlet receptacles, switches, junction boxes and panel box.

(3) Remove four (4) exterior 300 watt lighting fixtures. Tag and crate.

(4) Remove six (6) interior fluorescent light fixtures. Tag and crate.

b. Building Disassembly:

(1) Windows and Doors: Remove and salvage for re-use.

(2) Roof: Remove aluminum ridge roll and closure strips. Remove corrugated aluminum roofing panels. Remove 1-inch x 2-inch aluminum eave angle. Salvage for re-use.

(3) Siding: Remove flat metal panels from southwest side of building. Salvage for re-use. Remove and dispose of wood framing behind panels. Remove corner flashing. Remove all corrugated aluminum siding and salvage for re-use.

(4) Purlins: Remove 2" x 4" purlins between roof trusses. Salvage for re-use.

(5) Trusses: Remove and salvage for re-use.

(6) Walls: Brace opening at base of door. Remove all nuts from anchor bolts at floor plate. Remove and salvage walls in four (4) section. Cut anchor bolts flush to slab.

(7) Concrete Pad: Remove pad to top of slab.

2.1.2.3 Tags:

a. Each item to be crated is to be tagged with a white "G" grade 13 point, 100% chemical wood pulp stock tag with 12"-26 gauge double wire. Each tag shall be marked with black indelible ink and identify the item and the building from which it was removed.

2.1.2.4 Crates:

a. Material:

(1) Crates are to be constructed of wood. Sides and top shall be 3/4" C-D plywood or 1" dense commercine southern pine decking, surfaced dry with a maximum moisture contents of 19 percent. Decking and 2 x 4 lumber used on pallet shall be No. 2 hardwood.

(2) Nails: Use 8d common in 3/4" material and 10d in 1" material. Space all nails 6" on center.

b. Execution:

(1) Crates are to be fabricated with tight joints. Knot holes or gaps between planks will not be permitted.

(2) Each item to be crated must be tagged. The tag shall be attached to the item and shall identify (1) the item and (2) the building from which it was removed.

(3) Each tagged item placed in crates shall be packed with seltzer, styrofoam "Pop Corn", or other similar packing material used to protect the product during handling and shipping.

(4) Each sealed crate shall have painted on the font vertical panel, the number of the building from which the contents were removed and the box number. The letters and numbers shall be gothic, stenciled with black paint and shall be three inches tall. The word "FRONT" is also to be stenciled on the front of each crate in two inch tall letters.

(5) Each sealed crate shall have a clear poly front envelope adhesively applied to the front of each crate. The envelope shall be window style, back loading, totally waterproof, and 5½" x 4" in size. The envelope shall have printed across the top in bold letters, "PACKING LIST ENCLOSED". The packing list to be inserted into the envelope will be the original from a three-part list and it shall list the items contained in the crate. A copy of the packing list is to be returned to the Contracting Officer.

PART 4 - COST ESTIMATE

CONSTRUCTION COST ESTIMATE
LHAAP - CLOSURE OF UNLINED EVAPORATION POND
SUMMARY

ITEM		ESTIMATED COST ($1984)
1.0	Demolition & Disassembly	$ 51,200
2.0	Temporary Washdown Station	1,610
3.0	Fencing	3,553
4.0	Sludge Solidification	121,962
5.0	Sludge Removal	278,460
6.0	Base for Clay Cap	163,295
7.0	Clay Cap	142,278
8.0	Sand Filter	67,763
9.0	Topsoil & Turfing	40,616
10.0	Contingency	87,074
	TOTAL	$957,811

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CONSTRUCTION COST ESTIMATE
LHAAP - CLOSURE OF UNLINED EVAPORATION POND
DETAILED ESTIMATE

ITEM	QUANTITY	UNIT	UNIT COST ($1984) MATERIALS	LABOR	EQUIPMENT	TOTAL	TOTAL COST ($1984)
1.0 Demolition and Disassembly:							
1.1 Plug 2" dia. x 50-60' deep monitoring wells with concrete	7	EA.	28.00	50.00	45.00	123.00	861
1.2 Remove concrete wash pad	1	EA.	---	264.00	256.00	520.00	520
1.3 Remove 30" washout culvert	1	EA.	---	200.00	240.00	440.00	440
1.4 Disassemble & store rocket motor washout system							
a. Beams 6"	303	L.F.	---	2.50	4.50	7.00	2,121
8"	156	L.F.	---	4.60	5.00	9.60	1,498
10"	206	L.F.	---	6.50	5.50	12.00	2,472
12"	54	L.F.	---	7.00	6.00	13.00	702
16"	86	L.F.	---	8.50	6.50	15.00	1,290
b. Columns 6"	44	L.F.	---	2.75	4.50	7.25	319
8"	71	L.F.	---	7.00	5.50	12.50	888
10"	232	L.F.	---	9.50	6.50	16.00	3,712
c. Crane rail	150	L.F.	---	5.00	5.00	10.00	1,500
d. Crane	1	EA.	---	150.00	150.00	300.00	300
e. Hoists	2	EA.	---	150.00	150.00	300.00	600
f. Collector	1	EA.	---	70.00	80.00	150.00	150
g. Rocket motor washer	1	EA.	---	800.00	700.00	1500.00	1,500
h. Strainer	1	EA.	---	80.00	70.00	150.00	150
i. Strainer dolly	1	EA.	---	70.00	80.00	150.00	150
j. Spreader bars	2	EA.	---	70.00	80.00	150.00	300
k. Nozzles	3	EA.	---	75.00	75.00	150.00	450
l. Varidyne unit	1	EA.	---	150.00	150.00	300.00	300
m. High pressure pump	1	EA.	---	70.00	80.00	150.00	150
n. Concrete demolition	30	C.Y.	---	50.00	50.00	100.00	3,000
o. Piping on structure	1	L.S.	---	600.00	200.00	800.00	800
p. Lights & speaker	1	L.S.	---	2200.00	200.00	2400.00	2,400
q. Panel box	1	EA.	---	600.00	---	600.00	600
r. Pull box	1	EA.	---	600.00	---	600.00	600
s. Meter panel	1	EA.	---	600.00	---	600.00	600
t. Electrical lines	1	L.S.	---	600.00	---	600.00	600
u. Air lines	500	L.F.	---	2.50	2.50	5.00	2,500
v. Water lines	1,000	L.F.	---	2.50	2.50	5.00	5,000
w. Valves	1	L.S.	---	500.00	500.00	1000.00	1,000

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CONSTRUCTION COST ESTIMATE
LHAAP - CLOSURE OF UNLINED EVAPORATION POND
DETAILED ESTIMATE

ITEM	QUANTITY	UNIT	UNIT COST ($1984) MATERIALS	LABOR	EQUIPMENT	TOTAL	TOTAL COST ($1984)
1.5 Disassemble control building:							
a. Door	1	EA.	---	15.00	---	15.00	15
b. Windows	2	EA.	---	20.00	---	20.00	40
c. Roof	440	S.F.	---	0.50	---	0.50	220
d. Siding	640	S.F.	---	0.80	---	0.80	512
e. Trusses	400	S.F.	---	0.80	0.70	1.50	600
f. Walls	640	S.F.	---	1.00	---	1.00	640
1.6 Remove asphalt pavement	150	S.Y.	---	0.50	1.50	2.00	300
1.7 Tag and crate salvaged equipment	1	L.S.	1500.00	4500.00	400.00	6400.00	6,400
1.8 Hauling of equipment and debris	1	L.S.	---	1500.00	3500.00	5000.00	5,000
2.0 Temporary Washdown Station:							
2.1 6" x 3" tapping valve & sleeve	1	EA.	450.00	150.00	150.00	750.00	750
2.2 3" water line	150	L.F.	1.10	1.20	1.60	3.90	585
2.3 3" gate valve	1	EA.	150.00	82.00	---	232.00	232
2.4 2½ hydrant connection	1	EA.	20.00	10.00	---	30.00	30
2.5 3/4" hose bib	1	EA.	5.00	7.00	---	13.00	13
3.0 Fencing:							
3.1 Silt fence	1,000	L.F.	0.40	0.35	0.20	0.95	950
3.2 Temporary 7' chain link fence	110	L.F.	6.50	1.50	---	8.00	880
3.3 Relocate existing chain link fence	350	L.F.	---	2.50	---	2.50	875
3.4 New 7' chain link fence w/barbed wire	80	L.F.	8.90	1.70	---	10.60	848
4.0 Sludge Solidification:							
4.1 Residual dewatering	300,000	GAL.	0.20(1)	0.01	0.01	0.22	66,000
4.2 Incorporate cement	418	C.Y.	79.88	19.00	35.00	133.88	55,962
5.0 Sludge Removal:							
5.1 Excavation	4,641	C.Y.	---	0.29	0.71	1.00	4,641
5.2 Transportation (225 mi.)	4,641	C.Y.	---	11.20	22.80	34.00	157,794
5.3 Disposal	4,641	C.Y.	25.00(1)	---	---	25.00	116,025

(1) Material cost represents cost for contract disposal.

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CONSTRUCTION COST ESTIMATE
LHAAP - CLOSURE OF UNLINED EVAPORATION POND
DETAILED ESTIMATE

ITEM	QUANTITY	UNIT	UNIT COST ($1984) MATERIALS	LABOR	EQUIPMENT	TOTAL	TOTAL COST ($1984)
6.0 Base for Clay Cap:							
6.1 On-site excavation	9,142	C.Y.	---	0.29	0.71	1.00	9,142
6.2 Borrow area clearing & grubbing	4.1	AC.	---	997.00	903.00	1900.00	7,790
6.3 Borrow excavation & hauling (0.6 mi.)	19,791	C.Y.	---	1.01	3.33	4.34	85,893
6.4 Fill	28,933	C.Y.	---	0.26	0.73	0.99	28,644
6.5 Compaction	28,933	C.Y.	---	0.49	0.61	1.10	31,826
7.0 Clay Cap:							
7.1 Borrow area clearing & grubbing	4.1	AC.	---	997.00	903.00	1900.00	7,790
7.2 Borrow excavation	15,620	C.Y.	---	0.29	0.71	1.00	15,620
7.3 Borrow hauling (4.6 mi.)	15,620	C.Y.	---	1.11	3.35	4.46	69,665
7.4 Fill	15,620	C.Y.	---	0.26	0.73	0.99	15,464
7.5 Compaction	15,620	C.Y.	---	0.96	1.20	2.16	33,739
8.0 Sand Filter:							
8.1 Sand fill	3,598	C.Y.	15.52	0.26	0.73	16.51	59,403
8.2 Sand compaction	3,598	C.Y.	---	0.26	0.32	0.58	2,087
8.3 6" perforated PVC pipe	1,160	L.F.	2.10	1.67	---	3.77	4,373
8.4 6" PVC pipe	100	L.F.	1.43	1.67	---	3.10	310
8.5 Filter fabric	651	S.Y.	1.07	0.12	---	1.19	775
8.6 Drainage gravel	43	C.Y.	15.15	1.80	0.69	17.64	758
8.7 Rip-rap	1.0	C.Y.	45.00	5.71	5.80	56.51	57
9.0 Topsoil & Turfing:							
9.1 Excavation	4,630	C.Y.	---	0.29	0.71	1.00	4,630
9.2 Processing	4,630	C.Y.	---	0.15	0.35	0.50	2,315
9.3 Hauling (0.6 mi.)	3,231	C.Y.	---	0.38	1.14	1.52	4,911
9.4 Hauling (4.6 mi.)	1,399	C.Y.	---	1.11	3.35	4.46	6,240
9.5 Fill	4,630	C.Y.	---	0.26	0.73	0.99	4,584
9.6 Compaction	4,630	C.Y.	---	0.26	0.32	0.58	2,685
9.7 Grading	15,100	S.Y.	---	0.20	0.31	0.51	7,701
9.8 Mulch	15,100	S.Y.	0.19	0.01	0.01	0.21	3,171
9.9 Seed	15,100	S.Y.	0.04	0.11	0.03	0.18	2,718

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CONSTRUCTION COST ESTIMATE
LHAAP - CLOSURE OF UNLINED EVAPORATION POND
DETAILED ESTIMATE

ITEM	QUANTITY	UNIT	UNIT COST ($1984) MATERIALS	LABOR	EQUIPMENT	TOTAL	TOTAL COST ($1984)
9.10 Lime	15,100	S.Y.	0.04	0.02	---	0.06	906
9.11 Fertilizer	15,100	S.Y.	0.03	0.02	---	0.05	755
10.0 Contingency (10%)							87,074
TOTAL							957,811

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