US Army Corps of Engineers®
Omaha District

Final Site-Specific Work Plan
Strother Field
FUDS Property No. B07KS0277

Site Inspections at Multiple Sites, NWO Region
Formerly Used Defense Sites
Military Munitions Response Program

Contract No. W912DY-04-D-0010
Delivery Order No. 003

September 2009

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Military Munitions Response Program

Submitted to:

U.S. Department of the Army
U.S. Army Corps of Engineers, Omaha District

Prepared by:

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List of Acronyms and Abbreviations

°F	Fahrenheit
ASR	Archives Search Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CSM	conceptual site model
DCE	1,2-dichloroethylene
DERP	Defense Environmental Restoration Program
DMM	discarded military munitions
DoD	U.S. Department of Defense
DQO	data quality objective
EM	Engineering Manual
EOD	Explosives Ordnance Disposal
EPA	U.S. Environmental Protection Agency
ER	Engineer Regulation
FSP	Field Sampling Plan
ft	feet
FUDS	Formerly Used Defense Sites
GPS	global positioning system
HAZWOPER	*Hazardous Waste Operations and Emergency Response*
HRS	Hazard Ranking System
IDW	investigation-derived waste
IEP	Important Ecological Place
ITRC	Interstate Technology and Regulatory Council
KDHE	Kansas Department of Health and Environment
KDWP	Kansas Department of Wildlife and Parks
KGS	Kansas Geological Survey
KSHS	Kansas State Historical Society
MC	munitions constituents
MD	munitions debris
MEC	munitions and explosives of concern
MMRP	Military Munitions Response Program
MRA	munitions response area
MRS	munitions response site
MRSPP	Munitions Response Site Prioritization Protocol
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDAI	No Department of Defense Action Indicated
NOAA	National Oceanic and Atmospheric Administration
NWK	USACE Kansas City District
NWO	USACE Northwestern Division Omaha District
PAH	Polycyclic aromatic hydrocarbon
PCE	tetrachloroethylene
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan

List of Acronyms and Abbreviations (Cont.)

RI/FS	Remedial Investigation/Feasibility Study
ROE	Right-of-Entry
SAP	Sampling and Analysis Plan
Shaw	Shaw Environmental, Inc.
SI	Site Inspection
SSHP	Site Safety and Health Plan
SSWP	Site-Specific Work Plan
TCA	1,1,1-trichloroethane
TCE	Trichloroethylene
TPP	Technical Project Planning
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
UTM	Universal Transverse Mercator
UXO	unexploded ordnance
Work Plan	*Final Type I Work Plan*

1.0 Introduction

This Site-Specific Work Plan (SSWP) presents the information necessary to conduct field activities associated with a Site Inspection (SI) planned at Strother Field. The SI field activities will consist of site reconnaissance for munitions and explosives of concern (MEC) and sampling and analysis of soil, sediment, and surface water for munitions constituents (MC).

MEC are military munitions that may pose unique explosives safety risks, such as unexploded ordnance (UXO), discarded military munitions (DMM), or MC present in high enough concentrations to pose an explosive hazard. MC are any materials originating from UXO, DMM, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions (10 United States Code [USC] 2710(e)(3) and 10 USC 2710(e)(2)).

1.1 Project Authorization

The Department of Defense (DoD) has established the Military Munitions Response Program (MMRP) to address DoD sites suspected of containing MEC or MC. Under the MMRP, the U.S. Army Corps of Engineers (USACE) is conducting environmental response activities at Formerly Used Defense Sites (FUDS) for the Army, the DoD Executive Agent for the FUDS program.

Pursuant to USACE Engineer Regulation (ER) 200-3-1 (USACE, 2004a) and the *Management Guidance for the Defense Environmental Restoration Program* (DERP) (Office of the Deputy Under Secretary of Defense [Installations and Environment], September 2001), USACE is conducting FUDS response activities in accordance with the DERP statute (10 USC 2701 et seq.), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (42 USC 9601), Executive Orders 12580 and 13016, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] Part 300). As such, USACE is conducting remedial SIs, as set forth in the NCP, to evaluate hazardous substance releases or threatened releases from eligible FUDS.

While not all MEC/MC constitute CERCLA hazardous substances, pollutants, or contaminants, the DERP statute provides DoD the authority to respond to releases of MEC and MC, and DoD policy states that such responses shall be conducted in accordance with CERCLA and the NCP.

Shaw Environmental, Inc. (Shaw) is responsible for conducting SIs at FUDS in the northwest region managed by the USACE Northwestern Division Omaha District (NWO) Military Munitions Design Center. Shaw has prepared this SSWP for the USACE, under USACE Contract No. W912DY-04-D-0010, as a supplement to the *Final Type I Work Plan* (Work Plan; Shaw, 2006).

1.2 Site Name and Location

Strother Field, formerly Strother Army Air Field, FUDS property number B07KS0277, is located approximately 5 miles south of Winfield and 6 miles north of Arkansas City in Cowley County, Kansas (Figure 1). The FUDS is located in Sections 13 and 24 of Township 33 South (T33S), Range 3 East (R3E) and Sections 18 and 19 of T33S, R4E.

Strother Field is included in the MMRP Inventory in the *Defense Environmental Programs Annual Report to Congress Fiscal Year 2007* (DoD, 2007) with range information as follows:

FUDS Name	Federal Facility Identification	Range Total Acres
Strother Field	KS79799F031800	240

The range areas and coordinates for the FUDS are listed in the *ASR Supplement* (USACE, 2004b). As shown in the table below, Site ID 00OEW consists of one munitions response site (MRS), Range Complex No. 1, with two subranges (skeet range and pistol range). The skeet and pistol ranges partially overlap each other and the safety fan for the pistol range is partially outside the FUDS boundary.

Range Name	Subrange Name	Range Identification	Approximate Area (acres)	UTM Coordinates* (meters)
Range Complex No. 1		B07KS027700R01	239.5	X = 674733.67 E Y = 4116998.03 N
	Skeet Range	B07KS027700R01-SR01	30	X = 674846.67 E Y = 4116367.02 N
	Pistol Range	B07KS027700R01-SR02	224	X = 674720.68 E Y = 4117042.03 N

*Coordinates for the range(s) are in Universal Transverse Mercator (UTM), Zone 14, NAD 83.

The MRS is consistent with the range identified in the *ASR Supplement* (USACE, 2004b) and the MMRP Inventory, with respect to size and location.

The FUDS is situated on land owned by private landowners and industrial companies. The FUDS property boundary is shown on Figures 2, 3, and 4. The *ASR Supplement* (USACE, 2004b) indicated that the area of the FUDS is approximately 1,386. Figures 2, 3, and 4 present the layout of Range Complex No. 1 on historical (1950 and 1963) and recent (2006) aerial photographs.

Chemical training areas and ammunition storage areas at Strother Field are not considered MMRP sites.

1.3 Scope and Objectives

The primary objective of the MMRP SI is to determine whether or not a FUDS project warrants further response action under CERCLA. The SI collects the minimum amount of information necessary to make this determination as well as it (i) determines the potential need for a removal action; (ii) collects or develops additional data, as appropriate, for Hazard Ranking System (HRS) scoring by the U.S. Environmental Protection Agency (EPA); and (iii) collects data, as appropriate, to characterize the release for effective and rapid initiation of the Remedial Investigation and Feasibility Study (RI/FS). An additional objective of the MMRP SI is to collect the additional data necessary to complete the Munitions Response Site Prioritization Protocol (MRSPP).

The scope of the SI reported herein is restricted to evaluation of the presence of MEC or MC related to historical use of the FUDS prior to transfer. Potential releases of hazardous, toxic, or radioactive wastes are not addressed within the current scope. The intent of the SI is to confirm the presence or absence of contamination from MEC and/or MC. The general approach for each SI is to conduct a records review and site reconnaissance in order to evaluate the presence or absence of MEC and to collect samples at locations where MC might be expected based on the conceptual site model (CSM) (Appendix A). The following decision rules are used to evaluate the results of the SI:

- Is No DoD Action Indicated (NDAI)? An NDAI recommendation may be made if:
  - There is no indication of MEC; and
  - MC contamination does not exceed screening levels determined from Technical Project Planning (TPP).
- Is an RI/FS warranted? An RI/FS may be recommended if:
  - There is evidence of MEC hazard. MEC hazard may be indicated by direct observation of MEC during the SI, by indirect evidence (e.g., a crater potentially caused by impact of UXO), or by a report of MEC being found in the past without record that the area was subsequently cleared; or
  - MC contamination exceeds screening levels determined from TPP.
- Is a removal action warranted? A removal action may be needed if:
  - High MEC hazard is identified. Shaw will immediately report any MEC findings so that USACE can determine the hazard in accordance with the MRSPP. An example of a high hazard would be finding sensitive MEC at the surface in a populated area with no barriers to restrict access; or
  - Elevated MC risk is identified. Identification of a complete exposure pathway (e.g., confirming MC concentrations above health-based risk standards in a water supply well) would trigger notification of affected stakeholders. Data would be presented at a second TPP meeting regarding the possible need for a removal action.

For purposes of applying these decision rules, USACE has provided guidance that evidence of MEC will generally be a basis of recommending RI/FS. Evidence of MEC may include confirmed presence of MEC from historical sources or SI field work, or presence of munitions debris (MD).

1.4 Site Inspection Process

The steps involved in conducting an SI include:

- Reviewing existing data,
- Following the TPP process,
- Preparing the SSWP,
- Conducting the SI field activities (site reconnaissance, media sampling, and analysis), and
- Preparing the SI Report.

The TPP process is one through which project objectives and data collection processes are identified, and site stakeholders are brought together to discuss goals and objectives. This process includes the following phases:

- Identification of the current project area,
- Determination of data needs,
- Development of data collection options, and
- Finalization of the data collection program.

A multi-disciplinary team of key stakeholders attended a TPP meeting(s) in order to participate in the process so SI activities can be conducted in a timely and efficient manner.

1.5 Munitions Response Site Prioritization Protocol

The DoD is required to assign a relative priority for each munitions response site (MRS) within a munitions response area (MRA). This process is to be completed for all DoD sites including FUDS, which are known or suspected of containing UXO, DMM, or MC.

Definitions:

Defense Sites – Locations that are or were owned by, leased to, or otherwise possessed or used by the DoD. The term does not include any operational range, operating storage, or manufacturing facility, or facility that is used for or was permitted for the treatment or disposal of military munitions (10 USC 2710(e)(1)).

Munitions Response Area – An MRA refers to any area on a Defense Site that is known or suspected to contain UXO, DMM, or MC. Examples are former ranges and munitions burial areas. An MRA can be comprised of one or more MRS (32 CFR 179.3).

Munitions Response Site – A discrete location within an MRA that is known to require a munitions response (e.g., remedial response) (32 CFR 179.3). MRSPP scoring is completed for each MRS.

1.6 TPP Summary

The TPP meeting for Strother Field was conducted on February 13, 2009, at offices of the Kansas Department of Health and Environment (KDHE) located in Topeka, Kansas. Representatives from USACE NWO Military Munitions Design Center, USACE Kansas City District (NWK), KDHE, and Shaw were in attendance. An EPA representative was invited but did not attend.

By agreement with the USACE, other landowners were not present at this meeting. A separate meeting with these landowners may be held in the future.

Shaw summarized the SI process, presented site-specific information on Strother Field, discussed potential MEC and associated MC, and proposed MEC reconnaissance and MC sampling.

In general the participants were in agreement with the following:

MRSs – The MRS at Strother Field is Range Complex No. 1, which contains two subranges: a pistol range and a skeet range.

Stakeholders – The former Strother Field is currently an industrial park with a general aviation airport. Current ownership of the MRS property includes private landowners, an industrial business, and the cities of Winfield and Arkansas City.

MEC Hazard – Range Complex No. 1 is a former military range where small arms training occurred at two subranges: a pistol range and a skeet range. There is no evidence that munitions other than small arms were used at the ranges. Small arms present a low MEC hazard.

MEC Reconnaissance Objectives – A visual reconnaissance of the Range Complex No. 1 MRS is needed to document site conditions and identify MEC and MD and any other evidence of range activities.

MC Sampling – Sampling was proposed for both subranges at Range Complex No. 1. No receptors were identified for the surface water/sediment and groundwater pathways; however, following the TPP meeting it was determined that the surface water/sediment pathway would be sampled. Sampling at the pistol range will consist of six surface soil samples and one surface water/sediment sample to be analyzed for lead. Sampling at the skeet range will consist of six surface soil samples and one surface water/sediment sample to be analyzed for polycyclic aromatic hydrocarbons (PAHs) (if target fragments are observed) and lead. Ten surface soil samples and one surface water/sediment sample will be collected and analyzed for PAHs (if MRS samples are analyzed for PAHs) and lead for background comparison. Groundwater samples will not be collected due to the lack of receptors and use of groundwater (Appendix A,).

Screening Criteria – The SI human health screening criteria consist of the lower of the following values: 1) the Risk-Based Standards for Kansas Residential Scenario Pathway and 2) EPA Regional Screening Levels (Section 4.5). Ecological screening is not required.

Data Quality Objectives (DQOs) – No changes were made to the proposed DQOs and decision rules for Strother Field.

1.7 Decision Rules

The following proposed DQOs and decision rules will guide the technical approach at various stages of the SI as the specific MRS is evaluated:

Objective 1: Determine if the site requires additional investigation or can be recommended for NDAI based on the presence or absence of MEC.

DQO No. 1 – Using trained UXO personnel and a handheld all-metal detector, visual surface reconnaissance of the MRS will be conducted for physical evidence indicating the presence of MEC. The following decision rules will apply:

- If evidence of MEC is not found (other than MEC associated with small arms), the MRS will be recommended for NDAI relative to MEC.
- If evidence of MEC (other than small arms) is discovered and suspected to be hazardous, the MRS will be recommended for additional investigation.
- If there is indication of an imminent MEC hazard, the site may be recommended for a removal action.

For purposes of applying these rules, MEC associated with small arms is not considered to present a significant MEC hazard.

Objective 2: Determine if the site requires additional investigation or can be recommended for NDAI based on the presence or absence of MC above screening values.

DQO No. 2 – Surface soil, sediment, and surface water samples will be collected from the MRS and analyzed for MC of concern. Analytical results will be compared to background threshold and human health screening levels. The following decision rules will apply:

- If sample results are less than human health screening levels, the site will be recommended for NDAI relative to MC.
- If sample results exceed background threshold screening levels but are less than human health screening levels, the site will be recommended for NDAI relative to MC.
- If sample results exceed background threshold and human health screening levels, the site will be recommended for additional investigation.

1.8 MEC Technical Approach

The technical approach is based on the Work Plan (Shaw, 2006), *Final Technical Project Planning Memorandum* (Shaw, 2009), and the *Formerly Used Defense Sites, Military Munitions Response Program, Site Inspections, Program Management Plan* (USACE, 2005). In accordance with Section 3.1.1 of the Work Plan, the technical approach includes the following:

- Existing data will be used to document the presence or absence of MEC.

- A metal detector-assisted site reconnaissance will supplement the existing data in an attempt to identify evidence of MEC and/or MD at the ground surface, under vegetative cover, or beneath the surface.

If MEC is found during SI field activities, the following excerpted procedures will be followed, per Interim Guidance Document 06-05 and Safety Advisory 06-2 (see Appendix B for complete document):

> "a. (1) The property owner or individual granting rights-of-entry to the property will be notified of the hazard and advised to call the local emergency response authority (i.e., police, sheriff, or fire department). The individual will also be informed that if they do not call the local response authority within 1 hour, the individual who identified the UXO item will notify the local emergency response authority.
>
> (2) The local response authority will decide how to respond to the reported incident, including deciding not to respond (e.g., if the local response authority is already aware of the hazards on the property). If the local response authority decides to respond, the individual who identified the item or his designee will mark the location of the item and provide accurate location information to the emergency response authority. The individual who identified the item or his designee will generally remain in the area until the local response authority arrives, unless specifically indicated by the appropriate response authority that the individual may leave the area."
>
> "(c) Neither the U.S. Army Corps of Engineers personnel, nor their contractors have the authority to call EOD [Explosive Ordnance Disposal] to respond to an explosive hazard. This call is the responsibility of the local emergency response authority for FUDS properties and it must come through the proper chain of command on installations."

1.9 SSWP Organization

This SSWP supplements the Work Plan (Shaw, 2006), which includes an Accident Prevention Plan and Site Safety and Health Plan (SSHP) in Appendix D and a Sampling and Analysis Plan (SAP) in Appendix E that includes both the USACE Programmatic SAP and the Shaw SAP. The SAPs contain a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP). The Work Plan, as amended by this SSWP, governs work that will be implemented during the SI at the FUDS. This SSWP provides additional information not available in the Work Plan, including site information (background information, summary of historical documents evaluated, and resulting data needs), a discussion of activities to be conducted prior to mobilizing to the field, a presentation of field data to be collected, and appendices with supporting documents. Specifically, this SSWP includes the following sections:

- Section 1.0 Introduction,
- Section 2.0 Site Information,
- Section 3.0 Pre-Field Activities,
- Section 4.0 Site Inspection Activities,
- Section 5.0 Investigation-Derived Waste,

- Section 6.0 Proposed Schedule,
- Section 7.0 References,
- Figures,
- Tables,
- Appendix A Conceptual Site Model,
- Appendix B USACE Interim Guidance Document 06-05 and Safety Advisory 06-2, and
- Appendix C Site Safety and Health Plan Addendum.

2.0 Site Information

Unless otherwise referenced, the following historical and physical setting information in Sections 2.1 and 2.2 is taken from the *Archives Search Report* (ASR; USACE, 2006) and the *ASR Supplement* (USACE, 2004b). This section provides a summary of site-specific information not available in the Work Plan, which was used to profile the site in development of the CSM.

2.1 Property Description and History

2.1.1 Historical Military Use

Military use of the site began in 1942 with the purchase of 1,386 acres for the main airfield. The missions assigned to the site were basic training of Air Corps cadets. In June 1944, the installation was transferred to the Second Air Force to become a fighter pilot training station. The training at the field was of a more advanced nature for specific missions. This included additional instrument training, and strafing and bombing practice, which was not physically conducted at Strother Field. Four auxiliary landing fields were associated with Strother Field (#1, #2, #3, and #5) and used primarily for emergency and touch-and-go landings (USACE, 2006).

The conventional ordnance facilities documented at Strother Field were a small arms storage building, a magazine, an igloo, a skeet range, and a pistol range. No records were uncovered indicating the specific types of munitions being used or stored at the site or in which specific building they were stored. Ammunition storage areas are generally not evaluated as MMRP sites unless there is evidence of a release. Former base personnel indicated that only small arms munitions were used or stored at the FUDS during the basic flight training mission. When the installation became a fighter pilot training station, practice bombs and spotting charges would also have been stored on site. No documentation of other types of conventional munitions items was discovered (USACE, 2006). The only identified ranges are a skeet range and a pistol range.

The ASR confirmed that chemical training occurred on base (e.g., gas chamber exercises and pyrotechnic), but did not state a specific location (USACE, 2004). Chemical training materials known to have been present at Strother Field included chlorine gas, tear gas, and individual protection equipment. These chemical training materials do not meet the current definition of chemical warfare materiels. Pyrotechnics known to have been present at Strother Field included white phosphorous grenades and smoke pots. No documentation of other chemical training or pyrotechnic items was discovered (USACE, 2006). There is no historical documentation that of chemical training or use of pyrotechnics in a manner that would have resulted in a release of MEC or MC. The chemical training area at Strother Field has not been identified as an MMRP site and is not evaluated further in this SI.

The site was declared surplus in January 1946 and conveyed to the cities of Winfield and Arkansas City in May 1948. The pistol range berm was removed to construct a jet engine test cell for General Electric and a facility for Halliburton (USACE, 2006).

2.1.2 Munitions Information

Historical evidence indicated the only military munitions used at Strother Field (excluding other munitions that may have been stored) were small arms ammunition: shot gun shells at the skeet range and .22- and .45-caliber at the pistol range (USACE, 1994). Munitions information is provided in Table 1.

In the small arms ammunition used at the pistol range, lead accounts for more than 96 percent of the bullet mass, and even though jackets contain copper, and casings contain copper and zinc, they are present in relatively small quantities. Propellants are not an MC of concern because they would have been dispersed in the air at the firing line. Components other than lead are not carried forward as MC of concern because of nonhazardous properties, naturally occurring materials, limited mobility, limited quantities, or nature of munitions use.

Lead derived from lead shot is the primary MC at the skeet range. PAHs from the pitch-based targets at the skeet range are not MC; however, they are addressed under the MMRP as constituents potentially associated with former range use.

2.1.3 Ownership History

DoD use began in 1942 with the purchase of 1,386 acres for use as an Army Air Field. Construction at Strother Field began in May 1942. The post was activated in November 1942, although construction was still in progress. In June 1944, the installation and part of the housekeeping personnel were transferred to the Second Air Force. Strother Field was declared surplus in January 1946. The site was conveyed to the cities of Winfield and Arkansas City effective May 1948 (USACE, 2006).

The property is currently occupied by the Strother Field Airport and Industrial Park. Strother Field Industrial Park is managed by the Strother Field Commission, which represents Arkansas City and Winfield (EPA, 1994a). The Industrial Park covers the majority of the former base cantonment area. There are only a few original facilities, which remain standing. Currently, the Industrial Park has a variety of industries, including a major jet engine overhaul facility, a beer distributor, a driver's license office, and other manufacturers (USACE, 2006; Strother Field Industrial Park, 2000). There is no residential use of the property; however, the non-industrial portions of the site are used for agricultural production (USACE, 2006).

Current taxlot parcels in the FUDS area are shown in Figure 5.

2.2 Physical Setting

2.2.1 Topography and Vegetation

The FUDS is located in the Flint Hills physiographic region of Kansas, an area of flat-topped hills, limestone outcrops, long, steep slopes, and valleys covered with natural prairie grasses formed by the erosion of Permian-age limestones and shales. The streams in the Flint Hills have cut deep, precipitous channels. The Flint Hills are still largely native prairie grassland, one of the last great preserves of tallgrass prairie in the country. The tall grasses in this region are mostly big and little bluestem, switch grass, and Indian grass. Trees are rare, except along stream and river bottoms (Kansas Geological Survey [KGS], 1999).

As shown on Figure 6, the topographic slope at the FUDS is generally from the north to the southeast. Vegetation at the FUDS is "low grass and few shrubs" (USACE, 2004b).

2.2.2 Surface Water

Regional surface water drainage is shown on Figure 7. While the general topography of the site slopes from north to southeast, a swale (low area) intersects the FUDS south of Range Complex No. 1. The swale appears to conform to what was the original channel of Posey Creek, which was re-routed by the Army in the 1940s. Surface runoff from aircraft related industries at the FUDS either flows into this swale to an open drainage ditch parallel to the railroad or to storm sewer inlets (EPA, 1994a).

Posey Creek runs along the eastern border of the FUDS and drains into the Walnut River. The Strother Field Sewage Treatment Plant to the southeast of the FUDS, an industrial cooling tower near the central portion of the FUDS, and two groundwater remediation wells in the northern portion of the FUDS supply water to Posey Creek. As a result, Posey Creek becomes an artificial perennial stream as it passes through Strother Field. It is the only perennial surface water at the site. Posey Creek becomes a natural perennial stream approximately 1.5 miles downstream of the site, where it begins to intersect an alluvial aquifer, which contributes baseflow to the creek. The swale, drainage ditches, and the storm sewer all flow to Posey Creek at the southeastern corner of the FUDS (EPA, 1994a).

2.2.3 Sensitive Environments

The U.S. Fish and Wildlife Service (USFWS) and Kansas Department of Wildlife and Parks (KDWP) were contacted concerning Important Ecological Places (IEPs) and threatened or endangered species that might be present in the FUDS. Although Cowley County is home to 13 federal and state threatened and endangered species (KDWP, 2005), neither agency indicated that any areas of the FUDS were managed for ecological purposes or qualified as IEPs or sensitive environments. In addition, both agencies indicated that there were no concerns regarding proposed SI activities and threatened or endangered species at the FUDS (KDWP, 2009; USFWS, 2009).

Cultural resources require identification in order to complete HRS and MRSPP scoring. The Kansas State Historical Society (KSHS) reviewed its cultural resources files and indicated that the former Strother Field is situated in an upland area of low archaeological potential. KSHS also indicated that, because the site is located in a formerly cultivated area, proposed sampling activities are not likely to pose a threat to any intact cultural deposits and have little potential to impact standing structures that might be eligible for National Register listing, although none were identified at the FUDS. The KSHS concluded that the proposed sampling activities will have no effect on historic properties (KSHS, 2009).

2.2.4 Climate

The climate in the area is continental in nature. Summers are warm, with the majority of the annual precipitation occurring during this season. Winters tend to be cold with an occasional mild spell and moderate snowfall amounts (National Oceanic and Atmospheric Administration [NOAA], 2009a). At Winfield, Kansas, approximately 5 miles to the north, mean precipitation is 37.64 inches per year, based on data from 1971 to 2000. Mean monthly temperatures range from 30.6 degrees Fahrenheit (°F) in January to 80.5°F in July (NOAA, 2009b).

2.2.5 Geologic and Hydrogeologic Setting

2.2.5.1 Bedrock Geology

Nearly all of the rocks on the surface of Kansas are sedimentary in origin, consisting chiefly of shale, sandstone, and limestone. Below the surface rocks is a layer of Precambrian igneous rocks that underlie the entire state. In eastern Kansas, the most common surface rocks were formed during the Pennsylvanian period. These rocks are primarily marine and nonmarine shales, limestones, and sandstones. The Pennsylvanian rocks of Kansas are comprised of more than 65 formations with a total thickness of 950 meters.

Paralleling the area of Pennsylvanian rocks on the west is a north-south belt of Permian rocks. The Permian rocks in eastern Kansas are primarily limestone, shales, and cherts of the Flint Hills region. The surface rocks in central and south-central Kansas are siltstone, sandstones, and shales of Permian redbeds. Permian rocks to the west of the Arkansas River are noted for their salt and gypsum formations. The Permian bedrock of the area dips generally to the southwest. The Flint Hills extend north and south along the western edge of the Osage cuestas. The Flint Hills region derives its name from the abundance of chert, or flint, scattered over its surface (Simmons and Mandel, 1987).

The FUDS is located in an area of quaternary alluvium (late Pleistocene and Holocene) (Bayne, 1962). Shale bedrock is at a depth of approximately 53 feet (ft) below ground surface in the area of the FUDS (KGS, 2009).

2.2.5.2 Overburden Soils

Soil types at the FUDS are primarily loams including silt and silty clay loams. The most common soil types present in the FUDS area are the Tabler silty clay loam and Bethany silt loam. The Tabler silty clay loam is a moderately well-drained soil that forms from calcareous clayey alluvium on slopes of 0 to 1 percent. The saturated hydraulic conductivity is very low to moderately low. The typical profile is clay loam from 0 to 8 inches and silty clay from 8 to 60 inches. The Bethany silt loam is a well-drained soil that forms from clayey loess over old clayey alluvium on slopes of 1 to 3 percent. The saturated hydraulic conductivity is moderately low to moderately high. The typical profile is silt loam from 0 to 9 inches, silty clay loam from 9 to 16 inches, silty clay from 16 to 36 inches, and silty clay loam from 36 to 60 inches (U.S. Department of Agriculture [USDA], 2009).

2.2.5.3 Hydrogeology

The FUDS is underlain by the Flint Hills aquifer. Groundwater is readily available throughout the Flint Hills region. The Flint Hills aquifer consists of the Permian limestones in the Chase and Council Grove Groups. The limestone aquifers in these rock units are sources of water for many springs and for public water supply throughout the Flint Hills region. Locally, well yields are estimated at up to 1,000 gallons per minute from the limestones that form this aquifer (Mcfarlane, 2000). Most of the water storage capacity of a limestone aquifer comes from the bedding plane faults and vertical cracks. Because of the transient nature of the bedding plane fractures, groundwater flow in the Flint Hills aquifer tends to be variable (Davidson, 2009).

Groundwater migration is generally from east to west. Recharge takes place where aquifers outcrop to the east and water moves down the regional bedrock dip toward the west. The bedrock aquifers are separated by thick, relatively impermeable shale units that lead to confined conditions (Aber, 2004). Typically, the water source for most domestic and stock wells within the Flint Hills aquifer includes about 30 to 50 ft of limestone (Mcfarlane, Misgna, and Buddemeier, 2000).

At the FUDS, depth to groundwater in wells ranges from 7 to 34 ft below ground surface and the available lithology logs indicate the wells are installed in clay and sand (KGS, 2009).

2.3 Population and Land Use

2.3.1 Nearby Population

The FUDS is located 5 miles south of Winfield and 6 miles north of Arkansas City, in Cowley County, Kansas. Recent estimates indicate the 2007 population of Winfield was 11,539 persons (City-Data.com, 2009a) and the 2007 population of Arkansas City was 11,168 persons (City-Data.com, 2009b). The estimated 2008 population of Cowley County was 34,065 (U.S. Census Bureau, 2009) or approximately 31.9 persons per square mile.

According to the U.S. Census Bureau, the 2000 population within a 2-mile radius of the FUDS property boundary was 509 persons and the numbers of housing units was 214. The population density in the area of the FUDS ranges from approximately 14.3 to 4,653.3 persons per square mile (Figure 8).

There are no schools or parks within an approximate 4-mile radius of the FUDS; however, an airport is located at the FUDS and two churches are located within an approximate 2-mile radius. Figure 9 shows sensitive receptor locations identified from available Geographic Information System resources.

2.3.2 Land Use

Prior to DoD use, the land was used primarily for agricultural purposes (cultivation and livestock). DoD use began in 1942 with the purchase of 1,386 acres for an Army Air Field. During the span of DoD use, conventional ordnance, chemical training materials, and pyrotechnics were used and/or stored at the site. Documented ordnance facilities at Strother Field included a small arms storage building, a magazine, an igloo, a skeet range, and a pistol range. The site was declared surplus in January 1946 and conveyed to the cities of Winfield and Arkansas City in May 1948 (USACE, 2006).

The property is currently occupied by the Strother Field Airport and Industrial Park. The Industrial Park covers the majority of the former base cantonment area. Only a few of the original facilities remain standing, including a hangar, waste water treatment facilities, and a water tower. Currently the Industrial Park has a variety of industries, including a major jet engine overhaul facility, a beer distributor, a driver's license office, and other manufacturers. The non-industrial portions of the site are used for agricultural production (USACE, 2006).

2.3.3 Area Water Supply

According to the Safe Drinking Water Information System, there are 15 active community public water systems located in Cowley County. The systems supply water to cities and rural water districts. The source of water is groundwater, surface water, or purchased surface water. One non-transient, non-community public water system services the Strother Field Airport and Industrial Park from a groundwater source (EPA, 2009a).

Figure 10 shows registered groundwater wells located on, and in the vicinity, of the FUDS. These wells consist of domestic, livestock, public water supply, irrigation, industrial, and monitoring wells (KGS, 2009). Thirty-two monitoring wells, six "other" wells (injection or dewatering wells), two remediation/recovery wells (former public water supply wells), one public water supply well, and one domestic well are located within the FUDS boundaries.

Since 1984, groundwater samples collected and analyzed by KDHE indicated the presence of chlorinated organic chemicals in several wells supplying Strother Field Industrial Park from a non-DoD source. The principal contaminants (trichloroethylene [TCE]; 1,2-dichloroethylene

[DCE]; 1,1,1-trichloroethane [TCA]; tetrachloroethylene [PCE]; and 1,1-DCE) are common industrial solvents known to persist in groundwater. KDHE collected a second series of samples from the Strother Field Public Water Supply wells, as well as samples from several private wells in the adjacent community of Hackney, the water distribution system, influents and effluents from the Strother Field waste water treatment plant, two monitoring wells on-site, and several off-site control locations (for comparison purposes). The Strother Field Public Water Supply was discontinued in June 1983. About 2,300 people use wells within 3 miles of the site as a source of drinking water (EPA, 2007a).

A five-year review of the site indicated that the selected remedial action continues to operate and function as intended by the Record of Decision (EPA, 1994a) and the Explanation of Significant Differences (EPA, 1998). The site's data indicate that contaminated groundwater is being contained; a review of the specific contaminants of concern indicates that the total levels of the contaminants of concern are decreasing, and the percentages of the specific contaminants of concern are changing to indicate that natural attenuation is occurring (EPA, 2006d).

2.3.4 Access

The FUDS is located south of Winfield, Kansas, and can be reached by taking Highway 77 south. The FUDS can be accessed by turning right (west) on 7th Avenue from Highway 77. The MRS within the FUDS can be reached by driving approximately 0.5 miles on 7th Avenue and turning right (north) on B Street. The southern portion of the MRS is located straight ahead approximately 0.2 miles. The property is currently occupied by the Strother Field Airport and Industrial Park; the non-industrial portions of the site are used for agricultural production. Access is not restricted.

2.4 Summary of Previous Investigations

There are no documented MEC finds or MEC-related incidents at the FUDS. There are no previous sample results for MC of concern reported for the FUDS.

2.5 Other Land Uses that May Have Contributed to Contamination

This section presents the summaries of investigations of non-munitions contamination at the FUDS.

2.5.1 Chlorinated Solvents in Groundwater

There are two chlorinated solvent plumes from a non-DoD source within the FUDS with associated degradation products present in both plumes. TCE is the parent contaminant in the northern plume, where a General Electric test cell has been identified as the main source (KDHE, 2009). Several possible sources have been identified for PCE in the southern plume, including the Greif Bros. Corporation (now Greif, Inc.), Cessna Aircraft, and Gordon-Piatt Energy Group, Inc.

Until 1983, the Strother Field Commission operated a water supply system consisting of eight wells on the site. After the use of the Industrial Park wells as a source of drinking water was discontinued, water was brought in by tank trucks. The Strother Field Commission installed two wells upgradient of the contaminated plume to supply water to the tenants. Two of the eight water supply system wells remained in use to supply process water for the industries located on the field. For the last several years, the Strother Field Commission has pumped these wells to contain the groundwater contamination beneath the site. In 1985, General Electric, a potentially responsible party, installed groundwater extraction wells and air stripping towers to remove volatile organic compounds from the groundwater under an administrative order with KDHE (EPA, 2007b). The site is being monitored to determine if migration is being effectively prevented and if natural attenuation of contaminants is occurring. Rural Water Districts are located immediately downgradient of the site (KDHE, 2009).

2.5.2 Polycyclic Aromatic Hydrocarbons and Lead

Due to the nature of industrial activities occurring at the FUDS, PAHs and lead from non-DoD sources may be present in various media. If sampling is conducted for PAHs and lead, sample locations will be biased towards areas that are less likely to be impacted by surrounding industrial activities (i.e., crop fields rather than around buildings).

2.6 Conceptual Site Model

The CSM for Strother Field identified a low explosive hazard for potential small arms at the FUDS. MC of greatest concern for the possible small arms ranges is the metal lead. At the pistol range, the highest concentrations of source metals from munitions activity are anticipated where projectiles and/or casings may have accumulated at the ground surface, e.g., at the berm and firing line, respectively. Although PAHs from the pitch-based targets at the skeet range are not MC, they are addressed under the MMRP as constituents potentially associated with former range use. The likely distribution of lead and PAHs was predicted from a model for skeet ranges published by the Interstate Technology and Regulatory Council (ITRC, 2003) and supported by Shaw project experience. The highest density of target fragments (target fragments fall zone), and therefore PAHs, were predicted closer to the firing position. Lead and PAHs were predicted in the middle zone (target fragments and lead shot fall zone), and lead was predicted in the outermost zone (lead shot fall zone). Soil was identified as a potentially complete pathway (Appendix A).

Surface water/sediment was identified as a potentially complete pathway due to the presence of a stream within the MRS located downrange of the firing lines and target berm. Groundwater is considered an incomplete pathway because former public supply wells within the MRS were converted to remediation/recovery wells due to the presence of chlorinated solvents in groundwater, and groundwater receptors were not identified. Potential exposure by inhalation of vapor is not a concern for non-volatile MC under normal environmental conditions and air is

considered an incomplete pathway. Potential inhalation of soil particles is included in the development of health-based screening values for soil and is thus considered through the soil exposure pathway.

3.0 Pre-Field Activities

3.1 Coordination with State Historic Preservation Office

Cultural resources require identification in order to complete HRS and MRSPP scoring. The Kansas State Historical Society (KSHS) reviewed its cultural resources files and indicated that the former Strother Field is "situated in an upland area of low archaeological potential." KSHS also indicated that, because the site is located in a formerly cultivated area, proposed sampling activities are not likely to pose a threat to any intact cultural deposits and have little potential to impact standing structures that might be eligible for National Register listing although none were identified at the FUDS. The KSHS concluded that the proposed sampling activities will have no effect on historic properties (KSHS, 2009).

3.2 Coordination Regarding Natural Resources

The USFWS and Kansas Department of Wildlife and Parks (KDWP) were contacted concerning IEPs and threatened or endangered species that might be present in the FUDS. Although Cowley County is home to 13 federal and state threatened and endangered species (KDWP, 2005), neither agency indicated that any areas of the FUDS were managed for ecological purposes or qualified as IEPs or sensitive environments. In addition, both agencies indicated that there were no concerns regarding proposed SI activities and threatened or endangered species at the FUDS (KDWP, 2009; USFWS, 2009).

3.3 Review of Historical Aerial Photographs

A review of historical (1950 and 1963) and current (2006) aerial photographs of the FUDS has been completed as part of preparation of this SSWP. The pistol range berm is identifiable in both historical aerial photographs and is no longer present in the current aerial photograph. No features are discernible in the skeet range in historical or current aerial photographs.

3.4 Coordination of Rights-of-Entry

Per Section 2.5.2 of the Work Plan (Shaw, 2006) and as the geographic USACE District office for the Strother Field FUDS, the Project Manager from the USACE NWK District office is responsible for obtaining the Rights-of-Entry (ROEs) for the property where the SI activities will be performed (Figure 5). Access to identified property is necessary for conducting field activities. All ROEs for this investigation have been granted (Table 2).

3.5 Equipment

An all metal detector will be used to support the reconnaissance effort. A hand-held global positioning system (GPS) unit will be used for traverses and to document any surface remains, document the reconnaissance survey, and identify the location of MEC, if found.

3.6 Communications

The primary means of on-site communication will be cellular telephones or radios. A satellite phone will be carried as a backup form of communication. The two-person field team (and any other accompanying parties) will remain together throughout all aspects of the field activities.

3.7 Training and Briefing

All site personnel will have completed the minimum training in accordance with 29 CFR 1910.120 (e) *Hazardous Waste Operations and Emergency Response (HAZWOPER)* and *Engineering Manual (EM) 385 1-1, Safety and Health Requirements Manual, Section 28, HAZWOPER.* Standard training requirements for field activities (for FUDS work) are listed in the SSHP Addendum in Appendix C.

Any additional training will be conducted on site during the Daily Tailgate Safety Briefing to include awareness of endangered species, culturally sensitive areas, and anticipated ordnance types. In addition, emphasis will be placed on the known presence of biota at the site.

4.0 Site Inspection Activities

The SI activities proposed at the FUDS are site reconnaissance and soil, sediment, and surface water sampling. SI field activities will be conducted in accordance with the SSHP Addendum (Appendix C). The SSHP Addendum is a supplement to the program-wide Accident Prevention Plan and SSHP contained in the Work Plan (Shaw, 2006). SI field activities will be documented in the field logbook.

4.1 Key Personnel

This section identifies key project personnel and their specific roles and responsibilities for each SI activity conducted at the FUDS. Additionally, this section defines the responsibilities, authority, and the interrelationships of all personnel who manage, perform, and verify activities affecting quality, particularly for personnel who need the organizational freedom and authority to:

- Initiate action to prevent the occurrence of nonconformance,
- Identify and record any quality problems,
- Initiate, recommend, or provide solutions through designated channels,
- Verify the implementation of solutions, and
- Control further processing, delivery, or installation of non-conforming items until the deficiency or unsatisfactory condition has been corrected.

Project Manager – The Shaw Project Manager will have overall responsibility, authority, and accountability for the project. Mr. Peter Kelsall is the Project Manager. He will provide additional management or technical support when needed and will serve as the final reviewer on all technical documents produced for the project.

Chemical Quality Control Officer – The Shaw Chemical Quality Control Officer shall ensure that all chemistry-related objectives, including responsibilities for DQO definitions, sampling and analysis, project requirements for data documentation and validation, and final project reports are attained. Mr. Tim Roth will serve as the Chemical Quality Control Officer for this project.

Health and Safety Manager – The Shaw Health and Safety Manager is responsible for the development and implementation of the SSHP and SSHP Addendum for the SI. Mr. Dave Mummert, CIH, will serve as the Health and Safety Manager for this project.

Technical Lead – The Shaw Technical Lead will oversee the technical aspects of the inspection activities. Ms. Cindy Burns will serve as the Technical Lead for this site.

Field Team Leader – The Shaw Field Team Leader will be responsible for the management and execution of all field project activities in accordance with the approved Work Plan, as well as

federal, state, and local laws and regulations. The Field Team Leader will also act as Site Safety and Health Officer. Ms. Cindy Burns will serve as the Field Team Leader for this site. The Field Team Leader will function as the primary point of contact for the stakeholders and field personnel, and will document technical progress, needs, potential problems, and recommended solutions.

UXO Technician – The UXO Technician will be responsible for the UXO avoidance measures to be implemented during field activities. One of the following individuals will serve as the UXO Technician: David Watkins (1420), Rob Irons (1137), Jim Bayne (1212), Ron Stanfield (1161), or Thomas Folger (1752).

4.2 Field Reconnaissance

This section discusses the visual surface reconnaissance planned for the MRS.

4.2.1 Objectives

A visual surface reconnaissance will be conducted along a meandering path through portions of the FUDS (Figure 11). The reconnaissance has three main objectives:

- Document general site conditions (field logbook, photographs, GPS waypoints) for the MRS, even if MEC has been documented from previous investigations or from SI reconnaissance;
- Identify and locate MEC, MD, and/or other evidence of range activities that may be present in order to test and verify the CSM (Appendix A) and to "ground truth" features seen on aerial photographs; and
- Optimize sample locations, biased to locations where MC is most likely to be present.

UXO avoidance will be conducted during all SI field activities. If MEC is observed at any point during field activities, the field team will respond according to the requirements of the SSHP and SSHP Addendum (in Appendix C) and make appropriate notifications in accordance with USACE direction (Appendix B). Reconnaissance for the purpose of determining the presence or absence of MEC will be terminated, and further reconnaissance will be limited to the minimum amount necessary to document site conditions and determine appropriate sample locations. If evidence of munitions activity is observed that is inconsistent with the CSM, notification will be made to USACE and KDHE and a variance to this SSWP would be submitted to initiate appropriate changes to the SI approach.

4.2.1.1 Document General Site Conditions

The following conditions, if present, will be recorded in the field logbook and documented by digital photographs:

- Access limitations (fencing, gates, rivers, buildings, etc.);
- Land use (agriculture, development, buildings, campgrounds, dumping, etc.);

- Land disturbance (destruction of historic berms, excavation, fill, subsidence, etc.);
- Type and condition of vegetative cover and habitat (noting especially any distressed populations);
- Presence or potential presence of wildlife, including (but not limited to) gallinaceous birds (grouse, pheasants, etc.), and waterfowl (ducks, geese, etc.);
- Wetlands or other features that would qualify the site as an IEP;
- Soil conditions;
- Presence or absence of surface water (streams, ponds, etc.);
- Direction of surface water flow;
- Location and condition of groundwater wells;
- Evidence of use of surface water or groundwater for human consumption, stock watering, or irrigation;
- General physical setting and topography;
- Any activities that could result in contamination; and
- Photograph details (GPS waypoint, key features, direction, time, distance to key objects, etc.).

4.2.1.2 Document Evidence of Military Activities

A visual surface reconnaissance will be performed within the MRS to assess potential evidence of former military activities that could be used to verify the CSM. The following conditions will be recorded in the field logbook and documented by digital photographs and GPS:

- Presence or absence of MEC or MD, such as cartridge cases, bullets or bullet fragments; and
- Location and physical description of range features such as firing points, berms, targets, observation posts, craters, foxholes, and historical military signs.

Based on USACE guidance, reconnaissance of this type will be limited to the identified former range areas, in the absence of evidence suggesting munitions-related activities in other portions of the FUDS.

4.2.1.3 Sample Locations

Reconnaissance will also be used to select optimal sample locations; i.e., samples will be biased to locations with evidence of former munitions activity, if observed. The following conditions will be recorded in the field logbook (include text and sketches, when applicable) and documented by digital photographs:

- Rationale for selecting sample location (e.g., presence of MEC or MD, staining, distressed vegetation);
- Description of sample location (e.g., face of berm, in front of target); and

- Soil conditions (as appropriate); and
- Surface water or sediment conditions (as appropriate).

Background sample locations will be selected in areas that do not appear to have been impacted by past site operations or current industrial operations based on criteria such as similarity to soils within the MRS and site accessibility.

4.2.2 Reconnaissance Methods

The site reconnaissance will be performed by conducting a visual inspection of appropriate and accessible portions of the range by a field team of two or more persons, including a qualified UXO technician. The UXO technician will supplement the visual inspection with the use of a hand-held all-metal detector in areas where vegetation or soil cover may obscure potential ferrous objects. The path walked during the reconnaissance will be recorded using a hand-held GPS unit. Reconnaissance will not include detailed mapping; however, GPS waypoints and tracks will be presented on SI figures.

The metal detector will generally be used in areas where it would be difficult to see objects on the ground surface because of vegetation or other site conditions. The metal detector may also be used around targets or in areas where subsurface MEC may reasonably be expected. The metal detector might not be used in portions of the MRS if the ground surface is visible and there is no visual evidence indicating the presence of ferrous munitions-related objects, or in areas where interference from ferrous objects unrelated to munitions, such as buried utilities, are present. Reconnaissance will be limited in areas that are actively being used for industrial purposes (Figure 11).

4.2.3 Extent of Reconnaissance

Site reconnaissance will use available aerial photographs and a Geographic Information System base map developed from the ASR and other sources. Field crews will be provided both current and historical aerial photographs. Information shown on the reconnaissance base map will include MRS boundaries, property boundaries, topography, current roads, and buildings. One objective of reconnaissance is to "ground truth" features seen on aerial photographs (e.g., if targets are still visible or if buildings have been removed or added).

The reconnaissance effort will be focused on the MRS and may be further concentrated in areas where MEC or MC is most likely to be found based on the CSM (e.g., target berm). General site conditions will be documented throughout the MRS and as appropriate in other parts of the FUDS.

At the Range Complex No. 1 MRS, the reconnaissance effort will cover areas of the skeet range that are not currently used for industrial activities (i.e., parking lots). The estimated total length of the meandering path at the skeet range is 15,000 ft (Figure 11).

At the pistol range, the reconnaissance effort will be concentrated at the firing line and down range at the former berm location. Additional reconnaissance may be conducted beyond the former berm location and target lines. The estimated total length of the meandering path at the pistol range is approximately 10,000 ft (Figure 11).

4.3 Field Sampling

This SSWP details sampling to be conducted, by media, as discussed during the TPP meeting and documented in the *Final TPP Memorandum* (Shaw, 2009). The collection of soil, sediment, and surface water samples is proposed for the MRS. Surface soil samples will be collected as composite samples (7-point, wheel pattern with a 2-ft radius). Sediment and surface water samples will be collected as discrete samples. Sample location rationale is presented in Table 3.

In all instances, samples will be collected using clean, new, disposable sampling equipment, such as a spoon or scoop and bowl. Nondisposable tools, such as a spade, shovel, or trowel, may be used to remove vegetation, roots, and gravel prior to collection of the soil samples. Soil, sediment, and surface water samples will be collected in accordance with this section and with the SAP/FSP Section 6.1 and Shaw Standard Operating Procedures T-FS-101 and T-FS-124 in Appendix E of the Work Plan (Shaw, 2006). Sample designations and quality assurance/quality control (QA/QC) sample requirements are summarized in Table 4.

4.3.1 MRS Samples

A total of 16 samples are planned for the Range Complex No. 1 MRS: six surface soil samples, one surface water sample, and one sediment sample at each the pistol and skeet sub-ranges (Figure 12). These samples are designed to assess the potential presence of MC associated with past activities involving the use of military munitions.

4.3.1.1 Pistol Range

Surface Soil Samples

Six surface soil samples will be collected and analyzed to determine if there has been a release of MC to surface soil related to past range activities, and if so, whether the concentrations pose a threat to human receptors. The six surface soil samples will be collected in the vicinity of the location where the former berm is believed to have existed, based on the configuration of a typical pistol range, and analyzed for lead (Figure 12).

Sampling locations will be adjusted in the field based on results of the visual reconnaissance. If physical evidence of past munitions activity is observed during site reconnaissance, sample locations will be adjusted and biased, using professional judgment, in accordance with the observed evidence and the CSM. If the area is paved, samples will be collected from adjacent unpaved locations. Samples will not be collected adjacent to industrial areas (within 10 ft of parking areas or buildings).

The surface soil samples collected from the pistol range will be analyzed for lead by EPA SW-846 Method 6020A.

Surface Water and Sediment Samples

A surface water sample, co-located with a sediment sample, will be collected and analyzed to determine if there has been a release of MC to surface water/sediment related to past range activities and if so, whether the concentrations pose a threat to human receptors. The surface water and sediment samples will be collected downrange of the firing lines and target berm in the stream bed of Posey Creek (Figure 12).

The surface water and sediment samples collected from the pistol range will be analyzed for lead by EPA SW-846 Method 6020A.

Groundwater Samples

No groundwater samples will be collected and analyzed because it is unlikely that lead, which is potentially present in soil, has impacted groundwater because lead is relatively insoluble. Groundwater was also determined to be an incomplete pathway because there is no groundwater use of the FUDS due to the presence of chlorinated solvents.

4.3.1.2 Skeet Range

Surface Soil Samples

Six surface soil samples will be collected and analyzed to determine if there has been a release of MC to surface soil. Surface soil samples will be collected in areas of the range where lead and PAH concentrations are predicted to be the greatest based on the distribution pattern for a typical skeet range. The samples will be collected in the area where target fragment and lead shot accumulation are predicted to be the greatest (Figure 12).

Sampling locations will be adjusted in the field based on results of the visual reconnaissance. If physical evidence of past munitions activity is observed during site reconnaissance, sample locations will be adjusted and biased, using professional judgment, in accordance with the observed evidence and the CSM. If the area is paved, samples will be collected from adjacent unpaved locations. Samples will not be collected adjacent to industrial areas (within 10 ft of parking areas or buildings.

The six surface soil samples collected from the target fragments fall zone and from the target fragments and lead shot fall zone will be analyzed for lead by EPA SW-846 Method 6020A and PAHs by EPA SW-846 Method 8270C (low level) (if target fragments are observed).

Surface Water and Sediment Samples

One surface water sample, co-located with a sediment sample, will be collected and analyzed to determine if there has been a release of MC to surface water/sediment related to past range activities and if so, whether the concentrations pose a threat to human receptors. The surface

water and sediment samples will be collected downrange of the skeet range in the stream bed of Posey Creek (Figure 12).

The surface water and sediment samples collected from the skeet range will be analyzed for lead by EPA SW-846 Method 6020A PAHs by EPA SW-846 Method 8270C (low level) (if target fragments are observed within the MRS).

Groundwater Samples

Groundwater was also determined to be an incomplete pathway because there is no groundwater use of the FUDS due to the presence of chlorinated solvents.

4.3.2 Background Sampling

Ten background surface soil samples will be collected in the areas outside of the MRS in areas that do not appear to have been impacted by past MMRP range activities or current industrial activities to ensure that a true representation of the local soil chemistry is obtained. Surface soil samples will be compositionally similar to MRS samples.

One background surface water sample and one background sediment sample will be collected upgradient and outside of the MRS in an area that does not appear to have been impacted by past MMRP range activities or current industrial activities.

Actual background sample locations will be determined in the field after samples have been collected from the MRS. The ten surface soil samples, one surface water sample, and one sediment sample will be analyzed for lead by EPA SW-846 Method 6020A and for PAHs by EPA SW-846 Method 8270C low level (if MRS samples are analyzed for PAHs).

4.3.3 Quality Assurance/Quality Control Samples

Quality control samples, including field duplicates and matrix spike/matrix spike duplicate samples, will be collected as detailed in Table 4. The USACE NWO Military Munitions Design Center has directed that no quality assurance (field split) samples will be collected for the SI at this site.

4.3.4 Sample Preservation, Packaging, and Shipping

Sample preservation and packaging are provided in Shaw SAP/FSP Tables 4-1 and 4-2 in Appendix E of the Work Plan (Shaw, 2006). Sample shipment will follow the procedures specified in Section 4.0 of the Shaw SAP/FSP. Completed analysis request/chain-of-custody records will be secured and included with each shipment of coolers per Section 7.1.3 of the Shaw SAP/FSP. Samples will be shipped to the following laboratory:

Test America - Denver
4955 Yarrow Street
Arvada, Colorado 80002
Phone: 303.736.0100
Fax: 303.431.7171
Attention: Sample Receiving/Deb Henderer

4.4 Analytical Program

Soil, sediment, and surface water samples will be analyzed using EPA SW-846 methodology as presented in Section 5.0 of the NWO FUDS QAPP in Appendix E of the Work Plan (Shaw, 2006). Soil, sediment, and surface water will be analyzed for lead by EPA SW-846 Method 6020A and PAHs by EPA SW-846 Method 8270C (low level) (if target fragments are observed). Sample designations and analyses are presented in Table 4.

For soil samples possibly impacted by small arms fire (.50-caliber ammunition or smaller), samples will be passed through an ASTM No. 10 (2-millimeter) wire mesh sieve at the laboratory prior to analysis for lead in order to remove coarser particles and foreign objects, including large metallic lead fragments from bullets, which have a low degree of bio-availability (ITRC, 2003; EPA, 2003).

Chemical data will be reported via a hard-copy data package and electronic format following the requirements described in the Shaw SAP/FSP Sections 7.1 and 7.2 (Appendix E) of the Work Plan and applicable portions of the USACE QAPP (Shaw, 2006). These data deliverables will be validated in accordance to the requirements referenced in Section 8.2 of the Shaw SAP/FSP.

4.5 Background and Screening Values

A comparison of site sample data to background data will be necessary to distinguish a munitions-related release from ambient conditions resulting from naturally occurring or anthropogenic sources. Where the body of background data includes sufficient samples (surface soil samples), a background threshold comparison of site concentrations to the background 95th upper tolerance limit or 95th percentile, as appropriate, will be made (EPA, 1989, 1992a, 1994b, and 2002). If one or more site samples exceed the background threshold, the following tests may also be applied:

- A nonparametric comparison of the central tendencies or medians of the site and background distributions, using the Wilcoxon rank sum test (EPA, 1994b, 2002, and 2006a).

Where the body of background data is limited (surface water and sediment), the site-to-background comparison will be conducted according to guidance for SI activities and HRS scoring (EPA, 1992b). Background concentrations for analytes are taken to be the maximum values observed in the limited background data set (EPA, 1995). A comparison is then made to

determine if a hazardous substance in the media is "significantly above the background level" according to the HRS criteria (40 CFR Appendix A to Part 300, Table 2-3):

1. If the sample measurement is less than or equal to the sample quantitation limit, no observed release is established.
2. If the sample measurement is greater than or equal to the sample quantitation limit, then:
    - If the background concentration is not detected, an observed release is established when the sample equals or exceeds the sample quantitation limit.
    - If the background concentration equals or exceeds the detection limit, an observed release is established when the sample is three times or more above the background concentration.

Background threshold values, for comparison to site data per the above HRS criteria, are three times the maximum detected background concentration. For analytes not detected in background samples, the background threshold is the sample quantitation limit.

Site sample data that exceed background concentrations will be compared to appropriate human health screening criteria to determine if additional investigation should be recommended. These screening criteria were developed during the TPP process and are based on guidance provide by USACE-NWK and KDHE. The human health screening criteria for surface soil, sediment, and surface water are a combination of EPA Regional Screening Levels and Risk-Based Standards for Kansas. Both sets of standards are residential, which is considered conservative because the FUDS property is used for agricultural purposes, and land use is not expected to change in the future. The lower of the two concentrations will be used as the human health screening value. Table 5 lists the human health screening criteria for surface soil and sediment and Table 6 lists the human health screening criteria for surface water.

4.6 Site-Specific Information/Data

In addition to observations and data directly obtained from field activities discussed in Sections 4.2 and 4.3, site-specific information/data will be collected for the FUDS to supplement that found in the ASR and *ASR Supplement*. Initial information collected has been incorporated in the SSWP. This site information will be supplemented using research via Internet searches, requests from agency contacts (KSHS, USFWS, etc.), and site contacts, if applicable. Site-specific information/data will include geology, climate, hydrogeology, federally and state listed threatened and endangered species known to be or potentially be on site, sensitive habitats, wetlands, cultural and archeological resources, water resources, vegetation, waste disposal sites, and impact mitigation measures.

Further data collection will be conducted to complete the MRSPP scoring sheets and to collect the pertinent MC-related HRS scoring information. The primary information needed to complete the MRSPP scoring, such as hazard type (i.e., explosive or chemical) and accessibility, will come from historical site documents (ASR, *ASR Supplement*, etc.). To further supplement current

on- and off-site information needed for receptor scoring, additional data will be collected on the current on- and off-site activities/structures, population density, CERCLA sites, Resource Conservation and Recovery Act sites, well locations, and water supply information.

5.0 Investigation-Derived Waste

Investigation-derived waste (IDW) will be managed in accordance with Work Plan Section 3.7 and Shaw SAP/FSP Section 9.0 in Appendix E of the Work Plan (Shaw, 2006). All IDW is presumed nonhazardous unless field observations indicate otherwise. The following types of IDW will be managed as specified in Appendix E of the Work Plan (Shaw, 2006):

- Personal protective equipment and disposable equipment (i.e., gloves, disposable sampling scoop): Bagged and routed to a municipal landfill;
- Excess surface soil: Returned to the source (i.e., ground surface); and
- Water used in cleaning of reusable equipment: Poured on ground surface.

6.0 Proposed Schedule

The proposed schedule for field activities and reporting is provided below. The timing of the field activities assumes there will be no delays because of inclement weather.

- Field Work Begins: October 2009.
- Draft SI Report Submitted: January 2010.
- Draft SI Report Comments Due: February 2010.
- Draft Final SI Report Submitted: March 2010.
- Draft Final SI Report Comments Due: May 2010.
- Second TPP Meeting: May 2010.
- Final SI Report Submitted: May 2010.

7.0 References

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Figures

DRAWING NUMBER: 124_StrotherField_010_Fig1_SiteLocation_SSWP

DRAWN BY: M. Mireiter 12/30/08

OFFICE: DEN

655000 666000 677000 688000 699000

4139500 4130000 4120500 4111000 4101500

Belle Plaine
Udall
Winfield
Burden
Oxford
Winfield
Geuda Springs
Arkansas City

Ninnescah River
Cowskin Creek
Stewart Creek
Dutch Creek
Timber Creek
Timber Creek Lake
Cedar Creek
Spring Creek
Silver Creek
Slate Creek
Winser Creek
Walnut River
Grouse Creek
Crabb Creek
Cowley County State Lake
Lake Wynds
Chilocco Creek
Osage Creek
Little Beaver Creek

Sumner County
Cowley County
Kay County
Osage County

81 35 15 160 166 77

Legend

Strother Field FUDS Boundary

NOTES:
1) FUDS property boundary was derived from the Strother Field ASR Supplement (USACE, 2004).
2) Topographic maps (Cowley and Sumner Counties) were obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.

N

0 1.5 3 6 Miles

REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 1

SITE LOCATION

STROTHER FIELD
FUDS PROPERTY NUMBER B07KS0277

US Army Corps of Engineers®
Omaha District

Shaw®

673500 674400 675300 676200 677100

4117600
4116800
4116000
4115200
4114400

Pistol Range
Skeet Range

Pistol Range
Skeet Range
Pistol Range Target Berm

DRAWING NUMBER: 124_StrotherField_011_Fig2_1950Aerial_SSWP

DRAWN BY: M. Mireiter 12/30/08

OFFICE: DEN

Legend

Strother Field FUDS Boundary

Range in the MMRP Inventory

Range Complex No. 1

Sub-Ranges

Skeet Range

Pistol Range

NOTES:
1) FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
2) Aerial photograph was obtained from the U.S. Geological Survey and is dated September 5, 1950.

N

0 625 1,250 2,500
Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 2

1950 AERIAL PHOTOGRAPH

STROTHER FIELD
FUDS PROPERTY NUMBER B07KS0277

US Army Corps of Engineers®
Omaha District

Shaw®

673500 674400 675300 676200 677100

4117600 4116800 4116000 4115200 4114400

Pistol Range

Skeet Range

Pistol Range

Skeet Range

Pistol Range
Target Berm

1B-149GS-CMZ

Legend

Strother Field FUDS Boundary

Range in the MMRP Inventory

Range Complex No. 1

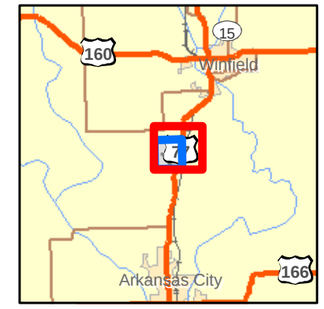
Sub-Ranges

Skeet Range

Pistol Range

NOTES:
1) FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
2) Aerial photograph was obtained from the U.S. Geological Survey and is dated May 4, 1963.

N



0 625 1,250 2,500 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 3

1963 AERIAL PHOTOGRAPH

STROTHER FIELD
FUDS PROPERTY NUMBER B07KS0277

US Army Corps of Engineers®
Omaha District

Shaw®

OFFICE	DRAWN BY		DRAWING NUMBER
DEN	M. Mireiter	12/30/08	124_StrotherField_018_Fig3_1963Aerial_SSWP

673500 674400 675300 676200 677100

4117600 4116800 4116000 4115200 4114400

Pistol Range
Skeet Range
202nd Rd
61st Rd
CORD 4
77
9th Ave
7th Ave
5th Ave
4th Ave
2nd Ave
A St
B St
C St
D St
E St
USHY 77
71st Rd
Posey Creek
McKay
CORD 27
Strother Field Sewage Treatment Plant
Strother Field

Pistol Range
Skeet Range
Posey Creek
Pistol Range Target Berm

Legend

Strother Field FUDS Boundary

Range in the MMRP Inventory

Range Complex No. 1

Sub-Ranges

Skeet Range

Pistol Range

Intermittent Stream

Perennial Stream

NOTES:
1) FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
2) Aerial photograph (Cowley County) was obtained from the U.S. Department of Agriculture, Service Center Agencies; photograph is from the USDA-APFO National Agriculture Imagery Program (NAIP), 2006.

N

160 15 Winfield 77 Arkansas City 166

0 625 1,250 2,500 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 4

2006 AERIAL PHOTOGRAPH

STROTHER FIELD
FUDS PROPERTY NUMBER B07KS0277

US Army Corps of Engineers®
Omaha District

Shaw®

DRAWING NUMBER: *124_StrotherField_012_Fig4_2006Aerial_SSWP*

DRAWN BY: *M. Mireiter* *12/30/08*

OFFICE: DEN

DRAWING NUMBER: 124_StrotherField_015_Fig5_ParcelOwnership_SSWP

DRAWN BY: M. Mireiter 12/30/08

OFFICE: DEN

674000 674500 675000 675500 676000

4117600 4117200 4116800 4116400 4116000

Pistol Range

Skeet Range

1 2 3 4 5

CORD 4 61st Rd 202nd Rd 9th Ave 7th Ave CORD 20 71st Rd A St B St D St US HWY 77 77

Strother Field

Legend

- Strother Field FUDS Boundary
- Taxlot Parcel

Range in the MMRP Inventory

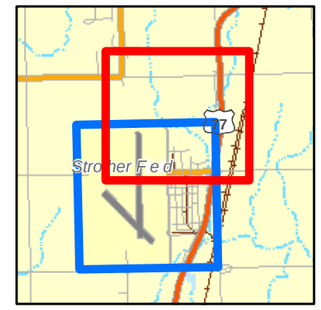
- Range Complex No. 1

Sub-Ranges

- Skeet Range
- Pistol Range

NOTES:

1) FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
2) Parcel data was obtained from the Cowley County Appraiser's Office (620-221-5430).
3) Aerial photograph (Cowley County) was obtained from the U.S. Department of Agriculture, Service Center Agencies; photograph is from the USDA-APFO National Agriculture Imagery Program (NAIP), 2006.



N

0 350 700 1,400 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 5

PARCEL OWNERSHIP

STROTHER FIELD
FUDS PROPERTY NUMBER B07KS0277

US Army Corps of Engineers®
Omaha District

Shaw®

DRAWING NUMBER: 124_StrotherField_013_Fig6_Topo_SSWP

DRAWN BY: M. Mireiter 12/30/08

OFFICE: DEN

673500 674400 675300 676200 677100

4117600 4116800 4116000 4115200 4114400

Pistol Range

Skeet Range

Pistol Range

Skeet Range

Pistol Range Target Berm

STROTHER AIRFIELD

Hackney

Posey Creek

61st Rd

202nd Rd

9th Ave

7th Ave

5th Ave

4th Ave

2nd Ave

A St

B St

C St

D St

71st Rd

McKay

CORD 4

CORD 27

BM 1161

BM 1213

BR 1181

WT

77

160

166

15

Winfield

Arkansas City

Legend

Strother Field FUDS Boundary

Range in the MMRP Inventory

Range Complex No. 1

Sub-Ranges

Skeet Range

Pistol Range

NOTES:

1) FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
2) Topographic map (Cowley County) was obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.

N

0 625 1,250 2,500 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

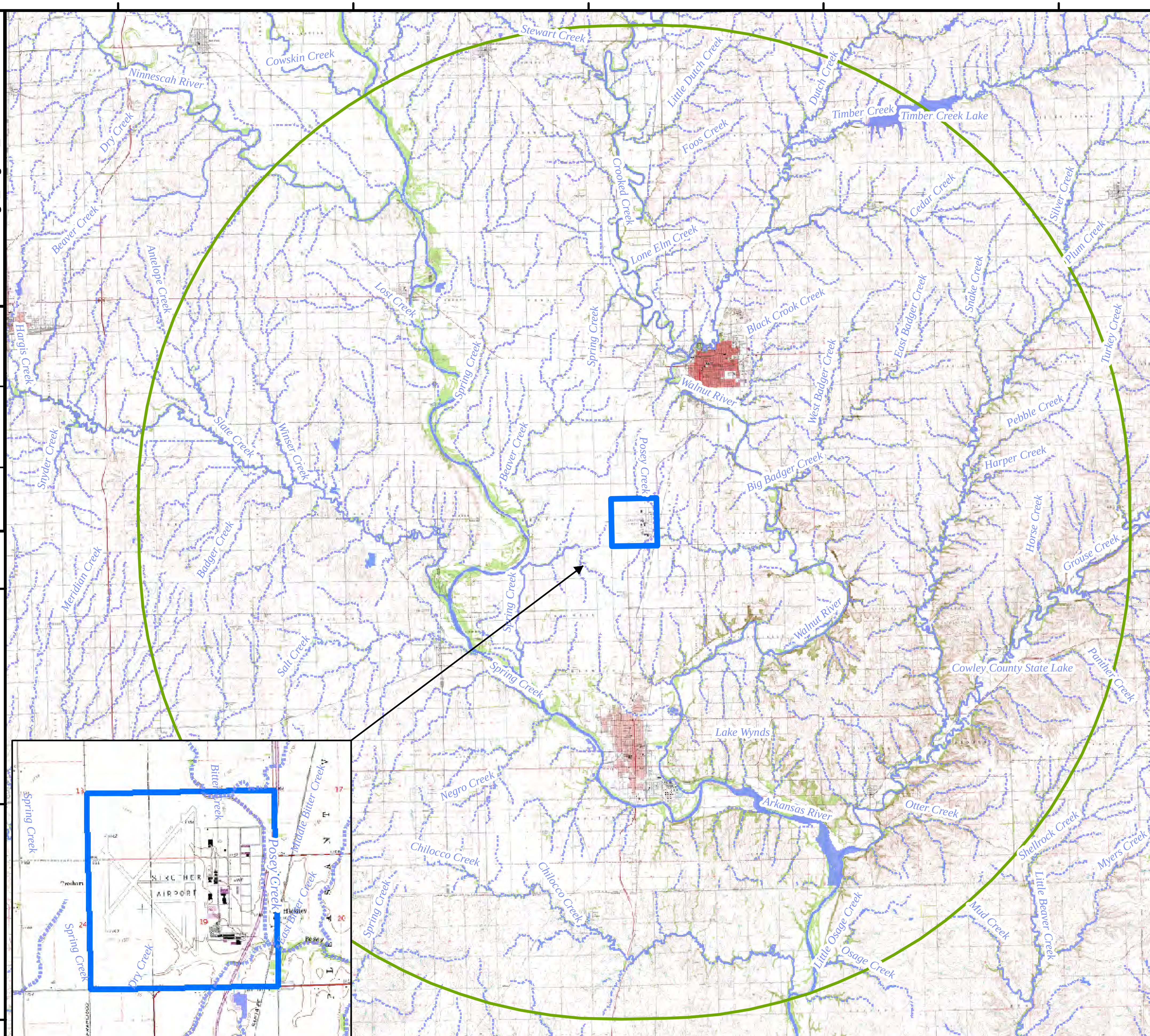
FIGURE 6

TOPOGRAPHIC MAP

STROTHER FIELD
FUDS PROPERTY NUMBER B07KS0277

US Army Corps of Engineers®
Omaha District

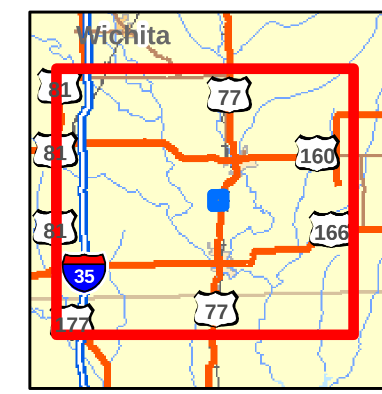
Shaw®



Legend

- Strother Field FUDS Boundary
- 15-Mile Radius from FUDS Boundary
- Intermittent Stream
- Perennial Stream

NOTES:
1) FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
2) Topographic maps (Cowley and Sumner Counties) were obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.



N

0 1.625 3.25 6.5 Miles

REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 7

REGIONAL SURFACE WATER DRAINAGE WITHIN A 15-MILE RADIUS

STROTHER FIELD
FUDS PROPERTY NUMBER B07KS0277

US Army Corps of Engineers®
Omaha District

Shaw®

DRAWING NUMBER	124_StrotherField_014_Fig7_RegSW_SSWP
DRAWN BY	M. Mireiter 12/30/08
OFFICE	DEN

DRAWING NUMBER: 124_StrotherField_019_Fig8_2000Demographics_SSWP

DRAWN BY: M. Miller 12/30/08

OFFICE: DEN

2000 CENSUS DATA			
Population		Housing Units	Households
Within FUDS Boundary	37	15	13
FUDS + 1/4 Mile	68	27	25
FUDS + 1/2 Mile	76	31	28
FUDS + 1 Mile	173	78	70
FUDS + 2 Miles	509	214	200
FUDS + 3 Miles	1,529	599	561
FUDS + 4 Miles	2,993	1,237	1,136

664000 668000 672000 676000 680000

4122400 4118600 4114800 4111000 4107200

149.7 186.9 3907.1 201.3 3078 5500 1037.8 4104.2 4653.3 4464.7 377.1 21.9 5.4 14.3 111.1 24.9 369.9 536.9 1057.9

Strother Field

1/4-Mile Radius
1/2-Mile Radius
1-Mile Radius
2-Mile Radius
3-Mile Radius
4-Mile Radius

Geuda Springs

Arkansas City

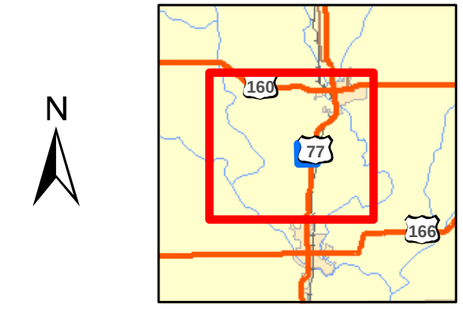
Legend

- Strother Field FUDS Boundary

2005 Census Block Group Population

- 500 - 800
- 801 - 1200
- 1201 - 1600
- 1601 - 2000
- Census Block Centroid Unit
- 10.5 — Number of People Per Square Mile Within Census Block Group

NOTES:
1) FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
2) Census data were obtained from StreetMap (ESRI, 2006).
3) The 2005 population of Cowley County was 31.9 people per square mile.
4) The Census Block Centroid Units represent centroids of the smallest entities for which the Census Bureau tabulates census information, bounded on all sides by visible features such as streets, streams, and railroad tracks, and/or invisible boundaries such as city, town, and county limits. The population assigned to a centroid unit may be a positive integer or zero. The centroid populations were summed within defined distances from the FUDS boundary to generate population totals presented on the inset table.
5) Aerial photograph (Cowley County) was obtained from the U.S. Department of Agriculture, Service Center Agencies; photograph is from the USDA-APFO National Agriculture Imagery Program (NAIP), 2006.



REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 8

CENSUS DATA WITHIN A 4-MILE RADIUS

STROTHER FIELD
FUDS PROPERTY NUMBER B07KS0277

US Army Corps of Engineers®
Omaha District

Shaw®

DRAWING NUMBER: 124_StrotherField_020_Fig9_SensRec_SSWP

DRAWN BY: M. Mireiter 12/30/08

OFFICE: DEN

667400 671100 674800 678500 682200

4122000 4118500 4115000 4111500 4108000

Range Complex No. 1

Walnut River

Big Badger Creek

Spring Creek

77

15

166

Legend

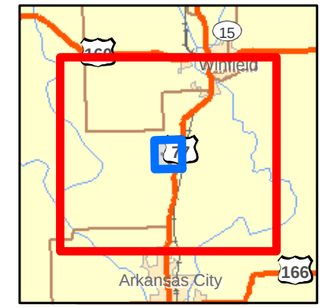
- Strother Field FUDS Boundary
- 4-Mile Radius from FUDS Boundary

Range in the MMRP Inventory

- Range Complex No. 1
- Wetlands Area
- School
- Park
- Church
- Airport

NOTES:

1) FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
2) Wetlands data was obtained from the U.S. Fish and Wildlife Service, May 2006, NWIDBA.CONUS_wet_poly: Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Washington, DC. FWS/OBS-79/31., U.S. Fish and Wildlife Service, Branch of Habitat Assessment, Washington, D.C.
3) Topographic map (Cowley County) was obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.



N

0 0.5 1 2 Miles

REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 9

SENSITIVE RECEPTORS AND ENVIRONMENTS WITHIN A 4-MILE RADIUS

STROTHER FIELD
FUDS PROPERTY NUMBER B07KS0277

US Army Corps of Engineers®
Omaha District

Shaw®

DRAWING NUMBER: 124_StrotherField_021_Fig10_GWWells_SSWP

DRAWN BY: M. Mireiter 12/30/08

OFFICE: DEN

667400 671100 674800 678500 682200

4122000 4118500 4115000 4111500 4108000

Range Complex No. 1

Walnut River

Big Badger Creek

Spring Creek

77

15

Legend

- Strother Field FUDS Boundary
- 4-Mile Radius from FUDS Boundary

Range in the MMRP Inventory

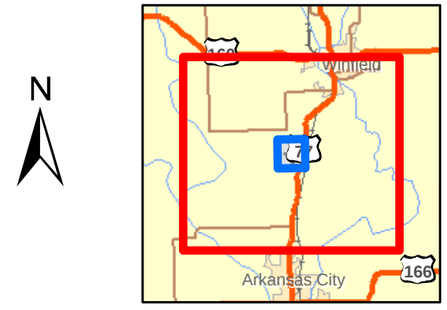
- Range Complex No. 1

Groundwater Well Type

- Public Water Supply
- Domestic
- Remediation/Recovery
- Industrial
- Irrigation
- Feedlot/Livestock/Windmill
- Monitoring Well/Observation/Piezometer
- Other

NOTES:

1) FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
2) Groundwater well data was obtained from the Kansas Geological Survey, Water Well Completions Records Database (http://www.kgs.ku.edu/Magellan/WaterWell/index.html).
3) Topographic map (Cowley County) was obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.



REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 10

GROUNDWATER WELL LOCATIONS WITHIN A 4-MILE RADIUS

STROTHER FIELD
FUDS PROPERTY NUMBER B07KS0277

US Army Corps of Engineers®
Omaha District

Shaw®

DRAWING NUMBER: 124_StrotherField_016_Fig11_PropRecon_SSWP

DRAWN BY: M. Mireiter 12/30/08

OFFICE: DEN

674540 674710 674880 675050 675220

4116700

4116550

4116400

4116250

4116100

Pistol Range

Skeet Range

Posey Creek

Strother Field

Pistol Range Target Berm

9th Ave

A St

B St

D St

Legend

Strother Field FUDS Boundary

Range in the MMRP Inventory

Range Complex No. 1

Sub-Ranges

Skeet Range

Pistol Range

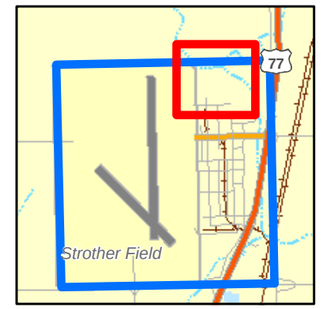
Pistol Range Target Berm

Intermittent Stream

Proposed Reconnaissance Path

NOTES:

1) FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
2) Aerial photograph (Cowley County) was obtained from the U.S. Department of Agriculture, Service Center Agencies; photograph is from the USDA-APFO National Agriculture Imagery Program (NAIP), 2006.



N

0 125 250 500

Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 11

PROPOSED RECONNAISSANCE PATH

STROTHER FIELD
FUDS PROPERTY NUMBER B07KS0277

US Army Corps of Engineers®
Omaha District

Shaw®

DRAWING NUMBER 124_StrotherField_017_Fig12_PropSampleLocs_SSWP

DRAWN BY M. Mireiter 12/30/08

OFFICE DEN

674540 674710 674880 675050 675220

4116700 4116550 4116400 4116250 4116100

Pistol Range

Skeet Range

Estimated Lead Shot Fall Zone

Estimated Target Fragments and Lead Shot Fall Zone

Estimated Target Fragments Fall Zone

Pistol Range Target Berm

Powell Creek

Strother Field

9th Ave

A St

B St

D St

Legend

Strother Field FUDS Boundary

Range in the MMRP Inventory

Range Complex No. 1

Sub-Ranges

Skeet Range

Pistol Range

Skeet Range Estimated Shotfall Zones[2]

Lead Shot

Target Fragments

Target Fragments and Lead Shot

Pistol Range Target Berm

Intermittent Stream

Background Surface Soil

Background Surface Water/Sediment

Pistol Range Surface Soil

Pistol Range Surface Water/Sediment

Skeet Range Surface Soil

Skeet Range Surface Water/Sediment

NOTES:

1) FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
2) Shotfall zone boundaries are based on previous skeet range investigations (adapted from the ITRC *Characterization and Remediation of Soils at Closed Small Arms Ranges*, ITRC, 2003).
3) Aerial photograph (Cowley County) was obtained from the U.S. Department of Agriculture, Service Center Agencies; photograph is from the USDA-APFO National Agriculture Imagery Program (NAIP), 2006.

N

77

Strother Field

0 125 250 500 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 12

PROPOSED SAMPLE LOCATIONS

STROTHER FIELD
FUDS PROPERTY NUMBER B07KS0277

US Army Corps of Engineers®
Omaha District

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Tables

Table 1
Munitions Information
Strother Field, Cowley County, Kansas

Munitions	Component and Munitions Constituents	Munitions Constituents of Concern
Small Arms – .22- and .45-caliber	Projectile – lead, antimony (jacket – gilding metal, steel, copper)	Lead
	Casing – copper and zinc	None
	Propellant – smokeless powder, single-base (nitrocellulose) or double-base (nitrocellulose and nitroglycerin)	None
Small Arms – Shotgun	Shot – lead	Lead
	Propellant – smokeless powder; nitrocellulose, diphenylamine, graphite, dinitrotoluene	None
	Targets – PAHs*	PAHs

Note: This table identifies various component and munitions constituents that may have been present in munitions used at the FUDS. Many of these constituents are not carried forward as MC of concern in the SI for one or more of the following reasons: nonhazardous properties, naturally occurring materials, limited mobility, limited quantities, and nature of munitions use. MC of concern are considered indicators of a potential MC release for the SI.

*Although PAHs from the pitch-based targets potentially used at the skeet range are not MC, they are addressed under the MMRP as constituents potentially associated with former range use.

FUDS = Formerly Used Defense Site
MC = Munitions Constituents
MMRP = Military Munitions Response Program
PAH = Polycyclic Aromatic Hydrocarbon
SI = Site Inspection

Table 2
Rights-of-Entry Status
Strother Field, Cowley County, Kansas

Parcel ID	Date Signed by Landowner	Right-of-Entry Duration	Estimated Date to Contact Prior to Field Work
1	May 14, 2009	9 months	1 week prior
2	May 14, 2009	9 months	1 week prior
3	April 13, 2009	9 months	1 week prior
4	April 16, 2009	9 months	1 week prior
5	April 17, 2009	9 months	1 week prior

Table 3
Sample Location Rationale
Strother Field, Cowley County, Kansas

Location	Sample Location ID	Sample Media	Sample Location Rationale
Range Complex No. 1 - Skeet Range	124A001	Soil	Surface soil samples will be collected within two fall zones of the skeet range. Surface water/sediment samples will be collected downrange of the firing point in Posey Creek. Sampling locations will be determined in the field based on the visual identification of the MRS, reconnaissance, and presence of MD or other indicators of potentially impacted soils.
	124A002		
	124A003		
	124A004		
	124A005		
	124A006		
	124A007	Surface Water	
		Sediment	
Range Complex No. 1 - Pistol Range	124A008	Soil	Surface soil samples will be collected near the former berm location. Surface water/sediment samples will be collected downrange of the firing line and former berm in Posey Creek. Sampling locations will be determined in the field based on the visual identification of the MRS, reconnaissance, and presence of MD, or other indicators of potentially impacted soils.
	124A009		
	124A010		
	124A011		
	124A012		
	124A013		
	124A014	Surface Water	
		Sediment	
Background	124A015	Soil	Ten background surface soil samples will be collected in association with Range Complex No. 1. Sampling locations will be based on visual observation that the area does not appear to be impacted by past site operations or current industrial operations, and will be collected outside of the range safety fan. Surface water and sediment background samples will be collected upgradient of the MRS.
	124A016		
	124A017		
	124A018		
	124A019		
	124A020		
	124A021		
	124A022		
	124A023		
	124A024		
	124A025	Surface Water	
		Sediment	

MD – Munitions debris.
MRS – Munitions response site.

Table 4
Sample Designations, Quality Assurance/Quality Control, and Analyses
Strother Field, Cowley County, Kansas

Location	Sample Location ID	Sample Type	Sample Number	Sample Media	QA/QC Samples		Analysis/EPA Method
					Field Duplicate	MS/MSD	
Range Complex No. 1 - Pistol Range	124A001	Composite	NWO-124-0001	Soil		NWO-124-0001-MS/MSD	Lead by SW-846 6020A
	124A002	Composite	NWO-124-0002	Soil			
	124A003	Composite	NWO-124-0003	Soil			
	124A004	Composite	NWO-124-0004	Soil	NWO-124-0013		
	124A005	Composite	NWO-124-0005	Soil			
	124A006	Composite	NWO-124-0006	Soil			
	124A007	Discrete	NWO-124-1001	Sediment			
		Discrete	NWO-124-2001	Surface Water			
Range Complex No. 1 - Skeet Range	124A008	Composite	NWO-124-0007	Soil			Lead by SW-846 6020A, PAHs by SW-846 8270C (low level)*
	124A009	Composite	NWO-124-0008	Soil			
	124A010	Composite	NWO-124-0009	Soil			
	124A011	Composite	NWO-124-0010	Soil			
	124A012	Composite	NWO-124-0011	Soil			
	124A013	Composite	NWO-124-0012	Soil	NWO-124-0014		
	124A014	Discrete	NWO-124-1002	Sediment			
		Discrete	NWO-124-2002	Surface Water		NWO-124-2003	
Background	124A015	Composite	NWO-124-5001	Soil		NWO-124-5001-MS/MSD	Lead by SW-846 6020A, PAHs by SW-846 8270C (low level)*
	124A016	Composite	NWO-124-5002	Soil			
	124A017	Composite	NWO-124-5003	Soil			
	124A018	Composite	NWO-124-5004	Soil			
	124A019	Composite	NWO-124-5005	Soil			
	124A020	Composite	NWO-124-5006	Soil			
	124A021	Composite	NWO-124-5007	Soil			
	124A022	Composite	NWO-124-5008	Soil			
	124A023	Composite	NWO-124-5009	Soil			
	124A024	Composite	NWO-124-5010	Soil			
	124A025	Discrete	NWO-124-5011	Sediment	NWO-124-5012		
		Discrete	NWO-124-6001	Surface Water		NWO-124-6001-MS/MSD	

*PAHs will be only be analyzed if evidence of target fragments is observed.
EPA = U.S. Environmental Protection Agency.
MS/MSD = Matrix spike/matrix spike duplicate.
PAH = Polycyclic aromatic hydrocarbons.
QA/QC = Quality assurance/quality control.

Table 5
Human Health Screening Criteria for MC of Concern in Surface Soil and Sediment
Strother Field, Cowley County, Kansas

Analyte	KDHE RSK[a] Residential Scenario Soil Pathway	EPA Regional Screening Level Residential Soil[b]	Final SI Screening Level[c]	PQL
Metals (mg/kg)				
Lead	400	400	**400**	0.4
Polycyclic Aromatic Hydrocarbons (mg/kg)				
Acenaphthene	300	3400	**300**	0.005
Acenaphthylene[d]	NVA	1700[d]	**1700**	0.005
Anthracene	13	17000	**13**	0.005
Benzo(a)anthracene	12	0.15	**0.15**	0.005
Benzo(a)pyrene	1.2	0.015	**0.015**	0.005
Benzo(b)fluoranthene	12	0.15	**0.15**	0.005
Benzo(ghi)perylene[d]	NVA	1700[d]	**1700**	0.005
Benzo(k)fluoranthene	10	1.5	**1.5**	0.005
Chrysene	6.4	15	**6.4**	0.005
Dibenz(a,h)anthracene	1.2	0.015	**0.015**	0.005
Fluoranthene	220	2300	**220**	0.005
Fluorene	270	2300	**270**	0.005
Indeno(1,2,3-cd)pyrene	0.76	0.15	**0.15**	0.005
Naphthalene	104	1500	**104**	0.005
Phenanthrene[d]	NVA	1700[d]	**1700**	0.005
Pyrene	140	1700	**140**	0.005

Abbreviations and Acronyms:
EPA = U.S. Environmental Protection Agency
KDHE = Kansas Department of Health and Environment
MC = Munitions Constituents
mg/kg = milligrams per kilogram
NVA = No Value Available
PQL = Practical Quantitation Limit
RSK = Risk-Based Standards for Kansas
SI = Site Inspection

Notes

[a] Risk-Based Standards for Kansas (RSK) Manual, Appendix A, Tier 2 Risk-Based Summary Table, Kansas Department of Health and Environment (KDHE)/Bureau of Environmental Remediation, dated June 2007.

[b] 2009 EPA Regional Screening Levels for Chemical Contaminants at Superfund Sites; Website: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm.

[c] Final Screening Value selected using the lower of the following:

1. State Value (Kansas)
2. EPA Regional Screening Level

A final SI screening value is shown in bold unless it is less than the PQL. If laboratory cannot meet any of the preferred PQLs with routine SW-846 methodology as supported by Method Detection Limits that are no greater than 1/3 PQL, then laboratory's PQL must be identified in laboratory submittal as failing to meet the PQL. Some screening values cannot be obtained with routine methodology to the PQL. In those cases, the PQL achievable with a routine SW-846 methodology would be accepted.

[d] Based on EPA Regional Screening Level for pyrene as a surrogate value.

Table 6
Human Health Screening Criteria for MC of Concern in Surface Water
Strother Field, Cowley County, Kansas

Analyte	EPA Regional Screening Level - Tap Water [a]	Federal Ambient Water Criteria		Kansas Surface Water Quality Standards		Final SI Screening Level [d]	PQL
		Consumption of Water and Organisms [b]	Consumption of Organisms [b]	Food Procurement [c]	Domestic Water Supply [c]		
Metals/Inorganics (mg/L)							
Lead	NVA	NVA	NVA	NVA	0.015	**0.015**	0.003
Polycyclic Aromatic Hydrocarbons (mg/L)							
Acenaphthene	2.2	0.67[e]	0.99[e]	0.99	0.67	**0.67**	0.0001
Acenaphthylene[f]	1.1	NVA	NVA	0.0000311	NVA	**1.1**	0.0001
Anthracene	11	8.3	40	40	NVA	**8.3**	0.0001
Benzo(a)anthracene	0.000029	0.0000038	0.000018	0.000018	NVA	0.0000038	0.0001
Benzo(a)pyrene	0.0000029	0.0000038	0.000018	0.000018	NVA	0.0000029	0.0001
Benzo(b)fluoranthene	0.000029	0.0000038	0.000018	0.000018	NVA	0.0000038	0.0001
Benzo(ghi)perylene[f]	1.1	NVA	NVA	0.0000311	NVA	0.0000311	0.0001
Benzo(k)fluoranthene	0.00029	0.0000038	0.000018	0.000018	NVA	0.0000038	0.0001
Chrysene	0.0029	0.0000038	0.000018	0.000018	NVA	0.0000038	0.0001
Dibenz(a,h)anthracene	0.0000029	0.0000038	0.000018	0.000018	NVA	0.0000029	0.0001
Fluoranthene	1.5	0.13	0.14	NVA	NVA	**0.13**	0.0001
Fluorene	1.5	1.1	5.3	5.3	NVA	**1.1**	0.0001
Indeno(1,2,3-cd)pyrene	0.000029	0.0000038	0.000018	0.000018	NVA	0.0000029	0.0001
Naphthalene	0.00014	NVA	NVA	NVA	NVA	**0.00014**	0.0001
Phenanthrene[f]	1.1	NVA	NVA	0.0000311	NVA	0.0000311	0.0001
Pyrene	1.1	0.83	4.0	4.0	NVA	**0.83**	0.0001

Abbreviations and Acronyms

EPA = U.S. Environmental Protection Agency
MC = munitions constituents
MDL = method detection limit
mg/L = milligrams per liter
NVA = No Value Available
PQL = Practical Quantitation Limit
RSK = Risk-Based Standards for Kansas
SI = Site Inspection

Notes

[a] 2009 EPA Regional Screening Levels for Chemical Contaminants at Superfund Sites; Website: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_ table/Generic_Tables/index.htm.

[b] National Recommended Water Quality Criteria, U.S. Environmental Protection Agency, Office of Water, 2006. These constituents are considered priority pollutants unless indicated otherwise.

[c] Values from Kansas Surface Water Quality Standards, Tables of Numeric Criteria, Table 1a. Prepared by KDHE, Bureau of Water, December 6, 2004.

[d] A final SI screening value is shown in bold if it is less than the PQL. If laboratory cannot meet any of the preferred PQLs with routine SW-846 methodology as supported by MDLs that are no greater than 1/3 PQL, then laboratory's PQL must be identified in laboratory submittal as failing to meet the PQL. Some screening values cannot be obtained with routine methodology to the PQL. In those cases, the PQL achievable with a routine SW-846 methodology would be accepted.

[e] The organoleptic effect criterion is more stringent than the value for priority toxic pollutants.

[f] Based on pyrene as a surrogate.

Appendix A
Conceptual Site Model

1.0 Conceptual Site Model – Range Complex No. 1

1.1 Overview

A site-specific conceptual site model (CSM) summarizes available site information and identifies relationships between exposure pathways and associated receptors. A CSM is used to determine the data types necessary to describe site conditions and quantify receptor exposure, and discusses the following information:

- Current site conditions and future land use;
- Potential munitions and explosives of concern (MEC) and munitions constituents (MC) sources (e.g., lead projectiles in an impact berm);
- Affected media;
- Governing fate and transport processes (e.g., surface water runoff and/or groundwater migration);
- Exposure media (i.e., media through which receptors could contact site-related MEC and MC);
- Routes of exposure (e.g., inhalation, incidental ingestion, and dermal contact); and
- Potential human and/or representative ecological receptors at the exposure point. Receptors likely to be exposed to site MEC or MC are identified based on current and expected future land uses.

The CSM is evaluated for completeness and further developed as needed through Technical Project Planning meetings and additional investigation.

1.2 Background

The CSM is based on information presented in the *Inventory Project Report* (U.S. Army Corps of Engineers [USACE], 1994), the *Archives Search Report* (ASR; USACE, 2006), and the *ASR Supplement* (USACE, 2004) for Strother Field. The CSM will be updated with information obtained during the Site Inspection (SI).

1.2.1 Overview of Site Characteristics

Strother Field is located approximately 5 miles south of Winfield and 6 miles north of Arkansas City in Cowley County, Kansas. The Formerly Used Defense Site (FUDS) contains one munitions response site (MRS), Range Complex No. 1. The MRS consists of two subranges: a pistol range and a skeet range. The former Range Complex No. 1 is no longer under Department of Defense control and is used for a general aviation airport with an industrial park and agricultural purposes. The ground surface has been heavily disturbed due to agricultural and industrial activities since its military use. The land including and surrounding the MRS is currently owned by the cities of Winfield and Arkansas City, an industrial company, and private landowners.

The FUDS is located in an area characterized by flat-topped hills, limestone rock outcrops, long steep slopes, and valleys covered with natural prairie grasses (Kansas Geological Survey [KGS], 1999). Vegetation consists of heavy grass with numerous shrubs (USACE, 2004).

The FUDS is located in an area of quaternary alluvium. There are no sensitive ecosystems in the FUDS nor are there any identified threatened or endangered species or designated critical habitat for threatened or endangered within the FUDS; therefore, a screening level ecological risk assessment will not be conducted.

1.2.2 History of Use

Military use of the site began in 1942 with the purchase of 1,386 acres for the main airfield. The missions assigned to the site were basic training of Air Corps cadets. In June 1944, the installation was transferred to the Second Air Force to become a fighter pilot training station. The training at the field was of a more advanced nature for specific missions. This included additional instrument training and strafing and bombing practice, which was not physically conducted at Strother Field. Four auxiliary landing fields were associated with Strother Field (#1, #2, #3, and #5) and used primarily for emergency and touch-and-go landings (USACE, 2006).

The conventional ordnance facilities documented at Strother Field were a small arms storage building, a magazine, an igloo, a skeet range, and a pistol range. No records were uncovered indicating the specific types of munitions being used or stored at the site or in which specific building they were stored. Ammunition storage areas are not considered hazardous and are not MMRP sites. Former base personnel indicated that only small arms munitions were used or stored at the FUDS during the basic flight training mission. When the installation became a fighter pilot training station, practice bombs and spotting charges would also have been stored on site. No documentation of other types of conventional munitions items was discovered (USACE, 2006). The only identified ranges are a skeet range and a pistol range.

The ASR confirmed that chemical training occurred on base (e.g., gas chamber exercises and pyrotechnic), but did not state a specific location (USACE, 2004). Chemical training materials known to have been present at Strother Field included chlorine gas, tear gas, and individual protection equipment and are not considered hazardous. These chemical training materials do not meet the current definition of chemical warfare materiels. Pyrotechnics known to have been present at Strother Field included white phosphorous grenades and smoke pots. No documentation of other chemical training or pyrotechnic items was discovered (USACE, 2006). Chemical training areas for chlorine gas, tear gas, and individual protection equipment are not MMRP sites.

The site was declared surplus in January 1946 and conveyed to the cities of Winfield and Arkansas City in May 1948. The pistol range berm was removed to construct a jet engine test cell for General Electric and a facility for Halliburton (USACE, 2006).

1.2.3 Munitions and Associated MC

The munitions used at Strother Field during use as a small arms range include .22-.and .45-caliber small arms at the pistol range and 12-gauge shotgun rounds at the skeet range. The predominant MC is lead from small arms. Lead accounts for more than 96 percent of the bullet mass. Other metals, present in primer, tracer, and igniter compositions, were present in small quantities and widely dispersed from scattered aerial firing positions. Propellants are not an MC of concern because they would have been dispersed in the air at the firing line. Polycyclic aromatic hydrocarbons (PAHs) from the pitch-based targets at the skeet range are not MC; however, they are addressed under the MMRP as constituents potentially associated with former range use. Many of the other components and MC are not carried forward as MC of concern because of nonhazardous properties, naturally occurring materials, limited mobility, limited quantities, or nature of munitions use.

1.2.4 Previous MEC Finds

There are no previous MEC finds reported for the FUDS.

1.2.5 Previous MC Sample Results

There are no previous sample results reported for MC of concern at the former Range Complex No. 1.

1.2.6 Current and Future Land Use

Currently, the FUDS is used for industrial and agricultural purposes. The FUDS is currently an industrial park with a general aviation airport. There is no residential use of the property; however, the non-industrial portions of the site are in agricultural production (USACE, 2006). The land use is not expected to change.

1.2.7 Sensitive Environments

The FUDS is located at an industrial park where some portions of the land are used for agriculture. There are no residences located on the property. There are no wetlands identified in the area. No threatened or endangered species have been identified in the area (U.S. Fish and Wildlife Service [USFWS], 2009; Kansas Department of Wildlife and Parks [KDWP], 2009).

1.3 MEC Evaluation

This section provides an evaluation of the potential MEC associated with the munitions formerly used at the Range Complex No. 1. An analysis of the exposure pathways and receptors for MEC is provided in Diagram 1.

1.3.1 Types of MEC

Known or suspected MEC present at the Range Complex No. 1 are small arms ammunition (.22- and .45- caliber small arms and 12-gauge shotgun shells).

1.3.2 Human Receptors

The former Range Complex No. 1 is located in an area with moderate population density (31.9 persons per square mile in Cowley County). Thirty-seven persons, 15 housing units, and 13 households are located within the FUDS and 509 persons, 214 housing units, and 200 households are located within a 2-mile radius of the FUDS (ESRI, 2006).

Human receptors include property owners, industrial users, agricultural users, and trespassers.

1.3.3 Route of Exposure

Potential route of human exposure to MEC is through direct contact in soil.

1.3.4 Predicted Risk Level

A deliberate effort must be applied (using a tool resembling a firing pin) to a very specific small point (the primer) to make a discovered small arms round function. Small arms ammunition presents a very low hazard risk. There have not been any reports of the discovery of intact rounds.

1.4 MC Pathway Evaluation

This section provides an evaluation of the potential MC associated with the munitions formerly used at Range Complex No. 1. MC associated with the former munitions activity that lack the potential for a significant release that would threaten human health or the environment are discussed below. An analysis of the exposure pathways and receptors for MEC is provided in Diagram 2.

1.4.1 Types of MC

The MC associated with small arms munitions are metals (lead, copper, zinc, antimony, nickel, and iron) and propellants (smokeless powder, single-base [nitrocellulose] or double-base [nitrocellulose and nitroglycerin]). Propellants were not identified as constituents to be analyzed because they would have been dispersed in the air at the firing line.

The projectiles, casings, and tracer, igniter, and primer compositions of the ammunition used contained several metals. The metals potentially constituting a significant source include lead and antimony (from the alloy forming the body or point filler of projectiles), and copper and zinc (from brass cartridge casings). Other metals associated with small arms ammunition are unlikely sources of a release. Iron, the principal constituent of steel in some projectiles and casings, is nonhazardous and relatively immobile. Nickel may have been a minor constituent of the jacketing material on some projectiles but would be present in small quantities in comparison to other metals (lead, antimony, and copper). Other metals, present in primer, tracer, and igniter compositions, were present in small quantities and widely dispersed from scattered aerial firing positions.

Of the metals, lead was identified as the potential MC because lead accounts for more than 96 percent of the bullet mass and the other metals are present in relatively small quantities;

therefore, analysis for lead alone is considered an adequate indicator of the presence of metals. Casing-related metals were not identified as constituents to be analyzed because spent casings, which would have accumulated along the firing line, would have been collected and disposed of in accordance with required maintenance of the range.

At the pistol range, the highest concentrations of source metals from munitions activity are anticipated where projectiles and/or casings may have accumulated at the ground surface, e.g., at the berm and firing line, respectively.

Although PAHS from the pitch-based targets at the skeet range are not MC, they are addressed under the MMRP as constituents potentially associated with former range use. The likely distribution of lead and PAHs was predicted from a model for skeet ranges published by the Interstate Technology & Regulatory Council (ITRC, 2003) and supported by Shaw Environmental, Inc. (Shaw) project experience. The highest density of target fragments (target fragments fall zone), and therefore PAHs, were predicted closer to the firing position. Lead and PAHs were predicted in the middle zone (target fragments and lead shot fall zone), and lead was predicted in the outermost zone (lead shot fall zone).

1.4.2 Soil Exposure (Terrestrial) Pathway

1.4.2.1 Sources of MC

MC would be derived from spent small arms ammunition and would be deposited on site soils throughout the fall zone of the skeet range and primarily in the former berm area of the pistol range; however, the berm was removed and the soil was used to construct other facilities. The property in and around the MRS has been disturbed for industrial and agricultural purposes.

1.4.2.2 Exposure Pathway

The primary migration pathway for the dispersal of potential MC is from target area soil runoff from the skeet range and pistol range impact berm area into low-lying areas.

1.4.2.3 Land Use and Access

The skeet range and former pistol berm area are located on land used for crops and industrial businesses at an industrial park with a general aviation airport. There are no known access controls; Strother Field is open to unrestricted public access.

1.4.2.4 Human Receptors

The potential routes of human exposure to potentially contaminated soil are dermal contact, ingestion, and inhalation of soil particulates during intrusive work. Potential receptors include site owners, industrial and agricultural workers, and trespassers.

1.4.2.5 Human Health Assessment

The soil exposure pathway from potential MC is considered to be potentially complete.

1.4.2.6 Ecological Assessment

There are no wetlands located in or around the FUDS boundaries. Endangered or threatened species that are listed in Cowley County according to the USFWS and the KDWP are not known to exist within the FUDS. A screening level ecological risk assessment is not required.

1.4.3 Surface Water/Sediment Pathway

1.4.3.1 Sources of MC

A swale (low area) intersects the FUDS south of Range Complex No. 1. The swale appears to conform to what was the original channel of Posey Creek, which was re-routed by the Army in the 1940s. Surface runoff from aircraft related industries at the site either flows into this swale, to an open drainage ditch parallel to the railroad, or to storm sewer inlets (U.S. Environmental Protection Agency [EPA], 1994).

Posey Creek runs along the eastern border of the FUDS and drains into the Walnut River. The Strother Field Sewage Treatment Plant to the southeast of the FUDS, an industrial cooling tower near the central portion of the FUDS, and two groundwater remediation wells in the northern portion of the FUDS supply water to Posey Creek. As a result, Posey Creek becomes an artificial perennial stream as it passes through Strother Field. It is the only perennial surface water at the site. Posey Creek becomes a natural perennial stream approximately 1.5 miles downstream of the site, where it begins to intersect an alluvial aquifer, which contributes baseflow to the creek. The swale, drainage ditches, and the storm sewer all flow to Posey Creek at the southeastern corner of the FUDS (EPA, 1994). MC impacted soil could potentially impact surface water from runoff.

1.4.3.2 Migration Pathway

Surface runoff flows into a swale located south of the Range Complex No. 1 to an open drainage ditch parallel to the railroad spur, or to storm sewer inlets, all of which eventually flow to Posey Creek at the southeastern corner of the FUDS. Runoff from the Range Complex No. 1 could potentially reach surface water pathways.

1.4.3.3 Surface Water Use and Access

Surface water from Posey Creek is not used for drinking water or other known purposes. There are no barriers preventing access to the creek.

1.4.3.4 Human Receptors

Potential human receptors have exposure to surface water at the FUDS and downgradient of the FUDS through recreational activities such as fishing.

1.4.3.5 Human Health Assessment

The surface water exposure pathway from potential MC is considered to be potentially complete. Although no use of surface water was identified on the FUDS, human receptors have access to

surface water at and downgradient of the FUDS and may use the surface water pathway for recreational activities.

1.4.3.6 Ecological Assessment

There are no wetlands located in or around the FUDS boundaries. Endangered or threatened species that are listed in Cowley County according to the USFWS and the KDWP are not known to exist within the FUDS. A screening level ecological risk assessment is not required.

1.4.4 Groundwater Pathway

1.4.4.1 Sources of MC

Potential sources of MC anticipated would be lead that may be present in surface soil and PAHs if target fragments are observed.

1.4.4.2 Migration Pathway

The groundwater migration pathway for human exposure to MC is considered incomplete because of the low mobility of lead and PAHs in soil; metals readily bind with clay and the predominant soil type at the FUDS is a clay loam/silty clay.

1.4.4.3 Groundwater Use and Access

Thirty-two groundwater wells are present within the FUDS boundary. The majority of the wells are monitoring wells used to investigate chlorinated solvents in groundwater. One public water supply well, located in the southwestern portion of the FUDS, provides water to Strother Field. Two former public water supply wells near the MRS were converted to remediation/recovery wells, which currently discharge to Posey Creek.

Based on the review of logs for nearby registered wells, the local depth to groundwater is approximately 7 to 34 feet below ground surface (KGS, 2009).

1.4.4.4 Human Receptors

Groundwater located beneath the MRS is not expected to be used for any purposes due to the presence of chlorinated solvents. A public supply well is located approximately 1 mile southeast of the MRS, within the FUDS, and serves a population of approximately 1,390 people (EPA, 2009).

1.4.4.5 Human Health Assessment

Unless a substantial source of MC is found in the surface soil, it is unlikely that groundwater would be affected. The groundwater pathway is considered to be incomplete. If a substantial MC source is discovered in surface soil, the groundwater pathway can be added in future investigations.

1.4.5 Air Pathway

Although there are not any significant suspected sources of MC, the potential for airborne MC is present but considered very small. Potential exposure by inhalation of vapor is not a concern for non-volatile MC under normal environmental conditions, and air is considered an incomplete pathway. Potential inhalation of soil particles is included in the development of health-based screening values for soil, and is thus considered through the soil exposure pathway.

1.5 Summary

Evaluation of the CSM indicates the following known conditions or data gaps:

Pathway	Presence of MEC	Presence of MC	Notes
Soil	Spent small arms rounds, fragments, or duds potentially	Potentially complete pathway	Soil disturbance from agricultural activities has occurred many years in the upper ground surface of affected area.
Sediment	No	Considered to be complete pathway	There are possible sediment receptors through downgradient recreational use of the surface water pathway.
Surface Water	No	Considered to be complete pathway	There are possible surface water receptors through downgradient recreational use of the surface water pathway.
Groundwater	No	Considered to be incomplete pathway	Groundwater is not presently considered a viable pathway due to the general immobility of lead and PAHs. No groundwater use around MRS due to presence of chlorinated solvents.
Air	No	Considered to be incomplete pathway	Non-volatile MC under normal conditions are not a concern for inhalation of vapors. Insufficient MC source limits significance of this pathway.

1.5.1 Presence of MEC

There have been no reports of the discovery of unspent rounds. A deliberate effort must be applied (using a tool resembling a firing pin) to a very specific small point (the primer) to make a discovered small arms round function. Small arms ammunition presents a very low hazard risk.

1.5.2 Presence of MC

MC sampling has not occurred at Strother Field. Any MC present in surface soil would be derived from spent small arms ammunition and would be deposited on site soils primarily in the fall zones of the skeet range and former target berm of the pistol range. The primary migration pathway for the dispersal of potential MC is from target area soil runoff from the former berm area and the skeet range.

2.0 References

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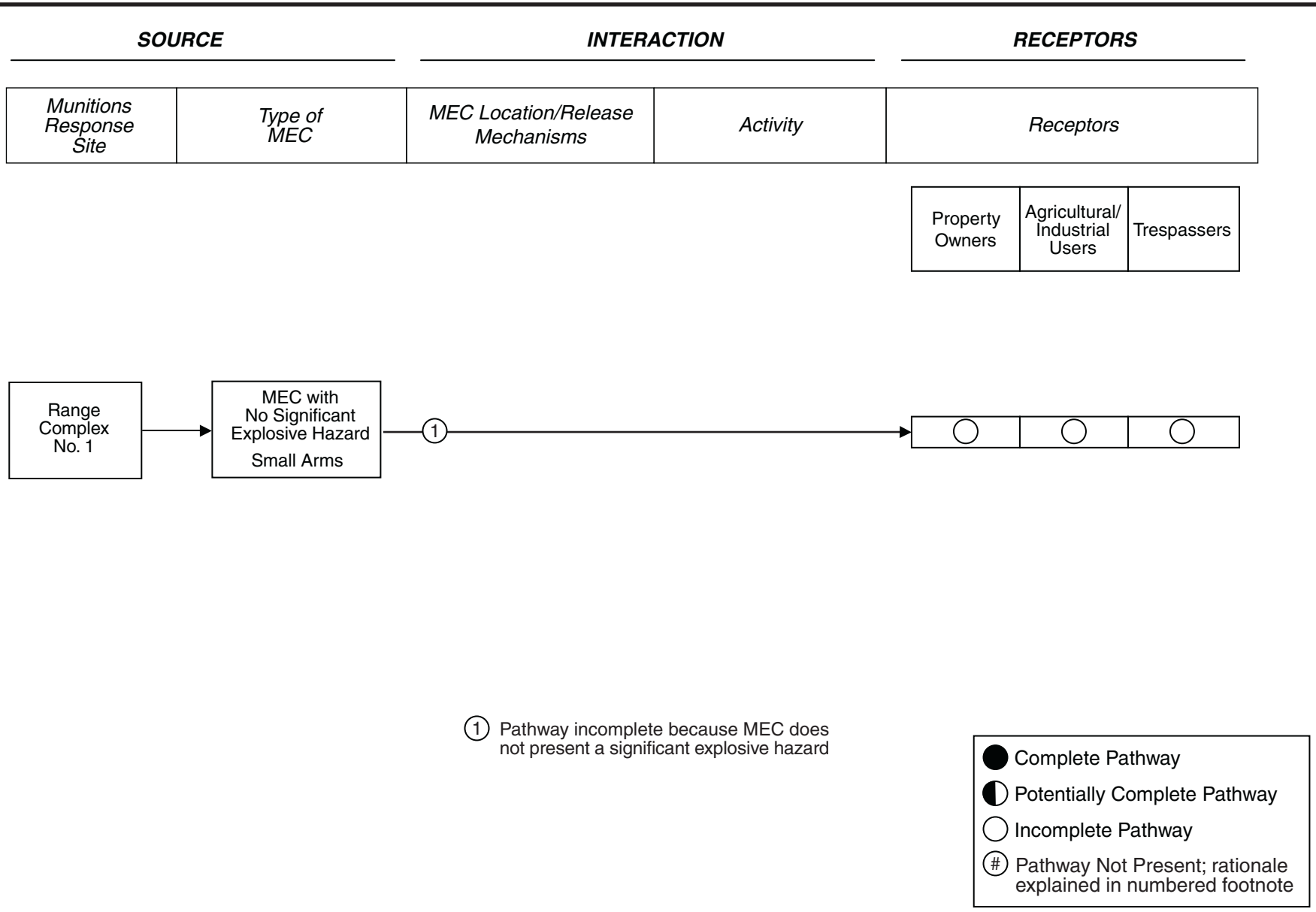
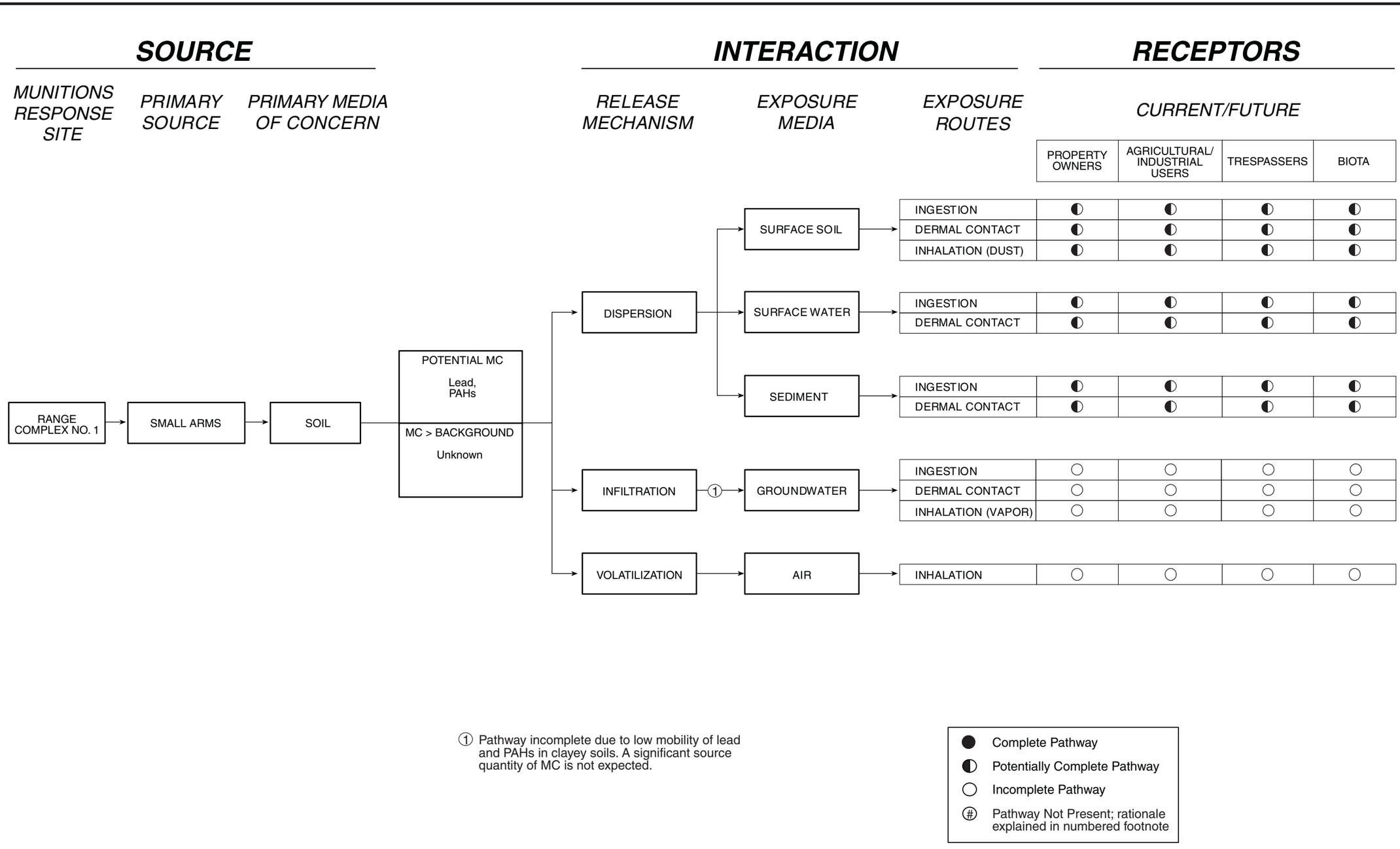


Shaw Environmental, Inc.

Diagram 1
MEC Exposure Pathway Analysis
Strother Field

DRAWING BY	JIS, III	CHECKED BY			DRAWING NO.
	3/23/09	APPROVED BY			S-116188-3/09-w



Shaw® Shaw Environmental, Inc.

Diagram 2
MC Exposure Pathway Analysis
Strother Field

DRAWING NO. S-116188-309-w
CHECKED BY
APPROVED BY
JIS, III 3/18/09
DRAWING BY

Appendix B
USACE Interim Guidance Document 06-05 and Safety Advisory 06-2

DEPARTMENT OF THE ARMY
HUNTSVILLE CENTER, CORPS OF ENGINEERS
P.O. BOX 1600
HUNTSVILLE, ALABAMA 35807-4301

REPLY TO
ATTENTION OF:

MAR 1 6 2006

CEHNC-OE-CX

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Procedure for Preliminary Assessment (PA) and Site Inspection (SI) Teams that Encounter Unexploded Ordnance (UXO) While Gathering Non-UXO Field Data, Military Munitions Center of Expertise (MM CX) Interim Guidance Document (IGD) 06-05

1. PURPOSE: This procedure describes the responsibilities of project teams during the preliminary assessment and site investigation phases should unexploded ordnance (UXO) be discovered.

2. APPLICABILITY: This guidance is applicable to the geographic military Districts, Military Munitions Response Program (MMRP) Design Centers, Major Subordinate Commands (MSCs), and designated Remedial Action Districts performing MMRP response actions.

3. REQUIREMENTS AND PROCEDURES:

a. During site visits to formerly used defense site (FUDS) properties to gather PA or SI information, in the rare instance that a UXO-qualified individual identifies an item that is an explosive hazard, the following actions will occur:

(1) The property owner or individual granting rights of entry to the property will be notified of the hazard and advised to call the local emergency response authority (i.e., police, sheriff, or fire department). The individual will also be informed that if they do not call the local response authority within 1 hour, the individual who identified the UXO item will notify the local emergency response authority.

(2) The local response authority will decide how to respond to the reported incident, including deciding not to respond (e.g., if the local response authority is already aware of the hazards on the property). If the local response authority decides to respond, the individual who identified the item or his designee will mark the location of the item and provide accurate location information to the emergency response authority. The individual who identified the item or his designee will generally remain in the area until the local response authority arrives, unless specifically indicated by the appropriate response authority that the individual may leave the area.

(3) During the SI, the state regulator may also be notified at their request.

b. During site visits to active installations or Base Realignment and Closure (BRAC) sites to gather PA or SI information, in the rare instance that a UXO-qualified individual identifies an item that is an explosive hazard, the following actions will occur:

(1) The installation point of contact (POC) or the BRAC coordinator will be notified of the hazard and requested to notify explosive ordnance disposal (EOD) through their channels.

(2) The installation/EOD will make the determination if they are going to respond to the incident. The installation/EOD may be aware of the hazards at the site and make the decision not to respond. If the installation/EOD decides to respond, the individual who identified the item or his designee will mark the location and provide accurate location information to the installation/EOD unit and will remain in the area unless the installation/EOD unit requests otherwise.

c. Neither the US Army Corps of Engineers personnel, nor their contractors have the authority to call EOD to respond to an explosive hazard. This call is the responsibility of the local emergency response authority for FUDS properties and it must come through the proper chain of command on installations.

d. AR 75-14 and AR 75-15 contain the information on how EOD responds to explosives hazards.

4. EFFECTIVE DATES: The requirements and procedures set forth in this interim guidance are effective immediately. They will remain in effect indefinitely, unless superseded by other policy or regulation.

5. POINT OF CONTACT: If you need additional information, please contact Mr. Brad McCowan at 256-895-1174.

Carol A. Youkey

CAROL A. YOUKEY, P.E.
Chief, Center of Expertise for Ordnance
and Explosives Directorate

DEPARTMENT OF THE ARMY
HUNTSVILLE CENTER, CORPS OF ENGINEERS
P.O. BOX 1600
HUNTSVILLE, ALABAMA 35807-4301

May 23, 2006

REPLY TO
ATTENTION OF:

OE Safety Division for Ordnance
and Explosives Directorate

Shaw Environmental
4171 Essen Lane
Baton Rouge, Louisiana 70809

Dear Sir/Madam:

This is Safety Advisory 06-2 – Munitions and Explosives of Concern (MEC) Safety During Site Inspections (SI), Pre-Work Plan Visits, Archive Search Reports (ASR) Investigations and Other Site Visits of a Non-Intrusive Nature.

Reference EP 75-1-1, EP 385-1-95a, and Interim Guidance Document (IGD), March 15, 2006.

The following procedures will be followed if an item is found that has an explosive hazard during the activities identified in the subject line:

a. MEC items are not to be moved or disturbed during the above subject SI, Pre-Work Plan visits, ASR Investigations and other site visits of a non-intrusive nature.

b. The locations of any discovered explosive hazardous items should be marked for accurate relocating purposes and the information provided to the designated Point of Contact (POC) and any emergency response authorities as may be required.

c. During site visits to active Installations and/or Base Realignment and Closure (BRAC) sites the identified Installation POC or the BRAC coordinator should be notified of discovered MEC hazards. They then will request any appropriate emergency response action as deemed necessary through their channels if required.

d. When a site visit is on a Formerly Utilized Defense Site, the property owner shall be notified in the event of finding any found explosive hazards along with the location of the explosive item(s) found, the property owner should then in turn notify their local emergency response authorities.

e. During these site visits all required MEC security requirements should be implemented as necessary and required. All team members are to be instructed in and made aware of any MEC security requirements.

f. All team members will be briefed on these procedures prior to any site investigations being performed and daily before any work begins.

This Safety Advisory is intended to serve as an explosives safety reminder.

Comments or questions about this Safety Advisory can be directed to the undersigned at (256) 895-1598/82.

Sincerely,

Wayne H. Galloway
Chief, OE Safety Division for
Ordnance and Explosives Directorate

Appendix C
Site Safety and Health Plan Addendum

ADDENDUM KS-28 TO SITE SAFETY AND HEALTH PLAN (SSHP) **REVIEWS AND APPROVAL** US Army Corps of Engineers, Omaha District	This SSHP is a part of the Omaha District Safety Program. Please read and comply with USACE EM 385-1-1 and CENWO OM 385-1-1.	
Reviewer	**Date**	**Signatures**
Authored by: Cindy Burns	6/2/09	**Signature:** Cindy Burns
Peer Review by: David Mummert, CIH	6/3/09	**Signature:** David Z Mummert
Quality Control Review (QCR) by: Rachel Vavra	7/1/09	**Signature:** Rachel Vavra
Project Manager Review by: Peter Kelsall	7/6/09	**Signature:** **Signature on file**
USACE Omaha District MM DC OE Safety Specialist Review: James J. Mars	9/10/09	**Signature:**
USACE Omaha District MM DC Project Manager Approval: John Miller	9/10/09	**Signature:**

ADDENDUM KS-28 TO SITE SAFETY AND HEALTH PLAN (SSHP) **TITLE PAGE** US Army Corps of Engineers, Omaha District	This SSHP is a part of the Omaha District Safety Program. Please read and comply with USACE EM 385-1-1 and CENWO OM 385-1-1.

PROJECT NAME: Formerly Used Defense Sites (FUDS) Site Inspection (SI) – Strother Field

PURPOSE OF ADDENDUM:

This Addendum provides details specific to activities at this FUDS that were not provided in the approved Accident Prevention Plan and Site Safety and Health Plan included in the *Final Type I Work Plan, Site Inspections at Multiple Sites, NWO Region* (Shaw Environmental, Inc. [Shaw], 2006).

DESCRIBE THE CHANGES EFFECTED BY THIS ADDENDUM:

Add site-specific supplemental information.

SITE SAFETY AND HEALTH PLAN ADDENDUM

Site Name:	Strother Field
Site Location:	Strother Field, FUDS property number B07KS0277, is located approximately 5 miles south of Winfield and 6 miles north of Arkansas City in Cowley County, Kansas. The FUDS is approximately 1,386 acres.
Purpose of Visit:	SI to conduct site reconnaissance for munitions and explosives of concern (MEC) and surface soil sampling to evaluate the presence of munitions constituents (MC).
Date(s) of Site Visit:	October 2009
Office:	Shaw Environmental, Inc., Denver, Colorado office
Address:	7604 Technology Way, Suite 300 Denver, CO 80237
Telephone:	720-554-8265

Date Prepared: June 1, 2009

Updated: September 9, 2009 (Site Visit date; Section III chart footnotes; Section XII Lightning Safety)

SI work at this FUDS will be conducted in accordance with the approved Accident Prevention Plan and Site Safety and Health Plan (SSHP) included in the *Final Type I Work Plan, Site Inspections at Multiple Sites, NWO Region* (Work Plan; Shaw, 2006). This Addendum provides details specific to activities at this FUDS that were not provided in the SSHP.

I. SITE DESCRIPTION AND PREVIOUS INVESTIGATIONS

(A site map is provided in the Site-Specific Work Plan [SSWP].)

A. SITE DESCRIPTION:

- Size: SI field activities will be conducted at the FUDS which covers approximately 1,386 acres.
- Present Usage (Check all that apply)

☐ Military	☐ Recreational	☒ Agricultural
☐ Residential	☐ Commercial	☐ Landfill
☐ Natural Area	☒ Industrial	☐ Oil/gas pumping

☐ Secured	☒ Active	☒ Unknown
☐ Unsecured	☐ Inactive	

B. PAST USES:

Military use of the site began in 1942 with the purchase of 1,386 acres for the main airfield. The mission assigned to the site was basic training of Air Corps cadets. In June 1944, the installation was transferred to the Second Air Force to become a fighter pilot training station. The training at the field was of a more advanced nature for specific missions. This included additional instrument training, and strafing and bombing practice, which was not physically conducted at Strother Field. Four auxiliary landing fields were associated with Strother Field (#1, #2, #3, and #5) and used primarily for emergency and touch-and-go landings (U.S. Army Corps of Engineers [USACE], 2006).

The conventional ordnance facilities documented at Strother Field were a small arms storage building, a magazine, an igloo, a skeet range, and a pistol range. No records were uncovered indicating the specific types of munitions being used or stored at the site, or in which specific building they were stored. Former base personnel indicated that only small arms munitions were used or stored at the FUDS during the basic flight training mission. When the installation became a fighter pilot training station, practice bombs and spotting charges would also have been stored on site. No documentation of other types of conventional munitions items was discovered (USACE, 2006). The only identified ranges at Strother Field are a skeet range and a pistol range.

The *Archives Search Report* (ASR) confirmed that chemical training occurred on base (e.g., gas chamber exercises and pyrotechnic), but did not state a specific location (USACE, 2004). Chemical training materials known to have been present at Strother Field included chlorine gas, tear gas, and individual protection equipment. These chemical training materials do not meet the current definition of chemical warfare materiels. Pyrotechnics known to have been present at Strother Field included white phosphorous grenades and smoke pots. No documentation of other chemical training or pyrotechnic items was discovered (USACE, 2006). The ASR did not indicate that releases occurred from these areas.

The site was declared surplus in January 1946 and conveyed to the cities of Winfield and Arkansas City in May 1948. The pistol range berm was removed to construct a jet engine test cell for General Electric and a facility for Halliburton (USACE, 2006).

C. SURROUNDING POPULATION:

☒ Rural	☐ Residential	☐ Commercial
☐ Urban	☒ Industrial	☒ Agricultural

D. PREVIOUS SAMPLING/INVESTIGATION RESULTS:

There are no documented MEC finds or MEC-related incidents at the FUDS. There are no previous sample results for MC of concern reported for the FUDS.

Due to the nature of industrial activities occurring at the FUDS, polycyclic aromatic hydrocarbons (PAHs) may be present in various media. This will be considered if sampling is conducted for PAHs.

There are two chlorinated solvent plumes, from a non-Department of Defense (DoD) source, within the FUDS, with associated degradation products present in both plumes. Trichloroethene is the parent contaminant in the northern plume, where a General Electric test cell has been identified as the main source (Kansas Department of Health and Environment [KDHE], 2009). Several possible sources have been identified for tetrachloroethene in the southern plume, including the Greif Bros. Corporation (now Greif, Inc.), Cessna Aircraft, and Gordon-Piatt Energy Group, Inc.

Until 1983, the Strother Field Commission operated a water supply system consisting of eight wells on the site. After the use of the Industrial Park wells as a source of drinking water was discontinued, water was brought in by tank trucks. The Strother Field Commission installed two wells upgradient of the contaminated plume to supply water. Two of the eight water supply system wells remained in use to supply process water for the industries located on the field. For the last several years, the Strother Field Commission has pumped these wells to contain the groundwater contamination beneath the site. In 1985, General Electric, a potentially responsible party, installed groundwater extraction wells and air stripping towers to remove volatile organic compounds from the groundwater under an Administrative Order with KDHE (U.S. Environmental Protection Agency [EPA], 2007). The site is being monitored to determine if migration is being effectively prevented and if natural attenuation of contaminants is occurring. Rural Water Districts are located immediately downgradient of the site (KDHE, 2009).

II. DESCRIPTION OF ON-SITE ACTIVITIES

☒ Walk Through	☐ Drive Through	☐ Fly Over
☐ On-Road	☐ Off-Road	☐ On-Path
☒ Off-Path		
☐ Other Specify		

Activities/Tasks to be Performed

A visual surface reconnaissance will be conducted along a meandering path through portions of the FUDS, and will be performed by conducting a visual inspection of the ground surface by a field team of two or more persons, including a qualified unexploded ordnance (UXO) technician. The UXO technician will supplement the visual inspection with the use of a magnetometer in areas where vegetation or soil cover may obscure metal objects.

UXO avoidance will be conducted during all SI field activities. If evidence of munitions activity is observed that is inconsistent with the conceptual site model (CSM) described in Appendix A, notification will be made to USACE, and a variance to this SSWP will be submitted to initiate appropriate changes to the SI approach.

The anticipated total length of meandering path reconnaissance to be walked within the FUDS is approximately 25,000 linear feet, including approximately 10,000 feet within the pistol range and 15,000 feet at the skeet range. Surface soil, sediment, and surface water samples will be collected for lead in the pistol and skeet ranges. If target fragments are observed in the skeet range, samples will also be analyzed for PAHs.

III. SITE PERSONNEL AND RESPONSIBILITIES

	Training					
Name/Responsibility	HAZWOPER 40-hour	8-hour HAZWOPER refresher	Hazardous Waste Site Supervisor	First Aid	Cardiopulmonary Resuscitation	UXO Specialist
Cindy Burns Field Team Leader/Site Safety and Health Officer (SSHO)	09/22/01	8/28/08	7/23/09	10/10/08	10/10/08	NA
UXO Technician David Watkins (1420) or Rob Irons (1137) or Jim Bayne (1212) or Ron Stanfield (1161) or Thomas Folger (1752)	X	X	X	X	X	X

NA – Not applicable.
X – Indicates that the technicians have the training, but were completed on different dates.

IV. HAZARD ANALYSIS

A. Safety and Health Hazards Anticipated:

☐ Cold	☒ Heat Stress	☒ Tripping Hazard
☐ Noise	☐ Electrical	☐ Falling Objects
☒ Foot Hazard	☒ Biological	☐ Overhead Hazard
☐ Radiological	☐ Confined Space	☐ Water
☐ Explosive	☒ Climbing	☐ Flammable
☒ Other Specify: thunderstorms, tornadoes		

B. Overall Hazard Evaluation:

☐ High	☐ Moderate	☒ Low	☐ Unknown

JUSTIFICATION:

Historical evidence indicates that small arms were used at the subranges. Small arms present a low explosive hazard.

V. SITE INSTRUCTIONS FOR MEC AVOIDANCE

UXO avoidance will be conducted in accordance with the SSHP and USACE EP 75-1-2 during all SI activities. See Section 4.3 of the SSHP for full scope of MEC avoidance requirements.

a. DO NOT touch or move any ordnance items regardless of the marking or apparent condition.
b. DO NOT visit an ordnance site if an electrical storm is occurring or approaching. If a storm approaches during a site visit, leave the site immediately and seek shelter.
c. DO NOT use radio or cellular phones in the vicinity of suspected ordnance items.
d. DO NOT walk across an area where the ground cannot be seen. If dead vegetation or dead animals are observed, leave the area immediately due to potential chemical agent contamination.
e. DO NOT drive vehicles into suspected MEC areas; use clearly marked lanes.
f. DO NOT carry matches, lighted cigarettes, lighters, or other flame-producing devices into a MEC site.
g. DO NOT rely on color codes for positive identification of ordnance items or their contents.
h. Only the on-site UXO technician is allowed to approach suspected ordnance items to take photographs, and prepare a full description (take notes of the markings or any other identifiers/features).
i. The location of any ordnance item(s) found during the SI should be clearly marked so it can be easily located and avoided.
j. Always assume ordnance items contain a live charge until it can be determined otherwise.

Section 4.3 of the SSHP defines on-site MEC avoidance requirements for FUDS properties. In general, the purpose of MEC or anomaly avoidance during SI activities is to avoid any potential surface or subsurface anomalies. Intrusive anomaly investigation is not authorized during MEC avoidance operations. The reconnaissance and sampling field work shall include a minimum of two people, one of whom shall be a UXO technician. This team will be on site during all sampling activities. Sampling personnel must be escorted at all times in areas potentially containing MEC until the UXO team has completed the access surveys and the cleared areas are marked. If anomalies or MEC are detected, the UXO team will halt escorted personnel in place, select a course around the item, and instruct escorted personnel to follow. If MEC are encountered, the team will stop work in the vicinity and make notifications as outlined in the Work Plan. The team is not to conduct further investigation or removal of any MEC.

VI. SITE CONTROL AND COMMUNICATIONS

A. SITE WORK ZONES: Rigid demarcation of work zones, e.g., using barricades or caution tape, will generally not be required for this project. The Field Team Leader/SSHO, in consultation with the UXO technician, will determine the boundary of an Exclusion Zone (EZ) to be established around a specific area of activity, appropriate to the potential hazards. The boundaries may be described by physical features, e.g., fences, tree lines, or topographic features, or may be defined by a radius around the center of activity. The EZ boundary will be verbally communicated to team members, who will maintain a watch to assure that only field team members are within the work zone. If a bystander or intruder approaches the EZ, the field team will cease work and ask the person to remain outside the area. A Contamination Reduction Zone (CRZ) will generally not be required because personnel decontamination is not anticipated. If required, a CRZ will be established in a manner similar to that described for the EZ. The support zone will consist of all portions of the site not defined as an EZ or CRZ.

B. COMMUNICATIONS:

(1) ON-SITE: Verbal communications will be used among team members to communicate to each other on-site. If this communication is not possible, the following hand signals will be used.

GRIP PARTNER'S WRIST OR BOTH HANDS AROUND WAIST – Leave the area immediately.

HAND GRIPPING NOSE – Unusual smell detected.

THUMBS UP – OK, I am all right or I understand.

THUMBS DOWN – No, negative.

(2) OFF-SITE: Off-site communications will be established at the site and may include an on-site cellular phone or the nearest public phone or private phone that may be readily accessed.

☒ Cellular Phone: Cindy Burns (720-984-6117)
☐ Public/Private phone

TELEPHONE NUMBERS:	
1. MEDICAL FACILITY (Emergency Care): William Newton Memorial Hospital	(620) 221-2300
2. MEDICAL FACILITY (Non-Emergency Care): Via Christi Occupational and Environmental Medicine	(316) 687-9794
3. FIRE DEPARTMENT: Winfield Fire Department Arkansas City Fire Department	911 (emergency) (620) 221-5560 (620) 441-4430
4. POLICE DEPARTMENT: Winfield Police Department Arkansas City Police Department	911 (emergency) (620) 221-5555 (620) 441-4444
5. POISON CONTROL CENTER:	(800) 222-1222
6. USACE MM DC PROJECT MANAGER: John Miller	(402) 995-2735 (office) (402) 350-3735 (cell)
7. USACE DISTRICT PROJECT MANAGER: Mirek Towster	(816) 389-3886 (office)
8. USACE OE SAFETY: JJ Mars	(402) 995-2287 (office) (402) 740-4979 (cell)
9. SHAW PROJECT MANAGER: Peter Kelsall	(720) 554-8178 (office) (303) 981-8435 (cell)
10. SHAW TECHNICAL LEAD: Cindy Burns	(720) 554-8265 (office) (720) 984-6117 (cell)
11. SHAW FIELD TEAM LEADER: Cindy Burns	(720) 554-8265 (office) (720) 984-6117 (cell)
12. SHAW OE SAFETY: Brian Hamilton	(303) 690-3816 (office) (303) 809-0416 (cell)
13. SHAW UXO TECHNICIAN: David Watkins (#1420), Rob Irons (#1137), Jim Bayne (#1212), Rueben Rhodes (#0169), Ron Stanfield (#1161), or Thomas Folger (#1752) (Contact: Morey Engle)	(303) 690-3870 (720) 480-3204 (cell)
14. SHAW HOTLINE/HELPDESK:	(866) 299-3445
15. SHAW HEALTH AND SAFETY MANAGER: David Mummert	(419) 425-6129 (office) (419) 348-1544 (cell)
16. ALLONE HEALTH:	(877) 720-7770

(3) EMERGENCY SIGNALS: In the case of small groups, a verbal signal for emergencies shall suffice. The emergency signal for large groups should be incorporated at the discretion of the UXO technician.

☒ Verbal ☐ Nonverbal (Specify)

VII. INCIDENT REPORTING

(1) ACCIDENTS: Safety-related incidents and accidents will be immediately reported to the Shaw Project Manager, Shaw Health and Safety Manager, Shaw Hotline/Helpdesk, and the USACE Military Munitions Design Center (MM DC) Project Manager. Additional notifications within the USACE organization will be coordinated by the USACE MM DC Project Manager. Additional accident reporting responsibilities of Shaw personnel are described in Section 1.9 of the Accident Prevention Plan.

A copy of the Shaw Incident Notification, Reporting, and Management Procedure will be on site with the field team.

(2) NEAREST HOSPITAL/MEDICAL FACILITY

William Newton Memorial Hospital
1300 E 5th Ave
Winfield, KS 67156
(620) 221-2300

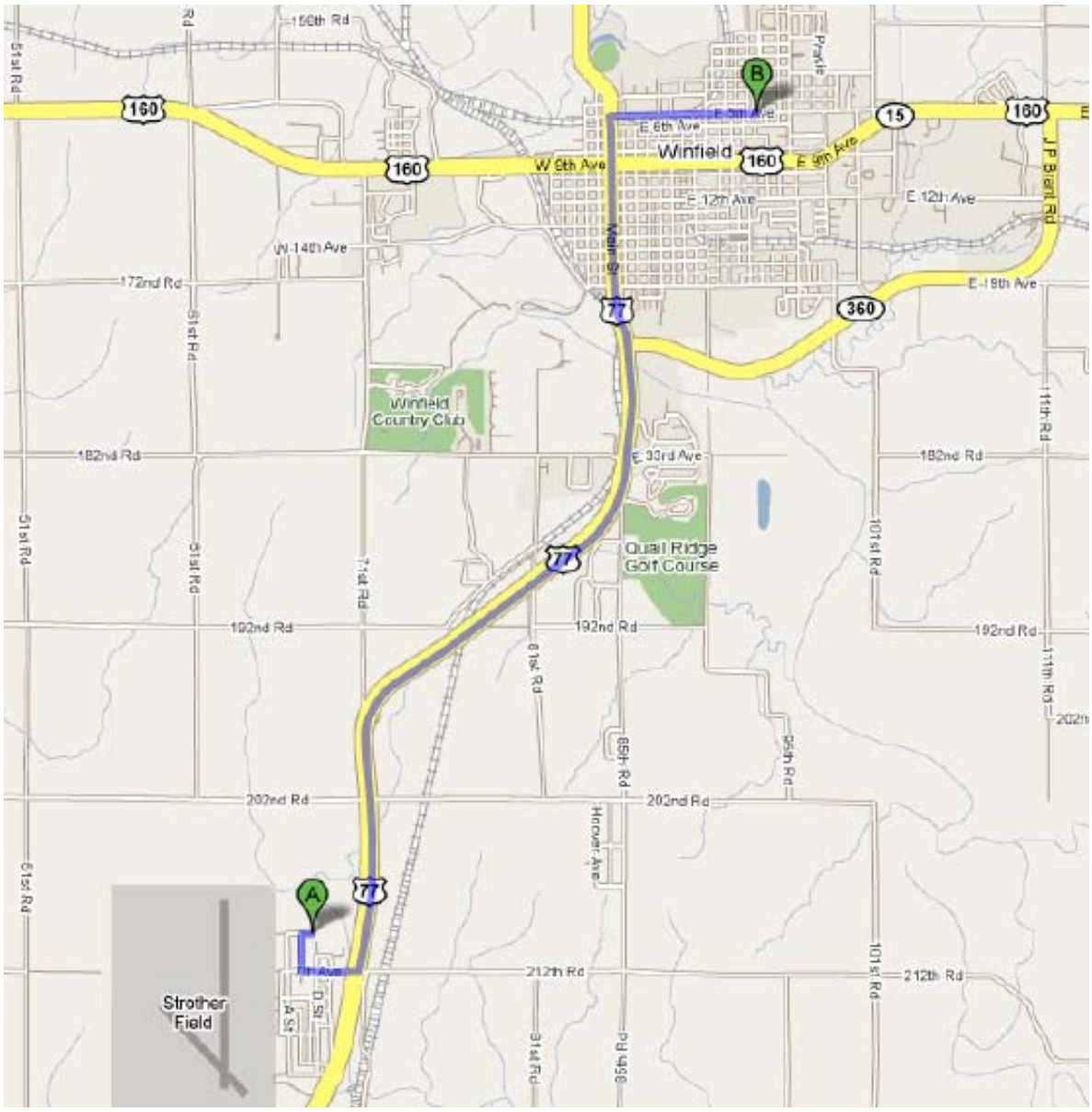
Driving directions to William Newton Memorial Hospital
7.1 mi – about **13 minutes**

A Strother Field – 9th Ave

1.	Head **west** on **9th Ave** toward **B St**	285 feet
2.	Turn **left** at **B St**	0.2 miles
3.	Turn **left** at **7th Ave**	0.3 miles
4.	Turn **left** at **US-77**	5.7 miles
5.	Turn **right** at **E 5th Ave**	8.3 miles

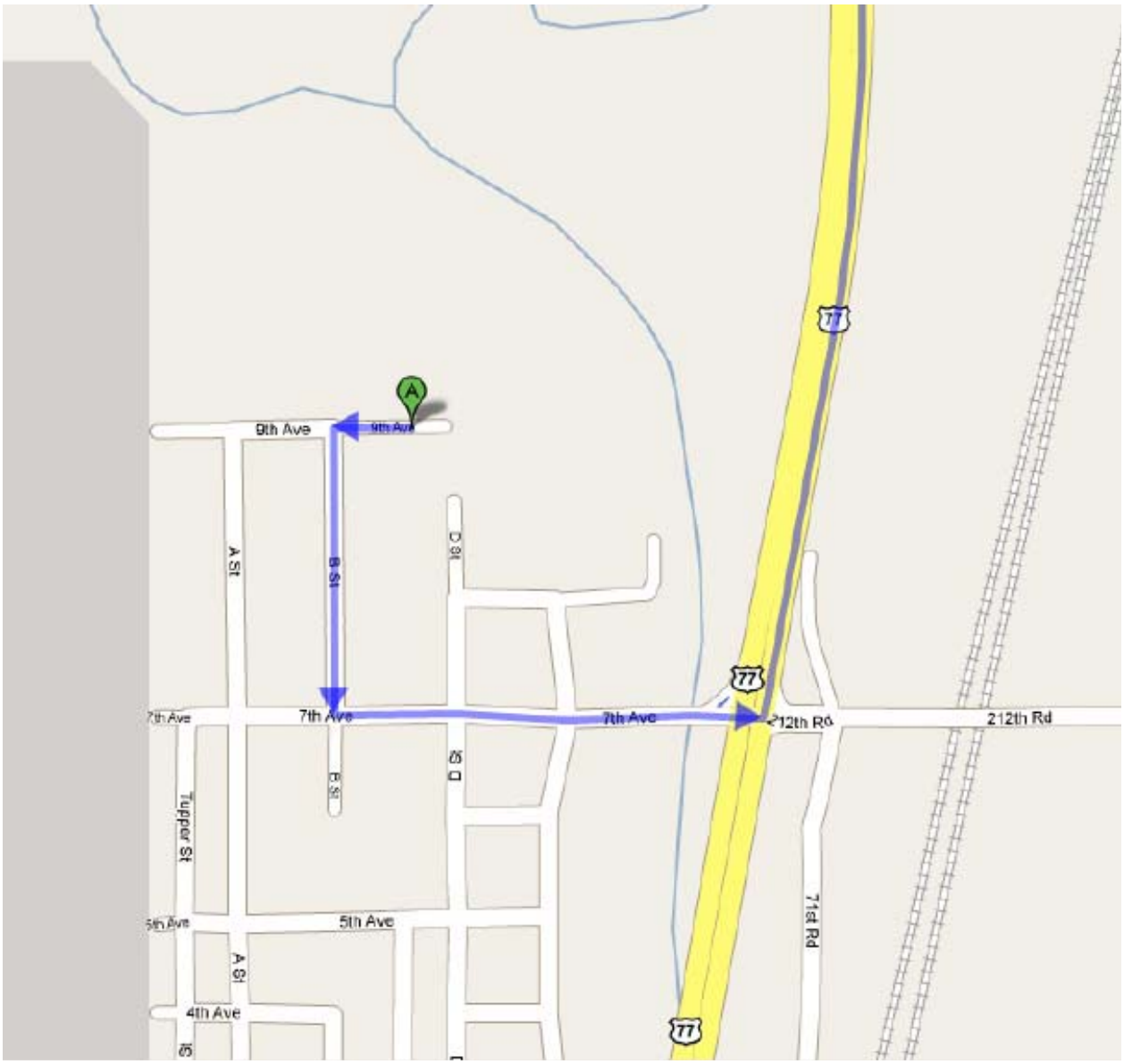
B William Newton Memorial Hospital
1300 E 5th Ave
Winfield, KS 67156

1) Strother Field to William Newton Memorial Hospital



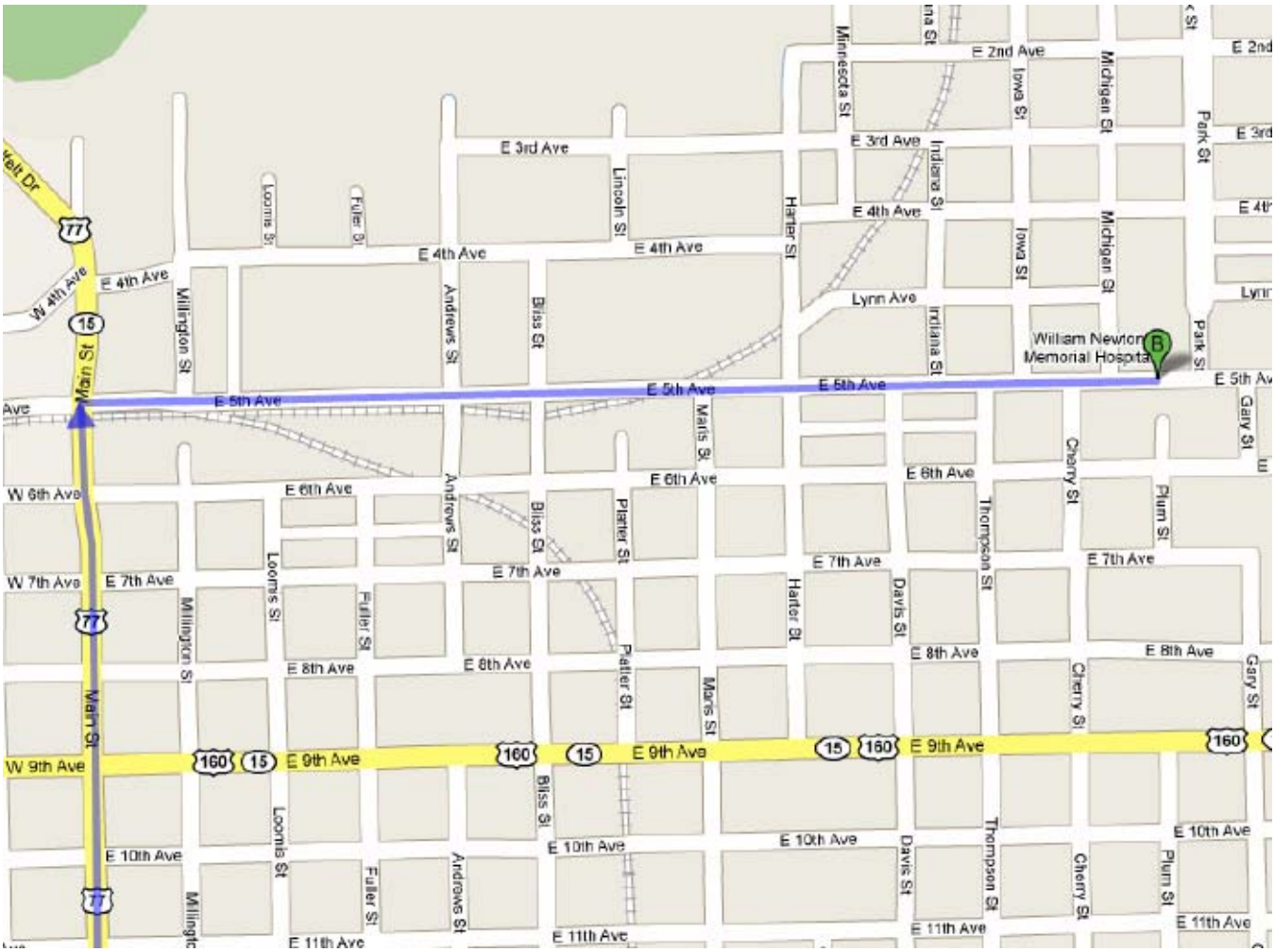
↑ North

2) Strother Field to William Newton Memorial Hospital



North

3) Strother Field to William Newton Memorial Hospital



North

(3) CLINIC FOR NON-EMERGENCY MEDICAL TREATMENT
In the event of a work-related, non-life threatening injury, the following occupational health clinic is approved by AllOne Health for medical treatment of Shaw employees:

Via Christi Occupational and Environmental Medicine
2535 East Lincoln St
Wichita, KS 67211
(316) 687-9794

Driving directions to Via Christi Occupation and Environmental Medicine
54.2 mi – about **1 hour 2 minutes**

Strother Field – 9th Ave

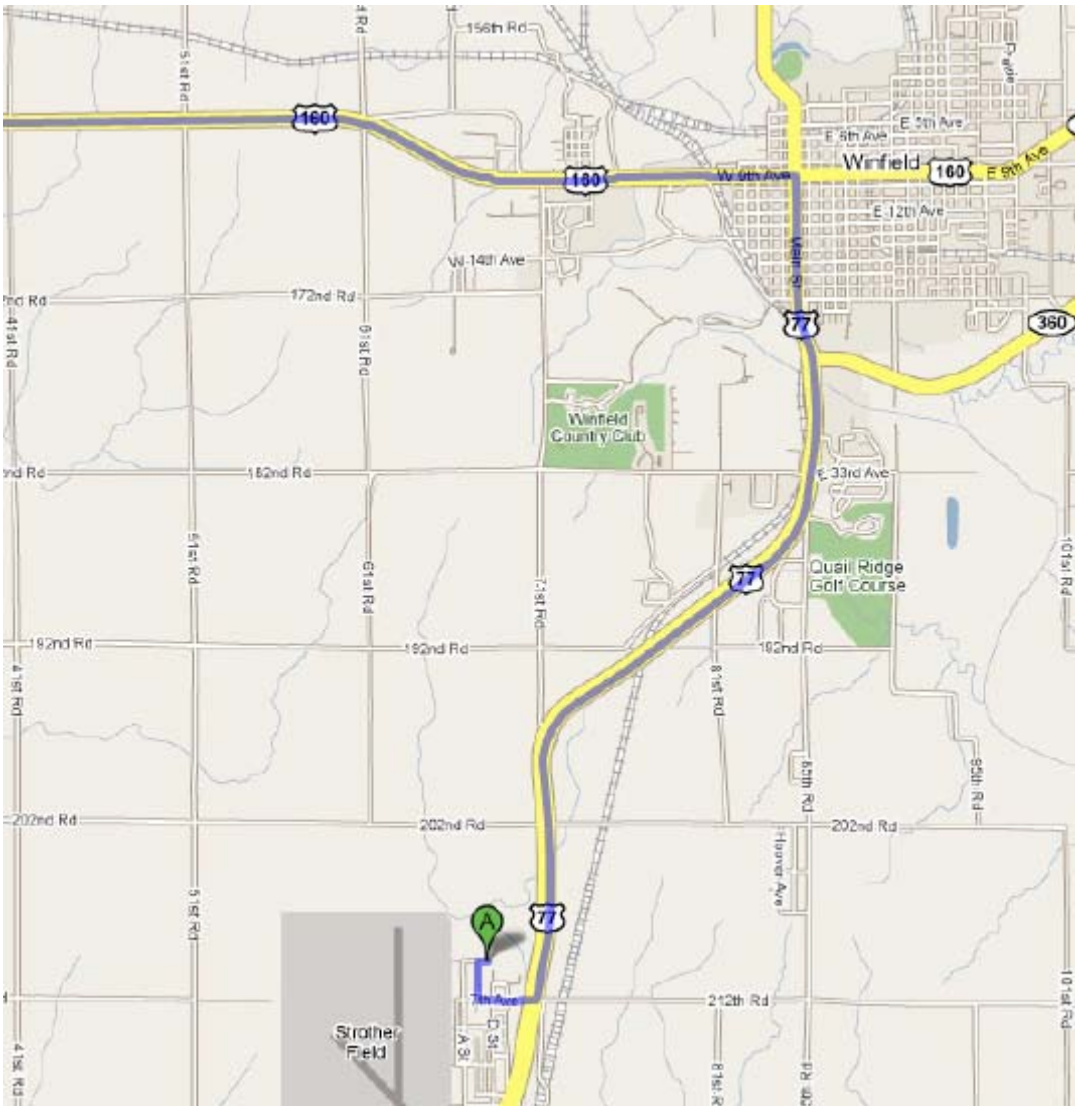
1.	Head **west** on **9th Ave** toward **B St**	285 feet
2.	Turn **left** at **B St**	0.2 miles
3.	Turn **left** at **7th Ave**	0.3 miles
4.	Turn **left** at **US-77**	5.4 miles
5.	Turn **left** at **W 9th Ave/US-160**	19.6 miles
6.	Turn **right** to merge onto **I-35 N/Kansas Turnpike**	22.5 miles
7.	Take exit **42** for **I-235/US-81/I-135** toward **Salina/Wichita**	0.6 miles
8.	Merge onto **I-35 N**	5.0 miles
9.	Take exit **5A** for **Lincoln St**	0.3 miles
10.	Turn **right** at **E Lincoln St**	0.2 miles

Via Christi Occupational and Environmental Medicine
2535 East Lincoln St
Wichita, KS 67211

1) Strother Field to Via Christi Occupational and Environmental Medicine

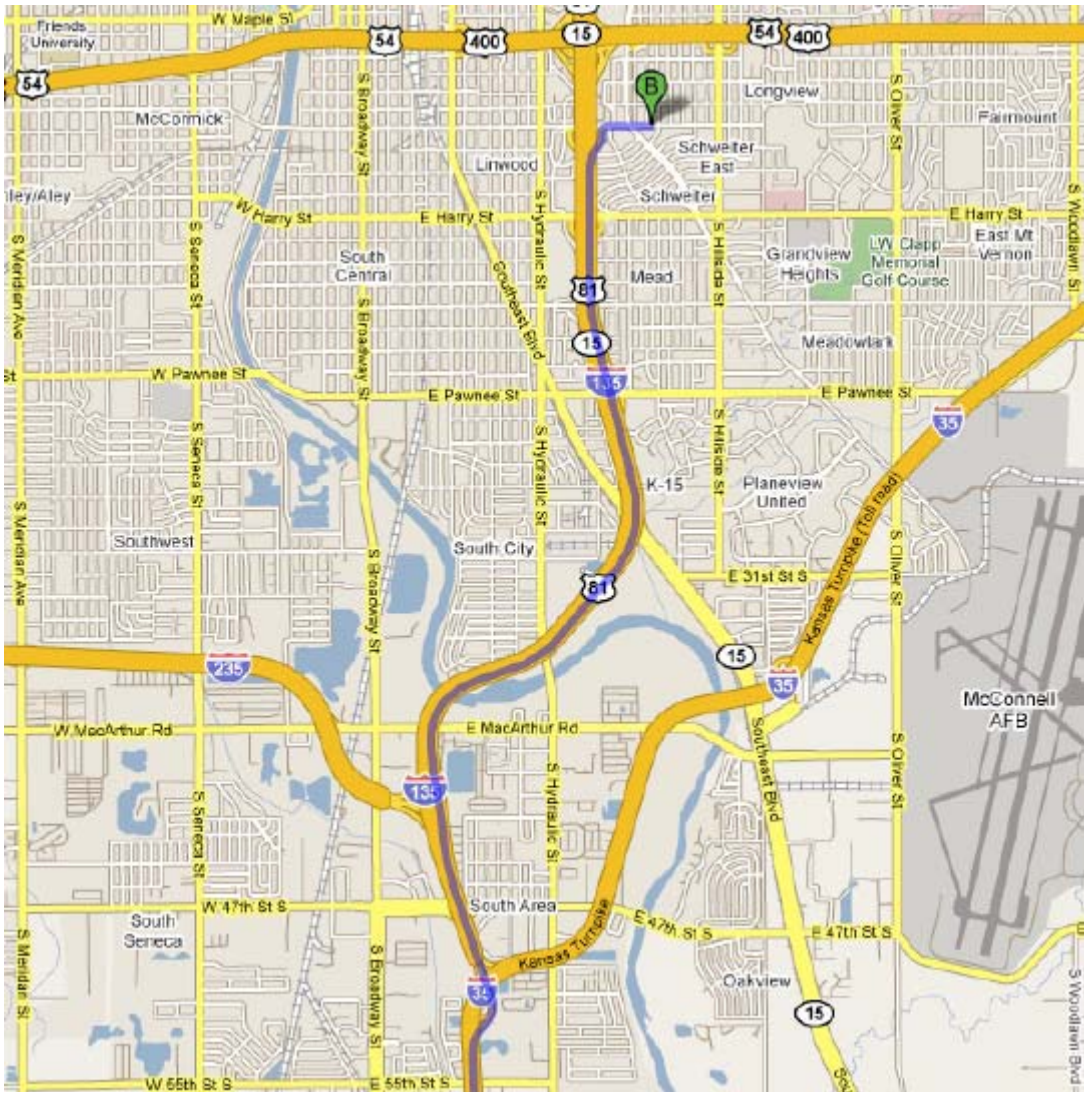
North

2) Strother Field to Via Christi Occupational and Environmental Medicine



North

3) Strother Field to Via Christi Occupational and Environmental Medicine



North

VIII. PERSONAL PROTECTIVE EQUIPMENT

For field work to be performed at this site, Level D personal protective equipment (PPE) and latex gloves are required. Level D PPE requirements are defined in Section 5.1.5 of the SSHP (Shaw, 2006). In general, the use of hard hats is required on all USACE work sites, except on MEC-contaminated sites. At this FUDS, hard hats will only be worn if an overhead hazard is identified. If hard hats are worn, they will be securely fastened to the wearer's head. Personnel will don protective coveralls and sample gloves prior to collecting soil samples to mitigate potential exposure to metal contaminants. Personnel will wet the sampling area prior to collecting the sample if the soil is not sufficiently wet to preclude the evolution of dust. By utilizing personal protective equipment and wetting of the sample substrate, this should preclude dermal or inhalation exposure to the potential metal contaminants. Tyvek® coveralls and gloves will be worn if poisonous plants, ticks, or other biological hazards are observed in the work area.

Contingency: If the chemical hazard is significantly different than what is expected, the Project Health and Safety Manager will be consulted to select the appropriate PPE.

SI field activities may be conducted in rural areas during hunting season. A review of hunting seasons within the area of the FUDS will be conducted prior to mobilization and discussed with the team members. All field team members will wear high visibility orange (hunter's orange) vests and hats while conducting reconnaissance and sampling activities during hunting seasons.

IX. DECONTAMINATION PROCEDURES

Decontamination procedures are not anticipated as Level D PPE is being used. If decontamination is necessary, procedures defined in Section 7.0 of the SSHP in the Work Plan will be followed. Team members are cautioned not to walk, kneel, or sit on any surface with potential leaks, spills, or contamination. After collecting samples in potentially metal impacted areas, personnel will wash their hands and face prior to eating smoking or drinking.

X. TRAINING

All site personnel and visitors will have the minimum training required by EM 385-1-1, 29 CFR 1910.120(e), and DDESB TP-18. The Shaw Field Team Leader will verify that all on-site personnel and visitors have completed the appropriate training prior to admitting the individuals on site. Additionally, the UXO technician assigned to this field reconnaissance will inform personnel before entering, of any potential site specific hazards and MEC safety procedures.

XI. GENERAL

The number of persons visiting the site will be held to a minimum. The UXO technician can supervise no more than six non-UXO qualified persons while on MEC sites performing intrusive or non-intrusive work per DDESB TP-18. The Field Team Leader (with concurrence from the Health and Safety Manager) may modify this SSHP Addendum if site conditions warrant. All changes to the SSHP require USACE review and concurrence before new procedures can be applied in the field.

XII. SEVERE WEATHER CONTINGENCY PLAN

Personnel should be aware of the possibility for the occurrence of severe weather. Severe weather may include:

- Tornadoes,
- Thunderstorms (lightning, rain, hail),
- High winds, and
- Blizzards.

The Field Team Leader, SSHO, or designee will listen to a weather forecast, watch the Weather Channel or local news program before going to the field. Based on the forecast, field activities could be delayed or suspended early. Additionally, field personnel should be aware of/informed of daily weather forecasts. Local weather broadcasts and information from a severe weather alert radio will be monitored by the Field Team Leader, SSHO, or designee when the likelihood for severe weather exists. The National Weather Service (http://www.nws.noaa.gov) should be consulted frequently. Weather conditions will be monitored throughout the day by all field team members.

Generally, cellular telephone communication will be used to alert crews to threatening weather. Necessary precautions or response, directed by the SSHO, will be taken in the event of severe weather. The Field Team Leader will decide what operations, if any, are safe to perform based on existing conditions and anticipated conditions.

The best protection against most severe weather episodes is to avoid them. This means seeking shelter before the storm hits.

TORNADO SAFETY

The Field Team Leader, SSHO, or designee will identify the nearest tornado shelter prior to beginning site operations. The location and route will be discussed in the initial safety briefing, repeated at least once a week and discussed when new personnel arrive onsite.

When a tornado has been sighted, go to the identified tornado shelter immediately. If in a trailer or vehicle, get out immediately and go to a tornado shelter immediately. Do not attempt to out-drive a tornado since they are erratic and move swiftly.

In the event you do not have time to go to the identified tornado shelter, personnel should take cover in a basement or interior room of a strong building, ditch or culvert. If you take cover in a building:

- Go to the basement or storm cellar. If there is no basement, go to an interior room on the lower level (bathrooms, closets, interior hallways); interior hallways on the lowest floor are usually safest.
- Get under a piece of sturdy furniture such as a workbench or heavy table or desk and hold on to it.

- Use arms to protect head and neck.
- Stay away from windows, doors, and outside walls.

If you take cover in a ditch or culvert:

- Lie and shield your head with your hands.
- If in a car, get out and take shelter in a nearby building.
- Be aware that ditches and culverts may fill up with water quickly and use these as shelters as a last resort.

LIGHTNING SAFETY

When clouds with dark bases and wind speeds pick up, anticipate thunderstorms and lightning. Those who have been struck by lightning generally did not seek cover in a timely fashion.

The "flash/bang" (f/b) technique of measuring the distance to lightning will be reviewed with all personnel. The f/b technique is defined as: for each 5 seconds from the time of observing the lightning flash to hearing the associated thunder, the lightning is 1 mile away. All outside activities will be suspended when a lightning flash is immediately in the area or the f/b measuring 30 seconds (6 miles away) is noted. Personnel will gather in the safe area for a head count and further instructions.

Safe areas include:

- Fully enclosed metal-topped vehicles with windows up.
- Substantial and permanent buildings.

Unsafe areas include:

- Small structures including huts and rain shelters.
- Nearby metallic objects like fences, gates, instrumentation and electrical equipment, wires, and power poles.

The following shall also be avoided when lightning is in the area:

- Tall isolated objects (for example trees),
- High ground,
- Open fields,
- Water,
- Using hard-wired telephones and headsets, and
- Heavy equipment.

If hopelessly isolated from shelter during close-in lightning, adopt a low crouching position with feet together (up on toes, if possible) and hands on ears. If hair stands on end or rises on back of neck, a lightning strike is imminent.

Remember the warning phrase from the National Lightning Safety Institute: "If you can see it (lightning), flee it; if you can hear it (thunder), clear it."

People who have been struck by lightning do not carry an electrical charge and are safe to handle. Apply first aid immediately, if you are qualified to do so. Get emergency help promptly.

Outdoor activities may resume when 30 minutes has elapsed since the last observable f/b equaled 30 seconds or greater.

XIII. HEAT STRESS

The SI field activities will be conducted in the summer months and hot and humid weather conditions will possibly be encountered. Daily weather forecasts will be provided to all the field team members and discussed at the Daily Health and Safety Tailgate Meeting to ensure appropriate clothing is being worn. Additionally, weather conditions will be monitored throughout the day by all field team members.

The combination of warm ambient temperature, humidity and protective clothing increases the potential for heat stress. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and individual characteristics. Extremely hot weather can cause physical discomfort, loss of efficacy, or personal injury. Individuals vary in their susceptibility to heat stress.

Heat stress disorders include rash, cramps, exhaustion, and stroke. Heat stress awareness training will be a part of the initial training session and will be reinforced, as necessary, during daily tailgate safety meetings. Heat stress prevention is outlined in procedure HS400 of the Shaw Corporation Health and Safety Procedures Manual. This information will be reviewed during safety meetings. Workers are encouraged to increase consumption of water and electrolyte-containing beverages, (e.g., Gatorade®, water), will be provided on site.

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur, ranging from mild to fatal. Heat-related problems include:

Heat Rash - Caused by continuous exposure to heat and humidity and aggravated by chafing clothes. Heat rash decreases the body's ability to tolerate heat as well as being a nuisance.

Heat Cramps - Caused by profuse perspiration with inadequate electrolytic fluid replacement. Heat cramps cause painful muscle spasms and pain in the extremities and abdomen.

Heat Exhaustion - Caused by increased stress on various organs to meet increased demand to cool the body. Heat exhaustion causes shallow breathing; pale, cool, moist skin; profuse sweating; and dizziness. Promptly moving the affected individual to a cool place to lie down and providing cool fluids to drink can alleviate heat exhaustion.

Heat Stroke - The most severe form of heat stress. This is a life-threatening situation. Call EMS. Heat stroke symptoms include hot, dry skin; no perspiration; nausea; dizziness; confusion; strong, rapid pulse; and coma. The body must be cooled immediately to prevent severe injury or death. Remove the victim from heat. Immerse victim in cool bath or wet clothing to allow better evaporative cooling.

The following practices may help reduce the probability of succumbing to heat stress:

- Acclimate workers to heat conditions when field operations are conducted during hot weather.
- Provide plenty of liquids to replace the body fluids lost by perspiration. Fluid intake must be forced because, under conditions of heat stress, the normal thirst mechanism is not adequate to bring about a voluntary replacement of lost fluids.
- Train personnel to recognize the signs and symptoms of heat stress and its treatment.
- Rotate personnel to various job duties, if possible.
- Encourage workers to take rests and report symptoms whenever they feel any adverse effects that may be heat-related. The frequency of breaks may need to be increased based on worker recommendation to the SSHO and Field Team Leader.

Individuals succumbing to the symptoms of heat stress will notify the Field Team Leader. In the event of heat stress, halt activities and initiate treatment. Early detection and treatment of heat stress can prevent the onset of more serious heat stroke or exhaustion conditions. Individuals that have succumbed to any heat-related illness become more sensitive and predisposed to additional heat stress situations.

Notify Team Leader if you have a condition such as cardiac (heart) disease that may affect your ability to tolerate heat, or if you are taking medications such as beta-andrenergic receptor blockers and calcium-channel blockers, diuretics, antihistamines, phenothiazines, or cyclic antidepressants. If you are not sure if your prescription medication is one of those, please contact your doctor or pharmacist.

For additional information regarding heat stress, refer to Section 4.2.2 of the approved Accident Prevention Plan and Site Safety and Health Plan included in the *Final Type I Work Plan, Site Inspections at Multiple Sites, NWO Region* (Work Plan; Shaw, 2006).

XIV. POISONOUS SNAKE AVOIDANCE

Personnel conducting investigations in rural areas have the potential to come in contact with snakes. While most snakes are harmless and are generally a sign of a healthy ecosystem, two families of venomous snakes are native to the United States. The first family of poisonous snakes is that of the pit vipers, which includes rattlesnakes, copperheads, and cottonmouths. The other family of poisonous snakes includes two species of coral snakes found chiefly in the southern states.

For people operating in rural areas, it may be impossible to completely prevent contact with poisonous snakes. However, there are several precautions which can lower the risk of being bitten:

- Be aware of the types of snakes that may exist in your field area, the habitats they prefer, and their seasonal occurrence. Within "snake season," review potential hazards each day and/or each time you move into a new area.
- Leave snakes alone. Many people are bitten because they try to kill a snake or get a closer look at the snake.
- Use caution when walking in high grass areas. Wear high-top leather boots (greater than or equal to 8 inches) or snake chaps depending on the geographical location and season.
- Remain on hiking paths or cleared walking areas as much as possible.
- Keep hands and feet out of areas you can't see. Don't pick up rocks or other ground items if it can be avoided.
- Be cautious and alert when climbing rocks.
- Make noise while walking through brushy weeded areas. Vibrations may cause snakes to leave the area.
- If a snake is observed, give it a wide berth of approximately 6 feet. Leave it alone and don't try to catch it or scare it off.

If a person is bitten by a snake, some basic steps should be taken:

- Call 911 or seek immediate medical care.
- Wash the bite with soap and water if possible.
- Immobilize the bitten area and keep it lower than the heart.

Attempt to identify the snake if this can be done without putting a person at risk. Type of information to be collected would include the species of snake if known, its size, coloration, length, and a description of the head. All of this information would be useful to the emergency room personnel or the local poison control center in determining if the snake was poisonous.

XV. TICK AVOIDANCE

Personnel conducting investigations in rural areas have the potential to come in contact with ticks. Ticks find a host by seeking out carbon dioxide that is put out through the skin. For the SI field team operating in rural areas, it may be impossible to completely prevent contact with ticks. However, there are several precautions which can lower the risk of being bitten:

- When walking through wooded areas or areas with grass do not sit on the ground. If possible, sit on rocks.
- Insect repellant containing at least 30% Deet can be effective in masking the carbon dioxide excretion.
- Wear light-colored clothing when possible as ticks are dark and more easily seen on light colored clothing.
- Tuck the bottom of pants into socks or boots.

- If ticks are observed in the area, then Tyvek® coveralls are to be worn as stated in Section VIII.
- Always check your entire body for ticks, including your hair. Use a fine-tooth comb.
- Leave wildlife alone as they may carry ticks.
- Keep hands and feet out of areas you can't see. Don't pick up rocks or other ground items if it can be avoided.

How to remove a tick:

- Grasp the tick with tweezers and slowly pull on the tick, at a 90 degree angle. As you pull, the tick will release from the skin.
- Do not use fire or a hot match to remove a tick.
- Wash the bite with soap and water if possible.

SAFETY BRIEFING CHECKLIST

SITE NAME: Strother Field	DATE/TIME: /

GENERAL INFORMATION

(Check subjects discussed)

☐ PURPOSE OF VISIT

☐ IDENTIFY KEY SITE PERSONNEL

☐ TRAINING AND MEDICAL REQUIREMENTS

SPECIFIC INFORMATION

☐ SITE DESCRIPTION/PAST USES

☐ RESULTS OF PREVIOUS STUDIES

☐ POTENTIAL SITE HAZARDS

☐ MEC SAFETY PROCEDURES

☐ SITE SOPs

☐ SITE CONTROL AND COMMUNICATIONS

☐ EMERGENCY RESPONSE

- ☐ LOCATION OF FIRST AID KIT
- ☐ EMERGENCY PHONE NUMBERS AND LOCATION
- ☐ LOCATION AND MAP TO NEAREST MEDICAL FACILITY
- ☐ PPE AND DECONTAMINATION

Stress the following during the briefing: If hazardous conditions arise, stop work, evacuate the area, and notify the SSHO and Shaw PM immediately.

PLAN ACCEPTANCE FORM

SITE SAFETY AND HEALTH PLAN ADDENDUM
FOR

Site Name: Strother Field
Location: Cowley County, Kansas

I have read and agree to abide by the contents of the Site Safety and Health Plan and this Addendum and I have attended the Safety Briefing for the aforementioned site.

NAME (PRINTED)	OFFICE	SIGNATURE	DATE

Person presenting the safety briefing:

_____ _____

SIGNATURE DATE