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October 6, 2006

Mr. George Harris, Chief
Environmental Review Section
Fort Stewart
1550 Frank Cochran Drive, Building 1137
Fort Stewart, GA 31314

Re: **Draft Final Operational Range Phase I Qualitative Assessment**
Fort Stewart, Georgia

Dear Mr. Harris:

1. Enclosed (1 hard copy and 2 electronic copies) is the Draft Final Operational Range Phase I Qualitative Assessment Report for Fort Stewart. In addition to the report, the electronic copies also include a copy of the Read-Ahead Package, Site Visit Trip Report, and the Response to Comments documents for the Draft version of the report. The Deputy Assistant Secretary of the Army, (Environment, Safety and Occupational Health) has recently directed that individual Phase I Assessment Reports be finalized on a single date after all the Phase I Range assessments have been completed. It is currently planned that these assessments will be finalized in FY09.

2. The reason for the single finalization date is that the assessments will be used to identify and prioritize ranges that need further assessment. Therefore, it is critical that the assessments are defensible and conducted in a standardized manner. The U.S. Army Environmental Center (USAEC) and the U.S. Center for Health Promotion and Preventive Medicine (USACHPPM) are providing program oversight and utilizing a standardized protocol to ensure assessment have consistency and defensibility to allow an "apples to apples" evaluation for prioritization.

3. The final check for standardization will be conducted by USAEC and USACHPPM. Once this has been completed, the contractors will be directed to finalize the Phase I Assessment Reports with any required changes and forward them to you.

DOCUMENT 1

4. The Draft Range Assessment Public Affairs Guidance (PAG) and a Department of Defense Memorandum are also enclosed. These documents provide additional information regarding how to address questions regarding the range assessment report. The final PAG and any new guidance will be provided to you as it is developed.

5. If you have any questions regarding this matter please call John Buck at USAEC at 410-436-4844 or Rhonda M. Stone at 484-688-0368.

Regards,

MALCOLM PIRNIE, INC.

Rhonda M. Stone

Rhonda M. Stone

Enclosures

c: ACSIM ODEP (George Cushman)
c: CHPPM (Barrett Borry)
c: USAEC (John Buck)
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DRAFT FINAL
OPERATIONAL RANGE PHASE I QUALITATIVE ASSESSMENT REPORT
FORT STEWART
FORT STEWART, GEORGIA

OCTOBER 2006

Prepared for:

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DRAFT FINAL
OPERATIONAL RANGE PHASE I QUALITATIVE ASSESSMENT REPORT
FORT STEWART
FORT STEWART, GEORGIA

DoD Contract Number: W912DR-05-D-0004

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Malcolm Pirnie, Inc. prepared this report at the direction of the United States Army Corps of Engineers (USACE). This document should be used only with the approval of the USACE or another authorized Department of the Army official organization. This report is based, in part, on information provided in other documents and is subject to the limitations and qualifications presented in the referenced documents.

October 2006

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ABBREVIATIONS/ACRONYMS

°F	Degrees Fahrenheit
3ID(M)	3rd Infantry Division (Mechanized)
amsl	Above Mean Sea Level
ARID-GEO	Army Range Inventory Geodatabase
ARNG	Army National Guard
cal	Caliber
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSM	Conceptual Site Model
DNT	Dinitrotoluene
DoD	Department of Defense
DoDI	Department of Defense Instruction
DoE	Department of Engergy
DPTMS	Directorate of Plans, Training, Mobilization and Security
DPW	Directorate of Public Works
EOD	Explosive Ordnance Disposal
FY	Fiscal Year
GA	Georgia
GIS	Geographic Information System
HE	High Explosives
HMX	Cyclotetramethylenetetranitramine
I	Interstate
in.	Inches
LS	Limited Source
MC	Munitions Constituents
MCOC	Munitions Constituents of Concern
MEC	Munitions and Explosives of Concern
MGW	Munitions Used/Groundwater Pathways/No Receptors
MGW (H/E)	Munitions Used/Groundwater Pathways/Human or Ecological Receptors
mm	Millimeter
MPU	Munitions Used/Pathways Unlikely
MSW	Munitions Used/Surface Water Pathways/No Receptors
MSW (H/E)	Munitions Used/Surface Water Pathways/Human or Ecological Receptors
MSWGW	Munitions Used/Surface Water Pathways/Groundwater Pathways/No Receptors
MSWGW (H/E)	Munitions Used/Surface Water Pathways/Groundwater Pathways/Human or Ecological Receptors
N/A	Not Applicable
OB	Open Burn
OD	Open Detonation
ORAP	Operational Range Assessment Program
PETN	Pentaerythritol tetranitrate
RCRA	Resource Conservation and Recovery Act
RDX	Cyclotrimethylenetrinitramine
RFMSS	Range Facilities Management Support System
SWMU	Solid Waste Management Unit
TNT	Trinitrotoluene
U.S.	United States

USACE	United States Army Corps of Engineers
USACHPPM	United States Army Center for Health Promotion and Preventive Medicine
USAEC	United States Army Environmental Center
USC	United States Code
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WP	White Phosphorus

EXECUTIVE SUMMARY

PURPOSE:

This qualitative assessment, hereinafter referred to as Phase I Assessment, evaluates Fort Stewart's operational range area to assess whether further investigation is needed to determine if potential munitions constituents of concern (MCOC) are or could be migrating off-range at levels that may pose an unacceptable risk to human health or the environment. The Phase I Assessment results in the categorization of operational ranges as appropriate, as follows:

- **Referred – Refer to Appropriate Cleanup Program:** ranges with compelling evidence (e.g., sampling data) to indicate the presence of an off-range release that potentially poses an unacceptable risk to human health or the environment;
- **Inconclusive – Phase II Quantitative Assessment Required:** ranges where existing information either is insufficient to make a source-receptor interaction determination or indicates the potential for such interaction to be occurring; or
- **Unlikely – Five-Year Review[1]:** ranges where, based upon a review of readily available information, there is sufficient evidence to show that there are no known releases or source-receptor interactions that could present an unacceptable risk to human health or the environment based on a review of the information available.

SUMMARY OF FINDINGS:

To facilitate the qualitative analysis, MCOC sources, potential migration pathways from a range, and potential off-range human and/or ecological receptors associated with the ranges at Fort Stewart were evaluated. Each range was then placed into one of several descriptive groups that meet the criteria for the Inconclusive and Unlikely categories.

The 274 operational ranges at Fort Stewart that were included in the qualitative assessment have been divided into the following two categories:

- **Inconclusive** – Eighty-eight operational ranges consisting of firing points, impact areas and small arms ranges totaling 118,200 acres
- **Unlikely** – One-hundred-eighty-six ranges consisting of firing points, impact areas, small arms ranges, and training and maneuver areas totaling 168,560 acres

These findings are summarized in **Table ES-1.**

[1] All operational ranges must be periodically re-evaluated to determine if there is a release or substantial threat of release of MCOC from an operational range to an off-range area. Range groups categorized as Unlikely are to be re-evaluated at least every five years. Re-evaluation may occur sooner if significant changes (e.g., changes in range operations, site conditions, and regulatory changes) occur that affect determinations made during the Phase I Assessment.

Table ES-1: Summary of Findings, Conclusions, and Recommendations

Category	Group Identification	Total Number of Ranges and Acreage	Source(s)	Pathway(s)	Human Receptors	Ecological Receptors	Recommendations (Future Steps)
Inconclusive	Munitions used; surface water and groundwater pathways present; human and ecological receptors identified	40 operational ranges; 56,788 acres	Firing points, impact areas, and small arms firing	Surface water and shallow groundwater	Residents down gradient, local and off-range residents, and recreational users of the Ogeechee River	Wetlands and threatened and endangered species	Phase II Quantitative Assessment is required.
	Munitions used surface water pathways present human and ecological receptors identified	48 operational ranges; 61,412 acres	Firing points, impact areas, and small arms firing	Surface water	Residents down gradient, local and off-range residents, and recreational users of the Ogeechee River	Wetlands and threatened and endangered species	Phase II Quantitative Assessment is required.
Unlikely	Limited or no munitions have been used	32 operational ranges; 34,762 acres	No source – limited or no military munitions use	Not evaluated	Not evaluated	Not evaluated	Re-evaluate during the five-year review.
	Munitions used; surface water and groundwater pathways present	154 operational ranges; 133,798 acres	Firing points, impact areas, small arms firing and training areas	Surface water and groundwater	None	None	Re-evaluate during the five-year review.

1.0 Introduction

The United States (U.S.) Army is conducting qualitative assessments at operational ranges to meet the requirements of Department of Defense (DoD) policy and to support the U.S. Army Sustainable Range Program. The operational range qualitative assessment (hereinafter referred to as Phase I Assessment) is the first phase of the U.S. Army Operational Range Assessment Program (ORAP). The Phase I Assessment will review readily available data to evaluate, verify, validate, document, and report on operational ranges within the United States and its territories. Phase I Assessments are being conducted on Active Army, Army Reserve, and Army National Guard (ARNG) installations (including both federal and state owned).

The conclusions in this report have been based, in part, on information obtained from third parties, including historical aerial photographs, environmental agency records, well logs, and other public geologic records regarding the sites obtained from various sources. Unless noted, Malcolm Pirnie has not independently evaluated or verified the accuracy or completeness of such third party information. Visual observations of the site only represent conditions at the time of the site visit. Malcolm Pirnie makes no warranties that the on-site observations made during the site visit are representative of historical or future conditions at the site.

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1.1 Project Drivers, Scope, and Objectives

The Phase I Assessment process evaluates potential source-receptor interaction between off-range[2] receptors and the migration of potential munitions constituents of concern (MCOC) from an operational range.

The ORAP is being implemented to fulfill requirements identified implicitly or explicitly in:

- DoD Directive 4715.11 *Environmental and Explosives Safety Management on Operational Ranges Within the United States* , 10 May 2004 and
- DoD Instruction 4715.14 *Operational Range Assessments,* 30 November 2005.

1.2 Purpose

The purpose of this Phase I Assessment is to evaluate Fort Stewart's operational ranges to assess whether further investigation is needed to determine if potential MCOC are or could be migrating off-range at levels that may pose an unacceptable risk to human health or the environment.

Based on the readily available data obtained during the Phase I Assessment process, all operational ranges at Fort Stewart's were placed into groups according to military munitions use, the presence or absence of potential MCOC, migration pathways, and receptors. Each operational range group was then placed into one of three possible categories: Referred, Inconclusive, or Unlikely.

[2] Off-range areas include those areas outside of the boundaries of the operational range area, as established by the Army Range Inventory Geodatabase (ARID-GEO). Off-range areas may include both on-installation (i.e., cantonment areas) and off-installation areas or locations.

- **Referred – Refer to Appropriate Cleanup Program:** ranges with compelling evidence (e.g., sampling data) to indicate the presence of an off-range release that potentially poses an unacceptable risk to human health or the environment.

- **Inconclusive – Phase II Quantitative Assessment Required:** ranges where existing information either is insufficient to make a source-receptor interaction determination or indicates the potential for such interaction to be occurring.

- **Unlikely – Five-Year Review[3]:** ranges where, based upon a review of readily available information, there is sufficient evidence to show that there are no known releases or source-receptor interactions that could present an unacceptable risk to human health or the environment based on a review of the information available.

Appendix A provides a glossary of common terms referred to in the ORAP program.

1.3 General Installation Information

Fort Stewart consists of 279,400 acres (1) and is located north of Hinesville, Georgia (Ga), approximately 40 miles southwest of Savannah, Ga. **Figure 1-1** depicts the general location of Fort Stewart. Fort Stewart is the largest Army installation east of the Mississippi River, spanning portions of Bryan, Evans, Liberty, Long and Tattnall counties. Fort Stewart can accommodate training for 50,000 Reserve Component soldiers annually. Tank, field artillery, helicopter gunnery, and small arms ranges are used simultaneously throughout the year. The runway at Hunter Army Airfield (Hunter) and Fort Stewart's proximity to the Port of Savannah help make Fort Stewart/Hunter the Army's premier heavy, rapid force point of deployment. Fort Stewart and Hunter Army Airfield is one installation. Fort Stewart and Hunter Army Airfield are noncontiguous properties and are regulated by state and federal environmental regulations as separate installations; are regulated by different cleanup regulations; and therefore are being investigated separately in the ORAP. As such, Hunter is being investigated under separate cover from Fort Stewart in the ORAP.

Fort Stewart traces its history to Camp Stewart, which was established in 1940 after Congress authorized funding for the purchase of property in coastal Georgia for the purpose of building an anti-aircraft artillery training center. On 1 July 1940, the first 5,000 acres were bought; additional purchases followed. The large expanse of property was required for the firing ranges and impact areas that an anti-aircraft artillery training center needed for live-fire training.

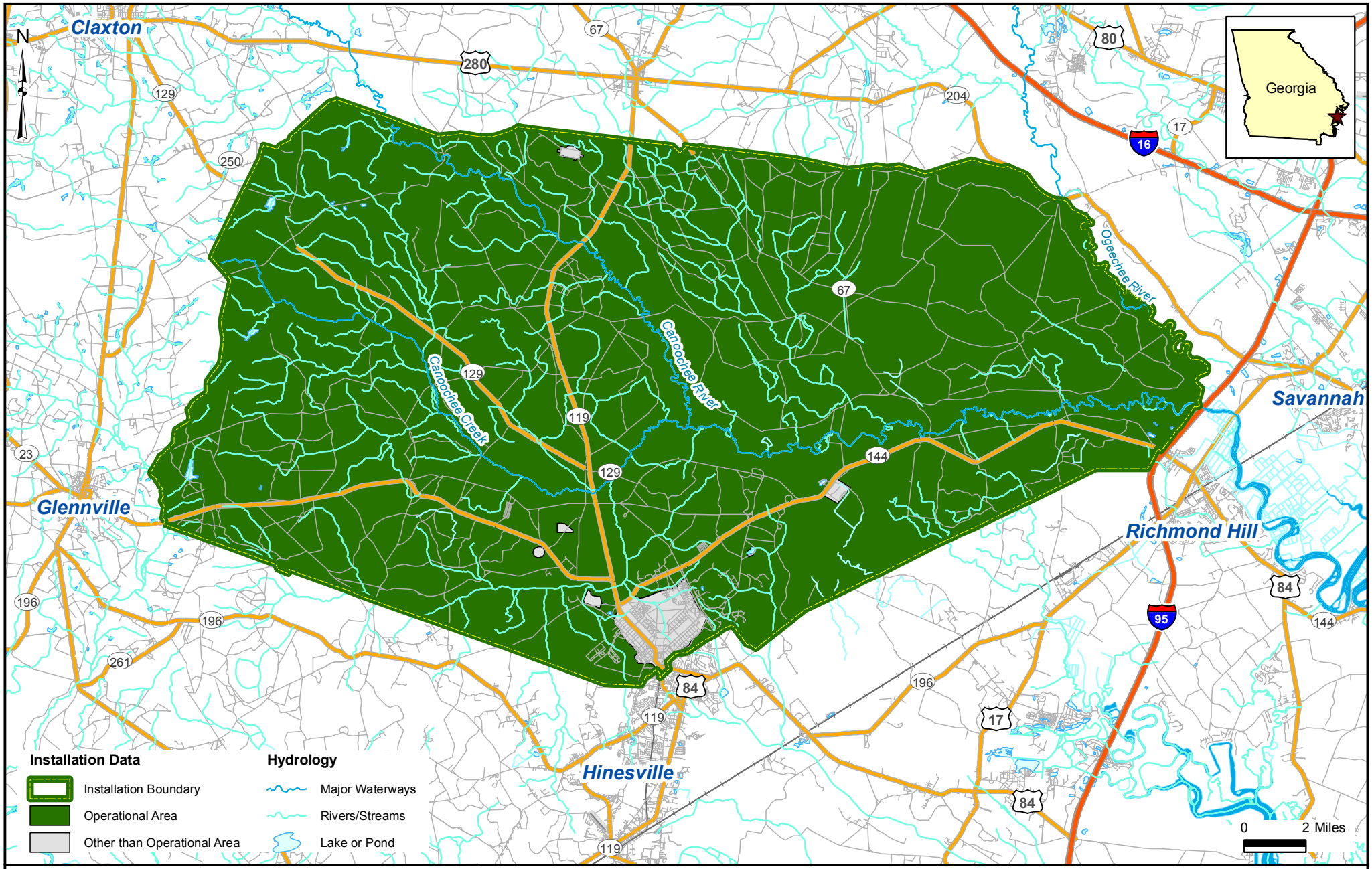
Fort Stewart is currently responsible for the combat training of the equivalent of two heavy divisions of the Army. This training includes soldiers stationed at Fort Stewart, across Georgia, and at other locations of the southeastern United States. The primary mission of Fort Stewart is to support and assist in training the 3rd Infantry Division (Mechanized) (3ID[M]). It is also responsible for supporting non-divisional units' training for their respective combat roles. In addition, Fort Stewart has an area mission to provide support and services to other agencies, Reserve forces, and installations within the prescribed area of responsibility (1).

[3] All operational ranges must be periodically re-evaluated to determine if there is a release or substantial threat of release of MCOC from an operational range to an off-range area. Range groups categorized as Unlikely are to be re-evaluated at least every five years. Re-evaluation may occur sooner if significant changes (e.g., changes in range operations, site conditions, and regulatory changes) occur that affect determinations made during the Phase I Assessment.

Fort Stewart is the home of the 3rd Infantry Division the Army's first modular division with the following major units: 1st, 2d and 4th Heavy Brigade Combat Teams, 3d Sustainment Brigade, 3d Combat Aviation Brigade, 385th Military Police Battalion, and the Special Troops Battalion. U.S. Army Special Operations Command has two battalions at Hunter Army Airfield that train at Fort Stewart, the 1-75th Ranger Battalion and the 3-160th Special Operations Aviation Regiment. The 3rd Heavy Brigade Combat Team, 3ID operates out of Fort Benning, Ga, but often trains at Fort Stewart.

A majority of Fort Stewart is designated as operational range area, with 274 ranges listed in the September 2005 version of the Army Range Inventory Database Geo-database (ARID-GEO). The perimeter of the installation is mainly non-firing maneuver and training ranges. The active ranges deeper within the installation currently provide (and historically have provided) the space necessary for live-fire impact areas from tank and anti-aircraft artillery. Surrounding the impact areas are live-fire ranges designated for either small or large caliber military munitions.

Figure 1-2 depicts the layout and the operational range area/range complex area identified during the ARID-GEO September 2005 update. For ease of review, installations were divided into regions based on watershed and surface water drainage. These are explained further in Section 3.3.2.

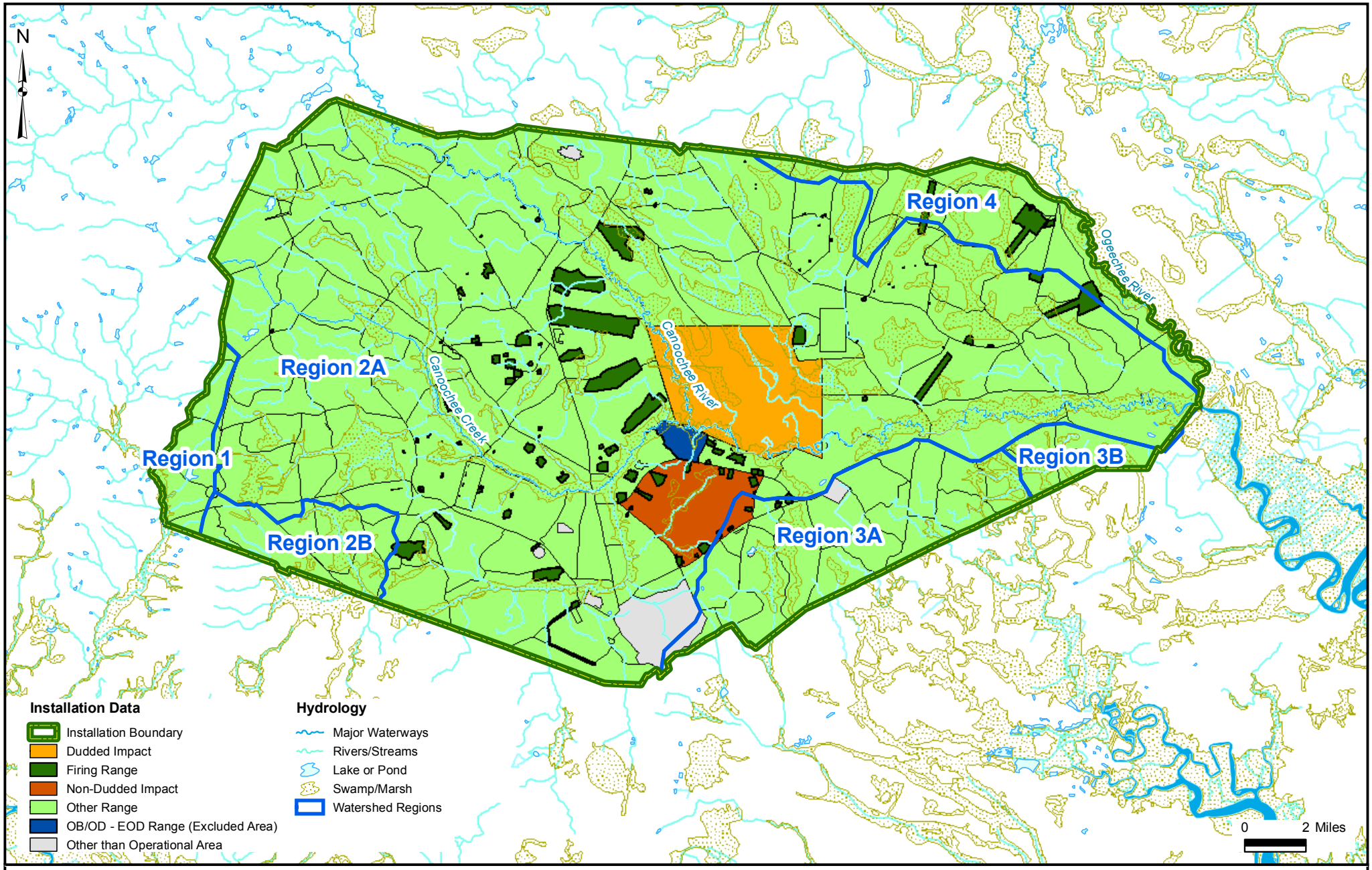


Operational Range Qualitative Assessment
Fort Stewart, GA

Figure 1-1
Installation Location

Data Sources:
AEC, ARID Geo-Database, 2002 & September 2005
ESRI StreetMap USA, 2005

Date: October 2006
Prepared By: Malcolm Pirnie, Inc.
Prepared For: U.S. Army
Contract Number: W912DR-05-D-0004



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Operational Range Qualitative Assessment
Fort Stewart, GA

Figure 1-2
Operational Range Area & Grouping Regions

Data Sources:
AEC, ARID Geo-Database 2002 & September 2005
ESRI StreetMap USA, 2005

Date: October 2006
Prepared By: Malcolm Pirnie, Inc.
Prepared For: U.S. Army
Contract Number: W912DR-05-D-0004

2.0 Assumptions, Programmatic Exclusions and Data Collection Efforts

2.1 Assumptions

Statements in this report were made using available documents and data obtained during the centralized data collection efforts and site visit. The findings and conclusions of the supporting documents and data are assumed to be accurate and scientifically defensible. Conclusions and recommendations are based on the data gathered during the Phase I Assessment.

The Phase I Assessment assumes that the primary pathways for off-range migration are water related. This is to conform to the DODI 4715.14 emphasis on off-range migration. The water media are surface water, sediment, and groundwater. Other media could be considered if site-specific conditions dictate.

2.2 Programmatic Exclusions

The following mechanisms for potential migration pathways for MCOC have been evaluated and programmatically excluded from the ORAP, except in unique situations that compel their inclusion: air emissions, surface soil, terrestrial mammals migrating off-range, human consumption of terrestrial wildlife, migratory birds, and dermal contact and incidental ingestion of surface water.

2.2.1 Air Emissions

Air emissions from detonating military munitions have been evaluated under a variety of studies conducted by the DoD, the Army, the Emergency Planning and Community Right-to-Know Act's Toxic Release Inventory, and the Agency for Toxic Substances and Disease Registry. These studies indicate that off-range receptor exposure to MCOC via the air pathway does not pose an unacceptable level of risk. Therefore, the U.S. Army Environmental Center (USAEC) has decided on a programmatic basis not to evaluate this pathway further during the Phase I Assessment. Should additional information become available that identifies potential problems associated with this potential MCOC migration pathway, this decision will be re-evaluated.

2.2.2 Surface Soil

The surface soil pathway is not to be evaluated unless potential off-range residential or ecological receptors are within 200 feet of a suspected source of MCOC. This determination is based on Section 3.5.2, Soil Exposure Pathway Targets, of the U.S. Environmental Protection Agency (USEPA) Guidance for Performing Preliminary Assessments under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) EPA/540/G-91/013. In general, the results of a variety of range studies indicate that the likelihood of encountering potential source-receptor interactions through the soil pathway is extremely low.

2.2.3 Terrestrial Receptor Consumption

A potential source-receptor interaction pathway that results from the consumption of terrestrial receptors (e.g., deer and other wildlife species) has been evaluated and is recommended for exclusion from the ORAP. Studies conducted by the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) and other organizations have indicated that the uptake and bioaccumulation of select MCOC (e.g., explosives) in terrestrial receptors do not pose a viable health risk to off-range receptors.

These investigations show that deer and other wildlife species exposed to higher levels of MCOC in soil, especially around explosive manufacturing areas, do not contain detectable levels of military unique compounds. Although some heavy metals can bioaccumulate within edible tissue, such as the case with mercury, findings are inconsistent with terrestrial populations found both on and off-range. Based on the data gathered during these investigations, and considering the conservatism and uncertainty related to the risk assessment process, the health risk with consuming deer and other game harvested on range is no greater than with harvesting game off-range. Therefore, terrestrial wildlife, migratory birds, and livestock have been programmatically excluded.

USACHPPM continues to support the inclusion of fish as a potential pathway/exposure point via the food chain. This assumption is based on the theory that if contaminants are present in a water body, fish have a more intensive, long-term exposure potential than terrestrial receptors, which may only come into contact with the contamination during incidental, short-term exposures.

2.2.4 Exposure to Surface Water

A programmatic exclusion for the dermal contact and incidental ingestion of MCOC within the off-range surface water pathway for areas other than designated recreational areas (or areas known or suspected of being used frequently for swimming) is recommended.

While this may be a viable exposure pathway in some instances, it is not expected to be significant in most cases due to the extremely low levels of MCOC that have been found in surface water during previous quantitative range studies. Therefore, it is recommended that this pathway only be evaluated when there is evidence that the surface water body is used regularly for swimming.

2.3 Summary of Data Collection Efforts

Five primary sources of information were researched as part of the data collection effort for the Phase I Assessment. The sources of data include:

- Data repositories and databases (e.g., e.g., ARID-GEO, Technical Information Center);
- Installation data repositories (e.g., e.g., Fort Stewart Geographic Information System (GIS) database););
- Personal interviews (e.g., Fort Stewart Personnel);
- Windshield survey; and
- Off-installation data sources and repositories ((e.g., USEPA, state of Georgia Web sites, Liberty County Environmental Health Department).

Prior to the site visit, information on Fort Stewart and the surrounding area was obtained from centralized databases and assembled into several profiles. Data gaps regarding military munitions usage and off-range receptors were identified during this effort. Operational range data from the September 2005 update of the ARID-GEO was used to develop this qualitative report. A site visit to Fort Stewart was conducted from 6-9 March 2006, to verify the previously collected information and fill data gaps. Range Facility Management Support System (RFMSS) data on military munitions usage for Fiscal Year (FY) 01 – FY06 (1 June 2001 to 23 February 2006) were obtained, along with documents on off-range receptors to the south (Hinesville, GA). Windshield surveys were conducted to the northeast (vicinity of Ellabell, GA) and southeast (vicinity of Fleming, GA) of Fort Stewart. Interviews with Fort Stewart staff and non-installation staff also provided useful information. All of

this information was used to construct the conceptual site model (CSM) profiles discussed throughout this report. **Appendix B** lists references used in the Phase I Assessment.

3.0 Conceptual Site Model Profiles

Section 3 provides a description of the installation and its environment based on information obtained during the Phase I Assessment process. The section includes five profile types:

- Facility profile: Describes man-made features and potential sources (for example, the current and historical installation area/layout and the munitions type/usage associated with the operational range area).
- Physical profile: Describes physical features/factors that may affect release, transport, and access of potential MCOC (for example, meteorological data, topography, geology, hydrogeology, and surface waters and water resource use).
- Munitions/release profile: Describes potential MCOC and associated release mechanisms/pathways.
- Land use and exposure profile: Provides information used to identify and evaluate the applicable exposure scenarios, receptors, and receptor locations.
- Ecological profile: Describes natural habitats of the installation and associated ecological receptors.

3.1 Facility Profile

3.1.1 Current and Historic Range Layout

Fort Stewart is located on the southeastern coastal plain of Georgia, spreading over five counties: Evans, Bryan, Tattnall, Long, and Liberty. The closest population center is the city of Hinesville, GA, located directly south of Fort Stewart. The city of Savannah, GA, is approximately 40 miles to the northeast (**Figure 1-1**).

Virtually all of Fort Stewart was obtained by purchase from private landowners between 1940 and 1945. The Fort Stewart boundaries have not changed since 1945. Fort Stewart is situated south of Interstate (I) 16 and west of I-95. The installation boundaries are roughly defined by the intersection of I-16 and I-95 and the cities of Richmond Hill, Hinesville, Glennville, Claxton, and Pembroke.

Fort Stewart spans approximately 39 miles from east to west and 19 miles from north to south, and comprises of 279,400 acres according to the Fort Stewart Environmental Office. However, according to the ARID-GEO GIS data, Fort Stewart is comprised of 291,771 acres, which conflicts with the installations area and use areas listed in the Fort Stewart Environmental Office. The ARID-GEO acreages were derived from GIS and included overlapping ranges areas.

Fort Stewart currently has 274 operational ranges, encompassing 286,760 acres (**Figure 1-2**). Military munitions related activities currently occur at 103 of the 274 ranges, and these 103 ranges encompass 25,856 acres. Areas not currently associated with military munitions related activities include the cantonment area (3,383 acres), which is situated centrally on the southern boundary, six historical ranges identified in the ARID-GEO (1,628 acres), and 144 operational ranges (260,904 acres) that are utilized as maneuver/training areas. Ranges listed as training and maneuver areas include limited or no military munitions related training, runways and parade grounds. Historical range outline maps from 1941 through 1998 show that 164,525 acres of the installation were utilized historically for military munitions related activities, including firing fans and impact areas.
Fort Stewart was established in 1940 as an anti-aircraft artillery center to prepare artillery troops for overseas deployment. Training activities associated with World War II decreased by the end of 1944.

Between January and September 1945, the installation operated as a prisoner-of-war camp. The installation was deactivated in September 1945. In August 1950, Fort Stewart was reactivated to train anti-aircraft artillery units for the Korean War. The training mission was expanded to include armor training concurrent with anti-aircraft artillery training in 1953. Fort Stewart was designated a permanent Army installation in 1956.

An element of the U.S. Army Aviation School from Fort Rucker, Alabama, was relocated to Fort Stewart in 1966, and the post became the U.S. Army Flight Training Center. Aviation training at Fort Stewart was phased out in 1973, when all aviation training was consolidated at Fort Rucker.

The 1st Battalion, 75th Infantry Regiment (Ranger) was activated on 31 January 1974, and Fort Stewart became a training and maneuver area, providing tank, field artillery, helicopter gunnery, and small arms training for Regular Army, Army Reserves, and ARNG units. The 24th Infantry Division was permanently stationed at Fort Stewart in 1975.

Historical military munitions use at Fort Stewart has been documented through the review of historical range mapping. This historical military munitions use typically occurred over the same areas in use today. **Figure 3-1** depicts the historical range outlines from 1941, 1957, 1962, 1964, 1966, 1971, 1994 and 1998. These ranges utilized small arms, medium caliber, large caliber, anti-aircraft, anti-tank, and additional unidentified historical military munitions. They also contained explosive ordnance disposal (EOD) areas. No current military munitions related activity was identified in the RFMSS data at 186 of the 274 operational ranges; however, the potential for MCOC from historical military munitions use exists at these historical ranges. Historical ranges as described in this report are firing ranges that are not currently utilized for munitions activity.

3.1.2 Munitions Types and Usage

A majority of Fort Stewart is designated as operational ranges. Installation operations do not include range clearance procedures, except in the case of hand grenades. As a result, MCOC may be encountered in historical and current impact areas. Current military munitions use for individual ranges has been tabulated through the RFMSS data on military munitions usage for FY01 – FY06 (1 June 2001 to 23 February 2006). Approximately 34 million total rounds of military munitions were utilized during this time period. The large majority of these were small arms rounds to include 216,000 small arms tungsten rounds (green ammo). Blanks, pyrotechnics, obscurants, and small to large caliber military munitions, including rockets, large bombs, hand grenades, as well as, high explosive (HE) white phosphorus (WP) projectiles, were used in much smaller amounts, as recorded by RFMMS. According to interviews with Fort Stewart Range Control, it is common practice to burn unused powder bags at firing points, increasing the potential for MCOC at these locations.

Records regarding simulated military munitions use on ranges are designated as "other ranges" (typically maneuver and training areas), and records are kept for total installation usage not individual operational range usage. From 2003 to 2005, approximately 30,000 rounds of simulator military munitions and smoke grenades were used throughout Fort Stewart on maneuver and training areas. This quantity cannot be attributed to individual ranges.

There are several distinct watersheds present at Fort Stewart. The ranges have been divided by watershed region (as displayed on **Figure 3-1)** for ease of discussion. These regions are discussed below:
Region 1 (Altamaha Watershed), which consists of 4,584 acres, is located along the western boundary of the installation and drains westerly into the Altamaha River system. Region 1 consists of six ranges, with two of the ranges partially located in other watershed regions. These six ranges currently have no military

munitions related activities. Historical use in this region includes the Kent Range, identified on a 1941 range map. This range was utilized for air-to-ground unidentified historical military munitions. A current employee of the Integrated Training Area Management program who has worked on Fort Stewart since 1950, recalled construction of a staging field over the firing fan of the Kent Range in the 1960's. He recalled that a 75-millimeter (mm) HE round was discovered during the construction.

Region 2A (Canoochee Watershed) consists of 223,299 acres. This region generally drains easterly into the Canoochee River system and encompasses a majority of the installation. Region 2A consists of 220 ranges, of which 79 ranges currently have military munitions use. The military munitions currently used in Region 2A include small arms ammunition, small to large caliber military munitions, rockets, missiles, and HE rounds. Historical range use in Region 2A overlapped 30 of the 141 current operational ranges where no military munitions related activities currently occur. These historical ranges consisted of tank ranges, small arms ranges, anti-aircraft ranges, anti-tank ranges, and ranges of unidentified historical munitions. Historical military munitions use identified in Region 2A included small arms ammunition, small to large caliber military munitions, and multiple unidentified historical military munitions.

Region 2B (Canoochee Sub-watershed), located in the southwest corner of the installation, was established as a subgroup to Region 2A due to small tributaries of the Canoochee River that flow southeast off installation then back onto the installation in a northeasterly direction into Region 2A. Region 2B consists of 8,253 acres and six ranges, with one range partially located in Regions 1 and 2A. The ranges in Region 2B have no current military munitions related activities. Historical range use in Region 2B overlapped four current ranges with no active military munitions related activities. Historical ranges identified in Region 2B comprise tank ranges, small arms ranges, and multi-purpose ranges. Historical military munitions use in Region 2B included small arms, small caliber, and multiple unidentified historical military munitions.

Region 3A (Laurel View Watershed), located on the southeastern portion of the installation, is 23,574 acres and drains southeast into the Laurel View River system. Region 3A consists of 24 ranges, five of which overlap into Region 2A. The ranges in Region 3A include 19 ranges with no military munitions related activities and five with current military munitions use. The military munitions used at these ranges include small arms, and large caliber military munitions. Historical range use in Region 3A overlapped 10 current ranges with no current military munitions related activities. Historical ranges identified in Region 3A consist of tank ranges, small arms ranges, EOD ranges, rifle grenade ranges, and anti-tank ranges. Historical military munitions use in Region 3A included small arms ammunition, rockets, and multiple unidentified historical military munitions.

Region 3B (Ogeechee Sub-watershed), located east of and adjacent to Region 3A, was established as a subgroup because of a separate surface water drainage pattern, which flows southeasterly to the Ogeechee River. Region 3B is 4,224 acres and consists of three ranges, all of which are engaged in non-military munitions related activities. No historical military munitions related activities are known to have occurred in Region 3B.

Region 4 (Ogeechee Watershed), which drains northeast into the Ogeechee River system, is located along the northeastern boundary and is 15,326 acres. Region 4 consists of 15 ranges, seven of which overlap into Region 2A. Four of the ranges in Region 4 currently have operational military munitions use. The military munitions used in Region 4 include small to large caliber munitions, HE rounds, rockets, and missiles. The remaining 11 ranges have no current military munitions related activities. Historical range use in Region 4 overlapped six current ranges with no military munitions related activities. Historical ranges identified in Region 4 consist of tank ranges, air-to-ground ranges, and anti-aircraft ranges. Historical military munitions use in Region 4 included unidentified historical military munitions.

Table 3-1 provides a summary of the types of historical military munitions use and munitions and explosives of concern (MEC) within each region.

Table 3-1: Summary of Historical Range Use and MEC at Fort Stewart

Historical Range Type	Regions	Number of Historical Ranges	Munitions
Tank	2A, 2B, 3A, and 4	7	Multiple
Small arms	2A, 2B, and 3A	13	.50-caliber (cal) or less, 2.75-inch (in.) and 3.5-in. rockets
Air-to-ground	1, 2A, 2B and 4	16	Multiple unidentified historical military munitions
Anti-aircraft	2A and 4	7	40-mm, .50-cal, 90-mm
EOD	3A	2	Multiple
Rifle grenade	3A	3	2.75-in. - 3.5-in. rockets
Unidentified	2A	1	Unidentified historical military munitions
Multi-purpose	2B	1	Multiple
Anti-tank	2A and 3A	2	2.75-in. - 3.5-in. rockets

Fort Stewart historically utilized a designated range for the demolition of waste munitions. This area was identified in the ARID-GEO as an operational range, the EOD Range. In 1987 this range was permitted within the regulatory framework of the Resource Conservation and Recovery Act (RCRA) Part B Permit #GA9210020872 by the Georgia Department of Natural Resources Environmental Protection Division, (GaEPD) for the treatment of waste unexploded ordnance by open detonation or open burning. Within the Part B Permit the EOD Range was designated a Hazardous waste site and was addressed under a RCRA Corrective Action Plan as a Solid Waste Management Unit (SWMU) 12A.

The EOD Range consisted of the Open Detonation (OD) (SWMU 12B) unit and the Open Burn (OB) (SWMU 12C) unit. A RCRA Subpart X permit was granted on August 14, 1997. In December of 1997 Georgia adopted the Military Munitions Rule. At that time Fort Stewart determined that it would no longer need the Subpart X Permit to support the training requirements of the 38th Explosive Ordnance Detachment (EOD) and that munitions that were formerly disposed of as wastes would then be recycled.

Four former EOD areas were found to be located on current operational ranges. These ranges are inactive EOD ranges and are identified as SWMUs 8, 9, 10, 11. SWMU 8, 9, and 10 are Response Complete with no further action required. The Phase II RCRA Facility Investigation (RFI) report for SWMU 11 recommended institutional controls and no further monitoring (constituents will remain on site). On June 28, 2006 GaEPD notified Fort Stewart that the groundwater and surface water monitoring was complete for EOD Range (SWMU 12) and also recommended institutional controls and that no further monitoring was required; (constituents will remain on site). (The SWMUs were excluded as sources if the military munitions and MEC are being managed under another program, e.g., RCRA).

3.2 Physical Profile

3.2.1 Meteorology

Fort Stewart has a humid, subtropical climate, with long, warm, humid summers and short, mild winters. Temperatures range from an average of 80 degrees Fahrenheit (^{o}F) in July to 50 ^{o}F in December, with an annual average of 70 ^{o}F. Average annual precipitation is 50 in., with slightly over half falling from June through September. The wettest month is July, with an average rainfall of 7.6 in., and the driest is November, with an average rainfall of 1.6 in. Under normal conditions, wind speed rarely exceeds 5 knots; however, thunderstorms, hurricanes and tropical storms, occurring most frequently from May through September, can produce gusty surface winds of over 25 knots from the northwest.

3.2.2 Topography

Fort Stewart is located in the Lower Georgia Coastal Plain physiographic province, a segment of the Atlantic Coastal Plain of eastern North America. The general topography of this province is flat to gently rolling with relatively low elevations that decrease gradually to sea level at the Atlantic Ocean. The topography is marked by the presence of numerous marine terraces, many of which consist of low elongated ridges that parallel the coastline. These low ridges generally are separated by wide swampy valleys. Fort Stewart rises from near sea level in the eastern portion of the installation to 183 feet above mean sea level (amsl) along its western border. Most of the land is less than 33 feet amsl with slopes of less than 3 percent (1).

3.2.3 Geology

Fort Stewart is located in the lower Coastal Plain physiographic province and is underlain by a moderately thick wedge of unconsolidated and semi-consolidated sediments that overlie carbonate rocks (limestone and dolostone of Eocene to Oligocene age) at varying depths that dip to the southeast. These sediments consist of a sandy surface layer over subsoil that may be sandy, clayey, loamy, or a combination thereof. These sediments range from approximately 50 to 180 feet thick, with low to moderate permeability.

3.2.4 Hydrogeology

There are three distinct aquifer systems in the Fort Stewart region, the surficial, the Brunswick, and the Floridan aquifer systems. The surficial aquifer consists of Miocene to post Miocene age deposits of sand, silt and clay, ranging in thicknesses from 155 to 230 feet. The Brunswick aquifer is further divided into the upper and lower Brunswick aquifers and consists of Miocene to Oligiocene-aged fine to coarse sand, silt and clay. These deposits extend between 375 and 445 feet below ground surface. Beneath the Brunswick aquifer is the Floridan aquifer system, which is considered the principal source of all water uses in the coastal area (2). The Floridan aquifer serves as the primary source of large groundwater withdrawals in the coastal area. This aquifer is comprised of two distinct layers referred to as the upper Floridan and lower Floridan aquifers. This system consists of deep sequences of limestone and dolomite of the Eocene to Oligocene age. The upper Floridan aquifer is derived from the Oligocene series of sandy, phosphatic limestone and is underlain by the Ocala Limestone of the Eocene age.

According to regional aquifer and groundwater flow studies conducted by the United States Geological Society (USGS) in the Coastal Plain area, the Floridan aquifer system is under artesian conditions and is separated from the two shallow aquifer systems by confining units consisting of silty clay and dense phosphatic dolomite. These confining units occur beneath the surficial aquifer and beneath the Brunswick aquifer. Reported vertical hydraulic conductivities of the confining unit separating the surficial aquifer and the Brunswick aquifer range from $5.3x10^{-5}$ to $1.3x10^{-4}$ feet/day. The hydraulic

conductivities for the confining unit separating the Brunswick and upper Floridan aquifer range between $2.3x10^{-3}$ and 3.0 feet/day (2).

Recharge for the Floridan aquifer system is an area 60 - 100 miles northwest of Savannah. The directional flow of the surficial aquifer is believed to follow the flow patterns of the surface water. The surface aquifer is recharged directly from rainfall percolating through sediments. During dry months, the base flow of streams and rivers of the coastal area is maintained by discharge from the surface aquifer.

The City of Hinesville currently operates three water supply wells that contribute to a blended water distribution system. Two of the city wells are located within a four-mile radius of Fort Stewart. On the basis of their combined pumping capacities, these two wells contribute 48 percent of the city's total water supply. All of the city wells are drilled to a depth of approximately 700 ft with water intakes set at a depth of 115 to 128 ft. The entire interval from the intake to total depth is open in each well, indicating that the city water supply is drawn from the bottom half of the surficial aquifer, both Brunswick aquifers and the Upper Floridan aquifer. Windshield surveys performed during the site visit identified wellheads on many of the residences near the southeastern installation boundary. The depths of the residential wells are unknown; however, personnel interviewed at the Liberty County Environmental Health Department relayed that there is no minimum depth requirement for well drilling permits. The drilling of private wells into the surficial aquifer for irrigation is encouraged to reduce the draw on the primary Floridan aquifer. Available geologic information indicated that most of these private wells produce water from the Miocene-aged Upper Brunswick, although some of them may also be open in the shallower surficial aquifer. It is unknown whether the private wells utilizing the surfical aquifer are used solely for irrigation or as a potable water source, as well (3).

Fort Stewart maintains its own potable water distribution system. There are 31 groundwater wells located within the installation boundary. Five of these wells are used to supply water to the distribution system that serves the cantonment area. These wells are produced from the upper Floridan aquifer. There are four other active groundwater supply wells located elsewhere on the installation that serve as individual water supplies. The remaining 22 wells are distributed across the installation. Of these, 2 wells are on standby, and the remaining 20 wells are no longer in use.

3.2.5 Soils

In coastal Georgia, drainage from three physiographic provinces, the Blue Ridge Mountains, Piedmont Plateau, and Coastal Plain, affect the composition of the alluvial deposits. Near Fort Stewart, the parent material for all soils is water-lain sediments deposited during and prior to the Pleistocene age (4).

As a result of the mild climate, freezing and thawing cycles have little effect on soil weathering. Much of the rainfall percolates through the soil and moves dissolved and suspended materials downward. As a result, most of the soils on uplands are highly weathered, leached, strongly acidic, and low in natural fertility and organic matter.

3.2.6 Surface Water

Four major lakes and ponds are located at Fort Stewart, and approximately 90,000 acres of the installation consist of designated wetlands, most of which are associated with surface streams, rivers, and ponds. Fort Stewart has many surface water resources, including rivers, streams, ponds, and lakes that spread over four watershed regions (Altamaha River, Canoochee River, Ogeeche River and the Laurel View River watersheds) (**Figure 3-2**). A majority of the installation is located within the watershed of the Canoochee River. The Canoochee River flows primarily west to east centrally through Fort Stewart to its confluence with the Ogeechee River. The Ogeechee River forms part of the northeastern border of Fort Stewart and

is an identified recreational resource, with a boat ramp listed at Morgans Bridge at this northeastern boundary. Although most of the installation is drained by the Canoochee River Watershed, part of the northeast quadrant drains directly into the Ogeechee River. The southwest quadrant is drained by Beards Creek, which is part of the Altamaha River Watershed. The southeast quadrant drains into the Laurel View River, with Peacock Creek, Raccoon Branch, and the Jerico River leaving the installation as the headwaters of this system. Two sub-watersheds have also been identified on Fort Stewart. These sub-watersheds are associated with the Canoochee River and Ogeechee River watershed systems; however, they are physically separated from the main watershed systems on Fort Stewart. Off installation, these sub-watershed systems join the main watershed systems and, for the interest of the Phase I Assessment, have been identified as sub-watersheds. The four watershed regions of the Altamaha, Canoochee, Laurel View and Ogeechee rivers, along with two sub-watersheds associated with the Canoochee River and Ogeechee River watersheds, form the regions of surface water movement off installation.

3.2.7 Vegetation

Of the 279,400 acres comprising Fort Stewart, approximately 3,383 acres are developed as cantonment area. The remainder is used for operational ranges and training areas or is held as non-operational area. Relatively small changes in elevation have significant effects on vegetation, with wetlands and hardwood bottoms in lower areas and upland and scattered hardwoods at higher elevations. Approximately 235,000 acres are forested and, of this, approximately 155,000 acres are pine forest (primarily in upland areas). Major species are longleaf pine (*Pinus palustris*), slash pine (*Pinus elliottii*), and loblolly pine (*Pinus taeda*). Approximately 70,000 acres are composed of river bottomlands and swamps. Major tree species include tupelo (*Nyssa sylvatica*), other gums (*Nyssa spp*.), water oak (*Quercus nigra*), and bald cypress (*Taxodium distichum*). An additional 30,000 acres consist of open range and training areas, characterized by grasses, shrubs, and scrub-tree (oak) growth.

3.3. Military Munitions/Release Profile

3.3.1 Potential MCOC

Based on a review of the data collected for Phase I (e.g., GIS data and site visit interviews with range and environmental office personnel), potential source areas for off-range releases were identified in Regions 1, 2A, 2B, 3A and 4. The source areas and related MCOC are detailed for all of the regions in **Table 3-2**. No MCOC sampling data was identified during the data collection and review for this Phase I. Table 3-2 includes all potential MCOC for historical ranges that utilized unidentified historical military munitions.

Table 3-2: Current and Historical MCOC

Region	Source Area	Potential MCOC
1	Kent Range (historical)	TNT, 2,4-DNT, and 2,6-DNT
2A	Firing points, impact areas and training areas (current and historical)	TNT, HMX, PETN, RDX, 2,4-DNT, 2,6-DNT, WP, lead, antimony, copper, zinc, tungsten, and perchlorate
2B	Impact areas (historical)	TNT, HMX, PETN, RDX, 2,4-DNT, 2,6-DNT, WP, lead, antimony, copper, zinc and tungsten
3A	Firing points, impact areas and training areas (current and historical)	TNT, HMX, PETN, RDX, 2,4-DNT, 2,6-DNT, WP, lead, antimony, copper, zinc, tungsten, and perchlorate
3B	There were no current or historical MCOC sources found in this region.	N/A
4	Firing points, impact areas and training areas (current and historical)	TNT, HMX, PETN, RDX, 2,4-DNT, 2,6-DNT, WP, lead, antimony, copper, zinc, tungsten, and perchlorate

N/A – not applicable
TNT – trinitrotoluene
DNT – dinitrotoluene
WP – white phosphorus
PETN – pentaerythritol tetranitrate
HMX – cyclotetramethylenetranitramine
RDX – cyclotrimethylenetranitramine

3.3.2 Release Mechanisms/Migration Pathways

Surface water moving off range provides a possible migration pathway for MCOC. The four watershed regions of the Altamaha, Canoochee, Ogeechee, and Laurel View rivers, along with two sub-watersheds associated with the Canoochee River and Ogeechee River, form the regions of possible MCOC migration off range via surface water and sediments, as described in Section 3.2.6 and shown in **Figure 3-2**. Receptor interactions beyond the 15-mile downstream limit were not considered based on guidance developed by the USEPA for the CERCLA preliminary assessments. Therefore, potential source areas within 15 miles of a surface water exit point are considered to have complete exposure pathways via surface water. Potential sources outside the 15-mile limit to a surface water exit on Fort Stewart are not considered to have receptors present.

Groundwater in the surficial aquifer has also been identified as a potential pathway for MCOC to migrate off range. The Floridan aquifer has been identified as being physically separate from the surficial aquifer (Section 3.2.4) and, therefore, was not evaluated as a potential pathway. As discussed in Section 3.2.4, the surrounding community's municipal water system draws from the surficial aquifer for potable and non-potable water. It is unlikely for groundwater to reach potential receptors at distances greater than four miles. Therefore, source areas farther than four miles from the boundary of Fort Stewart are not considered to have complete exposure pathways via groundwater. The groundwater directional flow (Section 3.2.4) is believed to follow the pattern of the surface water. Based on the identified potential source areas and expected direction of groundwater flow, areas within four miles of a potential source where potential groundwater receptors could be located are shown on **Figure 3-3**.

Region 1 contains potential MCOC from historical military munitions use. Overland flow moving westward towards the Altamaha Watershed has the potential to carry MCOC off range to potential human and ecological receptors. Human and ecological receptors are located within four miles of the historical firing fan of the Kent Range; therefore, groundwater is considered a potential MCOC migration pathway to human and ecological receptors.

Region 2A encompasses the Canoochee River Watershed; all surface water that enters this region exits Fort Stewart at one point at the eastern boundary confluence of the Ogeechee River. All Region 2A ranges located more than 15 miles from the confluence of the Ogeechee River are considered incomplete for exposure pathways via surface water. A 15-mile buffer from the point at which the Canoochee River leaves the boundary of Fort Stewart is shown on **Figure 3-2**. Any sources of MCOC west of this buffer have no potential receptors. Source areas east of the buffer have the potential to carry MCOC off range to human receptors. Human and ecological receptors are present within four miles of current and historical potential MCOC source areas in Region 2A; therefore, groundwater is also a potential migration pathway to human and ecological receptors (**Figure 3-3)**.

Region 2B contains potential MCOC from historical use. Surface water in this area flows south/southeast off range, then northeast back on range. The surface water flow off range has the potential to carry MCOC off range to human receptors. Human receptors are located within four miles of the historical source area of potential MCOC in Region 2B; therefore, groundwater is a potential MCOC migration pathway to human receptors (**Figure 3-3)**.

Region 3A contains potential MCOC from current and historical military munitions use. Overland flow moving southeast towards the Laurel View River Watershed has the potential to carry MCOC off range to potential human receptors. Human receptors are located within four miles of the current and historical source areas; therefore, groundwater is considered a potential MCOC migration pathway to human receptors.

Region 3B has no sources of MCOC; therefore, no potential migration pathways exist.

Region 4 contains potential MCOC from current and historical military munitions use. Overland flow moving northeast towards the Ogeechee River has the potential to carry MCOC off range to potential human receptors who recreationally utilize this water system. Human receptors are located within four miles of the current and historical source areas; therefore, groundwater is considered a potential MCOC migration pathway to human receptors.

Table 3-3 provides an overview of potential MCOC source areas, surface water and groundwater pathways, and presence or absence of potential receptors by region.

Table 3-3: Release Mechanisms/Migration Pathways

Region	MCOC Present	Surface Water Pathway	Groundwater Pathway	Receptors Present Within 15 Miles/4 Miles
1	Yes	Yes	Yes	Yes/Yes
2A	Yes	Yes	Yes	Yes/Yes
2B	Yes	Yes	Yes	Yes/Yes
3A	Yes	Yes	Yes	Yes/Yes
3B	No	N/A	N/A	N/A
4	Yes	Yes	Yes	Yes/Yes

3.4 Land Use and Human Receptor Profile

3.4.1 Current Land Use

The area surrounding the installation is mixed use and contains residential, commercial, and industrial activities. The Ogeechee River, which forms the northeastern boundary, is utilized for recreational activities, such as boating and fishing.

3.4.2 Adjoining Areas of Concern

There are no adjoining areas that potentially could contribute MCOC onto Fort Stewart

3.4.3 Current Human Receptors

The human receptors include residents (in on-installation housing and in nearby off-installation residential areas), workers (on-installation and in off-installation areas surrounding the installation), and fishermen utilizing on-installation or nearby off-installation areas for recreational purposes. The pathways to these receptors are detailed above. The human receptor areas include residential and commercial/industrial communities within four miles of current and historical source areas who utilize groundwater from the surficial aquifer or who may utilize groundwater from the surficial aquifer in the future. Human receptors also include recreational users who utilize surface water from the designated watershed systems within a 15-mile radius of current and historical source areas. Activities outside of Fort Stewart include recreational, commercial, residential, and industrial uses. Recreational activities occurring outside of Fort Stewart include boating on and fishing and swimming in the Ogeechee River.

3.4.4 Resource Use Location

Fort Stewart maintains its own potable water distribution system. There are 31 groundwater wells located on the installation (5). Five of these wells are used to supply water to the distribution system that serves the cantonment area. These wells obtain water from the lower Floridan aquifer. There are four other active groundwater supply wells located elsewhere on the installation that serve as individual water supplies. The remaining 22 wells are distributed across the post. Of these, two wells are on standby, and the remaining 20 wells are no longer in use.

Fort Stewart also provides recreational opportunities for anglers, with over 20 ponds and lakes totaling almost 500 acres of fishable waters, in addition to 260 miles of streams and rivers. The Ogeechee River, which forms part of the northeastern boundary of Fort Stewart, is a known recreationally utilized river.

3.5 Ecological Receptor Profile

Fort Stewart acts as a home to many threatened, endangered or special concern plants and animals. Based on their risk of extirpation or decline, 17 wildlife species and nine plant species that occur or may occur at Fort Stewart have been designated a special status at the federal and/or state level (**Table 3-4**) (1).

Table 3-4: Threatened and Endangered Species (6)

Species	Common Name	Federal Status*	State Status*	Global Rank*	State Rank*
Insect					
Cordulegaster sayi	Say's spiketail	SC		G1G2	S1

Species	Common Name	Federal Status*	State Status*	Global Rank*	State Rank*
	dragonfly				
Birds					
Aimophila aestivalis	Bachman's sparrow	SC	R	G3	S3
Alienates forficatus	swallow-tailed kite		R		
Falco peregrinus	Peregrin falcon		E		
Falco sparveniuspaulus	southeastern American kestrel	SC			
Haliaeetus leucocephalus l.	southern bald eagle	T	E	G	S
Mycteria americana	wood stork	E	E	G	S
Picoides borealis	red-cockaded woodpecker	E	E	G2	S2
Sterna antillarum	least tern		R		
Reptiles					
Drymarchon corais couperi	eastern indigo snake	T	T	G4T3	S3
Gopherus polyphemus	gopher tortoise	SC	T	G2	S3
Heterodon simus	southern hognose snake	SC		G4G5	S3
Pituophis melanoleucus mugitus	Florida pine snake	SC		G5	S3
Amphibians					
Ambystoma cingulatum	flatwoods salamander	T	R	G4	S3
Notophthalmus perstriatus	striped newt	SC	R	G3	S2
Rana capito capito	Carolina gopher frog	SC		G4	S3
Fish					
Acipenser brevirostrum	shortnose sturgeon	E	E	G2	S2

Species	Common Name	Federal Status*	State Status*	Global Rank*	State Rank*
Plants					
Agromonia incisa	incised groovebur	SC		G3	S2S3
Balduina atropurpurea	purple honeycomb head	SC	R	G2G3	S2
Bumelia thornei	swamp buckthorn	SC	E	G1Q	S1
Elliottia racemosa	Georgia plume		T	G2G3	S2S3
Fothergilla gardenii	dwarf witch-alder		T	G4	S2
Litsea aestivalis	pondspice	SC	T	G4G5	S2
Physotegia leptophylla	narrowleaf obedient plant		T	G4G5	SH
Sarracenia minor	hooded pitcher plant		U	G4G5	S4
Stewartia malacodendron	silky camellia		R	G4	S2

* E - Endangered (federal and state code)
T - Threatened (federal and state code)
SC - Species of Concern (federal)
R - Rare (state)
S1 or G1 - Critically imperiled because of extreme rarity
S2 or G2 - Imperiled because of rarity
S3 or G3 - Either very rare and local throughout its range or found locally, even abundantly, in a restricted range
S4 or G4 - Apparently secure, although it may be quite rare in parts of its range, especially at the periphery
S5 or G5 - Demonstrably secure, although it may be rare in parts of its range, especially at the periphery

According to the Installation's Department of Public Works, Environmental and Natural Resources Division, six federally listed threatened or endangered species are known to occur on Fort Stewart: the southern bald eagle (*Haliaeetus leucocephalus*), eastern indigo snake (*Drymarchon coralis couperi*), flatwoods salamander (*Ambystoma cingulatum)*, wood stork (*Mycteria Americana*), red cockaded woodpecker (*Picoides borealis*) and the shortnose sturgeon (*Acipenser brevirostrum)*.

The southern bald eagle, federally listed as threatened, is located on the western side of the installation. Warnings regarding this animal are primarily geared to the hunters and fishermen who use the installations land for recreational purposes. Adverse impacts on the species have been not been noted.

The eastern indigo snake, federally listed as threatened, is uncommon and locally distributed on the installation. The majority of eastern indigo snake observations at Fort Stewart have been at gopher tortoise burrows in sandhills. The installation's four known eastern indigo snake populations are associated with sandhills along the Canoochee River, the Ogeechee River, and Beards Creek (1).

The shortnose sturgeon, federally listed as endangered, has been seen off installation south of the confluence of the Canoochee and Ogeechee rivers. Adverse impacts on the species have been not been noted.

The flatwoods salamander, federally listed as threatened, habitat is widespread on the installation and includes many areas that are not heavily used or impacted by mechanized training activities, namely wetlands.

The red cockaded woodpecker, federally listed as endangered, is habitat specific. There are 303 sites identified as red cockaded woodpecker clusters on Fort Stewart.

The wood stork, federally listed as endangered, is not known to nest on Fort Stewart. The wood stork is know to occasionally forage in the wetlands present on Fort Stewart

3.5.1 Sensitive Environments

Several sensitive environments are present on or around the area of Fort Stewart, excluding the cantonment area: the Ogeechee River (which is listed as a potential candidate to be named as a federally designated National Wild and Scenic River); the Canoochee River and its tributaries; habitats for six federally listed threatened or endangered species; and approximately 90,000 acres of wetlands.

3.5.2 Habitat Type(s)

Approximately 3,383 acres of Fort Stewart's 279,400 acres comprise the cantonment area. The remaining area is used for operational ranges and training areas or is held for non-training related activities.

Approximately 225,000 acres is forested (approximately 80 percent of the land area). Pine forest, with major species including the slash pine, loblolly pine, and the long-leaf pine, comprises 66 percent of the forested land. River bottomlands and swamps, whose major species include tupelo, gum, water oak, and bald cypress trees, comprise 34 percent of the forested land. Approximately 90,000 acres of the forested areas are designated wetlands. Phase I evaluates off-range areas that are considered sensitive ecological habitats and the species that live in these habitats. These include wetlands and associated streams, the Ogeechee River, and threatened and endangered habitats.

3.5.3 Ecological Receptors

The southern bald eagle, eastern indigo snake, flatwoods salamander, wood stork, and the shortnose sturgeon have been identified as potential ecological receptors. The southern bald eagle has been identified near the western edge of the installation. The potential exists for the bald eagle to forage off range in areas of the Altamaha Watershed, where the potential exists for MCOC to be carried off range through groundwater and surface water. The eastern indigo snake habitat has been identified in areas in and extending off-installation in the area of Regions 1, 2A, and 4, in the sandhills of the Canoochee River, the Ogeechee River, and Beards Creek, and is known to forage in the margins of wetlands areas. The wood stork is known to occasionally forage in the wetlands present on Fort Stewart and extending off-installation in the vicinity of Region 2A and 3A. The flatwoods salamander has known habitat in wetland

areas which extends off-installation in the area of Region 2A. The potential exist for MCOC contact to occur in these wetland areas which provided foraging area and habitat for the eastern indigo snake, flatwoods salamander, and woodstork from overland flow from upgradient operational ranges and groundwater discharge into these wetlands during times of high rainfall in Region's 1, 3 and 4. The shortnose sturgeon has been identified immediately off installation at the confluence of the Canoochee and Ogeechee rivers outside of Regions 2A and 4. Potential MCOC from current and historical sources in Regions 2A and 4 may be carried in overland flow or via surficial groundwater discharge to this off-post location.

3.6 Relationship of Potential MCOC Sources to Habitat and Potential Off-Range Receptors

There are several distinct watersheds present at Fort Stewart. The area off installation to the west of Region 1 falls within the foraging area of the threatened southern bald eagle and the threatened eastern indigo snake. Potential MCOC may interact with these ecological receptors and human receptors because of surface water/groundwater interaction as described at the end of this section.

The endangered shortnose sturgeon which has been identified directly off installation to the east of Region 2A at the confluence of the Canoochee and Ogeechee Rivers, and human recreational users of the Ogeechee River are potential receptors for interaction with MCOC that may be in Region 2A.

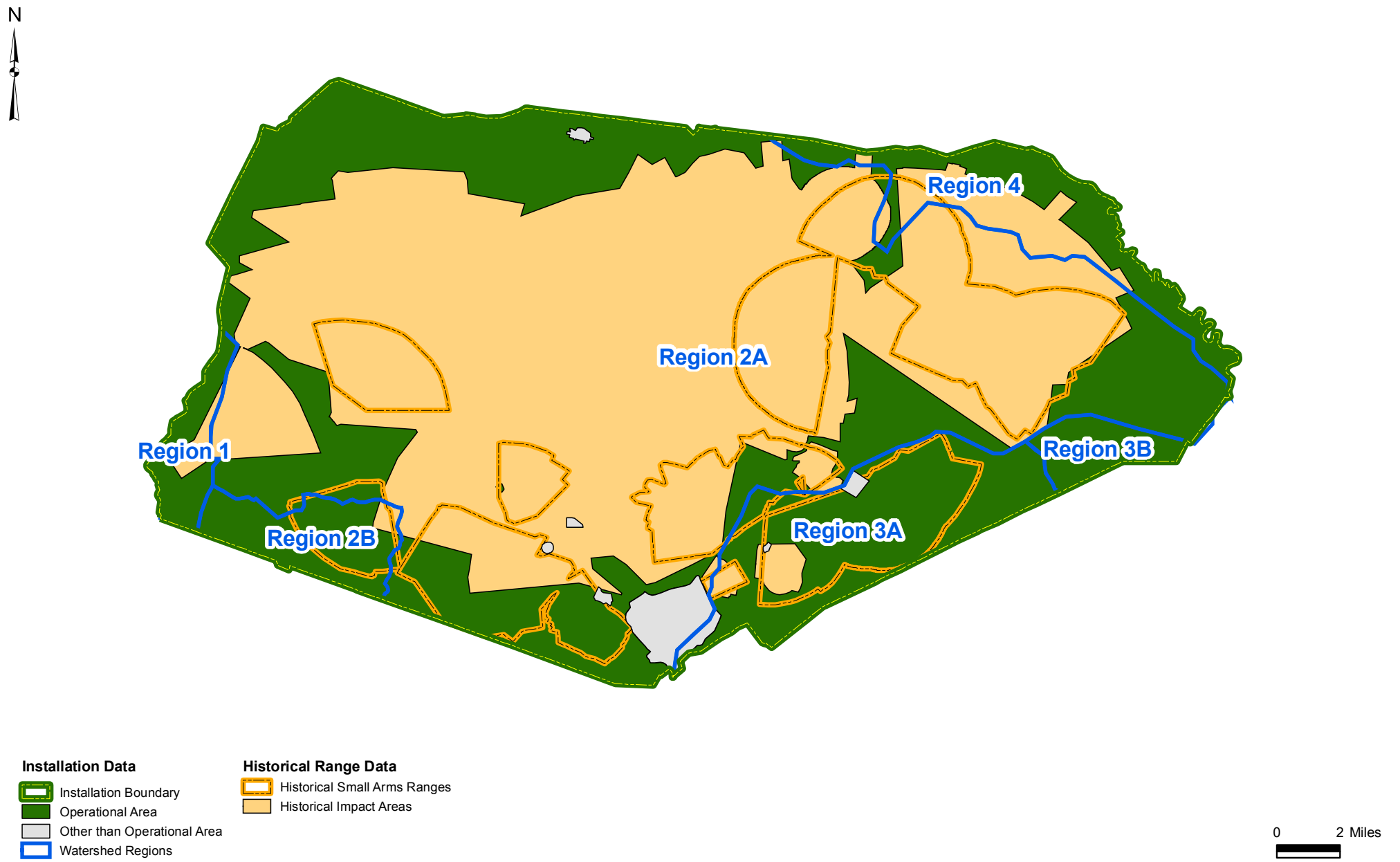
Overland flow and surface water in Region 2B have the ability to carry potential MCOC from historical impact areas and small arms firing points off installation to human receptors because of surface water/groundwater interaction as described at the end of this section.

Overland flow and surface water from Region 3A have the ability to carry potential MCOC from current and historical firing points, impacts areas, and small arms firing points off installation. Potential human receptors The endangered woodstork is known to forage in wetlands which extend off-installation located in the area directly down gradient from Region 3A. Habitat suitable for the threatened flatwoods salamander also exists and extends in the area off-installation down gradient of Region 3A.

No potential MCOC exist in Region 3B; therefore interaction with human and/or ecological receptors is not expected.

Overland flow and surface water draining Region 4 have the ability to carry potential MCOC off installation to the Ogeechee River. The Ogeechee River is known as a recreationally used river with the potential for interaction with human receptors. This area on and off-installation down gradient from Region 4 is recognized as threatened eastern indigo snake habitat.

The depth to groundwater indicates that groundwater in the surficial aquifer and surface water are highly connected. The shallow groundwater flow generally follows the surface water flow, and each system provides a recharge/discharge function for the other. If transported off installation via surface water runoff or through infiltration or leaching into the groundwater, the MCOC may have the potential to reach public municipal and private domestic potable and non-potable groundwater wells to the northeast and southeast of the installation within four miles of the source areas. They may also reach the down gradient habitat of the shortnose sturgeon, woodstork, eastern indigo snake, flatwoods salamander, and the southern bald eagle as discussed previously.

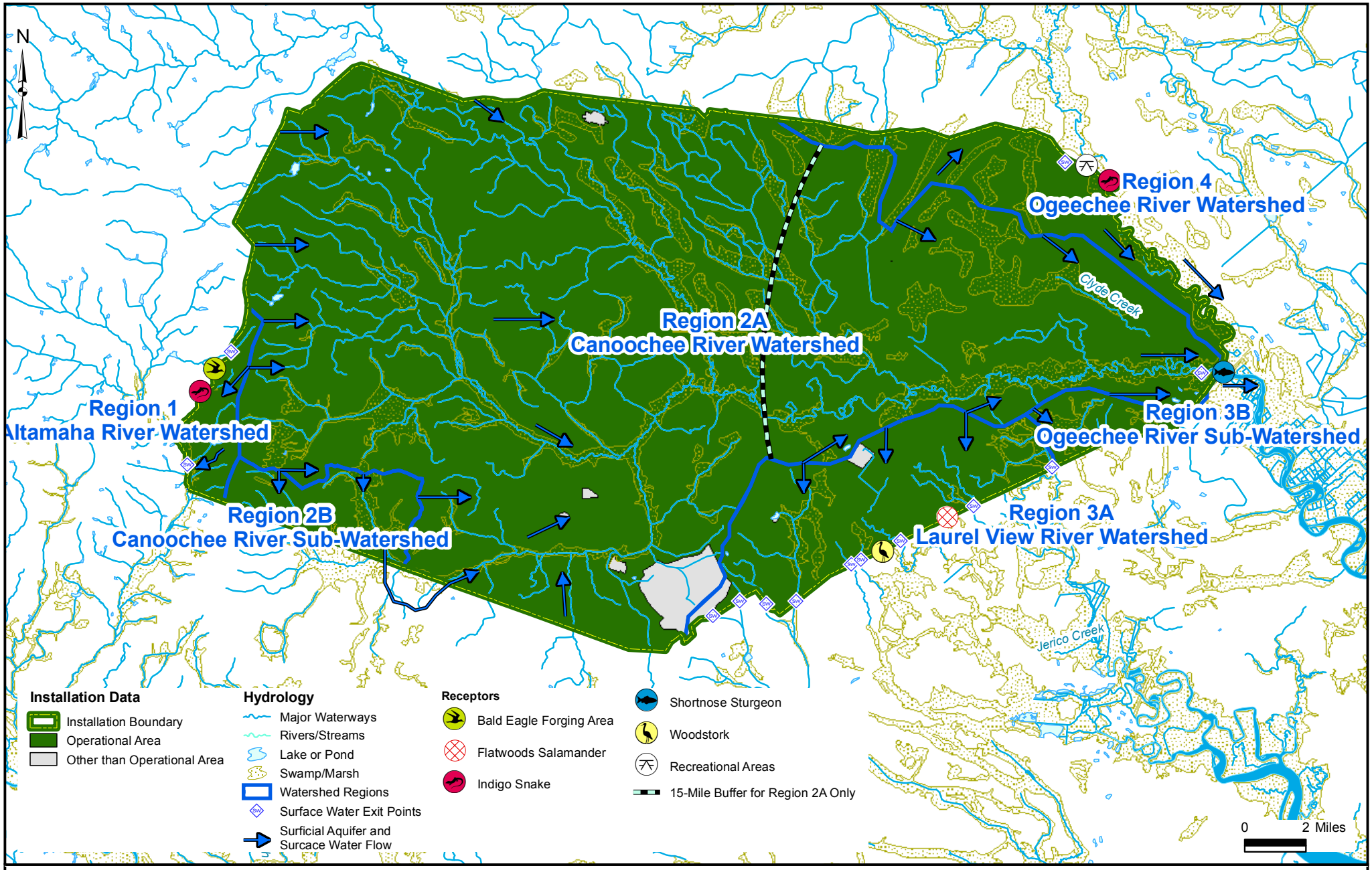


Operational Range Qualitative Assessment
Fort Stewart, GA

Figure 3-1
Historical Source Areas

Data Sources:
AEC, ARID Geo-Database 2002 & September 2005
AEC, A/I Inventory, December 1999

Date: October 2006
Prepared By: Malcolm Pirnie, Inc.
Prepared For: U.S. Army
Contract Number: W912DR-05-D-0004



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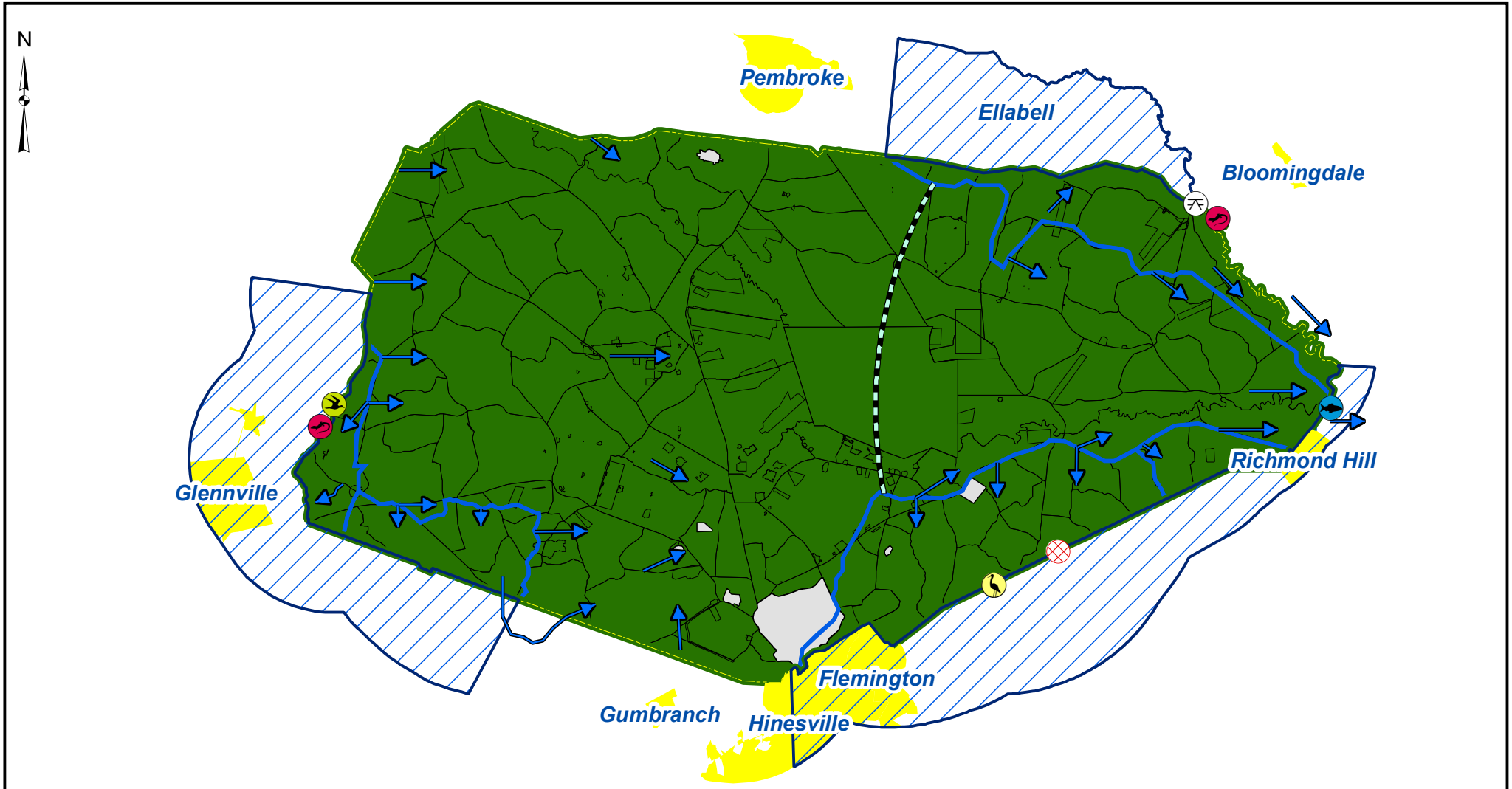
Operational Range Qualitative Assessment
Fort Stewart, GA

Figure 3-2
Surface Water Pathways

Data Sources:
AEC, ARID Geo-Database 2002 & September 2005
Fort Stewart, GA, 2006

Date: October 2006
Prepared By: Malcolm Pirnie, Inc.
Prepared For: U.S. Army
Contract Number: W912DR-05-D-0004



Operational Range Qualitative Assessment
Fort Stewart, GA

Figure 3-3
Ground Water Pathways

Data Sources:
AEC, ARID Geo-Database 2002 & September 2005
ESRI StreetMap USA, 2005
Fort Stewart, GA, 2006
Date: October 2006
Prepared By: Malcolm Pirnie, Inc.
Prepared For: U.S. Army
Contract Number: W912DR-05-D-0004

4.0 Grouping and Categorization Methods

4.1 Grouping Rationale

The September 2005 ARID-GEO data identified operational ranges within the installation boundaries. The identified operational ranges may contain many ranges, firing points, or other activities. For the purpose of the Phase I Assessment, the operational range areas could be divided into any of the following possible groups based on three CSM components: source of MCOC, migration pathway, and receptors:

- **LS**: Limited or no munitions have been used on the range.
- **MPU**: Munitions have been used on the range, but migration pathways are unlikely or incomplete.
- **MSW**: Munitions have been used on the range. A surface water migration pathway was identified, but no receptors have been identified.
- **MGW**: Munitions have been used on the range. A groundwater migration pathway was identified, but no receptors have been identified.
- **MSWGW**: Munitions have been used on the range. Groundwater and surface water migration pathways have been identified, but no receptors have been identified.
- **MSW (H/E)**: Munitions have been used on the range. The surface water source-receptor interaction is potentially complete (for human or ecological receptors).
- **MGW (H/E)**: Munitions have been used on the range. The groundwater source-receptor interaction is potentially complete (for human or ecological receptors).
- **MSWGW (H/E)**: Munitions have been used on the range. The surface water and groundwater source-receptor interactions are potentially complete (for human or ecological receptors).

A "No Off-Range Release" determination can be designated in the event that an operational range area has a source of MCOC, a pathway/release mechanism, and an identified off-range receptor. In such cases, the sampling data must indicate, based on professional judgment, that no source-receptor interaction exists (i.e., either source or off-range MCOC are not at a level which may pose an unacceptable risk to human health or the environment). In such a case, the phrase "No Release" is added to the appropriate group established above for the description of the operational range area (i.e., MSWGW (H/E) – No Release), and associated text explains the rationale for the source-receptor interaction.

4.2 Categorization Rationale

Ranges in groups MSW (H/E), MGW (H/E), and MSWGW (H/E) are designated as either Referred or Inconclusive, depending on the availability of actual sampling data. If one or more MCOC is present in off-range media (e.g., groundwater, sediment, surface water, or soil) as confirmed through compelling sampling data, then the ranges in any of these three groups (MSW (H/E), MGW (H/E), and MSWGW (H/E)) will be placed into the Referred category. If sampling data is unavailable or insufficient to assess definitive impacts, then the ranges in these groups will be placed into the Inconclusive category. Ranges in the LS, MPU, MSW, MGW, and MSWGW groups are

automatically designated as Unlikely because at least one CSM component (source of MCOC, pathway, or receptor) is absent. The categorizations are summarized as follows:

- **Referred – Refer to Appropriate Cleanup Program:** ranges with compelling evidence (e.g., sampling data) to indicate the presence of an off-range release that potentially poses an unacceptable risk to human health or the environment.
- **Inconclusive – Phase II Quantitative Assessment Required:** ranges where existing information either is insufficient to make a source-receptor interaction determination or indicates the potential for such interaction to be occurring.
- **Unlikely – Five-Year Review[4]:** ranges where, based upon a review of readily available information, there is sufficient evidence to show that there are no known releases or source-receptor interactions that could present an unacceptable risk to human health or the environment based on a review of the information available.

[4] All operational ranges must be periodically re-evaluated to determine if there is a release or substantial threat of release of MCOC from an operational range to an off-range area. Range groups categorized as Unlikely are to be re-evaluated at least every five years. Re-evaluation may occur sooner if significant changes (e.g., changes in range operations, site conditions, and regulatory changes) occur that affect determinations made during the Phase I Assessment.

5.0 Conceptual Site Model Narrative

The operational ranges at Fort Stewart have been divided into regions based on the various watersheds that are present. These regions provided naturally occurring geographical areas to assist with the descriptions of the operational ranges. In order to describe the relationships among the operational ranges, potential MCOC and potential receptors, the operational ranges at Fort Stewart have been placed into four groups: Group MSWGW (H/E), Group MSW (H/E), Group LS, and Group MSWGW. The rationale for placing the ranges in these groups is discussed in the sections below and is based on the source of potential MCOC, exposure pathways, and potential receptors. This information will determine if there is a potential source-receptor interaction for each relevant pathway identified, which will be used to determine the appropriate categorization for each group. **Figure 5-1** depicts the range groupings which are described below. **Figure 5-2** depicts the range groupings that only have potential MCOC present from current and historical military munitions use as described below. The potential source-receptor interactions based on the CSM components described below and depicted on **Figure 5-3** for Group MSWGW (H/E), **Figure 5-4** for Group MSW (H/E), **Figure 5-5 for** Group LS, and **Figures 5-6** for Group MSWGW.

5.1 Group MSWGW (H/E)

5.1.1 Primary Source and MCOC

Two main types of potential MCOC sources were identified in Group MSWGW (H/E) ranges: firing points and impact areas. Impact areas were identified at two operational ranges, and firing points were identified at nine current operational ranges. Numerous historical range fans, which include firing points and impact areas, overlap 31 current operational ranges. Military munitions currently used on Group MSWGW (H/E) operational ranges include small to large caliber military munitions, rockets, bombs, HE rounds, and grenades.

5.1.2 Source Media

Primary source media identified at the ranges in Group MSWGW (H/E) include soil, surface water, and sediment. MCOC can deposit in surface water and sediment by direct firing. High order detonations, which constitute most munitions detonations, generate undetectable to barely detectable and diffuse surface residuals.

Because there is no direct contact of MCOC with groundwater, shallow groundwater is considered a secondary source where potential MCOC can leach/infiltrate into shallow groundwater from soil, sediment, and surface water. However, the possibility exists for high order detonations to create craters in the surface soil that may expose groundwater. If this occurs, any low order detonations in and around these types of craters may expose the groundwater to direct contact with potential MCOC. Surface water and sediment can also be secondary sources by receiving surface water runoff or erosion from soil source areas or by groundwater discharge at the surface (i.e., springs). The Floridan aquifer is not anticipated to be affected by MCOC because of its upward pressure gradient, its separation from the shallow aquifer near the surface, and the distance between any sources of MCOC and the recharge area.

5.1.3 Pathway Analysis

Migration mechanisms for potential MCOC in soil at the ranges in Group MSWGW (H/E) include leaching and infiltrating through the soil profile to groundwater and surface erosion and subsequent runoff to sediment and surface water. At Fort Stewart, the high groundwater table produces equally

high interaction between surface water and shallow groundwater. As a result, MCOC have the potential to migrate from surface water to shallow groundwater and from shallow groundwater to surface water. MCOC in the surface water and shallow groundwater systems are subject to plant and animal uptake and human ingestion and/or dermal absorption. This groundwater pathway only exists for the surficial aquifer and not for the Floridan aquifer, because of its upward pressure gradient and physical separation from the surficial aquifer.

5.1.4 Potential Source-Human Interaction Pathway Analysis

The Ogeechee River is a known fishing and recreation area. Surface water and sediment in these recreational areas are potential pathways for human receptors via dermal contact or accidental ingestion. **Figure 3-2** depicts the areas for potential recreational surface water receptors in the vicinity of Fort Stewart. In addition, fish are known to bioaccumulate certain MCOC, including metals. There is no reported evidence of bioaccumulation in or around Fort Stewart; however, such bioaccumulation from exposure either on range or off range is possible. Therefore, consumption of fish is a potential pathway to humans. Groundwater in the surficial aquifer has also been identified as a potential pathway for MCOC to migrate off range. The Floridan aquifer has been identified as being physically separate from the surficial aquifer and not a groundwater pathway. As discussed in Section 3.2.6, potential human receptors utilizing the surficial aquifer for potable water within four miles of range source areas have been identified. **Figure 3-3** depicts the areas for potential groundwater receptors in the vicinity of Fort Stewart.

5.1.5 Potential Source-Ecological Interaction Pathway Analysis

The migration of potential MCOC off range from the sources identified at the ranges in Group MSWGW (H/E) through surface water and groundwater pathways has the potential to affect sensitive environments (e.g., wetland habitats). The confluence of the Canoochee and Ogeechee rivers immediately off range has been identified as a habitat of the federally endangered shortnose sturgeon. The area off installation to the west of Region 1 falls within the foraging area of the threatened southern bald eagle. The migration of MCOC off range through surface water and groundwater pathways has the potential to affect these sensitive off-range habitats.

5.2 Group MSW (H/E)

5.2.1 Primary Source and MCOC

Two main types of potential MCOC sources were identified on Group MSW (H/E) ranges: firing points and impact areas. Impact areas were identified at two operational ranges, and firing points were identified at 20 current operational ranges. Numerous historical range fans, which included firing points and impact areas, overlap 28 current operational ranges. Military munitions currently used on Group MSW (H/E) ranges include small to large caliber military munitions, rockets, bombs, HE rounds, and grenades.

5.2.2 Source Media

Primary source media identified at the ranges in Group MSW (H/E) include soil, surface water, and sediment. MCOC can deposit in surface water and sediment by direct firing. High order detonations, which constitute most munitions detonations, generate undetectable to barely detectable and diffuse surface residuals. Shallow groundwater is considered a secondary source where potential MCOC can leach/infiltrate into shallow groundwater from soil, sediment, and surface water. Surface water and sediment can also be secondary sources by receiving surface water runoff or erosion from soil source

areas or by groundwater discharge at the surface (i.e., spring) and surface water recharge of groundwater.

5.2.3 Pathway Analysis

At the ranges in Group MSW (H/E), surface water flow and sediment transport provide a direct migration mechanism for the surface water system. MCOC in the surface water system is subject to plant and animal uptake and human ingestion and/or dermal absorption. At Fort Stewart, the high groundwater table produces equally high interaction between surface water and shallow groundwater. As a result, MCOC have the potential to migrate from surface water to shallow groundwater and from shallow groundwater to surface water. MCOC in the surface water and shallow groundwater systems are subject to plant and animal uptake and human ingestion and/or dermal absorption. This groundwater pathway only exists for the surficial aquifer and not for the Floridan aquifer, because of its upward pressure gradient and physical separation from the surficial aquifer. Overland flow and range runoff offer another transport mechanism for MCOC to reach surface water from soil.

5.2.4 Potential Source- Human Interaction Pathway Analysis

Surface water and groundwater present potential MCOC migratory pathways as discussed in the preceding section. However, no receptors for groundwater were identified within four miles of the potential sources at the ranges in Group MSW (H/E). Therefore, only surface water and sediment in the identified recreational areas are considered complete pathways for human receptors via dermal contact or accidental ingestion

5.2.5 Potential Source Ecological Interaction Pathway Analysis

The confluence of the Canoochee and Ogeechee rivers immediately off range has been identified as a habitat of the endangered shortnose sturgeon. The migration of MCOC off range through surface water has the potential to affect this sensitive off-range habitat.

5.3 Group LS

5.3.1. Primary Source and MCOC

The operational ranges in Group LS were limited to light training/maneuver areas and had limited or no current/historical sources of MCOC identified during Phase I.

5.3.2 Source Media

The operational ranges in Group LS had limited or no sources identified during the assessment; therefore, source media is not discussed in this section.

5.3.3 Pathway Analysis

Operational ranges in Group LS had limited or no sources identified during the assessment; therefore, potential pathways were not evaluated.

5.3.4 Potential Source-Human Interaction Pathway Analysis

The operational ranges in Group LS had limited or no sources identified during the assessment; therefore, potential human source-receptor interactions are not present.

5.3.5 Potential Source-Ecological Interaction Pathway Analysis

The operational ranges in Group LS had limited or no sources identified during the assessment; therefore, potential ecological source-receptor interactions are not present.

5.4 Group MSWGW

5.4.1 Primary Source and MCOC

One main type of potential MCOC source was identified on Group MSWGW ranges: firing points. Firing points were identified at 61 current operational ranges. Numerous historical range fans overlap 154 current operational ranges. Military munitions currently used on Group MSWGW ranges include small to large caliber military munitions, rockets, bombs, HE rounds, and grenades.

5.4.2. Source Media

Primary source media identified at the ranges in Group MSWGW include soil, surface water, and sediment. MCOC can deposit in surface water and sediment by direct firing. High order detonations, which constitute most munitions detonations, generate undetectable to barely detectable and diffuse surface residuals. However, the possibility exists for high order detonations to create craters in the surface soil that may expose groundwater. If this occurs, any low order detonations in and around these types of craters may expose the groundwater to direct contact with potential MCOC. Surface water and sediment can also be secondary sources by receiving surface water runoff or erosion from soil source areas or by groundwater discharge at the surface (i.e., spring). Because of the physical separation and the upward pressure gradient, the Floridan aquifer is not anticipated to be affected by MCOC.

5.4.3 Pathway Analysis

Migration mechanisms for potential MCOC in soil at the ranges in Group MSWGW include leaching and infiltrating through the soil profile to groundwater and surface erosion and subsequent runoff to sediment and surface water. At Fort Stewart, the high groundwater table produces equally high interaction between surface water and shallow groundwater. As a result, MCOC has the potential to migrate from surface water to shallow groundwater and from shallow groundwater to surface water. MCOC in the surface water and shallow groundwater systems are subject to plant and animal uptake and human ingestion and/or dermal absorption. This groundwater pathway only exists for the surficial aquifer and not the Floridan aquifer, due to its upward pressure gradient and physical separation from the surficial aquifer.

5.4.4 Potential Source-Human Interaction Pathway Analysis

Surface water and groundwater present a potential MCOC migratory pathway as discussed for Group MSWGW (H/E). However, due to the size of Fort Stewart (279,400 acres), the potential sources at the ranges in Group MSWGW were considered to be too distant for possible contact by receptors because the distance from these sources to off-range points of exit is greater than 15 miles for surface water and greater than four miles for groundwater. Receptor interactions beyond the 15-mile downstream limit were not considered based on guidance developed by the USEPA for CERCLA preliminary assessments. Therefore, MCOC is not expected to reach off-range receptors, including recreational users of the Ogeechee River and groundwater users in the vicinity of Fort Stewart.

5.4.5 Potential Source-Ecological Interaction Pathway Analysis

Surface water and groundwater present a potential MCOC migratory pathway as discussed previously. However, the distance from these sources to off-range points of exit is greater than 15

miles for surface water and greater than four miles for groundwater. Receptor interactions beyond the 15-mile downstream limit were not considered based on guidance developed by the USEPA for the CERCLA preliminary assessments. Therefore, MCOC is not expected to migrate to sensitive off-range habitats.

5.5 Data Uncertainty

Private domestic groundwater wells were identified during the site visit; however, a complete well survey has not been identified for the region surrounding Fort Stewart. The Liberty County Environmental Health Department stated that well permits are required for the drilling of private groundwater wells; however, no restriction on well depth exists and permits are rarely requested. There is no regulation preventing shallow groundwater wells from being used for human consumption/potable water source. The percentage of the population within a four mile radius of the Fort Stewart source areas utilizing shallow groundwater from the surficial aquifer as potable water source is unknown.

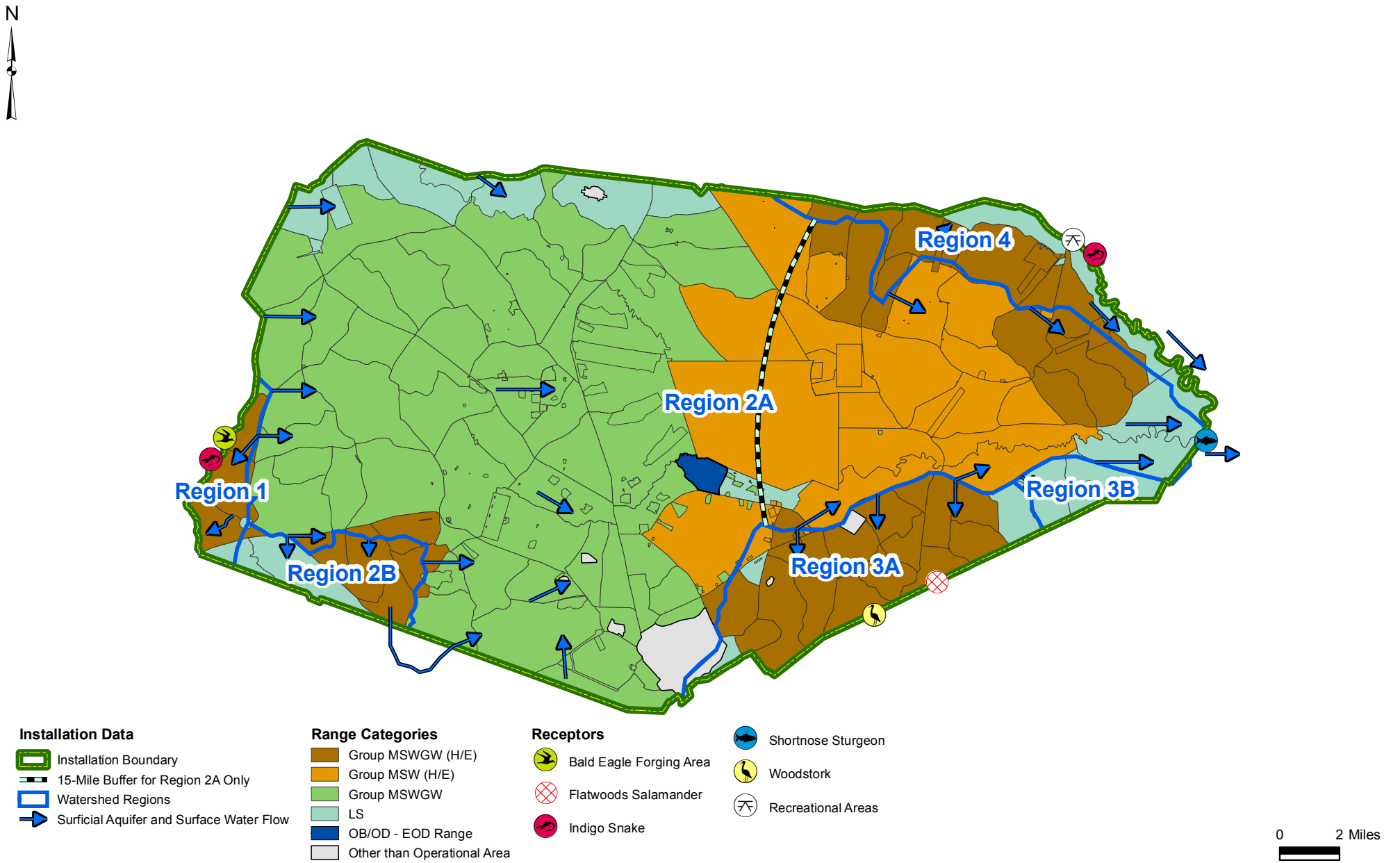
The reported confining unit vertical hydraulic conductivities are based on available data from regional studies encompassing Florida, coastal Georgia, and South Carolina. The values represent core permeameter data from samples collected in adjacent counties (e.g., Glynn County) and may not reflect actual conditions at Fort Stewart. In addition, core permeameter results are indicative of matrix permeability and do not take into account secondary permeabilities.

The RFMSS data utilized for the Phase I Assessment was tabulated from 1 June 2001 to 23 February 2006. Military munitions use before these dates have not been recorded. According to interviews with Fort Stewart Range Control, military munitions use documented in RFMSS only pertained to ranges designated as "firing ranges." Records regarding simulated military munitions use on ranges are designated as "other ranges" (typically maneuver and training areas), and records are kept for total installation usage not individual operational range usage. From 2003 to 2005, approximately 30,000 rounds of simulator military munitions and smoke grenades were used throughout Fort Stewart on maneuver and training areas. This quantity cannot be attributed to individual ranges. Simulator military munitions and smoke grenades may contain perchlorate.

Table 5-1 displays the breakdown of groups occurring in each region as displayed on **Figure 5-1**

Table 5-1: Summary of the Conceptual Site Model Components

Group Identification	Primary Sources	Primary MCOC	Source Media	Release Mechanisms	Exposure Media	Exposure Routes	Receptors
Group MSWGW (H/E)	Firing points and impact areas	TNT, PETN, 2,4-DNT, 2,6-DNT, RDX, HMX, WP, perchlorate, lead, antimony, copper, zinc, and tungsten	Soil, surface water, sediment, and groundwater	Leaching, infiltration, erosion/runoff, plant and animal uptake, recharge/discharge groundwater and surface water	Surface water/sediment, food chain and groundwater	Ingestion and dermal absorption	Off-range workers, off-range residents, off-range ecological organisms
Group MSW (H/E)	Firing points and impact areas	TNT, PETN, 2,4-DNT, 2,6-DNT, RDX, HMX, WP, perchlorate, lead, antimony, copper, zinc, and tungsten	Soil, surface water, and sediment	Leaching, infiltration, erosion/runoff, plant and animal uptake	Surface water/sediment, and food chain	Ingestion and dermal absorption	Off-range workers, off-range residents, off-range ecological organisms
Group LS	Limited or no munitions use	N/A	N/A	N/A	N/A	N/A	N/A
Group MSWGW	Firing points and impact areas	TNT, PETN, 2,4-DNT, 2,6-DNT, RDX, HMX, WP, perchlorate, lead, antimony, copper, zinc, and tungsten	Soil, surface water, sediment, and groundwater	Leaching, infiltration, erosion/runoff, plant and animal uptake, and recharge/discharge groundwater and surface water	Surface water/sediment, food chain and groundwater	None	None

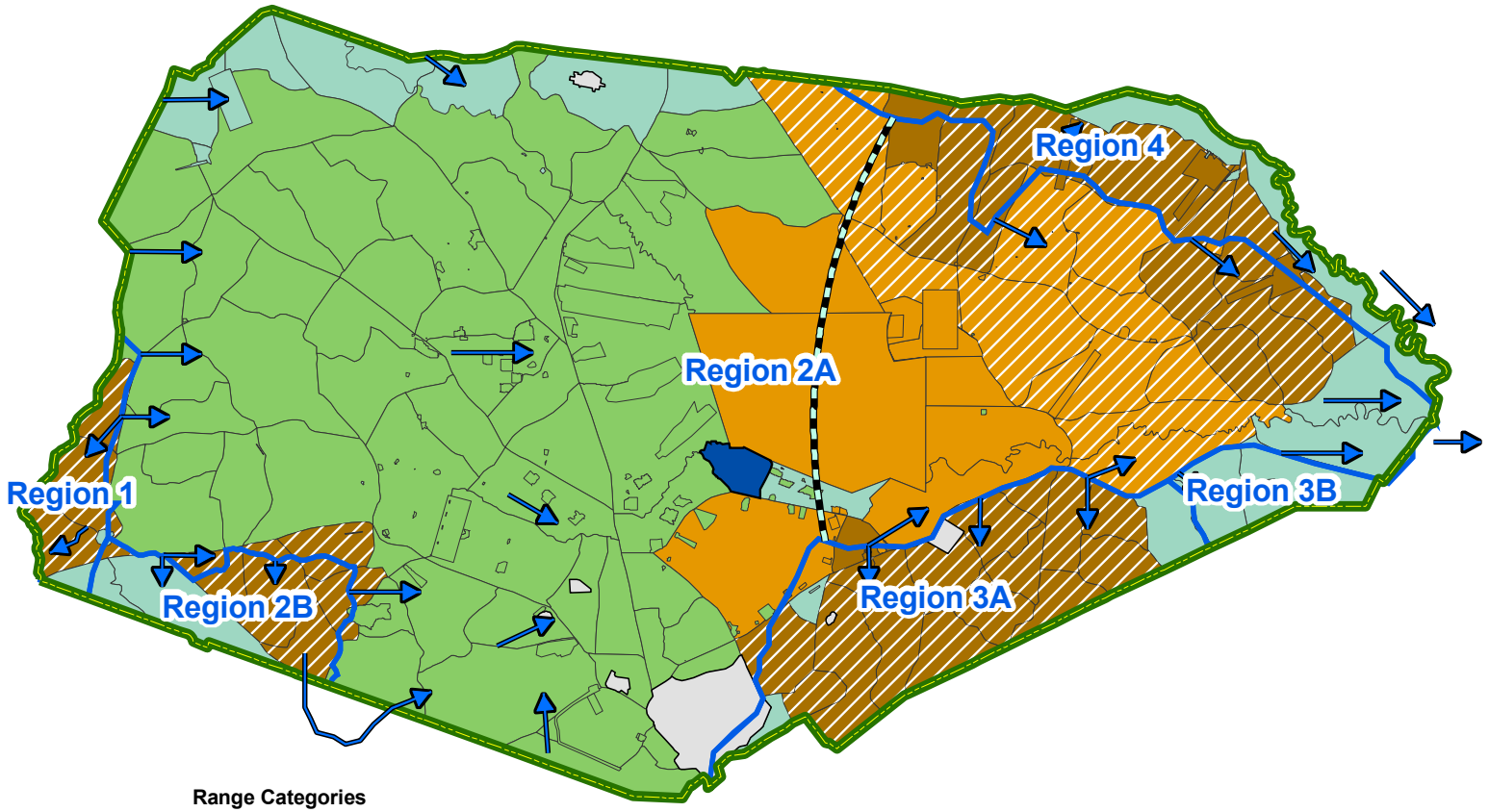


Operational Range Qualitative Assessment
Fort Stewart, GA

Figure 5-1
Individual Range Groupings

Data Sources:
AEC, ARID Geo-Database 2002 & September 2005
Fort Stewart, GA, 2006

Date: October 2006
Prepared By: Malcolm Pirnie, Inc.
Prepared For: U.S. Army
Contract Number: W912DR-05-D-0004



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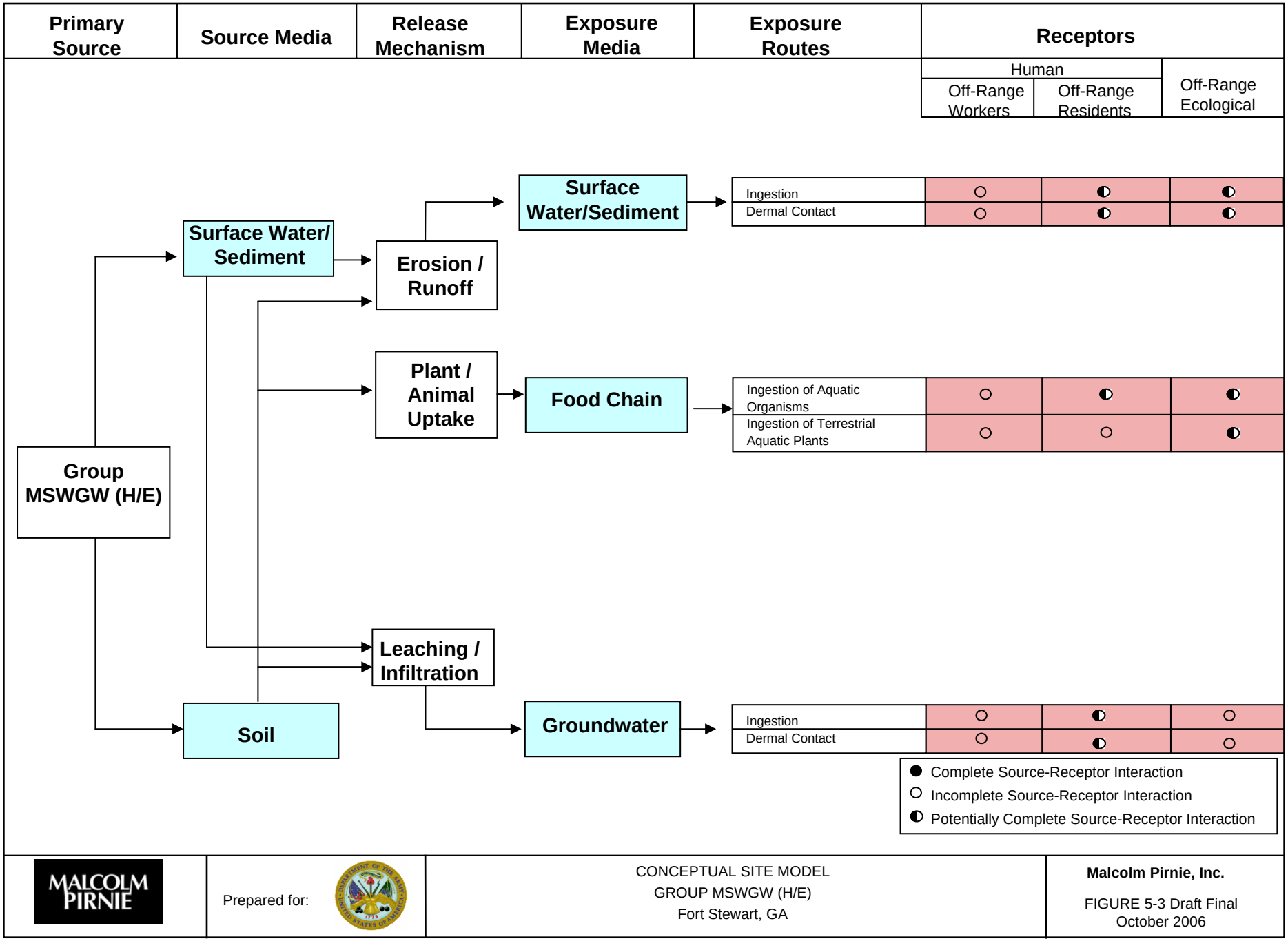
Operational Range Qualitative Assessment
Fort Stewart, GA

Figure 5-2
Range Groupings Historic vs. Current

Data Sources:
AEC, ARID Geo-Database 2002 & September 2005
Fort Stewart, GA, 2006

Date: October 2006
Prepared By: Malcolm Pirnie, Inc.
Prepared For: U.S. Army
Contract Number: W912DR-05-D-0004



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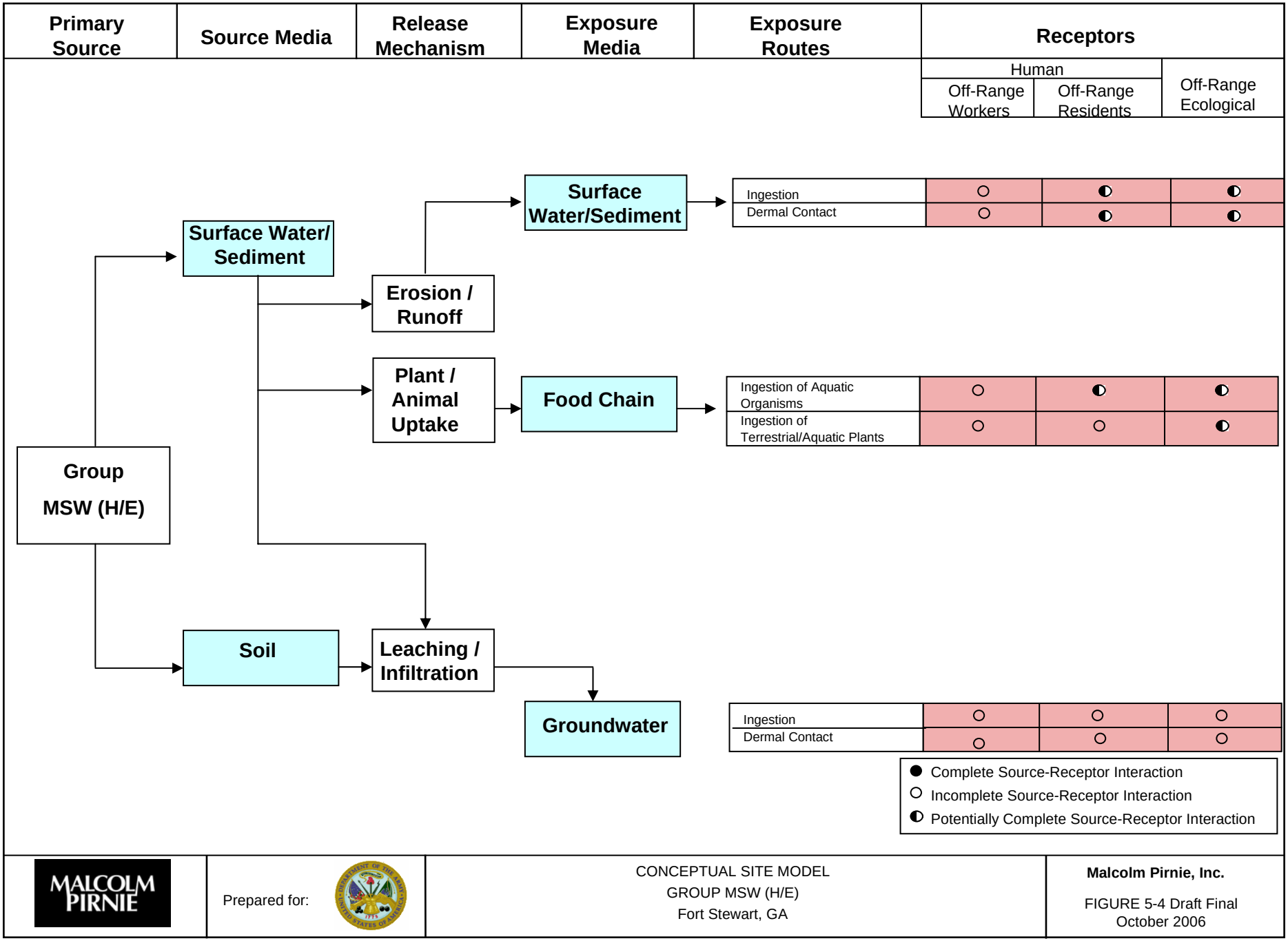
Prepared for:

CONCEPTUAL SITE MODEL
GROUP MSWGW (H/E)
Fort Stewart, GA

Malcolm Pirnie, Inc.

FIGURE 5-3 Draft Final
October 2006



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CONCEPTUAL SITE MODEL
GROUP MSW (H/E)
Fort Stewart, GA

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FIGURE 5-4 Draft Final
October 2006

Primary Source	Source Media	Release Mechanism	Exposure Media	Exposure Routes	Receptors: Human: Off-Range Workers	Receptors: Human: Off-Range Residents	Receptors: Off-Range Ecological
Group LS	Surface Water/ Sediment	Discharge/ Recharge	Surface Water/Sediment	Ingestion	○	○	○
				Dermal Contact	○	○	○
		Plant / Animal Uptake	Food Chain	Ingestion of Aquatic Organisms	○	○	○
				Ingestion of Terrestrial / Aquatic Plants	○	○	○
		Erosion / Runoff	Off-Range Surface Soil	Incidental Ingestion	○	○	○
				Dermal Absorption	○	○	○
				Inhalation (Dust)	○	○	○
		Leaching/ Infiltration					
	Soil		Groundwater	Ingestion	○	○	○
				Dermal Contact	○	○	○

● Complete Source-Receptor Interaction
○ Incomplete Source-Receptor Interaction
◐ Potentially Complete Source-Receptor Interaction

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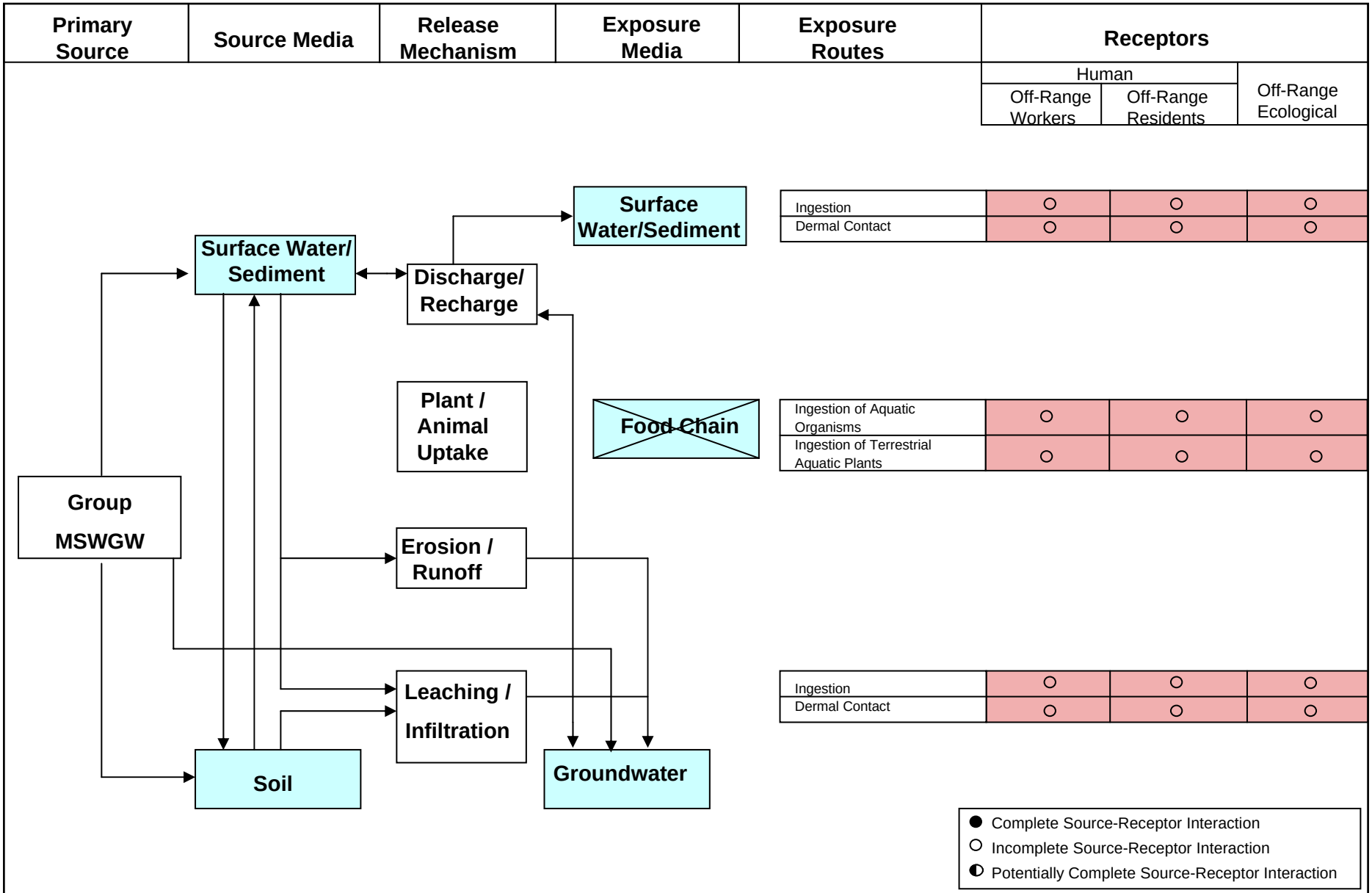
Prepared for:

CONCEPTUAL SITE MODEL
GROUP LS
Fort Stewart, GA

Malcolm Pirnie, Inc.

FIGURE 5-5 Draft Final
October 2006



MALCOLM PIRNIE

Prepared for:

CONCEPTUAL SITE MODEL
GROUP MSWGW
Fort Stewart, GA

Malcolm Pirnie, Inc.

FIGURE 5-6 Draft Final
October 2006

6.0 Conclusions and Recommendations

For the purpose of Phase I, the operational ranges at Fort Stewart have been categorized as described below. The conclusions and recommendations for these operational ranges are presented in **Table 6-1.** These conclusions are based on readily available information collected to date. Re-evaluation of these conclusions and recommendations should be conducted if significant changes to range operations or site conditions are identified.

Referred

Based on the data received during Phase I, no operational ranges at Fort Stewart were placed into the Referred category.

Inconclusive

Operational ranges where a source of potential MCOC has been identified and an exposure pathway and receptors have been identified have been placed into the Inconclusive category, which consist of Groups MSWGW (H/E) and MSW (H/E). A total of 88 ranges were identified as having the potential for MCOC to migrate off range and affect human or ecological receptors (based on current and historical military munitions usage at Fort Stewart and a review of potential migration pathways and potential human or ecological receptors).

Group MSWGW (H/E)

The 40 ranges identified in Group MSWGW (H/E), covering 56,788 acres of Fort Stewart, have current and/or historical sources of potential MCOC that were identified during Phase I. These sources have potential migration pathways via groundwater, surface water/sediment, and plant and animal uptake that could facilitate potential MCOC migration off range to contact either human or ecological receptors. Of the 40 ranges, 31 ranges (totaling 53,225 acres) have no MCOC from current sources and were placed into Group MSWGW (H/E) only due to historical sources.

Group MSW (H/E)

The 48 ranges identified in Group MSW (H/E), covering 61,412 acres of Fort Stewart, have current and/or historical sources of potential MCOC that were identified during Phase I. These sources have potential migration pathways via surface water/sediment and plant and animal uptake that could facilitate MCOC migration off range to contact either human or ecological receptors. There are no MCOC sources from current operations on 28 of the 48 ranges (28,730 acres); these were placed into Group MSW (H/E) only because of historical sources.

Unlikely

receptor) absent have been placed in the Unlikely category. Ranges in Groups LS and MSWGW were placed into the Unlikely category. A total of 186 ranges were identified as being unlikely to have potential MCOC to migrate off range and affect human/ecological receptors (based on current and historical military munitions usage at Fort Stewart and a review of potential migration pathways and potential human or ecological receptors).

Group LS

Based on the data reviewed during the qualitative assessment, the 32 ranges in Group LS (covering 34,762 acres of Fort Stewart) have no known sources of MCOC from current or past activities.

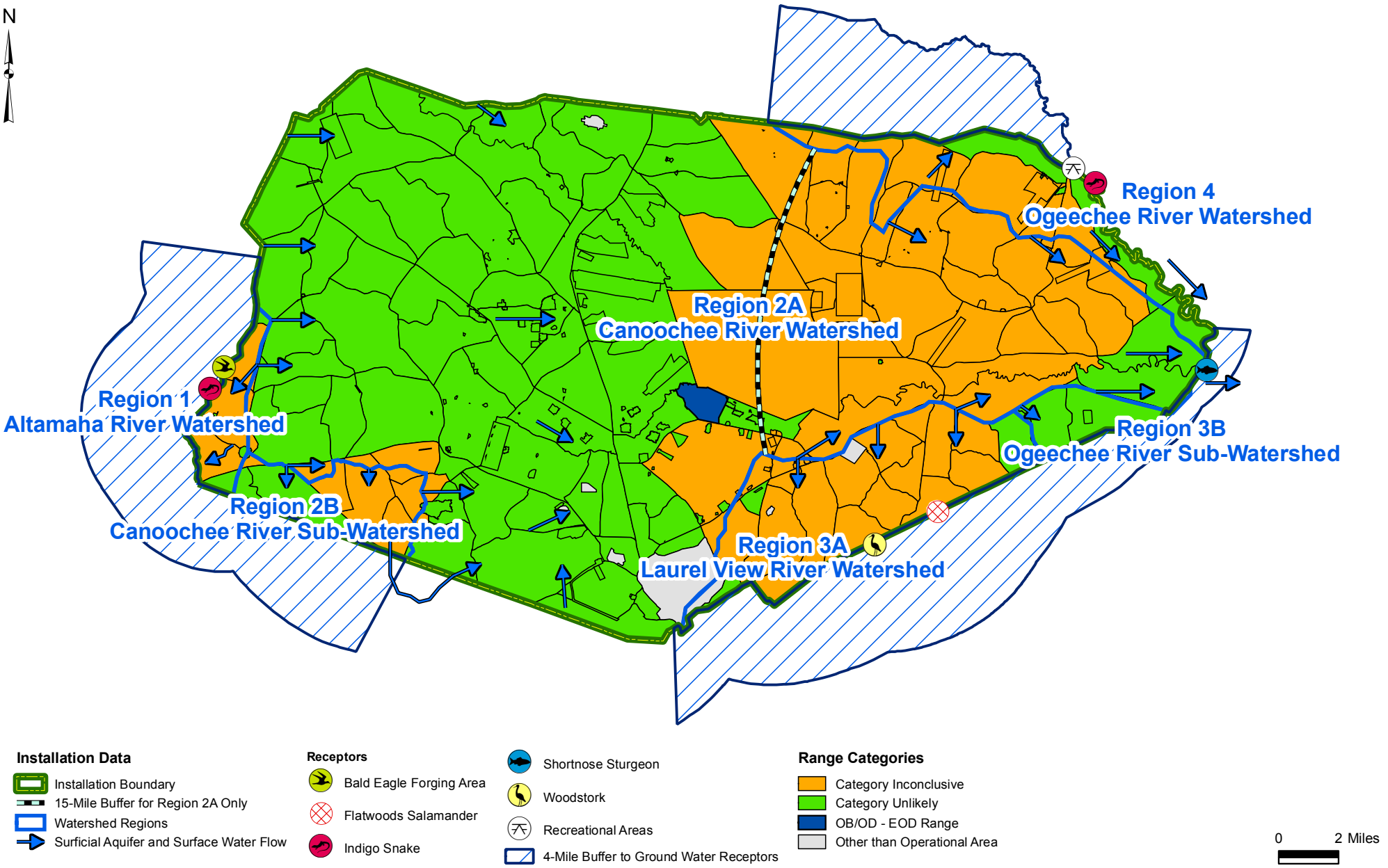
Group MSWGW

The 154 ranges in Group MSWGW, covering 133,886 acres of Fort Stewart, were found to have sources of potential MCOC. Pathways for surface water and groundwater migration of potential MCOC off range were present; however, no receptors were identified within 15 miles downstream of the source areas. Therefore, no further assessment of the source-receptor interaction was conducted.

Figure 6-1 depicts summary of conclusions and recommendations for Fort Stewart.

Table 6-1: Summary of Conclusions and Recommendations for Fort Stewart

Category	Group Identification	Total Number of Ranges and Acreage	Source (s)	Pathway(s)	Human Receptors	Ecological Receptors	Recommendations (Future Steps)
Inconclusive	MSWGW (H/E)	40 operational ranges, 56,788 acres	Firing points, impact areas, and small arms firing	Surface water and shallow groundwater	Local and off-range residents and recreational users of the Ogeechee River	Wetlands and threatened and endangered species	Phase II Quantitative Assessment is required.
	MSW (H/E)	48 operational ranges, 61,412 acres	Firing points, impact areas, and small arms firing	Surface water	Local and off-range residents and recreational users of the Ogeechee River	Wetlands and threatened and endangered species	Phase II Quantitative Assessment is required.
Unlikely	LS	32 operational ranges, 34,762 acres	No source – limited or no military munitions use	Not evaluated	Not evaluated	Not evaluated	Re-evaluate during the five-year review.
	MSWGW	154 operational ranges, 133,798 acres	Firing points, impact areas, small arms firing and training areas	Surface water and groundwater	None	None	Re-evaluate during the five-year review



Operational Range Qualitative Assessment
Fort Stewart, GA

Figure 6-1
Summary of Conclusions

Data Sources:
AEC, ARID Geo-Database 2002 & September 2005
Fort Stewart, GA, 2006

Date: October 2006
Prepared By: Malcolm Pirnie, Inc.
Prepared For: U.S. Army
Contract Number: W912DR-05-D-0004

Appendix A: Glossary of Terms

GLOSSARY OF TERMS

The terms outlined below are those that will be used commonly during the Phase I Assessment process. The relevant reference for each is presented at the end of the definition. If no reference is presented, then the term is not an official Department of Defense (DoD) definition and should be applied only to the Phase I Assessment process.

Dudded Impact Area – An area having designated boundaries within which all dud-producing ordnance will detonate or impact. Vehicle bodies are sometimes placed in the area to act as targets for direct and indirect artillery fire. The primary function of the impact area is to contain weapons effects as much as possible using earthen berms or natural terrain features. Impact areas containing unexploded ordnance may not be used for maneuver. Each area, typically managed and scheduled by either numeric, lettered, or alpha-numeric code through the installation training or range control manager (e.g., Directorate of Plans, Training, Mobilization and Security (DPTMS) or DPTMS-equivalent), should be accounted for with a separate facility number and real property record.[5]

Group – A group is a collection of one or more ranges within an operational range area (range complex area) that shares similar characteristics. Similar characteristics can include types of activities, munitions usage, geographic proximity, surface water or groundwater divides, or even common receptors.[6]

Inconclusive – Phase II Quantitative Assessment Required – ranges where existing information either is insufficient to make a source-receptor interaction determination or indicates the potential for such interaction to be occurring.[6]

Large Caliber - Munitions include projectiles greater than 60-mm (including 75-mm, 76-mm, 81-mm, 90-mm, 105-mm, 155-mm, 14-inch and 16-inch projectiles).[6]

Medium Caliber - Munitions include projectiles sized from 20-mm to 60-mm (including 20-mm, 25-mm, 30-mm, 37-mm, 40-mm and 60-mm projectiles).[6]

[5] Definition derived from the Department of the Army Pamphlet 415-28 *Guide to Army Real Property Category Codes* (February 11, 2000).
[6] This definition was based on guidance from the *U.S. Army Operational Range Assessment Program Qualitative Assessments Protocol* (November 2005), as well as further input/guidance from the U.S. Army Environmental Center and the U.S. Army Center for Health Promotion and Preventive Medicine.

Military Munitions – All ammunition products and components produced or used by the armed forces for national defense and security, including ammunition products or components under the control of the DoD, the U.S. Coast Guard, the U.S. Department of Energy (DoE), and the Army National Guard (ARNG). The term military munitions includes: confined gaseous, liquid, and solid propellants; explosives; pyrotechnics; chemical and riot control agents; smoke and incendiaries, including bulk explosives and chemical warfare agents; chemical munitions; rockets; guided and ballistic missiles; bombs; warheads; mortar rounds; artillery ammunition; small arms ammunition; grenades; mines; torpedoes; depth charges; cluster munitions and dispensers; demolition charges; and devices and components thereof. Military munitions do not include wholly inert items; improvised explosive devises; and nuclear weapons, nuclear devices, and nuclear components, other than non-nuclear components of nuclear devices that are managed under the nuclear weapons program of the DoE after all required sanitization operations under the Atomic Energy Act of 1954 (42 United States Code [U.S.C.] 2001 et seq.) have been completed. (10 U.S.C. 101(e)(4)(A) through (C))

Munitions Constituents (MC) – Any materials that originate from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions. (10 U.S.C. 2710(e)(3))

Munitions Constituents of Concern (MCOC) – Those MC that have the potential to migrate from a source area to a receptor (human or ecological) in sufficient quantity to cause an unacceptable risk to human health or the environment. (DoD Instruction [DODI] 4715.14, November 30, 2005) MCOC for high explosives include: TNT; HMX; PETN; RDX; DNT; 2,6-DNT; and white phosphorus (WP). MCOC for small arms include lead, antimony, copper, zinc, and tungsten. MCOC for training areas include perchlorate.[6]

Non-dudded Impact Area - An area having designated boundaries within which ordnance that does not produce duds will impact. This area is composed mostly of the safety fans for small arms ranges. The primary function of the impact area is to contain weapons effects as much as possible using earthen berms or natural terrain features. Each area, typically managed and scheduled by either numeric, lettered, or alpha-numeric code through the installation training or range control manager (e.g., DPTM or DPTM-equivalent), should be accounted for with a separate facility number and real property record. These impact areas may be used for maneuver, at the cost of curtailing the use of weapons ranges.[5]

Off-Range Area – For the purpose of the Phase I Assessment, off-range areas include those areas outside of the boundaries of the operational range area as established by the Army Range Inventory Geodatabase (ARID-GEO). Off-range areas may include both on- (e.g., cantonment areas) and off-installation locations.

Operational Range – A range that is under the jurisdiction, custody, or control of the Secretary of Defense and that is used for range activities or, although not currently being used for range activities, that is still considered by the Secretary to be a range and has not been put to a new use that is incompatible with range activities. (10 U.S.C. 101(e)(3))

Other Munitions - Munitions from aerial fire (rockets and large bombs), hand grenades, light anti-tank weapons, and anti-armor missiles.[6]

Pathway – The environmental medium through which an MCOC is transported from the source to the receptor. (DODI 4715.14, November 30, 2005)

Range – The term range, when used in the geographical sense, means a designated land or water area that is set aside, managed and used for range activities of the DoD. The term includes: (A) firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, impact areas, electronic scoring sites, buffer zones with restricted access, and exclusionary areas and (B) airspace areas designated for military use in accordance with regulations and procedures proscribed by the Administrator of the Federal Aviation Administration. (10 U.S.C. 101 (e)(1)(A) and (B))

Range Complex – For the purpose of the Phase I Assessment, range complexes are contiguous operational ranges that may be grouped together and assessed as a single range (also referred to as an operational range area).

Receptor – A human, animal, or plant species that is exposed, or that may be exposed, to MC. (DODI 4715.14, November 30, 2005)

Referred – ranges with compelling evidence (e.g., sampling data) to indicate the presence of an off-range release that potentially poses an unacceptable risk to human health or the environment.[6]

Sensitive Environments – Terrestrial or aquatic resources, fragile natural settings, or other areas with unique or highly valued environmental features.[6]

Small Arms – Small arms include all shotgun, .22-, .223-, .30-, .32-, .38-, .45-, and .50-caliber, 5.56-mm, 7.62-mm, 9-mm and 10-mm weapons.[6]

Small Caliber – Munitions used in small arms and fired from weapons with muzzle diameter of up to .50-caliber or one-half inch.[6]

Source – An area where MC may have been deposited, disposed, or placed. (DODI 4715.14, November 30, 2005)

Training Area – For the purpose of the Phase I Assessment, training areas refer to the ranges that have non-live-fire troop activities. These areas can have a variety of activities that include bivouac, troop movement, and tactics.

Unknown Munitions - Items that have not been identified or positively identified.[6]

Unlikely – Five-Year Review – ranges where, based upon a review of readily available information, there is sufficient evidence to show that there are no known releases or source-receptor interactions that could present an unacceptable risk to human health or the environment based on a review of the information available.[6]

Appendix B: References

B1 – General/Project Drivers and Guidance Documents

B2 – References

B3 – Data Repositories and Databases

B4 – On-Installation Sources/Repositories

B5 – Personnel Interviews

B6 – Off-Installation Sources/Repositories

B1 – General/Project Drivers and Guidance Documents

Department of Defense Directive 4715.11 *Environmental and Explosive Safety Management on Operational Ranges Within the United States*. 10 May 2004.

Department of Defense Instruction 4715.14 *Operational Range Assessments*. 30 November, 2005.

U.S. Army Operational Range Assessment Program Qualitative Assessments Protocol. Prepared by U.S. Army Center for Health Promotion and Preventive Medicine Army Operational Range Assessment Team. November 2005.

Final Work Plan/Management Plan for the Operational Range Assessment Program Qualitative Operational Range Assessments. December 2005.

U.S. EPA Interim Final Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. June 1997.

U.S. EPA Guidance for Performing Preliminary Assessments under CERCLA EPA/540/G-91/013: U.S. EPA Soil Exposure Pathway Targets. September 1991.

B2 – References

1. Gene Stout and Associates, Jones Technologies, Inc. *Fort Stewart Integrated Natural Resources Management Plan.* 2005.

2. Clarke, John S., David C. Leeth, DaVette Taylor-Harris, Jamie A. Painter, and James A. Labowski. *Hydraulic Properties of the Floridian Aquifer System and Equivalent Clastic Units in Coastal Georgia and Adjacent Parts of South Carolina and Florida*. U.S. Geological Survey Information Circular 109. 2004.

3. Installation Restoration Program. Army National Guard. *Preliminary Assessment Report for National Guard Training Center, Georgia Army National Guard, Fort Stewart, Georgia,* July 1993

4. Payne, D.F., Malek Abu Rumman, and J.S. Clarke. *Simulation of Ground-water Flow in Coastal Georgia and Adjacent parts of South Carolina and Florida — Predevelopment, 1980, and 2000.* U.S. Geological Survey Scientific Investigations Report 2005-5089: 91. 2005.

5. Environmental Science and Engineering. *Installation Assessment of Headquarters, 24th Infantry Division and Fort Stewart, Ga Report No. 334.* October 1983.

6. Fort Stewart, Multi-Species Endangered Species Management Plan, 2001.

B3 – Data Repositories and Databases

U.S. Army Environmental Center (USAEC)

Title	Publication Date	Monitor Organization
Operational Range Inventory System – operational range and installation GIS data	September 2005	N/A
Integrated Natural Resources Management Plan 2000 – 2005, Fort Stewart and Hunter Army Airfield, Georgia		N/A
National Environmental Policy Act documents		
Environmental Assessment of the Proposed Revision of the 1994 "Management for the Red-cockaded Woodpecker on Army Installations"	June 1996	U.S. Army Corp of Engineers (USACE)
Final Environmental Assessment and Finding of No Significant Impact, Fort Stewart, Georgia	April 2004	N/A

Army Knowledge Online
No relevant information/documentation was obtained.

Army Range Inventory Database (ARID)
Phase II Data: ARID data, ARID-GEO, Active/Inactive inventory data, Closed/Transferring/Transferred ranges geo-database

Environmental Restoration Information System
No relevant information/documentation was obtained.

Geographic Information System Repository
Aerial map of the installation

Integrated Training Area Management
No relevant information/documentation was obtained.

Range Facilities Management Support System (RFMSS)
Ammunition expenditures: 1 June 2001 through 23 February 2006

Training Center Sustainment Initiative
No relevant information/documentation was obtained.

Technical Information Center

Title	Publication Date	Monitor Organization
Installation Assessment of Headquarters 24th Infantry Division and Fort Stewart, GA. Report No. 334	October 1983	U.S. Army Toxic and Hazardous Materials Agency
Pest Management Survey No. 16-62-0517-90 Fort Stewart, Georgia, 22-26 January 1990	April 1990	N/A

Pest Management Survey No. 16-62-0530-90 Fort Stewart, Georgia and Hunter Army Airfield, Georgia, 21-24 May 1990	June 1990	N/A
Water Quality Consultation No. 31-62-0140-90 Fort Stewart and Hunter Army Airfield, Fort Stewart, Georgia, 13-17 November 1989	December 1989	N/A
Evaluation of Solid Waste Management Units Fort Stewart, Georgia, 30 March – 3 April 1987, Hazardous Waste Consultation No. 37-26-1382-88	May 1988	N/A
Pesticide Risk Management Study No. 17-44-0279-89 Fort Stewart, Georgia, 21-25 September 1987	August 1989	N/A
Environmental Program Review No. 32-24-7038-89 24th Infantry Division (Mechanized) Fort Stewart and Hunter Army Airfield, Fort Stewart, Georgia, 1-12 August 1988	October 1989	N/A
Final Contamination Evaluation/Closure Plan, Fort Stewart Fire Training Areas, Savannah, Georgia, November 1990	November 1990	N/A
Air Pollution Management Consultation No. 42-21-MM70-92 Medical Waste Incinerator Evaluation, Fort Stewart, GA, 23-25 June 1992	June 1992	USACE
Preliminary Site Inspection Report For Fort Stewart Military Reservation, Contract No. DAAA15-90-D-0001 Task 9	September 1992	USACE
Hazard Ranking System (HRS2) Score Summary Report for Fort Stewart Military Reservation, Contract No. 5-90-D-0001, Task 9	September 1992	USACE
Preliminary Assessment Report for National Guard Training Center, Georgia National Guard, Fort Stewart, Georgia	July 1993	National Guard Bureau
Air Pollution Emission Statement: Fort Stewart, Fort Stewart, Georgia (Final)	October 1994	USAEC
Health Care Facilities Waste Management Study No. 37-08-2593-95, Fort Stewart, Georgia	February 1995	N/A
United States Army Fort Stewart/Hunter Army Airfield, Waste Analysis Plan	April 1991	N/A
Interim Measures SWMU FST-013 Fire Training Pit Wright Army Airfield, Fort Stewart, Georgia	April 1995	N/A
An Archaeological Collections Summary for Fort Stewart, Georgia. Information Provided for Compliance with the Native American Graves Protection and Repatriation Act Section 6 Summary	July 1995	USAEC
White Phosphorus Wetland Storage Installation Assessment Report: Fort Stewart	October 1993	USAEC
Environmental Compliance Assessment System (ECAS) Environmental Compliance Assessment Report, Fort Stewart and Hunter Army Airfield, Georgia, 29 April – 17 May 1996	July 1996	N/A
Environmental Compliance Assessment System (ECAS) Environmental Compliance Assessment Report No. 38-EH-3149-00, Fort Stewart and Hunter Army Airfield, Georgia,	April 2000	N/A

10 – 21 April 2000		
Installation Assessment Fort Stewart, Georgia	December 1982	N/A

Title	Publication Date	Monitor Organization
Archives Search Report for the Fort Stewart Cantonment Area, Hinesville, Georgia	August 2005	USACE
Design, Revision, and Application of Groundwater Flow Models for Simulation of Selected Water-Management Scenarios in the Coastal Area of Georgia and Adjacent Parts of South Carolina and Florida	2000	U.S. Geological Survey (USGS)
EDR Well Search Report, EDR Area Study – Fort Stewart, Georgia	May 2002	Environmental Data Resources, Inc.
Integrated Natural Resources Management Plan (2001 – 2005) Fort Stewart and Hunter Army Airfield, Georgia	Working Draft	Fort Stewart Directorate of Public Works
Fort Stewart Facility Comments Report	2005	N/A
Fort Stewart Hazardous Waste Facility Permit #HW-045 (SandT), EPA ID No. GA9 210 020 872	September 2004	Georgia Department of Natural Resources
Fort Stewart Installation Corrective Action Plan		N/A
Fort Stewart Installation Status Report	2006	N/A
Groundwater in Coastal Georgia	March 2001	USGS
Phase II RCRA Facility Investigation Report for 16 Solid Waste Management Units at Fort Stewart, Georgia	April 2000	USACE
Real Property Master Plan for Fort Stewart, Long Range Component	June 2002	USACE
Water System Evaluation Technical Report, Fort Stewart	July 2005	USACE

B4 – On-Installation Sources/Repositories

Range Control Office
RFMSS expenditures June 2001 – February 2006
Operational range tour map

Engineering Office
No relevant information/documentation was obtained.

B5 – Personnel Interviews

Fort Stewart Department of Public Works (DPW), Environmental Division
Date of interview: 9 March 2006 by Rhonda Stone (Malcolm Pirnie, Inc.)
No documents obtained.

Fort Stewart DPW, Environmental Division
Date of interview: 9 March 2006 by Rhonda Stone, Jessica Forester, and Greg Firely (Malcolm Pirnie, Inc.)
USGS, state, and local groundwater documents obtained (see Appendix B3).

Fort Stewart DPW, Environmental Division
Date of interview: 6 March 2006 by Rhonda Stone and Steve Burhans (Malcolm Pirnie, Inc.)
No documents obtained.

Fort Stewart, Directorate of Plans, Training, Mobilization and Security (DPTMS)
Date of interview: 6 March 2006 by Rhonda Stone and Steve Burhans (Malcolm Pirnie, Inc.)
RFMSS ammunition expenditures and operational range tour map obtained.

Fort Stewart DPTMS
Date of interview: 8 March 2006 by Steve Burhans (Malcolm Pirnie, Inc.)
No documents obtained.

Fort Stewart, Integrated Training Area Management
Date of interview: 6 March 2006 by Rhonda Stone and Steve Burhans (Malcolm Pirnie, Inc.)
No documents obtained.

Hunter DPW, Environmental Division
Date of interview: 6 March 2006 by Rhonda Stone (Malcolm Pirnie, Inc.)
Open Burn/Open Detonation Resource Conservation and Recovery Act permit, Solid Waste Management Unit sites, and land use/master plan documents obtained (Appendix B3).

B6 – Off-Installation Sources/Repositories

County Offices
Liberty County Environmental Health Department
Date of interview: 9 March 2006 by Greg Firely and Jessica Forester (Malcolm Pirnie, Inc.)
No documents obtained.