GEOPHYSICAL PROSPECTION AND ARCHEOLOGICAL INVESTIGATIONS OF THE PROPOSED BRIDGE REPLACEMENT, ENTRANCE ROAD REALIGNMENT, AND NEW VISITOR PARKING LOT PROJECT AT THE FORT LARNED NATIONAL HISTORIC SITE, 14PA305, PAWNEE COUNTY, KANSAS

By
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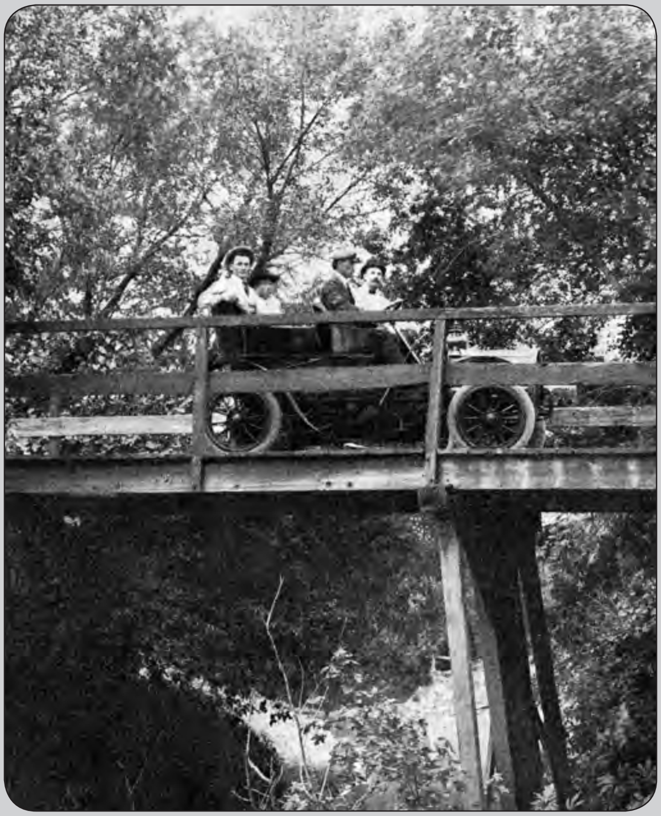

MIDWEST ARCHEOLOGICAL CENTER
Technical Report: No. 132

United States Department of the Interior
National Park Service
Lincoln, Nebraska

2012

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Cover photo caption:
Rambler Automobile on the old government bridge
which spans the Pawnee Creek near Fort Larned, Kansas
(Courtesy of Fort Larned National Historic Site)

This report has been reviewed against the criteria contained in 43CFR Part 7, Subpart A, Section 7.18 (a) (1) and, upon recommendation of the Midwest Regional Office and the Midwest Archeological Center, has been classified as

Available

Making the report available meets the criteria of 43CFR Part 7, Subpart A, Section 7.18 (a) (1).

ABSTRACT

The National Park Service's Midwest Archeological Center staff with Volunteer-In-Parks participants conducted geophysical investigations of the underground electric line installation construction project at the Fort Larned National Historic Site (14PA305) in Pawnee County, Kansas. The geophysical investigations were conducted between July 13 and July 18, 2009. The investigations were requested by the FOLS resource manager at the Fort Larned National Historic Site. The project was located along the western side of the fort next to the row of Officers' Quarters. The geophysical survey included a magnetic survey with dual fluxgate gradiometer and a resistance survey with a resistance meter and twin probe array. The geophysical survey was conducted in an attempt to identify any buried archeological remains associated with the fort in the vicinity of the construction project for the installation of the park's underground electric line. The archeological monitoring of the underground electric line installation occurred between November 17 and 19, 2009. The monitoring activities included the documentation of the installation line and new transformer locations with a global positioning system unit and the monitoring of excavations for the directional boring access pits. The geophysical survey identified numerous buried archeological remains associated with the remnants of the military activities at the site, as well as more recent 19^{th} and 20^{th} century farming and park activities at the site. The total area investigated by the geophysical survey in the FOLS geophysical project area was 16,161 m^2 or 3.99 acres.

ACKNOWLEDGEMENTS

This project was completed with the support and assistance from the Fort Larned National Historic Site staff. Sincere appreciation is extended to the FOLS Superintendent Kevin McMurry, the FOLS Chief of Resource Management George Elmore, and the FOLS Facility Manager Bill Chapman who participated in the planning and implementation of the geophysical survey and archeological excavation project. All of the FOLS park staff went out of their way to make the MWAC crew feel welcome and provided assistance in getting the work done efficiently, safely, and as comfortably as possible during the archeological investigations.

At the Midwest Archeological Center, we would like to thank Dr. Mark Lynott (MWAC Manager) and Dr. Ralph Hartley (MWAC Archeological Assistance and Partnership Program Manager) for their direction, leadership, and support during the project. We also appreciate the geophysical survey and archeological excavation efforts of the MWAC field crew: Blair Benton, Michael Favell, Curt Sedlacek, and David Wolf. We are also grateful for the support provided by Administrative Officer Jill Lewis, and the rest of the MWAC staff for all of their help without which this project would not have been completed as smoothly or efficiently as it was. Darin Schlake, Bryttie Duren, and Bailey Koziol provided logistical, computer, transportation, and personnel support during the project while Alan Weber, Jeff Larson, and Dustin Gonzales provided editing and report preparation in the publishing of this document. We are grateful for their review comments of the draft manuscript.

We would also like to extend our gratitude to the Denver Service Center staff for their assistance and guidance on the project. Tracy Cudworth served as the project leader. Lee Terzis was the National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) specialist for the project and compiled the Planning, Environment, and Public Comment documents (PEPC) for the project compliance activities. We would also like to recognize the Midwest Region's Federal Lands Highways Program (FLHP) coordinator Wayne Vander Tuin for his support of the project at the Fort Larned National Historic Site.

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1. INTRODUCTION

The geophysical survey and archeological investigations at five selected geophysical project area locations within the Fort Larned National Historic Site (Site 14PA305), in Pawnee County, Kansas (Figure 1), were conducted as part of the National Park Service's (NPS) Midwest Archeological Center (MWAC) archeological assistance to the park's construction and compliance activities related to the removal of the existing highway bridge across Pawnee Fork (also referred to as the Pawnee River) on the northwest side of the fort, the proposed construction of a new pedestrian bridge at the southwest corner of the fort quadrangle, and the realignment of the entrance road and parking lot location to the left side of Pawnee Fork near the southwest corner of the fort buildings and parade ground (Bringelson 2010; De Vore 2010). The archeological investigations were requested by the Transportation Division staff of the NPS Denver Service Center (DSC), to evaluate the archeological resources in the parking lot, entrance road, and pedestrian bridge construction zones in compliance with Section 106 of the National Historic Preservation Act of 1966 as amended through 2006 (NPS 2006a:35-99). In order to facilitate the development of the project's Environmental Assessment (EA), the DSC staff contacted MWAC to conduct a reconnaissance survey of alternative locations for the proposed bridge replacement, entrance road re-alignment, and a new visitor parking lot construction. As part of the reconnaissance level survey, geophysical prospection techniques were used to identify and pinpoint possible archeological features. Once the features were identified, archeological testing consisting of shovel/auger testing and excavation units were used to investigate the geophysical anomalies. Aerial photographs were also analyzed to provide information of the nature of the geophysical anomalies and to identify potential river crossings and military bridge locations.

Fort Larned National Historic Site (FOLS) was authorized by legislation enacted by the Congress of the United States in 1964 under Public Law 88-541 (FOLS 1995:6). The national historic site was established to commemorate the significant role of the fort in the opening of the West. The law provided for the acquisition of 750 acres of land including the fort site and nearby remains of the Santa Fe Trail along with scenic easements. Fort Larned served as base of military operations against the hostile Plains Indians and for protection of commerce along the eastern part of the Santa Fe Trail during the 1860s and 1870s. The military post also served as the Indian Bureau Agency for the administration of the terms of the Fort Wise Treaty of 1861 with the Central Plains Indian tribes.

The proposed DSC construction project calls for the demolition of the deteriorating 95-meter length concrete highway bridge across Pawnee Fork that served the park's historic core and accessible parking area (Bringelson 2010). Approximately 2425 square meters of gravel and paved accessible parking areas will also be removed. A wooden pedestrian bridge will be constructed near the historic military crossing of Pawnee Fork at the southwest corner of the row of Officers' Quarters on the west side of the fort's parade ground. The pedestrian bridge will be constructed to represent the 1874 military style structure. The two-lane, paved entrance road will be extended approximately 0.65 kilometers along the left bank of Pawnee Fork to the location of the proposed paved 50-space parking lot, which will connect to the fort's historic core by means of the wooden pedestrian bridge across Pawnee Fork and accessible walkway. In order to determine the effects of the construction project impacts on the park's buried archeological resources, the DCS planning staff requested an archeological inventory and evaluation of the Areas of Potential Effect (APE) associated with two possible alternative actions to achieve the desired project results (Figure 2). The potential impact areas for the two construction alternatives cover approximately 157,000 m^2 or 38.80 acres. Approximately 60% of the potential impact area (92,000 m2 or 22.73 acres) lies in open grassy areas of the park and has not been subjected to an archeological inventory (Figure 3).

The archeological and geophysical investigations were conducted from August 2 to August 20, 2010, along the western side of the fort next to the row of Officers' Quarters and on the left side of Pawnee Fork to the west and north of the fort quadrangle. The geophysical survey included a magnetic survey with dual fluxgate gradiometer, three limited resistance surveys with a resistance meter and twin probe array, and a small ground penetrating radar survey with a gpr cart system and 400 mHz antenna. These techniques offered inexpensive, rapid, and relatively non-destructive and non-invasive methods of identifying buried archeological resources and site patterns, which were detectable and also provided a means for sampling relatively large areas in an efficient manner (Roosevelt 2007:444-445; and Von Der Osten-Woldenburg 2005:621-626). The geophysical survey was conducted in order to identify buried archeological remains associated with the fort in the vicinity of the proposed construction corridor and area of potential effect associated with the proposed bridge removal and bridge and parking lot replacement project. In addition to the geophysical survey of the proposed construction zone, targeted shovel/auger tests were strategically placed within the project areas to test and refine geophysical interpretations of the various anomalies. The shovel/auger test transect will be placed in the areas of the proposed pedestrian bridge crossing and the proposed location of the parking lot. Formal excavation units will also be placed over geophysical anomalies to provide complementary data on the nature and potential significance of the buried archeological features.

2. ENVIRONMENTAL SETTING

Fort Larned National Historic Site is located within the Plains Border section of the Great Plains province of the Interior Plains division of the North American continent (Fenneman 1931:25-30). The site also lies within the Rolling Plains and Breaks land resource region of the Central Great Plains Winter Wheat and Range Region major land resource area (USDA 2006:195-196,200-202). The region consists of submature to mature dissected plains. The dissected plains are broad with undulating and rolling uplands that generally contain narrow valleys with steep hilly side slopes. Local relief in the region is measures in meters to tens of meters. However, broad flood plains and terraces occur along the larger rivers. Fort Larned is located on the right or south bank of the Pawnee Fork, a tributary of the Arkansas River. The area surrounding Fort Larned is relatively flat with featureless terraces and bottom lands of the Great Bend lowland region of the Arkansas River lowlands (Schoewe 1949:291-296). The area is transected by numerous abandoned channels of the Pawnee Fork. Sedimentary rock outcrops in the county range from the Cretaceous to Quaternary Periods (McLaughlin 1949; Schoewe 1949:261-273). Terrace deposits along the Pawnee Fork consist of Pleistocene and Holocene Epoch alluvium from the Quaternary Period; however, some of the alluvial deposits may date to the Tertiary Period.

The area also lies on the western edge of the Illinoian biotic province (Dice 1943:21-23). The native vegetation is dominated by mixed grass prairie vegetation, which consists of tall and mid-height grasses. Little bluestem, big bluestem, switchgrass, sideoats grama, and western wheatgrass represent the major grass species (Brown 1985:46-53; Dodge and Roth 1978:65; Küchler 1974; Shelford 1963:334-344; USDA 2006:202). Stands of cottonwoods occur on the flood plains along the major rivers. Numerous species of fords are also present including sunflowers, goldenrods, and ragweed. Wildlife in the region includes white-tailed deer, coyote, raccoon, black-tailed jackrabbit pheasant, bobwhite quail, meadowlark, and mourning dove along with a variety of songbirds, rodents and smaller mammals, reptiles, amphibians, insects, and aquatic fauna including bass, catfish, bluegill, and bullhead (Brown 1985:46-53; Shelford 1963:334-344; USDA 2006:202). Bison, pronghorn antelope, elk, and wolves were present in the region during the prehistoric and early historic periods.

Mollisols dominate the soil groups in the region (Foth and Schafer 1980:111-142; USDA 2006:202). Entisols are also present but to a lesser extent (Foth and Schafer 1980:37-62; USDA 2006:202). The loamy to clayey soils range from shallow to very deep and moderately well drained to somewhat excessively drained. The soil temperature is a mesic regime. The soils also have an ustic soil moisture regime (USDA 2006:202). Within the immediate project area, the soils belong to the New Cambria-Bridgeport-Hord soil association identified by *deep, nearly level, well drained and moderately well drained soils that have a silt loam to silty clay subsoil* (Dodge and Roth 1978:4). The soil within the project areas A, B, D, and E is identified as a Bridgeport silt loam (soil mapping unit Br) with 0 to 2 percent slopes (Dodge and Roth 1978:8,37). The nearly level Bridgeport soil is a deep, well drained soil is found on low terraces, which is occasionally flooded. The silt loam soil is formed in silty alluvial sediments on long, convex areas adjacent to major stream. It is moderately permeable with a high available water capacity. Fertility is high while the runoff rate is slow. The soil has a low shrink-swell potential. The surface layer is very friable. It has a moderately alkaline pH reaction (Dodge and Roth 1978:8,37). Project area C lies within the Uly silt loam (soil mapping unit - Ub) with 1 to 3 percent slopes (Dodge and Roth 1978:20,43-44). The gently sloping Uly soil is a deep, well drained soil is found on convex upland ridgetops and side slopes. The silt loam soil is formed in thick deposits of calcareous loess. It is moderately permeable with a high available water capacity. Fertility is high while the runoff rate is medium. The soil has a moderate shrink-swell potential. The surface layer is friable and easily tilled. It has a mildly to moderately alkaline pH reaction (Dodge and Roth 1978:20,44).

The climate is a temperate continental climate with warm summers and cold winters (Bark 1978:2-3; Trewartha and Horn 1980:299-302; USDA 2006:201). Annual precipitation averages 60 cm. Most of the precipitation occurs in the form of rain between April and September. Snowfalls can be heavy with an annual average of 55 cm. The average annual temperature is 13.4 degrees C with a January daily average of -0.39 degrees C and a July daily average of 26.7 degrees C (Bark 1978:60-61). The region averages a freeze free period of approximately 180 days ranging from 145 to 210 days (USDA 2006:201). The prevailing winds are from the south. Severe windstorms can occur along with occasional tornadoes in well developed thunderstorms (Bark 1978:2-3).

3. CULTURAL HISTORY OF THE FORT LARNED NATIONAL HISTORIC SITE

Little physical evidence is available from archeological investigations of the Fort Larned National Historic Site for the prehistoric occupation of the area (Boszhardt and Bednarchuk 2008). The numerous archeological investigations at the park have focused on the historic military occupation of Fort Larned (MWAC 1998). Information concerning the prehistoric use of the region is summarized in the publications of Robert J Hoard and William E. Banks (2006), Patricia J. O'Brien (1984), John D. Reynolds and William B. Lees (2004), and Waldo R. Wedel (1959). The project area lies within the Arkansas River Lowlands archeological study unit (Brown 1987:XVI-1—XVI-16).

The prehistoric period has been divided into several traditions denoting changes in technology, subsistence, and settlement patterns. The project area lies within the Central Plains Subarea of the Plains archeological cultural area of North America (Willey 1966:311-329). The prehistoric period is generally divided into the Paleoindian (11,000-7,000 B.C), Archaic 7,000 B.C. to A.D. 1), Ceramic (A.D. 1-1500), and Protohistoric (A.D. 1500-1800) periods, although the durations and manifestations of any individual tradition are specific to the local region. The historic period begins in 1541 with the arrival of Coronado's band of Spanish explorers. The historic period (Holt 1990; HPD 1984,1987; Lees 1989; Reynolds and Lees 2004:44-55) has been divided into five separate study contexts including the European and American exploration and contact with Native Americans (1541-1820), American exploration and settlement (1820-1865), rural and agricultural dominance (1865-1900), time of contrasts (1900-1939), and the recent past (1939-present).

Prehistoric Periods

The prehistoric periods have been described in several publications. The prehistoric contexts have been summarized by Patricia J O'Brien (1984) and in the State's prehistoric archeological preservation plan by Kenneth L. Brown (1987:XVI-1—XVI-16) and Kenneth L. Brown and Marie E. Brown (1987:IX-1—IX-26). These include the Paleoindian Period (11,000 to 7,000 B.C.), the Archaic Period (7,000 B.C.to A. D. 1), the Ceramic Period (A.D. 1-1500), and the Protohistoric Period (A.D. 1500-1541).

The Paleoindian Period in the Arkansas River lowlands is poorly represented in the archeological record (Blackmar and Hofman 2006:46-75; Brown and Brown 1987:IX-16—IX-24; O'Brien 1984:27-37; Reynolds and Lees 2004:11-14; Wedel 1959:536-538). The Paleoindians are represented by small bands of nomadic hunter-gatherers who subsisted off large game animals such as mammoths and bison, as well as other Pleistocene fauna and supplemented their diets with seeds, roots, berries, nuts, and small animals. The Paleoindian Period is divided into three stages based on projectile point forms: 1) Llano or Clovis Complex (11,000-9,000 B.C.), 2) Folsom Complex (9,000-8,000 B.C.), and 3) Plano Complexes (8,000-7,000 B.C.). In the Arkansas River lowlands, the Paleoindian period is represented by isolated finds of Clovis and later Paleoindian projectile points (Brown and Brown 1987:IX-1—IX-26).

The Archaic Period represents a shift in the reliance on large game to an increasing diversity of technologies associated with hunting, fishing, trapping, foraging, plant processing, and woodworking. The Archaic is further divided into the Early (6,000-5,000 B.C.), Middle (5,000-2,000 B.C.), and Late Archaic (2,000 B.C-A. D. 1) stages with increases in highly regionalized adaptation to local environmental niches and increasing populations (Blackmar and Hofman 2006:46-75; O'Brien 1984:39-44; Reynolds and Lees 2004:14-22; Wedel 1959:538-542). Stemmed and notched projectile points dominate the tool kit. Ground stone tools are being incorporated into the Archaic tool kit for grinding seeds into meal. Subsistence consists of a season round of exploitation of a diversity of faunal and floral resources. Habitation sites are becoming more permanent with increasing populations. The Archaic period within the Arkansas River lowlands is not very well represented.

The Ceramic Period spans the Early Ceramic or Plains Woodland period (A.D. 1-1000), the Middle Ceramic period (A.D. 900-1500), and the Late Ceramic or Protohistoric period (A.D. 1500-1825). The Early Ceramic period is marked by the introduction of pottery, as well as changes in social organization, subsistence strategies, and technology (Bozell 2006:93-104; Logan 2006:76-92; O'Brien 1984:45-55; Reynolds and Lees 2004:22-32; Wedel 1959:542-557). Bow and arrow technology is introduced during the Early Ceramic period. Subsistence is largely based on hunting and intensive plant gathering: however, by the end of the Early Ceramic period, incipient plant domestication is occurring along with the introduction of tropical cultigens such as maize. Mound construction associated with mortuary activities occur across the eastern United States including the eastern and northern parts of Kansas. Hopewellian influences from Ohio are documented in the eastern part of the state. The Early Ceramic period within the Arkansas River lowlands is not very well represented. The Middle Ceramic period in the eastern United States is associated with the Mississippian cultures with their development of urban centers and temple mounds. The Middle Ceramic cultures have adapted a dual economy with maize, squash, and bean agriculture supplemented by hunting and wild food gathering. The bow and arrow becomes widespread during the period. Introduction of the rectangular earthlodge occurs in the northern part of the state associated with the Central Plains Tradition village farmers of the Upper Republican, Nebraska, and Smoky Hill complexes (O'Brien 1984:59-62; Reynolds and Lees 2004:32-41; Roper 2006:105-132; Wedel 1959:557). The Middle Ceramic period in central Kansas, including Pawnee County, is defined by the poorly documented Pratt Culture (Brown 1987:XVI-2—XVI-5; Wedel 1959:503-512). The Pratt complex exhibits aspects of the Central Plains tradition and the Southern Plains cultures. The economy consists of hunting, gathering, and agriculture. Structures consist of flattened sides with rounded and braced corners with four center support posts and a central heart and interior cache pits. Artifacts consist of small, notched and unnotched triangular projectile points, alternately beveled diamond-shaped knives, bone tools, and sand tempered and shell tempered ceramics. The Late Ceramic period, including the protohistoric and early historic tribal periods, consist of the Great Bend aspect, the historic Wichita, and the Dismal River aspect/Plains Apache (Blakeslee and Hawley 2006:165-179; Brown 1987:XVI-6—XVI-16; Lees 1989:69-71,83-84; Marshall 2006:219-232; O'Brien 1984:67-78; Reynolds and Lees 2004:41-44; Scheiber 2006:133-150; Vehik 2006:206-218; Wedel 1959:47-82,571-615). The Late Ceramic period represents a period of change in the Great Plains region of Kansas with the arrival of the European explorers in Kansas, including the Spanish under Coronado in 1541 and the French under de Bourgmont in 1724. During this period, specific historic tribes, such as the Kansas, Pawnee, Wichita, and Plains Apache are identifiable in the archeological record. The period ends with the removal of Native American tribes from the Eastern United States into Kansas in the early 1800s. The period presents the development of historic Native American tribes and the initial contact of the tribes with European explorers. The Great Bend aspect in central and southern Kansas is associated with the development of the historic Wichita while the Dismal River aspect is associated with the historic Apache and the Oneota aspect may be associated with the Kansas. The Wichita, Pawnee, and Kansa represent agricultural villagers while the Plains Apache remain nomadic.

Historic Periods

Compared to the prehistoric period in the region, the historic periods are extremely well documented. The initial exploration of the region by Europeans and contact with Native American tribes in Kansas had a profound effect on the native populations during the historic period between 1541 and 1825. The 16th century explorations by the Spanish with Coronado in 1541, Onate in 1601, and Ulibarri in 1706, and the 17th century explorations by the French explorers de Bourgmont in 1724 and Trudeau in 1794 provide written accounts of their observations of the landscape and interactions with Native American tribes (Lees 1989:71; Reynolds and Lees 2004:44-48). The American Lewis and Clark 1804-1086 expedition traveled along the northeastern part of Kansas while Pike in 1806 traveled across Kansas to Colorado and New Mexico. Thomas Say of the Stephen Long expedition provided additional insight into the Kansas territory in 1819 (Lees 1989:69-71).

Between 1820 and 1865, Kansas saw the resettlement of many eastern Native American tribes, as well the establishment of American settlement within the state (HPD 1987; Lees 1989:71-73; Reynolds and Lees 2004:48-51). While the Pawnee, Wichita, and Plains Apache were no longer permanent residents in the state, the Kansa and the Osage remained important state residents. During the late 1820s and the 1830, several eastern woodland tribes including the Sac and Fox, the Ioway, the Illinois, the Otoe, Delaware, Cherokee, Chippewa, and others were resettled in eastern Kansas (O'Brien 1984:79-82). In addition to the Native American tribes, American missionaries and traders moved into the state to work with the tribes. The Santa Fe Trail and the Oregon and California Trails carried American emigrants and commerce across Kansas during this period. Kansas Territory was established in 1854 under the Kansas-Nebraska Act. In 1861, Kansas was admitted to the Union. American settlement occurred rapidly along the eastern third of the state. Settlement during this portion of the period was characterized the establishment of forts, farms, roads, schools, towns, and the completion of the government land office surveys of the state (O'Brien 1984:83-86). In the years leading up to the Civil War and during the Civil War, eastern Kansas was the focus of much violence over the issue of slavery. The Indian War of 1864 resulted in hostilities between the Plains Indians and the American settlers in the state, which also had an effect on the Kansas forts including Fort Larned (Ware 1994).

In North America during the late 1700s and into the mid-1800's; land purchases, wars, and treaties, created change that had an impact to the American landscape, including the Louisiana Purchase, the Mexican-American War, the expansion westward through the means of Manifest Destiny, and the Civil War. To accommodate these changes and to provide security, military forts and outposts were established along the major travel and trade routes. One of these forts, established in 1859 was first labeled as a “camp on the Pawnee River” along the Santa Fe Trail. Later the fort became known as Camp Alert. In 1860 the camp moved and re-named to Fort Larned, to its current location just outside of the current town of Larned, Kansas (Oliva 1982:xi). Fort Larned was named for Col. Benjamin F. Larned, the Paymaster General of the Army. In 1859 Col. Larned was eligible for retirement and the fort was named after him in honor of his service. The Fort was strategically located along Pawnee Fork. It was established to form a eastern front for the overland travels to the New Mexico territory and Fort Union. Fort Larned being roughly midway between the two major forts of Union and Leavenworth served as a respite and sanctuary for travelers along the Santa Fe Trail.

Following the Civil War, Kansas developed from a frontier to a state with a diversified economy during the period of rural and agricultural dominance between 1865 and 1900 (HPD 1984; Lees 1989:73-74; Reynolds and Lees 2004:51-53). Most of these tribes were moved elsewhere by the 1870s, although the Iowa Tribe of Kansas and Nebraska, the Kickapoo Tribe of Indians in Kansas, the Prairie Band Potawatomi Nation, and the Sac and Fox Nation retained reservations within the state to the present day. This opened more land in the state to American settlement. Railroad construction in Kansas began in the late 1860s. The railroads played a significant role in the further development of the state’s agricultural dominance throughout the period. The location of the railroads played an important role in the deciding factor in the location of new towns across the state. During this period, the state’s agricultural economy focused on wheat cultivation and on livestock production and processing. During the early part of the period, Kansas railheads provided shipping points for the Texas cattle drives to the eastern market places. Additional hostilities with the Plains Indians resulted in conflicts during 1867 and 1868. Major General Winfield S. Hancock with troops from Fort Leavenworth and Fort Riley including the newly organized Seventh Cavalry under Lieutenant Colonel George A. Custer camped in the grassy field on the left bank of Pawnee Fork across from the fort buildings and parade ground in April 1867 (Oliva 1997:45-47). By 1870, American settlement in the eastern half of the state was complete. In 1877, large group of Cheyenne left their Oklahoma reservation and crossed Kansas. By 1890, the entire state was settled; however, this was not without severe hardships for the American emigrants. The economic collapse in the 1890s resulted in the decrease in the farming population in the western part of the state; however, this economic downturn was to provide development of the state’s mineral extraction industries, including drilling for oil and natural gas and mining for coal and salt. The Fort Larned military reservation was transferred from the Department of War to the Department of the Interior’s General Land Office in 1883. In 1884, the buildings and lands of the military reservation were sold at public auction and adapted for use as a private ranch (Oliva 1997:93-96; Quinn Evans/Architects 1996:1-1—1-3).

During the time of contrast from 1900 to 1939, the agricultural industry in the state rebounded with increasing mechanization and diversity (Holt 1990; Lees 1989:74-75; Reynolds and Lees 2004:53-54). The mineral extraction industries continued to expand throughout the period. The automobile was becoming an important means of transportation for people and goods during this period. World War I and the Great Depression also had significant impacts on the state's economy and population. The 1930s drought had a major impact on the state, especially in the agricultural region in western Kansas.

The recent past from 1939 to the present resulted in many major changes in the nation, which were also represented in the state (Lees 1989:75; Reynolds and Lees 2004:54-55). World War II had a major impact on the state's population with increases in military training at the army and army air corps bases and the deployment of the fighting men overseas. Women filled the industrial and manufacturing roles that the men had occupied prior to the start of the war. Prisoner-of-War camps were established throughout the state. Following the war, the period continued to see a decline in the rural population with smaller farms and communities suffering from the movement away from the rural areas to larger urban areas. Following the war large-scale land leveling and agricultural terracing make it possible for fewer farmers to grow the crops and livestock needed to produce the grain, dairy, and meat for public consumption. Federal highway and reservoir construction also altered the landscape. In 1957, the Fort Larned Historical Society was founded and opened the old fort to the public. The Fort Larned site was designated a National Historic Landmark in 1960. In 1964, Congress authorized the establishment of the Fort Larned National Historic Site as a national park. The fort property was acquired by the National Park Service in 1966. The National Park Service continued to restore the fort's buildings to represent the 1868 military use since becoming a National Historic Site (Oliva 1997:96-99; Quinn Evans/Architects 1996:2-28—2-30).

4. PREVIOUS CULTURAL RESOURCE INVESTIGATIONS

The cultural resource investigations at the Fort Larned National Historic Site have produced numerous archeological reports, which are summarized in the cultural sites inventory for the park (MWAC 1998,2007). The first archeological investigations at the site in the late 1960s, the 1970s, the 1980s, and the 1990s occurred as preliminary steps in the reconstruction of the military post (Albright and Scott 1974; Dial 1991; Hunt 1983; Griffin 1991; Monger 1981; Perttula and Shaw 1980; Richner 1979; Scott 1974,1975, 1998a,1998b; Spears 1978; Sudderth 1981,1983a,1983b; Thiessen 1983; Zalucha and Olinger 1976a,1976b). Other archeological projects in the 1970s included the archeological survey of a detached landholding containing trail ruts associated with the Santa Fe Trail southwest of the park (Nickel 1975), the archeological survey of the a proposed sandstone quarry exhibit (Nickel 1987), salvage archeology associated with the construction of the museum and visitors center (Monger 1976), construction of the maintenance facility (Lees 1984), archeological monitoring of utility line installations and reconstruction activities (Elmore 1983a,1983b, 1984,1986,1988a,1988b,1989; Griffin 1987; Hunt 1990; Monger 1980; Thiessen 1987), and other archeological compliance related projects (Scott 2005). In addition to the archeological investigations, geophysical investigations at the fort included the magnetic survey of HS-3 and suspected privy location (Weymouth 1978), the metal detector survey of the proposed new visitors center location (Scott 1995), the geophysical investigations of the potential location for the Cavalry Stables (Kern and De Vore 1999), and the geophysical investigations and monitoring activities associated with the installation of the buried electric line (Baier 2009; De Vore 2009; De Vore and Baier n.d.) .

A number of histories have been written about Fort Larned and its association with the Santa Fe Trail (Brown 1964; Oliva 1982,1985,1997; Reaves 1995; Unrau 1956; Utley and Watkins 1993). In addition the histories, several historic furnishing studies and structure reports, management documents, and other cultural resource studies related to Fort Larned National Historic Site were compiled for the park since its establishment in 1966 (Albright and Scott 1974; Clemensen 1978,1980; Cockrell et al. 1991; FOLS 1988,1995; MWRO 1978; Quinn Evans/ Architects 1996,1999; Rickey and Crellin 1967; Sheire 1968,1969; Stinson 1966).

5. PRESENT GEOPHYSICAL AND ARCHEOLOGICAL INVESTIGATIONS

The five archeological/geophysical project areas are located around the northwest and southwest perimeter of the buildings surrounding the quadrangular parade ground and in the open field on the west side or left bank of Pawnee Fork. The investigations are concentrated along the back side of the Officers row of buildings on the west side of the parade ground adjacent to the 2009 geophysical survey area. Geophysical Project Area A is located on the west side of the 2009 geophysical grid along the access road behind the fort's buildings and parade ground (Figure 3). It extends to the irrigation ditch south of the access road. The vegetational coverage consists of domestic grasses, which are kept mown by the park staff. Geophysical Project Area B lies on the left side of Pawnee Fork in a large grassy field (Figure 4), which has been cultivated in the past. The grass is allowed to grow and prescribed burns are conducted on a cyclic basis for control the buildup of dead grass. The project area extends across southern portion of the field along the bank of the Pawnee Fork and along the west side of the paved park entrance road (County Road 242). Geophysical Project Area C is located on the southeast side of the intersection of the paved US Highway 158 and the gravel County Road of 180th Avenue (Figure 5). The project area is also located in the grassy field containing Geophysical Project Area B. Geophysical Project Area D is located on the east side of the 2009 geophysical project area near the southwest corner of the parade ground and Quartermaster's storeroom (Figure 6). It extends to the irrigation ditch south of the access road. The vegetational coverage consists of domestic grasses, which are kept mown by the park staff. Geophysical Project Area E is located on the east side of the 2009 geophysical project area near the northwest corner of the parade ground behind the Enlisted Men's Barracks and Visitors Center, and the Officers' Quarters (Figure 7). It extends to the bank of Pawnee Fork on the north side of the grid. The vegetational coverage consists of domestic grasses, which are kept mown by the park staff.

The 2010 archeological investigations of the proposed parking lot and bridge replacements along with the extension of the entrance road consists of two phases with the geophysical survey representing the first phase and archeological excavations and shovel testing of selected areas within the geophysical project areas that yielded data concerning buried archeological resources that would be impacted by the proposed construction project representing the second phase of the field project. The geophysical phase includes the survey of the project areas with a dual fluxgate gradiometer system, as well as selected areas for additional resistance survey with a resistance meter and twin probe array and ground penetrating radar survey with a gpr cart system and 400 mHz antenna. The formal archeological excavation phase includes the shovel testing of the area proposed for the parking lot, as well as areas that may be impacted by the construction of the pedestrian bridge across the Pawnee Fork between the parking lot and the fort's parade ground at the southwest corner of the Officers' Quarters. Formal excavations were placed in areas where geophysical anomalies suggested the presence of unknown archeological features.

Geophysical Grid Layout

The initial mapping point for the establishment of Geophysical Project Area A was the mapping station used in the establishment of the 2009 geophysical survey grid (De Vore 2009,2010; De Vore and Baier n.d.). The point was located one meter west of the southwest corner of the Company Officers Quarters (HS-7) backyard fence and approximately five centimeters south of the southern fence wall. A second grid point from the 2099 geophysical survey grid along the south side of the Officers' Quarters backyard served as a backsight to establish the geophysical grid's east-west baseline. The baseline orientation was 27 ½ degrees west of magnetic north. After relocating the grid stakes and marking their location with tent pegs along the west side of the 2009 geophysical grid, the 2010 geophysical grid at the Geophysical Project Area A was established using an Ushikata S-25 TRACON surveying compass (Ushikata 2005) and a 100-meter tape measure (Figure 8). Wooden hub stakes for the grid unit corners were placed at 20-meter intervals from the 2009 western grid edge between the park's service road, the river levee, and the irrigation ditch. The grid was triangular shaped and measured 70 meters north-south by 120 meters east-west (Figure 9). Six complete and 13 partial 20-meter by 20-meter grid units, which were used to control the placement of the instruments during data acquisition, were established in the FOLS Geophysical Project Area A (De Vore 2010). The area investigated by the geophysical survey in the FOLS Geophysical Project Area A was 5,082 m^2 or 1.26 acres.

The FOLS Geophysical Project Area B was located in the grassy field to the west of the fort buildings on the left side of Pawnee Fork (Figure 10). The initial mapping station for Area B was 20 meters north of the northeast corner of the bridge over the Pawnee Fork on Country Road 180th Avenue and 10 meters to the east of the road in the grassy field. Using the surveying compass and 100-meter tape, the north-south baseline was established along the western edge of the field next to the county road ditch. The grid was oriented 5.5 degrees west of magnetic north. The initial baseline measured 160 meters. The east-west baseline extended 240 meters. After filling in the corners of the grid units with wooden hub stakes, the grid extended 520 meters north-south by 380 meters east-west. The grid extended from the county road and bridge across the Pawnee Fork along the left bank of the river to the park entrance road near the existing parking lot. One hundred sixteen complete and 13 partial 20-meter by 20-meter grid units were established in the FOLS Geophysical Project Area B (De Vore 2010). The area investigated by the geophysical survey in the FOLS Geophysical Project Area B was 68,308 m^2 or 16.88 acres.

From the mapping station in Area B, a survey line was extended to the northwest corner of the field next to the county road and US highway intersection. The rectangular grid area FOLS Geophysical Area C in the northwest corner of the field measured 35 meters north-south by 100 meters east-west (Figure 11). It also had the same orientation of 5.5 degrees west of magnetic north that Area B had. Five complete and 10 partial 20-meter by 20-meter grid units were established in the FOLS Geophysical Project Area C (De Vore 2010). The area investigated by the geophysical survey in the FOLS Geophysical Project Area C was 3,500 m^2 or 0.86 acres.

FOLS Geophysical Project Area D was located on the east side of the 2009 geophysical grid next to the southwestern corner of the parade ground (Figure 12). The rectangular area measured 60 meters east-west by 120 meters north-south and was oriented on the same bearing as Area A. Seventeen complete and one partial 20-meter by 20-meter grid units were established in the FOLS Geophysical Project Area D (De Vore 2010). The area investigated by the geophysical survey in the FOLS Geophysical Project Area D was 6,990 m^2 or 1.73 acres.

FOLS Geophysical Project Area E was located on the northeast side of the 2009 geophysical grid next to the northwestern corner of the parade ground (Figure 13). The grid extends from the Visitors Center in the Enlisted Men Barracks to the bridge and handicap parking lot. It also extended into the back yards of Officers' Quarters No. 9 and No. 8. The grid block was oriented with the same bearing as the 2009 grid and Area A. The grid block measured approximately 120 meters north-south by 100 meters east-west. Eleven complete and five partial 20-meter by 20-meter grid units were established in the FOLS Geophysical Project Area E (De Vore 2010). The area investigated by the geophysical survey in the FOLS Geophysical Project Area E was 5,968 m^2 or 1.47 acres.

A total area of 89,848 m^2 or 22.20 acres was investigated during the magnetic survey of the five geophysical project areas during 2010. Three areas were surveyed with the resistance meter and twin probe array including one 20-m by 60-m area in Geophysical Project Area A and two locations in Geophysical Project Area B, including a 15-m by 20-m area near the southeast corner of the project area and a 40-m by 40-m area in the southwest corner of Geophysical Project Area B. The total area inventoried during the resistance survey was 2,960 m^2 or 0.73 acres. A 40-m by 60-m area in Geophysical Project Area B was surveyed with the ground penetrating radar cart system and 400 mHz antenna. The gpr survey area totaled 2,400 m^2 or 0.59 acres.

Twenty-meter ropes were placed along the east-west grid lines connecting the grid unit corners. These ropes formed the north and south boundaries of each grid unit during the data collection phase of the survey. Additional ropes were placed at two-meter intervals across the grid unit in a north-south orientation (Figure 14). The survey ropes served as guides during the magnetic data acquisition. The ropes were marked with different color tape at half-meter and meter increments designed to help guide the survey effort. Once the geophysical survey of each grid unit was completed the survey ropes were flipped to the next adjacent grid unit. As the survey activities progressed across the geophysical project area, a sketch map was completed indentifying both cultural and natural surface features in the project area (Figure 15). The geophysical data were acquired across the grid units beginning in the lower left hand corner of each grid unit (Geoscan Research 1987:43-54,2003:5/2-5/11).

The geophysical survey grid corner stakes at the project area within the FOLS geophysical project area were mapped with a Trimble GeoXH global positioning system (GPS) handheld receiver (Figure 16) and external antenna (Trimble 2007a) along with surface features including access roads, the irrigation ditch, trees, the Pawnee Fork bank and levee, etc. The GPS readings at stationary points (i.e., grid unit corners and individual surface features) were collected with 30 readings from five or more satellites while line segment data were collected at one second intervals along the path of the line. The field

GPS data were collected in the universal transverse mercator (UTM) projection for the Zone 14 North coordinates of the North American Datum of 1983 (NAD83) horizontal datum. The data were transferred to a laptop computer via the Trimble TerraSync software (Trimble 2007b,2007c). The data was then differentially corrected using the Trimble Pathfinder Office software (Trimble 2007d) using the continuously operating reference station (CORS) HAVILAND (HVLK) site located 60 kilometers away at Haviland, Kansas (Table 1). Four files were processed with 2777 (93.8%) of 2959 selected positions were code corrected by post-processed. One thousand four hundred sixty-six (49.5%) of 2959 selected positions were carrier corrected by post-processing with one (0.1%) of the code positions chosen over carrier since it was higher quality. The estimated range for the 2959 corrected positions yielded 2.8% within an accuracy range of 0-15 cm, 14.2% within and accuracy range of 15-30 cm, 219.8% within an accuracy range of 30-50 cm, 9.7% within an accuracy range of 0.5-1.0 m, 1.0% within an accuracy range of 1.0-2.0 m, 43.9% within an accuracy range of 2.0-5.0 m, and 8.6% at an accuracy range greater than 5.0 m. The high DOP values resulted from a variety of sources including multi-pathing of the satellite signal through the overhead tree canopy, poor satellite geometry, and the number of satellites present during the collection phase. After the raw survey data in the standard storage format (SSF) was post processed, the corrected data were exported to excel data files and imported into Surfer 9 (Golden Software 2009) for final display. In addition to identifying the locations of the geophysical grid units and other natural and cultural features, locations of linear depressions and/or cuts in the river banks were also recorded with the GPS unit (Figure 17). These locations appear to represent river crossings and potential locations for the military bridge across the Pawnee Fork.

Geophysical Prospection Techniques

Geophysical prospection techniques available for archeological investigations consist of a number of techniques that record the various physical properties of earth, typically in the upper couple of meters; however, deeper prospection can be utilized if necessary. Geophysical techniques are divided between passive techniques and active techniques. Passive techniques are primarily ones that measure inherently or naturally occurring local or planetary fields created by earth related processes under study (Heimmer and DeVore 1995:7,2000:55; Kvamme 2001:356,2005:424). The primary passive method utilized in archeology is magnetic surveying. Other passive methods with limited archeological applications include self-potential methods, gravity survey techniques, and differential thermal analysis. Active techniques transmit an electrical, electromagnetic, or acoustic signal into the ground (Heimmer and DeVore 1995:9,2000:58-59; Kvamme 2001:355-356). The interaction of these signals and buried materials produces altered return signals that are measured by the appropriate geophysical instruments. Changes in the transmitted signal of amplitude, frequency, wavelength, and time delay properties may be observable. Active methods applicable to archeological investigations include electrical resistance/resistivity, electromagnetic conductivity (including ground conductivity and metal detectors), magnetic susceptibility, and ground penetrating radar. Acoustic active techniques, including seismic, sonar, and acoustic sounding, have very limited or specific archeological applications. Additional information on the basic geophysical techniques used during the present survey may be found in publications by Drs. Arnold Aspinall, Chris Gaffney, and Armin Schmidt (2008), Dr.

Bruce Bevan (1991,1998), Dr. Anthony Clark (2000), Dr. Lawrence B. Conyers (2004), Drs. Lawrence B. Conyers and Dean Goodman (1997), Dr. Andrew David (1995,2001), Dr. Rinita Dalan (2008), Drs. Andrew David, Neil Linford, and Paul Linford (2008), Drs. Chris Gaffney and John Gater (2003), Drs. Chris Gaffney, John Gater, and Sue Ovenden (1991,2002), Don H. Heimmer and Steven L. De Vore (1995,2000), Dr. Kenneth Kvamme (2001,2003,2005), Drs. I. Scollar, A. Tabbagh, A. Hesse, and I. Herzog (1990), and Dr. John Weymouth (1986).

Magnetic Survey

A magnetic survey is a passive geophysical survey (see Aspinall et al. 2008; Bevan 1991,1998:29-43; Breiner 1973;1992:313-381; Burger 1992:389-452; Clark 2000:92-98,174-175; Davenport 2001: 50-71; David 1995:17-20; David et al. 2008:20-24; Dobrin and Savit 1988:633-749; Gaffney and Gater 2003:36-42,61-72; Gaffney et al. 1991:6,2002:7-9; Hanson et al. 2005:151-175; Heimmer and DeVore 1995:13,2000:55-56; Kvamme 2001:357-358,2003:441,2005:434-436,2006a:205-233,2006b:235-250; Lowrie 1997:229-306; Milsom 2003:51-70; Mussett and Khan 2000:139-180; Nishimura 2001:546-547; Oswin 2009:43-54,126-135; Robinson and Çoruh 1988:333-444; Scollar et al. 1990:375-519; Telford et al. 1990:62-135; Weymouth 1986:343; and Witten 2006:73-116 for more details on magnetic surveying). A dual system fluxgate gradiometer was used during the geophysical investigations at the five FOLS geophysical project areas.

A magnetic survey is a passive geophysical prospection technique used to measure the earth's total magnetic field at a point location. Its application to archeology results from the local effects of magnetic materials on the earth's magnetic field. These anomalous conditions result from magnetic materials and minerals buried in the soil matrix. Iron artifacts have very strong effects on the local earth's magnetic field. Other cultural features, which affect the local earth's magnetic field, include fire hearths and soil disturbances (e.g., pits, mounds, wells, pithouses, and dugouts), as well as geological strata. Magnetic field strength is measured in nanoteslas (nT; Sheriff 1973:148). In North America, the earth's magnetic field strength ranges from 40,000 to 60,000 nT with an inclination of approximately 60° to 70° (Milsom 2003:43; Weymouth 1986:341). The project area has a magnetic field strength of approximately 59,280 nT (Peddie 1992; Sharma 1997:72-73) with an inclination of approximately 71° 36' (Peddie and Zunde 1988; Sharma 1997:72-73). Magnetic anomalies of archeological interest are often in the ±5 nT range, especially on prehistoric sites. Target depth in magnetic surveys depends on the magnetic susceptibility of the soil and the buried features and objects. For most archeological surveys, target depth is generally confined to the upper one to two meters below the ground surface with three meters representing the maximum limit (Clark 2000:78-80; Kvamme 2001:358). Magnetic surveying applications to archeological investigations have included the detection of architectural features, soil disturbances, and magnetic objects/artifacts (Bevan 1991; Clark 2000;92-98; Gaffney et al 1991:6; Heimmer and DeVore 1995,2000; Weymouth 1986:343).

Two modes of operation for magnetic surveys exist: the total field survey and the gradient survey. The instrument used to measure the magnetic field strength is the magnetometer (Bevan 1998:20). The total field survey uses a single magnetic sensor. Three different types of magnetic sensors have been used in the magnetometer: 1) proton free precession sensors, 2) alkali vapor (cesium or rubidium) sensors, and 3) fluxgate sensors (for a detailed description of the types of magnetometers constructed from these sensors see Clark 2000:66-71; Milsom 2003:45-47; Scollar et al. 1990:450-469; Weymouth 1986:343-344).

The total field magnetometer is designed to measure the absolute intensity of the local magnetic field. This type of magnetometer utilizes a single sensor. Due to diurnal variation of the earth's magnetic field, the data collected with a single sensor magnetometer must be corrected to reflect these diurnal changes. One method is to return to a known point and take a reading that can be used to correct the diurnal variation. A second method is to use two magnetometers with one operated at a fixed base station collecting the diurnal variation in the magnetic field. The second magnetometer is used to collect the field data in the area of archeological interest. Common magnetometers of this types used in archaeological investigations include the proton precession magnetometer, the Overhauser effect magnetometer (a variation of the proton-precession magnetometer), and the cesium magnetometer.

The magnetic gradient survey is conducted with a gradiometer or a magnetometer with two magnetic sensors at a fixed vertical distance apart. The instrument measures the magnetic field at two separate heights. The top sensor reading is subtracted from the bottom sensor reading. The resulting difference is recorded. This provides the vertical gradient or change in the magnetic field. Diurnal variations are automatically canceled. This setup also minimizes long range trends. The gradiometer provides greater feature resolution and potentially provides better classification of the magnetic anomalies. Two commonly used gradiometers in archeological investigations are the cesium gradiometer and the fluxgate gradiometer. They are capable of yielding 5 to 10 measurements per second at a resolution of 0.1 nT (Kvamme 2001:358). Cesium gradiometers record the absolute total field values like the single sensor total field magnetometers. It also records the gradient change between the bottom and top sensors. The fluxgate sensors are highly directional, measuring only the component of the field parallel to the sensor's axis (Clark 2000:69). They also require calibration (Milsom 2003:46-47). Both cesium and fluxgate gradiometers are capable of high density sampling over substantial areas at a relatively rapid rate of acquisition (Clark 2000:69-71; Milsom 2003:46-47).

The dual fluxgate gradiometer system, the Bartington Grad 601-2 single axis magnetic gradiometer (Figure 18), is a vector magnetometer, which measures the strength of the magnetic field in a particular direction (Bartington Instruments 2007). The dual fluxgate gradiometer sensor configuration of the instrument uses two fluxgate gradiometer sensor tubes separated by a distance of one meter. The dual gradiometer records two lines of data during each traverse reducing the distance walked and the survey time by half compared to the time and distance covered with a single gradiometer system. The sensors must be accurately balanced and aligned along the direction of the field component to be measured. The first reference point for balancing and aligning the dual gradiometer is located at N0/E60; however, it was moved to N0/E40 during the course of the magnetic survey. The instrument is aligned on magnetic north. The fluxgate gradiometer sensor tubes in the dual gradiometer are spaced one meter apart with the two tubes also spaced at one meter apart. The instrument is carried so the two sensors in each tube are vertical to one another with the bottom sensors approximately

30 cm above the ground. Each sensor reads the magnetic field strength at its height above the ground. The gradient or change of the magnetic field strength between the two vertical sensors is recorded in the instrument's memory for both sensor tubes. These gradients are not in absolute field values but rather voltage changes, which are calibrated in terms of the magnetic field strength. The dual fluxgate gradiometer also provides a continuous record of the magnetic field strength across each line for each traverse across the grid unit.

The magnetic survey for the dual fluxgate gradiometer was designed to collect eight samples per meter along 1.0-meter traverses or eight data values per square meter at the five FOLS geophysical project areas (Table 2). The data were collected in a zig zag fashion with the surveyor alternating the direction of travel along each traverse across the grid. A total of 3,200 data values were collected for each complete 20 by 20 meter grid unit surveyed during the project. The magnetic data were recorded in the memory of the dual fluxgate gradiometer and downloaded to a field laptop computer when the instrument's memory became full, at the end of the day, and at the completion of the survey in the FOLS geophysical project area. The magnetic data from the dual fluxgate gradiometer were downloaded into the Bartington GRAD 601 software (Bartington 2007). The data were then imported into ARCHAEOSURVEYOR for processing (DW Consulting 2008). Shade and trace plots were generated in the field before the instrument's memory cleared.

Resistance Survey

The resistance survey is an active geophysical technique, which injects a current into the ground (see Bevan 1991,1998:7-18; Burger 1992:241-318; Carr 1982; Clark 2000:27-63,171-174; Davenport 2001:29-30; David 1995:27-28; David et al. 2008:24-28; Dobrin and Savit 1988:750-773; Gaffney and Gater 2003:26-36,56-61; Gaffney et al. 1991:2;2002:7; Hallof 1992: 39-176; Heimmer and DeVore 1995:29-35,2000:59-60; Kvamme 2001:358-362,2003:441-442,2005:434-436; Lowrie 1997:206-219; Milsom 2003:83-116; Mussett and Khan 2000:181-201; Nishimura 2001:544-546; Oswin 2009: 32-43,118-126; Robinson and Çoruh 1988:445-478; Scollar et al. 1990:307-374; Sharma 1997:207-264; Somers 2006:109-129; Telford et al. 1990:522-577; Van Nostrand and Cook 1966; Weymouth 1986:318-341; Witten 2006:299-317; and Zonge et al. 2005:265-300 for more details on resistivity surveys). The voltage is measured and by Ohm's Law, one may compute the resistance at any given point (**R=V/I** where **R** is resistance, **V** is voltage, and **I** is current). Due to the problem of contact resistance between two electrodes in the ground, a typical resistance survey makes use of four electrodes or probes. The current passes through two electrodes and the voltage is measured between the other two probes. The configuration of the electrodes also varies (see Milsom 2003:99 and Weymouth 1986:324 for common configurations).

Resistance or resistivity changes result from electrical properties of the soil matrix. Changes are caused by materials buried in the soil, differences in soil formation processes, or disturbances from natural or cultural modifications to the soil. In archeology, the instrument is used to identify areas of compaction and excavation, as well as, buried objects such as brick or stone foundations. It has the potential to identify cultural features that are affected by the water saturation in the soil, which is directly related to soil porosity, permeability, and chemical mature of entrapped moisture (Clark 2000; Heimmer and De Vore 1995:30). Its application to archeology results from the ability of the instrument to detect lateral changes on a rapid data acquisition, high resolution basis, where observable contrasts exist. Lateral changes in anthropogenic features result from compaction, structural material changes, buried objects, excavation, habitation sites, and other features affecting water saturation (Heimmer and De Vore 1995:37). The resistivity survey may sometimes detect the disturbed soil matrix within the grave shaft.

The Geoscan Research RM15-D resistance meter uses the PA20 multiple probe array (Geoscan Research 2007). Arranged as a twin probe array, a current and voltage probes are located on a mobile frame, which is moved around the site (Figure 19). Two additional probes are located away from the survey area, which also consists of a current probe and voltage probe. The mobile probes are set 0.5 meters apart on the multiprobe array frame. The remote probes are set a distance 30 times the mobile probe separation. The probes on the frame are located at a fixed distance apart. A general rule of thumb for the depth investigation of resistance survey is that the depth is equal to the distance of probe separation. This value is not a unique number but an average for the volume of soil 0.5 meters depth and a surface diameter of 0.5 meters under the center point of the instrument frame. The probes are connected to the resistance meter, which is also on the frame. Wings may be added to the frame to expand the separation distance of the probes; however, this requires the resurvey of the grid for each change in the probe separation distance. The measurement is taken when the mobile probes make contact with the ground and completes the electrical circuit. The resulting resistance value is the average of 16 readings. The average value is stored in the resistance meter's memory until downloaded to a field laptop computer.

The resistance survey was designed to collect two samples per meter along 1.0-meter traverses or two data values per square meter at the three selected areas within FOLS Geophysical Project Areas A and B (Table 3). The data were collected in a zigzag fashion with the surveyor maintaining the alternating the direction of travel for each traverse across the grid. A total of 800 data values were collected for a complete 20 meter by 20 meter grid unit. The resistance data were recorded in the memory of the resistance meter and downloaded to a laptop computer at the completion of each day's survey effort. The resistance data were imported into Geoscan Research's GEOPLOT software (Geoscan Research 2003) for processing. Both shade relief and trace line plots were generated before the instrument's memory was cleared.

Ground Penetrating Radar Survey

The ground-penetrating radar (gpr) survey is an active geophysical technique that uses pulses of radar energy (i.e., short electromagnetic waves) that are transmitted into the ground through the surface transmitting antenna (see Annan 2005:357-438; Bevan 1991,1998:43-57; Clark 2000:118-120,183-186; Conyers 2004,2006:131-159,2007:329-344; Conyers and Goodman 1997; Davenport 2001:89-103; David 1995:23-27; Gaffney and Gater 2003:47-51,74-76; Gaffney et al. 1991:5-6,2002:9-10; Goodman et al. 2007:375-394; Heimmer and DeVore 1995:42-47,2000:63-64; Kvamme 2001:363-365,2003:442-443;2005:436-438; Lowrie 1997:221-222; Milson 2003:167-178; Mussett and Khan

2000:227-231; Nishimura 2001:547-551; Scollar et al. 1990:575-584; Weymouth 1986:370-383; and Witten 2006:214-258 for more details on ground-penetrating radar surveys). This radar wave is reflected off buried objects, features, or interfaces between soil layers. These reflections result from contrasts in electrical and magnetic properties of the buried materials or reflectors. The contrasts are a function of the dielectric constant of the materials (Sheriff 1973:51). The depth of the object or soil interface is estimated by the time it takes the radar energy to travel from the transmitting antenna and for its reflected wave to return to the receiving antenna. The depth of penetration of the wave is determined by the frequency of the radar wave. The lower the frequency, the deeper the radar energy can penetrate the subsurface; however, the resulting resolution, or the ability to distinguish objects, features, and soil changes, decreases. These low frequency antennas generate long wavelength radar energy that can penetrate several tens of meters under certain conditions, but can only resolve larger targets or reflectors. The higher the radar wave frequency, the higher the resulting resolution but the penetration depth decreases. High frequency antennas generate much shorter wavelength energy, which may only penetrate a meter into the ground. The generated reflections from these high frequency antennas are capable of resolving objects or features with maximum dimensions of a few centimeters. A resulting tradeoff exists between subsurface resolution and depth penetration: the deeper the penetration then the resulting resolution is less or the higher the resolution then the resulting depth penetration is much shallower.

As radar antenna system (transmitting and receiving antennas) is moved along the survey line, a large number of subsurface reflections are collected along the line. The various subsurface materials affect the velocity of the radar waves as they travel through the ground (Conyers and Goodman 1997:31-40). The rate at which these waves move through the ground is affected by the changes in the physical and chemical properties of the buried materials through which they travel. The greater the contrast in electrical and magnetic properties between two materials at the interface results in a stronger reflected signal. As each radar pulse travels through the ground, changes in material composition or water saturation, the velocity of the pulse changes and a portion of the energy is reflected back to the surface where it is detected by the receiving antenna and recorded by ground-penetrating radar unit. The remaining energy continues to pass into the subsurface materials where it can be reflected by deeper reflectors until the energy finally dissipates with depth. The radar system measures the time it takes the radar pulse to travel to a buried reflector and return to the unit. If the velocity of the pulse is known, then the distance to the reflector or the depth of the reflector beneath the surface can be estimated (Conyers and Lucius 1996).

The success of the survey is dependent on soil and sediment mineralogy, clay content, ground moisture, depth of the archeological resource, and surface topography and vegetation. The ground-penetrating radar signal can be lost or attenuated (i.e., quickly dissipated) in soils that have high moisture content, high electrical conductivity, highly magnetic materials, or high clay contents. Dry soils and sediments, especially those with low clay content, represent the best conditions for energy propagation. A ground-penetrating radar survey, with its capability for estimating the depth and shape of buried objects, may be an extremely valuable tool in the search of grave shafts and trenches. At times, radar cannot profile deep enough or the strata may be so complex as to render the trenches, graves, and other types of excavations indistinguishable from the surrounding soil profile.

The TerraSIRch SIR System-3000 survey cart system (GSSI 2003) operated an antenna at a nominal frequency of 400 megahertz (mHz). The antenna was mounted in a cart that recorded the location of the radar unit along the grid line (Figure 20). The gpr profiles were collected along 0.5 meter traverses beginning in the southwest corner of the grid unit with the initial profile collected from west to east. The data were collected in a zigzag or bidirectional fashion with the surveyor alternating the direction of travel for each traverse across the grid. Five hundred twelve samples were collected for each scan and 50 scans were collected per meter. A total of 81 radar profiles were collected across the selected area within the FOUS Geophysical Project Area B for a distance of 4,860 meters. Ground penetrating radar surveys generally represent a trade-off between depth of detection and detail. Lower frequency antennas permit detection of features at greater depths but they cannot resolve objects or strata that are as small as those detectable by higher frequency antennas. Actual maximum depth of detection also depends upon the electrical properties of the soil. If one has an open excavation, one can place a steel rod in the excavation wall at a known depth and use the observed radar reflection to calibrate the radar charts. When it is not possible to place a target at a known depth, one can use values from comparable soils. Reasonable estimates of the velocity of the radar signal in the site's soil can be achieved by this method (Conyers and Lucius 1996). Using one of the hyperbolas on a radargram profile from the geophysical project area (Goodman 2005:76), the velocity was calculated to be approximately 7.5 cm per nanosecond (ns). For a time slice between 5 and 15 ns with the center at 10 ns (two way travel time), the approximate depth to the center of the gpr slice would be 37.5 cm. With a time window of 50 nanoseconds, the gpr profile extended to a depth of 1.63 meters. The gpr data were recorded on a 512 mb compact flash card and transferred to a field laptop computer at the end of the survey.

Geophysical Data Processing

Processing of geophysical data requires care and understanding of the various strategies and alternatives (Kvamme 2001:365; Music 1995; Neubauer et al. 1996). Drs. Roger Walker and Lewis Somers (Geoscan Research 2003) provide strategies, alternatives, and case studies on the use of several processing routines commonly used to process magnetic, resistance, and conductivity data in the GEOPLOT software. David et al. (2008:42-45) presents a basic description of steps involved in the processing of magnetic, resistance, and ground penetrating radar data. Dr. Kenneth Kvamme (2001:365) also provides a series of common steps used in computer processing of geophysical data:

> *Concatenation* of the data from individual survey grids into a single composite matrix;
>
> *Clipping and despikin*g of extreme values (that may result, for example, from introduced pieces of iron in magnetic data);

Edge matching of data values in adjacent grids through balancing of brightness and contrast (i.e., means and standard deviations);

Filtering to emphasize high-frequency changes and smooth statistical noise in the data;

Contrast enhancement through saturation of high and low values or histogram modification; and

Interpolation to improve image continuity and interpretation.

It is also important to understand the reasons for data processing and display (David et al. 2008:45-49; Gaffney et al. 1991:11). They enhance the analyst's ability to interpret the relatively huge data sets collected during the geophysical survey. The type of display can help the geophysical investigator present his interpretation of the data to the archeologist who will ultimately use the information to plan excavations or determine the archeological significance of the site from the geophysical data.

Processing Dual Fluxgate Gradiometer Magnetic Data

The magnetic data were recorded in the memory of the gradiometer and downloaded to a field laptop computer when the instrument's memory was full or at the completion of day's survey effort. Upon completion of the magnetic survey with the dual fluxgate gradiometer system at each one of the five FOLS Geophysical Project Area A through E, the data were processed in the ARCHAEOSURVEYOR computer program. The grid data file was assembled into a composite file (DW Consulting 2008:31-32). The data were destriped to remove any traverse discontinuities that may have occurred from operator handling or heading errors (DW Consulting 2008:9,60). The magnetic data from the FOLS Geophysical Project Area A ranged from -121.9 nT to 129.83 nT with a median of 0.00 nT, a mean of -0.48 nT, and a standard deviation of 19.330 nT after the application of the destriping operation. The magnetic data from the FOLS Geophysical Project Area B ranged from -116.4 nT to 185.9 nT with a median of 0.00 nT, a mean of 0.03 nT, and a standard deviation of 5.635 nT after the application of the destriping operation. The magnetic data from the FOLS Geophysical Project Area C ranged from -104.1 nT to 171.46 nT with a median of 0.00 nT, a mean of 0.16 nT, and a standard deviation of 10.065 nT after the application of the destriping operation. The magnetic data from the FOLS Geophysical Project Area D ranged from -199.0 nT to 136.9 nT with a median of 0.00 nT, a mean of -0.72 nT, and a standard deviation of 24.341 nT after the application of the destriping operation. The magnetic data from the FOLS Geophysical Project Area E ranged from -200.0 nT to 199.3 nT with a median of 0.00 nT, a mean of 0.62 nT, and a standard deviation of 46.550 nT after the application of the destriping operation. Upon completion of the destriping function, the data were interpolated by expanding the number of data points in the traverse direction and by reducing the number of data points in the sampling direction to provide a smoother appearance in the data set and to enhance the operation of the low pass filter (DW Consulting 2008:9,61). This changed the original 8 x 1 data point matrix into a 4 x 4 data point matrix. The low pass filter was then applied over the entire data set to remove any high frequency, small scale spatial detail (DW Consulting 2008:9,71). This transformation may result in the improved visibility of larger, weak archeological features. The data were then exported as an ASCII dat file (DW Consulting 2008:39) and placed in the SURFER 9 contouring and 3d surface mapping program (Golden Software 2009). Image and contour maps of the dual fluxgate gradiometer data were generated for the survey grid blocks at the FOLS Geophysical Project Areas A through E (Figures 21 through 25).

Processing Resistance Data

At the end of the day or upon completion of the resistance survey, the resistance data from the three selected grid blocks in the FOLS Geophysical Project Areas A and B were downloaded into a field laptop computer for further processing in GEOPLOT (Oswin 2009:79-80). The grid files were combined to form a composite file and further processed in GEOPLOT (Oswin 2009:80-86). The resistance data composite file from the FOLS survey grid blocks were despiked to remove any random, spurious measurements caused by contact with buried cobbles or stones during the averaging of the multiple readings taken at each survey point (Geoscan Research 2001:6/35-6/39). Despiking may be accomplished with the processing routine in GEOPLOT or manually by editing each individual grid file. The edge match routine was applied to remove discontinuities between grid edges (Geoscan Research 2001:6/45-6/47). Discontinuities may result from the improper placement of the remote probes as they are moved across the survey area, as well as changes in soil moisture content resulting from loss of moisture due to evaporation or increase in moisture from rain showers. The resistance data from the resistance survey at the survey grid block in FOLS Geophysical Project Area A after the application of the edge matching and despiking routines ranged from 12.7 ohms to 31.6 ohms with a mean of 20.24 ohms and a standard deviation of 2.589 ohms. The resistance data from the resistance survey at the survey grid block in the southeast corner of the FOLS Geophysical Project Area B after the application of the search and replace and the despiking routines ranged from 7.1 ohms to 16.2 ohms with a mean of 8.33 ohms and a standard deviation of 0.822 ohms. The resistance data from the resistance survey at the survey grid block in the southwest corner of the FOLS Geophysical Project Area B after the application of the despiking routine ranged from 10.1 ohms to 41.8 ohms with a mean of 20.23 ohms and a standard deviation of 9.283 ohms. The interpolation routine was then applied to the data set to arrange the data from a 2 x 1 square matrix to an equally spaced 4 x 4 square matrix (Geoscan Research 2001:6/53-6/56). A high pass filter was then applied over the composite data set. The high pass filter was used to remove low frequency, large scale spatial detail such as a slow changing geological 'background' trend (Geoscan Research 2001:6/49-6/52). The data were then exported as an ASCII dat file and placed in the SURFER 9 mapping program (Golden Software 2009; Oswin 2009:86-95). Image and contour maps of the resistance data were generated for the FOLS survey grid area (Figures 26 through 28).

Processing Ground Penetrating Radar Data

The gpr radargram profile line data are imported into GPR-SLICE (Goodman 2005) for processing. The first step in GPR-SLICE is to create a new survey project under the file menu. This step identifies the file name and folder locations. The next step is to transfer the gpr profile data to the project folder. The next step is to create the information file. The file contains the basic information on profile names and data format, the number of profiles, lengths of the profiles with the starting and ending locations along the x and y axes along with the number of samples per scan, scans per marker, markers per unit of measurement, the data format size, and the extent of the open time window in nanoseconds (ns). The information file can be edited if necessary to correct profile lengths. The 16-bit GSSI radargrams are imported into the GPR-SLICE project folder for further processing. The 16-bit data are then converted to remove extraneous header information and to regain the data. During the conversion process, the signal is enhanced by applying gain to the radargrams. Once the conversion process is completed, the next step is to reverse the profile data. Since the radargrams were collected in the zigzag mode, every even line needs to be reversed. The next step is to insert navigation markers into the resample radargrams, which are based on the total number of scans in the radargram. The next step is to create the time slices of the profile data (Conyers and Goodman 1997; Goodman et al. 1995). The program resamples the radargrams to a constant number of scans between the markers and collects the time slice information from the individual radargrams. The number of slices is identified along with the slice thickness, which allows for adequate overlap between the slices. The offset value on the radargram where the first ground reflection occurs is identified and is used to identify the first radargram sample at the ground surface. The cut parameter is set to resample the gpr data. The final step in the slice menu is to create the XYZ data files for each slice. The slices are gridded using the Kriging algorithm to estimate the interpolated data. A low pass filter is then applied to the dataset to smooth noisy data in the time slices. At this point, one may view the time sliced radar data in the pixel map menu for the project areas at the geophysical project area (Figure 29). In addition, the original processed grid slices and the low pass filtered grid slices can be exported in the Surfer grid format. The surfer grid file is transformed into an image plot in Surfer 9. Generally, one time slice is selected for further display and analysis. Time slice 7 from 13 to 17 ns (Figure 30) is selected as the representative slice for further analysis of the gpr data at the geophysical project area. The ground penetrating radar data from time slice 7 before the low pass filter was applied to the data from the FOLS Geophysical Project Area B ranged from 2,187,536 SI units of amplitude strength to 202,526,182 SI units of amplitude strength with a mean of 33,540,126 SI units of amplitude strength, and a standard deviation of 19,484,994 SI units of amplitude strength. The slice data are interpolated to create the 3D dataset in the grid menu. The number of grids is now equal to 95 ((20-1)*5). The 3D data may be displayed as a series of z slices in the creation of a 3D cube with a jpeg output for animating the 3D cube.

Geophysical Data Interpretations

Andrew David (1995:30) defines interpretation as a "holistic process and its outcome should represent the combined influence of several factors, being arrived at through consultation with others where necessary." Interpretation may be divided into two different types consisting of the geophysical interpretation of the data and the archaeological interpretation of the data. At a simplistic level, geophysical interpretation involves the identification of the factors causing changes in the geophysical data. Archeological interpretation takes the geophysical results and tries to apply cultural attributes or causes. In both cases, interpretation requires both experience with the operation of geophysical equipment, data processing, and archeological methodology; and knowledge of the geophysical techniques and properties, as well as known and expected archeology. Although there is variation between sites, several factors should be considered in the interpretation of the geophysical data. These may be divided between natural factors, such as geology, soil type, geomorphology, climate, surface conditions, topography, soil magnetic susceptibility, seasonality, and cultural factors including known and inferred archeology, landscape history, survey methodology, data treatment, modern interference, etc. (David 1995:30; David et al. 49). It should also be pointed out that refinements in the geophysical interpretations are dependent on the feedback from subsequent archeological investigations. The use of multiple instrument surveys provides the archeologist with very different sources of data that may provide complementary information for comparison of the nature and cause (i.e., natural or cultural) of a geophysical anomaly (Clay 2001). Each instrument responds primarily to a single physical property: magnetometry to soil magnetism, electromagnetic induction to soil conductivity, resistivity to soil resistance, and ground penetrating radar to dielectric properties of the soil to (Weymouth 1986:371).

Interpreting the Magnetic Data

Interpretation of the magnetic data (Bevan 1998:24) from the project requires a description of the buried archeological feature of object (e.g., its material, shape, depth, size, and orientation). The magnetic anomaly represents a local disturbance in the earth's magnetic field caused by a local change in the magnetic contract between buried archeological features, objects, and the surrounding soil matrix. Local increases or decreases over a very broad uniform magnetic surface would exhibit locally positive or negative anomalies (Breiner 1973:17). Magnetic anomalies tend to be highly variable in shape and amplitude. They are generally asymmetrical in nature due to the combined affects from several sources. To complicate matters further, a given anomaly may be produced from an infinite number of possible sources. Depth between the magnetometer and the magnetic source material also affect the shape of the apparent anomaly (Breiner 1973:18). As the distance between the magnetic sensor on the magnetometer and the source material increases, the expression of the anomaly becomes broader. Anomaly shape and amplitude are also affected by the relative amounts of permanent and induced magnetization, the direction of the magnetic field, and the amount of magnetic minerals (e.g., magnetite) present in the source compared to the adjacent soil matrix. The shape (e.g., narrow or broad) and orientation of the source material also affects the anomaly signature. Anomalies are often identified in terms of various arrays of dipoles or monopoles (Breiner 1973:18-19). A magnetic object in made of magnetic poles (North or positive and South or negative). A simple dipole anomaly contains the pair of opposite poles that relatively close together. A monopole anomaly is simply one end of a dipole anomaly and may be either positive or negative depending on the orientation of the object. The other end is too far away to have an affect on the magnetic field.

Magnetic anomalies of archeological objects tend to be approximately circular in contour outline. The circular contours are caused by small size of the objects. The shape of the object is seldom revealed in the contoured data. The depth of the archaeological object can be estimated by half-width rule procedure (Bevan 1998:23-24; Breiner 1973:31; Milsom 2003:67-70). The approximations are based on a model of a steel sphere with a mass of 1 kg buried at a depth of 1.0 m below the surface with the magnetic measurements made at an elevation of 0.3 m above the ground. The depth of a magnetic object is determined by the location of the contour value at half the distance between the peak positive value of the anomaly and the background value. With the fluxgate gradiometer, the contour value is half the peak value since the background value is approximately zero. The diameter of this contour (Bevan 1998:Fig. B26) is measured and used in the depth formula where **depth = diameter – 0.3 m** (Note: The constant of 0.3 m is the height of the bottom fluxgate sensor above the ground in the Geoscan Research FM36 were I carry the instrument during data acquisition. This value needs to be adjusted for each individual that carries the instrument.). The mass in kilograms of the object (Bevan 1998:24, Fig. B26) is estimated by the following formula: **mass = (peak value - background value) * (diameter)^3/60**. It is likely that the depth and mass estimates are too large rather than too small, since they are based on a compact spherical object made of iron. Archeological features are seldom compact but spread out in a line or lens. Both mass and depth estimates will be too large. The archaeological material may be composed of something other than iron such as fired earth or volcanic rock. Such materials are not usually distinguishable from the magnetic data collected during the survey (Bevan 1998:24). The depth and mass of features comprised of fired earth, like that found in kilns, fireplaces, or furnaces could be off by 100 times the mass of iron. If the archeological feature were comprised of bricks (e.g., brick wall, foundation, or chimney), estimates could be off by more than a 1000 times that of iron. The location of the center of the object can also be determined by drawing a line connecting the peak positive and peak negative values. The rule of thumb is that the center of the object is located approximately one third to one half of the way along the line from the peak positive value for the anomaly. One should also be cautious of geophysical anomalies that extend in the direction of the traverses since these may represent operator-induced errors. The magnetic gradient anomalies may be classified as three different types: linear, 2) dipole, and 3) monopole.

Preliminary analysis of the magnetic data while in the field indicated the presence of numerous magnetic anomalies within the five geophysical project areas. Over all, there are numerous magnetic anomalies across the geophysical project areas. These anomalies appear to be associated with metal artifacts and buried archeological features, as well as modern intrusions. In the Geophysical Project Area A on the west side of the 2009 geophysical project area, the 1974 University of Colorado excavations of the Sutler's residence and store are indicated by extremely strong square shaped magnetic anomalies (Figure 31). The Sutler's mess hall, located between the Sutler's residence and store, is indicated by a square outline of fairly strong magnetic anomalies which are located in the vicinity of the park's gravel access road on the southwest side of the main fort buildings. There is a linear magnetic anomaly oriented to the southwest of the Sutler's residence, which may represent a trail used the Native Americans to trade and get their annuities. The gravel access roads on the south and west sides of the row of Officers' Quarters appear as slight linear magnetic disturbances. A buried utility line is also indicated by a strong linear magnetic anomaly consisting of the typical high/low value beaded pattern. A cluster of relatively strong magnetic anomalies is located to the west of the Sutler's residence. Other linear magnetic anomalies appear to represent possible trails or river crossings. Throughout the project area, numerous magnetic anomalies are present. These anomalies may represent historic military period artifacts and features along with farming and modern park materials. Geophysical Project Area B is located on the left bank of the Pawnee Fork in the open grassy field. Along the edges of the field next to the Pawnee Fort, there are several clusters of magnetic anomalies and other linear anomalies that appear to be related to the farming period including fence lines, a skeet shooting location, and possible race track (Figure 32). In addition, the modern telephone and gas lines are identified by linear anomalies and very strong magnetic anomalies, as well as a staging area for the stone used in riprap along the bank of the Pawnee Fork. Besides the more recent magnetic anomalies associated with farm and modern period activities, several linear anomalies appear to represent trail segments and river crossing trail segments. Geophysical Project Area C, located in the southeast corner of the intersection of State Highway 156 and the 180th Avenue county road, contains a few isolated magnetic anomalies, which are probably associated with agricultural activities (Figure 33). In addition to the isolated materials, an underground cable box, buried gas line, and boundary markers and fence posts are indicated in the magnetic data. Geophysical Project Area D is located on the south side of the parade ground and east side of the 2009 geophysical project area (Figure 34). Buried utility lines along with fence lines and access roads and lanes are noted in the magnetic data as linear magnetic anomalies. A square shaped anomaly near the west side of the quartermaster building may represent the location of a guard house in the open area between the quartermaster's building and the row of Officers' Quarters. The area contains a high concentration of magnetic anomalies. These anomalies could be associated with military, farming, and modern park activities and materials. The Geophysical Project Area E is located on the northeast side of the 2009 geophysical grid by the Officers' Quarters and the Enlisted Men's Barracks (Visitors Center). Magnetic anomalies represent the parade ground gravel path, the visitor sidewalk from the parking lot, buried utility and sewer lines, the handicap parking area, manhole and drain covers, paved and gravel access roads, along with numerous smaller magnetic anomalies associated with military, farming and modern park activities. In addition to these materials and modern intrusions to the fort's buried archeological, there is a square shaped magnetic outline to the northeast of the row of Officers' Quarters (Figure 35). This magnetic anomaly may represent the location of the Adjutant Office building. In addition to these large clusters of magnetic anomalies, there are smaller clusters located outside of these large ones. The smaller clusters may be locations of discarded material, as well as building locations associated with the military occupation or more recent farming activities. These anomalies all bear further ground truthing examination with traditional archeological excavation techniques.

Interpreting the Resistance Data

Interpretation of the resistivity data results in the identification of lateral changes in the soil. Since the array parameters are kept constant through out the survey, the resulting resistance values varies with changes in the subsurface sediments/soil matrix and buried archeological resources. For each probe separation, the depth penetration is approximately the same as the distance between the current and potential probe on the mobile array frame, which was 0.5 meters. The resistance measurement for each point represents the average value for the hemispheric volume of soil with the same radius. If the soil below the survey area was uniform, the resistivity would be constant throughout the area. Changes in soil characteristics (e.g., texture, structure, moisture, compactness, etc.) and the composition of archeological features result in differences in the resistances across the surveyed grid. Large general trends reflect changes in the site's geology whereas small changes may reflect archeological features. An advantage to the resistance survey and its interpretation is its usefulness in areas that have high concentrations of metal objects such as the three project areas in this study.

In addition of the magnetic survey of the geophysical project areas, limited resistance and ground penetrating radar surveys were conducted to enhance our understanding of the magnetic anomalies. The possible trail and the Sutler's residence are indicated in the resistance data from Geophysical Project Area A (Figure 36). In Geophysical Project Area B, two areas were surveyed with the resistance meter and twin probe array. One area is located along the river bank immediately across from the fort (Figure 37). The resistance survey suggests square shaped anomalies that may be associated with the military bridge. A second area was located along the southwest corner of the project area where a concentration of stone was noted on the surface (Figure 38). The stones were initially thought to be part of a building foundation but the resistance data did not indicated any potential foundation. After further examination of the area, it is believed that the concentration of stone and associated magnetic anomalies is related to the riprap activities along the bank of the Pawnee Fork. The resistance data from the FOLS geophysical survey area illustrates a number of resistance anomalies previously identified in the dual fluxgate gradiometer magnetic data set from the project area. The resistance anomalies include the gravel access road and the location of the wooden backyard fences. In addition to these linear resistance anomalies, there are a number of linear anomalies across the project area. Some may represent locations of old trails, fence lines, and other cultural features. Concentrations of resistance anomalies in the backyards appear to represent the locations of privies or small sheds, as well as possible garden plots. As with the magnetic anomalies, ground truthing with traditional archeological excavation techniques are warranted to determine the nature of these anomalies and their relationship to the military occupation at Fort Larned.

Interpreting the Ground Penetrating Radar Data

Analysis and interpretation of the gpr data may be conducted in several different ways. The individual radargrams for each profile line may be analyzed for hyperbolic reflections. The radargrams may be combined and processed to provide planar time slices of the data. The time slices may also be combined to form 3D cubes of the gpr data. The majority of the gpr radargrams show numerous small reflections along any given profile. Most of the analysis of the gpr data is done with the 3D display while moving through the numerous time slices, but in order to provide a graphic representation of the anomalous areas, an individual time slice was selected.

A ground penetrating radar survey was conducted in an area where there appeared to be numerous linear magnetic anomalies tentatively identified as trail segments. A strong reflection in the gpr data appears to be associated with a curve in the possible trail segment identified in the magnetic data (Figure 40).

Combined Geophysical Data Set Interpretations

A different way of looking at the geophysical data collected during the investigations of the survey area at parking lot area is to combine the complementary data sets into one display. A number of the different geophysical anomalies overlap suggesting a strong correlation between the geophysical data and the buried archeological features (Ambrose 2005; Kvamme 2007:345-374). These areas of overlap would be considered areas of high probability for ground truthing and the investigations of buried archeological resources. While these correlations are important, individual isolated occurrences also need ground truthing in order to determine their unique nature as well. Complementary data from the geophysical survey efforts at the FOLS geophysical project area indicate the locations of historic military artifact or sheet midden concentrations and more recent 19th and 20th century farming building locations and related activity areas, as well as modern National Park Service modifications to the military landscape. In the FOLS Geophysical Project Area A, magnetic and resistance data from a 20-m by 60-m area were combined (Figure 41). The location of the Sutler's Store and a possible trail are indicated in the data along with other concentrations of geophysical anomalies. In the southeastern corner of the FOLS Geophysical Project Area B, the magnetic and resistance data suggest possible location for the footings or piers of the military bridge across the Pawnee Fork near the southwest side of the main fort buildings and parade ground (Figure 42). The magnetic and resistance data from the southwestern corner of the FOLS Geophysical Project Area B provided data that indicated the concentration of rock noted on the surface were debris left from the construction of the rip-rap along the bank of the Pawnee Fork near the county road bridge (Figure 43). Magnetic anomalies suggest that the area along the county road contained items tossed from vehicles on the road, as well as items deposited in the corner of the field during seasonal flooding. A ground penetrating radar survey a 40-m by 60-m in the eastern portion of the FOLS Geophysical Project Area B combined with the magnetic survey data from the area, identified the possible wagon trail segment in along the eastern side of the field (Figure 44). The segment may be part of the Fort Larned-Fort Hayes military road, other military roads between Fort Larned and other Kansas forts, or a portion of the Santa Fe Trail on the north side of Pawnee Fork.

Aerial Photography

While aerial photography and photographic interpretation are not new to archeology, they are often under used in archeological investigations. The aerial photographs provide a different perspective of an area than can be seen on the ground. The imagery can provide a systematic means of searching for cultural features that have gone unnoticed at ground level. During normal site detection (reconnaissance level) surveys, the archeologist is limited to sites that are *1) small enough to be comprehended on the ground from visible remains, 2) accessible within practical and economical limits, 3) still visible in spite of modern-day cultivation and construction, and 4) recognizable, even through the erosion effects of nature may have been operating over a long time* (Avery and Berlin 1992:225).

The use of aerial photography as a detection technique is not limited to the foregoing conditions (Aschmann et al. 1975; Duel 1969; Riley 1987). Remnants of past landscapes that are too large to visualize from the ground may be detectible on some form of aerial imagery. This can also be said of past landscapes that have been incorporated into the present one and are unrecognizable at ground level. Aerial views provide greater range and vertical perspective of patterns of objects not apparent on the ground. Landscapes and other types of cultural features may be revealed as shadow patterns, soil color variations, differences in height, density, or color of plants that grow above the buried cultural features (Avery and Berlin 1992:227-235; Jones and Evans 1975; Wilson 1982). Stereo pairs of photographs provide vertical distortion that can be used in photogrammetric site mapping. Aerial photographs taken over a period of time, as well as in different seasons also provides information on the cultural resources. The spatial extent of a site can be identified on an aerial photograph and then verified in the field.

Since the 1920s, the U.S. Department of Agriculture (USDA) has been systematically collecting aerial photographic flights over the United States. These flights have been used to classify agricultural land and crops. These are only a couple of applications for the aerial photographs. The photographs, which are taken approximately every three to ten years, can provide information on land use, prehistoric and historic archeology, forestry applications, geological interpretations, engineering applications, urban-industrial analysis, etc. Today, over 90 percent of the United States has aerial photographic coverage. Three U.S. governmental agencies serve as primary repositories for aerial photographs acquired by the federal government. They are the Earth Resources Observation Systems Data Center of the U.S. Geological Service, Sioux Falls, South Dakota; the Aerial Photographic Field Office of the U.S. Department of Agriculture's Farm Service Agency (previously called the Agricultural Stabilization and Conservation Service), Salt Lake City, Utah; and the National Archives and Records Library, General Services Administration, Washington, D.C. Currently Farm Service Agency's Aerial Photography Field Office retains the USDA aerial photographs from 1955 to the present. Aerial photographs taken before 1955 are curated at the Cartographic and Architectural Section of the National Archives and Records Administration in College Park, Maryland.

Aerial photographs of the current project area at the Fort Larned National Historic Site were obtained from the National Archives (Table 5) and the Aerial Photographic Field Office (Table 6). Aerial photographs from the National Archives were from 1938 and 1950. These black and white photographs were taken at a scale of 1:20,000 (1" = 1667"). The 1956 and the 1963 black and white aerial photographs from the Aerial Photographic Field Office (APFO) were also at a scale of 1:20,000. By the 1970s, the USDA started acquiring aerial photographs at a scale of 1:40,000. The aerial photographs were taken at a higher altitude of 20,000 feet. This allowed more areal coverage with each photo frame. The APFO 1970 and 1979 photos were taken at a scale of 1:40,000 while the 1975 photos were acquired at a scale of 1:48,000. An interagency Federal effort was initiated in 1978 to provide the greatest number of users with the systematic aerial coverage of the United States under the National High Altitude Program (NHAP). Between 1980 and 1987, black and white aerial photography was taken at a scale of 1:80,000, while color infrared imagery was collected at a scale of approximately 1:60,000. The APFO 1981 and 1985 NHAP aerial photographs were taken in color infrared at a scale of 1:60,000. The National Aerial Photography Program (NAPP) was instituted in 1987 among the Federal agencies including USDA to acquire aerial photographs at an altitude of 20,000 feet with a scale of 1:40,000. Each 9-inch by 9-inch frame covers approximately a five mile by five mile area. The APFO 1991, 1996, and 2002 aerial photos were acquired as black and white imagery. In 2003, the USDA's Farm Service Agency began the National Agriculture Imagery Program (NAIP). The purpose of the program was to make digital ortho photography available to public and government agencies with one year of its acquisition. The imagery was acquired at one-meter ground sample distance with six meter horizontal accuracy. The imagery was collected in the natural color spectrum (Red, Green, and Blue) including the 2003, 2004, and 2005 APFO aerial photographs. Since 2007, the infrared band was also delivered as part of the imagery acquisition process. The imagery was acquired at a scale of 1:40,000.

The 1938 aerial photograph from the National Archives contains numerous features associated with the historic fort setting (Figure 45). Modifications to the Enlisted Men's Barracks and Post Hospital (HS-1 and HS-2), the Quartermaster's buildings including the storehouse (HS-6), Commissaries (HS-4 and HS-5), and the Shops Building (HS-3) for use as barns and other ranch/farm related buildings are noticeable on the aerial photograph. The Officers Quarters, including HS-7 and HS-9 along with the Commanding Officer's Quarters (HS-8) are being maintained as farm residences. In addition to the view of the buildings in the fort's historic core, a number of linear anomalies appear to represent trail swales on both sides of the Pawnee Fork. These swales may be segments of the Santa Fe Trail, as well as military roads between Fort Larned and other Kansas forts. There also appear to be five potential river crossings. The potential river crossing at the south end of the trail swale that heads north of the fort may be the location of the military bridge on the southwest side of the fort's core. The other crossings may be fords or ferry locations.

The next series of USDA aerial photographs of the Fort Larned vicinity were taken in 1950. The aerial photograph showed several trail swales including the ones noted on the 1938 aerial photograph (Figure 46). Seven prospective river crossings were identified including the five visible on the 1938 aerial photograph. Although new features were noted on the 1950 aerial photograph, it did not mean that such features were relatively new dating to the period following the taking of the 1938 aerial photograph. Changes in vegetation cover, crop rotation, soil moisture content, time of year, etc., also played important roles in the ability of the photographic interpreter to identify cultural and natural features. Besides the identification of more trail swales and river crossings, the photograph also documented the increase usage of livestock pens adjacent to the barracks and Quartermaster's buildings along with newer farm buildings, silos, and sheds. In the field west of the fort's historic core across the Pawnee Fork. A lighter colored farm lane extended around the main field. In the area south of the field, a trap range and buildings were noted. Since these features were not present in the 1938 aerial photograph, it was assumed that the trap range and associated trap house and storage building were built after 1938. There also appeared to be an increase in the size and number of trees within in the historic fort's core, as well as along the Pawnee Fork and the oxbow on the east side of the historic fort's core.

By 1956, the tree growth continued in the core area, as well as along both banks of the Pawnee Fort (Figure 47). The trap range is still present although the actual shooting location appeared to have been demolished. The main trail swales were still visible on both sides of the river, as well as the potential river crossings.

The 1963 aerial photograph contained fewer noticeable features associated with the trail swales and river crossings. The trap building was still present although the range was demolished. Livestock pens along the historic core buildings also appeared to have been removed. These changes reflected the development of the historic fort as a tourist attraction beginning in 1957 with the founding of the Fort Larned Historical Society (Oliva 1982:96-97). The development of a picnic area near the entrance to the Frizell Fort Larned Ranch along U.S. Highway 156 was also noticed in the aerial photograph. A bridge was also constructed across the Pawnee Fork on the northwest side of the historic fort's historic core of buildings in 1963 and was visible on the aerial photograph.

By 1970, the fort buildings were in the process of being restored to their historic military appearance (Figure 49). The federal government purchased the land and buildings in 1966 after Congress authorized the National Park Service to add Fort Larned to its growing list of national historic sites (Oliva 1982:96-97). By 1975, the existing buildings were restored to their military appearance. Changes in the presence of trees was also indicated on the aerial photograph. The large lot of trees to the north of Officer's Row was removed between 1970 and 1975. Two river crossings were still visible, as well as a trail swale that cut across the field northwest of the fort's core area. Aerial photographs from 1979 (Figure 51), 1981 (Figure 52), and 1985 (Figure 53) provide additional views of changes in vegetation and land use associated with park activities. Most trail related features were obscured by vegetational and land used changes over the decade. In 1991, the reconstruction of the fort's Blockhouse (HS-10) was present in the aerial photograph (Figure 54). The primary potential location of the military bridge across the Pawnee Fork was present in the aerial photographs from 1980s, as well as those from 1997 (Figure 55), 2002 (Figure 56), 2003 (Figure 57), 2004 (Figure 58), and 2005 (Figure 59).

Archeological Excavation Methodology

The archeological excavations at FOLS consisted of excavation of regularly spaced shovel/auger tests and a formal 2-m by 1-m test excavation unit. The excavations were conducted with shovels, trowels, and fence posthole augers. The orifice for the posthole auger hole was approximately 30 cm in diameter. The units were excavated to an approximate depth of 50 centimeters below the ground surface (cmbs). The sediment removed from the units was screened through ¼" steel mesh. All artifacts identified during the excavations were recovered for further analysis.

Shovel/Auger Testing

Ground truthing with shovel tests using fence posthole augers (Figure 60) was conducted along the inside of the levee next to the farm era ice house foundation to the southwest of the main post, across a 100-meter square area in the vicinity of the proposed parking lot location, and the stone concentration in southwest corner of the open field. Four shovel test units were placed along the river side of the protective levee above the Pawnee Fork on the FOLS side of the river (Figure 61). The shovel tests were also located to the north of the FOLS Geophysical Project Area A and west of the 2009 geophysical survey area (Table 7). The shovel test (ST) units were placed 10 meters apart on the bank side of the protective levee. ST1A was excavated to a depth of 30 cmbs and contained concrete fragments to a depth of 10 cmbs. ST2A was excavated to a depth of 50 cmbs. A roofing nail and mortar fragments were recovered from the upper 10 cm. Between 20 and 30 cmbs, a second roofing nail was recovered. A piece of water rolled, clear glass was recovered from 30-40 cmbs. ST3A was excavated to a depth of 50 cmbs and contained a 9d common wire nail, a 2d wire nail, and inch wide box staple between 20 and 30 cmbs. ST4A was placed inside the stone foundation of the farm era ice house. The excavation extended to a depth of 30 cm. Concrete and charcoal fragments were identified in the mixed fill from inside the foundation. One hundred shovel test locations were laid out in the proposed parking lot area (Table 8). Ninety-nine of the 100 units were excavated with the first unexcavated unit used as the reference point for laying out the remaining units. The shovel test were spaced at 10 meter intervals and excavated to a depth of 50 cmbs (Figure 62). The 50 cmbs depth was selected as the bottom of the excavation based on the soil composition. Of the 99 shovel tests excavated, only six produced artifacts or related ecofacts (Table 8). The artifacts consisted of a centerfire 12 gauge Remington/Union Metallic Co. shotgun shell base from ST 20, a right astragalus from *Bos taurus* and an unidentified bone fragment in ST25, and three mortar fragments from ST54. ST15 contained some mussel shell while ST 60 and ST 80 contained some charcoal flecking. The artifacts were related to the farm period. Five more shovel tests (Table 9) were excavated at the southwest corner of the project area (Figure 63). The shovel tests (ST101 through ST105) were placed in a grid unit (N40/E0 to N60/E20) to test the presence of a structure, however upon further investigation it was realized that this area of limestone was most likely used as a staging area for the riprap along the Pawnee Fork near the county road bridge.

Formal Archeological Excavation Unit

A single excavation unit (TU1) was placed over a strong magnetic anomaly in the southern part of the open field next to the left bank of Pawnee Fork (Figure 64). The excavation extended two meters north-south by one meter east-west. The southwest corner of the unit was located at N40/E101 (Figure 65). The unit was excavated in 10 cm arbitrary units to a depth of 30 cmbs. The upper portion of the unit consisted of a very dark grayish brown (10YR3/2) silty loam plowzone. The sub soil consisted of a brown (10YR7/3) silty loam (Figure 50). Sections a railroad ties were noted as appearing to foundation foots to s small structure. Gravel was placed between the ties for drainage. Artifacts recovered from TU1 consisted of two centerfire shotgun shell bases (a Peters Victor 12 gauge shell base and a Winchester Ranger 12 gauge shell base), two crown bottle caps, pieces of asphalt shingles, a foil gum wrapper, wire staple, a 6d common wire nail, a clay pigeon fragment, a roofing nail, and the interior foil from a bottle cap (Table 10). The excavation of the test unit revealed the foundation of a farm related trap or skeet house for shooting clay pigeons.

6. ARTIFACT ANALYSIS

Excavations of the geophysical project areas yielded a small sample of historic artifacts associated with the farming activities at the old fort site during the 20th century (Table 11). Historic artifacts from the shovel test and test unit excavations were divided into several material categories consisting of ceramics (e.g., clay pigeon fragment), glass (e.g., curved glass, metal (e.g., nails, wire, shotgun shell bases, bottle crown caps, aluminum foil), bone (e.g., faunal remains), stone (e.g., mortar and concrete). Using a functional classification developed by Roderick Sprague (1980-81) for historic artifacts, the artifacts from the archeological investigations at the parking lot project area at the FOLS Geophysical Project Areas consisted of personal items, domestic items, architecture, and unknowns.

Personal Items

Within the personal items (Sprague 1980:255), the indulgences category is represented by two pieces of aluminum foil. One folded piece of foil may be a gum wrapper of the internal foil wrapper from a cigarette package. The small circular piece of foil is the interior bottle cap liner, which measures approximately 2.2 cm in diameter.

Three crown cap bottle closures were recovered from the excavation unit in FOLS Geophysical Project Area B (Sprague 1980:255). The beer or soda pop bottle caps measure approximately 3 cm in diameter. The ferrous metal caps contain 21 points around the external diameter of the edge of the cap.

The pastimes and recreation category contains a piece of a clay pigeon (Sprague 1980:255). Three brass, shotgun shell bases were also recovered during the excavations. One base contains the impressed lettering REM-UMO over SHURSHOT and No 12 on opposite sides of the primer between the lettering. REM-UMO headstamp represents the combined Remington and Union Metallic Company that merged to form REM-UMC from 1911 to 1934 (Steinhauer 2011). One base contained the words PETERS over VICTOR with MADE IN U.S.A. on the left side and 12 on the right side of the primer. A large P surrounds the primer. The Peters Company operated between 1887 and 1934 when it was purchased by DuPont along with REM-UMO to form the Remington Arms Company (Steinhauer 2011). The third shotgun shell base contained the word WINCHESTER over Ranger. Between the word WINCHESTER and the primer the smaller sized words MADE IN U.S.A. were stamped on the base. On the left side of the primer, the word № occurred with the number 12 on the right side of the primer. Winchester added the "MADE IN U.S.A." to the headstamp on its shotgun shells after 1937 (Steinhauer 2011).

Domestic Items

Domestic items (Sprague 1980:256) recovered from the parking lot excavations at the Fort Larned National Historic Site consist of housewares and appliances items in the gustatory (e.g., faunal remains) category. The faunal remains represent subsistence ecofacts that are part of the gustatory group within housewares and appliances under the domestic items (Sprague 1980:256). One bone element and one bone fragment are among the artifacts recovered from the archeological investigations of the bridge replacement project areas. The right astragalus is from *Bos taurus* (domestic cattle) is the single identifiable element (Gilbert 1973,1990). The other faunal remain is a bone fragment from a large mammal, probably *Bos taurus*.

Architecture

Architecture (Sprague 1980:256) includes construction items such as materials (e.g., concrete, mortar, and asphalt shingles) and hardware (e.g., nails, staples, and wire), and plumbing items for sanitation (i.e., drain tile). Construction materials are used in buildings and other structures at Fort Larned. Hardware items are materials used to hold the construction materials together.

Among the construction materials recovered from the archeological investigations, there were two small fragments of concrete, three pieces of mortar, and two pieces of a composite asphalt shingle. Hardware recovered from the archeological investigations included wire nails, a possible staple, and a piece of wire (Sprague 1980:256). A total of seven wire nails represented the nails recovered from the archeological investigations. Wire nails replaced the cut nails in everyday usage following a major strike that affected the nail industry in the 1880s (Loveday 1983:137-139). The four wire nails included one 3d nail with a rounded head, a 4d common wire nail, a 6d common wire nail, and an 8d common wire nail. Two functional categories were represented by the wire nails: 1) small construction nails between 2d and 5d for finish work, shingles, and lathes and 2) medium construction nails between 6d and 16d for framing, sheathing, roofing, casing, siding, flooring, and/or shingles (De Vore 1987:76). The remaining wire nails consist of one 5/8-inch, one 7/8-inch, and one 1 5/8 inch length roofing nails for attaching shingles to the roof of a structure. A bent piece of flatten wire measuring approximately an inch on three sides appeared to be a staple used to hold staves of a wooden basket together. A piece of 16 gauge (1.92 mm in diameter) was also recovered during the archeological investigations.

Unknowns

The unknown category (Sprague 1980:258) contains an unidentifiable fragment of glass. Due to the small size of the clear glass fragment, the purpose or use of the item cannot be positively identified. The exterior surface of the glass fragment is patinated and water rolled or smoothed.

7. CONCLUSIONS AND RECOMMENDATIONS

During the period from August 2 to August 20, 2010, geophysical investigations were conducted at the Fort Larned National Historic Site (14PA305) along the western side of the fort next to the row of Officers' Quarters and on the left side of Pawnee Fork to the west and north of the fort quadrangle. The geophysical survey included a magnetic survey with dual fluxgate gradiometer, three limited resistance surveys with a resistance meter and twin probe array, and a small ground penetrating radar survey with a gpr cart system and 400 mHz antenna. The geophysical survey was conducted in an attempt to identify buried archeological remains associated with the fort in the vicinity of the proposed military bridge reconstruction and parking lot relocation construction project. The geophysical survey identified numerous buried archeological remains associated with the remnants of the military activities at the site, as well as more recent 19th and 20th century farming and park activities at the site. The total area investigated by the geophysical survey in the FOLS geophysical project area was 89,848 m^2 or 22.20 acres (Figure 66).

The surveys resulted in the identification of numerous subsurface anomalies. The magnetic and resistance data collected at the site provided information of the physical properties (magnetic and soil resistance properties) of the subsurface materials. Standard methodology for conducting geophysical investigations was used with standard 20-meter by 20-meter grid sizes where feasible. The results of the geophysical survey indicated the presence of buried features and artifact concentrations related to the military period, historic farming era, and modern park activities associated with the occupation of the Fort Larned National Historic Site in the late 19th and 20th centuries. The identification of several trail segments on both sides of the Pawnee Fork along with potential river crossings represents significant archeological resources associated with the military during the active lifespan of Fort Larned. Aerial photographs from the 1930s to 2005 were also analyzed. A number of trail swales were noted in the earlier photographs (Figure 66). In addition to the trail swales, six potential river crossing locations were identified from the aerial photographs, as well as nine potential locations noted during the archeological investigations along the left bank of the Pawnee Fork. The six from the aerial photographs were also identified in the nine location mapped with the GPS unit during the archeological investigations. Two of the potential crossings may represent the potential location for the military bridge across the Pawnee Fork.

Finally, refinement of the archeological and geophysical interpretation of the survey data is dependent on the feedback of the archeological investigations following geophysical survey (David 1995:30). Should additional archeological investigations occur at the site investigated during this project, the project archeologist is encouraged to share additional survey and excavation data with the geophysical investigator for incorporation into the investigator's accumulated experiences with archeological problems? Throughout the entire geophysical and archeological investigations, communication between the geophysicist and the archeologist is essential for successful completion of the archeological investigations. It is also important for the investigators to disseminate the results of the geophysical survey and archeological investigations to the general public. It is through their support in funds and labor that we continue to make contributions to the application of geophysical techniques to the field of archeology.

Large scale mechanized excavation by the construction equipment should be conducted within the area of potential effect for the entrance road modification and parking lot relocation project. The field contains several remnants of the Santa Fe Trail as well as military trails from Fort Larned to other posts, such as Fort Hayes. Due to the physical nature of the trail remains, it is better to have a large area opened than to conduct small scale archeological excavations. The road construction equipment could remove the soil in layers, especially the plow zone, in order to provide better visual examination of the construction area for trail segment remnants. It is recommended that archeological monitoring of the areas selected for the entrance road modification, parking lot relocation, and the Pawnee Fork pedestrian bridge by a professional archeologist occur during the construction phase of the project. Construction should stop upon the identification of archeological features by the professional archeologist and time provided to evaluate and document the uncovered archeological features.

This report has provided a review and analysis of the geophysical and archeological data collected during the investigations of the proposed bridge replacement and parking lot relocation construction project at the Fort Larned National Historic Site. The geophysical techniques applied to the investigations at Site 14PA305 have proven successful in the identification of buried archeological resources in the present archeological/geophysical project areas. The geophysical techniques combined with traditional archeological shovel test and excavation methodology have the potential to identify the subsurface features associated with the historic and possibly the prehistoric use across the park. This information will be used by the Midwest Archeological Center and the Fort Larned National Historic Site staffs to guide further archeological inquiry into the nature of the archeological resources at the military post (Site 14PA305) and help direct future National Park Service geophysical surveys and archeological excavations at other locations within the boundary of the Fort Larned National Historic Site.

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Tables

Table 1. Global positioning system corrected grid coordinates for the FOLS Geophysical Project Areas A, B, C, D, and E (Site 14PA305).

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
1	-99.219	38.1822	596.571	480829	4226054	623.255	Geophys Feature Pt-2009 survey stake.
2	-99.22	38.1833	598.285	480758	4226176	624.968	Geophys Feature Pt-project area a
3	-99.22	38.1831	597.056	480765	4226158	623.739	Geophys Feature Pt-project area a
4	-99.219	38.1832	598.362	480784	4226165	625.045	Geophys Feature Pt-project area a
5	-99.219	38.183	597.566	480792	4226147	624.249	Geophys Feature Pt-project area a
6	-99.22	38.183	598.5	480773	4226139	625.183	Geophys Feature Pt-project area a
7	-99.219	38.1828	598.349	480781	4226121	625.032	Geophys Feature Pt-project area a
8	-99.219	38.1826	596.854	480789	4226103	623.538	Geophys Feature Pt-project area a
9	-99.219	38.1829	598.546	480800	4226128	625.229	Geophys Feature Pt-project area a
10	-99.219	38.1825	598.652	480796	4226084	625.336	Geophys Feature Pt-2009 stake
11	-99.219	38.1823	596.888	480804	4226065	623.571	Geophys Feature Pt-project area a
12	-99.219	38.1821	598.366	480811	4226047	625.05	Geophys Feature Pt-2009 mapping station
13	-99.218	38.1825	596.749	480904	4226084	623.433	Geophys Feature Pt-project area a
14	-99.218	38.1823	597.262	480911	4226067	623.947	Geophys Feature Pt-project area a
15	-99.218	38.1822	597.578	480919	4226048	624.263	Geophys Feature Pt-project area d
16	-99.218	38.182	597.183	480927	4226030	623.867	Geophys Feature Pt-project area d
17	-99.218	38.1818	597.037	480934	4226011	623.721	Geophys Feature Pt-project area d
18	-99.218	38.1817	596.846	480942	4225993	623.531	Geophys Feature Pt-project area d
19	-99.218	38.1815	596.807	480950	4225974	623.492	Geophys Feature Pt-project area d
20	-99.217	38.1815	597.181	480967	4225980	623.866	Other Line-irrigation ditch
20	-99.217	38.1815	597.206	480967	4225980	623.891	Other Line-irrigation ditch
20	-99.217	38.1815	597.329	480965	4225977	624.014	Other Line-irrigation ditch
20	-99.217	38.1815	597.386	480961	4225974	624.071	Other Line-irrigation ditch
20	-99.217	38.1815	597.332	480956	4225971	624.017	Other Line-irrigation ditch
20	-99.217	38.1814	597.309	480952	4225967	623.994	Other Line-irrigation ditch
20	-99.218	38.1814	597.329	480948	4225963	624.014	Other Line-irrigation ditch
20	-99.218	38.1814	597.32	480943	4225959	624.005	Other Line-irrigation ditch
20	-99.218	38.1813	597.331	480939	4225955	624.016	Other Line-irrigation ditch
20	-99.218	38.1813	597.271	480934	4225951	623.956	Other Line-irrigation ditch
20	-99.218	38.1812	597.253	480930	4225947	623.937	Other Line-irrigation ditch
20	-99.218	38.1812	597.415	480924	4225944	624.1	Other Line-irrigation ditch
20	-99.218	38.1812	597.397	480921	4225942	624.082	Other Line-irrigation ditch
21	-99.218	38.1811	596.808	480917	4225929	623.493	Other Line-two-track lane
21	-99.218	38.1811	596.783	480917	4225929	623.468	Other Line-two-track lane
21	-99.218	38.1811	597.066	480916	4225933	623.75	Other Line-two-track lane
21	-99.218	38.1812	597.31	480914	4225939	623.995	Other Line-two-track lane
21	-99.218	38.1812	597.265	480912	4225944	623.949	Other Line-two-track lane
21	-99.218	38.1813	597.068	480909	4225950	623.753	Other Line-two-track lane
21	-99.218	38.1813	596.973	480907	4225956	623.658	Other Line-two-track lane
21	-99.218	38.1814	596.918	480904	4225962	623.602	Other Line-two-track lane
21	-99.218	38.1814	596.841	480902	4225968	623.526	Other Line-two-track lane
21	-99.218	38.1815	596.835	480899	4225974	623.519	Other Line-two-track lane

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
21	-99.218	38.1815	596.851	480897	4225980	623.535	Other Line-two-track lane
21	-99.218	38.1816	596.857	480894	4225987	623.542	Other Line-two-track lane
21	-99.218	38.1817	596.886	480892	4225993	623.57	Other Line-two-track lane
21	-99.218	38.1817	596.922	480889	4225999	623.606	Other Line-two-track lane
21	-99.218	38.1818	596.907	480886	4226005	623.591	Other Line-two-track lane
21	-99.218	38.1818	596.874	480884	4226011	623.558	Other Line-two-track lane
21	-99.218	38.1819	596.892	480882	4226017	623.576	Other Line-two-track lane
21	-99.218	38.1819	596.549	480879	4226023	623.233	Other Line-two-track lane
21	-99.218	38.182	596.47	480878	4226027	623.154	Other Line-two-track lane
22	-99.219	38.1823	596.386	480860	4226066	623.07	Site Feature Line-parade ground gravel path
22	-99.219	38.1823	596.236	480863	4226067	622.92	Site Feature Line-parade ground gravel path
22	-99.218	38.1823	596.943	480865	4226068	623.627	Site Feature Line-parade ground gravel path
22	-99.218	38.1824	596.33	480870	4226071	623.014	Site Feature Line-parade ground gravel path
22	-99.218	38.1824	596.915	480876	4226073	623.599	Site Feature Line-parade ground gravel path
22	-99.218	38.1824	597.349	480882	4226075	624.033	Site Feature Line-parade ground gravel path
22	-99.218	38.1824	597.331	480888	4226078	624.015	Site Feature Line-parade ground gravel path
22	-99.218	38.1824	596.764	480894	4226080	623.448	Site Feature Line-parade ground gravel path
22	-99.218	38.1825	596.751	480900	4226083	623.435	Site Feature Line-parade ground gravel path
22	-99.218	38.1825	596.778	480906	4226085	623.462	Site Feature Line-parade ground gravel path
22	-99.218	38.1825	596.216	480912	4226088	622.9	Site Feature Line-parade ground gravel path
22	-99.218	38.1825	596.736	480918	4226090	623.42	Site Feature Line-parade ground gravel path
22	-99.218	38.1826	596.801	480924	4226093	623.485	Site Feature Line-parade ground gravel path
22	-99.218	38.1826	596.834	480930	4226096	623.518	Site Feature Line-parade ground gravel path
22	-99.218	38.1826	596.328	480936	4226098	623.012	Site Feature Line-parade ground gravel path
22	-99.218	38.1826	596.087	480943	4226101	622.771	Site Feature Line-parade ground gravel path
22	-99.218	38.1826	596.09	480949	4226103	622.774	Site Feature Line-parade ground gravel path
22	-99.217	38.1827	596.01	480955	4226105	622.694	Site Feature Line-parade ground gravel path
22	-99.217	38.1827	596.092	480961	4226108	622.776	Site Feature Line-parade ground gravel path
22	-99.217	38.1827	596.343	480967	4226111	623.027	Site Feature Line-parade ground gravel path
22	-99.217	38.1827	596.262	480974	4226114	622.946	Site Feature Line-parade ground gravel path
22	-99.217	38.1828	596.421	480980	4226116	623.106	Site Feature Line-parade ground gravel path
22	-99.217	38.1828	596.558	480986	4226119	623.243	Site Feature Line-parade ground gravel path
22	-99.217	38.1828	596.112	480987	4226120	622.796	Site Feature Line-parade ground gravel path
23	-99.217	38.1828	596.079	480987	4226120	622.764	Site Feature Line-blockhouse gravel trail
23	-99.217	38.1828	595.73	480988	4226120	622.414	Site Feature Line-blockhouse gravel trail
23	-99.217	38.1828	595.979	480992	4226121	622.663	Site Feature Line-blockhouse gravel trail
23	-99.217	38.1828	596.608	480998	4226124	623.292	Site Feature Line-blockhouse gravel trail
23	-99.217	38.1829	596.564	481004	4226127	623.248	Site Feature Line-blockhouse gravel trail
23	-99.217	38.1829	596.645	481010	4226129	623.329	Site Feature Line-blockhouse gravel trail
23	-99.217	38.1829	596.66	481017	4226131	623.345	Site Feature Line-blockhouse gravel trail
23	-99.217	38.1829	595.89	481023	4226133	622.575	Site Feature Line-blockhouse gravel trail
23	-99.217	38.1829	596.741	481030	4226134	623.425	Site Feature Line-blockhouse gravel trail
23	-99.217	38.1829	596.176	481036	4226133	622.861	Site Feature Line-blockhouse gravel trail

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
23	-99.217	38.1829	599.089	481037	4226132	625.773	Site Feature Line-blockhouse gravel trail
24	-99.217	38.1828	596.292	480988	4226120	622.976	Site Feature Line-parade ground gravel path
24	-99.217	38.1828	596.785	480987	4226120	623.469	Site Feature Line-parade ground gravel path
24	-99.217	38.1828	596.327	480986	4226125	623.011	Site Feature Line-parade ground gravel path
24	-99.217	38.1829	596.816	480983	4226130	623.5	Site Feature Line-parade ground gravel path
24	-99.217	38.1829	598.417	480980	4226136	625.1	Site Feature Line-parade ground gravel path
24	-99.217	38.183	598.573	480977	4226142	625.257	Site Feature Line-parade ground gravel path
24	-99.217	38.1831	598.054	480974	4226149	624.738	Site Feature Line-parade ground gravel path
24	-99.217	38.1831	598.044	480972	4226155	624.727	Site Feature Line-parade ground gravel path
24	-99.217	38.1832	596.477	480970	4226162	623.161	Site Feature Line-parade ground gravel path
24	-99.217	38.1832	595.8	480967	4226169	622.484	Site Feature Line-parade ground gravel path
24	-99.217	38.1833	595.874	480965	4226175	622.558	Site Feature Line-parade ground gravel path
24	-99.217	38.1834	595.857	480962	4226181	622.541	Site Feature Line-parade ground gravel path
24	-99.217	38.1834	595.916	480960	4226188	622.599	Site Feature Line-parade ground gravel path
24	-99.217	38.1835	595.941	480957	4226194	622.625	Site Feature Line-parade ground gravel path
24	-99.217	38.1835	596.012	480954	4226201	622.695	Site Feature Line-parade ground gravel path
24	-99.218	38.1836	597.305	480951	4226207	623.988	Site Feature Line-parade ground gravel path
24	-99.218	38.1836	596.632	480948	4226213	623.316	Site Feature Line-parade ground gravel path
24	-99.218	38.1837	596.121	480945	4226219	622.804	Site Feature Line-parade ground gravel path
24	-99.218	38.1838	596.211	480943	4226226	622.894	Site Feature Line-parade ground gravel path
24	-99.218	38.1838	598.194	480941	4226232	624.877	Site Feature Line-parade ground gravel path
24	-99.218	38.1839	596.861	480939	4226239	623.544	Site Feature Line-parade ground gravel path
24	-99.218	38.1839	596.21	480937	4226242	622.893	Site Feature Line-parade ground gravel path
25	-99.218	38.1839	596.277	480937	4226242	622.961	Site Feature Line-cemetery gravel path
25	-99.218	38.1839	594.569	480937	4226243	621.252	Site Feature Line-cemetery gravel path
25	-99.218	38.1839	593.706	480942	4226244	620.389	Site Feature Line-cemetery gravel path
25	-99.218	38.1839	595.996	480948	4226247	622.68	Site Feature Line-cemetery gravel path
25	-99.218	38.184	594.686	480947	4226252	621.369	Site Feature Line-cemetery gravel path
25	-99.218	38.184	594.871	480943	4226257	621.554	Site Feature Line-cemetery gravel path
25	-99.218	38.1841	595.137	480944	4226262	621.82	Site Feature Line-cemetery gravel path
25	-99.218	38.1841	597.32	480949	4226266	624.003	Site Feature Line-cemetery gravel path
25	-99.217	38.1841	597.194	480955	4226269	623.877	Site Feature Line-cemetery gravel path
25	-99.217	38.1842	597.238	480961	4226271	623.921	Site Feature Line-cemetery gravel path
25	-99.217	38.1842	597.674	480966	4226274	624.357	Site Feature Line-cemetery gravel path
25	-99.217	38.1842	597.382	480973	4226276	624.065	Site Feature Line-cemetery gravel path
25	-99.217	38.1842	597.293	480979	4226278	623.976	Site Feature Line-cemetery gravel path
25	-99.217	38.1843	597.154	480985	4226281	623.837	Site Feature Line-cemetery gravel path
25	-99.217	38.1843	595.516	480990	4226284	622.199	Site Feature Line-cemetery gravel path
25	-99.217	38.1843	597.35	480997	4226286	624.033	Site Feature Line-cemetery gravel path
25	-99.217	38.1843	597.388	481003	4226289	624.072	Site Feature Line-cemetery gravel path
25	-99.217	38.1843	597.137	481009	4226291	623.82	Site Feature Line-cemetery gravel path
26	-99.216	38.1839	596.275	481055	4226242	622.958	Site Feature Point-monument
27	-99.218	38.1839	594.689	480937	4226243	621.372	Site Feature Line-parade ground gravel path

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
27	-99.218	38.1839	594.562	480937	4226242	621.245	Site Feature Line-parade ground gravel path
27	-99.218	38.1839	594.599	480933	4226241	621.282	Site Feature Line-parade ground gravel path
27	-99.218	38.1839	594.61	480927	4226239	621.293	Site Feature Line-parade ground gravel path
27	-99.218	38.1838	594.031	480922	4226236	620.714	Site Feature Line-parade ground gravel path
27	-99.218	38.1838	594.499	480916	4226234	621.182	Site Feature Line-parade ground gravel path
27	-99.218	38.1838	594.496	480911	4226231	621.179	Site Feature Line-parade ground gravel path
27	-99.218	38.1838	594.507	480905	4226229	621.19	Site Feature Line-parade ground gravel path
27	-99.218	38.1838	594.514	480899	4226227	621.197	Site Feature Line-parade ground gravel path
27	-99.218	38.1837	594.251	480894	4226224	620.934	Site Feature Line-parade ground gravel path
27	-99.218	38.1837	594.305	480888	4226222	620.988	Site Feature Line-parade ground gravel path
27	-99.218	38.1837	594.333	480882	4226219	621.016	Site Feature Line-parade ground gravel path
27	-99.218	38.1837	594.355	480876	4226217	621.038	Site Feature Line-parade ground gravel path
27	-99.218	38.1837	594.351	480870	4226215	621.034	Site Feature Line-parade ground gravel path
27	-99.218	38.1836	594.359	480864	4226212	621.042	Site Feature Line-parade ground gravel path
27	-99.219	38.1836	594.41	480858	4226210	621.093	Site Feature Line-parade ground gravel path
27	-99.219	38.1836	594.865	480852	4226207	621.548	Site Feature Line-parade ground gravel path
27	-99.219	38.1836	594.878	480846	4226204	621.561	Site Feature Line-parade ground gravel path
27	-99.219	38.1835	594.53	480840	4226202	621.213	Site Feature Line-parade ground gravel path
27	-99.219	38.1835	596.088	480835	4226199	622.771	Site Feature Line-parade ground gravel path
27	-99.219	38.1835	595.926	480829	4226196	622.609	Site Feature Line-parade ground gravel path
27	-99.219	38.1835	596.189	480823	4226194	622.872	Site Feature Line-parade ground gravel path
27	-99.219	38.1834	596.342	480817	4226191	623.025	Site Feature Line-parade ground gravel path
27	-99.219	38.1834	596.34	480811	4226189	623.023	Site Feature Line-parade ground gravel path
27	-99.219	38.1834	596.306	480811	4226188	622.989	Site Feature Line-parade ground gravel path
27	-99.219	38.1834	596.474	480812	4226185	623.157	Site Feature Line-parade ground gravel path
27	-99.219	38.1833	596.333	480815	4226179	623.016	Site Feature Line-parade ground gravel path
27	-99.219	38.1833	594.636	480816	4226173	621.319	Site Feature Line-parade ground gravel path
27	-99.219	38.1832	594.128	480819	4226167	620.812	Site Feature Line-parade ground gravel path
27	-99.219	38.1832	594.141	480821	4226161	620.824	Site Feature Line-parade ground gravel path
27	-99.219	38.1831	594.714	480824	4226155	621.397	Site Feature Line-parade ground gravel path
27	-99.219	38.1831	594.616	480827	4226148	621.299	Site Feature Line-parade ground gravel path
27	-99.219	38.183	595.082	480829	4226142	621.765	Site Feature Line-parade ground gravel path
27	-99.219	38.1829	594.328	480832	4226136	621.011	Site Feature Line-parade ground gravel path
27	-99.219	38.1829	594.383	480834	4226130	621.066	Site Feature Line-parade ground gravel path
27	-99.219	38.1828	594.445	480837	4226123	621.128	Site Feature Line-parade ground gravel path
27	-99.219	38.1828	594.519	480840	4226117	621.202	Site Feature Line-parade ground gravel path
27	-99.219	38.1827	594.504	480842	4226111	621.187	Site Feature Line-parade ground gravel path
27	-99.219	38.1827	594.542	480845	4226104	621.226	Site Feature Line-parade ground gravel path
27	-99.219	38.1826	594.555	480847	4226098	621.239	Site Feature Line-parade ground gravel path
27	-99.219	38.1825	594.574	480850	4226091	621.258	Site Feature Line-parade ground gravel path
27	-99.219	38.1825	594.542	480853	4226085	621.225	Site Feature Line-parade ground gravel path
27	-99.219	38.1824	594.433	480855	4226079	621.117	Site Feature Line-parade ground gravel path
27	-99.219	38.1824	594.407	480858	4226073	621.091	Site Feature Line-parade ground gravel path

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
27	-99.219	38.1823	594.315	480861	4226067	620.999	Site Feature Line-parade ground gravel path
27	-99.219	38.1823	596.146	480862	4226066	622.83	Site Feature Line-parade ground gravel path
28	-99.218	38.1826	596.03	480938	4226099	622.714	Site Feature Line-center gravel path n-s
28	-99.218	38.1837	593.845	480884	4226221	620.528	Site Feature Line-center gravel path n-s
29	-99.217	38.1833	596.264	480963	4226180	622.948	Site Feature Line-center gravel path e-w
29	-99.217	38.1833	596.343	480963	4226180	623.027	Site Feature Line-center gravel path e-w
29	-99.217	38.1833	596.355	480959	4226179	623.038	Site Feature Line-center gravel path e-w
29	-99.217	38.1833	596.242	480954	4226177	622.926	Site Feature Line-center gravel path e-w
29	-99.218	38.1833	596.236	480948	4226174	622.919	Site Feature Line-center gravel path e-w
29	-99.218	38.1833	596.16	480942	4226171	622.844	Site Feature Line-center gravel path e-w
29	-99.218	38.1832	596.116	480935	4226169	622.8	Site Feature Line-center gravel path e-w
29	-99.218	38.1832	596.087	480929	4226166	622.77	Site Feature Line-center gravel path e-w
29	-99.218	38.1832	593.827	480921	4226164	620.51	Site Feature Line-center gravel path e-w
29	-99.218	38.1832	593.845	480915	4226161	620.529	Site Feature Line-center gravel path e-w
29	-99.218	38.1831	593.911	480909	4226158	620.594	Site Feature Line-center gravel path e-w
29	-99.218	38.1831	596.122	480904	4226156	622.805	Site Feature Line-center gravel path e-w
29	-99.218	38.1831	596.161	480904	4226156	622.844	Site Feature Line-center gravel path e-w
30	-99.218	38.1831	595.051	480899	4226153	621.734	Site Feature Point-flagpole
31	-99.218	38.1831	593.954	480894	4226152	620.638	Site Feature Line-center gravel path e-w
31	-99.218	38.1831	595.956	480894	4226151	622.64	Site Feature Line-center gravel path e-w
31	-99.218	38.1831	595.912	480890	4226149	622.596	Site Feature Line-center gravel path e-w
31	-99.218	38.183	595.947	480885	4226147	622.63	Site Feature Line-center gravel path e-w
31	-99.218	38.183	596	480879	4226144	622.684	Site Feature Line-center gravel path e-w
31	-99.218	38.183	596.016	480873	4226142	622.699	Site Feature Line-center gravel path e-w
31	-99.218	38.183	596.048	480867	4226139	622.732	Site Feature Line-center gravel path e-w
31	-99.219	38.183	596.101	480860	4226137	622.784	Site Feature Line-center gravel path e-w
31	-99.219	38.1829	596.102	480854	4226134	622.785	Site Feature Line-center gravel path e-w
31	-99.219	38.1829	596.173	480847	4226132	622.857	Site Feature Line-center gravel path e-w
31	-99.219	38.1829	596.203	480841	4226129	622.886	Site Feature Line-center gravel path e-w
31	-99.219	38.1829	596.171	480836	4226127	622.854	Site Feature Line-center gravel path e-w
32	-99.219	38.1833	595.082	480803	4226171	621.765	Geophys Feature Pt-project area e stake
33	-99.219	38.1833	595.914	480821	4226180	622.597	Geophys Feature Pt-project area e stake
34	-99.219	38.1834	595.802	480840	4226187	622.485	Geophys Feature Pt-project area e stake
35	-99.219	38.1835	595.27	480857	4226195	621.953	Geophys Feature Pt-project area e stake
36	-99.219	38.1836	598.047	480831	4226205	624.73	Geophys Feature Pt-project area e stake
37	-99.219	38.1835	596.81	480814	4226199	623.493	Geophys Feature Pt-project area e stake
38	-99.219	38.1834	596.543	480795	4226191	623.225	Geophys Feature Pt-project area e stake
39	-99.219	38.1834	596.925	480777	4226184	623.608	Geophys Feature Pt-project area e stake
40	-99.219	38.1836	596.756	480788	4226210	623.439	Geophys Feature Pt-project area e stake 2009
41	-99.219	38.1837	596.337	480806	4226217	623.02	Geophys Feature Pt-project area e stake
42	-99.219	38.1837	596.231	480825	4226224	622.914	Geophys Feature Pt-project area e stake
43	-99.219	38.1838	597.546	480842	4226231	624.228	Geophys Feature Pt-project area e stake
44	-99.219	38.184	596.187	480836	4226250	622.869	Geophys Feature Pt-project area e stake

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
45	-99.219	38.1839	596.177	480817	4226243	622.86	Geophys Feature Pt-project area e stake
46	-99.219	38.1838	596.745	480799	4226235	623.428	Geophys Feature Pt-project area e stake
47	-99.219	38.1838	595.622	480781	4226228	622.305	Geophys Feature Pt-project area e stake
48	-99.22	38.1839	595.404	480773	4226246	622.087	Geophys Feature Pt-project area e stake
49	-99.219	38.184	596.803	480787	4226252	623.485	Geophys Feature Pt-project area e stake
50	-99.219	38.184	596.46	480794	4226255	623.142	Geophys Feature Pt-project area e stake
51	-99.219	38.1841	595.345	480809	4226261	622.027	Geophys Feature Pt-project area e stake
52	-99.219	38.1841	595.287	480828	4226269	621.969	Geophys Feature Pt-project area e stake
53	-99.219	38.1837	595.156	480829	4226222	621.839	Other Point-manhole cover
54	-99.219	38.1837	595.054	480825	4226221	621.737	Other Point-manhole cover
55	-99.219	38.1836	595.922	480837	4226204	622.605	Other Line-asphalt sidewalk
55	-99.219	38.1836	596.081	480837	4226203	622.764	Other Line-asphalt sidewalk
55	-99.219	38.1835	595.78	480833	4226203	622.463	Other Line-asphalt sidewalk
55	-99.219	38.1836	595.857	480828	4226205	622.54	Other Line-asphalt sidewalk
55	-99.219	38.1836	595.773	480825	4226210	622.455	Other Line-asphalt sidewalk
55	-99.219	38.1837	595.476	480823	4226215	622.159	Other Line-asphalt sidewalk
55	-99.219	38.1837	595.108	480821	4226221	621.791	Other Line-asphalt sidewalk
55	-99.219	38.1838	595.069	480818	4226228	621.752	Other Line-asphalt sidewalk
55	-99.219	38.1838	595.118	480816	4226234	621.801	Other Line-asphalt sidewalk
55	-99.219	38.1839	595.455	480813	4226240	622.137	Other Line-asphalt sidewalk
55	-99.219	38.1839	595.969	480811	4226246	622.651	Other Line-asphalt sidewalk
55	-99.219	38.184	596.071	480808	4226252	622.754	Other Line-asphalt sidewalk
55	-99.219	38.184	596.284	480804	4226258	622.966	Other Line-asphalt sidewalk
55	-99.219	38.1841	596.397	480799	4226262	623.08	Other Line-asphalt sidewalk
55	-99.219	38.1841	596.144	480795	4226265	622.827	Other Line-asphalt sidewalk
56	-99.219	38.1841	596.33	480794	4226263	623.012	Other Point-storm drain
57	-99.219	38.184	596.138	480803	4226255	622.82	Other Point-storm drain
58	-99.219	38.1839	595.256	480806	4226245	621.938	Other Point-storm drain
59	-99.219	38.1839	595.499	480811	4226242	622.182	Other Line-asphalt sidewalk
59	-99.219	38.1839	595.439	480810	4226242	622.121	Other Line-asphalt sidewalk
59	-99.219	38.1839	595.421	480807	4226242	622.104	Other Line-asphalt sidewalk
59	-99.219	38.1839	595.333	480803	4226241	622.016	Other Line-asphalt sidewalk
59	-99.219	38.1839	595.09	480803	4226241	621.773	Other Line-asphalt sidewalk
60	-99.219	38.1839	595.25	480803	4226240	621.932	Other Polygon-handicapped parking lot asphalt
60	-99.219	38.1839	595.57	480803	4226241	622.253	Other Polygon-handicapped parking lot asphalt
60	-99.219	38.1839	595.665	480802	4226244	622.347	Other Polygon-handicapped parking lot asphalt
60	-99.219	38.184	595.925	480801	4226249	622.607	Other Polygon-handicapped parking lot asphalt
60	-99.219	38.184	595.582	480801	4226253	622.265	Other Polygon-handicapped parking lot asphalt
60	-99.219	38.184	595.957	480798	4226252	622.639	Other Polygon-handicapped parking lot asphalt
60	-99.219	38.184	596.071	480794	4226253	622.753	Other Polygon-handicapped parking lot asphalt
60	-99.219	38.184	596.005	480793	4226253	622.688	Other Polygon-handicapped parking lot asphalt
60	-99.219	38.184	595.934	480794	4226250	622.616	Other Polygon-handicapped parking lot asphalt
60	-99.219	38.1839	595.908	480794	4226245	622.59	Other Polygon-handicapped parking lot asphalt

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
60	-99.219	38.1839	595.819	480795	4226239	622.501	Other Polygon-handicapped parking lot asphalt
60	-99.219	38.1839	595.756	480795	4226239	622.439	Other Polygon-handicapped parking lot asphalt
60	-99.219	38.1839	595.879	480800	4226240	622.561	Other Polygon-handicapped parking lot asphalt
60	-99.219	38.1839	595.709	480802	4226240	622.392	Other Polygon-handicapped parking lot asphalt
60	-99.219	38.1839	595.25	480803	4226240	621.932	Other Polygon-handicapped parking lot asphalt
61	-99.219	38.1838	595.868	480805	4226228	622.55	Other Point-storm drain
61	-99.219	38.1867	592.4	480810	4226553	619.081	Geophys Feature Pt-project area b stake
62	-99.219	38.1867	592.562	480790	4226553	619.243	Geophys Feature Pt-project area b stake
63	-99.22	38.1867	592.609	480770	4226553	619.289	Geophys Feature Pt-project area b stake
64	-99.22	38.1865	592.693	480750	4226533	619.373	Geophys Feature Pt-project area b stake
65	-99.22	38.1865	592.834	480770	4226533	619.514	Geophys Feature Pt-project area b stake
66	-99.219	38.1865	592.745	480790	4226533	619.426	Geophys Feature Pt-project area b stake
67	-99.219	38.1865	592.627	480810	4226533	619.308	Geophys Feature Pt-project area b stake
68	-99.219	38.1863	592.829	480810	4226513	619.51	Geophys Feature Pt-project area b stake
69	-99.219	38.1863	592.56	480790	4226513	619.241	Geophys Feature Pt-project area b stake
70	-99.22	38.1863	592.624	480770	4226513	619.305	Geophys Feature Pt-project area b stake
71	-99.22	38.1863	592.634	480750	4226513	619.315	Geophys Feature Pt-project area b stake
72	-99.22	38.1862	592.556	480710	4226492	619.237	Geophys Feature Pt-project area b stake
73	-99.22	38.1862	592.69	480730	4226493	619.37	Geophys Feature Pt-project area b stake
74	-99.22	38.1862	592.795	480730	4226492	619.476	Geophys Feature Pt-project area b stake
75	-99.22	38.1862	592.735	480750	4226493	619.416	Geophys Feature Pt-project area b stake
76	-99.22	38.1862	592.808	480770	4226493	619.489	Geophys Feature Pt-project area b stake
77	-99.219	38.1862	592.573	480790	4226493	619.254	Geophys Feature Pt-project area b stake
78	-99.219	38.1862	592.422	480810	4226493	619.103	Geophys Feature Pt-project area b stake
79	-99.219	38.186	592.8	480790	4226473	619.481	Geophys Feature Pt-project area b stake
80	-99.22	38.186	592.683	480770	4226473	619.364	Geophys Feature Pt-project area b stake
81	-99.22	38.186	592.552	480750	4226473	619.233	Geophys Feature Pt-project area b stake
82	-99.22	38.186	592.633	480730	4226473	619.314	Geophys Feature Pt-project area b stake
83	-99.22	38.186	592.401	480710	4226472	619.082	Geophys Feature Pt-project area b stake
84	-99.22	38.1858	592.549	480710	4226452	619.23	Geophys Feature Pt-project area b stake
85	-99.22	38.1858	592.772	480730	4226452	619.453	Geophys Feature Pt-project area b stake
86	-99.22	38.1858	592.731	480751	4226452	619.412	Geophys Feature Pt-project area b stake
87	-99.22	38.1858	592.778	480771	4226453	619.459	Geophys Feature Pt-project area b stake
88	-99.219	38.1858	592.517	480791	4226453	619.198	Geophys Feature Pt-project area b stake
89	-99.219	38.1856	593.362	480791	4226433	620.043	Geophys Feature Pt-project area b stake
90	-99.22	38.1856	592.656	480771	4226433	619.337	Geophys Feature Pt-project area b stake
91	-99.22	38.1856	592.672	480751	4226433	619.353	Geophys Feature Pt-project area b stake
92	-99.22	38.1856	592.549	480731	4226432	619.23	Geophys Feature Pt-project area b stake
93	-99.22	38.1856	592.558	480711	4226432	619.239	Geophys Feature Pt-project area b stake
94	-99.22	38.1854	592.479	480711	4226412	619.16	Geophys Feature Pt-project area b stake
95	-99.22	38.1854	592.547	480731	4226412	619.228	Geophys Feature Pt-project area b stake
96	-99.22	38.1854	592.673	480751	4226413	619.354	Geophys Feature Pt-project area b stake
97	-99.22	38.1854	592.698	480771	4226413	619.38	Geophys Feature Pt-project area b stake

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
98	-99.219	38.1853	593.197	480791	4226393	619.878	Geophys Feature Pt-project area b stake
99	-99.22	38.1853	592.701	480771	4226393	619.382	Geophys Feature Pt-project area b stake
100	-99.22	38.1853	592.439	480751	4226393	619.12	Geophys Feature Pt-project area b stake
101	-99.22	38.1853	592.538	480731	4226392	619.219	Geophys Feature Pt-project area b stake
102	-99.22	38.1853	592.479	480711	4226392	619.16	Geophys Feature Pt-project area b stake
103	-99.22	38.1852	592.426	480691	4226392	619.107	Geophys Feature Pt-project area b stake
104	-99.221	38.1852	592.283	480671	4226392	618.964	Geophys Feature Pt-project area b stake
105	-99.221	38.1851	592.359	480671	4226372	619.04	Geophys Feature Pt-project area b stake
106	-99.221	38.1849	592.327	480652	4226351	619.008	Geophys Feature Pt-project area b stake
107	-99.221	38.1847	592.732	480652	4226332	619.413	Geophys Feature Pt-project area b stake
108	-99.221	38.1845	593.025	480652	4226312	619.706	Geophys Feature Pt-project area b stake
109	-99.221	38.1843	592.923	480652	4226292	619.605	Geophys Feature Pt-project area b stake
110	-99.221	38.1845	593.216	480667	4226312	619.898	Geophys Feature Pt-project area b stake
111	-99.221	38.1845	592.523	480672	4226311	619.204	Geophys Feature Pt-project area b stake
112	-99.221	38.1847	592.904	480672	4226332	619.586	Geophys Feature Pt-project area b stake
113	-99.221	38.1849	592.634	480672	4226352	619.315	Geophys Feature Pt-project area b stake
114	-99.22	38.1851	592.502	480691	4226371	619.183	Geophys Feature Pt-project area b stake
115	-99.22	38.1849	592.599	480691	4226352	619.281	Geophys Feature Pt-project area b stake
116	-99.22	38.1847	593.129	480692	4226332	619.811	Geophys Feature Pt-project area b stake
117	-99.22	38.1847	593.22	480692	4226327	619.901	Geophys Feature Pt-project area b stake
118	-99.22	38.1847	593.138	480712	4226332	619.82	Geophys Feature Pt-project area b stake
119	-99.22	38.1849	592.965	480712	4226352	619.646	Geophys Feature Pt-project area b stake
120	-99.22	38.1851	592.469	480711	4226372	619.151	Geophys Feature Pt-project area b stake
121	-99.22	38.1851	592.537	480731	4226372	619.218	Geophys Feature Pt-project area b stake
122	-99.22	38.1849	593.04	480732	4226352	619.722	Geophys Feature Pt-project area b stake
123	-99.22	38.1848	593.177	480732	4226343	619.859	Geophys Feature Pt-project area b stake
124	-99.22	38.1849	592.802	480752	4226353	619.483	Geophys Feature Pt-project area b stake
125	-99.22	38.1851	592.365	480751	4226373	619.046	Geophys Feature Pt-project area b stake
126	-99.22	38.1851	592.15	480770	4226373	618.832	Geophys Feature Pt-project area b stake
127	-99.219	38.1851	593.23	480791	4226373	619.912	Geophys Feature Pt-project area b stake
128	-99.22	38.1819	592.616	480758	4226017	619.299	Geophys Feature Pt-project area c stake
129	-99.22	38.1818	592.878	480763	4226005	619.562	Geophys Feature Pt-project area c stake
130	-99.22	38.1816	592.695	480770	4225986	619.379	Geophys Feature Pt-project area c stake
131	-99.219	38.1814	592.863	480778	4225968	619.547	Geophys Feature Pt-project area c stake
132	-99.219	38.1813	592.961	480785	4225950	619.646	Geophys Feature Pt-project area c stake
133	-99.219	38.1812	592.754	480788	4225944	619.438	Geophys Feature Pt-project area c stake
134	-99.22	38.1812	592.609	480766	4225944	619.293	Geophys Feature Pt-project area c stake
135	-99.22	38.1814	592.795	480759	4225961	619.479	Geophys Feature Pt-project area c stake
136	-99.22	38.1815	592.667	480752	4225979	619.351	Geophys Feature Pt-project area c stake
137	-99.22	38.1817	592.656	480744	4225997	619.339	Geophys Feature Pt-project area c stake
138	-99.22	38.1817	592.628	480742	4226002	619.311	Geophys Feature Pt-project area c stake
139	-99.22	38.1816	592.805	480726	4225990	619.488	Geophys Feature Pt-project area c stake
140	-99.22	38.1816	592.548	480721	4225988	619.232	Geophys Feature Pt-project area c stake

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
141	-99.22	38.1815	592.931	480733	4225971	619.615	Geophys Feature Pt-project area c stake
142	-99.22	38.1813	592.725	480741	4225953	619.409	Geophys Feature Pt-project area c stake
143	-99.22	38.1812	593.082	480745	4225943	619.766	Geophys Feature Pt-project area c stake
144	-99.22	38.1812	593.288	480724	4225942	619.972	Geophys Feature Pt-project area c stake
145	-99.22	38.1812	593.235	480723	4225945	619.919	Geophys Feature Pt-project area c stake
146	-99.22	38.1814	593.574	480715	4225964	620.258	Geophys Feature Pt-project area c stake
147	-99.22	38.1815	593.223	480708	4225979	619.907	Geophys Feature Pt-project area c stake
148	-99.22	38.1814	593.436	480691	4225970	620.12	Geophys Feature Pt-project area c stake
149	-99.22	38.1813	593.274	480696	4225956	619.958	Geophys Feature Pt-project area c stake
150	-99.22	38.1812	593.121	480702	4225942	619.805	Geophys Feature Pt-project area c stake
151	-99.221	38.1812	593.213	480680	4225942	619.897	Geophys Feature Pt-project area c stake
152	-99.221	38.1813	593.186	480678	4225949	619.87	Other Point-100 meters
153	-99.221	38.1814	593.457	480672	4225964	620.14	Other Point-100 meters
154	-99.221	38.1814	593.31	480652	4225960	619.994	Other Point-100 meters
155	-99.221	38.1812	593.266	480659	4225941	619.95	Other Point-100 meters
156	-99.221	38.1812	593.436	480643	4225940	620.12	Geophys Feature Pt-project area b stake
156	-99.221	38.1812	593.64	480643	4225940	620.324	Geophys Feature Pt-project area b stake
156	-99.221	38.1812	593.547	480643	4225942	620.231	Geophys Feature Pt-project area b stake
156	-99.221	38.1812	593.765	480644	4225946	620.448	Geophys Feature Pt-project area b stake
156	-99.221	38.1813	593.666	480645	4225950	620.35	Geophys Feature Pt-project area b stake
156	-99.221	38.1813	593.763	480646	4225955	620.446	Geophys Feature Pt-project area b stake
156	-99.221	38.1813	593.693	480647	4225959	620.376	Geophys Feature Pt-project area b stake
156	-99.221	38.1814	593.803	480647	4225963	620.487	Geophys Feature Pt-project area b stake
157	-99.221	38.1812	593.522	480631	4225939	620.206	Geophys Feature Pt-project area b stake
157	-99.221	38.1812	593.868	480631	4225939	620.552	Geophys Feature Pt-project area b stake
157	-99.221	38.1812	593.801	480634	4225939	620.484	Geophys Feature Pt-project area b stake
157	-99.221	38.1812	593.791	480640	4225939	620.475	Geophys Feature Pt-project area b stake
157	-99.221	38.1812	593.759	480646	4225940	620.443	Geophys Feature Pt-project area b stake
157	-99.221	38.1812	593.635	480652	4225940	620.319	Geophys Feature Pt-project area b stake
157	-99.221	38.1812	593.913	480658	4225940	620.597	Geophys Feature Pt-project area b stake
157	-99.221	38.1812	593.753	480664	4225940	620.437	Geophys Feature Pt-project area b stake
157	-99.221	38.1812	593.799	480670	4225940	620.483	Geophys Feature Pt-project area b stake
157	-99.221	38.1812	593.807	480676	4225940	620.491	Geophys Feature Pt-project area b stake
157	-99.221	38.1812	593.74	480682	4225940	620.424	Geophys Feature Pt-project area b stake
157	-99.221	38.1812	593.847	480688	4225940	620.53	Geophys Feature Pt-project area b stake
157	-99.22	38.1812	593.679	480694	4225940	620.362	Geophys Feature Pt-project area b stake
157	-99.22	38.1812	593.672	480700	4225941	620.356	Geophys Feature Pt-project area b stake
157	-99.22	38.1812	593.558	480706	4225940	620.242	Geophys Feature Pt-project area b stake
157	-99.22	38.1812	593.879	480712	4225941	620.563	Geophys Feature Pt-project area b stake
157	-99.22	38.1812	593.368	480718	4225941	620.052	Geophys Feature Pt-project area b stake
157	-99.22	38.1812	593.575	480725	4225941	620.259	Geophys Feature Pt-project area b stake
157	-99.22	38.1812	593.573	480730	4225941	620.257	Geophys Feature Pt-project area b stake
157	-99.22	38.1812	593.757	480736	4225941	620.441	Geophys Feature Pt-project area b stake

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
157	-99.22	38.1812	593.627	480742	4225941	620.311	Geophys Feature Pt-project area b stake
157	-99.22	38.1812	593.574	480748	4225941	620.259	Geophys Feature Pt-project area b stake
157	-99.22	38.1812	593.503	480754	4225941	620.187	Geophys Feature Pt-project area b stake
157	-99.22	38.1812	593.358	480759	4225941	620.042	Geophys Feature Pt-project area b stake
157	-99.22	38.1812	593.394	480765	4225941	620.078	Geophys Feature Pt-project area b stake
157	-99.22	38.1812	593.402	480771	4225941	620.087	Geophys Feature Pt-project area b stake
157	-99.219	38.1812	593.082	480777	4225941	619.766	Geophys Feature Pt-project area b stake
157	-99.219	38.1812	593.211	480783	4225941	619.895	Geophys Feature Pt-project area b stake
157	-99.219	38.1812	592.737	480788	4225941	619.421	Geophys Feature Pt-project area b stake
158	-99.22	38.1816	593.419	480770	4225991	620.103	Geophys Feature Pt-project area b stake
158	-99.22	38.1816	593.383	480770	4225991	620.067	Geophys Feature Pt-project area b stake
158	-99.22	38.1816	593.47	480768	4225990	620.154	Geophys Feature Pt-project area b stake
158	-99.22	38.1816	593.744	480763	4225988	620.428	Geophys Feature Pt-project area b stake
158	-99.22	38.1816	593.711	480758	4225987	620.395	Geophys Feature Pt-project area b stake
158	-99.22	38.1816	593.807	480754	4225985	620.49	Geophys Feature Pt-project area b stake
158	-99.22	38.1815	593.417	480743	4225981	620.101	Geophys Feature Pt-project area b stake
158	-99.22	38.1815	593.521	480738	4225979	620.205	Geophys Feature Pt-project area b stake
158	-99.22	38.1815	593.5	480735	4225977	620.184	Geophys Feature Pt-project area b stake
158	-99.22	38.1815	593.353	480729	4225975	620.037	Geophys Feature Pt-project area b stake
158	-99.22	38.1815	593.521	480724	4225973	620.205	Geophys Feature Pt-project area b stake
158	-99.22	38.1815	593.505	480718	4225971	620.189	Geophys Feature Pt-project area b stake
158	-99.22	38.1814	593.652	480712	4225968	620.336	Geophys Feature Pt-project area b stake
158	-99.22	38.1814	593.751	480707	4225966	620.434	Geophys Feature Pt-project area b stake
158	-99.22	38.1814	593.771	480701	4225964	620.455	Geophys Feature Pt-project area b stake
158	-99.22	38.1814	593.662	480695	4225962	620.345	Geophys Feature Pt-project area b stake
158	-99.22	38.1814	593.777	480690	4225960	620.461	Geophys Feature Pt-project area b stake
158	-99.221	38.1813	594.044	480684	4225958	620.728	Geophys Feature Pt-project area b stake
158	-99.221	38.1813	594	480678	4225957	620.683	Geophys Feature Pt-project area b stake
158	-99.221	38.1813	593.859	480671	4225955	620.542	Geophys Feature Pt-project area b stake
158	-99.221	38.1813	593.849	480665	4225954	620.532	Geophys Feature Pt-project area b stake
158	-99.221	38.1813	593.801	480659	4225952	620.484	Geophys Feature Pt-project area b stake
158	-99.221	38.1813	593.981	480653	4225951	620.665	Geophys Feature Pt-project area b stake
158	-99.221	38.1813	594.214	480647	4225950	620.898	Geophys Feature Pt-project area b stake
158	-99.221	38.1813	594.08	480641	4225949	620.763	Geophys Feature Pt-project area b stake
158	-99.221	38.1812	593.624	480635	4225948	620.307	Geophys Feature Pt-project area b stake
158	-99.221	38.1812	593.736	480629	4225948	620.42	Geophys Feature Pt-project area b stake
158	-99.221	38.1812	593.267	480625	4225947	619.951	Geophys Feature Pt-project area b stake
159	-99.221	38.1814	593.352	480628	4225962	620.035	Geophys Feature Pt-project area b stake
159	-99.221	38.1814	593.482	480628	4225962	620.165	Geophys Feature Pt-project area b stake
159	-99.221	38.1814	593.925	480629	4225961	620.608	Geophys Feature Pt-project area b stake
159	-99.221	38.1814	593.739	480633	4225961	620.422	Geophys Feature Pt-project area b stake
159	-99.221	38.1814	593.652	480639	4225962	620.336	Geophys Feature Pt-project area b stake
159	-99.221	38.1814	594.28	480644	4225962	620.963	Geophys Feature Pt-project area b stake

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
159	-99.221	38.1814	593.965	480649	4225963	620.649	Geophys Feature Pt-project area b stake
159	-99.221	38.1814	594.064	480654	4225964	620.748	Geophys Feature Pt-project area b stake
159	-99.221	38.1814	594.322	480658	4225965	621.005	Geophys Feature Pt-project area b stake
159	-99.221	38.1814	594.925	480663	4225966	621.609	Geophys Feature Pt-project area b stake
159	-99.221	38.1814	595.166	480666	4225967	621.85	Geophys Feature Pt-project area b stake
159	-99.221	38.1814	595.203	480671	4225967	621.887	Geophys Feature Pt-project area b stake
159	-99.221	38.1814	594.926	480677	4225968	621.61	Geophys Feature Pt-project area b stake
159	-99.221	38.1814	594.971	480682	4225969	621.655	Geophys Feature Pt-project area b stake
159	-99.221	38.1815	594.713	480688	4225971	621.397	Geophys Feature Pt-project area b stake
159	-99.22	38.1815	594.683	480693	4225974	621.367	Geophys Feature Pt-project area b stake
159	-99.22	38.1815	595.019	480699	4225977	621.703	Geophys Feature Pt-project area b stake
159	-99.22	38.1815	594.95	480703	4225980	621.633	Geophys Feature Pt-project area b stake
159	-99.22	38.1816	594.749	480708	4225983	621.433	Geophys Feature Pt-project area b stake
159	-99.22	38.1816	594.729	480713	4225986	621.413	Geophys Feature Pt-project area b stake
159	-99.22	38.1816	594.758	480718	4225990	621.441	Geophys Feature Pt-project area b stake
159	-99.22	38.1817	594.965	480722	4225994	621.648	Geophys Feature Pt-project area b stake
159	-99.22	38.1817	594.734	480727	4225997	621.418	Geophys Feature Pt-project area b stake
159	-99.22	38.1817	594.331	480731	4226001	621.015	Geophys Feature Pt-project area b stake
159	-99.22	38.1818	595.048	480736	4226005	621.732	Geophys Feature Pt-project area b stake
159	-99.22	38.1818	595.176	480740	4226009	621.86	Geophys Feature Pt-project area b stake
159	-99.22	38.1818	595.256	480743	4226013	621.94	Geophys Feature Pt-project area b stake
159	-99.22	38.1819	595.296	480747	4226017	621.98	Geophys Feature Pt-project area b stake
159	-99.22	38.1819	595.012	480750	4226022	621.696	Geophys Feature Pt-project area b stake
159	-99.22	38.182	595.11	480754	4226026	621.793	Geophys Feature Pt-project area b stake
159	-99.22	38.182	595.233	480757	4226031	621.917	Geophys Feature Pt-project area b stake
159	-99.22	38.182	595.177	480759	4226036	621.861	Geophys Feature Pt-project area b stake
159	-99.22	38.1821	594.527	480761	4226042	621.211	Geophys Feature Pt-project area b stake
159	-99.22	38.1821	595.453	480764	4226047	622.136	Geophys Feature Pt-project area b stake
159	-99.22	38.1822	595.396	480765	4226053	622.079	Geophys Feature Pt-project area b stake
159	-99.22	38.1822	595.158	480767	4226059	621.841	Geophys Feature Pt-project area b stake
159	-99.22	38.1823	595.327	480768	4226065	622.011	Geophys Feature Pt-project area b stake
159	-99.22	38.1824	595.278	480768	4226070	621.962	Geophys Feature Pt-project area b stake
159	-99.22	38.1824	594.805	480768	4226077	621.489	Geophys Feature Pt-project area b stake
159	-99.22	38.1825	595.376	480768	4226082	622.059	Geophys Feature Pt-project area b stake
159	-99.22	38.1825	595.125	480768	4226088	621.809	Geophys Feature Pt-project area b stake
159	-99.22	38.1826	595.947	480769	4226094	622.631	Geophys Feature Pt-project area b stake
159	-99.22	38.1826	594.761	480769	4226100	621.444	Geophys Feature Pt-project area b stake
159	-99.22	38.1827	594.881	480769	4226106	621.564	Geophys Feature Pt-project area b stake
159	-99.22	38.1827	595.295	480769	4226111	621.978	Geophys Feature Pt-project area b stake
159	-99.22	38.1828	593.223	480770	4226117	619.907	Geophys Feature Pt-project area b stake
159	-99.22	38.1828	595.879	480769	4226119	622.563	Geophys Feature Pt-project area b stake
159	-99.22	38.1828	596.571	480768	4226123	623.254	Geophys Feature Pt-project area b stake
159	-99.22	38.1829	594.617	480767	4226129	621.3	Geophys Feature Pt-project area b stake

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
159	-99.22	38.1829	595.353	480765	4226135	622.036	Geophys Feature Pt-project area b stake
159	-99.22	38.183	595.509	480763	4226141	622.192	Geophys Feature Pt-project area b stake
159	-99.22	38.183	595.444	480761	4226146	622.127	Geophys Feature Pt-project area b stake
159	-99.22	38.1831	595.184	480759	4226151	621.867	Geophys Feature Pt-project area b stake
159	-99.22	38.1831	594.955	480757	4226156	621.638	Geophys Feature Pt-project area b stake
159	-99.22	38.1832	594.757	480756	4226159	621.44	Geophys Feature Pt-project area b stake
159	-99.22	38.1832	594.526	480754	4226164	621.209	Geophys Feature Pt-project area b stake
159	-99.22	38.1832	594.128	480752	4226169	620.811	Geophys Feature Pt-project area b stake
159	-99.22	38.1833	593.897	480749	4226174	620.579	Geophys Feature Pt-project area b stake
159	-99.22	38.1833	595.409	480747	4226180	622.092	Geophys Feature Pt-project area b stake
159	-99.22	38.1834	596.272	480744	4226186	622.954	Geophys Feature Pt-project area b stake
159	-99.22	38.1834	597.812	480740	4226190	624.495	Geophys Feature Pt-project area b stake
159	-99.22	38.1835	592.957	480741	4226196	619.639	Geophys Feature Pt-project area b stake
159	-99.22	38.1835	594.342	480738	4226202	621.024	Geophys Feature Pt-project area b stake
159	-99.22	38.1836	593.805	480737	4226207	620.488	Geophys Feature Pt-project area b stake
159	-99.22	38.1836	594.224	480735	4226206	620.907	Geophys Feature Pt-project area b stake
159	-99.22	38.1836	591.504	480737	4226211	618.186	Geophys Feature Pt-project area b stake
159	-99.22	38.1837	594.516	480737	4226215	621.199	Geophys Feature Pt-project area b stake
159	-99.22	38.1837	593.198	480738	4226219	619.881	Geophys Feature Pt-project area b stake
159	-99.22	38.1837	593.932	480741	4226224	620.615	Geophys Feature Pt-project area b stake
159	-99.22	38.1838	594.566	480743	4226229	621.249	Geophys Feature Pt-project area b stake
159	-99.22	38.1839	593.758	480747	4226240	620.44	Geophys Feature Pt-project area b stake
159	-99.22	38.1839	594.091	480750	4226245	620.773	Geophys Feature Pt-project area b stake
159	-99.22	38.184	595.451	480754	4226249	622.134	Geophys Feature Pt-project area b stake
159	-99.22	38.184	595.129	480759	4226251	621.812	Geophys Feature Pt-project area b stake
159	-99.22	38.184	594.944	480765	4226253	621.626	Geophys Feature Pt-project area b stake
159	-99.22	38.184	594.513	480771	4226255	621.195	Geophys Feature Pt-project area b stake
159	-99.22	38.184	594.93	480776	4226256	621.612	Geophys Feature Pt-project area b stake
159	-99.219	38.184	594.032	480782	4226257	620.715	Geophys Feature Pt-project area b stake
159	-99.219	38.1841	594.181	480787	4226259	620.863	Geophys Feature Pt-project area b stake
159	-99.219	38.1841	592.631	480793	4226262	619.313	Geophys Feature Pt-project area b stake
159	-99.219	38.1841	593.115	480798	4226264	619.798	Geophys Feature Pt-project area b stake
159	-99.219	38.1841	592.607	480801	4226265	619.289	Geophys Feature Pt-project area b stake
159	-99.219	38.1841	596.986	480803	4226263	623.669	Geophys Feature Pt-project area b stake
159	-99.219	38.1841	594.727	480805	4226265	621.41	Geophys Feature Pt-project area b stake
159	-99.219	38.1841	593.943	480808	4226267	620.626	Geophys Feature Pt-project area b stake
159	-99.219	38.1841	593.569	480808	4226268	620.252	Geophys Feature Pt-project area b stake
159	-99.219	38.1842	593.604	480811	4226272	620.286	Geophys Feature Pt-project area b stake
159	-99.219	38.1842	592.663	480814	4226276	619.346	Geophys Feature Pt-project area b stake
159	-99.219	38.1842	592.994	480816	4226281	619.677	Geophys Feature Pt-project area b stake
159	-99.219	38.1843	593.352	480821	4226290	620.034	Geophys Feature Pt-project area b stake
159	-99.219	38.1844	593.501	480824	4226293	620.183	Geophys Feature Pt-project area b stake
160	-99.219	38.1841	593.211	480795	4226266	619.893	Geophys Feature Pt-project area b stake

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
161	-99.219	38.1841	594.783	480783	4226265	621.465	Geophys Feature Pt-project area b stake
162	-99.219	38.185	594.809	480780	4226359	621.491	Geophys Feature Pt-project area b stake
163	-99.219	38.185	597.011	480790	4226359	623.693	Geophys Feature Pt-project area b stake
164	-99.219	38.1849	594.374	480785	4226357	621.056	Geophys Feature Pt-project area b stake
164	-99.219	38.1849	594.986	480785	4226357	621.668	Geophys Feature Pt-project area b stake
164	-99.219	38.1849	597.374	480784	4226356	624.055	Geophys Feature Pt-project area b stake
164	-99.219	38.185	595.058	480785	4226363	621.74	Geophys Feature Pt-project area b stake
164	-99.219	38.185	595.099	480785	4226369	621.781	Geophys Feature Pt-project area b stake
164	-99.219	38.1851	595.255	480785	4226375	621.936	Geophys Feature Pt-project area b stake
164	-99.219	38.1852	595.077	480785	4226381	621.759	Geophys Feature Pt-project area b stake
164	-99.219	38.1852	594.957	480785	4226387	621.639	Geophys Feature Pt-project area b stake
164	-99.219	38.1853	594.541	480786	4226393	621.223	Geophys Feature Pt-project area b stake
164	-99.219	38.1853	594.275	480786	4226400	620.956	Geophys Feature Pt-project area b stake
164	-99.219	38.1854	594.196	480787	4226406	620.877	Geophys Feature Pt-project area b stake
164	-99.219	38.1854	594.405	480788	4226412	621.086	Geophys Feature Pt-project area b stake
164	-99.219	38.1855	594.298	480790	4226419	620.979	Geophys Feature Pt-project area b stake
164	-99.219	38.1855	594.198	480792	4226425	620.879	Geophys Feature Pt-project area b stake
164	-99.219	38.1856	594.268	480794	4226431	620.949	Geophys Feature Pt-project area b stake
164	-99.219	38.1857	594.561	480796	4226437	621.242	Geophys Feature Pt-project area b stake
164	-99.219	38.1857	594.647	480798	4226443	621.328	Geophys Feature Pt-project area b stake
164	-99.219	38.1858	594.545	480801	4226449	621.227	Geophys Feature Pt-project area b stake
164	-99.219	38.1858	594.688	480804	4226455	621.369	Geophys Feature Pt-project area b stake
164	-99.219	38.1859	594.51	480806	4226461	621.191	Geophys Feature Pt-project area b stake
164	-99.219	38.1859	594.852	480809	4226468	621.533	Geophys Feature Pt-project area b stake
164	-99.219	38.186	594.553	480812	4226474	621.234	Geophys Feature Pt-project area b stake
164	-99.219	38.186	594.336	480815	4226480	621.017	Geophys Feature Pt-project area b stake
164	-99.219	38.1861	594.573	480817	4226486	621.254	Geophys Feature Pt-project area b stake
164	-99.219	38.1862	594.762	480820	4226492	621.443	Geophys Feature Pt-project area b stake
164	-99.219	38.1862	594.314	480823	4226498	620.995	Geophys Feature Pt-project area b stake
164	-99.219	38.1863	594.275	480826	4226504	620.956	Geophys Feature Pt-project area b stake
164	-99.219	38.1863	594.562	480828	4226510	621.243	Geophys Feature Pt-project area b stake
164	-99.219	38.1864	594.565	480831	4226516	621.246	Geophys Feature Pt-project area b stake
164	-99.219	38.1864	594.327	480833	4226522	621.008	Geophys Feature Pt-project area b stake
164	-99.219	38.1865	594.356	480836	4226529	621.037	Geophys Feature Pt-project area b stake
164	-99.219	38.1865	594.215	480839	4226535	620.896	Geophys Feature Pt-project area b stake
164	-99.219	38.1866	594.285	480842	4226541	620.966	Geophys Feature Pt-project area b stake
164	-99.219	38.1866	594.692	480844	4226547	621.373	Geophys Feature Pt-project area b stake
164	-99.219	38.1867	594.336	480847	4226553	621.017	Geophys Feature Pt-project area b stake
164	-99.219	38.1868	594.5	480850	4226559	621.181	Geophys Feature Pt-project area b stake
164	-99.219	38.1868	594.509	480852	4226565	621.19	Geophys Feature Pt-project area b stake
164	-99.219	38.1869	594.472	480855	4226570	621.153	Geophys Feature Pt-project area b stake
164	-99.219	38.1869	594.386	480857	4226576	621.067	Geophys Feature Pt-project area b stake
164	-99.219	38.187	594.127	480860	4226582	620.808	Geophys Feature Pt-project area b stake

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
164	-99.219	38.187	594.237	480863	4226588	620.918	Geophys Feature Pt-project area b stake
164	-99.218	38.1871	594.054	480865	4226594	620.734	Geophys Feature Pt-project area b stake
164	-99.218	38.1871	594.229	480868	4226600	620.909	Geophys Feature Pt-project area b stake
164	-99.218	38.1872	594.38	480870	4226606	621.061	Geophys Feature Pt-project area b stake
164	-99.218	38.1872	594.342	480873	4226612	621.023	Geophys Feature Pt-project area b stake
164	-99.218	38.1873	594.416	480876	4226618	621.097	Geophys Feature Pt-project area b stake
164	-99.218	38.1873	594.523	480878	4226623	621.203	Geophys Feature Pt-project area b stake
164	-99.218	38.1874	594.225	480880	4226628	620.906	Geophys Feature Pt-project area b stake
164	-99.218	38.1874	594.31	480880	4226629	620.99	Geophys Feature Pt-project area b stake
165	-99.219	38.1861	594.06	480820	4226485	620.742	Geophys Feature Pt-project area b stake
165	-99.219	38.1861	594.182	480820	4226485	620.863	Geophys Feature Pt-project area b stake
165	-99.219	38.1861	594.296	480821	4226484	620.977	Geophys Feature Pt-project area b stake
165	-99.219	38.186	594.19	480825	4226480	620.871	Geophys Feature Pt-project area b stake
165	-99.219	38.186	594.189	480829	4226475	620.87	Geophys Feature Pt-project area b stake
165	-99.219	38.1859	594.298	480839	4226466	620.979	Geophys Feature Pt-project area b stake
165	-99.219	38.1859	594.493	480843	4226461	621.175	Geophys Feature Pt-project area b stake
165	-99.219	38.1858	594.472	480847	4226456	621.153	Geophys Feature Pt-project area b stake
165	-99.219	38.1858	594.409	480850	4226450	621.091	Geophys Feature Pt-project area b stake
165	-99.219	38.1857	594.147	480852	4226443	620.828	Geophys Feature Pt-project area b stake
165	-99.219	38.1857	594.564	480852	4226437	621.246	Geophys Feature Pt-project area b stake
165	-99.219	38.1856	594.456	480852	4226430	621.137	Geophys Feature Pt-project area b stake
165	-99.219	38.1855	594.322	480850	4226424	621.003	Geophys Feature Pt-project area b stake
165	-99.219	38.1855	594.492	480847	4226418	621.174	Geophys Feature Pt-project area b stake
165	-99.219	38.1854	594.107	480842	4226413	620.789	Geophys Feature Pt-project area b stake
165	-99.219	38.1854	594.14	480837	4226409	620.822	Geophys Feature Pt-project area b stake
165	-99.219	38.1854	594.266	480831	4226407	620.947	Geophys Feature Pt-project area b stake
165	-99.219	38.1854	594.374	480825	4226404	621.055	Geophys Feature Pt-project area b stake
165	-99.219	38.1853	594.175	480818	4226402	620.856	Geophys Feature Pt-project area b stake
165	-99.219	38.1853	594.529	480812	4226400	621.211	Geophys Feature Pt-project area b stake
165	-99.219	38.1853	594.365	480805	4226400	621.046	Geophys Feature Pt-project area b stake
165	-99.219	38.1853	594.953	480799	4226401	621.635	Geophys Feature Pt-project area b stake
165	-99.219	38.1854	594.077	480793	4226403	620.758	Geophys Feature Pt-project area b stake
165	-99.219	38.1854	594.441	480790	4226404	621.123	Geophys Feature Pt-project area b stake
166	-99.223	38.1881	593.332	480429	4226714	620.01	Geophys Feature Pt-project area b stake
167	-99.223	38.1883	593.605	480429	4226729	620.283	Geophys Feature Pt-project area b stake
168	-99.223	38.1885	593.778	480428	4226749	620.456	Geophys Feature Pt-project area b stake
169	-99.223	38.1885	593.879	480428	4226759	620.557	Geophys Feature Pt-project area b stake
170	-99.223	38.1886	594.131	480448	4226759	620.809	Geophys Feature Pt-project area b stake
171	-99.223	38.1886	594.545	480468	4226759	621.223	Geophys Feature Pt-project area b stake
172	-99.223	38.1886	594.535	480488	4226759	621.213	Geophys Feature Pt-project area b stake
173	-99.223	38.1886	594.502	480508	4226759	621.18	Geophys Feature Pt-project area b stake
174	-99.222	38.1886	594.129	480528	4226760	620.807	Geophys Feature Pt-project area b stake
175	-99.222	38.1885	594.083	480528	4226749	620.762	Geophys Feature Pt-project area b stake

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
176	-99.222	38.1883	594.048	480528	4226729	620.727	Geophys Feature Pt-project area b stake
177	-99.222	38.1882	593.978	480529	4226715	620.656	Geophys Feature Pt-project area b stake
178	-99.223	38.1882	594.08	480509	4226714	620.759	Geophys Feature Pt-project area b stake
179	-99.223	38.1883	594.172	480509	4226729	620.85	Geophys Feature Pt-project area b stake
180	-99.223	38.1885	594.291	480508	4226749	620.969	Geophys Feature Pt-project area b stake
181	-99.223	38.1885	594.2	480488	4226749	620.879	Geophys Feature Pt-project area b stake
182	-99.223	38.1883	594.068	480489	4226729	620.747	Geophys Feature Pt-project area b stake
183	-99.223	38.1881	594.001	480489	4226714	620.679	Geophys Feature Pt-project area b stake
184	-99.223	38.1881	593.797	480469	4226714	620.475	Geophys Feature Pt-project area b stake
185	-99.223	38.1883	593.805	480469	4226729	620.483	Geophys Feature Pt-project area b stake
186	-99.223	38.1885	594.13	480468	4226749	620.808	Geophys Feature Pt-project area b stake
187	-99.223	38.1885	593.973	480448	4226749	620.651	Geophys Feature Pt-project area b stake
188	-99.223	38.1883	593.774	480449	4226729	620.452	Geophys Feature Pt-project area b stake
189	-99.223	38.1881	593.559	480449	4226714	620.237	Geophys Feature Pt-project area b tent peg
190	-99.223	38.1874	592.12	480429	4226629	618.799	Geophys Feature Pt-project area b stake
191	-99.223	38.1865	591.956	480430	4226529	618.636	Geophys Feature Pt-project area b stake
192	-99.223	38.1856	591.928	480431	4226429	618.608	Geophys Feature Pt-project area b stake
193	-99.223	38.1847	592.079	480432	4226329	618.76	Geophys Feature Pt-project area b stake
194	-99.223	38.1841	592.605	480433	4226270	619.286	Geophys Feature Pt-project area b stake
195	-99.223	38.184	592.305	480434	4226250	618.986	Geophys Feature Pt-project area b stake
196	-99.223	38.1838	592.684	480434	4226230	619.365	Geophys Feature Pt-project area b stake
197	-99.223	38.1836	592.577	480434	4226210	619.258	Geophys Feature Pt-project area b stake
198	-99.223	38.1834	592.936	480434	4226190	619.617	Geophys Feature Pt-project area b stake
199	-99.223	38.1832	593.452	480434	4226171	620.134	Geophys Feature Pt-project area b stake
200	-99.223	38.1831	593.364	480434	4226150	620.045	Geophys Feature Pt-project area b stake
201	-99.223	38.1829	593.469	480434	4226130	620.151	Geophys Feature Pt-project area b stake
202	-99.223	38.1827	593.616	480435	4226110	620.298	Geophys Feature Pt-project area b stake
203	-99.223	38.1825	593.276	480435	4226090	619.958	Geophys Feature Pt-project area b stake
204	-99.223	38.1823	592.469	480435	4226069	619.151	Geophys Feature Pt-project area b stake
205	-99.223	38.1824	592.915	480455	4226075	619.597	Geophys Feature Pt-project area b stake
206	-99.223	38.1825	593.271	480455	4226090	619.953	Geophys Feature Pt-project area b stake
207	-99.223	38.1827	592.93	480455	4226110	619.612	Geophys Feature Pt-project area b stake
208	-99.223	38.1829	592.632	480455	4226130	619.314	Geophys Feature Pt-project area b stake
209	-99.223	38.1831	592.596	480454	4226150	619.278	Geophys Feature Pt-project area b stake
210	-99.223	38.1832	592.207	480454	4226170	618.889	Geophys Feature Pt-project area b stake
211	-99.223	38.1834	592.066	480454	4226190	618.748	Geophys Feature Pt-project area b stake
212	-99.223	38.1836	591.967	480454	4226209	618.649	Geophys Feature Pt-project area b stake
213	-99.223	38.1838	591.829	480454	4226229	618.51	Geophys Feature Pt-project area b stake
214	-99.223	38.184	591.987	480454	4226249	618.668	Geophys Feature Pt-project area b stake
215	-99.223	38.1841	592.118	480453	4226270	618.799	Geophys Feature Pt-project area b stake
216	-99.223	38.1841	592.037	480473	4226270	618.718	Geophys Feature Pt-project area b stake
217	-99.223	38.184	591.841	480473	4226250	618.522	Geophys Feature Pt-project area b stake
218	-99.223	38.1838	591.978	480473	4226230	618.659	Geophys Feature Pt-project area b stake

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
219	-99.223	38.1836	591.948	480474	4226210	618.629	Geophys Feature Pt-project area b stake
220	-99.223	38.1834	592.13	480474	4226190	618.812	Geophys Feature Pt-project area b stake
221	-99.223	38.1832	592.389	480474	4226170	619.071	Geophys Feature Pt-project area b stake
222	-99.223	38.1831	592.685	480474	4226150	619.366	Geophys Feature Pt-project area b stake
223	-99.223	38.1829	592.509	480474	4226130	619.19	Geophys Feature Pt-project area b stake
224	-99.223	38.1827	593.119	480475	4226110	619.801	Geophys Feature Pt-project area b stake
225	-99.223	38.1825	592.777	480475	4226090	619.459	Geophys Feature Pt-project area b stake
226	-99.223	38.1824	592.859	480475	4226080	619.541	Geophys Feature Pt-project area b stake
227	-99.223	38.1824	592.63	480475	4226075	619.312	Geophys Feature Pt-project area b stake
228	-99.223	38.1823	593.634	480495	4226070	620.316	Geophys Feature Pt-project area b stake
229	-99.223	38.1825	593.3	480495	4226090	619.982	Geophys Feature Pt-project area b stake
230	-99.223	38.1827	593.159	480494	4226110	619.841	Geophys Feature Pt-project area b stake
231	-99.223	38.1829	592.926	480494	4226130	619.608	Geophys Feature Pt-project area b stake
232	-99.223	38.1831	592.605	480494	4226150	619.287	Geophys Feature Pt-project area b stake
233	-99.223	38.1832	592.498	480494	4226170	619.18	Geophys Feature Pt-project area b stake
234	-99.223	38.1834	592.449	480494	4226190	619.131	Geophys Feature Pt-project area b stake
235	-99.223	38.1836	592.439	480494	4226210	619.12	Geophys Feature Pt-project area b stake
236	-99.223	38.1838	592.293	480493	4226230	618.974	Geophys Feature Pt-project area b stake
237	-99.223	38.184	592.359	480493	4226250	619.04	Geophys Feature Pt-project area b stake
238	-99.223	38.1841	592.421	480493	4226270	619.102	Geophys Feature Pt-project area b stake
239	-99.223	38.1841	592.458	480513	4226270	619.139	Geophys Feature Pt-project area b stake
240	-99.223	38.184	592.566	480513	4226250	619.247	Geophys Feature Pt-project area b stake
241	-99.223	38.1838	592.502	480513	4226230	619.183	Geophys Feature Pt-project area b stake
242	-99.223	38.1836	592.639	480513	4226210	619.32	Geophys Feature Pt-project area b stake
243	-99.223	38.1834	592.675	480514	4226190	619.357	Geophys Feature Pt-project area b stake
244	-99.223	38.1832	592.692	480514	4226170	619.373	Geophys Feature Pt-project area b stake
245	-99.222	38.1831	592.658	480514	4226150	619.34	Geophys Feature Pt-project area b stake
246	-99.222	38.1829	593.062	480514	4226130	619.744	Geophys Feature Pt-project area b stake
247	-99.222	38.1827	593.537	480514	4226110	620.219	Geophys Feature Pt-project area b stake
248	-99.222	38.1825	593.099	480514	4226090	619.781	Geophys Feature Pt-project area b stake
249	-99.222	38.1823	593.317	480515	4226070	620	Geophys Feature Pt-project area b stake
250	-99.222	38.1823	593.748	480515	4226065	620.431	Geophys Feature Pt-project area b stake
251	-99.222	38.1823	594.258	480536	4226061	620.941	Geophys Feature Pt-project area b stake
252	-99.222	38.1823	593.082	480535	4226071	619.764	Geophys Feature Pt-project area b stake
253	-99.222	38.1825	592.899	480535	4226091	619.582	Geophys Feature Pt-project area b stake
254	-99.222	38.1827	593.083	480535	4226111	619.765	Geophys Feature Pt-project area b stake
255	-99.222	38.1829	592.924	480534	4226131	619.606	Geophys Feature Pt-project area b stake
256	-99.222	38.1831	592.777	480534	4226151	619.459	Geophys Feature Pt-project area b stake
257	-99.222	38.1833	592.723	480534	4226171	619.405	Geophys Feature Pt-project area b stake
258	-99.222	38.1834	592.616	480534	4226191	619.298	Geophys Feature Pt-project area b stake
259	-99.222	38.1836	592.488	480533	4226211	619.17	Geophys Feature Pt-project area b stake
260	-99.222	38.1838	592.386	480534	4226231	619.068	Geophys Feature Pt-project area b stake
261	-99.222	38.184	592.328	480533	4226251	619.009	Geophys Feature Pt-project area b stake

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
262	-99.222	38.1842	592.318	480533	4226271	618.999	Geophys Feature Pt-project area b stake
263	-99.222	38.1842	592.238	480552	4226271	618.919	Geophys Feature Pt-project area b stake
264	-99.222	38.184	592.192	480553	4226251	618.874	Geophys Feature Pt-project area b stake
265	-99.222	38.1838	592.364	480553	4226231	619.046	Geophys Feature Pt-project area b stake
266	-99.222	38.1836	592.551	480553	4226211	619.233	Geophys Feature Pt-project area b stake
267	-99.222	38.1834	592.693	480553	4226191	619.375	Geophys Feature Pt-project area b stake
268	-99.222	38.1833	592.503	480554	4226171	619.185	Geophys Feature Pt-project area b stake
269	-99.222	38.1831	592.414	480553	4226151	619.096	Geophys Feature Pt-project area b stake
270	-99.222	38.1829	593.206	480554	4226130	619.888	Geophys Feature Pt-project area b stake
271	-99.222	38.1827	592.8	480554	4226111	619.482	Geophys Feature Pt-project area b stake
272	-99.222	38.1825	593.63	480554	4226091	620.312	Geophys Feature Pt-project area b stake
273	-99.222	38.1824	592.454	480555	4226071	619.137	Geophys Feature Pt-project area b stake
274	-99.222	38.1822	593.691	480555	4226051	620.373	Geophys Feature Pt-project area b stake
275	-99.222	38.1822	593.952	480576	4226052	620.634	Geophys Feature Pt-project area b stake
276	-99.222	38.1824	594.034	480575	4226071	620.717	Geophys Feature Pt-project area b stake
277	-99.222	38.1825	593.507	480575	4226091	620.189	Geophys Feature Pt-project area b stake
278	-99.222	38.1827	593.294	480575	4226111	619.976	Geophys Feature Pt-project area b stake
279	-99.222	38.1829	593.352	480574	4226131	620.034	Geophys Feature Pt-project area b stake
280	-99.222	38.1831	593.385	480574	4226151	620.067	Geophys Feature Pt-project area b stake
281	-99.222	38.1832	593.457	480574	4226171	620.139	Geophys Feature Pt-project area b stake
282	-99.222	38.1834	593.351	480573	4226191	620.033	Geophys Feature Pt-project area b stake
283	-99.222	38.1836	593.269	480573	4226211	619.951	Geophys Feature Pt-project area b stake
284	-99.222	38.1838	593.178	480573	4226231	619.86	Geophys Feature Pt-project area b stake
285	-99.222	38.184	593.278	480573	4226251	619.959	Geophys Feature Pt-project area b stake
286	-99.222	38.1842	593.205	480572	4226271	619.887	Geophys Feature Pt-project area b stake
287	-99.222	38.1843	592.961	480592	4226291	619.642	Geophys Feature Pt-project area b stake
288	-99.222	38.1842	593.369	480592	4226271	620.051	Geophys Feature Pt-project area b stake
289	-99.222	38.184	593.286	480593	4226251	619.967	Geophys Feature Pt-project area b stake
290	-99.222	38.1838	593.285	480593	4226231	619.967	Geophys Feature Pt-project area b stake
291	-99.222	38.1836	593.068	480593	4226211	619.749	Geophys Feature Pt-project area b stake
292	-99.222	38.1834	593.47	480593	4226191	620.152	Geophys Feature Pt-project area b stake
293	-99.222	38.1833	593.554	480593	4226171	620.236	Geophys Feature Pt-project area b stake
294	-99.222	38.1831	593.541	480593	4226151	620.224	Geophys Feature Pt-project area b stake
295	-99.222	38.1829	593.611	480594	4226131	620.294	Geophys Feature Pt-project area b stake
296	-99.222	38.1827	593.505	480594	4226111	620.188	Geophys Feature Pt-project area b stake
297	-99.222	38.1825	593.39	480594	4226091	620.073	Geophys Feature Pt-project area b stake
298	-99.222	38.1823	593.623	480594	4226070	620.305	Geophys Feature Pt-project area b stake
299	-99.222	38.1822	594.015	480595	4226051	620.697	Excavation Unit-project area b
300	-99.221	38.1822	595.185	480616	4226052	621.867	Geophys Feature Pt-project area b stake
301	-99.221	38.1824	591.992	480615	4226071	618.674	Geophys Feature Pt-project area b stake
302	-99.221	38.1825	593.84	480615	4226091	620.522	Geophys Feature Pt-project area b stake
303	-99.221	38.1827	593.862	480614	4226111	620.545	Geophys Feature Pt-project area b stake
304	-99.221	38.1829	593.334	480614	4226131	620.016	Geophys Feature Pt-project area b stake

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
305	-99.221	38.1831	593.516	480614	4226151	620.198	Geophys Feature Pt-project area b stake
306	-99.221	38.1833	593.405	480614	4226171	620.087	Geophys Feature Pt-project area b stake
307	-99.221	38.1834	593.444	480613	4226191	620.126	Geophys Feature Pt-project area b stake
308	-99.221	38.1836	593.431	480613	4226211	620.113	Geophys Feature Pt-project area b stake
309	-99.221	38.1838	593.388	480613	4226231	620.07	Geophys Feature Pt-project area b stake
310	-99.221	38.184	593.338	480613	4226251	620.019	Geophys Feature Pt-project area b stake
311	-99.221	38.1842	593.236	480612	4226271	619.918	Geophys Feature Pt-project area b stake
312	-99.221	38.1843	593.209	480612	4226291	619.891	Geophys Feature Pt-project area b stake
313	-99.221	38.1845	593.1	480612	4226311	619.782	Geophys Feature Pt-project area b stake
314	-99.221	38.1847	592.755	480612	4226331	619.436	Geophys Feature Pt-project area b stake
315	-99.221	38.1849	592.454	480612	4226351	619.135	Geophys Feature Pt-project area b stake
316	-99.221	38.1849	592.816	480632	4226351	619.497	Geophys Feature Pt-project area b stake
317	-99.221	38.1847	593.296	480632	4226331	619.978	Geophys Feature Pt-project area b stake
318	-99.221	38.1845	593.427	480632	4226311	620.108	Geophys Feature Pt-project area b stake
319	-99.221	38.1843	593.514	480632	4226291	620.195	Geophys Feature Pt-project area b stake
320	-99.221	38.1842	593.402	480632	4226271	620.084	Geophys Feature Pt-project area b stake
321	-99.221	38.184	593.368	480632	4226251	620.05	Geophys Feature Pt-project area b stake
322	-99.221	38.1838	593.634	480633	4226231	620.316	Geophys Feature Pt-project area b stake
323	-99.221	38.1836	593.422	480633	4226211	620.104	Geophys Feature Pt-project area b stake
324	-99.221	38.1834	593.265	480633	4226191	619.947	Geophys Feature Pt-project area b stake
325	-99.221	38.1833	593.402	480633	4226171	620.084	Geophys Feature Pt-project area b stake
326	-99.221	38.1831	593.263	480633	4226151	619.945	Geophys Feature Pt-project area b stake
327	-99.221	38.1829	593.545	480634	4226131	620.228	Geophys Feature Pt-project area b stake
328	-99.221	38.1827	593.198	480634	4226111	619.881	Geophys Feature Pt-project area b stake
329	-99.221	38.1825	593.396	480635	4226091	620.079	Geophys Feature Pt-project area b stake
330	-99.221	38.1824	593.984	480635	4226071	620.666	Geophys Feature Pt-project area b stake
331	-99.221	38.1822	593.237	480635	4226051	619.92	Geophys Feature Pt-project area b stake
332	-99.221	38.1822	593.527	480655	4226052	620.21	Geophys Feature Pt-project area b stake
333	-99.221	38.1822	593.217	480675	4226052	619.9	Geophys Feature Pt-project area b stake
334	-99.221	38.1821	592.351	480675	4226041	619.034	Geophys Feature Pt-project area b stake
335	-99.22	38.1821	588.627	480695	4226041	615.31	Geophys Feature Pt-project area b stake
336	-99.22	38.1821	589.578	480711	4226042	616.262	Geophys Feature Pt-project area b stake
337	-99.22	38.1822	589.646	480710	4226052	616.329	Excavation Unit-project area b
338	-99.22	38.1823	590.447	480710	4226062	617.13	Geophys Feature Pt-project area b stake
339	-99.22	38.1822	590.534	480710	4226052	617.217	Geophys Feature Pt-project area b stake
340	-99.22	38.1822	591.703	480696	4226052	618.386	Geophys Feature Pt-project area b stake
341	-99.22	38.1823	591.177	480695	4226067	617.86	Geophys Feature Pt-project area b stake
342	-99.221	38.1824	594.12	480675	4226072	620.803	Geophys Feature Pt-project area b stake
343	-99.221	38.1824	593.723	480655	4226072	620.406	Geophys Feature Pt-project area b stake
344	-99.221	38.1825	593.651	480675	4226092	620.334	Geophys Feature Pt-project area b stake
345	-99.221	38.1825	593.455	480654	4226091	620.138	Geophys Feature Pt-project area b stake
346	-99.221	38.1827	593.388	480654	4226111	620.07	Geophys Feature Pt-project area b stake
347	-99.221	38.1827	593.293	480674	4226112	619.976	Geophys Feature Pt-project area b stake

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
348	-99.221	38.1829	593.369	480674	4226132	620.051	Geophys Feature Pt-project area b stake
349	-99.221	38.1829	593.521	480654	4226131	620.204	Geophys Feature Pt-project area b stake
350	-99.221	38.1831	593.488	480654	4226151	620.17	Geophys Feature Pt-project area b stake
351	-99.221	38.1831	593.078	480673	4226151	619.761	Geophys Feature Pt-project area b stake
352	-99.221	38.1833	593.117	480654	4226171	619.799	Geophys Feature Pt-project area b stake
353	-99.221	38.1834	593.308	480654	4226191	619.99	Geophys Feature Pt-project area b stake
354	-99.221	38.1836	593.017	480653	4226211	619.699	Geophys Feature Pt-project area b stake
355	-99.221	38.1838	592.636	480653	4226231	619.318	Geophys Feature Pt-project area b stake
356	-99.221	38.1839	592.62	480653	4226241	619.302	Geophys Feature Pt-project area b stake
357	-99.221	38.1842	593.12	480642	4226271	619.801	Geophys Feature Pt-project area b stake
358	-99.22	38.1819	594.145	480735	4226018	620.829	Shovel Test-bridge 1
359	-99.22	38.182	594.412	480742	4226026	621.095	Shovel Test-bridge 2
360	-99.22	38.182	593.859	480748	4226034	620.543	Shovel Test-bridge 3
361	-99.22	38.1821	593.565	480754	4226042	620.248	Shovel Test-bridge 4
362	-99.22	38.1818	595.011	480739	4226009	621.694	Site Datum bridge removal project 1st
363	-99.22	38.182	593.742	480742	4226032	620.426	Other Point-stake 0-4
364	-99.22	38.1821	594.518	480746	4226037	621.201	Site Feature Point-stone foundation nw
365	-99.22	38.1821	594.126	480750	4226045	620.809	Site Feature Point-stone foundation ne
366	-99.22	38.1821	593.973	480757	4226042	620.657	Site Feature Point-stone foundation se
367	-99.22	38.182	594.105	480754	4226033	620.788	Site Feature Point-stone foundation sw
368	-99.22	38.1822	593.966	480761	4226056	620.649	Site Feature Point-possible crossing head 2
369	-99.22	38.1822	594.949	480761	4226055	621.632	Other Line-bank
369	-99.22	38.1822	595.061	480761	4226055	621.745	Other Line-bank
369	-99.22	38.1822	594.654	480761	4226056	621.338	Other Line-bank
369	-99.22	38.1822	594.756	480761	4226056	621.44	Other Line-bank
369	-99.22	38.1822	594.768	480761	4226055	621.452	Other Line-bank
369	-99.22	38.1822	594.619	480760	4226054	621.303	Other Line-bank
369	-99.22	38.1822	594.789	480757	4226050	621.472	Other Line-bank
369	-99.22	38.1822	594.914	480753	4226049	621.598	Other Line-bank
369	-99.22	38.1821	594.641	480749	4226047	621.324	Other Line-bank
369	-99.22	38.1821	593.911	480747	4226044	620.595	Other Line-bank
369	-99.22	38.1821	594.333	480746	4226039	621.016	Other Line-bank
369	-99.22	38.182	594.204	480744	4226034	620.888	Other Line-bank
369	-99.22	38.182	594.035	480741	4226032	620.719	Other Line-bank
369	-99.22	38.182	593.888	480739	4226028	620.571	Other Line-bank
369	-99.22	38.1819	593.574	480735	4226025	620.257	Other Line-bank
369	-99.22	38.1819	593.912	480731	4226022	620.596	Other Line-bank
369	-99.22	38.1819	593.924	480728	4226018	620.607	Other Line-bank
369	-99.22	38.1819	593.791	480727	4226017	620.474	Other Line-bank
370	-99.22	38.1819	593.799	480735	4226019	620.483	Site Feature Line-possible trail/river crossing 3
370	-99.22	38.1819	593.88	480736	4226020	620.564	Site Feature Line-possible trail/river crossing 3
370	-99.22	38.1819	593.796	480736	4226021	620.479	Site Feature Line-possible trail/river crossing 3
370	-99.22	38.1819	593.527	480735	4226024	620.21	Site Feature Line-possible trail/river crossing 3

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
370	-99.22	38.182	593.184	480735	4226028	619.868	Site Feature Line-possible trail/river crossing 3
370	-99.22	38.182	592.783	480735	4226031	619.466	Site Feature Line-possible trail/river crossing 3
370	-99.22	38.182	592.335	480735	4226033	619.019	Site Feature Line-possible trail/river crossing 3
371	-99.22	38.182	592.309	480735	4226033	618.993	Site Feature Line-possible trail/river crossing 4
371	-99.22	38.1821	592.145	480737	4226037	618.828	Site Feature Line-possible trail/river crossing 4
371	-99.22	38.1821	592.173	480737	4226037	618.857	Site Feature Line-possible trail/river crossing 4
371	-99.22	38.182	592.586	480739	4226037	619.27	Site Feature Line-possible trail/river crossing 4
371	-99.22	38.182	593.283	480742	4226036	619.966	Site Feature Line-possible trail/river crossing 4
371	-99.22	38.182	594.008	480745	4226035	620.691	Site Feature Line-possible trail/river crossing 4
372	-99.22	38.1817	593.243	480719	4225995	619.927	Site Feature Line-possible trail/river crossing 5
372	-99.22	38.1817	593.146	480719	4225995	619.829	Site Feature Line-possible trail/river crossing 5
372	-99.22	38.1817	593.184	480719	4225996	619.868	Site Feature Line-possible trail/river crossing 5
372	-99.22	38.1817	593.016	480718	4225998	619.7	Site Feature Line-possible trail/river crossing 5
372	-99.22	38.1817	593.148	480718	4226000	619.831	Site Feature Line-possible trail/river crossing 5
373	-99.221	38.1824	593.114	480645	4226072	619.796	Shovel Test-bridge 2
374	-99.221	38.1824	593.192	480635	4226072	619.875	Shovel Test-bridge 3
375	-99.221	38.1824	593.831	480625	4226072	620.514	Shovel Test-bridge 4
376	-99.221	38.1824	593.729	480615	4226072	620.411	Shovel Test-bridge 5
377	-99.221	38.1823	591.792	480604	4226070	618.475	Shovel Test-bridge 6
378	-99.222	38.1824	594.071	480594	4226071	620.753	Shovel Test-bridge 7
379	-99.222	38.1824	594.514	480585	4226071	621.197	Shovel Test-bridge 8
380	-99.222	38.1824	594.129	480575	4226071	620.811	Shovel Test-bridge 9
381	-99.222	38.1823	593.365	480565	4226071	620.047	Shovel Test-bridge 10
382	-99.221	38.1824	593.101	480655	4226072	619.784	Shovel Test-bridge 1
383	-99.222	38.1824	594.897	480565	4226081	621.579	Shovel Test-bridge 20
384	-99.222	38.1824	593.454	480575	4226081	620.136	Shovel Test-bridge 19
385	-99.222	38.1824	594.65	480585	4226081	621.332	Shovel Test-bridge 18
386	-99.222	38.1824	594.484	480595	4226082	621.167	Shovel Test-bridge 17
387	-99.221	38.1824	592.482	480604	4226081	619.165	Shovel Test-bridge 16
388	-99.221	38.1825	607.795	480622	4226085	634.478	Shovel Test-bridge 15
389	-99.221	38.1825	594.811	480625	4226082	621.494	Shovel Test-bridge 14
390	-99.221	38.1824	590.949	480634	4226079	617.632	Shovel Test-bridge 13
391	-99.221	38.1825	594.474	480645	4226082	621.157	Shovel Test-bridge 12
392	-99.221	38.1824	585.787	480654	4226074	612.47	Shovel Test-bridge 11
393	-99.221	38.1824	593.903	480655	4226072	620.586	Shovel Test-bridge 1
394	-99.221	38.1825	593.662	480655	4226092	620.345	Shovel Test-bridge 21
395	-99.221	38.1825	593.763	480644	4226092	620.446	Shovel Test-bridge 22
396	-99.221	38.1825	593.789	480634	4226091	620.472	Shovel Test-bridge 23
397	-99.221	38.1825	594.62	480624	4226092	621.303	Shovel Test-bridge 24
398	-99.221	38.1825	594.68	480614	4226092	621.362	Shovel Test-bridge 25
399	-99.221	38.1825	595.234	480604	4226092	621.916	Shovel Test-bridge 26
400	-99.222	38.1825	593.327	480594	4226091	620.009	Shovel Test-bridge 27
401	-99.222	38.1825	592.964	480585	4226091	619.647	Shovel Test-bridge 28

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
402	-99.222	38.1825	593.245	480575	4226091	619.928	Shovel Test-bridge 29
403	-99.222	38.1825	594.163	480565	4226091	620.846	Shovel Test-bridge 30
404	-99.222	38.1826	593.771	480565	4226100	620.453	Shovel Test-bridge 40
405	-99.222	38.1826	593.656	480575	4226101	620.339	Shovel Test-bridge 39
406	-99.222	38.1826	593.534	480584	4226101	620.216	Shovel Test-bridge38
407	-99.222	38.1826	593.512	480594	4226101	620.194	Shovel Test-bridge 37
408	-99.221	38.1826	594.099	480604	4226101	620.782	Shovel Test-bridge 36
409	-99.221	38.1826	594.999	480614	4226101	621.682	Shovel Test-bridge 35
410	-99.221	38.1826	595.669	480624	4226102	622.351	Shovel Test-bridge 34
411	-99.221	38.1826	594.313	480634	4226102	620.996	Shovel Test-bridge 33
412	-99.221	38.1826	593.895	480644	4226102	620.578	Shovel Test-bridge 32
413	-99.221	38.1826	594.027	480654	4226102	620.71	Shovel Test-bridge 31
414	-99.221	38.1827	594.058	480654	4226112	620.74	Shovel Test-bridge 41
415	-99.221	38.1827	594.018	480644	4226112	620.701	Shovel Test-bridge 42
416	-99.221	38.1827	593.927	480634	4226112	620.61	Shovel Test-bridge 43
417	-99.221	38.1827	593.994	480624	4226112	620.677	Shovel Test-bridge 44
418	-99.221	38.1827	593.749	480614	4226111	620.431	Shovel Test-bridge 45
419	-99.221	38.1827	593.659	480604	4226111	620.342	Shovel Test-bridge 46
420	-99.222	38.1827	593.756	480594	4226111	620.438	Shovel Test-bridge 47
421	-99.222	38.1827	593.693	480584	4226111	620.375	Shovel Test-bridge 48
422	-99.222	38.1827	593.616	480574	4226111	620.298	Shovel Test-bridge 49
423	-99.222	38.1827	593.632	480564	4226111	620.314	Shovel Test-bridge 50
424	-99.222	38.1828	593.581	480564	4226121	620.263	Shovel Test-bridge 60
425	-99.222	38.1828	593.572	480574	4226121	620.255	Shovel Test-bridge 59
426	-99.222	38.1828	593.646	480584	4226121	620.328	Shovel Test-bridge 58
427	-99.222	38.1828	593.739	480594	4226121	620.421	Shovel Test-bridge 57
428	-99.221	38.1828	593.713	480604	4226121	620.396	Shovel Test-bridge 56
429	-99.221	38.1828	593.709	480614	4226121	620.391	Shovel Test-bridge 55
430	-99.221	38.1828	593.838	480624	4226122	620.52	Shovel Test-bridge 54
431	-99.221	38.1828	593.95	480634	4226122	620.632	Shovel Test-bridge 53
432	-99.221	38.1828	593.915	480644	4226122	620.598	Shovel Test-bridge 52
433	-99.221	38.1828	594.071	480654	4226122	620.754	Shovel Test-bridge 51
434	-99.221	38.1829	594.079	480654	4226132	620.761	Shovel Test-bridge 61
435	-99.221	38.1829	593.992	480644	4226132	620.674	Shovel Test-bridge 62
436	-99.221	38.1829	593.906	480634	4226132	620.588	Shovel Test-bridge 63
437	-99.221	38.1829	593.855	480624	4226132	620.537	Shovel Test-bridge 64
438	-99.221	38.1829	593.769	480614	4226131	620.451	Shovel Test-bridge 65
439	-99.221	38.1829	593.693	480604	4226131	620.375	Shovel Test-bridge 66
440	-99.222	38.1829	593.651	480594	4226131	620.334	Shovel Test-bridge 67
441	-99.222	38.1829	593.605	480584	4226131	620.287	Shovel Test-bridge 68
442	-99.222	38.1829	593.51	480574	4226131	620.192	Shovel Test-bridge 69
443	-99.222	38.1829	593.499	480564	4226131	620.181	Shovel Test-bridge 70
444	-99.222	38.183	593.497	480564	4226140	620.18	Shovel Test-bridge 80

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
445	-99.222	38.183	593.5	480574	4226140	620.182	Shovel Test-bridge 79
446	-99.222	38.183	593.599	480584	4226141	620.281	Shovel Test-bridge 78
447	-99.222	38.183	593.66	480594	4226141	620.342	Shovel Test-bridge 77
448	-99.221	38.183	593.766	480604	4226141	620.448	Shovel Test-bridge 76
449	-99.221	38.183	593.864	480614	4226141	620.546	Shovel Test-bridge 75
450	-99.221	38.183	593.938	480624	4226141	620.621	Shovel Test-bridge 74
451	-99.221	38.183	593.993	480634	4226141	620.676	Shovel Test-bridge 73
452	-99.221	38.183	594.066	480644	4226142	620.749	Shovel Test-bridge 72
453	-99.221	38.183	594.207	480654	4226142	620.889	Shovel Test-bridge 71
454	-99.221	38.1831	594.077	480654	4226152	620.76	Shovel Test-bridge 81
455	-99.221	38.1831	594.042	480644	4226152	620.725	Shovel Test-bridge 82
456	-99.221	38.1831	593.965	480634	4226152	620.648	Shovel Test-bridge 83
457	-99.221	38.1831	593.934	480624	4226151	620.616	Shovel Test-bridge 84
458	-99.221	38.1831	593.912	480614	4226151	620.594	Shovel Test-bridge 85
459	-99.221	38.1831	593.762	480604	4226151	620.444	Shovel Test-bridge 86
460	-99.222	38.1831	593.795	480594	4226151	620.477	Shovel Test-bridge 87
461	-99.222	38.1831	593.664	480584	4226151	620.346	Shovel Test-bridge 88
462	-99.222	38.1831	593.671	480574	4226151	620.353	Shovel Test-bridge 89
463	-99.222	38.1831	593.641	480564	4226150	620.323	Shovel Test-bridge 90
464	-99.222	38.1832	593.626	480564	4226161	620.308	Shovel Test-bridge 100
465	-99.222	38.1832	593.678	480574	4226161	620.36	Shovel Test-bridge 99
466	-99.222	38.1832	593.852	480584	4226161	620.534	Shovel Test-bridge 98
467	-99.222	38.1832	593.935	480594	4226161	620.617	Shovel Test-bridge 97
468	-99.221	38.1832	594.075	480604	4226161	620.758	Shovel Test-bridge 95
469	-99.221	38.1832	594.198	480614	4226161	620.88	Shovel Test-bridge 95
470	-99.221	38.1832	594.181	480624	4226161	620.863	Shovel Test-bridge 94
471	-99.221	38.1832	594.329	480634	4226162	621.011	Shovel Test-bridge 93
472	-99.221	38.1832	594.424	480644	4226162	621.106	Shovel Test-bridge 92
473	-99.221	38.1832	594.427	480654	4226162	621.109	Shovel Test-bridge 91
474	-99.221	38.1843	594.381	480642	4226286	621.063	Site Feature Line-possible trail/river crossing 1
474	-99.221	38.1843	594.657	480643	4226286	621.338	Site Feature Line-possible trail/river crossing 1
474	-99.221	38.1843	594.499	480645	4226285	621.181	Site Feature Line-possible trail/river crossing 1
474	-99.221	38.1843	594.358	480647	4226285	621.04	Site Feature Line-possible trail/river crossing 1
474	-99.221	38.1842	593.764	480663	4226278	620.446	Site Feature Line-possible trail/river crossing 1
474	-99.221	38.1842	594.01	480668	4226278	620.692	Site Feature Line-possible trail/river crossing 1
474	-99.221	38.1842	591.337	480666	4226280	618.019	Site Feature Line-possible trail/river crossing 1
474	-99.221	38.1842	591.785	480669	4226278	618.467	Site Feature Line-possible trail/river crossing 1
474	-99.221	38.1842	591.21	480671	4226278	617.892	Site Feature Line-possible trail/river crossing 1
475	-99.221	38.1843	594.036	480662	4226289	620.718	Other Point-fence post/railroad tie
476	-99.221	38.1838	593.517	480656	4226227	620.199	Site Feature Line-possible trail/river crossing 7
476	-99.221	38.1838	593.534	480656	4226227	620.216	Site Feature Line-possible trail/river crossing 7
476	-99.221	38.1838	593.485	480656	4226227	620.167	Site Feature Line-possible trail/river crossing 7
476	-99.221	38.1838	593.33	480656	4226227	620.012	Site Feature Line-possible trail/river crossing 7

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
476	-99.221	38.1838	593.111	480658	4226228	619.793	Site Feature Line-possible trail/river crossing 7
476	-99.221	38.1838	592.818	480661	4226229	619.5	Site Feature Line-possible trail/river crossing 7
476	-99.221	38.1838	592.656	480663	4226228	619.338	Site Feature Line-possible trail/river crossing 7
476	-99.221	38.1838	592.704	480664	4226228	619.386	Site Feature Line-possible trail/river crossing 7
477	-99.221	38.1837	593.846	480658	4226217	620.528	Site Feature Line-possible trail/river crossing 8
477	-99.221	38.1837	593.914	480658	4226217	620.596	Site Feature Line-possible trail/river crossing 8
477	-99.221	38.1837	593.899	480658	4226217	620.581	Site Feature Line-possible trail/river crossing 8
477	-99.221	38.1837	594.258	480659	4226217	620.94	Site Feature Line-possible trail/river crossing 8
477	-99.221	38.1837	593.686	480660	4226216	620.368	Site Feature Line-possible trail/river crossing 8
477	-99.221	38.1837	594.069	480660	4226216	620.751	Site Feature Line-possible trail/river crossing 8
477	-99.221	38.1836	594.576	480661	4226214	621.258	Site Feature Line-possible trail/river crossing 8
477	-99.221	38.1836	593.072	480664	4226214	619.755	Site Feature Line-possible trail/river crossing 8
478	-99.221	38.1832	595.252	480675	4226160	621.935	Site Feature Line-possible trail/river crossing 9
479	-99.221	38.1827	594.709	480687	4226115	621.391	Site Feature Line-possible trail/river crossing 9
480	-99.221	38.1822	593.964	480653	4226050	620.647	Site Feature Line-possible trail/river crossing 10
480	-99.221	38.1822	594.06	480654	4226050	620.743	Site Feature Line-possible trail/river crossing 10
480	-99.221	38.1822	594.026	480657	4226049	620.71	Site Feature Line-possible trail/river crossing 10
480	-99.221	38.1822	593.936	480663	4226048	620.619	Site Feature Line-possible trail/river crossing 10
480	-99.221	38.1821	593.64	480668	4226048	620.323	Site Feature Line-possible trail/river crossing 10
480	-99.221	38.1821	593.907	480672	4226048	620.59	Site Feature Line-possible trail/river crossing 10
480	-99.221	38.1821	593.222	480676	4226047	619.905	Site Feature Line-possible trail/river crossing 10
480	-99.221	38.1821	592.976	480678	4226047	619.659	Site Feature Line-possible trail/river crossing 10
480	-99.221	38.1821	593.264	480679	4226047	619.947	Site Feature Line-possible trail/river crossing 10
480	-99.221	38.1821	593.959	480682	4226048	620.642	Site Feature Line-possible trail/river crossing 10
480	-99.221	38.1822	593.454	480682	4226049	620.137	Site Feature Line-possible trail/river crossing 10
480	-99.221	38.1822	592.617	480685	4226049	619.3	Site Feature Line-possible trail/river crossing 10
481	-99.222	38.1824	594.497	480594	4226076	621.18	Site Feature Line-possible trail/river crossing 11
481	-99.222	38.1824	594.579	480594	4226076	621.262	Site Feature Line-possible trail/river crossing 11
481	-99.222	38.1824	594.642	480594	4226074	621.324	Site Feature Line-possible trail/river crossing 11
481	-99.222	38.1823	594.549	480593	4226069	621.232	Site Feature Line-possible trail/river crossing 11
481	-99.222	38.1823	594.445	480592	4226064	621.128	Site Feature Line-possible trail/river crossing 11
481	-99.222	38.1822	595.124	480591	4226059	621.807	Site Feature Line-possible trail/river crossing 11
481	-99.222	38.1822	594.896	480590	4226054	621.579	Site Feature Line-possible trail/river crossing 11
481	-99.222	38.1822	594.839	480590	4226050	621.522	Site Feature Line-possible trail/river crossing 11
481	-99.222	38.1821	594.376	480589	4226046	621.059	Site Feature Line-possible trail/river crossing 11
481	-99.222	38.1821	594.475	480588	4226042	621.158	Site Feature Line-possible trail/river crossing 11
481	-99.222	38.1821	594.16	480588	4226038	620.843	Site Feature Line-possible trail/river crossing 11
481	-99.222	38.182	592.202	480590	4226035	618.885	Site Feature Line-possible trail/river crossing 11
481	-99.222	38.182	592.904	480590	4226031	619.587	Site Feature Line-possible trail/river crossing 11
481	-99.222	38.182	592.15	480591	4226031	618.833	Site Feature Line-possible trail/river crossing 11
482	-99.222	38.1822	594.406	480549	4226056	621.088	Site Feature Line-possible trail/river crossing 13
482	-99.222	38.1822	594.346	480549	4226056	621.029	Site Feature Line-possible trail/river crossing 13
482	-99.222	38.1822	594.372	480548	4226054	621.054	Site Feature Line-possible trail/river crossing 13

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
482	-99.222	38.1822	595.09	480547	4226052	621.772	Site Feature Line-possible trail/river crossing 13
482	-99.222	38.1822	594.918	480546	4226051	621.601	Site Feature Line-possible trail/river crossing 13
482	-99.222	38.1822	595.266	480546	4226050	621.948	Site Feature Line-possible trail/river crossing 13
482	-99.222	38.1822	594.293	480546	4226049	620.975	Site Feature Line-possible trail/river crossing 13
483	-99.223	38.1823	594.635	480507	4226064	621.317	Site Feature Line-possible trail/river crossing 15
483	-99.223	38.1823	594.601	480507	4226064	621.283	Site Feature Line-possible trail/river crossing 15
483	-99.223	38.1823	594.439	480507	4226063	621.121	Site Feature Line-possible trail/river crossing 15
483	-99.223	38.1823	594.215	480506	4226061	620.897	Site Feature Line-possible trail/river crossing 15
483	-99.223	38.1823	594.232	480506	4226060	620.915	Site Feature Line-possible trail/river crossing 15
484	-99.221	38.1843	594.036	480662	4226289	620.718	Other Point-bridge ne
485	-99.224	38.1823	595.15	480417	4226069	621.832	Other Point-bridge nw
486	-99.223	38.1817	594.987	480426	4226004	621.669	Other Point-bridge se
487	-99.224	38.1817	595.03	480417	4226004	621.712	Other Point-bridge sw
488	-99.224	38.1781	593.709	480424	4225601	620.394	Other Line-180th ave
488	-99.224	38.1781	593.789	480424	4225602	620.473	Other Line-180th ave
488	-99.224	38.1782	593.788	480424	4225605	620.472	Other Line-180th ave
488	-99.224	38.1784	594.041	480424	4225631	620.725	Other Line-180th ave
488	-99.224	38.1788	594.195	480424	4225676	620.879	Other Line-180th ave
488	-99.224	38.1793	594.493	480424	4225732	621.177	Other Line-180th ave
488	-99.224	38.1799	594.693	480423	4225797	621.377	Other Line-180th ave
488	-99.224	38.1805	595.117	480423	4225868	621.8	Other Line-180th ave
488	-99.224	38.1812	595.437	480423	4225944	622.12	Other Line-180th ave
488	-99.224	38.1819	595.463	480422	4226023	622.146	Other Line-180th ave
488	-99.224	38.1827	595.412	480422	4226106	622.094	Other Line-180th ave
488	-99.224	38.1834	595.004	480421	4226192	621.685	Other Line-180th ave
488	-99.224	38.1842	594.444	480421	4226281	621.125	Other Line-180th ave
488	-99.224	38.185	594.142	480420	4226370	620.822	Other Line-180th ave
488	-99.224	38.1858	594.13	480420	4226458	620.81	Other Line-180th ave
488	-99.224	38.1866	594.201	480419	4226545	620.88	Other Line-180th ave
488	-99.224	38.1874	594.415	480419	4226630	621.094	Other Line-180th ave
488	-99.224	38.1881	595.069	480418	4226706	621.747	Other Line-180th ave
488	-99.224	38.1885	595.572	480418	4226752	622.25	Other Line-180th ave
488	-99.224	38.1886	595.662	480418	4226762	622.34	Other Line-180th ave
488	-99.224	38.1887	595.978	480418	4226773	622.656	Other Line-180th ave
488	-99.224	38.1891	595.374	480418	4226815	622.051	Other Line-180th ave
489	-99.226	38.1887	595.417	480240	4226778	622.094	Other Line-156 hwy
489	-99.226	38.1887	595.354	480240	4226778	622.031	Other Line-156 hwy
489	-99.226	38.1887	595.452	480251	4226778	622.129	Other Line-156 hwy
489	-99.225	38.1887	595.576	480294	4226778	622.253	Other Line-156 hwy
489	-99.224	38.1887	595.821	480359	4226778	622.498	Other Line-156 hwy
489	-99.223	38.1887	596.14	480439	4226778	622.818	Other Line-156 hwy
489	-99.222	38.1887	596.179	480528	4226778	622.857	Other Line-156 hwy
489	-99.221	38.1887	595.449	480623	4226778	622.128	Other Line-156 hwy

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
489	-99.22	38.1887	594.73	480721	4226778	621.409	Other Line-156 hwy
489	-99.219	38.1887	594.615	480823	4226777	621.295	Other Line-156 hwy
489	-99.218	38.1887	594.634	480927	4226777	621.314	Other Line-156 hwy
489	-99.217	38.1887	594.624	481033	4226778	621.305	Other Line-156 hwy
489	-99.215	38.1888	594.727	481140	4226781	621.407	Other Line-156 hwy
489	-99.214	38.1889	594.706	481244	4226792	621.388	Other Line-156 hwy
489	-99.213	38.189	594.713	481340	4226807	621.395	Other Line-156 hwy
490	-99.218	38.1886	594.536	480938	4226764	621.216	Other Line-paved entrance road
490	-99.218	38.1886	594.574	480938	4226764	621.254	Other Line-paved entrance road
490	-99.218	38.1885	594.51	480935	4226756	621.19	Other Line-paved entrance road
490	-99.218	38.1883	594.515	480924	4226731	621.195	Other Line-paved entrance road
490	-99.218	38.188	594.521	480908	4226695	621.201	Other Line-paved entrance road
490	-99.218	38.1876	594.494	480889	4226652	621.175	Other Line-paved entrance road
490	-99.218	38.1872	594.639	480869	4226604	621.319	Other Line-paved entrance road
490	-99.219	38.1867	594.65	480847	4226555	621.331	Other Line-paved entrance road
490	-99.219	38.1863	594.708	480825	4226505	621.389	Other Line-paved entrance road
490	-99.219	38.1858	594.793	480803	4226457	621.474	Other Line-paved entrance road
490	-99.219	38.1854	594.915	480788	4226412	621.597	Other Line-paved entrance road
490	-99.219	38.185	595.75	480786	4226369	622.431	Other Line-paved entrance road
490	-99.219	38.1846	595.062	480787	4226324	621.744	Other Line-paved entrance road
490	-99.219	38.1842	595.925	480789	4226276	622.607	Other Line-paved entrance road
490	-99.219	38.184	595.389	480791	4226249	622.071	Other Line-paved entrance road
490	-99.219	38.1838	595.255	480792	4226236	621.938	Other Line-paved entrance road
491	-99.219	38.1854	594.385	480792	4226407	621.067	Other Line-parking area road
491	-99.219	38.1854	594.273	480792	4226407	620.955	Other Line-parking area road
491	-99.219	38.1853	594.248	480797	4226402	620.93	Other Line-parking area road
491	-99.219	38.1853	594.385	480815	4226401	621.067	Other Line-parking area road
491	-99.219	38.1854	594.355	480836	4226409	621.037	Other Line-parking area road
491	-99.219	38.1856	594.437	480851	4226426	621.119	Other Line-parking area road
491	-99.219	38.1858	594.225	480850	4226450	620.906	Other Line-parking area road
491	-99.219	38.186	593.937	480833	4226471	620.619	Other Line-parking area road
491	-99.219	38.1861	594.064	480823	4226481	620.745	Other Line-parking area road
492	-99.218	38.188	594.128	480914	4226692	620.808	Other Line-picnic area road
492	-99.218	38.188	594.243	480914	4226692	620.923	Other Line-picnic area road
492	-99.218	38.1879	593.978	480922	4226691	620.658	Other Line-picnic area road
492	-99.218	38.1879	594.037	480937	4226689	620.718	Other Line-picnic area road
492	-99.217	38.1879	593.691	480954	4226687	620.372	Other Line-picnic area road
492	-99.217	38.1879	594.105	480970	4226680	620.785	Other Line-picnic area road
492	-99.217	38.1877	594.11	480976	4226667	620.79	Other Line-picnic area road
492	-99.217	38.1876	594.063	480970	4226654	620.744	Other Line-picnic area road
492	-99.217	38.1875	593.802	480955	4226647	620.483	Other Line-picnic area road
492	-99.218	38.1875	593.962	480937	4226640	620.643	Other Line-picnic area road
492	-99.218	38.1874	594.113	480916	4226633	620.794	Other Line-picnic area road

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
492	-99.218	38.1874	594.277	480894	4226634	620.957	Other Line-picnic area road
493	-99.219	38.1838	595.059	480792	4226234	621.741	Other Line-access road
493	-99.219	38.1838	595.052	480793	4226233	621.734	Other Line-access road
493	-99.219	38.1838	595.106	480793	4226232	621.789	Other Line-access road
493	-99.219	38.1837	594.741	480793	4226222	621.424	Other Line-access road
493	-99.219	38.1836	594.499	480792	4226205	621.182	Other Line-access road
493	-99.219	38.1834	594.694	480778	4226190	621.377	Other Line-access road
493	-99.22	38.1833	594.761	480763	4226176	621.444	Other Line-access road
493	-99.22	38.1831	595.137	480761	4226159	621.82	Other Line-access road
493	-99.22	38.183	594.941	480768	4226141	621.624	Other Line-access road
493	-99.219	38.1828	594.59	480777	4226120	621.274	Other Line-access road
493	-99.219	38.1826	594.804	480787	4226097	621.487	Other Line-access road
493	-99.219	38.1824	594.678	480790	4226074	621.361	Other Line-access road
493	-99.219	38.1823	594.609	480789	4226060	621.292	Other Line-access road
493	-99.219	38.182	594.471	480785	4226036	621.155	Other Line-access road
493	-99.22	38.1818	594.21	480776	4226013	620.894	Other Line-access road
493	-99.22	38.1817	594.346	480760	4225993	621.03	Other Line-access road
493	-99.22	38.1815	594.325	480737	4225978	621.009	Other Line-access road
493	-99.22	38.1814	594.384	480709	4225967	621.068	Other Line-access road
493	-99.221	38.1813	594.501	480677	4225957	621.185	Other Line-access road
493	-99.221	38.1813	595.028	480642	4225950	621.712	Other Line-access road
493	-99.221	38.1812	594.461	480604	4225946	621.145	Other Line-access road
493	-99.222	38.1812	594.429	480563	4225945	621.112	Other Line-access road
493	-99.222	38.1812	594.414	480519	4225945	621.097	Other Line-access road
493	-99.223	38.1812	594.524	480476	4225946	621.207	Other Line-access road
493	-99.223	38.1812	594.781	480439	4225947	621.464	Other Line-access road
494	-99.22	38.1816	594.205	480749	4225982	620.889	Other Line-access road
494	-99.22	38.1816	594.179	480749	4225982	620.862	Other Line-access road
494	-99.22	38.1816	594.166	480758	4225985	620.85	Other Line-access road
494	-99.219	38.1817	593.981	480778	4225993	620.664	Other Line-access road
494	-99.219	38.1817	593.891	480804	4226003	620.575	Other Line-access road
494	-99.219	38.1818	593.883	480828	4226013	620.567	Other Line-access road
494	-99.219	38.1819	593.867	480851	4226022	620.551	Other Line-access road
494	-99.218	38.182	593.911	480877	4226028	620.596	Other Line-access road
494	-99.218	38.182	593.743	480905	4226032	620.427	Other Line-access road
494	-99.218	38.1821	593.632	480933	4226038	620.316	Other Line-access road
494	-99.217	38.1822	593.501	480959	4226048	620.185	Other Line-access road
494	-99.217	38.1823	593.505	480983	4226060	620.19	Other Line-access road
494	-99.217	38.1824	593.496	481004	4226071	620.18	Other Line-access road
494	-99.217	38.1825	593.635	481015	4226088	620.319	Other Line-access road
494	-99.217	38.1827	593.721	481016	4226105	620.405	Other Line-access road
494	-99.217	38.1828	593.753	481010	4226121	620.437	Other Line-access road
494	-99.217	38.183	593.817	481003	4226140	620.501	Other Line-access road

Table 1. Continued.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
494	-99.217	38.1831	593.967	480997	4226158	620.651	Other Line-access road
494	-99.217	38.1835	594.052	480982	4226193	620.736	Other Line-access road
494	-99.217	38.1836	594.025	480972	4226211	620.708	Other Line-access road
494	-99.217	38.1838	593.983	480961	4226229	620.666	Other Line-access road
494	-99.218	38.1839	594.114	480950	4226246	620.798	Other Line-access road
494	-99.218	38.1841	594.566	480939	4226260	621.249	Other Line-access road
495	-99.219	38.1819	593.583	480852	4226022	620.267	Other Line-access road
495	-99.219	38.1819	593.564	480852	4226022	620.249	Other Line-access road
495	-99.219	38.1819	593.584	480852	4226022	620.268	Other Line-access road
495	-99.219	38.1819	593.737	480839	4226019	620.421	Other Line-access road
495	-99.219	38.1819	593.76	480821	4226025	620.444	Other Line-access road
495	-99.219	38.1821	593.976	480809	4226040	620.66	Other Line-access road
495	-99.219	38.1822	594.179	480801	4226059	620.863	Other Line-access road
495	-99.219	38.1824	594.421	480793	4226078	621.105	Other Line-access road
496	-99.224	38.1794	594.514	480414	4225739	621.198	Other Line-maintenance road
496	-99.224	38.1794	594.098	480414	4225739	620.782	Other Line-maintenance road
496	-99.224	38.1793	594.512	480414	4225738	621.196	Other Line-maintenance road
496	-99.224	38.1793	594.548	480414	4225738	621.232	Other Line-maintenance road
496	-99.224	38.1793	594.305	480403	4225737	620.989	Other Line-maintenance road
496	-99.224	38.1793	594.3	480377	4225737	620.984	Other Line-maintenance road
496	-99.224	38.1793	594.541	480359	4225737	621.224	Other Line-maintenance road
496	-99.224	38.1793	594.592	480354	4225737	621.276	Other Line-maintenance road
496	-99.224	38.1793	594.871	480348	4225737	621.555	Other Line-maintenance road
497	-99.219	38.1823	593.312	480848	4226061	619.996	Geophys Feature Pt-project area b stake
498	-99.219	38.1821	593.033	480855	4226043	619.717	Geophys Feature Pt-project area b stake
499	-99.219	38.1819	593.016	480863	4226024	619.7	Geophys Feature Pt-project area b stake
500	-99.218	38.1818	592.952	480870	4226006	619.636	Geophys Feature Pt-project area b stake
501	-99.218	38.1816	592.91	480878	4225987	619.594	Geophys Feature Pt-project area b stake
502	-99.218	38.1814	592.917	480886	4225969	619.602	Geophys Feature Pt-project area b stake
503	-99.218	38.1813	592.909	480893	4225950	619.594	Geophys Feature Pt-project area b stake
504	-99.218	38.1813	592.826	480912	4225958	619.511	Geophys Feature Pt-project area b stake
505	-99.218	38.1815	592.803	480904	4225976	619.488	Geophys Feature Pt-project area b stake
506	-99.218	38.1817	592.817	480896	4225995	619.502	Geophys Feature Pt-project area b stake
507	-99.218	38.1818	592.836	480889	4226013	619.52	Geophys Feature Pt-project area b stake
508	-99.218	38.182	593.001	480881	4226032	619.685	Geophys Feature Pt-project area b stake
509	-99.218	38.1822	592.968	480874	4226050	619.652	Geophys Feature Pt-project area b stake
510	-99.218	38.1823	593.165	480866	4226069	619.848	Geophys Feature Pt-project area b stake
511	-99.218	38.1824	593.086	480885	4226076	619.77	Geophys Feature Pt-project area b stake
512	-99.218	38.1822	592.762	480892	4226058	619.446	Geophys Feature Pt-project area b stake
513	-99.218	38.1821	592.805	480900	4226040	619.49	Geophys Feature Pt-project area b stake
514	-99.218	38.1819	592.77	480907	4226021	619.454	Geophys Feature Pt-project area b stake
515	-99.218	38.1817	592.705	480915	4226003	619.39	Geophys Feature Pt-project area b stake
516	-99.218	38.1816	592.647	480923	4225984	619.332	Geophys Feature Pt-project area b stake

Table 1. Concluded.

ID	Longitude	Latitude	HAE	Easting	Northing	MSL	Description
517	-99.218	38.1814	592.722	480930	4225966	619.407	Geophys Feature Pt-project area b stake
518	-99.221	38.184	592.985	480653	4226252	619.667	Geophys Feature Pt-project area b stake
519	-99.222	38.1823	593.817	480536	4226070	620.499	Excavation Unit-bridge SW
520	-99.222	38.1824	593.763	480536	4226072	620.446	Excavation Unit-bridge NW
521	-99.222	38.1824	593.682	480537	4226072	620.365	Excavation Unit-bridge NE
522	-99.222	38.1823	593.694	480537	4226070	620.376	Excavation Unit-bridge SE
523	-99.222	38.1823	593.72	480536	4226070	620.403	Excavation Unit-bridge SW
524	-99.222	38.1823	593.665	480537	4226070	620.347	Excavation Unit-bridge SE
525	-99.222	38.1824	593.677	480537	4226072	620.359	Excavation Unit-bridge NE
526	-99.222	38.1824	593.714	480536	4226072	620.396	Excavation Unit-bridge NW
527	-99.223	38.1824	594.084	480443	4226079	620.766	Shovel Test-bridge 101
528	-99.223	38.1824	594.062	480447	4226080	620.744	Shovel Test-bridge 102
529	-99.223	38.1825	594.156	480445	4226083	620.838	Shovel Test-bridge 103
530	-99.223	38.1825	594.083	480443	4226086	620.765	Shovel Test-bridge 104
531	-99.223	38.1825	594.083	480443	4226086	620.765	Shovel Test-bridge 105

Table 2. Acquisition and instrumentation information for the dual fluxgate gradiometer survey used in the grid input template at the FOLS Geophysical Project Areas A through E (Site 14PA305).

GENERAL			
Acquisition	**Value**	**Instrumentation**	**Value**
Sitename	FOLS2010	Survey Type	Dual Gradiometer
Map Reference	Fort Larned, KS 7.5 minute quadrangle	Instrument	Bartington Grad601-2
Dir. 1st Traverse	Grid N	Units	nT
Grid Length (x)	20 m	Range	AUTO
Sample Interval (x)	0.125 m	Log Zero Drift	Off
Grid Width (y)	20 m	Baud Rate	19200
Traverse Interval (y)	1.0 m	Number of Sensors (tubes)	2
Traverse Mode	ZigZag	Download Software	Bartington GRAD601
FILE NOMINCLATURE	**Raw Data**	**Processed Data**	**Corrected Data**
Processing Software	Archeosurveyor		
Grid	dga01-dga19, dgb01-dgb177, dgc01-dgc15, dgd01-dgd18, dge01-dge16		
Composite	dgca, dgcb, dgcc, dgcd, dgce	dgacz, dgaczi, dgaczil, dgaczilr; dgbcz, dgbczi, dgbczil, dgbczilr; dgccz, dgcczi, dgcczil, dgcczilr; dgdcz, dgdczi, dgdczil. dgdczilr; dgecz, dgeczi, dgeczil, dgeczilr	

Table 3. Acquisition and instrumentation information for the resistance survey used in the grid input template at the FOLS Geophysical Project Areas A and B (Site 14PA305).

GENERAL			
Acquisition	**Value**	**Instrumentation**	**value**
Sitename	FOLS2009	Survey Type	Resistance
Map Reference	Fort Larned, KS 7.5 minute quadrangle	Instrument	RM15
Dir. 1st Traverse	Grid N	Units	Ohm
Grid Length (x)	20 m	Current Range	AUTO
Sample Interval (x)	0.5 m	Gain Range	AUTO
Grid Width (y)	20 m	Baud Rate	9600
Traverse Interval (y)	1.0 m	Frequency	137 Hz
Traverse Mode	Zigzag	High Pass Filter	13 Hz
ACCESSORIES			
	Accessories	Value	
	Array Hardware	PA5	
	Interface	AD1	
	Log Mode	Single	
	Configuration	Twin	
	Probe Spacing	0.5	
FILE NOMINCLATURE	**Raw Data**	**Processed Data**	**Corrected Data**
Processing Software	GEOPLOT		
Grid	3ra, 8ra, 11ra; 2br, 3br; a37br, a38br, a4abr, 142br		
Mesh	ram, rbm, rbbm		
Composite	rac, rbc, rbbc	racd, racdi, racdih, racdihr; rbc, rbcpr, rbcsr, rbcsrd, rbcsrdi, rbcsrdih; rbbcd, rbbcdi, rbbcdih, rbbcdihr	

Table 4. Acquisition and instrumentation information for the ground penetrating radar survey at the FOLS Geophysical Project Area B (Site 14PA305).

GENERAL			
Acquisition	**Value**	**Instrumentation**	**Value**
File Nam	FOLSB	Survey Type	GPR
Number of Profile Lines	81	Instrument	GSSI TerraSIRch SIR 3000
Dir. 1st Traverse	Grid N	Samples/scan	512
Grid Length (x)	60 m	Bits/sample	16
Scans/meter	50	Scans/second	50
Grid Width (y)	40 m	Meters/mark	1
Traverse Interval (y)	0.5 m	Diel Constant	8
Traverse Mode	Zigzag	Antenna	400 mHz
ACCESSORIES			
	Channel(s)	1	
	Range Gain (dB)	-20.0 -12.0 26.0 31.0 32.0	
	Position Correction	0 ns	
	Vertical IIR LP N = 1F	800 mHz	
	Vertical IIR HP N = 1F	100 mHz	
	Position (ns)	0	
	Range (ns)	50	

Table 5. Aerial Photographs for Section 32, T21S, R17W in Pawnee County, Kansas, at the National Archives.

Record	**Film**	**Scale**	**Year**
RG 145 ~ Can # KS 18 ~ Exposure CHH 2-125	70 mm Aerial B/W Negative	1:20,000	October 5, 1938
RG 145 ~ Can ON 35220 ~ Exposure CHH 6G - 126	10" x 10" Aerial B/W Negative	1:20,000	September 29, 1950

Table 6. Aerial Photographs for Section 32, T21S, R17W in Pawnee County, Kansas, at the Aerial Photography Field Office.

Contract Year	Scale	Film Type	Exact Date of Photography	Symbol/Code-Roll-Exposure No.
1956	1:20,000	Black & White	11-1-56	CHH-3R-114 CHH-3R-115 CHH-3R-116
1963	1:20,000	Black & White	7-22-63	CHH-2DD-216 CHH-2DD-217
1970	1:40,000	Black & White	10-12-70	CHH-2LL-62 CHH-2LL-63 CHH-2LL-64
1975	1:48,000	Black & White	8-21-75	S48 20145-175-46 S48 20145-175-47
1979	1:40,000	Black & White	10-25-79	USDA 40 20145-179-49 USDA 40 20145-179-50
1981	1:60,000	Color Infrared Print	10-19-81	380807 HAP-81 F-197-106 380807 HAP-81 F-197-107
1985	1:60,000	Color Infrared Print	6-19-85	380992 NHAP 2-205-161 380992 NHAP 2-205-162
1991	1:40,000	Black & White	8-15-91	NAPP-4324-47 NAPP-4324-48
1996	1:40,000	Black & White	5-7-97	NAPP-10282-208 NAPP-10282-209
2002	1:40,000	Black & White	3-27-02	NAPP-12888-89 NAPP-12888-90
2003	1:40,000	Color Print	7-1-03	USDA-FSA 40 NAIP03-08081-88 USDA-FSA 40 NAIP03-08081-89
2004	1:40,000	Color Print	7-13-04	USDA-FSA 40 NAIP04-08183-188 USDA-FSA 40 NAIP04-08183-189
2005	1:40,000	Color Print	6-27-05	USDA-FSA 40 NAIP05-08151-3 USDA-FSA 40 NAIP05-08151-4

Table 7. Shovel test data from the area north of the FOLS Geophysical Project Area A.

Shovel Test #	Depth (cm bs)	Description
1A	0-30	0-10 cm - concrete fragments; 10-30 cm - sterile
2A	0-50	0-10 cm - one tack, 3 possible mortar fragments; 10-20 cm – sterile; 20-30 cm – one tack; 30-40 cm – one glass fragment; 40-50 cm - sterile
3A	0-50	20-30 cm – one metal staple and two nails; 40-50 cm – sterile soil change at 40 cm to sandier soil
4A	0-30	0-10 cm – three pieces of concrete and two pieces of charcoal; 10-20 cm – three pieces of charcoal; 20-30 cm - sterile

Table 8. Shovel test data from the 100 meter square survey area in the FOLS Geophysical Project Area B.

Coordinates	Shovel Test #	Depth (cm bs)	Description
N40/E220	1	not excavated	Mapping datum for 100 meter by 100 meter shovel test area between N40/E130 and N130/E220
N40/E210	2	0-80 cm	30 cm diameter; silty loam, wet; 80 cm / sterile
N40/E200	3	0-50 cm	30 cm diameter; silty loam, wet; 50 cm / sterile
N40/E190	4	0-50 cm	30 cm diameter; silty loam (10YR3/2-wet) 0-30 cm; 30-50 cm – (10YR7/3-wet);/0-50 sterile
N40/E180	5	0-50 cm	30 cm diameter; silty loam 10YR3/2-wet; 30-50 cm 10YR7/3/ 0-50 sterile
N40/E170	6	0-50 cm	30 cm diameter; silty loam 10YR3/2, 7/3 at 20 cm, stopped at 30 cmbs; unable to get soil removed; too dust like
N40/E160	7	0-50 cm	30 cm diameter; silty loam, 10YR3/2 0-30 cmbs; 10YR7/3 – 30-50 cmbs/0-50 sterile
N40/E150	8	0-50 cm	30 cm diameter; silty loam, 10YR3/2 0-30 cmbs; 10YR7/3 – 30-50 cmbs/0-50 cm sterile
N40/E140	9	0-50 cm	30 cm diameter; silty loam, 10YR3/2 0-30 cmbs; 10YR7/3 – 30-50 cmbs/0-50 cm sterile
N40/E130	10	0-50 cm	30 cm diameter; silty loam, 10YR3/2 0-30 cmbs; 10YR7/3 – 30-50 cmbs/0-50 cm sterile
N50/E220	11	0-50 cm	30 cm diameter; 0-50 cmbs sterile; 10YR3/2 (wet) / 10YR7/3 dry silty loam
N50/E210	12	0-50 cm	30 cm diameter; 0-50 cmbs sterile
N50/E200	13	0-50 cm	30 cm diameter; 0-50 cmbs sterile
N50/E190	14	0-50 cm	30 cm diameter; 0-50 cmbs sterile
N50/E180	15	0-50 cm	30 cm diameter; 40-50 cmbs piece of shell
N50/E170	16	0-50 cm	30 cm diameter; shotgun shell at 10-20 cmbs
N50/E160	17	0-50 cm	30 cm diameter; 0-50 cmbs sterile
N50/E150	18	0-50 cm	30 cm diameter; 0-50 cmbs sterile
N50/E140	19	0-50 cm	30 cm diameter; 0-50 cmbs sterile
N50/E130	20	0-50 cm	30 cm diameter; shotgun shell at 10-20 cmbs
N60/E220	21	0-50 cm	30 cm diameter; 10YR3/2 – 0-30 cmbs, 30-50 cmbs 10YR7/3 – silty loam / 0-50 sterile
N60/E210	22	0-50 cm	30 cm diameter; 10YR3/2 – 0-30 cmbs, 30-50 cmbs 10YR7/3 – silty loam / 0-50 sterile
N60/E200	23	0-45 cm	30 cm diameter; 10YR3/2 – 0-30 cmbs, 30-45 cmbs 10YR7/3 – silty loam; stopped at 45 cmbs-unable to remove soil / 0-45 sterile
N60/E190	24	0-50 cm	30 cm diameter; 10YR3/2 – 0-30 cmbs, 30-50 cmbs 10YR7/3 – silty loam / 0-50 sterile
N60/E180	25	0-50 cm	30 cm diameter; 10YR3/2 – 0-30 cmbs, 30-50 cmbs 10YR7/3 – silty loam; L4 30-40 cmbs 2 pieces of bone, other layers all sterile
N60/E170	26	0-50 cm	30 cm diameter; 10YR3/2 – 0-50 cmbs, clay like soil / 0-50 sterile

Table 8. Continued.

Coordinates	Shovel Test #	Depth (cm bs)	Description
N60/E160	27	0-50 cm	30 cm diameter; 10YR3/2 – 0-40 cmbs, 40-50 cmbs 10YR7/3 / 0-50 sterile
N60/E150	28	0-50 cm	30 cm diameter; 10YR3/2 – 0-30 cmbs, 30-50 cmbs 10YR7/3 / 0-50 sterile
N60/E140	29	0-50 cm	30 cm diameter; 10YR3/2 – 0-30 cmbs, 30-50 cmbs 10YR7/3 / 0-50 sterile
N60/E130	30	0-50 cm	30 cm diameter; 10YR3/2 – 0-30 cmbs, 30-50 cmbs 10YR7/3 / 0-50 sterile
N70/E220	31	0-50 cm	30 cm diameter; 0-50 cmbs sterile
N70/E210	32	0-50 cm	30 cm diameter; 0-50 cmbs sterile
N70/E200	33	0-50 cm	30 cm diameter; 0-50 cmbs sterile
N70/E190	34	0-50 cm	30 cm diameter; 0-50 cmbs sterile
N70/E180	35	0-22 cm	30 cm diameter; 0-50 cmbs sterile
N70/E170	36	0-50 cm	30 cm diameter; 0-40 cmbs sterile; 40-50 cm pieces of shell and bone
N70/E160	37	0-50 cm	30 cm diameter; 0-50 cmbs sterile
N70/E150	38	0-50 cm	30 cm diameter; 0-50 cmbs sterile
N70/E140	39	0-50 cm	30 cm diameter; 0-50 cmbs sterile
N70/E130	40	0-50 cm	30 cm diameter; 0-50 cmbs sterile
N80/E220	41	0-50 cm	30 cm diameter; 0-50 cmbs No Artifacts 2/3 – 4/7
N80/E210	42	0-50 cm	30 cm diameter; 0-50 cmbs No Artifacts 2/3 – 4/7
N80/E200	43	0-50 cm	30 cm diameter; 0-50 cmbs No Artifacts 2/3 – 4/7
N80/E190	44	0-50 cm	30 cm diameter; 0-50 cmbs No Artifacts 2/3 – 4/7
N80/E180	45	0-50 cm	30 cm diameter; 0-50 cmbs No Artifacts 2/3 – 4/7
N80/E170	46	0-50 cm	30 cm diameter; 0-50 cmbs No Artifacts 2/3 – 4/7
N80/E160	47	0-50 cm	30 cm diameter; 0-50 cmbs No Artifacts 2/3 – 4/7
N80/E150	48	0-50 cm	30 cm diameter; 0-50 cmbs No Artifacts 2/3 – 4/7
N80/E140	49	0-50 cm	30 cm diameter; 0-50 cmbs No Artifacts 2/3 – 4/7
N80/E130	50	0-50 cm	30 cm diameter; 0-50 cmbs No Artifacts 2/3 – 4/7
N90/E220	51	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N90/E210	52	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N90/E200	53	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N90/E190	54	0-50 cm	30 cm diameter; cement – 10-20 cm, rest was sterile 7/3 -4/3
N90/E180	55	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N90/E170	56	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N90/E160	57	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N90/E150	58	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N90/E140	59	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N90/E130	60	0-50 cm	30 cm diameter; charcoal at 20-40 cmbs, not collected
N100/E220	61	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N100/E210	62	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N100/E200	63	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3

Table 8. Concluded.

Coordinates	Shovel Test #	Depth (cm bs)	Description
N100/E190	64	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N100/E180	65	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N100/E170	66	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N100/E160	67	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N100/E150	68	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N100/E140	69	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N100/E130	70	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N110/E220	71	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N110/E210	72	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N110/E200	73	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N110/E190	74	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N110/E180	75	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N110/E170	76	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N110/E160	77	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N110/E150	78	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N110/E140	79	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N110/E130	80	0-50 cm	30 cm diameter; charcoal fragments from 0-50 cm; No other artifacts 7/3 – 4/3
N120/E220	81	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N120/E210	82	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N120/E200	83	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N120/E190	84	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N120/E180	85	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N120/E170	86	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N120/E160	87	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N120/E150	88	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N120/E140	89	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N120/E130	90	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N130/E220	91	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N130/E210	92	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N130/E200	93	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N130/E190	94	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N130/E180	95	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N130/E170	96	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N130/E160	97	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N130/E150	98	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N130/E140	99	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3
N130/E130	100	0-50 cm	30 cm diameter; No Artifacts found 7/3 – 4/3

Table 9. Shovel test data from the southwest corner of the FOLS Geophysical Project Area B.

Shovel Test #	Depth (cm bs)	Description
101	0-50	30 cm diameter orifice; 0-20 cm bs silty loam wet; rock on surface but none subsurface
102	0-50	30 cm diameter orifice; 0-20 cm bs silty loam wet; rock on surface but none subsurface
103	0-50	30 cm diameter orifice; 0-20 cm bs silty loam wet; rock on surface but none subsurface
104	0-50	30 cm diameter orifice; 0-20 cm bs silty loam wet; rock on surface but none subsurface
105	0-50	30 cm diameter orifice; 0-20 cm bs silty loam wet; rock on surface but none subsurface

Table 10. Excavation unit data from the Test Unit 1 at the FOLS Geophysical Project Area B.

Coordinates (SW Corner)	Test Unit #	Depth (cm bs)	Dimensions (length m x width m)	Excavation comments
N40/E101	1	0-10	2 (n-s) x 1 (e-w)	¼" screen; 10YR3/2 silty loam; 2 shotgun shells and 2 bottle caps
N40/E101	1	10-20	2 (n-s) x 1 (e-w)	¼" screen; 10YR3/2 very dark grayish brown silty loam above 10YR5/3 brown silty loam; asphalt shingle, two nails, and plastic wrapper
N40/E101	1	20-30	2 (n-s) x 1 (e-w)	¼" screen; 10YR brown silty loam; possible temp building foundation with railroad ties for footings; and gravel base for drainage; copper staple or wire

Table 11. Artifacts collected from shovel test units and excavation unit at FOLS Geophysical Project Areas.

Catalog #	Description	Within Site
FOLS 6354	Two small fragments of concrete	South Shovel Test 2A, Level 1, 0-10cm below surface
FOLS 6355	Small wire nail	South Shovel Test 2A, Level 1, 0-10cm below surface
FOLS 6356	Single wire nail	South Shovel Test 2A, Level 3, 20-30cm below surface
FOLS 6357	Small piece of colorless melted glass	South Shovel Test 2A, Level 4, 30-40cm below surface
FOLS 6358	Two wire nails	South Shovel Test 3A, Level 3, 20-30cm below surface
FOLS 6359	Large wire staple	South Shovel Test 3A, Level 3, 20-30cm below surface
FOLS 6360	No. 12 shotshell head fragment, possibly a Remington Shurshot	North Shovel Test 20, 0-10cm below surface
FOLS 6361	Two fragments of bone, one joint fragment, one unknown	North Shovel Test 25, Level 4, 30-40cm below surface
FOLS 6362	Three small fragments of concrete	North Shovel Test 54, Level 2, 10-20cm below surface
FOLS 6363	Three corroded crown caps	Parking Lot North, Test Unit 1, Level 1, 0-10cm below surface
FOLS 6364	Small fragment of bakelite	Parking Lot North, Test Unit 1, Level 1, 0-10cm below surface
FOLS 6365	Single wire nail	Parking Lot North, Test Unit 1, Level 1, 0-10cm below surface
FOLS 6366	Small circular piece of aluminum, possible bottle capsule foil	Parking Lot North, Test Unit 1, Level 1, 0-10cm below surface
FOLS 6367	Winchester Ranger 12 gauge shotshell head fragment	Parking Lot North, Test Unit 1, Level 1, 0-10cm below surface

Table 11. Concluded.

Catalog #	Description	Within Site
FOLS 6368	Peters victor 12 gauge shotshell head	Parking Lot North, Test Unit 1, Level 1, 0-10cm below surface
FOLS 6369	Two wire nails, one is a roofing nail	Parking Lot North, Test Unit 1, Level 2, 10-20cm below surface
FOLS 6370	A single broken asphalt roofing shingle fragment that fits back together	Parking Lot North, Test Unit 1, Level 2, 10-20cm below surface
FOLS 6371	A foil wrapper with a small orange stripe	Parking Lot North, Test Unit 1, Level 2, 10-20cm below surface

Figures

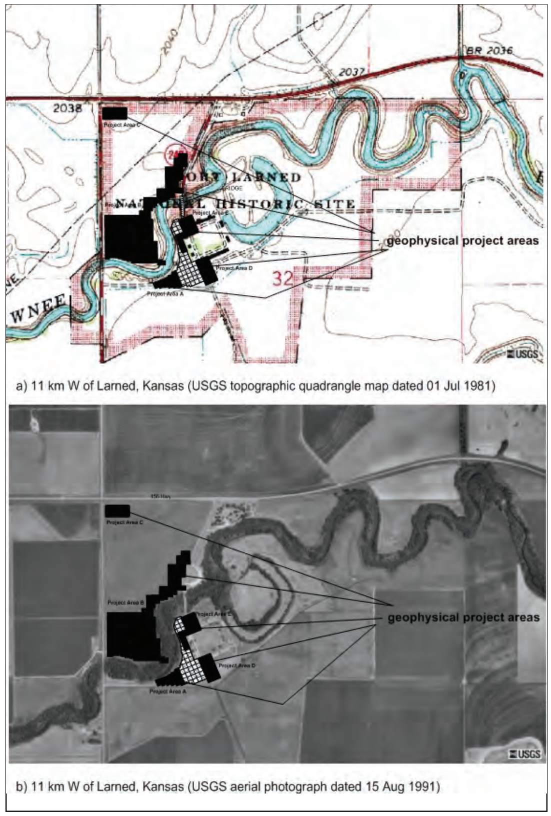

Figure 1. Location of the geophysical project areas at the Fort Larned National Historic Site (14PA305), Pawnee County, Kansas.

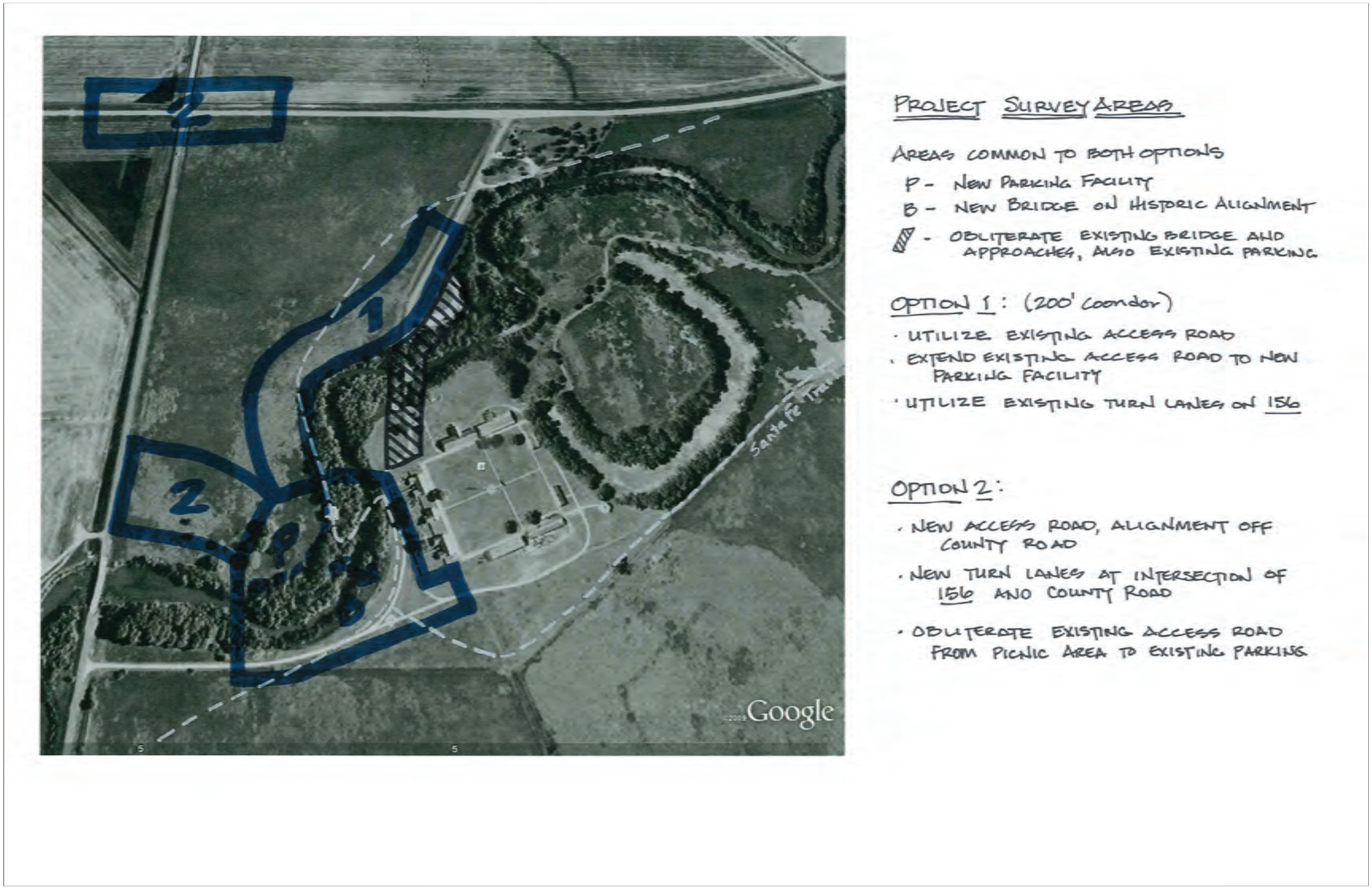

Figure 2. Bridge replacement project alternatives provided by DSC planning staff.

Figure 3. Areas of Potential Effect for geophysical and archeological investigations.

Figure 4. General view of the FOLS Geophysical Project Area A from the west side (view to the east northeast).

Figure 5. General view of the FOLS Geophysical Project Area B from the southwest corner of the grassy field (view to the northeast).

Figure 6. General view of the FOLS Geophysical Project Area C (view to the east).

Figure 7. General view of the FOLS Geophysical Project Area D (view to the north northwest).

Figure 8. General view of the FOLS Geophysical Project Area E from the southwest corner of the project area (view to the northeast).

Figure 9. Laying out the geophysical survey grid corner stakes with the surveying compass and 100-meter tape in project area B (view to the west).

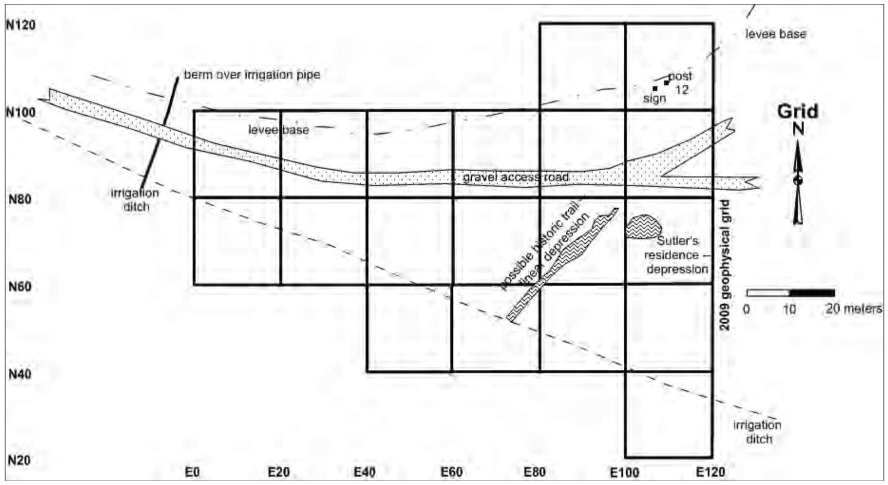

Figure 10. Sketch map of the FOLS Geophysical Project Area A.

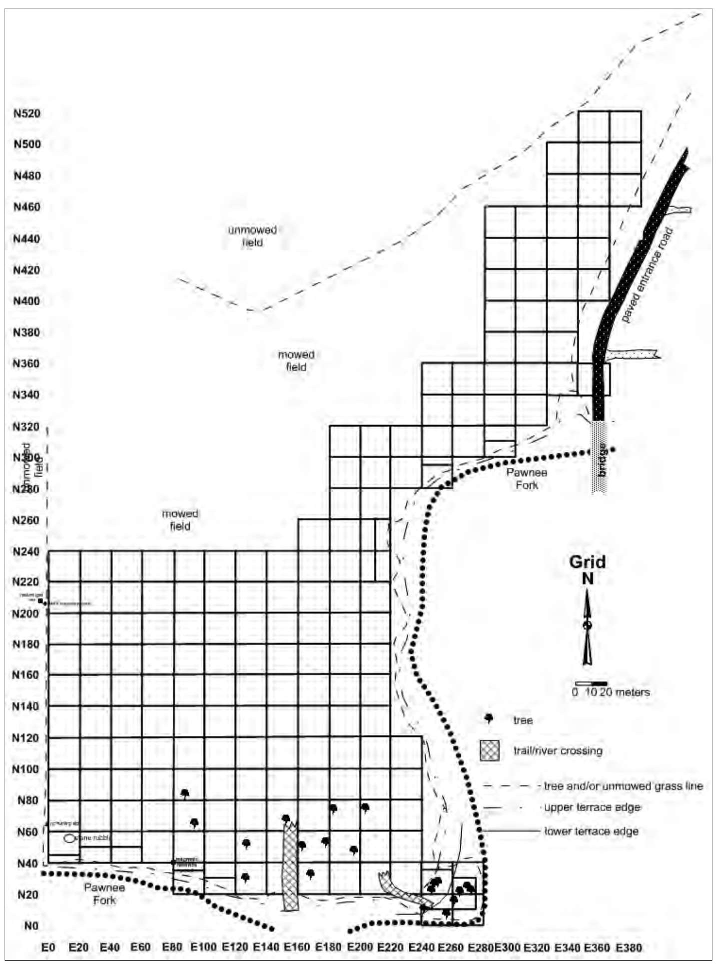

Figure 11. Sketch map of the FOLS Geophysical Project Area B.

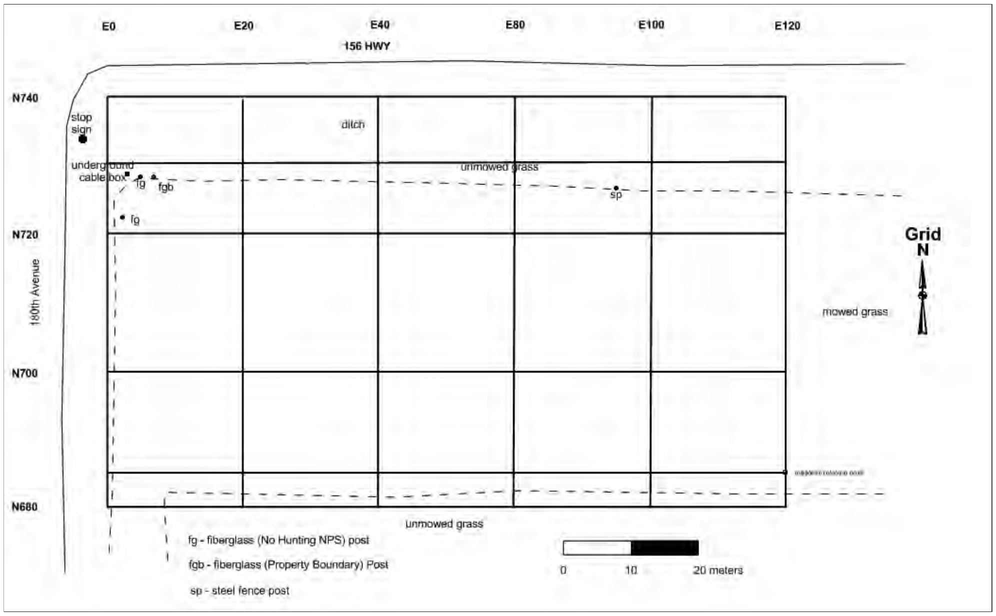

Figure 12. Sketch map of the FOLS Geophysical Project Area C.

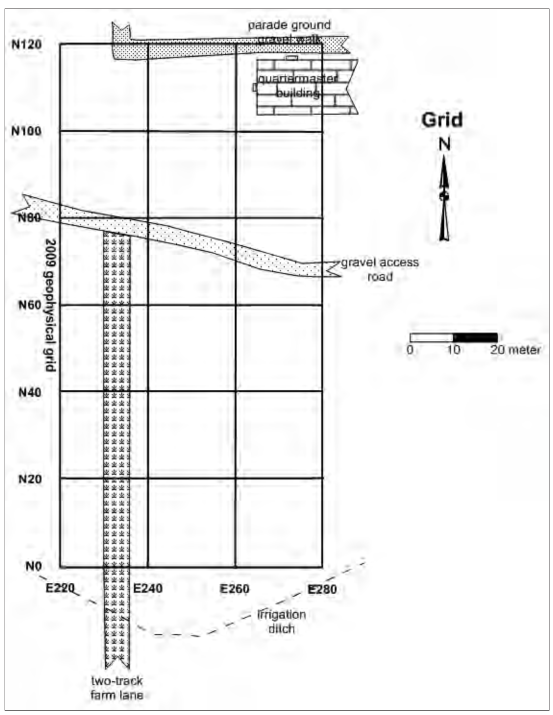

Figure 13. Sketch map of the FOLS Geophysical Project Area D.

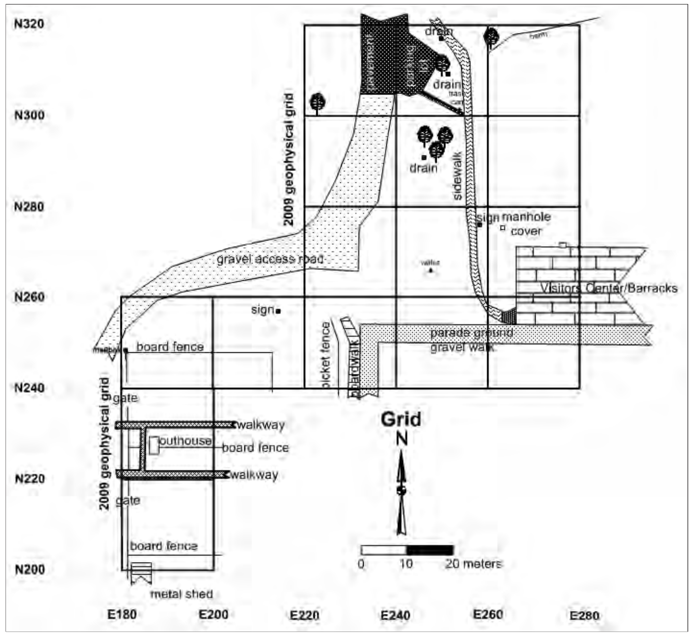

Figure 14. Sketch map of the FOLS Geophysical Project Area E.

Figure 15. Placing the surveying ropes on the geophysical grid in the southeast corner of project area B (view to the south).

Figure 16. Creating the sketch map of cultural and natural surface features in project area B (view to the west southwest).

Figure 17. Collecting GPS reading on one of the geophysical grid corner stakes with a GPS unit and external antenna (view to the south).

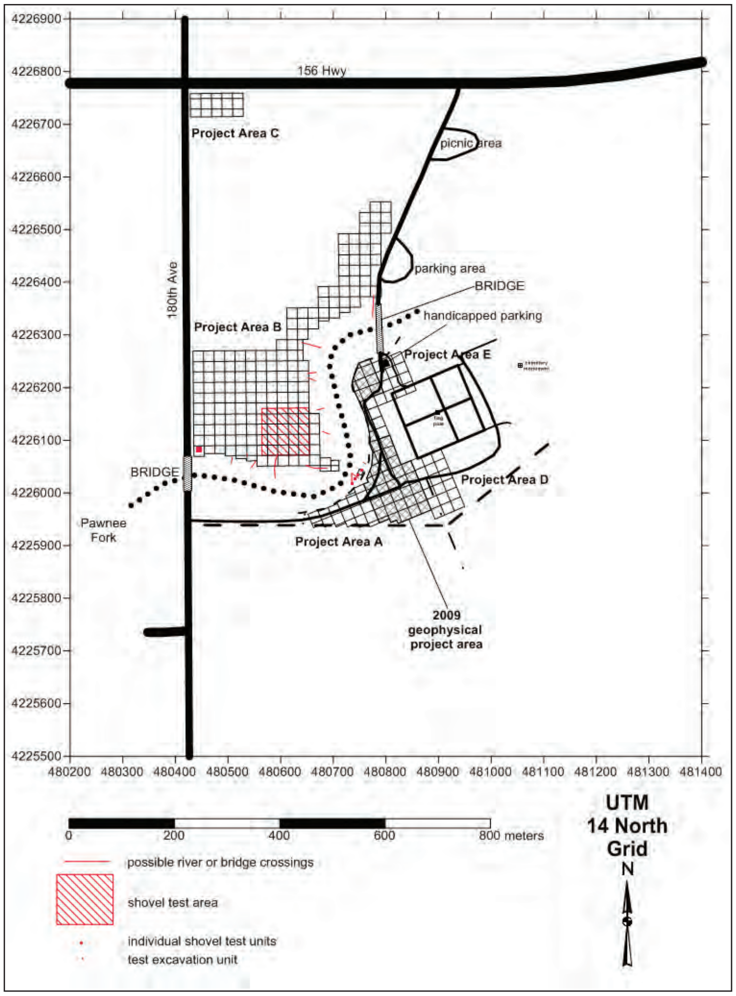

Figure 18. UTM grid of the geophysical project areas at the Fort Larned National Historic Site.

Figure 19. Conducting the magnetic survey with the dual fluxgate gradiometer (view to the south).

Figure 20. Conducting the resistance survey with the resistance meter and twin probe array (view to the north).

Figure 21. Conducting the ground penetrating radar survey with a gpr cart and 400 mHz antenna (view to the east).

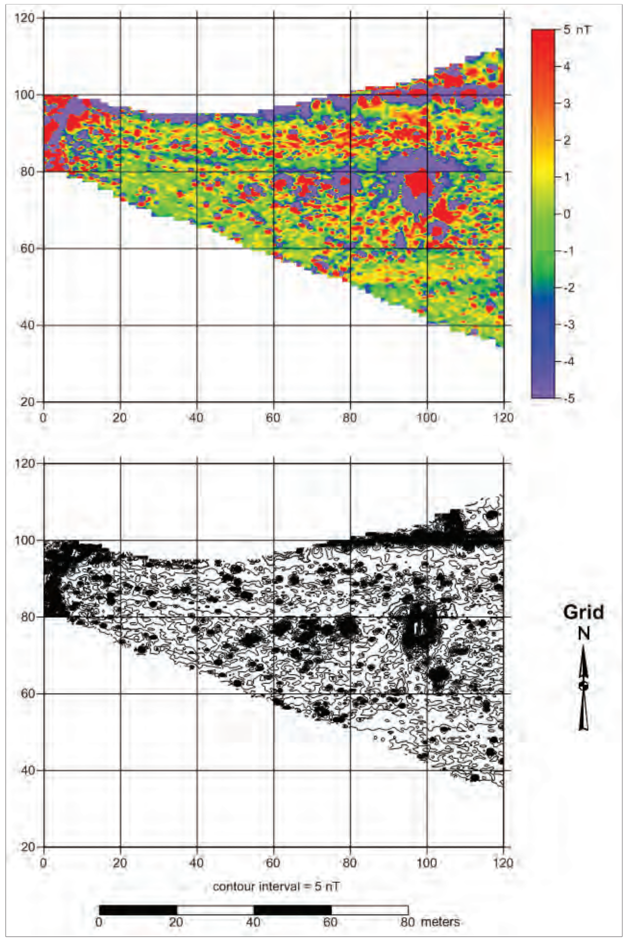

Figure 22. Image and contour plots of the dual fluxgate gradiometer magnetic data from the FOLS Geophysical Project Area A.

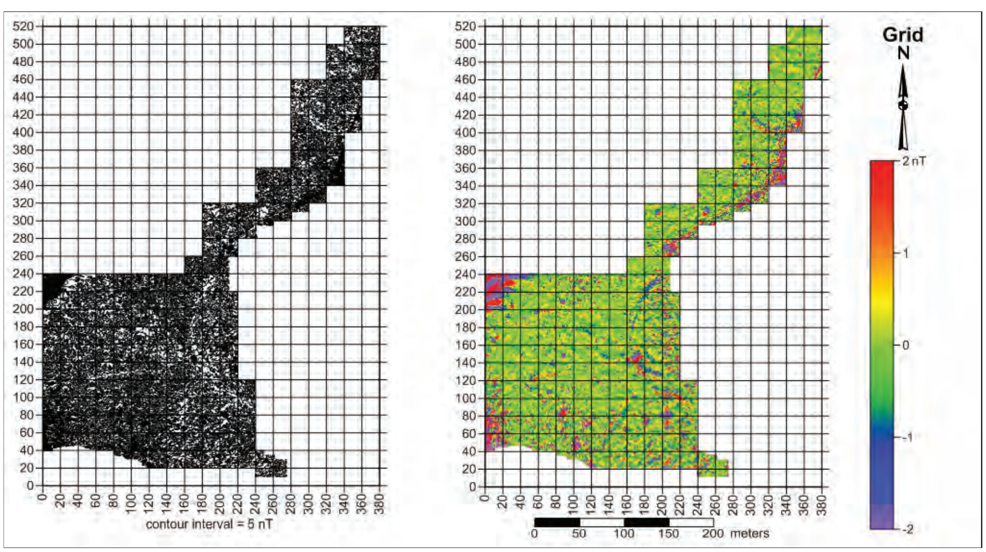

Figure 23. Image and contour plots of the dual fluxgate gradiometer magnetic data from the FOLS Geophysical Project Area B.

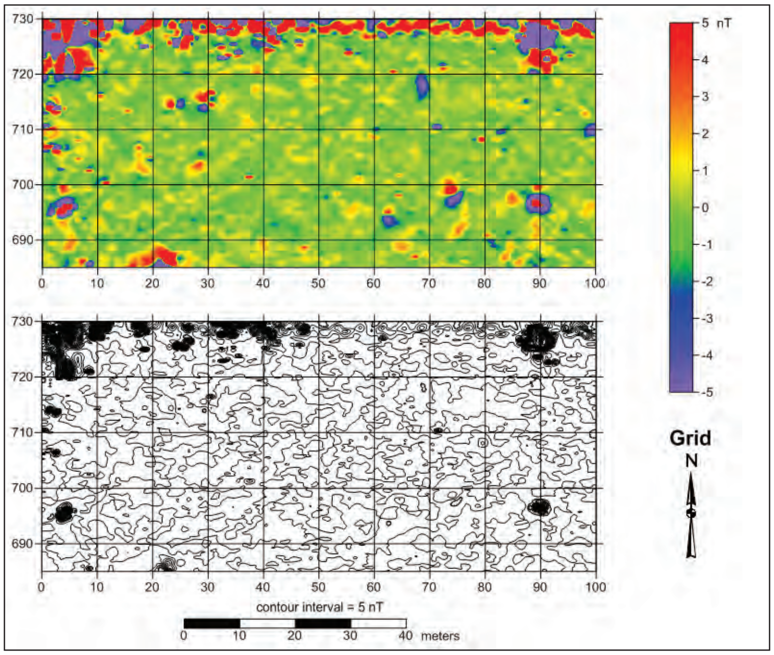

Figure 24. Image and contour plots of the dual fluxgate gradiometer magnetic data from the FOLS Geophysical Project Area C.

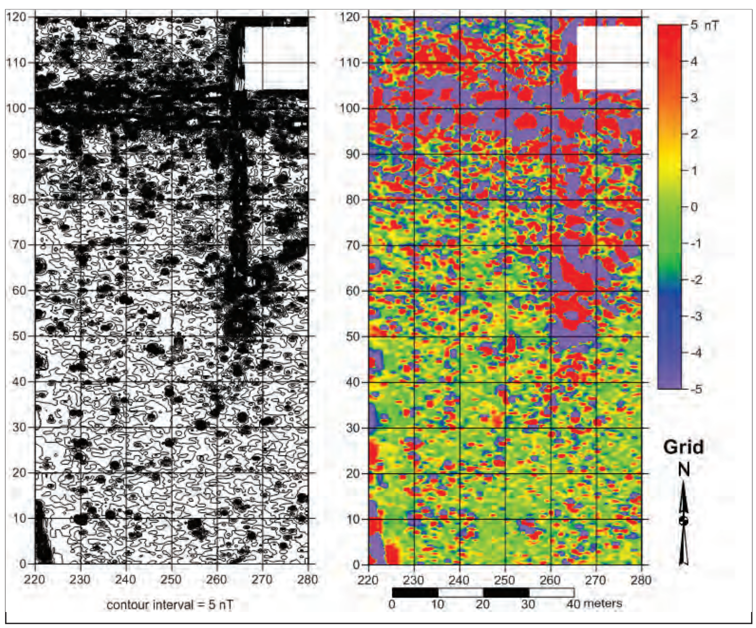

Figure 25. Image and contour plots of the dual fluxgate gradiometer magnetic data from the FOLS Geophysical Project Area D.

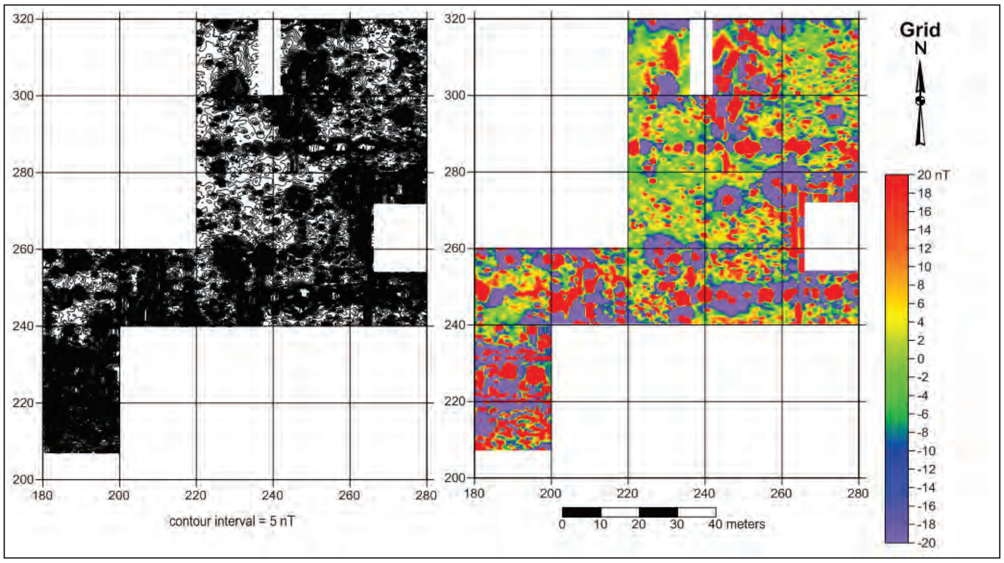

Figure 26. Image and contour plots of the dual fluxgate gradiometer magnetic data from the FOLS Geophysical Project Area E.

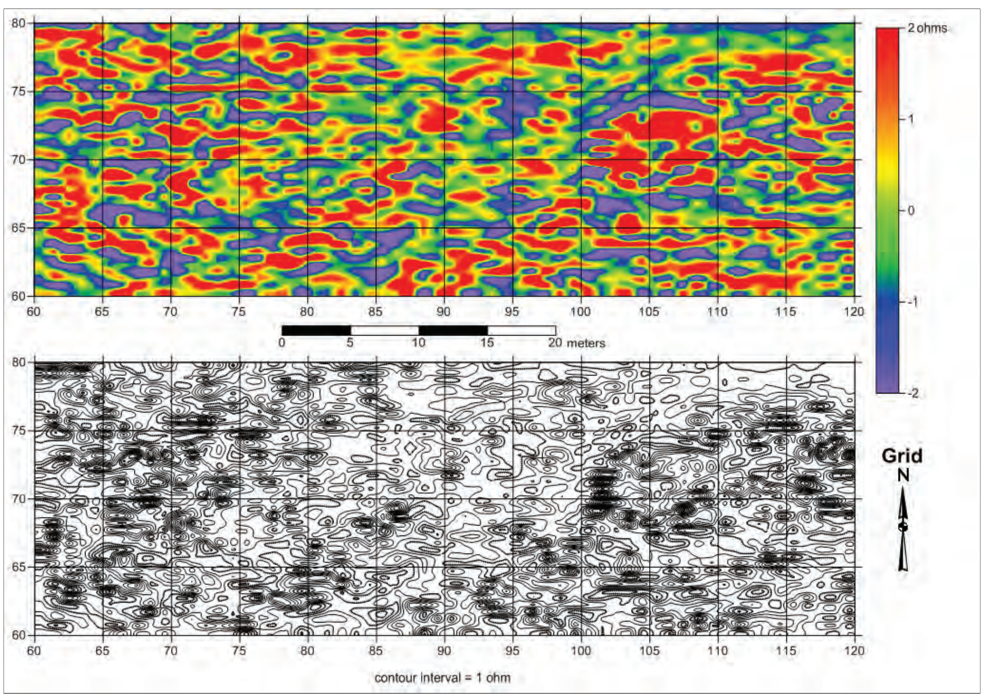

Figure 27. Image and contour plots of the resistance data from the FOLS Geophysical Project Area A.

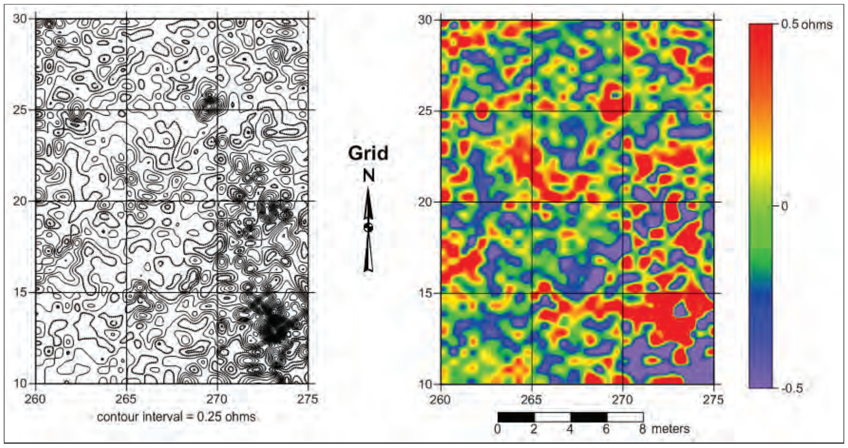

Figure 28. Image and contour plots of the resistance data from the southeast corner of the FOLS Geophysical Project Area B.

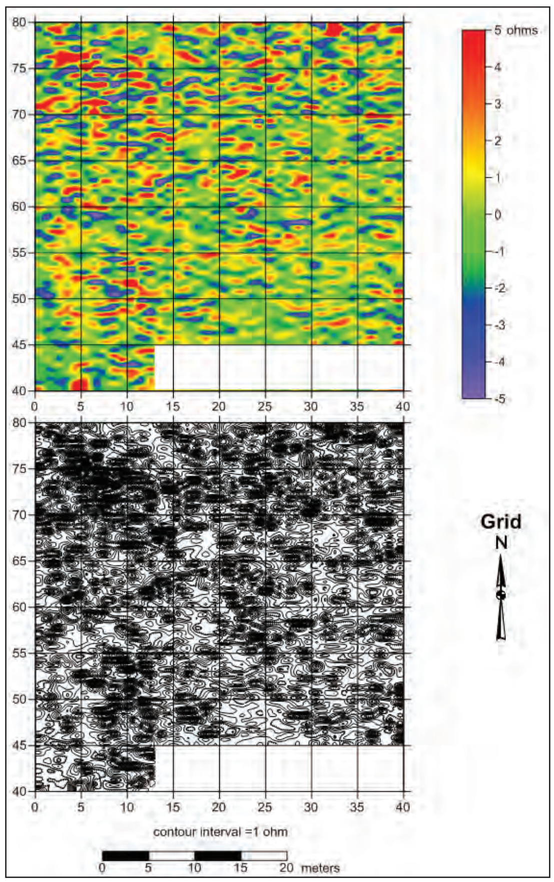

Figure 29. Image and contour plots of the resistance data from the southwest corner of the FOLS Geophysical Project Area B.

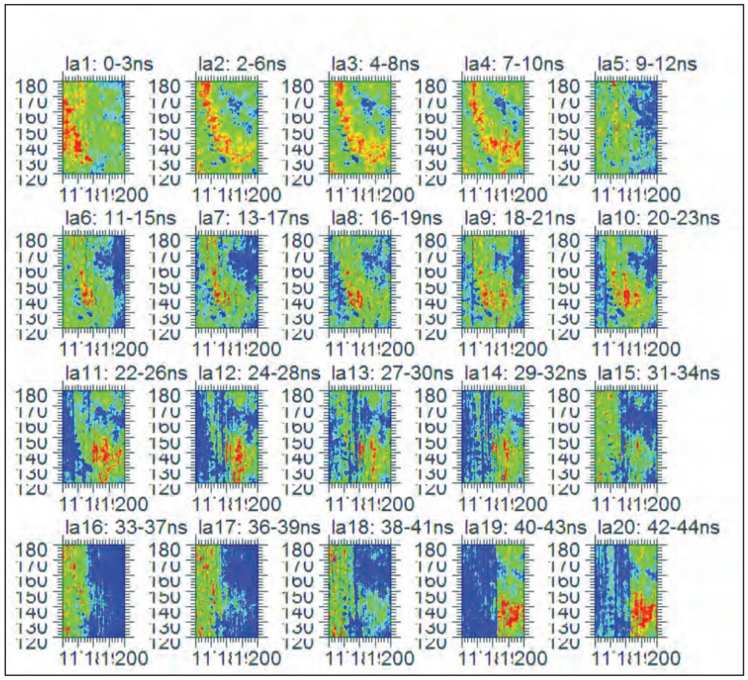

Figure 30. Time slice data from the gpr survey of the selected area within the FOLS Geophysical Project Area B.

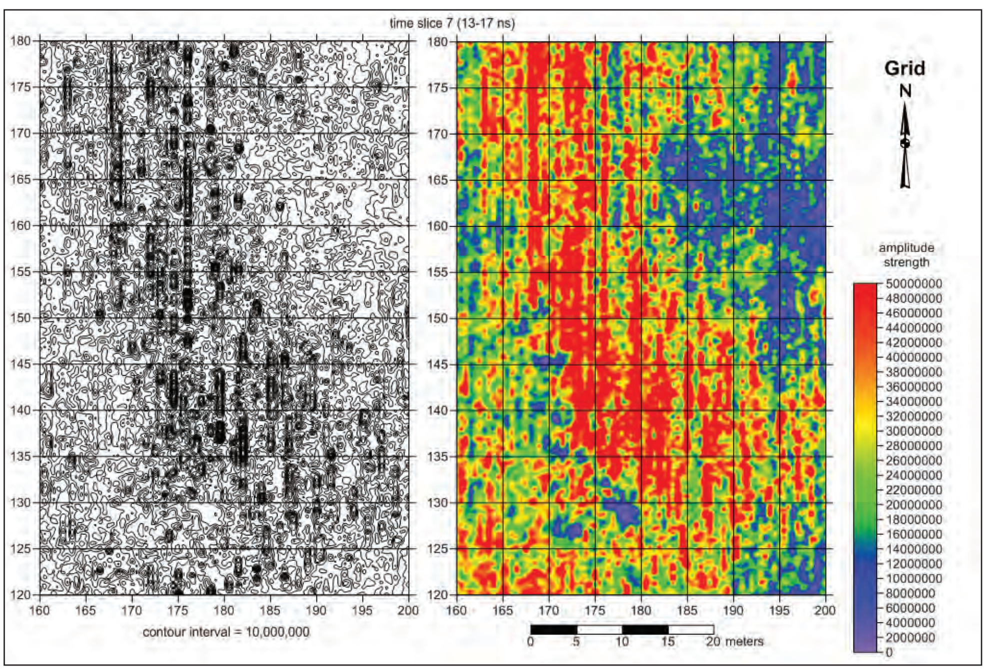

Figure 31. Image and contour plot of the ground penetrating radar time slice 7 (13-17 ns) data from the FOLS Geophysical Project Area B.

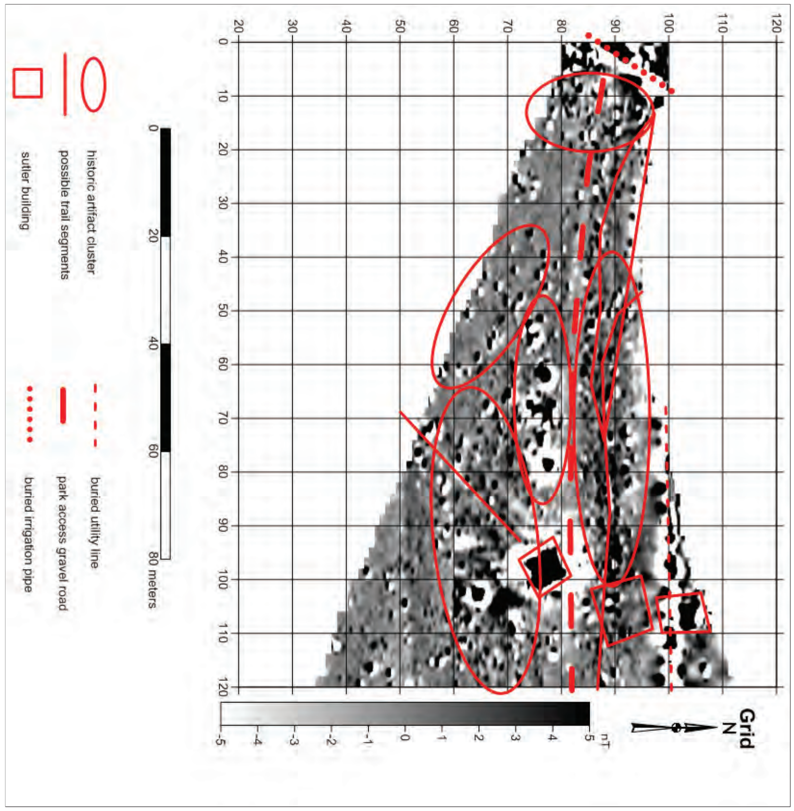

Figure 32. Interpretation of the magnetic data from the dual fluxgate gradiometer from the FOLS Geophysical Project Area A.

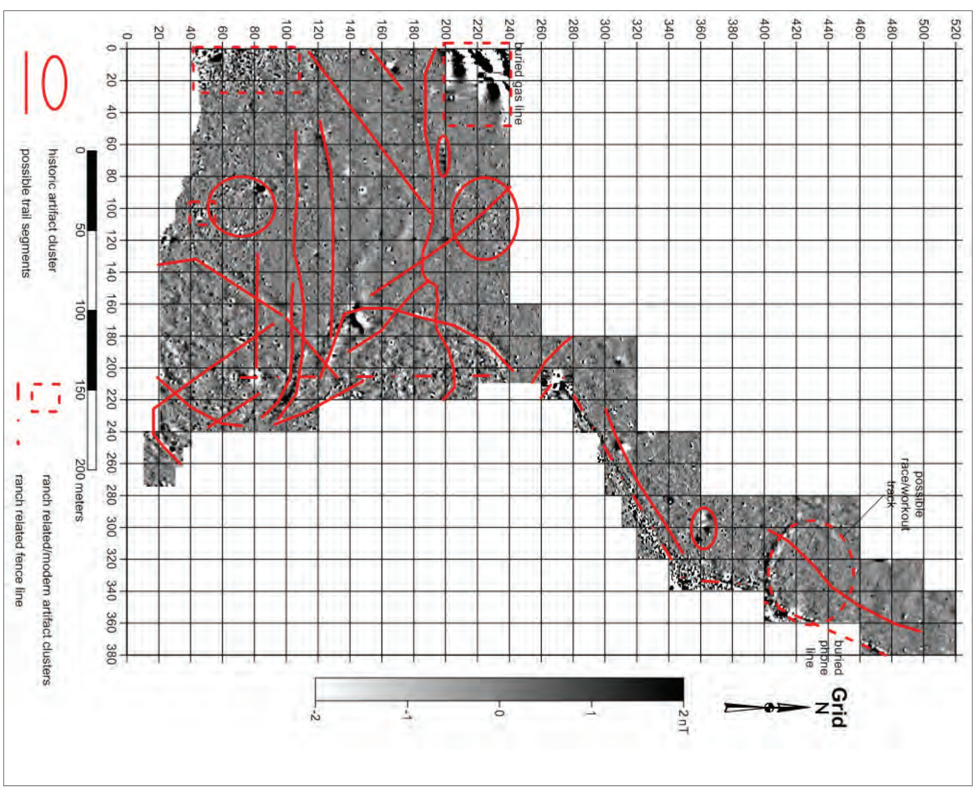

Figure 33. Interpretation of the magnetic data from the dual fluxgate gradiometer from the FOLS Geophysical Project Area B.

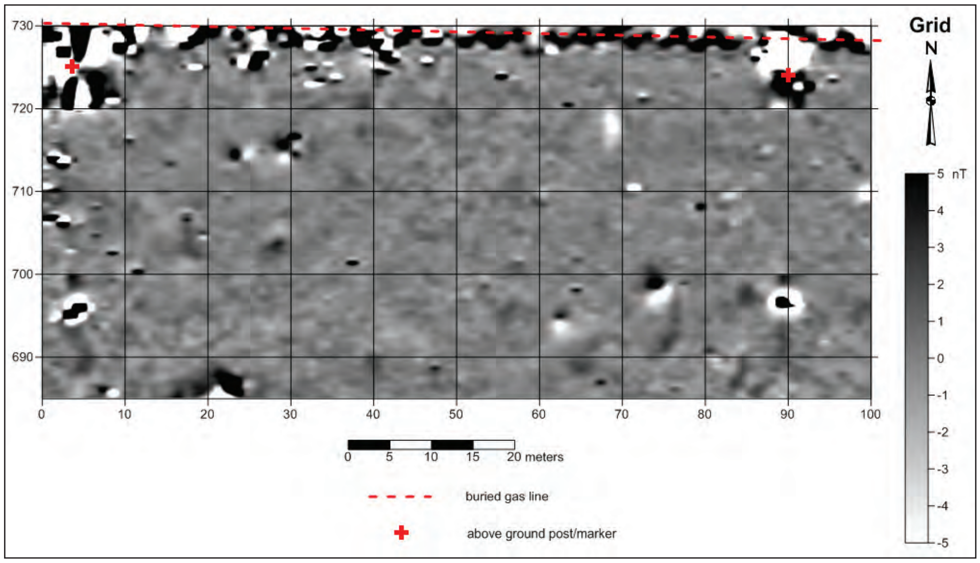

Figure 34. Interpretation of the magnetic data from the dual fluxgate gradiometer from the FOLS Geophysical Project Area C.

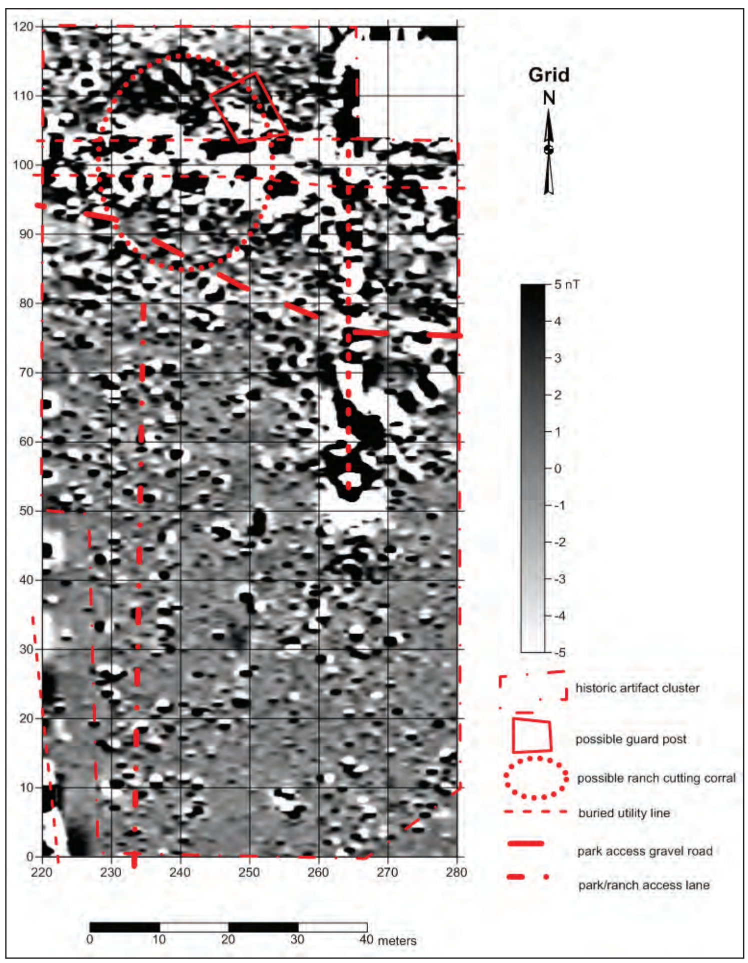

Figure 35. Interpretation of the magnetic data from the dual fluxgate gradiometer from the FOLS Geophysical Project Area D.

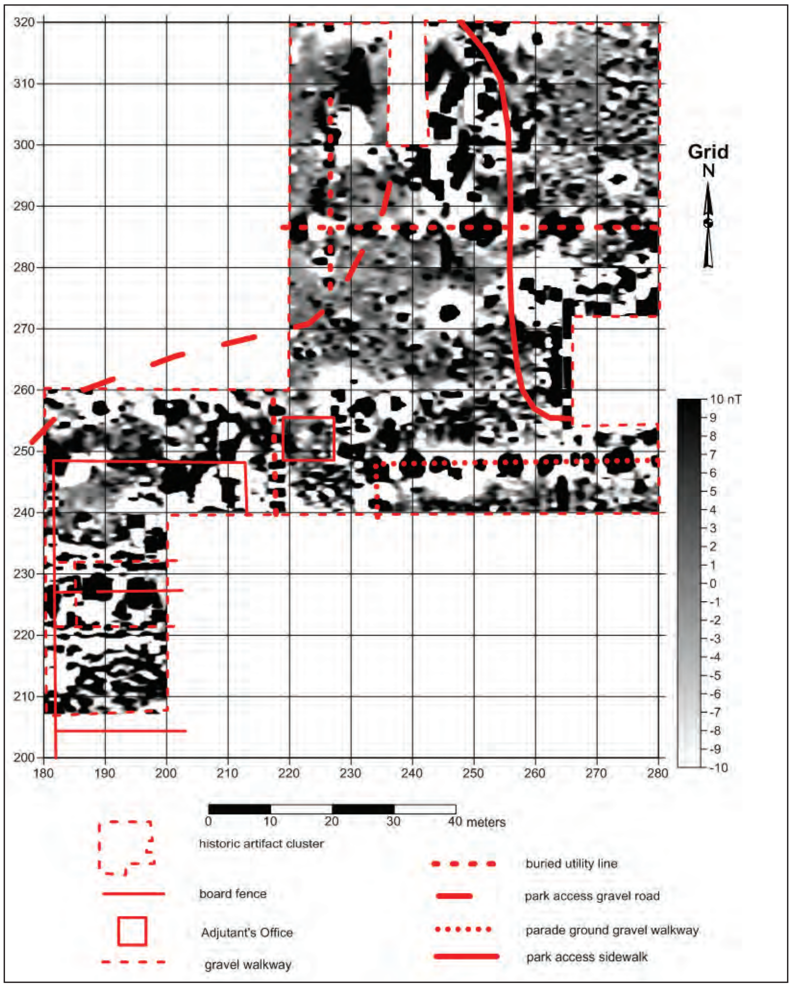

Figure 36. Interpretation of the magnetic data from the dual fluxgate gradiometer from the FOLS Geophysical Project Area E.

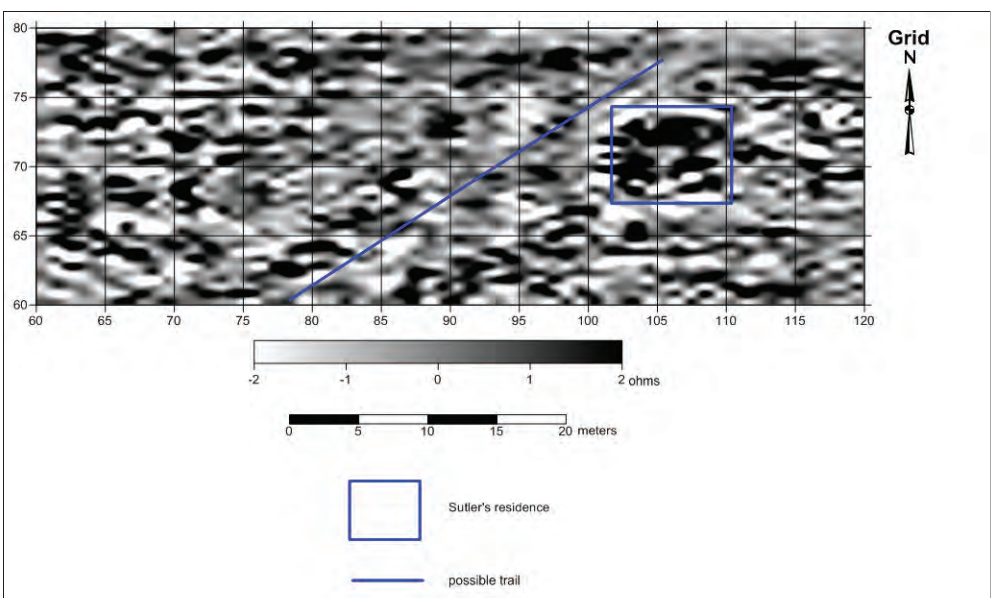

Figure 37. Interpretation of the resistance data from the selected area within the FOLS Geophysical Project Area A.

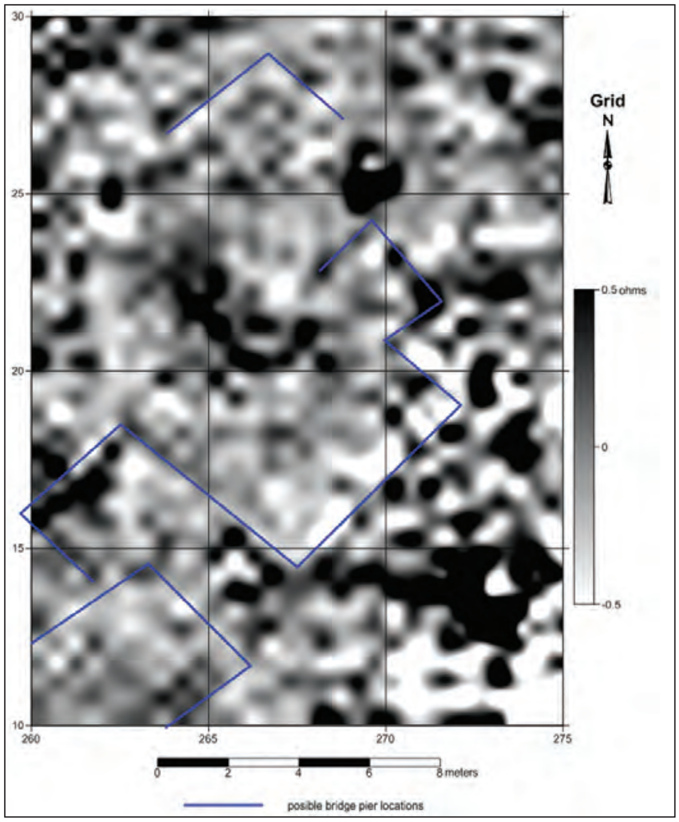

Figure 38. Interpretation of the resistance data from the southeast corner of the FOLS Geophysical Project Area B.

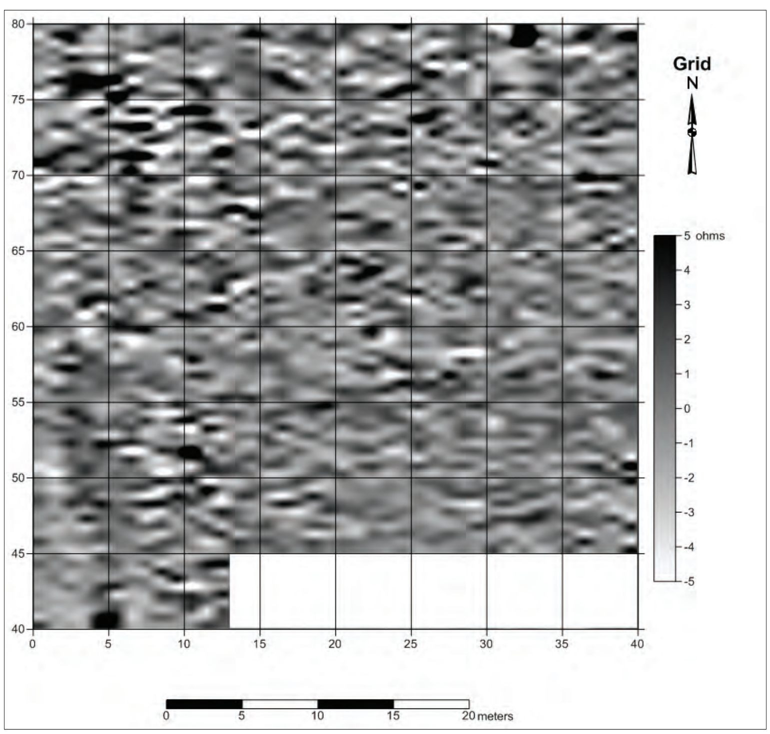

Figure 39. Interpretation of the resistance data from the southwest corner of the FOLS Geophysical Project Area B.

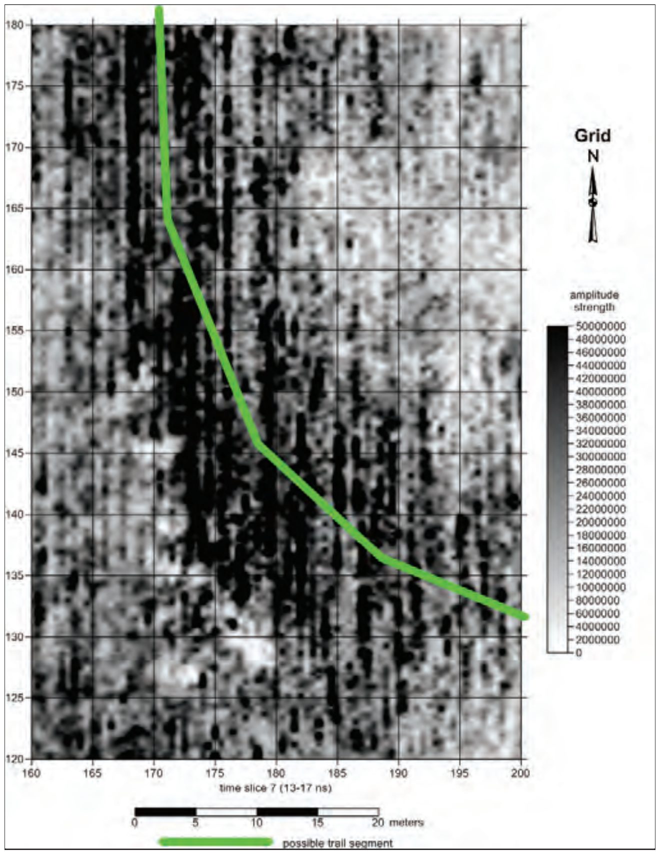

Figure 40. Interpretation of the ground penetrating radar data from time slice 7 (13-17 ns) from the selected area within the FOLS Geophysical Project Area B.

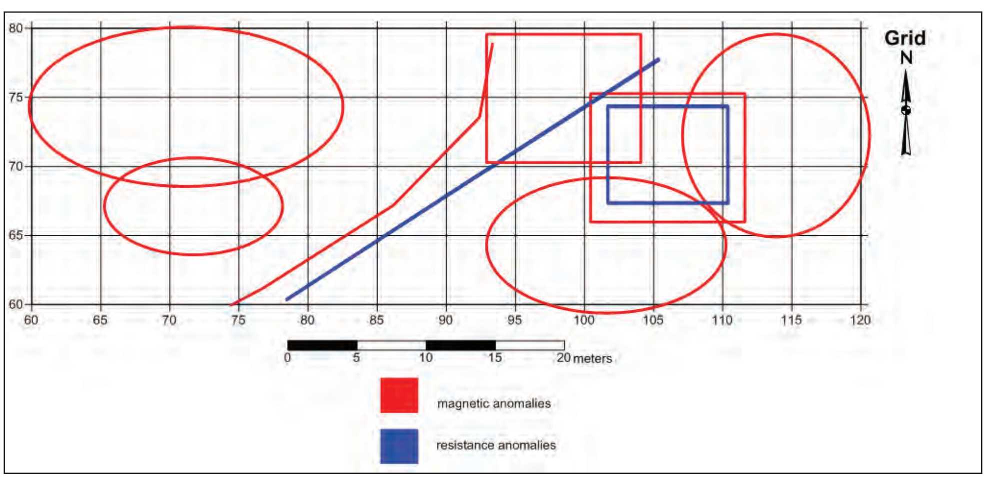

Figure 41. Combined magnetic and resistance anomalies from the FOLS Geophysical Project Area A.

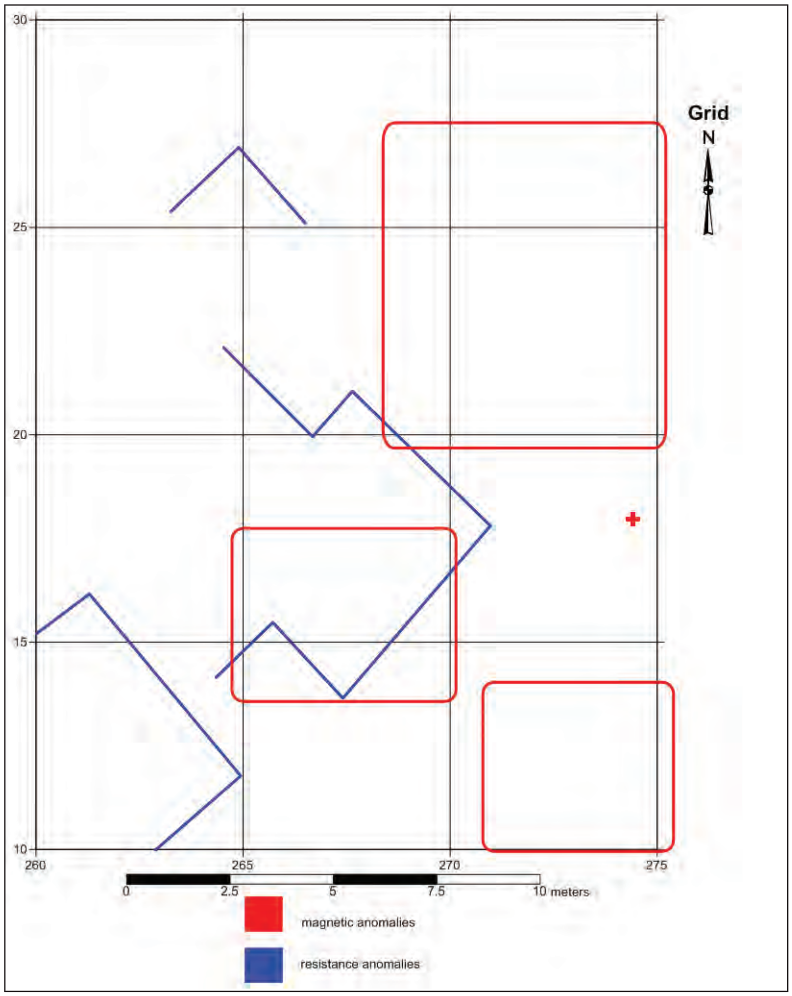

Figure 42. Combined magnetic and resistance anomalies from the southeast corner of the FOLS Geophysical Project Area B.

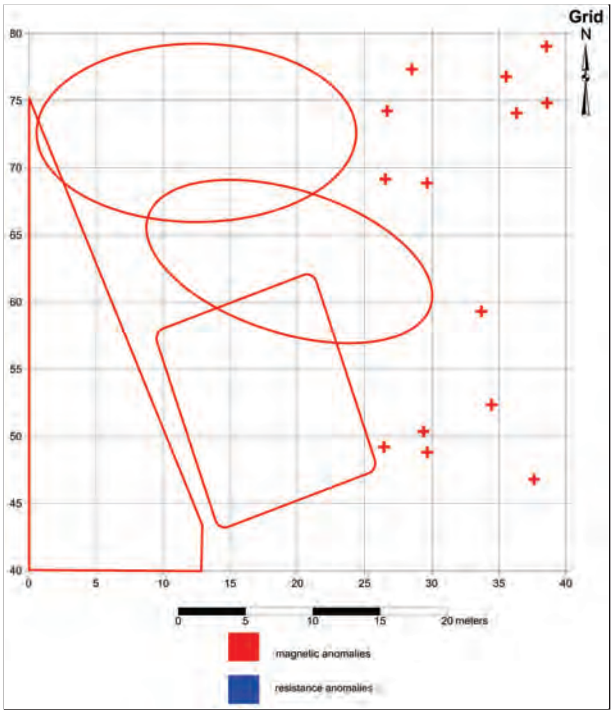

Figure 43. Combined magnetic and resistance anomalies from the southwest corner of the FOLS Geophysical Project Area B.

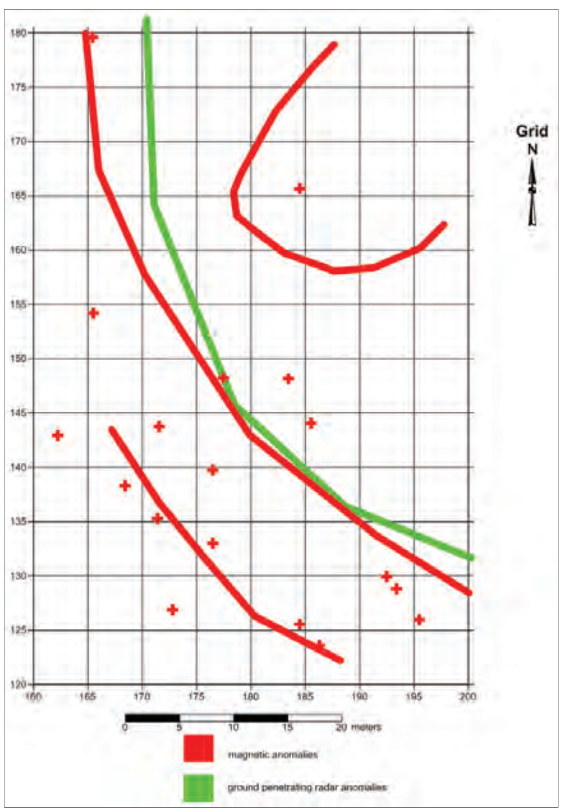

Figure 44. Combined magnetic and ground penetrating radar anomalies from the FOLS Geophysical Project Area B.

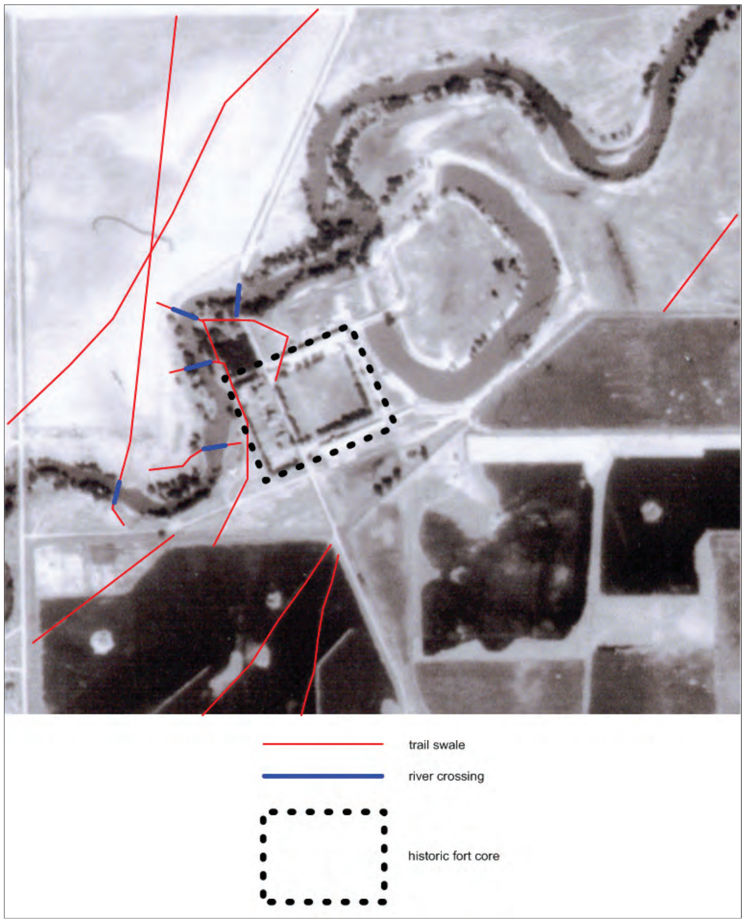

Figure 45. 1938 aerial photograph of the FOLS project area.

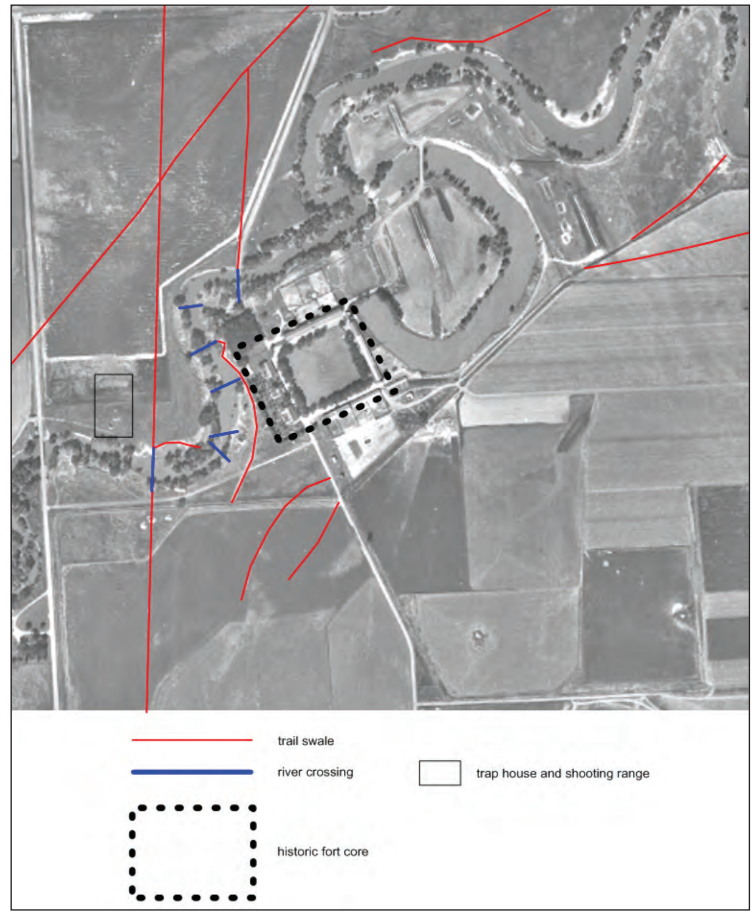

Figure 46. 1950 aerial photograph of the FOLS project area.

Figure 47. 1956 aerial photograph of the FOLS project area.

Figure 48. 1963 aerial photograph of the FOLS project area.

Figure 49. 1970 aerial photograph of the FOLS project area.

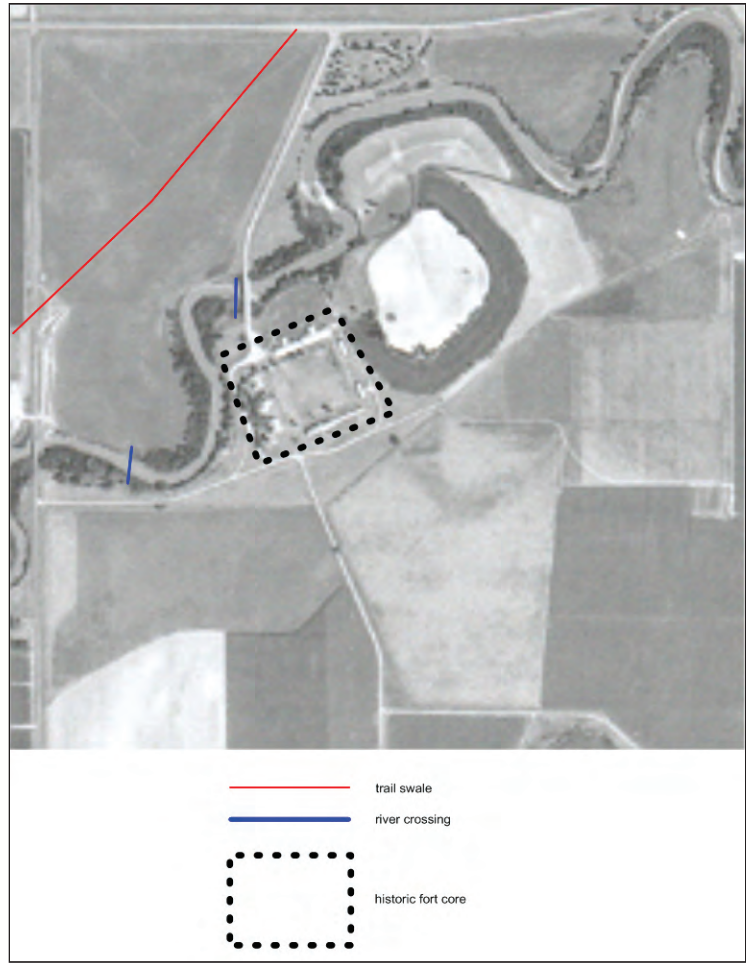

Figure 50. 1975 aerial photograph of the FOLS project area.

Figure 51. 1979 aerial photograph of the FOLS project area.

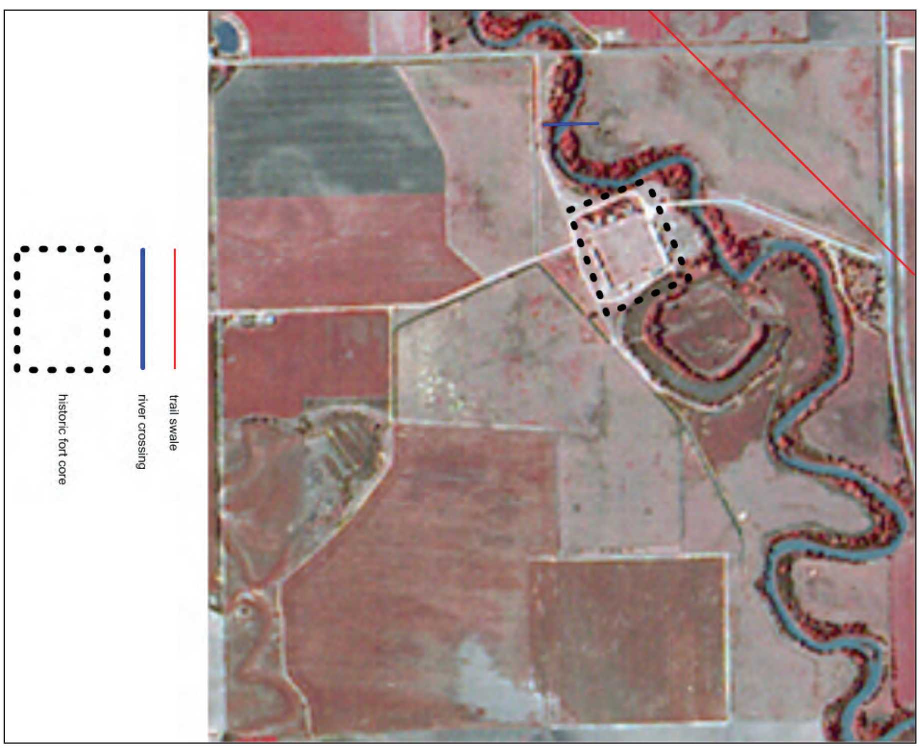

Figure 52. 1981 infrared aerial photograph of the FOLS project area.

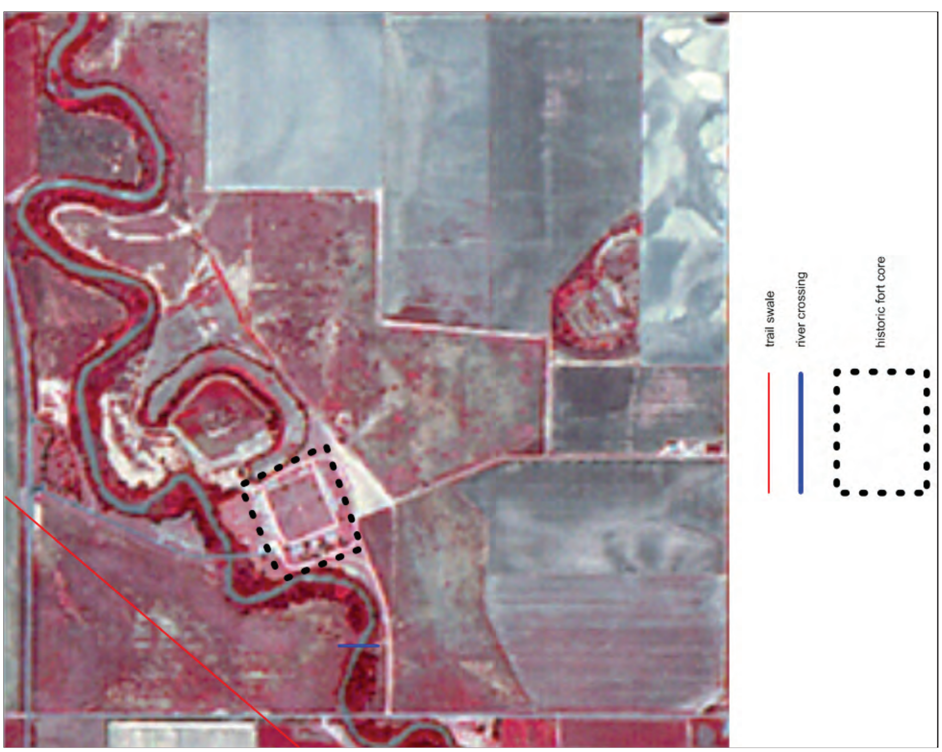

Figure 53. 1985 infrared aerial photograph of the FOLS project area.

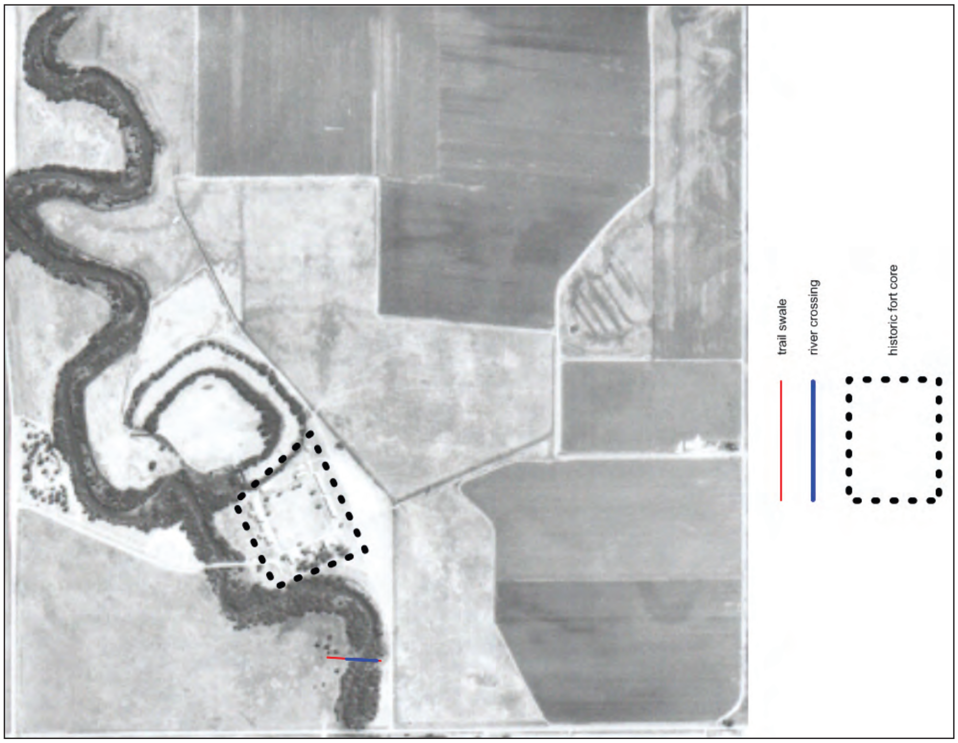

Figure 54. 1991 aerial photograph of the FOLS project area.

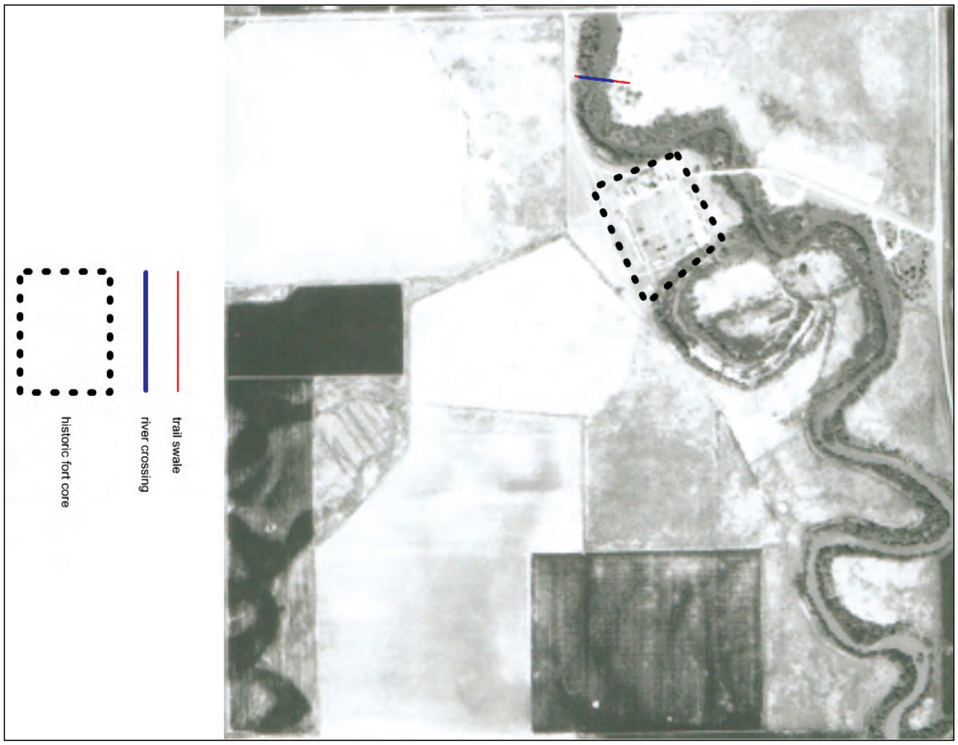

Figure 55. 1997 aerial photograph of the FOLS project area.

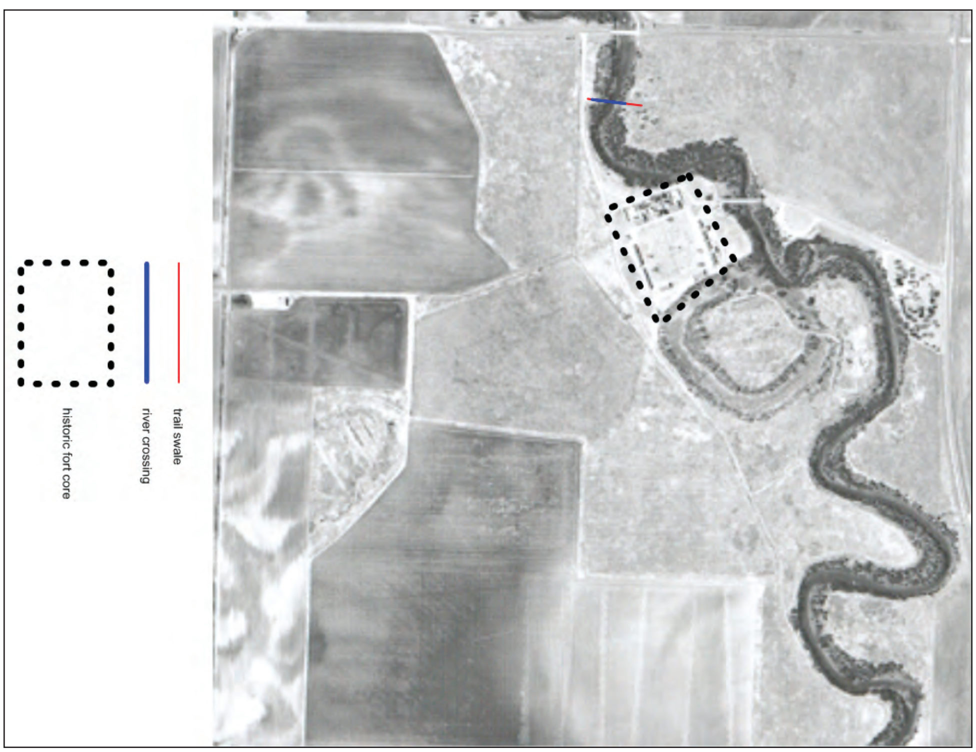

Figure 56. 2002 aerial photograph of the FOLS project area.

Figure 57. 2003 color aerial photograph of the FOLS project area.

Figure 58. 2004 color aerial photograph of the FOLS project area.

Figure 59. 2005 color aerial photograph of the FOLS project area.

Figure 60. Conducting auger excavation in the 100-m shovel test grid in Geophysical Project Area B.

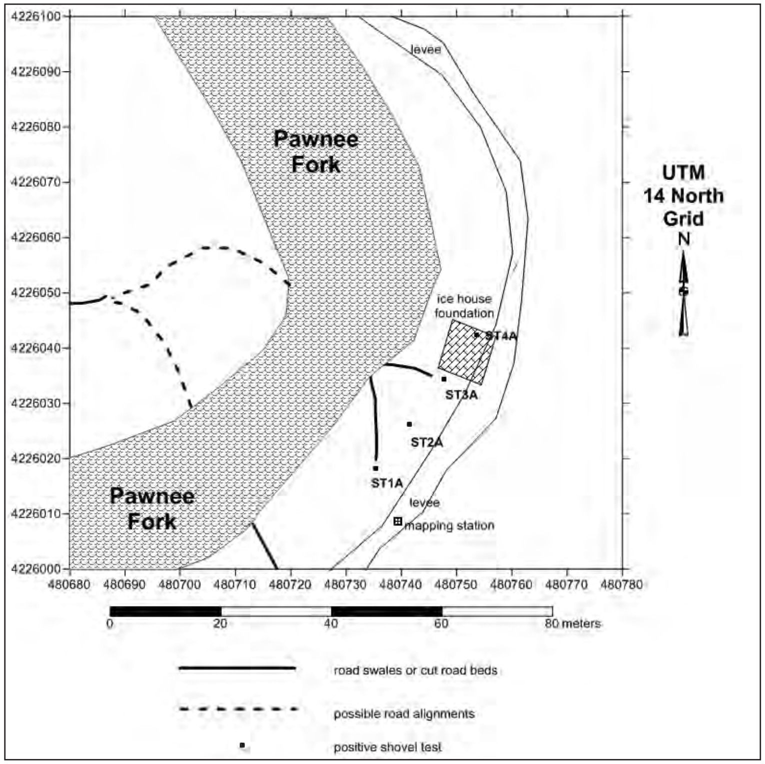

Figure 61. Shovel test locations on the north side of the FOLS Geophysical Project Area A to the southwest of the main fort buildings and parade ground.

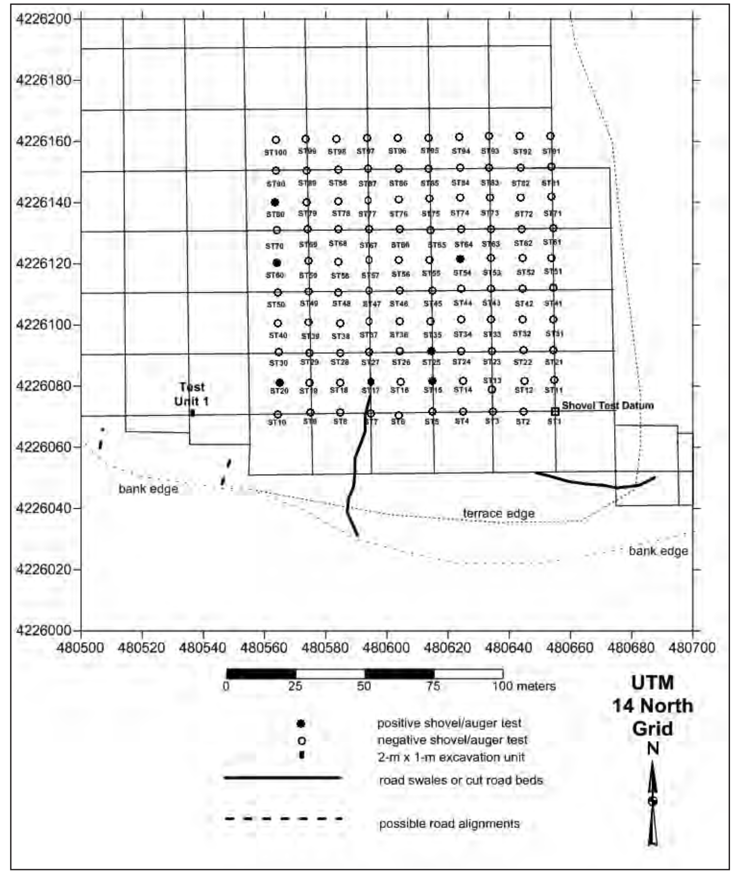

Figure 62. Shovel test and excavation unit locations on the FOLS Geophysical Project Area B.

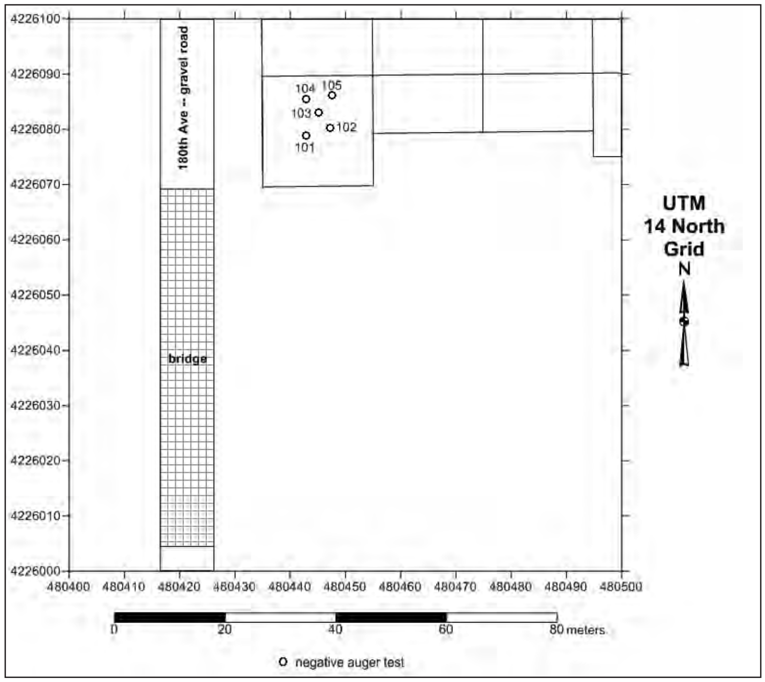

Figure 63. Shovel test locations in the southwest corner of the FOLS Geophysical Project Area B.

Figure 64. General view of Test Unit 1 in the south central part of the FOLS Geophysical Project Area B (view to the east northeast).

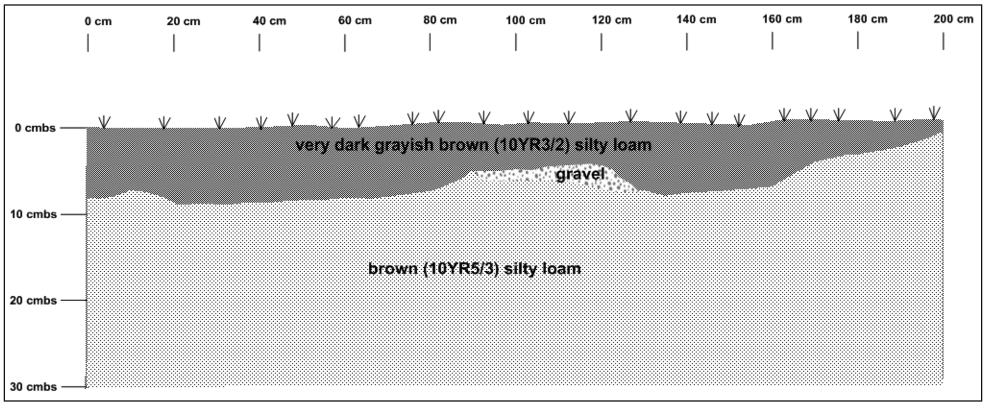

Figure 65. West wall profile of Test Unit 1 in the FOLS Geophysical Project Area B.

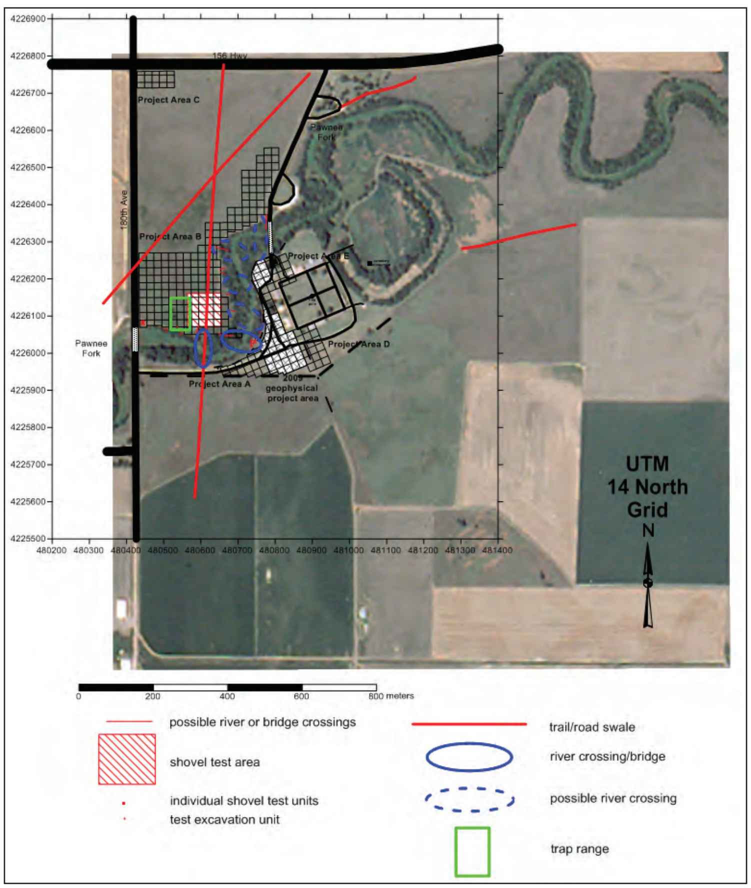

Figure 66. Summary of archeological and geophysical project at FOLS.