

**OPEN BURNING / OPEN DETONATION  
UXO BASELINE**

**VOLUME III  
TCRA AT CAMP GRANT, ILLINOIS**

**31 JANUARY 1996**

**CONTRACT:  
DACA-87-93-C-0048**

**Submitted To:**

**US ARMY ENGINEER DIVISION, HUNTSVILLE  
ATTN: CEHND-ED-SY**

**By:**

**NICHOLS RESEARCH CORPORATION**

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**US ARMY ENGINEER DIVISION, HUNTSVILLE  
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20. ABSTRACT (Continue on reverse side if necessary and identify block number) This volume contains laboratory analyses of soil and water samples collected to form the Camp Grant Rifle Range disposal area. Assays were conducted for a target list of semi-volatiles, nitroaromatics and nitramines and metals as developed in Volume I of this report. Samples of soil and water by background, post test detonation, and post TCRA were collected according to a sampling plan as modified for the Camp Grant disposal area. Lower quality materials and levels of contamination were found as anticipated because of the low net explosive weights involved (<0.5 lb) for each detonator of stress material. Sampling plan, sample collection sites, appearance of the detonation evidence and sites the TCRA are included.			

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## **OVERVIEW**

This report details the results of soil and water sampling from the site selected to dispose of Unexploded Ordnance (UXO) under Time Critical Removal Action (TCRA) requirement at Camp Claiborne, Louisiana. Samples collected were analyzed in the SEAS Laboratory in Huntsville, Alabama for target analytes developed and presented in Volume I. Photographs were taken of background, pre-, and post first detonation at the disposal site and after the TCRA action was completed. Video was taken before the first detonation, the detonation and post detonation from which stills were extracted and published herein along with selected 35mm camera stills. Both summary charts and original laboratory results as obtained from the SEAS is published herein.

# 1.0 INTRODUCTION

## 1.1 TCRA Site

The area of former Camp Grant which was remediated under TCRA was the former impact area for 3" stokes trench mortars, and possibly 37mm artillery shells. The specific area which was searched is the impact area for the stokes mortars which lies along the north bank of the Kishwaukee River. The area south of the river includes an old abandoned rock quarry which was designated for use as a demolition area. Due to the close proximity of private housing to the site, demolition shots were limited to one round per shot. Fuzed rounds which were found intact were blown in place and rounds without fuzes were taken to the quarry for disposal. Approximately 140 rounds were destroyed in the quarry demolition area at Camp Grant.

Documents pertaining to Camp Grant which were utilized for planning purposes are listed at Appendix 5.5.

## 1.2 Sampling Overview

The planned activities at Camp Grant for this task were to collect three sets of samples for analysis. Background samples were collected before any demolition activity took place. These samples establish the baseline levels of the analytes of concern. A second set of samples were collected after the initial demolition shot and finally, a third set of samples collected after the final demolition activities to determine the accumulated levels of analytes. Location of sampling points and the consolidation of samples varies from the sampling plan. Whenever possible, samples were themselves sampled and the consolidated sample used for analyses; the remaining individual samples were saved under refrigeration to be analyzed if anomalies developed necessitating further analysis. The layout of sample points varied from the sampling plan due to the nature of the demolition which took place which consisted of using perforating charges on each mortar at one of 12 sites. All other procedures of the sampling plan were followed. Because procedures for collecting, storing and transporting were similar to Camp Claiborne in Louisiana, a trip blank and rinsate samples were not used/taken.

## **2.0 BACKGROUND SAMPLING**

Background samples were collected on 29 August 1995. Samples were collected from the areas indicated by the squares on Figure 2.1. Distances were determined by the walls of the quarry determining the maximum distance, approximately 50 feet and a second set of samples were collected halfway between the demolition and the outer ring of samples. In addition, one sample was collected from the pile of sand being used to fill sand bags for the demolition bunker and which was to be used as tamping over the demolition shot. Figure 2.2 is a view from the open end of the quarry showing the bunker and the pile of sand. Eleven (11) samples were collected from 12 areas and a portion of each was taken to make up one composite sample for analyses. These samples have identification numbers beginning with 950829, followed by four digits identifying a particular sample. The composite sample was numbered 9508290920. Results are shown in the first column of Tables 2.1 (Semivolatile Concentration), Table 2.2 (Nitroaromatics/Nitramines) and Table 2.3 (Metals) and the original laboratory report is provided in Appendix D.

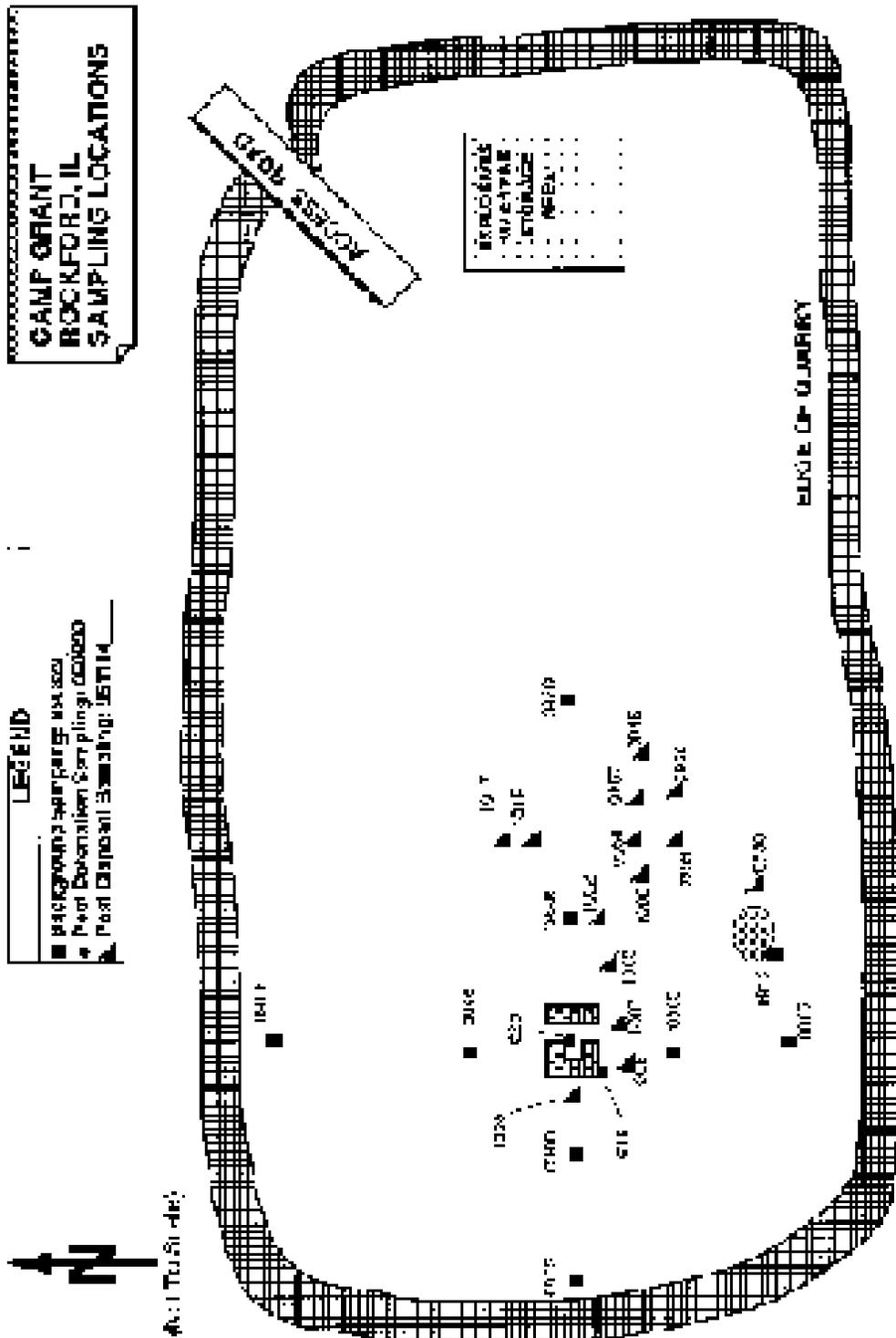


Figure 2.1 Soil and Water Sample Collection Locations at Camp Grant For Background, Flat Detection and Post TSPA.



**Figure 2.2 Demolition Bunker in the Quarry Used for UXO Disposal**





**TABLE 2.2 NITROAROMATICS AND NITRAMINES FOR CAMP GRANT**

Compound	0920 (1) µg/kg	0930 (2) µg/L	1012 (2) µg/kg	1015 (2) µg/kg	1017 (2) µg/kg
HMX	<17.4	<0.653	<26.1	<22.7	<25.1
RDX	<27.1	<1.02	<40.0	<35.3	<40.0
1,3,5 TNB	<30.5	<1.15	<45.8	<39.8	<45.8
2,4,6 TNT	<20.1	<0.753	<30.1	<26.2	<30.1
2,4 DNT	<74.0	<2.78	<111	<98.5	<111
2,6 DNT	<54.2	<2.03	<81.3	<70.7	<81.3

Key: RDX - Hexahydro-1,3,5-Trinitro-1,3,5-Triazine  
HMX - Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazone  
TNB - Trinitrobenzono  
TNT - Trinitrotoluene  
DNT - Dinitrotoluene

(1) Background  
(2) Post Disposal

TABLE 2.2 METALS CONCENTRATIONS AT CAMP GRANT

METAL	BACKGROUND (1)	POST DISPOSAL										Range
		WA CR 21	SOIL (5)	SOIL (4)	SOIL (3)	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	
	0.520	085C	1012	1013	1017	MAX.	AVG	AVG	AVG	AVG	AVG	AVG
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
COPPER	5	<.01	<.31	1.77	5.75	5.75	4.68	4.68	4.68	4.68	4.68	4.68
LEAD	50	<.06	<1.37	<3.14	<1.45	50	50	50	50	50	50	50
CHROMIUM	0	<.02	1.76	1.31	2.27	2	2.02	2.02	2.02	2.02	2.02	2.02
MERCURY	<2.32	<.01	<2.71	<2.09	2.37	14	2.34	2.34	2.34	2.34	2.34	2.34
HARIUM	14	<.01	7.51	2.57	3.77	14	3.00	3.00	3.00	3.00	3.00	3.00
NICKEL	5	<.05	<3.39	<2.62	1.95	3	3.00	3.00	3.00	3.00	3.00	3.00
POTASSIUM	191	<.05	<.56	63	69	191	120	120	120	120	120	120
ZINC	21	<.01	6.75	3.89	7.82	21	11.09	11.09	11.09	11.09	11.09	11.09
CADMIUM	<.058	<.01	<.38	<.52	<.25	<.69	0.43	0.43	0.43	0.43	0.43	0.43
ALUMINUM	1836	0.35	516	524	714	1836	752	752	752	752	752	752
CALCIUM	60,000	0.33	20767	24892	33086	60,000	28637	28637	28637	28637	28637	28637
TITANIUM	<2.9	<.05	13.1	34.6	51	61	35.74	35.74	35.74	35.74	35.74	35.74
NET RATE	Not Tested	0.156	0.576	0.61	1.02	1.02	0.45	0.45	0.45	0.45	0.45	0.45

1) COMPOSITE OF 8 SAMPLES (3 INJURY ATES AND 50 FEET RADIUS) 1/4 MILE NORTHWEST  
 2) FOR TAPEN IN 20 WALL MOUNTED POINT NEXT TO QUARRY WALL  
 3) COMPOSITE OF 12 SAMPLES, ONE EACH FROM EDGE OF EACH CLASH SAL AREA — 11 SAU 1715 FT 037N  
 4) COMPOSITE OF 8 LOCATIONS  
 5) COMPOSITE OF 6 LOCATIONS  
 6) LUNGS BACKGROUND RANGE FOR 10 COUNTS WITHIN METRE OF 0.005 (A 161) 241 AFA

## **3.0 FIRST DETONATION AT CAMP GRANT**

### **3.1 Detonation Site**

The first detonation took place on 30 August 1995. A survey crew discovered a 3" stokes mortar round on the surface of the ground while laying out grids for the magnetometer search. This round is shown in Figure 3.1 before it was transported to the quarry area.

The bunker shown in Figure 2.2 was used to attempt the detonation of the first UXO found (stokes mortar). The bunker was approximately 10' square on the outside and approximately 5' square on the inside with the walls being approximately 5' high. One wall, facing east had an opening or door located about 2' from the free standing sandbag wall. The 3" stokes mortar round was placed on a bed of sand in the bunker, counter-charged on top with 1/4 lb. of yellowstick explosive, and buried with sand to the level of the top sand bags after the opening in the bunker had been closed with a stack of sandbags. This represents a scaled depth of burial based on a 1/2 lb NEW of 135 ft./ton. At this depth, uplift and venting of gaseous products will occur with no measurable ejecta generated (nearly completely tamped explosion).

### **3.2 Sampling**

Sample collection pans were placed in the same locations from which background samples had been collected (see Figure 2.1). The detonation produced no fallout so that the pans were clean. The sand in the bunker was not measurably disturbed and the bunker was not damaged except for the single stack of sandbags in the opening being moved slightly outward (Figure 3.2).

The demolition crew removed sand from the bunker until the mortar round was found. From the appearance of the round, it was obvious that it had been inert (Figure 3.3). Only two samples were collected, one from the small amount of kickout sand on top of the sandbags on the southwest corner of the bunker and one from the area of the pit where the projectile was found after the detonation.

### **3.3 Laboratory Analysis of the Samples**

A decision was made not to analyze the samples collected after the first demolition shot since the round was inert and the only analytes recovered were from the 1/4 lb. initiator charge and were completely contained in the sand surrounding the explosion. The whitish products surrounding the detonation was  $\text{NaOH}$  and  $\text{Na}_2\text{CO}_3$ , neither of which constitute hazards.



**Figure 3.1 Stokes Mortar Prior to Demolition in the Bunker**



**Figure 3.2 Photo Showing Movement of Sandbags Covering Opening to the Demolition Pit (center of photo) Resulting From the 1/2 Pound Initiator Charge**



**Figure 3.3 Stokes Mortar as Uncovered (a) and Removed to the Top of the Bunker (b)  
White Residue in (a) is  $\text{NaOH}$  and  $\text{Na}_2\text{CO}_3$**

## **4.0 POST TCRA ACTIVITIES**

### **4.1 Demolition Site**

On 14 November 1995, the sampling crew returned to Camp Grant to collect the final set of post disposal activity samples. The demolition contractor, UXB, Inc. were in the process of closing down the site, having fired the last demolition shot six days previously. In the time between the last demolition shot and the final sampling, a snowfall of approximately 2" had occurred and the ground was still snow covered.

Subsequent to the first disposal operation, UXB, Inc. had obtained permission to alter the method of disposal. In view of the small explosive charges expected and considering the amount of labor involved in building the initial bunker, permission was obtained from the Corps of Engineers to utilize 12 smaller disposal sites within the quarry and to utilize explosive perforators rather than yellowstick on the rounds to be destroyed. The perforators are small commercially available charges which perforate the target with a super hot jet of explosive gasses, leaving a hole of between 3/8" and 1/2" diameter.

Figure 4.1 and 4.2 depict the residue of the 12 disposal areas as they appeared on 14 November 1995. The small mounds to the left of the wall of sand bags in Figure 4.1 and to the right of the sandbags in Figure 4.2 are the remains of the small disposal pits which had originally been constructed of sand bags. After completion of disposal operations and in agreement with park personnel, intact sand bags were stacked in a row and damaged sand bags were dumped on the spot with the cloth portions being disposed of by UXB.

### **4.2 Sampling**

Samples were collected from each of the 12 disposal sites by breaking off sand from several areas around each pit with a hammer. (Temperature was 14°F). One sample of ice was taken from a low area a few feet from the pits in a southerly direction. This sample was allowed to melt and was preserved as a water sample. Two additional samples were collected from sand and soil north of the wall of sandbags. One composite sample was collected at a distance of 3-7 meters from the sandbags and another at approximately 20 meters from the sandbags.

### **4.3 Laboratory Analysis**

All samples collected during the post TCRA activities begin with the designation 951114 plus four digits identifying the specific sample. The water sample was 9511141017 (10 m) and 9511141012 a composite sample from the 12 disposal pits. Only the water sample and the 3 composites samples were analyzed for the analytes of concern, with the remaining individual samples being preserved under refrigeration in case further analysis was deemed necessary. Table 2.1, 2.2, and 2.3 summarize the results of the laboratory analysis. Other original laboratory reports are provided in Appendix F.



**Figure 4.1 Disposal Area Looking South-West**



**Figure 4.2 Disposal Area Looking North-East**

## **5.0 SAMPLING PLAN**

### **5.1 Introduction**

The Army Corps of Engineers (COE) Huntsville is responsible for management, control and overseeing the removal of explosive ordnance items from Formerly Used Defense (FUD) Sites that contain Unexploded Ordnance (UXO). The COE's intent is to safely cleanup these sites and at the same time mitigate the potential for additional contamination resulting from the cleanup activities. Sampling is required to establish the relative site conditions both before and after remediation. This document provides the protocol to be used during sampling activity.

#### **5.1.1 Plan Objective**

This sampling plan is part of a larger task intended to develop a set of baseline data that characterizes the air soil and water contamination levels which can be expected to result from the OB/OD of explosive ordnance items found while restoring a typical FUD site. The intent of this plan is to develop the sampling methodology in a generic format that can be used during investigation activities. This plan has been developed in a generic format with the intent that it be used at any FUDS designated for study. This format that should be adjusted as necessary to conform to the specific site activities and conditions.

#### **5.1.2 Background**

The Huntsville Division, Corps of Engineers is responsible for the remediation of FUD sites which still have unexploded ordnance and explosive waste (OEW). Open burning and open detonation (OB/OD) has traditionally been the means of disposing of explosive ordnance, however concern has been expressed over the environmental effects of this activity. Alternate methods of disposal are both costly and increase the risk to personnel assigned to the task of disposal. The primary goal of this plan is to establish methods to collect soil and water samples from areas to be used for OB/OD operations at selected FUD sites. This will enable the determination of environmental effects, if any, associated with OB/OD and enable a comparison the effectiveness OB/OD to other disposal techniques.

### **5.2 Standard Sampling Procedures**

Standard sampling procedures ensure the consistency in the collection of the samples and data derived from the samples collected. A flow chart for sample collection procedures is shown in Figure 5.1. Consistent data and sample collection is essential to the development of defensible site data. These procedures include:

- required sampling equipment
- health and safety precautions
- field documentation
- standard sampling procedures for water, soils and air
- decontamination procedures and

proper handling of samples by field and laboratory personnel

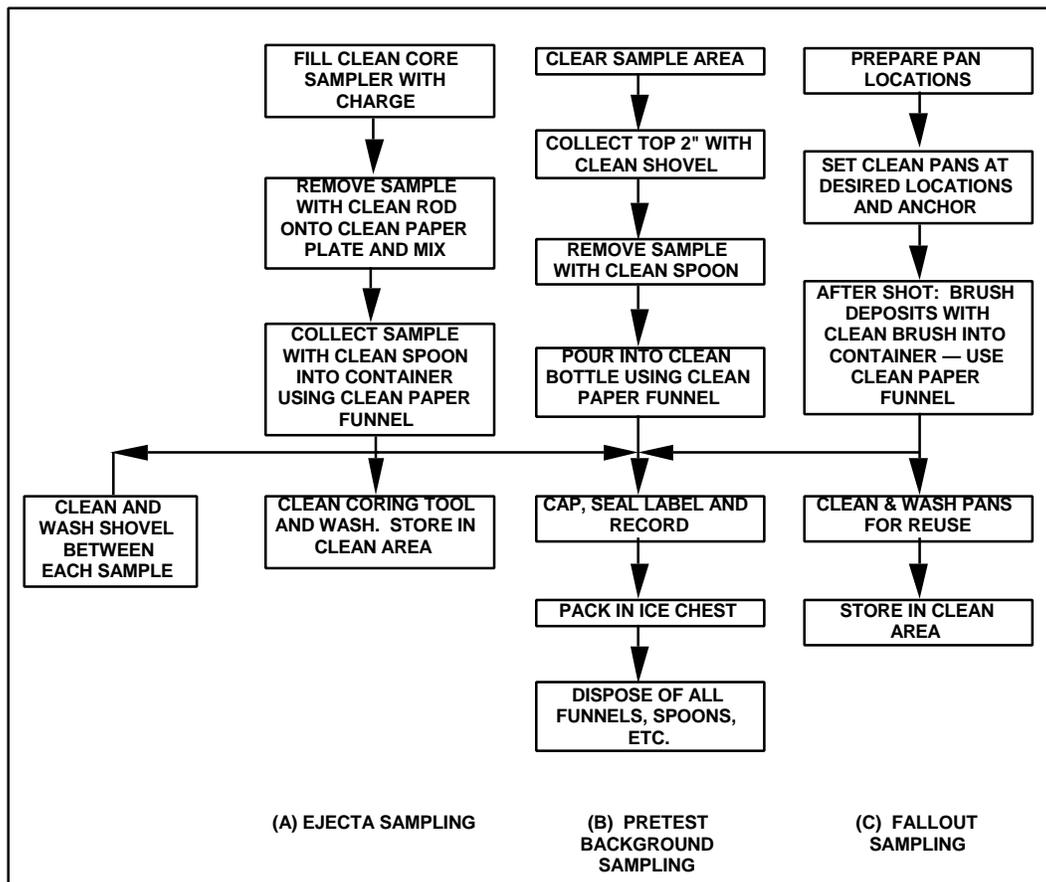


Figure 5.1 Sample Collection Procedure

### 5.2.1 Required Sampling Equipment

Presented in Appendix A is a list of field equipment necessary for sampling activities at a typical FUD site. The variety of activity at each site in addition to changing conditions (such as weather) may require additional equipment. Field personnel will note equipment changes in the field book

### 5.2.2 Health and Safety Precautions

Historically, environmental considerations have been secondary to overriding safety concerns at OB/OD sites. This has resulted in numerous sites being contaminated to varying degrees as a result of past activities. Safety is still the primary concern at all FUD sites. However, there is now a need to document the amount and type of contamination. All sampling activity detailed in this plan and conducted at FUD sites will operate within the established Health and Safety Plan (H-S plan) for that site. Specific safety concerns detailed in this plan address the sampling activity itself with the site specific H-S plan taking precedence over all other safety aspects developed as part of

this plan. In view of this, only cursory detail is required for the health and safety aspects in this plan. The detail provided here is intended to append to the site specific health and safety plan for the site under study.

Based on previous health and safety monitoring at FUD sites, sampling activity will be performed using limited personal protective equipment. Most activity can be conducted using level D protection with the addition of latex or nitrile gloves (to prevent sample contamination) and Safety Glasses. Additional guidance on health and safety precautions is provided in the specific site health and safety plan (SSHP) for the site under study.

**SAFETY:** The primary goal of the remediation action is to reduce the potential risk to the public that may occur due to the presence of unexploded ordnance or explosive waste. Therefore the site workers and the public must be protected and/or restricted from access to the site as appropriate. All activity related to UXO handling and destruction takes priority over the ancillary sampling activity.

### **5.3 Field Documentation**

Field log book:

All field notes for sampling activities should be recorded in a bound field log book dedicated to the sampling activity. During each day of sampling all occurrences and activity should be recorded. The logbook should provide a record of all events of the day that relate to the sampling activities. All entries into the logbook must be recorded in ink. If corrections are required, the incorrect entry will be lined through with a single line, and the corrected entry written in. As a minimum the following information should be recorded:

- Current date

- Weather conditions

- Sampling team members

- Visual condition of the sampling area

- Description and deviations from the sampling plan

- Brief description of activities around the sampling area

- Maps and sketches of the sampling area

- Observations that may influence sampling activity

Sampling Log Form

In addition to the field log book a sample log form should be completed for each sample taken. A copy of this log form is included in Appendix B. These forms will be maintained for future reference. The following information is recorded on the sample log form:

- Sample ID, date, time weather conditions

- Description of the material sampled (water, soil, munitions, residue)

- Sampling area and location

Relative time of sampling: (pre or post detonation sequence)

Expectations of sampling

Sampling technique used

Material sampled

Number and type containers filed according to Appendix B

#### **5.4 Standard Sampling Procedures :**

Standard sampling procedures consist of the following tasks:

Collection site preparation

Removal of undesirable loose materials by sweeping and segregation (rocks, sticks and leaves)

Collection of samples and filling of containers, marking containers

Field QA/QC activities, photos if necessary

Sample labels and chain of custody documentation

Decontamination of sampling equipment as necessary

Cleanup and removal of any collection materials

Sample handling and shipment

##### **5.4.1 Collection Site Preparation**

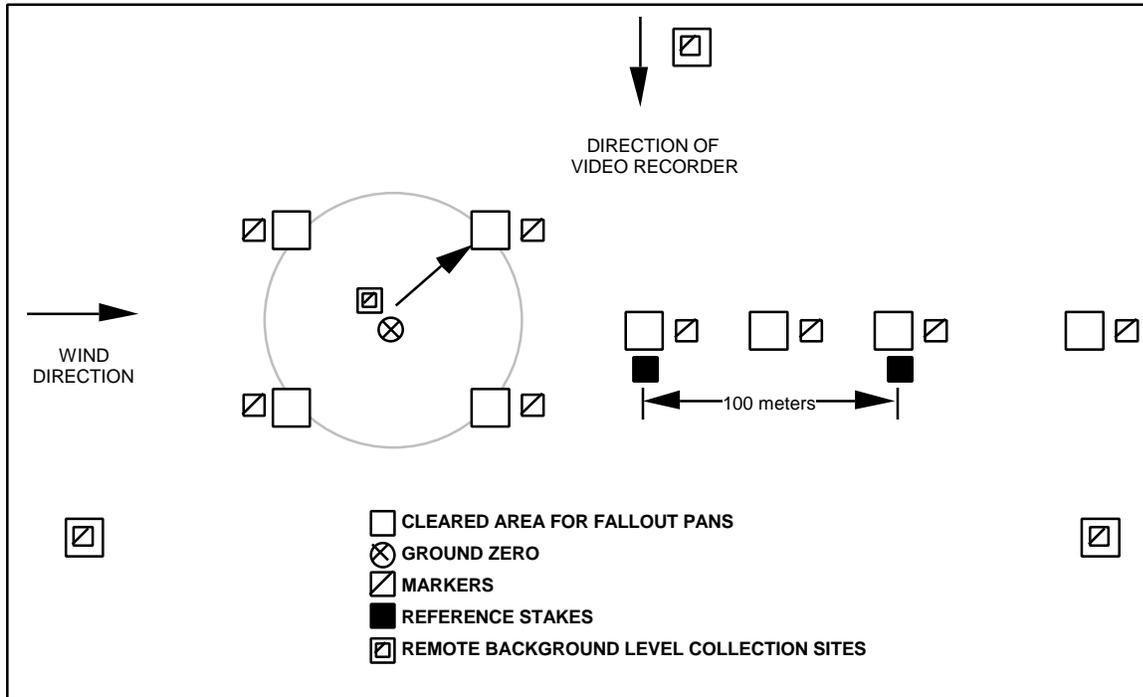
Fallout samples will be collected at surface level with metal pans at set intervals from ground zero. Sample areas will be cleared to virgin soil to receive these pans and provide access to the soil for pre- OB/OD soil sampling (background samples). These sites will be selected as close to detonation time as is allowed by the safety officer taking into account the prevailing wind direction and to insure pan cleanliness. Locations will be marked on a map of the OB/OD area to approximate scale.

Standing water area(s) within 200 to 300 meters of ground zero will have any leaves and debris moved to provide a clear surface on which fallout will be deposited.

Stakes marking area where pre-test and post-test samples have been taken will be driven within 2 inches of the surface and spray painted a bright color for ease of later re-location. Landmarks and any possible measurements which will aide in locating the approximate location of the markers will be entered into the map of the test area and in the OB/OD Field Logbook.

To aid in subsequent analysis of dust cloud dynamics, video of the dust cloud will be used to aid in the subsequent analysis. For reference, stakes with flagging easily visible will be placed at 100 meter intervals along the anticipated fallout collection area. Two cameras will be located (1) as close as safety allows and (2) at a distance which allows for the capture of the entire dust cloud in each frame.

Figure 5.2 shows the anticipated geometry of the sample collection sites and reference markers. A second ring (three if NEW is large: > 2000 kg) can be added with pans spaced 90° apart.



**Figure 5.2 Layout of Collection Sites and Markers**

## 5.4.2 Sample Collection

Sample collection includes standard procedures to retrieve samples as conditions and resources warrant. Proper handling of samples and preservatives is required. The collection methods should remain consistent for each sampling event and sample taken. Note that sampling parameters and schedules may change between sampling points therefore the sampling schedule Appendix C, Table C.1 should be checked prior to each sampling event. Refer to Appendix C for a listing of container types, sizes and preservatives for each media sampled.

### 5.4.2.1 Background

At the locations chosen in 5.4.1 initial soil samples are collected from the top 1 to 2 inches of soil with a shovel. Using a clean spoon, a smaller amount is selected and poured into a clean container using a paper funnel. Spoon and funnel are disposed of and a clean one used for each sample. A sample will be taken at ground zero prior to any detonation. Where a water sample is to be collected, the bottle is immersed until full, removed and then capped.

Excess samples are to be collected to insure backups are available should anomalies in the Assay occur. Correction of anomalies may require additional samples to resolve.

#### **5.4.2.2 Ejecta**

Upon given clearance by the safety officer/personnel, core samples will be taken of the ejecta material at the edge of the crater and (if allowed) within the crater). Depth will be determined based on eject thickness calculations prior to the explosion. A clear tube will be inserted into the soil for collection of each sample. The material collected will be ejected onto clean paper and a spoon used to collect the final sample which is put into a clean collection bottle through a clean paper funnel. Spoon and funnel are discarded after each use.

Excess samples are to be collected for reasons as stated in 5.4.2.1.

#### **5.4.2.3 Fallout**

Material which is deposited in each collection pan is collected as follows:

- (a) a clean brush is used to sweep all material in a pan to one end.
- (b) this material is then brushed into a bottle using a paper funnel.
- (c) paper funnel is discarded - brush is saved for later decontamination.

Should insufficient sample material result from one detonation the collected material will be consolidated, the pans must be cleaned in accordance with 5.10, dried and stored in a clean area until ready for emplacement for the next or subsequent shot. Brushes are cleaned and dried at the same time and returned to a clean storage bag.

#### **5.4.2.4 Surface Water**

Preservatives may be required in water samples for analysis of metals and other tests. Water samples will be collected using clean glass sample retrieval containers. In most cases containers will be provided from the laboratory with preservatives already in them. If the sample containers are filled directly from the water source, preservatives should be added after the container is filled.

#### **5.4.2.5 Soils and Explosive Residues**

Soil and residue samples will be collected with clean shovels and placed in the containers with spoons and disposable paper funnels.

### **5.5 Field QA/QC**

The QA/QC samples are collected in the field to assess the quality of the sampling activities and laboratory analysis. These QA/QC samples consist of the following:

- Trip Blanks
- Matrix spike and Matrix spike duplicates
- Rinsate samples and
- Duplicate samples

#### **5.5.1 Trip Blanks:**

Trip blanks are used to determine if contaminants are introduced to the field samples during the sample handling, storage and transportation. This sample is prepared by the laboratory

and transported and stored with the routine samples. The trip blank is not opened in the field but is subjected to the same handling and shipping procedures as the normal samples.

#### **5.5.2 Matrix Spike and Matrix Spike Duplicates:**

Matrix spike (MS) and Matrix spike duplicate (MSD) samples are used to determine if the matrix affects the analytical process. These samples should be taken from areas that are known to contain contamination. One MS and MSD each should be taken for each analytical method and for every 20 samples. The MS and MSD samples will be marked as such on the containers.

#### **5.5.3 Rinsate Samples:**

Rinsate samples are taken to determine if the sampling equipment is causing contamination in the samples. This sample is taken by pouring clean (contaminant free) deionized or reagent grade water (provided by the laboratory) over the sample retrieval equipment. This rinsing will be done once for every 20 samples taken and for each analysis method.

#### **5.5.4 Duplicate Samples:**

Duplicate samples are taken to provide a measure of method variability (imprecision) in both the sampling and analytical procedures. For water samples, this will be done by emptying the contents of the retrieval container into two sample containers, and alternating between the two while filling. The duplicates will be labeled the same as other samples so the lab will not be able to identify which samples are duplicates. Soil and residue samples will be done in the same way, however to avoid stratification the material should be homogenized before being placed into the two containers. Duplicate samples will be done once for every 20 samples taken and for each analysis method.

### **5.6 Sample Labels and Chain of Custody Documentation**

Sample documentation includes the correct use of labels and chain of custody records. Both labels, seals and the chain of custody forms will be provided by the laboratory along with the sample containers.

#### **5.6.1 Labels:**

Sampling personnel must affix a label to each sample container with the unique sample number marked in ink. This sample number will be date and time encoded. (i.e. if sample was taken at 1:35 on July 4, 1995 the sample number would be: 9507041335). In addition the preservative and analysis method and sample personnel will be noted. The labels should then be covered with clear tape to prevent tampering and insure they are affixed and legible after they have been immersed and refrigerated.

#### **5.6.2 Chain of Custody Seals:**

All samples will have a chain of custody seal placed over the lid of each container. The seal will be placed in such a way that it must be broken to remove the lid.

### **5.6.3 Chain of Custody (COC) Records:**

This Chain of Custody (COC) record documents the possession and handling of individual samples from the time of field collection to the laboratory submittal. This record must include the following information:

Sample number

Type of sample

Signature of sampler

Requested analysis

Type of container and preservative used.

A copy of the chain of custody record is presented in Appendix B. A copy of the COC record must be retained by the sampler prior to shipment. Shipping receipts used by the courier service (i.e.: Federal Express) will suffice as evidence of custody and tracking between the sampler and courier and the courier and laboratory receipt.

### **5.7 Sample Handling and Shipment**

After sample containers are filled, marked and labeled they must be placed in an ice chest and cooled to 4 degrees C. Ice should be placed in double plastic bags and placed on the containers. Packing materials will be used to separate the containers.

At the end of each day of sampling all samples must be packed on ice with packing material. Ice chests used for transporting samples will be supplied by the laboratory and must be durable and waterproof. Packing materials will be used to fill void spaces. Containers should be upright, with ice in plastic on top and more packing material placed over the ice. COC forms should be placed in Ziplock bags and affixed to the lid of the chest. The top should then be sealed with tape around all sides. The drain should also be taped shut. Shipping labels should be affixed to the top. Labels indicating this side up and fragile should also be placed on the outside of the chest.

The ice chests will be delivered to the analytical laboratory via overnight delivery service at the minimum of every 2 days or once per week. Samples shipped on Friday should be picked up or delivered to the laboratory on Saturday.

### **5.8 Decontamination Procedures for Sampling Equipment**

In most cases only limited amounts of contamination is expected on the sampling equipment. This contamination will consist of limited soil and dirt attached to the sampling equipment. All equipment used in sampling must be cleaned before and after usage to guard against cross contamination of samples. These items must be cleaned as appropriate with the following sequence:

scrub equipment withalconox detergent in potable water.

rinse with potable water

rinse with reagent grade or deionized water  
allow to air dry

Rinse water from the decontamination of the sampling equipment is considered to be relatively uncontaminated. This water can be disposed of on the ground near the sampling area.

## **5.9 Sampling Area Descriptions**

This section provides information pertaining to a generic sampling area. When the sites are defined this generic sampling plan will be modified to accommodate the specific site conditions and sampling program. A typical site will have two distinct sampling events occur, one before and one after the detonation activity. This is detailed in the following two sections:

### **5.10 Pre Detonation Sampling (Background Samples):**

Baseline samples may be required to establish the background site conditions prior to detonation. Samples considered "uncontaminated" will be taken as necessary of existing soils and water in the general area of the detonation. In some instances sites may contain UXO washout materials, or other environmental contamination due to historical uses. Regardless of the previous uses that have caused environmental contamination, it is necessary to establish current pre-detonation conditions as a baseline. This will be done by sampling the following areas:

- detonation site
- fall out area
- surface water (if any)
- ground water (if well(s) is/are available)

During pre detonation sampling, one or more of the four site area conditions may exist :

**5.10.1 Unaffected Background Samples:** Some areas of a site may not have been affected by ordnance use. These areas will be sampled to provide baseline conditions and provide information on the "pristine" condition of an unaffected area. This information will be compared against other samples to determine the relative condition of each area.

**5.10.2 Historical Contamination:** In most cases sites have known ordnance use that has occurred in the past. Sampling will be done to provide "quick look" screening and determine to what degree historical ordnance use has caused contamination at the site.

**5.10.3 Surface Water, Pre Detonation:** Surface water (if any) may be sampled to determine if explosives residues have caused contamination and are already present before planned detonation activity occurs.

**5.10.4 Ground Water Historical Contamination:** If available, water from local wells will be sampled to determine if explosives use in the area has induced contamination to reach and contaminate ground water. No post detonation sampling of ground water is anticipated since the sampling visit will not be of sufficient duration to allow contamination to reach ground water wells.

## **5.11 Post Detonation Sampling**

The intent of post detonation sampling is to monitor contamination induced by the current open detonation activity. A comparison of pre and post sample conditions should reveal this net change. Although the media sampled for both events is similar, the post detonation affected area will be apparent by observing disturbed soils and debris. During post detonation sampling, one or more of the four site area conditions may exist :

**5.11.1 Ejecta:** After an explosion, a mass of soil will be thrown a short distance and land near the crater. This soil can be sampled for explosive byproducts analysis.

**5.11.2 Crater Debris:** After an explosion some material will be compacted into the bottom and sides of the crater. Samples will be taken from these areas at a depth interval of 0-6 inches, the sample will be analyzed for metals and explosives byproducts.

**5.11.3 Fallout Collection:** Considerable airborne dust is generated during detonations. This dust will eventually return to the ground as fallout. If sufficient quantities can be collected for a sample, detonation byproducts in these materials will be analyzed.

**5.11.4 Surface Water:** Surface water will be sampled after detonation to determine if explosives residues were caused by fallout from the detonation activity.

## **5.12 Contaminated Soils Near UXO Washout**

Some UXO may be lying on the ground. After the item has been removed, soil from this site may be sampled and analyzed for explosives residues that may have washed out .

## **5.13 UXO and Munitions Debris**

Historical UXO may be left on the site in a broken and leaking condition. If necessary the munitions debris may be sampled and analyzed for explosives residues to determine if natural conditions over time has degraded the chemical makeup of the explosives material.

## **5.14 Air Sampling**

Sampling of airborne byproducts resulting from explosive detonations are both hard to capture because of rapid dispersal and hard to characterize and use as representative. Experiments done by others describe and through reliable methods have already characterized, these detonation byproducts. The sampling of air contaminants in explosives clouds is not feasible in this study, however the work done by others will be evaluated to determine what contamination is being sent into the air during detonation activity. The fate of these contaminants will be evaluated to determine what, if anything, should be done to understand the consequences of airborne releases from open burning and open detonation activity.

## **5.15 Follow-up Sampling**

Sites that have the higher detected concentrations of explosives in the soil may be characterized in greater detail by others to determine the vertical and lateral extent of explosives contamination. Information gathered during this phase of the work may be utilized to develop

cost-effective and regulatory acceptable remediation and/or disposal options. Follow up sampling will be the responsibility of others with specific tasking by the COE.

## **APPENDICES**

# **APPENDIX A**

## **EQUIPMENT AND SUPPLIES**

### 1. Sample Collection: Non-Consumables

- Aluminum Pans: Cleaned and Wrapped (12)
- Core Sampling Tubes: Cleaned and Wrapped
- 1 1/2" Paint Brushes - Natural Bristle (12) for assistance in collecting samples from pan (one each pan)
- Hammer, Clean
- Small, flat shovel
- Wire Staples for Close-in Pans (2 / pan) to prevent upset by blast
- Sample Bottles, Seals and Labels
- Cooler
- Video Recorder (2)
- Tape Measures (25 ft.; 300 ft.)

### 2. Sample Collection: Disposables

- Paper Funnels
- Paper Plates
- Wooden Spoons or Spatulas
- Wood Dowels (10:) : 1/8 inch diameter
- 1 x 2 x 2 inch Wood Blocks and Single use Core Sampling Tubes (10)
- <Alconox> Detergent
- De-ionized or Regent Grade Water
- Paper to Protect Clean Pans

### 3. Miscellaneous Disposable Supplies

- 2 x 2 Stakes to Mark Sample Areas (12) - each 2 feet long
- Spray Paint for Stakes
- 2 x 2 Stakes and large flags to Mark Video Reference Distances - each four feet long
- Clean Box to Carry Supplies
- Trash Bag for Consumables (for later disposal)

4. Miscellaneous

- Trip Blank
- Notebook and Sample Record Log (Tape Recorder o.k. for miscellaneous comments, observations, etc.)

**APPENDIX B**  
**CHAIN OF CUSTODY AND LOG**



## **APPENDIX C**

### **SAMPLING / ANALYSIS**

Sampling containers, preservatives (for water samples) deionized water, sample labels, custody seals and sample log should be obtained from the laboratory performing the assays. The deionized water is used to clean appliances used in sample collection between each sample. The quantities are as follows:

- (a) sample containers = number required times two plus rinsate sample jars and at least six spares;
- (b) bottle of preservative;
- (c) at least two quarts of de-ionized water (use judgment here; cleaning implements rather than using single use throw aways requires more water);
- (d) quality control trip blank, and
- (e) sufficient coolers to transport iced down samples to the laboratory.

Once samples are collected, labeled, sealed and recorded, they are packed in coolers and iced down and sealed for shipment. Overland by personal or company van or auto is preferred although use of Federal Express or other carrier is acceptable. Warning labels and content tabs should be attached if shipped via commercial carrier. Shipment must arrive at the laboratory before ice melts.

A target list of analytes for extraction and assay should as a minimum consists of those in Table C.1.

**TABLE C.1 TARGET ANALYTES FOR OPEN DETONATION SITES**

**a. Base/Neutral and Acid Compounds to be Analyzed Using USEPA Method 8270/625**

COMPOUND	COMPOUND	COMPOUND
Bis(2-chloroethyl)ether	4-Chlorophenyl phenylether	2-Nitrophenol
1,3-Dichlorobenzene	* Fluorene	2,4-Dimethylphenol
1,2-Dichlorobenzene	Azobenzene	2,4-Dichlorophenol
1,4-Dichlorobenzene	Hexachlorobenzene	4-Chloro-3-Methylphenol
Bis(2-chloroisopropyl)ether	* Phenanthrene	2,4,6-Trichlorophenol
N-Nitrosodi-n-propylamine	Anthracene	2,4-Dinitrophenol
Hexachloroethane	Dibutyl phthalate	* 4-Nitrophenol
Nitrobenzene	* Fluoranthene	2-Methyl-4,6-Dinitrophenol
Isophorone	* Pyrene	Pentachlorophenol
Bis(2-chloroethoxy)methane	* Butylbenzyl phthalate	
1,2,4-Trichlorobenzene	3,3'-Dichlorobenzidine	<b>ADDITIONAL COMPOUNDS:</b>
* Naphthalene	* Benzo(a)anthracene	1-Methylnaphthalene
Hexachlorobutadiene	Chrysene	* Acetophenone
2-Chloronaphthalene	* Bis(2-ethylhexyl)phthalate	* Diphenylamine
* Dimethyl phthalate	* Di-n-octyl phthalate	2-Aminonaphthalene
* 2,6-Dinitrotoluene	Benzo(b)fluoranthene	* 1-Nitropyrene
* Acenaphthylene	Benzo(k)fluoranthene	2,5-Diphenyloxazole
Acenaphthene	* Benzo(a)pyrene	* 2-Nitronaphthalene
* 2,4-Dinitrotoluene	Ideno(1,2,3-cd)pyrene	
* Diethyl phthalate	* Dibenzo(a,h)anthracene	<b>OTHER COMPOUNDS:</b>
Benzdine	Benzo(g,h,i)perylene	* 2-Methylnaphthalene
4-Bromophenyl phenyl ether	* N-Nitrosodiphenylamine	2-&/or 3-Methylphenol
N-nitrosodimethylamine	* Phenol	* 4-Methylphenol
Hexachlorocyclopentadiene	2-Chlorophenol	2,4,5-Trichlorophenol

**b. Metals to be Analyzed Using Method 6010**

* • Copper	* • Barium	* • Cadmium
* • Lead	* • Nickel	* • Aluminum
* • Chromium	* • Potassium	* • Calcium
• Mercury	* • Zinc	• Titanium

**c. Nitroaromatics and Nitramines to be Analyzed Using HPLC USEPA Method 8330**

* • HMX	• Nitrobenzene (Surrogate)
* • RDX	* • 2,4,6-Trinitrotoluene
* • 1,3,5-Trinitrobenzine	• 2-AM-Dinitrotoluene
• 1,3 Dinitrobenzine	• 2,4 Dinitrotoluene

\* - Indicates Commonality to BANGBOX SERIES Lists

## **APPENDIX D**

### **LABORATORY ANALYSES OF BACKGROUND SAMPLES**

This appendix contains the results of laboratory analyses performed by SEAS of Huntsville, Alabama. Concentrations of semivolatiles, nitroaromatics/nitramines, and metals are provided. The single sample analyzed was a composite from 11 separate samples collected in the quarry used for demolition of mortar rounds not blown-in-place. The target list of analytes used by SEAS is shown in Appendix C. The remaining 11 samples were iced, returned to Huntsville and frozen pending final analysis of the composite panel. After review and approval of the three volumes in this study, the samples will be discarded after 30 days. The chain of custody / field data sheet is also included.

Only one semivolatile compound exceeded the MDL: Dibutyl phthalate. This contamination is only slightly above the MDL (483 vs 330  $\mu\text{g}/\text{kg}_{\text{soil}}$ ) and is in all probability due to collection or laboratory contamination by plastics. All target nitroaromatics/nitramines are below the MDL, of the metals analyzed, only Mercury appears higher than at Camp Claiborne, Louisiana and is outside the Illinois Range of (0.02 - 0.99  $\mu\text{g}/\text{kg}_{\text{soil}}$ ).



10403768 DR. CLUTE 1 • HUNTSVILLE, ALABAMA 35894 • 205/233-6110

08/12/1995

Laboratory Report

Client: Nichols Research Corporation  
 2027 S. Newbern Parkway  
 Huntsville, AL 35815

ATTN: Wm. Martin

Sample ID: 9005250325  
 Date Received: 07/01/1995  
 Purchase Order No.: Cp Grant

Lab. No.: 1419-0445-01  
 QA # Sent to: 1995-08-19  
 Time Sampled: 0920

Constituent	Result	Method	Analysis	Date	Time
Copper (P)	< 1.00 mg/kg	6010	Ep	09-12-95	1300
Lead (P)	23 mg/kg	6010	Ep	09-12-95	1300
Chromium (I)	2 mg/kg	6010	Ep	09-12-95	1300
Vanadium (P)	< 0.10 mg/kg	6010	Ep	09-12-95	1300
Barium (P)	14 mg/kg	6010	Ep	09-12-95	1300
Nickel (P)	1 mg/kg	6010	Ep	09-12-95	1300
Potassium (P)	191 mg/kg	6010	Ep	09-12-95	1300
Zinc (P)	71 mg/kg	6010	Ep	09-12-95	1300
Cadmium (P)	< 0.05 mg/kg	6010	Ep	09-12-95	1300
Manganese (P)	1836 mg/kg	6010	Ep	09-12-95	1300
Selenium (P)	62,775 mg/kg	6010	Ep	09-12-95	1300
Titanium (P)	< 0.00 mg/kg	6010	Ep	09-12-95	1300

Method sources

EPA Test Methods for Evaluating Solid Waste, SW-846 Part 4  
 EPA Methods for Chemical Analysis of Water and Wastes (1991)  
 Standard Methods for the Examination of Water and Wastes  
 water, 18th ed  
 AOAC Part 186  
 HJOGA Manual of Analytical Methods (1984)

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**BASE/NEUTRAL-ACID COMPOUNDS**

**GC/MS Report**

US&PA Method 8270.625

Client: Nichols Research Corporation  
 Sample Description: 960200020  
 Matrix: GCLD  
 Analyst: F.P. Parks

Lab/Job No: 1416-2446-01  
 Date Received: 04/25/05  
 Date Extracted: 04/28/05  
 Date Analyzed: 05/12/05

Compound	MW g/g	Conc ng/g	Compound	MW g/g	Conc ng/g
Bis(4-chlorophenyl) ether	330	EMDL	4-chlorophenyl isopropyl ether	330	EMDL
1,3-Dichlorobenzene	330	EMDL	Fluorene	330	EMDL
1,4-Dichlorobenzene	330	EMDL	Quinazoline	330	EMDL
Bis(2-chloroisopropyl) ether	330	EMDL	Hexachlorobenzene	330	EMDL
N,N-Dimethylpropylamine	330	EMDL	Phenanthrene	330	EMDL
Diethylamine	330	EMDL	Acetophenone	330	EMDL
Nitrobenzene	330	EMDL	Dibutylamine	330	EMDL
Isophorone	330	EMDL	Phenanthrene	330	EMDL
Bis(2-chloroethyl) ether	330	EMDL	Cyrene	330	EMDL
1,2,4-Trichlorobenzene	330	EMDL	Benzylbenzylphthalate	330	EMDL
Niguldolone	330	EMDL	2,2-Dichlorobenzidine	330	EMDL
Hexachlorobenzene	330	EMDL	Benzylbenzylamine	330	EMDL
2-Oxocyclohexanone	330	EMDL	Chrysene	330	EMDL
Dimethylphthalate	330	EMDL	Di(2-ethylhexyl)phthalate	330	EMDL
2,6-Dichlorobenzene	330	EMDL	Di-nonylphthalate	330	EMDL
Acetanilide	330	EMDL	Benzylphenyl ether	330	EMDL
Acetanilide	330	EMDL	Benzylacetone	330	EMDL
2,4-Dinitrotoluene	330	EMDL	Indene(1,2,3-cd)pyrene	330	EMDL
Triethylphthalate	330	EMDL	Phenanthrenequinone	330	EMDL
Benzidine	330	EMDL	Benzophenone	330	EMDL
4-Cyanobenzyl alcohol	330	EMDL	N-Nitrosodimethylamine	330	EMDL
Nitroacetophenone	330	EMDL	OTHER COMPOUNDS**		
Hexachlorocyclopentadiene	330	EMDL	2-Methylnaphthalene	330	EMDL
<b>SUBSTITUTE RECOVERIES</b>		<b>% REC</b>	Recovered by 1. EML - Method Detection Limit 2. EML - HPLC Method Detection Limit 3. NPL - NPL Reference Date: 04-25-05		
Nitrobenzene	74				
2-Trifluorophenyl	74				
Triphenyl-11-	108				

Comments: \* Presence indicated, but less than method detection limit  
 \*\* Tentatively identified and quantitatively estimated.



**BASE/NEUTRAL ACID COMPOUNDS**

GC/MS Report

USEPA Method 8270.0Z6

Client: NCI/Ex Research Corporation  
 Sample Description: 9808290929  
 Matrix: SOLID  
 Analyst: T. P. Farris

Laboratory No.: 118 2415-01  
 Data Received: 2/1/95  
 Data Extracted: 8/12/96  
 Date Analyzed: 08/16/96

Compound	WDF1 ug/Kg	Comp2 ug/Kg	Additional Compounds	MDF1 ug/Kg	Comp2 ug/Kg
Phenol	330	BMDF	1-Methylmorpholine	LD	BMDF
2-Nitrophenol	330	BMDF	Acetophenone	LD	BMDF
3-Nitrophenol	330	BMDF	Diphenylamine	LD	BMDF
2,4-Dimethylphenol	330	BMDF	2-Acetylaminophenol	LD	BMDF
2,4-Dichlorophenol	330	BMDF	1-Nitropropane	LD	BMDF
4-Chloro-2-methylphenol	330	BMDF	2,5-Diphenylazane	LD	BMDF
2,4,6-Trichlorophenol	330	BMDF	2-Nitrophenol	LD	BMDF
2,4-Dinitrophenol	1650	BMDF			
4-Nitrophenol	1650	BMDF			
2-Methyl-4,6-dinitrophenol	1650	BMDF			
2-Nitrophenol	1650	BMDF			
<b>OTHER COMPOUNDS:</b>					
2-Methyl-3-Methylphenol	330	BMDF			
2-Methylphenol	330	BMDF			
2,4,6-Trichlorophenol	330	BMDF			
<b>QUALITY ASSURANCE</b>		<b>5 RPT</b>	1 MDL=Method Detection Limit 2 BMDF=Below Method Detection Limit 3 ND=Not Determined		Reviewed by:  Date: 9-15-95
Phenol	56				
2-Furophenol	56				
2,4,6-Trinitrophenol	56				

Comments: \* Presence indicated but less than method detection limit.

\*\* Tentatively identified and quantitatively estimated

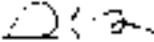


**Nitroaromatics and Nitramines by HPLC**  
 USEPA Method 8130

Client: Kinetik Metals Research Corporation  
 Client ID: 074829020  
 BEAM ID: 1415-2446-01

Date Analyzed: 01/26/06  
 Data Received: 9/1/05  
 Date Detected: 9/12/04

Compound	MCL ug/kg	Conc ug/kg
HMX	17.0	BMDL
RDX	27.1	BMDL
4,6,6-TNB	10.0	BMDL
1,3-DNT	11.4	NR
NE	15.7	NR
Tetryl	20.1	NR
2,4,6-TN <sup>+</sup>	20.1	BMDL
2-Azo-DNT	22.7	NR
4-Azo-DNT	11.7	NR
2,4-DNP	24.0	BMDL
2,6-DNT	24.2	BMDL
2-NF	29.8	NR
4-NF	32.6	NR
3-NF	50.0	NR

Comments: NR = Not Requested. BMDL = Below minimum detection limit  
 Analyzed: Elise Tallon  
 Approved: 



## **APPENDIX E**

### **LABORATORY ANALYSIS OF POST DETONATION SAMPLES**

The first UXO to be destroyed was a Stokes Mortar suspected to be sand filled (no black powder). It was buried in the sand bagged bunker under approximately 4 1/2 ft. of sand with a 1/2 lb. of KINEPAC as the initiator explosive. The explosion kicked out a small amount of sand on the top row of the bunker which was sampled. No sand or explosive products reached the pans set out to collect fallout and / or ejecta. A sample of the soil immediately surrounding the now deformed mortar was taken. The appearance was a dirty white: the white is in all probability  $\text{Ca}_2\text{CO}_3$ . Both samples were frozen and stored in the laboratory, but not analyzed.

## **APPENDIX F**

### **LABORATORY ANALYSIS OF POST DISPOSAL SAMPLES**

This appendix contains the results of laboratory analyses of four samples taken after all TCRA activities were terminated at Camp Grant, Illinois. The samples include one water/ice, one sand and two composites as described in Section 4. Concentrations and all semivolatile and nitroaromatic / nitramine compound were below the MDL. All metals were within the Illinois range of values except for mercury. It appears that mercury levels in the sand and soil samples are the same and are outside the range of 0.02 to 0.99  $\mu\text{g}/\text{g}_{\text{soil}}$ .



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11/9/90

laboratory report

Client: Nichols Research Corporation  
 4040 S. Memorial Parkway  
 Huntsville, AL 35895

MP#s: For Metals

Sample ID# Major use 0511129430  
 Date Received: 11/16/1990  
 Purchase Order No.: 0000

Lab. No.: 1478 8704-0  
 LSC# (AND IN): 1000-11-14  
 Date Reported: JUNE

Parameter	Results	Method	Analyst	Date	Time
El. Lead	0.167 mg/L	6110B	et	11-20-90	1600
Copper (T)	< 0.01 mg/L	6020	fs	11-20-90	0800
As (T)	< 0.01 mg/L	6020	fp	11-20-90	0800
Chromium (T)	< 0.02 mg/L	6020	fp	11-20-90	0800
Mercury (T)	< 0.01 mg/L	6020	fp	11-20-90	0800
Barium (T)	< 0.01 mg/L	6010	fp	11-20-90	0800
Nickel (T)	< 0.05 mg/L	6010	fs	11-20-90	0800
Fluoride (T)	< 1.00 mg/L	6010	fs	11-20-90	0800
Zinc (T)	< 2.00 mg/L	6020	fp	11-20-90	0800
Cadmium (T)	< 0.01 mg/L	6010	fp	11-20-90	0800
Aluminum (T)	0.20 mg/L	6010	fp	11-20-90	0800
Cobalt (T)	0.58 mg/L	6010	fp	11-20-90	0800
Lithium (T)	< 0.05 mg/L	6010	fp	11-20-90	0800

Method Sources

MP#s are Methods for Evaluating Solid Waste, SW-846 Fed. Reg.  
 EPA-Method for Chemical Analysis of Water and Wastes (1987)  
 Standard Methods for the Examination of Water and Waste  
 Water, 18th Ed.  
 69 CFR part 136  
 CIOGA Manual of Analytical Methods (1984)

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**BASE/NEUTRAL-ACID COMPOUNDS**

GC/MS Report  
USEPA Method 8270G/25

Client: Nichols Research Corporation  
Sample Description: 9611160970  
Matrix: WATER  
Analyte: F.F. Peaks

Laboratory No: 1416-1005-01  
Date Received: 11/16/95  
Date Detected: 11/17/95  
Date Analyzed: 11/20/95

Compound	MQL ng/L	Code	Compound	MQL ng/L	Code
2,4-Dichlorophenoxyacetic acid	100	EMDL	4-Chlorophenoxy-2-methyl-2-butanol	100	EMDL
1,2-Dichlorobenzene	100	EMDL	Fluorene	100	EMDL
1,2-Dichlorobenzene	100	EMDL	Azobenzene	100	EMDL
1,4-Dichlorobenzene	100	EMDL	Hexachlorobenzene	100	EMDL
2,4-Dichlorophenoxyacetic acid	100	EMDL	Phenanthrene	100	EMDL
2,4-Dichlorophenoxyacetic acid	100	EMDL	Anthracene	100	EMDL
Hexachlorocyclopentadiene	100	EMDL	Dibenz[a,h]anthracene	100	EMDL
Nitrobenzene	10	EMDL	Fluorethene	100	EMDL
Indole	200	EMDL	Pyrene	100	EMDL
Dibenz[ah]anthracene	100	EMDL	Benzo[ghi]perylene	100	EMDL
1,2,4-Trichlorobenzene	100	EMDL	2,3-Dichlorobenzidine	100	EMDL
Naphthalene	100	EMDL	Benzo[a]anthracene	100	EMDL
Hexachlorocyclopentadiene	100	EMDL	Chrysene	100	EMDL
2-Chlorophenol	100	EMDL	1-Ethyl-3-(3-oxophthalyl)isourea	100	EMDL
2,4-Dichlorophenoxyacetic acid	100	EMDL	Dibenz[ah]anthracene	100	EMDL
2,4-Dichlorophenoxyacetic acid	100	EMDL	Benzo[ghi]perylene	100	EMDL
Acenaphthene	100	EMDL	Peracetylene	100	EMDL
2,4-Dichlorophenoxyacetic acid	100	EMDL	Indole[1,2,3-cd]pyrene	100	EMDL
1-Naphthol	100	EMDL	Dibenz[ah]anthracene	100	EMDL
Benzo[e]pyrene	100	EMDL	Benzo[ghi]perylene	100	EMDL
4-Bromophenoxyacetic acid	100	EMDL	N-Ethylmaleimide	100	EMDL
N-nitrosodimethylamine	100	EMDL	OTIE R CUBEPOLIMIS 24	100	EMDL
Hexachlorocyclopentadiene	100	EMDL	2-Methyl-2-butanol	100	EMDL

SURrogate RECOVERIES	% REC	1 NDL=Not Detected	2 ND=Not Determined	Reviewed by:
2,4-Dichlorophenoxyacetic acid	93	EMDL=Not Detected		Date: 11/20/95
2-Chlorophenoxyacetic acid	96	EMDL=Not Detected		
Terphenyl-204	100	2 ND=Not Determined		

Comments: \* Pro-nor indicated EUI are then recoveries detected limits.  
\*\* Tentatively identified and quantitatively estimated



**BASE/NEUTRAL-ACID COMPOUNDS**

GLMS Report  
 EPA Method 8270/826

Client: N. J. Ho's Business Corporation  
 Sample Description: EPCO (4001)  
 Matrix: WATER  
 Analyst: K.M. Parag

Inventory No: 1116 88CE 01  
 Date Received: 11/17/96  
 Date Submitted: 11/17/96  
 Date Analyzed: 11/22/96

Compound	MDL ug/L	Class ug/L	Additional Compounds	MDL ug/L	Class ug/L
Phenol	100	EMDL	1 Nonylphenolalkylene	100	EMDL
3-Chlorophenol	100	EMDL	2-Octylphenol	100	EMDL
2-Nitrophenol	100	EMDL	4-Aminodiphenylamine	100	EMDL
2,4-Dinitrophenol	100	EMDL	1-Nitrophenol	100	EMDL
2,4-Dichlorophenol	100	EMDL	2,4-Dinitrophenol	100	EMDL
4-Chloro-2-Methylphenol	100	EMDL			
2,4,6-Trichlorophenol	100	EMDL			
2,4-Dichlorophenol	100	EMDL			
4-Nitrophenol	100	EMDL			
2-Methyl-4,6-Dinitrophenol	100	EMDL			
2,4,6-Trichlorophenol	100	EMDL			
<b>OTHER COMPOUNDS</b>					
5-Methyl-2-Methylphenol	100	EMDL			
4-Methylphenol	100	EMDL			
2,4,6-Trichlorophenol	100	EMDL			
<b>CHLORIDE RECOVERIES</b>				Revised by	
Pheno. dg	75		1 MDL Method Detection Limit		 Date: 11/22/96
2,4,6-Trichlorophenol	41		2 RVDI = Raw Method Detection Limit		
2,4,6-Trichlorophenol	35		3 ND = Not Determined		

Comments: \* Presence indicated, but less than method detection limit.  
 \*\* Quantitatively identified and quantitatively reported

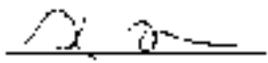


**Nitroaromatics and Nitramines by HPLC**  
USEPA Method 8330

Client Name: DuPont Research Corporation  
Client ID: 98111609M  
SEAS ID: 1428 3235 01

Date Analyzed: 11/23/95  
Data Received: 11/26/95  
Data Extracted: 11/29/95

Compound	MDL µg/L	Conc µg/L
HMX	0.053	BMDL
RDX	1.02	BMDL
1,3,5-TNB	1.05	BMDL
1,2-DNB	0.428	NR
NB	0.514	NR
Tetryl	1.05	NR
2,4,6-TNT	0.768	BMDL
2,4m-DNT	0.851	NR
4,6m-DNT	0.428	NR
2,4-DNT	3.75	BMDL
2,6-DNT	2.04	BMDL
2-NT	1.12	NR
4-NT	3.23	NR
6-NT	1.91	NR

Conc in µg: NR = Not Requested, BMDL = Below minimum detection limit  
Analyst: F. Jim Tallman  
Approved: 



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L.S. 495

LABORATORY RESULT

Client: Nichols Research Corporation  
 104E S. Memorial Parkway  
 Huntsville, AL 35815

Attn: Tom Hazzan

Sample ID: A001-001104012  
 Date Received: 11/15/1995  
 Purchase Order No.: Quote

Lab. No.: 1113-1203-01  
 Date Sampled: 1995 11 14  
 Time Sampled: 1012

Parameter	Result	Method	Analyst	Date	Time
Nitrate	0.00 mg/kg	4110B	ep	11-20-95	0800
Copper (T)	0.00 mg/kg	5010	ep	11-20-95	0800
Lead (T)	0.00 mg/kg	5010	ep	11-20-95	0800
Chromium (T)	0.00 mg/kg	5010	ep	11-20-95	0800
Manganese (T)	0.00 mg/kg	5010	ep	11-20-95	0800
Zinc (T)	0.00 mg/kg	5010	ep	11-20-95	0800
Mercury (T)	0.00 mg/kg	5010	ep	11-20-95	0800
Fluoride (T)	0.00 mg/kg	5010	ep	11-20-95	0800
Silver (T)	0.00 mg/kg	5010	ep	11-20-95	0800
Cadmium (T)	0.00 mg/kg	5010	ep	11-20-95	0800
Aluminum (T)	0.00 mg/kg	5010	ep	11-20-95	0800
Calcium (T)	0.00 mg/kg	5010	ep	11-20-95	0800
Vanadium (T)	0.00 mg/kg	5010	ep	11-20-95	0800

Method Source

EPA-1631 Method for Swallowing Solid Waste, SA-864-870-01  
 EPA-821/6-87-0101 Method for Metals in Water and Wastes (1982)  
 Standard Methods for the Examination of Water and Waste  
 Water, 18th Ed.,  
 40 CFR Part 136  
 ACRS Manual of Analytical Methods (1981)

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**BASE/NEUTRAL-ACID COMPOUNDS**

**GC/MS Report  
USEPA Method 8270/825**

Client : Nichols Research Corporation  
Sample Description: 9511741012  
Matrix : SOLID  
Analyst: E.F. Parks

Laboratory No. 1418-3205-02  
Date Received: 11/16/96  
Date Extracted: 11/20/96  
Date Analyzed: 11/20/96

Compounds	MDL1 ug/Kg	Conc2 ug/Kg	Compounds	MDL1 ug/Kg	Conc2 ng/Kg
Bis(2-chloroethyl)ether	330	BMDL	4-Chlorophenyl phenylether	330	BMDL
1,3-Dichlorobenzene	330	BMDL	Fluorene	330	BMDL
1,2-Dichlorobenzene	330	BMDL	Azobenzene	330	BMDL
1,4-Dichlorobenzene	330	BMDL	Hexachlorobenzene	330	BMDL
Bis(2-chloroisopropyl)ether	330	BMDL	Phenanthrene	330	BMDL
N-Nitrosodi-n-propylamine	330	BMDL	Acridene	330	BMDL
Hexachlorocyclopentadiene	330	BMDL	Dibutyl phthalate	330	BMDL
Nitrobenzene	330	BMDL	Fluoranthene	330	BMDL
Isopharmna	330	BMDL	Pyrene	330	BMDL
Bis(2-chloroethoxy)methane	330	BMDL	Bicyclobenzyl phthalate	330	BMDL
1,2,4-Trichlorobenzene	330	BMDL	3,3-Dichlorobenzidine	330	BMDL
Naphthalene	330	BMDL	Benzo(a)anthracene	330	BMDL
Hexachlorobutadiene	330	BMDL	Chrysene	330	BMDL
2-Chloronaphthalene	330	BMDL	Bis(2-ethylhexyl)phthalate	330	BMDL
Dimethyl phthalate	330	BMDL	Di-n-octyl phthalate	330	BMDL
2,6-Dinitrotoluene	330	BMDL	Benzo(b)fluoranthene	330	BMDL
Acenaphthylene	330	BMDL	Benzo(k)fluoranthene	330	BMDL
Acenaphthene	330	BMDL	Benzo(a)pyrene	330	BMDL
2,4-Dinitrotoluene	330	BMDL	Indeno(1,2,3-cd)pyrene	330	BMDL
Diethyl phthalate	330	BMDL	Dibenzo(a,h)anthracene	330	BMDL
Benzidine	660	BMDL	Benzo(g,h,i)perylene	330	BMDL
4-Bromophenyl phenyl ether	330	BMDL	N-Nitrosodiphenylamine	330	BMDL
N-nitrosodimethylamine	330	BMDL	OTHER COMPOUNDS:**		
Hexachlorocyclopentadiene	330	BMDL	2-Methylnaphthalene	330	BMDL
<b>SCROGATE RECOVERIES</b>		<b>% REC</b>	Reviewed by:		
Nitrobenzene-D5		116	 Date: 11-23-96		
2-Fluorobiphenyl		113			
Terphenyl-d14		171			
			1 MDL=Method Detection Limit 2 BMDL=Below Method Detection Limit 3 ND= Not Determined		

Comments: \* Presence indicated, but less than method detection limit.  
\*\* Tentatively identified and quantitatively estimated.



**BASE/NEUTRAL-ACID COMPOUNDS**

GC/MS Report

USEPA Method 8270/826

Client: Nichol Research Corporation  
 Sample Description: 9511141612  
 Matrix: SOLID  
 Analyst: M.K. Parks

Laboratory No: 1418-0205-02  
 Date Received: 7/2/95  
 Date Extracted: 11/30/95  
 Date Analyzed: 11/20/95

Compounds	MDL1 ug/kg	Comp2 ug/kg	Additional Compounds	MDL1 ug/kg	Comp ug/kg
Phenol	330	BMCL	2-Methylnaphthalene	330	BMCL
3-Chlorophenol	330	BMCL	Acetolactone	330	BMCL
2-Nitrophenol	330	BMCL	2-Juandehydroquinone	330	BMCL
2,4-Dimethylphenol	330	BMCL	Nitrophenol	330	BMCL
2,4-Dichlorophenol	330	BMCL	2-Methyl-1-naphthol	330	BMCL
2,4,6-Trichlorophenol	330	BMCL			
2,4-Dinitrophenol	1650	BYDT			
2-Methyl-4,6-Dinitrophenol	1650	BYDT			
2,4,6-Trinitrophenol	1650	BYDT			
<b>OTHER COMPOUNDS</b>					
2,4-Dimethylphenol	330	BMCL			
2-Methylphenol	330	BMCL			
2,4,6-Trichlorophenol	330	BYDT			
<b>SUBSTRATE RECOVERIES</b>				<b>Reviewed by:</b>	
Phenol-35	181	1 MDL=Method Detection Limit		 Date 11/20/95	
2-Fluorophenol	141	2 MDL=Reference Method Detection Limit			
2,4,6-Trichlorophenol	139	3 ND=Not Determined			

Comments: \* Presence indicated, but less than method detection limit.  
 \*\* Ten actively identified and quantitatively extracted.



**Nitroaromatics and Nitramines by HPLC**  
 USEPA Method 8330

Client Name: Nichols Research Corporation  
 Client ID: 9611241012  
 SEAS ID: 1-18-2206-02

Date Analyzed: 11/20/95  
 Data Received: 1/16/96  
 Date Submitted: 11/30/95

Compound	MLL ug/kg	Conc ug/kg
HMX	26.1	BMDL
RDX	40.6	BMDL
2,6-TNB	45.8	BMDL
3-DNB	17.1	NR
NT	26.6	NR
Tetryl	42.1	NR
2,4,6-LNT	36.1	BMDL
2-Am-DNT	34.1	NR
4-Am-DNT	17.6	NR
2,4-DNT	11.1	BMDL
2,6-LHT	44.1	BMDL
2-NT	44.7	NR
4-NT	46.3	NR
3-NT	46.3	NR

Comments: NR = Not Requested BMDL = Below minimum detection limit  
 Analyst: Elise Tallman  
 Approver: DL



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11/23/1995

Laboratory Report

Client: Nichols Research Corporation  
4040 S. Memorial Parkway  
Birmingham, AL 35217

Attn: Tim Sadler

Sample ID: Soil-95-11419-1  
Date Received: 11/15/1995  
Purchase Order No.: Q0000

Lab. No.: 1418-5205-03  
Date Sampled: 1995-11-13  
Time Sampled: 10:5

Parameter	Result	Method	Analyst	Limit	Unit
Nitrate	0.010 mg/kg	41105	dl	11-20-95	1540
Copper (C)	4.77 mg/kg	6010	Ep	11-20-95	0690
Lead (P)	4.312 mg/kg	6010	Ep	11-20-95	0030
Chromium (A)	1.35 mg/kg	6010	Ep	11-20-95	0690
Mercury (M)	< 0.05 mg/kg	6010	Ep	11-20-95	0000
Barium (B)	2.07 mg/kg	6010	Ep	11-20-95	000
Nickel (N)	0.202 mg/kg	6010	Ep	11-20-95	000
Cadmium (C)	0.00 mg/kg	6010	Ep	11-20-95	0000
Zinc (Z)	5.33 mg/kg	6010	Ep	11-20-95	0000
Selenium (S)	0.032 mg/kg	6010	Ep	11-20-95	0000
Manganese (M)	520 mg/kg	6010	Ep	11-20-95	0800
Cobalt (C)	0.092 mg/kg	6010	Ep	11-20-95	0800
Chloride (C)	24.3 mg/kg	6010	Ep	11-20-95	0800

Method Sources

- EPA Test Methods for Evaluating Solid Waste, SW-815 3rd Ed.
- EPA Methods for the Determination of Metals in Environmental Samples (1992)
- Standard Methods for the Examination of Water and Wastewater, 18th Ed.
- AOAC Official Methods
- NIEHS Manual of Analytical Methods (1994)

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**BASE/NEUTRAL-ACID COMPOUNDS**  
**GC/MS Report**  
**EPA Method 8270/8220**

Client: Michels Research Corporation  
 Sample Description: 9611141315  
 Matrix: SOLED  
 Analyst: R.F. Parks

Laboratory No: 1476-7607-07  
 Date Received: 11/19/96  
 Date Released: 11/17/96  
 Date Analyzed: 11/22/96

Compound	MW	Conc	Compound	MW	Conc
	g/g	ug/g		g/g	ug/g
Dib(2-chloroethyl)ether	330	RMID	4-(2-chloroethyl)phenyl ether	330	EMDL
1,2-Dichloroethane	330	EMDL	Fluorocob	330	EMDL
1,2-Dichlorobenzene	330	EMDL	Acetophenone	330	RMID
1,4-Dichlorobenzene	330	EMDL	Hexachlorobenzene	330	EMDL
Bis(2-chloroisopropyl) ether	300	EMDL	Chloroethane	440	EMDL
N-Methyl-2-pyrrolidone	100	EMDL	Anthracene	150	EMDL
Hexachlorocyclopentadiene	330	EMDL	Dibutyl phthalate	330	EMDL
Nitrobenzene	330	RMID	Phenanthrene	330	EMDL
Luophenone	330	EMDL	Tyrene	330	EMDL
Dib(2-chloroethyl) ether	330	RMID	Diethyl phthalate	330	EMDL
1,2,4-Trichlorobenzene	440	EMDL	3,3'-Dichlorobenzidine	330	EMDL
Naphthalene	330	RMID	Perfluoranthracene	330	EMDL
Hexachlorobenzene	330	EMDL	Lietyrene	330	EMDL
2,3-Dibromobenzaldehyde	330	EMDL	Di(2-ethylhexyl) phthalate	440	RMID
Dimethyl phthalate	330	EMDL	Di-n-octyl phthalate	440	EMDL
2,6-Dinitrotoluene	330	EMDL	Perchloroethane	330	RMID
Acenaphthylene	330	RMID	Perchloroethylene	330	EMDL
Acenaphthene	330	EMDL	Hexachlorocyclopentadiene	330	EMDL
2,4-Dinitrotoluene	330	EMDL	Diethyl 2,2'-biphenylene	330	RMID
Diethyl phthalate	330	EMDL	Dibenz(a,h)anthracene	330	EMDL
Benztidine	440	EMDL	Benzo(a)pyrene	330	EMDL
4-Bromophenyl phenyl ether	330	EMDL	N-N'-bis(2-phenylethyl)amine	330	EMDL
Nitrobenzodimethylamine	330	EMDL	OTHER COMPOUNDS**		
Hexachlorocyclopentadiene	330	EMDL	2-Methylanthracene	330	EMDL
<b>SUBSTRATE RECOVERY</b> 8.5%			* NDL=Not Detected Limit ** EMDL=below Method Detection Limit † NDL=Not Determined		
Naphthalene-D8	90		Performed by:  Date: 11-22-96		
2-Phenylphenyl	90				
Triphenyl-d10	126				

COMMENTS: \* Presently unlisted, but less than method detection limit  
 \*\* Tentatively identified and quantitation not attempted.



**BASE/NITRATED ACID COMPOUNDS**

GOMS Report  
 USEPA Method 8270/825

Client: Nichols Research Corporation  
 Sample Description: 0511141618  
 Matrix: SOLID  
 Analyst: B.K. Parks

Laboratory No.: 4-3305-03  
 Date Received: 11/26/95  
 Date Extracted: 12/1/95  
 Date Analyzed: 12/26/95

Compound	MDL µg/Kg	Conc µg/Kg	Additional Compounds	MDL µg/Kg	Conc µg/Kg
Phenol	330	HMUL	1-Methyl-2-naphthol	330	BMUL
2-Chlorophenol	330	BMUL	Acetophenone	330	HMUL
2-Nitrophenol	330	BMUL	2-Acetyl-1-naphthol	330	BMUL
2,4-Dimethylphenol	330	HMUL	1-Nitropyrene	330	BMUL
2,4-Dichlorophenol	330	BMUL	1,5-Diphenylhexazole	330	BMUL
4-Chloro-3-Methylphenol	330	BMUL			
2,4,6-Trichlorophenol	330	BMUL			
2,4-Dinitrophenol	1650	BMUL			
4-Nitrophenol	1650	BMUL			
2-Methyl-4,6-Dinitrophenol	1650	BMUL			
Penta-chlorophenol	1650	BMUL			
<b>OTHER COMPOUNDS</b>					
2-Nitro-3-Methylphenol	330	BMUL			
4-Methylphenol	330	BMUL			
2,4,5-Trichlorophenol	330	BMUL			
<b>SUBSTITUTE RECOVERIES</b>		7.16%	1 MDL=Method Detection Limit		Reviewed by  Date: 12/26/95
Phenol d6	101	3 BMUL=Below Method Detection Limit			
2-Fluorophenol	110	3 ND=Not Determined			
3,5-Dibromophenol	88				

Comments: \* Presence indicated, but less than method detection limit.  
 \*\* Tentatively identified or quantitatively determined

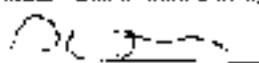


**Nitroaromatics and Nitramines by HPLC**  
 USEPA Method 8330

Client Name: Nichols Research Corporation  
 Client ID: 801-141010  
 GRAFID: 1418-3205-01

Date Analyzed: 11/28/96  
 Date Received: 11/16/96  
 Date Extracted: 12/26/94

Compound	MDL ug/Kg	Comp ug/Kg
HMX	22.7	UMDL
RDX	26.2	UMDL
1,3,5-TNB	29.6	UMDL
1,3-DNB	14.0	NR
HE	17.2	NR
Tetryl	20.8	NR
2,4,6-TNT	26.2	UMDL
2-Am-DNT	25.7	NR
4-Am-DNT	15.2	NR
2,4-DNT	96.5	UMDL
2,6-DNT	70.7	UMDL
2-NT	28.3	NR
4-NT	42.9	NR
6-NT	36.1	NR

Comments: NR = Not Requested, UMDL = Below minimum detection limit  
 Analyst: Brian Tallman  
 Approved: 



1304 CENTER DR., SUITE 1 - MONTICELLO, ALABAMA 35016 - 205/269-1110

11/27/1995

Laboratory Report

Client: Nichols Foodstuff Distributors  
4000 S. Memorial Parkway  
Monticello, AL 35016

Lab. No.: 1011F-0300-04  
Date Sampled: 1995-11-14  
Time Sampled: 10:17

PARAMETER	Results	Method	Analyst	Date	Time
Nitrate	1.00 mg/kg	4110D	SL	11-20-95	1400
Copper (C)	5.25 mg/kg	6010	SL	12-11-95	1400
Lead (L)	4.15 mg/kg	6010	SL	12-11-95	1400
Thionin (T)	3.77 mg/kg	6010	SL	12-11-95	1400
Vanadium (V)	1.44 mg/kg	6010	SL	12-11-95	1400
Selenium (S)	0.77 mg/kg	6010	SL	12-11-95	1400
Nickel (N)	1.55 mg/kg	6010	SL	12-11-95	1400
Potassium (P)	69 mg/kg	6010	SL	12-11-95	1400
Zinc (Z)	1.86 mg/kg	6010	SL	12-11-95	1400
Cadmium (C)	4.125 mg/kg	6010	SL	12-11-95	1400
Aluminum (A)	793 mg/kg	6010	SL	12-11-95	1400
Silver (S)	20096 mg/kg	6010	SL	12-11-95	1400
Chromium (C)	61 mg/kg	6010	SL	12-11-95	1400

Method Sources

EPA Test Methods for Evaluating Solid Waste, 816-010-01-01.  
EPA Method for Chemical Analysis of Water and Wastewater (1989)  
Standard Methods for the Examination of Water and Wastewater, 16th Ed.  
AOAC Official Methods of Analysis (1990)

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**BASE/NEUTRAL-ACID COMPOUNDS**

GC/MS Report

US EPA Method 8270/8255

Client: Nichols Research Corporation

Sample Description: 9511101017

Matrix: EOLID

Analyst: E.P. Horton

Laboratory No: 1416-2506-04

Date Received: 11/16/95

Data Entered: 11/16/95

Lab Analyst: 11/20/95

Compound	MDL ng/Kg	Conc μg/g	Compound	MDL ng/Kg	Conc μg/g
Bis(2-ethylhexyl)sebacate	110	EMDL	4-Chlorophenyl phenyl ether	320	EMDL
1,3-Dichlorobenzene	110	EMDL	Fluorene	330	EMDL
1,5-Dichlorobenzene	110	EMDL	Acetophenone	330	EMDL
2,4-Dichlorobenzene	110	EMDL	Hexachlorobenzene	330	EMDL
2,6-Dichlorobenzene	110	EMDL	Phenanthrene	330	EMDL
N,N-Dimethyl-p-terphenylamine	330	EMDL	Acetaminophen	330	EMDL
Hexachlorocyclopentadiene	330	EMDL	Diethyl phthalate	330	EMDL
Nitrobenzene	330	EMDL	Fluoranthene	330	EMDL
Isoprene	330	EMDL	Pyrene	330	EMDL
Bis(2-ethylhexyl)sebacate	330	EMDL	Butylphenyl methyl ether	330	EMDL
1,3,4-Trichlorobenzene	330	EMDL	2,2'-Dichlorobenzidine	330	EMDL
Naphthalene	330	EMDL	Hexachlorobenzene	330	EMDL
Hexachlorocyclopentadiene	330	EMDL	Chrysene	330	EMDL
2-Chloro-5-naphthol	330	EMDL	Bis(2-ethylhexyl)phthalate	330	EMDL
Dimethyl phthalate	330	EMDL	Di-n-octyl phthalate	330	EMDL
2,6-Dinitrobenzene	330	EMDL	Benzyl Dimethylamine	330	EMDL
Acenaphthylene	330	EMDL	Hexachlorobenzene	330	EMDL
Acenaphthene	330	EMDL	Benzo[a]pyrene	330	EMDL
2,9-Dinitrofluorene	330	EMDL	Tricarbonyl, 2,2-dipyrone	330	EMDL
Dibenzyl phthalate	330	EMDL	Dibenzofluoranthene	330	EMDL
Benzidine	330	EMDL	Fluoranthene	330	EMDL
4-(4-ethoxyphenyl) phenyl ether	330	EMDL	N-Nitrosodiphenylamine	330	EMDL
N-nitrosodimethylamine	330	EMDL	OTHER COMPOUNDS:*		
Hexachlorocyclopentadiene	330	EMDL	2-Methylphthalate	330	EMDL
<b>SUBROGATE RECOVERIES</b>		<b>9-95C</b>	<b>Reviewed by</b>		
Nitrobenzene-D <sub>5</sub>	95		1 MDL - Method Detector Limit		
2-Chlorobiphenyl	11		2 EMDL - Below Method Detection Limit		
Triphenyl-ethane	161		3 ND - Not Determined		

\* Compounds: \* Presence indicated, but less than method detection limit.

\*\* Quantitatively identified and quantitatively estimated.



**BASE/NEUTRAL-ACID COMPOUNDS**

GC/MS Report

USEPA Method 8270B

Client: Nichols Boronid Corporation

Sample Description: 9511141317

Matrix: SOLID

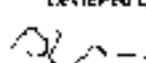
Analyst: Z.P. Parks

Laboratory No: 1429 9306 04

Date Received: 11/06/98

Date Extracted: 11/07/98

Date Analyzed: 11/20/98

Compound	MFL µg/g	Conc µg/g	Additional Compounds	MFL µg/g	Conc µg/g
Phenol	330	EMDL	1 Nonylphthalene	330	EMDL
2-Chlorophenol	330	EMDL	2 Octylphthalene	330	EMDL
3-Nitrophenol	330	EMDL	3 Ammonophthalene	330	EMDL
2,4-Dinitrophenol	330	EMDL	1-Nitrobenzene	330	EMDL
2,4,6-Trinitrophenol	330	EMDL	2,4-Dinitrophenol	330	EMDL
4-Chloro-2-Methylphenol	330	EMDL			
2,4,6-Trinitrophenol	330	EMDL			
2,4-Dinitrophenol	330	EMDL			
4-Nitrophenol	330	EMDL			
2-Methyl-4,6-Dinitrophenol	330	EMDL			
Benzenethiol	330	EMDL			
<b>OTHER COMPOUNDS:</b>					
2-Acetylphenol	330	EMDL			
4-Methylphenol	330	EMDL			
2,4,6-Trichlorophenol	330	EMDL			
<b>NOT DETECTED COMPOUNDS</b>			<b>Method Detection Limit</b>		
Phenol	55		2-FMFL Method		
2,4-Dinitrophenol	105		Selection Limit		
2,4,6-Trinitrophenol	12		3-NTD Not Determined		
			Detected by  Date 12-3-98		

Comments: \* Presence indicated, but less than method detection limit.  
 \*\* Tentatively identified and quantitatively estimated.



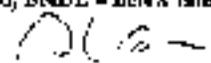
### Nitroaromatics and Nitramines by HPLC

USEPA Method 8313

Client Name: Nichols Research Corporation  
 Client ID: 951141017  
 SEAS ID: 1418-32DF-04

Date Analyzed: 11/23/95  
 Data Receiver: 11/16/96  
 Data Extracted: 11/23/95

Compound	MUL ug/Kg	Conv ug/Kg
DMX	28.1	NR
RDX	50.0	BMUL
1,3,5-TNR	46.8	BMUL
1,3-DNB	17.1	NR
NB	20.6	NR
Tetryl	42.1	NR
2,4,6-TNT	30.1	BMUL
2-Arn-DNT	34.1	NR
4-Arn-DNT	15.5	NR
2,4-Dnt	111	BMUL
2,6-DNT	81.3	BMUL
2-NIT	44.7	NR
4-NIT	36.3	NR
3-NIT	16.3	NR

Comments: NR - Not Reported, BMUL - Below minimum detection limit  
 Analyst: E. Joe Tollman  
 Approved: 



1206 OSTER DR. SUITE 100 FLORENCE, AL 36833 TEL: 334/666-7800 FAX: 334/666-7801

11/28/1995

ANALYTICAL REPORT

Client: Monda Research Corporation  
 2010 G. Memorial Parkway  
 Tusculville, AL 35810

Attn: Tom Martin

Sample No.: 887-931114111  
 Date Received: 11/28/1995  
 Purchase Order No.: Quest

Lab. No.: 1418 8205 04  
 Date Sampled: 1995-11-14  
 Time Sampled: 1077

Parameter	Result	Method	Conc./Vol.	Date	Time
Nitrate	1.02 mg/kg	4110E	6:	11-28-95	1615

Method Sources

EPA-Test Methods for Monitoring Solid Waste, 34-646 3rd Ed.  
 EPA-Method for Chemical Analysis of Water and Wastes (1985)  
 Standard Methods for the Examination of Water and Wastes-  
 18th Ed.  
 40 CFR Part 136  
 NIOSH Manual of Analytical Methods (1983)

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101 Deer Run, Suite 4  
 Rock Hill, Alabama 38066  
 (913) 384-7171

# CHAIN OF CUSTODY/FIELD DATA SHEET

1418-3105

CLIENT: NITEL RESEARCH CORP.

CLIENT ADDRESS: 4700 S GRANT

SUITE 200, RAILROAD BLVD, ROCK HILL, SC 29168

PROJECT NAME: FINGERPRINTS (FOR ID BECHLY)

SAMPLE DESCRIPTION	TYPE	DATE SAMPLED	TIME	MATERIALS	INSTRUMENT	COLLECTED BY	ANALYZED BY	REMARKS	ACCEPTED TO/LABORATORY	DATE	TIME
WATER	GC	05/14/08	10:30	1000	GC	1000	1000				
SEWAGE	GC	05/14/08	10:30	1000	GC	1000	1000				
1001											
1002											
1003											
1004											
1005											
1006											
1007											
1008											
1009											
1010											
1011											
1012											
1013											
1014											
1015											
1016											
1017											

REMARKS: Total of 17 samples held at home for analysis. 1001-1017 are results.

PREPARED BY: Mike Sabin  
 DATE: 05/14/08  
 TIME: 10:30

ACCEPTED TO/LABORATORY: NITEL  
 DATE: 05/14/08  
 TIME: 10:30

LABORATORY: NITEL

# **APPENDIX G**

## **UNCITED REFERENCES**

1. “Draft Engineering Evaluation and Cost Analysis Investigation Work Plan, Former Camp Grant Rifle Range, New Milford, Illinois”, August 1994, Engineering Science, Inc., and UXB International Inc. for USA CEHND.
  
2. Defense Environment Restoration Program (DERP) for Formerly Used Defense Sites (FUDS) — Ordnance and Explosive Waste Archives Search Report for Former Camp Grant Rifle Range, New Milford, Illinois”, Findings, August 1992, prepared by USA E Rock Island District and USA Defense Ammunition Center and School, USA CEHND.
  
3. “DERP for FUDS, Ordnance and Explosive Waste Archives Search Report for Former Camp Grant Rifle Range, New Milford, Illinois — Conclusions and Recommendations”, August 1992, prepared by USAE Rock Island District and USA Defense Ammunition Center and School for USA CEHND.
  
4. “Ordnance and Explosive Waste (OEW) Interim removal Action for Former Camp Grant Rifle Range, New Milford, Illinois”, December 1995, UXB International, Inc. for USA CEHND.
  
5. Telecons with Parson Engineering Science Inc. (various dates, December 1995 through January 1996) and draft tables of laboratory analyses of soil samples collected at sites of UXOs blown-in-place at Former Camp Grant Rifle Range.