



**US Army Corps
of Engineers** ®
Omaha District



FINAL SITE INSPECTION REPORT
Strother Field
Cowley County, Kansas
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

August 2010



Shaw Environmental, Inc.
7604 Technology Way, Suite 300
Denver, CO 80237

The views, opinions, and/or findings contained in this report are those of the author(s) and should not be construed as official Department of the Army position, policy, or decision, unless so designated by other documentation.

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Submitted to:

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

Prepared by:

Shaw Environmental, Inc.
7604 Technology Way, Suite 300
Denver, Colorado 80237

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Prepared/Reviewed by:

Shaw Technical Lead:	Cindy Burns
Shaw Project Chemist:	Tim Roth
Shaw Quality Control:	Rachel Vavra
Shaw Project Manager:	Peter Kelsall

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List of Acronyms and Abbreviations

°F	degrees Fahrenheit
µg/L	micrograms per liter
AAF	Army Air Field
ASR	Archives Search Report
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CSM	conceptual site model
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DQO	data quality objective
EDR	Environmental Data Resources, Inc.
EOD	Explosive Ordnance Disposal
EPA	U.S. Environmental Protection Agency
ER	Engineer Regulation
ESD	Explanation of Significant Differences
FR	Federal Register
FSP	Field Sampling Plan
ft	foot or feet
FUDS	Formerly Used Defense Sites
g	gram(s)
GE	General Electric
GIS	Geographic Information System
GPS	Global Positioning System
HRS	Hazard Ranking System
HTRW	hazardous, toxic, or radioactive wastes
IEP	Important Ecological Place
INPR	Inventory Project Report
KDHE	Kansas Department of Health and Environment
KDWP	Kansas Department of Wildlife and Parks
KGS	Kansas Geological Society
KSHPO	Kansas State Historic Preservation Office
KSHS	Kansas State Historical Society
lb	pound(s)
MC	munitions constituents
MD	munitions debris
MEC	munitions and explosives of concern
mg/kg	milligrams per kilogram
MMRP	Military Munitions Response Program
MRA	Munitions Response Area
MRS	Munitions Response Site
MRSPP	Munitions Response Site Prioritization Protocol
NAD	North American Datum

List of Acronyms and Abbreviations (Cont.)

NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDAI	No Department of Defense Action Indicated
NGVD	National Geodetic Vertical Datum
NOAA	National Oceanic and Atmospheric Administration
NWK	Northwestern Division Kansas City District
NWO	Northwestern Division Omaha District
PAH	polycyclic aromatic hydrocarbons
R3E	Range 3 East
RAC	Risk Assessment Code
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
SAP	Sampling and Analysis Plan
Shaw	Shaw Environmental, Inc.
SI	Site Inspection
SSWP	Site-Specific Work Plan
T33S	Township 33 South
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
UTL	upper tolerance limit
UTM	Universal Transverse Mercator
UXO	unexploded ordnance
Work Plan	<i>Final Type I Work Plan</i>
WP	white phosphorus
yd	yard(s)

Glossary of Terms

Comprehensive Environmental Response, Compensation, and Liability Act of 1980

(CERCLA) – Also known as “Superfund,” this congressionally enacted legislation provides the methodology for the removal of hazardous substances resultant from past / former operations. Response actions must be performed in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (USACE, 2003). CERCLA was codified as 42 USC 9601 et seq., on December 11, 1980, and amended by the Superfund Amendments and Reauthorization Act (SARA) on October 17, 1986.

Defense Sites – Locations that are or were owned by, leased to, or otherwise possessed or used by the Department of Defense (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)).

Discarded Military Munitions (DMM) – Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed consistent with applicable environmental laws and regulations (10 USC 2710(e)(2)).

Explosive Ordnance Disposal (EOD) – The detection, identification, on-site evaluation, rendering safe, recovery, and final disposal of unexploded ordnance and of other munitions that have become an imposing danger, for example, by damage or deterioration (10 USC 2710(e)(2)).

Formerly Used Defense Site (FUDS) – Real property that was formerly owned by, leased by, possessed by, or otherwise under the jurisdiction of the Secretary of Defense or the components, including organizations that predate DoD. Some FUDS properties include areas formerly used as military ranges (10 USC 2710(e)(2)).

Military Munitions – Ammunition products and components produced for or used by the armed forces for national defense and security, including ammunition products or components under the control of the DoD, the U.S. Coast Guard, the U.S. Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants, explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives, and chemical warfare agents, chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunitions, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges, and devices and components of the above.

The term does not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, and nuclear components, other than non-nuclear components of

nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 USC 2011 et seq.) have been completed (10 USC 101(e)(4)(A) through (C)).

Munitions Constituents (MC) – Any materials originating from unexploded ordnance (UXO), discarded military munitions (DMM), or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions (10 USC 2710(e)(3)).

Munitions Debris (MD) – Remnants of munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal (10 USC 2710(e)(2)).

Munitions and Explosives of Concern (MEC) – This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks means: (A) Unexploded ordnance (UXO), as defined in 10 USC 101(e)(5); (B) Discarded military munitions (DMM), as defined in 10 USC 2710(e)(2); or (C) Munitions constituents (e.g., TNT, RDX), as defined in 10 USC 2710(e)(3), present in high enough concentrations to pose an explosive hazard (10 USC 2710(e)(2)).

Munitions Response Area (MRA) – 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 comprises one or more munitions response sites (32 CFR§179.3).

Munitions Response Site (MRS) – A discrete location within an MRA that is known to require a munitions response (32 CFR§179.3).

Munitions Response Site Prioritization Protocol (MRSPP) – The MRSPP was published as a rule on October 5, 2005. This rule implements the requirement established in section 311(b) of the National Defense Authorization Act for Fiscal Year 2002 for the Department of Defense (DoD) to assign a relative priority for munitions responses to each location in the DoD's inventory of defense sites known or suspected of containing unexploded ordnance (UXO), discarded military munitions (DMM), or munitions constituents (MC). The DoD adopted the MRSPP under the authority of 10 USC 2710(b). Provisions of 10 USC 2710(b) require that the Department assign to each defense site in the inventory required by 10 USC 2710(a) a relative priority for response activities based on the overall conditions at each location and taking into consideration various factors related to safety and environmental hazards (70 FR 58016).

Range – A designated land or water area that is set aside, managed, and used for range activities of the Department of Defense. The term includes firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, impact areas, electronic scoring sites, buffer zones with restricted access, and exclusionary areas. The term also includes airspace areas designated for

military use in accordance with regulations and procedures prescribed by the Administrator of the Federal Aviation Administration (10 USC 101(e)(1)(A) and (B)).

Range Activities – Research, development, testing, and evaluation of military munitions, other ordnance, and weapons systems; and the training of members of the armed forces in the use and handling of military munitions, other ordnance, and weapons systems (10 USC 101(e)(2)(A) and (B)).

Risk Assessment Code (RAC) – An interim risk assessment procedure developed by the U.S. Army Engineering and Support Center, Huntsville (USAESCH), Ordnance and Explosives Directorate (CEHNC-OE) to address explosives safety hazards related to munitions. The RAC score was formerly used by the USACE to prioritize response actions at FUDS. The RAC procedure, which does not address environmental hazards associated with munitions constituents, has been superseded by the MRSPP.

Unexploded Ordnance (UXO) – Military munitions that (A) have been primed, fuzed, armed, or otherwise prepared for action; (B) have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and (C) remain unexploded either by malfunction, design, or any other cause (10 USC 101(e)(5)(A) through (C)).

1 *Executive Summary*

2 The Department of Defense (DoD) has established the Military Munitions Response Program
3 (MMRP) under the Defense Environmental Restoration Program to address DoD sites suspected
4 of containing munitions and explosives of concern (MEC) or munitions constituents (MC).
5 Under the MMRP, the U.S. Army Corps of Engineers (USACE) is conducting environmental
6 response activities at Formerly Used Defense Sites (FUDS) for the Army, DoD's Executive
7 Agent for the FUDS program. Shaw Environmental, Inc. (Shaw) is responsible for conducting
8 Site Inspections (SIs) at FUDS in the northwest region managed by the Omaha District Military
9 Munitions Design Center.

10 *SI Objectives and Scope*

11 The primary objective of the MMRP SI is to determine whether a FUDS project warrants further
12 response action under the Comprehensive Environmental Response, Compensation, and Liability
13 Act (CERCLA). The SI collects the minimum amount of information necessary to make this
14 determination, as well as it (i) determines the potential need for a removal action; (ii) collects or
15 develops additional data, as appropriate, for Hazard Ranking System (HRS) scoring by the U.S.
16 Environmental Protection Agency (EPA); and (iii) collects data, as appropriate, to characterize
17 the release for effective and rapid initiation of the Remedial Investigation and Feasibility Study.
18 An additional objective of the MMRP SI is to collect the additional data necessary to complete
19 the Munitions Response Site Prioritization Protocol (MRSP).

20 The scope of the SI reported herein is restricted to evaluation of the presence of MEC or MC
21 related to historical use of the FUDS prior to transfer. Potential releases of hazardous, toxic, or
22 radioactive wastes are not addressed within the current scope. The intent of the SI is to confirm
23 the presence or absence of MEC and/or associated MC.

24 *Strother Field*

25 This report presents the results of an SI conducted at Strother Field, FUDS property number
26 B07KS0277, located approximately 5 miles south of Winfield and 6 miles north of Arkansas
27 City in Cowley County, Kansas. Strother Field was commissioned in 1942 and was used
28 primarily for the basic training of Air Corps cadets. In 1944, the installation became a fighter
29 pilot training station. Training activities included instrument training, and strafing and bombing
30 practice, which was not physically conducted at Strother Field.

31 Conventional ordnance facilities documented at Strother Field included a small arms storage
32 building, a magazine, an igloo, a skeet range, and a pistol range. Only small arms munitions
33 were used or stored at the FUDS during the basic flight training mission; no documentation of
34 other types of conventional munitions items has been found. The only identified ranges are a
35 skeet range and a pistol range.

36 Chemical training occurred on base (e.g., gas chamber exercises and pyrotechnic) at an unknown
37 location. Pyrotechnics known to have been present at Strother Field included white phosphorus
38 grenades and smoke pots. No documentation of other chemical training or pyrotechnic items has
39 been found.

40 The site was declared surplus in January 1946 and conveyed to the cities of Winfield and
41 Arkansas City in May 1948.

42 Technical Project Planning

43 The approach for the SI was developed by Shaw in consultation with site stakeholders. A
44 Technical Project Planning meeting conducted in February 2009 was attended by representatives
45 from the USACE Omaha Design Center, USACE Kansas City District, the Kansas Department
46 of Health and Environment (KDHE), and Shaw. The stakeholders agreed to the approach and
47 identified one munitions response site (MRS), Range Complex No. 1, comprised of a pistol
48 range and a skeet range.

49 SI Field Activities

50 SI field activities, conducted in October 2009, included a site reconnaissance to look for
51 evidence of MEC. MEC or evidence of MEC associated with small arms was not identified.
52 Based on the identification of munitions debris (MD) from incendiary bombs and white
53 phosphorus grenades during the field effort, a potential disposal area was identified at the FUDS,
54 and was evaluated as a separate area during the SI. One potential MEC item, a portion of an
55 incendiary bomb, was identified within the Disposal Area. The item was disposed of by
56 personnel from the McConnell Air Force Base Explosive Ordnance Disposal team.

57 Surface soil, sediment, and surface water samples were collected for MC of concern at the Range
58 Complex No. 1 MRS. The results of surface soil sampling show that concentrations of MC of
59 concern from the former range are below the screening values agreed to by the stakeholders.

60 SI Recommendations

61 Results of the SI provide the basis for conclusions and/or recommendations for further actions at
62 the MRS and Disposal Area.

63 Range Complex No. 1 MRS

64 Based on historical evidence and results from the 2009 SI field activities, evidence of MEC is
65 not present at the MRS. Sampling results indicated that concentrations of MC are below
66 screening levels agreed by the stakeholders. Therefore, further investigation or removal action is
67 not required, and a recommendation of No DoD Action Indicated (NDAI) is made regarding
68 MEC and MC at the Range Complex No. 1 MRS.

69 Disposal Area

70 Based on results from the 2009 SI field activities, there is evidence of a disposal area at the
71 FUDS and evidence of MEC within the disposal area. A recommendation is made to add a

72 “Disposal Area” to the MRS Inventory for Strother Field. A recommendation for further
73 investigation for MEC is made for the Disposal Area based on the identification of MD and
74 potential MEC within the area. Consideration of a removal action is not warranted. Sampling
75 for MC was not conducted for the Disposal Area during the 2009 SI. However, a
76 recommendation is made for further investigation for MC given the lack of historical evidence
77 regarding the existence of the Disposal Area and the types of munitions that may have been used.

78 **1.0 Introduction**

79 This Site Inspection (SI) Report presents the results of an SI conducted at the Strother Field
80 Formerly Used Defense Site (FUDS) located between Winfield and Arkansas City, Kansas.
81 Shaw Environmental, Inc. (Shaw) has prepared this report for the U.S. Army Corps of Engineers
82 (USACE) in accordance with Task Order 003, issued under USACE Contract No. W912DY-04-
83 D-0010. Shaw is responsible for conducting SIs at FUDS in the northwest region managed by
84 the USACE Northwestern Division Omaha District (NWO) Military Munitions Design Center as
85 directed by the Performance Work Statement (Appendix A).

86 The technical approach is based on the *Final Type 1 Work Plan, Site Inspections at Multiple*
87 *Sites, NWO Region* (Work Plan; Shaw, 2006) and the *Formerly Used Defense Sites, Military*
88 *Munitions Response Program, Site Inspections, Program Management Plan* (USACE, 2005).

89 **1.1 Project Authorization**

90 The Department of Defense (DoD) has established the Military Munitions Response Program
91 (MMRP) to address DoD sites suspected of containing munitions and explosives of concern
92 (MEC) or munitions constituents (MC). Under the MMRP, the USACE is conducting
93 environmental response activities at FUDS for the Army, DoD's Executive Agent for the FUDS
94 program.

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

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

107 **1.2 Site Name and Location**

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

112 Strother Field is included in the MRS Inventory in the *Defense Environmental Programs Annual*
 113 *Report to Congress Fiscal Year 2009* (DoD, 2009) under Federal Facility Identification number
 114 KS79799F031800, with the following information:

Site ID	MSRPP Score	Nearest City	Ownership Interest	Range Total Area (acres)	Land Use Restrictions	Land Use Access Controls
000EW	Evaluation Pending	Hackney	No Data Available	240	Unrestricted public access	No controls

115 Range areas and coordinates are listed in the *ASR Supplement* (ASR Supplement) (USACE,
 116 2004b) as follows:

Range Name	Subrange Name	Range Identification	Approximate Area (acres)	UTM Coordinates* (meters)
Range Complex No. 1		B07KS027700R01	239.5	X = 674733.677 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

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

119 The FUDS is located on 1,386 acres. As shown in the table above, Site ID 000EW consists of
 120 one MRS, Range Complex No. 1, with two subranges (skeet range and pistol range). The MRS
 121 is consistent with the range identified in the ASR Supplement (USACE, 2004b) and the MRS
 122 Inventory (B07KS027700R01), with respect to size and location.

123 The skeet and pistol ranges partially overlap each other and a portion of the pistol range safety
 124 fan is located outside the FUDS boundary. As a result of the partial overlap, the approximate
 125 acreage of Range Complex No. 1 is less than the acreage of the two subranges combined.

126 In addition to the ranges listed in the MRS Inventory and ASR Supplement, the 2009 SI field
 127 team discovered evidence of a possible disposal area on the FUDS. The area, approximately
 128 28.3 acres in size, is evaluated as the "Disposal Area" throughout this SI.

129 Figures 1-2, 1-3, and 1-4 show the locations of the FUDS, Range Complex No. 1 MRS, and the
 130 Disposal Area on historical (1950 and 1963) and recent (2006) aerial photographs.

131 *1.3 Purpose, Scope, and Objectives of the Site Inspection*

132 The primary objective of the MMRP SI is to determine whether a FUDS project warrants further
 133 response action under CERCLA or not. The SI collects the minimum amount of information

134 necessary to make this determination, as well as it (i) determines the potential need for a removal
135 action; (ii) collects or develops additional data, as appropriate, for Hazard Ranking System
136 (HRS) scoring by the U.S. Environmental Protection Agency (EPA); and (iii) collects data, as
137 appropriate, to characterize the release for effective and rapid initiation of the Remedial
138 Investigation and Feasibility Study (RI/FS). An additional objective of the MMRP SI is to
139 collect the additional data necessary to complete the Munitions Response Site Prioritization
140 Protocol (MRSPP).

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

149 **Is No DoD Action Indicated (NDAI)?** An NDAI recommendation may be made if:

- 150 • There is no indication of MEC; and
- 151 • MC contamination does not exceed screening levels determined from Technical
152 Project Planning (TPP).

153 **Is an RI/FS warranted?** An RI/FS may be recommended if:

- 154 • There is evidence of MEC hazard. MEC hazard may be indicated by direct
155 observation of MEC during the SI, by indirect evidence (e.g., a crater potentially
156 caused by impact of unexploded ordnance [UXO]), or by a report of MEC being
157 found in the past without record that the area was subsequently cleared; or
- 158 • MC contamination exceeds screening levels determined from TPP.

159 **Is a removal action warranted?** A removal action may be needed if:

- 160 • High MEC hazard is identified. Shaw will immediately report any MEC findings
161 so that USACE can determine the hazard in accordance with the MRSPP. An
162 example of a high hazard would be finding sensitive MEC at the surface in a
163 populated area with no barriers to restrict access; or
- 164 • Elevated MC risk is identified. Identification of an imminent threat to human
165 health, safety, or the environment (e.g., confirming MC concentrations above
166 health-based risk standards in a well used as a source of drinking water) would
167 trigger notification of affected stakeholders. Data would be presented at a second
168 TPP meeting regarding the possible need for a removal action.

169 For purposes of applying these decision rules, USACE has provided guidance that evidence of
170 MEC will generally be a basis of recommending RI/FS. Evidence of MEC may include

171 confirmed presence of MEC from historical sources or SI field work, or presence of munitions
172 debris (MD).

173 ***1.4 Munitions Response Site Prioritization Protocol***

174 The MRSPP was published as a rule on October 5, 2005 (70 FR 58028). This rule implements
175 the requirement established in section 311(b) of the National Defense Authorization Act for
176 Fiscal Year 2002 for the DoD to assign a relative priority for munitions responses to each
177 location in the DoD's inventory of defense sites known or suspected of containing UXO,
178 discarded military munitions, or MC (70 FR 58016).

179 This report includes draft MRSPP scoring sheets for the MRS identified in this SI Report
180 (Appendix K). The MRSPP scoring will remain draft after this SI Report is finalized, pending
181 Army MRSPP Quality Assurance Panel review. The scoring will be reviewed on an annual basis
182 and reapplied as necessary to incorporate new information.

183 *2.0 Property Description and History*

184 Historical information contained in this SI report was obtained from the *Inventory Project Report*
185 (INPR) (USACE, 1994), *Archives Search Report (ASR)* (USACE, 2006b), and the ASR
186 Supplement (USACE, 2004b) for Strother Field. Additional historical information related to
187 non-DoD activities was obtained from various EPA documents related to HTRW activities.

188 *2.1 Historical Military Use*

189 Military use of the site began in 1942 with the purchase of 1,386 acres for the main airfield. The
190 missions assigned to the site were basic training of Air Corps cadets. In June 1944, the
191 installation was transferred to the Second Air Force to become a fighter pilot training station.
192 The training at the field was of a more advanced nature for specific missions. This included
193 additional instrument training, and strafing and bombing practice, which was not physically
194 conducted at Strother Field. Four auxiliary landing fields were associated with Strother Field
195 (#1, #2, #3, and #5) and used primarily for emergency and touch-and-go landings (USACE,
196 2006b).

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

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

213 Storage buildings are not considered to be potential MEC or MC sources because the act of
214 storing fixed ammunition and pyrotechnics does not present a significant potential of a release.
215 There is no evidence that chemical training, other than gas chamber exercises designed to test the
216 fit and adequacy of gas masks, occurred at Strother Field during World War II. Therefore, the

217 chemical training areas and ammunition storage areas at Strother Field are not considered
218 MMRP sites.

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

222 The SI field activities found evidence of disposal of munitions at Strother Field. No historical
223 information regarding such disposal has been found.

224 **2.2 Munitions Information**

225 Historical evidence indicates that the only conventional military munitions used at Strother Field
226 were small arms ammunition at the Range Complex No. 1 MRS: shotgun shells at the skeet
227 range and .22- and .45-caliber at the pistol range (USACE, 1994). In addition to small arms
228 ammunition, observations made during the SI reconnaissance indicate 4-pound (lb) AN-M50 and
229 AN-M54 series incendiary bombs and M15 WP grenades were disposed of within the Disposal
230 Area, which is located on the skeet range portion of the Range Complex No. 1 MRS.

231 Table 2-1 contains information on the munitions potentially present at the Range Complex No. 1
232 MRS and Disposal Area.

233 **2.3 Ownership History**

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

240 Currently, most of the former FUDS property is occupied by the Strother Field Airport and
241 Industrial Park, and managed by the Strother Field Commission, which represents Arkansas City
242 and Winfield (EPA, 1994a). The Industrial Park covers the majority of the former base
243 cantonment area. The remaining portions of the former FUDS property are privately owned.

244 There are only a few original facilities that remain standing. Currently the Industrial Park has a
245 variety of industries, including a major jet engine overhaul facility, a beer distributor, a driver's
246 license office, and other manufacturers (USACE, 2006b). There is no residential use of the
247 property. The non-industrial portions of the site are used for agricultural production (USACE,
248 2006b).

249 Current taxlot parcels in the FUDS area are shown in Figure 2-1. The Range Complex No. 1
250 MRS is located on airport and private properties. The Disposal Area is located on airport
251 property that is leased for agricultural use.

252 **2.4 Physical Setting**

253 **2.4.1 Topography and Vegetation**

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

261 As shown on Figure 2-2, the topographic slope at the FUDS is generally from the north to the
262 southeast. The topography observed by the 2009 SI field team was generally flat throughout the
263 subranges of Range Complex No. 1, with a steep drop to Posey Creek. Some slight depressions
264 were observed in the plowed fields within both subranges of Range Complex No. 1, as evidenced
265 by the pooled rainwater in several areas (Appendix E, Photo 8). The topography of the Disposal
266 Area was observed to be flat.

267 Vegetation on a large portion of the FUDS was observed by the 2009 SI field team to be planted
268 crops (predominantly wheat and beans) (Appendix E, Photos 7, 8, 20, and 22). Small areas of
269 prairie grasses were observed around the former firing line and target berm (no longer present) of
270 the pistol range portion of the Range Complex No. 1 MRS, the crops, and along property
271 boundaries (Appendix E, Photo 14). Large-growth trees were observed in scattered areas
272 throughout the industrial park, except along Posey Creek where trees and shrubs grow along the
273 banks within the Range Complex No. 1. Other vegetated areas within the industrial park
274 consisted of mowed grasses (Appendix E, Photos 13 and 46). Vegetation within the Disposal
275 Area consisted of planted wheat crops.

276 **2.4.2 Surface Water**

277 Regional surface water drainage is shown on Figure 2-3. While the general topography of the
278 site slopes from north to southeast, a swale (low area) intersects the FUDS south of Range
279 Complex No. 1. The swale appears to conform to what was the original channel of Posey Creek,
280 which was re-routed by the Army in the 1940s. Surface runoff from aircraft related industries at
281 the FUDS either flows into this swale, to an open drainage ditch parallel to the railroad spur, or
282 to storm sewer inlets (EPA, 1994a).

283 Posey Creek runs along the eastern border of the FUDS and drains into the Walnut River. The
284 Strother Field Sewage Treatment Plant to the southeast of the FUDS, an industrial cooling tower
285 near the central portion of the FUDS, and two groundwater remediation wells in the northern
286 portion of the FUDS supply water to Posey Creek. As a result, Posey Creek becomes an
287 artificial perennial stream as it passes through Strother Field. It is the only perennial surface
288 water at the site. Posey Creek becomes a natural perennial stream approximately 1.5 miles

289 downstream of the site, where it begins to intersect an alluvial aquifer that contributes baseflow
290 to the creek. The swale, drainage ditches, and the storm sewer all flow to Posey Creek at the
291 southeastern corner of the FUDS (EPA, 1994a).

292 The 2009 SI field team observed that the groundwater remediation wells and treatment systems
293 in the northern portion of the FUDS were no longer in use and were not supplying water to Posey
294 Creek. As a result, large sections of Posey Creek within the Range Complex No. 1 held stagnant
295 water that likely flows only during high rainfall events (Appendix E, Photos 39, 40, 47, 48, and
296 49). There were no surface water features observed in the Disposal Area.

297 *2.4.3 Land Use*

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

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

312 The majority of the land (approximately 65 percent) comprising the skeet range portion of the
313 Range Complex No. 1 is natural land or land used for growing crops (Appendix E, Photos 7, 8,
314 20, and 22). The remaining 35 percent is used or owned by Range Oil Company and a private
315 landowner for industrial purposes. The 2009 SI field team observed that Range Oil Company
316 uses their property to store out-of-service fuel tanks and oil pump jacks (Appendix E, Photos 5
317 and 23). To the west of Range Oil Company, a private landowner was observed using his
318 property to operate a trucking company (Appendix E, Photo 22).

319 The majority of the land (approximately 99 percent) comprising the pistol range portion of the
320 Range Complex No. 1 is used for growing crops. To the west of the former pistol range berm
321 (which is no longer present), the 2009 SI field team observed the former GE test cell location
322 (Figure 2-1). The structure, surrounded by a large berm, is still present on site but out of service.
323 An out-of-service air stripper, part of the water treatment system, was observed between the
324 former pistol range berm location and the GE test cell (Figure 2-1; Appendix E, Photo 13).

325 The land comprising the Disposal Area is entirely used for growing crops.

326 *2.4.4 Nearby Population*

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

332 According to the U.S. Census Bureau, the 2000 population within a 2-mile radius of the FUDS
333 property boundary was 509 persons, and the numbers of housing units was 214. The population
334 density within a 2-mile radius of the FUDS ranges from approximately 14.3 to 21.9 persons per
335 square mile (Figure 2-4). No residences were observed on the FUDS by the 2009 SI field team.

336 According to the U.S. Census Bureau, the 2000 population within a 2-mile radius of the Range
337 Complex No. 1 MRS was 490 persons in 204 housing units. Two residences were observed at
338 the northern portion of the pistol range safety fan of the Range Complex No. 1 MRS, outside of
339 the FUDS boundary.

340 According to the U.S. Census Bureau, the 2000 population within a 2-mile radius of the Disposal
341 Area was 365 persons in 160 housing units. There are no structures on the Disposal Area.

342 Figure 2-5 shows sensitive receptor locations identified from available Geographic Information
343 System (GIS) resources. Based on Figure 2-5, sensitive receptors within a 4-mile radius of the
344 FUDS include two churches and numerous wetlands.

345 *2.4.5 Climate*

346 The climate in the area is continental in nature. Summers are warm, with the majority of the
347 annual precipitation occurring during this season. Winters tend to be cold with an occasional
348 mild spell and moderate snowfall amounts (National Oceanic and Atmospheric Administration
349 [NOAA], 2009a). At Winfield, Kansas, approximately 5 miles to the north, mean precipitation is
350 37.6 inches per year, based on data from 1971 to 2000. Mean monthly temperatures range from
351 30.6 degrees Fahrenheit (°F) in January to 80.5°F in July (NOAA, 2009b).

352 *2.4.6 Area Water Supply*

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

358 Figure 2-6 shows registered groundwater wells located on, and in the vicinity, of the FUDS.
359 According to the KGS Water Well Completion Records Database, these wells consist of

360 domestic, livestock, public water supply, irrigation, industrial, and monitoring wells. Thirty-two
361 monitoring wells, six “other” wells (injection or dewatering wells), two remediation/recovery
362 wells (former public water supply wells), one public water supply well, and one domestic well
363 are located within the FUDS boundaries (KGS, 2009). The 2009 SI field team observed several
364 monitoring wells within the FUDS and Range Complex No. 1 MRS boundaries (Figure 2-6).

365 *2.4.7 Geologic and Hydrogeologic Setting*

366 The following subsections provide information on the geology and hydrogeology of the FUDS.

367 *2.4.7.1 Bedrock Geology*

368 Nearly all of the rocks on the surface of Kansas are sedimentary in origin, consisting chiefly of
369 shale, sandstone, and limestone. Below the surface rocks is a layer of Precambrian igneous rocks
370 that underlie the entire state. In eastern Kansas, the most common surface rocks were formed
371 during the Pennsylvanian period. These rocks are primarily marine and nonmarine shales,
372 limestones, and sandstones. The Pennsylvanian rocks of Kansas are comprised of more than
373 65 formations with a total thickness of 950 meters.

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

382 The FUDS is located in an area of quaternary alluvium (late Pleistocene and Holocene)
383 (Bayne, 1962). Based on lithologic logs for wells located in the area, shale bedrock is located at
384 a depth of approximately 53 feet (ft) below ground surface (bgs) in the area of the FUDS (KGS,
385 2009).

386 The 2009 SI field team did not observe any bedrock outcrops; however, abundant chert gravel
387 was observed on the ground surface in the southern portion of the plowed fields within the MRS
388 (Appendix E, Photos 7 and 8).

389 *2.4.7.2 Overburden Soils*

390 Soil types at the FUDS are primarily loams including silt and silty clay loams. The most
391 common soil types present in the FUDS area are the Tabler silty clay loam and Bethany silt
392 loam. The Tabler silty clay loam is a moderately well-drained soil that forms from calcareous
393 clayey alluvium on slopes of 0 to 1 percent. The saturated hydraulic conductivity is very low to
394 moderately low. The typical profile is clay loam from 0 to 8 inches and silty clay from 8 to
395 60 inches. The Bethany silt loam is a well-drained soil that forms from clayey loess over old

396 clayey alluvium on slopes of 1 to 3 percent. The saturated hydraulic conductivity is moderately
397 low to moderately high. The typical profile is silt loam from 0 to 9 inches, silty clay loam from
398 9 to 16 inches, silty clay from 16 to 36 inches, and silty clay loam from 36 to 60 inches (U.S.
399 Department of Agriculture [USDA], 2009).

400 Surface soil observed by the 2009 SI field team was soft clayey silt, dark brown to black, with
401 low to medium plasticity. During the sampling effort, surface soils were very moist from recent
402 rainfall. The Unified Soil Classification Code for the surface soil observed is ML (silt).

403 *2.4.7.3 Hydrogeology*

404 The FUDS is underlain by the Flint Hills aquifer. Groundwater is readily available throughout
405 the Flint Hills region. The Flint Hills aquifer consists of the Permian limestones in the Chase
406 and Council Grove Groups. The limestone aquifers in these rock units are sources of water for
407 many springs and for public water supply throughout the Flint Hills region. Locally, well yields
408 are estimated at up to 1,000 gallons per minute from the limestones that form this aquifer
409 (Mcfarlane, 2000).

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

415 The major source of groundwater for Strother Field is an alluvial aquifer comprised of sand and
416 gravel. Groundwater is generally encountered at a depth of 18 to 23 ft bgs and aquifer thickness
417 varies in the area. Thickness of the sand and gravel deposits ranges from 7 to 28 ft beneath the
418 FUDS. The general direction of groundwater flow in the alluvial aquifer is northwest to
419 southeast.

420 Based on well completion records, depth to groundwater in wells located at the FUDS ranges
421 from 7 to 34 ft bgs, and the available lithologic logs indicate the wells are installed in clay and
422 sand (KGS, 2009).

423 No groundwater observations were made by the SI field team.

424 *2.4.8 Sensitive Environments*

425 The U.S. Fish and Wildlife Service (USFWS) and Kansas Department of Wildlife and Parks
426 (KDWP) were contacted concerning Important Ecological Places (IEPs) and threatened or
427 endangered species that might be present in the FUDS (Appendix C). Although Cowley County
428 is home to 13 federal and state threatened and endangered species (KDWP, 2005), neither
429 agency indicated that any areas of the FUDS were managed for ecological purposes or qualified
430 as IEPs or sensitive environments (Table 2-2). In addition, both agencies indicated that there

431 were no concerns regarding proposed SI activities and threatened or endangered species at the
432 FUDS (KDWP, 2009; USFWS, 2009).

433 Cultural resources require identification in order to complete HRS and MRSPP scoring. The
434 Kansas State Historical Preservation Office (KSHPO) reviewed its cultural resources files and
435 indicated that the former Strother Field is situated in an upland area of low archaeological
436 potential (Appendix C). KSHPO also indicated that, because the site is located in a formerly
437 cultivated area, proposed sampling activities are not likely to pose a threat to any intact cultural
438 deposits and have little potential to impact standing structures that might be eligible for National
439 Register listing, although none were identified at the FUDS. KSHPO concluded that the
440 proposed sampling activities will have no effect on historic properties (Kansas State Historical
441 Society [KSHS], 2009). Sampling activities had minimal impact on the environmental setting
442 and indications of cultural or archaeological sites were not observed by the 2009 SI field team.

443 *2.5 Previous Investigations for MC and MEC*

444 *2.5.1 Inventory Project Report*

445 An INPR was completed by USACE in April 1994. The INPR determined that the site was
446 formerly used by DoD and therefore eligible under the DERP as a FUDS. One potential project
447 was identified at the FUDS, an “Ordnance and Explosive Waste” project (USACE, 1994).

448 *2.5.2 Archives Search Report*

449 The ASR for Strother Field was finalized in December 2006. Two ranges were identified in the
450 ASR: the pistol range and a skeet range. A site visit was conducted in January 1995. The site
451 team visited the small arms ranges located at the northern end of the property. The berm was
452 reportedly removed in the 1960s and the majority of the material was used to construct a jet
453 engine test cell for GE. No remnants of the berm were identified during the ASR site visit. The
454 ASR did not report any MEC or MD finds at Strother Field. The ASR was able to confirm that
455 chemical warfare training occurred at the FUDS (e.g., gas chamber exercises and pyrotechnics)
456 but was not able to identify a specific location (USACE, 2006b). There was no evidence that
457 chemical warfare training or pyrotechnics use occurred at the MRS.

458 One landowner interviewed during the ASR stated that one of the original farmers of the
459 property (location not specified) told him about plowing up a “foot long non-explosive item used
460 at the base during the war”; however, no further detail was given. The landowner indicated that
461 he had never encountered anything “out of the ordinary” (USACE, 2006b).

462 *2.5.3 ASR Supplement*

463 In 2004, the USACE completed an ASR Supplement, which identified one MRS, Range
464 Complex No. 1, with two subranges (a skeet range and a pistol range). Each range was ranked
465 according to the risk assessment code (RAC) procedure to address explosives safety hazards.
466 Possible scores range from 5 (lowest risk) to 1 (highest risk). The Range Complex No. 1 and

467 subranges were assigned RAC scores of 5 with a “RAC Override: Small Arms Only Range”
468 (USACE, 2004b).

469 *2.6 Groundwater Investigations for Chlorinated Solvents*

470 In 1982, KDHE detected chlorinated organic solvents in groundwater wells supplying drinking
471 water to the Strother Field Industrial Park. The principal contaminants (trichloroethylene [TCE];
472 1,2-dichloroethylene; 1,1,1-trichloroethane; tetrachloroethylene; and 1,1-dichloroethylene) are
473 common industrial solvents known to persist in groundwater. The Strother Field Public Water
474 Supply System, consisting of eight wells, was discontinued in June 1983. After the use of the
475 Industrial Park wells as a source of drinking water was discontinued, water was brought in to the
476 Industrial Park by tank trucks. The Strother Field Commission installed two wells upgradient of
477 the contaminated plume to supply water to the tenants. Two of the eight water supply system
478 wells remained in use to supply process water for the industries located on the field. For several
479 years, the Strother Field Commission pumped the wells to contain the groundwater
480 contamination beneath the site. In 1985, GE, a potentially responsible party, installed
481 groundwater extraction wells and air stripping towers to remove volatile organic compounds
482 from the groundwater under an administrative order with KDHE (EPA, 2007). In 1989, the
483 Strother Field Commission installed a new water supply well upgradient of the contamination to
484 supply drinking water for the industrial park (EPA, 2006a).

485 On March 28, 1990, GE entered into a consent agreement with KDHE to conduct an RI/FS
486 pursuant to CERCLA (EPA, 1994a). In 1993, GE completed the RI/FS for Strother Field. The
487 RI evaluated 12 potential source areas based on proximity to known areas of contamination and
488 historical information. Based on soil gas surveys, the source areas were narrowed to several
489 plumes (EPA, 1994a). There are two chlorinated solvent plumes from a non-DoD source within
490 the FUDS with associated degradation products present in both plumes. TCE is the parent
491 contaminant in the northern plume, which overlaps the western portion of the Range Complex
492 No. 1 MRS. The GE test cell was identified as the primary source (KDHE, 2009). As part of the
493 RI/FS, a Baseline Risk Assessment was performed to “assess the magnitude and potential of
494 actual or potential harm to public health and the environment resulting from the release of
495 hazardous substances from the site in the absence of remedial action” (EPA, 1994a). The FS
496 identified eight alternatives for groundwater and nine alternatives for soil.

497 In 1994, EPA completed a Record of Decision (ROD) to document the selected remedy for
498 groundwater and soils at Strother Field. The remedy was selected to prevent further migration of
499 contaminants off-site and to restore the groundwater to acceptable quality. The pump-and-treat
500 remedy included extraction and treatment of contaminated groundwater, as well as soil vapor
501 extraction treatment of soil source areas (EPA, 1994a).

502 In 1998, EPA completed an Explanation of Significant Differences (ESD), notifying the public
503 of the decision to modify the pump-and-treat remedy at Strother Field. The ESD also provided

504 notice that the contingency remedy for soil, detailed in the ROD, was planned for
505 implementation. Significant changes present in the ESD included: pumping and treatment at a
506 lower rate with fewer wells; expanded groundwater monitoring, and natural attenuation of
507 groundwater (EPA, 1998).

508 In 2006, EPA completed a Five-Year Review of the Strother Field Industrial Park site. The Five-
509 Year Review determined that the selected remedy proposed in the ROD was constructed and
510 implemented by GE in accordance with the ROD and ESD. The review indicated that the
511 selected remedial action was operating and functioning as intended. Site data indicated that
512 contaminated groundwater was being contained, total levels of contaminants of concern were
513 decreasing, and percentages of specific contaminants of concern were changing to indicated that
514 natural attenuation was occurring (EPA, 2006b).

515 The 2009 SI field team observed that the treatment system including air stripping towers was no
516 longer in use, as confirmed by the Strother Field Industrial Park manager.

517 *2.7 Other Land Uses that May Have Contributed to Contamination*

518 Because of the nature of industrial activities occurring at the FUDS as an industrial park,
519 polycyclic aromatic hydrocarbons (PAHs) and lead from non-DoD sources may be present in
520 various media. The 2009 SI field team observed machinery at the Range Oil Company property
521 within the skeet range portion of the Range Complex No. 1 MRS that could be potential sources
522 of PAHs and lead in various media.

523 In addition, the area has also been used for agricultural purposes prior to and following use of the
524 land by DoD. In general, agricultural use of land may include the use of fertilizers, pesticides,
525 and herbicides, although documentation of such use within the FUDS is unknown.

526 *2.8 Past Regulatory Activities*

527 There have been no regulatory actions reported for the site with respect to MEC or MC.

528 *2.9 Previous MEC Finds*

529 There were no previous documented MEC finds or MEC-related incidents at the FUDS.

530 3.0 Site Inspection Tasks

531 SI tasks conducted for this FUDS property involved compiling and reviewing historical reports
532 and information, using this information in the subsequent TPP and overall SI process. Following
533 the TPP meeting, the *Site-Specific Work Plan (SSWP)* was prepared to define the SI field
534 activities necessary to collect the information needed to address the data gaps and data quality
535 objectives (DQOs). Field work was conducted at the site in October 2009.

536 3.1 Technical Project Planning

537 TPP involved compiling and reviewing historical reports and information to identify data gaps
538 and develop a path forward. The TPP meeting for Strother Field was conducted on February 13,
539 2009 at offices of the Kansas Department of Health and Environment (KDHE) located in
540 Topeka, Kansas. Representatives from the USACE NWO Military Munitions Design Center,
541 USACE Northwestern Division Kansas City District (NWK), KDHE, and Shaw were in
542 attendance. A representative from the EPA Region 7 was invited but did not attend. By
543 agreement with the USACE, other landowners were not present at this meeting.

544 During the meeting and through subsequent TPP interaction, the TPP team agreed with the
545 following:

546 **MRSs** – The MRS at Strother Field is Range Complex No. 1, which contains two subranges, a
547 pistol range and a skeet range (Figure 3-1). (Because there was no historical evidence of the
548 Disposal Area, the area was not addressed during at the TPP meeting or subsequent documents.)

549 **Stakeholders** – The former Strother Field is currently an industrial park with a general aviation
550 airport. Current ownership of the MRS property consists of the cities of Winfield and Arkansas
551 City and private landowners.

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

555 **MC Sampling** – Sampling was proposed for both subranges at Range Complex No. 1. No
556 receptors were identified for the surface water/sediment and groundwater pathways; however,
557 following the TPP meeting it was determined that property owners (including property
558 managers), agricultural and industrial workers, and trespassers were potential human receptors,
559 and therefore the surface water/sediment pathway would be sampled. Sampling at the skeet
560 range would consist of six surface soil samples and one surface water/sediment sample to be
561 analyzed for PAHs (if target fragments are observed) and lead. Sampling at the pistol range
562 would consist of six surface soil samples and one surface water/sediment sample to be analyzed
563 for lead. Ten surface soil samples and one surface water/sediment sample would be collected

564 and analyzed for PAHs (if MRS samples are analyzed for PAHs) and lead for background
565 comparison. Groundwater samples would not be collected due to the lack of receptors and use of
566 groundwater.

567 **Screening Criteria** – The SI human health screening criteria for soil and sediment consist of the
568 lower of the following values: 1) the Risk-Based Standards for Kansas Residential Scenario Soil
569 Pathway and 2) EPA Regional Screening Levels. The SI human health screening criteria for
570 surface water consists of the lower of the following values: 1) the Kansas Surface Water Quality
571 Standards; 2) EPA Regional Screening Levels for Tap Water; and 3) Federal Ambient Water
572 Quality Criteria. Ecological screening is not required.

573 TPP meeting results were documented in the *TPP Memorandum* (Shaw, 2009a), which was
574 issued final on July 22, 2009 after incorporating comments from the stakeholders. The proposed
575 technical approach was defined in the *SSWP* (Shaw, 2009b), which was issued final on
576 September 27, 2009 after incorporating comments from the stakeholders.

577 A more complete discussion of the TPP meeting is contained in Appendix B. As discussed
578 during the TPP meeting and documented in the *TPP Memorandum* (Shaw, 2009b), the following
579 project objectives and DQOs were developed.

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

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

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

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

593 To address this DQO, site reconnaissance was conducted at both subranges within the MRS.
594 The site reconnaissance of the skeet range included a meandering path throughout the range,
595 with the exception of the southern portion of the Range Oil Company property, which was
596 fenced and inaccessible.

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

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

- 602 • If sample results are less than background screening levels, the MRS will be
603 recommended for NDAI relative to MC.
- 604 • If sample results exceed background screening levels but are less than human health
605 screening levels, the MRS will be recommended for NDAI relative to MC.
- 606 • If sample results exceed background and human health screening levels, the MRS will be
607 recommended for additional investigation.

608 SI sampling activities were conducted at each of the sub-ranges within the MRS to address this
609 DQO. The media sampled at both sub-ranges included surface soil, sediment, and surface water.

610 **3.2 Additional Records Research**

611 **3.2.1 Coordination with State Historic Preservation Office**

612 Cultural resources require identification in order to complete HRS and MRSPP scoring. KSHPO
613 reviewed its cultural resources files and indicated that the former Strother Field is “situated in an
614 upland area of low archaeological potential.” KSHPO also indicated that, because the site is
615 located in a formerly cultivated area, proposed sampling activities are not likely to pose a threat
616 to any intact cultural deposits and have little potential to impact standing structures that might be
617 eligible for National Register listing, although none were identified at the FUDS. KSHPO
618 concluded that the proposed sampling activities will have no effect on historic properties (KSHS,
619 2009).

620 **3.2.2 Coordination with Natural Resources Offices**

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

627 **3.2.3 Historical Aerial Photographs**

628 A review of historical (1950 and 1963) and recent (2006) aerial photographs of the FUDS has
629 been completed as part of preparation of this SI. The pistol range berm is identifiable in both
630 historical aerial photographs but is no longer present in the recent aerial photograph. In both
631 historical photographs, an unknown feature is present to the north of the berm. The feature is not
632 identified on historical maps of the FUDS. In the 1950 aerial photograph, a cleared area is
633 visible in the bottom center of the skeet range, presumably where the firing positions were
634 located. In the 1963 aerial photograph, there are no visible skeet range features. In both

635 photographs, the pistol range berm is still visible. Additional aerial photographs from
636 Environmental Data Resources, Inc. (EDR; 1981, 1996, 2002) show no additional range features
637 (EDR, 2008). No evidence of the Disposal Area was observed on historical aerial photographs.

638 **3.2.4 Environmental Database Search**

639 A search of available environmental records was conducted by EDR as a part of general
640 background information gathering for this FUDS. The EDR report was designed to meet the
641 search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR
642 Part 312) and the ASTM International Standard Practice for Environmental Site Assessments
643 (E 1527-05). Shaw used the report to further evaluate potential environmental risks associated
644 with the FUDS.

645 Search results indicated that Strother Field is listed on the FUDS database, as well as several
646 other databases (Appendix L). The FUDS is on the Final National Priorities List for chlorinated
647 solvents in groundwater related to industrial wastes. In the area of the Range Complex No. 1
648 MRS, GE was identified as a large-quantity generator for Resource Conservation and Recovery
649 Act wastes (including lead).

650 Additional information on the databases searched and the results for surrounding properties is
651 included in the EDR report found in Appendix L.

652 **3.2.5 Rights of Entry**

653 Prior to mobilizing to the site, the Project Manager from the USACE NWK District office
654 obtained the Rights of Entry for the properties where the SI field activities were performed.

655 **3.3 Field Work**

656 SI field activities, conducted the week of October 19, 2009, included site reconnaissance,
657 collection of surface soil, sediment, and surface water samples from the skeet range and pistol
658 range. Because it was not known that the Disposal Area existed, no samples were planned for
659 laboratory analysis. The following conditions were recorded in the field log book (Appendix D)
660 and/or by digital photographs (Appendix E):

- 661 • Presence or absence of evidence of MEC;
- 662 • Changes, if any, in sample location because of field constraints;
- 663 • Vegetative cover; and
- 664 • Presence or absence of water for sediment and surface water samples, and other
665 conditions encountered that impacted sample collection.

666 Temperatures encountered by the SI field team ranged from approximately 60°F to 75°F, with
667 occasional rain showers. The area received heavy rain the weekend before the field effort.

668 **3.4 Sampling and Analysis**

669 Surface soil, sediment, and surface water samples were collected from both subranges within the
670 Range Complex No. 1 MRS. Background surface soil, sediment, and surface water samples
671 were also collected. No samples were collected for laboratory analysis at the Disposal Area.

672 Surface soil and sediment samples were collected from the Range Complex No. 1 MRS at a
673 depth of 0 to 6 inches bgs. Surface soil samples were collected as composite samples (seven
674 discrete samples collected in a wheel pattern, with one sample collected from the center of the
675 wheel; the radius of the wheel is approximately 2 ft). The sediment and surface water samples
676 were collected as discrete samples. Surface soil samples were sieved by the laboratory with a
677 No. 10 sieve prior to analysis. Surface soil, sediment, and surface water samples were collected
678 in accordance with the Sampling and Analysis Plan/Field Sampling Plan (SAP/FSP) Section 6.1
679 and Shaw Standard Operating Procedures, Appendix E of the Work Plan (Shaw, 2006). MEC
680 avoidance procedures were followed during sampling in accordance with Shaw's Accident
681 Prevention Plan, Appendix D of the Work Plan (Shaw, 2006).

682 The surface soil, sediment and surface water samples were analyzed for lead by EPA SW-846
683 Method 6020. The samples collected from the skeet range were not analyzed for PAHs because
684 target fragments were not observed during the SI reconnaissance. Table 3-1 summarizes the
685 sampling conducted at the Range Complex No. 1 MRS.

686 **3.5 Laboratory Analysis and Data Quality Review**

687 Laboratory analysis was performed by Test America Laboratories of Denver, Colorado, using
688 methods defined in the SSWP. Analytical results are provided in Appendix F.

689 One hundred percent of the analytical data have been reviewed based on EPA CLP *National*
690 *Functional Guidelines for Organic Data Review* (EPA, 1999), and EPA CLP *National*
691 *Functional Guidelines for Inorganic Data Review* (EPA, 2004). ADR software (version 8.1) was
692 used to assist in the data validation process for all areas with the exception of initial calibration
693 blanks, continuing calibration blanks, interference check standards, serial dilutions, internal
694 standards, instrument tuning standards, and second-column confirmation. Data were evaluated
695 against specific criteria to verify the achievement of all precision, accuracy, representativeness,
696 completeness, comparability, and sensitivity goals established to meet the project DQOs.

697 The overall quality of the data collected is discussed in the Analytical Data QA/QC Report
698 (Appendix G). Results of the analyses suggest that representative samples were collected and
699 analyzed, and the results are indicative of the media analyzed. Some results were qualified as
700 described in the report. No data were qualified "R" as unusable. Overall, the data reflect
701 expected site conditions and they are fully usable for their intended purpose.

702 **3.6 Screening Values**

703 The following subsections describe the development of screening values for this SI.

704 **3.6.1 Background Data**

705 Background surface soil samples were collected at ten locations in an area located outside of the
706 MRS that did not appear to have been impacted by past MMRP range activities or current
707 industrial activities. Background sediment and surface water samples were collected from a
708 single location on Posey Creek that was located hydraulically upgradient and the pistol range
709 berm and skeet range. Background sample locations are depicted on Figure 3-2.

710 Background samples were analyzed for lead by EPA SW-846 Method 6020, except for one
711 surface soil sample that was compromised during shipment to the laboratory. Table 3-2 presents
712 the background surface soil data.

713 Shaw calculated the background screening level of lead in surface soil using published EPA
714 guidance (EPA, 1989, 1992, 1994b, 1995, and 2006c). The background screening level is a 95th
715 upper tolerance limit (UTL) for normally distributed analytes (lead). A summary of the
716 development of the background screening level for lead is presented in Appendix L. Shaw
717 compared reported concentrations of lead in the soil samples collected from the MRS to the
718 background screening level; a soil sample concentration exceeding this value is considered to be
719 above the range of naturally occurring background concentration. Shaw calculated a background
720 screening level for lead of 18.7 milligrams per kilograms (mg/kg) for this SI (Appendix L).

721 Where the body of background data is limited (in this case, sediment and surface water), the
722 site-to-background comparison was conducted according to guidance for SI activities and HRS
723 scoring (EPA, 1992). The background concentration for lead is taken to be the maximum value
724 observed in the limited background data set (EPA, 1995). A comparison is then made to
725 determine if a hazardous substance in the media is “significantly above the background level”
726 according to the HRS criteria (40 CFR Appendix A to Part 300, Table 2-3):

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

735 The background screening levels, for comparison to site data per the above HRS criteria, are
736 three times the maximum detected background concentration. For analytes not detected in
737 background samples, the background screening level is the sample quantitation limit.
738 Background screening levels for sediment and surface water are presented in Tables 3-3 and 3-4,
739 respectively.

740 **3.6.2 Human Health Screening**

741 Site sample data that exceed the background screening level were compared to appropriate
742 human health screening criteria to determine if additional investigation should be recommended.
743 These screening criteria were developed during the TPP process and are based on guidance
744 provided by USACE NWK and KDHE.

745 The human health screening level for soil and sediment consist of the lower of the following
746 values: 1) the Risk-Based Standards for Kansas Residential Scenario Soil Pathway (KDHE,
747 2007) and 2) EPA Regional Screening Levels (EPA, 2009b). The human health screening level
748 for surface water consists of the lower of the following values: 1) the Kansas Surface Water
749 Quality Standards; 2) EPA Regional Screening Levels for Tap Water (EPA, 2009b); and 3)
750 Federal Ambient Water Quality Criteria (KDHE, 2004). The final screening levels are all
751 residential, which is considered conservative because the FUDS property is used for agricultural
752 and industrial purposes, and land use is not expected to change in the future. Table 3-5 lists the
753 human health screening level for surface soil and sediment and Table 3-6 lists the human health
754 screening level for surface water.

755 **3.6.3 Ecological Screening**

756 According to the *Screening-Level Ecological Risk Assessment (SLERA) Guidance for FUDS*
757 *MMRP Site Inspections* (USACE, 2006a), only sites that are considered to be IEPs or are to be
758 managed for ecological purposes, require a SLERA. As shown in Table 2-2, the site does not
759 meet the criteria for designation as an IEP. Therefore, comparison to ecological screening levels
760 is not required.

761 **3.7 Variances from the SSWP**

762 Field SI activities were conducted in accordance with the SSWP. No variances from the SSWP
763 were necessary.

764 **3.8 Public Notice**

765 Prior to finalizing the SSWP, Shaw posted a public notice in the *Arkansas City Traveler* and the
766 *Winfield Daily Courier* with a request for additional historical information about the FUDS. The
767 public notice was published in both newspapers on February 28, 2009, with a request for
768 responses to be directed to NWK. No responses were received by NWK. The public notice
769 affidavits are included in Appendix C.

770 **3.9 Second TPP Meeting**

771 A second TPP meeting was held via telephone conference call on August 12, 2010. Participating
772 stakeholders included representatives of USACE NWO and NWK, KDHE, and Shaw. The
773 primary purpose of the meeting was to review the SI results and recommendations presented in
774 the Draft Final SI Report and to confirm that concurrence was received from all stakeholders
775 before issuing the Final SI Report. The stakeholders agreed with the conclusions and

776 recommendations proposed in the Draft Final SI Report issued in July 2010. The second TPP
777 meeting minutes are provided in Appendix B.

778 *4.0 Range Complex No. 1 MRS*

779 This section evaluates Range Complex No. 1 relative to its use for small arms training. As
780 described in Section 2.2, the SI field team found evidence of disposal of munitions other than
781 small arms within the footprint of Range Complex No. 1. The Disposal Area is evaluated
782 separately from Range Complex No. 1 in Section 5.0.

783 *4.1 History and Land Use*

784 The skeet and pistol sub-ranges comprising the Range Complex No. 1 MRS were used from
785 1942 to 1946. Skeet ranges were constructed to provide marksmanship training, which consisted
786 of firing shotguns at moving targets. Skeet ranges were typically located in open country.
787 Shooters fired from eight different stations positioned around a semicircle with a 63-ft radius.
788 Targets crossed in front of the shooters from either side of the front of the semicircle, thrown
789 from the high house on the left or the low house on the right. At some stations, shooters were
790 required to fire at one target flying from the left, and another flying from the right. At other
791 stations, shooters had to fire at two targets flying from both directions at the same time.

792 Standard military range specifications for skeet ranges from this period indicated a safety fan
793 consisting of a semicircle with a 900-ft radius. Skeet shooting results in a wide distribution of
794 shot over a fan-shaped fall zone. The likely distribution of MC was predicted from a model for
795 skeet ranges published by the Interstate Technology & Regulatory Council (ITRC, 2003). The
796 highest density of target fragments (“target fragments” fall zone), and therefore PAHs, were
797 predicted closer to the firing position. Lead and PAHs were predicted in the middle zone
798 (“target fragments and lead shot” fall zone), and lead was predicted in the outermost zone (“lead
799 shot” fall zone). The size of the potentially affected area for a single skeet range is 30 acres
800 (USACE, 2004b).

801 Pistol ranges were typically 30 yards (yd) wide by 50 yd long, and consisted of a firing line and
802 stationary targets positioned in front of an earthen backstop berm. The firing line accommodated
803 25 firing positions, and could have been positioned at 5, 10, 15, and 25 yd. The backstop berm
804 was situated approximately 5 ft behind the target line. A 5 degree angle of fire extended from
805 each end of the firing line downrange for 1,600 yd, and an additional 25 degree safety fan
806 extended downrange a distance of 1,200 yd. The safety fan of the pistol range extends beyond
807 the FUDS property to the north (USACE, 2004b).

808 Bullets and bullet fragments would have accumulated in the target berm of the pistol range.
809 Dropped ammunition, spent casings, used accessories, and packaging could have accumulated
810 along the firing lines; however, these items should have been collected and disposed of in
811 accordance with required maintenance of the range (USACE, 2004b).

812 Figures 1-2 and 1-3 show the location of Range Complex No. 1 on historical aerial photographs
813 from 1950 and 1963, respectively. In the 1950 aerial photograph, a cleared area is visible in the
814 bottom center of the skeet range, presumably where the firing positions were located. In the
815 1963 aerial photograph, there are no visible skeet range features. In both photographs, the pistol
816 range berm is still visible. The pistol range berm was later removed to construct a jet engine test
817 cell for GE and a facility for Halliburton (USACE, 2006b), as confirmed by the Strother Field
818 Industrial Park Manager, and is no longer visible on a 2006 aerial photograph (Figure 1-4).

819 The eastern and western portions of the former skeet range and the majority of the pistol range
820 are leased from the cities of Winfield and Arkansas City and used for agricultural production.
821 The central portion of the skeet range is owned by Range Oil Company, and the southern portion
822 of their property is enclosed with a fence and locked gate. The northern portion of their property
823 is used for staging out-of-service pump jack platforms and tanks. To the west of Range Oil
824 Company, a private landowner owns a portion of the former skeet and pistol sub-ranges. An
825 industrial business is operated in the southern portion of the privately owned property, and the
826 northern portion is leased for agricultural production. Aside from Range Oil Company's fenced
827 property, there are no access restrictions at the former skeet range. There are no access
828 restrictions at the former pistol range.

829 *4.2 Previous Investigations*

830 An INPR was completed for the FUDS by USACE in April 1994. The INPR determined that the
831 site was formerly used by DoD and, therefore, eligible under the DERP as a FUDS (USACE,
832 1994).

833 An ASR for the Strother Field FUDS and associated auxiliary airfields was finalized in
834 December 2006. A site survey visit conducted in January 1995 by USACE, St. Louis District,
835 indicated that there were no range-related features visible at the skeet range (USACE, 2006b).

836 In 2004, the USACE completed an ASR Supplement, which identified the skeet range and the
837 pistol range as subranges of Range Complex No. 1. The MRS and each subrange were ranked
838 according to the RAC procedure to address explosives safety hazards. Possible scores range
839 from 5 (lowest risk) to 1 (highest risk). Range Complex No. 1, the pistol range subrange and the
840 skeet range subrange were assigned RAC scores of 5 (USACE, 2004b).

841 Several investigations have been conducted in northern portion of the FUDS, near the Range
842 Complex No. 1 MRS, primarily related to HTRW (chlorinated solvents in groundwater) at the
843 former GE test cell facility. No sampling has been conducted for the MC of concern related to
844 historical military activities at Range Complex No. 1.

845 **4.3 MEC Evaluation**

846 **4.3.1 CSM Summary**

847 Potential MEC at the Range Complex No. 1 MRS consists of small arms ammunition. Surface
848 soil and subsurface soil are potential pathways of exposure to MEC. Potential human receptors
849 include property owners, agricultural workers, and trespassers. The potential route of human
850 exposure to MEC is direct contact. A CSM based on the SI findings at the MRS is presented in
851 Appendix J.

852 **4.3.2 Field Observations**

853 On October 20 and 21, 2009, a visual reconnaissance of Range Complex No. 1 was conducted
854 prior to collection of samples to identify evidence of former range activities (e.g., surface debris,
855 stressed vegetation). A three-person team, including a qualified UXO technician, conducted the
856 visual inspection. The visual reconnaissance was supplemented with an all-metal detector in
857 order to identify any metallic items that may be present. A representative from KDHE observed
858 a portion of the reconnaissance and sampling performed on October 20, 2009.

859 Reconnaissance was generally conducted along a meandering path within the Range Complex
860 No. 1 MRS. The path walked during the visual reconnaissance was recorded using a hand-held
861 Global Positioning System (GPS) unit. A total distance of approximately 35,350 ft was walked
862 during reconnaissance of the FUDS. Approximately 23,640 ft was walked in the MRS: 17,150 ft
863 in the skeet range, 6,488 ft in the pistol range, and 2,575 ft in the area of overlap. A total
864 distance of approximately 11,710 ft was walked in areas of the FUDS outside of the MRS.
865 During the field effort, Range Oil Company was not operational and personnel were not
866 available to provide access within the locked fence. In addition, the private property located
867 west of Range Oil Company's property was observed to be primarily hard gravel surfaces with
868 buildings.

869 Figure 4-1 shows the GPS paths and photograph locations for the SI. Field notes are provided in
870 Appendix D and photographs are included as Appendix E.

871 The SI field team did not observe any small arms MEC or MD (spent bullets, shell casings, etc.)
872 or target fragments that would have been anticipated for the small arms ranges comprising MRS.

873 **4.3.3 MEC Risk Assessment**

874 The following section presents a qualitative assessment of the risk associated with potential
875 MEC at Range Complex No. 1. This assessment is based on historical documentation, prior
876 investigation, and visual inspection conducted during this SI. A MEC assessment is provided to
877 convey relative risk on a scale from low to high and is not intended to be a thorough risk
878 assessment as would be conducted for an RI/FS.

879 Former ranges used exclusively for live fire of small arms ammunition are considered to present
880 no significant MEC hazard. Sites with minimal historical or physical evidence of a potential

881 explosive hazard are considered to pose a low MEC hazard. Sites with indirect evidence
882 indicating a potential MEC hazard, such as the presence of MD or the potential presence of MEC
883 in the subsurface, are assigned a moderate MEC hazard. Sites with a known MEC presence or
884 strong evidence of sensitive MEC are generally assigned a high MEC hazard. Mitigating factors,
885 such as evidence that MEC is limited to insensitive munitions, and/or a low human exposure
886 potential because of restricted access or remote location, may reduce the qualitative hazard
887 assessment.

888 Based on historical information, the MRS is a former small arms range complex where known
889 munitions activity was limited to the use of small arms ammunition. The MEC exposure
890 pathway is considered to be incomplete. Significant MEC risk for the MRS is not anticipated
891 based on the following:

- 892 • Historical evidence indicates only small arms ammunition (.22- and .45-caliber; 12-gauge
893 shotgun shells) was used at the MRS, and small arms ammunition does not pose a
894 significant explosive hazard;
- 895 • Historical reports of MEC discoveries are not known to exist, and evidence of MEC or
896 MD associated with the MRS was not found during the 2009 SI reconnaissance; and
- 897 • Large portions of the MRS have been plowed for more than 50 years without reported
898 MEC-related incidents.

899 Although the SI field team found evidence of disposal of munitions other than small arms within
900 the footprint of Range Complex No. 1, the MEC risk assessment associated with those munitions
901 is addressed for the Disposal Area in Section 5.3.3.

902 **4.4 Munitions Constituents Evaluation**

903 **4.4.1 CSM Summary**

904 According to the CSM (Appendix J), MC of concern at the Range Complex No. 1 MRS consists
905 of lead. Lead derived from lead shot is the primary MC of concern at the skeet range. PAHs
906 from the pitch-based targets at the skeet range are not MC; however, they are addressed under
907 the MMRP as constituents potentially associated with former range. PAHs were maintained as
908 MC of concern through the SSWP; however, target fragments were not observed within the skeet
909 range during the SI reconnaissance. Therefore, the only MC of concern at the skeet range was
910 lead. In the small arms ammunition used at the pistol range, lead accounts for more than
911 96 percent of the bullet mass, and even though jackets contain copper and casings contain copper
912 and zinc, they are present in relatively small quantities. Therefore, lead alone is considered an
913 adequate indicator of the presence of metals associated with small arms ammunition.

914 As discussed in the CSM (Appendix J), the highest concentrations of lead at the skeet range are
915 predicted to be present in the two outermost fall zones. At the pistol range, the highest
916 concentrations are predicted to be present at the former berm.

917 Soil, surface water, and sediment are identified in the CSM (Appendix J) as potentially complete
918 migration pathways for exposure to MC of concern. Property owners (including property
919 managers), agricultural and industrial workers, and trespassers are identified as potential human
920 receptors. The potential routes of human exposure are dermal contact, ingestion, and inhalation.

921 **4.4.2 Soil Exposure Pathway**

922 On October 20, 2009, the Shaw SI field team collected 14 surface soil samples from Range
923 Complex No. 1 MRS as proposed in the SSWP (Shaw, 2009b): six regular samples and one field
924 duplicate from the skeet range, and six regular samples and one field duplicate from the pistol
925 range. Because no MEC or MD consistent with small arms range use was observed, samples were
926 collected in the approximate locations proposed in the SSWP (Shaw, 2009b). GPS data for sample
927 locations is provided in Appendix H. All surface soil samples were analyzed for lead by EPA
928 SW-846 Method 6020.

929 Table 4-1 shows the analytical results for surface soil compared to background screening and
930 human health screening levels. Lead was detected in all 14 surface soil samples at
931 concentrations ranging from 22 mg/kg to 378 mg/kg. Sample locations and analytical results for
932 lead are shown on Figure 4-2.

933 Within the pistol range, lead concentrations ranged from 22 to 53.6 mg/kg. Within the skeet
934 range, lead concentrations ranged from 23.7 to 378 mg/kg. Four of seven lead results from the
935 skeet range exceeded 100 mg/kg. The elevated lead results generally correspond with sample
936 locations within the “target fragments and lead shot” and “lead shot” fall zones typical of a skeet
937 range (Figure 4-2), where lead concentrations would be expected to be higher.

938 **4.4.2.1 Comparison to Background Screening Values**

939 All 14 detections of lead exceeded the background screening level of 18.7 mg/kg for lead in soil.

940 **4.4.2.2 Comparison to Human Health Screening Values**

941 Lead concentrations did not exceed the human health screening level of 400 mg/kg for lead in
942 soil.

943 **4.4.2.3 Comparison to Ecological Screening Values**

944 No areas of the MRS are managed for ecological purposes or meet the criteria for an IEP;
945 therefore, surface soil analytical data were not compared to ecological screening levels.

946 **4.4.3 Surface Water Pathway**

947 On October 21, 2009, co-located sediment and surface water samples were collected from Posey
948 Creek within the Range Complex No. 1 MRS: one regular sediment sample, one regular surface
949 water sample, and one field duplicate surface water sample from the skeet range portion; and one
950 regular sediment sample and one regular surface water sample from the pistol range portion. The
951 sediment and surface water samples were analyzed for lead by EPA SW-846 Method 6020.

952 Table 4-2 shows the analytical results for sediment compared to background screening and

953 human health screening levels, and Table 4-3 shows the analytical results for surface water
954 compared to background and human health screening levels. The sediment and surface water
955 sample locations and analytical results for lead are shown on Figure 4-2. GPS data for sediment
956 and surface water sample locations are provided in Appendix H.

957 Lead was detected in the sediment samples at a concentration of 26.2 mg/kg (skeet range) and
958 11.1 mg/kg (pistol range). Lead was detected in the skeet range surface water sample and
959 duplicate at estimated concentrations of 1.29 micrograms per liter ($\mu\text{g/L}$) and 1.36 $\mu\text{g/L}$,
960 respectively. Lead was detected in the pistol range surface water sample at an estimated
961 concentration of 1.15 $\mu\text{g/L}$.

962 *4.4.3.1 Comparison to Background Screening Levels*

963 The lead concentrations in the sediment samples did not exceed the background screening level
964 of 28.8 mg/kg at the Range Complex No. 1 MRS. The lead concentrations in the surface water
965 samples did not exceed the background screening level of 4.23 $\mu\text{g/L}$ at the Range Complex No. 1
966 MRS.

967 *4.4.3.2 Comparison to Human Health Screening Levels*

968 The concentrations of lead in sediment and surface water samples did not exceed background
969 screening levels; therefore, comparison to human health screening levels is not required.

970 *4.4.3.3 Comparison to Ecological Screening Levels*

971 No areas of the MRS are managed for ecological purposes or meet the criteria for an IEP;
972 therefore, sediment and surface water analytical data was not compared to ecological screening
973 levels.

974 *4.4.4 Groundwater Pathway*

975 No groundwater samples were collected for this MRS because the groundwater migration
976 pathway for human exposure to MC is incomplete. The groundwater migration pathway for
977 human exposure to MC is considered incomplete because of the low mobility of lead in soil, and
978 because there are no human receptors for groundwater in the MRS or immediate vicinity. In
979 addition, groundwater from the MRS is not used for drinking water purposes because of
980 chlorinated organic solvents previously detected in groundwater.

981 *4.4.5 Air Pathway*

982 Inhalation of MC in vapor form is not a pathway of concern for non-volatile MC under normal
983 environmental conditions. Potential inhalation of soil particles is considered in the development
984 of health-based screening values for soil.

985 *5.0 Disposal Area*

986 *5.1 History and Land Use*

987 There is no historical information available for the Disposal Area. One interviewee in the ASR
988 indicated that he heard reports of burial sites at Strother Field, but specific locations were never
989 identified.

990 The Disposal Area is located on the skeet range portion of the Range Complex No. 1 MRS.
991 Aerial photographs evaluated during the ASR indicated that only features related to the skeet
992 range were observed in the area; there was no evidence of disturbance related to other activities.
993 Figures 1-2 and 1-3 show the location of the Disposal Area on historical aerial photographs from
994 1950 and 1963, respectively. In both figures, there is no evidence of disturbance. The years of
995 use of the Disposal Area are unknown. In general, Strother Field was used from 1942 to 1946.

996 The area was presumed to have been used for munitions disposal rather than a training range
997 based on the proximity to the cantonment area of Strother Field, as well as evidence indicating
998 several types of munitions present at the Disposal Area.

999 The land comprising the Disposal Area is entirely used for agricultural production. The property
1000 is owned by the cities of Winfield and Arkansas City, managed by the Strother Field
1001 Commission, and leased for farming. There are no access restrictions at the Disposal Area.

1002 *5.2 Previous Investigations*

1003 An INPR was completed for the FUDS by USACE in April 1994. The INPR determined that the
1004 site was formerly used by DoD and, therefore, eligible under the DERP as a FUDS (USACE,
1005 1994). The INPR did not address the Disposal Area.

1006 An ASR for the Strother Field FUDS and associated auxiliary airfields was finalized in
1007 December 2006. The ASR discussed potential burial areas at the FUDS, but locations were not
1008 identified. The ASR did not address the Disposal Area (USACE, 2006b).

1009 In 2004, the USACE completed an ASR Supplement, which did not include the Disposal Area
1010 (USACE, 2004b).

1011 Several investigations have been conducted in northern portion of the FUDS near the Disposal
1012 Area, primarily related to HTRW (chlorinated solvents in groundwater) at the former GE test cell
1013 facility. No sampling has been conducted related to historical military activities at Disposal
1014 Area.

1015 **5.3 MEC Evaluation**

1016 **5.3.1 CSM Summary**

1017 Potential munitions disposed at the Disposal Area consist of AN-M50 and AN-M54 incendiary
1018 bombs, and M15 WP smoke hand grenades. Surface soil and subsurface soil are potential
1019 pathways of exposure to MEC. Potential human receptors include property owners, agricultural
1020 workers, and trespassers. The potential route of human exposure to MEC is direct contact. A
1021 CSM based on the SI findings at the Disposal Area is presented in Appendix J.

1022 **5.3.2 Field Observations**

1023 On October 20 and 21, 2009, a visual reconnaissance was conducted to identify evidence of
1024 former range activities (e.g., surface debris, stressed vegetation). A three-person team, including
1025 a qualified UXO technician, conducted the visual inspection. The visual reconnaissance was
1026 supplemented with an all-metal detector in order to identify any metallic items that may be
1027 present. A representative from KDHE observed a portion of the reconnaissance and sampling
1028 performed on October 20, 2009.

1029 Reconnaissance was generally conducted along a meandering path. The path walked during the
1030 visual reconnaissance was recorded using a hand-held GPS unit. The existence of the Disposal
1031 Area was unknown prior to field work. Evidence of the Disposal Area was discovered during
1032 skeet range reconnaissance. Approximately 5,965 ft was walked in the Disposal Area, and a
1033 total distance of approximately 29,385 ft was walked in areas of the FUDS outside of the
1034 Disposal Area. Figure 4-1 shows the GPS paths and photograph locations for the SI. Field notes
1035 are provided in Appendix D and photographs are included as Appendix E.

1036 The field team observed MD and potential MEC associated with AN-M50 and AN-M54
1037 incendiary bombs (12 items) and M15 WP smoke hand grenades (2 items) (Appendix E, Photos
1038 30 through 38). The MD and potential MEC items were concentrated in an area approximately
1039 2 acres in size. Historical documentation did not indicate the usage of 4-lb incendiary bombs or
1040 smoke hand grenades at the FUDS. It is presumed that the area was used for munitions disposal
1041 given the mixed nature of the munitions, as well as the proximity to the cantonment area of the
1042 airfield.

1043 Upon initial discovery of the MD from AN-M50/AN-M54 incendiary bombs and M15 WP
1044 smoke hand grenades, none of the items were believed to be MEC. After further research, the
1045 UXO technician determined that one of the items was the remaining portion of one AN-M50
1046 incendiary bomb that was large enough to contain the first fire mixture, primer, and thermate,
1047 indicating that the item could be MEC (Appendix E, Photograph 35). The item could not be
1048 confirmed as MEC but it was treated as such as a precaution. The appropriate notifications were
1049 made to Shaw and USACE, and the Strother Field Industrial Park manager was contacted to
1050 report the item.

1051 The Strother Field Industrial Park manager contacted the Cowley County Sheriff about the AN-
1052 M50 incendiary bomb identified by the Shaw field team, and the Explosive Ordnance Disposal
1053 (EOD) Unit from McConnell AFB in Wichita, Kansas responded (Appendix E, Photos 53 and
1054 54). The EOD Unit confirmed the identification of the AN-M50 incendiary bomb found at the
1055 skeet range, but could not confirm that the item was MEC. The EOD Unit transported the item
1056 to the eastern portion of the FUDS, where it was destroyed amongst rubble piles from former
1057 runways (Figure 4-1; Appendix E, Photos 63, 70, 72; McConnell, 2009).

1058 *5.3.3 MEC Risk Assessment*

1059 The following section presents a qualitative assessment of the risk associated with potential
1060 MEC at the Disposal Area. This assessment is based on visual inspection conducted during this
1061 SI. A MEC assessment is provided to convey relative risk on a scale from low to high and is not
1062 intended to be a thorough risk assessment as would be conducted for an RI/FS.

1063 Physical evidence indicates that the area is a disposal area where AN-M50 and AN-M54
1064 incendiary bombs and M15 WP smoke hand grenades were potentially disposed of or destroyed.

1065 The AN-M50 incendiary bomb contains a firing assembly (essentially a shotshell primer),
1066 approximately 20 grams (g) of first fire mixture (magnesium powder and barium chromate), a
1067 1-inch diameter core of thermate (iron oxide, aluminum powder, barium nitrate, and sulfur), and
1068 a magnesium body weighing 1.25 lb. The AN-M50XA1 and AN-M50XA2 are designed to have
1069 a delayed detonation. The detonator is ignited by the burning thermate. For the AN-M50XA1,
1070 this is accomplished by replacing a portion of the thermate with a capsule containing 170 grains
1071 of black powder. Within the AN-M50XA2, a portion of the thermate is replaced with
1072 approximately 36 g of tetryl explosive.

1073 The AN-M50 incendiaries functioned on target impact when a firing pin strikes the percussion
1074 primer, igniting the first fire mixture. The burning of the first fire mixture ignites the thermate
1075 core, which burns and ignites the magnesium bomb body. In the AN-M50XA1, the thermate and
1076 magnesium burn down to the black powder capsule that detonates, causing burning magnesium
1077 to be dispersed over a wide area. The AN-M50XA2 functioned similarly to the AN-M50XA1
1078 except that when the thermate burns down to a specific point a delay detonator is activated. This
1079 ignites the tetryl explosive charge, fragmenting the nose weight between 60 and 240 seconds
1080 after impact.

1081 The AN-M54 incendiary bomb consists of a steel cylinder with a firing assembly (essentially a
1082 shotgun shell primer), approximately 20 g of first fire mixture (iron oxide, aluminum, barium
1083 nitrate, sulfur, black powder, and a dust reducing oil), and a filler core of 22 ounces of thermate
1084 (iron oxide, aluminum powder, barium nitrate, sulfur). In the AN-M54X a portion of the
1085 thermate is replaced with a capsule containing 170 grains of black powder. In the AN-M54XA1
1086 some of the thermate mixture is replaced with a magnesium disk and a steel capsule containing a
1087 tetryl explosive charge. A delay detonator is ignited by the burning magnesium.

1088 The AN-M54 functioned on target impact when the firing pin strikes the percussion primer,
1089 igniting the first fire mixture. The burning first fire mixture ignites the thermate core, which
1090 melts the steel cylinder. In the AN-M54X, the thermate burns down to the black powder
1091 capsule, which detonates causing molten steel to be dispersed over a wide area. The
1092 AN-M54XA1 is similar to the AN-M54X except that when the thermate burns down to the
1093 magnesium disk, the delay detonator is heated by the burning magnesium and ignited. After a
1094 delay, the tetryl explosive charge is detonated, fragmenting the capsule and scattering the
1095 fragments and molten metal.

1096 Clusters containing AN-M50 and AN-M54 bombs may have been loaded with 80 percent regular
1097 munitions and 20 percent delayed detonation munitions (AN-M50XA1, AN-M50XA2,
1098 AN-M54X, and AN-M54XA1). AN-M50 and AN-M54 incendiary bombs would pose little risk
1099 of injury if stepped on or driven over. Tampering with or attempting to disassemble an
1100 incendiary bomb could cause ignition, potentially resulting in severe injury, blindness, or death
1101 from the burning fire mixture (i.e., thermate or magnesium). In the case of the delayed
1102 detonation versions, a detonation may occur, potentially causing severe injury, blindness, or
1103 death.

1104 The M15 WP smoke hand grenade is a bursting-type grenade used for signaling, screening, and
1105 incendiary purposes. The screening effect of the smoke is limited because WP burns with such
1106 intense heat, the smoke tends to rise rapidly. Pieces of WP will burn for about 60 seconds,
1107 igniting any flammable substance contacted. The grenade body is constructed of sheet steel and
1108 is cylindrical in shape. The body has a fuze well liner and is filled with approximately 15 ounces
1109 of WP. The fuzes on M15 WP grenades are typically M206A1 or M206A2 pyrotechnic delay-
1110 detonating fuzes. They differ only in body construction. The fuze body contains a primer and a
1111 pyrotechnic delay column. Assembled to the fuze body are a striker, striker spring, safety lever,
1112 safety pin with pull ring, and a detonator assembly. The split end of the safety pin has an angular
1113 spread or a diamond crimp.

1114 Removal of the safety pin permits release of the safety lever. When the safety lever is released,
1115 it is forced away from the grenade body by a striker acting under the force of a striker spring.
1116 The striker rotates on its axis and strikes the percussion primer. The primer emits a small,
1117 intense burst of flame, igniting the delay element. The delay element will then burn for 4 to
1118 5 seconds before setting off the detonator. The detonator explodes, rupturing the body and
1119 exposing the WP filler to air. The WP will burn approximately 60 seconds.

1120 The restraining mechanisms of hand grenades can become damaged, become corroded, or
1121 deteriorate in their effectiveness over time. Disturbing these items in this condition could cause
1122 the fuze to function, detonating the burster or main charge through an unintentional release of the
1123 striker mechanism. In the case of a WP grenade such as the M15, this would cause the WP
1124 mixture to be exposed to air. This would result in ignition of the WP, potentially resulting in

1125 blindness, severe injury, or death from the burning fire mixture. Burns caused by WP are deep,
1126 painful and continue to burn as long as oxygen is present or until the WP is consumed. Vapors
1127 from burning WP and are irritating and poisonous.

1128 The area where MD and potential MEC items were found has been plowed for more than
1129 50 years without reported MEC-related incidents. Because MD and potential MEC from
1130 AN-M50/AN-M54 incendiary bombs and M15 WP smoke hand grenades are present at the
1131 Disposal Area, the MEC exposure pathway is considered to be complete. The overall risk from
1132 potential MEC at the Disposal Area is considered to be moderate for the following reasons:

- 1133 • Indirect evidence (MD and potential MEC) was observed that indicates the presence
1134 of AN-M50 and AN-M54 incendiary bombs and M15 WP smoke hand grenades at
1135 the area.
- 1136 • AN-M50 and AN-M54 incendiary bombs do not contain sensitive fuzes and pose
1137 little risk of injury if stepped on or driven on; however, tampering with or attempting
1138 to disassemble an incendiary bomb could cause ignition, potentially resulting in
1139 severe injury, blindness, or death; in the case of the delayed detonation versions, a
1140 detonation may occur, potentially causing severe injury, blindness, or death.
- 1141 • M15 WP smoke grenades do not contain sensitive fuzes; however, removal of the
1142 safety pins or failure of restraining mechanisms can cause ignition, potentially
1143 resulting in severe injury, blindness, or death.
- 1144 • The area was likely used for munitions disposal rather than as a range, given the
1145 mixed nature of the munitions, as well as the proximity to the cantonment area of the
1146 airfield.

1147 *5.4 Munitions Constituents Evaluation*

1148 Because the existence of the Disposal Area was unknown during project planning, samples were
1149 not planned for laboratory analysis.

1150 The munitions identified at the Disposal Area include AN-M50/AN-M54 incendiary bombs and
1151 M15 WP grenades. AN-M50 incendiary bombs are constructed of magnesium alloy with an iron
1152 nose plug. AN-M54 incendiary bombs are constructed of steel sheet metal. Both are 4 lb and
1153 contain a first fire mixture of magnesium powder and barium chromate, as well as thermate (iron
1154 oxide, aluminum powder, barium nitrate, sulfur). In the quantities associated with range
1155 activities (likely disposal) these major components of AN-M50 and AN-M54 incendiary bombs
1156 do not pose a threat to human health or the environment.

1157 Approximately 20 percent of the bombs in the cluster would have been delayed-detonation
1158 munitions, containing black powder or small amounts of tetryl. Because of the limited quantity
1159 of tetryl in these munitions, tetryl is not considered an MC of concern.

1160 WP associated with M15 WP grenades burns rapidly upon exposure to air, and may stick to soil
1161 particles and be changed to less harmful compounds within a few days (Agency for Toxic
1162 Substances and Disease Registry, 1997).

1163 The MC associated with munitions identified within the Disposal Area are not expected to be a
1164 concern because of limited quantities, limited exposure, and lack of surface drainage from the
1165 Disposal Area. However, given the lack of historical evidence regarding the existence of the
1166 Disposal Area and the types of munitions that may have been used, MC requires further
1167 investigation. Additional unknown munitions and MC of concern may be present at the Disposal
1168 Area, and potential migration pathways may exist.

1169 *6.0 Summary and Conclusions*

1170 The summary and conclusions of the SI are presented in this section. Recommendations for
1171 further action are presented in Section 7.0. An updated CSM is presented in Appendix J.

1172 The former Strother Field was used between 1942 and 1946. Strother Field is included on the
1173 MRS Inventory (DoD, 2009) and in the ASR Supplement (USACE, 2004b), with one identified
1174 MRS: Range Complex No. 1, comprised of skeet and pistol sub-ranges. A Disposal Area was
1175 identified based on observations from site reconnaissance, and was evaluated during the SI.

1176 *6.1 Range Complex No. 1*

1177 Shaw completed a visual reconnaissance of the MRS. The SI field team did not observe any
1178 small arms MEC or MD (spent bullets, shell casings, etc.) or target fragments that would have
1179 been anticipated for the type of small arms ranges comprising the MRS.

1180 There is no significant MEC hazard present because small arms ammunition does not pose a
1181 significant explosive hazard.

1182 The CSM (Appendix J) developed for this SI identified lead and PAHs as potential MC of
1183 concern based on the historical documentation indicating that only small arms were used at the
1184 Range Complex No. 1 MRS. The soil exposure pathway is complete; however, a significant
1185 release was not indicated. All other migration pathways were identified in the CSM as
1186 incomplete for exposure to MC of concern. Property owners (including property managers),
1187 agricultural and industrial workers, and trespassers were identified as potential human receptors.

1188 A total of 14 surface soil samples (including two field duplicates) were collected from the Range
1189 Complex No. 1 MRS. Because no MEC or MD consistent with small arms range use was observed,
1190 samples were collected in the approximate locations proposed in the SSWP. All 14 surface soil
1191 samples collected from the Range Complex No. 1 were analyzed for lead. The samples collected
1192 in the skeet range sub-range were not analyzed for PAHs because target fragments were not
1193 observed. Lead was detected in all of the soil samples at concentrations ranging from 22 mg/kg
1194 to 378 mg/kg.

1195 Co-located sediment and surface water samples were collected from Posey Creek within the
1196 Range Complex No. 1 MRS: one regular sediment sample, one regular surface water sample, and
1197 one field duplicate surface water sample from the skeet range portion; and one regular sediment
1198 sample and one regular surface water sample from the pistol range portion. Samples were
1199 collected in the approximate locations proposed in the SSWP. Lead was detected in the sediment
1200 samples at a concentration of 26.2 mg/kg (skeet range) and 11.1 mg/kg (pistol range). Lead was
1201 detected in the skeet range surface water sample and duplicate at estimated concentrations of

1202 1.29 µg/L and 1.36 µg/L, respectively, and in the pistol range surface water sample at an
1203 estimated concentration of 1.15 µg/L.

1204 Lead detections were compared to background and human health screening levels. The results
1205 are as follows:

- 1206 • Lead concentrations in the 14 surface soil samples exceeded the background screening
1207 level of 18.7 mg/kg for lead in surface soil. Lead exceedances ranged from 22 mg/kg to
1208 378 mg/kg.
- 1209 • Lead concentrations in surface soil did not exceed the human health screening level of
1210 400 mg/kg for lead in surface soil.
- 1211 • The lead concentrations in the sediment and surface water samples did not exceed
1212 background or human health screening levels for sediment or surface water.

1213 Sampling results for lead in surface soil indicate that the surface soil migration pathways are
1214 complete because lead concentrations exceeded the background screening level; however, a
1215 significant release of lead to surface soil at the MRS (from past military munitions activity) is not
1216 indicated because lead concentrations did not exceed the human health screening level.

1217 Sampling results for lead in sediment and surface water indicate these exposure pathways are
1218 incomplete.

1219 *6.2 Disposal Area*

1220 Shaw discovered the Disposal Area during visual reconnaissance of the skeet range portion of
1221 the Range Complex No. 1 MRS. The Disposal Area was identified based on the discovery of
1222 MD associated with AN-M50/AN-M54 incendiary bombs and M15 WP smoke grenades. One
1223 piece of MD from an AN-M50 incendiary bomb was later determined to be large enough to
1224 contain the components to qualify as potential MEC, and was reported to the appropriate
1225 stakeholders. The EOD Unit from McConnell AFB responded to destroy the item.

1226 Historical documentation did not indicate the disposal of 4-lb incendiary bombs or smoke
1227 grenades at the FUDS. The area was presumed to be used for munitions disposal given the
1228 mixed nature of the munitions and the proximity to the cantonment area of the airfield.

1229 However, there is no historical documentation of such usage.

1230 The area where MD and potential MEC items were found has been plowed for more than
1231 50 years without reported MEC-related incidents. Because MD and potential MEC from
1232 AN-M50/AN-M54 incendiary bombs and M15 WP smoke hand grenades is present at the
1233 Disposal Area, the MEC exposure pathway is considered to be complete. The overall risk from
1234 potential MEC at the Disposal Area is considered to be moderate for the following reasons:

- 1235 • Indirect evidence (MD and potential MEC) was observed that indicates the presence
1236 of AN-M50 and AN-M54 incendiary bombs and M15 WP smoke hand grenades at
1237 the area.

- 1238
- 1239
- 1240
- 1241
- 1242
- AN-M50 and AN-M54 incendiary bombs do not contain sensitive fuzes and pose little risk of injury if stepped on or driven on; however, tampering with or attempting to disassemble an incendiary bomb could cause ignition, potentially resulting in severe injury, blindness, or death; in the case of the delayed detonation versions, a detonation may occur, potentially causing severe injury, blindness, or death.
- 1243
- 1244
- 1245
- M15 WP smoke grenades do not contain sensitive fuzes; however, removal of the safety pins or failure of restraining mechanisms can cause ignition, potentially resulting in severe injury, blindness, or death.
- 1246
- 1247
- The area was likely used for munitions disposal given the mixed nature of the munitions, as well as the proximity to the cantonment area of the airfield.
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- The CSM (Appendix J) developed for this SI indicated that the MC associated with munitions identified within the Disposal Area (AN-M50 and AN-M54 incendiary bombs and WP smoke grenades) are not expected to be a concern because of limited quantities, limited exposure, and lack of surface drainage from the Disposal Area. Therefore, all migration pathways are considered incomplete. No samples were collected for laboratory analysis at the Disposal Area. Additional unknown munitions and MC of concern may be present at the Disposal Area, and potential migration pathways may exist.

1255 *7.0 Recommendations*

1256 Results of the SI provide the basis for conclusions and/or recommendations for further actions at
1257 the MRS.

1258 *7.1 Range Complex No. 1*

1259 Based on historical evidence and results from the SI field activities, there is no MEC hazard is at
1260 the Range Complex No. 1 MRS. Former ranges used exclusively for live fire of small arms
1261 ammunition are considered to present no significant MEC hazard.

1262 Lead concentrations in surface soil exceed the background screening level and may be related to
1263 past military munitions activity at the MRS; however, a significant release of lead to surface soil
1264 is not indicated because lead concentrations did not exceed the human health screening level.

1265 Lead concentrations in sediment and surface water were below background threshold and human
1266 health screening levels.

1267 In accordance with the decision rules established for this SI, a recommendation for NDAI is
1268 made with respect to MEC and MC for the Range Complex No. 1 MRS. Consideration of a
1269 removal action is not warranted.

1270 *7.2 Disposal Area*

1271 Based on evidence from the SI field activities, a MEC hazard is present in the Disposal Area
1272 because unexpected MD was identified and one potential MEC item was identified and
1273 destroyed. It is presumed that the area was used for munitions disposal given the mixed nature
1274 of the munitions and the proximity to the cantonment area of the airfield. However, there is no
1275 historical documentation of such usage.

1276 There is no MC of concern associated with the munitions identified at the Disposal Area;
1277 therefore, there are no complete migration pathways to receptors. However, additional unknown
1278 munitions and MC of concern may be present at the Disposal Area, and potential migration
1279 pathways may exist. A recommendation is made for further investigation for MC given the lack
1280 of historical evidence regarding the existence of the Disposal Area and the types of munitions
1281 that may have been used.

1282 The Disposal Area was not identified in the MRS Inventory. A recommendation is made to add
1283 the area to the inventory as "Disposal Area," with a size of 28.3 acres based on the fragmentation
1284 distances for the identified munitions (406 ft for the incendiary bombs and 517 ft for the WP
1285 grenade). A recommendation for further investigation is made for the Disposal Area because
1286 indirect evidence (MD and potential MEC) associated with incendiary bombs and WP grenades
1287 was found in the area. Consideration of a removal action is not warranted because the evidence

1288 is limited to the potential presence of munitions that do not contain sensitive fuzes. In addition,
1289 the majority of the Disposal Area has been plowed without incident for more than 50 years.

1290 **7.3 Munitions Response Site**

1291 Results of the SI field activities provide the basis for identifying MRSs and for scoring an MRS
1292 using MRSPP (Appendix K).

1293 Based on the use and physical distribution of the MRS at Strother Field, two MRSs are identified
1294 (Figure 7-1):

- 1295 1. MRS No. 1 – Range Complex No. 1
- 1296 2. MRS No. 2 – Disposal Area

1297 The Range Complex No. 1 MRS has an area of approximately 239.5 acres, consistent with the
1298 area and location of the range identified in the ASR Supplement (B07KS027700R01) and MRS
1299 Inventory. It is recommended that the Disposal Area be added to the MRS Inventory, with a size
1300 of approximately 28.3 acres as defined by the fragmentation distances of the munitions identified
1301 during the SI. The location of the Disposal Area is at UTM coordinates (Zone 14N, NAD 83)
1302 X=675077 (East), Y=4116343 (North).

1303 **8.0 References**

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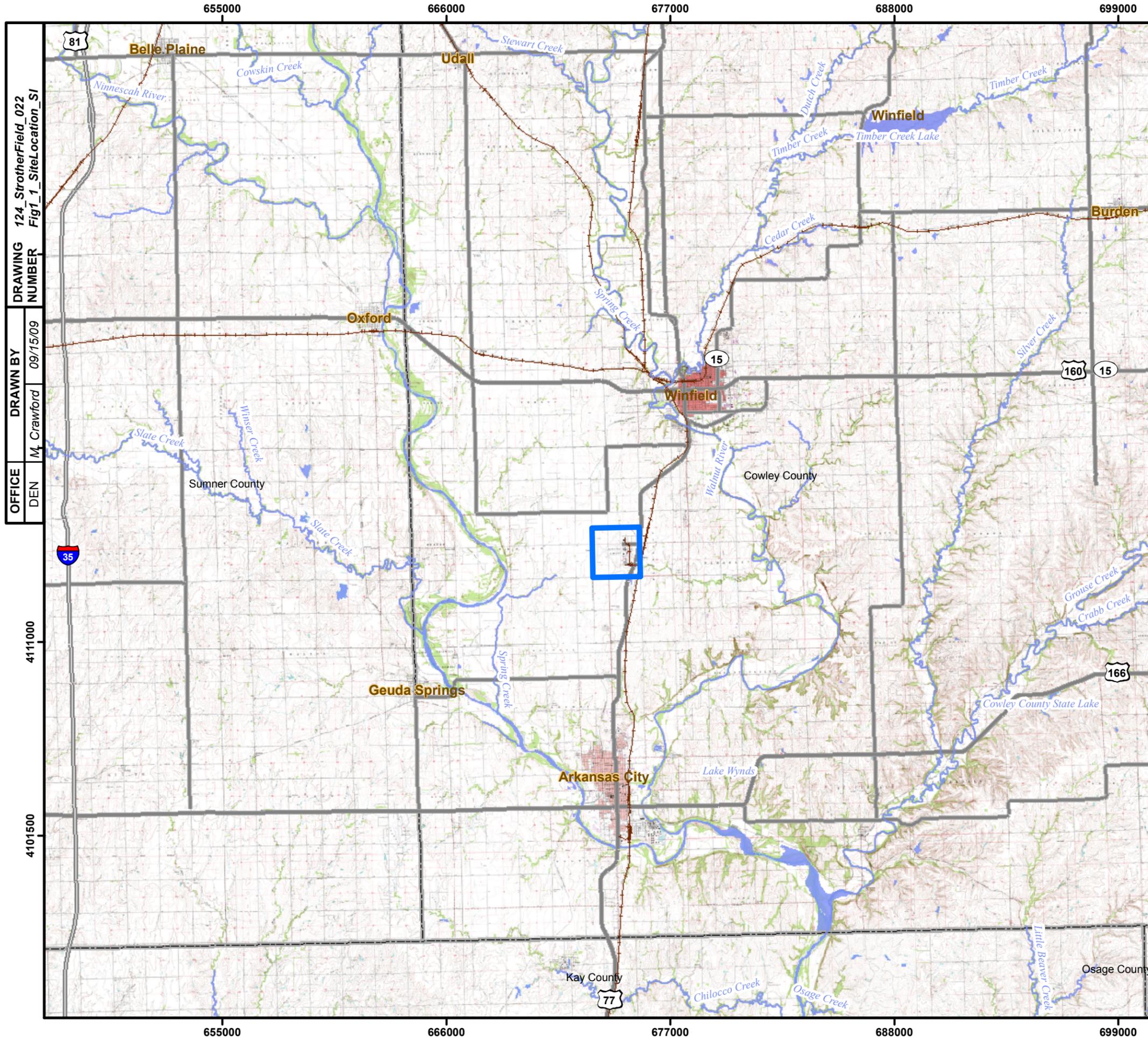
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Figures



DRAWING NUMBER: 124_StrotherField_022_Fig1_1_SiteLocation_SI
 DRAWN BY: M. Crawford
 DATE: 09/15/09
 OFFICE: DEN

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.



REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

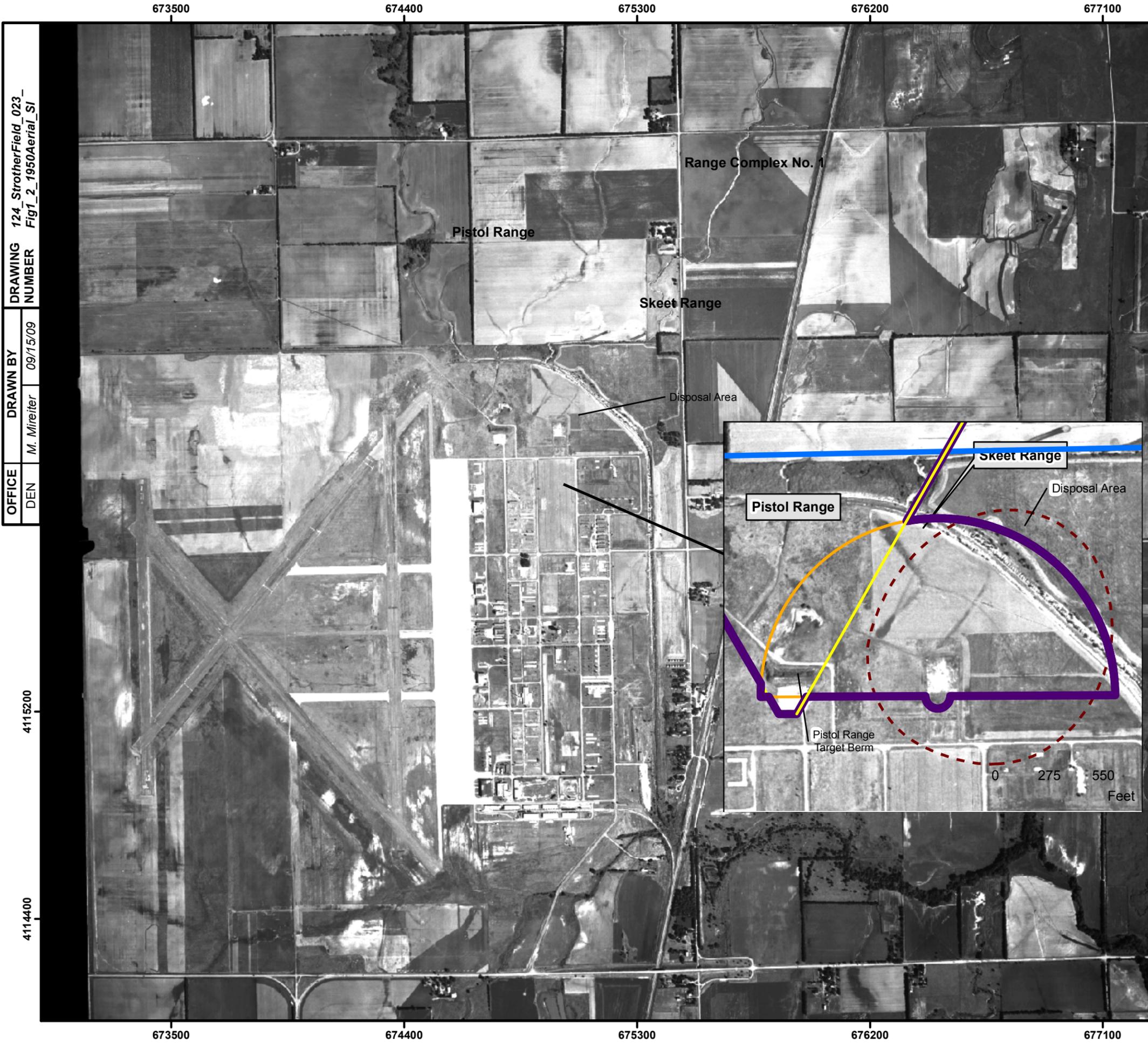


FIGURE 1-1

SITE LOCATION

STROTHER FIELD
 FUDS PROPERTY NUMBER B07KS0277



DRAWING NUMBER: 124_StrotherField_023_Fig1_2_1950Aerial_SI

DRAWN BY: M. Mireiter

DATE: 09/15/09

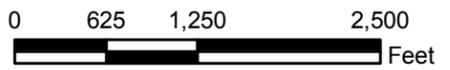
OFFICE: DEN

Legend

- Strother Field FUDS Boundary
- Disposal Area (Not in MRS Inventory)
- Range in the MRS 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) Disposal Area defined by observations of munitions debris from 2009 SI field team.
- 3) Aerial photograph was obtained from the National Archives and Records Administration and is dated September 5, 1950.



REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 1-2
1950 AERIAL PHOTOGRAPH

STROTHER FIELD
FUDS PROPERTY NUMBER B07KS0277





DRAWING NUMBER 124_StrotherField_024_Fig1_3_1963Aerial_SI_

DRAWN BY M. Mireiter 09/15/09

OFFICE DEN

4115200

4114400

673500 674400 675300 676200 677100

673500 674400 675300 676200 677100

Legend

- Strother Field FUDS Boundary
- Disposal Area (Not in MRS Inventory)

Range in the MRS Inventory

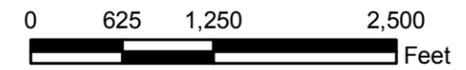
- Range Complex No. 1

Sub-Ranges

- Skeet Range
- Pistol Range

NOTES:

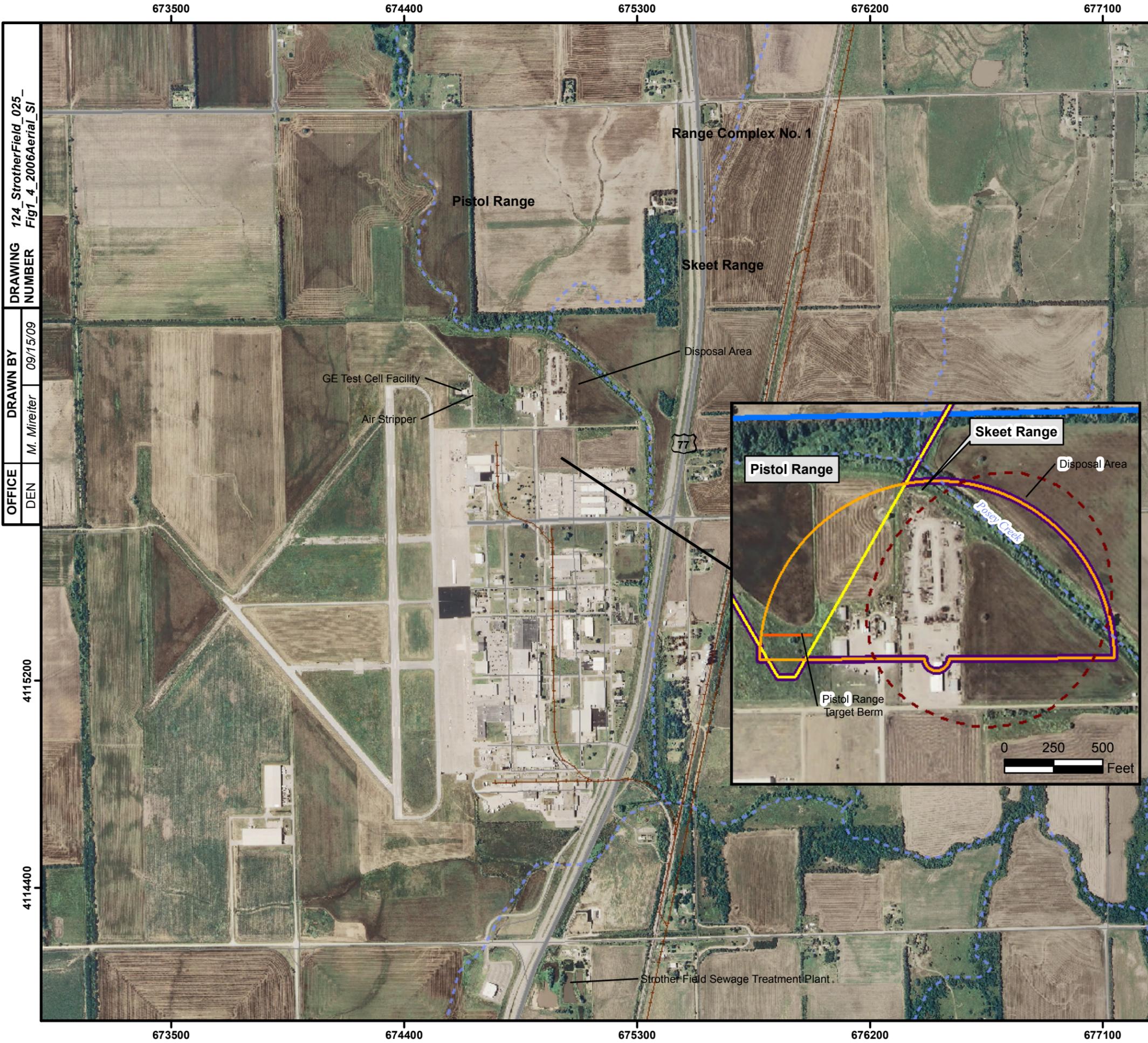
- 1) FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
- 2) Disposal Area defined by observations of munitions debris from 2009 SI field team.
- 3) Aerial photograph was obtained from the U.S. Geological Survey and is dated May 4, 1963.



REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 1-3
1963 AERIAL PHOTOGRAPH
 STROTHER FIELD
 FUDS PROPERTY NUMBER B07KS0277



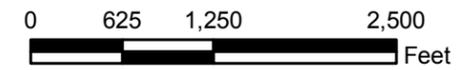
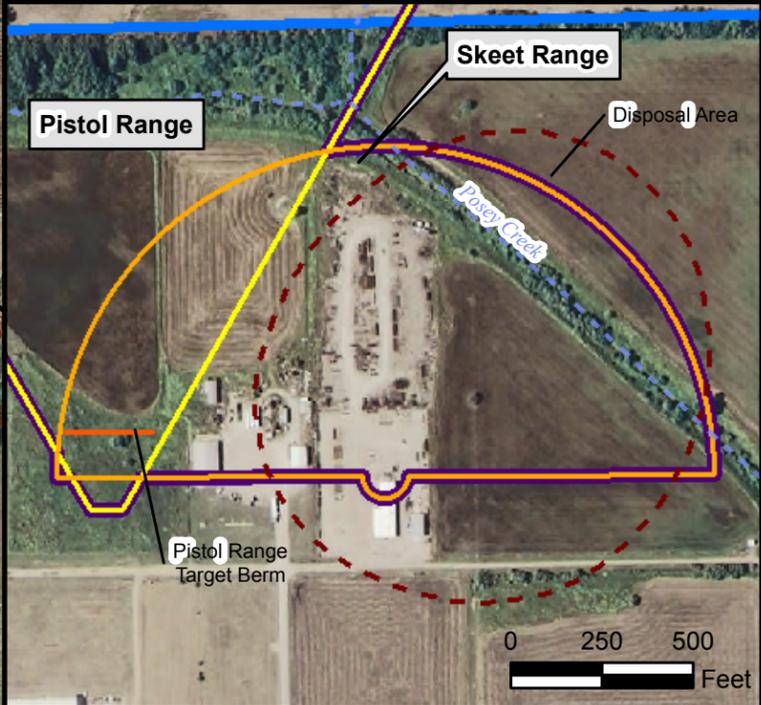


DRAWING NUMBER: 124_StrotherField_025_Fig1_4_2006Aerial_SI
 DRAWN BY: M. Mireiter
 DATE: 09/15/09
 OFFICE: DEN

Legend

- Strother Field FUDS Boundary
- Disposal Area (Not in MRS Inventory)
- Range in the MRS Inventory**
- Range Complex No. 1
- Sub-Ranges**
- Skeet Range
- Pistol Range
- Intermittent Stream
- Perennial Stream

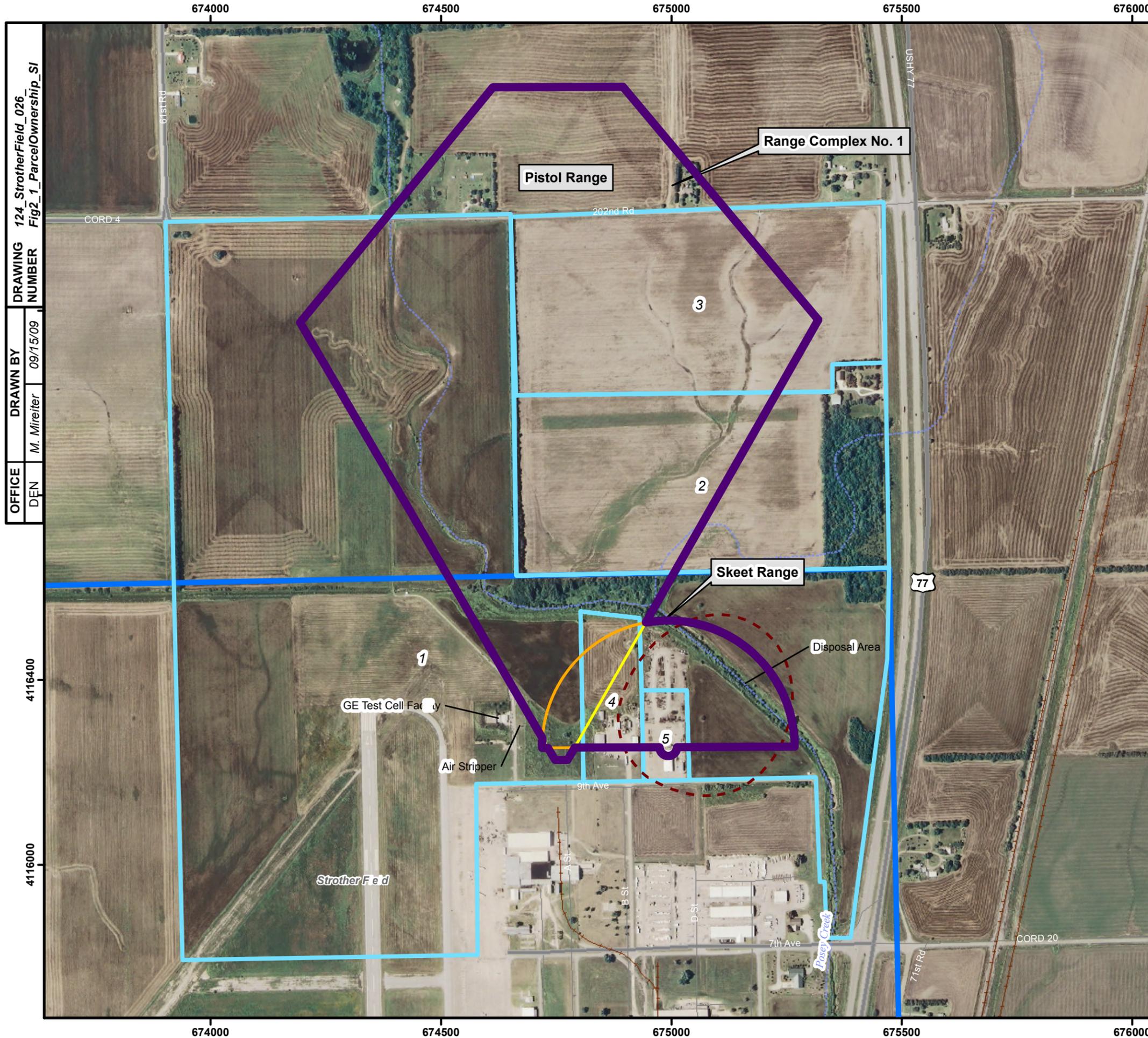
- NOTES:
- 1) FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
 - 2) Disposal Area defined by observations of munitions debris from 2009 SI field team.
 - 3) Aerial photograph (Covley County) was obtained from the U.S. Department of Agriculture, Service Center Agencies; photograph is from the USDA-APFO National Agriculture Imagery Program (NAIP), 2006.



REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 1-4
2006 AERIAL PHOTOGRAPH
 STROTHER FIELD
 FUDS PROPERTY NUMBER B07KS0277





OFFICE: DEN
 DRAWN BY: M. Mireiter
 DATE: 09/15/09
 DRAWING NUMBER: 124_StrotherField_026_Fig2_1_ParcelOwnership_SI

Legend

- Strother Field FUDS Boundary
- Taxlot Parcel
- Disposal Area (Not in MRS Inventory)

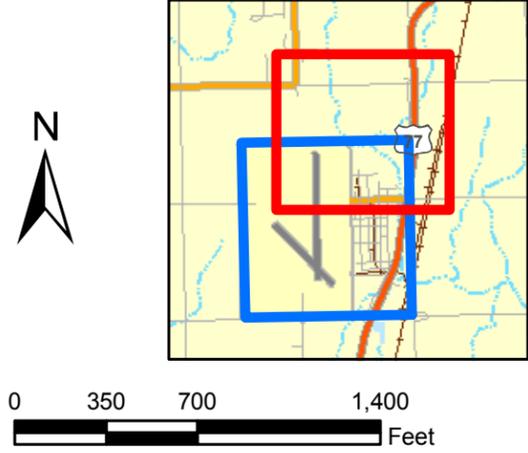
Range in the MRS Inventory

- Range Complex No. 1

Sub-Ranges

- Sket Range
- Pistol Range

- NOTES:
- 1) FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
 - 2) Disposal Area defined by observations of munitions debris from 2009 SI field team.
 - 3) Parcel data was obtained from the Cowley County Appraiser's Office (620-221-5430).
 - 4) 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.

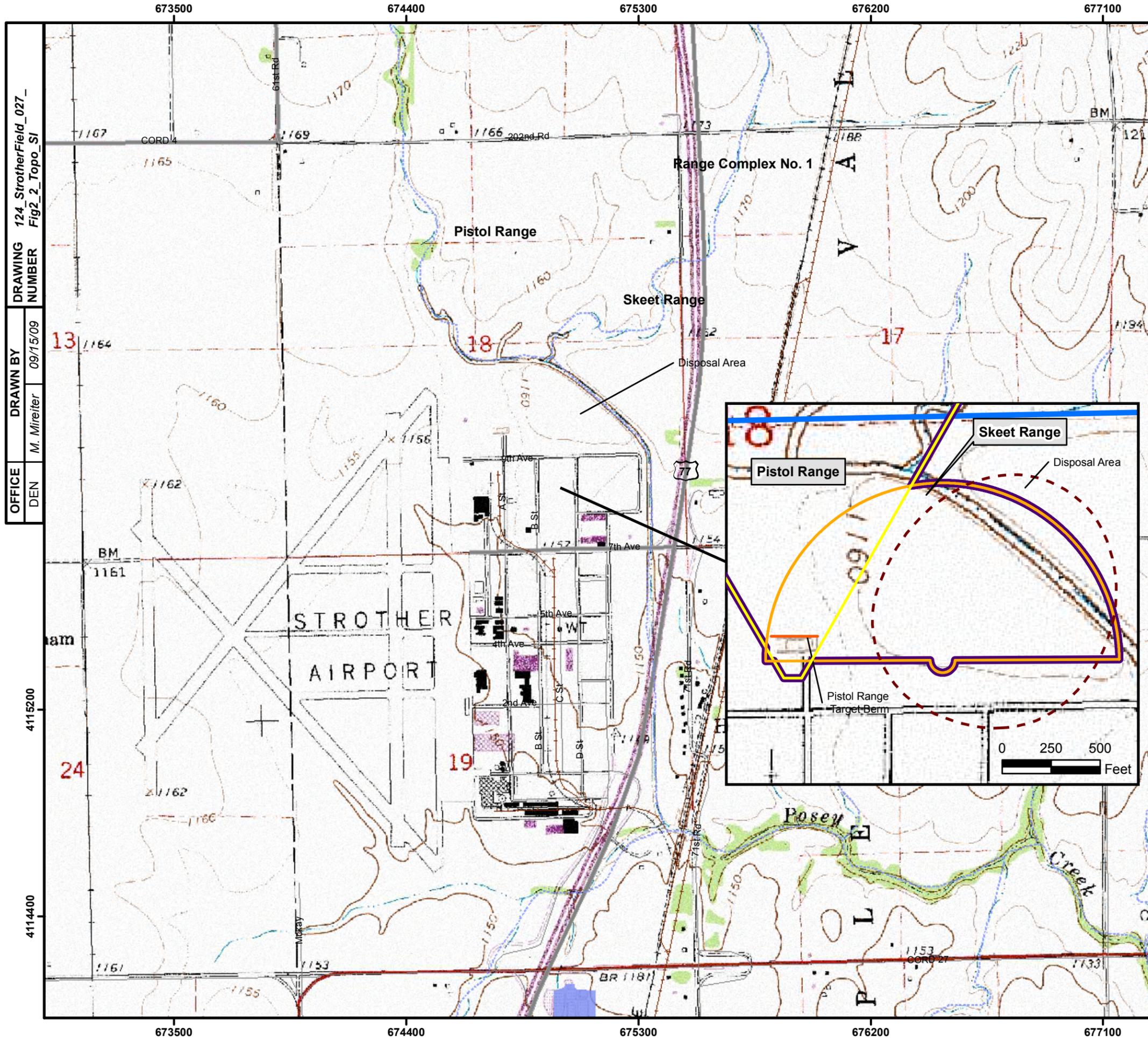


REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 2-1
PARCEL OWNERSHIP

STROTHER FIELD
 FUDS PROPERTY NUMBER B07KS0277





DRAWING NUMBER: 124_StrotherField_027_Fig2_2_Topo_SI
 DRAWN BY: M. Mireiter
 DATE: 09/15/09

Legend

- Strother Field FUDS Boundary
- Disposal Area (Not in MRS Inventory)
- Range in the MRS 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) Disposal Area defined by observations of munitions debris from 2009 SI field team.
 - 3) Topographic map (Cowley County) was obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.

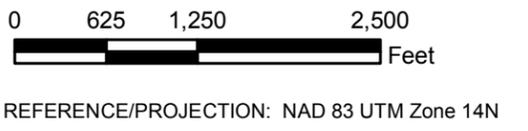
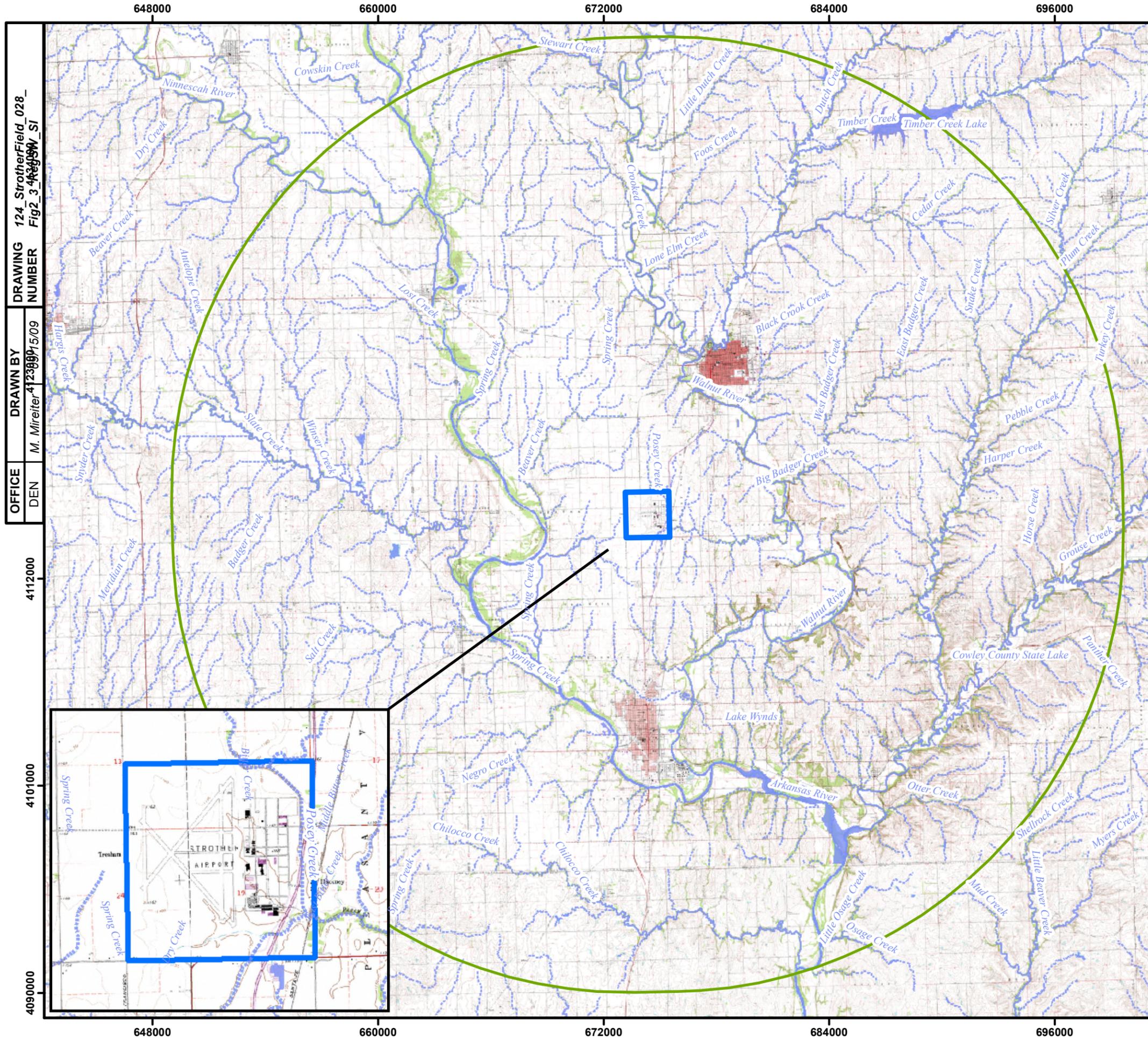


FIGURE 2-2
TOPOGRAPHIC MAP
 STROTHER FIELD
 FUDS PROPERTY NUMBER B07KS0277



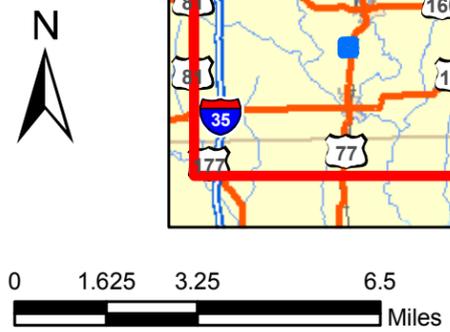


DRAWING NUMBER: 124 StrotherField_028_Fig2_3_46349SW_SI
 DRAWN BY: M. Mireiter 4123899/15/09
 OFFICE DEN:

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.



REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

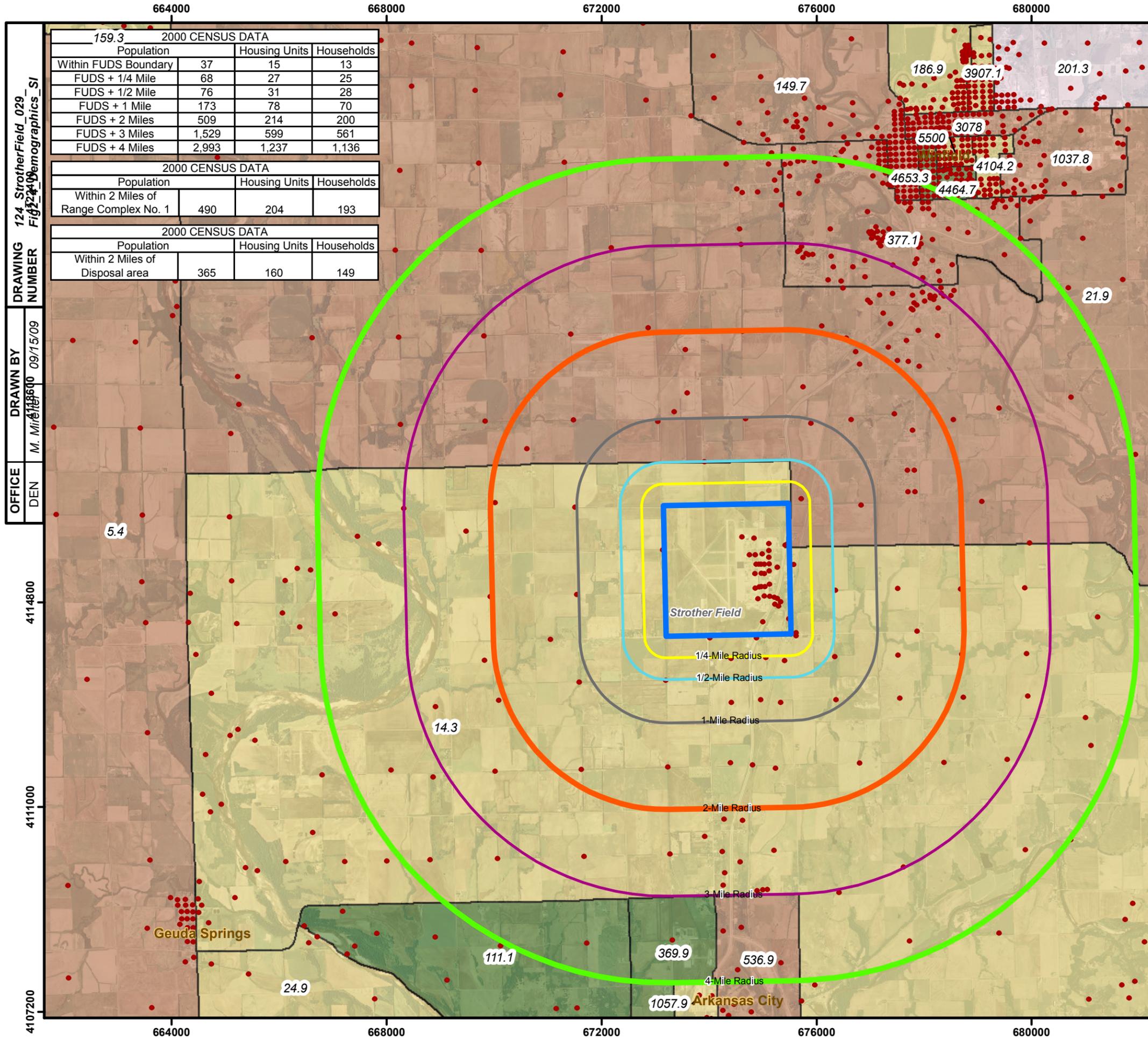
FIGURE 2-3
REGIONAL SURFACE WATER DRAINAGE
WITHIN A 15-MILE RADIUS

STROTHER FIELD
 FUDS PROPERTY NUMBER B07KS0277



4090000

4090000



159.3 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

2000 CENSUS DATA			
Population	Housing Units	Households	
Within 2 Miles of Range Complex No. 1	490	204	193

2000 CENSUS DATA			
Population	Housing Units	Households	
Within 2 Miles of Disposal area	365	160	149

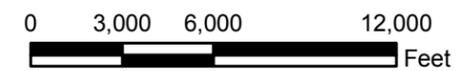
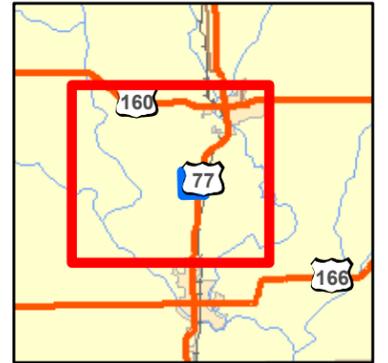
Legend

- Strother Field FUDS Boundary

2005 Census Block Group Population

- 500 - 800
- 801 - 1200
- 1201 - 1600
- 1601 - 2000
- Census Block Centroid Unit
- 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.



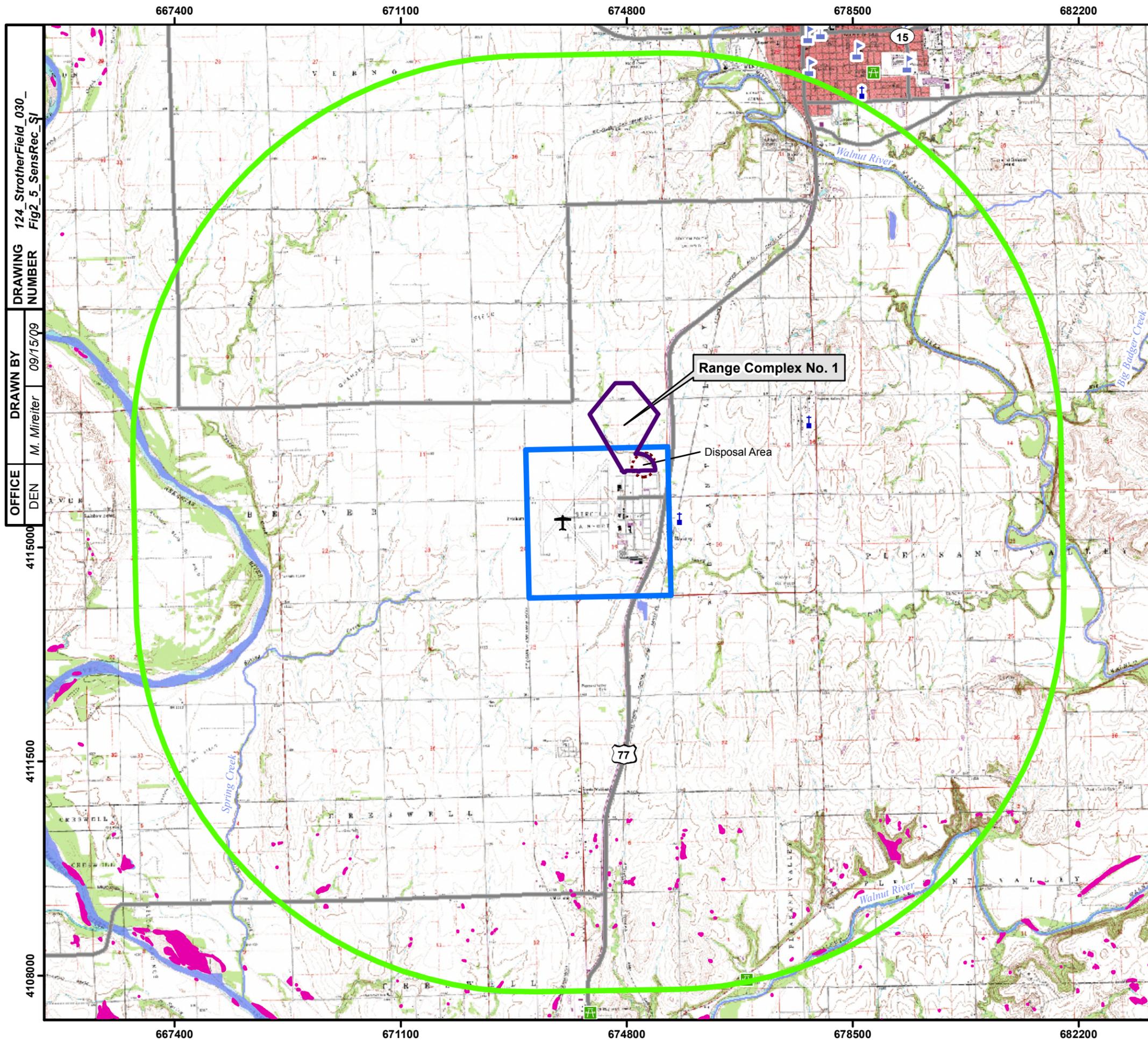
REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 2-4
CENSUS DATA WITHIN A 4-MILE RADIUS

STROTHER FIELD
 FUDS PROPERTY NUMBER B07KS0277



DRAWING NUMBER: 124 StrotherField_029 Fig 2-4 Demographics_SI
 DRAWN BY: M. Mirallegre
 DATE: 09/15/09
 OFFICE: DEN



DRAWING NUMBER 124_StrotherField_030_Fig2_5_SensRec_S1
 DRAWN BY M. Mireiter
 DATE 09/15/09
 OFFICE DEN
 4115000
 4111500
 4108000

Legend

- Strother Field FUDS Boundary
- 4-Mile Radius from FUDS Boundary
- Disposal Area (Not in MRS Inventory)

Range in the MRS 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) Disposal Area defined by observations of munitions debris from 2009 SI field team.
 - 3) 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.
 - 4) Topographic map (Crawley County) was obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.

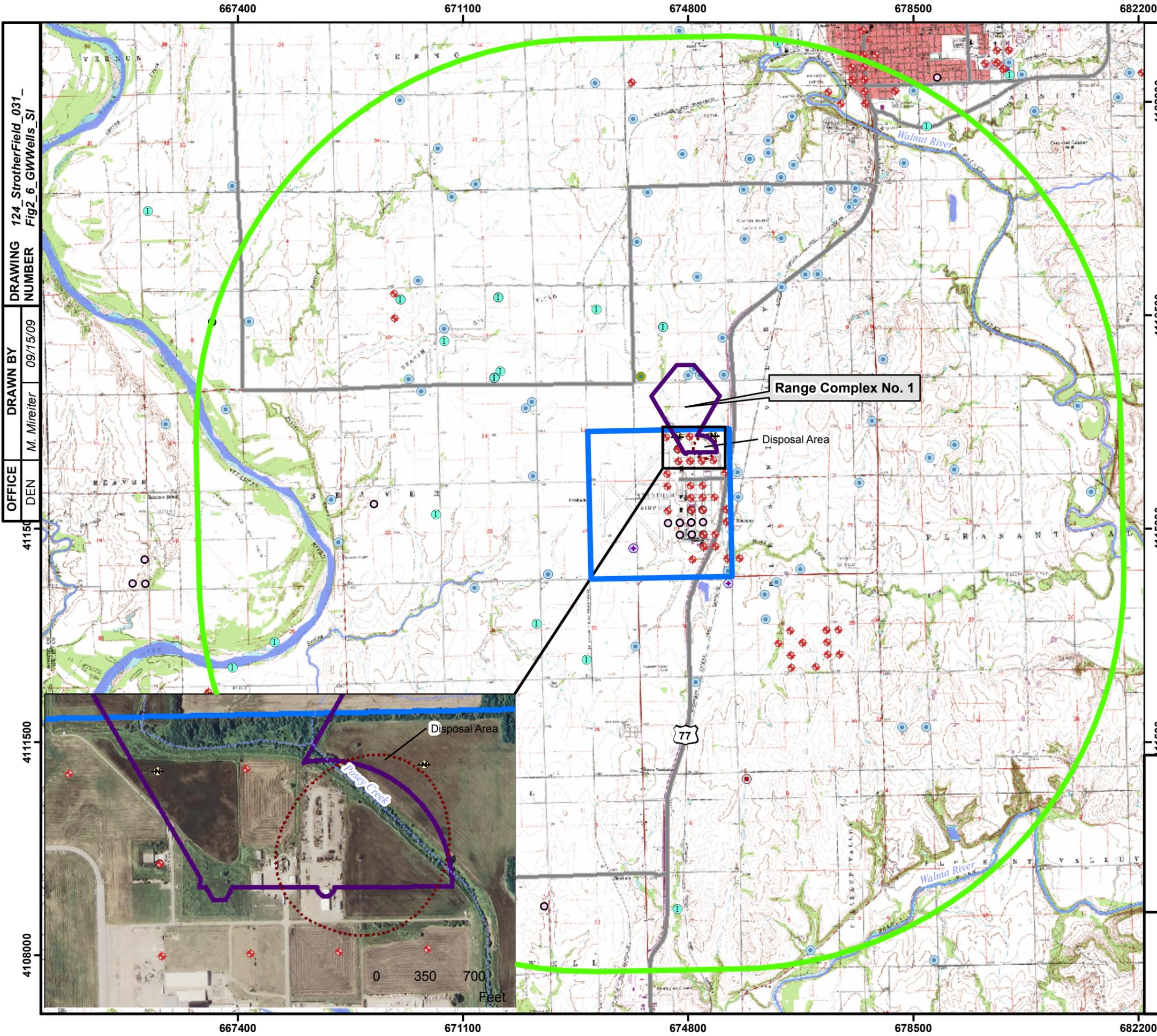
0 0.5 1 2 Miles

REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 2-5
SENSITIVE RECEPTORS AND ENVIRONMENTS WITHIN A 4-MILE RADIUS

STROTHER FIELD
 FUDS PROPERTY NUMBER B07KS0277





DRAWING 124 StrotherField_031_
 NUMBER Fig2_6_GWwells_SI
 DRAWN BY M. Mireiter
 DATE 09/15/09
 OFFICE DEN

Legend

- Strother Field FUDS Boundary
- 4-Mile Radius from FUDS Boundary
- Disposal Area (Not in MRS Inventory)

Range in the MRS 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) Disposal Area defined by observations of munitions debris from 2009 SI field team.
 - 3) Groundwater well data was obtained from the Kansas Geological Survey, Water Well Completions Records Database (<http://www.kgs.ku.edu/Magellan/WaterWell/index.html>).
 - 4) Topographic map (Cowley County) was obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.
 - 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.

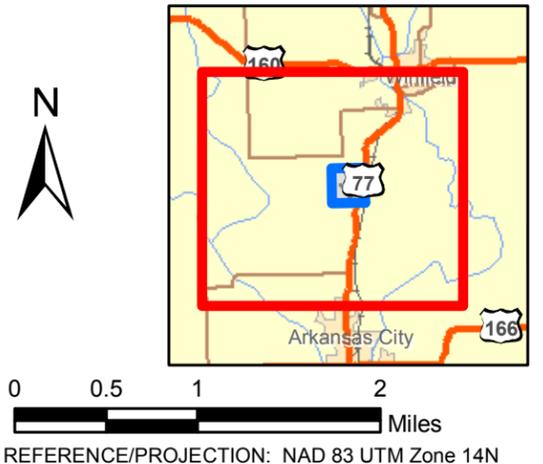


FIGURE 2-6
GROUNDWATER WELL LOCATIONS
WITHIN A 4-MILE RADIUS

STROTHER FIELD
 FUDS PROPERTY NUMBER B07KS0277



673500

674400

675300

676200

677100

DRAWING NUMBER 124_StrotherField_032_Fig3_1_SIMRS_SI

DRAWN BY M. Mireiter 09/15/09

OFFICE DEN

GE Test Cell

At

4115200

4114400

673500

674400

675300

676200

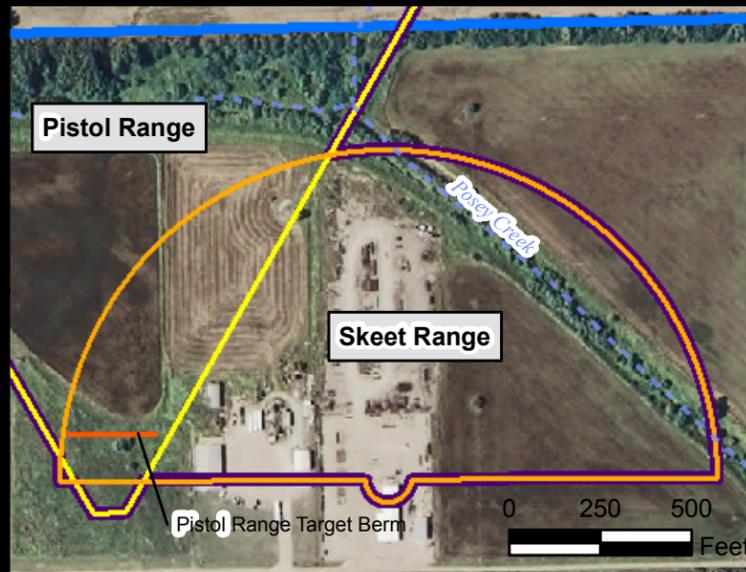
677100

Legend

- Strother Field FUDS Boundary
- Munitions Response Site**
 - Range Complex No. 1
- Sub-Ranges**
 - Skeet Range
 - Pistol Range
- Intermittent Stream
- Perennial Stream

NOTES:

- FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
- 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.

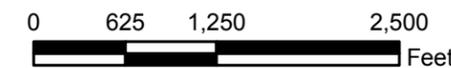


4117600

4116800

4116000

4115200



REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

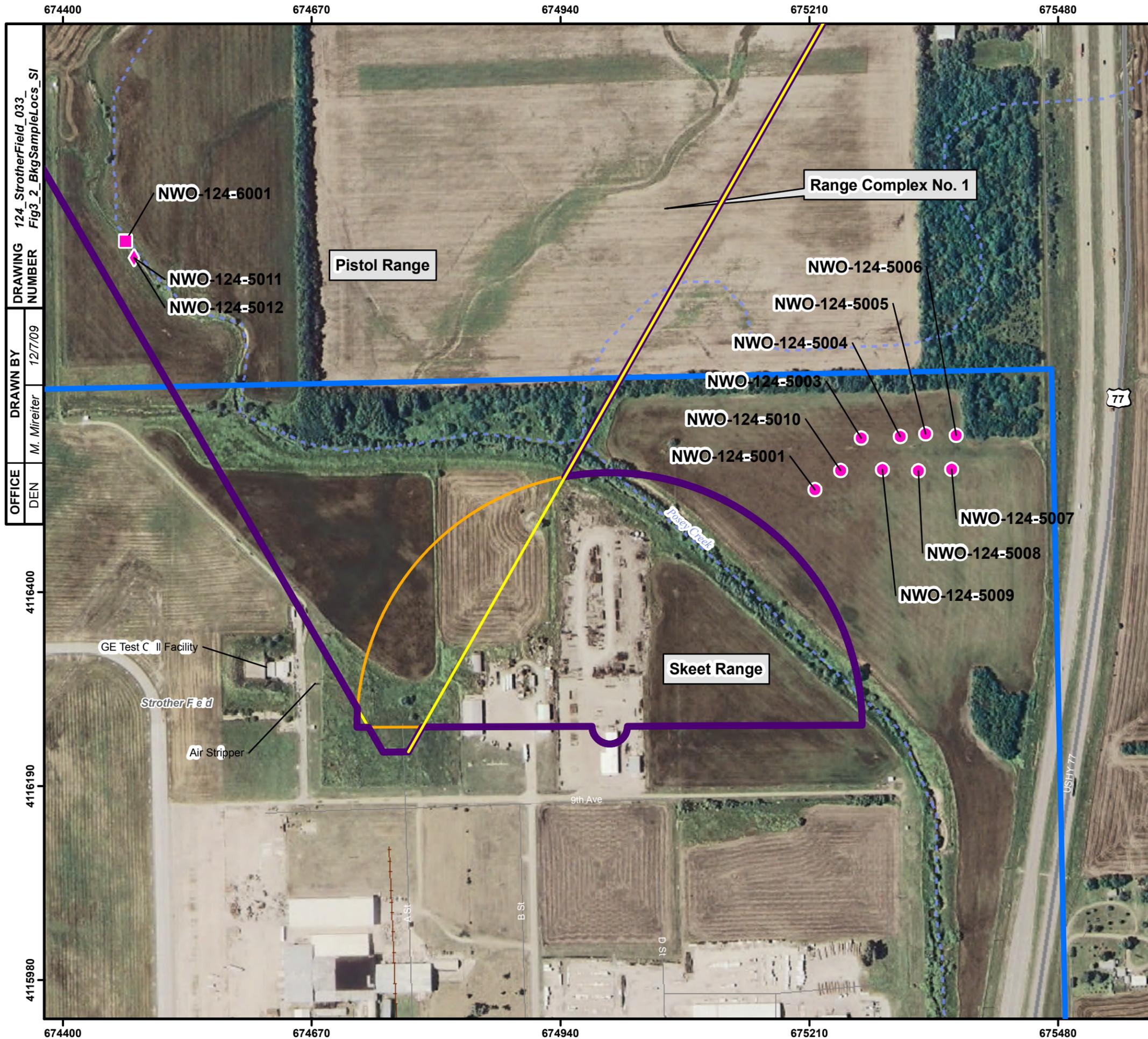
FIGURE 3-1
SITE INSPECTION
MUNITIONS RESPONSE SITE

STROTHER FIELD
 FUDS PROPERTY NUMBER B07KS0277



US Army Corps
 of Engineers®
 Omaha District





674400 674670 674940 675210 675480

124_StrotherField_033
 DRAWING NUMBER Fig3_2_BkgSampleLocs_SI
 DRAWN BY M. Mireiter 12/7/09
 OFFICE DEN

4116400 4116190 4115980
 GE Test Cell Facility
 Strother Field
 Air Stripper
 9th Ave
 A St
 B St
 D St
 USHY 77

Legend

- Strother Field FUDS Boundary
- Munitions Response Site**
- Range Complex No. 1
- Sub-Ranges**
- Skeet Range
- Pistol Range
- Intermittent Stream
- Perennial Stream
- Background Soil Sample Location
- ◆ Background Sediment Sample Location
- Background Surface Water Sample Location

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.

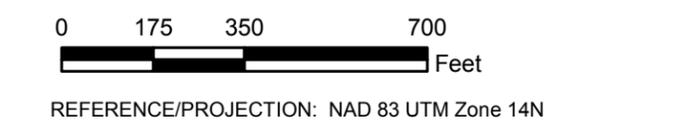
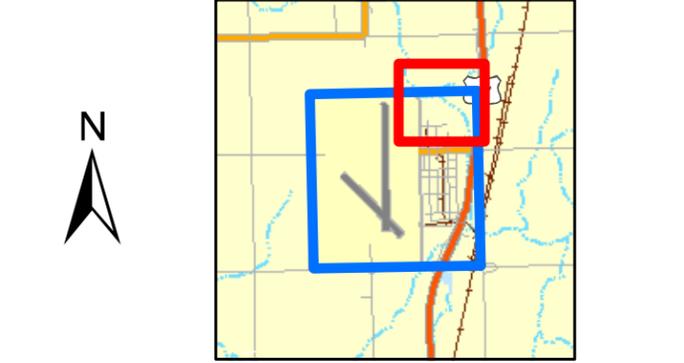
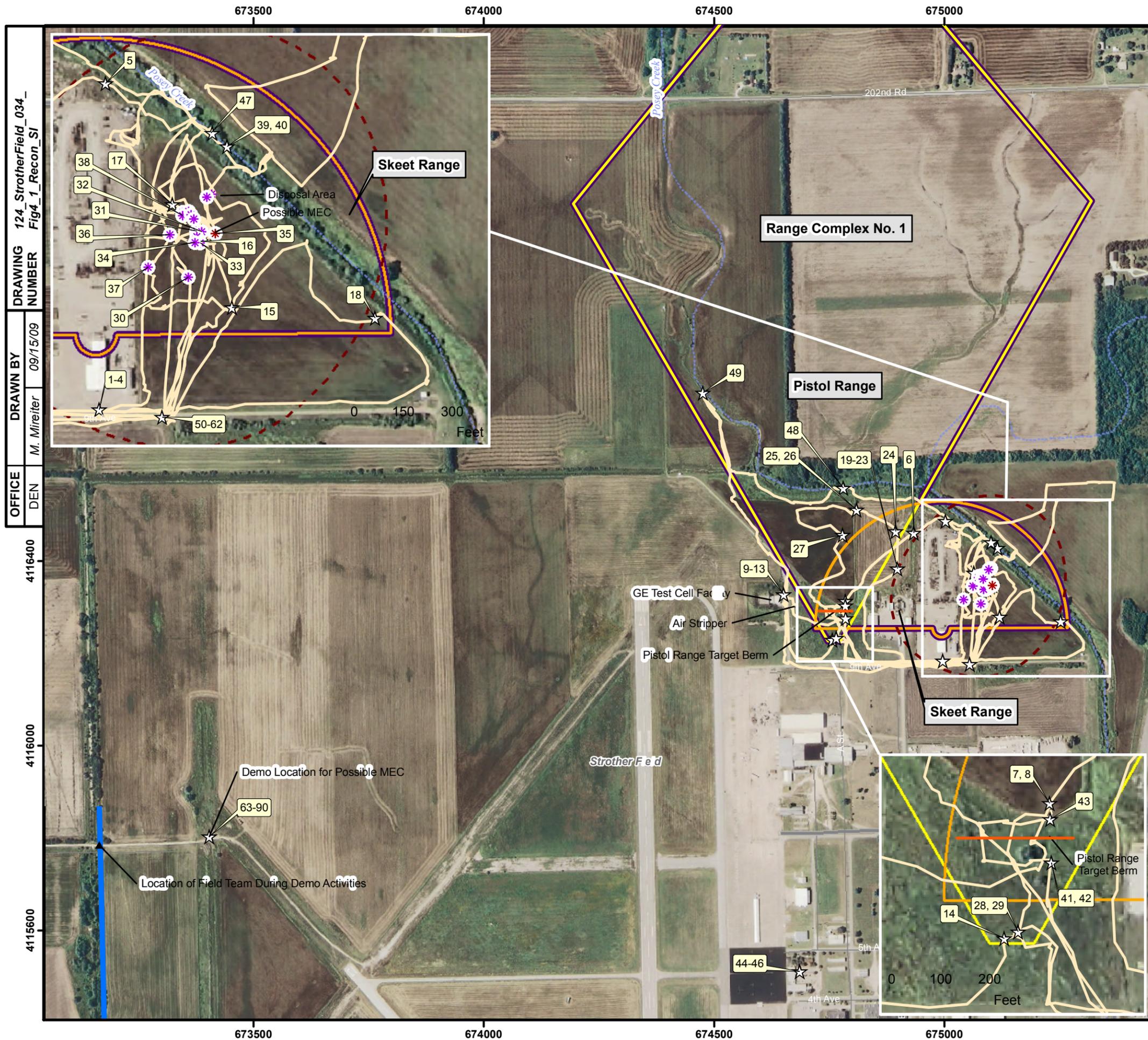


FIGURE 3-2
BACKGROUND SAMPLE LOCATIONS
 STROTHER FIELD
 FUDS PROPERTY NUMBER B07KS0277



Legend

- Strother Field FUDS Boundary
- Disposal Area (Not in MRS Inventory)
- Munitions Response Site**
- Range Complex No. 1
- Sub-Ranges**
- Skeet Range
- Pistol Range
- Reconnaissance Track
- * Munitions Debris Identified
- * Possible MEC Item Identified
- ☆ Photograph Location

NOTES:

- 1) FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
- 2) Disposal Area defined by observations of munitions debris from 2009 SI field team.
- 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.

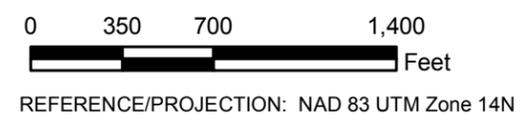
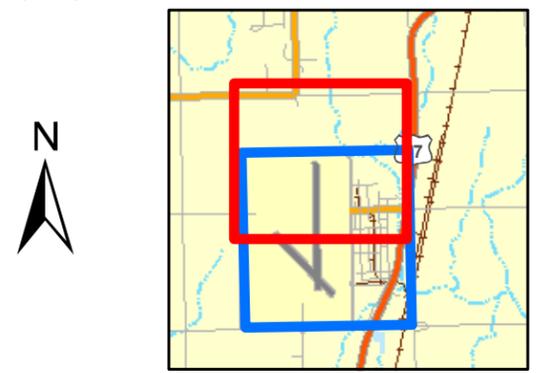
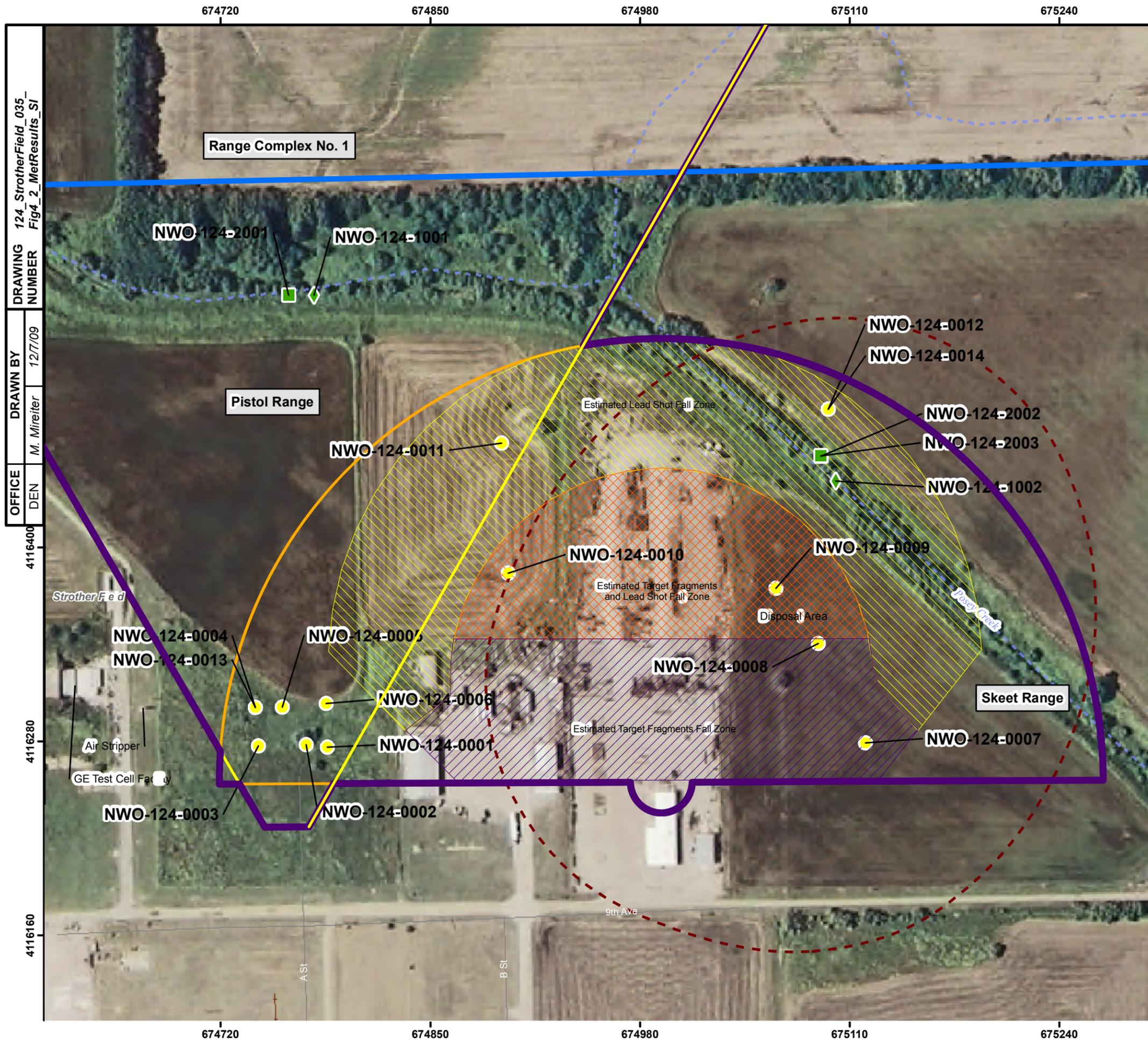


FIGURE 4-1
SITE INSPECTION RECONNAISSANCE

STROTHER FIELD
FUDS PROPERTY NUMBER B07KS0277





DRAWING NUMBER: 124_StrotherField_035_Fig4_2_MatResults_SI
 DRAWN BY: M. Mireiter
 DATE: 12/7/09
 OFFICE: DEN
 SCALE: 4116400, 4116280, 4116160

Legend

- Strother Field FUDS Boundary
- Disposal Area (Not in MRS Inventory)
- Munitions Response Site**
- Range Complex No. 1
- Sub-Ranges**
- Skeet Range
- Pistol Range
- Skeet Range Estimated Shotfall Zones²**
- Lead Shot
- Target Fragments
- Target Fragments and Lead Shot
- Intermittent Stream
- Perennial Stream
- Soil Sample Results Greater Than Background But Less Than Human Health Screening Values
- ◆ Sediment Sample Results Less Than Both Background and Human Health Screening Values
- Surface Water Sample Results Less Than Both Background and Human Health Screening Values

NOTES:

- 1) FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
- 2) Disposal Area defined by observations of munitions debris from 2009 SI field team.
- 3) Shotfall zone boundaries are based on previous skeet range investigations (adapted from the *Characterization and Remediation of Soils at Closed Small Arms Ranges* (ITRC, 2003)).
- 4) 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.

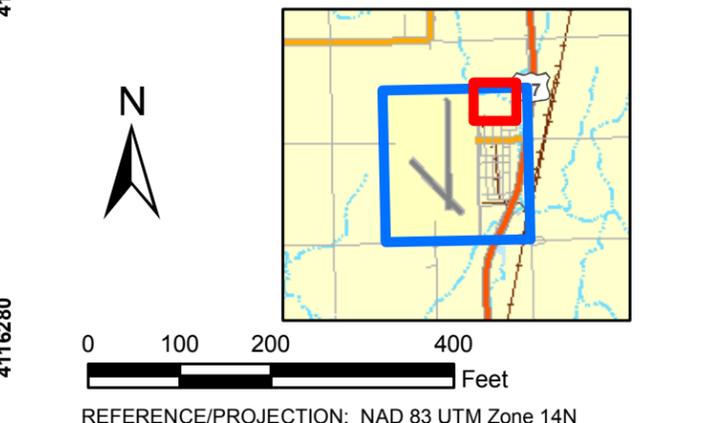
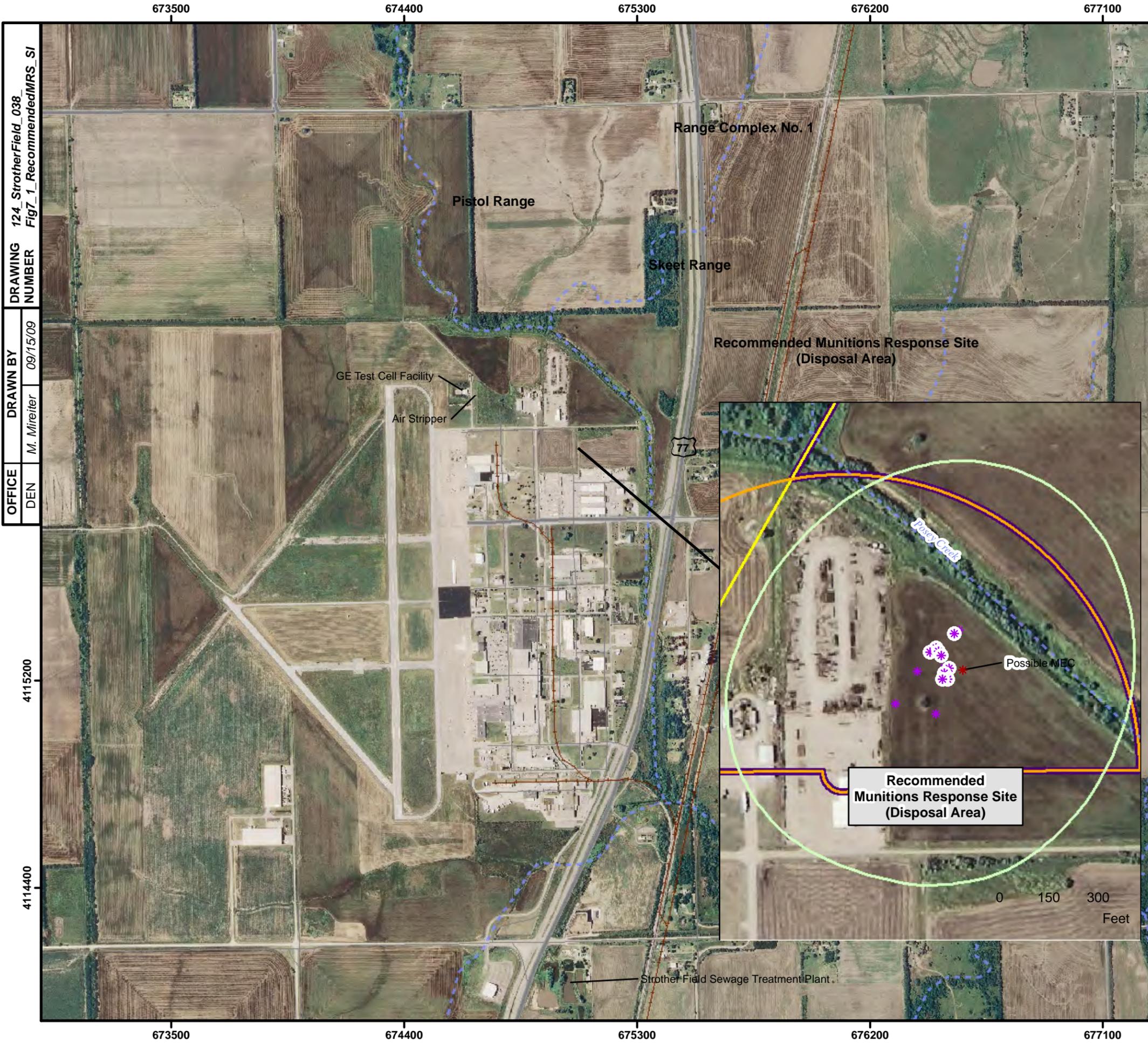


FIGURE 4-2
SAMPLE LOCATIONS AND LEAD RESULTS
 STROTHER FIELD
 FUDS PROPERTY NUMBER B07KS0277





DRAWING NUMBER: 124_StrotherField_038_Fig7_1_RecommendedMRS_SI
 DRAWN BY: M. Mireiter
 DATE: 09/15/09
 OFFICE: DEN

Legend

- Strother Field FUDS Boundary
- Recommended Munitions Response Site (Disposal Area)

Munitions Response Site

- Range Complex No. 1

Sub-Ranges

- Skeet Range
- Pistol Range

- Intermittent Stream
- Perennial Stream

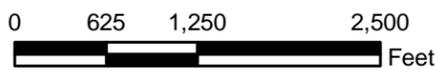
- * Munitions Debris Identified
- * Possible MEC Item Identified

NOTES:

- 1) FUDS property and range boundaries were derived from the Strother Field ASR Supplement (USACE, 2004).
- 2) Aerial photograph (Covley 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.







0 625 1,250 2,500 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 14N

FIGURE 7-1
RECOMMENDED MUNITIONS RESPONSE SITE (DISPOSAL AREA)
 STROTHER FIELD
 FUDS PROPERTY NUMBER B07KS0277



4115200
 4114400
 673500 674400 675300 676200 677100

Tables

**Table 2-1
Munitions Information
Strother Field, Cowley County, Kansas**

Area	Munitions	Component and Munitions Constituents	Munitions Constituents of Concern
Range Complex No. 1	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 ^a	PAHs
Disposal Area	AN-M50 and AN-M54 Incendiary Bombs	Body – magnesium, steel	None
		First Fire Mixture – magnesium powder, barium chromate	None
		Thermate – iron oxide, aluminum powder, barium nitrate, sulfur	None
		Incendiary Mixture – black powder (potassium nitrate, sulfur, charcoal) or tetryl	None
	M15 White Phosphorus Smoke Grenades	White Phosphorus ^b	None

Notes:

This table identifies various component and MC 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.

^a 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.

^b White phosphorus is not considered MC of concern because it burns rapidly upon exposure to air. White phosphorus may stick to soil particles and be changed to less harmful compounds within a few days (Agency for Toxic Substances and Disease Registry, 1997).

- FUDS - Formerly Used Defense Site
- MC - munitions constituents
- MMRP - Military Munitions Response Program
- PAH - polycyclic aromatic hydrocarbon
- SI - Site Inspection

**Table 2-2
Army Checklist for Important Ecological Places ^a
Strother Field, Cowley County, Kansas**

		Yes / No	Comments
1	Locally important ecological place identified by the Integrated Natural Resource Management Plan, BRAC Cleanup Plan or Redevelopment Plan, or other official land management plans	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
2	Critical habitat for Federal designated endangered or threatened species	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
3	Marine Sanctuary	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
4	National Park	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
5	Designated Federal Wilderness Area	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
6	Areas identified under the Coastal Zone Management Act	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
7	Sensitive Areas identified under the National Estuary Program or Near Coastal Waters Program	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
8	Critical areas identified under the Clean Lakes Program	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
9	National Monument	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
10	National Seashore Recreational Area	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
11	National Lakeshore Recreational Area	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
12	Habitat known to be used by Federal designated or proposed endangered or threatened species	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
13	National preserve	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
14	National or State Wildlife Refuge	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
15	Unit of Coastal Barrier Resources System	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
16	Coastal Barrier (undeveloped)	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
17	Federal land designated for protection of natural ecosystems	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
18	Administratively Proposed Federal Wilderness Area	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
19	Spawning areas critical for the maintenance of fish/shellfish species within river, lake, or coastal tidal waters	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
20	Migratory pathways and feeding areas critical for maintenance of anadromous fish species within river reaches or areas in lakes or coastal tidal waters in which fish spend extended periods of time	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
21	Terrestrial areas utilized for breeding by large or dense aggregations of animals	<input type="checkbox"/> / <input checked="" type="checkbox"/>	

Table 2-2 (Cont.)

		Yes / No	Comments
22	National river reach designated as Recreational	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
23	Habitat known to be used by state designated endangered or threatened species	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
24	Habitat known to be used by species under review as to its Federal endangered or threatened status	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
25	Coastal Barrier (partially developed)	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
26	Federally designated Scenic or Wild River	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
27	State land designated for wildlife or game management	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
28	State-designated Scenic or Wild River	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
29	State-designated Natural Areas	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
30	Particular areas, relatively small in size, important to maintenance of unique biotic communities	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
31	State-designated areas for protection or maintenance of aquatic life	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
32	Wetlands	<input type="checkbox"/> / <input checked="" type="checkbox"/>	
33	Fragile landscapes, land sensitive to degradation if vegetative habitat or cover diminishes	<input type="checkbox"/> / <input checked="" type="checkbox"/>	

Notes:

^a Based on EPA, 1990, 55 FR 51624, Table 4-23 – Sensitive Environments Rating Values, Dec. 14, 1990; EPA, 1997, ERAGS, Exhibit 1-1 List of Sensitive Environments.

**Table 3-1
Field Sample Summary
Strother Field, Cowley County, Kansas**

Location ID	Sample Number	Sample Purpose	Sample Type	Sample Date	Start Depth (ft)	End Depth (ft)	Laboratory Sample ID	Lead by SW-846 6020
Range Complex No. 1 - Pistol Range								
124A001	NWO-124-0001	REG	SS	20-Oct-09	0	0.17	D9J230370001	X
	NWO-124-0001-MS	MS	SS	20-Oct-09	0	0.17	D9J230370001S	X
	NWO-124-0001-MSD	MSD	SS	20-Oct-09	0	0.17	D9J230370001D	X
124A002	NWO-124-0002	REG	SS	20-Oct-09	0	0.17	D9J230370002	X
124A003	NWO-124-0003	REG	SS	20-Oct-09	0	0.17	D9J230370003	X
124A004	NWO-124-0004	REG	SS	20-Oct-09	0	0.17	D9J230370004	X
	NWO-124-0013	FD	SS	20-Oct-09	0	0.17	D9J230370013	X
124A005	NWO-124-0005	REG	SS	20-Oct-09	0	0.17	D9J230370005	X
124A006	NWO-124-0006	REG	SS	20-Oct-09	0	0.17	D9J230370006	X
124A007	NWO-124-1001	REG	SD	21-Oct-09	0	0.17	D9J230370015	X
	NWO-124-2001	REG	SW	21-Oct-09	---	---	D9J230367001	X
Range Complex No. 1 - Skeet Range								
124A008	NWO-124-0007	REG	SS	20-Oct-09	0	0.17	D9J230370007	X
124A009	NWO-124-0008	REG	SS	20-Oct-09	0	0.17	D9J230370008	X
124A010	NWO-124-0009	REG	SS	20-Oct-09	0	0.17	D9J230370009	X
124A011	NWO-124-0010	REG	SS	20-Oct-09	0	0.17	D9J230370010	X
124A012	NWO-124-0011	REG	SS	20-Oct-09	0	0.17	D9J230370011	X
124A013	NWO-124-0012	REG	SS	20-Oct-09	0	0.17	D9J230370012	X
	NWO-124-0014	FD	SS	20-Oct-09	0	0.17	D9J230370014	X
124A014	NWO-124-1002	REG	SD	21-Oct-09	0	0.17	D9J230370016	X
	NWO-124-2002	REG	SW	21-Oct-09	---	---	D9J230367002	X
	NWO-124-2003	FD	SW	21-Oct-09	---	---	D9J230367003	X

**Table 3-1
Field Sample Summary
Strother Field, Cowley County, Kansas**

Location ID	Sample Number	Sample Purpose	Sample Type	Sample Date	Start Depth (ft)	End Depth (ft)	Laboratory Sample ID	Lead by SW-846 6020
Background								
124A015	NWO-124-5001	REG	SS	20-Oct-09	0	0.17	D9J230373001	X
	NWO-124-5001-MS	MS	SS	20-Oct-09	0	0.17	D9J230373001S	X
	NWO-124-5001-MSD	MSD	SS	20-Oct-09	0	0.17	D9J230373001D	X
124A016	NWO-124-5002	REG	SS	20-Oct-09	0	0.17	Sample was compromised during shipment; not analyzed by the laboratory	
124A017	NWO-124-5003	REG	SS	20-Oct-09	0	0.17	D9J230373002	X
124A018	NWO-124-5004	REG	SS	20-Oct-09	0	0.17	D9J230373003	X
124A019	NWO-124-5005	REG	SS	20-Oct-09	0	0.17	D9J230373004	X
124A020	NWO-124-5006	REG	SS	20-Oct-09	0	0.17	D9J230373005	X
124A021	NWO-124-5007	REG	SS	20-Oct-09	0	0.17	D9J230373006	X
124A022	NWO-124-5008	REG	SS	20-Oct-09	0	0.17	D9J230373007	X
124A023	NWO-124-5009	REG	SS	20-Oct-09	0	0.17	D9J230373008	X
124A024	NWO-124-5010	REG	SS	20-Oct-09	0	0.17	D9J230373009	X
124A025	NWO-124-5011	REG	SD	21-Oct-09	0	0.17	D9J230373010	X
	NWO-124-5012	FD	SD	21-Oct-09	0	0.17	D9J230373011	X
	NWO-124-6001	REG	SW	21-Oct-09	---	---	D9J230367004	X
	NWO-124-6001-MS	MS	SW	21-Oct-09	---	---	D9J230367004S	X
	NWO-124-6001-MSD	MSD	SW	21-Oct-09	---	---	D9J230367004D	X

Notes:

X - Indicates a sample was collected and analyzed for the given parameter

ID - identification

ft - feet

REG - regular field sample

FD - field duplicate sample

MS - matrix spike

MSD - matrix spike duplicate

SS - surface soil (0 - 0.5ft below ground surface)

SD - sediment

SW - surface water

**Table 3-2
Surface Soil Background Concentrations
Strother Field, Cowley County, Kansas**

Location			124A015				124A017				124A018				124A019				124A020			
Sample Number			NWO-124-5001				NWO-124-5003				NWO-124-5004				NWO-124-5005				NWO-124-5006			
Sample Date			20-Oct-09				20-Oct-09				20-Oct-09				20-Oct-09				20-Oct-09			
Sample Depth (ft bgs)			0 to 0.17				0 to 0.17				0 to 0.17				0 to 0.17				0 to 0.17			
Sample Purpose			REG				REG				REG				REG				REG			
Fraction	Parameter	Units	Result	PQL	MDL	VQ	Result	PQL	MDL	VQ	Result	PQL	MDL	VQ	Result	PQL	MDL	VQ	Result	PQL	MDL	VQ
Metals	Lead	mg/kg	16.7	0.36	0.0164		16	0.376	0.0171		15	0.352	0.016		17.1	0.348	0.0158		16.7	0.388	0.0176	

Notes:

- ft - feet
- bgs - below ground surface
- mg/kg - milligrams per kilogram
- PQL - practical quantitation limit
- MDL - method detection limit
- REG - regular field sample
- VQ - validation qualifier

**Table 3-2
Surface Soil Background Concentrations
Strother Field, Cowley County, Kansas**

Location			124A021				124A022				124A023				124A024			
Sample Number			NWO-124-5007				NWO-124-5008				NWO-124-5009				NWO-124-5010			
Sample Date			20-Oct-09				20-Oct-09				20-Oct-09				20-Oct-09			
Sample Depth (ft bgs)			0 to 0.17				0 to 0.17				0 to 0.17				0 to 0.17			
Sample Purpose			REG				REG				REG				REG			
Fraction	Parameter	Units	Result	PQL	MDL	VQ												
Metals	Lead	mg/kg	16.8	0.384	0.0175		17.2	0.368	0.0167		17.3	0.368	0.0167		16.3	0.372	0.0169	

Notes:

- ft - feet
- bgs - below ground surface
- mg/kg - milligrams per kilogram
- PQL - practical quantitation limit
- MDL - method detection limit
- REG - regular field sample
- VQ - validation qualifier

**Table 3-3
Sediment Background Concentrations
Strother Field, Cowley County, Kansas**

Location			124A025				124A025			
Sample Number			NWO-124-5011				NWO-124-5012			
Sample Date			21-Oct-09				21-Oct-09			
Sample Depth (ft bgs)			0 to 0.17				0 to 0.17			
Sample Purpose			REG				FD			
Fraction	Parameter	Units	Result	PQL	MDL	VQ	Result	PQL	MDL	VQ
Metals	Lead	mg/kg	9.6	0.368	0.0167		9.09	0.384	0.0175	

Notes:

ft - feet

bgs - below ground surface

mg/kg - milligrams per kilogram

PQL - practical quantitation limit

MDL - method detection limit

REG - regular field sample

FD - field duplicate sample

VQ - validation qualifier

**Table 3-4
Surface Water Background Concentrations
Strother Field, Cowley County, Kansas**

Location				124A025			
Sample Number				NWO-124-6001			
Sample Date				21-Oct-09			
Sample Purpose				REG			
Fraction	Parameter	Filtered	Units	Result	PQL	MDL	VQ
Metals	Lead	N	µg/L	1.41	3	0.18	J

Notes:

µg/L - micrograms per liter

PQL - practical quantitation limit

MDL - method detection limit

REG - regular field sample

VQ - validation qualifier

Validation Qualifier Definitions

J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed

**Table 3-5
Human Health Screening Criteria for Surface Soil and Sediment
Strother Field, Cowley County, Kansas**

Analyte	KDHE RSK Residential Scenario Soil Pathway ^a	EPA Regional Screening Level Residential Soil ^b	Final SI Screening Level ^c	PQL
Metals (mg/kg)				
Lead	400	400	400	0.4

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.

**Table 3-6
Human Health Screening Criteria for 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

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 Final Screening Value selected using the lower of the following:

1. State Value (Kansas)
2. EPA Regional Screening Level
3. Federal Ambient Water Criteria

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.

**Table 4-1
Comparison of Surface Soil Results to Site Inspection Screening Levels
Strother Field, Cowley County, Kansas**

Sub-Range					Skeet Range				Skeet Range				Skeet Range				Skeet Range			
Location					124A008				124A009				124A010				124A011			
Sample Number					NWO-124-0007				NWO-124-0008				NWO-124-0009				NWO-124-0010			
Sample Date					20-Oct-09				20-Oct-09				20-Oct-09				20-Oct-09			
Sample Depth (ft bgs)					0 to 0.17				0 to 0.17				0 to 0.17				0 to 0.17			
Sample Purpose					REG				REG				REG				REG			
Fraction	Parameter	Units	Site Inspection Background 95th UTL / 95th Percentile	Site Inspection Human Health Screening Level	Result	PQL	MDL	VQ	Result	PQL	MDL	VQ	Result	PQL	MDL	VQ	Result	PQL	MDL	VQ
Metals	Lead	mg/kg	18.7	400	23.7	0.36	0.0164		126	0.364	0.0166		120	0.388	0.0176		378	0.396	0.018	

Notes:

[**Bold Face**] - Result exceeds Site Inspection Background 95th UTL / 95th Percentile

[*Italicized*] - Result exceeds Site Inspection Human Health Screening Level

ft - feet

bgs - below ground surface

mg/kg - milligrams per kilogram

UTL - upper tolerance limit

PQL - practical quantitation limit

MDL - method detection limit

REG - regular field sample

FD - field duplicate sample

VQ - validation qualifier

**Table 4-1
Comparison of Surface Soil Results to Site Inspection Screening Levels
Strother Field, Cowley County, Kansas**

Sub-Range					Skeet Range				Skeet Range				Skeet Range				Pistol Range			
Location					124A012				124A013				124A013				124A001			
Sample Number					NWO-124-0011				NWO-124-0012				NWO-124-0014				NWO-124-0001			
Sample Date					20-Oct-09				20-Oct-09				20-Oct-09				20-Oct-09			
Sample Depth (ft bgs)					0 to 0.17				0 to 0.17				0 to 0.17				0 to 0.17			
Sample Purpose					REG				REG				FD				REG			
Fraction	Parameter	Units	Site Inspection Background 95th UTL / 95th Percentile	Site Inspection Human Health Screening Level	Result	PQL	MDL	VQ												
Metals	Lead	mg/kg	18.7	400	364	0.364	0.0166		50.5	0.368	0.0167		51.7	0.372	0.0169		22	0.364	0.0166	

Notes:

[**Bold Face**] - Result exceeds Site Inspection Background 95th UTL / 95th Percentile

[*Italicized*] - Result exceeds Site Inspection Human Health Screening Level

ft - feet

bgs - below ground surface

mg/kg - milligrams per kilogram

UTL - upper tolerance limit

PQL - practical quantitation limit

MDL - method detection limit

REG - regular field sample

FD - field duplicate sample

VQ - validation qualifier

**Table 4-1
Comparison of Surface Soil Results to Site Inspection Screening Levels
Strother Field, Cowley County, Kansas**

Sub-Range					Pistol Range				Pistol Range				Pistol Range				Pistol Range			
Location					124A002				124A003				124A004				124A004			
Sample Number					NWO-124-0002				NWO-124-0003				NWO-124-0004				NWO-124-0013			
Sample Date					20-Oct-09				20-Oct-09				20-Oct-09				20-Oct-09			
Sample Depth (ft bgs)					0 to 0.17				0 to 0.17				0 to 0.17				0 to 0.17			
Sample Purpose					REG				REG				REG				FD			
Fraction	Parameter	Units	Site Inspection Background 95th UTL / 95th Percentile	Site Inspection Human Health Screening Level	Result	PQL	MDL	VQ												
Metals	Lead	mg/kg	18.7	400	47.2	0.368	0.0167		34.9	0.368	0.0167		36.1	0.356	0.0162		37.8	0.384	0.0175	

Notes:

[**Bold Face**] - Result exceeds Site Inspection Background 95th UTL / 95th Percentile

[*Italicized*] - Result exceeds Site Inspection Human Health Screening Level

ft - feet

bgs - below ground surface

mg/kg - milligrams per kilogram

UTL - upper tolerance limit

PQL - practical quantitation limit

MDL - method detection limit

REG - regular field sample

FD - field duplicate sample

VQ - validation qualifier

**Table 4-1
Comparison of Surface Soil Results to Site Inspection Screening Levels
Strother Field, Cowley County, Kansas**

Sub-Range					Pistol Range				Pistol Range			
Location					124A005				124A006			
Sample Number					NWO-124-0005				NWO-124-0006			
Sample Date					20-Oct-09				20-Oct-09			
Sample Depth (ft bgs)					0 to 0.17				0 to 0.17			
Sample Purpose					REG				REG			
Fraction	Parameter	Units	Site Inspection Background 95th UTL / 95th Percentile	Site Inspection Human Health Screening Level	Result	PQL	MDL	VQ	Result	PQL	MDL	VQ
Metals	Lead	mg/kg	18.7	400	53.6	0.372	0.0169		32.2	0.372	0.0169	

Notes:

[**Bold Face**] - Result exceeds Site Inspection Background 95th UTL / 95th Percentile

[*Italicized*] - Result exceeds Site Inspection Human Health Screening Level

ft - feet

bgs - below ground surface

mg/kg - milligrams per kilogram

UTL - upper tolerance limit

PQL - practical quantitation limit

MDL - method detection limit

REG - regular field sample

FD - field duplicate sample

VQ - validation qualifier

**Table 4-2
Comparison of Sediment Results to Site Inspection Screening Levels
Strother Field, Cowley County, Kansas**

Sub-Range					Skeet Range				Pistol Range			
Location					124A014				124A007			
Sample Number					NWO-124-1002				NWO-124-1001			
Sample Date					21-Oct-09				21-Oct-09			
Sample Depth (ft bgs)					0 to 0.17				0 to 0.17			
Sample Purpose					REG				REG			
Fraction	Parameter	Units	Background Threshold Level	Site Inspection Human Health Screening Level	Result	PQL	MDL	VQ	Result	PQL	MDL	VQ
Metals	Lead	mg/kg	28.8	400	26.2	0.372	0.0169		11.1	0.38	0.0173	

Notes:

[**Bold Face**] - Result exceeds Background Threshold Level

[*Italicized*] - Result exceeds Site Inspection Human Health Screening Level

ft - feet

bgs - below ground surface

mg/kg - milligrams per kilogram

PQL - practical quantitation limit

MDL - method detection limit

REG - regular field sample

VQ - validation qualifier

Table 4-3
Comparison of Surface Water Results to Site Inspection Screening Levels
Strother Field, Cowley County, Kansas

Sub-Range						Skeet Range				Skeet Range				Pistol Range			
Location						124A014				124A014				124A007			
Sample Number						NWO-124-2002				NWO-124-2003				NWO-124-2001			
Sample Date						21-Oct-09				21-Oct-09				21-Oct-09			
Sample Purpose						REG				FD				REG			
Fraction	Parameter	Filtered	Units	Background Threshold Level	Site Inspection Human Health Screening Level	Result	PQL	MDL	VQ	Result	PQL	MDL	VQ	Result	PQL	MDL	VQ
Metals	Lead	N	µg/L	4.23	15	1.29	3	0.18	J	1.36	3	0.18	J	1.15	3	0.18	J

Notes:

[**Bold Face**] - Result exceeds Background Threshold Level

[*Italicized*] - Result exceeds Site Inspection Human Health Screening Level

µg/L - micrograms per liter

PQL - practical quantitation limit

MDL - method detection limit

REG - regular field sample

FD - field duplicate sample

VQ - validation qualifier

Validation Qualifier Definitions

J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.