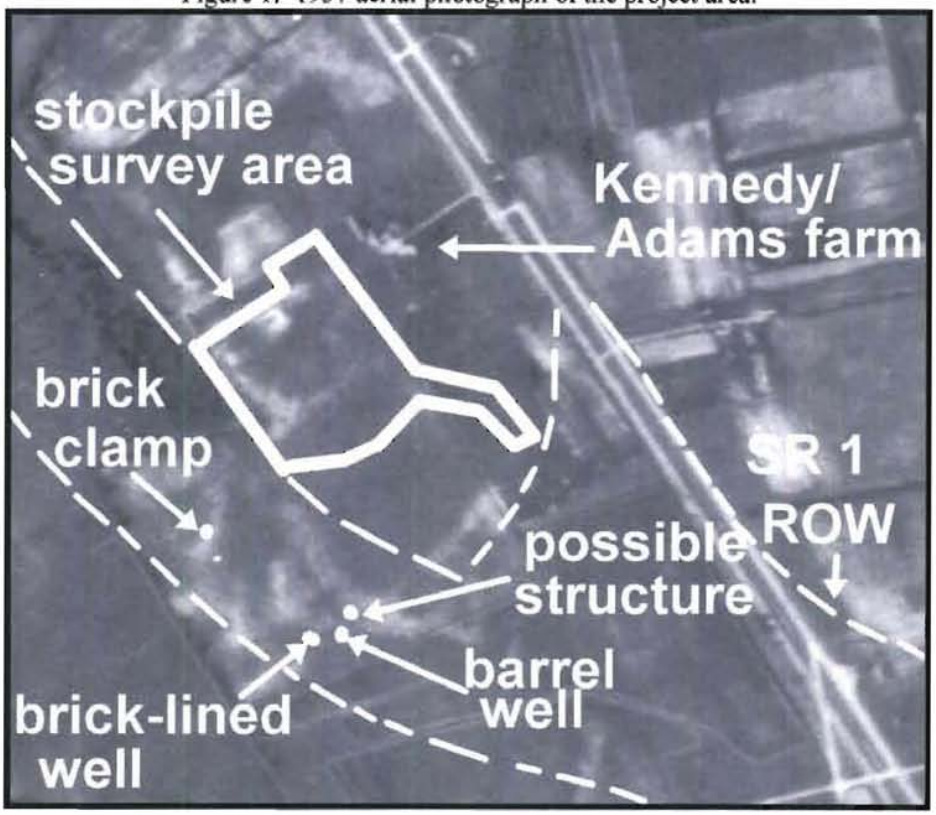
"...near where stood an old house."
– A Late 18th Century Delaware Brick Clamp

Patrick L. O'Neill
Parsons Engineering Science, Inc.
Fairfax, Virginia
SHA 2001
Long Beach, California

Little archaeological research has been conducted concerning small brick kilns or clamps, even though several dozen have been archaeologically recorded (Henry Miller 1996:38). While the number of reports containing research issues pertaining directly to small-scale brick manufacturing sites has risen since the early 1980s, relatively few accounts of comparative information exist, especially in Delaware. The research potential of clamps has many limitations to the retrievable information from brick-related study domains. Usually, temporal or functional use cannot be determined by analyzing brick sizes, nor can brick sizes relate such information such as structure type or size. Hand molded bricks themselves usually cannot be dated because they contain no temporal diagnostics, such as maker's marks or specific manufacturing techniques until after the advent of the brick machines. Therefore, further understanding of the features and techniques associated with the manufacturing of hand molded bricks is needed to enhance the knowledge of archaeological sites containing hand made bricks.

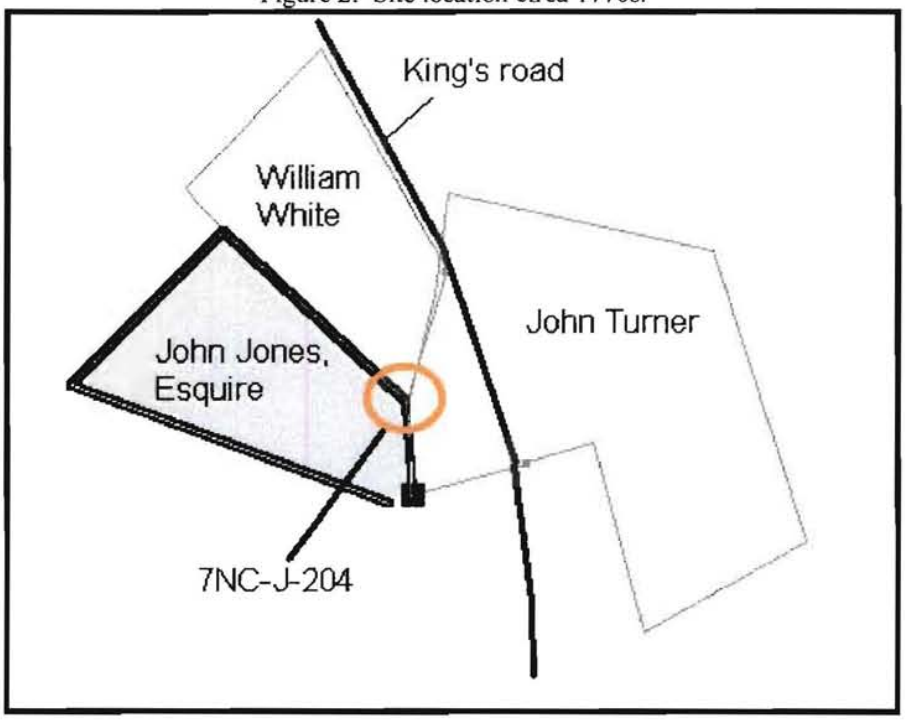
Parsons Engineering Science encountered a late 18th century brick clamp complex almost 150 meters from a contemporaneous barrel well, a historic pit, and a possible non-brick structure during Phase II and III investigations on the Jones Site in Delaware as part of the investigations on the SR 1 highway corridor (Figure 1). A late 19th century brick-lined well, presumably unassociated with the clamp, was found within 30 m of the barrel well. An additional 2.7 acres was surveyed as part of a temporary staging area yielding few historic artifacts, yet a brick feature confirming use of the bricks from the clamp was never recovered with the project area. Thus, the function of the clamp, with feature and artifact distributions and analysis will have to be fully analyzed to address Delaware research issues.

Figure 1: 1937 aerial photograph of the project area.



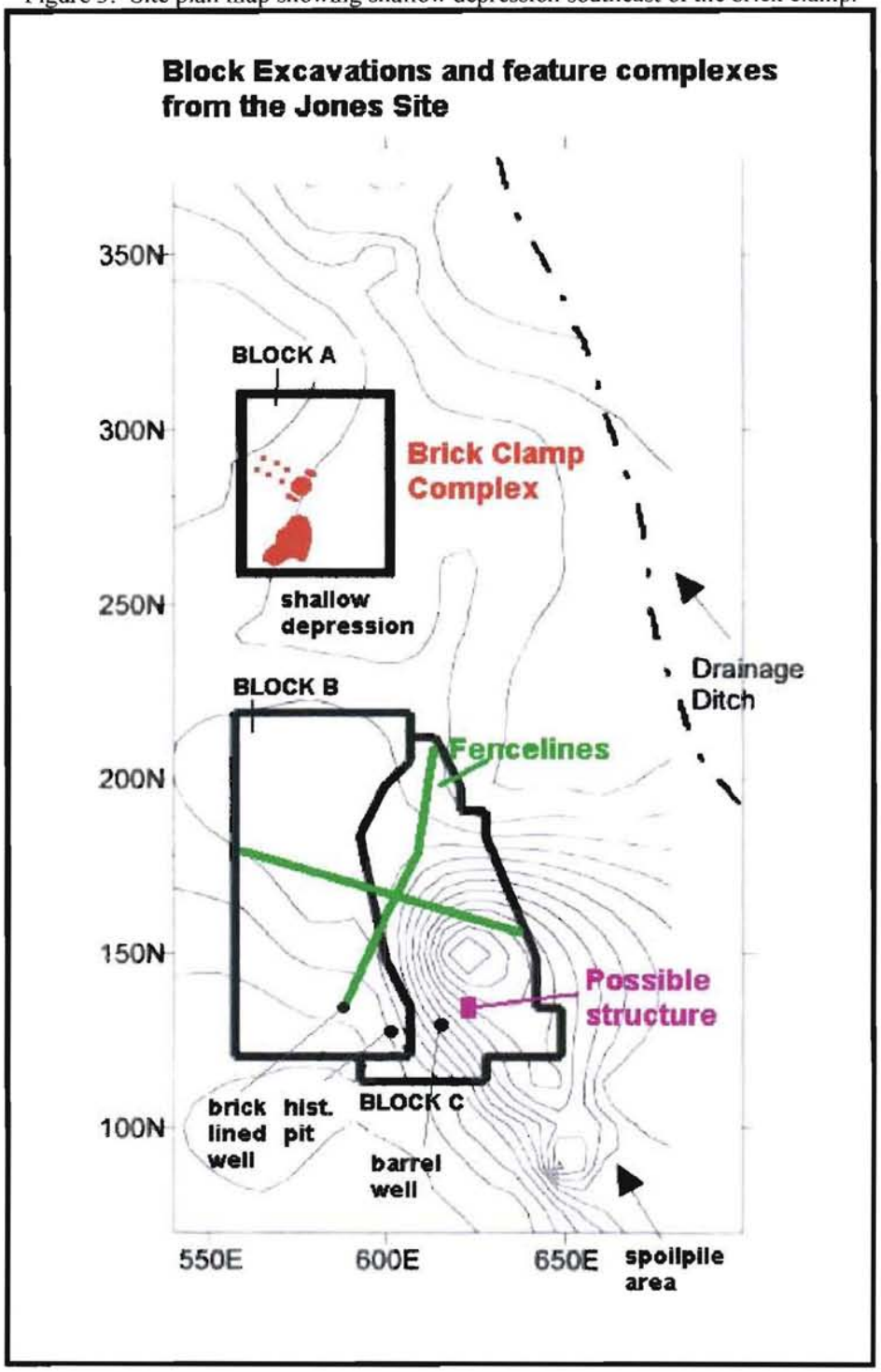
The Jones Sites was located on a gentle rise in an open plowed field bounded on the north and south by wooded swamps and on the east and west by drainage ditches constructed to drain the two swamps. Historically, the site was very close to the corners of three land patents granted by the Penn family in the mid-18th century in the general region of the clamp, making it difficult to determine on which tract the clamp resided (Figure 2). The site was named for John Jones, Esquire, and absentee landowner who purchased one of the three tracts in 1768, probably around the time the clamp was constructed.

Figure 2: Site location circa 1770s.



A shallow natural depression was situated in the west central portion of the site, a probable factor in the placement of the brick clamp complex as will be discussed later in this paper (Figure3). The site measured 850m by 100m and had apparently been plowed continuously for over 150 years, adding to the integrity of sub-plowzone contexts because of the lack of tree root disturbances. A large spoil pile had been placed on the southeast corner of the site in the early 1990s, prior to the archaeological investigations.

Figure 3: Site plan map showing shallow depression southeast of the brick clamp.



Phase II efforts consisted of hundreds of shovel tests, several test units, and mechanically stripped plowzone trenches. The data recovery program consisted of the taking of over 1800 soil chemistry samples on a site wide grid, the mechanical removal of almost 9000 m^2 of the plow zone, including the spoilpile, and 131 historic features were identified.

The brick clamp complex was completely contained within in Block A, identified in a Phase II backhoe trench (Figure 4). The remnants of the heat signature of the clamp was comprised entirely of heat-altered earth. No structural feature remnants existed, apparently being completely destroyed by cultivation. The feature was slightly ovoid, measuring 2 x 2.5 m and was first identified during the Phase II investigations while stripping a backhoe trench (Guerrant 1999). The trench had been placed within the concentration of plow zone brick fragments identified in the original survey and redefined during the implementation of the Phase II program (Bedell and Busby 1997; Abell and O'Neill 1999). At the time, I did not know exactly what defined a clamp. A clamp, I discovered, was basically a temporary edifice erected out of green brick and fired without the aid of a shell enclosure, such as a kiln. A field assessment of the lack of non-brick artifacts and the presence of the heat signature originally eliminated the feature as a forge, oven, or burned structure/building (Figure 5). No tree roots or rodent burrows had disturbed the feature.

Figure 4: Feature 18, the clamp heat signature, uncovered in the backhoe trench.

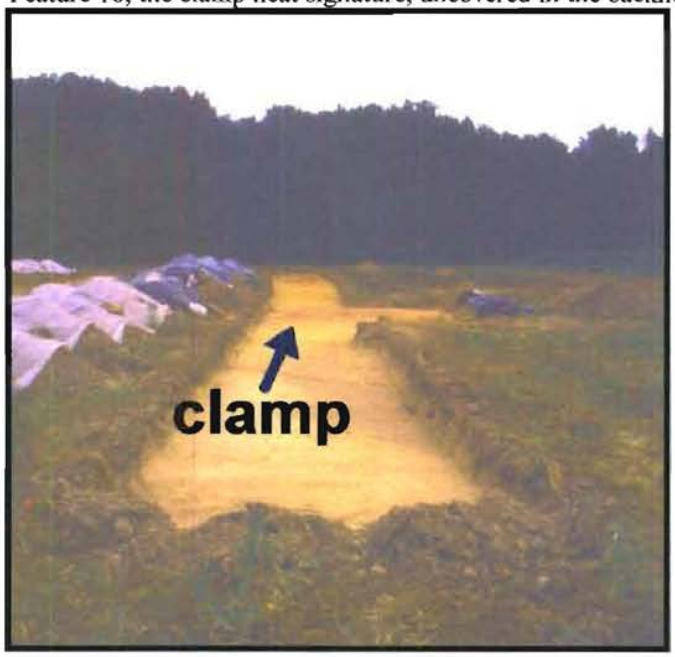


Figure 5: Figure 18, clamp heat signature, after Ap horizon has been removed.

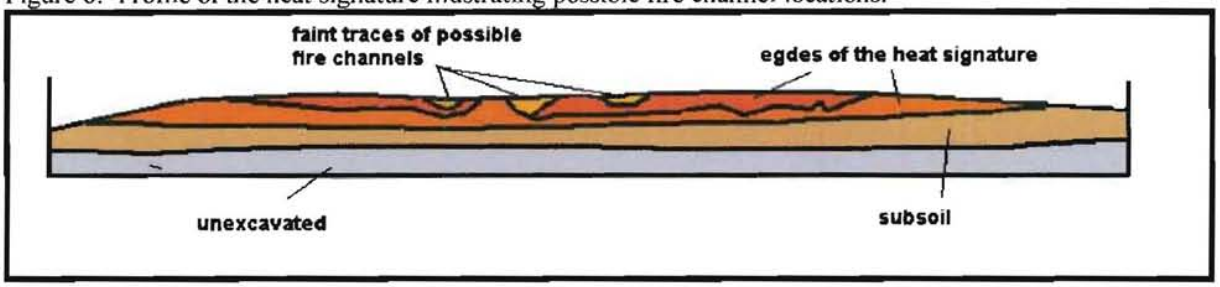
During testing, a single test unit was placed in the center of the feature revealing the heat signature extended 12 to14 cm into the subsoil below the interface of the plow zone (Figure 6). During Phase III, three additional excavation units were placed adjacent to the original unit to provide a detailed profile of the entire feature and search for evidence of fire channels (Figure 7). Fire channels would be definite proof the feature was a clamp or kiln, or so I was told by many colleagues. No obvious structural patterning of the heat signature was observed in plan view, only large amorphous regions of discolored heat altered earth.

Figure 6: Phase II test unit in the heat signature of the brick clamp.

Figure 7: Four 1 x 1m units bisected Feature 18, the clamp heat signature.

In profile, subtle fluctuations in the oxidized earth possibly suggested one to three fire channels may have been present across the feature (Figure 8). However, the boundaries of the possible channels were very uncertain and the observation is very inconclusive. If the clamp was fired more than once, the fire channels, if any, may have overlapped and diffused the edge of the channel boundaries. As the clamp needed to be fired from a week to a week and a half at around 1800F, the heat of the Jones Site clamp may have masked channel signatures (Diehl 1996:11; Glessner 1989).

Figure 8: Profile of the heat signature illustrating possible fire channel locations.



I was at first skeptical of the presence, or lack of, fire channels within any heat signature. Would these heat signatures of channels be that obvious in the archaeological record? A photograph of a brick clamp from Kentucky indicated that fire channels, if present, would be quite easily defined in a well-preserved feature (Figure 9; Wingfield et al. 1997). Thus, the lack of fire channels on the Jones Site clamp remains a mystery. The possibility exists that no channels were ever constructed and that the fire was concentrated within a single, centralized, undefined heat source, but the definitive answer was in the end, not forthcoming.

Figure 9: Fire channel heat signatures from a Kentucky brick clamp.

Two linear depressions filled with low-fired brick wasters located on either side of the brick clamp and averaged 1.8m long and 74 cm wide extending 12 to 14 cm below the plowzone/subsoil interface (Figure 10). The bricks within the features were very soft and crumbly, with no observed imbrication, and may have fallen into the depression left behind when whatever was in the feature was removed. The bricks were found above a 5 to 7 cm deep lens of silty clay loam, slightly different from the surrounding subsoil. The elongated features contained an undulating base with no flat surfaces that would suggest the footprint of flat beams, machinery, or the builder's excavation techniques. No other artifacts were found and no evidence of burning was observed in the depression. Fire channels were designed to allow for the fuel to

be added in one end and raked out the other end. Often, the archaeological record reveals "shinlogs", a stack of waster bricks or dirt, even a metal plate that was placed over both entrances to the channels to adjust the air flow, and the two linear depressions could be the base of a shinlog area. However, both features were situated almost a meter from the closest edge of the observed heat signature (Heite 1973:48).

Figure 10: Feature 22, a brick-filled depression with an undulating base next to the clamp heat signature.

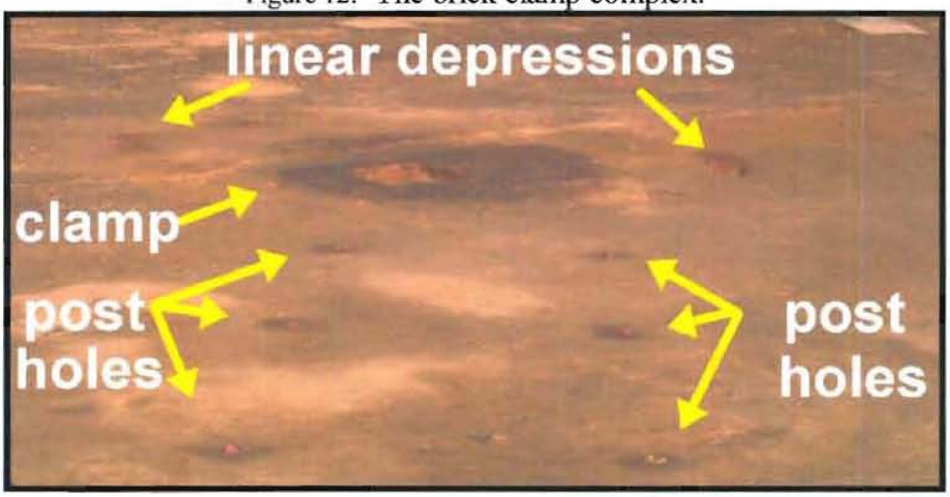
A series of six postholes were found in two rows of three in the same orientation as the two brick-filled linear features (Figure 11). The ground was slightly higher in the post series area than the heat signature or linear depressions, and it is probable that the posts represent a production or drying canopy or shed for the manufacturing of the brick. Few nails, no pane glass, or any other architectural-related artifacts were recovered from the post area to suggest a more substantial structure than a shed existed.

Figure 11: Plan of brick clamp complex.

The postholes were round in planview, and all contained post molds with relatively flat bottoms. The four posts closest to the heat signature were filled with brick waster fragments, coinciding with the radius of

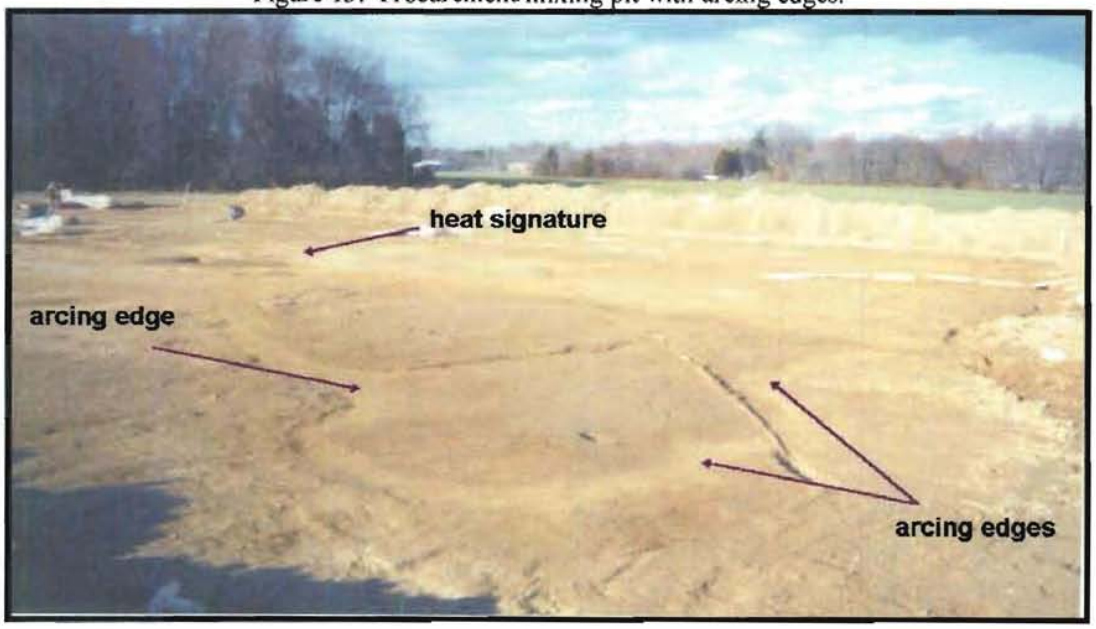
brick fragments surrounding the clamp in the plowzone, approximately 15 m from the center of the clamp. The heat signature, the two linear depressions, and the postholes were clear indications of the production processes for a possible brick clamp (Figure 12). No artifacts were found to suggest the features were part of a house, chimney, oven, forge, smokehouse, or tanning vats.

Figure 12: The brick clamp complex.



The procurement/mixing pit was located on ground slightly lower than the previously described features just a few meters from the heat signature (Figure 13). Excavations revealed a thin 14 to 17 cm depression filled with a dark matrix and low-fired brick wasters. The depression measured a globular 17 x 11 m with a very distinct boundary with curved arcing edges billowing in planview. The arcing edges join in three locations on the feature, which may represent separate depressions, excavation activity, or separate matrix mixing episodes. The clay borrow pits at the John Jay house in New York State contained such arcing feature characteristics, possibly the remains of a dredge pattern (Feister and Sopko 1996:57).

Figure 13: Procurement/mixing pit with arcing edges.

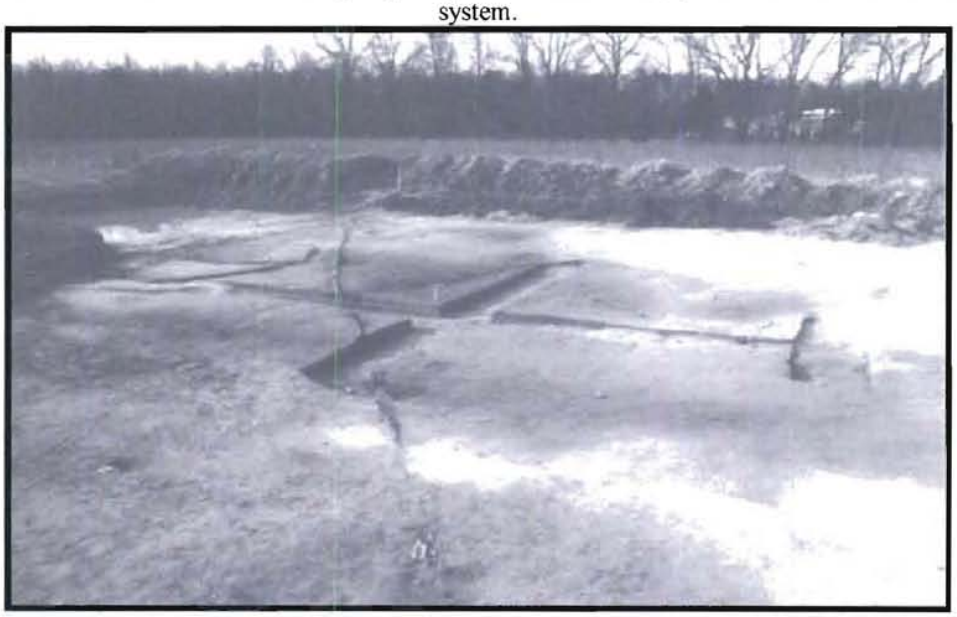


A three-pronged terra cotta drain tile system was constructed into the pit area possibly constructed by the WPA in the 1930s (Figure 14). At first, it was thought the drain was used during the brick clamp period, as some brick manufacturing facilities contain drains to remove the water from the mixing area (Feister and Sopko 1996:58).

Figure 14: Terra cotta drain tile system incising the procurement/mixing pit.

A cruciform-shaped excavation trench bisected the pit to provide morphological information (Figure 15). The trench was designed to also determine the relationship between the terra cotta drain tile system and the feature.

Figure 15: Cruciform trench investigating the procurement/mixing pit and the terra cotta drain tile system.



The base of the pit contained some of the more interesting information of the feature. Small 10 to 12 cm globular depressions were observed across the entirety of the cruciform trench (Figure 16). These depressions, never varying more than 1 to 2 cm in depth, could have been impressions from a beast of burden, such as an ox or horse or even human. The two small features on the left side of the trench could be distinct hoof impressions. Part of a large mammal tooth, possibly bovine, was also recovered from the feature fill.

Figure 16: Undulating base of the procurement/mixing pit possibly made by a human or beast of burden.

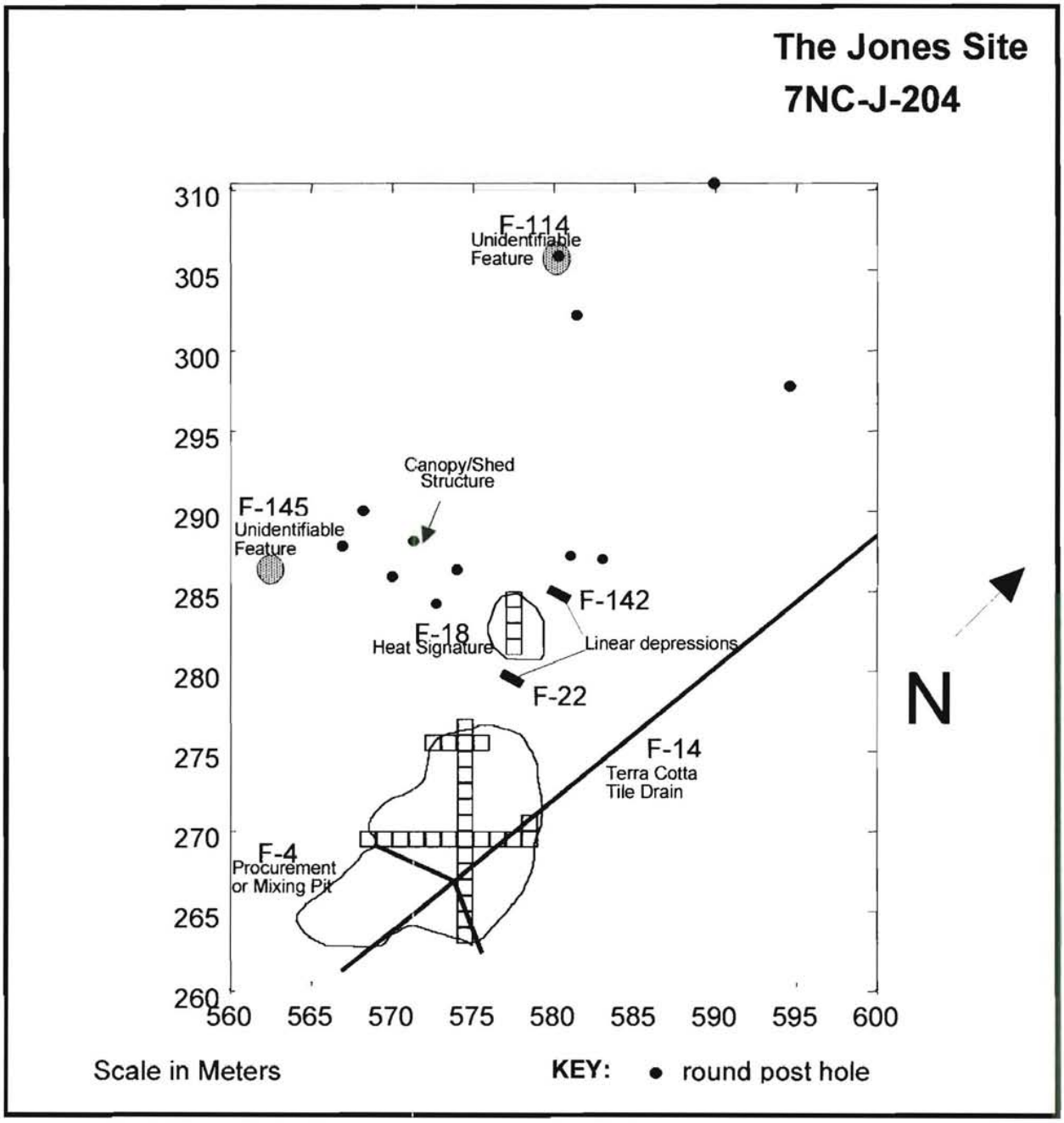
The pit contained a large amount of brick waster fragments, similar to the other sub-plow zone features of the brick clamp complex, probably the result of backfilling in the low spot after use (Feister and Sopko 1996:58). The John Jay House Site in New York contained a pit with feature fill and brick wasters above an organic lens, thought to be the result of leaving the pit open for a while after the clay was mined. This allowed leaves and other organic material to blow or wash into the depression (Feister and Sopko 1996:59). No such organic lenses were observed at the Jones Site.

The mixing pit matrix was very homogenous with no obvious evidence of depositional phases, pockets of unmixed matrix, subtle differentiation of the soil in any form. The placement of the pit in that particular region of the site was somewhat evident as a natural low spot existed in that area and there may have been water standing, or brought in for the mixing of the matrix. The low clay content of the subsoil under the mixing pit was surprising, almost a pure loam rather than a clay, and the region around the posts and heat signature was a sandy loam.

However, mild clays were preferred for hand-molded bricks because they did not have to be weathered like stiff clays and less temper had to be added to remove plasticity and control shrinkage (Feister and Sopko 1996:51). Less effort translated into fewer person hours and lower production costs (Searle 1911:26-27). The bricks from the Jones Site do not appear to contain any extra tempering than that in the surrounding subsoil. Therefore, the artisan producing the bricks must have assumed he could produce quality bricks from the matrix or the efforts would never have reached the firing stage.

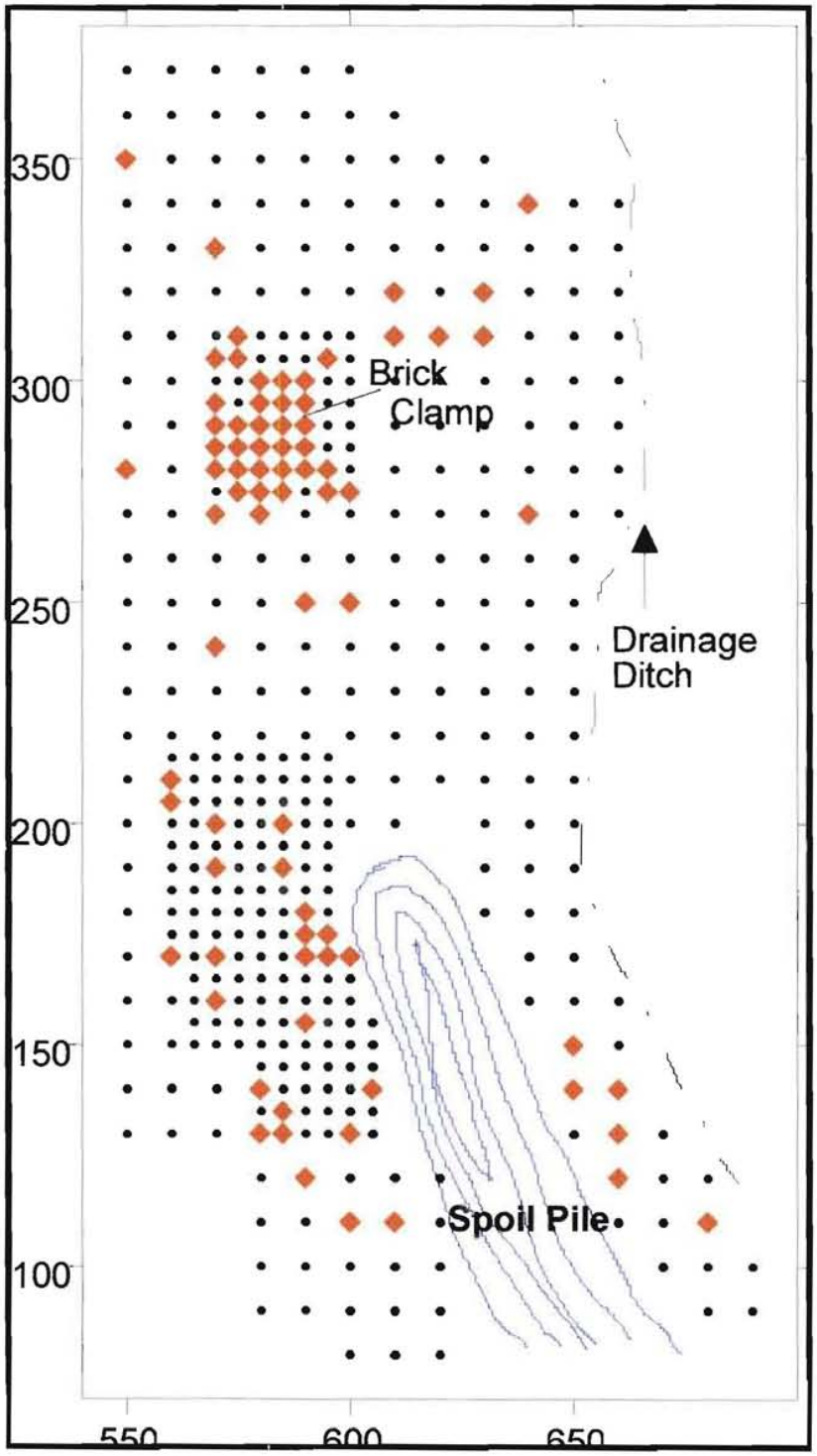
The above described features represented the entire production process of a brick clamp: the quarry pit, the mixing pit, the molding area, and the firing region (Figure 17). Rarely has such a well-defined clamp been recorded, the first of this caliber in Delaware. By studying distribution patterns of the brick by level of firing across the site, the definitive proof that the complex was a clamp can be ascertained.

Figure 17: Planview of the Brick Clamp Complex in Block A.



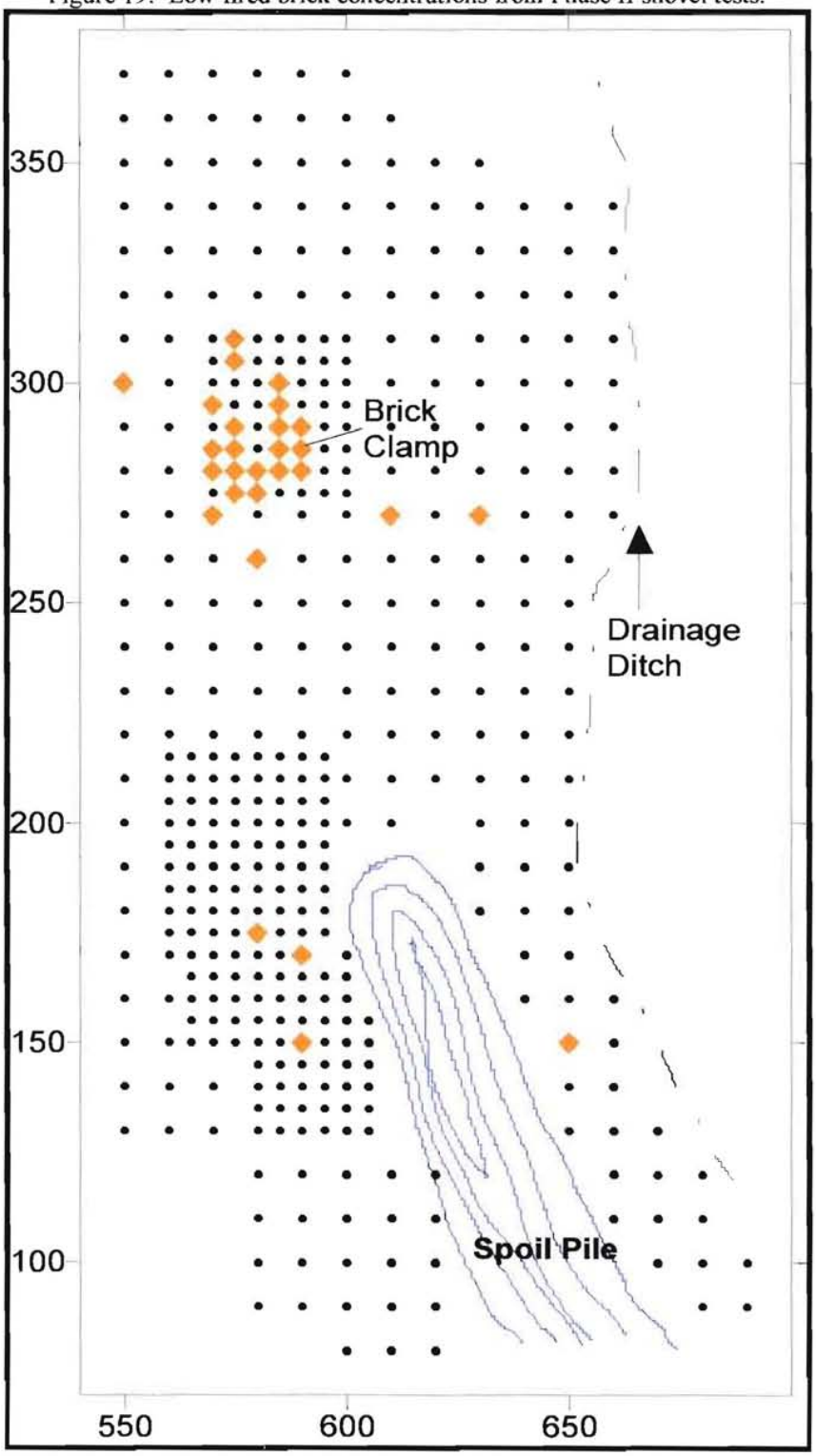
Hi-fired brick fragments, the desired brick product from a clamp, were found across the majority of the site, with higher concentrations near the clamp complex (Figure 18). And the higher quality bricks were more than likely robbed from the clamp, so this distribution does not indicate the complex as a clamp.

Figure 18: Hi-fired brick concentrations in Phase II shovel tests.



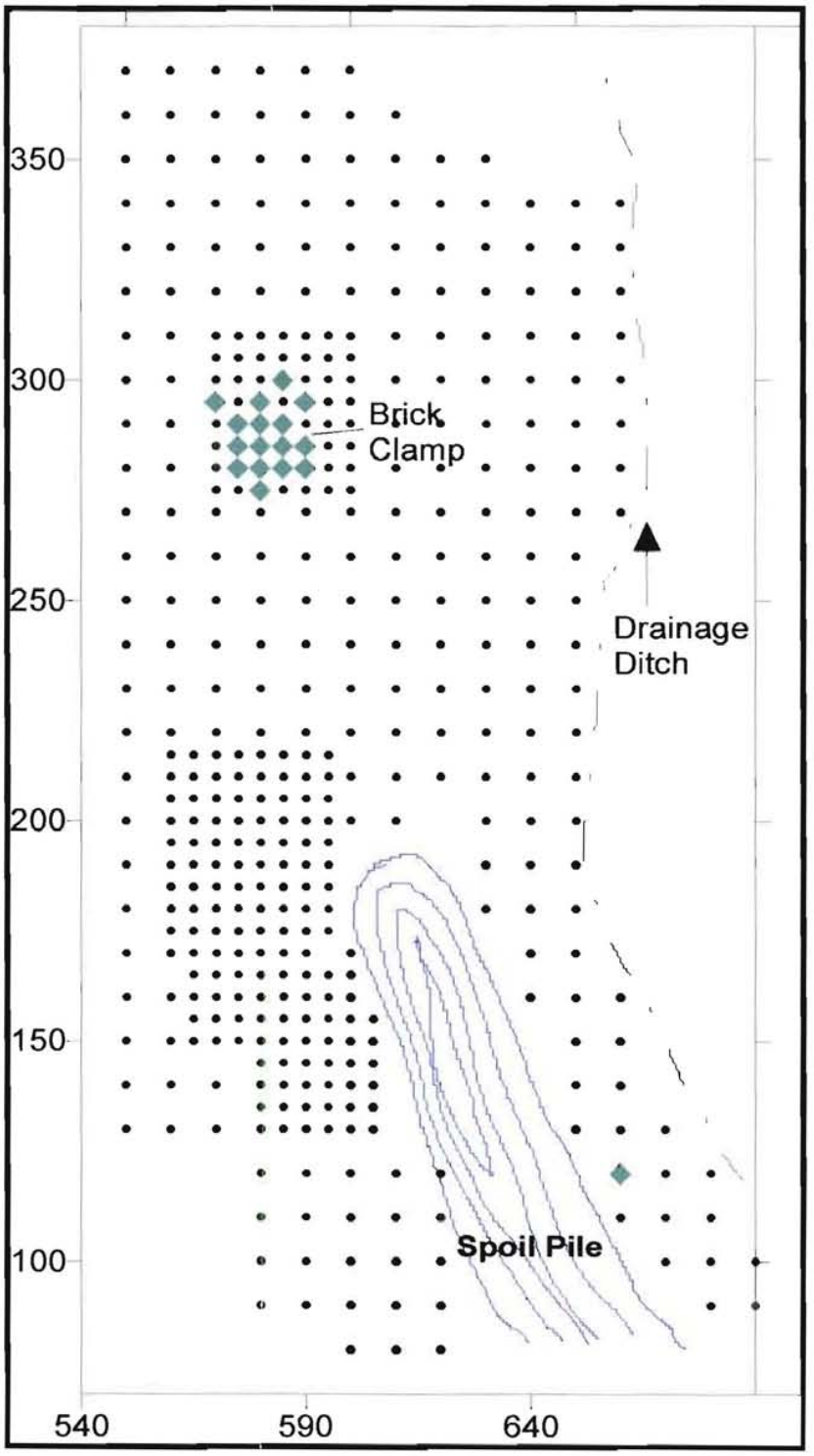
However, low fired brick, also called salmon or waster bricks, was found predominately in the clamp area, with some examples in the southern section of the site (Figure 19). This brick type was usually utilized for filling wall interiors or non-supportive walls, and could be re-fired, as it was a low quality brick, and many times un-usable.

Figure 19: Low-fired brick concentrations from Phase II shovel tests.



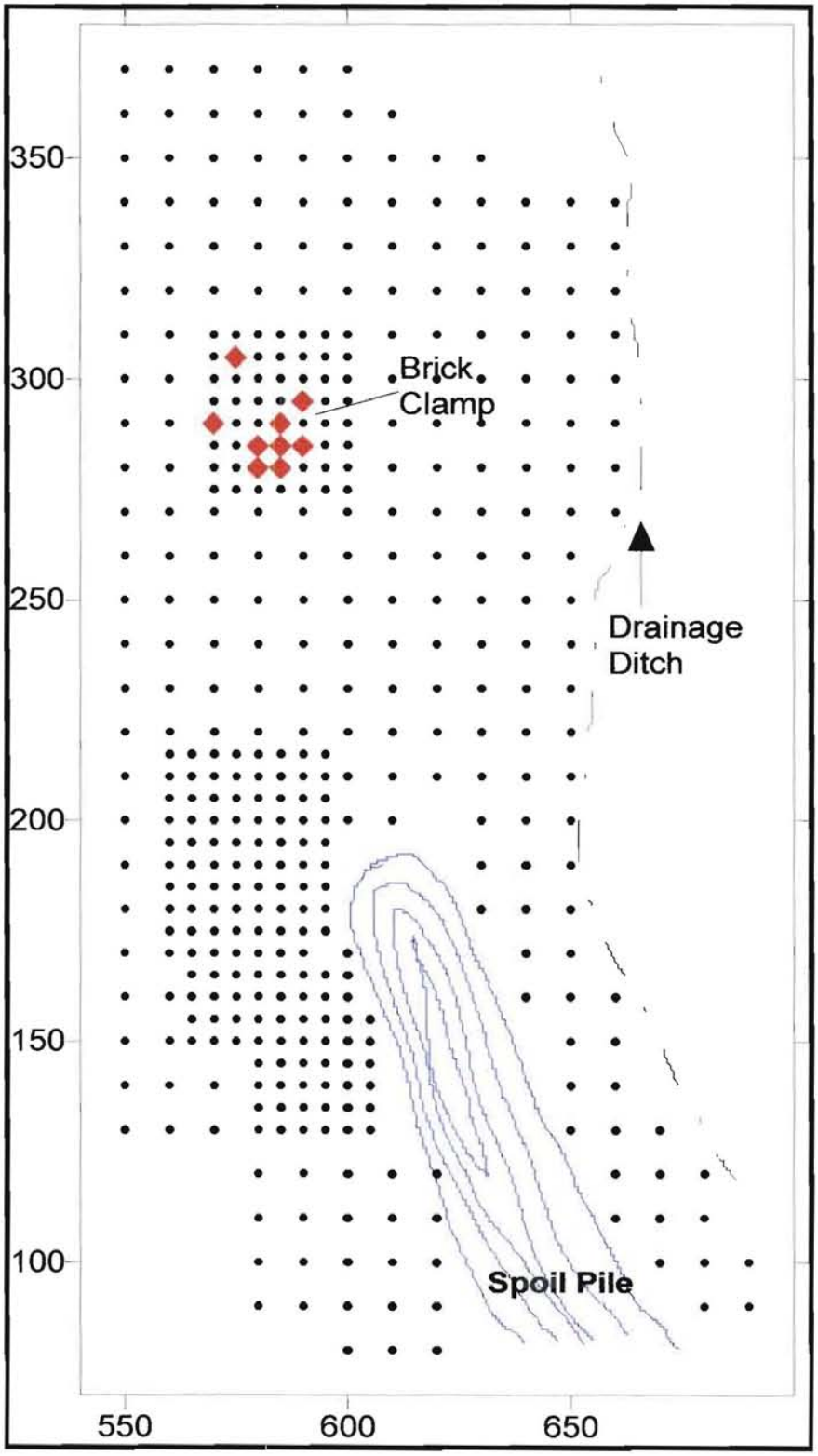
All but one glazed brick fragment was found near the clamp complex (Figure 20). Glazed brick, while used for decorative trimming, were predominately the result of direct contact with the clamp heat source and were usually broken and discarded.

Figure 20: Glazed brick concentrations from Phase II shovel tests.



Mis-fired brick, or slightly fired earth similar to daub, was found exclusively around the clamp (Figure 21). The concentration of mis-fired, glazed, and low-fired brick around the clamp was significant and helped define the feature complex as a probable clamp.

Figure 21: Mis-fired brick concentrations from Phase II shovel tests.

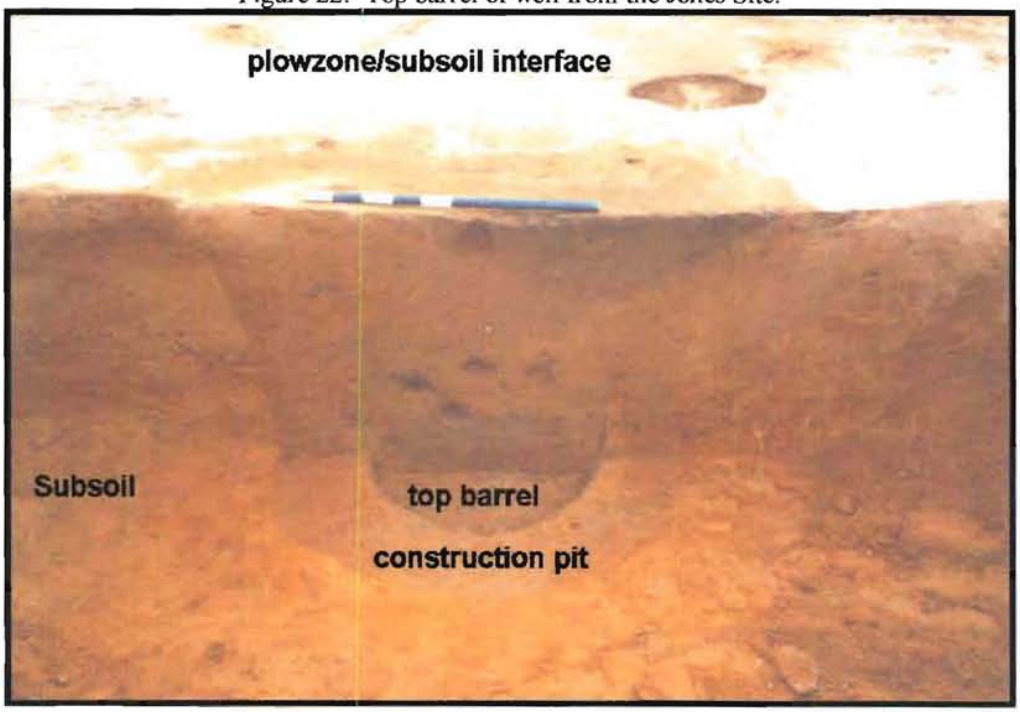


Other characteristics of the brick from the site, such as surface treatments, were recorded. To keep the matrix from adhering to the sides of a wooden mold, the mold was either treated with water (slop molding), sand, or sometimes oil (Diehl et al. 1996:5). The surface of a brick formed by slop molding, can sometimes be identified by the presence of smooth surfaces, rounded edges, and even brush strokes from using a "strike" to scrape the excess water from the exposed surfaces after molding (Feister and Sopko 1996:51). The surface of a brick formed by a sandy mold process is usually identifiable by the granular texture of the surface (Feister and Sopko 1996:51). Hand molded bricks may have cavities on the base where the hand thrown clay did not completely fill the mold. Striations on the top surfaces of hand molded bricks usually represent where a board or straightedge was utilized to scrap off the excess clay (Garvin 1994:21). Many of the bricks from the Jones Site have brushed and striated marks as well as rounded edges, all characteristics of a hand molded brick.

The non-brick artifacts from the clamp area number less than fifty, with most dating from the late 19th to early 20th century. However, two scratch-blue body sherds from inside the mixing pit and one Rhennish body sherd just outside the pit, all dating from the last half of the 18th century, were the only definitive artifacts to date the clamp complex, unless the structure the bricks were manufactured for could be identified. Clamps were usually located close to the structure being built from the brick and the yard or domestic scatter artifact noise usually masks, if not destroys, the ability to find and identify the brick making facility. Most owners of a historic brick house can point to the location on their property where the bricks were made for their dwelling (Glessner 1987:2). The artifacts and features from the site did little to easily reveal the location of such a structure. Of over 7500 artifacts from the Jones Site, only about 800 were non-brick historic artifacts, and the majority of these were late 19th to early 20th century artifacts, not from the preliminary date of use for the clamp in the late 18th century.

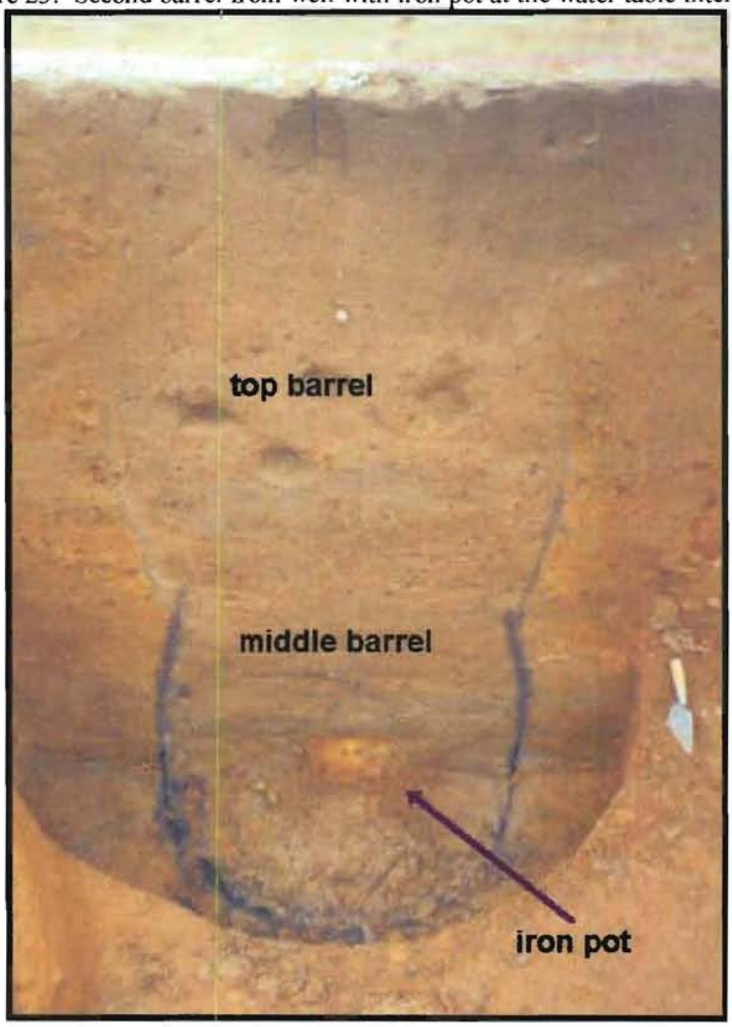
A barrel well was located next to the edge of the swamp on the southern end of the site almost 150 meters from the clamp complex. Three 1m tall barrels were placed inside of a larger construction pit, and the only artifact from the construction pit was a brass disc waistcoat button dating from 1770-1800. Inside the top barrel was a base sherd of a scratch blue vessel, with a similar design to the two fragments found in the mixing pit of the clamp (Figure 22).

Figure 22: Top barrel of well from the Jones Site.



The middle barrel contained part of a cast iron pot that may relate to iron pot fragments from a pit near the well containing fire cracked rock and hand molded brick (Figure 23). The pot was recovered at the water table interface.

Figure 23: Second barrel from well with iron pot at the water table interface.



The base of the bottom barrel contained a horseshoe, pot hook, stirrup, peach pits, whittled wood, leather straps, and two hand molded brick halves (Figure 24). A meter wide pit was found 10 meters to the west of the barrel well, and contained several large fire-cracked rock, part of an iron pot (possibly relating to the one in the well), and several hand made brick halves. No heat altered earth was located within the feature, thought to be a secondary deposit such as a trash pit.

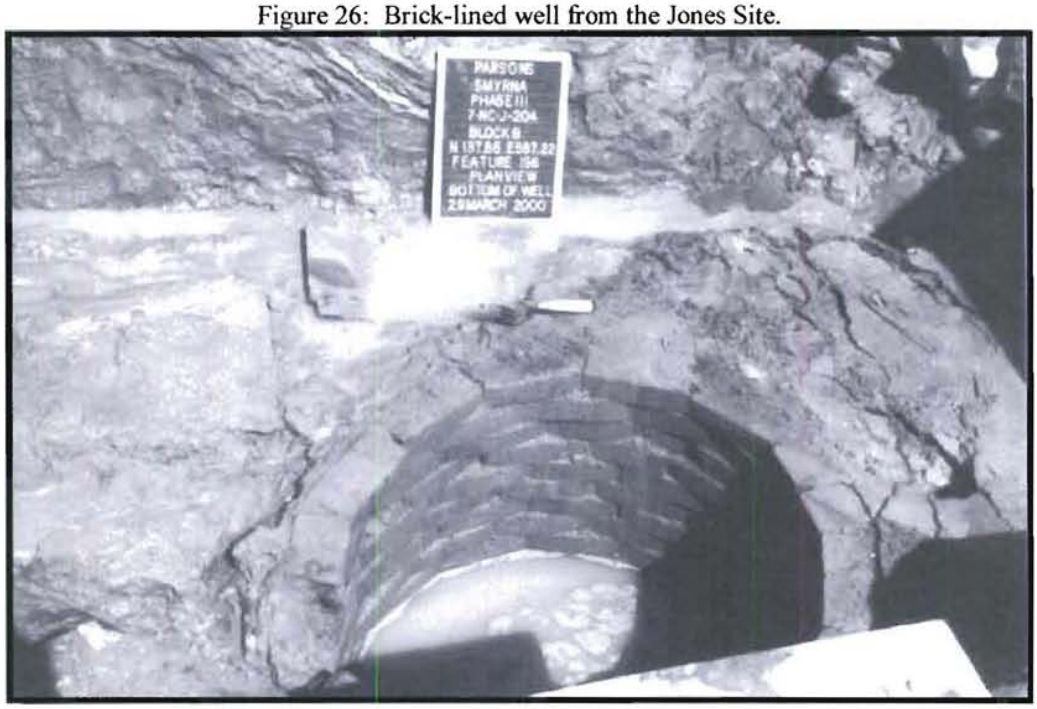
Figure 24: The bottom barrel from the well was almost entirely intact.

Six shallow square postholes were located 15 m to the east of the barrel well on a slightly higher slope (Figure 25). Two rows of three posts, one with a double posthole, suggest the presence of a structure and the few artifacts in the vicinity indicate that the structure may be contemporaneous with the barrel well and clamp, dating to the late 18th century. No heat signature or brick concentrations were found within or around the posthole complex, and no other contemporary structural information remained on site. Remember that the clamp was located at the intersection of three land tracts. An 1854 deed related that the corner near the region of the clamp was "**...near where stood an old house**." By 1854, any house that had been dilapidated, fallen down, or had been razed, would very likely have been constructed at the end of the 18th or early 19th century and could be represented by the post hole pattern near the barrel well. It is also possible that the surveyors saw the remains of the brick clamp and assumed it was an old house. In either event, the deed reference is thought to signify structural remains on the site at least in 1854.

Figure 25: Postholes for possible structure near barrel well.

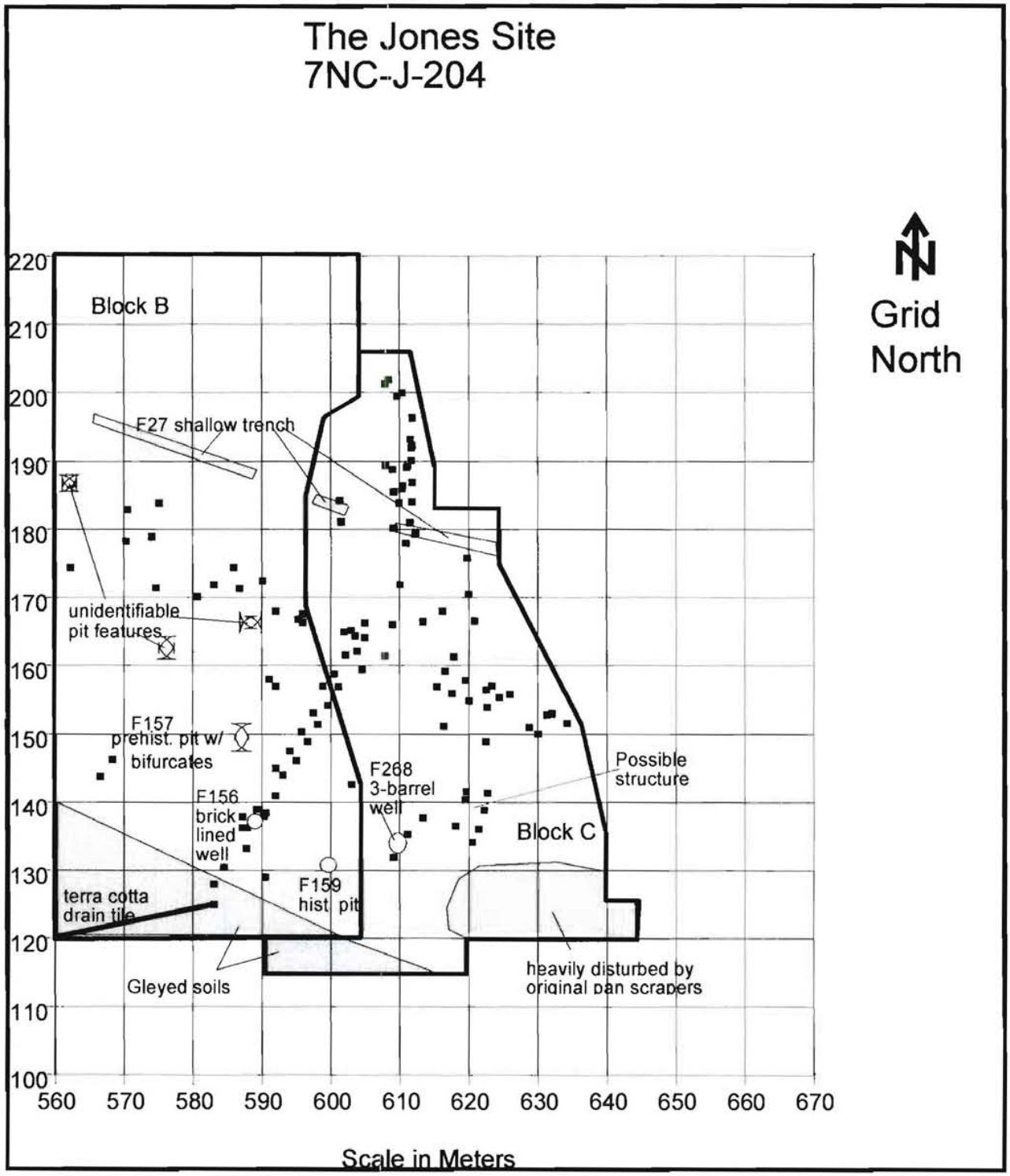
A late 19th century bricklined well was found almost 30 meters to the west of the barrel well and contained machine made brick, and is not thought to be associated with the clamp complex, and dated almost 60 years later than the most recent artifacts from the barrel well (Figure 26).

Figure 26: Brick-lined well from the Jones Site.



Dozens of square postholes formed at least two general fenceline orientations, but the fence posts probable date to the last half of the 19th century and are not contemporaneous with the clamp, barrel well, possible structure or historic pit (Figure 27). None of the postholes contained any brick fragments, and most were a darker matrix matching the Ap horizon, suggesting a more recent deposition of matrix into the holes.

Figure 27: Feature map of Blocks B and C at the Jones Site, illustrating the numerous fence posts.



Interpretation of the site on the one hand is relatively simple. A depression was formed when the subsoil was quarried for mixing with water from an unknown location within the depression. Then, the mud was formed and/or dried under a nearby canopy or shed roof structure on slightly higher ground. When the brick was dry, it was then stacked outside the canopy/shed area and fired. Little to no evidence of fire channels exist at the clamp. After the firing, the high fired brick was removed, possibly to the southern end of the site near the possible structure and barrel well location, although no evidence of brick features were found in that area of the site.

Artifact concentrations suggest the highway corridor encompassed the whole site, as the densities decrease to almost zero on all sides of the ROW and a brick related feature may never be found in future excavations outside the corridor. The low numbers of non-brick artifacts on the site suggest that both the late 18th and late 19th century components were very limited, and could represent two distinctly, separate, short-term, failed attempts to live on site.

Stage I analysis for the Jones Site is just beginning, and soils samples from across the site will be analyzed to aid in determining site functions and activity areas. Parsons will submit brick samples from the canopy/shed postholes, the procurement/mixing pit, barrel well, and bricklined well for chemical analysis. The research design follows work conducted in New York by Allan Gilbert, speaking later this morning, and utilizes an inductively-coupled plasma emission spectroscopy (ICP) to test for 25 trace elements (Gilbert et al. 1993:43-44). The brick samples will be compared to subsoil samples collected from the area under the procurement/mixing pit, between the canopy/shed postholes, and the gleyed soils just south of the two wells. It is our hope that the subsoils will contain unique trace elements to match with the hand made bricks. Petrographic analysis on the brick is also an option that we hope to explore.

The late 18th century brick clamp complex on the Jones Site was almost a perfect example of a rural brick manufacturing facility. The complex was saved from artifact contamination because the habitation occurred elsewhere on the site far away from the clamp. Because brick clamps and kilns are predominately placed on the original ground surface and not into a depression or construction trench, the features are easily destroyed by plowing. As has been shown, some structural integrity can still exist if the base of the clamp was subsurface or deeper than some plows could cultivate (Heite 1973:50). Unfortunately, the feature that could identify the use of the bricks from the clamp was not found with the project area. Yet, I hope that the research stemming from the Jones Site will help bring recognition to these feature types and enhance our knowledge of brick clamp complexes.

Bibliography

Abell, Julie, and Patrick L. O'Neill
1999 *Management Summary: Phase II Evaluation of the Jones Site (7NC-J-204) New Castle County, Delaware*. Prepared for the Delaware Department of Transportation, Dover, by Parsons Engineering Science, Inc., of Fairfax, Virginia.

Bedell, John C., and Virginia Busby
1997 *Management Report: Phase I Archaeological survey of the SR 1 Corridor, Smyrna to Pine Tree Corners, New Castle County, Delaware*. Prepared for the Delaware Department Of Transportation, Dover, by Louis Berger & Associates, Inc., Washington, D.C.

Diehl, Michael W., Allison Cohen Diehl, James M. Heidke, Elizabeth Miksa, Mark Neupert, and Michael K. Wiley
1996 *Archaeological Investigations of the Tucson Pressed Brick Company, Tucson, Arizona*. Prepared for Parsons Brinckerhoff of Tucson, Arizona by the Center for Desert Archaeology, Tucson, Arizona, Technical Report Series 96-13.

Feister, Lois M., and Joseph S. Sopko
1996 *18th- and Early 19th-Century Brickmaking at the John Jay Homestead: The Process, Products, and Craftsmen.* In *Northeast Historical Archaeology* 25:51-67.

Garvin, James L.
1994 *Small-Scale Brickmaking in New Hampshire.* In *The Journal of the Society for Industrial Archaeology* 20(1):19-31.

Gilbert, Allan S., Garman Harbottle, and Daniel de Noyelles
1993 *A Ceramic Chemistry Archive for New Netherlands/New York.* In *Historical Archaeology* 27(3):17-56.

Glessner, Donna
1989 *History in Wood, Stone and Brick.* In the *Laurel Messenger*, 30(1): February 1, 1989 Historical and Genealogical Society of Somerset County, Pennsylvania.

Guerrant, Alice
1999 Historical Archaeologist, Delaware SHPO. Site visit August 19, 1999.

Heite, Edward F.
1973 *Several Virginia Brick Clamps: A Summary of Brickmaking.* The Archeological Society of Virginia Quarterly Bulletin 28(10).

Miller, Henry S.
1996 *Archaeology of the Seventeenth-Century British Immigrant Experience in the Middle Atlantic Region.* In Historical Archaeology, Guides to Historical Archaeological Literature, Number 4.

Searle, Alfred B.
1911 *A Rudimentary Treatise on the Manufacturing of Brick and Tiles based on the work of Edward Dobson, Thoroughly Revised and Rewritten and Enlarged.* The Technical Press, Ltd., London.

Wingfield, Derek M., Michael D. Richmond, and Henry S. McKelway
1997 *Archaeological Remains of a Mid Nineteenth Century Brick Clamp: A First Look at Brick Clamps in Kentucky.* In *Ohio Valley Historical Archaeology: Journal of the Symposium on Ohio Valley Urban and Historic Archaeology*, Volume 12 (pages 68-88). Edited by Donald B. Ball.