Phase II Archaeological Assessment of 33FR2629, Elam Drake Farmstead at the John Glenn Columbus International Airport in Mifflin Township, Franklin County, Ohio

By

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With Contributions by
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ASC GROUP, INC.
ARCHAEOLOGY ARCHITECTURAL HISTORY ENVIRONMENT
CULTURAL AND ENVIRONMENTAL CONSULTANTS

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ABSTRACT

ASC Group, Inc. completed a Phase II site evaluation of 33FR2639, the Elam Drake Farmstead at the John Glenn Columbus International Airport in Mifflin Township, Franklin County, Ohio. The survey identified 22 historic features associated with the Elam Drake farmstead, including two cisterns, a dry well, a distribution box associated with the septic system, a small rectangular concrete lined depression near the house, a flagstone walkway, a brick patio and flagstone entryway, a sidewalk, historic post molds, a driveway remnant, a drain pipe and a drain, and builder's trenches around the smokehouse. While several components were newly identified during the assessment, no sealed artifact-bearing deposits or deposits directly associated with the Elam Drake occupation could be identified.

The assemblage consists of 811 historic artifacts, 167 pieces of faunal material, and nine prehistoric lithic items. The assemblage is consistent with the materials recovered from the Phase I survey around the Drake house and includes architectural elements, domestic-related artifacts, and faunal remains (Brown 2007).

The historic period artifact scatter appears to be related to the National Register of Historic Places-listed Elam Drake house that was occupied from the mid-l800s until the early 2000s. The assemblage lacked the temporally diagnostic materials that could be associated with Elam Drake's occupation of the house. While intact deposits were encountered around the house/smokehouse and near the barn, only those features directly associated with the construction of the buildings (i.e., foundation and builder's trench) can be directly associated with the Elam Drake occupation. A majority of the features and cultural materials recovered during this evaluation cannot be directly related to Elam Drake occupation, and are most likely related to occupations of the property after Elam Drake resided there. The post-Drake Family occupation and the commercial facility occupation have impacted the integrity of the Elam Drake component of the site through upgrades to the septic/drainage systems, installation of the pond, and subsequent grading and placement of gravel over two-thirds of the site for commercial purposes. The areas around the house have been damaged by post-Drake family improvements and upgrades, impacting the Elam Drake occupation deposits.

The historic archaeological component of this site does not have the potential to yield additional information that would be important to the understanding of the historic period in Mifflin Township, Franklin County, Ohio or more specifically the Elam Drake house (Criterion D). The historic archaeological component of this site is not considered to be eligible for inclusion to the National Register of Historic Places under Criterion D because it fails to meet the minimum criteria for eligibility (Andrus 1997).

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INTRODUCTION/PROJECT DESCRIPTION

Under contract with the Columbus Regional Airport Authority (CRAA), ASC Group, Inc. (ASC), completed a Phase II archaeological site evaluation of site 33FR2639, the Elam Drake Farmstead, for future development at the John Glenn Columbus International Airport (formerly the Port Columbus International Airport) in Mifflin Township, Franklin County, Ohio (Figures 1 and 2). The Elam Drake Farmstead is an 1856 farmstead located on land owned by the CRAA. The buildings are to be demolished for the Midfield Development Program at the John Glenn Columbus International Airport. The name of the airport changed to John Glenn Columbus International Airport from Port Columbus International Airport in June 2016. Contemporary references to the airport in this report use the new name; historical references to the airport retain the Port Columbus name, as that was the name in use at the time. The Federal Aviation Administration (FAA) is the lead federal agency for the undertaking.

The farmstead is still standing and the extant buildings and surrounding property have been listed on the National Register of Historic Places (NRHP) under Criteria B and C, as architectural resources. Elam Drake was a prominent brick mason and plasterer working in Columbus and the surrounding communities in the decades before he built his farmstead. Previous research has posited that in addition to being a working farm, the bricks used to build the Elam Drake house were produced on the property from clay mined there. The large pond on the property was thought to be the resource for the clay. A Phase I archaeological survey of the farmstead inventoried it as 33FR2639, but recommended the site not eligible for listing on the NRHP (Brown 2007).

After the Phase I archaeological survey was reviewed, the Ohio State Historic Preservation Office (SHPO) stated that "33FR2639 is an integral part of the National Register property" (Appendix B [Snyder, 5/10/2007]). Currently, a memorandum of agreement has been finalized and the Ohio SHPO requested additional testing and specified some areas to investigate at the site (described below).

Considering the aboveground property's NRHP status, any archaeological deposits associated with the Drake occupation in the second half of the nineteenth century were of interest and required further testing to identify and assess their archaeological potential. It was proposed that archaeological deposits associated with the Elam Drake Farmstead may make a significant contribution to our understanding of nineteenth-century farm life in Franklin County and the nineteenth-century brick-making processes and applications in rural construction.

Selected field methods included visual inspection and photo documentation, close-interval, hand-excavated shovel test pits (STPs); hand-excavated 1-meter (m) x 1-meter (m) [3.3-feet (ft) x 3.3-feet (ft)] test units (TUs); a geophysical survey including ground-penetrating radar (GPR) and magnetic gradient survey; the mechanical stripping of topsoil or modern overburden to search for features and identify anomalies detected during the geophysical work; and feature excavation. All field investigation techniques were completed in accordance with *Archaeological Guidelines* for such investigations put forward by the Ohio Historic Preservation Office (1994).

The geophysical survey included 3.2 acres (1.2 hectares [ha]) of magnetic gradient survey focusing on the north half of the property (to search for potential features associated with brick production) and around the house and barn to search for shaft features and pit features near the buildings. The ground-penetrating radar survey (0.8 acres [0.3 hectares]) focused on the area around the house and barn. Jarrod Burks, PhD, of Ohio Valley Archaeology, Inc., conducted the geophysical survey (Appendix C).

The assessment survey was conducted April 17–28, 2017. Kevin Schwarz, PhD, RPA, served as the project manager, David Klinge, MA, was the principal investigator, Dawn Walter Gagliano, MA, supervised the fieldwork and is the primary report author. David Trader, Jessica Munday, Jeff White, JoAnna Flowers Aukeman, and Eric Aukeman were archaeological field technicians.

RESEARCH DESIGN

RESEARCH GOALS

The purpose of the investigation is to collect sufficient data from 33FR2639 to evaluate the extent, density and nature of the site's archaeological deposits, the site's archaeological integrity, and, thus, the ability of the site to convey its significance.

The following factors were taken into consideration in the evaluation: historic context; potential historical significance compared to similar sites; and site integrity. In order to conduct this evaluation the following site data was evaluated:

- Presence of in situ remains and cultural features;
- Presence of intact or "sealed" archaeological deposits that relate to the Drake occupation;
- Quantity and quality of cultural materials present; and
- Areas of disturbance prohibiting or limiting archaeological investigation.

Per Ohio SHPO comments, the Phase II field investigation involved additional research of specific elements (Appendix B).

- Research related to the pond, to determine how it may have contributed to the historic activities that occurred at the site;
- Research and potential retrieval of artifacts from the cistern(s)/pits located near the house; and
- Research and potential retrieval of artifacts from the depressed area located between the house and barn.

BACKGROUND RESEARCH

Historic Context

As previously noted, the site and surrounding area have been previously surveyed at the Phase I level. An environmental and cultural history of the area, including Mifflin Township and Franklin County is available in the Phase I report (Brown 2007). For the purposes of this report, the background research and historic context will focus on Elam Drake and the Elam Drake Farmstead.

Elam Drake

Elam Drake was born on November 16, 1812, in East Windsor, Hartford County, Connecticut, one of eight children of Elias and Mary Collins Drake, natives of Connecticut. In 1831, when Elam was 21 years of age, the Drake family immigrated to Franklin County, Ohio. Once the Drake family settled in Mifflin Township, Elias Drake continued as a brick mason and plasterer, a profession Elam entered under the direction of his father. Elias and Elam Drake are associated with the construction of many of the earliest brick houses in Columbus and surrounding Franklin County. In 1837, Elam Drake married Angeline Patterson, a native of Mifflin Township, with whom he had six children, five sons and one daughter. In 1856, Elam Drake retired as a mason to his 62-acre farm on which he had constructed a brick house, brick barn, brick smokehouse/summer kitchen, and other structures (The Lewis Publishing Company 1901). In 1911, at age 98, Elam Drake died (Bureau of Vital Statistics, Death Certificate for Elam Drake, Vol. 631, File 8484, Ohio History Connection, and Columbus).

Elam Drake Farmstead

The project area, located at 2738 Ole Country Lane, was part of a 50-acre purchase by Elam Drake from Frederick Townsbury on February 1, 1837. Around the time of his retirement in 1856, the house and smokehouse/summer kitchen were built. Before then, Elam Drake and family were living in a log house acquired via Elam Drake's will. It was part of a 65.21-acre tract transferred to Elam Drake's heirs in 1912. In 1920, it passed out of the Drake family and has had 14 subsequent owners (Franklin County Recorder, Columbus, Ohio, Deed Book; Historic American Buildings Survey, Elam Drake Farmstead, 2006, ASC Group, Inc., Columbus, Ohio).

In 1850, the farm contained 30 and 20 acres (12.4 and 8.1 ha) of unimproved and improved land, respectively. The modest farm produced Indian corn, Irish potatoes, and butter, and its livestock consisted of a few horses, milk cows, cattle, and swine. By 1860, the farm had grown to 60 acres (24.2 ha), of which 40 acres (16.2 ha) were improved and 20 acres (8.1 ha) were unimproved. In addition to Indian corn, Irish potatoes, and butter; sweet potatoes and hay were produced. In 1870, the farm was 70 acres (28.3 ha), 60 acres (24.2 ha) of which were improved and 10 acres (4.0 ha) that were unimproved. Oats replaced sweet potatoes, and 30 sheep were added to the livestock inventory, producing 40 pounds of wool. In 1880, the farm remained 70 acres (28.3 ha), with 60 acres (24.2 ha) improved, 9 acres (3.7 ha) in woodland/forest, and a 1-acre (0.4-ha) apple orchard. Indian corn, Irish potatoes, hay, wheat, and butter were produced. Poultry were present (US Census Bureau, Productions of Agriculture, 1850–1880, Franklin County, Ohio, Ohio History Connection, Columbus).

The project area and its buildings are listed on the NRHP under Criterion C for the architecture of the structures on the property during its period of significance (1850–1874). A house, smokehouse kitchen, barn, outhouse, and garage are extant but vacant (Photos 1–5). A large pond is northeast of the house. The north or original end of the brick house is constructed in

American bond on a stone foundation. This portion of the house is one-story in height and square in plan, and appears to have been built as one large room accommodating all living, sleeping, and cooking functions. This portion of the house was built in 1856. The south end of the house was built sometime between 1856 and 1867, when the brick barn was constructed. This section of the house was also built of brick treated in American bond on a stone foundation. It is rectangular in plan and one-and-one-half-stories in height. The smokehouse and summer kitchen are combined in a small one-story square building to the west of the house. It too is constructed of brick in American bond on a coursed rubble stone foundation (NRHP Inventory Nomination Form, Elam Drake Residence, 1978, State Historic Preservation Office, Columbus, Ohio).

Photo 1. East elevation of Elam Drake house, looking west.

Photo 2. Overview of the smokehouse and original portion of the house, looking southeast.

Photo 3. West elevation of smokehouse and house, looking northeast.

Photo 4. South and east sides of barn, looking northwest.

Photo 5. Inscription in barn brick "D.F.D. 68."

Historic Atlases and Topographic Maps

The earliest map for Mifflin Township is Wheeler's (1842) *Franklin County, Ohio* map (Figure 3). This map shows E. (Elam) Drake owning property south of an unnamed road (Columbus and Johnstown Pike). The area north of the road containing the project area is shown owned by A. McElvain, but by this time Elam Drake owns the property (Franklin County Recorder, Columbus, Ohio 1837 Deed Book), so presumably the map is in error.

The Mifflin Township portion of the Map of Franklin County, Ohio (Graham 1856; Figure 4) shows that the site was contained within an 18-acre (7.3 ha) parcel owned by E. (Elam) Drake. The presumably residential building shown on the tract on this map is near the middle of this tract, set back from and north of an unnamed road (Columbus and Johnstown Pike) that bisects Elam Drake's property, the southern half of which is shown containing 40 acres (16.1-ha) and a toll gate.

The Mifflin Township portion of the *Atlas of Franklin Co. and of the City of Columbus, Ohio* (Caldwell 1872; Figure 5) shows the project area owned by E. (Elam) Drake. The presumably residential building on the Drake property is shown closer to Johnston (sic) [Johnstown] Pike. This is the extant house. The *Map of Franklin County, Ohio* (Brand 1883; Figure 6) shows Elam Drake owning 52.5 acres (21.2 ha) bisected by Johnston (sic) Pike. The USGS 1905 Westerville quadrangle (USGS 15' topographic map) [Figure 7] shows the house in the project area. Modie and Kilmer (1910) shows Elan (sic) Drake owning 62.25 acres (25.1 ha) bisected by the Columbus Turnpike (Figure 8).

Previously Documented Cultural Resources and Investigations

Background research included examination of the Ohio State Historic Preservation Office's (SHPO) Online Mapping System (SHPO 2017), Mills' (1914) *Archeological Atlas of Ohio,* and historical maps and atlases. SHPO's Online Mapping System (Figure 9) includes the location of National Historic Landmarks (NHL); historic properties listed in, determined eligible for listing in, and delisted from the NRHP; properties that have received federal and/or state historic rehabilitation tax credits; archaeological sites and architectural history resources inventoried in the Ohio Archaeological Inventory (OAI) and Ohio Historic Inventory (OHI), respectively; dams; cemeteries recorded by the Ohio Genealogical Society (Troutman 2003); and areas previously surveyed for cultural resources pursuant to Section 106 of the National Historic Preservation Act of 1966, state law, and other cultural resources management activities. The Ohio Historic Connection's Library contains historical atlases and maps.

This research shows the southern portion of the site was surveyed for archaeological resources (Addington and MacMinn 1978), the project area contains two structures recorded in the Ohio Historic Inventory, one archaeological site recorded in the Ohio Archaeological Inventory, and one historic property listed in the NRHP, the latter of which includes the two aforementioned structures. Historical maps and atlases are addressed elsewhere in this report.

The archaeological survey by Addington and MacMinn (1978) was primarily conducted at a reconnaissance level, not an intensive level, i.e., it undertook little fieldwork sufficient to identify archaeological sites that were not visible on the ground surface, and specifically did not include such fieldwork on the current project area. Gibbs et al. (2001) conducted a survey adjacent to the current project area for improvements to the Stelzer Road interchange associated with the airport. Although not shown on SHPO's Online Mapping System, Brown (2007) conducted a Phase I archaeological survey of a larger area that included all the current project area. He identified the aforementioned archaeological site (33FR2639), the archaeological component of the residential structure associated with the historic property. He concluded that neither the prehistoric nor the historic component of 33FR2639 was eligible for the NRHP because "no sealed deposits or stratigraphic layers were found" (Brown 2007:32). The SHPO did not concur with this recommendation citing insufficient data to make this determination.

METHODS

ARCHAEOLOGICAL FIELD METHODS

Field methods employed during the Phase II archaeological assessment of the Elam Drake Farmstead that would be impacted by the Midfield Development Program include: visual inspection, geophysical survey (GPR and magnetometer), photo documentation, STP excavation, hand-excavated test units (TU), hand-removal of topsoil, the mechanical stripping of the plow zone/topsoil (Trench), and feature excavation.

The Elam Drake Farmstead was subjected to a geophysical survey prior to commencing the Phase II archaeological assessment of 33FR2639. The area between the house and the barn and the area on the east and west of the barn were surveyed using both a GPR and a fluxgate gradiometer. The portion of the project area north of the barn was subject to a magnetometer survey. The results of the geophysics survey were subsequently used to determine the placement of mechanically stripped trenches. Appendix C contains a complete report on the geophysics survey.

The entire project area was visually inspected to identify readily visible archaeological resources and likely areas of disturbance. Areas surrounding the house were shovel scraped to remove the topsoil, revealing near surface features. The extant structures and farmstead elements were subjected to photographic documentation in order to document their current condition.

STP excavation is a subsurface testing strategy used to determine the presence of archaeological resources where ground surface visibility is less than 50 percent. STP excavations were placed in areas not previously investigated in the Phase I due to the dense wood/impenetrable undergrowth encountered in the Phase I survey. STPs were 50 cm (19.6 in) square in size and typically excavated to a minimum depth of 10 cm (4 in) into the subsoil. Soil from the STPs was screened through 0.25-in (0.63-cm) hardware cloth to facilitate the recovery of artifacts. Notes were taken on each STP, recording soil characteristics and the presence of cultural material.

Hand-excavated TUs were placed in areas of interest in order to determine if subsurface cultural materials are present at the site and identify any sealed deposits that can be associated with Elam Drake's occupation. Soil from the TUs were screened through 0.25-in (0.63-cm) hardware cloth to facilitate the recovery of artifacts. TUs were excavated in 10-cm (3.9-in) arbitrary levels within a stratum in order to glean information on horizontal and vertical integrity of cultural materials. All cultural materials were bagged according to level within a TU. Notes were taken on each TU, recording soil characteristics and the presence of cultural material in each level and for the overall unit.

Trenches were excavated to identify any subsurface features in areas of interest identified during the geophysical survey. A backhoe with a toothless grading bucket, measuring approximately 3.3 ft (1 m) wide was used to remove the topsoil and/or plow zone from a marked area. The trenches varied in size. The soil was removed down to the interface of the topsoil/B horizon. Notes were taken on each Trench, recording soil characteristics and the presence of cultural material. All soil staining/anomalies identified during the removal of the plow zone were flagged for further investigation once the trench was completely excavated. Each potential feature was initially investigated with a trowel to determine if it represented an area where further investigation was needed to ascertain its identity. Once determined to warrant further investigation, it was given a feature number then drawn and photographed in plan view. Each feature was bisected to establish the overall shape and depth and determine if it was a cultural feature or natural (i.e., tree root or rodent burrow).

LABORATORY METHODS AND ARTIFACT ANALYSIS

Phase II investigations of the project area resulted in the recovery of an assemblage of historic materials. Information for the type, quantity, and context of these materials is used to interpret the site and address issues of site formation. A complete catalogue of materials recovered from the site is presented in Appendix A. All artifacts were taken to the ASC Group, Inc., archaeological laboratory for processing and analysis. Artifacts were washed, dried, and analyzed during this stage of work.

HISTORIC ARTIFACT IDENTIFICATION AND ANALYSIS

Historic artifacts were identified using established and well-documented typologies. These included *The Development and Application of a Chronology for American Glass* (Deiss 1981), *Some Common Artifacts Found at Historical Sites* (Gillio et al. 1980), Ceramic Code Book (Magid 1984), *The Illustrated Guide to Collecting Bottles* (Munsey 1970), *Nail Chronology as an Aid to Dating Old Buildings* (Nelson 1968), *Flow Blue: A Collector's Guide to Pattern, History, and Values* (Snyder 1992), Telling Time for Archaeologists (Miller et al. 2000), and *Bottle Makers and Their Marks* (Toulouse 1971). Additional online resources, including *A Guide to Artifacts of the Upper Sagamon Basin* (Stelle et al. 2011) and the Florida Museum of Natural History (2017) research collection were also utilized.

Ceramics

Ceramic classifications and chronologies from Cushion (1980), DeBolt (1994), Greer (1981), Ketchum (1983, 1987, and 2000), Lehner (1988), Lofstrom et al. (1982), Raycraft and Raycraft (1990), and Stelle et al. (2011) were among those consulted to identify the various ceramic types within the collection. As an initial step, ceramic artifacts were sorted according to their paste type into four basic types: coarse earthenware, refined earthenware, stoneware, and porcelain. Sherds were then further assigned to a subtype based on known ware types (i.e., whiteware, American yellowware, buff-bodied stoneware, etc.), and then by decorative technique, motif, or maker's marks. When possible, a production date range was assigned to each sherd.

Glass

Glass identification and temporal affiliation followed studies by Deiss (1981), Ketchum (1971), Lorrain (1968), Putnam (1965), and Toulouse (1971). Bottle glass in particular was analyzed according to Deiss' (1981) classification, terminology, and definitions. Glass artifacts were initially divided into broad categories, based on function. If possible, window glass was identified by manufacturing technique as crown glass, broad glass, new broad glass, or plate glass. Vessel glass was further identified by vessel type, if sufficient evidence of form remained. When possible, a production date range based on diagnostic characteristics (form, production marks, decoration, etc.) was assigned to each shard.

Metal

Metal artifacts were identified by the type of metal (e.g., iron, steel, brass, copper, lead, etc.) and function (wagon hardware, tools, nails, etc.). Where possible, the manufacturing technique was identified, which can aid in functional or chronological assignation. This is most important in the classification of nail types (e.g., early machine-headed, machine-cut, and wire nails). However, metal objects, particularly ferrous artifacts, are often oxidized to the point that their original shape and function cannot be established.

Mineral

On historic sites, mineral artifacts tend to be energy-related items like coal or coke, special purpose lithic items like strike-a-lights or gunflints, or samples of architectural stone like roofing slates or footer/foundation blocks. If appropriate, item specific typographies were consulted for manufacturing and chronological information.

Textile

Historic textiles, rather than synthetic textiles, are not often encountered on archaeological sites. In general, the organic fibers of textiles are too susceptible to decomposition to be consistently preserved in archaeological contexts. When preservation does occur, it is typically due to exceptionally dry and well-drained, or water-logged and anaerobic contexts, either of which will prohibit micro-organism growth. If encountered, textiles are typically categorized by the parent material (i.e., wool or cotton) and then by function if that can be determined.

Synthetic

Synthetic artifacts are formed from manufactured parent materials. Beginning in the mid-nineteenth century, the prevalence of synthetic items has grown to dominate the material culture in American daily life. In some cases, particularly in modern petro-chemical plastics, it is impossible or impractical to determine the parent material of a particular synthetic compound and these materials are often categorized under the broad classification of “plastic.” When possible, the parent material (i.e., polystyrene, polyethylene, polyvinylchloride) can provide chronologically diagnostic dates for modern material. In addition, older synthetics, like vulcanized rubber and

Bakelite plastic (polyoxybenzylmethylenglycolanhydride), can also provide important chronological and functional markers for sites from the turn of the twentieth century. Identification of types and date ranges for synthetic materials were based on established typologies like those found in Telling Time for Archaeologists (Miller et al. 2000).

Organic

Organic artifacts are those manufactured from plants or animal components, or the byproducts of the preparation and consumption of plant and animal resources. While this classification can include textiles like cotton and wool, those have been classified separately based on the frequency with which they are recovered. Organic artifacts can also include bone handles from cutlery, leather from shoes, and the like. However, they are most often encountered as faunal waste and seeds/plant remains from food processing and consumption.

Prehistoric Artifact Identification and Analysis

Lithic materials are the most durable artifacts collected on archaeological sites. The most common means of forming stone tools was by chippage, a form of reduction of certain cryptocrystalline rocks. Chipped stone lithic materials from archaeological sites are usually divided into two general categories: debitage and tools. Tools are the final product of lithic reduction while debitage are the byproducts of such reduction.

Flake debris is defined here as lithic waste flakes exhibiting evidence of intentional removal from a parent piece. Flake debris is a useful indicator of prehistoric site activities. The analysis of flake debris involved the recording of several data sets including presence of cortex and probable stage of lithic reduction during which the flake was produced.

All lithic debris was separated into one of three general categories: flake, flake fragment, and shatter. Raw material analysis was also completed. Recovered artifacts were compared against a raw material type collection maintained by ASC and published descriptions and photographs of cherts.

Lithic tools are categorized as either formal tools or expedient tools. Formal tools are items that are labor and time intensive during production. They require raw material/blank preparation for manufacture and are typically curated, rather than discarded after use. Tools are considered formal when they have the ability to have an extended use life through resharpening, maintenance, reworking, recycling or transport. Expedient tools are defined as tools that are made as a need arises and are then discarded immediately after use. These tools differ from formal tools, often deemed curated tools, because they lack the ability to have an extended use-life.

Columbus/Delaware Chert

While there are separate Columbus and Delaware formations, the cherts in these formations are often difficult to distinguish from one another. Therefore, for the purposes of analysis, both types are essentially treated as one. The chert-bearing Delaware formation is within the marine limestones and dolomites of the Devonian system. This formation extends in a narrow band through central Ohio, including Franklin County. Delaware chert is tan to dark gray in color with relatively large lighter colored areas creating a mottled appearance, and often exhibits tiny ostracod inclusions (Stout and Schoenlaub 1945; Vickery 1983).

The chert-bearing Columbus formation is within the marine limestones and dolomites of the Devonian system. This formation extends in a narrow band through central Ohio, including Franklin County. The flint ranges in color from light mottled gray to brown (Stout and Schoenlaub 1945; Vickery 1983).

Upper Mercer Chert

The Upper Mercer member of the Pennsylvania system stretches across the state from Columbiana and Mahoning counties in northeastern Ohio to Scioto and Lawrence counties on the Ohio River (Converse 1972; Stout and Schoenlaub 1945). Although Upper Mercer is typically black, glossy, and fossiliferous, it can also be milky, straw-colored and pinkish (Flint 1951).

Vanport Chert

The Pennsylvanian-age Vanport member extends northward from Scioto and Lawrence counties on the Ohio River to Stark County. The most notable chert deposit within this member occurs in its central portion in Licking and Muskingum counties and is known as "Flint Ridge flint." This high-grade chalcedony was used extensively throughout prehistory, as evidenced by numerous aboriginal quarry pits on Flint Ridge itself, and by the fact that artifacts diagnostic for all of the different prehistoric temporal periods were fashioned from it. It occurs in a vast array and mottling of colors, is sometimes banded, and is of high lustrous quality (Stout and Schoenlaub 1945).

PHASE II SURVEY RESULTS

ASSESSMENT SURVEY

The entire project area was subjected to visual inspection in order to identify any aboveground features that were not previously recorded and to inspect the current condition for the extant structures and buildings. As noted previously, the farmstead is listed in the NRHP and a HABS survey and documentation were completed for the structures (Terpstra and Bennett 2006). This archaeological survey identified 22 historic features associated with the Elam Drake farmstead. Features will be described in detail below. A site schematic is presented in Figure 10. Visual inspection identified two cisterns, one dry well, a distribution box, and a small rectangular concrete-lined depression near the house.

Topsoil removal was conducted around the north side of the house and smokehouse. This involved the removal of the grass and the top few centimeters of soil with a flat shovel. The topsoil removal method identified several features, including a flagstone walkway, a brick patio and flagstone entryway, and a sidewalk.

A series of STPs (*n*=14) was excavated in the tree line near the fence row along the west side of the project area (Figure 10). This area was not subjected to testing during the Phase I survey or covered by the geophysical survey. A previously documented early twentieth century outhouse is still extant along this property line. Several units contained historic artifacts and modern items (Table 1; Appendix A). No additional cultural features were identified during the STP excavations.

Several TUs (*n*=7) were excavated around the smokehouse and in back of the house to identify additional features associated with the construction of the Drake family dwelling. Four additional features were identified.

A geophysical survey was completed on 3.2 acres (1.2 ha) of land surrounding the house and barns at the farmstead. The results of the survey were used to dictate the placement of the mechanically stripped trenches. Seven trenches were placed within the project area to identify near surface cultural features, especially those associated with potential brick-making operations onsite. Trenches varied in dimensions depending on the targeted geophysical anomalies. Nine features were identified during the mechanically stripped trenches: five in Trench 2, one in Trench 3, two in Trench 5, and one in Trench 7.

STPs

One transect of STPs was excavated along the westernmost edge of the project area. Fourteen STPs were investigated in the tree/bush line and adjacent to the property fence line to examine an area that was not subjected to a geophysical survey. The soils in this area are similar to those around the house and were not heavily impacted by grading and gravel deposition. The soil profile is represented by a brown (10YR 4/3) silt loam over a yellowish brown (10YR 5/4) silt clay loam (Table 1).

While a small assemblage of modern and historic artifacts was recovered from the STPs, no additional intact cultural features were identified. A summary of the cultural material from the STP is presented in Appendix A. The assemblage contains items similar to those recovered from the Phase I survey and are most likely associated with the Elam Drake occupation and later occupations at the site. The artifacts will be discussed in the artifact analysis section.

Table 1. STPs Excavated at 33FR2639, the Elam Drake Farmstead.

STP	Soils (depth in cm below ground surface)	Cultural Materials
1	0–15 Brown (10YR 4/3) silt loam 13–23 Yellowish brown (10YR 5/4) silt clay loam	0
2	0–25 Brown (10YR 4/3) silt loam 25–35 Yellowish brown (10YR 5/4) silt clay loam	0
3	0–20 Brown (10YR 4/3) silt loam 20–30 Yellowish brown (10YR 5/4) silt clay loam	2 Historic
4	0–33 Brown (10YR 4/3) silt loam 33–43 Yellowish brown (10YR 5/4) silt clay loam	17 Historic
5	0–30 Brown (10YR 4/3) silt loam 30–43 Yellowish brown (10YR 5/4) silt clay loam	9 Historic
6	0–45 Dark brown (10YR 3/3) silt loam 45–55 Yellowish brown (10YR 5/4) clay loam	27 Historic
7	0–18 Brown (10YR 4/3) silt loam 18–22 root impasse, yellowish brown (10YR 5/4) silt clay loam	7 Historic
8	0–35 Brown (10YR 4/3) silt loam 35–42 Yellowish brown (10YR 5/4) silt clay loam	1 Historic
9	0–39 Brown (10YR 4/3) silt loam 39–48 Yellowish brown (10YR 5/4) silt clay loam	0
10	0–33 Brown (10YR 4/3) silt loam 33–43 Yellowish brown (10YR 5/4) silt clay loam	2 Historic
11	0–40 Brown (10YR 4/3) silt loam 40–50 Yellowish brown (10YR 5/4) silt clay loam	0

Table 1. STPs Excavated at 33FR2639, the Elam Drake Farmstead.

STP	Soils (depth in cm below ground surface)	Cultural Materials
12	0–10 Brown (10YR 4/3) silt loam 10–20 Yellowish brown (10YR 5/4) silt clay loam	0
13	0–30 Brown (10YR 4/3) silt loam 30–40 Yellowish brown (10YR 5/4) silt clay loam	1 Prehistoric
14	0–13 Brown (10YR 4/3) silt loam 13–23 Yellowish brown (10YR 5/4) silt clay loam	0

Trenches

Seven mechanically stripped trenches were excavated at the site (Figure 10). The placement of many of the trenches was dictated by the results from the geophysical survey. An effort was made to target potential cultural features apparent in the geophysical anomaly data, specifically those associated with the construction of the Elam Drake structures and those with the potential to be related to brick making. Others were placed at the discretion of the supervising archaeologist. A brief description of each trench is presented below and a summary of each trench can be found in Table 2.

Table 2. Mechanically Stripped Trenches Excavated at 33FR2639, the Elam Drake Farmstead.

Trench #	Size (N-S x E-W)	Depth (BGS)	Features	Artifacts
1	14 m x 3 m (45 ft x 9.8 ft)	40 cm (15.7 in)	None	None
2	11 m x 3 m (36 ft x 9.8 ft)	58 cm (22.8 in)	2–6	None
3	1 m x 12 m (3.3 ft x 39.3 ft)	42 cm (16.5 in)	13	3 Historic
4	11 m x 3 m (36 ft x 9.8 ft)	40 cm (15.7 in)	None	2 Prehistoric
5	3 m x 8 m (9.8 ft x 26.2 ft)	36 cm (7.8 in)	12, 13 & 15	9 Historic 2 Prehistoric
6	1 m x 6 m (3.3 ft x 19.6 ft)	20 cm (7.8 in)	None	None
7	3 m x 4 m (9.8 ft x 13.1 ft)	20 cm (7.8 in)	14	None

Trench 1 was excavated in the area immediately north of the brick barn to expose Anomalies 1–3 delineated in the geophysical data (Figure 10; Table 2). A 14-m long x 3-m (45-ft x 9.8-ft) wide trench was excavated with the backhoe to a depth of 40 cm (15.7 in) below ground surface (bgs) [Figure 11; Photo 6]. The soils in the trench revealed that the area was subjected to heavy disturbance over the years. The profile shows a 12 to 15-cm (4.7 to 5.9-in) thick layer of gravel below a thin lens of redeveloping A-horizon soils (recent sod layer). Plastic, metal, and burned trees and debris was evident in the B horizon (Figure 12). Given the modern nature of these materials, none were collected. The geophysical survey had detected the modern burning of debris and earth moving. There was no brick kiln at this location.

Photo 6. Trench 1 plan view, looking north.

Trench 2 was excavated west of the brick barn, along the edge of the tree row and western property line (Figure 10). The placement of this trench was based on the identification of Anomalies 6–8 in the geophysical data. Additionally, a previously undocumented poured concrete slab was noted above the ground surface during the geophysical survey that might have been related to a kiln or brick-making location. Anomaly 6 was described as a possible kiln feature with only a portion of it covered during the geophysical survey. It was a highly magnetic anomaly that may be associated with the concrete slab. Anomaly 7 was identified in the GPR data as a flat radar reflector most likely related to gravel—maybe an earlier gravel surface. Anomaly 8 was a discrete flat reflector in the GPR data, which measured 2 m x 2 m (6.5 ft x 6.5 ft). These anomalies could be some deeply buried gravel or other material related to a foundation or other outbuilding (See Appendix C for details).

Trench 2 measured approximately 11 m (36 ft) north-south by 3 m (9.8 ft) east west (Figure 13; Table 2; Photo 7). The soil profile varied throughout the trench and is depicted in Figure 14. This area was most likely impacted to a varying degree by grading and gravel deposition over the years. Along the western edge of the trench, the previously mentioned concrete slab was exposed. It was poured on top of a layer of gravel and extended through the brush to the western property line/fence line. It measures approximately 10 m by 3 m (32 ft x 9 ft) and appears to be modern in construction.

During the removal of any remaining topsoil and gravel layer to a maximum depth of 58 cm bgs, five features were identified at the B horizon interface. Feature 2 was bisected and determined to be a tree root cast and non-cultural. Features 3–5 were identified as post molds and subjected to excavation. Feature 6 was a large area of coal and ash and was subjected to further investigation.

Photo 7. Plan view of Trench 2, looking north.

Trench 3 was excavated in the grassy area located between the house and the brick barn (Figure 10; Table 2). The geophysical survey indicated that there may be an old drive/road related to the barn, under the current yard. The magnetic data revealed a distinct signature that was interpreted as a brick drive beneath the more recent gravel a parking lot for a former business that owned the property prior to the CRAA. The signature is represented as a long linear anomaly and identified as Anomaly 13 in the geophysical results. Trench 3 was placed to cut across the possible brick driveway. It measured approximately 12 m (39.3 ft) east-west by 1 m (3.3 ft) north-south to a depth of 42 cm (16.5 in). The excavation revealed a thick layer of charcoal and ash mixed with gravel and brick fragments in the approximate location of Anomaly 13, and it is interpreted as a coal ash/fill driveway. This layer is beneath two layers of gravel deposited at different times. The various layers of gravel and charcoal are depicted in Figure 15 and Photo 8.

The layer of charcoal and ash appears to have been dumped over time, possibly as a way to dispose of the used fuel materials and as a filler for maintaining the driveway surface. A small assemblage of cultural materials was recovered from the charcoal/ash layer, including stoneware fragments.

Photo 8. North profile of Trench 3, view north.

Trench 4 was excavated north of the barn and immediately west of Trench 1 (Figure 10; Table 2). The trench measured approximately 11 m (36.0 in) north-south by 3 m (9.8 in) east-west and was excavated to a depth of 40 cm (15.7 in) bgs. The soil profile consisted of a thin layer of grassy sod over a 12-cm (4.7-in) thick layer of gravel (Photo 9). Underlying the gravel was a yellowish brown (10YR 5/4) clay loam subsoil. Several burned tree roots were noted in the base of the trench. A stone biface and a flake of Upper Mercer chert were collected from the trench during the cleaning/scraping process but were not associated with a feature. No additional cultural materials were collected nor features identified.

Photo 9. Plan view of Trench 4, looking north.

Trench 5 was excavated in the grassy yard, south of Trench 3 (Figure 10; Table 2). The placement of the trench aided at identifying part of Feature 13 (mentioned in Trench 3) and geophysical Anomaly 11, a distinct feature about 4 by 4 m (13 by 13 ft) in size. The geophysical interpretation suggests it could have been caused by moisture or undulations in the gravel, or could have been a large pit-type feature. The excavation of the trench identified a similar stratigraphy to Trench 3, but did not reveal any cultural features near the location of Anomaly 11. Two additional features were identified in Trench 5: Feature 12 and Feature 15 (Figure 16; Photo 10). Upon further examination, Feature 15 was determined to be non-cultural. Feature 12 is a terracotta drain.

The trench measured 8 m by 3 m (26.2 ft by 9.8 ft). The profile of Trench 5 is similar to that identified and described in Trench 3 (Figure 17; Photo 11). There are several gravel layers over a series of coal and ash depositional episodes. A handful of cultural materials was recovered, including a nail, ceramic sherds, glass, and two chert flakes.

Photo 10. Plan view of Trench 5, looking east.

Photo 11. North profile of Trench 5, showing Feature 13, a possible driveway, looking north.

Trench 6 was excavated immediately south of the large brick barn (Figure 10; Table 2). It measured approximately 1 m (3.3 ft) north-south by 6 m (19.6 ft) east-west. The soil profile revealed a 12-cm (4.7-in) thick layer of gravel over subsoil/B horizon. The B horizon is a brown (10YR 4/3) clay loam (Figure 18; Photo 12). No cultural materials or features were noted in this trench. The Ap horizon in this area appears to have been graded or stripped and replaced with gravel associated with the parking lot for a former business that owned the property prior to the CRAA.

Photo 12. Plan view of Trench 6, looking east.

Trench 7 was a small 3 m (9.8 ft) by 4 m (13.1 ft) area excavated against the west side of the barn (Figure 10: Table 2). The backhoe was used to remove a thick layer of gravel. The profile revealed the gravel directly overlaid the subsoil/B horizon (Photo 13). The excavation also exposed the barn foundation, which was identified as Feature 14. No additional artifacts or cultural features were identified in Trench 7.

Photo 13. Trench 7, profile of Feature 14, barn foundation, looking east.

Test Units

TU 1 was excavated near the northeast corner of the smokehouse, adjacent to the concrete pad between the smokehouse and the house (Figure 10; Table 3). The ground surface in this location was covered with large flat flagstone/fieldstones and was a part of Feature 10 (Figure 19; Photo 14). The flagstones were drawn and photographed then removed in order to excavate the soils underneath in an effort to identify any intact and/or sealed deposit associated with the Elam Drake-era construction and occupation of the site. The unit was also placed adjacent to a small brick patio located outside the smokehouse, identified as Feature 8.

The 1-m by 1-m (3.3-ft by 3.3-ft) TU was excavated to maximum depth of 49 cm (19.2 in) bgs and identified two distinct strata. The soils consist of a dark grayish brown (10YR 4/2) silt loam over a brown (10YR 4/3) silty clay. In the southwest corner of the unit, immediately adjacent to the smokehouse, the foundation stones of the smokehouse were identified along with a possible builder's trench (Feature 7). Feature 7 is a very loose very dark brown (10YR 2/2) silt loam (Figure 20; Photo 15). The excavation of the TU produced 76 artifacts, including nails, metal fragments, and brick fragments.

Photo 14. Plan view of TU 1, looking south. Flagstones on surface are part of Feature 10.

Photo 15. West profile of TU 1, showing stratigraphy, smokehouse foundation, and Feature 7 (builder's trench), view west.

TU 2 was excavated adjacent to the northwest corner of the smokehouse and adjacent to the flagstone entry to the smokehouse door (Figure 10; Table 3). The flagstone entry, identified as Feature 9, was drawn and photographed in plan view (Figure 21; Photo 16). Several stones were removed to excavate below surface. The 1-m by 1-m (3.3-ft by 3.3-ft) unit was excavated in 10 cm (3.9 in) arbitrary levels within each soil stratum. Four levels were excavated in TU 2 to a depth of 40 cm (15.7 in) below surface. The soil profile for TU 2 is a dark brown (10YR 3/3) silt loam over a dark yellowish brown (10YR 3/4) silty clay loam. The smokehouse foundation was exposed and a small builder's trench with possible chinking stone was identified around the foundation. The builder's trench was identified as Feature 7B and is associated with Feature 7 in TU 1. Feature 7B consists of a brown (10YR 4/3) silty clay loam with several small rocks adjacent to the foundation stones (Figure 22).

The assemblage recovered from TU 2 yielded 505 artifacts, including nails, window glass, bone, ceramics, miscellaneous metal items, and glass container sherds.

Photo 16. Test Unit 2, plan view at 25 cm bgs. Feature 7B is located in the southeast corner of TU associated with foundation stones, looking east.

TU 3 was excavated near the cistern between the house and the smokehouse. It was placed immediately adjacent to the concrete pad in this area (Figure 10; Table 3). During the first 10-cm (4-in) level, a layer of brick was encountered in the south half of the unit (Feature 16). They appear to be a brick patio or pad of some type. The northern half of the unit was excavated to a depth of 30 cm (12 in) bgs and revealed gravel fill and an intact drain pipe at about 30 cm (12 in) diameter, which runs underneath the brick surface (Feature 17). In order to examine the brick layer (Feature 16), three additional units (TUs 5, 6, and 7) were excavated to the south and west. The excavation identified an area of horizontal bricks surrounding a vertical terracotta drain (Feature 16). Figure 23 depicts Feature 16 in plan view, in Levels 1–3. Figure 24 shows the profile of TU 3 as a dark grayish brown (10YR 4/2) silt loam over the gravel fill with dark grayish brown (10YR 4/2) silt loam. Seventy-nine artifacts were recovered from TU 3.

TU 4 was excavated 1 m south of TU 3, at the corner of the cistern (Figure 10; Table 3). The placement of the unit was an attempt to determine if the brick layer (Feature 16) identified in TU 3 extended to the south. The excavation revealed that the brick layer did not extend to the south and was not present in TU 4. At approximately 30 cm (12 in) bgs, a metal pipe encased in concrete was encountered (Feature 18). It appears to run from the house toward the drain in TU 3 or Feature 16 (Figure 25). The soil profile is represented by a yellowish brown (10YR 5/4) silt loam over a brown (10YR 4/3) clay loam (Figure 26). The artifact assemblage recovered from TU 4 includes 28 historic items.

TU 5, 6, and 7 were excavated in order to determine what Feature 16 represented. Each was excavated to the top of the brick layer, approximately 10 cm (4 in) bgs. A small assemblage (*n*=72) of surface/near surface materials was recovered from these three units.

Table 3. Test Units Excavated at 33FR2639, the Elam Drake Farmstead.

Test Unit	Size (m)	Features	Cultural Materials Count
1	1 x 1 m (3.3 x 3.3 ft)	7	76
2	1 x 1 m (3.3 x 3.3 ft)	7B	505
3	1 x 1 m (3.3 x 3.3 ft)	16 & 17	79
4	1 x 1 m (3.3 x 3.3 ft)	16 & 18	85
5	1 x 1 m (3.3 x 3.3 ft)	16	28
6	1 x 1 m (3.3 x 3.3 ft)	16	8
7	1 x .5 m (1.6 ft)	16	36

Features

The excavations at the Elam Drake Property aimed at identifying intact archaeological deposits specifically associated with the occupation of the Elam Drake Farmstead. The site has been occupied/used from 1856 to the present, with at least four separate occupational episodes: 1) Elam Drake from 1856–1911; 2) Drake Family from 1911–1920; 3) post-Drake residential (Wallick and nine other owners) from 1920–2003; and 4) Commercial (CRAA) from 2006-present. In an effort to determine which deposits relate to the Elam Drake occupation and are useful for evaluation of the archaeological component of the site, each feature and/or deposit will be assigned to an occupational episode, when possible.

Feature 1 was identified in the eastern portion of the project area, approximately east of the house (Figure 10; Table 4). At the time of the survey, the area was covered with a piece of metal and partially collapsing in on itself. The metal cover was removed from the top to reveal a 2 m by 2 m by 2 m (6.5 ft by 6.5 ft x 6.5 ft) deep hole, partially filled with water. It was constructed of concrete block, surrounded by gravel and pieces of brick placed in the voids of the concrete block. One pipe feeds into the box from the house and another feeds away from the house (Photo 17). It has been identified as a dry well, associated with the house's septic system. This type of system was used in the 1940s and 1950s to deal with septic related materials (Mike Butts, excavator, personal communication, April, 2017). Feature 1 is associated with the post-Drake residential occupation.

Feature 2 was identified in the northern portion of Trench 2 (Figure 10; Table 4). It appeared as a dark round stain and identified as a possible post mold. Upon excavation of the south half of the feature, it was determined to be a tree root and non-cultural in nature.

Feature 3 is a post mold identified in Trench 2 at the Ap/B horizon interface (Figure 10; Table 4). The feature measured approximately 20 cm (7.8 in) in diameter. The feature was bisected to reveal a 17-cm (6.6-in) deep by 19-cm (7.4-in) wide straight-sided, round-bottomed post mold. The feature matrix was a brown (10YR 4/3) silt loam mixed with a yellowish brown (10YR 5/4) clay loam and was devoid of cultural materials (Figure 27; Photos 18 and 19). Due to the lack of cultural material, Feature 3 cannot be assigned to a period of occupation.

Table 4. Features Identified at 33FR2649, the Elam Drake Farmstead.

Feature #	Location	Description	Date
1	East side of house	Dry well	1940s–1950s
2	Trench 2	Tree root	Non Cultural
3	Trench 2	Post mold, round	Unknown
4	Trench 2	Post mold, round	Unknown
5	Trench 2	Post mold, square	Unknown
6	Trench 2	Coal lens	Post 1850
7/7B	Test Units 1 and 2	Builder's trench	1850s
8	North of smokehouse	Brick patio at smokehouse	Post 1850
9	North of smokehouse	Flagstone entry	Post 1850
10	North of house	Flagstone sidewalk	Post 1850
11	East side of house	Flagstone walkway	Post 1850
12	Trench 5	Drain pipe	Post 1850
13	Trenches 3 and 5	Driveway	Post 1850
14	Trench 7	Barn foundation	ca. 1868
15	Trench 5	Small linear stain (plow scar)	Non Cultural
16	Test Units 3 and 5–7	Brick paving surrounding drain	Pre 1950
17	Test Unit 3	Drain pipe (terracotta)	Pre 1950
18	Test Unit 4	Metal and concrete pipe	Pre 1950
19	North of house	D-box	Post 1960
20	North of house	Rectangular concrete depression	Unknown
21	Between house and smokehouse	Cistern 1	Post 1880
22	Between barn and barn/garage	Cistern 2	Post 1880

Photo 17. Feature 1, dry well, looking east.

Photo 18. Plan view, looking north, of Feature 3, Trench 2.

Photo 19. North profile of Feature 3, post mold.

Feature 4 is a post mold identified in Trench 2 at the Ap/B horizon interface (Figure 10; Table 4). The feature measured approximately 20 cm (7.8 in) in diameter. The feature was bisected to reveal a 23-cm (9.0-in) deep by 28-cm (11.0-in) wide straight-sided, round-bottomed post mold. The feature matrix was a brown (10YR 4/2) silt loam and devoid of cultural materials (Figure 28; Photos 20 and 21). Several large stones were recovered from the feature matrix and were most likely used as chinking stones to stabilize the wooden post. The feature was unable to be assigned to a particular occupational period.

Photo 20. Plan view of Feature 4, Trench 2, looking north.

Feature 5 is a square post mold identified in Trench 2 at the Ap/B horizon interface (Figure 10; Table 4). The feature measured approximately 20 cm (7.8 in) in diameter. The feature was bisected to reveal a 15-cm (5.9-in) deep by 10-cm (3.9-in) wide straight-sided, round-bottomed post mold. The feature matrix was a brown (10YR 4/1) silt loam and was devoid of cultural materials (Photos 22 and 23). Due to the lack of cultural material, Feature 5 cannot be assigned to a period of occupation.

Photo 21. North profile of Feature 4, post mold.

Photo 22. Plan view of Feature 5, Trench 2, looking north.

Photo 23. North profile of Feature 5, post mold.

Feature 6, located in Trench 2, was originally identified during the geophysical survey as Anomaly 6 (Figure 10). The magnetic data and the GPR data both showed a large anomaly on the far western edge of the survey area, adjacent to the tree line (Table 4; Photo 24). The geophysical survey suggested that the highly magnetic anomaly could be an area of intense burning (such as a kiln). A 50-cm (19.6-in) square unit was excavated in the middle in order to investigate the stratigraphy of the deposit (Photo 24). The profile revealed a black (10YR 2/1) layer of 90 percent coal over a mottled brown and yellowish brown (10YR 5/3 and 10YR 4/2) clay loam. No other cultural materials were recovered from the coal lens and represents a layer of coal from an unknown temporal period.

Photo 24. Plan view (view east) and profile (view north) of Feature 6, Trench 2.

Feature 7/7B is a builder's trench associated with the construction of the smokehouse/summer kitchen and identified in TU 1 and 2. The test units were excavated adjacent to the two northern corners of the smokehouse (Figures 10, 20, and 22; Table 4; Photos 15 and16). The builder's trench matrix was devoid of cultural materials but is associated with the construction of the smokehouse in 1856. This feature can be associated with the Elam Drake occupation.

Feature 8 is a brick patio adjacent to the northern face of the smokehouse (Figure 10; Table 4; Photo 25). It measures approximately 2 m (6.5 ft) east-west and 1 m (3.3 ft) north-south. It is placed next to a flagstone walkway (Feature 10) and a flagstone entry into the smokehouse (Feature 9). The date of construction of the brick patio was most likely after the construction of the smokehouse but it cannot be assigned to a particular period of occupation.

Photo 25. Feature 8, brick patio on north side of smokehouse, looking south.

Feature 9 represents a flagstone pad in front of the door on the north side of the smokehouse (Figure 10; Table 4). It is composed of two large flagstones laid immediately on the ground surface outside the door (Figure 21). The date of construction of Feature 9 was most likely after the construction of the smokehouse but cannot be assigned to a particular period of occupation.

Feature 10 was identified as a sidewalk associated with the Elam Drake house (Figure 10; Table 4). The sidewalk was first uncovered while clearing the grass and debris from the area immediately adjacent to the north side of the house (Photo 26). It is a flagstone sidewalk approximately 70 cm (27 in) wide and extends from the porch steps to the concrete pad between the house and smokehouse. It is unclear when the flagstones were laid down for the sidewalk and cannot be assigned to a particular period of time.

Photo 26. Feature 10, flagstone sidewalk on north side of house, looking west.

Feature 11 was an additional sidewalk identified in the side yard of the house, associated with the northern portion of the house (Figure 10; Table 4). The sidewalk consists of flagstone, poured concrete, and brick. The date of construction of the sidewalk was most likely after the construction of the house but cannot be assigned to a particular period of occupation.

Feature 12 was identified during the excavation of Trench 5. It has been identified as a drain pipe associated with the Elam Drake house. It is made of terracotta and is approximately 10 cm (3.9 in) in diameter (Figure 29; Table 4; Photo 27). A small section was removed for further analysis; however, no distinguishable markings or particular manufacturing style could be determined. It is interpreted as generic late nineteenth- to early twentieth-century drain tile. Only a small segment of the drain pipe was exposed, and it appears to extend southwest toward the house and northeast toward the pond. The date of construction of the drain was most likely after the construction of the house and is most likely associated with either the Elam Drake occupation or the Drake Family occupation.

Photo 27. Feature 12, drain pipe identified in Trench 5, looking east.

Feature 13 was originally identified as an anomaly during the geophysics survey of the yard between the house and the barn (Figure 10; Table 4). It was labeled Anomaly 13 and described as a long linear anomaly that may represent an older driveway, possibly a brick drive. The excavations of Trenches 3 and 5 revealed a 5-m–6-m (16.4-ft–19.6-ft) wide area of repeated coal and ash deposits covered with several layers of gravel (see Trench 3 and Trench 5 discussion). The date of construction and use of the driveway was most likely after the construction of the house and is most likely associated with either the Elam Drake occupation or the Drake Family occupation.

Feature 14, the barn foundation, was identified in Trench 7. Due to the thick gravel layer covering the area (Table 4; Photo 13), the backhoe was used to remove the gravel layer and expose the barn foundation. It consists of three courses of medium- and large-sized squared field stones laid directly on subsoil. The brick for the barn was placed directly on top of these foundation stones. The barn foundation is associated with the construction of the barn in 1868. This feature can be associated with the Elam Drake occupation.

Feature 15 was identified in Trench 5 (Figure 10; Table 4). It was a long narrow stain in the northwest portion of the trench, measuring approximately 10 cm (3.9 in) wide by 130 cm (51.1 in) long. It was drawn and photographed, then a small slit trench was cut through the middle of the stain. It extended down about 10 cm (3.9 in) before being terminated. It may represent a plow scar or the location of an old pipe. No further interpretation can be offered at this time.

Feature 16 is an area of brick paving surrounding a vertical drain (Table 4; Photo 28). It was identified in TUs 3, and 5–7. Originally identified in TU3, the other TUs were excavated to expose the bricks. The area measures approximately 40 cm (15.7 in) by 150 cm (59.1 in) and is only one brick course thick. The date of construction of the drain and the brick surrounding the drain is unknown. A few wheat pennies recovered from the test units surrounding the drain were dated to 1950 and 1958. The construction is probably associated with the post-Drake family occupation.

Photo 28. Features 16, 17, and 18 identified in TUs 3 and 5–7, looking west.

Feature 17 is a terracotta drain pipe identified in TU 3 at the base of the unit, running underneath the brick area associated with Feature 16 (Table 4; Photo 28). It is unclear if this was installed contemporaneously with the drain or before. The soil surrounding the drain pipe appears to be disturbed and mixed with gravels. The date of installation is unknown; however, it is most likely associated with the post-Drake residential occupation.

Feature 18 is a metal pipe surrounded by concrete that extends between the house and the drain area (Feature 16). It was identified in the north half of the TU 4 at approximately 30 cm (11.8 in) bgs (Table 4; Photo 28). The date of installation is unknown; however, it is most likely associated with the post-Drake residential occupation. The pipe may have been installed to improve the function of the house.

Feature 19 is a small 40-cm by 40-cm by 50-cm (15.7-in by 15.7-in by 19.6-in) poured concrete box with drain pipes extending in three directions. One plastic drain pipe entered the box from the house and two extended north into the yard (Figure 10; Table 4; Photo 29). It is often referred to as distribution box (D-box) for a septic system with a leach field. These were commonly installed in the 1970s. Feature 19 is of post-Drake residential occupation construction, associated with improvements to the septic system for the house.

Photo 29. Feature 19, concrete distribution D-box, view north.

Feature 20 is a concrete depression/foundation located immediately north of the house (Figure 10; Table 4). It was not identified during the Phase I work (Brown 2007); however, at the time of the Phase II site assessment, it was filled with tree debris and other modern trash. A backhoe was used to clean out the depression and it was subjected to photo documentation. The feature is a 2-m by 2-m by 2-m (6.5-ft by 6.5-ft by 6.5-ft) poured concrete wall, which forms a depression in the yard (Photo 30). A water line ran from the basement of the house to the east side of the foundation. Its use or function is unknown. While the date of construction is unknown, it is most likely associated with the post-Drake occupation.

Photo 30. Feature 20, concrete depression north of house, view south.

Feature 21 is a cistern (Cistern 1) located between the house and the smokehouse. At the time of the survey, it was capped with a 1 m^2 (3.3 ft^2) poured concrete cap (Figure 10; Table 4), but observation through cracks in the cap revealed it was filled with water. For safety reasons, it was not opened.

TU 3-7 were placed immediately adjacent to the concrete cap of the cistern in an attempt to identify how the cistern was constructed and to assess the cistern from the outside. If the cistern was a beehive-shaped construction (common in the late 1800s), the units placed next to the concrete pad would have revealed a subsurface structure. Rather than the anticipated cistern, the test units revealed that the concrete cap sits atop a rectangular concrete cistern that abuts the western wall of the house. The concrete cistern was adjacent to the brick paving identified in these test units and is visible in Photo 28 as the cast concrete structure in the center and right foreground.

The units were also placed next to the cistern in an effort to identify any materials associated with the Elam Drake occupation. The features (16-19) identified in TU 3-7, indicated that the area was modified in the post-Drake occupation period and the artifacts from these units cannot be positively identified with the Elam Drake occupation. The date of construction of the cistern is unknown, and it is not known whether this cistern replaced an earlier one. But, the cistern construction likely post-dates the invention of the portable rotary cement kiln/mixer, which was patented in 1880 (Miller et al. 2000). Although the patent date is 1880 and provides the earliest date possible for the use of this construction material, few late nineteenth century residences had concrete structures, and the first common use of such materials in a residential setting is around 1920. Thus, the cistern likely post-dates the period of significance for the site. It is possible that materials related to the active life of the cistern, after the Drake occupations, have collected at the bottom of the feature, but given its likely temporal associations and the presence of standing water in the cistern, it was decided to forego excavation of the feature.

Feature 22 is a cistern (Cistern 2) located between the barn and the barn/garage. At the time of the survey, it was capped with a 1 m^2 (3.3 ft^2) poured concrete cap (Figure 10; Table 4; Photo 31). The cistern was filled with water and for safety reasons was not opened. The presence of water in the cistern suggested that the cistern was still in operation, or was being fed water from a nearby source. The principal investigator and the field supervisor, in consultation with the backhoe operator, determined that it was not feasible and unsafe to remove the concrete cap and given the similarities between this feature and Feature 21, it was determined that it too likely post-dates the period of significance on site. Although it is possible that material has accumulated at the bottom of this feature, it is improbable that it is related to the Elam Drake occupation.

Photo 31. Feature 22, concrete-capped Cistern 2 between the barn and the barn/garage, looking north.

Artifact Analysis

The artifact assemblage recovered from the Phase II investigations was recovered primarily from around the smokehouse and backyard area of the main house. A small assemblage was recovered from the STP units along the fence line. The artifacts recovered are similar to those from the TU excavations and are most likely associated with the occupation of the farmhouse. The assemblage consists of 811 historic artifacts, 167 pieces of faunal material, and nine prehistoric lithic items (Appendix A). The assemblage is consistent with those materials recovered from the Phase I survey around the Drake house. The materials include many architectural and activities related items such as brick fragments, drain tile fragments, mortar, nails (round wire and square machine-cut), miscellaneous wires, metal fragments, flat metal pieces, hardware items (straps and hinges), and slate roofing pieces. Three artifacts of interest include an animal leg trap, a hammer head fragment, and a lock plate (Photo 32).

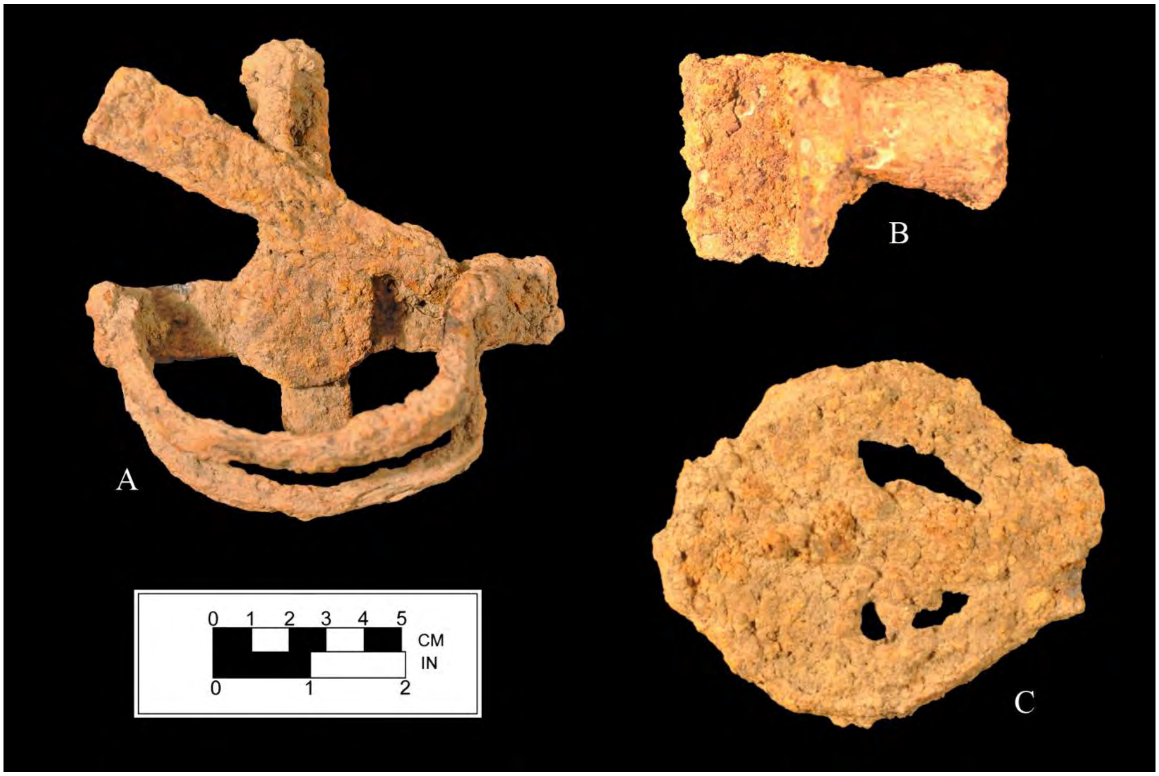

Photo 32. Metal artifacts recovered from excavations at 33FR2639: A) animal leg trap B) hammer head; and C) lock plate.

The domestic-related assemblage consists of ceramic and glass artifacts. The ceramic assemblage is dominated by plain/undecorated whiteware, porcelain, and a few pieces of ironstone, stoneware fragments, and redware (Photo 33). Temporally diagnostic ceramics include three pieces of hand-painted polychrome porcelain (Magid 1984), sponge-spattered whiteware (Magid 1984), and a piece of whiteware with a blue transfer print (1820–1860) [Stelle et al. 2001].

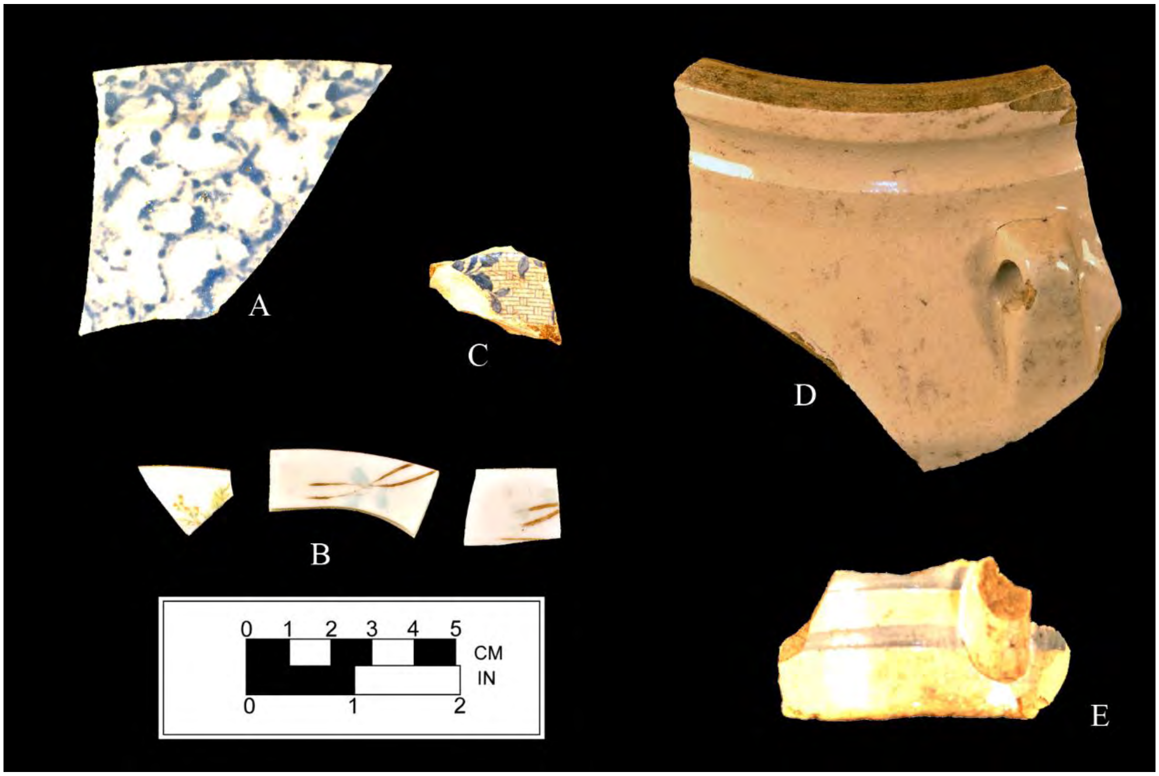

Photo 33. Sample of diagnostic ceramic sherds recovered from 33FR2639: A) sponge-spattered whiteware; B) hand-painted porcelain; C) blue transfer-print whiteware; D) stoneware sherd with strap handle; and E) stoneware cup sherd with annular banding.

The glass assemblage includes container glass fragments, flat glass fragments, and a light bulb glass fragment. Green bottle, brown bottle glass, aqua/light green canning jars, and other miscellaneous colorless container glass fragments were present. Seven pieces of black glass and two pieces of cobalt colored glass were recovered, but were too fragmentary to determine the type of containers they were from originally. One small brown glass bottle was recovered, but further identification beyond basic attributes was not possible. Two 22-caliber cartridge case fragments and one unidentified caliber cartridge case fragment were also recovered from the units behind the house. Three wheat pennies were collected from behind the house, each with readable dates. The dates are from the 1950s rather than the 1850s, when Elam Drake built the house. A key to a typewriter was recovered from near the house/smokehouse area, but it did not appear temporally diagnostic beyond an early twentieth century date (Photo 34).

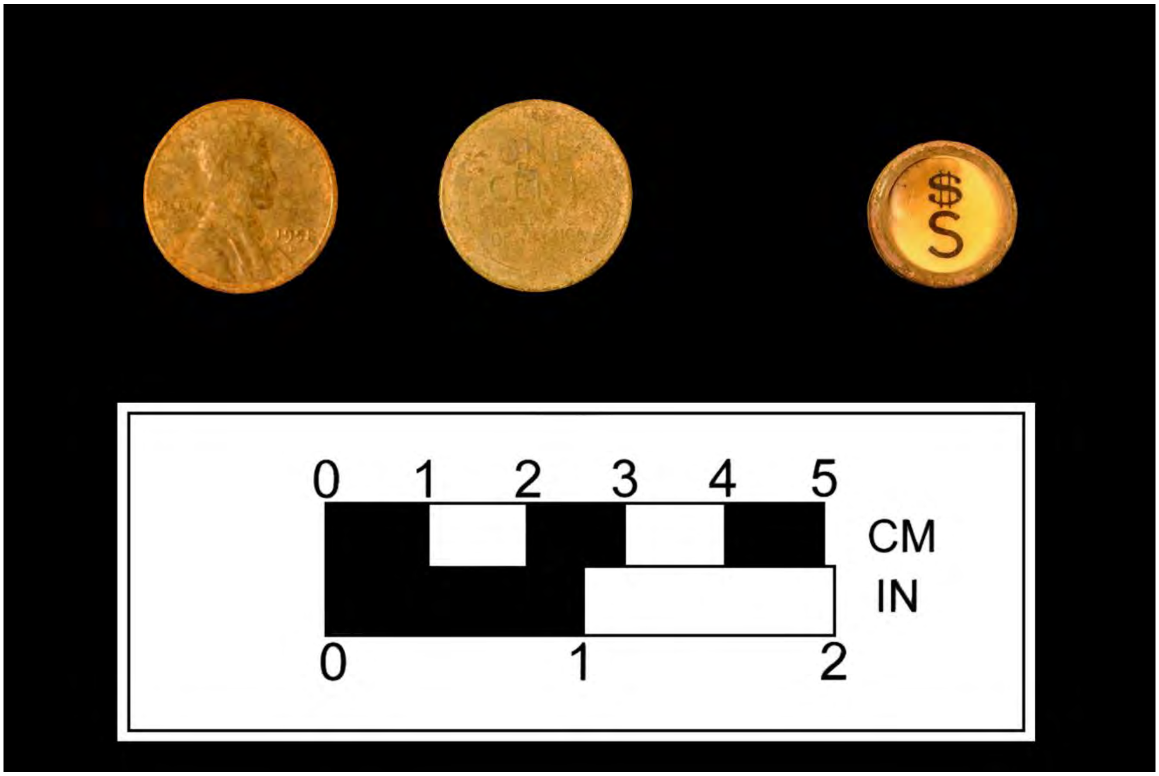

Photo 34. Wheat penny (front and back view) and a typewriter key recovered from 33FR2639.

The faunal assemblage was recovered from TUs associated with the house and smokehouse/summer kitchen. The faunal assemblage includes identifiable species such as chicken, domestic pig, and opossum. A majority of the assemblage consist of fragments of elements such as long bones, ribs, and vertebrae that were too fragmentary for more detailed analysis. Approximately 60 fragments (ribs, long bone and vertebrae) showed evidence of cutting or sawing. These items may be related to kitchen refuse or activities associated with the smokehouse.

A small prehistoric lithic assemblage was recovered from the site and consists of a biface, a possible core fragment, and seven pieces of manufacturing debris. The raw materials include locally available Columbus/Delaware chert and regionally available Upper Mercer and Vanport cherts.

CONCLUSIONS

The Phase II investigations at 33FR2639, the Elam Drake Property, aimed at documenting intact cultural features and associated artifact deposits with the occupation of Elam Drake during the mid- and late nineteenth century and the early twentieth century.

The Elam Drake Farmstead consists of several extant structures/buildings, including the house, a smokehouse, a brick barn, a barn/garage, an outhouse, and a pond. Through a combination of visual inspection, geophysical survey methods, near surface shovel scraping, mechanical plow zone stripping, STP excavations, TU excavations, and feature explorations, the field investigation identified 22 features. Newly identified features include a dry well, a distribution box, several flagstone walkways, a brick patio, a drain surrounded by bricks, builder's trenches, concrete-capped cisterns, historic post molds, coal piles, and remnants of the old driveway. The investigations produced 987 artifacts, including 811 historic artifacts, 167 faunal remains, and nine prehistoric lithic artifacts. A small sample of the artifacts was temporally diagnostic and confirms the late nineteenth to mid-twentieth century occupation of the farmstead. The investigation failed to identify any significant intact deposits that can be directly associated with the Elam Drake occupation. The builder's trench (Feature 7/7B) and the barn foundation (Feature 14) are the only two features that can be definitively associated with the Elam Drake occupation. Additional improvements to the property, such as sidewalks and waste removal upgrade, are associated with the Drake Family occupation and the post-Drake residential occupation. The site was owned/occupied by more than 10 different owners after the Drake Family resided at this location. One would expect to find improvement to the overall drainage and gutter systems. There is a progression of waste removal upgrades over time at the Elam Drake property, from an outhouse (s) to a dry well, and eventually to a distribution box and leach field. These upgrades and improvements to the residential site have impacted the site's overall integrity. While deposits were encountered underneath the sidewalk flag stones and the smokehouse entry stones, the date of construction for both of those is unknown. The materials recovered from those areas cannot be definitively assigned to the Elam Drake occupation or any other specific occupation.

The site has been heavily impacted by modern activities, including the grading of much of Ap horizon across the site and the repeated deposition of gravel over two-thirds of the project area. These modern activities have significantly modified the site and the site no longer retains integrity.

ANALYSIS RECOMMENDATIONS

RESEARCH QUESTIONS

While the extant structures at Elam Drake are currently on the NRHP under both Criterion B and Criterion C; the archaeology was considered to ineligible by Brown (2007) after a Phase I survey of the property. A portion of the site was not subjected to subsurface investigation due to a thick layer of gravel covering nearly two-thirds of the site, which was deposited in the mid-1980s. Review of the previous work and the proposed future development of the property prompted the SHPO to request additional investigations at the site to address specific questions regarding the site, including:

1. the presence of in situ remains and cultural materials, including “sealed” archaeological deposits that relate specifically to the Drake occupation;
2. the presence of cultural materials that correspond to the Drake occupation and produce materials that are not redundant to those recovered in the Phase I survey; and
3. the level of disturbance at the site and how it affects the integrity of the archaeology.

The excavations at 33FR2639 revealed the presence of several intact archaeological features, including a builder’s trench, a drain, brick patios, flagstone walkways, elements of various septic systems, and historic post molds. A moderate artifact assemblage was recovered from the excavations. The builder’s trench and the barn foundation are directly associated with the Elam Drake house and barn but they did not produce any cultural materials. The other features and archaeological deposits cannot be confidently associated with the Elam Drake occupation.

The level of disturbance at the site is extensive. The property was used as a parking facility for an airport-related business. Over the years, the land surrounding the structure was graded, removing most, if not all, of the Ap horizon. The areas between the house and barn and behind the barn were covered in numerous layers of gravel. Additionally, sometime in the mid-1950s or later, the pond was excavated and the soil removed from the pond area was scattered across an area behind the barns. While the areas immediately adjacent to the house and the smokehouse seem to have had minimal disturbance, modern earth moving and surface grading was visible at the time of the assessment.

Additionally, per Ohio SHPO comments, the Phase II field investigation aimed at addressing specific elements:

- Research related to the pond, to determine how it may have contributed to the historic activities that occurred at the site;
- Research and potential retrieval of artifacts from the cistern(s)/pits located near the house; and
- Research and potential retrieval of artifacts from the depressed area located between the house and barn.

In order to address specific research concerns from the SHPO office, research at 33FR2639 was geared toward understanding several previously uninvestigated areas of the site. Site folklore suggested that the bricks used to construct the extant structures were manufactured on site and were made from clay excavated from the pond area. However, review of the topographic maps shows that the 1954 and 1964 Northeast Columbus 7.5' topographic maps do not show a pond on the property, and the 1982 photorevised version shows a pond on the property. A review of historic aerial images of the property indicate the pond appears on the 1964 aerial image, but is absent from the 1938 and 1954 aerial image. If the clay used to manufacture bricks was excavated from the pond area, mid-century earth moving and land modifications to construct the pond in its current configuration have obliterated all evidence of this activity.

The assessment of 33FR2639 did document the presence of two cisterns on the property. One was located on the west side of the house, between the house and the smokehouse. This cistern was capped with a poured concrete slab, with a hole in the middle. Investigation of the cistern revealed that it was filled with water at the time of the archaeology work at the site. For safety reasons, the cap was not removed and was not subjected to further investigation. The second cistern was identified off the northeast corner of the barn, between the barn and the concrete-block barn/garage. This was capped with a concrete slab with a hole in it. It was filled with water as well. A cursory examination indicated that it is a brick cistern. However, for safety reasons, the cap was not removed nor further investigated. The placement of cisterns near the Elam Drake buildings suggest that they may have been contemporaneous with the Elam Drake occupation; however, they are concrete suggesting that they were constructed after 1880, during the post-Drake occupations.

The third area of concern was between the house and the barn, where there are large depressions that warranted further investigation. During the Phase I survey (Brown 2007), this area was covered with a thick layer of gravel and not subjected to STP excavation. During the

Phase II assessment, a geophysical survey was conducted in this area. The geophysical survey showed that this area was crisscrossed with various anomalies that most likely represent leach fields and utilities lines. One area of interest identified in the magnetic data was a possible old driveway/road related to the barn (See Appendix C for more details). It was as suggested that it might be a brick drive. Mechanical removal of the surface layer of soil in two areas revealed a possible older drive made from ash and coal dumpings rather than brick. However, a trench in front of the barn showed extensive grading of topsoil and subsequent deposition of gravel. It is highly improbable that intact cultural material or features remain in this area between the house and the barn, beyond those previously identified.

RECOMMENDATIONS

Based on the results of the background research, excavations, and analysis of cultural material from 33FR2639, the Elam Drake Farmstead, the archaeological component of the site does not retain integrity due to the extensive disturbance of the property.

The historic period artifact scatter relates to the NRHP Elam Drake house that was occupied from the mid-l 800s until recently. The assemblage lacked the temporally diagnostic materials that could be associated with Elam Drake's occupation. While intact deposits were encountered around the house, smokehouse, and near the barn, only those features directly associated with the construction of the buildings (i.e., foundation and builder's trench) can be directly associated with the Elam Drake occupation. A majority of the features and cultural materials recovered during this assessment cannot be confidently related to Elam Drake occupation and are most likely related to occupations of the property after Elam Drake resided here. The post-Drake residential occupation and the commercial facility occupation have impacted the integrity of the site through upgrades to the septic/drainage systems, installation of the pond, and subsequent grading and placement of gravel over two-thirds of the site for a parking facility. The areas around the house have been disturbed by post-Drake family improvements and upgrades impacting the Elam Drake occupation deposits.

The historic archaeological component of this site does not have the potential to yield additional information that would be important to the understanding of the historic period in Mifflin Township, Franklin County, Ohio, or more specifically the Elam Drake house. The archaeological component of this site is not considered to be eligible for inclusion to the NRHP under Criterion D because it fails to meet the minimum criteria for eligibility (Andrus 1997).

SUMMARY

ASC conducted a Phase II site evaluation of 33FR2639, the Elam Drake Farmstead, at the John Glenn Columbus International Airport in Mifflin Township, Franklin County, Ohio. Field methods included visual inspection and photo documentation, hand-excavated STPS; hand-excavated 1-m by 1-m (3.3-ft by 3.3-ft) TUs; a geophysical survey including GPR and magnetic gradient survey; topsoil removal; the mechanical stripping of topsoil and modern overburden to search for features and identify anomalies detected during the geophysical work; and feature excavation. All fieldwork was completed in accordance with the *Archaeology Guidelines* for such investigations put forward by the OHPO (1994).

The survey identified 22 historic features associated with the Elam Drake Farmstead; however, not all could be associated specifically with the Elam Drake occupation. Visual inspection identified two cisterns, a dry well, a distribution box associated with the septic system, and a small rectangular concrete-lined depression near the house.

Topsoil removal was conducted around the north and east sides of the house and smokehouse. This involved the removal of the grass and top few centimeters of soil using a flat shovel and trowel. The method identified several features, including a flagstone walkway, a brick patio and flagstone entryway, and a sidewalk.

A geophysical survey was completed on 3.2 acres (1.2 ha) of land surrounding the house and barns at the farmstead. The results of the survey were used to aid in the placement of the mechanically stripped trenches. Seven trenches were placed within the project area to identify near-surface cultural features, especially those associated with potential brick making operations onsite. Trenches varied in dimensions depending on the potential targeted anomalies. Nine features were identified in the mechanically stripped trenches.

Seven TUs were excavated around the smokehouse and back of the house to identify additional features associated with the construction of the Drake family dwelling. Four additional features were identified. Feature 7/7B, a builder's trench around the smokehouse, is related to the Elam Drake occupation. The other three features appear to be associated with a later occupation.

Fourteen STPs were excavated along the tree line near the fence row along the west side of the project area. This area was not subjected to testing during the Phase I investigation or during the geophysical survey. A previously documented early twentieth century outhouse is still extant along this property line. No additional cultural features were identified during the STP excavations.

The assemblage consists of 811 historic artifacts, 167 pieces of faunal material, and nine prehistoric lithic items. The assemblage is consistent with those materials recovered from the Phase I survey around the Drake house and includes architectural elements, domestic-related artifacts, and faunal remains.

The archaeological component of this site is recommended not eligible for inclusion to the NRHP under Criterion D because it fails to meet the minimum criteria for eligibility (Andrus 1997).

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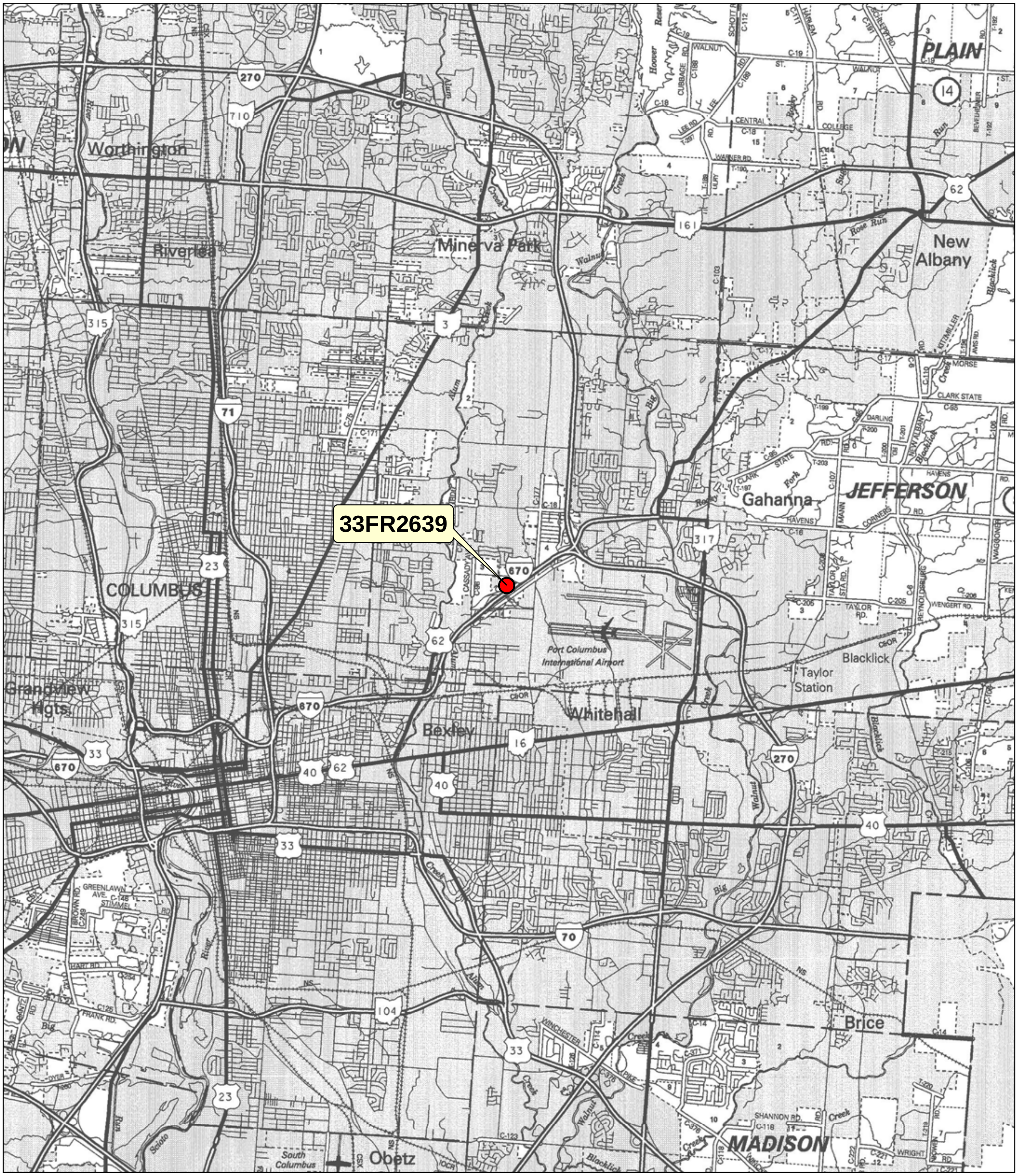
FIGURES



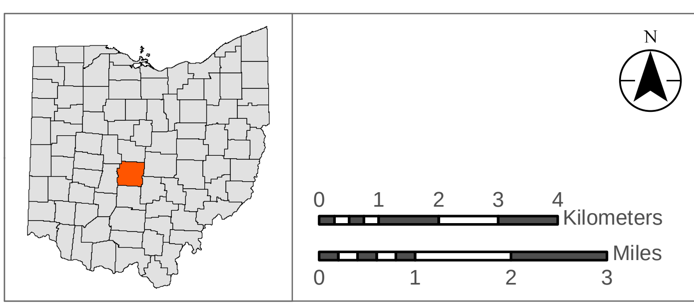
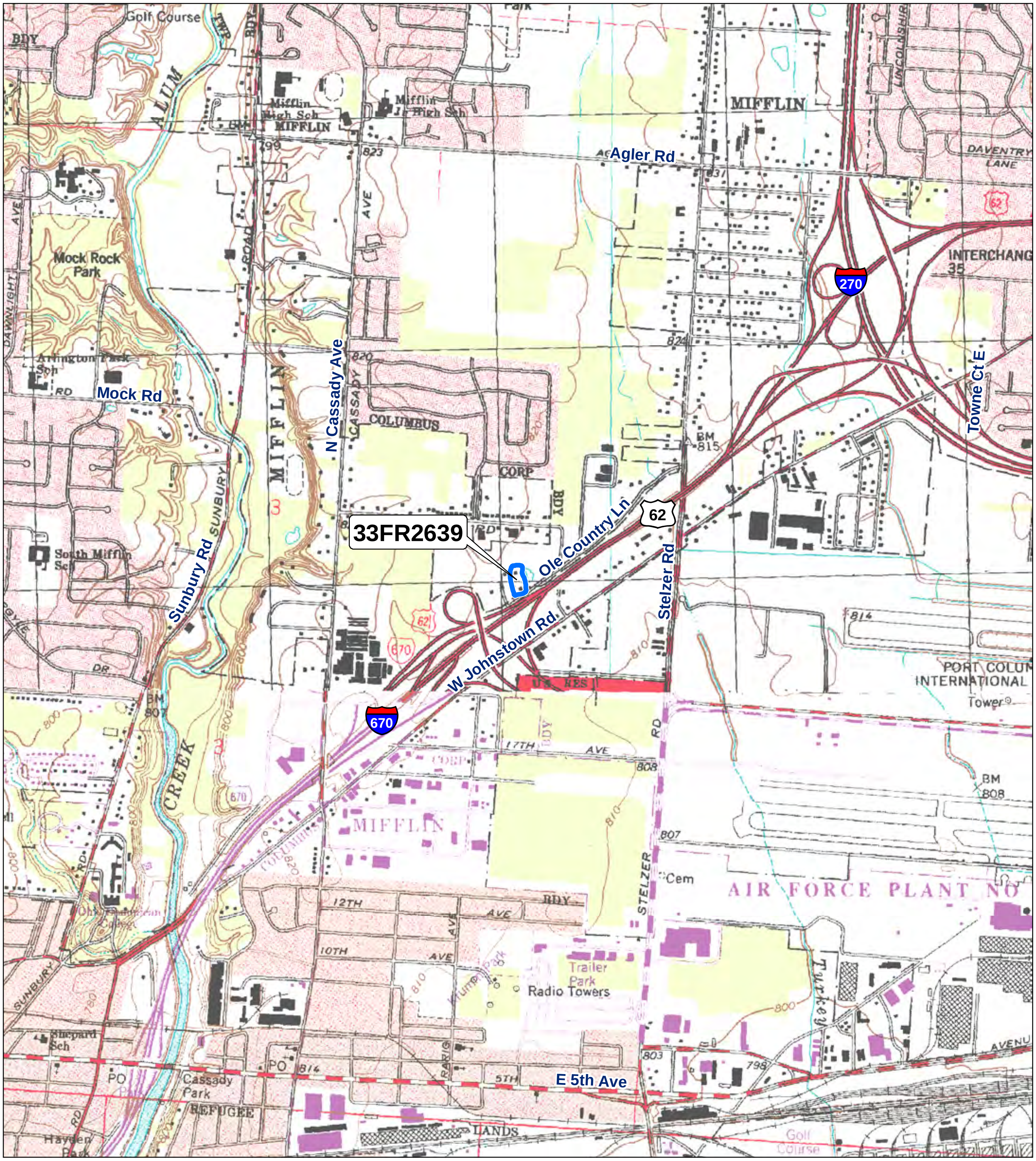


Figure 1

Portion of the ODOT Franklin County highway map showing the location of the project area and 33FR2639, the Elam Drake Property.



Site boundary

0 200 400 600 800 1000 Meters

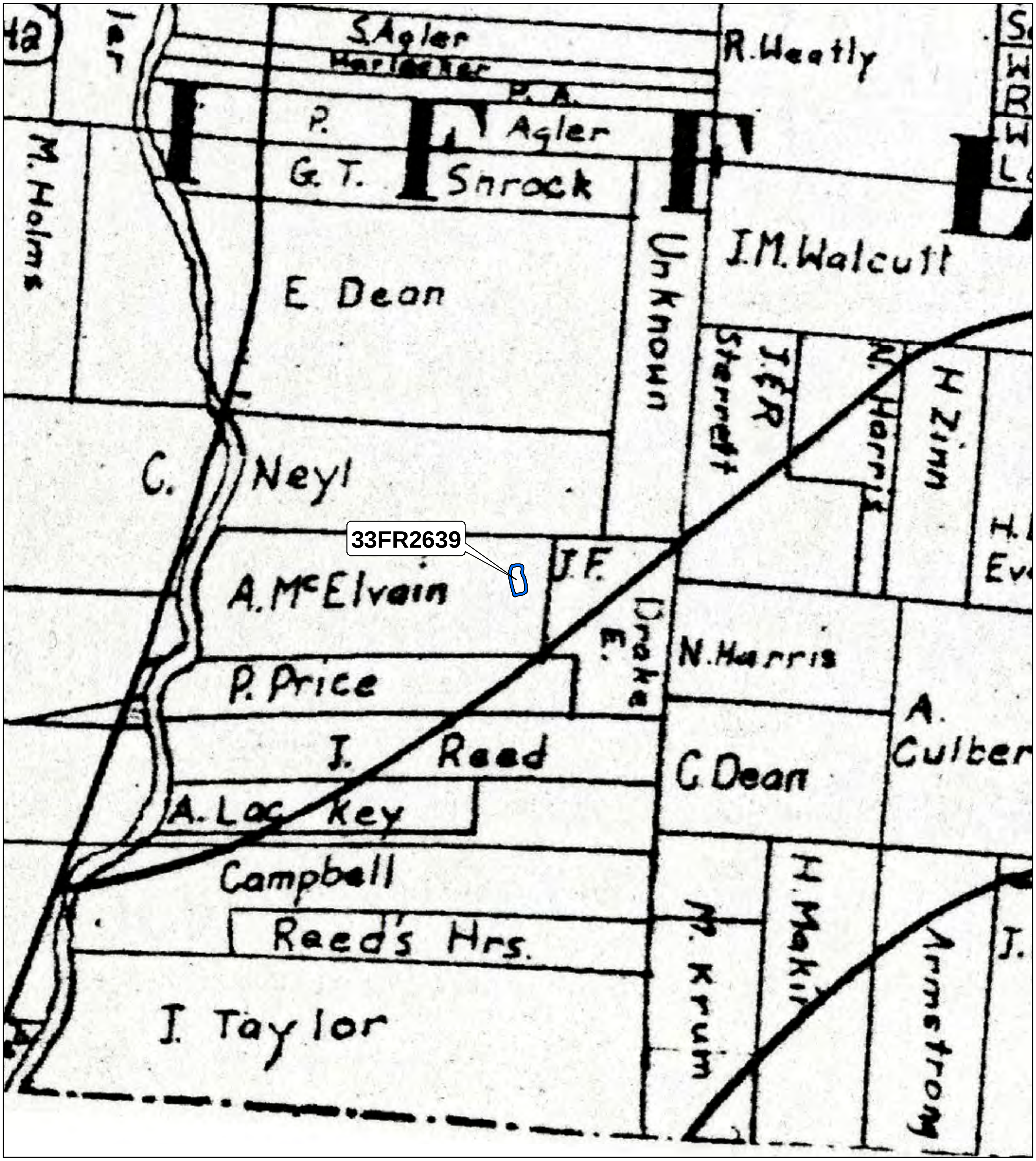
0 1000 2000 3000 Feet

N

Figure 2

Portions of the 1964 (photorevised 1982) Northeast Columbus and 1964 (photorevised 1994) Southeast Columbus, Ohio quadrangles (USGS 7.5' topographic maps) showing the location of the project area and 33FR2639, the Elam Drake Property.

Base: USGS Northeast Columbus and Southeast Columbus, Ohio, 7.5' series quadrangles



Site boundary

0 200 400 600 800 1000 Meters

0 1000 2000 3000 Feet

N

Figure 3

Portion of the *Atlas of Franklin County* (Wheeler 1842) showing E. (Elam) Drake owning property south of an unnamed road (Columbus and Johnstown Pike).

Base: Wheeler 1842

Site boundary

0 100 200 300 400 500 Meters

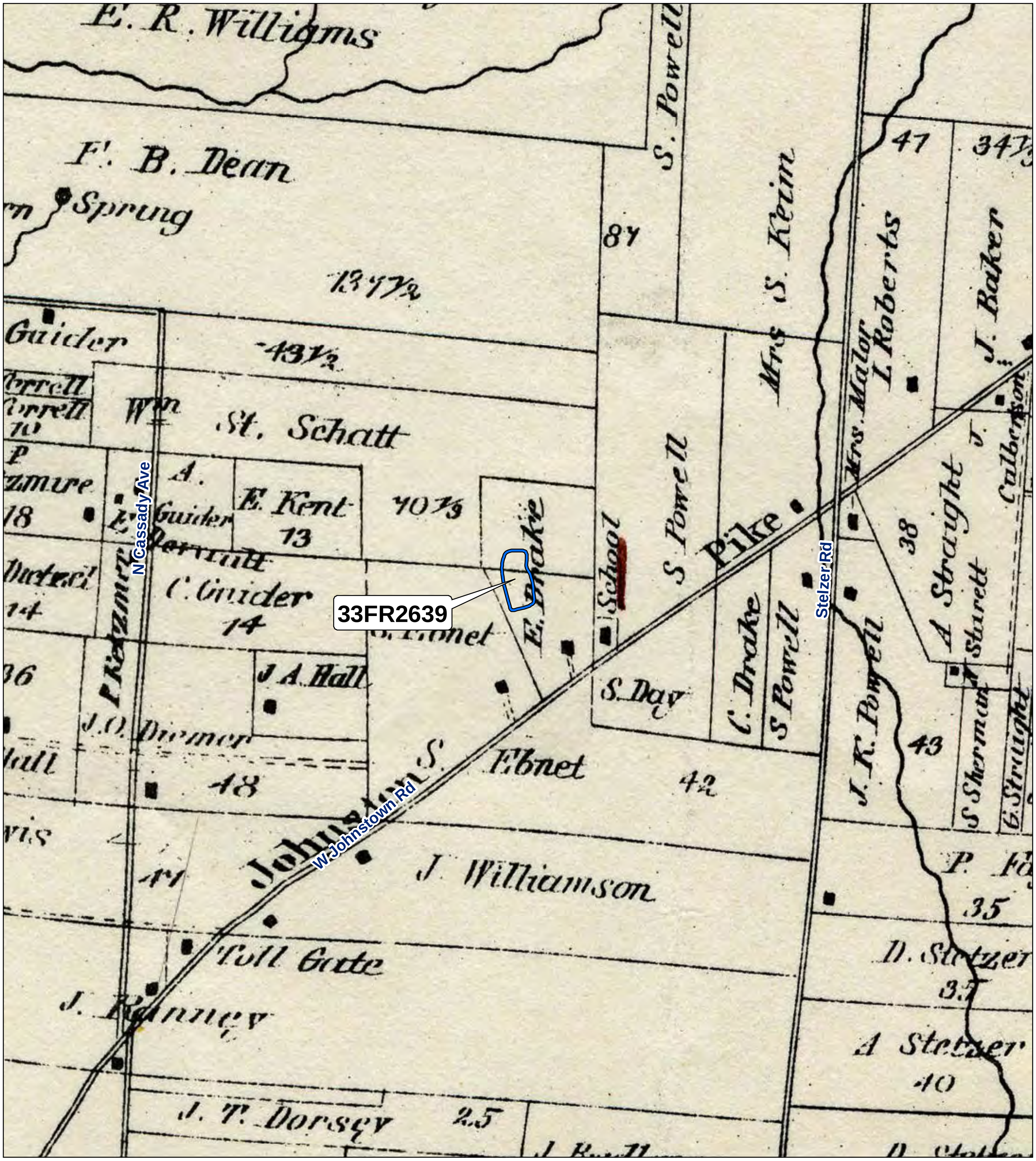
0 500 1000 1500 Feet

N

Figure 4

Portion of the *Map of Franklin County, Ohio* (Graham 1856) showing the 18-acre parcel owned by E. (Elam) Drake.

Base: Graham 1856



Site boundary

0 100 200 300 400 500 Meters

0 500 1000 1500 Feet

N

Figure 5

Portion of the *Atlas of Franklin Co. and of the City of Columbus, Ohio* (Caldwell 1872) showing the Elam Drake parcel and structure noted on the map.

Base: Caldwell 1872

Site boundary

0 100 200 300 400 500 Meters

0 500 1000 1500 Feet

N

Figure 6

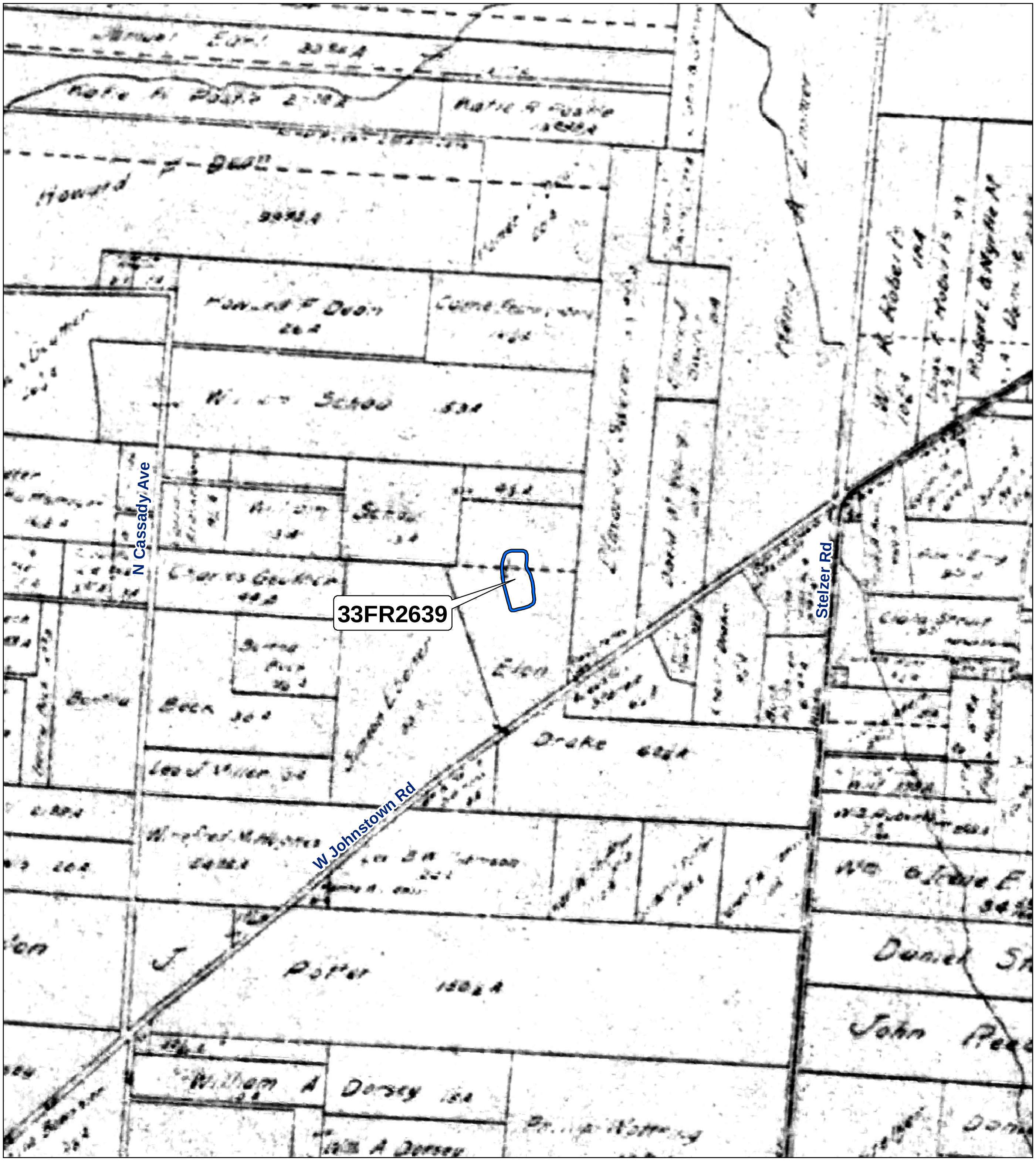
Portion of the *Map of Franklin County, Ohio* (Brand 1883) showing Elam Drake owning 52.5-acres (21.2 ha) bisected by Johnston (sic) Pike.

Base: Brand 1883

Figure 7

Portions of the 1925 East Columbus and 1905 Westerville, Ohio quadrangles (USGS 15' topographic maps) showing the house and barn in the project area.

Base: USGS Westerville and East Columbus, Ohio, 15' series quadrangles



Site boundary

0 100 200 300 400 500 Meters

0 500 1000 1500 Feet

N

Figure 8

Portion of the Modie and Kilmer 1910 maps shows Elan (sic) Drake owning 62.25-acres (25.8 ha) bisected by the Columbus Turnpike.

Base: Modie and Kilmer 1910

Site boundary
Archaeological site
Historic structure
NR determination of eligibilty
Previously surveyed area

0 25 50 75 100 125 Meters
0 125 250 375 Feet
N

Figure 9

Portion of the State Historic Preservation Office (2017) Online GIS Mapping System aerial showing the cultural resources located within or adjacent to 33FR2639.

Base: https://gis.ohpo.org 2017;
Aerial photograph 2013

Figure 10 **Sheet 1 of 2**

Site schematic showing the location of STPs, test units, trenches, features, and photograph locations identified during the Phase II assessment of 33FR2639, the Elam Drake Farmstead. (2 Sheets)

Site boundary
Positive shovel test pit
Negative shovel test pit
Trench
Test Unit
Feature
Feature boundary
Photograph location

N

0 3 6 9 12 15 Meters

0 10 20 30 40 50 Feet

Base: Aerial photograph 2013

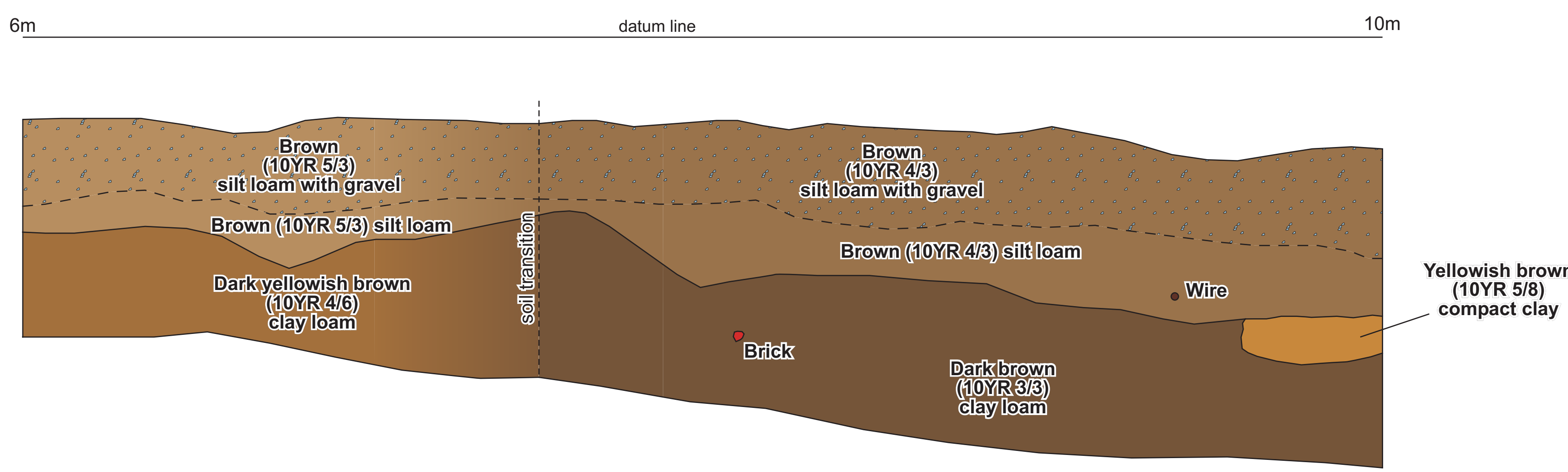
Figure 10 **Sheet 2 of 2**

Site schematic showing the location of STPs, test units, trenches, features, and photograph locations identified during the Phase II assessment of 33FR2639, the Elam Drake Farmstead. (2 Sheets)

Rock

Figure 11

Plan view of Trench 1.



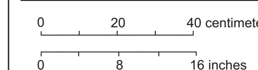


Figure 12

Profile of west wall of Trench 1.

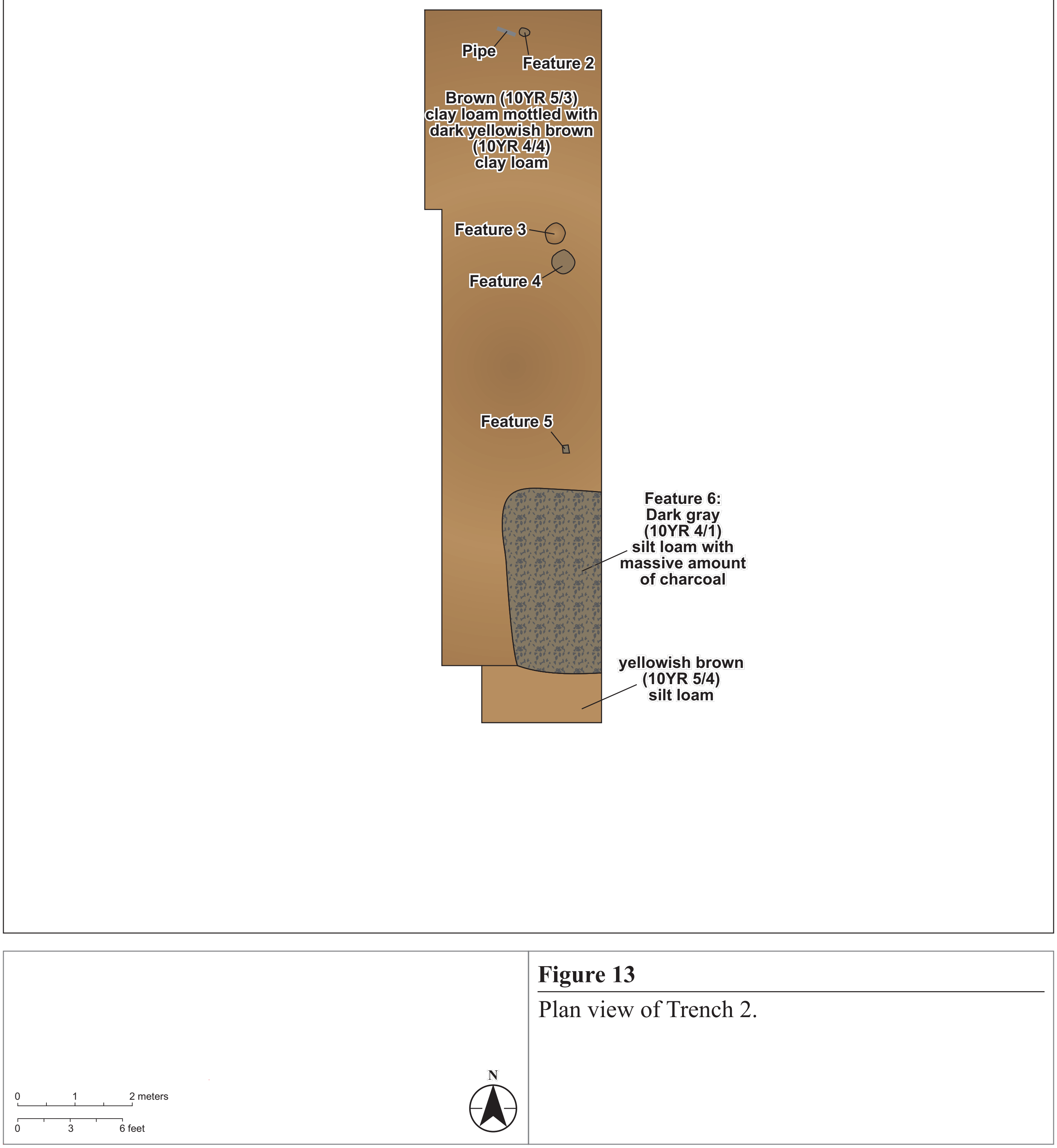


Figure 13

Plan view of Trench 2.

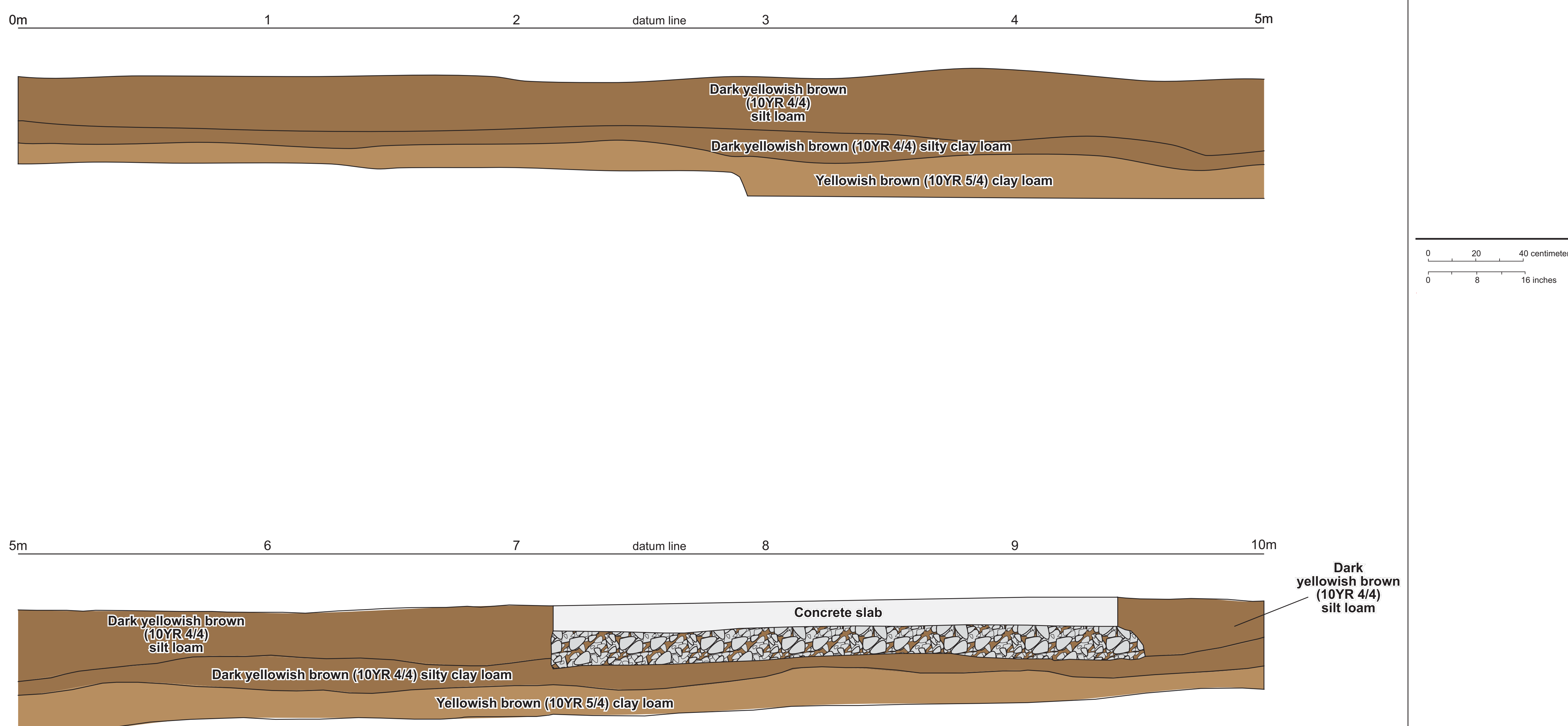


Figure 14

Profile of west wall of Trench 2.

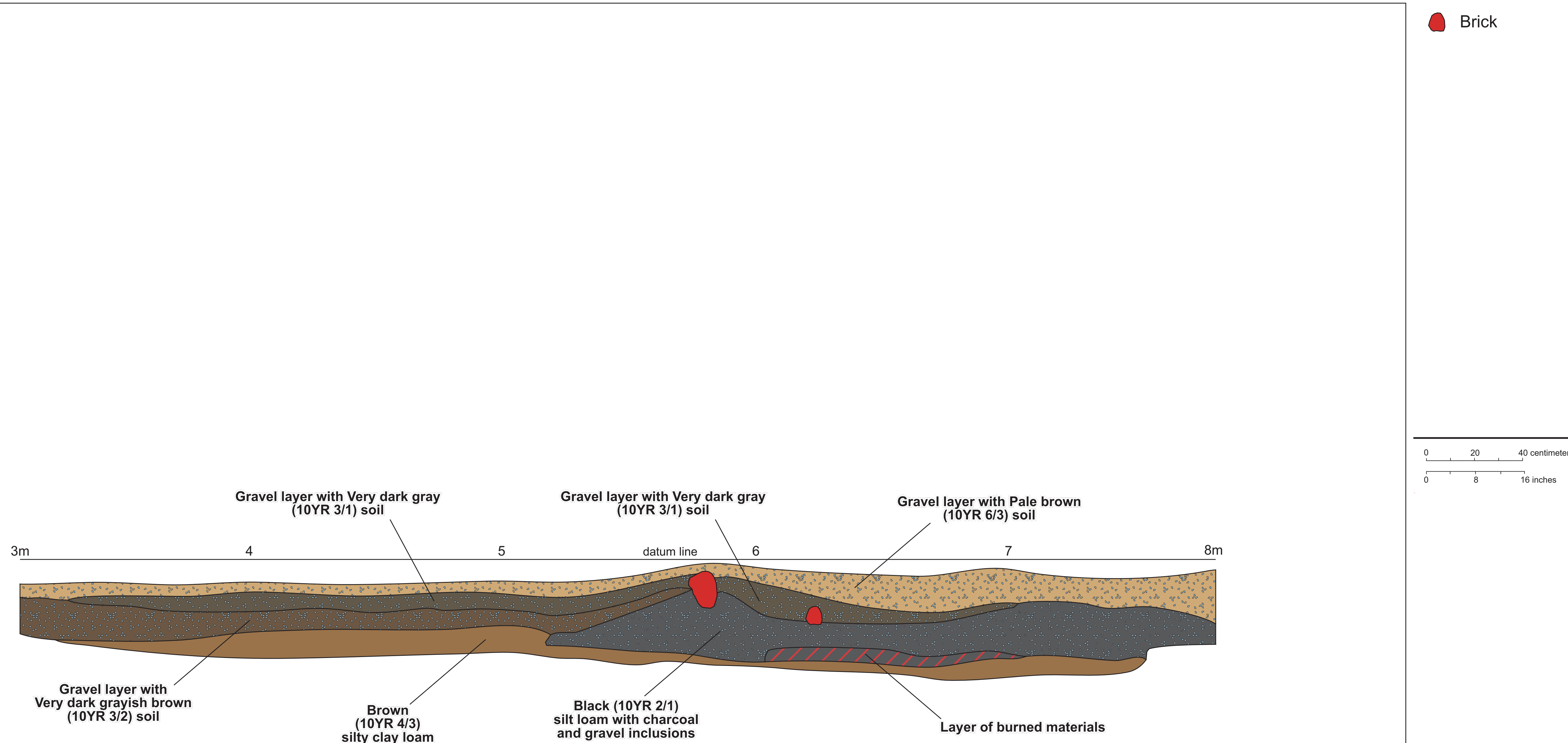


Figure 15

Profile of north wall of Trench 3.

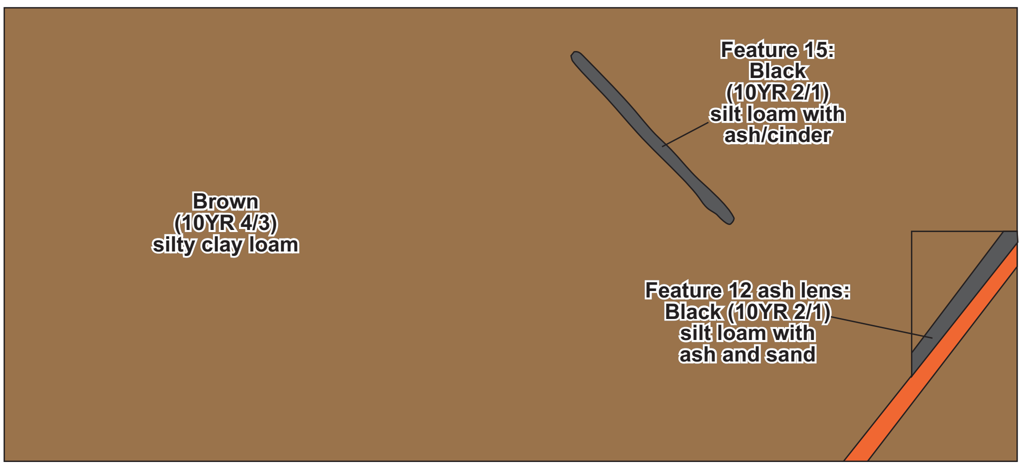
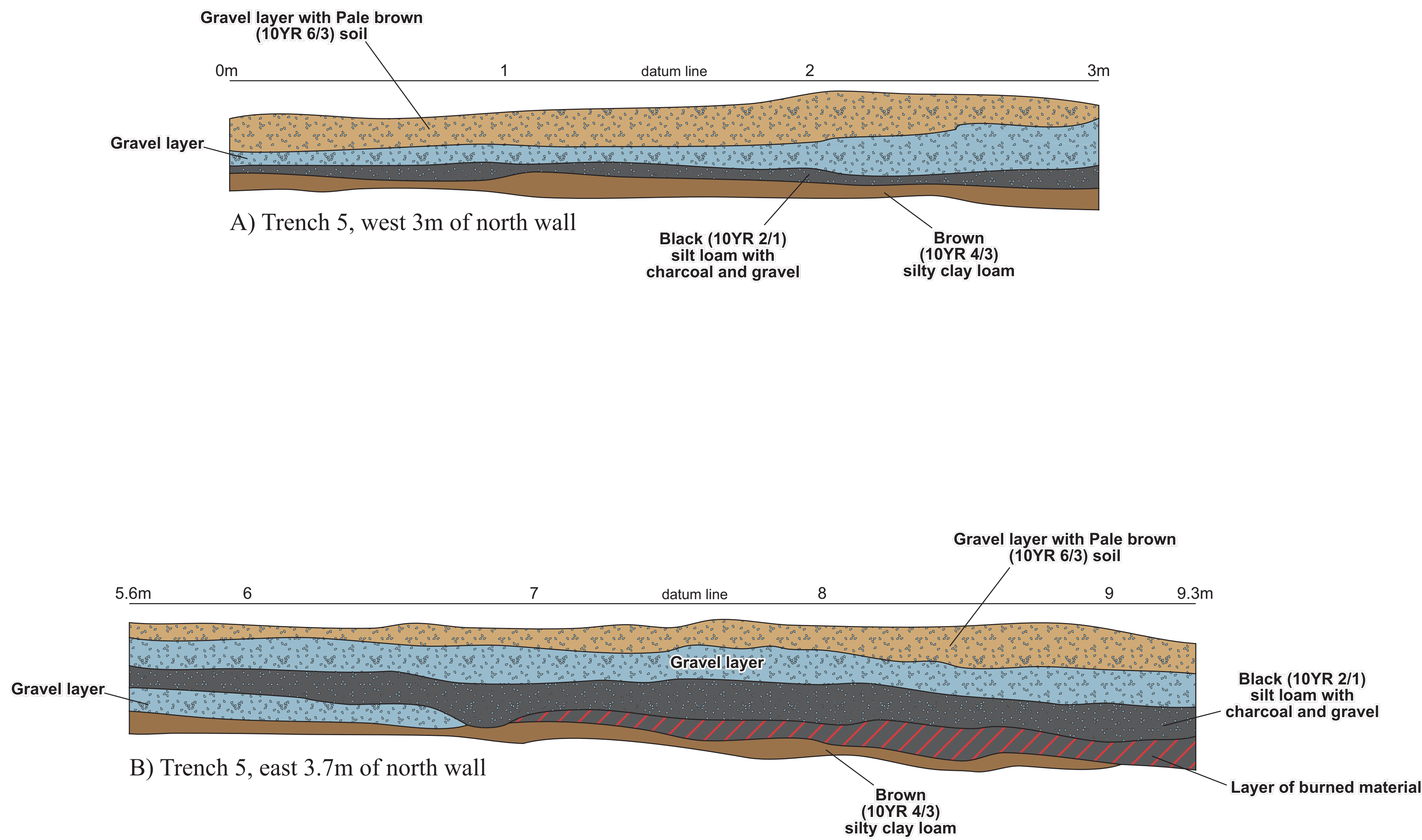


Figure 16

Plan view of Trench 5.



A) Trench 5, west 3m of north wall

B) Trench 5, east 3.7m of north wall

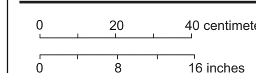


Figure 17

Profile of north wall of Trench 5.

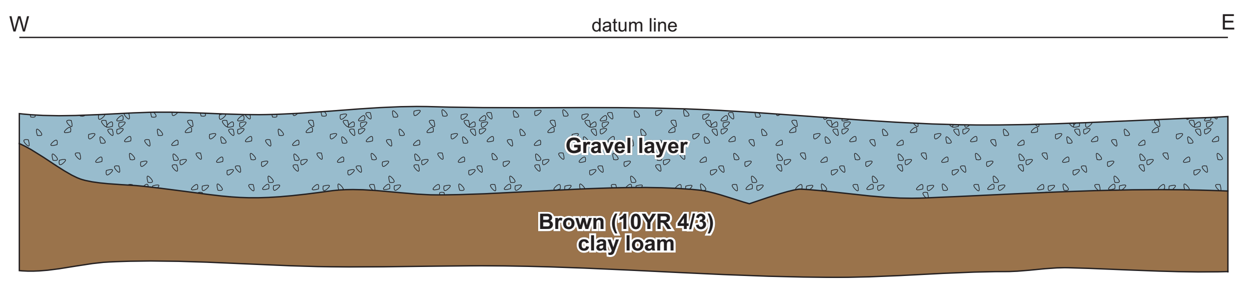


Figure 18

Profile of north wall of Trench 6.

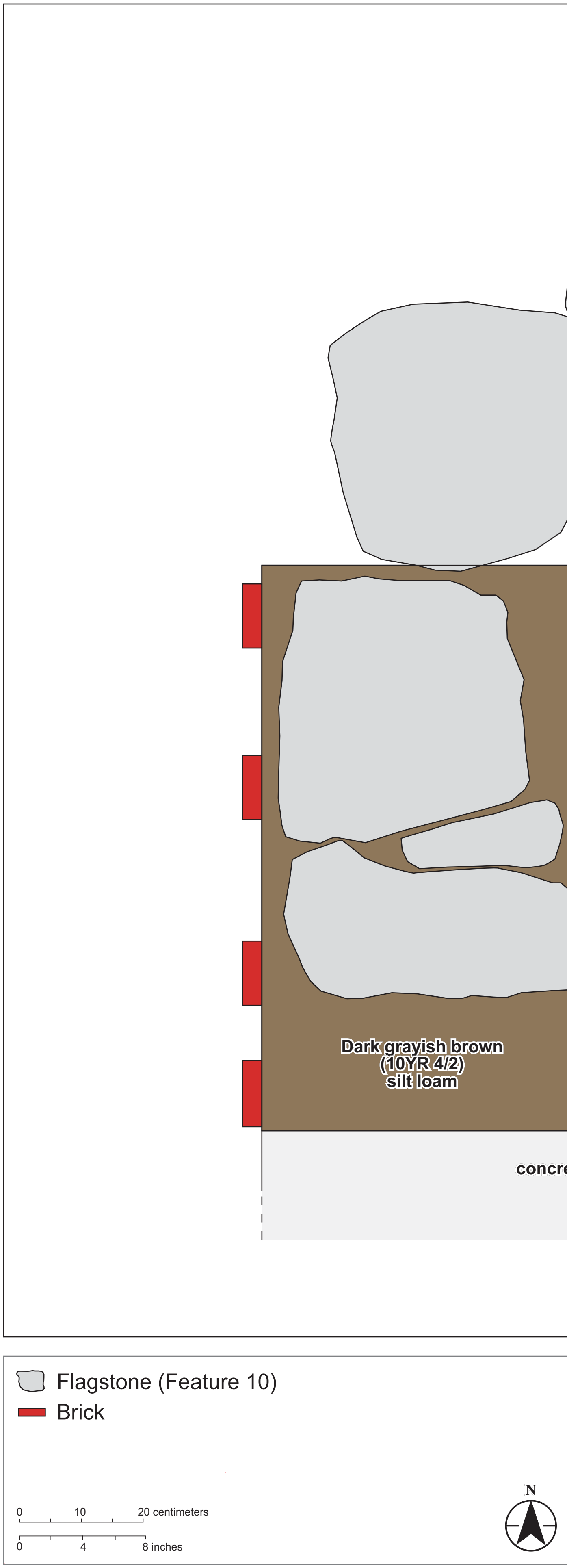
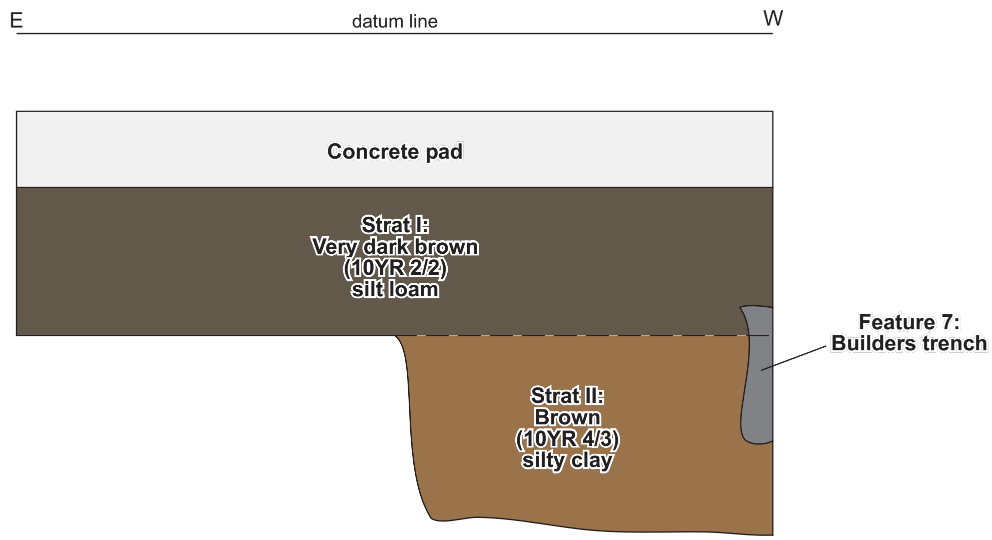
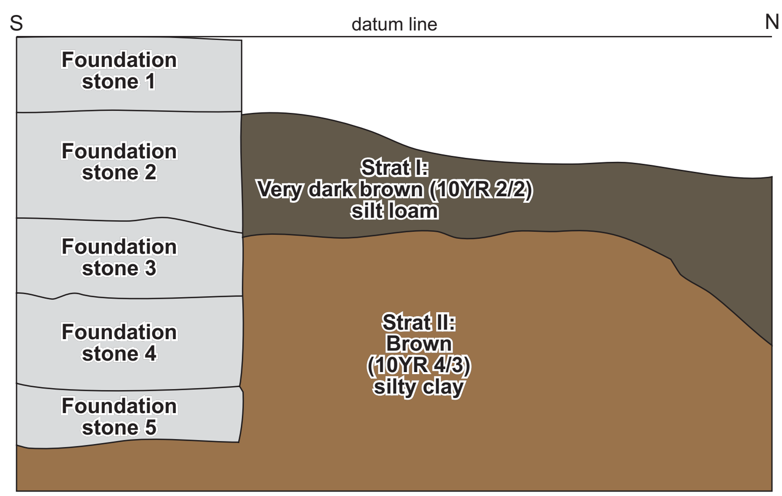


Figure 19

Plan view of surface of TU 1, showing flagstones associated with Feature 10.



A) Test Unit 1, south profile.



B) Test Unit 1, west profile.

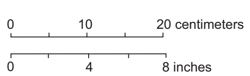


Figure 20

Profile of TU 1, showing smokehouse foundation and an associated builder's trench, Feature 7.

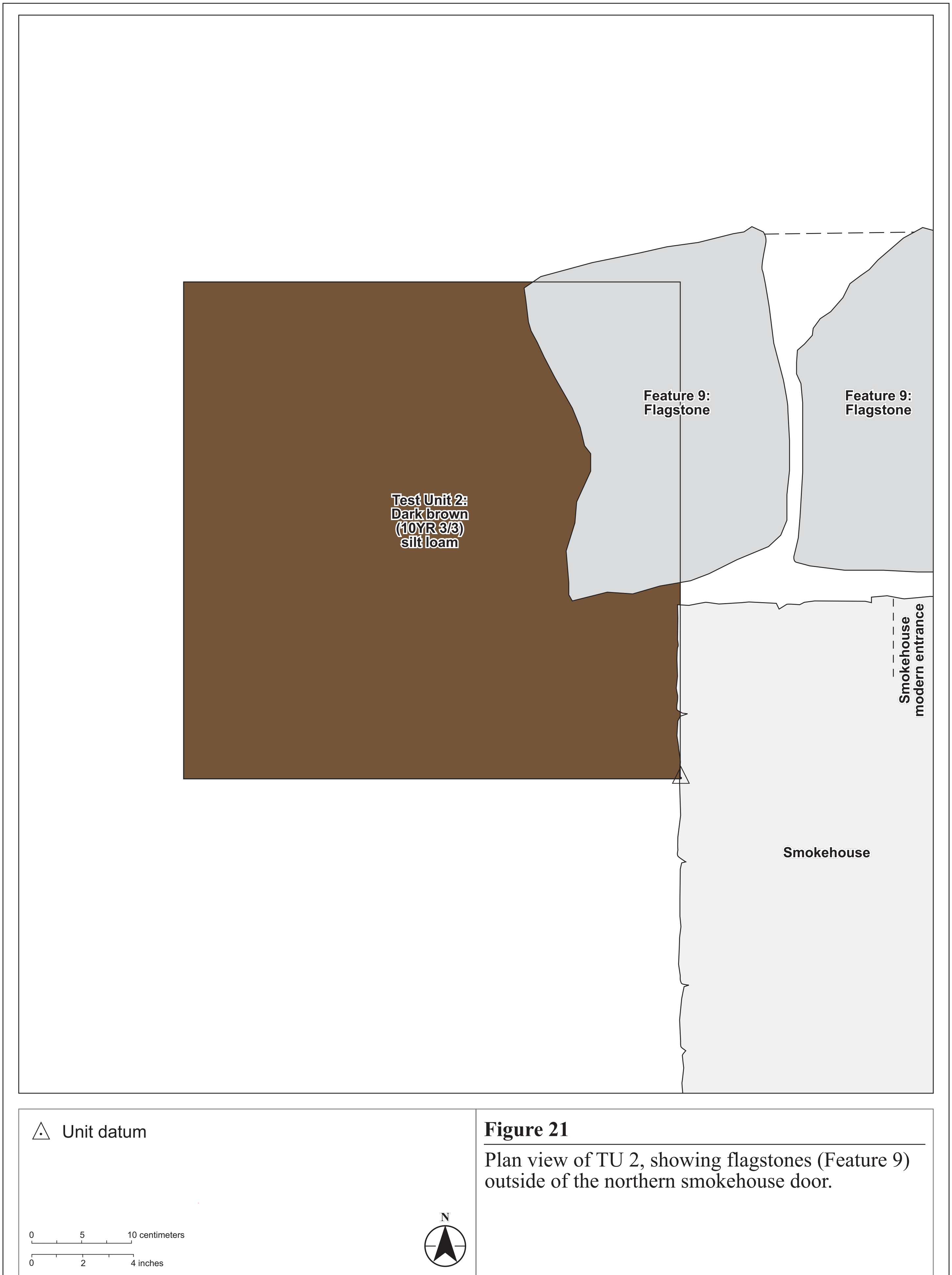
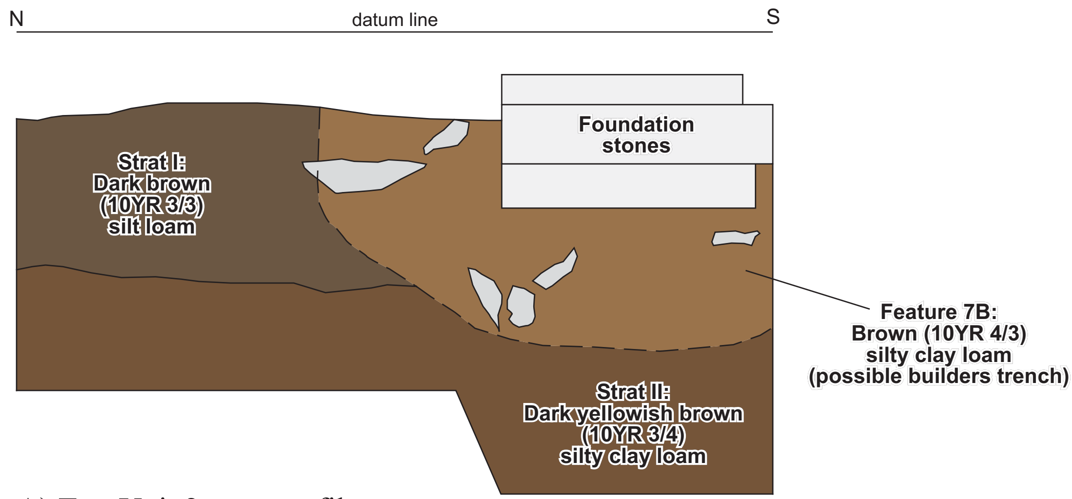
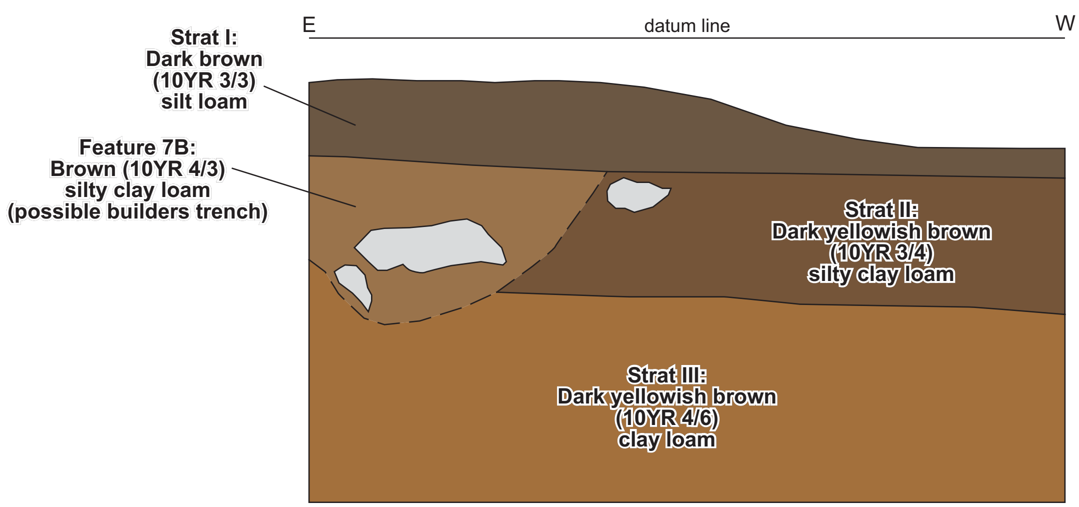


Figure 21

Plan view of TU 2, showing flagstones (Feature 9) outside of the northern smokehouse door.



A) Test Unit 2, east profile.



B) Test Unit 2, south profile.

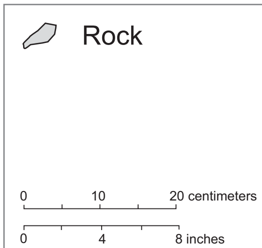
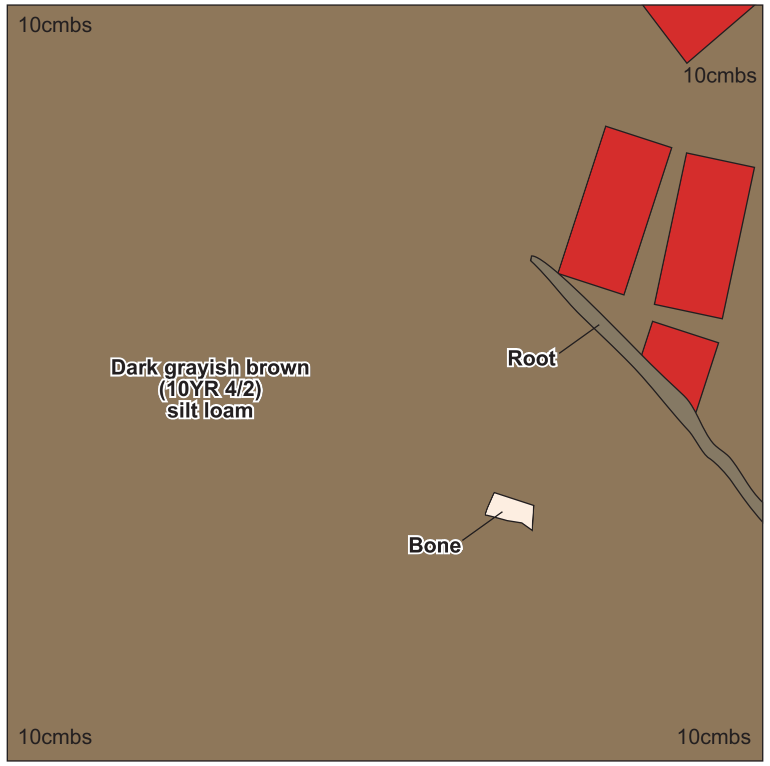
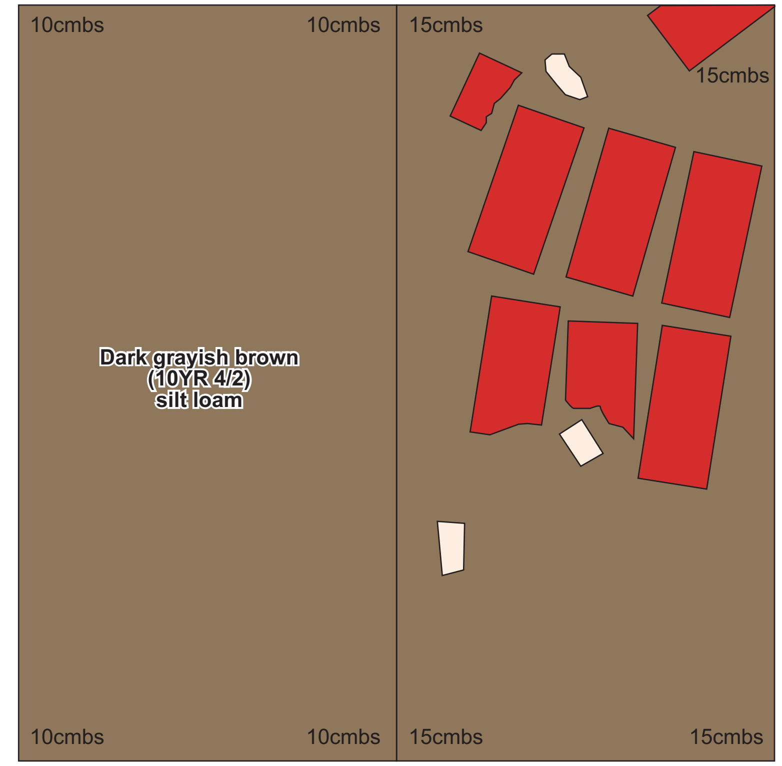


Figure 22

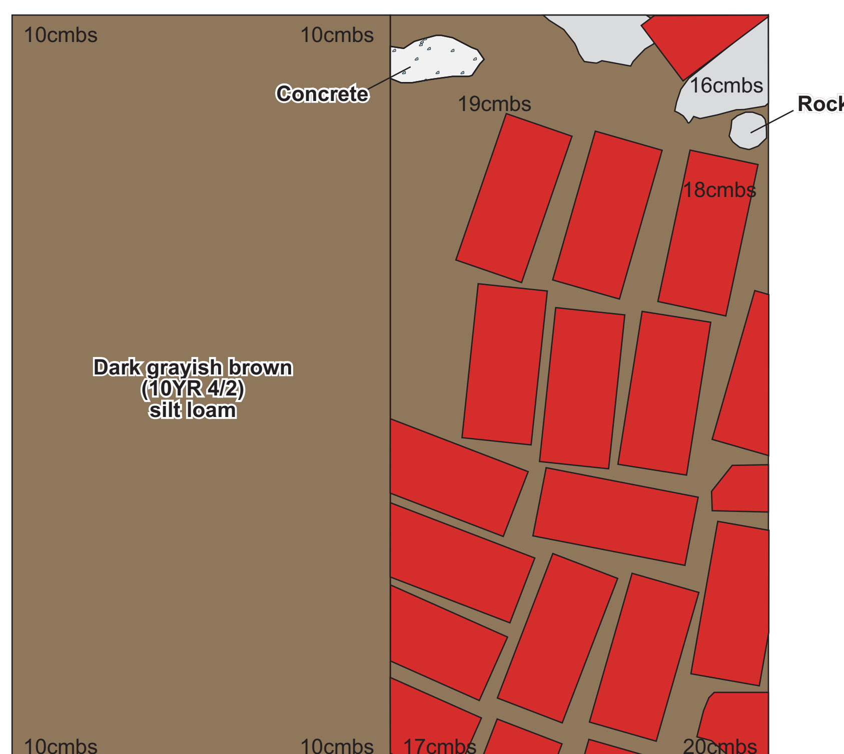
Profile of the east and south walls of TU 2, showing the building foundation and a builder's trench, Feature 7B.



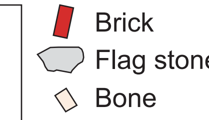
A) Test Unit 3, Level 1 plan view.



B) Test Unit 3, Feature 16, Level 1 plan view.



C) Test Unit 3, Feature 16, Level 2 plan view.



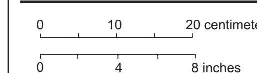
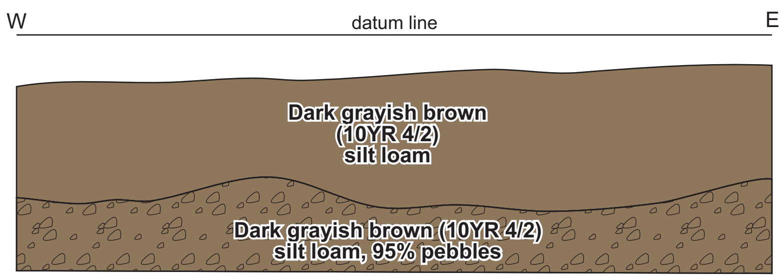


Figure 23

Plan views of TU 3, showing Feature 16.



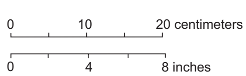
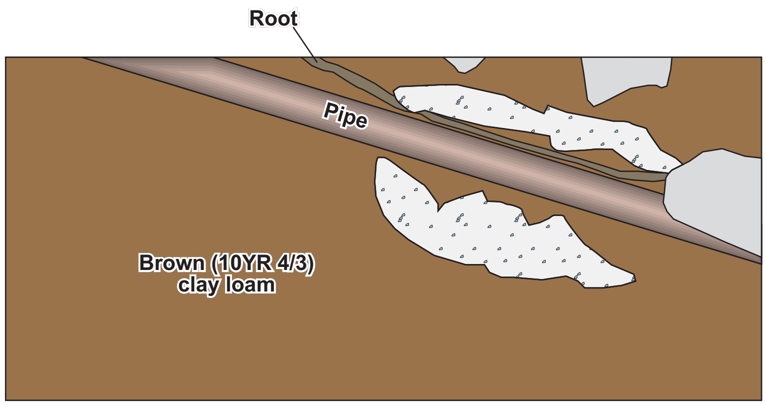


Figure 24

Profile of north wall of TU 3.



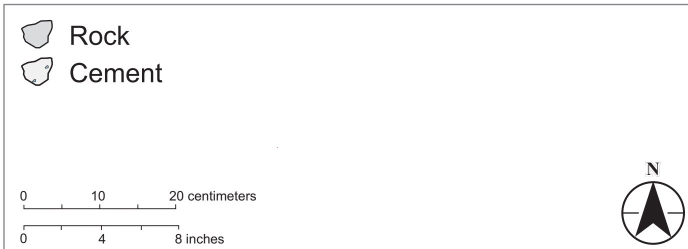
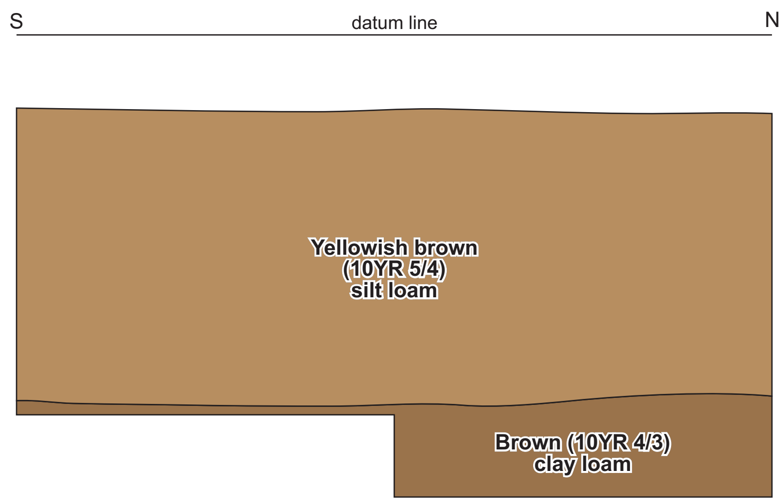


Figure 25

Plan view of TU 4, level 4.

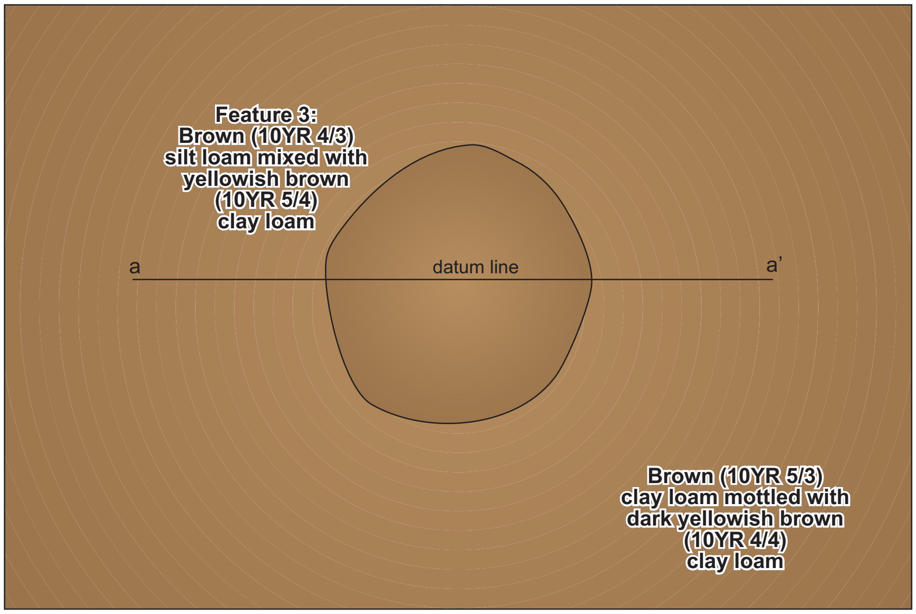


0 10 20 centimeters

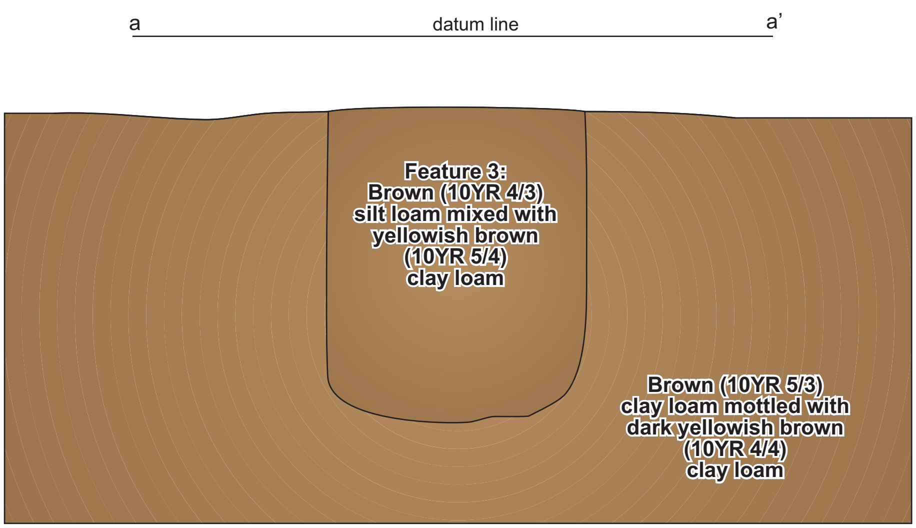
0 4 8 inches

Figure 26

Profile of west wall of TU 4.



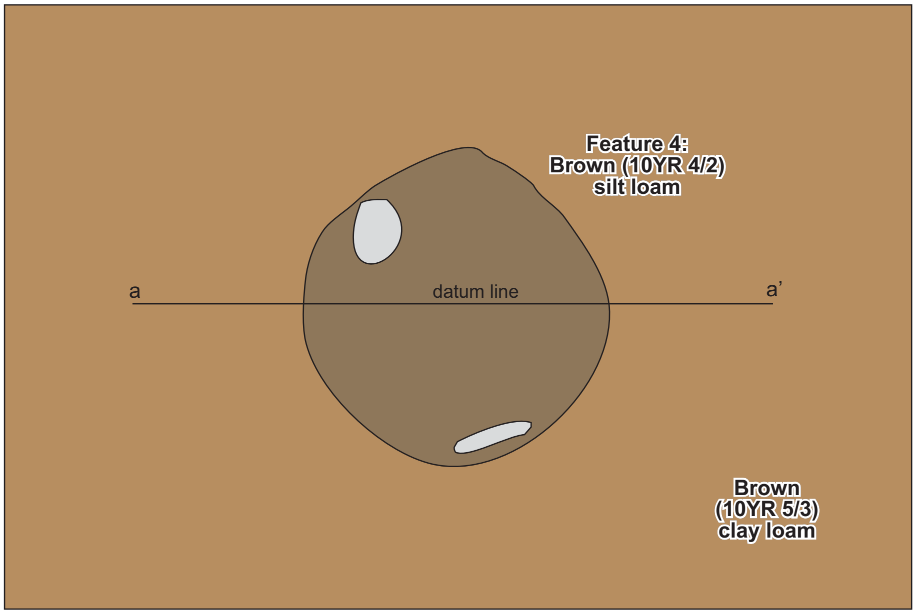
A) Feature 3 plan view.



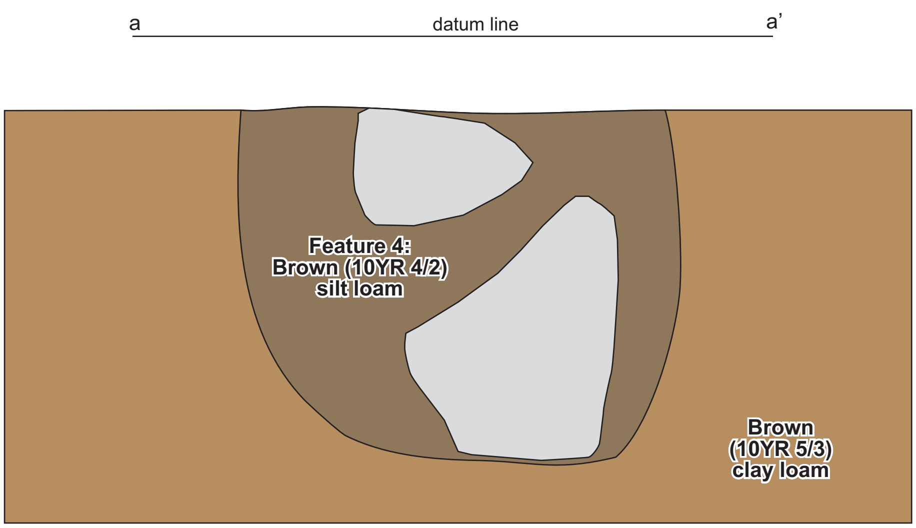
B) Feature 3 north profile.

Figure 27

Plan view and profile of north wall of Feature 3.



A) Feature 4 plan view.



B) Feature 4 north profile.

Rock

0 5 10 centimeters

0 2 4 inches

N

Figure 28

Plan view and profile of north wall of Feature 4.

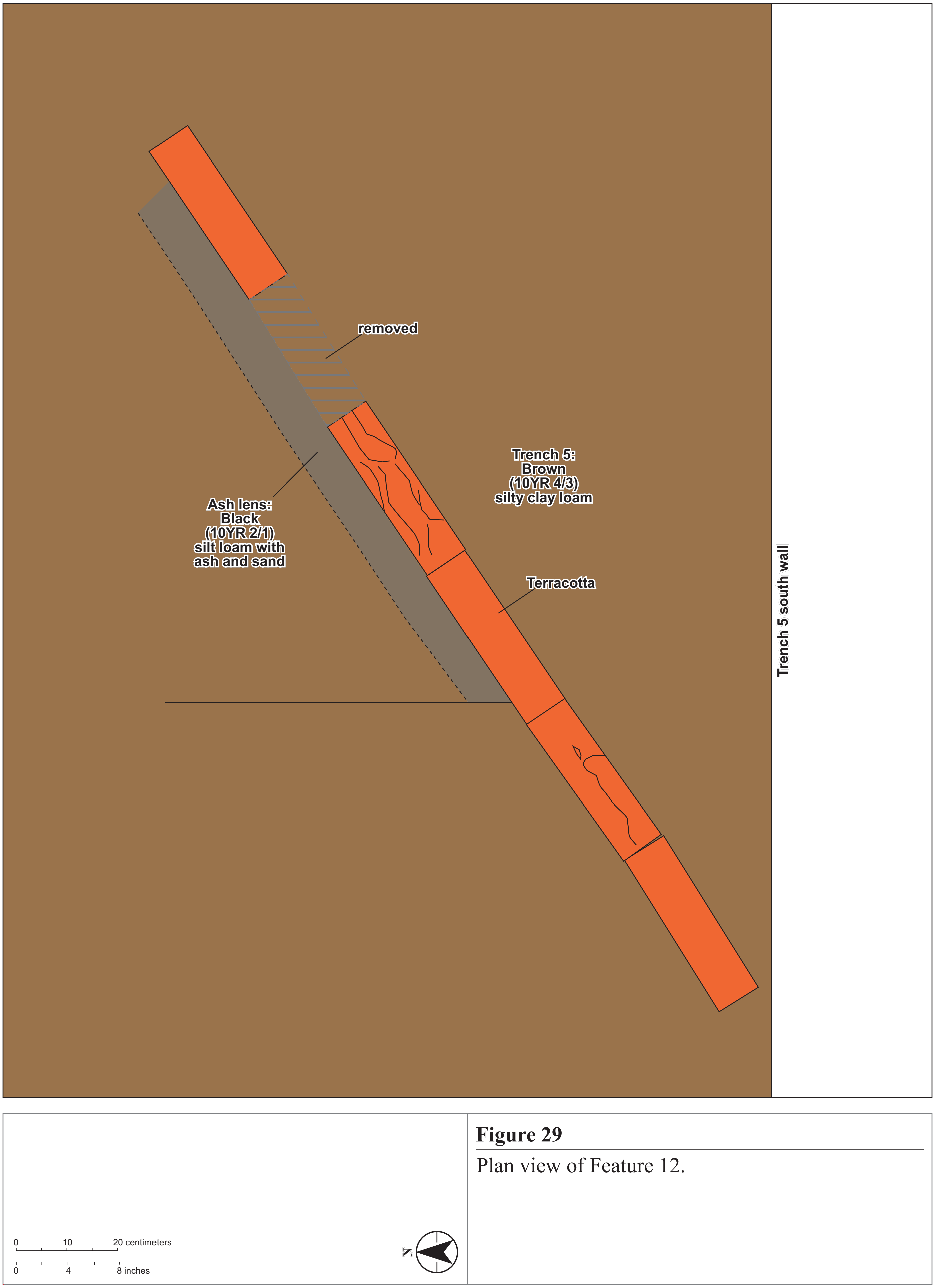


Figure 29

Plan view of Feature 12.

APPENDIX A: ARTIFACT ANALYSIS

Appendix A. Prehistoric Artifacts.

Lot	Context	Description	Type	Material	Count	Comment
33	Feature 16, Level 1	Flake fragment	Columbus/Delaware	Lithic	1	
22	STP 13	Whole flake	Columbus/Delaware	Lithic	1	
30	Trench 4	Biface	Upper Mercer	Lithic	1	
30	Trench 4	Flake fragment	Upper Mercer	Lithic	1	
7	Trench 5	Flake fragment	Upper Mercer	Lithic	1	
8	Trench 5	Whole flake	Upper Mercer	Lithic	1	
25	TU 2, Level 2	Whole flake	Upper Mercer	Lithic	1	
31	TU 2, Level 3, 36–46 cm	Core/Shatter	Vanport	Lithic	1	Heat Treated
35	TU 4, Level 1 10–20 cm	Shatter	Columbus/Delaware	Lithic	1	

Appendix A. Historic Artifacts.

Lot	Context	Functional Group	Description	Type	Material	Count	Weight (g)	Date Range	Reference	Comment
5	Trench 3, Coal and Ash layer	Domestic	Stoneware, crock, colorless glaze, buff paste	Body	Ceramic	2				
5	Trench 3, Coal and Ash layer	Domestic	Stoneware, cup, colorless glaze, buff paste, annual banding, blue	Body/base/handle	Ceramic	1				
6	Feature 10	Activities	Bell clapper		Ceramic	1				
8	Trench 5	Domestic	Container, jar, colorless	Body	Glass	1		1820-1860	Stelle et al. 2001	
8	Trench 5	Activities	Fuel	Cinder	Mineral	4				
8	Trench 5	Domestic	Milk, canning jar lid liner, opaque		Glass	1		1869 to present	Stelle et al. 2001	
8	Trench 5	Architectural	Nail, round, wire	Common	Metal, ferrous	1		1850s to present	Nelson 1968	
8	Trench 5	Domestic	Porcelain, plain	Rim	Ceramic	1				
8	Trench 5	Domestic	Whiteware, blue transfer print	Body	Ceramic	1				
9	TU 1, Level 1	Architectural	Nail, machine cut	Common	Metal, ferrous	1		1830s to present	Nelson 1968	
10	TU 1, Level 2	Architectural	Brick, fragments	Fragments	Ceramic	30				
10	TU 1, Level 2	Miscellaneous	Fragments, corroded	Unidentified	Metal, ferrous	7				
10	TU 1, Level 2	Architectural	Nail, round, wire	Common	Metal, ferrous	30				
11	TU 1, Level 3	Architectural	Brick, fragments		Ceramic	2				
12	TU 1, Wall	Architectural	Brick, fragments		Ceramic	5				
12	TU 1, Wall	Architectural	Nail, round, wire	Common	Metal, ferrous	1		1850s to present	Nelson 1968	
13	TU 2, surface	Domestic	Bottle, brown	Body	Glass	13		1850s to present	Nelson 1968	
13	TU 2, surface	Architectural	Brick	Fragments	Ceramic	20				
13	TU 2, surface	Architectural	Brick, fragments	Fragments	Ceramic	4				
13	TU 2, surface	Domestic	Container, colorless	Body	Glass	2				
13	TU 2, surface	Domestic	Container, jar, light aqua	Base	Glass	2				
13	TU 2, surface	Architectural	Drain tile		Ceramic	3				
13	TU 2, surface	Architectural	Flat, colorless	Window	Glass	3				
13	TU 2, surface	Activities	Fuel	Coal	Mineral	10				
13	TU 2, surface	Hardware	Hinge/bracket		Metal, ferrous	1				
13	TU 2, surface	Architectural	Nail, corroded	Fragments	Metal, ferrous	1				
13	TU 2, surface	Architectural	Nail, round, wire	Common	Metal, ferrous	1		1850s to present	Nelson 1968	
13	TU 2, surface	Architectural	Nail, round, wire	Common	Metal, ferrous	1				very large

Appendix A. Historic Artifacts.

Lot	Context	Functional Group	Description	Type	Material	Count	Weight (g)	Date Range	Reference	Comment
14	TU 2 Surface	Domestic	Bottle, green	Body	Glass	8				
14	TU 2 Surface	Architectural	Brick, fragments		Ceramic	23				
14	TU 2 Surface	Domestic	Container, colorless	Body	Glass	3				
14	TU 2 Surface	Activities	Fragment, colorless	Unidentified	Glass	2				
14	TU 2 Surface	Organic	Shell	Fragments	Organic	1				
15	STP 3	Domestic	Container, colorless	Body	Glass	1				
15	STP 3	Domestic	Whiteware, plain	Body	Ceramic	1				
16	STP 4	Domestic	Container, colorless	Body	Glass	2				
16	STP 4	Domestic	Container, light green	Body	Glass	1				
16	STP 4	Miscellaneous	Flat, colorless	Unidentified	Glass	3				
16	STP 4	Architectural	Flat, light green	Window	Glass	2				
16	STP 4	Architectural	Flat, thin, aqua	Window	Glass	2				
16	STP 4	Activities	Fuel	Coal	Mineral	1				
16	STP 4	Activities	Fuel	Cinder	Mineral	1				
16	STP 4	Domestic	Jar, colorless, rim	Rim	Glass	1				
16	STP 4	Domestic	Jar, light green, rim	Rim	Glass	1				
16	STP 4	Domestic	Stoneware, Albany slip interior, salt glaze exterior	Body	Ceramic	1				
16	STP 4	Domestic	Whiteware, plain	Body	Ceramic	2				
17	STP 5	Domestic	Container, colorless	Body	Glass	3				
17	STP 5	Miscellaneous	Flat, colorless	Unidentified	Glass	3				
17	STP 5	Domestic	Stoneware, Albany slip interior/exterior	Body	Ceramic	1				
17	STP 5	Domestic	Whiteware, plain	Body	Ceramic	2				
18	STP 6	Domestic	Container, aqua	Body	Glass	2				
18	STP 6	Domestic	Container, colorless	Body	Glass	1				
18	STP 6	Architectural	Flat, light green	Window	Glass	5				
18	STP 6	Activities	Fuel		Coal	2				
18	STP 6	Architectural	Nail, round, wire	Common	Metal, ferrous	2		1850s to present	Nelson 1968	
18	STP 6	Domestic	Porcelain, hand painted, polychrome blue/brown	Body	Ceramic	2		1828-1860	Magid 1984	refit

Appendix A. Historic Artifacts.

Lot	Context	Functional Group	Description	Type	Material	Count	Weight (g)	Date Range	Reference	Comment
18	STP 6	Domestic	Stoneware, Albany slip interior/exterior	Rim	Ceramic	2				
18	STP 6	Domestic	Whiteware, spongeware, blue	Rim	Ceramic	1		1840-1880	Magid 1984	
18	STP 6	Domestic	Whiteware, spongeware, blue	Body	Ceramic	10		1840-1880	Magid 1984	
19	STP 7	Architectural	Brick, fragments	fragments	Ceramic	3				
19	STP 7	Domestic	Container, cobalt	Body	Glass	1				
19	STP 7	Architectural	Flat, fragments	Unidentified	Metal, ferrous	1				
19	STP 7	Domestic	Redware, colorless	Body	Ceramic	1				
19	STP 7	Domestic	Redware, colorless, crock	Body	Ceramic	1				
20	STP 8	Domestic	Bottle, brown, medicine jar, rim missing	Body and base	Glass	1				30-S-B on bottom
21	STP 10	Domestic	Porcelain, plain	Rim	Ceramic	2				
23	Feature 12	Miscellaneous	Fragment	Unidentified	Metal, ferrous	1				
23	Feature 12	Miscellaneous	Melted, colorless	Unidentified	Glass	1				
23	Feature 12	Domestic	Milk, opaque	Lid liner	Glass	1		1869 to present	Stelle et al. 2001	
23	Feature 12	Architectural	Nail, corroded	Unidentified	Metal, ferrous	1				
24	Feature 9, surface	Organic	Mammalia, Opossum	Vertebra, Miscellaneous, Body	Organic	1	1.30			
24	Feature 9, surface	Organic	Mammalia, Opossum	Pelvis, Upper Hind	Organic	1	3.60			
24	Feature 9, surface	Organic	Mammalia, Opossum	Scapula, Upper Fore	Organic	1	3.60			
24	Feature 9, surface	Organic	Mammalia, Opossum	Tibia, Lower Hind	Organic	1	1.60			
25	TU 2, Level 2	Organic	Aves, UID Bird	Shaft Fragment, Miscellaneous	Organic	16	3.10			
25	TU 2, Level 2	Domestic	Bottle, brown	Body	Glass	1				
25	TU 2, Level 2	Domestic	Bottle, green	Body	Glass	1				
25	TU 2, Level 2	Architectural	Brick, fragments		Ceramic	6				
25	TU 2, Level 2	Domestic	Container, colorless	Body	Glass	3				
25	TU 2, Level 2	Architectural	Flat, light blue	Window	Glass	8				
25	TU 2, Level 2	Architectural	Flat, sheet	Unidentified	Metal, tin	7				
25	TU 2, Level 2	Domestic	flat, thick, black		Glass	1		1815–1885	Gillio et al. 1980	

Appendix A. Historic Artifacts.

Lot	Context	Functional Group	Description	Type	Material	Count	Weight (g)	Date Range	Reference	Comment
25	TU 2, Level 2	Miscellaneous	Fragments	Unidentified	Metal, ferrous	3				
25	TU 2, Level 2	Activities	Fuel	Coal	Mineral	4				
25	TU 2, Level 2	Hardware	Hammer head	Fragment	Metal, ferrous	1				
25	TU 2, Level 2	Domestic	Jar, thread, aqua	Rim	Glass	3				
25	TU 2, Level 2	Domestic	Jar, thread, colorless	Rim	Glass	2				
25	TU 2, Level 2	Hardware	Lock/bracket		Metal, ferrous	1				
25	TU 2, Level 2	Organic	Mammalia, Domestic pig	Fibula, Lower Hind	Organic	1	1.70			
25	TU 2, Level 2	Organic	Mammalia, Large-Medium UID Mammal	Shaft Fragment, Miscellaneous	Organic	1	0.80			
25	TU 2, Level 2	Organic	Mammalia, Large-Medium UID Mammal	Miscellaneous Fragment	Organic	3	4.40			
25	TU 2, Level 2	Architectural	Mortar		Ceramic	2				
25	TU 2, Level 2	Architectural	Nail, corroded	Fragments	Metal, ferrous	11				
25	TU 2, Level 2	Architectural	Nail, corroded		Metal, ferrous	1				
25	TU 2, Level 2	Architectural	Nail, round, wire	Common	Metal, ferrous	1		1850s to present	Nelson 1968	
25	TU 2, Level 2	Domestic	Porcelain, cup, hand painted, polychrome, green and pink, gold band on rim	Rim	Ceramic	1		1828-1860	Magid 1984	
25	TU 2, Level 2	Organic	Shell	Fragments	Organic	2				
25	TU 2, Level 2	Hardware	Animal leg trap		Metal, ferrous	3				3 pieces
25	TU 2, Level 2	Domestic	Stoneware, Albany interior/exterior, buff paste	Body	Ceramic	1				
25	TU 2, Level 2	Organic	Vertebrata, UID Vertebrate	Miscellaneous Fragment	Organic	3	0.10			
25	TU 2, Level 2	Domestic	Whiteware, plain	Body	Ceramic	2				
26	TU 2, Level 2	Domestic	Bottle, green	Body	Glass	8				
26	TU 2, Level 2	Architectural	Brick fragment, small		Ceramic	170				
26	TU 2, Level 2	Architectural	Brick, fragments, large		Ceramic	6				
26	TU 2, Level 2	Architectural	Brick, fragments, medium		Ceramic	20				
26	TU 2, Level 2	Domestic	Container, colorless	body	Glass	2				
26	TU 2, Level 2	Miscellaneous	Flat, corroded	Unidentified	Metal, ferrous	3				
26	TU 2, Level 2	Architectural	Flat, light aqua	Window	Glass	4				

Appendix A. Historic Artifacts.

Lot	Context	Functional Group	Description	Type	Material	Count	Weight (g)	Date Range	Reference	Comment
26	TU 2, Level 2	Activities	Fuel	Coal	Mineral	2				
26	TU 2, Level 2	Architectural	Nail, round, wire	Common	Metal, ferrous	9		1850s to present	Nelson 1968	
26	TU 2, Level 2	Architectural	Nail, round, wire	Roofing	Metal, ferrous	1		1850s to present	Nelson 1968	
26	TU 2, Level 2	Domestic	Porcelain, plain	Body	Ceramic	1				
26	TU 2, Level 2	Domestic	Whiteware, plain	Body	Ceramic	1				
27	TU 2, Level 3, 36-46	Architectural	Brick, fragments	Fragments	Ceramic	6				
28	TU 2, Level 2	Architectural	Brick, fragments	Handmade 1/2	Ceramic	1				
28	TU 2, Level 2	Hardware	Strap		Metal, ferrous	1				
31	TU 2, Level 3, 36-46	Organic	Aves, UID Bird	Shaft Fragment, Miscellaneous	Organic	3	1.20			
31	TU 2, Level 3, 36-46	Architectural	Brick, fragments	Fragments	Ceramic	6				
31	TU 2, Level 3, 36-46	Domestic	Container, colorless	Body	Glass	4				
31	TU 2, Level 3, 36-46	Domestic	Container, light blue	Body	Glass	2				
31	TU 2, Level 3, 36-46	Architectural	Drain tile, terracotta	Fragment	Ceramic	1				
31	TU 2, Level 3, 36-46	Architectural	Flat, light green	Window	Glass	2				
31	TU 2, Level 3, 36-46	Miscellaneous	Fragments	Unidentified	Metal, ferrous	3				
31	TU 2, Level 3, 36-46	Activities	Fuel	Coal	Mineral	2				
31	TU 2, Level 3, 36-46	Domestic	Ironstone, plain	Body	Ceramic	6				
31	TU 2, Level 3, 36-46	Organic	Mammalia, Domestic pig	Tooth, Molar, Head and Neck	Organic	1	6.50			
31	TU 2, Level 3, 36-46	Organic	Mammalia, Large-Medium UID Mammal	Shaft Fragment, Miscellaneous	Organic	6	12.60			
31	TU 2, Level 3, 36-46	Organic	Mammalia, Large-Medium UID Mammal	Shaft Fragment, Miscellaneous	Organic	1	3.10			
31	TU 2, Level 3, 36-46	Organic	Mammalia, Large-Medium UID Mammal	Shaft Fragment, Miscellaneous	Organic	1	1.90			
31	TU 2, Level 3, 36-46	Organic	Mammalia, Large-Medium UID Mammal	Miscellaneous Fragment	Organic	17	7.50			
31	TU 2, Level 3, 36-46	Organic	Mammalia, Small UID Mammal	Radius, Lower Fore	Organic	2	0.60			
31	TU 2, Level 3, 36-46	Architectural	Nail, round, wire	Common	Metal, ferrous	2		1850s to present	Nelson 1968	
31	TU 2, Level 3, 36-46	Organic	Shell	Fragments	Organic	7				

Appendix A. Historic Artifacts.

Lot	Context	Functional Group	Description	Type	Material	Count	Weight (g)	Date Range	Reference	Comment
31	TU 2, Level 3, 36-46	Domestic	Stoneware, Albany slip exterior, buff interior, gray paste	Body	Ceramic	5				
31	TU 2, Level 3, 36-46	Miscellaneous	Strap, flat	Fragments	Metal, ferrous	5				
31	TU 2, Level 3, 36-46	Domestic	Whiteware, plain	Body	Ceramic	5				
32	TU 3, Level 1 0-10	Organic	Mammalia, Large UID Mammal	Rib, Lower Middle	Organic	1	4.80			
32	TU 3, Level 1 0-10	Architectural	Tile, roofing	Fragment	Slate	1				
32	TU 3, Level 1 0-10	Activities	Typewriter key "S" and "#"		Metal and Plastic	2				
33	Feature 16, Level 1	Arms	22 caliber		Metal	2				one fragment/ one complete
33	Feature 16, Level 1	Organic	Aves, UID Bird	Shaft Fragment, Miscellaneous	Organic	10	1.10			
33	Feature 16, Level 1	Miscellaneous	Fragment, colorless	Unidentified	Glass	1				
33	Feature 16, Level 1	Organic	Mammalia, Large UID Mammal	Vertebra, Miscellaneous, Body	Organic	1	6.60			
33	Feature 16, Level 1	Organic	Mammalia, Large UID Mammal	Rib, Lower Middle	Organic	2	11.50			
33	Feature 16, Level 1	Organic	Mammalia, UID Mammal	Miscellaneous Fragment	Organic	2	1.10			
33	Feature 16, Level 1	Architectural	Nail, round, wire	Common	Metal, ferrous	3		1850s to present	Nelson 1968	
33	Feature 16, Level 1	Activities	White, modern	Fragment	Plastic	1				
33	Feature 16, Level 1	Architectural	Wire	Fragments	Metal, copper	2				
34	Feature 16, Level 2	Arms	Ammunition, caliber unknown	Incomplete	Metal	1				
34	Feature 16, Level 2	Organic	Aves, UID Bird	Shaft Fragment, Miscellaneous	Organic	18	3.50			
34	Feature 16, Level 2	Miscellaneous	Fragment, colorless	Fragments	Glass	2				
34	Feature 16, Level 2	Miscellaneous	Green, modern	Fragment	Plastic	1				
34	Feature 16, Level 2	Organic	Mammalia, Large UID Mammal	Rib, Lower Middle	Organic	1	16.40			
34	Feature 16, Level 2	Organic	Mammalia, Large UID Mammal	Rib, Lower Middle	Organic	1	23.70			
34	Feature 16, Level 2	Organic	Mammalia, Large-Medium UID Mammal	Miscellaneous Fragment	Organic	1	4.10			
34	Feature 16, Level 2	Architectural	Nail, round, wire	Common	Metal, ferrous	3		1850s to present	Nelson 1968	
34	Feature 16, Level 2	Personal	Penny, wheat, 1950		Metal	1		1950		

Appendix A. Historic Artifacts.

Lot	Context	Functional Group	Description	Type	Material	Count	Weight (g)	Date Range	Reference	Comment
34	Feature 16, Level 2	Activities	Shell, hole drilled	Complete	Organic	2				
34	Feature 16, Level 2	Miscellaneous	Wire	Fragments	Metal, ferrous	1				
35	TU 4, Level 1 10-20	Hardware	Bracket	Incomplete	Metal, ferrous	1				
35	TU 4, Level 1 10-20	Architectural	Brick, fragments		Ceramic	1				
35	TU 4, Level 1 10-20	Miscellaneous	Fragment, colorless	Fragment	Glass	1				
35	TU 4, Level 1 10-20	Organic	Mammalia, Large UID Mammal	Rib, Lower Middle	Organic	2	14.50			
35	TU 4, Level 1 10-20	Organic	Mammalia, Large-Medium UID Mammal	Miscellaneous Fragment	Organic	3	6.30			
35	TU 4, Level 1 10-20	Organic	Mammalia, Large-Medium UID Mammal	Shaft Fragment, Miscellaneous	Organic	1	16.30			
35	TU 4, Level 1 10-20	Organic	Mammalia, Large-Medium UID Mammal	Rib, Lower Middle	Organic	2	2.60			
35	TU 4, Level 1 10-20	Organic	Mammalia, Large-Medium UID Mammal	Rib, Lower Middle	Organic	1	2.00			
35	TU 4, Level 1 10-20	Organic	Mammalia, Small UID Mammal	Tibia, Lower Hind	Organic	1	0.50			
35	TU 4, Level 1 10-20	Miscellaneous	Red, modern	Fragment	Plastic	1				
35	TU 4, Level 1 10-20	Domestic	Whiteware, plain	Body	Ceramic	1				
39	TU 4, Level 2, 20-30	Organic	Aves, Chicken	Coracoid, Upper Fore	Organic	1	0.50			
39	TU 4, Level 2, 20-30	Architectural	Brick, fragments	Fragments	Ceramic	2				
39	TU 4, Level 2, 20-30	Miscellaneous	Cap	Unidentified	Metal, tin	1				
39	TU 4, Level 2, 20-30	Domestic	Container, colorless	Body	Glass	3				
39	TU 4, Level 2, 20-30	Architectural	Drain tile, redware, glazed		Ceramic	4				
39	TU 4, Level 2, 20-30	Architectural	Flat, light green	Window	Glass	2				
39	TU 4, Level 2, 20-30	Miscellaneous	Fragment, colorless	Fragments	Glass	3				
39	TU 4, Level 2, 20-30	Activities	Fuel	Cinder	Mineral	2				
39	TU 4, Level 2, 20-30	Organic	Mammalia, Domestic pig	Fibula, Lower Hind	Organic	3	1.70			
39	TU 4, Level 2, 20-30	Organic	Mammalia, Large-Medium UID Mammal	Miscellaneous Fragment	Organic	5	5.20			
39	TU 4, Level 2, 20-30	Organic	Mammalia, Large-Medium UID Mammal	Shaft Fragment, Miscellaneous	Organic	1	1.60			
39	TU 4, Level 2, 20-30	Organic	Mammalia, Large-Medium UID Mammal	Shaft Fragment, Miscellaneous	Organic	1	2.20			

Appendix A. Historic Artifacts.

Lot	Context	Functional Group	Description	Type	Material	Count	Weight (g)	Date Range	Reference	Comment
39	TU 4, Level 2, 20-30	Architectural	Nail, corroded	Fragments	Metal, ferrous	12				
39	TU 4, Level 2, 20-30	Domestic	Redware, plain, glazed	Body	Ceramic	1				
39	TU 4, Level 2, 20-30	Organic	Shell	Fragments	Organic	2				
39	TU 4, Level 2, 20-30	Domestic	Whiteware, plain	Body	Ceramic	5				
40	TU 4, Level 3, 30-40	Domestic	Bottle, cap, corroded		Metal, ferrous	1				
40	TU 4, Level 3, 30-40	Architectural	Drain tile, glazed	Fragment	Ceramic	3				
40	TU 4, Level 3, 30-40	Miscellaneous	Fragments	Unidentified	Metal, ferrous	4				
40	TU 4, Level 3, 30-40	Activities	Fuel	Coal	Mineral	1				
40	TU 4, Level 3, 30-40	Architectural	Nail, round, wire	Common	Metal, ferrous	4		1850s to present	Nelson 1968	
40	TU 4, Level 3, 30-40	Organic	Shell	Fragments	Organic	5				
40	TU 4, Level 3, 30-40	Domestic	Whiteware, plain	Body	Ceramic	3				
41	TU 3, Level 2, 10-20	Arms	22 caliber	Fragment	Metal	1				
41	TU 3, Level 2, 10-20	Organic	Aves, UID Bird	Shaft Fragment, Miscellaneous	Organic	10	1.70			
41	TU 3, Level 2, 10-20	Domestic	Bottle, brown	Body	Glass	1				
41	TU 3, Level 2, 10-20	Domestic	Bottle, green	Body	Glass	2				
41	TU 3, Level 2, 10-20	Miscellaneous	Cap, white, modern		Plastic	1				
41	TU 3, Level 2, 10-20	Domestic	Container, black	Body	Glass	1		1815-1885	Gillio et al. 1980	
41	TU 3, Level 2, 10-20	Domestic	Container, light aqua	Body	Glass	1				
41	TU 3, Level 2, 10-20	Architectural	Drain tile, glazed		Ceramic	1				
41	TU 3, Level 2, 10-20	Architectural	Drain tile, unglazed		Ceramic	1				
41	TU 3, Level 2, 10-20	Miscellaneous	Flat, colorless	Unidentified	Glass	5				
41	TU 3, Level 2, 10-20	Architectural	Flat, light green	Window	Glass	1				
41	TU 3, Level 2, 10-20	Miscellaneous	Flat, ribbed, colorless	Unidentified	Glass	1				
41	TU 3, Level 2, 10-20	Miscellaneous	Fragments		Plastic	2				
41	TU 3, Level 2, 10-20	Activities	Fuel	Coal	Lithic	3				
41	TU 3, Level 2, 10-20	Domestic	Lamp, colorless		Glass	2				
41	TU 3, Level 2, 10-20	Organic	Mammalia, Large UID Mammal	Vertebra, Miscellaneous, Body	Organic	2	12.30			

Appendix A. Historic Artifacts.

Lot	Context	Functional Group	Description	Type	Material	Count	Weight (g)	Date Range	Reference	Comment
41	TU 3, Level 2, 10-20	Organic	Mammalia, Large UID Mammal	Rib, Lower Middle	Organic	1	13.20			
41	TU 3, Level 2, 10-20	Organic	Mammalia, Large-Medium UID Mammal	Rib, Lower Middle	Organic	1	0.80			
41	TU 3, Level 2, 10-20	Organic	Mammalia, Large-Medium UID Mammal	Rib, Lower Middle	Organic	1	1.60			
41	TU 3, Level 2, 10-20	Organic	Mammalia, Large-Medium UID Mammal	Rib, Lower Middle	Organic	2	0.90			
41	TU 3, Level 2, 10-20	Organic	Mammalia, Large-Medium UID Mammal	Miscellaneous Fragment	Organic	1	1.30			
41	TU 3, Level 2, 10-20	Architectural	Nail, corroded	Fragments	Metal, ferrous	2				
41	TU 3, Level 2, 10-20	Architectural	Nail, machine cut	Common	Metal, ferrous	1		1830s to present	Nelson 1968	
41	TU 3, Level 2, 10-20	Architectural	Nail, round, wire	Common	Metal, ferrous	7		1850s to present	Nelson 1968	
41	TU 3, Level 2, 10-20	Architectural	Nail, round, wire	Roofing	Metal, ferrous	3		1850s to present	Nelson 1968	
41	TU 3, Level 2, 10-20	Architectural	Nail, round, wire	Fragments	Metal, ferrous	2		1850s to present	Nelson 1968	
41	TU 3, Level 2, 10-20	Miscellaneous	Ring, black, modern		Plastic	1				
41	TU 3, Level 2, 10-20	Architectural	Tile, roofing	Roofing	Slate	3				
41	TU 3, Level 2, 10-20	Domestic	Whiteware, plain	Body	Ceramic	2				
42	Feature 16, Level 2	Miscellaneous	Cap		Metal, ferrous	1				
42	Feature 16, Level 2	Architectural	Drain tile, redware, glazed		Ceramic	6				
42	Feature 16, Level 2	Organic	Mammalia, Large-Medium UID Mammal	Miscellaneous Fragment	Organic	1	3.00			
42	Feature 16, Level 2	Architectural	Nail, corroded	Unidentified	Metal, ferrous	4				
43	TU 3, Level 3	Domestic	Container, black	Body	Glass	6		1815-1885	Gillio et al. 1980	
43	TU 3, Level 3	Architectural	Drain pipe, redware, gray paste, clear glaze	Body	Ceramic	4				
43	TU 3, Level 3	Architectural	Flat, colorless	Window	Glass	3				
43	TU 3, Level 3	Architectural	Flat, light blue	Window	Glass	1				
43	TU 3, Level 3	Architectural	Flat, light green	Window	Glass	1				
43	TU 3, Level 3	Activities	Fuel	Charcoal	Mineral	2				Samples
43	TU 3, Level 3	Architectural	Nail, corroded	Unidentified	Metal, ferrous	1				
43	TU 3, Level 3	Domestic	Redware, glaze, crock	Body	Ceramic	1				
43	TU 3, Level 3	Organic	Shell	Fragments	Organic	4				

Appendix A. Historic Artifacts.

Lot	Context	Functional Group	Description	Type	Material	Count	Weight (g)	Date Range	Reference	Comment
44	TU 5, Level 1	Organic	Aves, UID Bird	Shaft Fragment, Miscellaneous	Organic	3	2.40			
44	TU 5, Level 1	Domestic	Container, cobalt	Body	Glass	1		1835s to present	Nelson 1968	
44	TU 5, Level 1	Domestic	Container, colorless	Body	Glass	1				
44	TU 5, Level 1	Architectural	Flat, light blue	Window	Glass	7				
44	TU 5, Level 1	Organic	Large-Medium UID Mammal	Rib, Lower Middle	Organic	1	5.00			
44	TU 5, Level 1	Organic	Mammalia, Large-Medium UID Mammal	Rib, Lower Middle	Organic	2	5.70			
44	TU 5, Level 1	Organic	Mammalia, Large-Medium UID Mammal	Shaft Fragment, Miscellaneous.	Organic	1	1.70			
44	TU 5, Level 1	Organic	Mammalia, UID Mammal	Shaft Fragment, Miscellaneous.	Organic	3	0.60			
44	TU 5, Level 1	Architectural	Nail, round, wire	Common	Metal, ferrous	1				
44	TU 5, Level 1	Personal	Penny, wheat, 1950		Metal	1				
44	TU 5, Level 1	Hardware	Screw, flat head	Common	Metal, ferrous	1				
44	TU 5, Level 1	Hardware	Screw, Philips head	Common	Metal, ferrous	1				
44	TU 5, Level 1	Miscellaneous	Strap/band		Metal, ferrous	1				
44	TU 5, Level 1	Activities	Wire	Fragments	Metal, ferrous	2				
44	TU 5, Level 1	Activities	Wire, bucket handle		Metal, ferrous	1				
44	TU 5, Level 1	Activities	Wire, clothes pin		Metal, ferrous	1				
45	TU 6, Level 1	Domestic	Container, colorless	Body	Glass	1				
45	TU 6, Level 1	Domestic	Container, light aqua	Body	Glass	1				
45	TU 6, Level 1	Furnishing	Lamp, colorless		glass	1				
45	TU 6, Level 1	Organic	Mammalia, Large-Medium UID Mammal	Miscellaneous Fragment	Organic	1	8.80			
45	TU 6, Level 1	Organic	Mammalia, Large-Medium UID Mammal	Rib, Lower Middle	Organic	1	2.10			
45	TU 6, Level 1	Architectural	Nail, machine cut	Common	Metal, ferrous	1				
45	TU 6, Level 1	Personal	Penny, wheat, 1958	Complete	Metal	1		1958		
45	TU 6, Level 1	Miscellaneous	Wire	Unidentified	Metal, ferrous	1				
46	TU 7, Level 1	Organic	Aves, UID Bird	Shaft Fragment, Miscellaneous	Organic	1	2.90			

Appendix A. Historic Artifacts.

Lot	Context	Functional Group	Description	Type	Material	Count	Weight (g)	Date Range	Reference	Comment
46	TU 7, Level 1	Domestic	Bottle, green	Body	Glass	1				
46	TU 7, Level 1	Architectural	Brick, fragments	Fragments	Ceramic	2				
46	TU 7, Level 1	Domestic	Container, light green	Body	Glass	1				
46	TU 7, Level 1	Miscellaneous	Fabric, tape	Fabric	Textiles	1				
46	TU 7, Level 1	Architectural	Flat, aqua	Window	Glass	2				
46	TU 7, Level 1	Architectural	Flat, light green	Window	Glass	1				
46	TU 7, Level 1	Domestic	Ironstone spongeware, blue	Body	Ceramic	1				
46	TU 7, Level 1	Organic	Mammalia, Large UID Mammal	Rib, Lower Middle	Organic	5	38.30			
46	TU 7, Level 1	Organic	Mammalia, Large UID Mammal	Rib, Lower Middle	Organic	3	32.80			
46	TU 7, Level 1	Organic	Mammalia, Large UID Mammal	Vertebra, Miscellaneous. Body	Organic	2	5.20			
46	TU 7, Level 1	Organic	Mammalia, Large-Medium UID Mammal	Miscellaneous Fragment	Organic	5	5.40			
46	TU 7, Level 1	Organic	Mammalia, Medium-Small UID Mammal	Pelvis, Upper Hind	Organic	1	1.60			
46	TU 7, Level 1	Architectural	Nail, round, wire	Common	Metal, ferrous	1		1850s to present	Nelson 1968	
46	TU 7, Level 1	Architectural	Nail, round, wire	Tack	Metal, ferrous	1		1850s to present	Nelson 1968	
46	TU 7, Level 1	Architectural	Nail, round, wire	Roofing	Metal, ferrous	1		1850s to present	Nelson 1968	
46	TU 7, Level 1	Architectural	Nail, square, machine made	Common	Metal, ferrous	1		1830s to present	Nelson 1968	
46	TU 7, Level 1	Activities	Redware, terracotta, flowerpot	Body	Ceramic	1				
46	TU 7, Level 1	Miscellaneous	Strap, flat	Unidentified	Metal, ferrous	1				
46	TU 7, Level 1	Miscellaneous	Unidentified, colorless	Unidentified	Glass	1				
46	TU 7, Level 1	Organic	Vertebrata, UID Vertebrate	Miscellaneous Fragment	Organic	2	0.60			
46	TU 7, Level 1	Domestic	Whiteware, plain	Body	Ceramic	1				

APPENDIX B: PHASE II ADDITIONAL RESEARCH FOR OHIO SHPO

OHIO
HISTORY

May 10, 2007

Kimberly Courts-Brown
U.S. Army Corps of Engineers, Huntington District
Regulatory Branch
502 Eighth Street
Huntington, WV 25701-2070

Re: Columbus Regional Airport Authority Rental Car Facility
Columbus, Franklin County, Ohio

Dear Ms. Courts-Brown,

This is in response to correspondence from your office dated March 22, 2007 (received March 28) regarding the above referenced project. Information for our review of this project has also been provided by Joel Brown, EMH&T, dated January 16, 2007 (received January 17) transmitting the report titled "Phase I Cultural Resources Survey for the approximately 24.3 ha (60 a.) Potential Automobile Related Facility in the City of Columbus, Franklin County, Ohio" dated January 15, 2007. The comments of the Ohio Historic Preservation Office (OHPO) are submitted in accordance with provisions of the National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 [36 CFR 800]).

The project involves acquisition and development of an approximately 60 acre tract to provide support for expansion and development of the Port Columbus Airport. The National Register listed Elam Drake house is located within this tract. The archaeological survey included background review, pedestrian walk-over, and shovel testing. The results of the survey included the identification of 4 archaeological sties and 2 architectural properties: Archaeological sites 33-FR-1828, 33-FR-2639, 33-FR-2640, and 33-FR-2641; Architectural properties FRA-9622-12, and the Elam Drake house. The research design for the archaeological survey was reviewed by OHPO prior to the survey and we agree that the field work was sufficient for this project. Based on the information presented in the report we concur with your findings that the three archaeological sites 33-FR-1828, 33-FR-2640, and 33-FR-2641 do not meet National Register eligibility criteria and no further work at these three sites is warranted at this time. Based on the information presented for architectural property FRA-9622-12, we concur with your finding that this building doesn't meet National Register eligibility criteria. No further work is necessary at these four properties.

The Elam Drake house is listed in the National Register of Historic Places. The National Register listing includes the house and several buildings, and the spatial organization of the buildings. Given the nomination, it is our opinion that the National Register listing also includes the archaeological

OHIO HISTORICAL SOCIETY
Ohio Historic Preservation Office
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www.ohiohistory.org

artifacts within this parcel that are associated with this cluster of buildings. That is, it is our opinion that archaeological site 33-FR-2639 is an integral part of this National Register property. We recommend that additional testing at archaeological site 33-FR-2639 has a reasonable potential to add new and important information about the activities associated with the Elam Drake house during its span of occupation.

We concur with your finding that the proposed project will have an adverse effect on the Elam Drake house historic property. We recommend that you follow regulations at 36 CFR 800 to engage consultation to resolve the adverse effect. The consultation process should include initiating efforts to identify consulting parties and to provide information to the public. As we work through this consultation process it seems likely that we will reach a point where it is appropriate to begin considering the development of a Memorandum of Agreement with stipulations to provide appropriate treatment. We believe that it would be helpful to first establish a sound and solid foundation on which to develop this agreement.

Any questions concerning this matter should be addressed to David Snyder or Lisa Adkins at (614) 298-2000, between the hours of 8 am. to 5 pm. Thank you for your cooperation.

Sincerely,

David Snyder

David Snyder, Ph.D., RPA, Archaeology Reviews Manager
Resource Protection and Review

DMS/ds (OHPO Serial Number 1011876, 1010459)

xc: Ms. Stacy Heaton, Columbus Regional Airport Authority, 4600 International Gateway, Columbus, OH 43219
Joel Brown, EMH&T, 5500 New Albany Road, Columbus, OH 43054

APPENDIX C: GEOPHYSICAL REPORT

Magnetic Gradient and Ground-Penetrating Radar Survey Results from the Elam Drake Site (33FR2639), a 19th Century Farm and National Register Property in Franklin County, Ohio:

Jarrod Burks, Ph.D. 2017

Ohio Valley Archaeology, Inc.
4889 Sinclair Rd., Suite 210
Columbus, OH 43229
www.ovacltd.com

OVAI Contract Report 2017-34

OVAI Contract Report #2017-34

Magnetic Gradient and Ground-Penetrating Radar Survey Results from the Elam Drake Site (33FR2639), a 19th Century Farm and National Register Property in Franklin County, Ohio

by

Jarrod Burks, Ph.D.

Prepared for:

ASC Group, Inc.
800 Freeway Drive North, Suite 101
Columbus, OH 43229

Prepared by:

Ohio Valley Archaeology, Inc.
4889 Sinclair Rd., Suite 210
Columbus, Ohio 43229
(614) 436-6926

2017

Project Summary

On April 12th and 13th, 2017, Ohio Valley Archaeology, Inc. conducted magnetic gradient and ground-penetrating radar surveys at the Elam Drake Residence site in Columbus, Ohio on behalf of ASC Group, Inc. The project was completed as part of a Phase II site assessment. The magnetic survey covered the area between the house and brick barn/garage complex, as well as the open field behind the barn. Numerous magnetic anomalies were detected, including several with magnetic signatures consistent with those known for brick clamps/kilns. A subsequent radar survey covered the yard between the house and the barn and targeted the areas of the possible brick clamps/kilns found in the magnetic survey behind and next to the brick barn. In all, 17 anomalies of potential archaeological interest were identified in the geophysical surveys. Many of these are associated with various iterations of the gravel drives and parking lots that once led up to and surrounded the brick barn complex. A cluster of anomalies was found to the northeast of the brick barn, and this could be the site of several brick firing facilities, though the area may have been extensively graded. Another cluster of anomalies located west of the brick barn appears to be associated with a smaller outbuilding visible on a 1953 aerial photograph. However, given the evidence for extensive land modifications in the general area of the site's buildings (e.g., the pond and the grading necessary to create the gravel drives and parking areas in the 2000s), the archaeological record associated with the Elam Drake Residence could be compromised in many areas of the site.

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Introduction

On April 12th and 13th, 2017, Ohio Valley Archaeology, Inc. conducted geophysical surveys on the grounds surrounding the Elam Drake Residence (33FR2639), a mid-nineteenth to early twentieth century rural farmstead located in Columbus, Ohio, just west of Port Columbus International Airport, known as John Glenn Columbus International Airport. The airport is owned by the Columbus Regional Airport Authority (CRAA). The surveys, conducted with a magnetometer and a ground-penetrating radar, were meant to locate possible features related to the house and farm complex. They focused on the house's back yard and the area around and behind an extant brick barn (Figure 1). In addition to possibly locating features such as outbuilding foundations, privies, trash pits, and paths/drives, among other things, the possibility of encountering the remains of brick making facilities also was high given that the house and barn were both built with brick likely made on site or nearby. The surveys were done on behalf of ASC Group, Inc. as part of a Phase II site assessment ahead of planned development for the property.

The following report begins with a brief consideration of the project area, with an eye to considering things that might impact the results of the geophysical surveys, such as soils and relatively recent modifications to the site. A methods section then outlines the two kinds of geophysical survey techniques used for the project: ground-penetrating radar and magnetometry. Examples of common historic-era features detected by these instruments, including brick-making features, are provided. The presentation of the survey results follows, with descriptions of anomalies of potential archaeological interest. A final section summarizes the results. Gridded maps of the anomalies and geophysical data are provided in the appendices at the end of the report.

Project Area Background

The Elam Drake house and barn complex are located on relatively level, poorly drained ground. Two soil series are mapped in the survey area, Pewamo and Bennington. Pewamo soils are poorly drained, clayey soils formed into glacial till located on moraines, relict near-shore zones, and lake plains (USDA-NRCS 2016). Gleyed Bt horizons are common in Pewamo soils at the base of the Ap (plowzone) horizon or just below at about 33 cm below surface. The wet conditions common to gleyed soils result in an overall reduction in soil magnetic susceptibility, which results in magnetically quiet (i.e., low variability) background readings in magnetic gradient surveys. However, glacial till in central Ohio tends to contain other magnetic materials, such as rocks—some of which are boulder sized. These rocks are quite common in Franklin County, especially in the northern half where they have been detected in magnetic gradient surveys in large numbers (e.g., just south of Dublin). Several large boulders were observed on the surface at various places around the Elam Drake project area, so the chances are high of finding additional rocks in the magnetic data. The magnetic signatures of large rocks can look very similar to the magnetic signatures of prehistoric and historic pit features.

Bennington Series soils, the second soil series in the survey area, occur on the slightly higher ground around the house and north to the barns. Bennington soils are silt loams formed in loamy till and have notably less clay than neighboring Pewamo soils (USDA-NRCS 2007). Gleying is present in the upper Bt horizon, showing that these soils too are poorly drained. Thus,

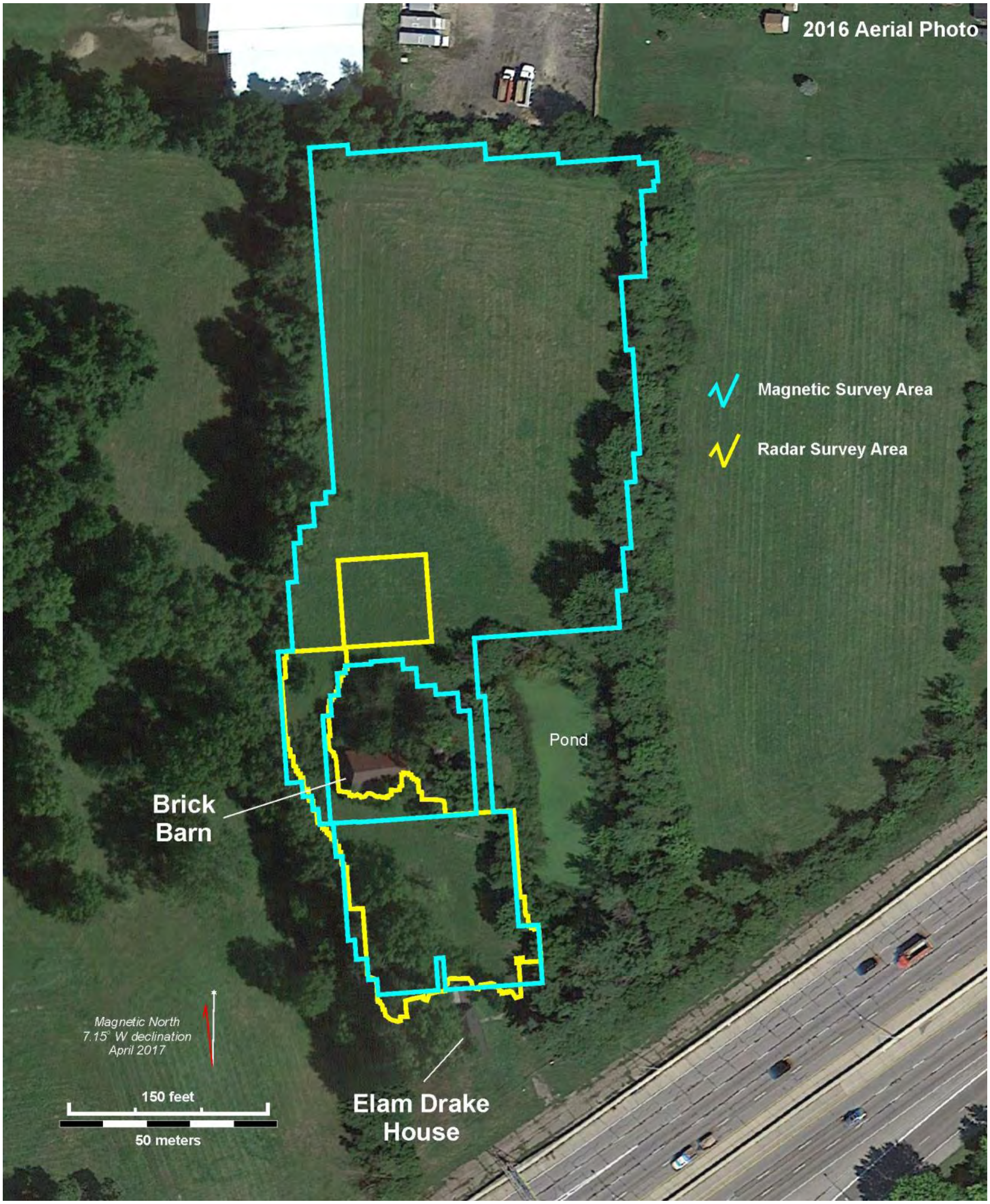

Figure 1. Map of the Elam Drake house area, showing the locations of the geophysical surveys.

the background magnetic variability of all soils in the survey area should be relatively low. Gravel-sized and larger rocks are present in Bennington soils, and these may be detectable in magnetic surveys. The lower amounts of clay in Bennington Soils should allow for better radar penetrating than in the more clayey Pewamo soil.

The Elam Drake house and its large brick barn were built in the 1850s and 1860s, reportedly with bricks made from clay excavated from somewhere on the 62-acre farm (see Elam Drake Residence National Register form 78002064). At that time it was not uncommon for the brick to be fired on site, as well. Given the size of the barn and house, and the fact that the two buildings were built over several construction episodes spanning a decade, the remains of more than one brick-firing facility could be present. However, Drake was also known to be an accomplished brick mason, no doubt with many ties to brick-making facilities around the area. While it is possible that the brick he used in his personal construction projects was made on the home property, he might also have acquired it from elsewhere.

Today the farm complex consists of a number of extant structures, including the house and large brick barn (with an addition off the northwest corner) that are visible in the Figure 1 aerial photograph. In addition to these, there is a smokehouse off the northwest corner of the house, an outhouse along the western fence line northwest of the smokehouse, and a cinderblock barn/garage east of the brick barn. The barn/garage is newer than the brick barn and is thought to have been built ca. 1950. Some of these structures are visible in the 1953 aerial photo shown in Figure 2. Also visible is a small outbuilding located to the west of the barn. Though no longer standing today, the concrete foundation of this structure is still present at the edge of the geophysical survey block and was observed extending into the brush west of the barn. Other than the disappearance of this small outbuilding, the layout of the house and outbuildings has changed little since the 1950s, though the portion of the property once in front of the house is now covered by Interstate 670.

A higher resolution image of the building complex from 2004 is shown in Figure 3. The arrangement of the buildings appears relatively unchanged. However, the ground around the buildings is notably different. By 2004, the barn complex was surrounded by a gravel parking lot for a former business that owned the property prior to the CRAA. And based on the size of the vehicles in the parking area behind the barn (two buses), this more recent gravel surface likely has a significant gravel base laid down after the topsoil was removed. What looks to be fresh soil to the north and east of the parking area is a berm that may be the topsoil that was removed to make way for the new gravel layer. Thus, much of the site midden from this area might now be located in that berm. The gravel parking lot and driveways from the 2004 aerial photograph are no longer visible at the surface in the 2016 aerial photograph from Figure 1, suggesting that vegetation has reclaimed the gravel surface. Nevertheless, buried gravel is quite distinctive in radar data, so the location and edges of the gravel from the 2004 aerial photo should be readily apparent in the radar data.

Another notable change since the 1950s is the addition of a pond located to the northeast of the house, and east of the 1953 gravel drive that goes by the house and to the barn/garage. This pond is located in a relatively low area of the property and its construction is unlikely to have impacted any features related to the building complex. However, the location of the fill removed to make the pond is unknown and if present in the geophysical survey area it could have buried important archaeological remains beyond the range of detection for the instruments used in the survey.

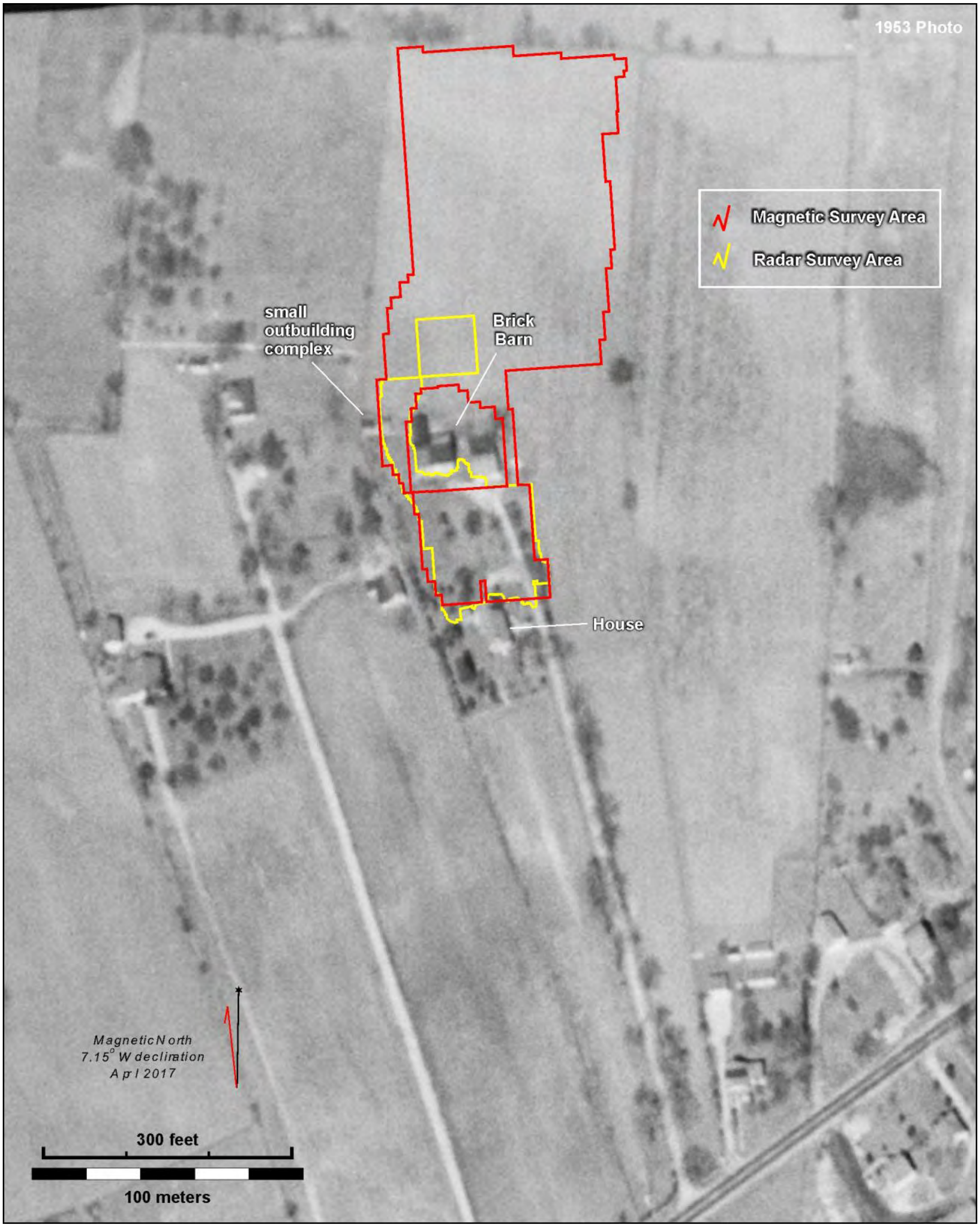

Figure 2. Historic aerial showing the Elam Drake House in 1953.

Figure 3. Aerial photograph from 2004, when the property was being used as a parking lot.

Geophysical Survey Methods

Geophysical survey instruments are commonly used around the world by archaeologists to find buried features such as building foundations, graves, storage pits, roads, fire hearths, and myriad other things left behind by the past occupants of a site. Most things of archaeological interest are no more than a few feet below the surface. At these depths, the instruments detect archaeological features by measuring the often subtle geophysical differences between the feature, its fill, and the surrounding soil, including for example differences in electrical conductivity, electrical resistance, and magnetism (e.g., Bevan 1998; Clark 2000; Conyers 2004, 2012; Gaffney and Gater 2003; Heimmer and DeVore 1995; Lowrie 1997; Weymouth 1986). Certain types of *objects* can also be detected with regularity.

Geophysical instruments are designed to measure a specific range of properties in the medium being tested, and some of these properties, like magnetism and electrical resistance, vary almost totally independent of one another. This means that when looking for buried things that are subtle and difficult to detect, it is worth using multiple instruments when possible. Not only is it difficult and sometimes impossible to predict which instrument will yield the best results, but the results of one instrument can be used to evaluate or inform the results of another. For example, a large magnetic anomaly can be shown to be associated with a large rock/boulder using radar data. Therefore, having at least two different kinds of geophysical data can greatly improve the success of a survey.

Two kinds of geophysical survey instrument were used in the Elam Drake site survey: a magnetometer and a ground-penetrating radar (Figure 4). The magnetometer, a Foerster Ferex 4.032 DLG 4-probe fluxgate gradiometer cart system, was used to cover the area around and behind the barn/garage complex, as well as the ground between the house and the barn/garage. A Sensors & Software Noggin 500 (MHz) ground-penetrating radar was used to survey a smaller area focused on the back yard of the house and two locations near the barn where the magnetometer detected large anomalies of potential interest. Geophysical surveys are typically conducted by using the instruments to take numerous readings along parallel lines (a.k.a. transects) in rectilinear blocks. Data points are recorded at timed intervals, or based on distance, as the instruments are moved along transects in each block. Blocks measuring 40x40 meters were used for the cart-based magnetometer, while the radar data were collected within 20x20 m and 20x40 meter blocks.

Generally, the data collected by geophysical survey instruments must be transferred to a computer where special software is used to process the data and make maps of the survey results. In these maps the data values are assigned a range of colors related to their amplitude. In areas with little change in the readings, the colors are all similar—think of these areas as the typical background signature of the site. Areas in the data with unusual values that differ from the background are referred to as *anomalies*. Of course, the real challenge is knowing which anomalies are important and which are caused by tree roots, animal burrows, and other things not significant to the goals of the project.

For the geophysical survey work at the Elam Drake site, there were two main survey objectives. One, locate possible historic-era features commonly found in house and barn lots, such as privies, cisterns, wells, refuse pits/deposits, old fence lines, and paths/drives. And two, identify possible anomalies related to brick production, especially brick-firing features. With these in mind, it is worth first considering how magnetometers and radar systems work, and what they find, before examining the results of the surveys.

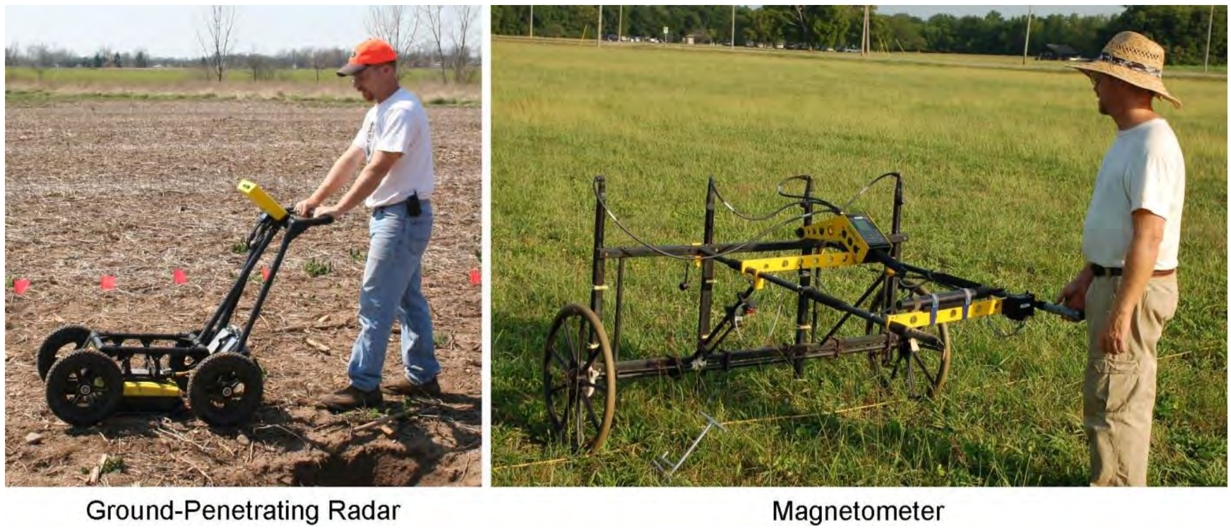

Figure 4. Geophysical survey instruments used during the survey.

Ground-Penetrating Radar Survey

Ground-penetrating radar (GPR) systems work in archaeology by moving a radar antenna along the ground as it transmits thousands of pulses of radar energy per second (Figure 5). As these waves of energy travel into the ground and encounter things, especially those things with distinctly different electrical properties, some of the energy is reflected back to the surface and received by the antenna (Conyers 2004, 2012; Gaffney and Gater 2003; Witten 2006). The instrument records how strong the reflections are and how long it took the energy to travel away from and back to the antenna. This radar travel time can be used to calculate the depth of a detected object or feature.

Many things below ground can cause strong and weak radar reflections, including tree roots, pipes, larger rocks/bedrock, distinct layers (especially gravel), building foundations, shaft-type features (e.g., graves, wells, cisterns, and privies), and disturbances to the natural soil layers. Radar energy can also penetrate asphalt, concrete, and gravel. In fact, concrete and asphalt are excellent materials on which to survey because they are very good at allowing the radar energy to pass into the ground. Other materials, especially clayey, moist soils, tend to absorb radar energy and do not allow it to pass. Sometimes this aids in detecting features; other times it limits feature detection and depth of penetration (Weaver 2006). At the extreme, radar energy cannot penetrate metals; therefore, metal pipes and other large metal objects are easily detected, but they can obscure things below them. Standing water at the surface can produce a similar effect as metal. Ultimately, the depth of the radar signal penetration, and the depth to which objects can be detected, depends on the frequency of the antenna being used and the conductivity of the ground. Higher frequency antennas (e.g., 1000 MHz) can detect small things (e.g., individual rocks in gravel) but only at shallow depths, while lower frequency antennas (e.g., 50 MHz) can penetrate into the ground much deeper but can only detect larger things (e.g., deeply buried tunnels). The frequency of the antenna, however, can be irrelevant if the ground is so conductive that all of the radar energy is absorbed (i.e., attenuated) before it can make its way back to the surface.

The Noggin Plus 500 MHz radar system used for the Elam Drake survey is a mid-range frequency system that is ideally suited to most archaeological applications. During the survey, forty traces were collected per meter (essentially, a “reading” [a.k.a. trace] taken every 2.5 cm) along transects spaced 50 cm apart. A 40 nanosecond time window was used to “listen” for return reflections from each pulse.

Each radar trace is a very narrow profile of the ground. When many of these traces are collected along a line and are then put together side by side they form a radargram, or radar profile (Figure 6). These radargrams are the nuts and bolts of a radar survey; they show the location, shape, and strength of the reflections detected by the radar. However, it can be very hard to interpret what has been found based on the radargrams alone, and some things of archaeological interest simply are not evident in profile.

Figure 6 is a radar profile showing two commonly detected historic-era feature types, a cistern and a building foundation (indicated as “Kitchen Wall”)—both of which date to the nineteenth century. Gray areas in the radargram indicate few to no reflections, the distinct black and white areas are strong reflections caused by something in the ground. Note how the two walls of the cistern create strong reflections near the ground surface, indicating that these are likely rock or brick walls. The sediment fill inside the top of the cistern is not much different than the surrounding soil and therefore is not evident, but deeper down into the cistern the fill has produced some strong radar reflections indicating that the type of fill or its moisture content changes with depth. The time it took for the radar reflections to go down and come back to the antenna is indicated on the right site of the radargram in nanoseconds. This has been converted to an estimated depth on the left side of the radargram. Time is converted to depth using the shapes of the hyperbolas (the upside-down, V-shaped anomalies in the radargram) to estimate the velocity of the radar energy as it goes through the ground.

When multiple radar profiles are collected side by side during a gridded survey, the profiles can be transformed into horizontal slice maps, allowing us to create a plan map of the site features, at least as the radar “sees” them. Radargrams are turned into three-dimensional blocks of data by arranging them side by side and having computer software fill in the gaps by estimating (i.e., interpolating) what should be in between the radargrams. The resulting 3D block of data can then be “sliced” horizontally and looked at from the top rather than the side—making it seem as if one is excavating down through the data, and the site, one layer at a time (Figure 7). These horizontal data slices are called “time slices” or “amplitude slices” and they show a horizontal map of radar reflection strength at a desired depth (Goodman et al. 1995). Strong reflections in the Figure 7 slice are red; areas with weaker reflections are violet or blue. The thickness of the slice can be adjusted to any desired setting, though slices 2-15 cm thick usually work the best on archaeology sites in the Midwest. In areas with lots of clutter, that is, reflections from things that are not of interest to the survey outcome such as rocks, building demolition rubble, and small animal burrows, a thicker slice may be able to better show the archaeological targets of interest—especially if they create reflections across a range of depths.

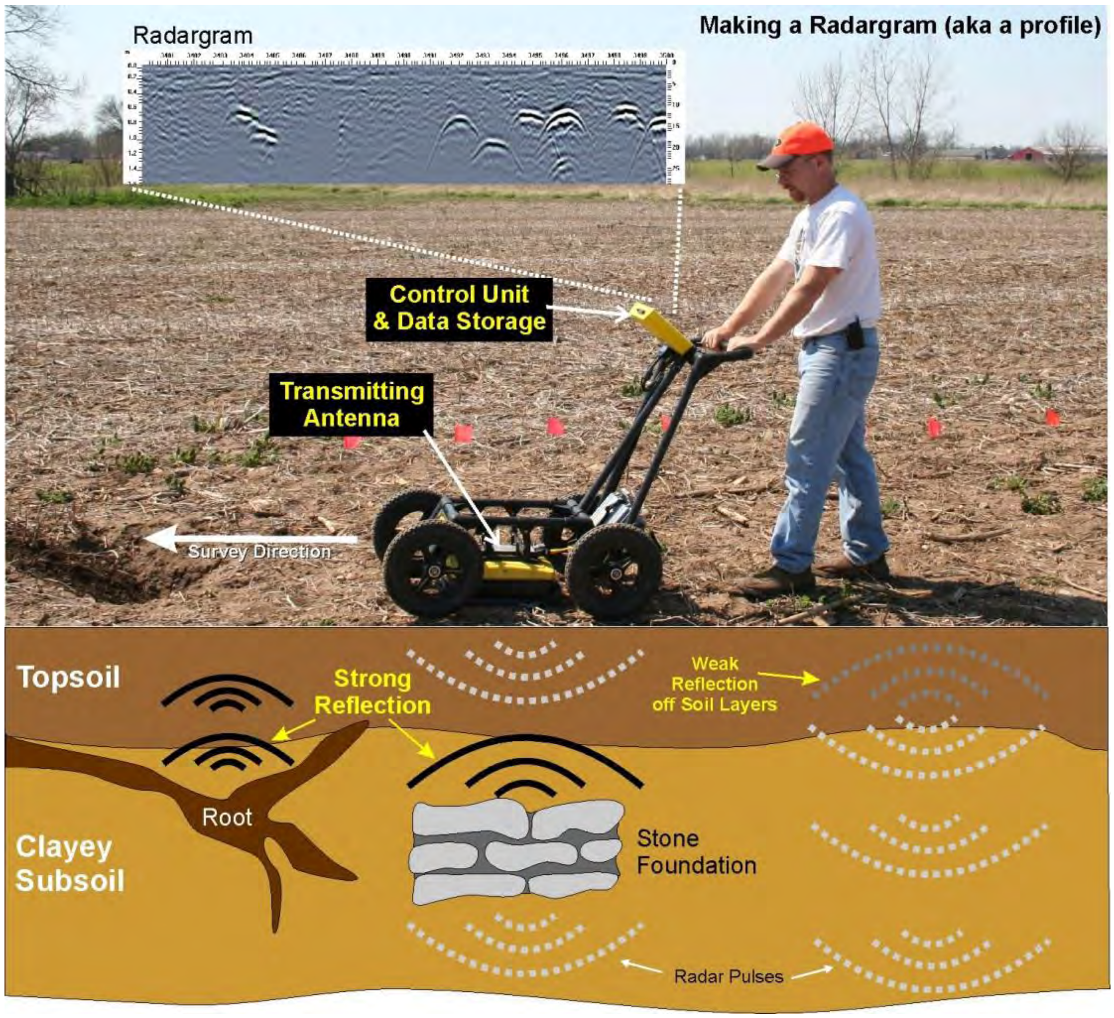

Figure 5. Graphic showing the Noggin 500 radar system in action creating a radargram.

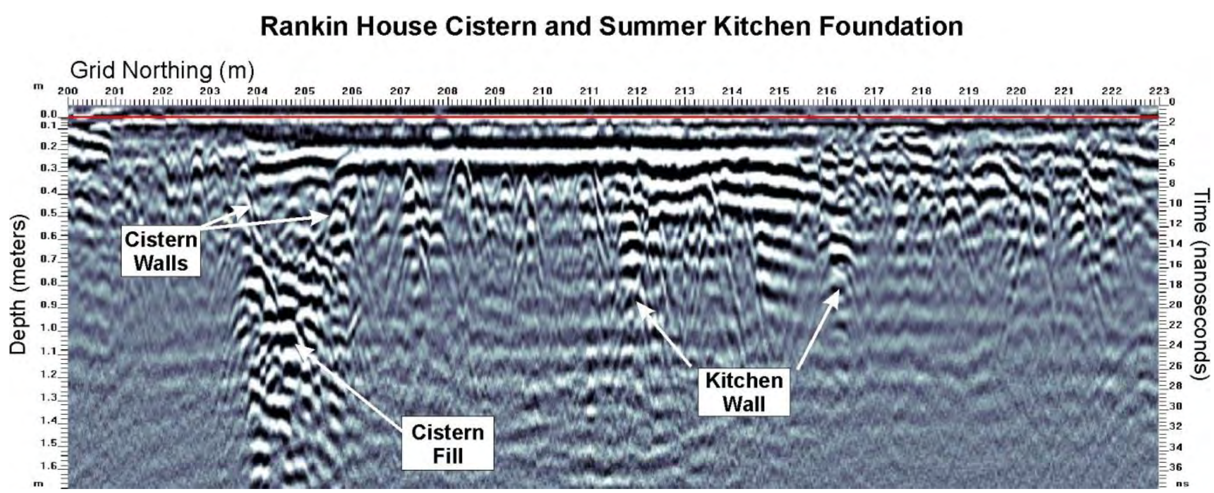

Figure 6. Example of a radargram containing historic-era archaeological features.

Because there are nearly an infinite number of ways to slice and display radar data, it can be quite difficult to show all of the important radar features from a survey area in one slice map. Often, radar data are shown as a series of side-by-side amplitude slices at varying depths. Each of the chosen slices shows a bit more of the radar reflection variability with depth. If one knows the velocity of the radar energy as it travels through the ground, then the actual depth of each slice can be estimated. When examining the Elam Drake radar data, a variety of slice thicknesses were tried in an effort to find the best thickness for imaging possible archaeological features, and in the end 5 cm-thick slices were found to work the best. Once the slices were produced (all data were processed in Ekko_Mapper 4 using a variety of processes, such as dewow, migration, enveloping, and background subtraction), they were exported to a software package called Surfer and then they were pulled into CorelDraw where they were layered into the site map with other site information.

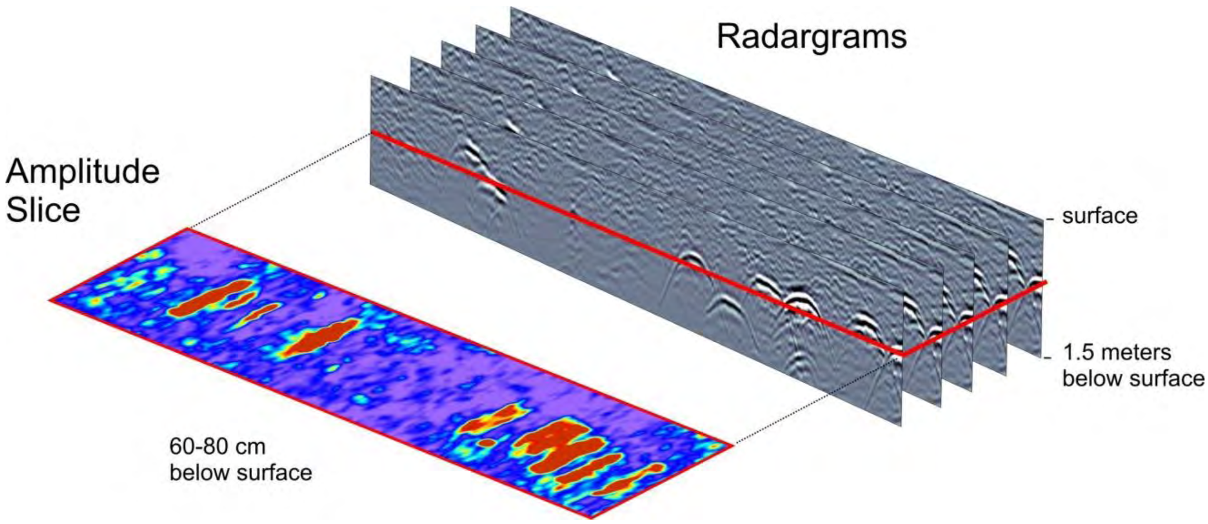

Figure 7. Creating amplitude slices from radargrams.

Interpreting Ground-Penetrating Radar Results

Radar data tend to be full of unusual, or anomalous, readings. Picking anomalies of interest in this mass of clutter is usually straightforward if one is attempting to identify foundations, cellars, and other large features that appear in the amplitude slice maps. Such features usually produce rectilinear anomalies that look like the shape of the foundation or cellar. Linear features such as utility lines or trenches, paths, walkways are also fairly easy to spot. More difficult to identify are shaft-type features, including wells, cisterns, and privies. With shaft-type features it is especially important to examine the radargrams, as well as the amplitude slice maps, for evidence of cultural features because shaft-type features are sometimes not evident in amplitude slice maps. This is especially the case with privies, which often lack architectural stone or brick and thus are hard to detect in radar surveys. Smaller features, such as foundation piers, are also sometimes only recognized in the radargrams. Therefore, every radargram was examined in the Elam Drake data for small and distinctive reflections, as well as looking for features in the slice maps.

Many examples of radar surveys around nineteenth century and later houses in Ohio have been documented. For example, Figure 8 includes two radar amplitude slice maps from the yard surrounding the John Rankin house in Ripley, Ohio. This brick house was built in the 1820s and was occupied into the twentieth century; today it is a house museum owned by the Ohio History Connection. In the shallow slice map (Figure 8, top) we can see a number of areas with strong radar reflections (the darker areas in the data), including a foundation from an addition off the right side of the house. Utility lines of various sorts are also visible. In the deeper slice (Figure 8, bottom) the reflections lighten up as the radar data extend below the tree roots and other soil-related anomalies. The tops of two shaft-type features become evident, as well as the foundation of a summer kitchen off the back corner of the house. Strong reflections within the summer kitchen foundation could be related to a small pit cellar once beneath the kitchen. The radar data from the Rankin house very clearly show these historic-era features. In fact, one could make relatively accurate, though preliminary, measurements of these features straight from the radar data.

Brick firing facilities are another type of archaeological feature sometimes encountered near houses, and there could be one or more of these around the Elam Drake house and barn. Their visibility in radar data varies and depends on the size of the kiln. Small brick clamps used to fire bricks for houses might look like large rocks in amplitude slice maps (Figure 9, top). But in profile, the base of a brick clamp found in a Pickaway County farm field looks more like the radar signature of a building floor. This clamp had been truncated by plowing and had few intact bricks remaining, but it was still quite distinctive in the radar data. Larger brick production facilities, such as the domed kilns used at the Nelsonville [Ohio] Brick Factory are very distinctive in radar data. These large, circular kilns are attached to external chimneys via a tunnel. The bases of several kilns, their tunnels, and the foundation of a chimney are all readily visible in the amplitude slice map in Figure 9. In profile these features are easy to pick out but they do not stand out from other features in the radargrams because of their large size—distinctive radar anomalies are seemingly everywhere in the Nelsonville radargrams. Thus, looking at slice maps as well as radargrams is just as important for large and distinctive features like brick kilns and clamps as it is for subtle shaft-type features such as privies.

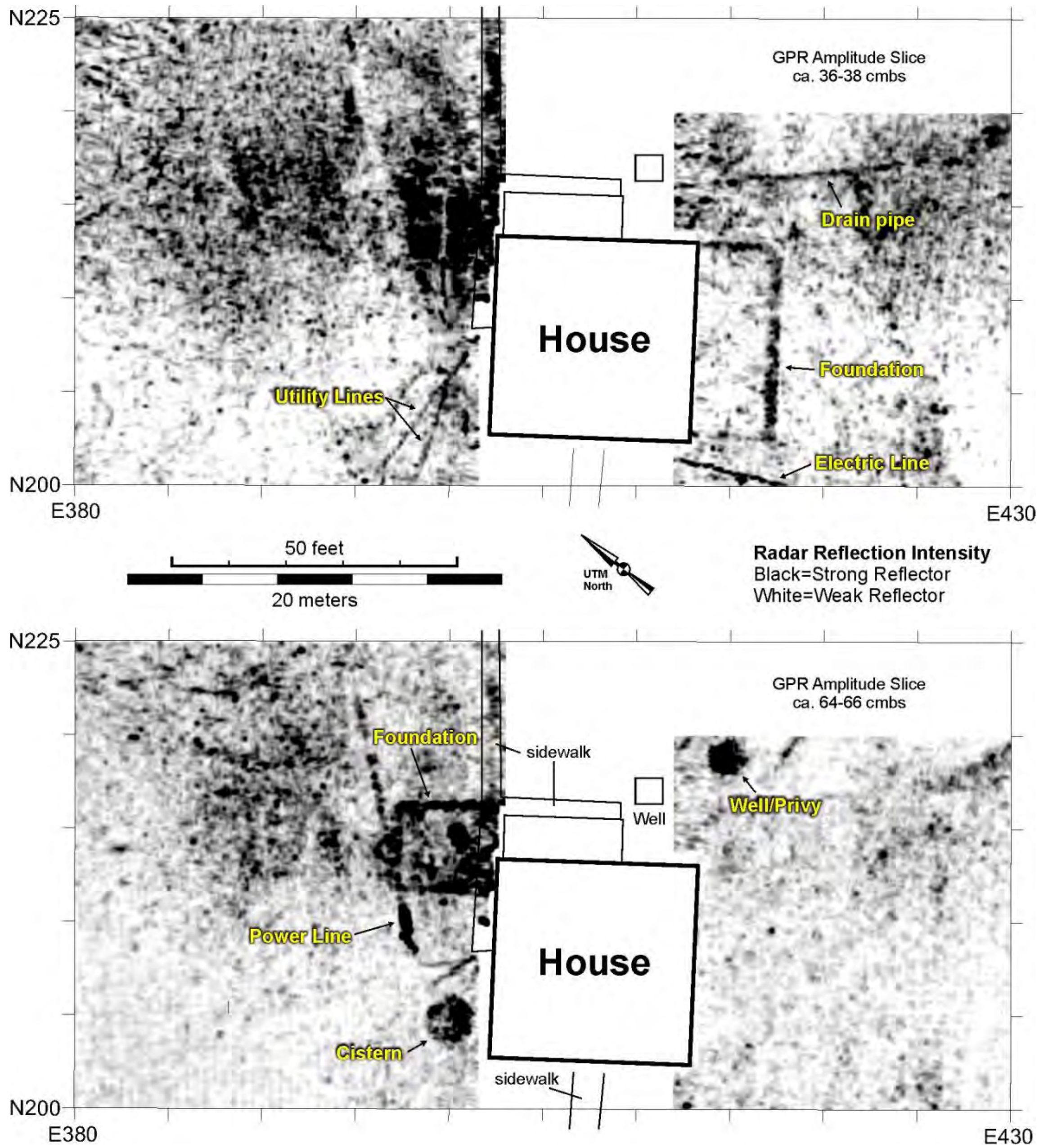

Figure 8. Example of historic-era features detected in radar amplitude slice maps from around a nineteenth century farmstead (Burks 2006).

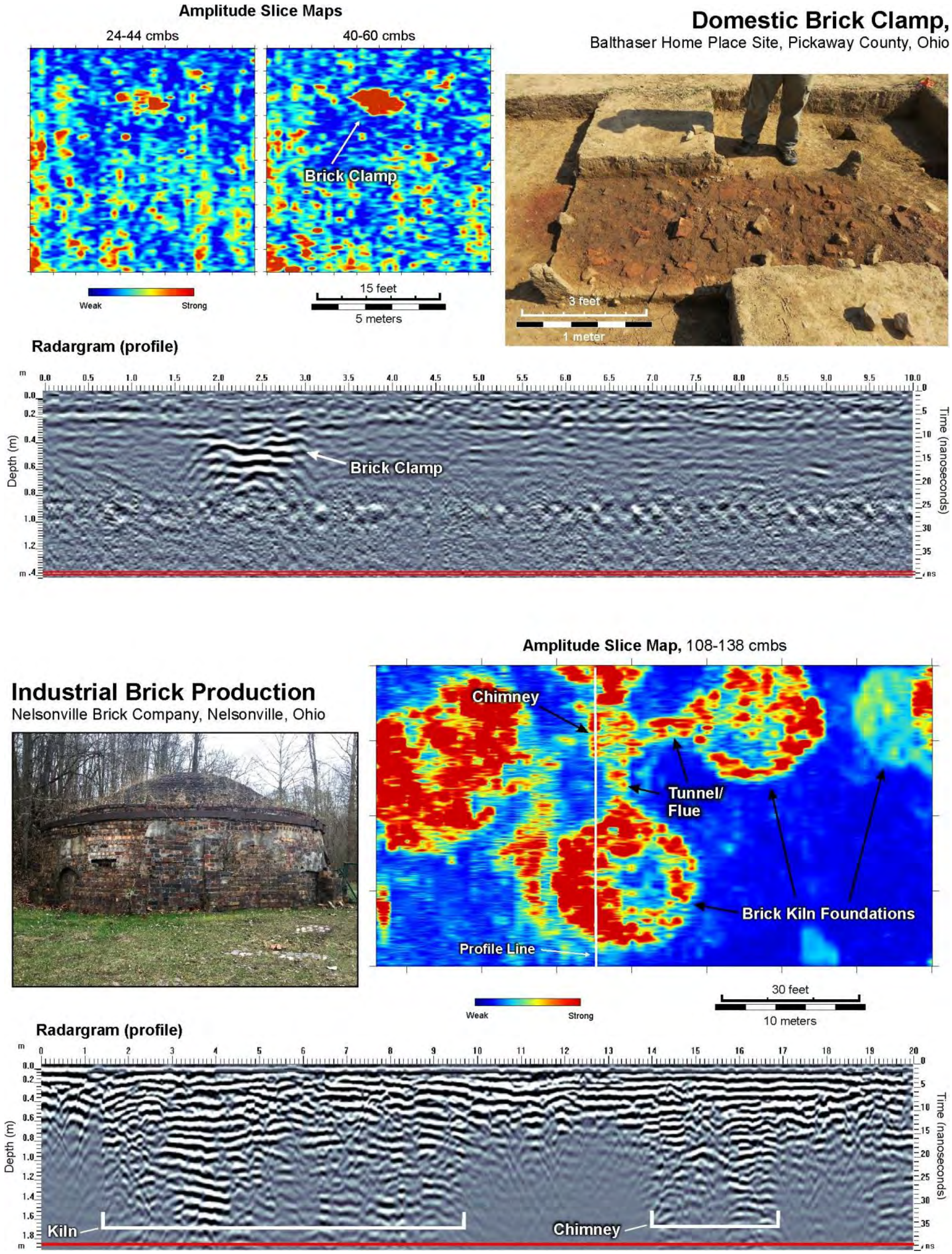

Figure 9. Examples of brick-making thermal features from Nelsonville Brick Company (industrial scale production) and a nineteenth century residential brick clamp in Pickaway County (Balthaser Home Place site).

Magnetic Gradient Survey

Magnetometers are very sensitive to ferromagnetic materials, that is, materials such as artifacts, rocks, and sediments that contain iron. In addition to a magnetometer's ability to sense iron objects, they also can detect changes in the soil related to iron oxides—especially variability in the thickness of topsoil or archaeological midden (the refuse that tends to build up at locations where people live). Areas with enhanced magnetic susceptibility caused by the presence of archaeological midden can appear in magnetic gradient data as areas of higher background variability and strongly magnetic plow marks.

Magnetometers react to two kinds of magnetization in archaeological sediments: thermoremanent magnetization and magnetic susceptibility (Aspinall et al. 2008; Clark 2000; Gaffney and Gater 2003). When sediments and some kinds of rocks are heated above a certain temperature, known as the ferromagnetic Curie temperature (ca. 500-700^{o}C; Lowrie 1997), they can become permanently magnetized—what is known as *thermoremanent*, or permanent, *magnetization*. Campfires and trash burning can produce more than enough heat to reach the Curie point. Upon cooling, magnetic iron oxides in the soil around or under the fire, such as magnetite and hematite, recrystalize and are fixed with a common orientation toward magnetic north. Intense heating can make an otherwise magnetically neutral (i.e., random) patch of ground highly magnetic by transforming less magnetic iron oxides (e.g., hematite) into a more magnetic iron oxide (e.g., magnetite and maghemite), and by producing magnetic ash (Linford and Canti 2001). Even sediments that have been disturbed and redeposited, such as by sweeping, raking, plowing, or other kinds of earth moving, can maintain at least some of their permanent magnetization, which is not reset until the sediments are once again heated up to a point above the Curie temperature. Objects and sediments that are permanently magnetic do not require the presence of an outside magnetic field to be detectable, unlike those materials that are magnetic because of their magnetic susceptibility.

Soils and ferromagnetic substances that have high *magnetic susceptibility* react when they are in the presence of a magnetic field. On archaeological sites it is the earth's own magnetic field that causes these magnetic reactions. Certain soil horizons and components of soil, such as organic rich topsoil (A horizon), are generally more susceptible to magnetic fields than other soil horizons (Le Borgne 1955, 1960), such as Bt (i.e., subsoil) horizons. This can be a very useful principle on many kinds of archaeology sites, where the most common kind of archaeological feature is the pit feature—a hole dug into the ground that has been filled with topsoil and/or site midden and refuse. If a hole dug a few feet into the ground is backfilled with mixed up sediments, the backfilled hole will likely have a different magnetic susceptibility than the surrounding, intact soils—especially if the hole is entirely filled with topsoil. Furthermore, human occupation of an area is known to enhance a soil's magnetic susceptibility (Dalan and Banerjee 1998; Tite and Mullins 1971). Pits filled with this magnetically enhanced soil generally are detectable on magnetic surveys. While the mechanisms behind soil susceptibility enhancement are complex and not totally understood, bacteria that use and produce small magnetic particles are known to contribute to the process (Fassbinder et al. 1990), as well as burning and the amount of certain iron oxides present in the soil (Evans and Heller 2003; Graham 1974; von Frese 1984).

Like most magnetometers, the Foerster Ferex fluxgate gradiometers used for the Elam Drake survey are passive instruments (i.e., they do not create a magnetic field), and they simultaneously detect both kinds of magnetism, remanent magnetism and magnetic susceptibility. They cannot differentiate the two. Each of the Ferex's four gradiometers consists of two fluxgate sensors spaced 65 cm apart, one atop the other. Thus, they measure the localized change in the vertical component of the magnetic field as it exists between the two sensors while the instrument is pushed back and forth across the survey area (Figure 10). The uppermost detector in each gradiometer senses (along one axis) the earth's background magnetic field, which in the Midwest U.S. region measures approximately 50,000-55,000 nanotesla (nT) and can vary in one day as much as a few hundred nanotesla from morning to evening (Breiner 1973). The lower detector senses the earth's background magnetic field (along one axis) *and* changes in it caused by objects or soils on the surface or as much as about two to three feet beneath (or above) the surface. Even deeper features and soils can be detected if their magnetic fields are strong enough to affect the earth's magnetic field as far away as the magnetometer's bottom sensors as the magnetometer cart moves over the feature.

Fired earth in prehistoric hearths and organic-rich soil in buried pits or ditches tend to concentrate the earth's magnetic field in measurable amounts of approximately 2-30 nT, while large iron objects or brick-filled features can measure in the hundreds or thousands of nanoteslas. Sandy soils or deep, highly organic soils can reduce the range of more subtle features to 1.5-5 nT. And this magnetic variability is not always linked to changes in soil color that are readily identifiable during excavation.

As the magnetometer cart is moved back and forth along the survey transects, the instrument's datalogger records the magnetic readings for the top and bottom detector on a timed interval, and onboard electronics subtract the reading of the top detectors (earth's varying background magnetism) from the reading of the bottom detectors (earth's varying background magnetism plus local magnetic variability), leaving—in principle—the local magnetic gradient or difference caused by surface and buried phenomena[1]. These numbers are then stored in the instrument until a data dump is performed. It is this localized difference that allows us to detect buried archaeological features.

The data were transferred from the Foerster Ferex's datalogger to a laptop computer using Foerster's Ferex Dataline (v. 3.404) software. Small spatial adjustments were made to the data in Dataline to correct for zig-zag error (what Foerster refers to as "slippage" in their Ferex manual) and in some cases a single-track "automatic compensation" was performed to remove striping from line to line. The data were then exported as xyz files, regridded in Surfer, rotated, and imported into Geoscan Research's Geoplot (ver. 3.00s) software for further data processing and to assemble the 40 m x 40 m survey blocks into a composite of the entire survey area. Magnetic data processing involves applying mathematical algorithms to the data in an effort to reduce background noise and accentuate the potential, buried archaeological phenomena. Three processing algorithms were used in Geoplot to prepare the magnetic gradient datasets for presentation and analysis: zero mean traverse, interpolation, and low pass filter.

After processing, the data were exported from Geoplot and pulled into Surfer 10.0, where a color scale and grid were added. The surfer images were then copied into CorelDRAW for integration with the site map, interpretation, and final image production. Data processing is necessary to prepare the data for interpretation and visualization; however, excessive processing can also produce false data anomalies. Care was taken to avoid creating false anomalies.

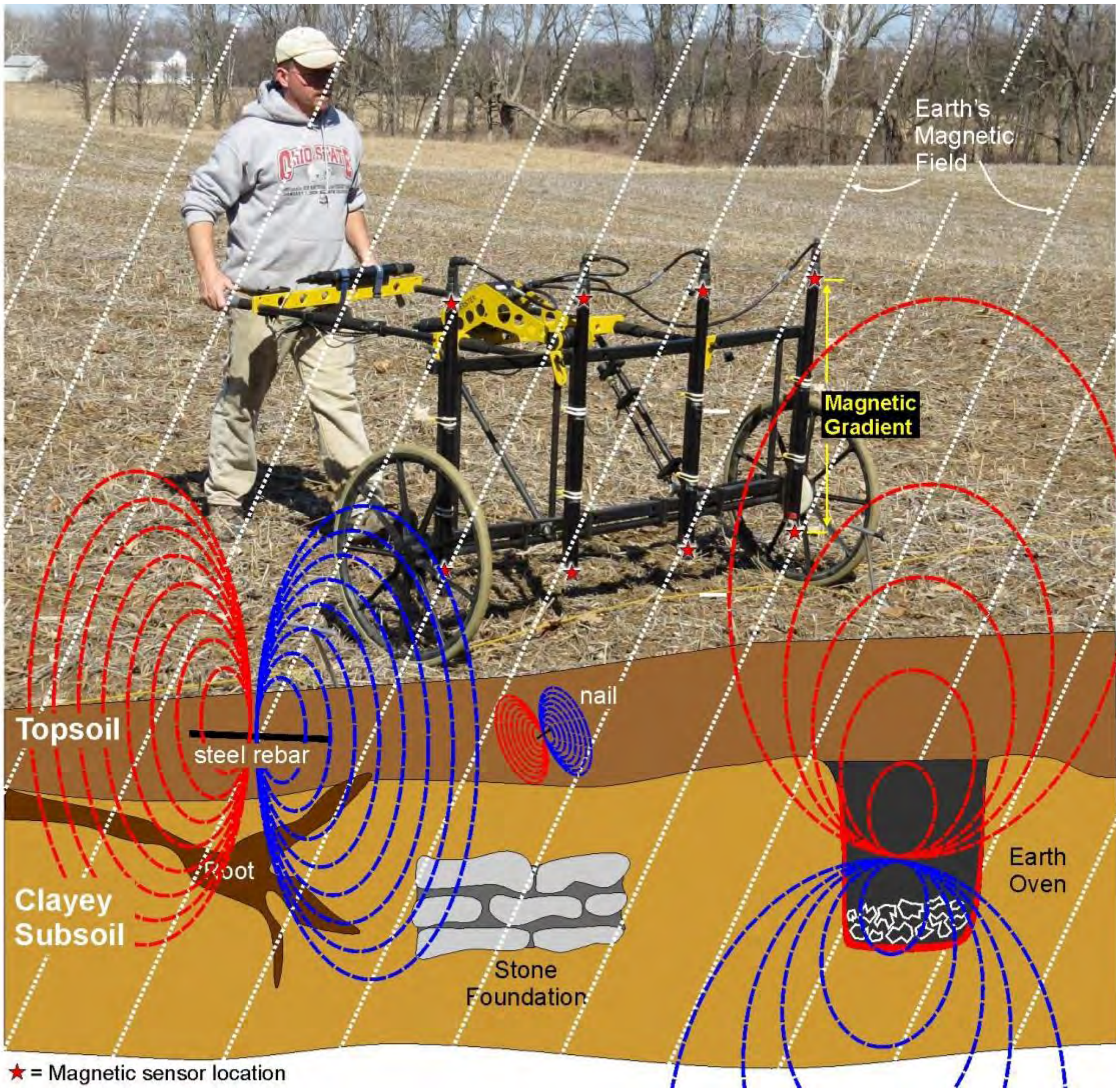

Figure 10. Graphic demonstrating magnetic fields and a magnetometer array moving through them.

Interpreting Magnetic Gradient Results

There is a certain knack to interpreting magnetic gradient data at archaeology sites; general rules of thumb vary between historic-era and prehistoric sites, and across sites with differing soils. Historic sites are usually covered in iron objects that are very magnetic and the signatures of these objects can dominate a dataset, obscuring the locations of important archaeological features. At prehistoric sites, archaeological features can be subtle in magnetic data, and they often look similar to the magnetic anomalies created by rocks, animal burrows, and variations in the thickness of the A horizon/plow zone. Thus, it is important to apply a consistent approach when interpreting magnetic data, but it should be one that is flexible and inquisitive because every survey can produce unanticipated results that do not fit our expectations.

In most magnetic gradient data there are five kinds of potentially significant magnetic anomalies that occur on archaeology sites: Monopolar Positive, Dipolar Simple, Dipolar Complex, Multi-Monopolar Positive, and Monopolar Positive/Dipolar Simple[2]. Figure 11 illustrates a selection of these anomaly types. It can be useful to classify a site's anomalies as this is one way to locate archaeological features of interest, especially on ancient Native American sites. The shape, size, intensity, and polarity (positive or negative) of magnetic anomalies is determined by the characteristics of the anomaly's source (or target), including the target's (object or archaeological feature) shape, material composition, mass, orientation, and depth. An object or feature's anomaly shape can also be affected by the magnetic signatures of nearby objects and features. And of course, anomaly shape and intensity is influenced by where on the planet (especially latitude) the survey was conducted, which determines the inclination of the earth's magnetic field: approximately horizontal at the equator and vertical at the poles.

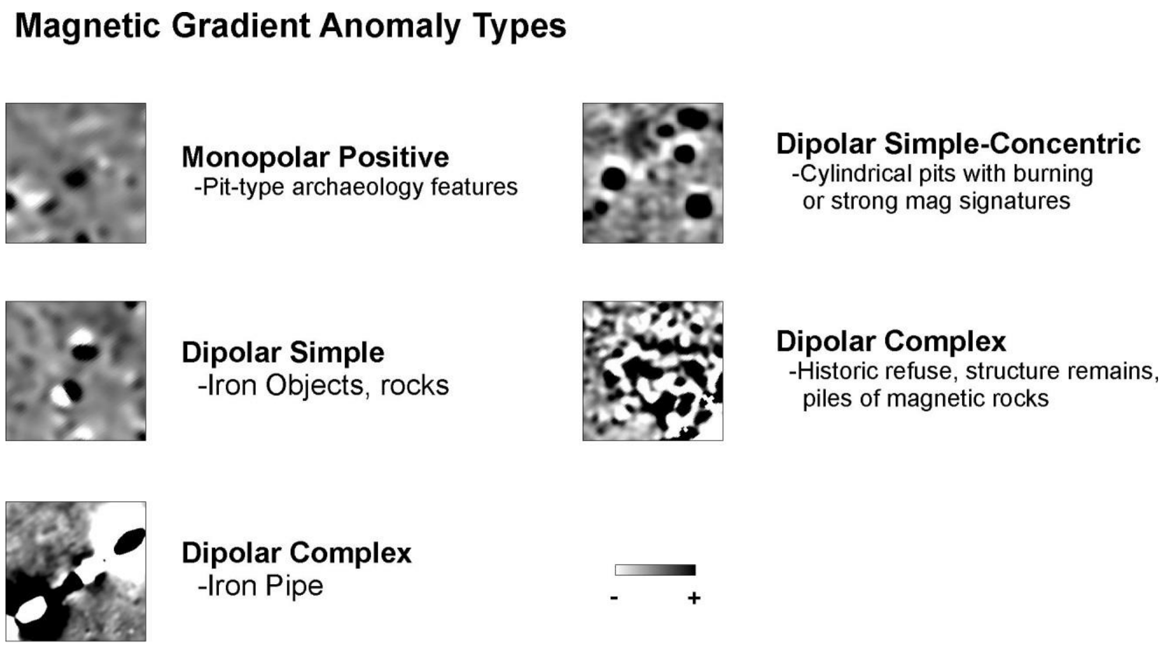

Figure 11. A selection of magnetic gradient anomaly types used in the data analysis (monopolar positive type not shown).

Most targets of interest, such as pit features, hearths, wells, foundations, cellars, and the like, produce fairly consistent kinds of magnetic anomalies that are comparable all across the U.S. and at similar latitudes around the globe where soils are formed into alluvium, glacial tills, and even eolian deposits. For example, in vertical gradiometer data like that collected at Elam Drake, precontact Native American pit features are almost always weakly magnetic (3–30 nT), positive monopolar anomalies, unless they are filled with highly magnetic rocks. As a type of pit feature, historic cisterns, wells, and privies can also appear as somewhat stronger, positive monopolar anomalies. However, historic pits frequently contain large amounts (high mass) of highly magnetic materials, such as bricks and iron objects. If these materials are numerous or are large in size, they can make the historic pit's magnetic signature look like that of a large bar magnet with north and south poles (i.e., dipolar). Given these consistencies between magnetic anomalies and their sources, the five anomaly classes used in this report serve to describe and summarize the magnetic survey results as well as provide an estimate for the kinds of targets found. The following descriptions help define these anomaly classes.

Monopolar Positive (MP)- Anomalies in this class are localized, positive peaks in the magnetic gradient signature of the site. They appear as isolated dark gray to black areas in grayscale data displays (Figure 11). Typically, these anomalies are created by localized areas of soil with increased magnetic susceptibility (e.g., pit features, large tree root casts, or somewhat burned surfaces). However, it is not uncommon for weakly magnetic or deeply buried objects with a dipolar magnetic signature (e.g., an iron object or a large magnetic rock) to be detected as positive or negative monopolar anomalies. If one of the poles of a dipolar anomaly is close to the surface (and close to the magnetometer) and the opposite pole is too far away to be detected (because it is too deep underground, for example), then objects that typically produce distinctive dipolar anomalies (iron objects) can be mistaken for those that typically produce monopolar anomalies (pit features). Positive monopolar targets of interest, such as pit features, can produce peak intensities ranging from 1 nT to 200 nT, though only historic period features tend to be greater than 40 nT in intensity (unless highly magnetic rocks are present). Not all pit features, prehistoric or historic, produce positive monopolar anomalies. In fact, a small percentage of pit features can produce dipolar simple and dipolar complex anomalies, especially when intensely burned, *in situ* sediments and rocks are present within the feature. Thus, prehistoric earth ovens and hearths are sometimes dipolar anomalies. Historic-era pits filled with large iron objects will also likely be dipolar.

Dipolar Simple (DS)- Dipolar anomalies are characterized by negative and positive peaks that are immediately adjacent to one another, making distinctive black and white anomalies in magnetic data (Figure 11). A simple dipolar anomaly has only one positive and one negative peak. These peaks can be similar in size and intensity (e.g., +6/-5 nT) or highly asymmetrical (e.g., +57/-4 nT). Iron objects and magnetic rocks are the most common sources of dipolar anomalies on archaeology sites. In general, the larger (greater mass) the iron object, the more magnetic intensity (i.e., higher highs and lower lows) it will have and the more area its magnetic signature/influence will affect. For example, most nails, while highly magnetic, are so small that when buried in the plow zone or just below the surface they are difficult to detect with a gradiometer during a typical survey, unless there are many nails bunched together or the instrument is held very close to the ground. Conversely, a foot-long piece of half-inch-diameter iron rebar pounded down into the ground vertically (like a datum) is exceptionally magnetic and can be detected (as a large positive area surrounded by negative, or vice versa) from 2-3 meters away (i.e., making an anomaly 4-6 meters across). The rusted off bottoms of steel fence posts look very similar to this, only larger if they are still buried in the ground vertically. Steel well casings left in the ground are even more magnetic, and they can be detected from over ten meters away even though the steel pipe is not visible at the surface. Exceptionally magnetic prehistoric features, such as hearths and intact earth ovens, can also produce dipolar simple anomalies. Frequently, the magnetic signature of these burned prehistoric features appears as an area of strong positive values (up to 35-40 nT) surrounded by a weak negative ring—much like the signature of a bar magnet buried in the ground vertically. These are here referred to as Dipolar Simple-Concentric type anomalies (see Figure 11 for an example). However, the positive and negative components of the signature also can be side by side, which is common for shallow, burned features. With most dipolar simple anomalies in the northern hemisphere (because of the inclination of the earth's magnetic field), the target creating the anomaly is located below, but not directly, the positive area of the anomaly (Bevan 1998).

Dipolar Complex (DC)- Complex dipolar anomalies are clusters of multiple negative and positive peaks of varying intensity (Figure 11). They can take on all kinds of shapes and sizes. Typically, this class of anomaly is associated with burned areas or features/disturbed areas filled with magnetically mixed sediments and objects. In-filled historic foundations and cellars, as well as some back-filled trenches and excavation pits, produce dipolar complex anomalies because the mixed fill in these features is more or less magnetic than the surrounding soils and generally contains historic objects that are also magnetic (in fact, the example in Figure 11 is the foundation and remains of a summer kitchen). Areas of soil burned to different depths and/or temperatures can also produce this kind of anomaly (Linford and Canti 2001). Prehistoric structure and mound floors, if intact, sometimes appear as dipolar complex anomalies. Lightning strikes are an important natural source of dipolar complex anomalies. The electrical current induced to flow in the ground by lightning can generate a very strong magnetic field, changing the remanent magnetization of the materials it flows through (Verrier and Rochette 2002). Classic lightning strike anomalies, or LIRMs (Lightning Induced Remanent Magnetism anomalies) come in two basic varieties: those that are dipolar complex and have a tentacled appearance, and those that are horizontal with a long, narrow dipolar complex anomaly (Beard et al. 2009; Bevan 1995; Jones and Maki 2005). Lightning strike anomalies in Ohio can range in size from a couple meters across to over 50 meters long (Burks 2014). Excavations at the locations of these anomalies have shown that the lightning strikes produce nothing that would be visible in a typical archaeological excavation (e.g., Maki 2005). Extensive animal burrow systems, such as those of groundhogs, sometimes produce similar anomalies, as well, though not as large or intense as lightning strikes. Dipolar complex anomalies can have weak (+5/-5 nT) or very strong (+1000/-1000 nT, or more) magnetic gradient signatures.

Multi-Monopolar Positive (MMP)- Anomalies in this class are groups of positive monopoles, generally arranged in linear or arcing patterns, that are usually fairly weak (1-4 nT) in intensity. Most gradiometer datasets are full of dozens or hundreds of small, weakly positive anomalies—making it difficult to pick individual features out of the mass of anomalies. However, patterned groups of anomalies (MMPs) stand out from the other small anomalies (Kvamme 2008). Architectural facilities such as prehistoric structures, post circles, or historic fences can produce linear arrangements of small, weakly positive monopolar anomalies. This class of anomaly is rare in gradiometer data, especially in survey data collected along transects separated by more than 50 cm. Exceptionally large postholes (>30 cm in diameter), or those filled with burned sediment, can be more evident in magnetic data. Likewise, the magnetic signatures of two or more closely spaced postholes can combine to make a more obvious, and larger, anomaly.

Monopolar Positive/Dipolar Simple (MP/DS)- In some cases it is difficult to discern whether an anomaly is monopolar positive or just a portion of a dipolar simple anomaly. These anomalies are assigned to the MP/DS class. In essence, this class serves as an "unknown" category like those used in any type of analysis or classification scheme. More often than not, these anomalies likely are iron objects or small magnetic rocks oriented in such a way that their negative pole is almost too far away to be detected.

Every magnetic gradient dataset from an archaeological site contains hundreds or even thousands of magnetic anomalies—some strong, some weak—and only some of these are caused by cultural features. While the magnetic anomaly classes presented above do not cover all variability, they do attempt, at a general level, to begin the process of segregating and categorizing the magnetic signatures of potentially cultural anomalies. Though intended to be descriptive, these five classes *do* commonly correlate with certain kinds of archaeological and natural features found just below the surface and this has been shown at many dozens of archaeology sites in the Midwest. A few examples serve to illustrate this.

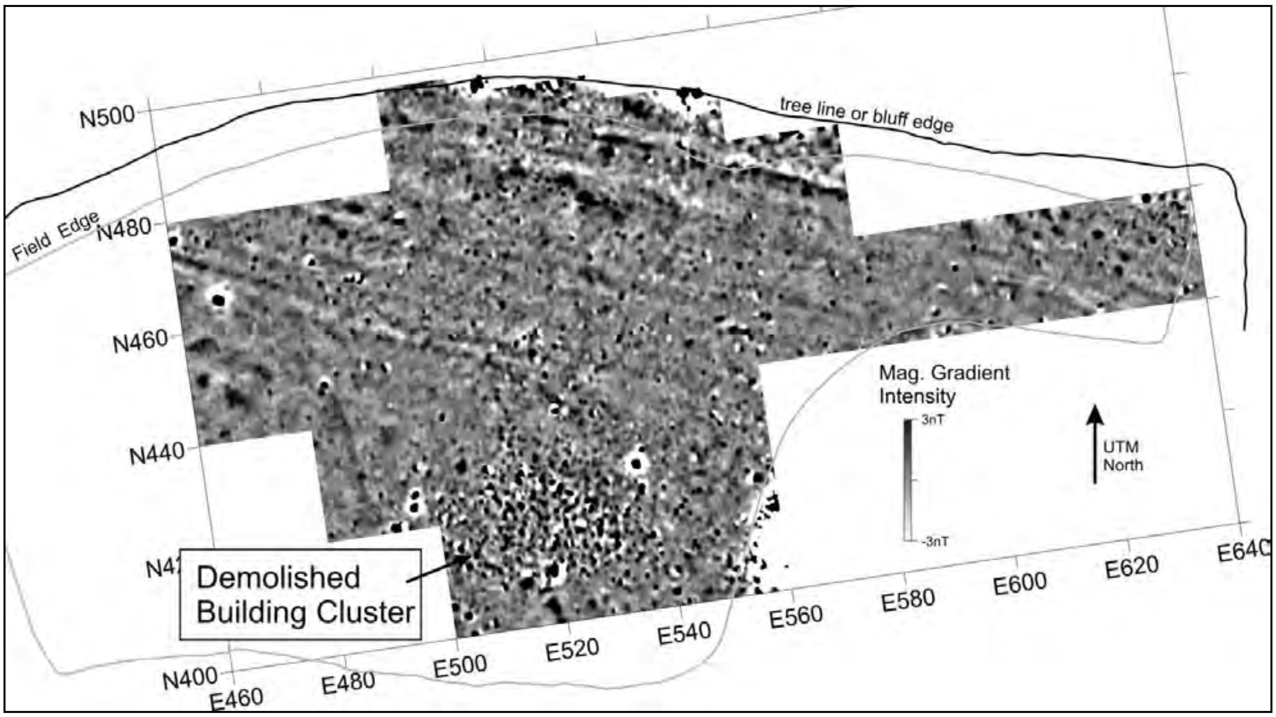

Figure 12. Example of magnetic gradient data from a demolished barn location (Dillon site, from Burks 2011).

Dipolar simple anomalies are some of the most frequently encountered magnetic anomalies at archaeology sites. Typically, they are ignored because they are associated with stray iron objects or rocks, but sometimes they indicate the locations of pit-type features or buildings. For example, Figure 12 shows a large cluster of magnetic anomalies in the location of a barn that was torn down and burned at the Dillon site in northern Ohio (from Burks 2011). Dark areas are more magnetic while light areas are less magnetic. Relatively even gray tones represent areas with little magnetic variability. The magnetic anomalies in the barn cluster are likely related to iron building hardware and other iron objects left in the barn when it was demolished. The large dipolar-concentric anomalies at either end of the cluster could be cisterns. At the north edge of the survey area the small monopolar positive anomalies, especially to the northeast, are related to the precontact Native American occupation of the site.

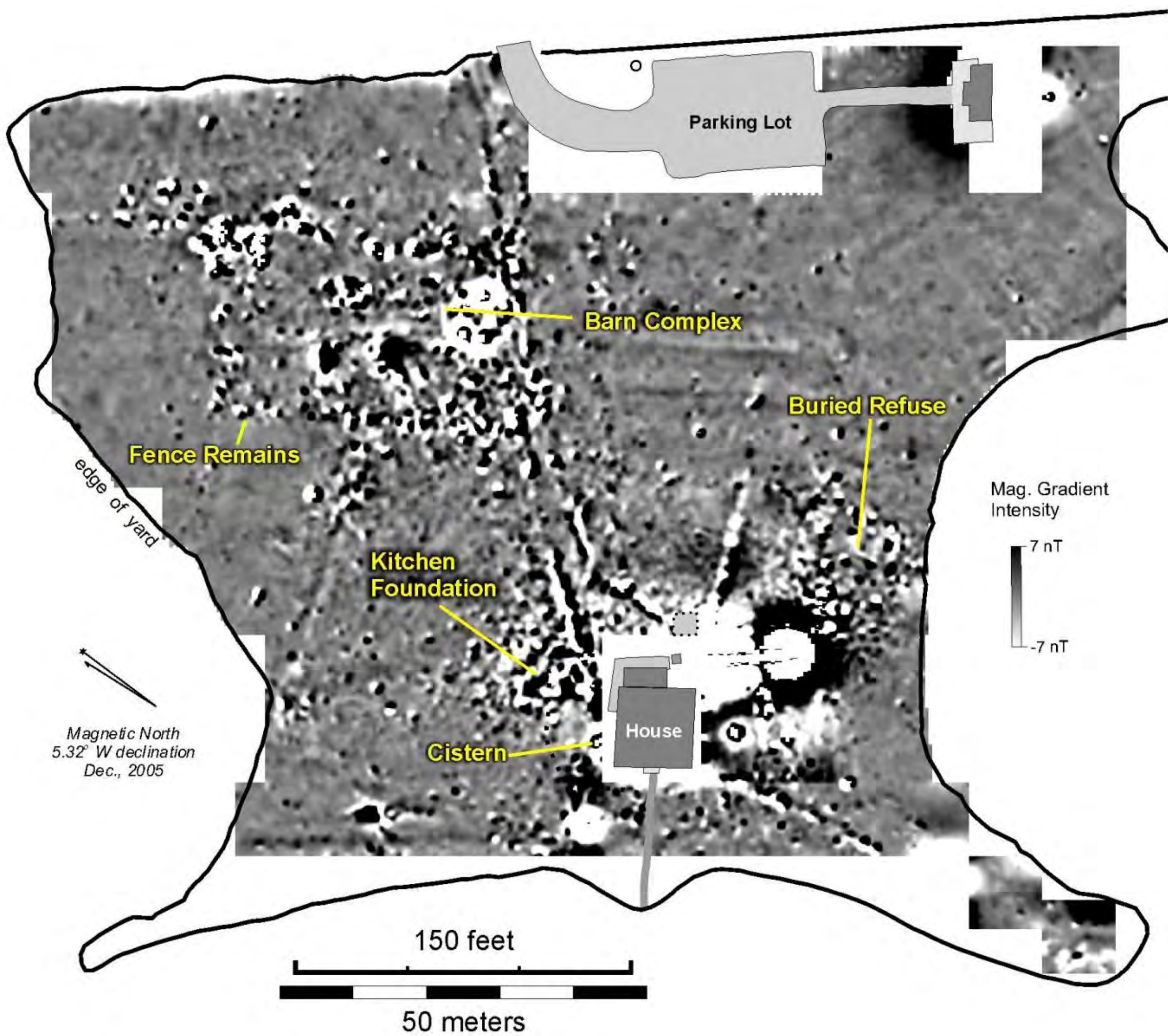

Figure 13. Example of magnetic gradient data collected around a historic period farmstead, the John Rankin House in Ripley, Ohio (from Burks 2006).

Magnetic survey data from historic period house and farm complexes are always busy with anomalies. Figure 13 is a batch of magnetic data from the John Rankin house in Ripley, Ohio. This house and farm complex started out as a log cabin and not long thereafter a brick house was built in 1828. Large barns and other outbuildings have come and gone over the last nearly 190 years, and today all that remains is the house. Many features of note were detected in the magnetic data around the Rankin house. Linear utility lines extend out from the house in all directions. Numerous dipolar simple anomalies indicate the locations of larger iron objects and roughly delineate the primary midden surrounding the house. A cluster of iron objects to the west of the house occurs in a swale and indicates the location of a nineteenth-century refuse dump. A large cistern next to the house and the remains of a summer kitchen are also represented in the data. Behind the house, a large cluster of anomalies indicates the location of a barn complex. While the footprint of the barn is not clear in the data, large dipolar complex anomalies coincide with its approximate location. The remains of a wire fence that once surrounded the barn are also evident.

Fired clay objects such as bricks should be highly magnetic. However, because of their small size individual bricks do not always show up in magnetic gradient surveys on archaeology sites. But brick-firing features, such as kilns and clamps, should be readily detectable. They not only contain concentrations of burned clay objects (i.e., bricks), but the intense heat used to fire the bricks also typically burned the ground below and around them. For example, the brick clamp from Pickaway County mentioned earlier in the radar methods section also was readily apparent in the magnetic gradient data collected at the site (Figure 14). Note the size and shape of the anomaly; it is a dipolar simple-concentric anomaly with a peak amplitude of about 130 nT. The positive core of the anomaly roughly matches the size and shape of the clamp in the ground. Excavation revealed the ground around the base of the clamp to be reddened by the high temperatures achieved inside the clamp. The high temperatures reached inside the much larger Nelsonville Brick Company kilns also magnetized the ground, but in a slightly unexpected way. Strongly magnetic anomalies at these kilns were found at the locations of each of the fire boxes built into the sides of the circular kilns. This makes the kilns look a bit like wagon wheels in the magnetic data (Figure 14), with a central hub and radiating spokes. The magnetic signatures of the Nelsonville kilns were so strong that they exceeded the measurement range of the magnetometer used for that survey (Geoscan Research FM256 fluxgate gradiometer). Regardless, sometimes we must look for patterns in the structure of magnetic anomaly clusters in order to understand what has been detected.

Of course, there are other things in the ground that can create magnetic anomalies that look much like the magnetic signatures of prehistoric and historic features. Some of this *equifinality* can be overcome by knowing the peak magnetic amplitude and anomaly type for each anomaly of interest. For this reason, magnetic anomalies from the Elam Drake site data were closely examined and their peak magnetic amplitudes were recorded, along with other anomaly characteristics. Each anomaly is considered in detail in the following results section.

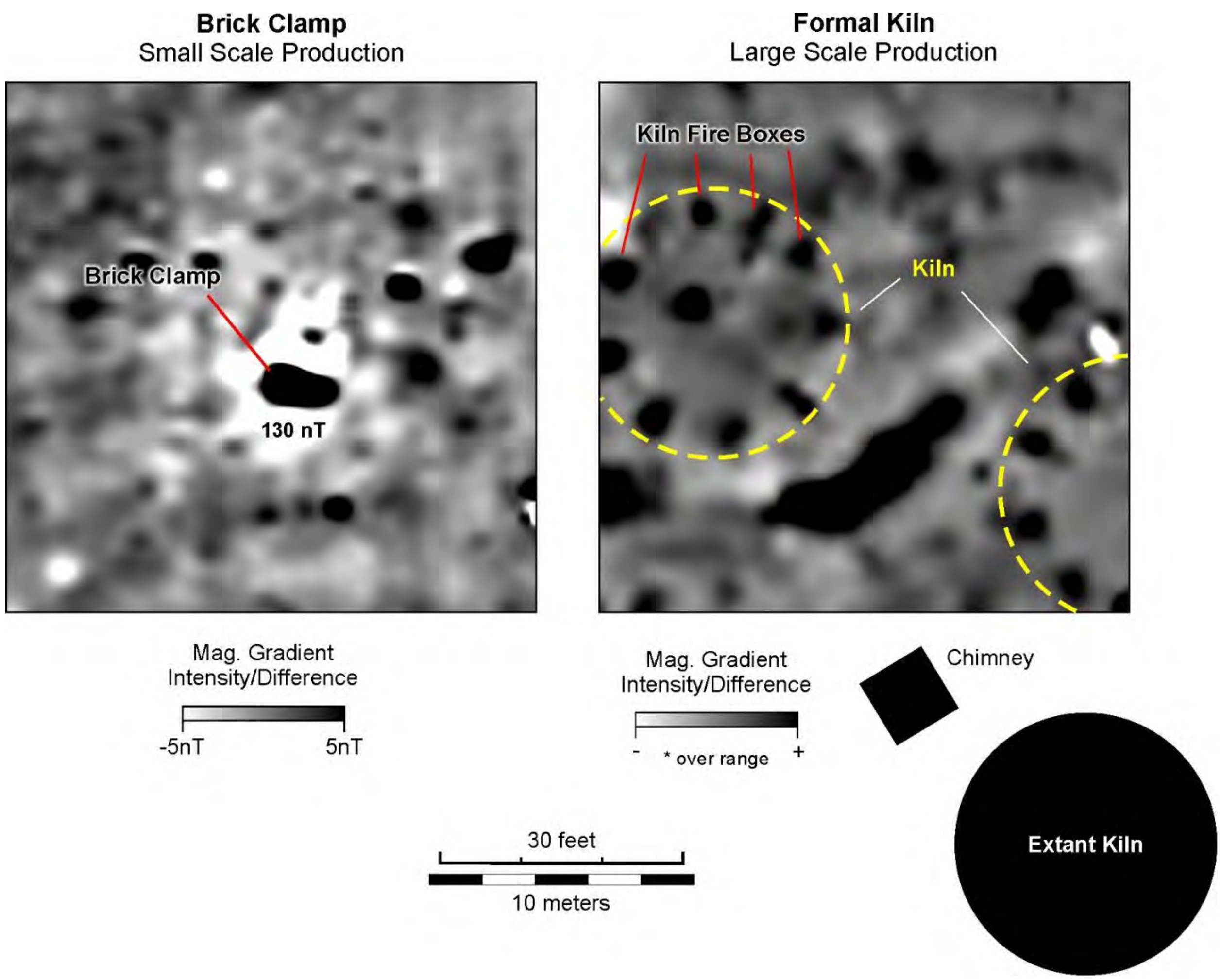

Figure 14. Examples of brick-making thermal features from (left) a nineteenth century residential brick clamp in Pickaway County (Balthaser Home Place site), and (right) the Nelsonville Brick Factory (industrial scale production in Nelsonville, Ohio).

Geophysical Survey Results

The Survey Grid

The survey grid used for the Elam Drake geophysical data collection was laid out with a Leica TC405 total station and fiberglass measuring tapes (Figure 15). The transit was initially set up at N1030, E1000; the angle of the tree line along the west edge of the open field to the north was used to establish grid north—having a grid that aligned to the edges of this large field helped limit the numbers of partial 40x40 m magnetic survey blocks. Wood stakes were set at 40-meter intervals in the area north of the barn and 20-meter intervals south of the barn. Five datum nails (10-inch galvanized nails pounded flat with the surface) were set after completion of the survey work. Their coordinates are presented in Table 1. The total station was also used to map the locations of building corners.

The geophysical survey grid and the datum nails were tied to real-world coordinates using a Trimble GeoXT (submeter) global positioning system (GPS). All measured survey grid stake locations are an average of at least 10-15 real-time corrected GPS positions, datums are an average of 20 readings. The coordinates provided for the datums in Table 1 are useful for relocating the datum pins with a GPS and a metal detector, but they are not accurate enough to precisely georeference the geophysical survey data for use in generating precise coordinates in a GIS. Any attempt to re-establish the grid on site should use these coordinates to locate the datum pins and a laser transit (along with the survey grid coordinates) to set out new positions on the grid or to locate specific anomalies of interest.

Table 1. Survey grid datum coordinates.

	Grid North	Grid East	UTM North*	UTM East*	Comment
Datum 1	1030	1000	4430077.56	336055.10	10-inch galvanized nail
Datum 2	1000	1000	4430047	336058	10-inch galvanized nail
Datum 3	945.76	990.25	4429992.70	336064.80	10-inch galvanized nail
Datum 4	940	1000	4429987	336060.60	10-inch galvanized nail
Datum 5	940	1020	4429987.90	336080.50	10-inch galvanized nail

*UTM Zone 17 north, Datum=NAD83

At the time of the geophysical survey field work on April 12th and 13th, the survey area was well mowed. Figure 16 (top) shows the site conditions south of the brick barn and the adjacent barn/garage. Several architectural- and utilities-related features are evident at the surface behind the house, including the concrete foundation for a small building, a concrete junction box for a utility line (Figure 16, bottom), and what appear to be small stone/concrete footers perhaps for a shed or other feature present in the 2000s when the property was used as a parking facility. The distribution box is shown on Figure 10, Sheet 1 of the report, labeled as Feature 19. The small stone/concrete footers were investigated by ASC and were found to be two individual paver stones, which did not appear to be part of an intact walkway. They were located approximately 3 m (9 ft) apart. They were located east of Feature 19 and west of Trench 5 but were not labeled on Figure 10, Sheet 1 because they were determined to not be an intact feature. These three sets of small features appear on subsequent interpretation and data maps. The grass in the area behind the barn was slightly taller at the time of the survey (Figure 17), and there was standing water in the east third of the field. The gravel from the gravel drives and the parking area around the barn was visible at the surface in most areas where it is evident in the 2004 aerial photograph (see Figure 3).

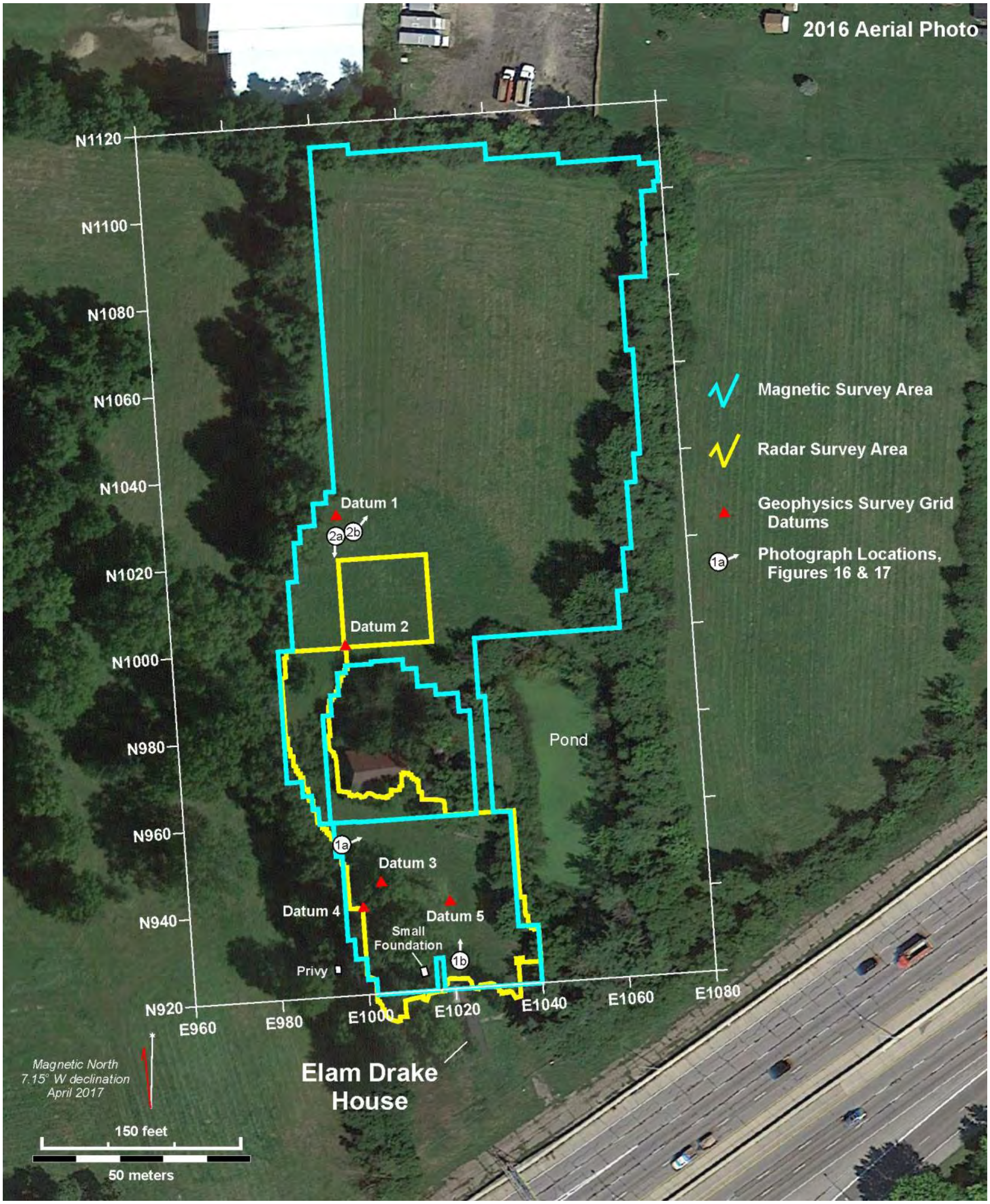

Figure 15. Map of the survey grid showing the datum locations.

Figure 16. Images of the survey area behind the house, (1a) looking northeast at barn and barn/garage and (1b) looking down at a concrete junction box related to the 20th century sewer system behind the house.

Figure 17. Photographs of the area adjacent to and behind the brick barn.

Magnetic and Radar Survey Results

Seventeen numbered anomalies of potential archaeological interest were identified in the magnetic and radar survey results. In Figure 18, red indicates magnetic anomalies and blue is associated with radar anomalies. The small blue circular anomalies lacking numbers are distinctive reflections identified in the radargrams; these might be subsurface features. Before specifically addressing each of the numbered anomalies, let's first take a closer look at the geophysical data.

The magnetic gradient data are presented in Figure 19. Large clusters of dipolar simple and dipolar complex anomalies were found to the north and south of the barn/garage complex. Utility lines are also present in the magnetic data between the house and the barn. There are relatively few anomalies in the low, wet ground north of the gravel parking lot (north of N1040). These appear to be a mix of iron objects and rocks rather than pit features.

A detailed view of one of the radar amplitude slice maps is presented in Figure 20, at 70-75 cm below surface. This is deeper than the more recent gravel drives and parking areas visible in the 2004 aerial photo. Very few features of note are evident at this depth, except for the leach field lines associated with an iteration of the house's septic system and the main gravel drive that is visible in the 1953 aerial photo running by the house and back to the garage/barn area.

Figure 21 shows a series of radar amplitude slice maps at select depths, with shallower slices in the upper left and deeper in the lower right. The very strong reflections caused by the gravel drives and parking areas dominate most of the slices from 10-50 cm below surface. Not visible are any obvious signs of rectilinear foundations or shaft type features. Detailed views of the slice maps with a 1-meter grid overlay are presented in Appendix C; slices are presented at 5-cm increments down to 55 cm below surface and then at 10-cm increments beneath that. All radargrams were examined for evidence of possible features. While several anomalies of note were encountered in the radargrams (these are indicated by small blue circles in Figure 18), none appeared to be associated with obvious shaft-type features.

The following presents a more detailed description of the 17 numbered anomalies of potential archaeological interest.

Anomaly 1: Possible brick kiln, 4x5 m, magnetic anomaly with peak intensity of 1938.30nT. Not distinctive in radar data. Area appears to have been graded; layer of rock at surface for parking. Grading may have taken away part of the possible kiln and it could have scattered it around (perhaps that is what constitutes Anomaly 3).

Anomaly 2: Cluster of radar and strongly magnetic anomalies. Large magnetic anomaly at the center is about 2x2 meters in size and 4626.82nT in strength. This too could be a small kiln. Grading in this area likely has damaged this possible feature. Small radar anomalies extend down into the ground to the west of the central magnetic anomaly. They could be associated with additional possible pit-type features, large rocks, or other historic features.

Anomaly 3: This is the general boundary of a cluster of iron objects surrounding and perhaps related to one or two possible kiln features. Given the likelihood of grading in this area, this

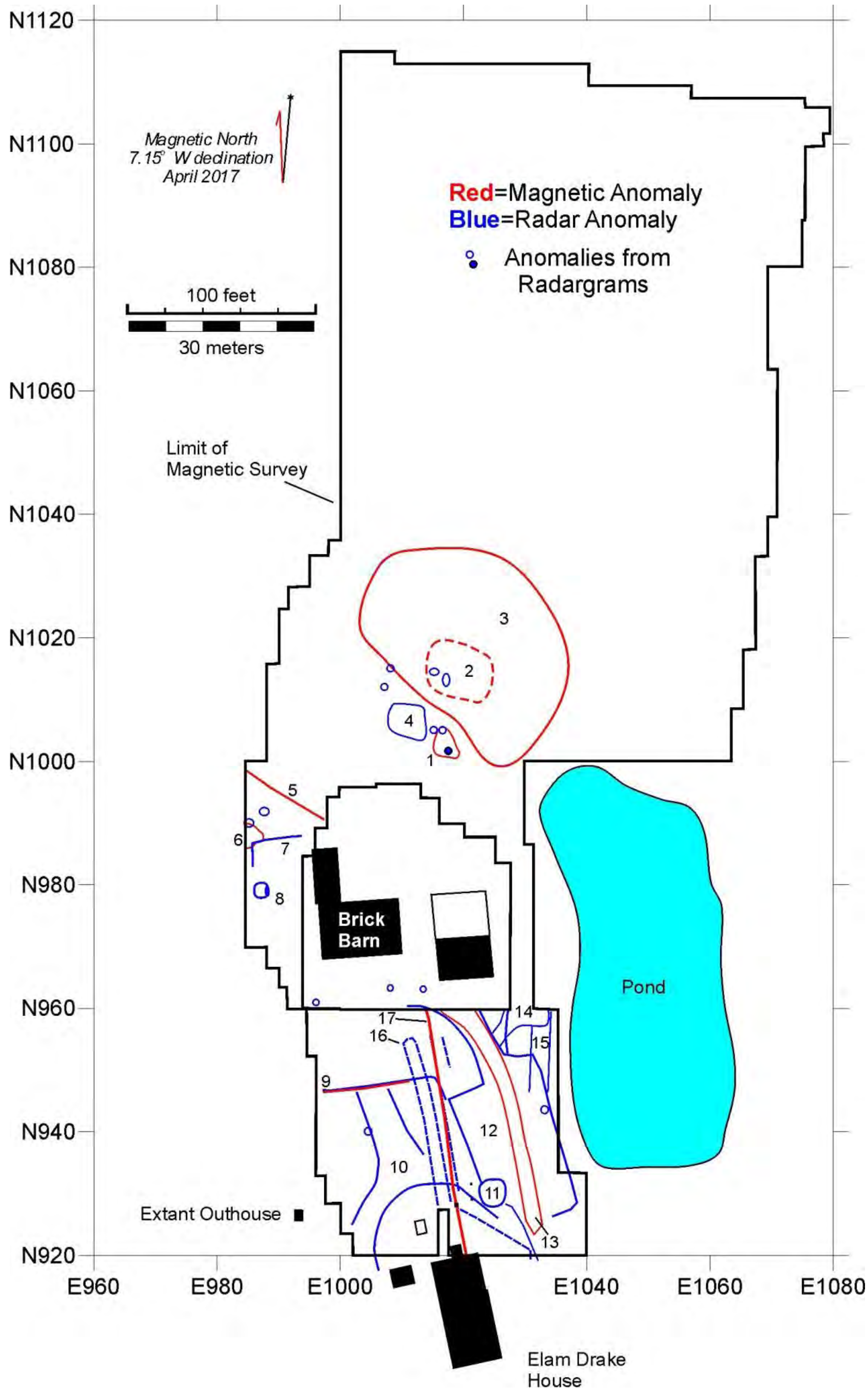

Figure 18. Interpretive map showing anomalies of potential archaeological interest.

cluster of magnetic objects could be displaced from the possible kilns or other features in the immediate area. The northern part of the Anomaly 3 cluster is coincident with the berm at the back edge of the former parking lot. Thus the magnetic objects could be within the fill of this berm. If they are large objects, they might also be located beneath the berm. It is possible that the sediment from the berm is derived from grading the parking lot area or from excavating the pond to the southeast. If the latter, then the magnetic objects within the berm could be displaced from the area of the pond.

Anomaly 4: Flat reflector in the radar data, about 5x6 m, visible from about 30-40 cm below surface. It is located immediately west of a possible brick kiln. Nothing notable at this location in the radar profiles, which suggests that this could be related to the gravel parking lot, could be water, or might be a thin cultural layer just below the gravel.

Anomaly 5: Negative linear anomaly in the magnetic data. Could be a trench for a utility line; however, no utilities are present in the radar data, which would indicate that this is a deep trench and any possible utility line is deeper than the radar could penetrate.

Anomaly 6: Possible brick kiln. Only a portion of this was covered during the geophysical survey as it is located at the edge of the brush, to the west of the barn. It is approximately the same size as Anomaly 1 but is much more magnetic at 6163.06nT—suggesting it could be more intact. At least one small radar anomaly is located at the northern edge of the magnetic anomaly. This anomaly is also located just northeast of a concrete slab that extends off to the west, into the brush (the slab is associated with the small outbuilding identified on the 1953 aerial photograph in Figure 2). Anomaly 6 might also be associated with this concrete slab, rather than being a kiln.

Anomaly 7: This is a very distinct edge to a flat radar reflector that likely is related to gravel, perhaps an earlier gravel surface that predates the most recent iteration of the gravel drive/parking lot that once surrounded the barn.

Anomaly 8: This is a discrete, flat reflector in the radar data measuring about 2x2 m in size. There are distinctive, deeper radar reflections along its east side. It is most distinctive in the radar data from 40-55 cmbs and lies beneath the recent layer of gravel. This could be deeper gravel or some other distinctive material perhaps related to a foundation or other small outbuilding.

Anomaly 9: This is a distinctive edge in the gravel parking area from the radar data that once surrounded the barn. There may be a utility line or some other trench feature here based on the magnetic data.

Anomaly 10: Possible gravel drive that once ran around the house. Visible in the radar data from 10-25 cmbs. Leach field lines (Anomaly 16) for a later sewer system cut through it on the east side.

Anomaly 11: Distinctive feature, about 4x4 m, in the radar data from 60-80 cmbs. This area is covered by gravel and served as a parking lot in the 2000s. While this feature could be secondary radar reflections caused by moisture or undulations in the gravel parking lot, it might also be higher moisture levels inside a large pit-type feature, such as a cellar. This is the approximate location of a small gravel pull off in the 1953 aerial photograph.

Anomaly 12: Gravel parking lot visible in radar data.

Anomaly 13: Older road/drive related to the barn. With such a distinct signature in the magnetic data, this may be a different kind of paving material (perhaps gravel, cinders, or brick) than the material used in the latest version of the gravel parking lot and drives. It appears to be best preserved/visible between N940 and N960.

Anomaly 14: Gravel drive visible in the radar data.

Anomaly 15: Gravel road in radar data.

Anomaly 16: Leach field lines for a 20th century sewer system.

Anomaly 17: Utility line, probably a steel/iron pipe, running from the house to the barn. Visible in the magnetic data. It appears to intersect a concrete utility junction box visible at the ground surface (see Figure 16, bottom).

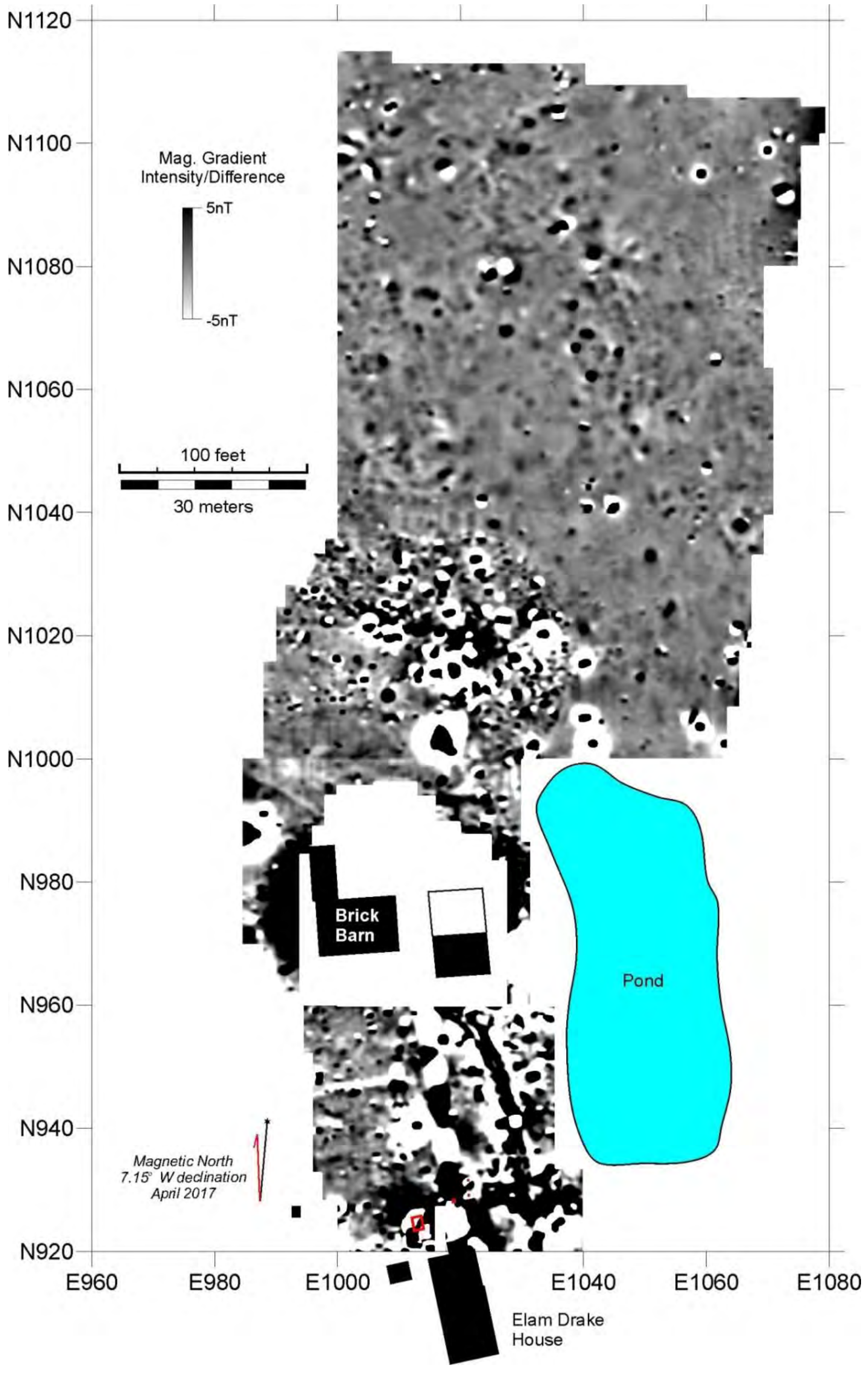

Figure 19. Magnetic gradient survey results.

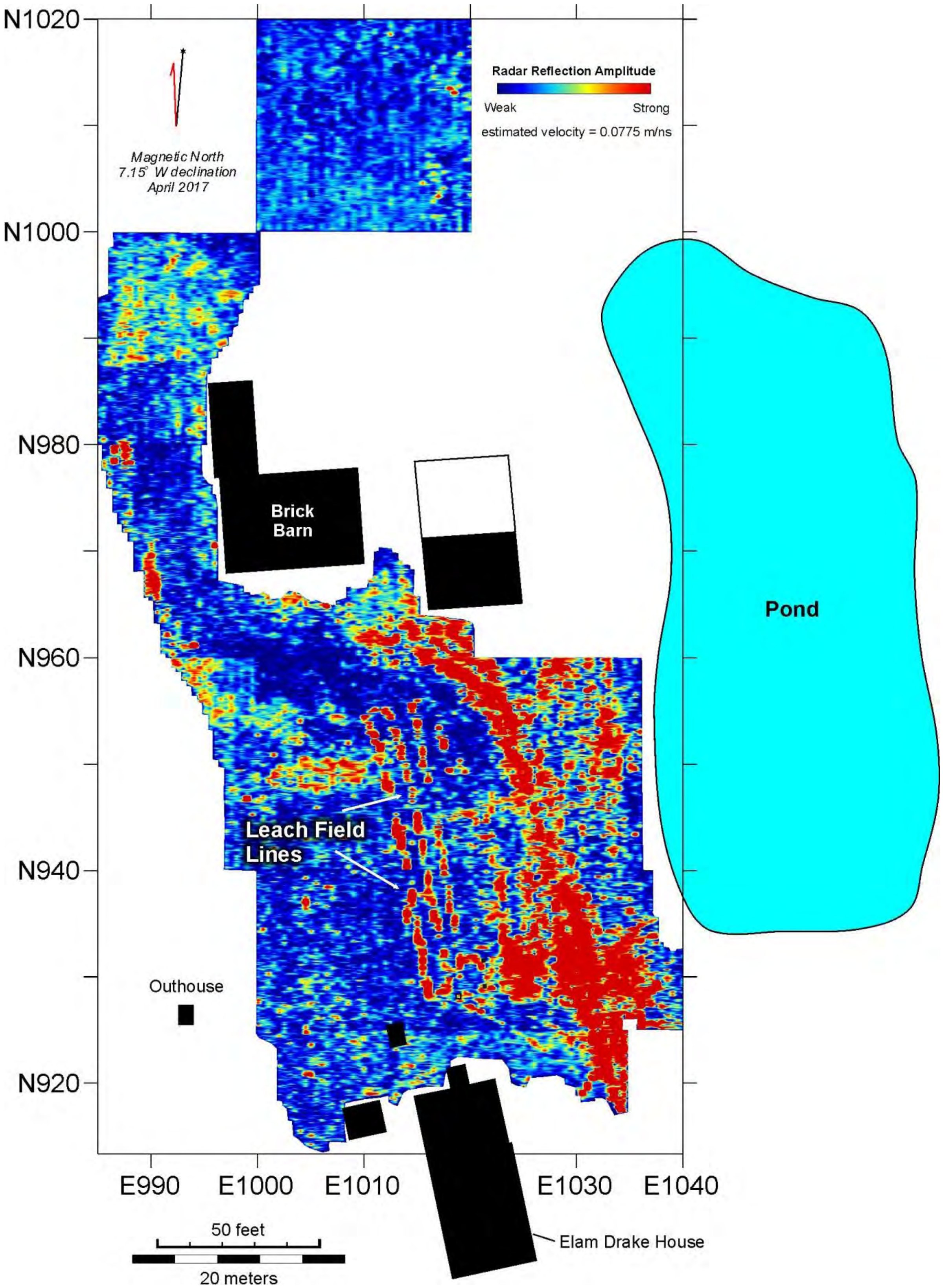

Figure 20. Detailed view of a ground-penetrating radar amplitude slice map at 70-75 cm below surface.

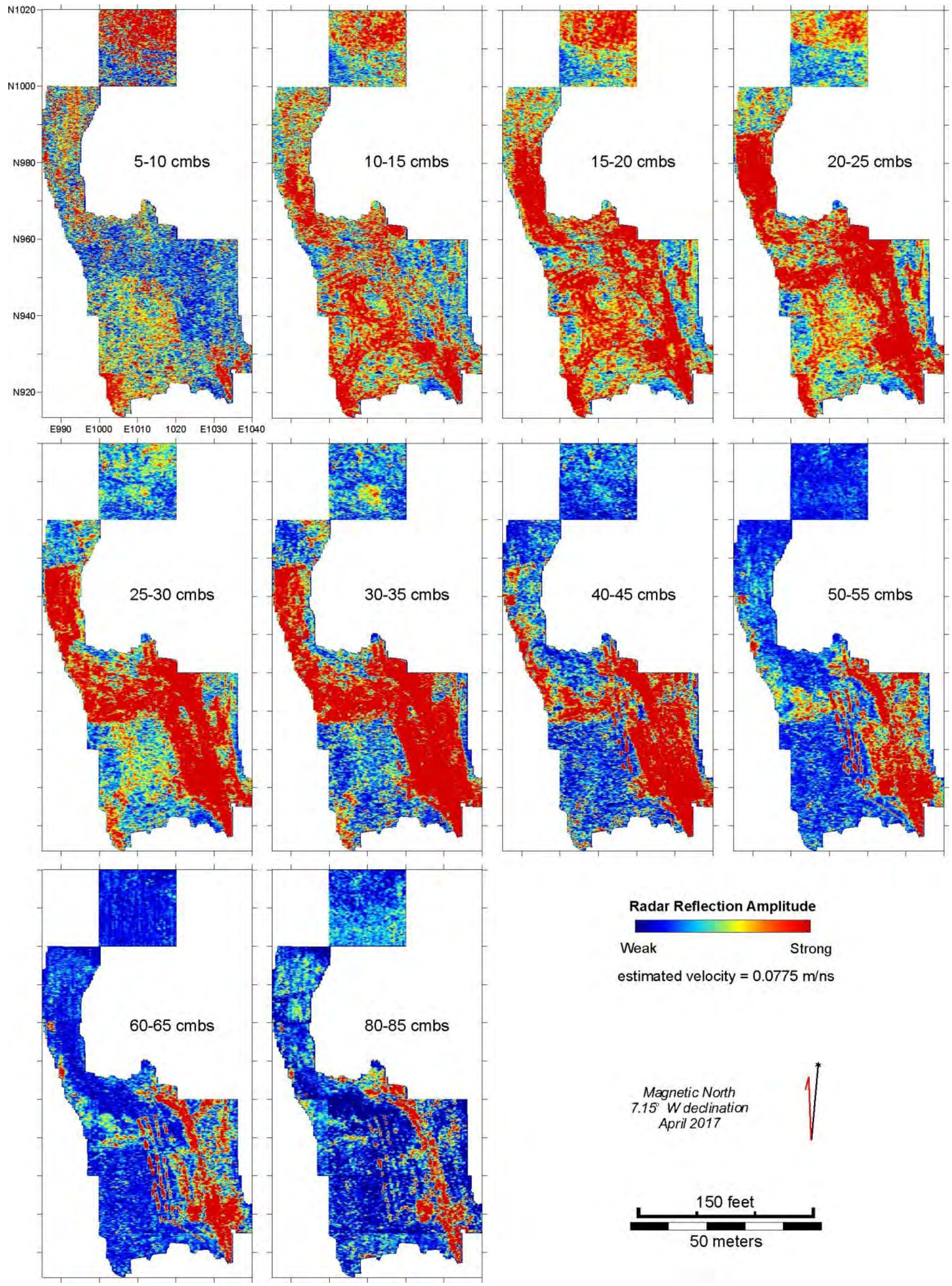

Figure 21. A series of radar amplitude slice maps at select depths.

Summary and Recommendations

On April 12th and 13th, 2017, Ohio Valley Archaeology, Inc. conducted magnetic gradient and ground-penetrating radar surveys at the Elam Drake Residence, a National Register Property in Columbus, Ohio. The work was done on behalf of, and with assistance from, ASC Group, Inc. as part of a Phase II site assessment related to a planned development in the area. Locating historic-era features associated with the house and barn complex, such as privies, wells, cisterns, trash pits, and paths/drives, was the primary goal of the survey. Finding brick-firing features was also a possibility given the scale of the brick architecture and Elam Drake's profession as a brick mason.

Seventeen geophysical anomalies of potential archaeological interest were identified and described. The magnetic survey located the typical mix of iron objects and utility lines that commonly surrounds houses and outbuildings. A notable cluster located north of the barn/garage building complex may include one or more intensively heated features. These fire-related anomalies are consistent with magnetic anomalies detected at known brick-firing sites. A similar magnetic anomaly also was found west of the brick barn. However, and strangely, these probable burned features are not readily apparent in the radar data. This suggests that (1) they are not brick firing features, such as brick clamps or kilns, or (2) they are/were brick firing features but have been extensively disturbed. The large cluster (Anomaly 3) of probable iron objects behind the barn/garage, in an area of grading, suggests extensive disturbance or the location of another outbuilding.

The ground-penetrating radar survey focused on the ground between the house and the barn, as well as covering the areas of the possible brick-firing features found in the magnetic data. The various iterations of gravel drives and parking areas showed up readily in the radar data, as well as the leach field lines associated with a twentieth century septic system. However, no major shaft-type features or outbuilding foundations were detected. Given that the smokehouse and a later privy are still standing, there may not be many features to actually find in the back yard that are not already visible. It might also be that some of these features, such as earlier privies, are located in the brushy wood line growing out from the western edge of the yard, in the general area where the extant privy is located. Given Drake's fondness for brick, it seems likely that he would have had a brick-lined privy somewhere near the house.

End Notes

1. Fluxgate gradiometers might be better referred to as difference meters, for they technically do not measure a gradient. Rather, they are detecting the difference in the strength of the magnetic field along one axis and at two points, the spacing between which is usually fixed. Sensor spacing in gradiometers affects the strength of the final recorded reading. For example, the readings from a gradiometer with a 65 cm sensor spacing would be about 1.07 times stronger than those from an instrument with a 50 cm sensor spacing (assuming several important things: the feature is not right at the surface, a magnetic field inclination that is about vertical, and the bottom sensor is at about 30 cm above the surface while the archaeology is about 40 cm beneath the surface) (Bruce Bevan, personal communication, 2013).

2. Truly monopolar magnetic anomalies are theoretically possible but have rarely, if ever, been observed in the "wild" (Merrill 2010). All anomalies are actually dipolar, but in many cases appear monopolar because one of the poles is too far away (i.e., underground) to be detected by the magnetometer. Thus, the terms used in the magnetic anomaly classification refer to the *appearance* of the anomalies in the magnetic data maps, not their true structure.

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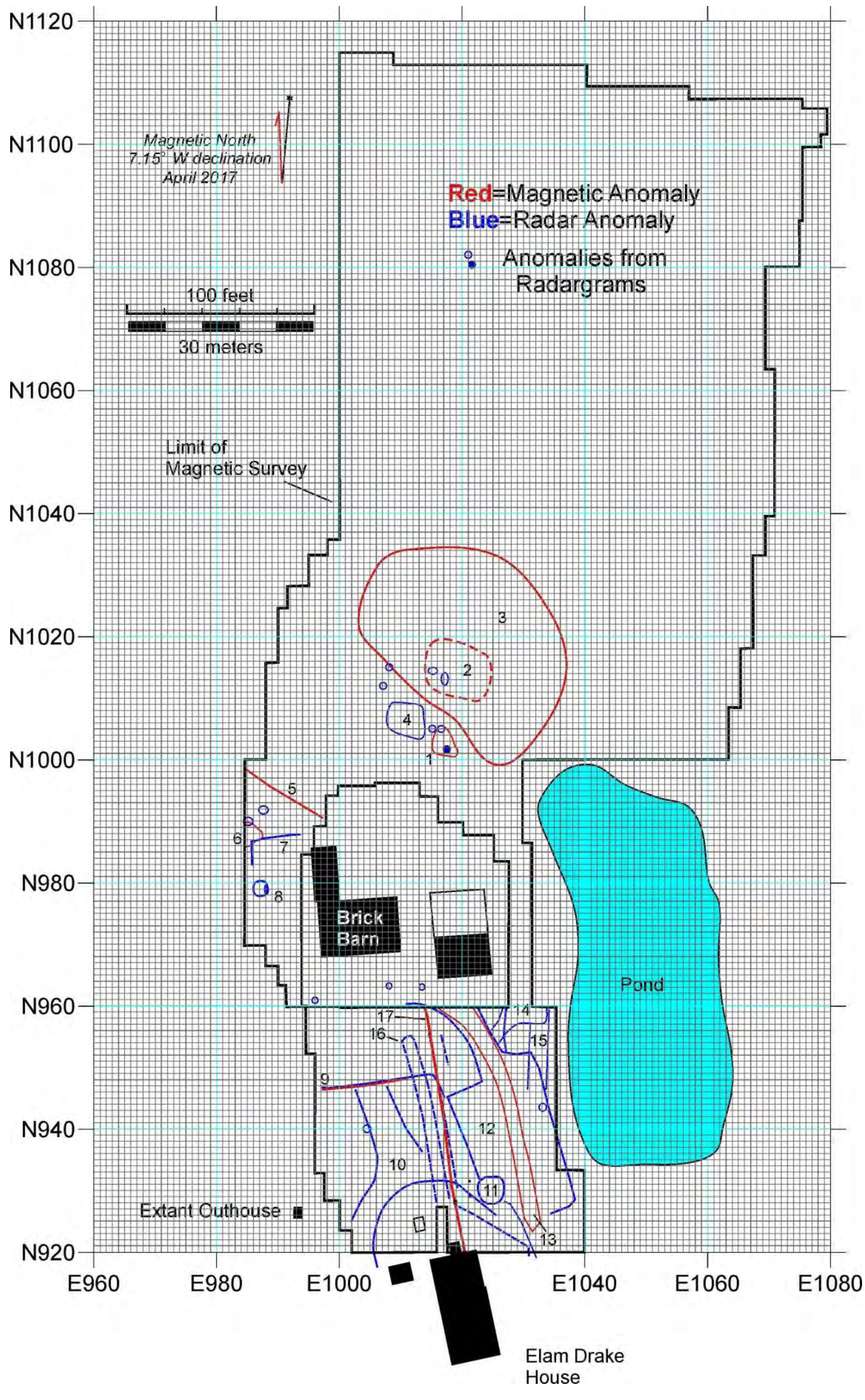
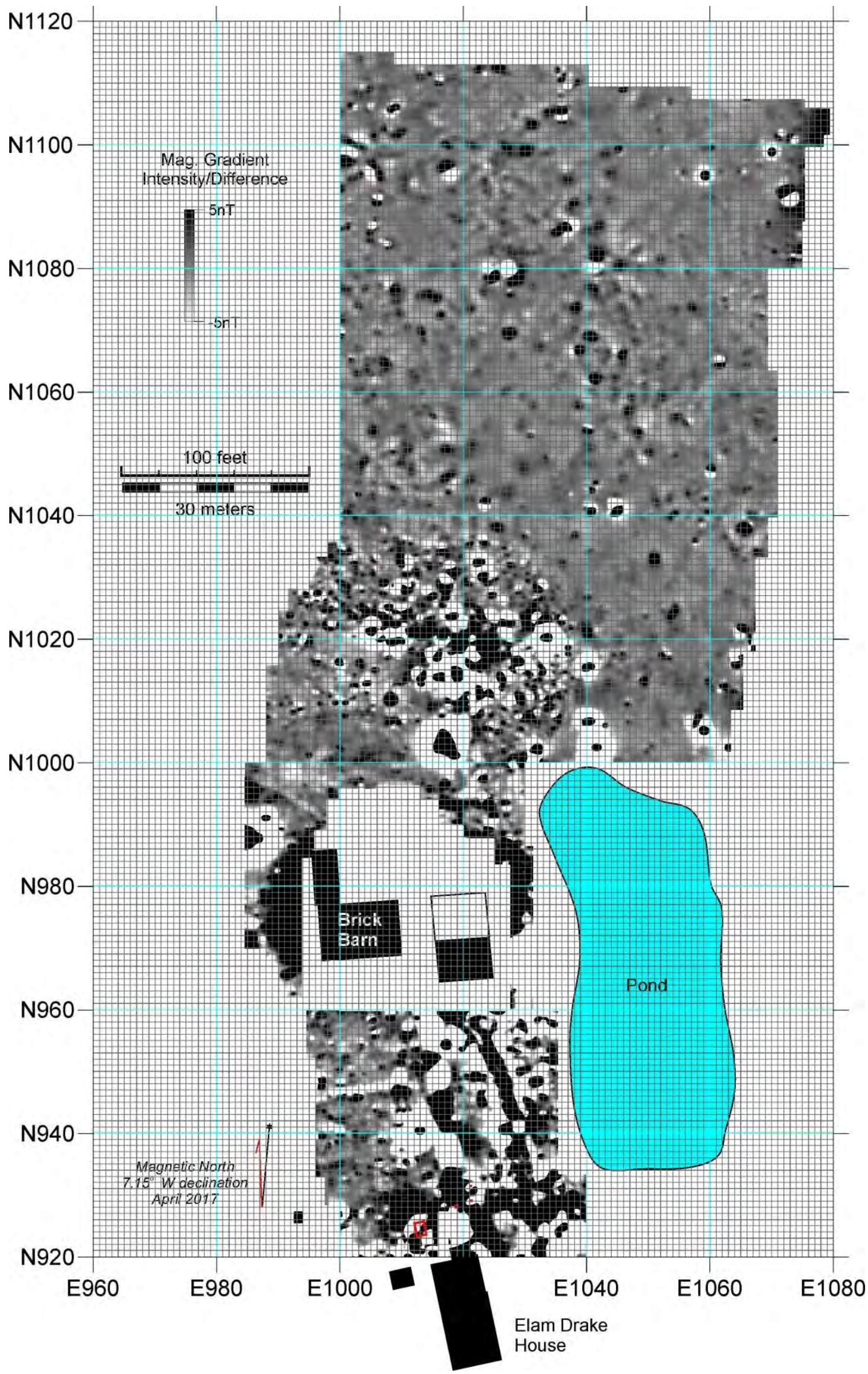
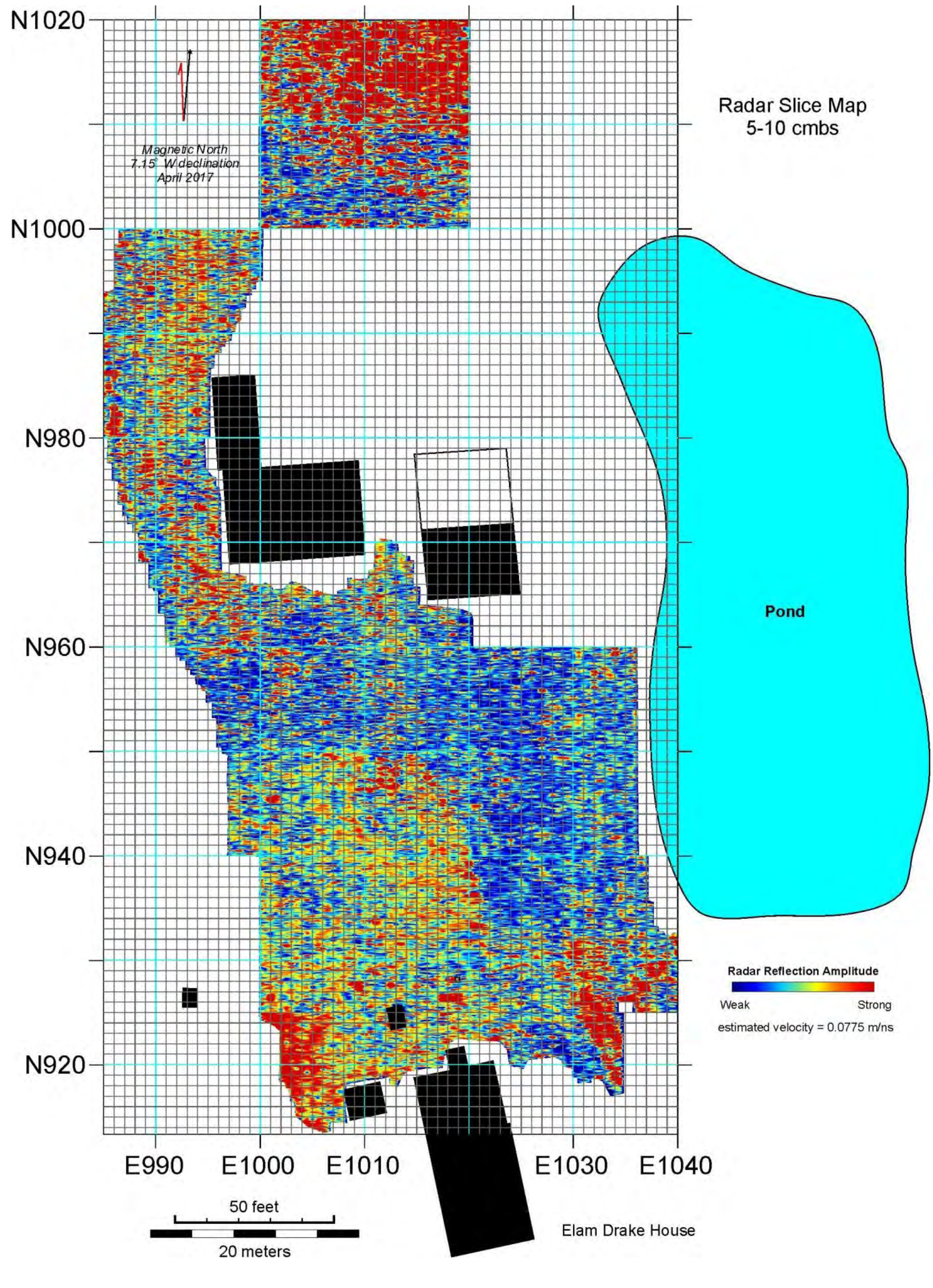
Appendix A. Map of anomalies of potential interest with a 1-meter grid overlay.

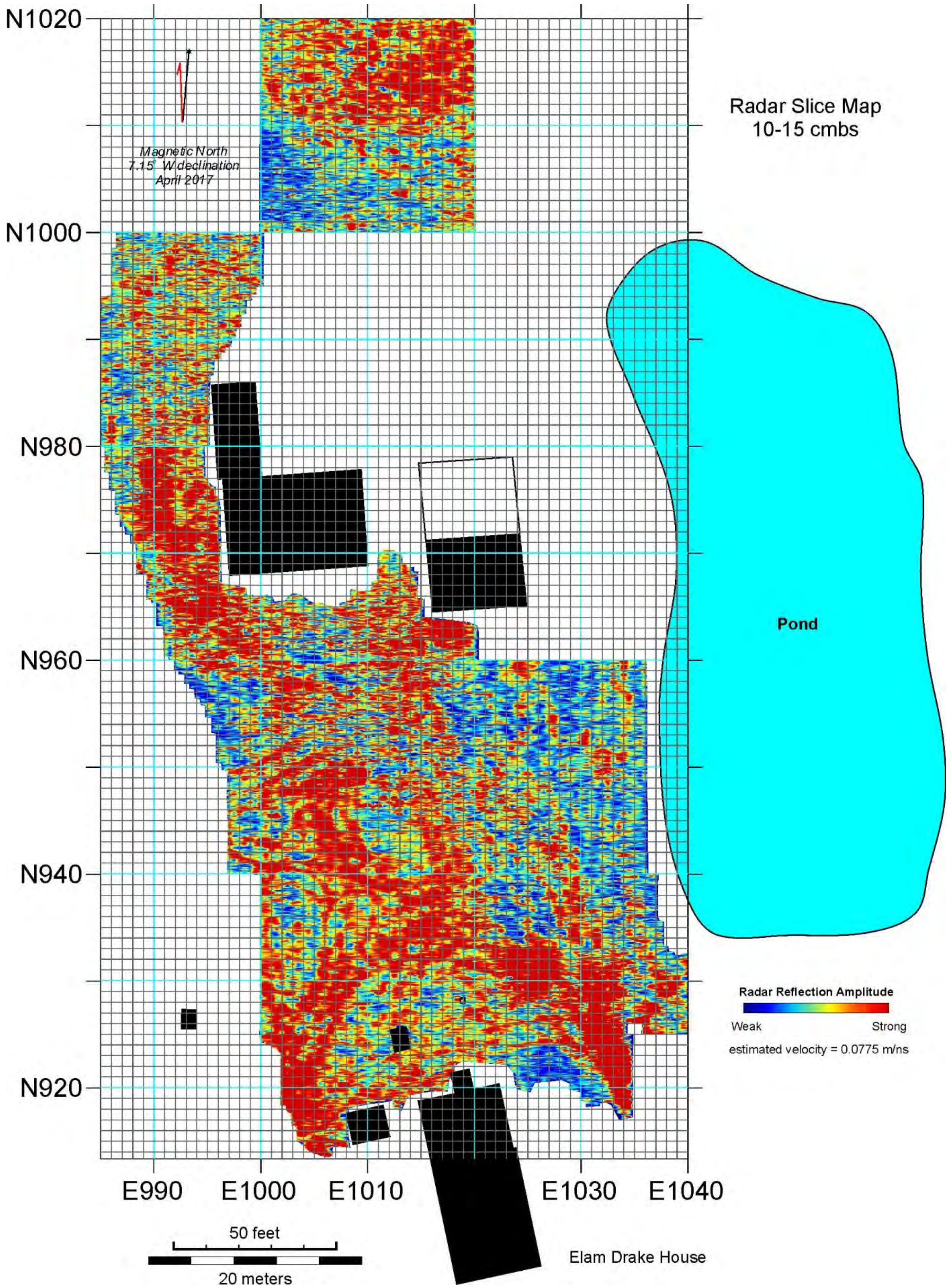


Appendix B. Magnetic gradient data with a 1-meter grid overlay.

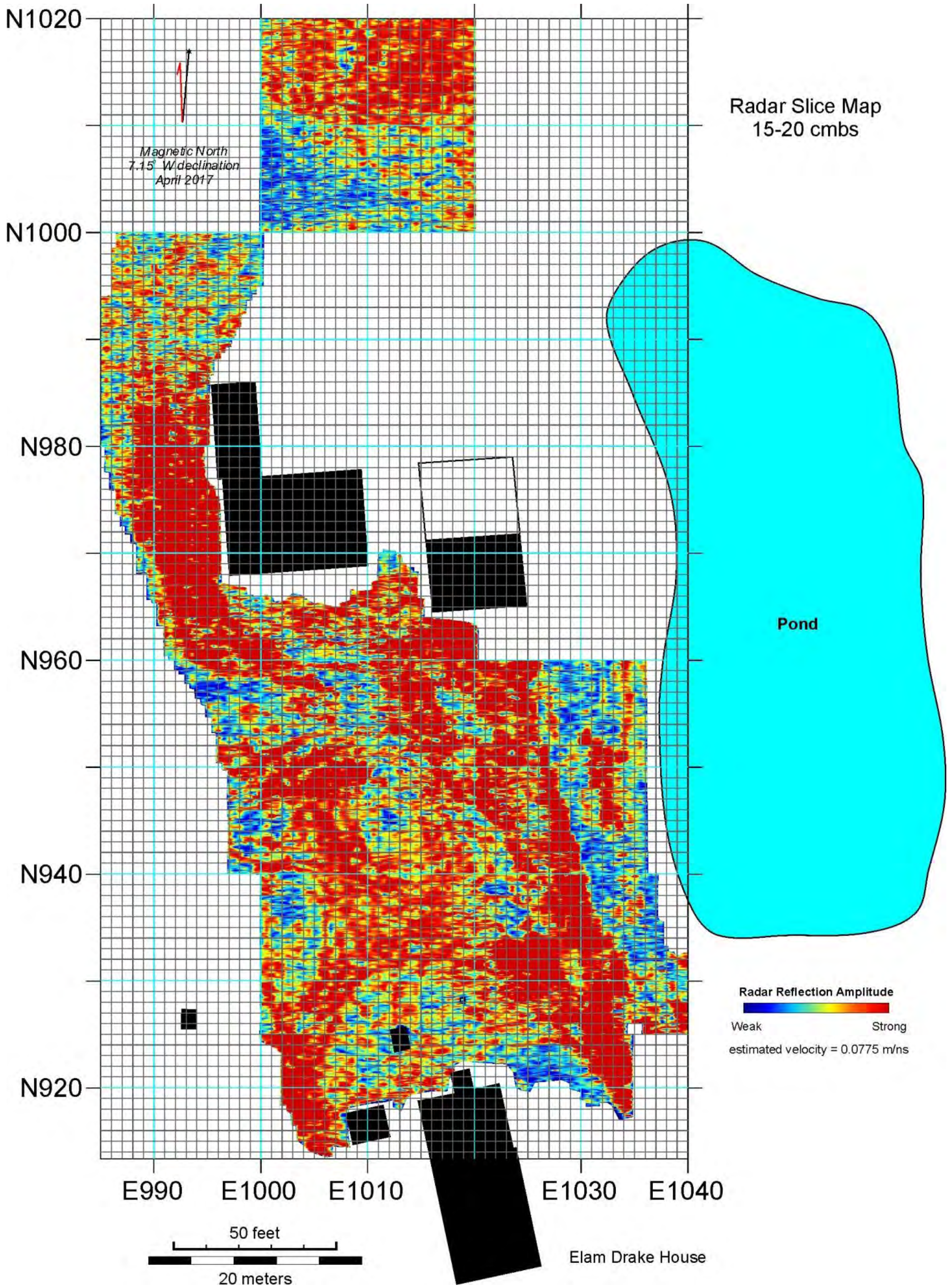


Appendix C. Radar amplitude slice maps at select depths with 1-meter grid overlay.





N1020
N1000
N980
N960
N940
N920
Magnetic North
7.15° W declination
April 2017
Radar Slice Map
10-15 cmbs
Pond
Radar Reflection Amplitude
Weak
Strong
estimated velocity = 0.0775 m/ns
E990
E1000
E1010
E1030
E1040
50 feet
20 meters
Elam Drake House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N1000
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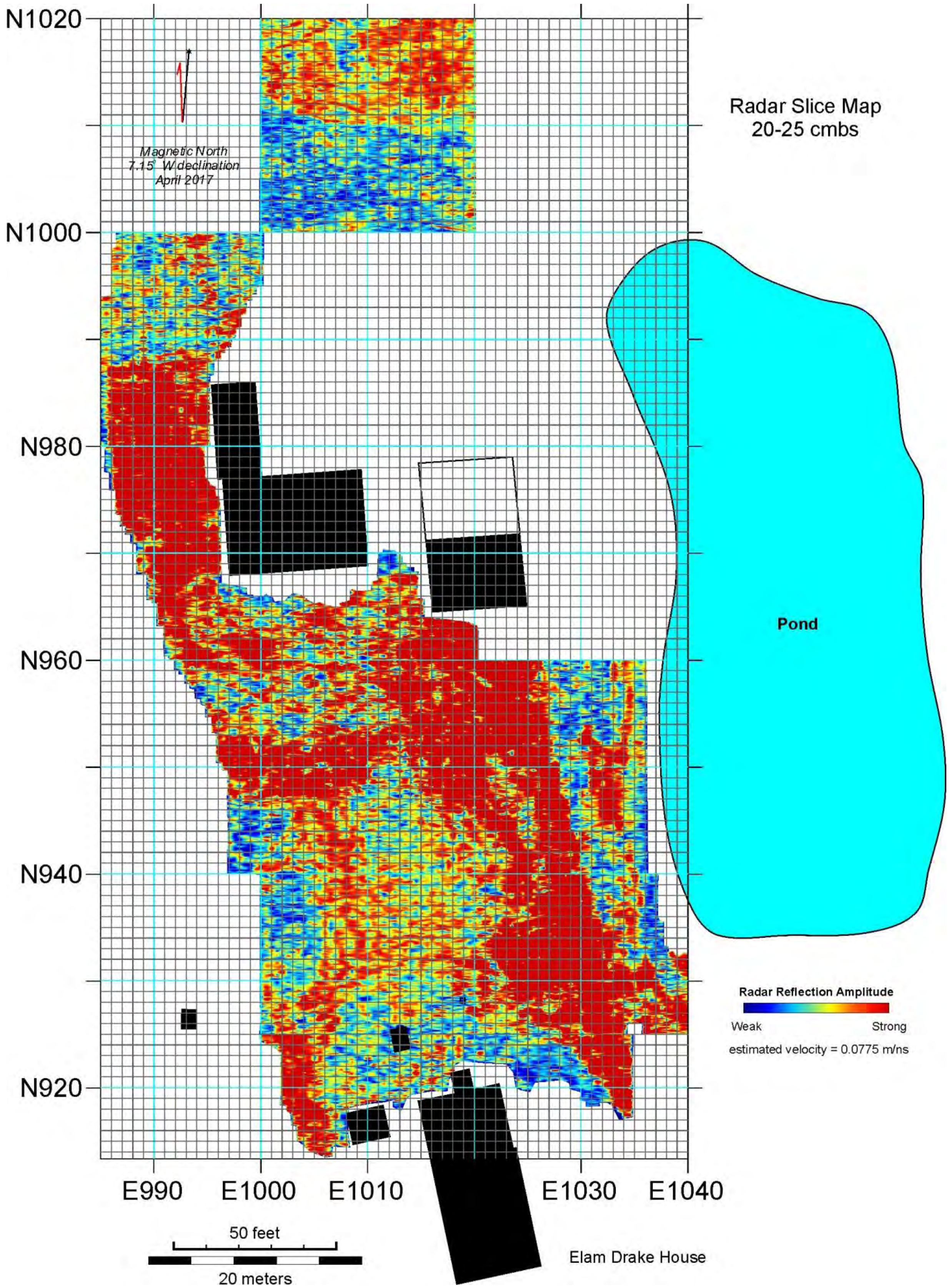
N940
N920
E990
E1000
E1010
E1030
E1040
Magnetic North
7.15° W declination
April 2017
Radar Slice Map
15-20 cmbs
Pond
Radar Reflection Amplitude
Weak
Strong
estimated velocity = 0.0775 m/ns
50 feet
20 meters
Elam Drake House


N1020
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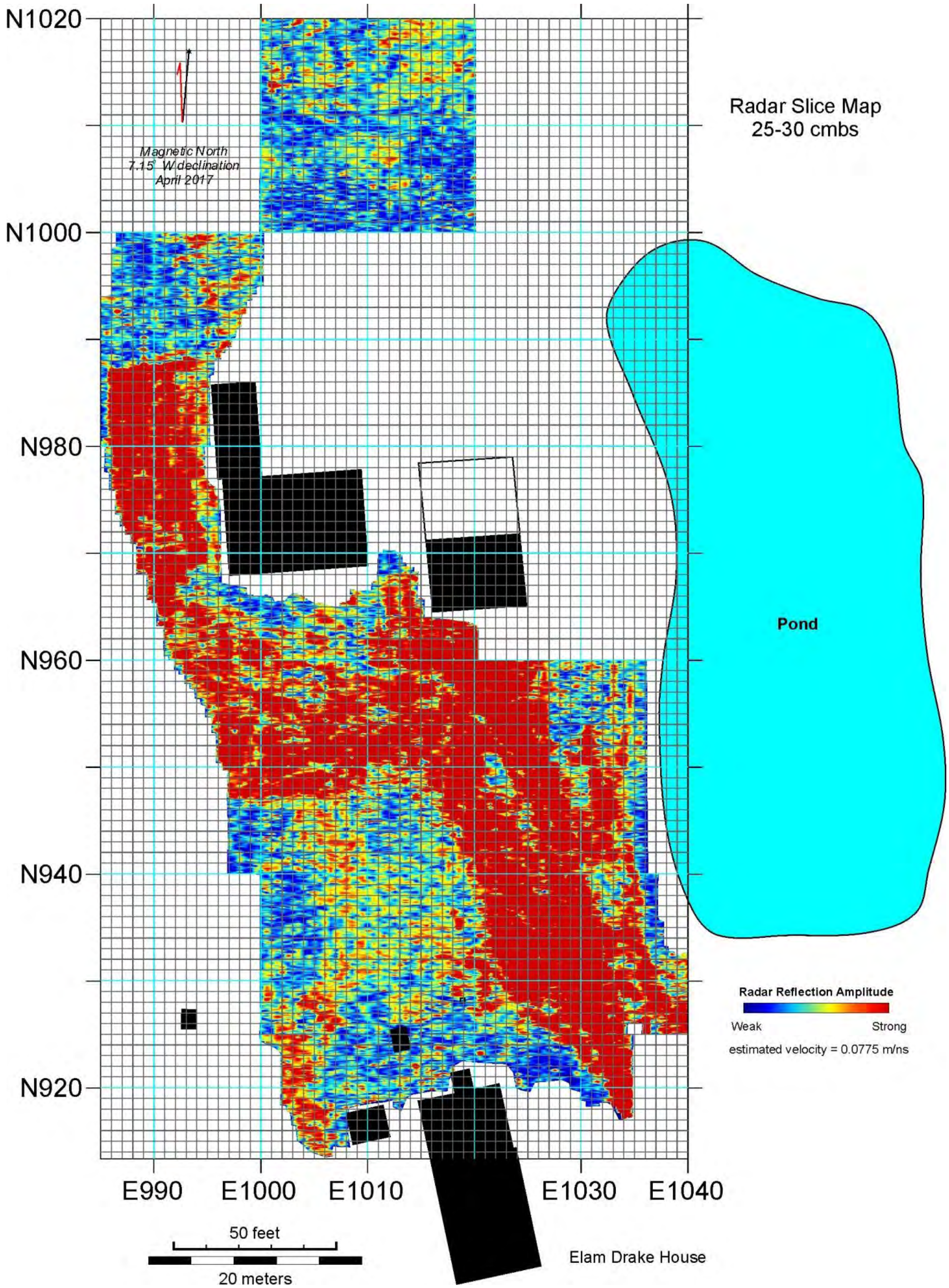

Radar Slice Map
25-30 cmbs
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N1000
N980
N960
N940
N920
Magnetic North
7.15° W declination
April 2017
Pond
Radar Reflection Amplitude
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Strong
estimated velocity = 0.0775 m/ns
E990
E1000
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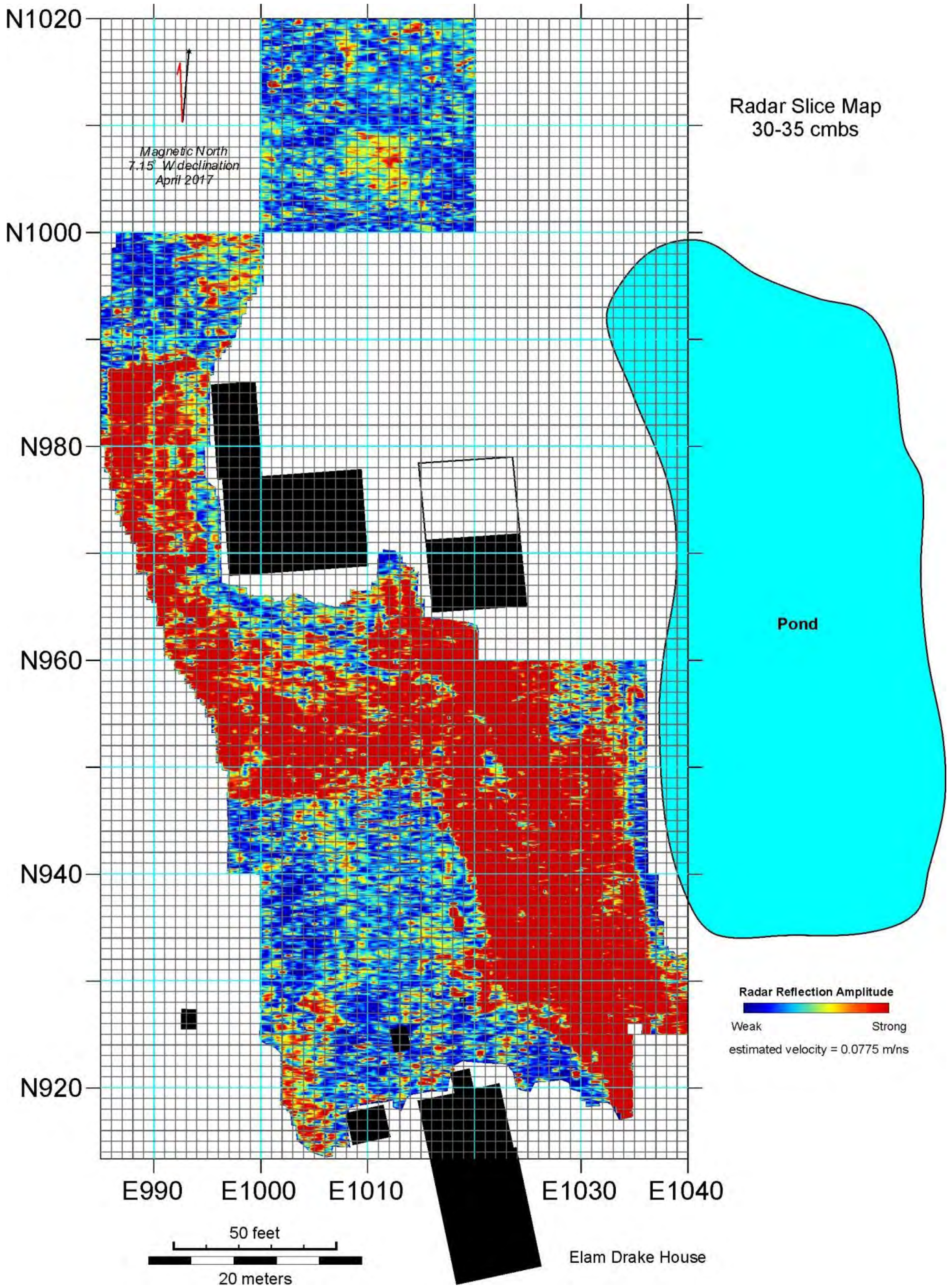
E1030
E1040
50 feet
20 meters
Elam Drake House



Radar Slice Map
30-35 cmbs
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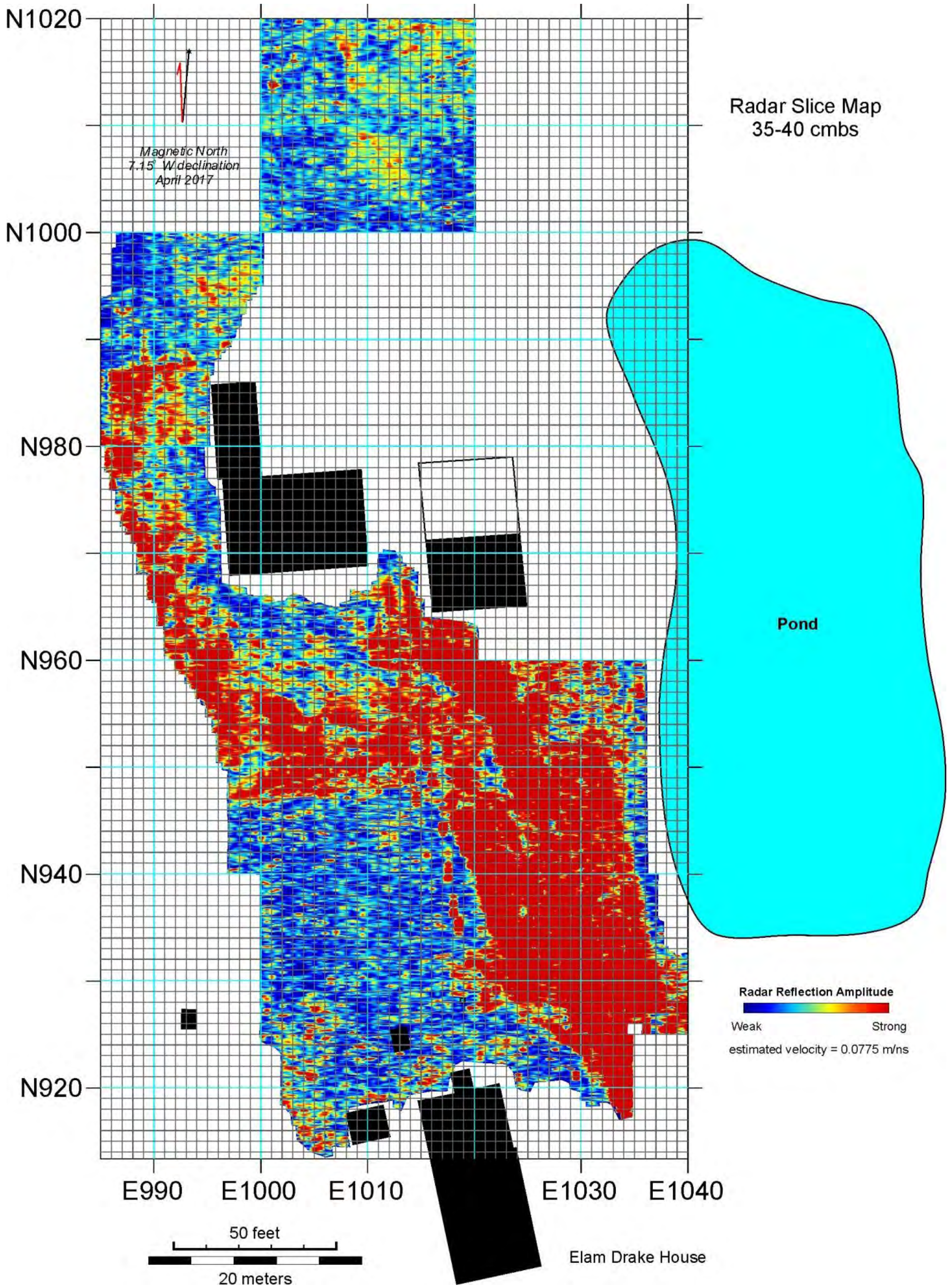
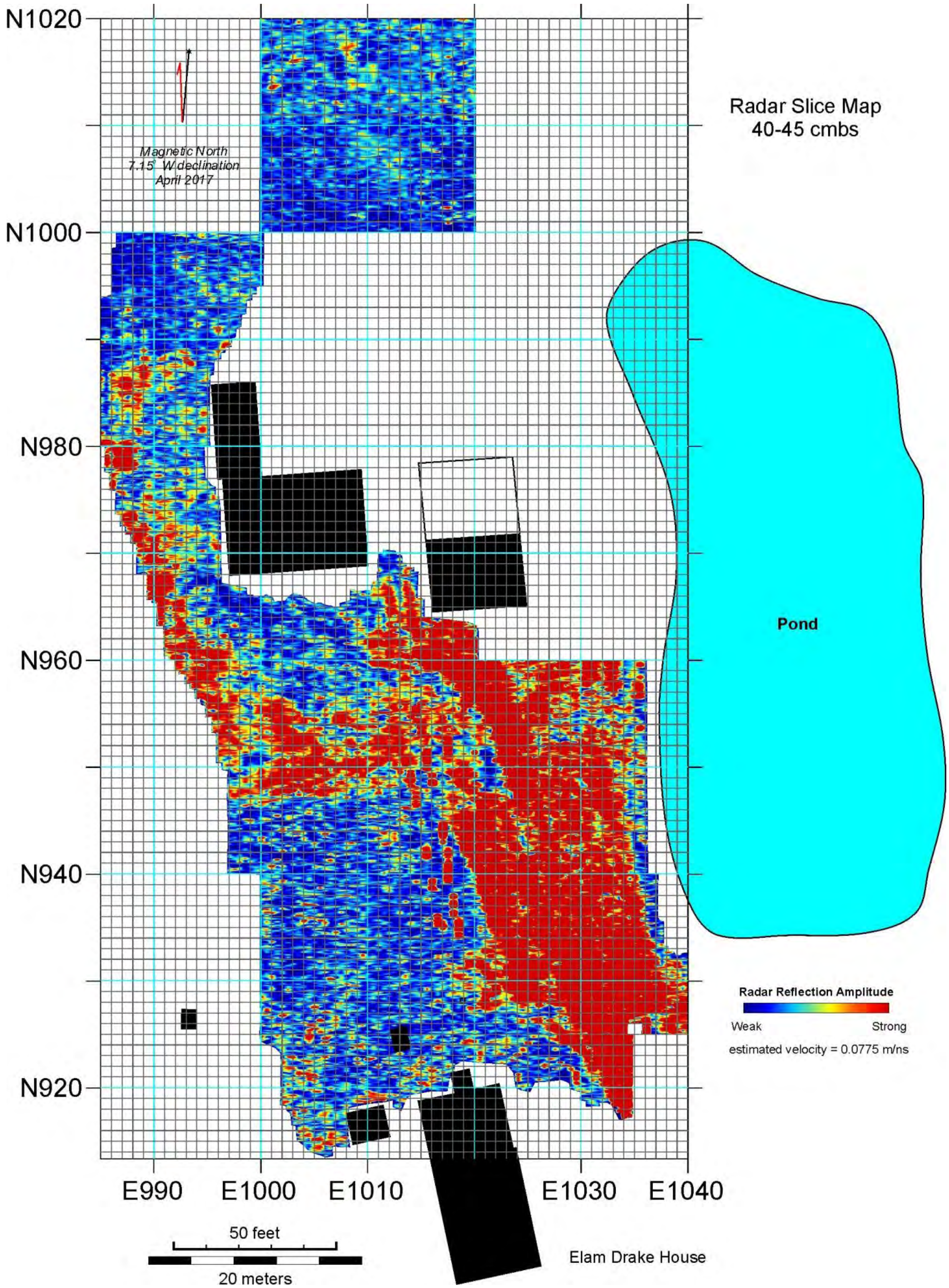
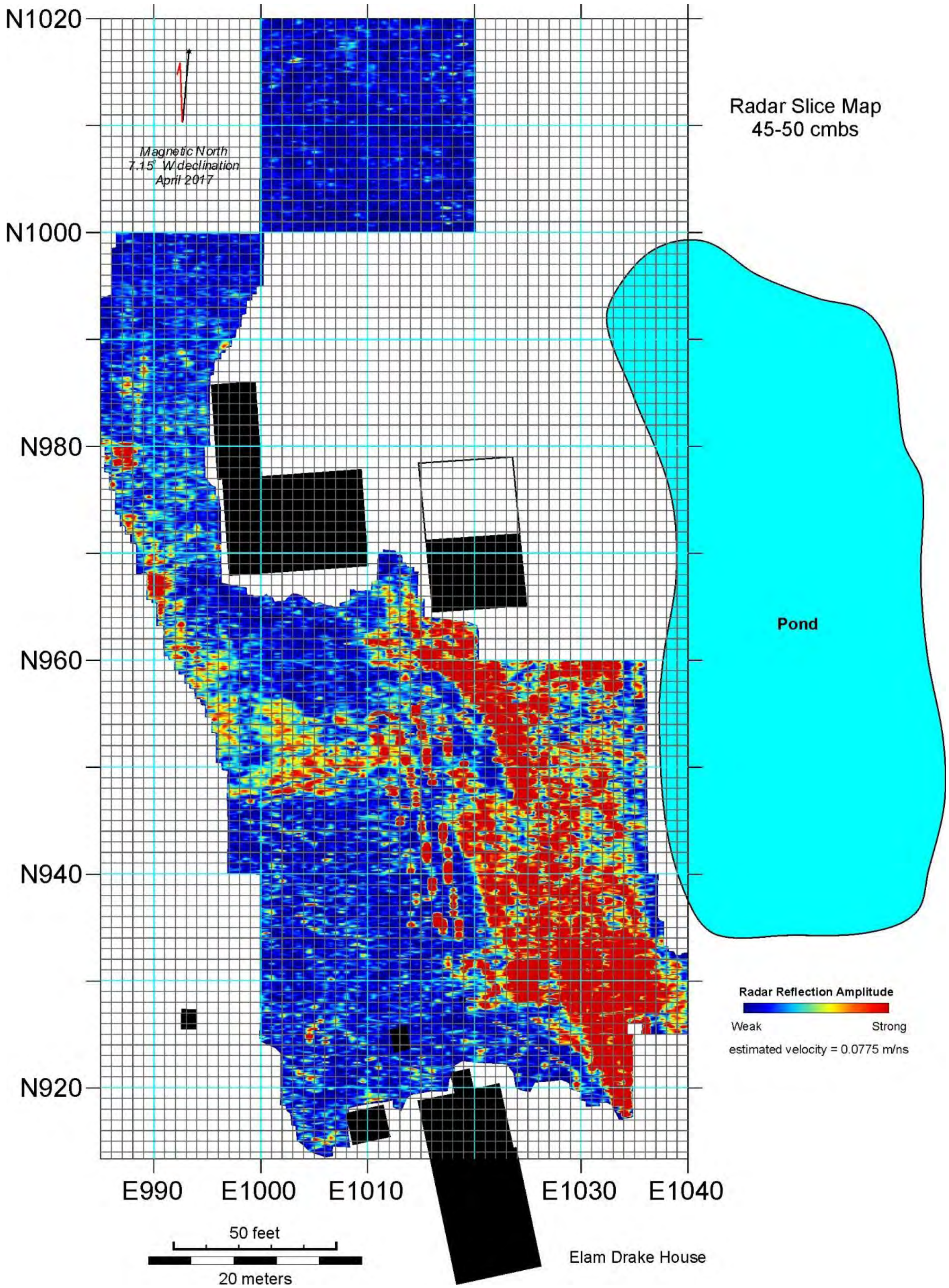
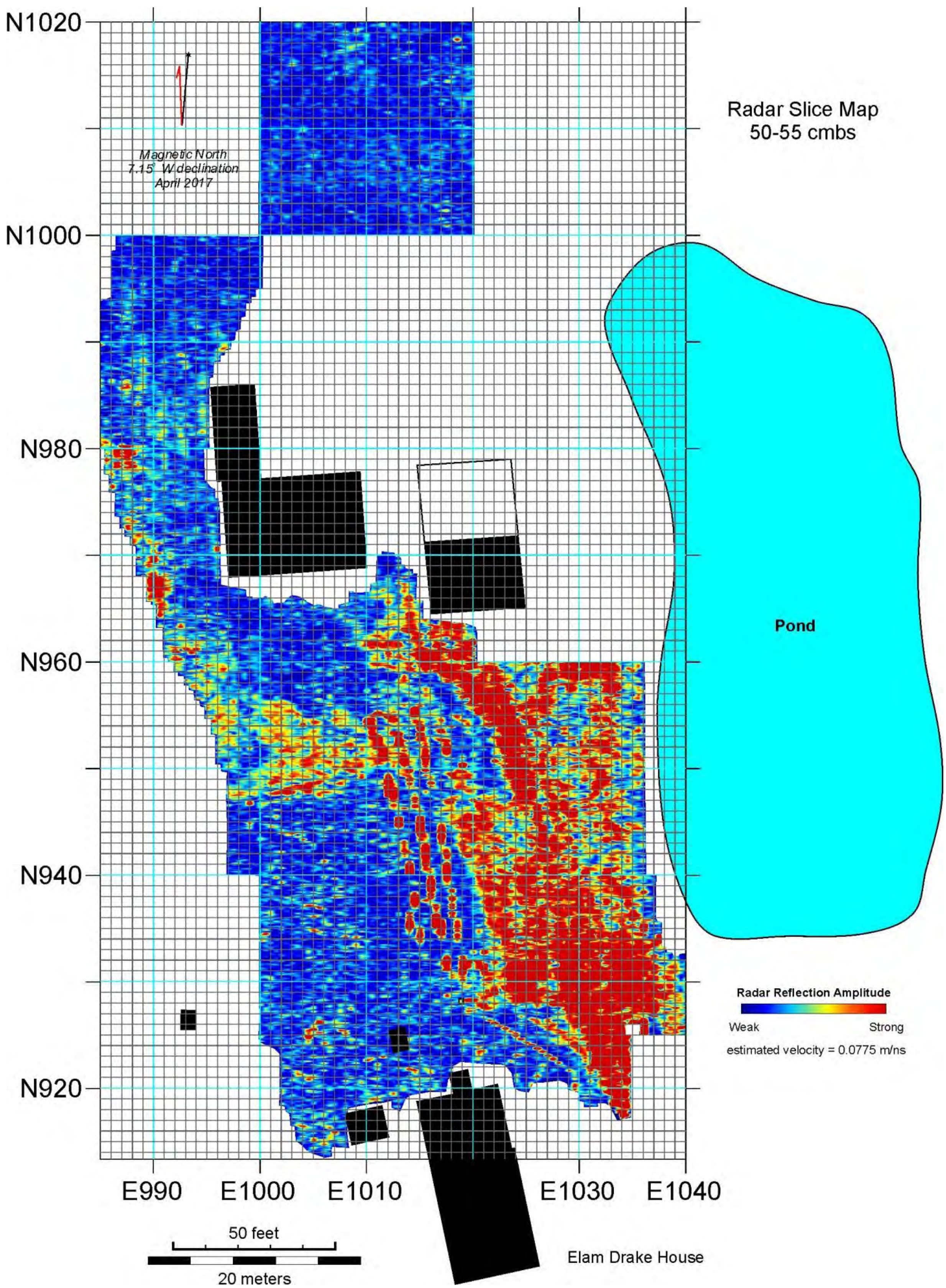
April 2017
N1020
N1000
N980
N960
N940
N920
E990
E1000
E1010
E1030
E1040
Pond
Radar Reflection Amplitude
Weak
Strong
estimated velocity = 0.0775 m/ns
50 feet
20 meters
Elam Drake House

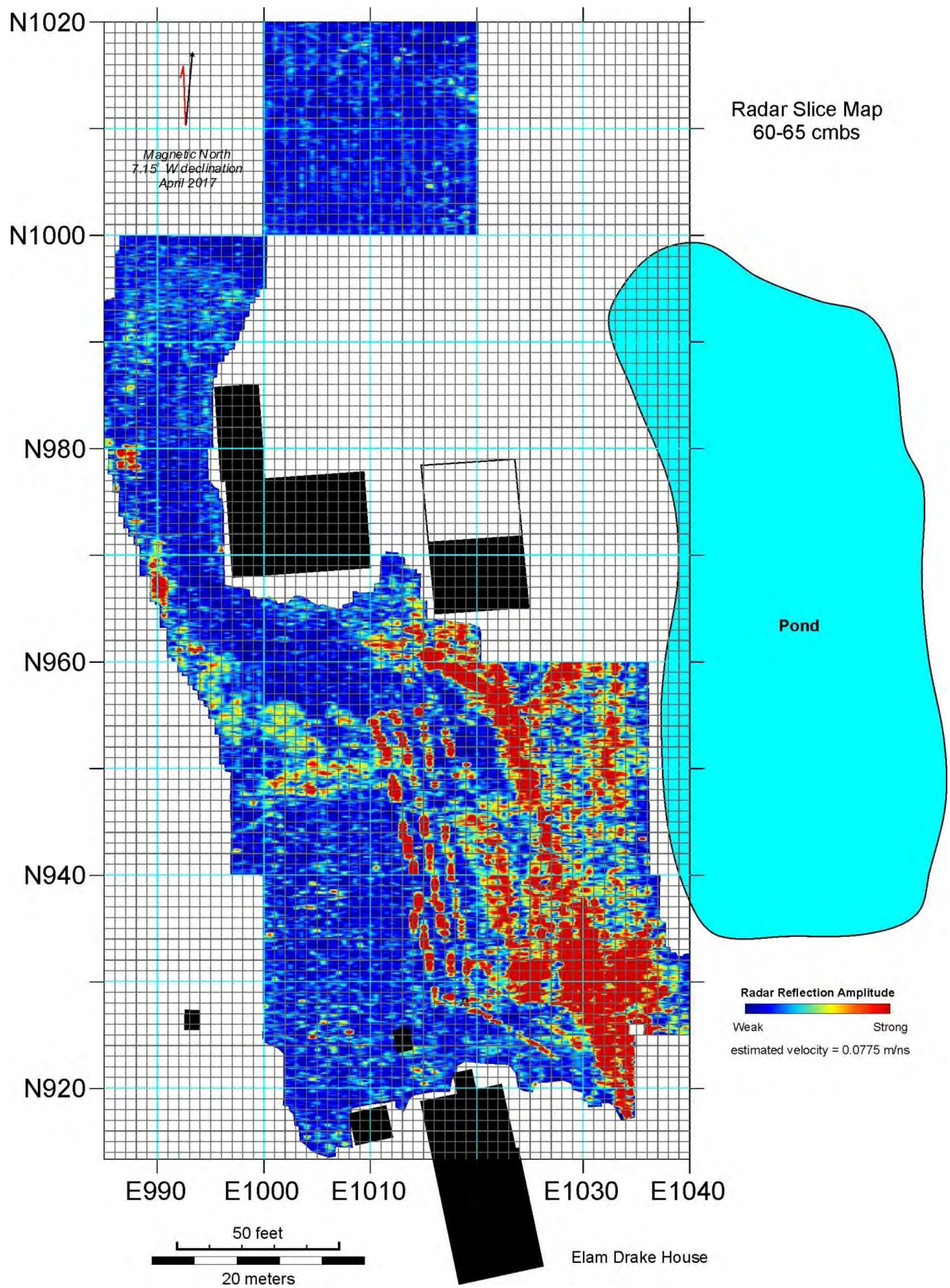

Radar Slice Map
35-40 cmbs
Magnetic North
7.15° W declination
April 2017
N1020
N1000
N980
N960
N940
N920
E990
E1000
E1010
E1030
E1040
Pond
Radar Reflection Amplitude
Weak
Strong
estimated velocity = 0.0775 m/ns
50 feet
20 meters
Elam Drake House



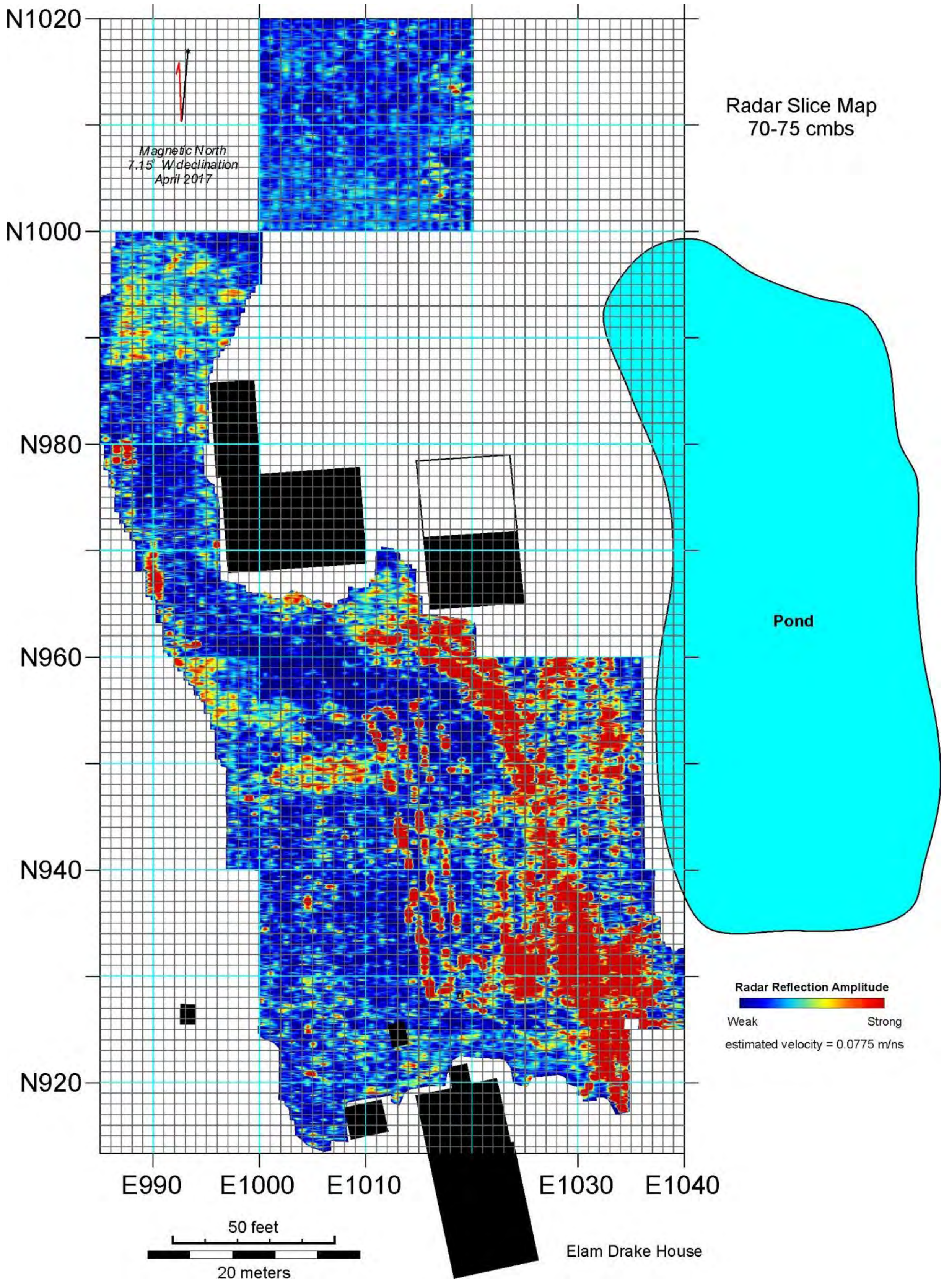
Radar Slice Map
40-45 cmbs
Magnetic North
7.15° W declination
April 2017
N1020
N1000
N980
N960
N940
N920
E990
E1000
E1010
E1030
E1040
Pond
Radar Reflection Amplitude
Weak
Strong
estimated velocity = 0.0775 m/ns
50 feet
20 meters
Elam Drake House

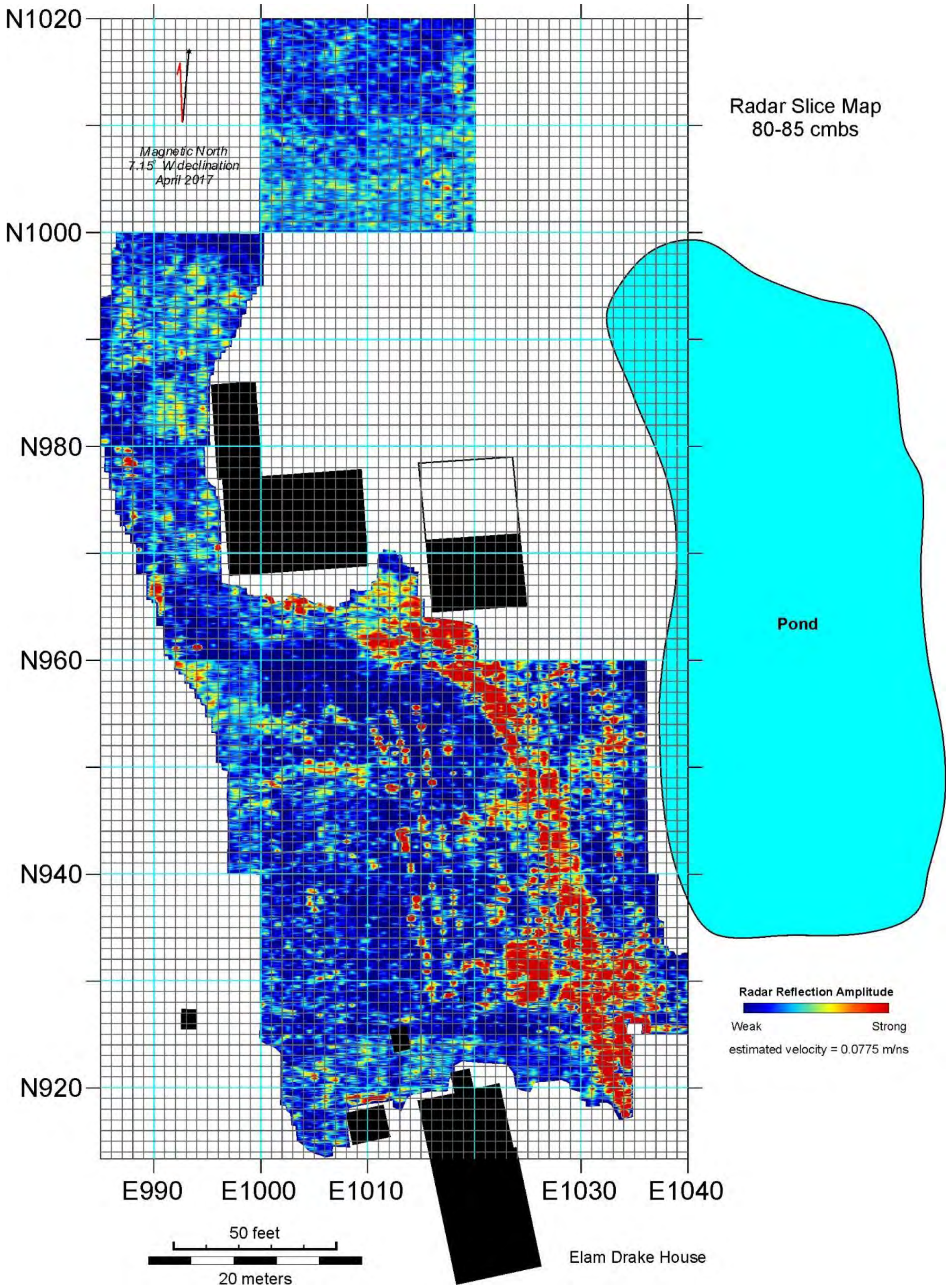

N1020
N1000
N980
N960
N940
N920
E990
E1000
E1010
E1030
E1040
Magnetic North
7.15° W declination
April 2017
Radar Slice Map
45-50 cmbs
Pond
Radar Reflection Amplitude
Weak
Strong
estimated velocity = 0.0775 m/ns
50 feet
20 meters
Elam Drake House


N1020
N1000
N980
N960
N940
N920
E990
E1000
E1010
E1030
E1040
Magnetic North
7.15° W declination
April 2017
Radar Slice Map
50-55 cmbs
Pond
Radar Reflection Amplitude
Weak
Strong
estimated velocity = 0.0775 m/ns
50 feet
20 meters
Elam Drake House



N1020
N1000
N980
N960
N940
N920
E990
E1000
E1010
E1030
E1040
Magnetic North
7.15° W declination
April 2017
Radar Slice Map
60-65 cmbs
Pond
Radar Reflection Amplitude
Weak
Strong
estimated velocity = 0.0775 m/ns
50 feet
20 meters
Elam Drake House


Radar Slice Map
70-75 cmbs
Magnetic North
7.15° W declination
April 2017
N1020
N1000
N980
N960
N940
N920
E990
E1000
E1010
E1030
E1040
Pond
Radar Reflection Amplitude
Weak
Strong
estimated velocity = 0.0775 m/ns
50 feet
20 meters
Elam Drake House



N1020
N1000
N980
N960
N940
N920
E990
E1000
E1010
E1030
E1040
Magnetic North
7.15° W declination
April 2017
Radar Slice Map
80-85 cmbs
Pond
Radar Reflection Amplitude
Weak
Strong
estimated velocity = 0.0775 m/ns
50 feet
20 meters
Elam Drake House