Michael L. Hargrave

Geophysical Detection of Features and Community Plan at New Philadelphia, Illinois

ABSTRACT

Geophysical surveys, including magnetic field gradient and electrical resistance techniques, were conducted at New Philadelphia to identify productive locations for excavation, investigate the community plan, and present students with training in these techniques. Excavation of a sample of the most promising anomalies identified foundations, stone-lined and pit cellars, wells, a privy, and other features. Archival records available during the fieldwork provided no evidence for the presence of four features constructed in the 1840s and 1850s. Features directly associated with houses, such as foundations and cellars, are located very near the platted locations of streets, alleys, and corners, whereas many of the non-residential features occur in the middle portions of lots.

Introduction

The 2004–2006 investigations at New Philadelphia yielded a wealth of new information, from the existence of early occupations for which the available archival records provided no hints, to household variation in dietary, discard, and consumer practices (Shackel 2006). The project was also successful in that the lives of many individuals—members of the local and descendant communities, student excavators, university and museum researchers, local historians, landowners, and casual visitors—were enriched by opportunities to examine the remains of the actual homes and possessions of New Philadelphia's early residents. Such opportunities to connect with the past often occur during archaeological fieldwork, but they were particularly plentiful at New Philadelphia. Many factors made these opportunities possible: a rich archival record, the sustained involvement of Frank McWorter's descendants, a highly motivated preservationist group (the New Philadelphia Association), a growing awareness of Free Frank's story (Walker 1983) among the broader public, and most importantly, the identification of well-preserved archaeological deposits. This article focuses on how geophysical techniques were used to locate subsurface archaeological features and to develop a better understanding of New Philadelphia's community plan.

Goals

The use of geophysics at New Philadelphia had three goals. The first objective—one that had important implications for the success of the overall project—was to identify productive areas for hand excavation. Archival sources, including the town's 1836 plat, tax records dating back to 1867 (earlier records exist but had not yet been thoroughly examined), the federal census from 1850 onward, a sketch map of the remains of the town in the early 20th century (Burdick 1992), early aerial photographs, and a controlled surface collection of artifacts (Gwaltney 2004; Gwaltney and Beasley, this volume) provided general information about the likely presence of architectural features within particular 60 × 120 ft. town lots. That information allowed the excavators to identify promising portions of the 42 ac. site, but could not guarantee that excavation units would encounter subsurface features dating to the 19th century. One could fit 288 5 × 5 ft. excavation units into a single town lot, so it was very unlikely that any given unit would fortuitously encounter relatively small but important features like cellars, cisterns, wells, or privies. It was hoped that the geophysical surveys would identify subsurface features, allowing the excavators to focus on highly informative contexts with relatively few unproductive units.

A second goal was to develop a landscape-scale geophysical image (Kvamme 2003) of New Philadelphia that would allow a better understanding of the town's community plan, that is, the spatial arrangement of streets, houses, other buildings, specialized facilities, gardens, pastures, refuse dumps, and so forth. The 1836 plat, and a later version published in an 1872 Pike County atlas (Pike County Deed Book 1836:183; Ensign 1872; Walker 1983:104) depicted the planned arrangement of streets, alleys, and lots, but the extent to which they

Historical Archaeology, 2010, 44(1):43-57.

ever actually existed was uncertain. The only evidence for other details of the community plan (houses and wells) was an informant's sketch map (Burdick 1992) and an early aerial photograph, both of which pertained primarily to the late 19th and mid-20th centuries.

The third objective was to introduce students to geophysics, primarily through opportunities for hands-on experience in data collection. Geophysical techniques are not widely understood or used by many archaeologists in the U.S. (Hargrave et al. 2002). To overcome this, students and colleagues must be made aware of geophysics' potential benefits and limitations.

Geophysical Methods

Two geophysical techniques were used at New Philadelphia: electrical resistance and magnetic field gradiometry. These techniques have been found to be effective at a number of other Illinois historic sites, and their usefulness at New Philadelphia was verified by a one-day, preliminary survey conducted in April 2004. Conductivity might also have been useful, but the appropriate instrument was not readily available. Conventional wisdom suggested that the site's silty clay soil would not be favorable for ground penetrating radar (GPR). In retrospect, the abundance of rock and brick in features that occurred immediately below the plow zone may have made GPR useful, but in practical terms, it was not essential to use a third technique to achieve project goals.

The resistance survey was conducted using a Geoscan Research RM15 (Hargrave et al. 2002; Somers 2006). The RM15 consists of a resistance meter, digital display, and memory unit mounted atop a lightweight frame. At the bottom of the frame is a horizontal beam that supports either two or three probe electrodes. The probes were spaced 50 cm apart, and this distance determined the approximate depth of survey. When the probes are inserted into the ground, a small electrical current is injected by one probe, and the potential is measured by the adjacent probe. The instrument calculates the resistance, which is the ease or difficulty with which the current passes through the soil at that location.

Variation in resistance depends largely upon moisture content. Changes in resistance are generally gradual across an undisturbed expanse of soil. Localized disturbances associated with archaeological features, concentrations of architectural debris, large rocks, tree roots, plow furrows, and other phenomena cause abrupt differences in moisture content. When resistance data are collected at regular, closely spaced intervals across the site, features can be detected as anomalies, which are discrete loci characterized by resistance values that are distinct from their immediate surroundings.

In the 2004 and 2006 surveys an MPX multiplexer was added to the resistance system. This allowed two measurements to be made (using three probes) at each data collection point. Data were collected at 50 cm intervals along traverses that were spaced at 1 m intervals, resulting in four resistance values per square meter. The MPX was not used in 2005 because of technical problems. One reading was collected at 50 cm intervals along the traverses, resulting in a data density of two values per square meter. Areas surveyed in 2005 are characterized by (Figure 1) lower resolution and, because the summer of 2005 was very dry, lower contrast between possible features and their surroundings. A three-person crew comprised of field school students and instructors was able to collect resistance data in five or six 20 × 20 m blocks per day.

The magnetic survey was conducted using a Geoscan Research FM36 gradiometer in 2004 and 2005; the instrument was upgraded to an FM256 in 2006. This instrument includes two fluxgate sensors vertically separated by a fixed distance of 50 cm. Two geophysical properties—induced and remanent magnetism—allow some materials to be detected in a magnetic survey. A material's induced magnetism, a response to earth's magnetic field, is determined by its magnetic susceptibility. This potential to be magnetized depends largely upon its content of iron oxides. Cultural activities that result in the deposition of burned and organic materials can cause localized increases in magnetic susceptibility. A-horizon soils and culturally enriched feature fill are generally characterized by a higher magnetic susceptibility than the underlying B-horizon (Kvamme 2006).

Materials containing iron oxides that have been subjected to high temperatures assume a thermoremanent magnetism. As materials heated beyond their Curie point (about 565–675°C)

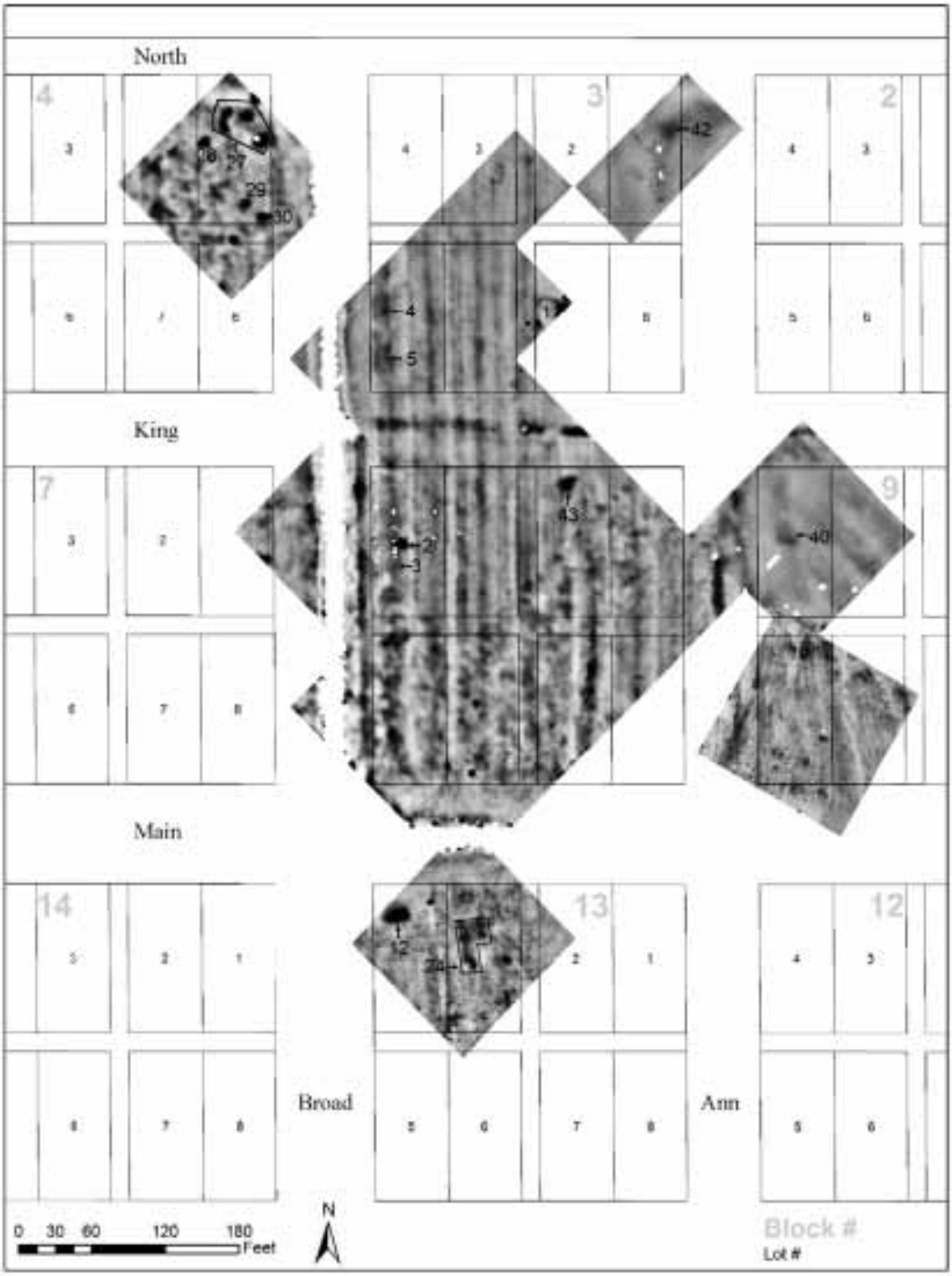

FIGURE 1. Results of the electrical resistance survey. Anomalies discussed in the text are numbered; see Tables 1 and 2 for corresponding feature numbers. (Map by author, 2008.)

cool, components of their iron oxides are realigned relative to earth's current magnetic field (Breiner 1999). Implications of this process for magnetic survey include the potential for detecting artifacts such as bricks, concentrations of daub and pottery, and features such as kilns, hearths, and burned houses (Kvamme 2006). Ferrous metals are, of course, highly magnetic, and strong anomalies associated with iron artifacts typically dominate magnetic maps of historic sites.

The magnetic data at New Philadelphia were also collected in a series of 20 × 20 m grids (Figure 2). Eight data values per linear meter were recorded along transects that were spaced at 1 m intervals, resulting in a data density of eight readings per square meter. Working in a field school setting, it was possible to survey 10 or 12 grids in a normal day. The field strategy was to survey relatively large, continuous areas with the gradiometer, and then to conduct electrical resistance survey in the most promising areas. The magnetic survey ultimately covered 6.5 ac., whereas the resistance survey included 4.25 ac.

The 1836 historic town plat (Pike County Deed Book 1836:183; Ensign 1872; Walker 1983:104) indicated that New Philadelphia's streets and alleys were oriented relative to the cardinal directions, and it was assumed that most structures, fences, and other linear features would conform to that orientation. Because one of the software techniques used to process the magnetic survey data tends to remove linear anomalies that are oriented parallel to the data collection traverses, the geophysical grid at New Philadelphia was oriented northeast to southwest.

Geophysical survey was conducted for two or three days during the first week of each field season. The students' hands-on experience in data collection was supplemented by an evening introductory lecture, opportunities to see preliminary maps when the data were downloaded to a laptop computer during the day, and the excavation team's use of the geophysical maps to guide the placement of many of the excavation units. The excavation team made the final decisions about which of the anomalies recommended for investigation would actually be excavated, and where to place the excavation units. Some town lots were of particular interest because of the ethnicity, occupation, or historical significance of the individuals believed to have lived there. In a few such cases, anomalies were excavated that were not—based on the geophysical data alone—viewed as probable features, but were nevertheless the most promising targets in high-priority lots.

Anomaly Detection and Interpretation

An effective interpretation of geophysical data requires an understanding of basic geophysical principles, a reasonable amount of archaeological field experience, and previous experience in integrating the two. The reliability of one's interpretations is always enhanced by "ground truthing," that is, the investigation of selected anomalies using small-scale excavations or other independent information (Hargrave 2006). Ground truthing is important because diverse phenomena can often result in very similar anomalies. Additionally, the horizontal dimensions of a magnetic anomaly can be quite deceiving. Very weak magnetic anomalies are often coterminous with (near-surface) buried features or objects, but the relationships between the horizontal dimensions of a strong magnetic anomaly and those of its source are often complex (Breiner 1999).

Resistance anomalies are easier to interpret in that they generally reflect the size and shape of their subsurface sources. At New Philadelphia, however, tire ruts, ridges, and furrows that presumably resulted from the plowing done just prior to the surface collection are apparent in the geophysical data, particularly in Blocks 3 and 8 (Figure 1). The ridges, which appear as positive resistance anomalies because they were drier at the time of survey, made it difficult to detect small resistance anomalies associated with possible features.

At New Philadelphia, the resistance anomalies provided more reliable information about subsurface features than did the magnetic anomalies. Many of the magnetic anomalies are associated with ferrous artifacts in the plow zone. It was assumed that in-situ architectural features and secondary deposits of building debris would be manifest by positive resistance anomalies. It was also assumed that most historic features would include some ferrous metal artifacts or brick, and would thus also exhibit a magnetic anomaly. The primary criterion for identifying probable features was the co-occurrence of a

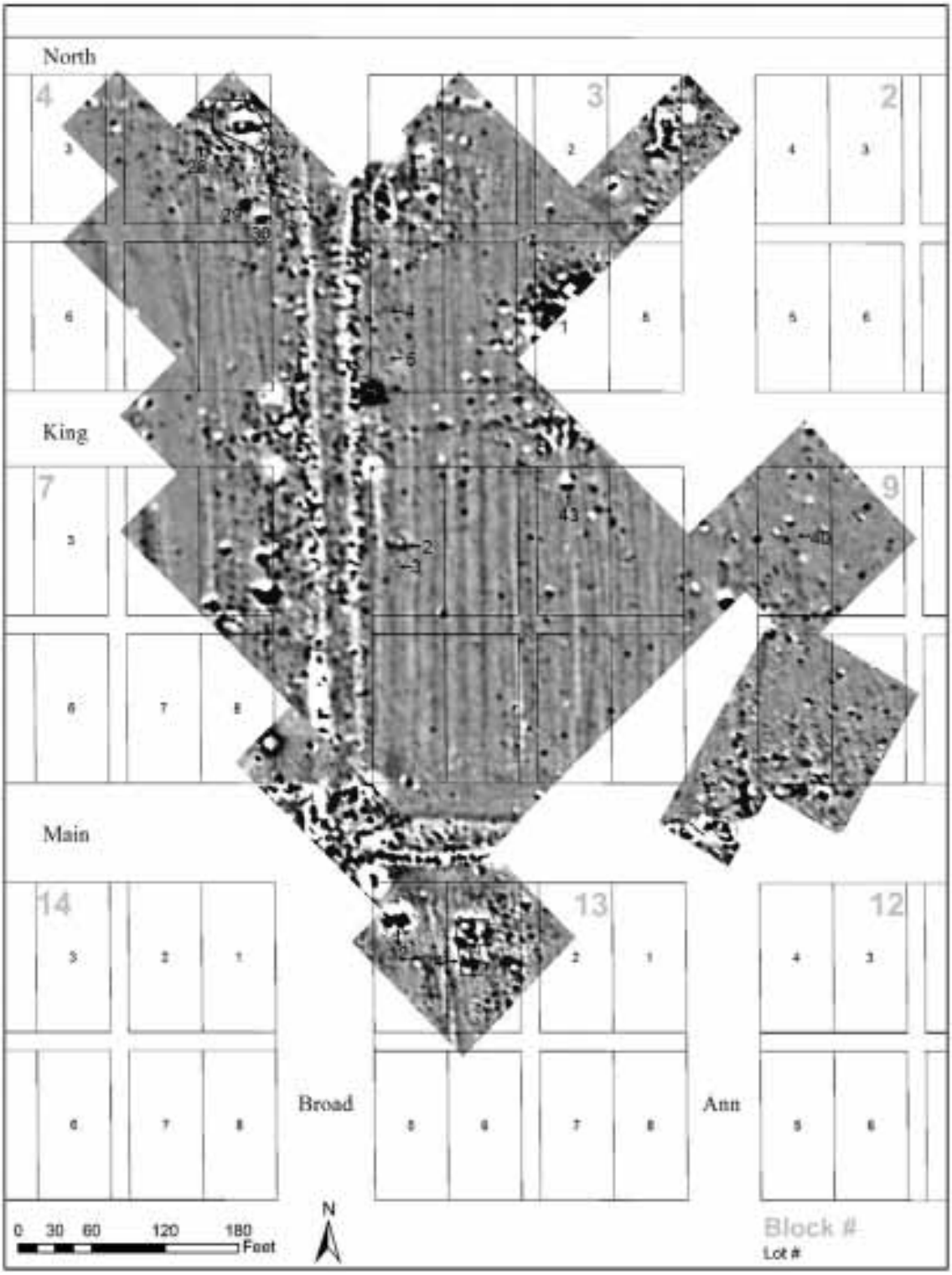

FIGURE 2. Results of the magnetic field gradient survey. Anomalies discussed in the text are numbered; see Tables 1 and 2 for corresponding feature numbers. (Map by author, 2008.)

magnetic anomaly and a feature-sized, relatively symmetrical positive resistance anomaly at the same location.

Results of the resistance and magnetic surveys are presented here as grayscale image maps (Figures 1 and 2). Higher values are darker gray to black; lower values are lighter gray to white. Contrast has been manipulated to present the overall maps to their best advantage, with the result that some of the most subtle anomalies discussed here (e.g., anomalies 3 and 5) are difficult to see (Figure 1). They were detected and evaluated when the data were viewed on a computer screen or using higher-contrast hard-copy maps.

Excavation of Selected Anomalies

Forty-three anomalies were recommended for excavation, and about one-third (n=16, 37%) of those were investigated over the course of the three field seasons. Only one-half (n=8, 50%) of the investigated anomalies were associated with cultural features (Table 1), but this success rate is actually an underestimate. Anomaly 40 would not have been recommended for excavation based on its own merits, but was investigated in hopes of identifying a very high-priority target—an African American schoolhouse that operated within the town before 1874. Anomaly 42 was associated with a concentration of refuse likely related to a blacksmith's shop, but was not numbered as a feature. Finally, Anomaly 27 (actually a cluster of three closely spaced anomalies) was investigated with a test unit and dismissed, although the unit was not optimally located (Table 2). Taking anomalies 27, 40, and 42 into account raises the success rate to about two-thirds.

Pre-Civil War Features

One of the geophysical survey's important contributions was the detection of several features that date to the town's early (pre–Civil War) period. Feature 7 is a rectangular pit believed to have been used as a cellar, beneath the floor of a cabin constructed in the mid 1840s, possibly when Spaulding Burdick bought the lot (Block 4, Lot 1) from Frank McWorter in 1846. No indications of the cabin itself were detected. Feature 7 measured 3.5 × 10.5 ft. and extended to about 1.3 ft. below the plow zone. The abundant brick and fieldstone rubble in the feature fill accounts for its appearance as a high-resistance anomaly, and suggests that the feature was filled quickly, probably when the briefly occupied cabin was demolished (Shackel 2006:3C.7).

Feature 13, a well, was a circular, 8 × 9 ft. scatter of brick, cinder, metal and other artifacts,

TABLE 1
INVESTIGATED ANOMALIES, ASSOCIATED WITH FEATURES AS PREDICTED

Anom.	Blk.	Lot	Feat.	Type	Description	Date	Location
1	3	7	16, 17 21	Stone walls	Rectangular stone foundation	1867–1880s 1900–1930s	Mid-lot, near Mid-lot, near alley
28	4	1	19	Storage or privy	Rectangular, stone-lined	1848–1860s	Mid-lot, no access
29	4	1	13	Well	Circular	1840s	Near alley
30	4	1	7	Pit cellar	Rectangular, sub-floor?	1840s	Street-alley corner
43	8	2	14	Stone-lined cellar	Below frame house; entry ramp	1850s–1870s, 1930s	Near street Near street
2	8	4	4	Well	Circular	1850s	Mid-lot, no access
24	13	3	9	Fill zone	Above buried barn	?–1937	Mid-lot, no access
12	13	4	11, 12	Cellar, stone walls	Associated with S. and L. McWorter house	1854–1937	Near street

Note: Feature 15 occurs above Feature 16, but is probably a secondary deposit of rock.
Source: Shackel (2006).

TABLE 2
INVESTIGATED ANOMALIES, PREDICTED FEATURE TYPE NOT PRESENT

Anom.	Blk.	Lot	Feat.	Type	Description	Date	Location
42	3	1	None	Waste pile	Associated with blacksmith shop	?–early 20th century	Near street
4	3	5	8	Post hole	Small, square	?	Mid-lot, near street
4	3	5	10	Ash deposit	Irregular plan	?	Mid-lot, near street
5	3	5	None	—	—	—	—
35	3	6	?	Excavation incomplete	—	—	—
27	4	1	None	—	Recent gravel deposit	—	—
3	8	4	None	—	—	—	—
40	9	4	None	—		—	—

Source: Shackel (2006).

abundant fieldstones, and large pieces of mortar, and was located a few feet northwest of Feature 7. It retained its circular shape to about 4.2 ft. below the surface, and probably extended much deeper below the base of excavations. Its ceramic contents suggest that it too dates to the 1840s, and much of its contents is very likely derived from the briefly occupied cabin (Shackel 2006:3C.9–12).

Deep, well-constructed privies are rare at early- and mid-19th-century rural sites in Illinois (Mazrim 2002), and only one example was found at New Philadelphia. Feature 19 was a 5 × 6 ft. rectangular structure with five courses of dry-laid stone. It may have been constructed for use as a storage feature shortly after D. A. Kittle bought the lot (Block 4, Lot 1) from Frank McWorter in 1848, and then used as a privy in the 1850s. It is also possible that Feature 19 was initially constructed to serve as a privy (Shackel 2006:3C.16–21). The abundant stone contents account for Feature 19's appearance as a well-defined, high-resistance anomaly.

A second well, Feature 4 (in Block 8, Lot 4), also dates to the town's pre–Civil War period. This feature's roughly circular upper portion sloped down to a cylindrical shaft about 6 ft. in diameter. Rock, mortar, and brick contents account for the feature's detection as a high-resistance anomaly, but the low density of organic refuse and domestic artifacts suggests that it was rapidly filled during the 1850s (Shackel 2006:3E.31–34).

Later Features

The most substantial features identified at New Philadelphia are associated with its Civil War–era and postwar occupations. Feature 14 (in Block 8, Lot 2) was a large (18.6 × 16 ft.) cellar with an average depth of about 2.7 ft. below the plow zone. An extension off the northeast corner that is clearly discernable in the resistance data (Figure 1, Anomaly 43) represents a sloping entrance. Lath impressions on some of the plaster contents indicate this feature was a cellar beneath a frame building with plaster walls. The lower fill zone dates to the 1860s, whereas the upper material dates to the early 1870s (Shackel 2006:3E.4–14). The abundant fieldstone, mortar, and other artifacts account for the high resistance values associated with Feature 14.

Anomaly 1 was initially viewed as a linear resistance anomaly running east–west from a 19th-century log cabin that was brought to the site by the current landowners (Figure 1). Investigation of this portion of the anomaly early in the 2006 field season revealed a relatively shallow scatter of fieldstone and bricks (Feature 15) that was probably consolidated at this location by those who farmed the site. Continued excavation disclosed a well-preserved fieldstone wall (Feature 16). A reexamination of Anomaly 1 revealed that another linear component extended to the south, corresponding to the west wall (Feature 21) of the foundation. This portion of

Anomaly 1 was partially obscured by a prominent anomaly associated with a plow furrow, and its significance was not initially appreciated. Archival data indicate the house was built on Block 3, Lot 7 shortly after the Civil War, used for about 15 years, and then demolished in the 1880s. A second house was built on the same foundation after 1900, and existed into the 1930s (Shackel 2006:3B.35).

Lots 3 and 4 in Block 13 were of particular interest because an informant who lived at the site in the early 20th century described a large structure there as a "hotel" (Shackel 2006:3G.1–3). The structure burned in 1937, but no indications of its remains or an associated barn are visible in a 1939 aerial photograph. The detection of a number of resistance and magnetic anomalies in Lots 3 and 4 suggested the presence of at least two architectural features. Heavily mottled soil and a distinct fill zone (Feature 9) encountered during excavation of the Anomaly 24 complex suggested that the remains of a structure (presumably the barn) had been buried using soil that probably included transported fill from the construction of a nearby pond (Shackel 2006:3B.8).

Based on its size and shape, Anomaly 12 was predicted to be associated with architectural remains. The excavation of a number of units resulted in the identification of Features 11 and 12. These features represent the south and north walls (respectively) of the stone-lined cellar associated with a house built on Block 13, Lot 4 by Squire and Louisa McWorter in 1854 (Shackel 2006:3G.1). It is interesting that the resistance anomaly associated with this stone-walled cellar was crisply defined but also exhibited irregular edges. It is possible that the upper portions of the cellar walls collapsed during the fire, or were (in the case of Feature 11) displaced by plowing (Shackel 2006:3G.10). Deeper portions of the cellar walls were found to be much more intact, but these were beyond the depth range of the resistance. In comparison, Anomaly 1 exhibits far more regular, linear edges that reflect the better state of preservation of the fieldstone walls represented by Features 16, 17, and 21.

Negative Findings

A number of the investigated anomalies were neither associated with features, nor, at least, with the types of features that had been expected (Table 2). Anomaly 42 (Block 3, Lot 1) was detected in a low area near Baylis Road, where a blacksmith shop was located during the late 19th century. Excavation encountered a concentration (not recorded as a feature) of metal debris, charcoal, and slag, suggesting that this anomaly represents a waste pile located near the shop (Shackel 2006:3B.1–5). Anomaly 42 exhibited a much lower contrast with its immediate surroundings than did other resistance anomalies that proved to be associated with cellars, pits, and wells (Figure 1), although the associated magnetic anomaly was very promising (Figure 2).

Anomaly 4, located near Broadway Street in Block 3, Lot 5, was one of the geophysical study's biggest disappointments. This resistance anomaly was rectangular, rather crisply defined, measured about 9 × 6.6 ft., and was viewed as a good candidate to be a large pit, possibly a sub-floor cellar. Soil conditions were too dry to permit coring, so the Anomaly 4 locale was investigated by six 5 × 5 ft. units—a significant allocation of time and effort. No feature was found to correspond to the targeted anomaly, although two small features (whose presence had not been predicted) were found nearby. Feature 8 was a square post mold, and Feature 10 was an elongate ash layer (Shackel 2006:3B.15–19).

Anomaly 5 (Block 3, Lot 5) consisted of two low-contrast linear resistance anomalies whose configuration was consistent with structure walls. Systematic soil coring found no indications for an architectural feature, and no further investigations were conducted (Shackel 2006:3B.19). Similarly, Anomaly 3 (Block 8, Lot 4) consisted of several faint linear resistance anomalies that resembled the walls of a rectangular structure. Here again, soil coring failed to provide any evidence for subsurface features (Shackel 2006:3E.45). The investigation of Anomalies 3 and 5 represented attempts to identify very subtle evidence for structures that did not include stone foundations or cellars. Although the results were negative in these cases, it should not be assumed that ephemeral structures are not present at the site.

Anomaly 27, a cluster of three large, high-contrast resistance anomalies in Block 4, Lot 1, was investigated by a 5 × 5 ft. grid of soil

cores and the excavation of a test unit of the same size. Excavation recovered window glass, ceramics, fence staples, and wire, as well as a concentration of small stones, each approximately 0.1 ft. in diameter, in the western portion of the unit. Based on these findings, Anomaly 27 was interpreted in the field as a deposit of gravel associated with the relatively recent grading of nearby Baylis Road (Shackel 2006:3C.23). In retrospect, however, it appears that the excavation unit did not actually intersect any of the three anomalies that were designated as Anomaly 27, and additional investigation is warranted.

The excavation team was particularly interested in identifying remains of the African American school building that was, according to oral history, located on Block 9, Lot 4 until about 1872 (Shackel 2006:3F.1–3). One of several units excavated prior to the geophysical survey encountered a 1.5 ft. long fieldstone pier (Feature 6). This portion of the site is very heavily eroded. The stone pier was located only 0.2 ft. below the surface, and plow-scarred subsoil occurred at that depth. Resistance and magnetic surveys were conducted in hopes of finding additional remains of the schoolhouse. Unfortunately, no well-defined anomalies consistent with architectural remains were identified in that lot. A very low-contrast but roughly rectangular anomaly was investigated, but yielded no evidence for subsurface features (Figure 1, Anomaly 40). That anomaly would not have been recommended for investigation based on geophysical data alone if found elsewhere at the site; it simply represented the best target for excavation in this high priority lot.

Finally, Features 1 and 3 were identified in excavation units that were located using the 1939 aerial photograph and surface artifact evidence (Gwaltney 2004) rather than geophysical data, but were later found to correspond to geophysical anomalies (Table 3). Feature 1, a 5 × 5 ft. shallow pit cellar located in Block 9, Lot 5 (Shackel 2006:3F.7), corresponds to a small resistance anomaly that, based on its size, would probably not have been singled out for investigation (larger, somewhat more promising anomalies are located nearby) (Figure 1). Feature 3 was a substantial fieldstone foundation (in Block 7, Lot 1) believed to represent a late- 19th-century addition to the original structure that was reportedly built in the mid-19th century (Shackel 2006:3D.4–5). This foundation was later found to correspond to a distinct magnetic anomaly. Unfortunately, available time did not permit resistance survey to be conducted in this area.

Summary of Ground Truthing

Most of the excavations at New Philadelphia focused on the largest, most clearly defined (in geophysical terms, highest-contrast) resistance anomalies, so it is not too surprising that they identified substantial features like fieldstone foundations, large cellars, wells, and a stone-lined privy (Table 1). These represent the largest volume feature types that one would expect to find at 19th-century rural historic sites in the Midwest (Mazrim 2002). Most of the features had been used as refuse receptacles when abandoned, so they provided relatively large

TABLE 3
FEATURES FOUND WITHOUT USING GEOPHYSICAL DATA

Anom.	Blk.	Lot	Feat.	Type	Description	Date	Location
—	3	4	2	Lime slacking pit	Shallow, rectangular	19th cent.	Mid-lot, no access
—	3	4	5	Post hole	Non-architectural	?	Mid-lot, no access
—	7	1	3	Stone foundation	Assoc. with 19th century addition	Mid-1800s–ca. 1940	Street-alley corner
—	9	5	1	Pit cellar	Square, sub-floor?	1854–1860s	Near street
—	9	4	6	Stone footer	Assoc. with late 19th century school?	Pre-1872–post-1909	Street-alley corner

Source: Shackel (2006).

and informative artifact assemblages (Shackel 2006). These features also represented concentrations of in-situ or discarded building debris, and this contributed significantly to their strong resistance contrast with the surrounding soil. Most of the excavated anomalies that were not associated with features (or at least, not the predicted type of features) (Table 2), were lower contrast and less-crisply defined. They were investigated in hopes of locating the remains of relatively ephemeral structures, or high-priority structures that were, based on archival or oral history information, believed to be located on particular lots. Several of the low-contrast anomalies were investigated only by soil coring, a technique that is very cost effective, but more likely to verify the presence of architectural features or debris, than subtle features like shallow pits with faint fill. On balance, very few low-contrast anomalies were investigated by excavation units, so it is not known if other examples of that category may be associated with cultural features.

Uninvestigated Anomalies

Population estimates for New Philadelphia throughout the 19th century (King 2007) suggest that a number of additional structure and feature clusters must be present. Roughly two-thirds of the 43 anomalies originally recommended for excavation have not been investigated. A reexamination of the geophysical maps after the completion of fieldwork identified additional anomalies that also warrant investigation. None of the promising but uninvestigated resistance anomalies suggest features as large as the Feature 14 cellar, the stone-walled cellar associated with features 11 and 12 (Squire and Louisa McWorter's house), or the stone foundation represented by Features 16, 17, and 21. A number of the uninvestigated anomalies could, however, be comparable to the smaller excavated features (for example, Features 4, 7, 13, and 19). Most of the uninvestigated anomalies occur in the vicinity of large excavated features, so they could provide expanded samples of artifacts, facilities, and subsistence remains related to those occupations. A few of the uninvestigated anomalies occur in isolation and could conceivably represent the remains of archaeologically unidentified households.

The absence of any additional promising resistance anomalies comparable in size and contrast to Features 11, 12, and 14, and Features 16, 17, and 21 suggests that the unidentified structures are either located in lots that have not yet been surveyed, or were structures that lacked substantial cellars and foundations. Early cabins, relatively modest frame houses of the later 19th century, and outbuildings of all periods may have been supported by stone piers that were later removed for use in subsequent structures, or removed as obstacles to plowing. One would expect mid- and late-19th-century occupations to be manifest by concentrations of nails and possibly brick. Unfortunately, magnetic anomalies are so numerous (Figure 2) that it is difficult to identify discrete, small clusters that may be associated with unidentified structures.

Future Survey

To date, only about 15% of the 42 ac. town has been magnetically surveyed, and the resistance data cover only 10%. Although these percentages are low, most of the lots that included dense architectural debris in the controlled surface collection were included in the magnetic survey (Gwaltney 2004; Gwaltney and Beasley, this volume). Only four or five lots need to be added to the resistance survey to include all areas of dense architectural debris.

Unfortunately, much of the site may not be suitable for ground-based geophysical survey. For example, the westernmost 40 to 50 lots (roughly one-third of the town) have, to some extent, been impacted by agricultural terracing. Relatively few surface artifacts were present in the western terraced area (Gwaltney 2004; Gwaltney and Beasley, this volume), but it is not known if this reflects the effects of terracing or simply that this part of the town was never developed. Some terraces are also present on the east side of the site, and some of the (unterraced) investigated areas (for example, Block 9, Lot 4) are heavily eroded. Localized areas of intact deposits may well exist in any of these impacted site areas, and their value should not be discounted without additional work. Large portions of Blocks 13 and 18, and much smaller portions of Blocks 12 and 19 may have escaped the impacts of terracing, although the paucity of surface artifacts suggests that few features may be present there.

New Philadelphia's Community Plan

The 1836 plat conveys Frank McWorter's plan for New Philadelphia's layout (Pike County Deed Book 1836:183; Ensign 1872; Walker 1983:104), but the available archival sources do not indicate the extent to which his intentions were actually realized. Large-area geophysical maps supplemented by small-scale, carefully targeted excavations can provide specific evidence for the actual internal organization of the town during the second half of the 19th century (Hargrave et al. 2002; Kvamme 2003).

At New Philadelphia, residential and non-residential features exhibit distinct locational patterns. Residential features at the town site, defined here as those likely to be directly associated with a residential structure (a house), include cellars, foundations, and a stone pier. Non-residential features include two wells, a privy (perhaps originally a storage facility), two small (non-architectural) post holes, a lime slacking pit, a refuse deposit associated with a blacksmith shop, the buried remains of a barn, and an ash pit. In the following discussion, multiple residential features associated with a single structure are only counted once (Features 16, 17, and 21 are counted as a single feature, as are Features 11 and 12).

All of the residential features identified at New Philadelphia are located very near the platted locations of streets, alleys, or corners (Table 4 and Figure 3). Only one residential feature (the foundation represented by Features 16, 17, and 21) is located in the middle (relative to the long axis) portions of a lot, and it is located very near an alley. In contrast, most (7 of 9, or 77.8%) of the non-residential features are located mid-lot, and a majority of those (5 of 7) have no direct access (close proximity) to a street or alley. Two others (a post and an ash pit) are located mid-lot but reasonably close to a street. Only Anomaly 29 (Feature 13, a well) is located near a corner (Table 4 and Figure 3).

A similar pattern is suggested by the location of cellars on lots at New Salem, Illinois, platted in 1829, only a few years before New Philadelphia (Mazrim and Naglitch 1996). Illustrations in an 1872 atlas suggest that commercial buildings in Pike County towns were consistently—and town houses were generally—located very near the street. The positions of the illustrated rural houses relative to a road were far more variable, however (Ensign 1872; Wurst 2007). The tendency for residential features at New Philadelphia to occur very near streets and corners is thus not unusual, but it is nevertheless relevant in several respects. This pattern may be useful if locating such features is a goal of future excavations. Other factors being equal, anomalies located in those portions of lots are more likely to be features associated with houses than are anomalies located elsewhere. If interpretive exhibits (models or images) are developed for the site in the future, it would be reasonable to depict nearly all houses as being

TABLE 4
FEATURE LOCATIONS ON LOTS

Location on lot	Residential	N	%	Non-residential	N	%	Total N
Mid-lot, no access	—	—	—	2, 24, 28, F-2, F-5	5	55.6	5
Mid-lot, near alley	1	1	14.3	—	—	—	1
Mid-lot, near street	—	—	—	4, 4	2	22.2	2
Street-street corner	—	—	—	—	—	—	—
Street-alley corner	30, F-3, F-6	3	42.9	—	—	—	3
Near alley only	—	—	—	29	1	11.1	1
Near street only	12, 43, F-1	3	42.9	42	1	11.1	4
Total	**—**	***7***	***100***	**—**	***9***	***100***	***16***

Note: No access indicates the feature is not located near a street or alley. This table includes two features (a post and a lime slacking pit) that were not located within the geophysical survey area. Feature (F) numbers are used where available. Excavation of Anomaly 4 identified two features (F-8, F-10).

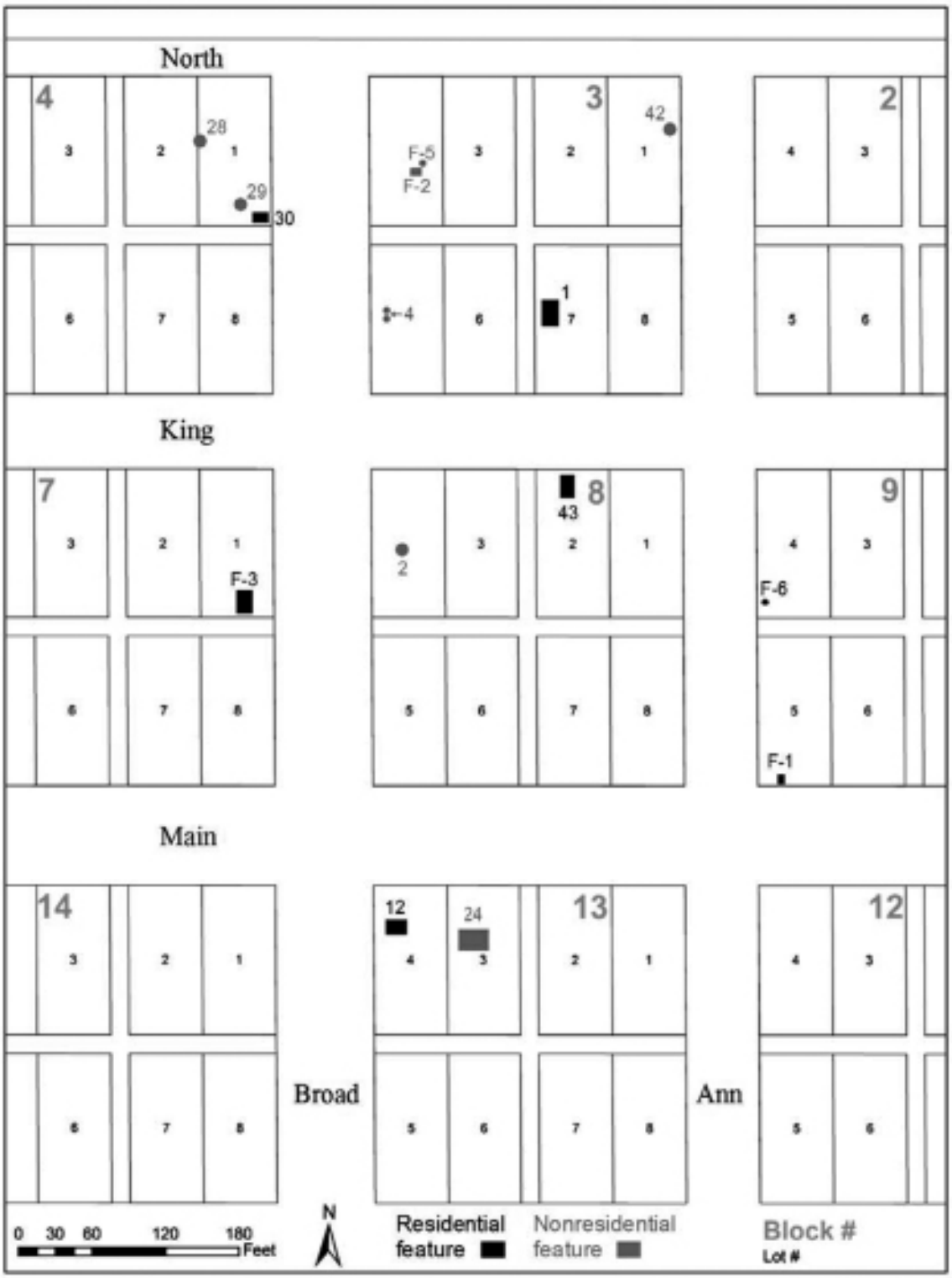

FIGURE 3. Location of residential (black) and nonresidential (gray) features on lots. Labels represent anomaly numbers if available. Features are not plotted to scale. (Map by author, 2008.)

located near streets or street-alley corners, and a majority (62.5%) of the outbuildings and facilities as being located in the middle portions of lots, away from corners.

Locating houses near a street would have maximized the resident's access to thoroughfares, and opportunities for social interaction. There is some evidence that New Philadelphia's early (ca. 1850) merchants, craftspeople, and service providers favored corner lots (Walker 1983:134, figure 8). Locating the house near a street or corner would also preserve a large portion of the lot for gardens, pastures, outbuildings, and outdoor work areas, as well as areas devoted to activities that may have been viewed as private (e.g., privies and refuse discard). Facilities that were often located behind rural Illinois homes before 1840 included cellars, privies, crop storage pits, scalding and butchering pits, cisterns, and water barrels (Mazrim 2007:91). At rural homes, criteria for locating such facilities probably included proximity to the house, shade, and prevailing winds. In towns, the size and shape of one's lot and proximity to streets, alleys, and neighboring homes probably also influenced the spatial patterning of facilities and activities. Interestingly, the subdivision of square blocks into eight rectangular lots would have minimized the size of private areas (that could not easily be seen from the street) behind the houses of those who occupied corner lots (which represent 50% of all lots).

The extent to which alleys played a role in the spatial structure of activities at New Philadelphia is unclear (Dorsey 1891). In densely populated settlements, alleys allowed wagons, horses, and other livestock to be moved from outbuildings behind the house to the street without crossing neighboring lots. New Philadelphia, however, was never densely occupied. It would not be surprising if some of the platted alleys in the settled portion of the town were rarely used (and perhaps not even discernable), whereas others may have simply been treated as streets. For example, Anomaly 1 is located mid-lot (on Lot 7 of Block 3), and is very near, and oriented parallel to an alley (Figure 3). The arrangement of residential and nonresidential features at New Philadelphia may reflect a more-rural, or at least, a less-formalized use of space than one would see in a more densely populated town with a similar layout. Such questions are important to a comprehensive understanding of life in mid-19th-century New Philadelphia, but unfortunately, they cannot yet be addressed adequately with such an incomplete sample of the town's features.

Conclusion

The geophysical surveys at New Philadelphia were highly successful in identifying productive contexts for excavation. In general, the 2004–2006 field schools focused on the most promising anomalies, and this resulted in the excavation of a number of substantial features, including stone foundations, cellars, wells, and a stone-lined privy. Focusing on the most promising anomalies is a common approach to the use of geophysical data, particularly in situations where field time is limited, or where research goals make it imperative to recover large artifact assemblages from good contexts. The downside of this focus was that it limited the ability to investigate a representative sample of the anomalies (Kvamme et al. 2006). Only a few "minor features"—two post holes and an ash pit—were identified, and these were incidental finds. Otherwise, the project documented no examples of the small pits of indeterminate function that are common at 19th-century rural sites in Illinois (Mazrim 2002). Admittedly, the excavation of such features might contribute relatively little to an understanding of economic and social life at New Philadelphia. As humble as these features may seem, however, they too represent an aspect of the town's community plan, and could contribute to a better understanding of the patterned use of space. From a methodological perspective, one would like to know if such features are manifest in the geophysical data.

Achieving a better understanding of New Philadelphia's town plan was the most challenging goal, but progress was made in several areas. It appears that there are distinct locational patterns for residential and non-residential features, and a tendency for houses to be located near lot corners. The use of geophysics also allowed the identification of several features dating to the town's earliest (pre–Civil War) period. No evidence for those occupations was present in the archival data that were available during the fieldwork.

Future research at New Philadelphia will provide an opportunity to expand the geophysical surveys

in search of additional households, investigate a sample of the more ambiguous anomalies, and provide a more refined understanding of the town's community plan.

Acknowledgments

My thanks to Paul Shackel, Chris Fennell, and Terry Martin for the opportunity to participate in this project. Virtually all of the information that I have included here concerning the excavated features, their contents, and historic context is the result of research done by Paul, Chris, Terry, Claire Martin, and Charlotte King. Claire and Terry provided me with useful insights into the status of their ongoing archival research. Chris Fennell established the geophysical grid and provided GIS data layers that helped in the production of my figures. Carey Baxter also assisted with GIS and graphics tasks. I have benefited from Robert Mazrim's comments on a draft of this paper. My thanks to the many 2004–2006 field school students and instructors who assisted with the geophysical fieldwork, particularly Terry Martin. Finally, I am grateful for the hospitality extended by Larry and Natalie Armistead, and Pat and Marvin Likes, and for the Armistead's permission to work on their land.

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Michael L. Hargrave
U.S. Army Engineer Research and Development Center
Construction Engineering Research Laboratory
P.O. Box 9005
Champaign, IL 61826-9005.