FINAL SAMPLING REPORT
Drinking Well Sampling Event
Former Camp Butner, NC

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EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers (USACE), Wilmington District conducted a drinking well sampling event in the former Camp Butner, North Carolina (NC) in August 2004. This report summarizes the results of the sampling event. The objective of the sampling event was to determine if there are any impacts on groundwater quality associated with Department of Defense (DOD) activities at the former Camp Butner. The sampling event consisted of the collection and analysis of groundwater samples collected from residential wells. The former Camp Butner area is shown in Figure 1.

Twenty-three drinking wells were sampled during this event. The rationale for the sample location was to bias the wells within areas used as ranges at the former Camp Butner or near areas with historical ordnance and explosive waste (OEW) discoveries. The rationale for each sample location is shown in Table 1. An off-site location was selected for comparison purposes because of its position outside of the boundaries of the former Camp Butner and absence of OEW in the vicinity.

Groundwater samples were collected from each location identified in Table 2 and Figure 2. The procedure used for the sampling event was consistent with the Environmental Protection Agency (EPA) Region 4 standard operating procedure (SOP) for residential well sampling and in accordance with the USACE Wilmington District Sampling and Analysis Plan (USACE 2004). The sampling procedure included determination of the well location (global positioning satellite coordinates), selection of the sample location (spigot at the well or before treatment system), purging of the well, sample collection, laboratory analysis, and data review using the USACE Automated Data Review software.

Samples from each location were analyzed for a comprehensive list of substances including those typically analyzed for under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The analytical list is identified in Table 3. Screening levels are tools used to evaluate the analytical results. The screening levels serve as an initial comparison to help determine what subsequent action (if any) is necessary. The project screening levels used for this sampling event are included in Table 4.

The complete analytical results are included in Table 5 and only the detected results are shown in Table 6. A total of 188 substances were analyzed at each location not including metals twice (total and dissolved). The results indicate a large number of substances were not detected. The results indicate only 9 substances were detected above the project screening levels. Substances detected above the project screening levels are shown in Figures 3 through 6. The 9 substances detected above the project screening levels include: chloroform; bis(2-ethylhexyl)phthalate; alpha-chlordane; gamma-chlordane; heptachlor epoxide; perchlorate; iron; lead; and manganese. Evaluation of these substances indicates only perchlorate and lead may be present due to DOD activities at Camp Butner.

Perchlorate was detected at 12 of the 23 locations including the off-site location. Perchlorate was detected above the project screening level at two locations, which were relatively shallow wells. All of the perchlorate detections are below or within the current EPA drinking water guidance range for human health protection. Perchlorate is both a naturally occurring and man-made substance. Potential sources at the Camp Butner area may include munitions, flares, fertilizer application, and defoliant application. One homeowner participating in the investigation has confirmed the use of Bulldog Soda fertilizer at his residence. Bulldog Soda has been determined to contain naturally occurring perchlorate.

Lead was detected at 9 locations and detected above the project screening level at one location in the unfiltered sample and at one location in the filtered sample. Lead typically adsorbs to sediment and these detections may be due to sediment in the sample. Lead is naturally occurring, but rare. Other potential sources of lead at Camp Butner may include munitions, water supply piping, gasoline, vehicle exhaust, and paint containing lead.

The results do not identify any clear pattern or trend and the data is inconclusive whether DOD activities at Camp Butner have impacted the groundwater quality. However, the perchlorate and lead detections warrant further investigation.

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LIST OF ACRONYMS, ABBREVIATIONS AND SYMBOLS

µg/L	micrograms per Liter
ADR	Automated Data Review
bgs	Below Ground Surface
BVWST	B&V Waste Science and Technology Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
Co	Company
DOD	Department of Defense
EDMS	Environmental Data Management System
EE/CA	Engineering Evaluation/Cost Analysis
EM	Engineer Manual
EPA	Environmental Protection Agency
ft	Foot/Feet
gpm	Gallon(s) Per Minute
GPS	Global Positioning Satellite
Inc	Incorporated
L	Liter
MCL	Maximum Contaminant Level
mL	milliliter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MTBE	Methyl Tert Butyl Ether
NAD	North American Datum
NAS	National Academy of Sciences
NC	North Carolina
NCAC	North Carolina Administrative Code
NCDENR	North Carolina Department of the Environment and Natural Resources
OEW	Ordnance and Explosive Waste
PCB	Polychlorinated Biphenyl
PRG	Preliminary Remediation Goal
QA	Quality Assurance
QC	Quality Control
SI	Site Investigation
SOP	Standard Operating Procedure
SVOC	Semi-volatile Organic Compound
USACE	United States Army Corps of Engineers

LIST OF ACRONYMS, ABBREVIATIONS AND SYMBOLS (continued)

USGS	United States Geology Service
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound

1. 0 INTRODUCTION

1.1 Purpose and Objective

This report has been prepared by the United States Army Corps of Engineers, Wilmington District (USACE) to summarize the fieldwork conducted from August 9 through August 12, 2004 in the area of the former Camp Butner, North Carolina (NC). The fieldwork was conducted by USACE, Wilmington District personnel. The objective of the sampling effort consisted of the collection and analysis of groundwater samples collected from drinking wells to determine if there are any impacts on groundwater quality from use of Camp Butner.

1.2 Site History

Camp Butner, a former U.S. Army installation, was located in the north central part of North Carolina in the counties of Granville, Durham, and Person (see Figure 1). Camp Butner was officially activated in August 1942 and occupied approximately 40,400 acres. The camp was established as a training and maneuvering area for World War II combat troops. In addition to the troop cantonment area, the reservation included at least 15 ammunition training ranges, hand grenade ranges, a gas chamber, flame-thrower training range, a small arms training range, and ammunition shipping, receiving, and storage areas. The camp remained active until 1946 when it was declared excess (USACE 1993). Existing land use of the former Camp Butner includes approximately 16,550 acres owned by the State of North Carolina and approximately 4,750 acres occupied by the Camp Butner National Guard Training Center. The remaining land consists of the Town of Butner, residential use, agricultural use, and the Federal Correctional Complex.

1.3 Summary of Existing Site Data

USACE, Savannah District conducted a Site Investigation (SI) of a landfill located under Lightning Lake in November 1991. Soil and groundwater samples were collected from four borings completed as groundwater monitoring wells around the perimeter of Lightning Lake. Surface water and sediment samples were collected from Lightning Lake, Lake Butner, and an unnamed creek upstream of Lightning Lake. The samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), explosives, metals, total organic halogens, and total recoverable petroleum hydrocarbons. An SI report was prepared in May 1992 and concluded based on the lab data and current land use, human health or the environment were not imminently threatened and recommended no further action (BVWST/USACE 1992) which the North Carolina Department of Environment and Natural Resources (NCDENR) concurred.

2.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

This section discusses the physical characteristics of the Camp Butner area including geologic and hydrogeologic conditions.

2.1 Physiography

The former Camp Butner area is located in the Piedmont province, which includes rolling topography with rounded hills and long low ridges. The terrain is hilly with elevation in the area ranging from 280 to 500 feet above mean sea level (USACE 1993).

2.2 Surface Water

The study area contains a number of perennial streams with numerous intermittent tributaries. These streams generally drain from the hills to the southwest. The majority of this area drains into the Knap of Reeds Creek, which is part of the Neuse River watershed. A small portion of the western section of this facility drains to the west into the Flat River. The Flat River also drains into Neuse River.

2.3 Geology and Soils

The Camp Butner area is located within Durham sub-basin of the Triassic basin. The basin is characterized by east dipping Triassic sedimentary rocks of the Newark Group. The eastern edge of the basin is defined by the Jonesboro fault. The Triassic rocks are comprised of arokosic sandstones, shales, and conglomerates that are intruded by younger diabase dikes and sills. The soils in the former Camp Butner area are in the White-Store Creedmoor soil association, which consists of gently sloping to moderately steep well-drained soils (sandy loam) with a subsoil of firm clay (USACE 1992).

The United States Geology Service (USGS) indicates the geology of the area consists mainly of Cambrian metavolcanic rocks and Paleozoic sedimentary and metasedimentary rocks with some Lower Paleozoic and Precambrian granite gneiss and granite and Lower Mesozoic sedimentary and igneous rocks. According to the USGS, the primary aquifer in the Camp Butner area is a crystalline rock and undiffernentiated sedimentary rock aquifer, which includes granite, mafic and felsic volcanic rocks, gneiss, schist, slate, phyllite, quartzite, minor conglomerate, sandstone, and shale (USGS 1997).

2.4 Hydrogeology

Information provided by residents in the former Camp Butner area participating in this sampling event is provided in Appendix A. Two well drilling companies that have installed wells in the former Camp Butner area were contacted to gather additional information regarding typical well and groundwater characteristics. These well drilling companies are Acme Well Company (Co), Incorporated (Inc) in Durham, North Carolina and Craig Husketh Water Well Drilling in Creedmoor, North Carolina. Both of these sources indicate groundwater used for drinking water at the site is typically a bedrock aquifer. Wells are typically completed as open holes in the bedrock below the surface casing. These sources also indicate there is a surficial aquifer.

Mr. David Hutson of Acme Well Co, Inc indicated the geology was complex in the former Camp Butner area and wells could range from 100 to 600 feet (ft) in depth with an average depth of approximately 250 ft. Mr. Hutson stated the casing depth is typically 50 ft deep. The flow rate could range from 4 to 15 gallons per minute (gpm), however, the flow was typically toward the lower end around 4 gpm. Mr. Hutson also indicated the depth to groundwater could range from a shallow depth to a couple of hundred ft.

Mr. Craig Husketh of Craig Husketh Water Well Drilling indicated wells in the former Camp Butner are typically 200 to 300 ft deep. Mr. Husketh stated the casing depth ranges from 20 to 80 ft deep and the flow rate ranges from 2 to 10 gpm. Mr. Husketh indicated the average depth to groundwater could range from 10 to 400 ft.

Specific information regarding the monitoring wells installed in 1991 for the SI indicate groundwater was encountered in one well in the unconsolidated aquifer above bedrock at 24 ft bgs. Groundwater was encountered in the other three wells from 7.5 feet to 13 feet in the bedrock at a depth of 21 to 45 feet bgs. After well installation, static water was measured from 15 to 45 ft bgs (BVWST/USACE 1992).

2.5 Drinking Water Supply

The potable water supply for the city of Butner was constructed in 1942 to support soldiers at Camp Butner. The city of Butner assumed control of the potable water supply system after Camp Butner was closed. The source of potable water is the Holt Reservoir (also known as Lake Butner), with a storage capacity of approximately 10 billion gallons (USACE 1993). The Holt Reservoir is fed by Lightning Lake. Potable water outside of the city of Butner is typically provided by individually owned wells.

3.0 METHODOLOGY

3.1 Determination of Sample Locations

Table 1 identifies the addresses and rationale for the selection of wells for this sampling event. Twenty-five (25) primary locations and 13 alternate locations were originally selected for sampling during the investigation. These locations were selected from information obtained (i.e. rights of entry) during the Unexploded Ordnance (UXO) Engineering Evaluation/Cost Analysis (EE/CA) site characterization. A site visit was conducted on April 28, 2004 to verify residences at the selected locations. Several locations were removed from further consideration because a residence was not present or due to well closure at that location. Additional locations were included based on visual confirmation of a residence and well during this site visit.

A well sample request and well information sheet was mailed to the 38 locations identified on July 8, 2004. The objective was to sample 25 wells, which is approximately 10% of the existing drinking wells in the Camp Butner area. This is an adequate sample size for an initial screening investigation. Several of the well sample requests were not returned or returned with a response indicating no desire to participate in the sampling event. Twenty-one well sample requests were returned with positive responses to participate in the sampling event. Phone communication with some residents that did not return the well sample requests obtained additional locations resulting in 23 final locations selected for the sampling event. Information regarding the wells provided by the residents has been summarized in Appendix A.

3.2 Field Investigation

Groundwater samples were collected from each location identified in Table 2 and Figure 2. The sampling event was conducted from August 9 to August 12, 2004. Information in this table includes sampling location, date collected, and well global positioning satellite (GPS) coordinates. The procedure used for the sampling activity is consistent with the Environmental Protection Agency (EPA) Region 4 standard operating procedure (SOP) for residential sampling (USEPA 2001) and USACE Engineer Manual (EM) 200-1-3 Requirements for Sampling and Analysis Plans (USACE 2001).

3.2.1 Determination of Well Location

At each location USACE personnel located the well visually. The coordinates of the well were determined using a Trimble GeoExplore XT GPS unit. For well locations where the coordinates could not be determined at the well due to limited opening above the GPS unit (i.e. tree canopy), the coordinates were collected from the nearest point were a reading was possible. The Trimble

GeoExplore XT GPS unit has an accuracy of approximately 10 feet. Well location data for each residence is included in Table 2 and is expressed as North American Datum of 1983 (NAD 83) NC State Plane Grid in feet.

3.2.2 Sampling Point Selection

Whenever possible, a sample point was selected which was as close as possible to the well itself. If possible, the sample point was located prior to (upstream of) a treatment system or storage tank. At a couple of the residences, the sample point was located after a storage tank. In these instances, the system was purged additional time to allow for a complete exchange of water into the tank and at the sample location. An outdoor spigot was used as the sample point for all residences.

One location was selected as an offsite location for comparison purposes because of its location outside of the boundaries of the former Camp Butner and absence of OEW in the vicinity. To date, the direction of groundwater flow in the vicinity of Camp Butner has not been confirmed and thus the chosen offsite location may not be a true background location.

3.2.3 Purging

All locations were purged for a minimum of 15 minutes unless otherwise noted in the well purge and sampling record forms included in Appendix B. The wells were purged at a high flow rate, approximately 3-5 gallons per minute (gpm). Purge water was allowed to discharge, approximately 20 to 30 feet away from the sampling point, to the ground surface. Water quality data was collected after purging a minimum of 15 minutes using a YSI 9620 water quality meter to ensure a consistent water stream and groundwater representative of the aquifer.

The YSI 9620 water quality meter was calibrated daily following the manufacturer’s instructions. Calibration was successful for pH, conductivity, dissolved oxygen, and oxidation-reduction potential. However, calibration for turbidity was difficult and did not appear to be successful. This problem was noted on the well purge and sampling record forms for the first location of each day: North Carolina National Guard (August 9th); Camp Barham (August 10th); 4835 Uzzle Road (August 11th); and 4710 Moriah Road (August 12th). Visual inspection of these locations indicated the water was clear indicating an incorrect turbidity reading from the meter.

At most locations, the well was allowed to continue purging at a high flow rate, approximately 3-5 gpm while water quality data was recorded to address the turbidity calibration problem. Therefore, the purge period for most locations was approximately 30 minutes. A minimum of three readings were recorded for the water quality data on the well purge and sampling record forms included in Appendix A. These forms also contain a description of the sampling location, and information regarding any residential treatment/storage.

At 564 Bethany Church Road, flow from the spigot slowed and stopped periodically after the reading for the water quality data was recorded. In order to avoid running the well completely dry, recording of the water quality data was stopped after one reading. The total purge time for this location was approximately 23 minutes.

3.2.4 Sample Collection

After purging was completed and stabilization parameters were documented, the required samples were collected. Samples were collected from each location for laboratory analysis in the following order:

1. Three 40-milliliter (mL) glass vials preserved with hydrochloric acid for VOCs
2. Two 1 liter (L) amber glass nonpreserved containers for SVOCs
3. Two 1 L amber glass nonpreserved containers for pesticides/PCBs
4. Two 1 L amber glass nonpreserved containers for herbicides
5. Three 1 L amber glass nonpreserved containers for explosive compounds and nitroglycerin
6. One 250 mL plastic nonpreserved container for perchlorate
7. One 250 mL plastic container preserved with sodium hydroxide and asorbic acid for cyanide
8. One 250 mL plastic container preserved with nitric acid for total metals
9. One 250 mL plastic container preserved with nitric acid for dissolved metals

With the exception of the samples for dissolved metals at all locations, all of the samples were collected directly into the sample container. The water samples for dissolved metals were first collected into a clean unpreserved 250 mL or larger plastic container first. A peristaltic pump equipped with an inline 45-micrometer filter and tubing dedicated to that location was used to pump the sample out of the non-preserved pre-cleaned bottle and into the appropriate pre-preserved sample bottle.

At 4878 Uzzle Road, the spigot used for collecting the samples was too low to allow for collection of water directly into the amber glass containers. A clean unpreserved polyethylene container was used to collect the water sample and subsequently fill the amber glass containers. No organic compounds were detected in the primary or duplicate samples above the laboratory detection limit, despite the use of polyethylene bottle coming into contact with samples being analyzed for SVOCs, pesticides, PCBs, explosives and nitroglycerine. Sample collection at this location for VOCs, perchlorate, cyanide, total metals, and dissolved metals was collected directly into the sample container.

Primary samples were collected from each of the 23 locations for laboratory analysis during the sampling event. In addition, Quality Assurance/Quality Control (QA/QC) samples, consisting of field duplicate and matrix spike/matrix spike duplicate (MS/MSD) were collected. Temperature blanks were included in each sample container and trip blanks were included in each sample container with VOCs for laboratory analysis. A short description of these QA/QC samples is provided below:

- A field duplicate is an environmental sample used to assess field precision. The collection of duplicate groundwater samples is obtained by alternately filling sample containers with the primary sample from the sampling device for each parameter.
- A matrix spike (MS) is an environmental sample to which known concentrations of analytes have been added. A matrix spike duplicate (MSD) is an environmental sample, which is spiked with known concentrations of substances. The primary purpose of the MS and MSD samples is to assess the effect of the matrix on the analytical process. A secondary purpose is to assess the precision of the analytical process.
- Trip blanks are samples of organic-free (deionized) water that are prepared in the laboratory and shipped onsite with the other sample containers. They are then returned to the laboratory unopened in each shipping container that contains aqueous VOC samples and analyzed. Trip blanks are used to assess if any volatile contamination has been introduced in the sampling or sample handling or sample storage process.
- Temperature blanks are containers (e.g., 40 mL) of water packaged along with field samples in the shipping cooler that represent the temperature of the incoming cooler upon receipt at the laboratory. Use of these samples within a shipping container enables the receiving laboratory to assess the temperature of the shipment without disturbing any project field samples.

Field duplicate samples were collected at a rate of 10% or three samples. The locations of the duplicate samples were 653 Lakeview Drive, 4835 Uzzle Road, and 2202 Tilley Farm Road. MS/MSD samples were collected at a rate of 5% or one sample equal to two sample volumes). Trip blanks were shipped to the laboratory every day in the shipping container with the VOC samples. A trip blank was inadvertently not included in the shipping container with VOC samples on August 10th. The only VOC detected in samples collected on August 10th was Chloroform at an estimated concentration of 0.23 ug/L at Camp Eason. Rinsate blanks were not collected since dedicated sampling equipment was used for each location.

3.3 Laboratory Analysis

All groundwater samples were placed in a cooler with ice immediately following collection. At the end of each sampling day the ice was repackaged in order to maintain the temperature during shipping. The samples collected during that day were shipped via FedEx to Accutest Laboratories in Dayton, New Jersey 08810. Samples for perchlorate analysis were sent from the Accutest Laboratory to General Engineering Laboratories at 2040 Savage Road, Charleston, South Carolina 29417. Chain of Custody forms can be found in Appendix B. The samples were analyzed for the groups of parameters and analytical methods shown in Table 3.

For the VOC analysis a purge volume of 25 mL was specified in order to obtain the lowest possible detection levels. The specified data reporting package was a fully data validatable USEPA level 4-type, suitable for third party data validation, which includes all raw data. All analytical results will be reviewed using the USACE Automated Data Review and Environmental Data Management System (ADR/EDMS) Software, which complies with the USEPA National Functional Guidelines for organics and inorganic analysis. The data review was conducted by the USACE contractor ENSR. A summary of the data review is included in section 5.

3.4 Project Screening Levels

The project screening levels are tools used to evaluate the analytical results and serve as an initial comparison to help determine what subsequent actions are necessary. The project screening levels were identified by the USACE, Wilmington District in the Sampling and Analysis Plan (USACE 2004) and concurred by NCDENR.

Identification of the screening levels was identical for each substance to be analyzed. The most stringent of the North Carolina groundwater quality standards in 15A North Carolina Administrative Code (NCAC) 02L.0202 or the Federal Maximum Contaminant Levels (MCLs) in 40 Code of Federal Regulations (CFR) 141.61 and 141.62 were identified as the project screening level. If there was not a NC groundwater quality standard or Federal MCL for a substance, the USEPA Region IX tap water Preliminary Remediation Goal was identified as the project screening level. The project screening levels are included as Table 4.

4.0 RESULTS

This section discusses the analytical results by groups of analytical substances. Table 5 contains all of the laboratory analytical results for each location. Table 6 is provided to clarify the results and identifies only the detected substances for each location. Figures 3 through 6 illustrate the substances that were detected above project screening levels for each location. Appendix C contains an electronic version of the laboratories full data package.

4.1 Volatile Organic Compounds

Two VOCs were detected above the laboratory detection limit. Methyl tert butyl ether (MTBE) was detected at 71.1 micrograms per Liter (µg/L) (4710 Moriah Road), which is below the project screening level of 200 µg/L. MTBE is almost exclusively used as a fuel additive in motor gasoline. MTBE came into use in 1979 (http://www.epa.gov/safewater/mtbe.html), which is after the close of Camp Butner in January 1947. This detection of MTBE may be related to an underground storage tank in the area or spillage of gasoline associated with filling vehicles.

Chloroform was detected at an estimated concentration of 0.23 µg/L (Camp Eason), which is above the project screening level of 0.19 µg/L. Small amounts of chloroform may be formed as an unwanted product during the process of adding chlorine to water for disinfection purposes.

4.2 Semi-Volatile Organic Compounds

One SVOC was detected above the laboratory detection limit at two locations. Bis(2-ethylhexyl)phthalate was detected at 9.3 µg/L (Camp Eason) and 7.9 µg/L (5057 Clayton Road), which are above the project screening level of 3 µg/L. Bis(2-ethylhexyl)phthalate is a common lab contaminant introduced during the analytical process and may be the source of its presence.

4.3 Pesticides and PCBs

Three pesticides were detected above the laboratory detection limit at one location (2022 Tilley Farm Road). Alpha-Chlordane was detected at 0.088 µg/L and gamma-Chlordane was detected at 0.13 µg/L, which are above the project screening level of 0.027 µg/L for the total of all chlordane compounds. Heptachlor epoxide was detected at 0.48, which is above the project screening level of 0.004 µg/L.

Chlordane and heptachlor epoxide were first introduced in the United States in 1947 and 1950 respectively. This time frame is after the close of Camp Butner in January 1947. These

detections may be associated with agricultural used in the area.
(http://envirocancer.cornell.edu/FactSheet/Pesticide/fs11.chlordane.pdf)
(http://envirocancer.cornell.edu/FactSheet/Pesticide/fs12.heptachlor.pdf)

PCBs were not detected above the laboratory detection limit at any location.

4.4 Herbicides

Herbicides were not detected above the laboratory detection limit at any location.

4.5 Explosive Compounds and Nitroglycerin

Explosive compounds and nitroglycerin were not detected above the laboratory detection limit at any location.

4.6 Perchlorate

Perchlorate was detected at 12 of 23 locations ranging from 0.079 to 10.3 µg/L. Perchlorate was detected above the project screening level of 3.6 µg/L at two locations. The detections above the project screening level were 3.94 µg/L (652 Lakeview Drive) and 10.3 µg/L (564 Bethany Church Road). These two detections above the project screening level were both detected in relatively shallow wells according to information provided by residents (Appendix A). The depth of these wells is 120 ft (564 Bethany Church Road) and 145 ft (652 Lakeview Drive).

Currently there is not a Federal or NC standard for perchlorate. The project screening level is the EPA Region IX tap water preliminary remediation goal (PRG), which is intended as an initial screening-level evaluation of environmental measurements. The PRGs are not legally enforceable standards and are used for screening purposes only. In January 2003, the EPA reaffirmed its 1999 interim guidance, which identified a range of 4-18 µg/L as the drinking water range for perchlorate for protection of human health. The guidance is considered interim pending the outcome of the National Academy of Sciences (NAS) review of EPA's risk assessment. The perchlorate detections of 3.94 and 10.3 µg/L are below or within this interim guidance range.

Perchlorate is both a naturally occurring and man-made substance. Perchlorate is found naturally occurring in some fertilizers made from Chilean nitrates. These fertilizers are primarily used for certain crops including fruits, vegetables, tobacco, and cotton. A particular fertilizer that is imported from Chile in the United States is Bulldog Soda. Bulldog Soda has been confirmed to contain naturally occurring perchlorate (Urbansky 2000). One homeowner who had a perchlorate detection has confirmed the use of Bulldog Soda fertilizer at their residence.

Perchorate is also used as a manmade substance in numerous applications throughout the world. Some of these applications include:

- Oxidizing agent in munitions, fireworks, and flares
- Impurity in sodium chlorate used as a defoliant the agricultural and railroad industry for weed control
- Used to fix dyes in the textile industry
- Bleaching agent in the paper and pulp industry
- Used as a component of air bag inflators
- Manufacture of matches

A number of potential sources exist in the Camp Butner area and include munitions and the agricultural, railroad, and textile industries.

4.7 Cyanide

Cyanide was not detected above the laboratory detection limit at any location.

4.8 Metals

As stated earlier, samples for metals analysis were collected twice. Many metals are likely to adsorb to sediment in groundwater samples and potentially influence the analytical results. The first sample is collected directly from the sample point and is referred to as the total metals sample. The second sample for metals was collected in a clean unpreserved container and transferred through a filter to a clean preserved container, producing a dissolved metals sample. This discussion refers to the total metals results unless specifically mentioned otherwise.

Twenty metals were detected above the laboratory detection limits at various locations including aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, sodium, thallium, vanadium, and zinc. Only iron, lead, and manganese were detected above the project screening level.

Iron was detected at 13 of 23 locations and was detected above the project screening level of 300 µg/L at 10 locations. At 6 of the 10 locations where iron was detected above the project screening level, the dissolved metals result was not detected above the laboratory detection limit of 100 µg/L. At all locations were iron was detected the dissolved metals result was much lower than the total metals result. These results indicate the difference between the total metals and dissolved metals results are most likely due to sediment entrained in the samples.

Manganese was detected at 18 of 23 locations and was detected above the project screening level of 50 µg/L at 14 locations. The project screening levels for iron and manganese are the NC groundwater quality standards. These standards are identical to the Federal MCL, which are secondary MCLs and are primarily for aesthetics such as taste and odor in public water systems.

Corrosion or iron-fixing bacteria on iron and steel casings and well fittings can contribute to high iron concentrations. According to the USGS the primary aquifer in the former Camp Butner area is a crystalline rock aquifer. Crystalline rock aquifers are composed of crystalline metamorphic and igneous rocks of many types. The crystalline rocks can contribute iron and manganese in the groundwater when the rocks are weathered. The median iron concentration in crystalline aquifers is around 1,000 µg/L with some concentrations as high as 25,000 µg/L (USGS 1997). The presence of iron and manganese is most likely naturally occurring.

Lead was detected at 8 of 23 locations and was detected above the project screening level of 15 µg/L at one location at 39.9 µg/L in the total metals or unfiltered sample (4535 Uzzle Road). Lead was not detected above the laboratory detection limit of 3.0 µg/L for dissolved or filtered metals. This appears to indicate sediment was entrained in the sample causing the higher total metals result. Lead was detected at the reference location at 4.4 µg/L.

Lead was also detected above the project screening level at 35.7 µg/L at one location in the dissolved metals or filtered sample (Camp Barham). Lead was detected at 8.2 µg/L in the total or unfiltered metals result for lead for this location, which does not exceed the project screening level of 15 µg/L. The dissolved lead concentration being greater then the total lead concentration may be an anomaly, and thus the data results for lead at this location may not be indicative of the total or dissolved groundwater metal concentration. An explanation for this may be that the total and dissolved sample bottles were inadvertently switched. Lead was detected at the off-site location at 4.4 µg/L. Lead is naturally occurring, but rare. Other potential sources of lead at Camp Butner may include munitions, water supply piping, gasoline, vehicle exhaust, and paint containing lead.

4.9 Duplicate Samples

Field duplicate samples were collected to assess the precision of the field sampling activities. These samples were collected at a rate of 10% or at three locations. The locations of the duplicate samples were 653 Lakeview Drive, 4835 Uzzle Road, and 2202 Tilley Farm Road. The field duplicate results agree with the primary sample results, as both sample results for each location were consistent indicating quality control procedures were followed during the field activities of the sampling event.

4.10 Summary

The sampling event was an initial screening investigation conducted with the primary objective of identifying impacts to groundwater quality from DOD activities associated with Camp Butner. Twenty-three drinking wells were sampled representing approximately 10% of the drinking wells in the former Camp Butner area.

A total of 188 substances were analyzed at each location not including metals twice (total and dissolved). The results indicate a large number of substances were not detected. The results indicate only 9 substances were detected above the project screening levels which include: chloroform; bis(2-ethylhexyl)phthalate; alpha-chlordane; gamma-chlordane; heptachlor epoxide; perchlorate; iron; lead; and manganese. Evaluation of these substances indicates only perchlorate and lead may be present due to DOD activities at Camp Butner.

Perchlorate was detected in a random manner in the sample locations throughout the former Camp Butner area. Perchlorate was detected above the project screening level at two locations, which were from relatively shallow wells according to information provided by homeowners in Appendix A. All of the detections were below or within the current EPA human health guidance range for drinking water. Perchlorate is both a naturally occurring and man-made substance. Potential sources at the Camp Butner area may include munitions, flares, fertilizer application, and defoliant application. One homeowner participating in the investigation has confirmed the use of Bulldog Soda fertilizer at his residence. Bulldog Soda has been determined to contain naturally occurring perchlorate.

Lead was also detected in a random manner in the sample locations throughout the former Camp Butner area. Two detections were above the drinking water standard. Lead is likely to adsorb to sediment and these detections may be due to sediment in the sample. Lead was detected at the off-site location at 4.4 µg/L. Lead is naturally occurring, but rare. Other potential sources of lead at Camp Butner may include munitions, water supply piping, gasoline, vehicle exhaust, and paint containing lead.

5.0 DATA REVIEW

The analytical data was reviewed using the USACE Automated Data Review and Environmental Data Management System (version 5.0). The analytical data was reviewed in accordance with EPA National Functional Guidelines and EPA Region IV data review guidelines. The Data Review Report can be found in Appendix D.

The review process as presented in Appendix D concludes that the analytical data from this well sampling event for the Former Camp Butner is of acceptable quality. The overall quality of the data was determined to be acceptable with minimal qualification. There were no findings in this review that would prohibit the data form being considered usable for the intended purpose of this sampling effort.

6.0 RECOMMENDATIONS

The data set is limited as this was a screening investigation. At many sample locations, the well depth and specific hydrogeologic information was unknown. Therefore, it is impossible to compare the results with a high degree of confidence. The results do not identify any clear pattern or trend and the data is inconclusive whether DOD activities at Camp Butner have impacted the groundwater quality. However, the perchlorate and lead detections warrant further investigation. The Corps will continue to work with the State and community to determine what work should be included in subsequent investigations.

7.0 REFERENCES

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FIGURES

TABLES

APPENDIX A

WELL INFORMATION

Table A-1: Well Information Summary

LOCATION	INSTALLATION DATE	WELL DRILLER INFO	WELL DEPTH	CASING DIAMETER/ DEPTH	PUMP DEPTH/ PUMP RATE	ESTIMATED DEPTH TO GROUNDWATER
National Guard			230 feet	6 inches/Unknown		
652 Lakeview Dr.	May 10, 2002	Acme Well Drilling	145 feet	6 inches/43 feet	Unknown/50 gpm	78 feet
653 Lakeview Dr.						
658 Lakeview Dr.	Fall/Winter 1996	Craig Husketh				
3536 Fletchers Way						
Camp Barham						
Camp Eason						
4051 Range Rd	1960s		200 feet		185 feet	
4149 Range Rd	August 2001		400 feet	Unknown/20 feet	350 feet/35 gpm	25 feet
750 Little Mountain Rd			185 feet			20 feet
4535 Uzzle Rd						
191 Falcon Lane	1991	Craig Husketh	425 feet	8 inches/35 feet	410 feet/6 gpm	280 feet
4553 Uzzle Rd	August 2002				Unknown/15 gpm	300 feet
4573 Uzzle Rd						
4578 Uzzle Rd						
4710 Moriah Rd	1950s		100 feet	6 inches		20 feet
4709 Moriah Rd						
5057 Clayton Rd						
Hester Farm/Residence off Uzzle Road						
627B Enon Rd						
564 Bethany Church Rd	1977	Heater Well Company	120 feet	6 inches	108 feet/2.3 gpm	15 feet
6305 Isham Chambers Rd			200 feet		Unknown/3-4 gpm	
2202 Tilley Farm Rd						

APPENDIX B

SAMPLING RECORD FORMS and CHAIN OF CUSTODY FORMS

APPENDIX C

LABORATORY PACKAGES

APPENDIX D

DATA REVIEW REPORT AND AUTOMATED DATA REVIEW FILES