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THE MERLE BEACH SCHOOL SITE (20CL 275):
AN ASSESSMENT OF THE ARCHAEOLOGY
OF RURAL MID-MICHIGAN EDUCATION
DURING THE NINETEENTH CENTURY,
AND METHODS FOR ITS EXAMINATION
presented by

Valerie J. Hartzer

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Joseph L. Chartkoff
Major professor

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By

Valerie J. Hartzer

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ABSTRACT

THE MERLE BEACH SCHOOL SITE (20CL 275):
AN ASSESSMENT OF THE ARCHAEOLOGY
OF RURAL MID-MICHIGAN EDUCATION
DURING THE NINETEENTH CENTURY,
AND METHODS FOR ITS EXAMINATION

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Valerie J. Hartzer

This thesis examines a rural schoolhouse, the Merle Beach School Site, located in Olive Township, Clinton County, Michigan, which was in use from 1863 to 1966. The thesis has two foci. The first involves the examination of the rural schoolhouse as a type of archaeological site, one which to date has been largely unexamined in Michigan archaeology. Another part of this focus involves the examination of the significance of the rural school as a community institution and the evolution of its functions over time. The second focus assesses the comparative effectiveness of alternate procedures used in site sampling to provide relatively accurate representative data on this type of archaeological site.

This is dedicated to my two greatest loves and supporters
Paul and Selena

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INTRODUCTION

The purpose of this thesis is two-fold. One is to examine the rural schoolhouse of the Nineteenth Century, its role in American rural society, its function in the community, and the spatial patterning of its archaeological remains, through which we can investigate these roles and functions in one particular schoolhouse. The second aim is to study the effectiveness of a number of different sampling methods and examine the relative contributions of alternate sampling methods on a small, discrete site, such as a small rural schoolhouse.

For much of the United States' early history the vast majority of the population has lived in rural areas. In 1790, 96.6% of the U.S. population lived in rural areas. By 1880, 77.4% of the U.S. population still lived in rural areas, and by 1900, 66.9% of the U.S. population was still living in rural areas, accounting for the majority of the total population, despite increasing urbanization and industrialization (Foght 1910: 5). With such a large proportion of the population living in rural areas, rural education was extremely important, since that is how the majority of children was educated. Even as late as 1910, half of all U.S. school children, 12 million in all, attended rural schools (Foght 1910: 2). With the number of rural schools, their vast importance to the life of the people cannot be underestimated. There has been some historical study of rural education and individual rural schools, but comprehensive studies incorporating archaeological evidence as well as historical evidence are virtually nonexistent. Archaeology is beginning to look at institutions and their social functions, such as the standard forms of manorial architecture and the power they conveyed (Johnson 1992:

45-55), and total control and integration of social life in Lowell, Massachusetts, by the Boott Mills corporation (Beaudry 1989: 19-32). The investigation of rural schoolhouses, with their important role in American society, would be a significant contribution to archaeology.

By using a combination of different archaeological sampling methods to extract a wide range of data from across a large section of the site of the Merle Beach school (20CL 275), as a means of delineating activity areas at and around the schoolhouse, an archaeological picture of daily activities at a schoolhouse can be drawn. By adding to the archaeological record through the use of archival records of the school district, its schoolhouse and local history, a more complete picture of the schoolhouse, and its place in the community can be drawn than has before been possible through either history or archaeology alone.

Nineteenth and early Twentieth Century schoolhouses have undergone little in the way of formal archaeological investigation throughout Michigan. There have only been two formal excavations of schoolhouses within the state (John Halsey, personal communication 1997). No site report was completed for one of the schoolhouses, as nothing but a building trench with evidence of a mortar-topped stone foundation and a few slate pencils were uncovered (Mark Branstner, personal communication 1997). The other schoolhouse is the subject of the present thesis, the Merle Beach school, which had a rich collection of artifacts, including construction debris and a small amount of domestic debris, such as pieces of dishware, as well as buttons and other small personal objects. This makes the Merle Beach school site an especially rich site and a uniquely valuable research opportunity.

In addition to being a unique research opportunity for the study of an important, as yet little-studied, facet of history, the site under study was small and reasonably well documented, making it an ideal laboratory for the study of a number of different sampling strategies. By performing different sample test strategies, the results of each test could be compared to look at the relative effectiveness of each type of test. Also, documented information about the school and its use could allow for a controlled assessment of the productivity of each testing method. Archaeologists have long been looking at different sampling methods, but seldom does such a good site, one that is small enough to encourage the use of multiple types of sampling, present itself.

The first goal of the study is to ask what the role was of the schoolhouse in rural America during the Nineteenth Century. What functions did the schoolhouse serve in the community in which it was constructed? What in particular was the role of the school, education, and the schoolhouse in Michigan during this time period? How does Merle Beach school fit into the patterns of rural schoolhouses through out the state?

Education was highly valued by even the earliest Colonial settlers to North America. In 1642, the General Court of the Massachusetts Bay Colony enacted a law that required all parents and masters (craftsmen with apprentices, or those with indentured servants) to provide an education in reading, writing and civil law through either home instruction or a common school. This act further required that in every township containing fifty families a public school was to be established and that, when the population reached one hundred families, a grammar school capable of educating children to be university-ready be formed (Hosford 1870: 23-24). Schooling was compulsory under this system (Hosford 1870: 24):

> The common school education of each child was an original condition of settlement, a fundamental principle of the social

> compact, as between parents and children, masters and servants, under the guardianship of the State.

The usual manner of school management in most areas of the country was for rural education to be administered directly by the local community. In the beginning this would have been by towns or villages, which were broken into school districts, and then by township, as the country was surveyed; many states had switched to this method of school management by 1882. As the Nineteenth Century progressed, and more people began to move into urban areas, urban schools began to become too large to accommodate students in a one room structure. The concept of the graded school came about during the mid-Nineteenth Century (Kiddle, et al 1877: 3-4), in which children were separated by their ages and moved through the studies of one grade of course work a year. This concept was particularly valuable to the urban schools, as children could be broken into grades and each grade placed in its own room, accommodating the much larger number of students. In addition, the graded school of the city was often likened to the wonders of industry and the new factories and conveyor belts, and was heralded as the modern, progressive way to educate children. In contrast to the urban graded schools, students in the rural one-room school progressed at their own pace through the eight primary grades. Usually, several small groups of children at about the same level as each other would be seated together in several clusters around the same common room, more or less broken into grades. By the close of the Nineteenth Century many educators began to see the rural school as an outmoded icon of the past.

As rural enrollments began to decline in the 1870s and the concept of the graded school began to become popular, rural school districts could not maintain the costs of upkeep for a large number of scattered schoolhouses, each with its own teacher, equipment, library, school building, and out-buildings. This led to the formation of consolidated schools (Foght 1910: 306). Consolidation meant that small, poor districts could pool their resources. They could construct multi-room schools and offer graded schools for less than the upkeep and hiring of a teacher had cost each one-room school. The consolidated schools were frequently placed in the center of the school districts that they served and were farther than the district schools they replaced. Fortunately, savings among the consolidated school districts most often resulted in enough extra money that children living far from the new schools could be conveyed by wagons, later buses, at no additional cost. This new practice reduced the long walks that many children needed to make in order to go to and from school. In some cases high school courses could also be taught, allowing more rural children the chance of both high school education and the background needed to attend college (Foght 1910: 322).

Rural schoolhouses in the Nineteenth Century were frequently the center of a great deal of community activity, with dances, socials, plays, and public assemblies of all kinds such as town officers meetings and school board meetings. Often the schoolhouse was the first public building constructed in a settlement and was used for multiple purposes, until additional public buildings could be constructed (Smith 1880: 7-9). As a whole, education was highly prized in American society of the Nineteenth Century. It was seen as the means to an enlightened citizenry (Culter and Stone 1913: 159) and a great deal of emphasis was put upon improving education and providing instruction in as many branches of learning, including classical studies, as could be accomplished on the budget of the rural school district (Smith 1880: 28).

Rural schools typically employed either two school teachers for two short, several month terms, or one school teacher for a four to six month term of school each year. Rural schools accommodated students of all grades, first through eighth, with one teacher providing instruction at all grade levels. In order to ensure quality education the best teacher a district could afford was a high priority for at least one session a year. A sufficient schoolhouse with some type of blackboard and enough desks to fit the number of students that regularly attended as well as some basic equipment were the other expenses needed to maintain a rural school. Because the equipment and personnel were fairly minimal in a rural school, even relatively poor areas could frequently afford to provide an adequate, or at least a minimal, school. Also, as the expense of a schoolhouse was necessary for even a basic school, it could be reused for other community social events and activities and be of further use to the community reducing the expense of building other buildings if need be (Smith1880: 7-9). For example, in Olive Township, where the Merle Beach school is located, church services were held at schoolhouses around the township until the Olive church was built in 1864 (Anonymous A 1880: 496). One of the schools in that same township, the Muskrat schoolhouse (which later became Merle Beach school), was also used to house early meetings of the local Grange, a rural social society, until a proper Grange hall could be built (Anonymous A 1880: 496).

In this study a rural schoolhouse, Merle Beach School, located near DeWitt, Michigan, was chosen to be investigated archaeologically. Historical records were drawn upon to derive a model of what a typical rural schoolhouse and grounds would contain, what buildings would be commonly found on such a site, where they would commonly be placed, and what activities occurred at a rural schoolhouse.

After generating a rough model of a rural school, a strategy for excavating a rural school site was devised, including the excavation of several different size sampling units. Both systematic and random means of sample unit selection were utilized.

Following the excavation of the site, the artifacts were analyzed through a number of statistical tests in order to examine the relative effectiveness (Schiffer1978) of the different sampling units and unit selection strategies. Also, an examination was made of what this excavation can tell archaeologists about the nature of the archaeological remains of school sites and how they can be more effectively excavated.

The next chapter is an examination of the rural school, its history, and the history of the Merle Beach School.

Chapter 1
HISTORY

1.0. Introduction

In order to examine the Merle Beach schoolhouse as an example of a Nineteenth Century rural schoolhouse, it must first be placed in the context of its times. First, a brief examination of the nature of the rural schoolhouse is provided to establish a framework for its investigation, followed by an examination of the Federal laws and the ideology governing Federal regulations and funding of education, which establishes the role the federal government played. The impact of federal regulations and funding on schools at the local level, during the Nineteenth Century, was also examined for this study. Examining the Federal government's role in early school history is fundamental to understanding why schools were organized as they were, why they were funded locally, and why they were not standardized. Another aspect which places the Merle Beach schoolhouse within the context of its times is the philosophy which guided education during the Nineteenth Century, and the impact that this philosophy had on the structure of rural education and its management within the local one-room schoolhouse.

Shifting the focus of the analysis of schools to the local level, the Merle Beach school must be examined within the context of the organization of the county, township, and school district within which it was formed. This task requires the examination of the community as it formed, grew, and declined, and how these phases impacted the schoolhouse and its changing role within the community. Another important aspect of examining the Merle Beach school is to look at the schoolhouse itself and the types of activities which would have occurred there.

1.1. The Nature of the One-Room School

The place to begin when considering the excavation of a one-room schoolhouse is the nature of the one-room school and the activities held there. In rural communities, the one-room school was frequently the first civic building erected, and sometimes the only one a very small town would have (Anonymous A 1880; Foght 1910: 148-151). School sessions were held for between three and nine months a year, usually in two sessions. Typically, school terms were held from late summer to early spring, and a young female teacher, usually a local teenager with a state certificate, would be hired for the beginning of the year (Anonymous C 1861-1930). An adult male teacher would usually take over when the snows started and the larger, older boys came to school. School classes were generally held from eight o'clock in the morning until four o'clock in the afternoon, with two fifteen minute recess periods and an hour break for dinner (that is, lunch). During these periods children played group games and organized games or played with whatever equipment the school had, usually a set of swings or other inexpensive equipment that was simple (Culter and Stone 1913: 112-124).

All ages of children were taught together in one room at these schools. Children were grouped together by grade and each grade worked its way though a series of exercises in a particular subject. Students were advanced as they progressed and held back if they did not do well on tests and assignments. As a result, one student might complete two grades in one year and another might take two years to complete a grade. Each student in each grade in each subject was required to recite, a process in which the class stood in front of the school and answered the teacher's questions on the presented material. Students also were required to present long oral papers and to recite speeches of famous people, placing a great deal of emphasis on public speaking (Culter and Stone 1913: 75-100; Mueller 1926: 179-194).

Schools were simple buildings with one large classroom and two small coatrooms, one for the boys and one for the girls. The classroom held a set of desks for students of all ages and sizes, a large table or desk for the teacher, and a stove. A black-painted panel of wood or a slate chalkboard was nailed to one wall, and there might be pictures or maps as school funds allowed. The surrounding out-buildings were few and simple, usually consisting of two outhouses, one for each sex, and a shed to house fuel for the stove. Some schools had a nearby cottage for the teacher, or a stable for the teacher's horse if the teacher rode a long way to the school (Otwell 1923; Foght 1910: 122, 124, 126-132).

School was only held from Monday to Friday. The building was frequently used after hours for social events such as school socials, school board and town meetings, children's plays and activities, and local farm club meetings. On Sundays the schoolhouse was frequently used for prayer meetings or church services when the town had no church. Touring preachers or religious revivalists might preach at the schoolhouse on Sundays (Anonymous 1880).

All in all, the rural one-room schoolhouse was an all-purpose building with simple fittings that served many vital roles in the community which it served. It differed slightly in every community where such a school was built, and its functions differed slightly from community to community, ever flexible, ever changing with time.

1.2. The Federal Role in Shaping Local Rural Education

An initial consideration of the Federal role in rural education will be an investigation of the attitudes and perceived role of education by the federal government, and how these attitudes shaped educational policy in Michigan. Examining the Federal government's role in early school history is fundamental to understanding why schools were organized as they were, why they were funded locally, and why they were not standardized. Education played an important role in the community and in the social life of individuals. Education was intended to socialize children for their adult lives, teach them the necessary skills they would need as adults, and convey a knowledge of the world at large. With the many functions the school filled, it played an important role in children's lives.

As Oramel Hosford states in the 1873 *Atlas of Michigan*, "as early as 1787, an ordinance was passed by Congress for the government of the North Western Territory, in which it was declared that 'schools and the means of education shall forever be encouraged.'" The federal objective for education in its early legislation was to encourage the education of children to promote the development of an enlightened citizenry. At the turn of the Nineteenth Century the federal government became much more forceful in seeing that at least a minimal education be given to all children.

The territory of Michigan was organized in 1805 and the first school law enacted in 1809 by the territorial legislature (Anonymous D 1880: 7). This law called for the division of the most heavily settled areas into school districts, and established an annual tax to support schools (Putnam 1904: 4). In 1817 a new school law was passed establishing the University of Michigan. That law gave the university faculty complete control of overseeing schools at all levels, but proved to be impractical in that it prevented taxpayers from having any control over the university faculty, which were appointed by the territorial government (Putnam 1904: 6). In 1821 a new education law was passed which put the university under the control of an elected board of trustees (Putnam 1904: 8). This law, in effect, limited the control of the University over local schools, nullifying the 1817 school law. It was in effect until the passage of the 1827 school law.

In 1823 and 1827 the United States government changed the administrative structure of the territory by establishing the position of Governor and board of advisors elected by the people. Governmental reorganization also resulted in the division of the territories into townships, and provided for local township control of municipal services (Putnam 1904: 11).

As a result of this reorganization, a new education law was passed in 1827 which turned management of schools over to the township government. It provided for the division of townships into school districts, and established minimum requirements for the operation of a school (Anonymous D 1880: 11-12). These modifications gave local residents greater control over their area schools by allowing them to elect their own school board officers and run their schools in a way that met their needs best, both financially and for the greatest benefit of their community. Each township could then subdivide itself into school districts. Each district could hire its own teacher with the direct consent of the local parents, rather than being forced to comply with either state and federal regulators or interference from collegiate governing boards, like the University of Michigan, as under the old regulations of 1823.

1.3. The Philosophy Guiding the Development of Local Schools, Especially in Rural Michigan.

One of the ideals held by educators across the country, at the turn of the Twentieth Century, was that schools contribute greatly to the public life of the community. As Horace Seerley points out (1910: 4-5):

> the people need to be awake to every interest that contributes to the welfare of the whole community, and, since happiness, usefulness, and prosperity depend very largely upon intelligence, morals, and culture, it becomes a matter of self-preservation to have good schools. In the United States public school education is commonly left to the local community, and experience has proved this plan is wise and good if the people recognize the value and the importance of good education to society as a whole and to the individuals in particular.

Educators across the country also believed that a good school could and should be the center of community activity and that, in so doing, foster democracy: "Democracy ... requires that people meet to discuss problems of government and community welfare, and choose officers from among their number to carry out their will" (Mueller 1926: 314-15).

Another ideal that turn of the century educators were striving to realize was the use of school gardens to teach practical farming to the children, as well as lessons in cooking and canning and other farm skills (Foght 1910:236-253).

In Michigan achieving the goals of good education and using the school as a basis of community life was something of a challenge for the rural schools. Rural schools frequently had classes when a teacher could be found and enough money to pay a teacher was available, so school years were variable in length from year to year as the fortunes of the area changed. Children in rural schools also had variable attendance as they were frequently needed for tasks at home. Sometimes older children left school to work full time on the farm. Children in rural Michigan frequently attended from two to four months of school a year (Anonymous C 1861-1930).

The early schoolhouse served as a meeting room until other buildings, such as town halls, grange halls, and churches, could be built. Spelling bees, school socials and literary society meetings were also held in schools in some areas. However, rural schools in Michigan varied widely, with some schools being used for school activities only.

In Michigan, like other "northern states, from the fact that the school terms extend over that part of the year in which gardens do not grow ... not much has been accomplished in school gardens in our rural schools" (Culter and Stone 1913:175); little use was made of school gardens or the teaching of farming to rural children. Many Michigan schools, like Merle Beach with its walnut and hickory trees along the edges of its plot, had only a few trees along their fence lines, and school yards too small to plant gardens or much in the way of trees or flowers. The greatest contributing factor to a lack of school gardens in Michigan, however, was the short growing season, which falls almost entirely outside of the months that school was taught. In the case of Merle Beach, the land is unsuitable for gardening because it is poorly drained and may have been designated as the school land for that very reason.

1.4. Establishment of the Merle Beach School

Clinton County was established by an act of the Territorial Legislature on March 2, 1831 (Anonymous A 1880: 334). The first settler in the county was George Campeau, who established the first trading post in Maple Rapids in 1826, before the official establishment of the county (County History 1880: 338). Another trading post was established in 1832 by Hiram Benedict (Daboll 1906:

445). In 1833 yet another trading station was erected near DeWitt by David Scott (Daboll 1906: 445). Settlers soon arrived in the area and by 1857 the first railroad line going to St. John's was established. Originally the county was all one township, that of DeWitt, and was broken up in 1837 into four townships (Anonymous A 1880: 334-335). Today, by contrast, Clinton County is divided into 16 townships.

Olive Township was detached from DeWitt Township in March of 1841 (Anonymous A 1880: 494-5). It was first settled in 1837 by Ephram Merrihew, who settled with the families of his children and other relatives, in the town of Olive. Settlers soon began populating the area and in 1853 the DeWitt Road was opened as a stage coach and mail route. The first tavern in the area was opened by Myron Wolcott in 1853. It was called The Half-Way House because of its position at the halfway point between DeWitt and St. Johns (Anonymous A 1880, 492).

On October 12, 1841, School Districts Two, Three, Four, and Five were established (Anonymous A 1880: 496). School District number Three was served by the Merle Beach School. The school was originally referred to as the Muskrat School because of its proximity to Muskrat Lake. It was subsequently renamed in 1898 after the Merle Beach Hotel and Resort, which sat on the shores of Muskrat Lake (Anonymous B 1980: 510).

The first schoolhouse, the Muskrat School, sat across the road from the present day location of the Merle Beach school and was a crude log building. A new clapboard sided schoolhouse was erected at the present location of the Merle Beach school in 1863 (Terry Shaffer, personal communication 1995) and is the school building which still stands at the site.

1.5. Operation of the Merle Beach School

The Merle Beach School was a fairly typical rural school of the late Nineteenth and early Twentieth Centuries. It often struggled financially, with school taught for as many months as could be afforded. Upkeep was provided for the school building as money could be found to improve it.

The following chart shows the total annual expenses for each school in Olive Township, as well as the annual expenses for hiring teachers, and expenses for the annual upkeep of each school and its grounds (Anonymous C 1861-1930). The data show that in 1861 District number Three, the district with the Merle Beach School, had the highest expenditures for teachers of any district. In 1863 Merle Beach spent the second highest amount for teachers of any district in the township. By 1886 the amount spent on teachers had slipped to fourth out of five districts.

This trend continued in 1873 and 1874, but in 1880 Merle Beach had risen to the third highest expenditure for teachers of the five districts and by 1900 was paying the second highest amount for teachers in the township. By 1920 Merle Beach was paying the highest amount for teachers of any school in the township. By 1930 Merle Beach was once more paying the second highest amount for its teachers. The total amount spent on school expenses was about commensurate with how much was being spent on teachers: If Merle Beach was paying the second highest wages, then the district was spending the second highest amount overall to support schooling. (See table one for details.)

Table 1:
School Expenses for the Olive Township Schools 1861-1930
(In dollars, taken from the Annual School Supervisor's Reports)

	1861	1863	1866	1868	1873	1874	1880	1900	1920	1930
#1 total expenses	99.23	69.31	95.28	79.25	132.51	187.1	296.43	274.71	1054	1696
amount paid teachers	24	47	65	45.5	102	116	133.37	196	765	1035
building repair			5	3	6.08	17.49				
#2 total expenses		84.55	182.78	151.71	504.68	290.32	262.39	334.23	1020	1667
amount paid teachers	52	32	146.77	136	161	192	165.3	255	675	900
building repair		2	2.55	6.8	300			15.9		
#3 total expenses		79.5	87.66	188.7	191.8	242.8	344.81	355.55	1137	1568
amount paid teachers	75.5	19.5	51	127	127.5	145.88	252	200	810	990
building repair	10	3.99			0.6	48.93	5	27.18		
#4 total expenses		61.5	345.77	329.45	813.57	319.63	319	316.4	1110	1856
amount paid teachers	57	61.5	112.6	142	187	216	164	199.75	560	1035
building repair	7		235	200	3.95			460.04		
#5 total expenses			125.25	171.25	323.89	338.14	242	270		1967.3
amount paid teachers			97.87	144	234.5	216	164	23.63		990
building repair					0.5	54.97				

Table 2:
Attendance Records for District Three, Olive Township, Clinton County, Michigan
(Taken from the Annual School Supervisor's Reports)

Year	Number of months of school held	Number of children living in the district	Number of children attending school	% children who in district who attended MB school
1861	7	41	41	100%
1863	6	57	40	71.90%
1866	4	46	42	91.30%
1868	6	61	40	65.57%
1873	6	62	48	77.42%
1874	7.5	57	51	89.47%
1880	9	95	86	90.52%
1900	9	17	11	64.70%
1920	9	35	20	57.14%

The Merle Beach school, according to the map in the 1861 school supervisor's annual report, was located in District Three of Olive Township in Clinton County. The report shows that, for that year, forty-one children attended the school, which was held for seven months. Table two shows the trends in attendance in District Three of Olive Township, Merle Beach school.

The data from the school supervisor's reports (1863-1930) show the attendance patterns at the Merle Beach school. In 1863 fifty-seven children between the ages of five and twenty were located in the district, but only forty-nine attended school that year. In 1866 forty-two out of forty-six school-aged children attended. From 1868 to 1874 school attendance was relatively stable at between forty and fifty children, despite an increase in the number of school age children in the district, which rose from forty-six in 1866 to sixty-two in 1873. In 1868 school attendance dropped sharply. That year, of the sixty-one school age children in the district, only forty attended school at Merle Beach. Of the six months that school was in session, the average child during these years attended school for between two and four months.

After 1880 the number of children of school age living within the school district declined. In that year, of the ninety-five school age children living within the district, eighty-six attended the school. By 1900 there were only seventeen children of school age living in the district, with eleven children attending the school. By 1920, the number of children within the district had risen again to thirty-five school age children, with twenty attending Merle Beach school, and in 1930 there were twenty -eight children of school age living in the district, with only thirteen of them attending the school. Clearly as time progressed, fewer and fewer children attended the school. Falling enrollments may represent the increasing urbanization of the United States as the Twentieth Century progressed. Decreases in rural school enrollments may also be reflective of a trend toward smaller families as farm machinery became cheaper and more readily available, requiring fewer people to operate a farm. These hypotheses require further study in order to determine the exact reasons for ever-decreasing rural school enrollments in the early Twentieth Century, but turn the investigation in the direction of the fate of the Merle Beach School in particular.

1.6. The Fate of the Merle Beach School

In 1898 a resort/hotel was built on Muskrat Lake and named the Merle Beach Resort for the Marl, Merle to the locals, a natural fertilizer substance, found on the lake's shore. According to the school supervisor's reports from 1880-1900, the number of school age children in the district decreased drastically from fifty-seven children to only seventeen. This is a surprising trend, as the resort should have provided a large influx of local jobs, which should have allowed more people to start families. On the other hand, the increased number of jobs from the resort may have attracted either young unmarried people from outside of the community or within it, and neither group tended to have many children. Enrollments declined as the number of school age children declined during these years. The enrollment at Merle Beach school fell from eighty-six in 1880 to eleven in 1900.

From 1900 to 1920 the number of school age children rose from seventeen to thirty-five, so the increased jobs may have had some impact. The number of school age children enrolled at Merle Beach school increased at this time from eleven to twenty, almost double. The number of school age children decreased between 1920 and 1930 from thirty-five to twenty-eight as the Depression began. School enrollments at Merle Beach decreased during this time as well, going from twenty to thirteen. In the 1920's the Merle Beach Hotel and Resort became largely a public dance hall and began to wane as a resort (Anonymous B 1980: 511). The shift in function of the resort may have reduced the number of jobs at the resort and consequently may be reflected in the falling number of school age children.

The schoolhouses in Olive Township all suffered the same sort of enrollment attrition rate that Merle Beach suffered. Under consolidation laws passed in 1964, the schools began consolidation with the St. John's school district (Anonymous B: 509). Merle Beach school closed its doors in June of 1966 (Terry Shaffer, personal communication 1990).

The rural one-room school had become increasingly common as settlers moved westward across the newly expanding western territories of the growing United States. They allowed children living in sparsely settled rural areas to get a least the basics of reading, writing and arithmetic. The schoolhouse also served as a meeting hall and town center for the fledgling communities. As the Nineteenth Century progressed cities became larger. The sheer numbers of children to be educated became too much for the one-room school model and children were broken into in graded schools, divided by their ages. Educational reformers saw this as a better way to ensure a broader and more formal education for children. By the turn of the century, rural schools were forced to compete and were often required to meet minimal standards for curriculum by law. Rural schools increased the number of days that school was held, introduced an increased number of subjects and introduced new courses in farming, home economics for the girls, and carpentry for the boys.

But more and more people were being attracted to the cities, and rural numbers dwindled. Fewer and fewer children attended each rural one-room school and then they began to combine at the county level and consolidate.

By comparison to the other rural schools of the Nineteenth and early Twentieth Centuries, Merle Beach was a very typical school with increasingly better teachers and curriculum, and longer periods that school was in session. Merle Beach school stayed in use far longer than most one-room schools of its day and was not consolidated until the mid-1960s.

Turning from the specific history of Merle Beach school, examining the archaeological record, what types of data are likely to be evident on the site of a rural schoolhouse from the Nineteenth Century? What activities could be reconstructed? What types of social data are the archaeological remains of a schoolhouse likely to provide?

1.7. Types of Potential Archaeological Data in the Context of a One-Room Schoolhouse

When considering the Merle Beach schoolhouse site, we need to consider the types of data that are likely to be found when archaeologically investigating a school from the Nineteenth Century. The first consideration must be what types of artifactual remains are likely to be common. Are these artifacts likely to be in high or low frequency? Accounts of typical one-room schools suggest that these schools were usually sparsely furnished and had few small pieces of equipment that would have been used and discarded. This account of the furnishings of a schoolroom by a teacher in 1913 (Culter and Stone 1913: 203) is a good example of a very well equipped rural school during the late Nineteenth and early Twentieth Centuries:

> There were seven fine pictures on the walls, a large case of maps, a globe, a dictionary, liquid and dry measures, a cupboard for seat-work material and tools, a bookcase with three hundred volumes, an organ, a teacher's table, two chairs, and a blackened stove.

Also included were a number of student desks, a wall of blackboards, a water pail, and assorted pencils, pens, ink, paper and coal to fuel the stove (Otwell 1923: 88). Most rural schools were not that elaborate. Things such as paper, pens, ink, and school books were usually purchased by each student's parents for their child. The sparseness of the inventories of Nineteenth Century schoolhouses would seem to indicate a low probability of potential artifacts. Rural children were not likely to be from wealthy homes so the number of objects that they would have carried around with them would have been very few. Typically buttons, pencil pieces, slate pencil pieces, and perhaps a penny would have been common small objects likely to have been lost and not retrieved, entering into the archaeological record (Schiffer 1976: 32-33).

The grounds of schoolhouses in the Nineteenth Century usually contained two or three outbuildings, usually one outhouse for each sex and a building for storage of yard and maintenance equipment and stove fuel (Otwell 1923: 88). Some schoolhouses also had gardens for demonstrating and teaching agriculture (Foght 1910: 179-203). A better glimpse of what a typical Michigan schoolhouse and its grounds would include can be found in Card (1919: 41-42), which gives the following description for a "Standard School":

> Yard and Outbuildings
>
> 1. Ample ground of at least one-half acre.
> 2. Some trees and shrubs.
> 3. Good approaches to the house.
> 4. Two well kept, widely separated outhouses.
> 5. Convenient fuel house.

The Schoolhouse

1. House well built, in good repair and painted.
2. Good foundation.
3. Well lighted.
4. Attractive interior decorations.
5. Good blackboards, some suitable for small children.
6. Heated with room heater and ventilator in corner, or basement furnace which brings clean air through the furnace and removes foul air from room.
7. Hardwood floors

Furnishings and Supplies

1. Desks suitable for children of all ages, properly placed.
2. Good teacher's desk.
3. Good book cases.
4. A good collection of juvenile books suitable as aids to school work as well as for general reading.
5. Set of good maps, a globe, dictionary, thermometer, sanitary water supply.

It should be emphasized that many schools were below "Standard School" requirements and many were above those requirements. One of the implications of the description of the "Standard School" is that the minimum number of expected buildings is four, with two privies, most likely located toward the edges of the property, and a coal or woodshed close to the schoolhouse proper. This should necessitate some sort of test excavations near the edges of the site and around the schoolhouse proper, if it can still be located.

Schoolhouses were frequently remodeled as their needs changed, rather than being torn down and replaced with new buildings, so some building debris such as rusted nails and plaster pieces would be likely to have become artifacts. Rural schoolhouses would also have had a portion of their land set aside and used as a playground for the children during recess and lunchtime. Playgrounds often had equipment such as the giant's stride, or stride swing (see Figure 1), swings, vaulting horses, teeter totters and play field areas (Culter and Stone

1913:112-124). These areas would have been likely to receive a lot of heavy foot traffic, and small objects would most likely be either carried to the edges of the play areas, or broken from being stepped on. Artifacts would rarely be found in the playground areas, and large open areas of low artifact density might be indicative of such playground areas.

Figure 1:
Sketch of Girls Playing on a Rough Stride Swing

Different artifact categories would be potentially sensitive to a number of different social organizational categories, such as wealth, religion, ethnicity, and gender. In the case of a rural schoolhouse several social categories would not really be possible to detect.

Race would be difficult to determine as most of the children attending a rural school would have the same types of school clothes, books, pens, pencils, and small toys, with little to differentiate pupils of different racial backgrounds. Unlike areas where slavery had existed, Michigan was home to a fairly sizeable free black population which would not necessarily have used radically different goods of a poorer quality, as they would have on a Southern plantation area (Otto 1977: 105-107). As schoolhouses do not have a large number of discarded household goods (Schiffer 1976: 30-31), it would be very difficult to determine any differences in race among the students.

Ethnicity would be difficult to judge as well, because the most distinctive markers would be styles of dress, hair, languages spoken at home, and the types of food the children brought for their lunches (Mueller 1926: 195-230, 234-245). Clothing would not be expected to be discarded at school, hair styles leave no remains unless there are human remains (which would not be expected to occur at a schoolhouse), and food remains would be easily perishable, except possibly in a privy context. Privies, being small, would be generally hard to locate.

Food remains taken from privy contexts would only be likely to give percentages of particular types of food remains, and butchering methods and some general food preparation data. Food waste data might, in turn, lead to a percentage of individuals using the site with the same food preferences, from which ethnicity might be possible to tease out, but this is largely speculative (Otto 1977: 104-105).

Religion would also be difficult to differentiate archaeologically at a schoolhouse, as the only markers that would survive would be metal ornaments, such as crosses, crucifixes, and stars of David. Had any of these religious symbols been evident in the archaeological remains, it would be difficult to assess whether these remains related to the schoolhouse's function as a school or as a community building, frequently housing church activities (Anonymous A 1880: 496). A mixture of different religious symbols, such as a star of David, a crucifix, and a plain cross would have indicated loss during school activities, as these would not be found together if they were the result of a ceremony of a single religious sect (Schiffer 1976). Small children would likely have either not worn such ornaments of faith to school or would have taken very good care of them, especially if they were made of a precious metal, such as gold or silver. Most likely these artifacts would have been curated, or cared for very carefully, as they had spiritual significance (Schiffer 1976:39-40).

Social class indicators might be possible to discern archaeologically at a schoolhouse. They may consist of such things as silver buttons, instead of horn, shell, or plastic. China doll's heads, which were used on expensive dolls, would be another indicator of a child from a high social class family. Other social class sensitive artifacts would include imported china with intact and traceable maker's marks, and gold or silver jewelry. Unfortunately, as many schools were used for church and community activities, fancy clothing articles could be the result of such activities, rather than an indicator that students came from wealthier homes (Foght 1917: 157).

Many social class sensitive artifacts would be unusual on a school site, such as fancy, imported ceramics, as there were very few domestic activities occurring on such sites, and large scale ceramic discard would be unlikely

(Schiffer 1976). Fancy jewelry would likely be curated items (Schiffer 1976: 39-40).

Gender could be detected from the toys and toy pieces in an archaeological context. Broken doll heads or jacks might indicate where girls played, while pieces of toy soldiers, remnants of baseballs, baseball gloves, or marbles would be more likely to indicate where boys played (Culter and Stone 1913: 6-7, 22-23, 116-124). In many aspects boy's and girl's facilities, such as cloak rooms, play areas, and privies, were highly segregated, and in schools with home economics or wood shop classes these activities were also gender segregated (Foght 1910: 236-253).

Age differences on a schoolhouse site is potentially more difficult to determine archaeologically. The largest markers of a change from childhood to teen/adult status would have been the wearing of long dresses for women and long trousers for men (Culter and Stone 1913; Fought 1910). Differences of dress would be difficult to view archaeologically, as artifacts such as lost buttons would have few differences between longer and shorter dresses and trousers.

Teenagers would engage in different activities, such as girls stitching and knitting in their spare time rather than playing jump rope or with jacks. Lost items, such as pins and sewing needles, would then be indicators of older girls; however, such small artifacts would be difficult to find archaeologically, and might not preserve well. Boy's activities most likely would not change radically, as boys of all ages tend to be active in organized team games (Culter and Stone 1913: 113-117). Not until the 1950s or so do artifacts such as tampons and sanitary maxi pads become widely available for use. These, however, would only be recoverable in a privy context. This would require that privies were in use at a site as late as the 1950's and that the pads and tampons had not decomposed, to be recovered. Such a find would indeed be an indicator that teenage girls had used a schoolhouse, but it is doubtful finding this type of evidence would be recovered archaeologically.

During the Nineteenth Century it was common for teenagers to stay home on the farm and begin their adult life of chores, so few older children went to school (Anonymous C 1961-1930).

Some artifacts could also be useful in dating strata at a schoolhouse site, items such as coins, square cut nails (which were in use predominately in the Nineteenth Century), china with maker's marks which were used for only a discrete period of time, and to a lesser degree slate pencils which tended to be used during the Nineteenth Century, but may have held on longer in poorer areas where paper was difficult to come by.

1.8. Conclusions

By examining the history of school legislation and attitudes toward education, a good deal can be learned about the conditions under which schoolhouses came to be formed. Local communities became the primary forces supporting schools. For better or for worse, local fortunes and financial fluctuations had substantive impact upon the quality of teachers, school facilities, and the range of subjects taught in a rural schoolhouse. Frequently, small schools in relatively poor rural areas, such as Merle Beach, had short school sessions. The main focus of studies was on basic subjects such as reading and writing, arithmetic, history, and sometimes geography.

Sites, such as historic schoolhouses, present a challenge for archaeologists. Schoolhouses were small sites with heavy foot traffic, which would result in artifactual materials being deposited in sparse quantities, at the edges of the highest foot traffic areas. These sites were used for short periods, and the children attending rural schools would likely have had little in the way of playthings and belongings to lose or discard regularly; artifacts would likely be disperse and few in number. Small rural schools, generally did not have teachers living on the premises, nor did they generally have formal cooking activities, which would have resulted in the discarding of glass and tableware in sizable quantities (Schiffer 1978: 30-33). This is in stark contrast to house sites, where domestic activities and high rates of discard of domestic refuse would have been quite common (Carillo 1977: 73-79).

Despite the challenges that schoolhouses present to the archaeologist, they can still be sources of information on site use, artifacts can indicate the specific activities that occurred on a site, and such sites can provide some general information on the children that attended the school, such as their gender, age, and socioeconomic status.

With the ground work of placing Merle Beach school in a historical context in place, with some of the potential archaeological expectations enumerated, the next step in evaluating the site in an archaeological framework was to develop a methodology and a sampling strategy which would be likely to reveal activity patterning.

Chapter 2
METHODOLOGY

2.0. Introduction

A methodology chapter focuses on the types of research strategies employed in a study, as well as the ways in which the researcher goes about collecting the data and why she chose the ways she went about collecting this data. Within the present chapter the rationale behind sampling and why a sampling approach was used in the excavation design at the Merle Beach schoolhouse site is presented and examined. In addition, several different types of sampling research designs are examined along with the reasons for applying some aspects of a particular sampling research design, for example, using a particular size of sample unit or choosing a particular sample unit selection process, while discarding others. The use of archival research, and its nature and limitations, are also examined. Finally, the data analysis methods employed are discussed and examined.

For archaeology, methodology can be considered to involve the means by which archaeologists go about conducting their field and laboratory research, the choices they make in why they are doing what they do, and their reasons for making those choices. Methodology involves how archaeologists decide what types of units to use, where to place them, and how deep to excavate them. Methodology also involves how archaeologists decide how to wash, treat, catalog artifacts, and in fact decide how to store, handle, and conserve artifacts after their excavation. In the case of historical archaeology, methodology also includes what types of archival research are considered appropriate. It helps to determine which archival sources to use, and to decide whether interviews from former property holders, or participants at the site when the site was in use, are appropriate.

In sum, methodology covers all of the different decision making aspects of how archaeologists go about excavating a site, handling the artifacts they find, and initially interpreting the artifacts they find. Methodology both shapes the research design and enables the researcher to discard unfeasible research designs or designs that would be too costly before the money for the research is spent. Careful attention to research design can prevent costly mistakes in the field.

2.1. Sampling Research Design

In arriving at the choice of the final sampling research design that was employed in the study of the Merle Beach School site, a review of the types of structures and features that would potentially be at the site, their sizes and properties, and what sort of testing might reveal these features were considered. Then a review of the sampling literature was undertaken, and a series of potential subsurface sample unit sizes and sample selection strategies were examined. Then several types of sample collection units were chosen, along with several different ways of selecting sample units. Of the selected strategies, it was hoped, at least one would reveal some sort of patterning across the site, as well as reveal which sampling method had been more successful at revealing patterning. The following section outlines the reasoning and literature that were employed in this study.

When Chenhall (1979: 3) points out that "archaeologists have long recognized that inferences about human behavior are in fact based upon small and sometimes inadequate samples," he raises the very valid point that no archaeologist can hope to completely excavate a site. Archaeology is a field in which excavation is always a form of sampling the total potential universe of a buried site. This is for two reasons. First, the cost of excavation is great enough that an archaeologist can almost never excavate a large percentage of any site. In addition, the act of excavation destroys the data base, so that so that all of the data in a site can never be fully recovered.

Archaeologists have long been looking for better ways to investigate a site in a systematic, probabilistic way without resorting to large scale excavations. The earliest attempts at a probabilistic method of sampling the archeological record include Carl Lloyd's 1937 study of Ackmen pueblo (Mueller 1974: 1); Kroeber (1916) and Spier (1917) in their Zuni area surveys (Chenhall 1979: 3); and the Viru Valley survey (Ford and Willey 1949, as cited by Chenhall 1979: 3). Probabilistic sampling "guides the selection of cases to be investigated, and does so in such a manner that biases are minimized" (Redman 1973: 63), so that rather than investigators relying just on their judgment or biases, a percentage of the total area is chosen for study in some more objective manner. Binford (1964: 427) adds "sampling ... does not mean the mere substitution of a partial coverage for a total coverage. It is the science of controlling and measuring the reliability of information through the theory of probability." Probabilistic sampling has been successfully carried out on areas as large as whole river valleys, such as the Chaco Canyon survey (Judge 1972, as cited by Judge, Ebert and Hitchcock 1979: 92-123) and also as small as sampling areas within a site such the sampling program at Ft. Johnson (South and Widmar 1977).

The Merle Beach school site presented some interesting challenges as a site for sampling. It is a small site, measuring only 165 feet by 125 feet with the schoolhouse itself extant, as well as a piece of playground equipment and a flag pole remaining on the site. Since the site is small, and much of it may have been used as a playground, artifact distributions may be spotty and heavily dispersed by heavy foot traffic. With the scantiness of potential artifactual remains, some types of data collection methods would be better than others for recovering widely distributed, low frequency artifacts on relatively small sites. With large portions of a site having potentially very low numbers of artifacts, which would be scattered broadly over the site, knowing where to intensively excavate would be almost impossible, and the time and financial resources that it would require make large scale, intensive excavation a highly ineffective investigation technique for this type of site. It would seem that some sort of a systematic, probabilistic sampling strategy would be a more sensible approach. Sampling is usually faster, covers the whole area in some way so that patterns can be determined in number and type of artifacts uncovered, and can be used to point out areas where additional, more concentrated excavation might be worthwhile.

2.2. Sample Collection Units and Sample Unit Selection

One way of sampling a site requires no subsurface excavation: surface collection. Surface collection can be done on nearly all sites, assuming that the ground cover is relatively sparse. As Lightfoot (1986: 485) states, "where ... optimal conditions prevail, the most common discovery procedure is the pedestrian surface survey, a technique that involves the systematic inspection of the ground surface at a given level of intensity," or rather where a patch of ground is walked over systematically by a particular number of field workers per unit area.

While intensive surface collection is most frequently performed in areas of dry, sparse vegetation, it can be performed, though with much less reliable results, in areas with short cut grass or low lying ground cover. Ideally, where the ground has a fair amount of vegetation, the best way to surface collect is to scrape the grass layer off and then surface collect, an example of which is the 1968 study by Binford at the Hatchery West site in Illinois (Flannery 1976: 52-54). Clearly, the technique has more benefits in sparsely vegetated climates, but since no site can be entirely determined by its surface remains, the technique can still be used, with significantly reduced results, in areas with uniform, low level ground cover.

One benefit of intensive surface collection is that a fairly small site can be covered rather completely in a short period of time. Another advantage is that the site can be covered completely if the site is rather small, which is even better than trying to draw a representative sample from the area of the site. The technique is, however, flexible enough that a very large site can be sampled and those units selected can be intensively surface collected, as in the case of the studies done at Çayönü Tepesi and Girik-i-Haciyan, Turkey, performed by Charles Redman and Patty Jo Watson in 1968 (Flannery 1976: 54). Additionally, intensive surface collection does not require a highly trained field crew or special field crew training, above and beyond showing the crew members the types of artifacts that they are likely to find. Intensive surface collection has a great deal of flexibility and can be done with fairly minimal effort and cost.

Intensive surface collection, despite its many benefits, has some significant drawbacks. First, it is only most effective when the land surface is bare or nearly so, or where a significant amount of disturbance has already occurred and peeling the vegetation off of the surface will not unduly disturb the spatial placement of artifacts. Secondly, intensive surface collection is, for larger sites, time intensive and requires a fairly large field crew. While not expensive in terms of needing large outlays of money for expensive equipment and large work crews on average and small sites, it can be labor intensive performing it on larger sites.

Also, modern artifacts tend to build up on the surface of undisturbed sites and can obscure the patterning of older deposition or give the mistaken impression that there was only modern use of a site. The final drawback is that soil erosion patterns, animal soil disturbances, and human digging, construction and mound building activities can make artifact patterning misleading, but this is true of all archaeological recovery techniques. The technique of intensive surface collection clearly has a number of advantages over subsurface excavation techniques, as well as some drawbacks.

Subsurface testing refers to methods that all involve excavation of some kind. Subsurface sampling is invasive and destructive by its nature, for once a structure or site is excavated the primary data is lost for future archaeologists. There are many different subsurface sample collection units that can be employed during sampling. Those that will be examined here include shovel testing, core boring/posthole testing, and test pitting.

The first subsurface sample collection unit to be examined is shovel testing, in which a shovel is used to dig into the soil and the soil is either observed for artifacts or is sifted through a screen to detect artifacts. Usually these tests are done in lines or transects at some standard interval. Shovel testing results in a wide, shallow test hole about a foot in diameter. This is a method that has primarily been used for "regional survey ... in places where the ground surface is covered by vegetation, prohibiting its direct examination" (Shott 1985: 457).

The advantages of shovel testing are many. It is quick, requiring only two people to quickly stake out several rows with measuring tapes and chaining pins. The samples can then be excavated, one row to a field member with only a shovel, a sifter screen and a few artifact bags. Shovel testing needs little in the way of special equipment, requiring only a few sifter screens, shovels, measuring tapes and stakes or chaining pins. Special training of field crew members is not required as no special equipment is used. Shovel testing can be done quite effectively with a very small field crew of two to four and still cover a reasonable area. It can also be effective where there is significant ground cover such as tall grass, dense forest, or low-lying shrub growth. Despite the many advantages of shovel testing, there are also many drawbacks inherent in the technique.

While shovel-testing has been in use in archaeology since at least 1976, it has been under great scrutiny and criticism since the mid 1980's. Shovel-testing has been argued to be poor at locating sites (Shott 1985 and 1989). It has never really been used to define intrasite patterning, since the samples are wide and shallow shovel -tests do not necessarily accurately detect natural stratigraphy. After examining a wide body of the literature debating the viability of shovel-testing (Lightfoot 1989; Nance and Ball 1989; Shott 1985, 1989), it appeared that shovel-testing would not be an adequately sensitive testing method and seemed better suited for presence/absence data than predicting concentrations of artifacts that would indicate features and structures on the Merle Beach school site. It therefore was not employed in this study.

Another subsurface sample collection unit that is often employed is core sampling. Core sampling involves boring into the soil with an auger, a posthole digger or other boring tool to remove a column of soil. The soil is then observed to determine the stratigraphic layers and then, typically, screened for artifacts. This is done with either a small hand boring device with a diameter a few inches across or with a larger mechanical boring device with a six inch or larger diameter.

The advantages of using core boring techniques are several. First, the cores obtained provide "minimally disturbed section[s] of subsurface materials" (Stein 1986: 505), which means that cores can be used to distinguish between culturally relevant strata and natural strata; next, cores can, if spread regularly over the site surface, indicate the horizontal extent of any cultural deposits (Stein 1986: 513). Also, cores can be used to determine the subsurface depths and outlines of features (Stein 1986: 513). In addition, core samples can be analyzed using the same techniques as column samples, so very small materials, such as seeds and pollen, can be collected as well as larger artifacts. Finally, cores can, depending on the type of boring equipment used, be used to sample sites of nearly any depth, and of almost any soil composition and in almost any type of environment (Stein 1986: 511- 512). As Schuldenrein points out (1991: 132), coring is very versatile, and can be used as a site discovery method, as a method of testing a known site, and as a means of extracting specific stratigraphic data from areas or features within a site.

Coring also has a number of limitations. Firstly, observations are limited by the type of coring tool that is selected. With a small bore coring tool, such as a 1½ " diameter hand auger, the data is limited to observing stratigraphy, in a very narrow area, which may be useful for studying features but which will be harder to use for site discovery. A 3" or 4" diameter mechanical drill or auger can yield significantly larger samples which can reveal artifacts, a more in-depth analysis of stratigraphy, or be used as a column sample (Stein 1986: 512-13; Schuldenrein 1991: 134). Some types of augers also force some of the soil into their hollow handles, and these portions are lost for research. Posthole diggers have also been employed as augers, but they have a number of drawbacks including "possible contamination because sediments are churned by the device rather than extracted in consolidated form," and posthole diggers can only reach sediment depths of "50-125cm below the surface," making them inappropriate for deep cultural deposits, or where deep deposits are expected (Stein 1986: 517).

Posthole diggers used in place of core boring devices, however, have a number of benefits to their use. One benefit is that they have a larger bore size than a hand auger, so they can provide a better view of soil profiles. While they do not bring up completely intact soil stratum, carefully used to penetrate a stratum at a time, they can achieve a more intact profile than a shovel test. Posthole tests can also probe deeper than shovel tests, although not as deep as a hand or power auger. Posthole testing can also be accomplished economically, and a hand posthole digger can be used in soils difficult for power driven equipment to handle, or in tight areas, or in areas with difficult topography (e.g., the sides of steep hills), where power driven equipment is not practical to use (Stein 1986: 517). Posthole diggers also require less specialized training of field crews than power driven equipment, which makes it easier to find labor. Mechanical coring devices can also be expensive, with the most advanced costing from $500-$1000 dollars per day to rent both the machine and operator, with each of these cores taking one to three days to obtain (Stein 1986: 516). A large number of sites have been sampled using posthole tests from as early as 1947 (South and Widmer 1977: 128).

Then there is the sample collection unit of the square test pit. Test pitting "can provide information on the composition and the stratification of the site, locate areas of activity or especially rich deposits within it" (Hestor et al. 1975:.71-2). Test pitting can be used as a final step in the survey of an area, used as a method of excavation or used as a preliminary step in excavating a large area. Test pits are always square and tend to be uniformly one meter square, if the site is excavated metrically, and between three and five feet square, if excavated in English units, as some historic sites are excavated. The reason for the relative standardization and small range of variability in test pit size is that "squares much smaller would squeeze out the archaeologists, and larger units are overly destructive (and too time-consuming)" (Thomas 1991: 108).

David Hurst Thomas (1991: 108) notes, in test pits, "archaeologists must maintain control of the finds ... the x axis (front to back), the y axis (side to side), and the z axis (top to bottom). This is why archeologists dig square holes." In other words, square test pits allow archaeologists to place an artifact in a bounded three dimensional space, which allows the researchers to observe the patterns in distribution across test pits in order to detect floors and activity areas. Artifacts may be located in time, relative to each other, by observing their location in the z axis, assuming undisturbed stratigraphy.

The advantages of test pits include the fact that they provide a larger exposure of the site than a shovel test or posthole test can. Secondly, posthole tests can allow for much greater stratigraphic control, by allowing the archeologist to peel layers off in an area large enough to maneuver, but not too large. Thirdly, test pits can be strung together to observe a large area of a site or to focus on a feature. One disadvantage is that test pits, because of their relatively small size when compared with larger area exposures, cannot show large features such as structures, except for small portions of such features, unless several test units are strung together. Another disadvantage is that test pits take more time and cost more than either shovel testing or posthole testing.

After examining all of the different sample collection units outlined above, looking at their strengths and weaknesses, I decided upon a research design that combined surface collecting and two different subsurface sample collection units for the excavation and analysis of the Merle Beach school site. For the surface collection I decided to divide the entire site surface into a number of large units to intensively surface collect, after the site was closely mowed. I decided to follow the surface collection with a series of posthole samples selected through a uniform systematic arrangement of lines, or transects, across the site.

Systematic unit selection was used for the posthole samples for a number of reasons. A systematic unit arrangement allows for uniform subsurface testing of a site; however, the regular placement of units may cause regularly placed features to be missed if the feature regularity causes features to fall between the test units (Plog 1976: 139-143). In an effort to lessen this common pitfall, I staggered half of the transects, in effect creating not square arrangements of posthole tests but diamond shaped arrangements. The other reason for using a systematic arrangement of postholes is that, in some instances, systematically chosen units can be better at observing site structure than randomly chosen units (Plog 1976: 141-143).

Then I elected to use a random selection to choose a number of five foot by five foot square units. A random selection method was chosen, as little was known archaeologically about schoolhouse sites, so stratification of the area was impossible. Also, five foot by five foot test pits are rather large sized units to excavate, and only a limited number of them could be excavated, so without a way of stratifying the site, random selection of test pits seemed the least biased method of test pit selection.

Surface collection was chosen to cover as much of the total surface area of the site as possible and to see whether surface remains had any correlation to patterns found through subsurface testing. Posthole testing was chosen as a compromise between mechanical augering and shovel testing, since posthole testing allows for more control in observing and preserving the natural stratigraphy during excavation than shovel testing, and is less costly and requires less expertise of field crew than mechanical augering.

Five foot by five foot test units were selected to provide a number of wide exposure excavations in order to observe site patterning of artifacts and to provide a larger excavation unit that could then be compared to the posthole tests, in order to see if the posthole tests revealed similar patterning. The design was selected with the idea that all of the tests could be compared to see if one testing method revealed similar patterns that were borne out by another testing method, in an attempt to compare the effectiveness of the different sampling methods. The research design for the sampling program as a whole was largely based upon South and Widmar (1977: 128-131) and Plog (1976: 137-144). A full formal description of the sampling research design that was chosen and the number of units used follows.

The Merle Beach School Site measures 165 feet north to south by 125 feet east to west, and has been divided up into 25 foot by 25 foot square units. A 15 foot wide strip running the length of the site from east to west along the southern site boundary was excluded to make the units easier to handle. This section of the site was chosen for exclusion because it is not known to have played an active part of the site's use historically and because it contains the remains of a pet belonging to the owner. The site also contains the schoolhouse, which is still standing, along with a piece of remaining playground equipment and several trees, most of which are located around the perimeter of the site (see map 2 page x of appendix B).

2.2.1. Phase 1: Non-invasive techniques

Surface collecting. Each 25' x 25' square was walked and the artifacts collected. This yielded a sample of 100 percent of the total site area.

2.2.2. Phase 2: Invasive techniques

Part 1: Posthole testing. One posthole core 12 inches in depth was drilled every 12.5 feet in transects 12.5 feet apart in an east-west direction across the site. The posthole tests were offset by 12.5 feet in half of the transects in order to minimize symmetrical deposits that could be missed by a completely regular arrangement of posthole placement. This yielded 68 tests, or .0078 percent of the total site surface.

Part 2: A series of nine 5 foot by 5 foot pits was excavated to a depth of 1.5 feet. Each test pit was randomly chosen within its 25 foot square (excluding large features, such as the schoolhouse and the flagpole). This yielded a 1.09 percent sample of the total site area.

Overall, 100 percent of the site received some sort of testing. Approximately, 1.10 percent of the site received subsurface testing of some sort.

2.3. Archival Research

Archival research is a bit different in terms of methodology and requires different considerations than those applied to field and lab methods. First, the types of data are very different. Archives are usually repositories of old records, diaries, histories, and other documents. Usually, they are built up through the donations of private families, contributing their old family diaries, letters, and scrap books. Histories are usually of local towns or counties and were often commissions for community anniversaries or other big events. Old records are frequently donated to archives when local town halls, county halls of records, or state bureaus run out of space for the storage of old records. Because nearly all of the materials in an archive is donated material, it is frequently a fragmented collection of different things.

In archaeology this hodgepodge of records presents a number of challenges. Frequently, direct records of the site in question, such as deeds of sale, wills of previous landowners, diaries of previous landowners or users, or account books of site users/owners, may exist; then again, none of these may have been created or kept, or documents may have been lost or burned during a court move or building fire. For public types of buildings and activities, there are usually state, county, or municipal records, but these may have been kept sporadically, not filled out completely, or available for only short periods of the time that a site was occupied. There may also be little that documents a site directly, but there may be a great deal of indirect references, requiring a good deal of intense research in order to establish accurate connections. Finally, with archival sources, the viewpoints of the individuals and the time periods they were writing in may need to be taken into consideration, and the information obtained from sources culled through carefully. Additionally, since many things, like local histories, may have been used to highlight the most wealthy citizens in the area or may have been written as a public civic pride project, they may be inaccurate or not match other sources. Careful selection of archival sources and the selections that are taken from them, therefore, becomes very important.

In assessing what sorts of archival research to undertake for this study, a number of things had to be taken into consideration. As far as is known, none of the teachers who taught at Merle Beach school left any memoirs that had been entered into any of the local archives. However, a great deal could still be found out about the school, since the state required annual school supervisors, reports starting in 1860 and ending in1931 (Anonymous C). These reports covered most of the time period that the school was in use. County histories, both those written during the Nineteenth Century (Anonymous A) and one written fairly recently by the local county historical society (Anonymous B), were able to give background about the area, how the schoolhouse was used, and the types of events and activities it was used for. They also gave the social and local business profile for the area around the schoolhouse, providing a glimpse at the rise and fall of the community.

2.4. Data Analysis Methods

Not only is the sampling research design used in artifact collection important, but so is how the material is handled upon collection and afterward. All of the artifacts from each surface collection unit were bagged and marked with the date collected, the type of unit, and the initials of the collector. As each level of each sample unit was excavated, it was screened through ¼" mesh screen. The resulting artifacts were then bagged and labeled with the date, provenience, and excavator's initials. The bags were then given a field number and were counted and logged in the field catalog. Artifacts were then washed a bag at a time, each bag being noted in the washing log. The artifacts were then counted once again and the final counts were recorded. For the items where enormous amounts of materials were collected, such as unburned coal or brick, these items were counted, weighed, and discarded. The final data tables can be found on page y of the appendix.

A series of statistical tests was then run on the raw data. These tests included a three dimensional contour map for each artifact type for each data set, a Pearson correlation matrix for each data set, a three cluster K-means cluster analysis for the posthole and the five foot unit data sets, and a five cluster K-means cluster analysis for the five foot unit data. The three data sets were compared to test sampling effectiveness using exploratory data analyses methods, employing box and whisker diagrams.

2.5. Conclusions

The focus of study at the Merle Beach school site was two fold: to both archaeologically examine a Nineteenth Century rural school site and examine the effectiveness of a number of different sample strategies used in archaeology on this type of site. To accomplish both of these ends, the sample research design outlined in this chapter and the analysis methods employed were designed to address both issues. The use of a series of different sampling strategies, followed by a statistical comparison of their results, was meant to allow the relative effectiveness of each strategy to be determined. The sample research design was also chosen to increase the likelihood of uncovering the activities that occurred at the site and the areas in which these activities occurred. The sample research design that was employed was also chosen to cover as much of the surface area of the site as possible in order to increase the probability that any subsurface features would be discovered. The study as a whole strives to understand the activities that occurred at a rural school in use during the Nineteenth Century, taking the Merle Beach school as its example, and to develop methods by which many small, poorly understood sites, such as schoolhouses, can be studied archaeologically in productive, and cost effective ways.

Chapter 3

DATA ANALYSIS AND INTERPRETATIONS

3.0. Introduction

A series of different sampling research designs, each incorporating a different sized sample collection unit (with these units chosen in a different manner) were excavated at the Merle Beach schoolhouse. Then each sample research design was evaluated utilizing statistical analyses to determine its effectiveness at locating artifacts and activity patterns across the site. The three different sampling research designs were then compared statistically, to determine that sampling research design which was most effective at determining artifact patterning across the site.

3.1. Spatial Organization: Surface Collection Data

The surface collection consisted of 30 units of 25' by 25', 625 sq. ft. each, which were walked by a field crew member who collected all objects found within each area, after the site had been mowed. Artifacts were found in only 15, or half, of the 30 collection units. The highest percentages of artifacts (those units containing five percent or higher of the total artifacts) were from units 24, 25 and 30, which were clustered around the schoolhouse in the northeast corner of the site (see map 2, p. 121). The highest percentage of the total artifacts within this test was unit 30, which accounted for 56.12% of the total artifacts recovered in the surface collection.

Several statistical analyses were then performed on the surface collection data. The first stage involved constructing a contour map of each artifact variable plotted against the xy-coordinates of the surface collection units, with the intent of displaying the density of artifacts as they were spread out spatially across the site area (maps 3-6, pp. 122-128), similar to the technique employed at the Mask site (Whallon 1984: 249-253). The second stage was to assemble a frequency distribution and two graphs (graphs 1, p. 157) of the distribution, in order to observe the shape of the distribution curve and any sharp changes or outliers. This procedure revealed that the bulk of the units had artifact frequencies clustered around zero, with a few outliers, indicating that most units had a small number of artifacts. Finally, a Pearson's correlation matrix was run to determine any relationships between the artifacts that may not have become evident through visual comparison of the multiple contour maps. This is also similar to Whallon's treatment of the Mask site (Whallon 1984: 250-251).

The resultant contour maps revealed clustered patches of a few artifacts in one or two areas of the site. The spatial patterning revealed for the artifact categories of bottle glass, metal, flat glass, square headed nails, wire nails, and unburned coal were all nearly identical, with very high concentrations of artifacts around and just to the west of the schoolhouse. Plaster and shingle were all aggregated in one area centering in the northeastern-most area of the site behind the school house. Wood has a small clustering along the east fence row directly behind the schoolhouse, not far from several trees along the fence row. A small cluster of bone was located in the far southeast corner of the site, along the east fence row. Mixed small artifacts also tended to cluster along the fence row, between the clusters of bone and wood.

The artifact category Other Mixed Ceramics has a rather unusual contour map, with two sizable clusters. One is directly in the region around the schoolhouse, similar to the distribution of metal, and the other occurs toward the south end of the site about twenty feet from its southern edge. The contour map distributions for slate display the highest concentrations in what would have been the playground area. Concrete also occurs in the same spatial patterning as slate, with one discrete cluster in the center of the playground area. Plastic has the most unusual contour map, with two small clusters. The largest cluster of plastic pieces occurred in the northeast corner of the schoolhouse, in the same area as the highest concentrations of shingle and plaster.

The Pearson's correlation matrix resulting from the surface collection showed strong positive correlations between metal, wire nails, square headed nails, and unburned coal (r values of 1.0). Weaker associations were found between flat glass, square and wire nails, and unburned coal, as well as between other mixed ceramics and square and wire nails. These correlations reinforce the results of the contour mapping, with many of the same patterns emerging in the surface collection data.

3.2. Interpretations of the Spatial Organization of the Surface Collection Data

That the spatial patterning for bottle glass, metal, flat glass, square headed nails, and unburned coal were all very similar, with concentrations in the same area right around and just to the west of the schoolhouse, would suggest a similarity of depositional patterns of activities at the schoolhouse. This is probably linked to a combination of two factors. One of them involves the reconstruction activities of the landowner that occurred shortly before the excavation of the site (Terry Shaffer, personal communication 1991). Secondly, the close scattering of artifacts such as metal and unburned coal, which would have been used when the schoolhouse was in use, suggests that small amounts of commonly used materials fell directly around the schoolhouse, possibly as a result of regular sweeping and maintenance by teachers and cleaning personnel.

As all of the plaster and shingle were clustered into one area behind the schoolhouse, it may possibly indicate that plasterboard and shingles were briefly stored in this area, during a relatively recent remodeling phase of the schoolhouse. Since all of the wood remains come from the fence row, near still extant trees, the surface wood probably comes from modern shed tree bark and has no cultural significance. With bone remains located in only one small area close to the fence, the bone may represent the residue of modern small animal deaths or, more likely, the meals of local farm cats or other small animals. Given the distance from the schoolhouse, the bone most likely is not directly related to activities at the schoolhouse. The other mixed small artifacts clustered between the bone and wood deposits are probably small bits of modern trash that have blown onto the site, especially since they are near the fence row and don't appear to be objects that would be directly related to the school, such as bits of rubber.

As the artifact category Other Mixed Ceramics clustered in two different regions of the site, this may either indicate different types of ceramic being used at two different times in the site's history, or that ceramics were discarded in two areas of the site. Some of the ceramics on the south side of the site are most likely drainage tiles, based on the dark brown glazed interior, their lighter glazed brown exterior, and the red terracotta paste of the sherds. Since the school did put in a septic field in the southwest corner of the site in the 1950s, the clay drain tile pieces may date from this period (Terry Shaffer, personal communication, 1990).

The slate was clustered in the middle of what would have been the playground area, which could indicate that children either took their slates outside and used them to play games with, or that modern children, just before the close of the school, used found slate pieces as toys of some sort. It is highly unusual to find small artifacts, such as slate pieces, lying in an area that was open to heavy foot traffic. The pieces of slate may simply not be indicative of a specific organized activity but may simply have landed where they happened to fall from a broken slate, or a teacher sweeping the floor, rather than indicating a particular use of slate in that particular area.

Concrete had the same patterning as slate. As small chips of cement may have flaked off of the cement porch in the last years of the school, it is again possible that the children at the school may have picked them up and used them as toys, or that cement was mixed there during reconstruction of the school. Finally, plastic has its highest concentrations in the same area as shingle and plaster, reinforcing the possible interpretation that building materials were placed here briefly while the school was in a phase of reconstruction.

3.3. Spatial Organization: Posthole Data

The sample chosen for posthole testing consisted of a series of 70 postholes. The locations of the postholes were plotted along east-west transects spaced 12.5 feet apart, with tests placed every 12.5 feet along each transect. Two of the selected postholes could not be excavated as they fell inside of the foundation of the schoolhouse. The transects were numbered from south to north. All of the postholes were excavated in layers by visual soil changes, and were screened. All of the resultant artifacts were bagged and counted. Data Table 2 (Appendix) shows the level counts for all posthole test pits. Of the 68 pits excavated, only 13 yielded artifacts, with the highest percentage of artifacts coming from 10 of the test pits. Each of these pits had one or more levels which accounted for 4 or more percent of the total artifacts collected during the excavations. The highest percentage of the total artifacts recovered in this phase came from the units N1077.5 E1000/B level (4.97%), N1077.5 E1125/A level (13.82%), N1090 E1112.5/A level (11.23%), and N1102.5 E1125/A level (11.02%). These units cluster in two areas, with one around the rear back corner of the schoolhouse, and another cluster in the front of the schoolhouse (map 2, p. 121).

As with the surface collection materials, the posthole tests were first analyzed by plotting a series of contour maps for each artifact (maps 17-42, p. 129-141). Graphs of the frequency distribution (graph 3, p. 158) were observed for the shape and nature of the distribution, which revealed that most of the units clustered around zero with a few outliers, indicating small quantities of artifacts in most units.

Unlike the surface collection artifacts, which displayed a large number of similar patterns of spatial distribution, the artifacts obtained from the posthole tests had few artifacts that shared similar contour patterns. Chert flakes had one cluster that overlapped the square headed nails, located on the south side of the school, but also had a cluster further to the west in the middle of the playground area. Burned coal, unburned coal, screws, and walnut shells all clustered in the northwest corner of the site, closest to the road. This location happened to be near what appeared to be a nut tree, so the walnuts are probably modern and have no bearing on the interpretation of the site as a whole. Bottle glass and flat glass and the other mixed artifacts occur in the same area of the site, in the northeast corner along the fence row. About ten feet to the west a cluster of glazed white ware occurs in a similar pattern to the cluster of barbed wire. Pennies and wood clustered in the same pattern to the east and slightly south of the schoolhouse. Metal, brick, shotgun shell casings, and plaster all clustered in a similar manner along the east fence row behind the schoolhouse.

Chalk and charcoal appear to cluster together at the far north of the site along the north fence row. Slate and concrete also appear to cluster together just to the south of the school.

A Pearson's correlation matrix of the posthole data did little to clarify the patterning observed through the contour maps. The analysis of the Pearson correlation analysis run on the posthole tests showed very few strong correlations. There were moderate correlations (between .66 and .70) between plaster and screws, brick and shotgun shell casings, and between bottle glass and flat glass. The only fairly strong association (.944) was between slate and chalk, which would make sense for a school site, as they are related in their use within the school room. The Pearson's correlation results again largely reinforce the spatial patterns observed by the contour maps, with the exception of the slate/chalk correlation, which did not appear in the comparison of the contour maps of these artifacts. Also, screws did not appear to cluster with brick, shotgun shell casings, brick, and plaster in the comparison of the contour maps. The Pearson's correlations may have been off, since the use of the correlation matrix is highly unreliable if the relationship between the variables is non-linear and if the distribution is not symmetrical and can yield inaccurate results (Speth and Johnson 1976: 36). Also the data set included a number of zero cells which can "drastically alter the magnitude of a correlation coefficient, and even transform a statistically significant negative correlation into a positive value" (Hesse 1971, as cited by Speth and Johnson 1976: 38). With the inconclusive nature of the spatial patterning data for the posthole test data, another method of statistical analysis was performed, called the K-means test.

The K-means test is "a non-hierarchical divisive cluster analysis which attempts to minimize the intracluster variances while maximizing the intercluster distances" (Ammerman and Kintigh 1982: 39). In other words, it attempts to break a population into clusters without first separating the population into strictly nested stages, so it can frequently show patterns in raw data from the spatial clustering that other methods may obscure or overlook. In short, the K-means test looks for clusters of artifacts whose means all cluster around some common point or centroid (Johnson and Johnson 1975: 286).

The K-means test was performed with three clusters in an attempt to tease out some relationships between the artifacts. The first cluster consisted of all of the artifacts, the second clustered brick and bottle glass, and the third cluster paired unburned and burned coal together. The results of the K-means test simply confirmed the results of the Pearson's correlation and the contour maps. The K-means test's failure to find additional artifact associations points to a general lack of large scale artifact spatial clustering for the posthole tests. Probably, the tests yielded too few and too dispersed artifacts to be able to give any really meaningful patterning.

3.4. Interpretations of the Spatial Organization of the Posthole Data

As metal, brick, shotgun shell casings, and plaster are primarily building materials, and occur in similar clusters, this may have represented a dump for them when the school was remodeled at one point, but with so few materials clustering together, this is highly conjectural at best. As most of the artifacts that clustered together in the posthole data appear to do so primarily along the fence rows, it is possible that the clusters all represent trash thrown out from the school or from farmers in the field adjacent to the schoolhouse. There are also several artifacts which have distinctive contour maps all their own, such as mortar, which occur independently of the other artifacts. However, the posthole tests did result in very small amounts of material being found within each test, and the lack of total material may be part of the reason for the spotty artifactual patterning.

3.5. Spatial Organization: Five Foot by Five Foot Unit Data

A series of eight units, five feet by five feet square, was intensively excavated to one sterile level, and a ninth unit was partially excavated until severe rains and flooding forced a halt to the excavation. The dirt from each level of each unit was sifted through ¼" mesh screening. Again, levels were determined by visible changes in the color of the soil. The highest percentage of the total artifacts in all of the test units occurred in N1160 E1005 (15.01%), N1110 E1120 (24.54%), N1145 E1080 (38.47%), N1125 E1025 (6.90 %), and N1055 E1070 (5.27%). These units are located at the front northwesternmost corner, 25' north of the schoolhouse, fifty feet in front of the schoolhouse, directly behind the schoolhouse, and in the middle of the playground (map 2, p. 121).

In comparing the highest concentration of artifacts within each test and mapping them together (see map 2), the highest artifact concentrations seem to cluster around the schoolhouse near the porch and directly behind it. There are also dense concentrations of artifacts toward the north edge of the property, one of which revealed a building trench, possibly the coal house. There is also, unexpectedly, one cluster of artifacts in what would have been part of the playground.

As with both the surface collection units and the posthole tests, a series of contour maps was generated for each of the artifact classes excavated from the five foot by five foot units (maps 43-72, pp. 142-156). A frequency distribution was also constructed and a graph of it (graph 5, p. 159) observed to determine its shape and nature, with all of its values clustering around zero with a few outliers, indicating a low density of artifacts within each test unit. When the contour maps were compared, five groups of artifacts emerged with very similar contour maps. Fire cracked rock, chert flakes, wood, square nails and brick all had the same general spatial pattern, with three areas of high concentration, on the far south side of the site, the northeastern corner of the site, and the far west side of the site, with the highest concentrations located at the northeast corner. Unexpectedly, stone tool fragments had a completely different spatial distribution than fire cracked rock or chert flakes, and had a completely different pattern than any of the historic artifacts.

A second group of artifacts that had similar contour maps consisted of wire nails, metal, unburned coal, bottle glass, concrete and bone. This accounts for the majority of the historic artifacts. These cluster in the northeast of the site, to the north of the schoolhouse, sweeping right next to it and on the far west edge of the site, directly next to the road. The footing trench of an outbuilding which was filled with unburned coal was recovered to the north of the schoolhouse.

A third group of artifacts that have highly similar contour maps include sheet metal, barbed wire and charcoal. The clusters of these artifacts occurred largely in the northwest corner of the site, closest to the road. In the case of barbed wire specifically, there is also a concentration in the far southeast corner nearest to the road.

The fourth group of artifacts with highly similar contour maps was comprised of other mixed ceramics and mollusk shell. These artifacts clustered in a wide band across the west and south sides and another wide band along the north-northeast side close to the schoolhouse.

The fifth and final group of artifacts with highly similar contour maps consists of slate and mortar. These concentrations are primarily located in the southwest corner of the site, near the road, with a second cluster on the east side of the site. For slate they are in the same general pattern but in a more narrow band a little further from the road and further from the east side of the site as well. These artifacts may have been pushed to the edges of the site from one particular phase of reconstruction of the schoolhouse.

Finally there is a whole class of artifacts that have distributional contour map patterns that appear to behave differently than any other artifact groups. These artifacts include flat glass, glazed white ware ceramic, pearl ware and transfer printed ceramics, other miscellaneous artifacts, plastic, peach pits, and walnut shells. The walnut shells are clustered in only one discrete place on the site, in the far northwest corner in a unit that sits under a nut tree. They are almost certainly the modern annual fall from the tree. The glazed white ware ceramics and the pearl and transfer printed ware ceramics had very different spatial patterns from each other and from the other historic artifacts. The peach pits had very specific clustering in primarily two areas, the south margin of the site and the west margin of the site, and a small pocket at the northeast corner of the site.

After the comparison of the contour maps, a Pearson's correlation matrix was performed and the number of correlations was very high, obscuring any artifact associations. Almost every artifact had a correlation with several artifacts that displayed an r value of .6 or higher, indicating a moderate to high level of correlation. Again, Pearson's correlations can only be reliable with linear relationships between pairs of variables and with symmetrical distributions, neither of which case held in this instance (Speth and Johnson 198: 36) Also, there was one contour map which showed all zero values, which can grossly distort a Pearson's correlation (Speth and Johnson 1976: 38). In an attempt to reduce the noise and pick out useful artifact associations, a K-means test was performed.

A K-means test was performed in two separate runs, the first with three clusters and the second with five clusters. The first cluster in the first run included fire cracked rock, chert flakes, stone tool fragments, square headed nails, shotgun shell casings, metal, and barbed wire. This cluster cut across several of the clusters observed by the inspection of the contour maps. The second cluster from the first run was composed of just sheet metal, and the third cluster included just wire nails. In an attempt to get a less confusing and more meaningful statistical analysis, a second run of the K-means test with five clusters was performed. The first cluster of the second test included fire cracked rock, stone tool fragments, square headed nails, shotgun shell casings, and barbed wire. The second cluster was comprised of only sheet metal; the third cluster, only wire nails; the fourth cluster, only metal; and the fifth cluster, only stone tool flakes. These new clusters were no better than the original K-means test and did not contribute meaningfully to the delineation of useful artifact associations. The failure of both the Pearson's correlation and the K-means test to provide significant artifact correlations and clusters suggests that the artifact classes possibly exhibit independent clustering behavior. This indicates that there were few specialized activity areas with related artifacts for each use. It points to a multi-use site with a great deal of flexibility, which would be expected for a schoolhouse that was frequently was used for community activities.

The difficulty in examining artifact associations for the five foot by five foot unit tests may be that the large number of different types of artifacts, many in relatively small numbers, throws off attempts to view associations and clustering between different artifact types.

3.6. Interpretations of the Five Foot by Five Foot Unit Data

From the materials found in the one pit located in the middle of the playground, it would appear that these remains represent a small trash deposit. The artifacts scattered around the schoolhouse are mostly building materials and appear to be trash deposits from remodeling episodes. The unit with a high concentration of artifacts, located directly next to the road (map 2, p. 121) could represent either a trash pit from the schoolhouse or refuse from the stage coach route which ran past the schoolhouse. The postholes with the highest artifact concentrations are all in close proximity to the five foot by five foot units, with high artifact concentrations, and are clustered close to the schoolhouse. This clustering close to the schoolhouse would be expected as small objects, like buttons, would tend to be lost as children came back to the schoolhouse from recess and lunch time games. It would also be explainable that a teacher or janitor sweeping the schoolhouse floor would sweep small items out of the door and into the grass immediately around the porch.

The coal-filled trench may represent an outbuilding which may have been the school's coal house. The wire nails probably indicate that the structure was from after the turn of the century, when wire nails came into exclusive use (Nelson 1968). Bottle glass and concrete are also possibly indicative of remodeling of the schoolhouse at the same time that the shed was erected.

From the location of the clusters of metal and barbed wire, most likely the metal and barbed wire pieces were being deposited there by farmers, and this is refuse tossed to the margins of the farmer's fields, not primarily school material. As the mollusk shell was primarily buttons and button pieces, it is not surprising that they would occur close to the school and all along the playground area, as that is where they were lost as children ran inside from recess or other activities.

The very different patterning of the glazed white ware, pearl ware, and transfer printed ceramics suggests it is possible that these were remnants from the schoolhouse's auxiliary uses as a meeting house rather than as part of its regular use as a school. As the scattering of peach pits is very discrete and seems almost systematic; these areas may have been where the modern children ate their lunches and tossed their peach pits.

3.7. Analysis and Comparison of the Sampling Methods

The first step in analyzing and comparing the three data collection methods was to establish data frequency tables and inspect the line graphs that resulted from plotting the data (graphs 1-8, pp. 157-160). Two data frequency tables were constructed for each of the two data sets (the surface collection data and the posthole test data). For each data set, one data frequency graph plots the number of units having artifacts, and the resulting artifact frequency was divided in grouped intervals, i.e. 0-6, 7-12, etc. The other data frequency graph for each data set plots the number of artifact classes against the frequency of the artifact's distribution, again grouped in intervals. The five foot by five foot unit data set is treated in the same manner, except that four data distribution graphs were constructed, two of each type. The second set of data distributions removes the unburned coal, which occurs in such abundance that is can shift the mean and standard deviation, making any summary statistics of limited utility.

The second step in analyzing the different data collection methods was to perform an exploratory analysis of the data frequency distributions. First the basic statistics of mean, median, and standard deviation were computed for both the frequency and the artifact variables for each of the distributions as shown in table 3.

Table 3:
Basic Statistics for Artifact Distributions

Type of testing	MEAN	MEDIAN	STANDARD DEV.
SurfaceCollection 1			
No. of artifacts	72.5	72.5	41.413
frequency of artifacts	0.75	0	2.447
Surface Collection 2			
No. of artifacts	62	62	35.496
frequency of artifacts	0.75	0	2.245
Post Holes 1			
No. of artifacts	83	83	47.329
frequency of artifacts	1.35	0	3.066
Post Holes 2			
No. of artifacts	40.7	41	23.191
frequency of artifacts	2.75	0	6.98
Five Foot Units 1			
No. of artifacts	1358	1367	841.25
frequency of artifacts	0.563	0	1.504
Five Foot Units 2			
No. of artifacts	1244.26	1239	706.989
frequency of artifacts	1.632	0	6.157
Five Foot Units 3			
No. of artifacts	249	249	140.683
frequency of artifacts	1.579	0	3.58
Five Foot Units 4			
No. of artifacts	359	359	202.583
frequency of artifacts	0.474	0	0.772

In choosing which statistical method to use in viewing the spread of a distribution and its attributes, a statistic that is more resistant to outliers can be helpful in recognizing the actual patterning of the values within the distribution. A good statistic for this is the median, which is the value above which half of the values in a data set occur and below which half occur. The mean and standard deviation, on the other hand are "in particular ... nonresistant summaries of location and spread" (Hartwig and Dearing 1979: 19). Examining the chart of basic statistics, above, in the case of the first and third set of data for the five foot by five foot units, the mean for artifact frequency goes from .563 to 1.579 when a very large value was removed to make the distribution more representative of the whole. The median, in contrast, remained zero.

One median-based statistical display is the box and whisker diagram. The box and whisker diagram uses the median as its point of reference and splits the distribution as a whole into two parts using a vertical line to indicate the median. The sides of the "box" in the diagram are made up of the upper and lower "hinges." The lower hinge "is the point above which three-fourths and below which one-fourth of the values lie and the upper hinge is that point above which lie one fourth of the values and below which lie the other three quarters" (Hartwig and Dearing 1979: 21). The "whiskers" on the plot represent plus and minus one intervals of the same size as the numeric distance between the two hinges. Any values beyond the whiskers represent outliers, and if far away from the median, they represent distant outliers.

In examining the first box and whisker diagram of the artifact frequency for the surface collection data (graph 9, p. 161), the distribution of values is found to be largely contained to zero with very little spread and one outlier at 10, meaning that the frequencies of the artifacts clustered around zero with one outlier. In examining the box and whisker diagram for the numbers of artifacts, which is the listing of the intervals of numbers of artifacts, a distribution from zero to the highest number of artifacts with equal whiskers, and equal sized box sides, means that the number of artifact intervals is a normal distribution, with equally sized intervals.

The second box and whisker diagram for the surface collection data examined the artifact frequency (graph 10, p. 161). Again the box is centered narrowly around 0-1 with an outlier around 2 or 3 and two distant outliers around 10, meaning that the majority of artifact classes have very few members except for three which had very large values. Again, examining the second box and whisker diagram for the numbers of artifacts for the surface collection data, the distribution has a box centered at 83 with equal sized boxes and whiskers, meaning that the artifact number intervals are equal in size (graphs 11-12, p. 161).

All of the box and whisker diagrams for the postholes (graphs 13-16, p. 162) and the five foot by five foot units (graphs 17-24, pp. 163-164) display the same pattern as the diagrams for the surface collection data. All of the data distributions are heavily skewed toward zero and the numeric region immediately around zero.

With data frequency distributions which are heavily skewed in one direction, and are non-normal, not producing a bell-shaped curve or half bell-shaped curve when plotted, there is little statistically that can be done to compare them. In such an event, descriptive statistics and an exploratory data analysis approach can be a useful way to compare the data distributions for trends, similarities, and differences.

In order to be able to properly compare the frequency distributions, since each sample was of a different size and examined a different amount of soil, it was necessary to derive a common unit of measure and apply it to each of the distributions. A first set of transformed data frequency distributions employed a volume-based factor of the average number of artifacts per cubic inch of soil. These were generated by dividing the number of artifacts in each sample unit by the number of cubic inches in that sample unit, and then taking each of the artifact frequency measurements for each unit, summing and dividing the total by the number of units containing artifacts. Then each original data frequency value was multiplied by the average number of artifacts per cubic inch for that type of sample. The surface collection data, however, could not be viewed in this manner as they occurred on the surface, so this set of transformed distributions was abandoned.

A second set of transformed data distribution tables was constructed in the same manner as the first except that the number of artifacts per square inch of the test units was used. Then each of the values within that distribution was multiplied by the artifact per square inch value to obtain the values in table q. A series of basic statistics including the maximum value, the minimum value, the mean of that test's distribution, and the standard deviation were calculated for each test's distribution table. The results are presented in the table below:

Table 4:
Basic Statistics for the Transformed Artifact Densities

	Frequ 1	Frequ 2	Frequ 3
No. of cases	20	20	19
Minimum Value	0	0	0
Maximun Value	0.001	0.38	1
Mean	0	0.043	0.112
Standard Deviati	0	0.105	0.313

The values are very small for all of the distributions. For the first distribution, the maximum value was .001, which is very low, a minimum value of 0, a mean of 0, and a standard deviation of 0. For the second distribution, the maximum value was .380, which is also very low, a minimum value of 0, a mean of .043, and a standard deviation of .105. For the third distribution, the maximum value was 1, which is again very low, a minimum value of 0, a mean of .1112, and a standard deviation of .313. All of these values are extremely low, and most of them are also non- integer decimal numbers. Most statistical tests are designed for integer number values and are not reliable for non-integer and zero values. This would indicate the utility of an exploratory data analysis framework within which to examine the nature of the data sets.

Consulting the box and whisker diagram for the distribution for the surface collection (graph 25, p. 165), the diagram shows a lower hinge of zero, an upper hinge a fraction above zero, and a whisker just barely above the upper hinge. This is a very tight spread of values around zero. There is one distant outlier at .001. The largest value is very far away from the majority of the values, is a distant outlier, and is well below one.

The box and whisker diagram for the posthole test distribution (graph 26, p. 165) is similar to that of the first distribution. There is a lower hinge at 0 and an upper hinge at about .005. Again the main values of the distribution are very closely grouped together. There are two distant outliers, one at .3, and the other at .380, the latter of which is the maximum value for the distribution. Again, even the distant outliers are well below zero and the majority of the distribution is very closely clustered around zero.

The box and whisker diagram for the five foot test square distribution (graph 27, p. 165) is similar to both of the other distributions. The lower hinge is at zero and the upper hinge is a fraction above zero; there is an outlier just above the upper hinge and a distant outlier at one. This distribution has one as its greatest outlier, with all other values tightly clustered around zero.

The resultant artifact frequencies had values which were so small that statistical tests of comparable test effectiveness, such as the difference of means test, could not be applied. It is therefore inconclusive as to which testing strategy was most effective since their efficacy could not comparatively measured.

3.8. Additional Non-Statistically Based Interpretations

The surface collection almost exclusively resulted in the collection of modern trash and building materials, such as asphalt shingle pieces. It was in general not very useful for the prediction of high concentrations of subsurface artifacts. In fact, for the three surface collection units with the highest artifact concentrations, the postholes in these areas had low artifact concentrations. This probably reflects different activities occurring in the post-school house period and to the accumulation of small waste items that have blown onto the site, such as cigarette wrappers.

In only two cases, N1115 E1100 and N1165 E1005, did posthole tests with high artifact concentrations coincide with five foot by five foot units that had high artifact concentrations. In short, the posthole tests did not appear to be a good predictor of high artifact concentration areas, which would have predicted features and out-buildings in any meaningful way. Overall, the five foot by five foot units gave the best view of subsurface features and concentrations of artifacts, but that would be predictable with any larger unit, since the larger the unit, the more data and artifacts one would naturally predict finding. However, the way the research design was set up, with each test method applied independently, it is unknown what would have been recovered if the five foot by five foot units had been located near the postholes with the highest artifact concentrations, rather than independently. It is similarly unknown what the difference in the results would have been if each of the locations of the sampling tests had been located based on the highest concentrations of the units from the previous tests; for example, locating the postholes in rows near the surface collection areas with the highest artifact concentrations, then locating the five by five foot units by the postholes with the highest artifact concentrations. However, since it appeared that the posthole and surface collection artifact concentrations didn't seem to overlap very significantly, it is doubtful that a strategy where each phase is dependent on the previous phase would not have been that successful in locating significant features.

CONCLUSIONS

The thesis has two foci: the first is to archeologically analyze the Merle Beach School Site as an example of a rural Nineteenth Century schoolhouse, and the second is to evaluate the types of sampling methods that would be best used to excavate such a site. As there is very little literature written on archaeological investigations of schoolhouses in Michigan, little is known about the exact nature of the data to be found when excavating a schoolhouse, and there is still a great deal left to discover regarding the best techniques to employ in their investigation.

1. Conclusions of Compared Sampling Strategies

From examining the data provided by the different sampling methods, several things become apparent. Firstly, while surface collection does allow for the widest coverage of a given site, it frequently results in the recovery of modern trash blown or later deposited on the site after the site's previous usage. On sites such as the Merle Beach School site, with a dense cover of vegetation, small objects can be obscured, so coverage is often not truly complete and not entirely representative of the materials which may be buried at the site. Therefore, surface collection should be used with care and the results should be closely examined. Surface collection is frequently not a good indicator of the nature of the artifact deposition and patterning within a site.

Posthole tests have the advantages of being smaller and better at preserving vertical stratigraphic layering, and are also fast and easy to perform, just like shovel testing, but they are also not necessarily good predictors of areas with features and high artifact concentrations. In the case of the Merle Beach School excavation the posthole tests with the highest artifact concentrations did not point to the area where a five foot by five foot pit located the trench of a small outbuilding, probably a coal shed (Terry Shaffer, personal communication 1991). However, since five by five foot units were not located near all of the areas with postholes with high artifact concentrations, it is impossible to speculate whether the postholes with high concentrations would have revealed additional features, and perhaps later examination of the site in these still unexamined areas would answer this definitively.

The five foot by five foot unit excavations, not surprisingly, seemed to provide the greatest amount of data. One located behind the schoolhouse seemed to be a refuse pit of building materials from one of the renovations of the schoolhouse. Another five foot by five foot unit, located to the north of the schoolhouse, revealed a trench from a small outbuilding, probably the school's coal house. It is hardly surprising that larger excavations would reveal larger, more complex site patterning. So would exposing, layer by layer, the entire surface area of a site. Doing so is usually impossible, however, as it is simply too costly or would require heavy earth moving equipment which is often expensive to maintain and often difficult to obtain and operate.

From the excavations at the Merle Beach School, a series of more effective and productive methods can be constructed. Surface collection provided little in the way of artifacts representative of the time period that the site was in use. Surface collection can therefore be excluded. Rather than using auger holes, postholes, or shovel tests which do not provide adequate volume or statigraphic control as excavation units , a series of small test pits would be more appropriate. Small units such as two foot by two foot test pits, or fifty centimeter by fifty centimeter test pits in a much higher frequency, say a hundred, drawn from a stratified random sample would be much more useful and time efficient. Then, instead of the larger five foot by five foot pits, larger surface area exposures could be excavated in areas where large artifact groupings or features were indicated by the test pits. This would allow for a greater understanding of the site layout, allowing for whole features, such as the entire building from which the trench segment was found, to be excavated. This would give an all around better picture of the site and site activities.

2. Results of the Patterning and Interpretations About Schoolhouse Use

From the excavations at the Merle Beach School site, it appears that there was at least one phase of significant remodeling, evidenced by the large amount of building materials found in the five foot by five foot unit located behind the schoolhouse. Probably several smaller episodes of remodeling occurred as well during the school's use life, such as repainting, tightening loose or damaged shingles and boards, painting, and other general maintenance. There is also evidence of a small outbuilding located north of the schoolhouse. It had a three foot deep foundation trench which was largely filled with coal and old metal remains. It appears to have been the coal house.

There was very little in the way of domestic refuse such as tableware and bottle glass in the deposit. Although both were present in small amounts, there were very few sherds of each. The sherds were very small in size and from a large number of ware types. The paucity of sherds indicates that domestic activities were not a regular occurrence at the Merle Beach School. It is most probable that the teachers lived someplace other than the schoolhouse. It also appears that large scale cooking "domestic science" classes, common at the turn of the century, were not being taught at the Merle Beach School, or the amount of domestic wares would be greater (Foght 1910: 236-253). This interpretation is not entirely conclusive, however, because neither the boy's nor the girl's privies was discovered in the excavation. Those pits may have been where such domestic refuse would have been deposited.

Faunal remains were very scant, with only small fragments of animal bones even from the large five foot by five foot units. Probably any food consumed onsite, such as the lunches of the teacher and school children, was likely to have been of more processed foods (perhaps slices of meat rather than larger animal parts, for example, chicken legs or rib sections). It is also possible that any domestic food remains, such as lunch box waste, was removed from the site daily by each student, or that it was dumped into the privies or into other trash pits not yet located.

A significant amount of the artifacts that were recovered during the schoolhouse excavation consisted of lumps of burned and unburned coal. Coal would have been stored and used in abundance to heat the school after the conversion from wood fuel around 1920 (Terry Shaffer, personal communication), but it was found only in the area of the coal filled trench, confirming the building's uses as a storehouse for coal. Also, the fact that no other coal was found indicates that it wasn't used for other site level activity.

A general lack of artifacts in the wide open space outside of the immediate surroundings of the schoolhouse would indicate that this was the playground area. A play yard would be expected to be virtually artifact free. Since it was a zone of high foot traffic with many children running around, any artifacts would likely be pushed to the very fringes of the area. There are also a number of children's games, like tag, jumping rope, or playing ball games, which use few or no pieces of equipment and hence would result in no loss of these objects and no deposition into the archaeological record. In the cases of jumping rope and ball, the equipment used would be used over and over until it could no longer be used and would then end as intentional discard, not something that would be found on a playground.

The only personal objects that were found that related to the children were a few buttons made of mollusk shell and plastic and one 1946 penny. These lost objects were probably found around the playground as vigorous games and play would be likely to put stress on clothing buttons, causing them to fall off and swinging on the stride swing would be likely to cause loose items, like change, fall out of the pockets, becoming lost. The general lack of small portable toys, such as marbles and jacks, could be related to the location and social class of the school district. Small portable toys like jacks and marble, because they are small and highly portable, would be expected to appear in the archaeological record, as their small size makes it easy for them to fall out of a pocket or disappear in tall grass. Merle Beach School was located in a relatively poor rural area with risky fortunes, which rose and fell several times during its uselife. Poor rural children are not likely to own much in the way of toys and are likely to curate closely those they do possess. Such students, therefore, are either not likely to bring toys to school, or they are likely to keep a close eye on them, losing them very infrequently. Additionally, poor rural children are likely to use natural objects or found objects such as sticks, pebbles, leaves, and nutshells as playthings in the absence of formal toys.

Finally there were a few school-specific objects found during the excavation, including a number of pieces of slate pencil, smooth slate, chalk, and the broken-off erasers from pencils. These indicate the use of the site as a school and cover potentially the entire time period of the school's use, with the slate pencils being the oldest and the pencil ends the newest. These were found closest to the schoolhouse and were possibly swept out the door during cleaning.

Alternatively, they may represent concentrations of certain outdoor activities close to the school buildings.

Overall, the artifact patterning did show marked patterns of activity, identifying a coal shed, a lack of artifacts indicating a playground, a number of artifacts indicating the site's use as a schoolhouse, and a lack of domestic activity. The lack of toys indicated that the school site was a rather poor rural school.

3. Summary of Conclusions and Recommendations

The data obtained from the sampling program at the Merle Beach School site illustrates some important weaknesses as well as strengths of some of the sampling methods employed, and points to new directions for research methodology. The surface collection and posthole samples yielded too small a number of artifacts to be able to allow for statistically relevant analyses of the data. The posthole samples yielded samples too small volumetrically and allowed too low a level of visibility of the stratigraphy. The five foot by five foot excavations allowed for an adequate volume of soil to be excavated, yielded a significant number of artifacts, and afforded good visibility of the soil's stratigraphy. However, the five foot by five foot units were time and labor intensive, and there weren't enough of them in this sample to give a comprehensive view of site structure and usage patterns.

The inadequacies of the sampling methods employed at the Merle Beach School Site suggests a new direction for sampling small sites. Using a test pitting strategy employing a large number of small test pits, such as two foot by two foot or fifty centimeter by fifty centimeter test pits, would yield a larger and more representative data set. A hundred test units could be chosen randomly from a set of zones dividing the site. This large number of test pits could be excavated relatively rapidly, would allow for good stratigraphic control, and would allow for a much wider area to be observed. In this project, nearly 60 two foot by two foot test pits could have been excavated in the time used to excavate the nine five foot by five foot units that were completed. One hundred two foot by two foot units could be excavated in the time used for all three of the types of excavations completed for this study.

Following the small test pits, larger shallow area exposure type excavations could be undertaken, especially focussing on areas where features, such as the partially exposed building trench, are uncovered. These large exposures, as they would be shallow scrapings, could be done fairly easily as well, and would yield a significantly greater area to be exposed. This would allow for the potential discovery of whole building remains and the exposure of whole living floors. Such an approach would enable the researcher to look at the patterning across the site as a whole in a really broad sense, unmatched by test pitting or trenching. In addition to a change in sample size and the frequency of units used to sample an area of a rural school site, some areas would provide better data than others.

As a result of the archival, historical, and archaeological examination, a great deal can be deduced about the way rural schoolhouses were laid out. Rural schoolhouses were laid out with extreme regularity. Plans describing them appear in nearly every publication on the rural one-room school (Foght 1910: 121-124, Culter and Stone 1913: 19-34, Smith 1880). From these accounts and the archaeological data, a template of a typical rural schoolhouse can be established. The rural schoolhouse site consists of a schoolhouse, two outhouses (one toward each edge of the property), a woodshed situated not far from the schoolhouse, and possibly a small stable for the teacher's horse.

Based upon this template, several new approaches can be taken in future archaeological study of a rural school site. Since rural school sites are very regular, future sampling strategies can make use of this knowledge. Excavations can be intensified in certain specific areas, such as along the fence rows, where the privies would most likely have been dug and re-dug over the years, as well as in the open spaces directly adjacent to the schoolhouse, to locate the stable or fuel house common to all of these sites. This allows archeologists to stratify their sampling areas and focus on the areas of schoolhouse sites that would be most likely to reveal the structure and lay out of school buildings.

The results of the Merle Beach School study do reveal a great deal about the structure of the rural schoolhouse. This can be used to contrast the rural school with the urban school. For example, the North Larch Street school in Lansing, which was excavated by Mark Branstner, revealed the remains of a multi-room structure building foundation, thought to be two stories high, clearly a much different type of site than a rural school building (Mark Branstner, personal communication 1997).

An urban school, in addition to being considerably larger, would be likely to produce very different artifacts than a rural schoolhouse. There would likely be a number of broken toy pieces discarded deliberately, as a school with several grades as well as a gymnasium would likely have toys and sports equipment that a small rural school would not have the facilities to house. Urban children might come from a wider spectrum of socio-economic backgrounds and different neighborhoods, so there might very well be a wider spectrum of items that were lost in play, such as fancy marbles, expensive buttons, china doll heads, perhaps a piece or two from a ceramic tea set, or lost jacks. There might also be more noticeable differentiation in what children ate, possibly indicating either socio-economic or ethnic differences, from the refuse deposited in most likely privy pits.

More formal and systematic disposal of debris and waste is more likely to occur in urban areas which are frequently covered by sanitation codes than in rural areas which were less formal about sanitation during the Nineteenth Century (Foght 1910: 282-83).

The new sampling strategies suggested by the shortcomings of the data collected at Merle Beach School lead in a bold new direction for small site excavation. Such new sampling strategies can contribute greatly to the field, leading archaeologists to new levels of understanding of cultural processes.

APPENDIX A
TABLES

Table 5: Surface Collection Data Set

Unit Designation: Artifact types	4	9	10	12	13	14	15	18
Metal								
# PcsUnburnCoal								
Bottle Glass								
Flat Glass				2				
Other Ceramic		1p.flwrpot						
Slate					2:1 finished			
Sq-cut Nails								
Wire Nails								
Shingle						1 pc.	4	
Plaster								
Concrete					1			
Other						1 pc. rubber	3	
Plastic	1 soft			1 hard,2soft				1 pc. hard
Bone			1					
Wood			1					
Total Artifacts	1	1	2	3	3	2	7	1

Table 5: Surface Collection Data Set

Unit Designation: Artifact types	19	21	24	25	26	27	30	Totals
Metal			1 pc.					1
# PcsUnburnCoal			2					2
Bottle Glass			1					1
Flat Glass	14		14					30
Other Ceramic			1 glz erthwr					2
Slate								2
Sq-cut Nails			1					1
Wire Nails			3					3
Shingle	2	1		13		1	96	118
Plaster			1				13pntd pcs.	14
Concrete								1
Other					1	1		6
Plastic			1 soft			1 hard	1 soft	8
Bone								1
Wood	1			4				6
Total Artifacts	17	1	25	17	1	3	110	196

Table 6: Raw Data for Posthole Collection

Provenience/Level: Artifact types	1027.5 1000/A	1040 1037.5/A	1040 1037.5/B	1040 1112.5/A	1040 1112.5/B	1052.5 1000/A	1052.5 1025/A	1052.5 1075/A	1065 1012.5/A	1065 1037.5/A	1065 1112.5/A
FCR		1		1				1			2
Flakes											
Stone Tool Frags											
Square Cut Nails											
Wire Nails											
Screw											
Shell Casing											
Metal											
Barbed Wire											
# PcsUnburnCoal	1										
#PcsBurnedCoal											
Bottle Glass										1	
Flat Glass				1	1				1		
Glazed WhiteW.											
Walnut Shell											
Wood											
Mollusk Shell											
Charcoal			2	1							
Slate											
Burned Slate											
Penny											
Paint Chips						1					
Brick							1	1			
Plaster											
Concrete											
Chalk											
Other											
Plastic											
Bone											
Grand Total	1	1	2	3	1	1	1	2	1	1	2

Table 6: Raw Data for Posthole Collection

Provenience/Level: Artifact types	1077.5 1000/B	1077.5 1050/A	1077.5 1050/B	1077.5 1100/A	1077.5 1100/B	1077.5 1125/A	1077.5 1125/A/B	1077.5 1125/B	1090 1067.5/A	1090 1087.5/A	1090 1087.5/B
FCR					2						
Flakes			1								1
Stone Tool Frags											
Square Cut Nails										3	
Wire Nails											
Screw											
Shell Casing							1				
Metal											
Barbed Wire											
# PcsUnburnCoal	1								3		
#PcsBurnedCoal	1										
Bottle Glass						1					
Flat Glass										1	
Glazed WhiteW.											
Walnut Shell											
Wood											
Mollusk Shell											
Charcoal											
Slate									3		
Burned Slate											
Penny				1							
Paint Chips											
Brick						60	1	7			1
Plaster											
Concrete											
Chalk											
Other		23 mortar				3 mortar					
Plastic											
Bone											
Grand Total	2	23	1	1	2	64	2	7	6	4	2

Table 6: Raw Data for Posthole Collection

Provenience/Level: Artifact types	1090 1087.5/C	1090 1112.5/A	1090 1112.5/B	1102.5 1000/A	1102.5 1050/A	1102.5 1075/A	1102.5 1125/A	1102.5 1125/B	1115 1037.5/A	1127.5 1025/A	1127.5 1025/B
FCR			1						1		
Flakes							1				
Stone Tool Frags											
Square Cut Nails		2				1					
Wire Nails					1	1					
Screw											
Shell Casing											
Metal		1						1			
Barbed Wire						1					
# PcsUnburnCoal		5				1					4
#PcsBurnedCoal									2	9	
Bottle Glass		2				2	1	2			
Flat Glass		3				1		1			
Glazed WhiteW.		1		1	1						
Walnut Shell											
Wood		10				1					
Mollusk Shell											
Charcoal					1						
Slate	19	1									
Burned Slate											
Penny											
Paint Chips											
Brick		26	1				48				
Plaster		1									
Concrete						3	1	2		1	
Chalk											
Other											
Plastic											
Bone											
Grand Total	19	52	2	1	3	11	51	6	3	10	4

Table 6: Raw Data for Posthole Collection

Provenience/Level: Artifact types	1127.5 1050/A	1127.5 1075/A	1127.5 1075/B	1127.5 1100/A	1127.5 1100/B	1127.5 1125/A	1140 1012.5/A	1140 1012.5/B	1140 1112.5/A	1140 1062.5/A	1140 1062.5/B
FCR	1										
Flakes											
Stone Tool Frags											
Square Cut Nails		1									
Wire Nails		1									
Screw								1			
Shell Casing											
Metal											
Barbed Wire						1					
# PcsUnburnCoal		2		1			2	1			1
#PcsBurnedCoal		1		3			20	13			1
Bottle Glass								1			
Flat Glass		5	1								
Glazed WhiteW.									1		
Walnut Shell											
Wood											
Mollusk Shell					2						
Charcoal											
Slate								1			
Burned Slate											
Penny											
Paint Chips											
Brick											
Plaster								1			
Concrete										1	
Chalk											
Other											
Plastic											
Bone											
Grand Total	1	10	1	4	2	1	22	18	1	1	2

Table 6: Raw Data for Posthole Collection

Provenience/Level: Artifact types	1152.5 1000/A	1152.5 1025/B	1152.5 1050/A	1152.5 1075/B	1152.5 1100/A	1152.5 1125/A	1152.5 1100/B	1165 1062.5/A	1165 1082.5/A	1165 1112.5/A	1165 1112.5/B
FCR											
Flakes											
Stone Tool Frags											
Square Cut Nails		1									
Wire Nails											
Screw											
Shell Casing											
Metal									1		
Barbed Wire									1		
# PcsUnburnCoal	14			7	1	2	2	1	1	1	
#PcsBurnedCoal			3		13		8				
Bottle Glass	3							2		6	
Flat Glass								1		4	2
Glazed WhiteW.				4							
Walnut Shell	4	3						1 burned			
Wood											
Mollusk Shell											
Charcoal					4		3				
Slate											
Burned Slate			8		1						
Penny											
Paint Chips											
Brick											
Plaster											
Concrete											
Chalk					2						
Other										1 styrofoam	
Plastic											
Bone											
Grand Total	21	4	11	11	21	2	13	5	3	12	2

Table 6: Raw Data for Posthole Collection

Provenience/Level:	1165	Totals
Artifact types	1112.5/C	
FCR		10
Flakes		3
Stone Tool Frags		0
Square Cut Nails		8
Wire Nails		3
Screw		1
Shell Casing		1
Metal		3
Barbed Wire		3
# PcsUnburnCoal		51
#PcsBurnedCoal		74
Bottle Glass	2	24
Flat Glass	1	23
Glazed WhiteW.		8
Walnut Shell		8
Wood		11
Mollusk Shell		2
Charcoal		11
Slate		24
Burned Slate		9
Penny		1
Paint Chips		1
Brick		145
Plaster		2
Concrete		8
Chalk		2
Other		27
Plastic		0
Bone		0
Grand Total	3	463

Table 7: Raw Data for 5x5 ft. Units

Artifact types	N 1075E 1030/A	N 1075 E 1030/B	N 1075 E 1030/A/B	Totals N1075 E 1030	N 1070 E 1080/surf
FCR					
Flakes					
Stone Tool Frags					
Sq-cut Nails					
Wire Nails					
Shell Casing					
Metal					
Sheet Metal					
Barbed Wire					
# PcsUnburnCoal	4			4	10
#PcsBurnedCoal	16			16	1
Bottle Glass	6			6	
Flat Glass	2			2	1
Glazed WhiteW.			2	2	
Pearlware&Transfer Prnt					
Other Ceramic	2 gry glaz red			2	
Walnut Shell					
Wood					
Mollusk Shell					
Charcoal	1			1	
Slate Pencil					
Slate					1
Mortar					1
Peach Pits		1		1	
Brick	2			2	
Plaster					
Concrete					
Chalk					
Other					
Plastic	2 buttons	1 hard		3	
Bone					
Totals of all Artifacts per Unit				39	

Table 7: Raw Data for 5x5 ft. Units

Artifact types	N 1070 E1080 A	N 1070 E 1080/A/B	N 1070 E 1080/B N 1/2	N 1070 E 1080/B S 1/2	Totals N 1070 E 1080
FCR	4			1	5
Flakes			1		1
Stone Tool Frags					
Sq-cut Nails					
Wire Nails					
Shell Casing					
Metal					
Sheet Metal					
Barbed Wire		2			2
# PcsUnburnCoal	2	4			16
#PcsBurnedCoal		1			2
Bottle Glass	2:1w/"s"imprint		4		6
Flat Glass	1				2
Glazed WhiteW.					
Pearlware&Transfer Prnt					
Other Ceramic					
Walnut Shell	3 pcs.				3
Wood					
Mollusk Shell		2 buttons			2
Charcoal					
Slate Pencil					
Slate	4				5
Mortar					1
Peach Pits					
Brick				2	2
Plaster	9				
Concrete					9
Chalk					
Other	3 pcs.				3
Plastic	Rexall"wrapper				1
Bone	1 sm. animal				1
Totals of all Artifacts per Unit					61

Table 7: Raw Data for 5x5 ft. Units

Artifact types	N 1160 E 1005/surf.	N 1160 E 1005/A E½	N 1160 E 1005/A W½
FCR		2	1
Flakes			
Stone Tool Frags			1
Sq-cut Nails		5	
Wire Nails			
Shell Casing			
Metal			33 flat pcs.
Sheet Metal			
Barbed Wire		1	14
# PcsUnburnCoal		1	6
#PcsBurnedCoal			
Bottle Glass		2	8
Flat Glass	1	11	5
Glazed WhiteW.	1	23	2
Pearlware&Transfer Prnt			
Other Ceramic			
Walnut Shell	332;130whole,164 1/2s,31pcs.; 12 whole poss. burned		90;35 whole,41 1/2s,14 pcs.
Wood			3:2 tbrush pcs.
Mollusk Shell			
Charcoal			14
Slate Pencil			
Slate			
Mortar			
Peach Pits			1
Brick			
Plaster			
Concrete			1
Chalk			
Other	13 unknown nuts; 2whole,4 1/2's; 5 pcs. ; 1pc. light bulb		
Plastic			
Bone			1
Totals of all Artifacts per Unit			

Table 7: Raw Data for 5x5 ft. Units

Artifact types	N 1160 E 1005/A/B	N 1160 E 1005 B	Totals N 1160 E 1005	N 1030 E 1105 surf	N 1030 E 1105 A/B
FCR	3		6		2
Flakes					
Stone Tool Frags			1		
Sq-cut Nails	5		10		1
Wire Nails					2
Shell Casing	1		1		
Metal			33		
Sheet Metal					
Barbed Wire			15		
# PcsUnburnCoal	1		8	2	
#PcsBurnedCoal					
Bottle Glass	1		11		
Flat Glass	2		19	12	1
Glazed WhiteW.	3		29		
Pearlware&Transfer Prnt	12 bl perlwar		12		
Other Ceramic					1 drain tile
Walnut Shell	2 pcs.	1:1/2 shell	425		1
Wood			3		
Mollusk Shell					
Charcoal	57		71		2 pcs.
Slate Pencil					
Slate				2: 1finished	
Mortar					
Peach Pits			1		
Brick					4
Plaster					
Concrete			1	1	1
Chalk					
Other			14		
Plastic					
Bone			1		
Totals of all Artifacts per Unit			661		

Table 7: Raw Data for 5x5 ft. Units

Artifact types	N 1030 E 1105 B N1/2	N 1030 E 1105 B/wall prof.	Totals N 1030 E 1105
FCR	5		7
Flakes			
Stone Tool Frags			
Sq-cut Nails	2 long,one thin		3
Wire Nails			2
Shell Casing			
Metal			
Sheet Metal			
Barbed Wire			
# PcsUnburnCoal			2
#PcsBurnedCoal			
Bottle Glass			
Flat Glass			13
Glazed WhiteW.			
Pearlware&Transfer Prnt			
Other Ceramic	1 drain tile	1 gray glazed stoneware	3
Walnut Shell			1
Wood			
Mollusk Shell			
Charcoal			2
Slate Pencil			
Slate			2
Mortar			
Peach Pits			
Brick			4
Plaster			
Concrete			2
Chalk			
Other			
Plastic			
Bone			
Totals of all Artifacts per Unit			41

Table 7: Raw Data for 5x5 ft. Units

Artifact types	N1110 E 1120 A W1/2	N 1110 E 1120 surf	N1110 E1120 A	N 1110 E 1120 W 1/2
FCR				4
Flakes				
Stone Tool Frags	3			
Sq-cut Nails	27:5lng,2md,20 short	1 long		7 short;3pcs.
Wire Nails	11:1lng,9shrt,1tack			
Shell Casing				
Metal	1 "wear fit" button;1 crowntype botl cap	1 pc wire; 1 crowntype botl cap		1 ornament; 2 buttons
Sheet Metal	1 pc.			3 strips
Barbed Wire	2			
# PcsUnburnCoal				
#PcsBurnedCoal		2		
Bottle Glass	20: 2neck,2 body	2		11;2grn,1 base
Flat Glass	72	12		74; 43 green
Glazed WhiteW.	7			50
Pearlware&Transfer Prnt				
Other Ceramic				8 wht porcln
Walnut Shell				
Wood	3	1		1
Mollusk Shell	1		1 pc.	
Charcoal				2
Slate Pencil	1			1
Slate	5			3 finished
Mortar		1		6
Peach Pits				
Brick				
Plaster				
Concrete				
Chalk				
Other	1 blck leather strap; 1 pc. light bulg glass	8 shingle		
Plastic	1 white,cup lid pc.	1 white, cup lidpc.		
Bone	1 animal			
Totals of all Artifacts per Unit				

Table 7: Raw Data for 5x5 ft. Units

Artifact types	Totals N 1110 E 1120	N 1145 E 1080 surf	N 1145 E 1080 A	N 1145 E 1080 A/B
FCR	4			5
Flakes				1
Stone Tool Frags	3			
Sq-cut Nails	35			
Wire Nails	11			
Shell Casing				
Metal	7			3:2slag; 1 pipefitting
Sheet Metal	4			
Barbed Wire	2			
# PcsUnburnCoal		20		
#PcsBurnedCoal	2	8		
Bottle Glass	33	8		26:1btlfrag"rawl trade m"; 1 neck pc. 2 brown
Flat Glass	158		1	15
Glazed WhiteW.	57			6
Pearlware&Transfer Prnt				1 pc plate PW; 2bluwht TP
Other Ceramic	8			1 brnglztile
Walnut Shell				
Wood	5			5
Mollusk Shell	2		1 button	1 button
Charcoal	2			
Slate Pencil	2			
Slate	8			
Mortar	7			
Peach Pits				
Brick			1	
Plaster		1		6
Concrete		1		1
Chalk				27
Other	10			
Plastic	2			1
Bone	1			6 animal
Totals of all Artifacts per Unit	363			

Table 7: Raw Data for 5x5 ft. Units

Artifact types	N 1145 E 1080 B	N 1145 E 1080 B/C	N 1145 E 1080 C/E1/2
FCR	5 also 1.375 lbs.	1	3
Flakes		2	
Stone Tool Frags			
Sq-cut Nails	24: 4lrg.,20 sm.	6: 2 lrg., 4 sm.,1lrghd	
Wire Nails	15: 4 lrg., 11 sm.		
Shell Casing			
Metal	5:2hinge,1handl,2metal pieces; 16 broken nails	2: 1 lrg piece , 1 piece slag	
Sheet Metal			
Barbed Wire	1		
# PcsUnburnCoal	1996		55 pcs.
#PcsBurnedCoal			
Bottle Glass	2 clear cut; 9 blue;56 clear;3 green	9	12
Flat Glass		24	
Glazed WhiteW.	11; 1impressed rim		
Pearlware&Transfer Prnt			
Other Ceramic	6:1 brn glaz; 5 unglz	9 unglzed,flower pot	
Walnut Shell	11; 1 whole,10 pcs.		10: 8 pcs.,2 whole
Wood	4		4
Mollusk Shell	4 buttons	1 sm. snail shell	
Charcoal			
Slate Pencil			
Slate			
Mortar			
Peach Pits			
Brick	2 @ .25 lbs.	2	
Plaster	2		
Concrete	4 and 91 @ 26.25 lbs.	1	4
Chalk	4 yellow		
Other	2 pencl eraser ends		2 alum foil
Plastic	2:1 white; 1red button	2: 1twstie, 1 flat pc.	
Bone		2 vertebrae sm. animl	
Totals of all Artifacts per Unit			

Table 7: Raw Data for 5x5 ft. Units

Artifact types	N 1145 E 1080 C/W1/2	Totals N 1145 E 1080	N 1105 E 1060 surf.	N 1125 E 1025 surf.
FCR		14pcs.		
Flakes		3		
Stone Tool Frags				
Sq-cut Nails	1	31		
Wire Nails		15		
Shell Casing				
Metal		27	1 coathanger wire	
Sheet Metal				
Barbed Wire		1		
# PcsUnburnCoal	61 pcs.	2273*		
#PcsBurnedCoal		9		
Bottle Glass	3	117		
Flat Glass		40		
Glazed WhiteW.		17		
Pearlware&Transfer Prnt		3		
Other Ceramic	4 unglzed,flowpot	20		
Walnut Shell	7: 5pcs.,2 whole	28		4 whole
Wood	3	16		
Mollusk Shell		7		
Charcoal				
Slate Pencil				
Slate				
Mortar				
Peach Pits				1:½ -pit
Brick		3		
Plaster		9		
Concrete	14:7 at 4.0 lbs.,7	24		
Chalk		31		
Other		4	1 black rubber	4 half hickory nuts
Plastic		5	2 yellow tape frags.	
Bone	1 pc. sm. animal	9		
Totals of all Artifacts per Unit		2706	4	

Table 7: Raw Data for 5x5 ft. Units

Artifact types	N 1125 E 1025 surf. N1/2	N1125 E 1060 surf.	N 1125 E 1025 B	Totals N1125 E 1025
FCR				
Flakes				
Stone Tool Frags				
Sq-cut Nails				
Wire Nails			13 frgs.	13
Shell Casing				
Metal	1 pc. iron slag		1 terminal connector 1 copper pc.	3
Sheet Metal			1 metal disc,5 frags.	6
Barbed Wire				
# PcsUnburnCoal	4 small			4
#PcsBurnedCoal	38			38
Bottle Glass			4 clear	4
Flat Glass			9 clear	9
Glazed WhiteW.			2:1 handle	2
Pearlware&Transfer Prnt				
Other Ceramic				
Walnut Shell				4
Wood				
Mollusk Shell				
Charcoal				
Slate Pencil				
Slate			5	5
Mortar				
Peach Pits				1
Brick				
Plaster				
Concrete	23		4 small pcs.	27
Chalk				
Other		2 hickory nuts; 1 cigarette filter		7
Plastic				
Bone	1 sm. animal		1 sm. animal	2
Totals of all Artifacts per Unit				125

Table 7: Raw Data for 5x5 ft. Units

Artifact types	N 1055 E 1070 A	N1055 E 1070 A/B	N 1055 E 1070 B	N 1055 E 1070 B/C	N 1055 E 1070 A/B/C wall
FCR	2		5		
Flakes	1		2		1
Stone Tool Frags			1 quartzite utilized flake		
Sq-cut Nails	2	1			
Wire Nails					1
Shell Casing					
Metal					
Sheet Metal	1				
Barbed Wire					
# PcsUnburnCoal	19	2			
#PcsBurnedCoal					
Bottle Glass		9 clear	1		
Flat Glass		4 clear	5		
Glazed WhiteW.					
Pearlware&Transfer Prnt					
Other Ceramic					
Walnut Shell					
Wood		3			
Mollusk Shell					
Charcoal			6	1	
Slate Pencil					
Slate			1		
Mortar					
Peach Pits	2pcs.				
Brick	3 red	3 red			
Plaster					
Concrete					
Chalk					
Other					
Plastic	2:1 white, 1blk soft		1:1/2 button		
Bone					
Totals of all Artifacts per Unit					

Table 7: Raw Data for 5x5 ft. Units

Artifact types	Totals N1055 E 1070	Total Artifacts all Units
FCR	7	43
Flakes	4	8
Stone Tool Frags		4
Sq-cut Nails	3	82
Wire Nails	1	42
Shell Casing		1
Metal		71
Sheet Metal	1	11
Barbed Wire		20
# PcsUnburnCoal	21	2328
#PcsBurnedCoal		67
Bottle Glass	10	187
Flat Glass	9	252
Glazed WhiteW.		107
Pearlware&Transfer Prnt		15
Other Ceramic		33
Walnut Shell		461
Wood	3	27
Mollusk Shell		11
Charcoal	7	83
Slate Pencil		2
Slate	1	21
Mortar		8
Peach Pits	2	5
Brick	6	17
Plaster		9
Concrete		63
Chalk		31
Other		39
Plastic	3	16
Bone		14
Totals of all Artifacts per Unit	78	4078

Table 8: Coal, Concrete and FCR Weights for 5 Ft. Units

Provenience	Unburned Coal	Burned Coal	Concrete	FCR	Brick
	wt. in Lbs.	wt. in Lbs.	wt. in Lbs	wt. In Lbs	wt. in Lbs.
N 1125 E 1025 B	44.375	0.25	0.75		
N 1145 E 1080 B	4.25		26.75	1.375	0.25
N 1145 E 1080 C	24.53		4	0.125	0.375
N 1145 E 1080 C W ½	4.5		4		
1145 E 1080 C W ½ Trenc	7.9				
N 1145 E 1080 E ½	3.755				
N 1110 E 1120 A					19

Table 9: Pearson Correlation Matrix for the Surface Collection Data

	METAL	FLTGLS	OTRCER	SLATE	SCNAILS	WNAILS	SHINGLE	PLASTR	CONCRT	OTHER	PLASTIC
METAL	1.000										
FLTGLS	0.691	1.000									
OTRCER	0.695	0.459	1.000								
SLATE	-0.034	-0.053	-0.050	1.000							
SCNAILS	1.000	0.691	0.695	-0.034	1.000						
WNAILS	1.000	0.691	0.695	-0.034	1.000	1.000					
SHINGLE	-0.042	-0.050	-0.061	-0.042	-0.042	-0.042	1.000				
PLASTR	0.042	0.000	0.004	-0.037	0.042	0.042	0.987	1.000			
CONCRT	-0.034	-0.053	-0.050	1.000	-0.034	-0.034	-0.042	-0.037	1.000		
OTHER	-0.062	-0.095	-0.089	-0.062	-0.062	-0.062	-0.031	-0.067	-0.062	1.000	
PLASTIC	0.217	0.182	0.099	-0.079	0.217	0.217	0.201	0.233	-0.079	-0.053	1.000
BONE	-0.034	-0.053	-0.050	-0.034	-0.034	-0.034	-0.042	-0.037	-0.034	-0.062	-0.079
WOOD	-0.050	0.102	-0.071	-0.050	-0.050	-0.050	0.078	-0.053	-0.050	-0.089	-0.113
UBCOAL	1.000	0.691	0.695	-0.034	1.000	1.000	-0.042	0.042	-0.034	-0.062	0.217

Table 9: Pearson Correlation Matrix for the Surface Collection Data

	BONE	WOOD	UBCOAL
METAL			
FLTGLS			
OTRCER			
SLATE			
SCNAILS			
WNAILS			
SHINGLE			
PLASTR			
CONCRT			
OTHER			
PLASTIC			
BONE	1.000		
WOOD	0.199	1.000	
UBCOAL	-0.034	-0.050	1.000

Table10: Pearson Correlation Matrix for the Posthole Data

	FCR	FLAKES	SCNAILS	WNAILS	SCREW	SHLCAS	METAL	BARWIR	UNCOAL	BCOAL	BOTGLS
FCR	1.000										
FLAKES	-0.077	1.000									
SCNAILS	0.056	0.401	1.000								
WNAILS	-0.077	-0.048	0.249	1.000							
SCREW	-0.044	-0.027	-0.032	-0.027	1.000						
SHLCAS	-0.044	-0.027	-0.032	-0.027	-0.016	1.000					
METAL	0.09	0.301	0.249	-0.048	-0.027	-0.027	1.000				
BARWIR	-0.077	-0.048	0.096	0.301	-0.027	-0.027	0.301	1.000			
UNCOAL	-0.047	-0.082	0.102	0.022	0.131	-0.047	0.127	-0.012	1.000		
BCOAL	-0.067	-0.051	-0.053	-0.036	0.815	-0.029	-0.051	-0.051	0.219	1.000	
BOTGLS	-0.042	0.126	0.064	-0.001	0.072	0.072	0.253	-0.001	0.308	0.022	1.000
FLTGLS	0.043	0.057	0.349	0.360	-0.037	-0.037	0.178	-0.004	0.108	-0.053	0.665
GWWARE	-0.005	-0.045	0.069	0.094	-0.025	-0.025	0.094	-0.045	0.379	-0.047	-0.009
WALSHEL	-0.07	-0.044	0.104	-0.044	-0.025	-0.025	-0.044	-0.044	0.597	-0.046	0.243
WOOD	0.236	-0.03	0.509	0.029	-0.017	-0.017	0.564	0.029	0.250	-0.032	0.187
MOLSHEL	-0.044	-0.027	-0.032	-0.027	-0.016	-0.016	-0.027	-0.027	0.013	0.048	-0.037
CHAR	0.051	-0.041	-0.048	0.040	-0.023	-0.023	-0.041	-0.041	0.100	0.468	-0.055
SLATE	-0.04	0.555	0.759	-0.034	0.033	-0.020	-0.003	-0.034	-0.006	0.008	-0.029
BSLATE	-0.049	-0.031	-0.036	-0.031	-0.017	-0.017	-0.031	-0.031	-0.030	0.110	-0.041
PENNY	0.527	-0.027	-0.032	-0.027	-0.016	-0.016	-0.027	-0.027	-0.047	-0.029	-0.037
PAINCHP	-0.044	-0.027	-0.032	-0.027	-0.016	-0.016	-0.027	-0.027	-0.047	-0.029	-0.037
BRICK	0.018	0.292	0.118	-0.047	-0.026	0.774	0.471	-0.047	0.014	-0.049	0.272
PLASTR	0.141	-0.039	0.325	-0.039	0.702	-0.022	0.385	-0.039	0.272	0.560	0.179
CONCRT	-0.077	0.126	0.173	0.476	-0.027	-0.027	0.126	0.476	0.057	0.024	0.126
CHALK	-0.044	-0.027	-0.032	-0.027	-0.016	-0.016	-0.027	-0.027	0.131	0.508	-0.037
OTHER	-0.044	-0.027	-0.032	-0.027	-0.016	-0.016	-0.027	-0.027	0.013	-0.029	0.830
OTHER	-0.044	-0.027	-0.032	-0.027	-0.016	-0.016	-0.027	-0.027	0.013	-0.029	0.830
MORTAR	-0.049	0.561	-0.036	-0.031	-0.018	0.114	-0.031	-0.031	-0.052	-0.033	-0.027

Table10: Pearson Correlation Matrix for the Posthole Data

	FLTGLS	WWARE	ALSHEL	WOOD	MOLSHEL	CHAR	SLATE	BSLATE	PENNY	PAINCHP	BRICK
FCR											
FLAKES											
SCNAILS											
WNAILS											
SCREW											
SHLCAS											
METAL											
BARWIR											
UNCOAL											
BCOAL											
BOTGLS											
FLTGLS	1.000										
GWWARE	0.013	1.000									
WALSHEL	-0.038	-0.040	1.000								
WOOD	0.280	0.207	-0.027	1.000							
MOLSHEL	-0.037	-0.025	-0.025	-0.017	1.000						
CHAR	-0.027	-0.006	-0.037	-0.026	-0.023	1.000					
SLATE	0.073	-0.019	-0.031	0.031	-0.020	-0.029	1.000				
BSLATE	-0.041	-0.028	-0.028	-0.019	-0.017	0.094	-0.022	1.000			
PENNY	-0.037	-0.025	-0.025	-0.017	-0.016	-0.023	-0.020	-0.017	1.000		
PAINCHP	-0.037	-0.025	-0.025	-0.017	-0.016	-0.023	-0.020	-0.017	-0.016	1.000	
BRICK	0.094	0.031	-0.042	0.288	-0.026	-0.040	-0.005	-0.030	-0.026	-0.026	1.000
PLASTR	0.169	0.132	-0.035	0.697	-0.022	-0.033	0.048	-0.025	-0.022	-0.022	0.189
CONCRT	0.057	-0.045	-0.044	0.059	-0.027	-0.041	-0.034	-0.031	-0.027	-0.027	0.119
CHALK	-0.037	-0.025	-0.025	-0.017	-0.016	0.944	-0.020	0.109	-0.016	-0.016	-0.026
OTHER	0.688	-0.025	-0.025	-0.017	-0.016	-0.023	-0.020	-0.017	-0.016	-0.016	-0.026
OTHER	0.688	-0.025	-0.025	-0.017	-0.016	-0.023	-0.020	-0.017	-0.016	-0.016	-0.026
MORTAR	-0.041	-0.029	-0.028	-0.019	-0.018	-0.026	-0.022	-0.020	-0.018	-0.018	0.074

Table10: Pearson Correlation Matrix for the Posthole Data

	PLASTR	CONCRT	CHALK	OTHER	OTHER	MORTAR
FCR						
FLAKES						
SCNAILS						
WNAILS						
SCREW						
SHLCAS						
METAL						
BARWIR						
UNCOAL						
BCOAL						
BOTGLS						
FLTGLS						
GWWARE						
WALSHEL						
WOOD						
MOLSHEL						
CHAR						
SLATE						
BSLATE						
PENNY						
PAINCHP						
BRICK						
PLASTR	1.000					
CONCRT	-0.039	1.000				
CHALK	-0.022	-0.027	1.000			
OTHER	-0.022	-0.027	-0.016	1.000		
OTHER	-0.022	-0.027	-0.016	1.000	1.000	
MORTAR	-0.025	-0.031	-0.018	-0.018	-0.018	1.000

Table 11: Pearson Correlation Matrix for 5Ft. Unit Data

	FCR	FLAKES	STFRAG	SCNAILS	WNAILS	SHCAS	METAL	SHMETAL	BWIRE	UBCOAL	BCOAL
FCR	1.000										
FLAKES	0.658	1.000									
STFRAG	-0.030	-0.285	1.000								
SCNAILS	0.560	0.187	0.694	1.000							
WNAILS	0.321	0.149	0.278	0.671	1.000						
SHCAS	0.000	0.000	0.000	0.000	0.000	1.000					
METAL	0.704	0.428	0.065	0.750	0.756	0.000	1.000				
SHMETAL	0.028	-0.265	0.291	0.060	-0.150	0.000	-0.147	1.000			
BWIRE	0.149	-0.214	0.307	0.127	-0.227	0.000	-0.089	0.967	1.000		
UBCOAL	0.763	0.522	-0.168	0.586	0.606	0.000	0.964	-0.170	-0.093	1.000	
BCOAL	-0.381	-0.196	-0.231	-0.184	0.523	0.000	0.090	-0.084	-0.267	0.044	1.000
BOTGLS	0.758	0.496	0.096	0.777	0.694	0.000	0.988	-0.109	-0.037	0.962	0.005
FLTGLS	0.134	-0.151	0.935	0.842	0.516	0.000	0.326	0.024	0.053	0.090	-0.151
GWWAR	0.181	-0.182	0.954	0.832	0.400	0.000	0.305	0.394	0.430	0.091	-0.217
PWARE	0.291	-0.088	0.164	0.171	-0.123	0.000	0.099	0.937	0.961	0.126	-0.208
OTHCER	0.722	0.374	0.173	0.817	0.707	0.000	0.964	-0.225	-0.144	0.916	-0.026
WALSHE	0.149	-0.187	0.193	0.059	-0.235	0.000	-0.081	0.975	0.984	-0.061	-0.212
WOOD	0.811	0.561	0.142	0.796	0.647	0.000	0.960	-0.022	0.054	0.934	-0.089
MOLSHEL	0.747	0.461	0.059	0.717	0.637	0.000	0.945	-0.228	-0.104	0.929	-0.046
CHAR	0.119	-0.160	0.212	0.020	-0.299	0.000	-0.168	0.974	0.976	-0.147	-0.253
SLATPEN	-0.064	-0.217	0.945	0.696	0.373	0.000	0.114	-0.031	-0.017	-0.128	-0.161
SLATE	-0.207	-0.266	0.611	0.296	0.398	0.000	-0.096	-0.156	-0.179	-0.297	0.199
MORTAR	-0.062	-0.215	0.929	0.666	0.336	0.000	0.088	-0.056	-0.020	-0.147	-0.185
PECHPT	-0.193	0.498	-0.302	-0.375	-0.099	0.000	-0.280	-0.185	-0.314	-0.224	0.328
BRICK	0.522	0.753	-0.434	-0.133	-0.186	0.000	0.048	-0.417	-0.368	0.200	-0.291
PLASTR	0.760	0.515	-0.164	0.588	0.609	0.000	0.966	-0.170	-0.094	1.000	0.046
CONCRT	0.252	0.187	-0.305	0.153	0.759	0.000	0.595	-0.120	-0.196	0.585	0.714
CHALK	0.760	0.515	-0.164	0.588	0.609	0.000	0.966	-0.170	-0.094	1.000	0.046
OTHER	0.047	-0.318	0.654	0.461	0.309	0.000	0.127	0.817	0.784	-0.027	0.074
PLASTIC	0.441	0.653	-0.080	0.461	0.290	0.000	0.676	-0.455	-0.367	0.706	-0.115
BONE	0.708	0.440	-0.095	0.612	0.728	0.000	0.969	-0.078	-0.028	0.970	0.194

Table 11: Pearson Correlation Matrix for 5Ft. Unit Data

	BOTGLS	FLTGLS	GWWAR	PWARE	OTHCER	WALSHE	WOOD	MOLSHEL	CHAR	SLATPEN	SLATE
FCR											
FLAKES											
STFRAG											
SCNAILS											
WNAILS											
SHCAS											
METAL											
SHMETAL											
BWIRE											
UBCOAL											
BCOAL											
BOTGLS	1.000										
FLTGLS	0.339	1.000									
GWWAR	0.341	0.919	1.000								
PWARE	0.150	-0.039	0.347	1.000							
OTHCER	0.969	0.445	0.383	0.023	1.000						
WALSHE	-0.031	-0.060	0.328	0.982	-0.150	1.000					
WOOD	0.987	0.353	0.387	0.233	0.937	0.058	1.000				
MOLSHEL	0.942	0.324	0.284	0.036	0.929	-0.138	0.913	1.000			
CHAR	-0.106	-0.062	0.321	0.958	-0.226	0.991	-0.005	-0.224	1.000		
SLATPEN	0.128	0.969	0.859	-0.156	0.244	-0.137	0.144	0.125	-0.116	1.000	
SLATE	-0.144	0.659	0.478	-0.370	-0.044	-0.312	-0.162	0.006	-0.303	0.718	1.000
MORTAR	0.100	0.953	0.838	-0.180	0.216	-0.156	0.114	0.144	-0.139	0.990	0.773
PECHPT	-0.230	-0.336	-0.390	-0.287	-0.327	-0.246	-0.198	-0.361	-0.162	-0.229	-0.136
BRICK	0.125	-0.321	-0.436	-0.281	0.119	-0.322	0.167	0.105	-0.262	-0.330	-0.308
PLASTR	0.962	0.093	0.094	0.125	0.918	-0.062	0.934	0.929	-0.149	-0.125	-0.296
CONCRT	0.504	-0.097	-0.149	-0.060	0.438	-0.163	0.435	0.536	-0.249	-0.241	0.143
CHALK	0.962	0.093	0.094	0.125	0.918	-0.062	0.934	0.929	-0.149	-0.125	-0.296
OTHER	0.129	0.500	0.751	0.715	0.063	0.726	0.186	0.068	0.699	0.423	0.328
PLASTIC	0.728	0.128	0.049	-0.212	0.692	-0.351	0.712	0.669	-0.374	0.049	-0.328
BONE	0.947	0.152	0.167	0.170	0.890	-0.009	0.916	0.929	-0.105	-0.072	-0.142

Table 11: Pearson Correlation Matrix for 5Ft. Unit Data

	MORTAR	PECHPT	BRICK	PLASTR	CONCRT	CHALK	OTHER	PLASTIC	BONE
FCR									
FLAKES									
STFRAG									
SCNAILS									
WNAILS									
SHCAS									
METAL									
SHMETAL									
BWIRE									
UBCOAL									
BCOAL									
BOTGLS									
FLTGLS									
GWWAR									
PWARE									
OTHCER									
WALSHE									
WOOD									
MOLSHEL									
CHAR									
SLATPEN									
SLATE									
MORTAR	1.000								
PECHPT	-0.264	1.000							
BRICK	-0.330	0.516	1.000						
PLASTR	-0.144	-0.229	0.194	1.000					
CONCRT	-0.233	-0.016	-0.112	0.585	1.000				
CHALK	-0.144	-0.229	0.194	1.000	0.585	1.000			
OTHER	0.412	-0.354	-0.645	-0.025	0.121	-0.025	1.000		
PLASTIC	0.024	0.189	0.366	0.704	0.114	0.704	-0.353	1.000	
BONE	-0.083	-0.253	0.052	0.970	0.726	0.970	0.141	0.585	1.000

Table 12: K-Means Cluster Analysis Table for Posthole Sample

Summary Statistics for Three Cluster Analysis

VARIABLE	BETWEEN SS	DF	WITHIN SS	DF	F-RATIO	PROB
FCR	0.092	2	12.438	65	0.24	0.787
FLAKES	0.43	2	2.438	65	5.735	0.005
SCNAILS	0.061	2	14.984	64	0.13	0.879
WNAILS	0.009	2	2.857	64	0.096	0.99
SCREW	0.485	2	0.5	64	31.045	0
SHLCAS	0.485	2	0.5	65	31.544	0
METAL	0.43	2	2.438	65	5.735	0.005
BARWIR	0.008	2	2.859	65	0.094	0.91
UNCOAL	11.391	2	279.359	65	1.325	0.273
BCOAL	1383.721	2	171.75	65	261.839	0
BOTGLS	5.898	2	80.984	65	2.367	0.12
FLTGLS	0.283	2	94.938	65	0.097	0.98
GWWARE	0.045	2	18.234	65	0.08	0.923
WALSHEL	0.059	2	25	65	0.076	0.926
WOOD	0.111	2	99.109	65	0.036	0.964
MOLSHEL	0.004	2	3.938	65	0.03	0.97
CHAR	22.948	2	30.246	64	24.279	0
SLATE	0.295	2	363.234	65	0.026	0.974
BSLATE	0.309	2	63.5	65	0.158	0.854
PENNY	0.001	2	0.984	65	0.03	0.97
PAINCHP	0.001	2	0.984	65	0.03	0.97
BRICK	6428.592	2	917.938	65	227.607	0
PLASTR	0.457	2	1.484	65	10.002	0
CONCRT	0.361	2	11.109	65	1.057	0.353
CHALK	1.941	2	2	65	31.544	0
OTHER	0.001	2	0.984	65	0.03	0.97
MORTAR	2.824	2	525.234	65	0.175	0.84

Table 12: K-Means Cluster Analysis Table for Posthole Sample

CLUSTER NUMBER: 1

Members		Statistics				
CASE	DISTANCE	VARIABLE	MINIMUM	MEAN	MAXIMUM	ST.DEV.
1	0.23	FCR	0	0.16	2	0.44
2	0.23	FLAKES	0	0.03	1	0.17
3	0.23	SCNAILS	0	0.13	3	0.49
4	0.23	WNAILS	0	0.05	1	0.21
5	0.23	SCREW	0	0	0	0
6	0.19	SHLCAS	0	0	0	0
7	0.23	METAL	0	0.03	1	0.17
8	0.23	BARWIR	0	0.05	1	0.21
9	0.23	UNCOAL	0	0.7	14	2.09
10	0.23	BCOAL	0	0.31	9	1.25
11	0.23	BOTGLS	0	0.27	8	1.11
12	0.23	FLTGLS	0	0.34	7	1.21
13	0.46	GWWARE	0	0.11	4	0.53
14	0.23	WALSHEL	0	0.13	4	0.63
15	0.23	WOOD	0	0.17	10	1.24
16	0.45	MOLSHEL	0	0.03	2	0.25
17	0.3	CHAR	0	0.06	2	0.3
18	0.23	SLATE	0	0.36	19	2.38
19	0.23	BSLATE	0	0.13	8	0.99
20	0.28	PENNY	0	0.02	1	0.12
21	0.23	PAINCHP	0	0.02	1	0.12
22	0.23	BRICK	0	0.47	27	3.35
23	0.25	PLASTR	0	0.02	1	0.12
24	0.26	CONCRT	0	0.08	3	0.41
25	0.23	CHALK	0	0	0	0
26	0.23	OTHER	0	0.02	1	0.12
27	0.42	MORTAR	0	0.36	23	2.85
28	0.22					
29	0.23					
30	4.37					
31	0.23					
32	0.46					
34	0.23					
35	0.23					
36	0.69					
37	3.64					
38	5.57					
39	0.28					
40	0.38					
41	0.23					
42	0.71					
44	0.23					

Table 12: K-Means Cluster Analysis Table for Posthole Sample

45	0.42
46	0.23
47	0.23
48	1.81
49	0.28
50	1.16
51	0.67
52	0.29
54	0.23
55	0.29
56	0.23
57	0.23
58	2.72
59	0.62
60	1.62
61	1.44
63	0.31
64	0.23
65	0.23
66	0.43
67	0.32
68	1.98

Table 12: K-Means Cluster Analysis Table for Posthole Sample

CLUSTER NUMBER: 2

Members		Statistics				
CASE	DISTANCE	VARIABLE	MINIMUM	MEAN	MAXIMUM	ST.DEV.
33	1.97	FCR	0	0	0	0
43	1.97	FLAKES	0	0.5	1	0.5
		SCNAILS	0	0	0	0
		WNAILS	0	0	0	0
		SCREW	0	0	0	0
		SHLCAS	0	0.5	1	0.5
		METAL	0	0.5	1	0.5
		BARWIR	0	0	0	0
		UNCOAL	0	0	0	0
		BCOAL	0	0	0	0
		BOTGLS	1	2	3	1
		FLTGLS	0	0.5	1	0.5
		GWWARE	0	0	0	0
		WALSHEL	0	0	0	0
		WOOD	0	0	0	0
		MOLSHEL	0	0	0	0
		CHAR	0	0	0	0
		SLATE	0	0	0	0
		BSLATE	0	0	0	0
		PENNY	0	0	0	0
		PAINCHP	0	0	0	0
		BRICK	48	58	68	10
		PLASTR	0	0	0	0
		CONCRT	0	0.5	1	0.5
		CHALK	0	0	0	0
		OTHER	0	0	0	0
		MORTAR	0	1.5	3	1.5

Table 12: K-Means Cluster Analysis Table for Posthole Sample

CLUSTER NUMBER: 3

Members		Statistics				
CASE	DISTANCE	VARIABLE	MINIMUM	MEAN	MAXIMUM	ST.DEV.
53	1.37	FCR	0	0	0	0
62	1.37	FLAKES	0	0	0	0
		SCNAILS	0	0	0	0
		WNAILS	0	0	0	0
		SCREW	0	0.5	1	0.5
		SHLCAS	0	0	0	0
		METAL	0	0	0	0
		BARWIR	0	0	0	0
		UNCOAL	3	3	3	0
		BCOAL	21	27	33	6
		BOTGLS	0	0.5	1	0.5
		FLTGLS	0	0	0	0
		GWWARE	0	0	0	0
		WALSHEL	0	0	0	0
		WOOD	0	0	0	0
		MOLSHEL	0	0	0	0
		CHAR	0	3.5	7	3.5
		SLATE	0	0.5	1	0.5
		BSLATE	0	0.5	1	0.5
		PENNY	0	0	0	0
		PAINCHP	0	0	0	0
		BRICK	0	0	0	0
		PLASTR	0	0.5	1	0.5
		CONCRT	0	0	0	0
		CHALK	0	1	2	1
		OTHER	0	0	0	0
		MORTAR	0	0	0	0

Table 13: K-Means Cluster Analysis Table for 5ft. Units -- 3 Clusters

Summary Statistics for Three Cluster Analysis

VARIABLE	BETWEEN SS	DF	WITHIN SS	DF	F-RATIO	PROB
FCR	102.127	2	63.429			
FLAKES	5.46	2	13.429	6	4.83	0.056
STFRAG	0.508	2	7.714	6	1.22	0.359
SCNAILS	554.032	2	1002.857	6	0.198	0.826
WNAILS	133.143	2	190.857	6	1.657	0.267
SHCAS	0	2	0	6	2.093	0.204
METAL	578.286	2	41.714	6	.	.
SHMETAL	891.175	2	35.714	6	41.589	0
BWIRE	183.841	2	5.714	6	74.859	0
UBCOAL	4564732.571	2	417.429	6	96.517	0
BCOAL	62.794	2	1227.429	6	32806.086	0
BOTGLS	10571.175	2	839.714	6	0.153	0.861
FLTGLS	231.365	2	20204.857	6	37.767	0
GWWARE	376.889	2	2694	6	0.034	0.966
PWARE	128	2	0	6	0.42	0.675
OTHCER	303.143	2	52.857	6	.	.
WALSHEL	157804.698	2	16.857	6	17.205	0.003
WOOD	193.143	2	24.857	6	28083.887	0
MOLSHEL	37.841	2	5.714	6	23.31	0.001
CHAR	4296.127	2	37.429	6	19.867	0.002
SLATPEN	0.127	2	3.429	6	344.346	0
SLATE	14	2	56	6	0.111	0.897
MORTAR	2.032	2	40.857	6	0.75	0.512
PECHPT	0.508	2	3.714	6	0.149	0.865
BRICK	4.889	2	32	6	0.41	0.681
PLASTR	72	2	0	6	0.458	0.653
CONCRT	342.286	2	607.714	6	.	.
CHALK	854.222	2	0	6	1.69	0.262
OTHER	106	2	96	6	.	.
PLASTIC	13.841	2	9.714	6	3.313	0.107
BONE	62.508	2	3.714	6	4.275	0.07
				6	50.487	0

Table 13: K-Means Cluster Analysis Table for 5ft. Units -- 3 Clusters

CLUSTER NUMBER: 1

Members		Statistics				
CASE	DISTANCE	VARIABLE	MINIMUM	MEAN	MAXIMUM	ST.DEV.
1	6.29	FCR	0	3.29	7	3.01
2	7.9	FLAKES	0	0.71	4	1.39
3	4.94	STFRAG	0	0.43	3	1.05
4	5.26	SCNAILS	0	5.86	35	11.97
6	3.96	WNAILS	0	3.86	13	5.22
7	26.26	SHCAS	0	0	0	0
9	5.94	METAL	0	1.57	7	2.44
		SHMETAL	0	1.57	6	2.26
		BWIRE	0	0.57	2	0.9
		UBCOAL	0	6.71	21	7.72
		BCOAL	0	8.29	38	13.24
		BOTGLS	0	7.57	33	10.95
		FLTGLS	0	26.86	158	53.73
		GWWARE	0	9	57	19.62
		PWARE	0	0	0	0
		OTHCER	0	1.86	8	2.75
		WALSHEL	0	1.14	4	1.55
		WOOD	0	1.14	5	1.88
		MOLSHEL	0	0.57	2	0.9
		CHAR	0	1.71	7	2.31
		SLATPEN	0	0.29	2	0.7
		SLATE	0	3	8	2.83
		MORTAR	0	1.14	7	2.42
		PECHPT	0	0.57	2	0.73
		BRICK	0	2	6	2.14
		PLASTR	0	0	0	0
		CONCRT	0	5.43	27	9.32
		CHALK	0	0	0	0
		OTHER	0	3	10	3.7
		PLASTIC	0	1.57	3	1.18
		BONE	0	0.57	2	0.73

Table 13: K-Means Cluster Analysis Table for 5ft. Units -- 3 Clusters

CLUSTER NUMBER: 2

Members		Statistics				
CASE	DISTANCE	VARIABLE	MINIMUM	MEAN	MAXIMUM	ST.DEV.
8	0	FCR	14	14	14	0
		FLAKES	3	3	3	0
		STFRAG	0	0	0	0
		SCNAILS	31	31	31	0
		WNAILS	15	15	15	0
		SHCAS	0	0	0	0
		METAL	27	27	27	0
		SHMETAL	0	0	0	0
		BWIRE	1	1	1	0
		UBCOAL	2273	2273	2273	0
		BCOAL	9	9	9	0
		BOTGLS	117	117	117	0
		FLTGLS	40	40	40	0
		GWWARE	17	17	17	0
		PWARE	3	3	3	0
		OTHCER	20	20	20	0
		WALSHEL	28	28	28	0
		WOOD	16	16	16	0
		MOLSHEL	7	7	7	0
		CHAR	0	0	0	0
		SLATPEN	0	0	0	0
		SLATE	0	0	0	0
		MORTAR	0	0	0	0
		PECHPT	0	0	0	0
		BRICK	3	3	3	0
		PLASTR	9	9	9	0
		CONCRT	24	24	24	0
		CHALK	31	31	31	0
		OTHER	4	4	4	0
		PLASTIC	5	5	5	0
		BONE	9	9	9	0

Table 13: K-Means Cluster Analysis Table for 5ft. Units -- 3 Clusters

CLUSTER NUMBER: 3

Members		Statistics				
CASE	DISTANCE	VARIABLE	MINIMUM	MEAN	MAXIMUM	ST.DEV.
5	0	FCR	6	6	6	0
		FLAKES	0	0	0	0
		STFRAG	1	1	1	0
		SCNAILS	10	10	10	0
		WNAILS	0	0	0	0
		SHCAS	0	0	0	0
		METAL	1	1	1	0
		SHMETAL	33	33	33	0
		BWIRE	15	15	15	0
		UBCOAL	8	8	8	0
		BCOAL	0	0	0	0
		BOTGLS	11	11	11	0
		FLTGLS	19	19	19	0
		GWWARE	29	29	29	0
		PWARE	12	12	12	0
		OTHCER	0	0	0	0
		WALSHEL	425	425	425	0
		WOOD	3	3	3	0
		MOLSHEL	0	0	0	0
		CHAR	71	71	71	0
		SLATPEN	0	0	0	0
		SLATE	0	0	0	0
		MORTAR	0	0	0	0
		PECHPT	0	0	0	0
		BRICK	0	0	0	0
		PLASTR	0	0	0	0
		CONCRT	1	1	1	0
		CHALK	0	0	0	0
		OTHER	14	14	14	0
		PLASTIC	0	0	0	0
		BONE	1	1	1	0

Table 14: K-Means Cluster Analysis Table for 5Ft. Units -- 5 Clusters

Summary Statistics for 5 Cluster Analysis

VARIABLE	BETWEEN SS	DF	WITHIN SS	DF	F-RATIO	PROB
FCR	114.756	4	50.8	4	2.259	0.225
FLAKES	6.889	4	12	4	0.574	0.698
STFRAG	8.222	4	0	4	.	.
SCNAILS	1546.089	4	10.8	4	143.156	0
WNAILS	320.8	4	3.2	4	100.25	0
SHCAS	0	4	0	4	.	.
METAL	619.2	4	0.8	4	774	0
SHMETAL	926.089	4	0.8	4	1157.611	0
BWIRE	186.356	4	3.2	4	58.236	0.001
UBCOAL	4564802.8	4	347.2	4	13147.474	0
BCOAL	1095.022	4	195.2	4	5.61	0.062
BOTGLS	11326.089	4	84.8	4	133.562	0
FLTGLS	20315.422	4	120.8	4	168.174	0
GWWARE	3066.089	4	4.8	4	638.769	0
PWARE	128	4	0	4	.	.
OTHCER	348	4	8	4	43.5	0.001
WALSHEL	157814.756	4	6.8	4	23208.052	0
WOOD	210.8	4	7.2	4	29.278	0.003
MOLSHEL	40.356	4	3.2	4	12.611	0.015
CHAR	4299.556	4	34	4	126.458	0
SLATPEN	3.556	4	0	4	.	.
SLATE	52.8	4	17.2	4	3.07	0.151
MORTAR	42.089	4	0.8	4	52.611	0.001
PECHPT	1.022	4	3.2	4	0.319	0.853
BRICK	16.089	4	20.8	4	0.774	0.595
PLASTR	72	4	0	4	.	.
CONCRT	889.2	4	60.8	4	14.625	0.012
CHALK	854.222	4	0	4	.	.
OTHER	195.2	4	6.8	4	28.706	0.003
PLASTIC	16.756	4	6.8	4	2.464	0.202
BONE	65.422	4	0.8	4	81.778	0

Table 14: K-Means Cluster Analysis Table for 5Ft. Units -- 5 Clusters

CLUSTER NUMBER: 1

Members		Statistics				
CASE	DISTANCE	VARIABLE	MINIMUM	MEAN	MAXIMUM	ST.DEV.
1	3.15	FCR	0	3.8	7	3.19
3	2.25	FLAKES	0	1	4	1.55
4	2.66	STFRAG	0	0	0	0
6	2.36	SCNAILS	0	1.2	3	1.47
9	2.24	WNAILS	0	0.6	2	0.8
		SHCAS	0	0	0	0
		METAL	0	0.2	1	0.4
		SHMETAL	0	0.2	1	0.4
		BWIRE	0	0.4	2	0.8
		UBCOAL	0	8.6	21	8.33
		BCOAL	0	3.6	16	6.25
		BOTGLS	0	3.2	10	4.12
		FLTGLS	0	4.2	13	4.92
		GWWARE	0	0.8	2	0.98
		PWARE	0	0	0	0
		OTHCER	0	1	3	1.26
		WALSHEL	0	0.8	3	1.17
		WOOD	0	0.6	3	1.2
		MOLSHEL	0	0.4	2	0.8
		CHAR	0	2	7	2.61
		SLATPEN	0	0	0	0
		SLATE	0	1.6	5	1.85
		MORTAR	0	0.2	1	0.4
		PECHPT	0	0.6	2	0.8
		BRICK	0	2.8	6	2.04
		PLASTR	0	0	0	0
		CONCRT	0	2.2	9	3.49
		CHALK	0	0	0	0
		OTHER	0	0.8	3	1.17
		PLASTIC	0	1.8	3	1.17
		BONE	0	0.2	1	0.4

Table 14: K-Means Cluster Analysis Table for 5Ft. Units -- 5 Clusters

CLUSTER NUMBER: 2

Members		Statistics				
CASE	DISTANCE	VARIABLE	MINIMUM	MEAN	MAXIMUM	ST.DEV.
8	0	FCR	14	14	14	0
		FLAKES	3	3	3	0
		STFRAG	0	0	0	0
		SCNAILS	31	31	31	0
		WNAILS	15	15	15	0
		SHCAS	0	0	0	0
		METAL	27	27	27	0
		SHMETAL	0	0	0	0
		BWIRE	1	1	1	0
		UBCOAL	2273	2273	2273	0
		BCOAL	9	9	9	0
		BOTGLS	117	117	117	0
		FLTGLS	40	40	40	0
		GWWARE	17	17	17	0
		PWARE	3	3	3	0
		OTHCER	20	20	20	0
		WALSHEL	28	28	28	0
		WOOD	16	16	16	0
		MOLSHEL	7	7	7	0
		CHAR	0	0	0	0
		SLATPEN	0	0	0	0
		SLATE	0	0	0	0
		MORTAR	0	0	0	0
		PECHPT	0	0	0	0
		BRICK	3	3	3	0
		PLASTR	9	9	9	0
		CONCRT	24	24	24	0
		CHALK	31	31	31	0
		OTHER	4	4	4	0
		PLASTIC	5	5	5	0
		BONE	9	9	9	0

Table 14: K-Means Cluster Analysis Table for 5Ft. Units – 5 Clusters

CLUSTER NUMBER: 3

Members		Statistics				
CASE	DISTANCE	VARIABLE	MINIMUM	MEAN	MAXIMUM	ST.DEV.
5	0	FCR	6	6	6	0
		FLAKES	0	0	0	0
		STFRAG	1	1	1	0
		SCNAILS	10	10	10	0
		WNAILS	0	0	0	0
		SHCAS	0	0	0	0
		METAL	1	1	1	0
		SHMETAL	33	33	33	0
		BWIRE	15	15	15	0
		UBCOAL	8	8	8	0
		BCOAL	0	0	0	0
		BOTGLS	11	11	11	0
		FLTGLS	19	19	19	0
		GWWARE	29	29	29	0
		PWARE	12	12	12	0
		OTHCER	0	0	0	0
		WALSHEL	425	425	425	0
		WOOD	3	3	3	0
		MOLSHEL	0	0	0	0
		CHAR	71	71	71	0
		SLATPEN	0	0	0	0
		SLATE	0	0	0	0
		MORTAR	0	0	0	0
		PECHPT	0	0	0	0
		BRICK	0	0	0	0
		PLASTR	0	0	0	0
		CONCRT	1	1	1	0
		CHALK	0	0	0	0
		OTHER	14	14	14	0
		PLASTIC	0	0	0	0
		BONE	1	1	1	0

Table 14: K-Means Cluster Analysis Table for 5Ft. Units -- 5 Clusters

CLUSTER NUMBER: 4

Members		Statistics				
CASE	DISTANCE	VARIABLE	MINIMUM	MEAN	MAXIMUM	ST.DEV.
7	0	FCR	4	4	4	0
		FLAKES	0	0	0	0
		STFRAG	3	3	3	0
		SCNAILS	35	35	35	0
		WNAILS	11	11	11	0
		SHCAS	0	0	0	0
		METAL	7	7	7	0
		SHMETAL	4	4	4	0
		BWIRE	2	2	2	0
		UBCOAL	0	0	0	0
		BCOAL	2	2	2	0
		BOTGLS	33	33	33	0
		FLTGLS	158	158	158	0
		GWWARE	57	57	57	0
		PWARE	0	0	0	0
		OTHCER	8	8	8	0
		WALSHEL	0	0	0	0
		WOOD	5	5	5	0
		MOLSHEL	2	2	2	0
		CHAR	2	2	2	0
		SLATPEN	2	2	2	0
		SLATE	8	8	8	0
		MORTAR	7	7	7	0
		PECHPT	0	0	0	0
		BRICK	0	0	0	0
		PLASTR	0	0	0	0
		CONCRT	0	0	0	0
		CHALK	0	0	0	0
		OTHER	10	10	10	0
		PLASTIC	2	2	2	0
		BONE	1	1	1	0

Table 14: K-Means Cluster Analysis Table for 5Ft. Units – 5 Clusters

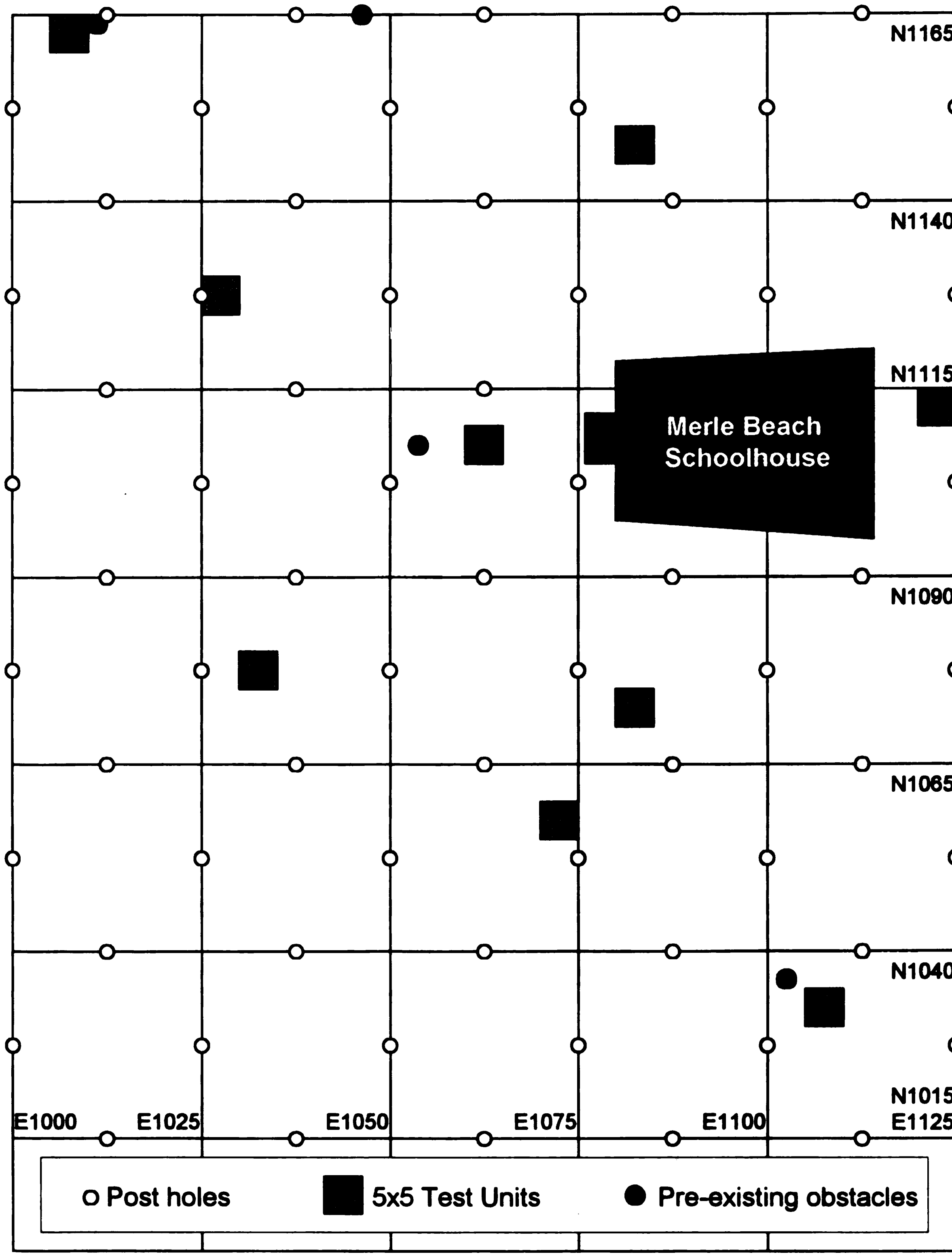
CLUSTER NUMBER: 5

Members		Statistics				
CASE	DISTANCE	VARIABLE	MINIMUM	MEAN	MAXIMUM	ST.DEV.
2	0	FCR	0	0	0	0
		FLAKES	0	0	0	0
		STFRAG	0	0	0	0
		SCNAILS	0	0	0	0
		WNAILS	13	13	13	0
		SHCAS	0	0	0	0
		METAL	3	3	3	0
		SHMETAL	6	6	6	0
		BWIRE	0	0	0	0
		UBCOAL	4	4	4	0
		BCOAL	38	38	38	0
		BOTGLS	4	4	4	0
		FLTGLS	9	9	9	0
		GWWARE	2	2	2	0
		PWARE	0	0	0	0
		OTHCER	0	0	0	0
		WALSHEL	4	4	4	0
		WOOD	0	0	0	0
		MOLSHEL	0	0	0	0
		CHAR	0	0	0	0
		SLATPEN	0	0	0	0
		SLATE	5	5	5	0
		MORTAR	0	0	0	0
		PECHPT	1	1	1	0
		BRICK	0	0	0	0
		PLASTR	0	0	0	0
		CONCRT	27	27	27	0
		CHALK	0	0	0	0
		OTHER	7	7	7	0
		PLASTIC	0	0	0	0
		BONE	2	2	2	0

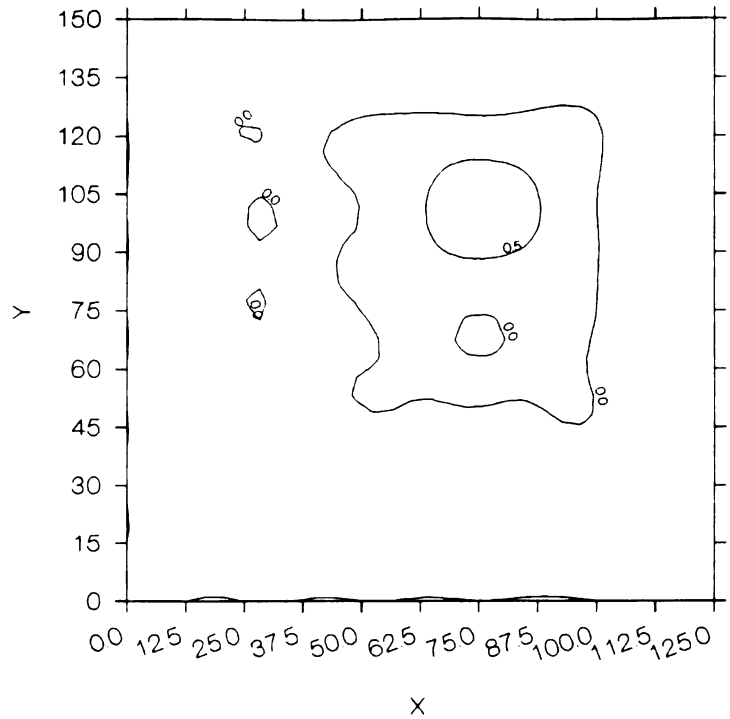
APPENDIX B
MAPS AND GRAPHS

Map 1:
Map of Michigan, Showing Lansing and the Location of the Merle Beach School Site

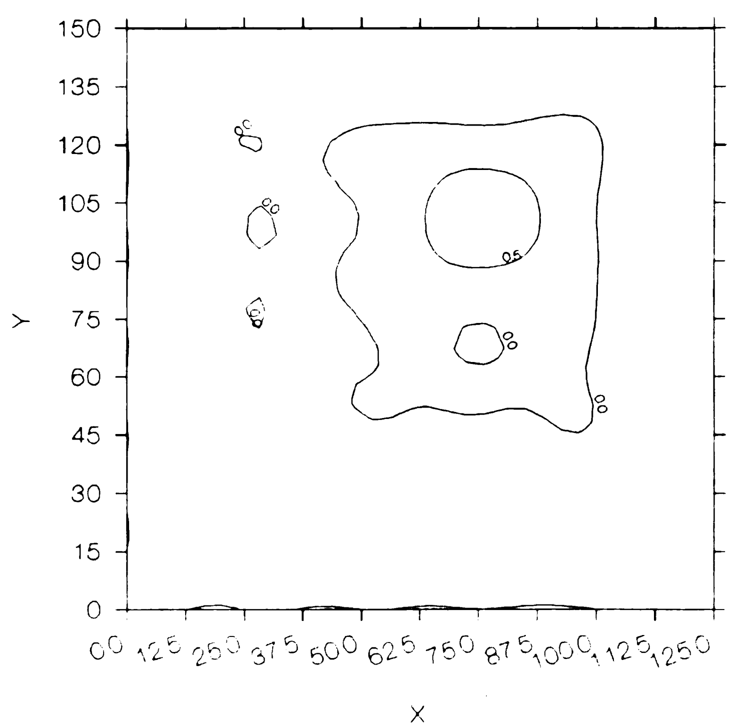
Map 2: Merle Beach Schoolhouse Site Map



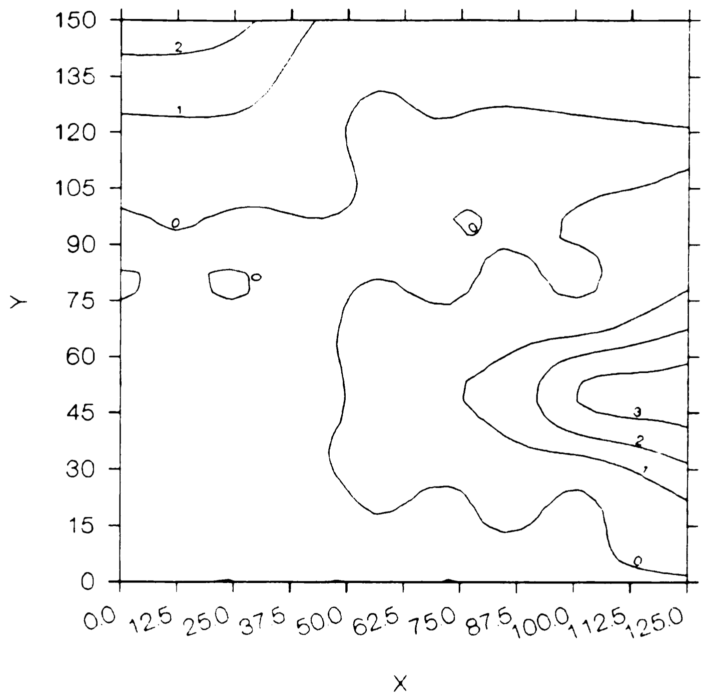
Map 3:
Surface Collection Contour Map for Bottle Glass



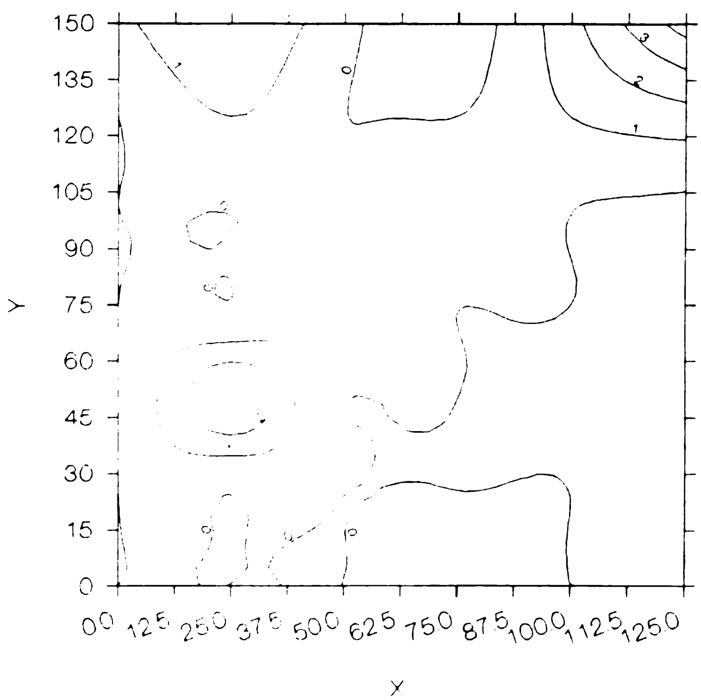
Map 4:
Surface Collection Contour Map for Metal



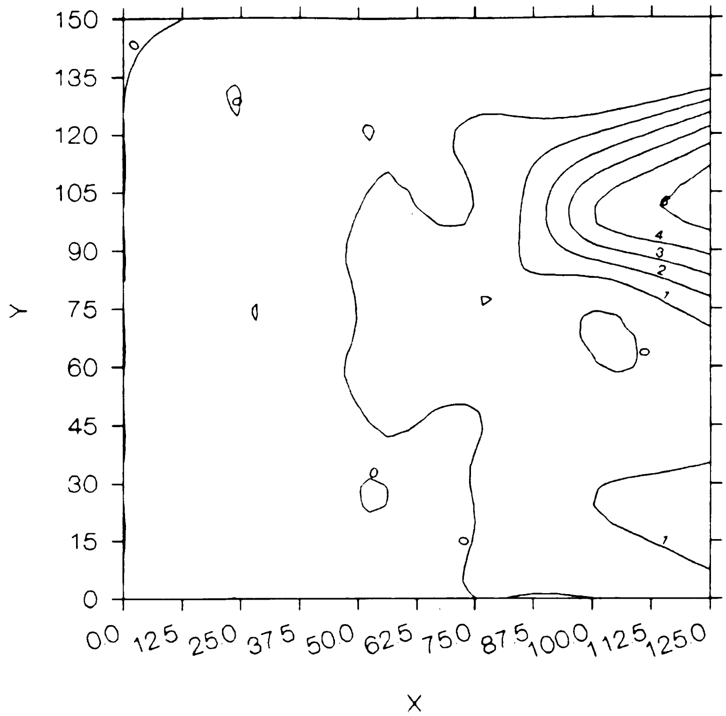
Map 5:
Surface Collection Contour Map for Other Artifacts



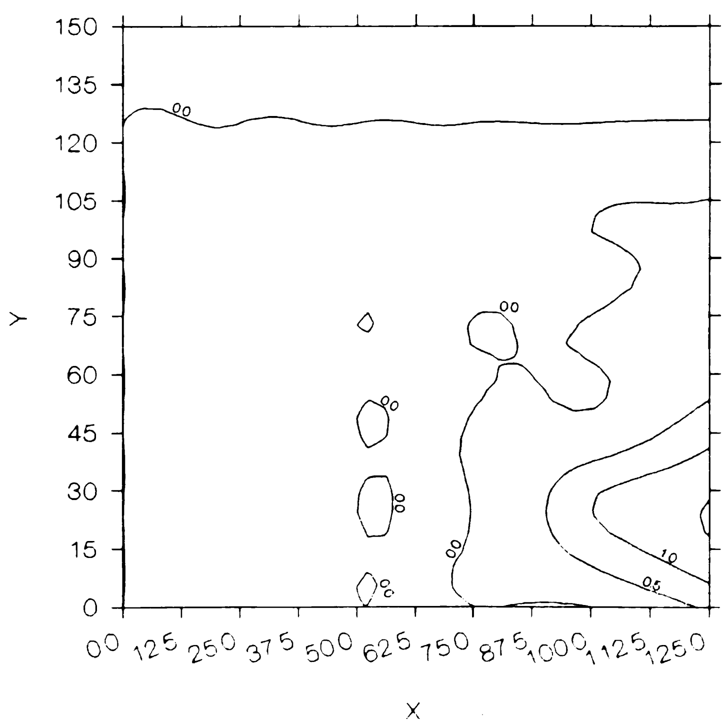
Map 6:
Surface Collection Contour Map for Plastic



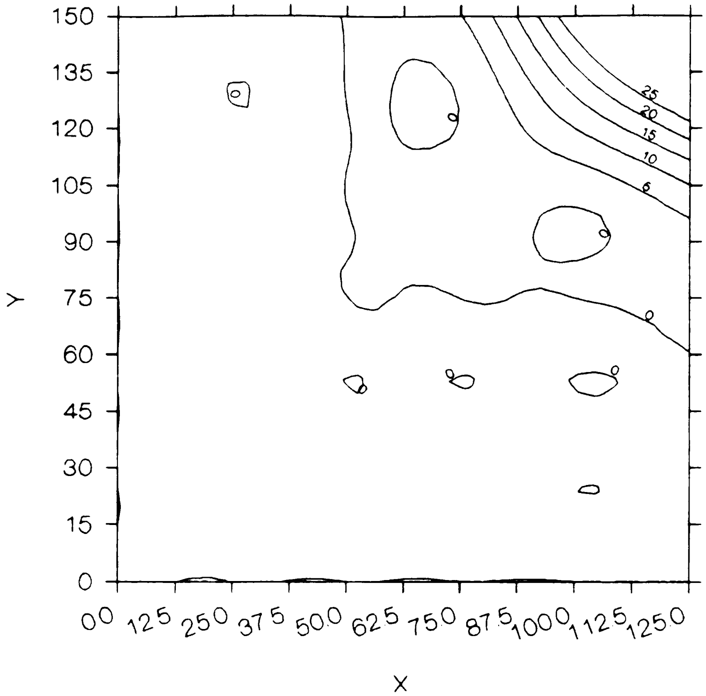
Map 7:
Surface Collection Contour Map for Wood



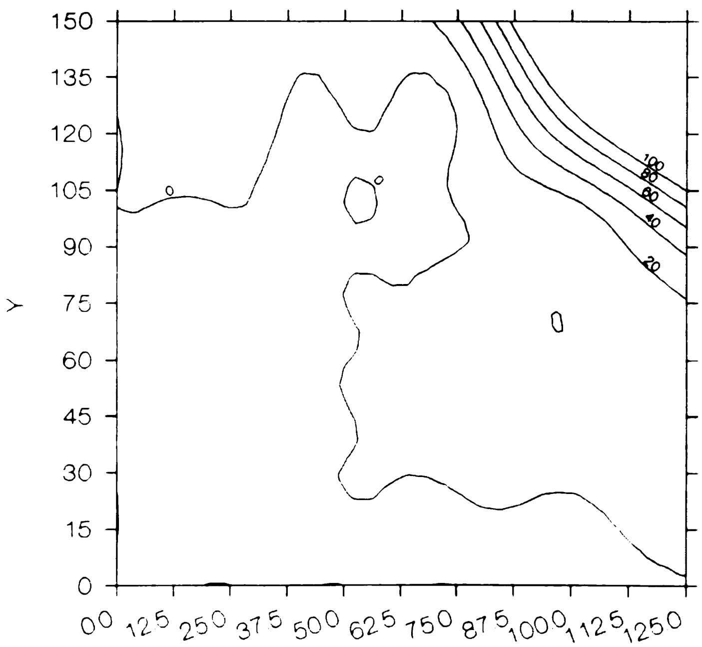
Map 8:
Surface Collection Contour Map for Bone



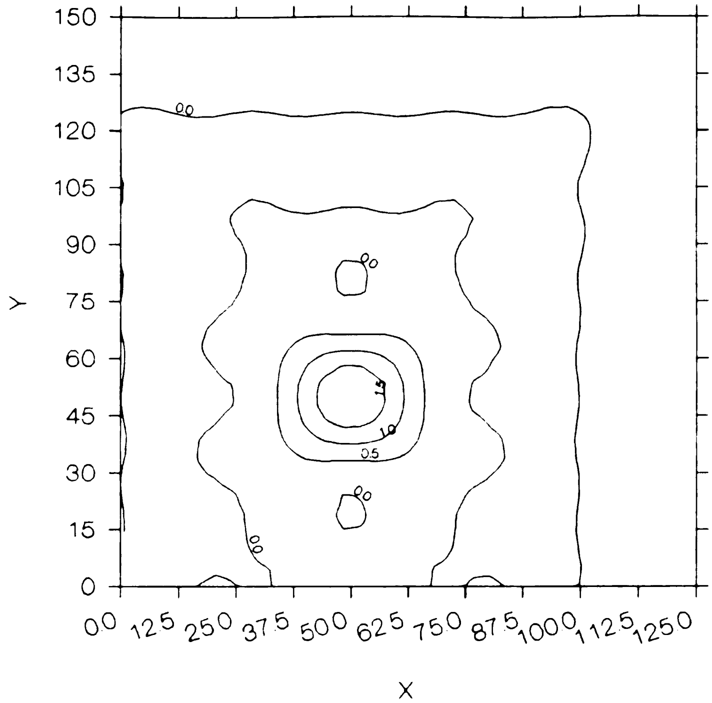
Map 9: Surface Collection Contour Map for Plaster



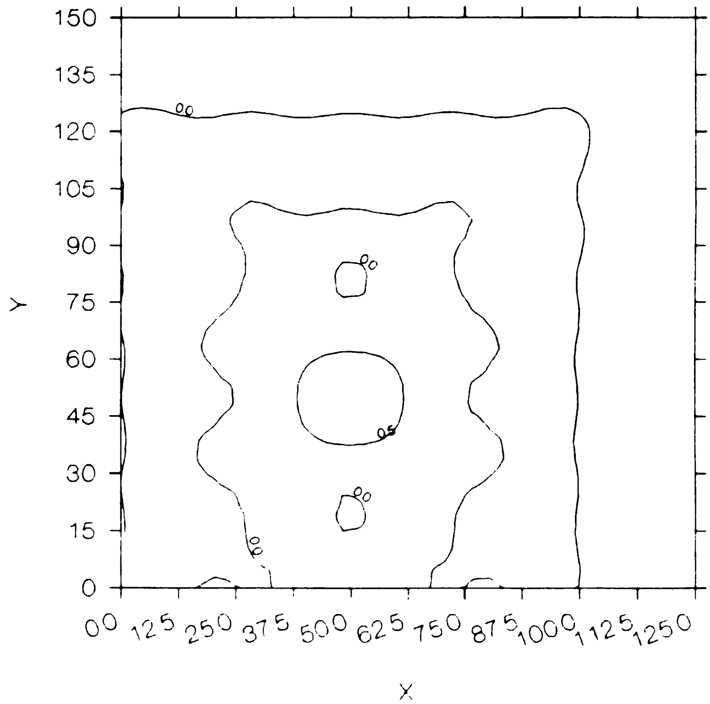
Map 10: Surface Collection Contour Map for Shingles



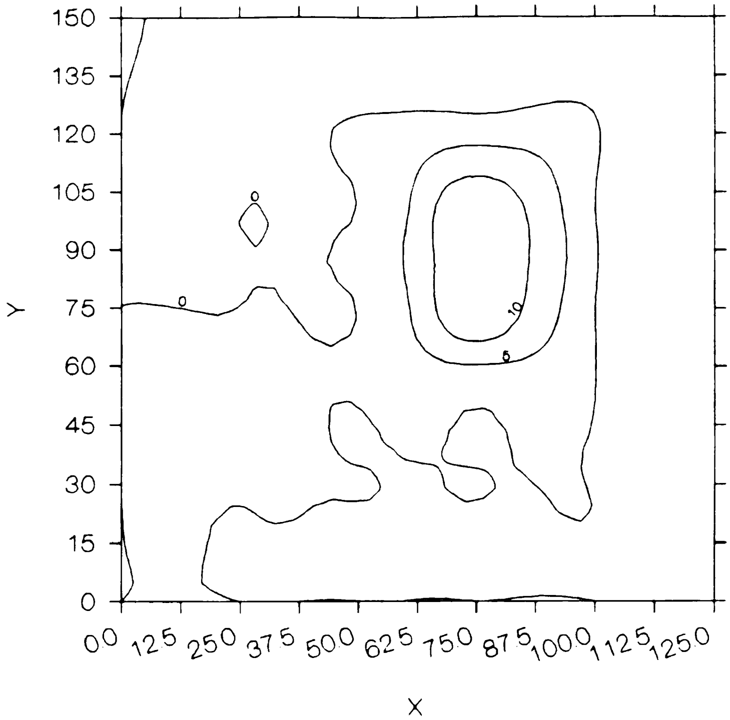
Map 11:
Surface Collection Contour Map for Slate



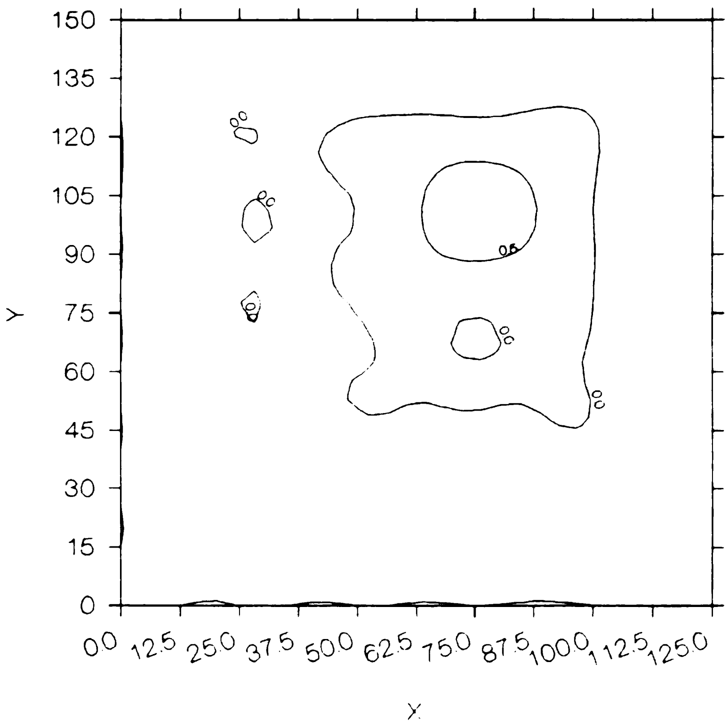
Map 12:
Surface Collection Contour Map for Concrete



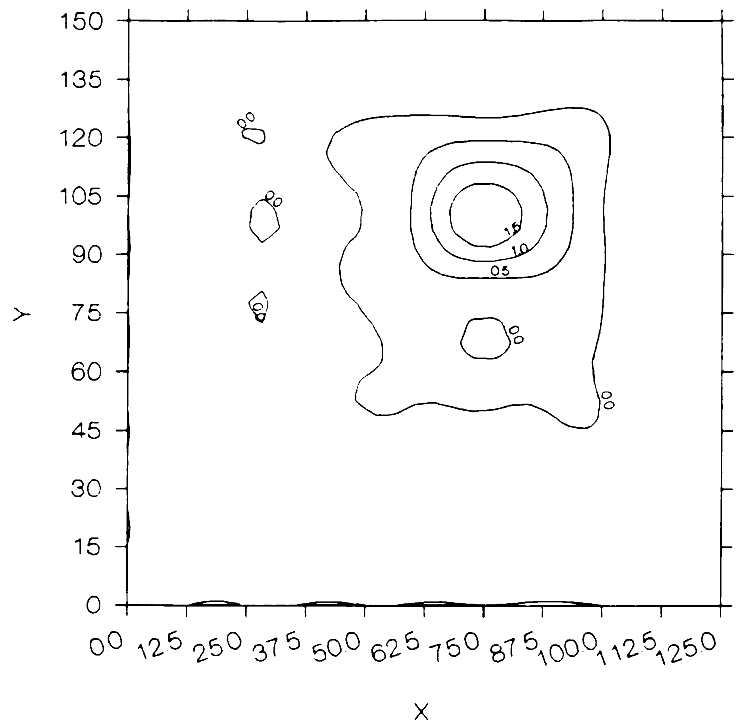
Map 13:
Surface Collection Map for Flat Glass



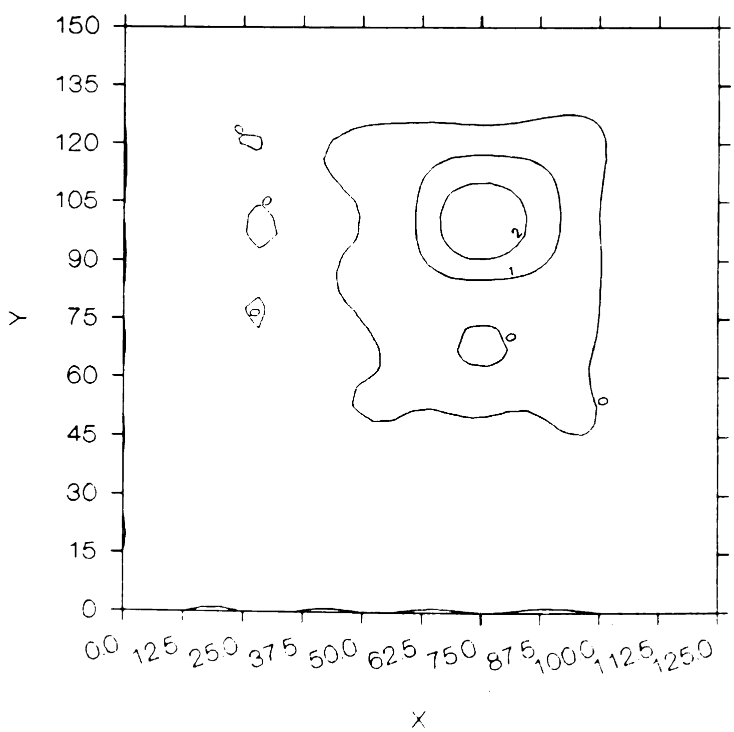
Map 14:
Surface Collection Contour Map for Square Nails



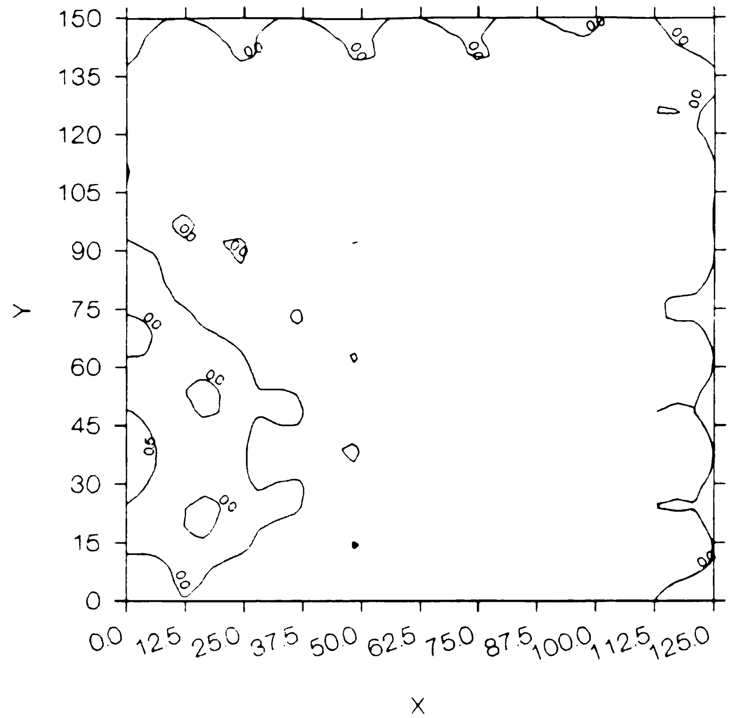
Map 15:
Surface Collection Contour Map for Unburned Coal



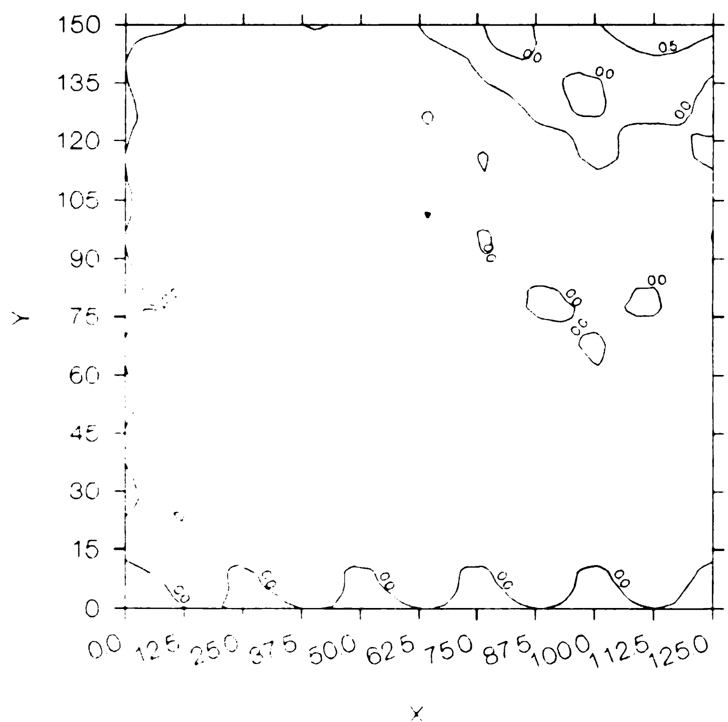
Map 16:
Surface Collection Contour Map for Wire Nails



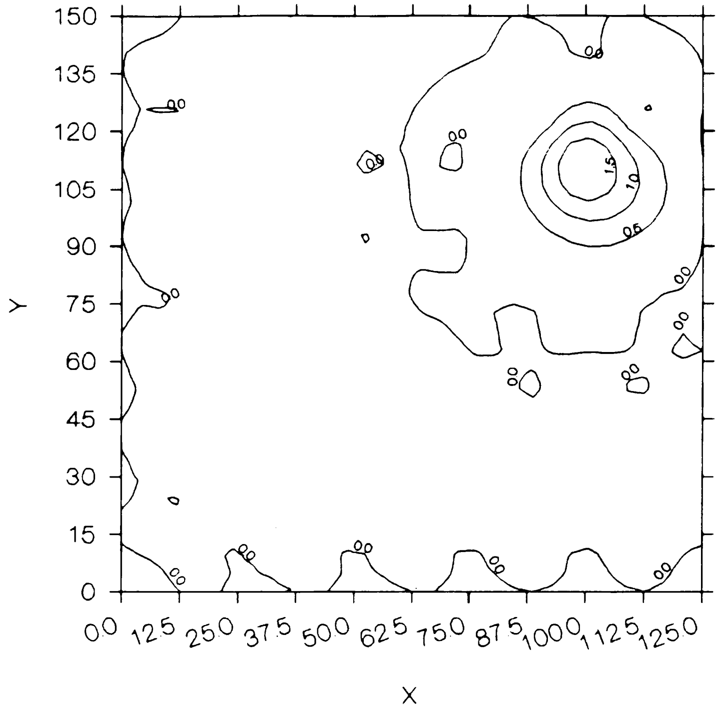
Map 17:
Posthole Contour Map for Paint Chips



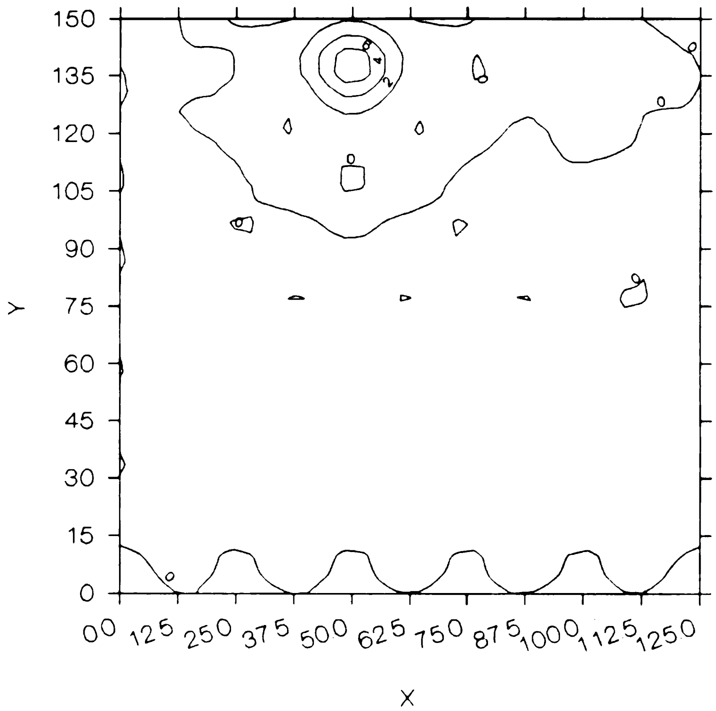
Map 18:
Posthole Contour Map for Other Artifacts



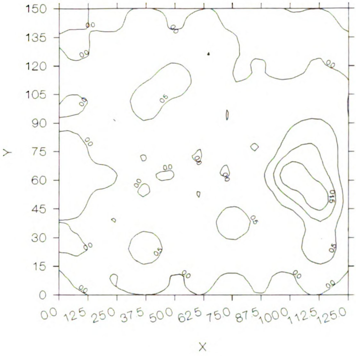
Map 19:
Posthole Contour Map for Mollusk Shell



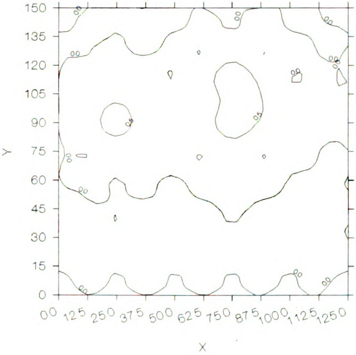
Map 20:
Posthole Contour Map for Burned Slate



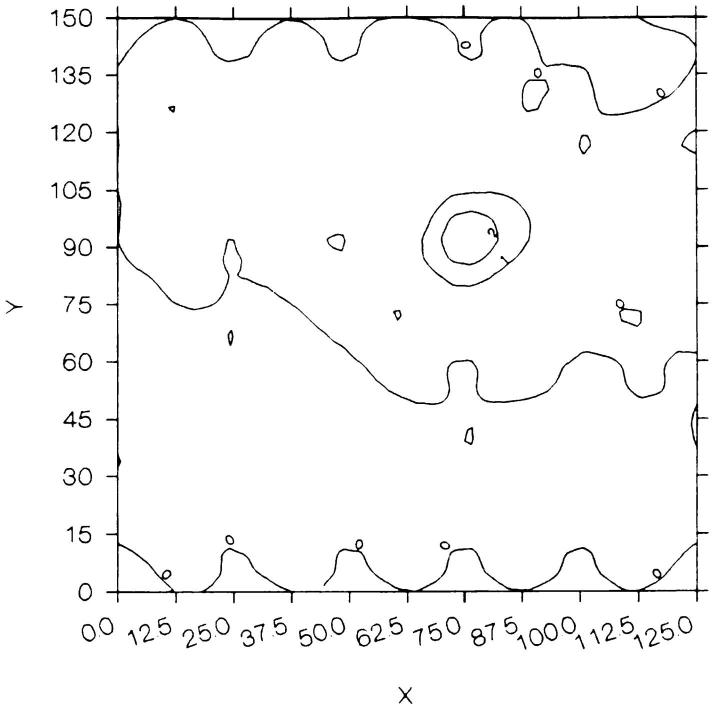
Map 21:
Posthole Contour Map for Fire Cracked Rock



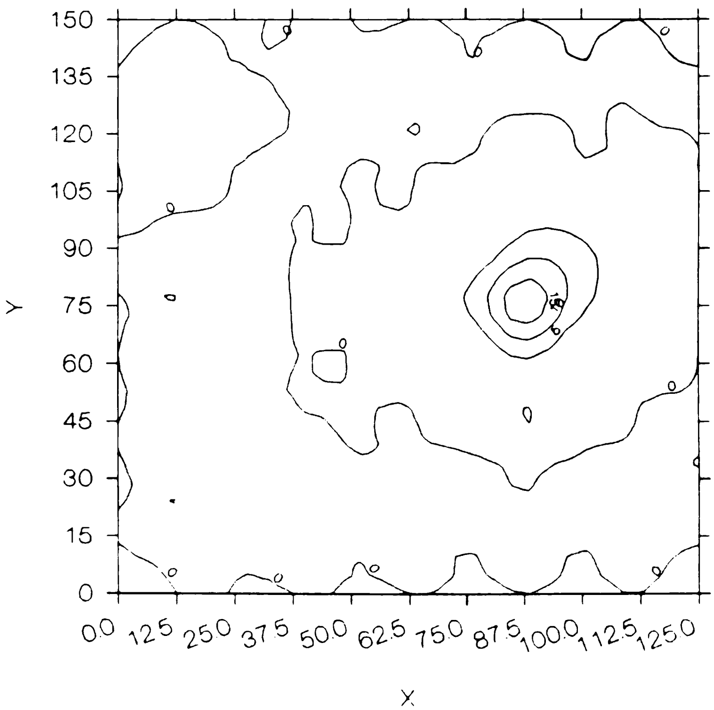
Map 22: Posthole Contour Map for Wire Nails



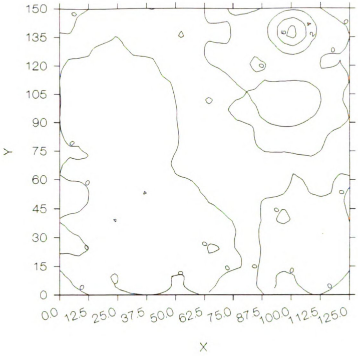
Map 23:
Posthole Contour Map for Concrete



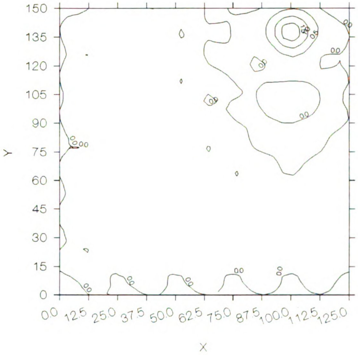
Map 24:
Posthole Contour Map for Slate



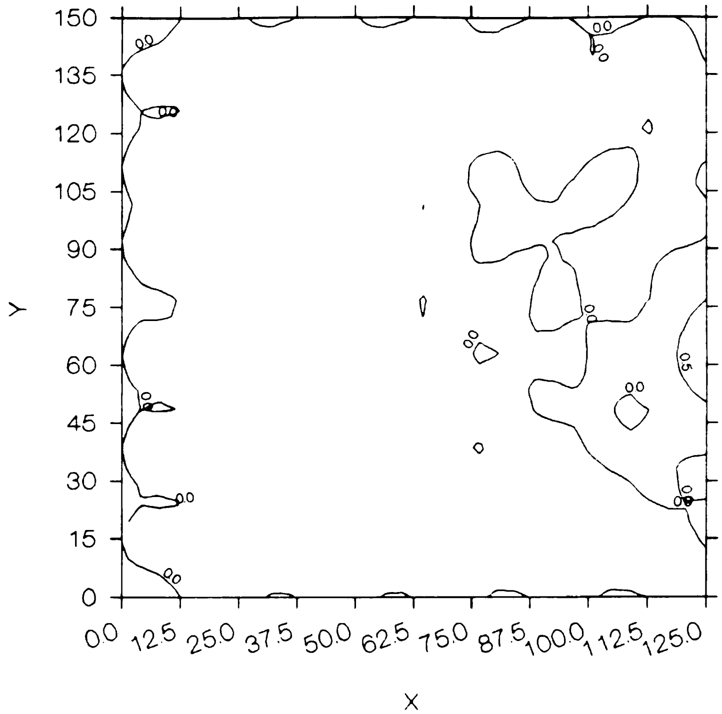
Map 25:
Posthole Contour Map for Charcoal



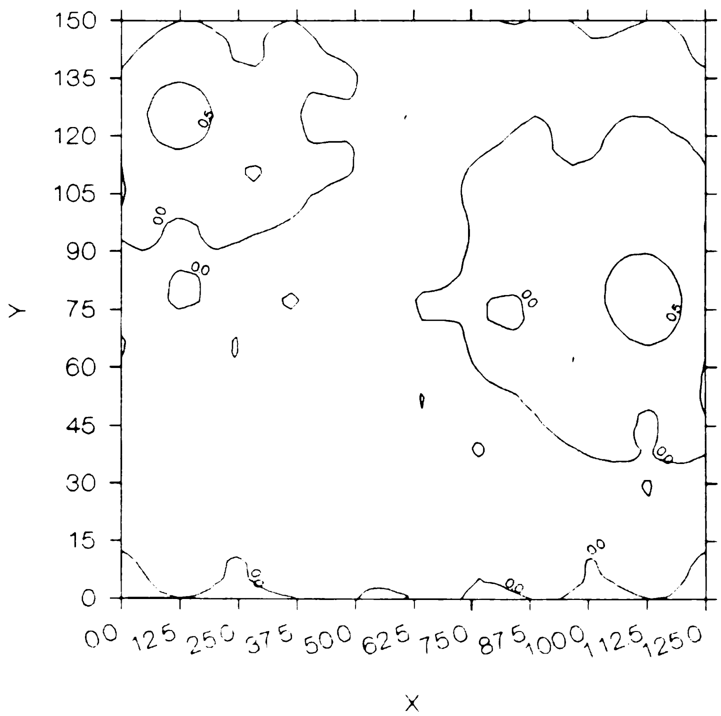
Map 26:
Posthole Contour Map for Chalk



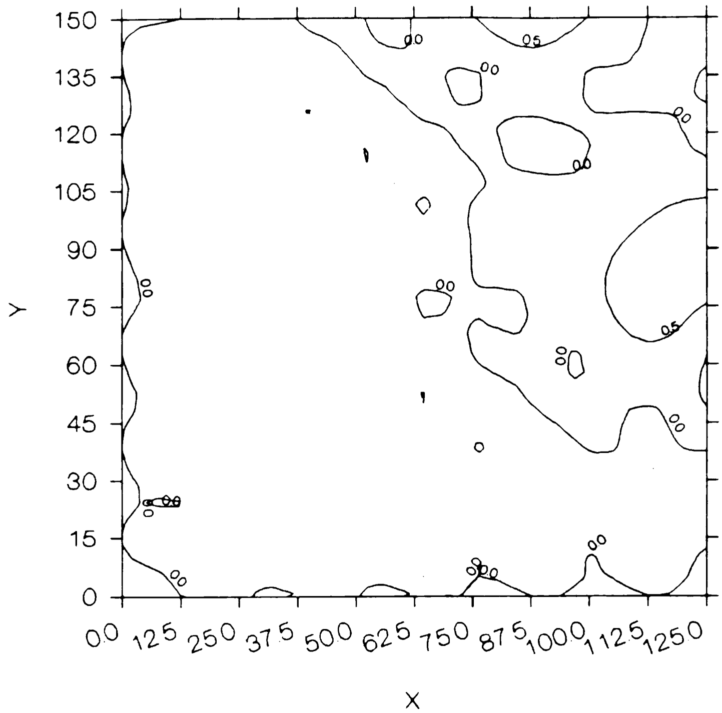
Map 27:
Posthole Contour Map for Shot Gun Shell Cases



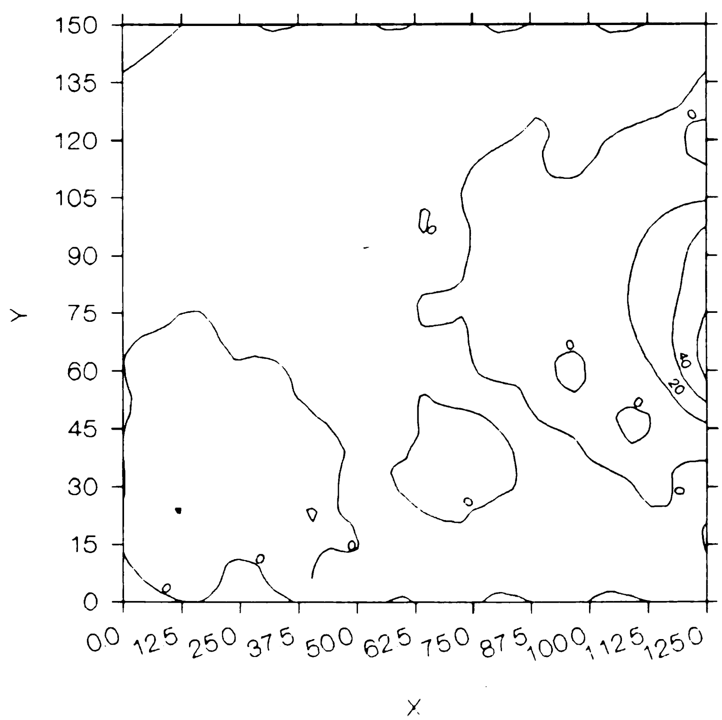
Map 28:
Posthole Contour Map for Plaster



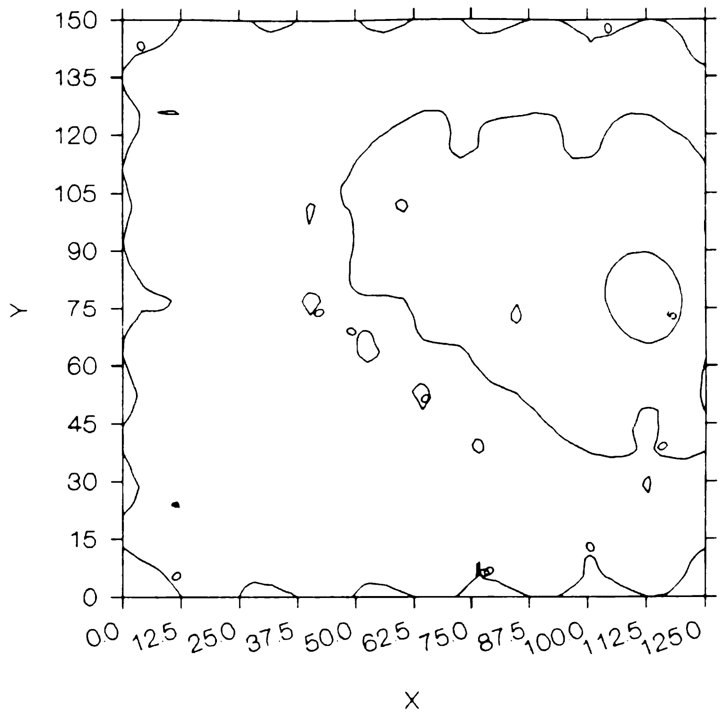
Map 29:
Posthole Contour Map for Metal



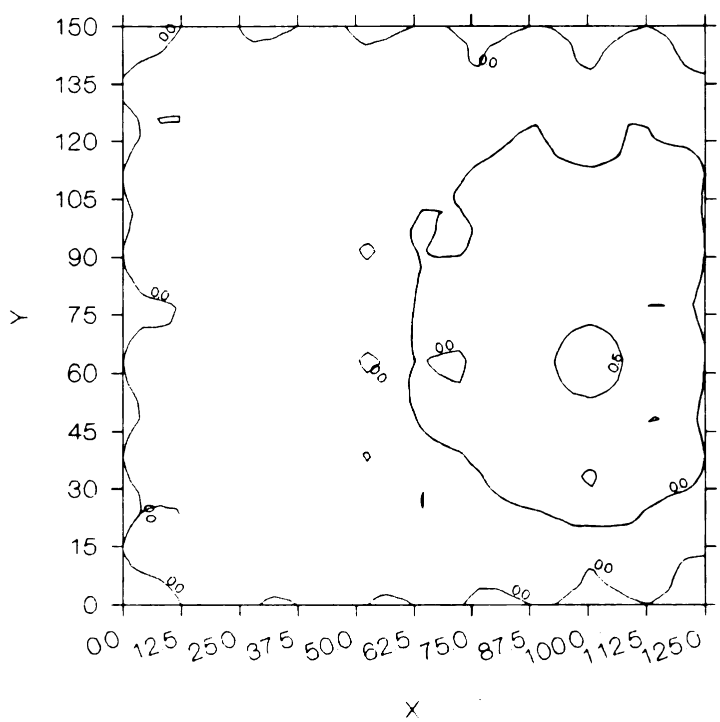
Map 30:
Posthole Contour Map for Brick



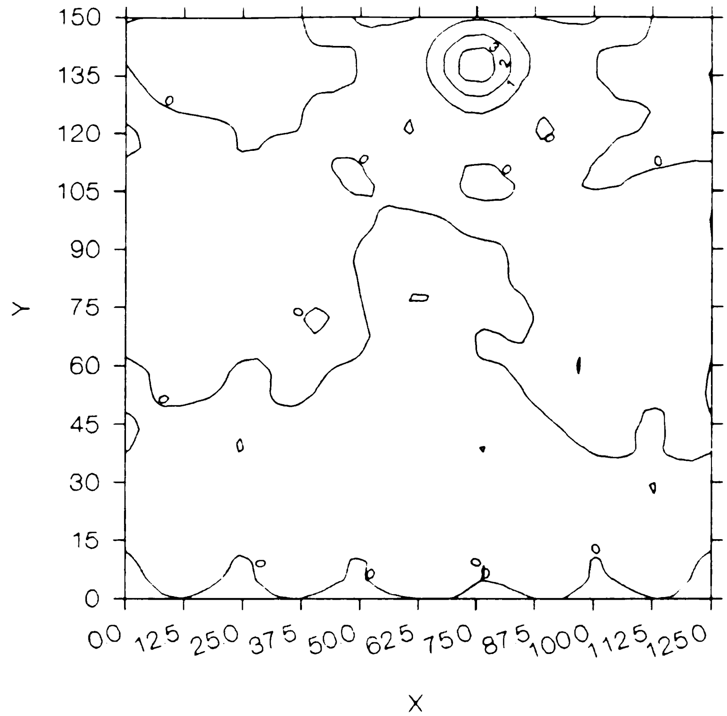
Map 31:
Posthole Contour Map for Wood



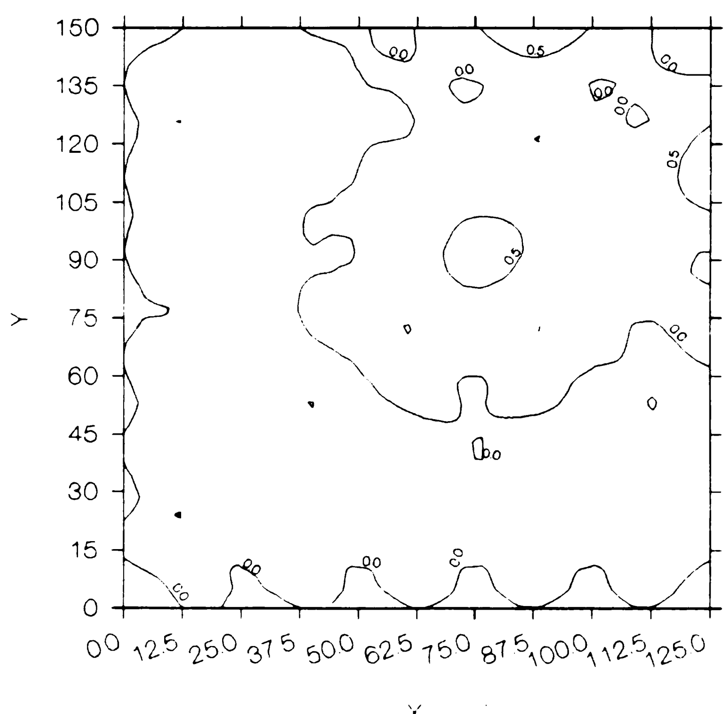
Map 32:
Posthole Contour Map for Pennies



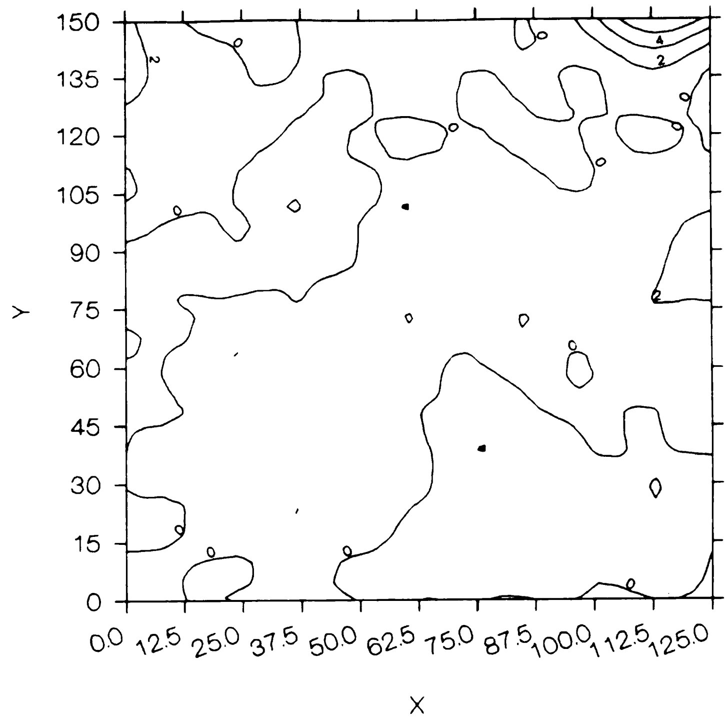
Map 33:
Posthole Contour Map for Glazed White Ware Ceramics



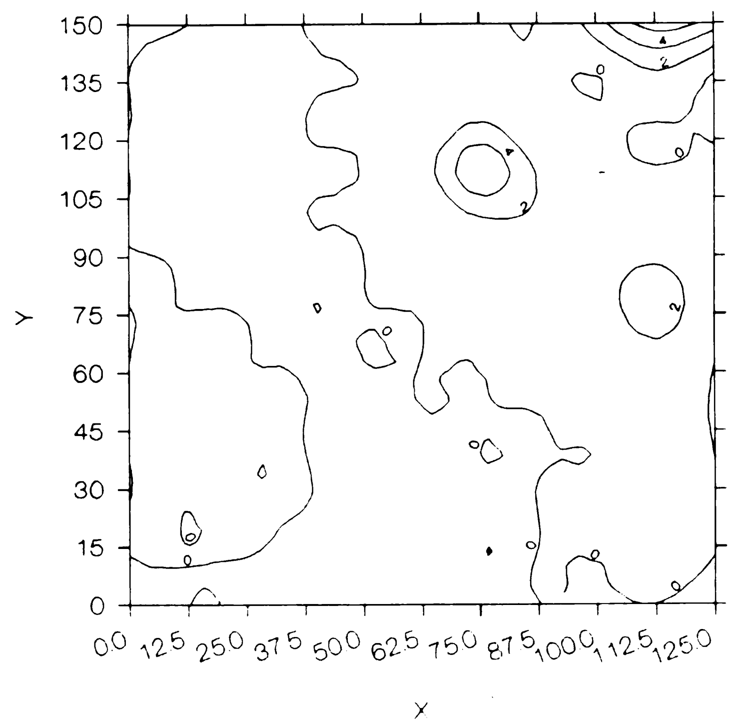
Map 34:
Posthole Contour Map for Barbed Wire



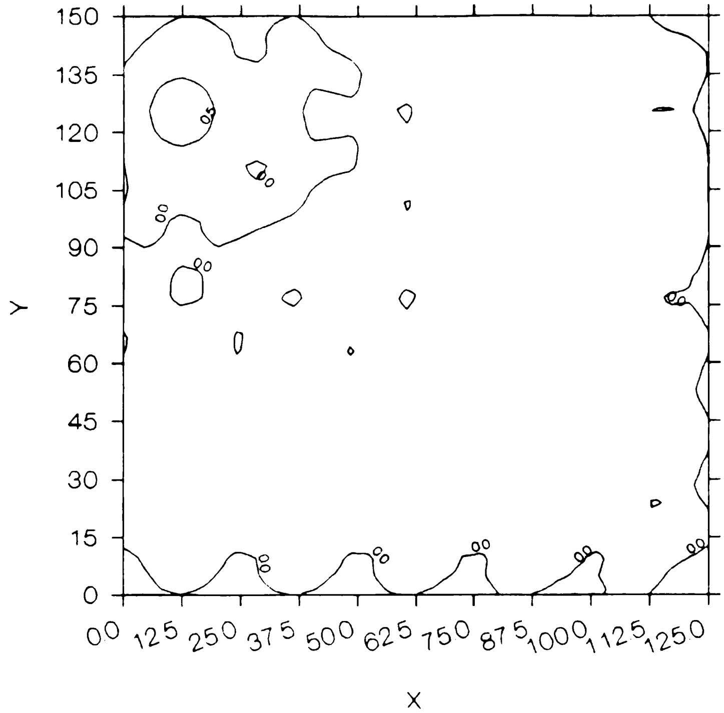
Map 35:
Posthole Contour Map for Bottle Glass



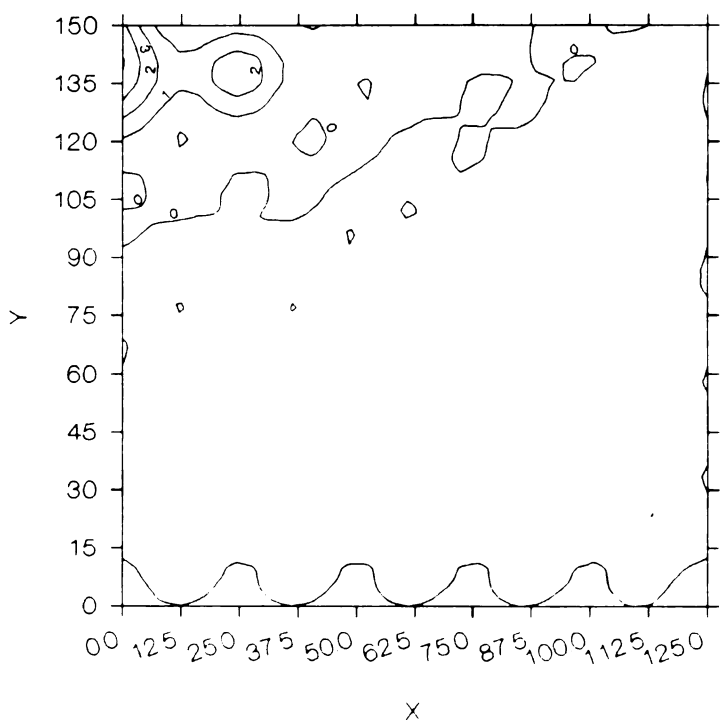
Map 36:
Posthole Contour Map for Flat Glass



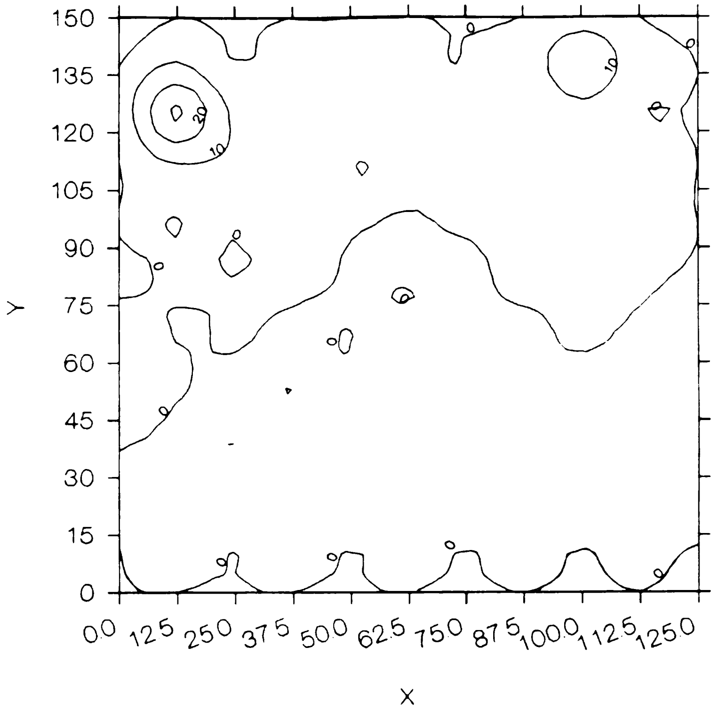
Map 37:
Posthole Contour Map for Screws



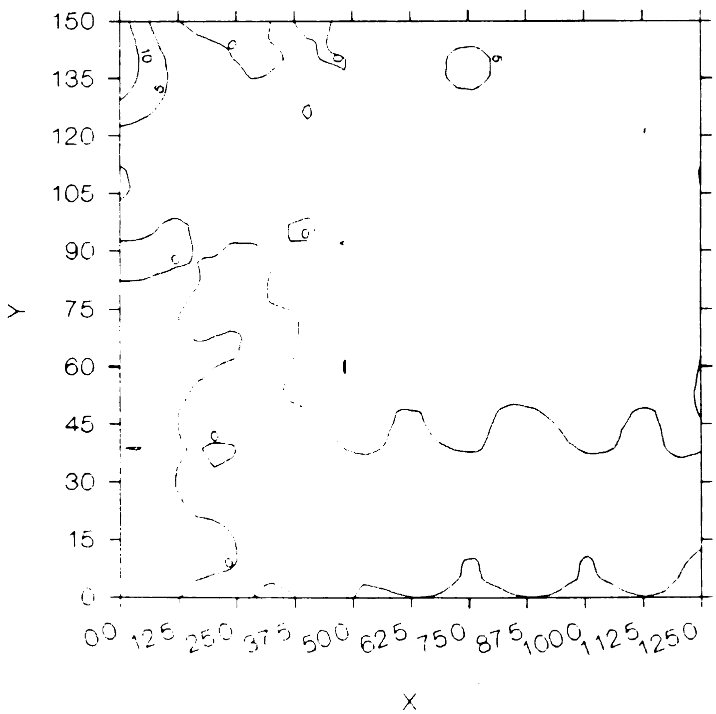
Map 38:
Posthole Contour Map for Walnut Shells



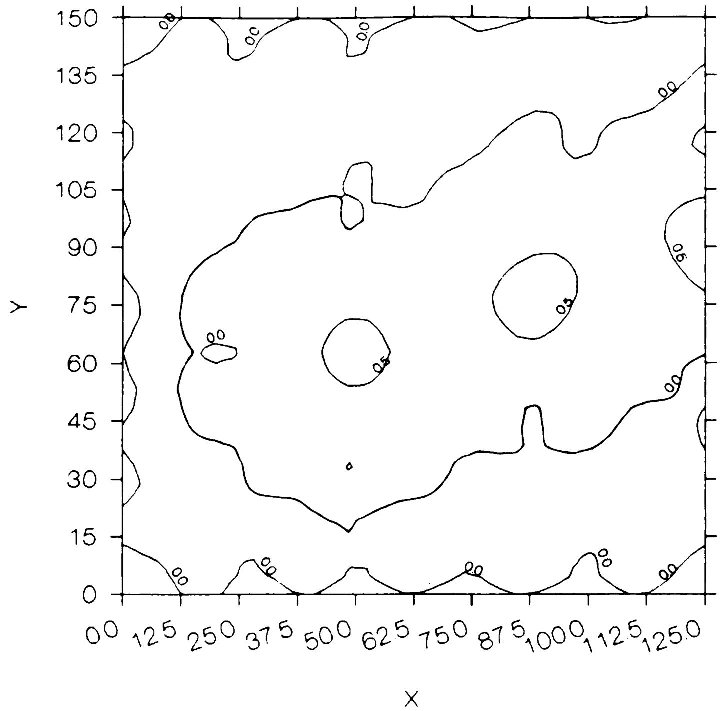
Map 39:
Posthole Contour Map for Burned Coal



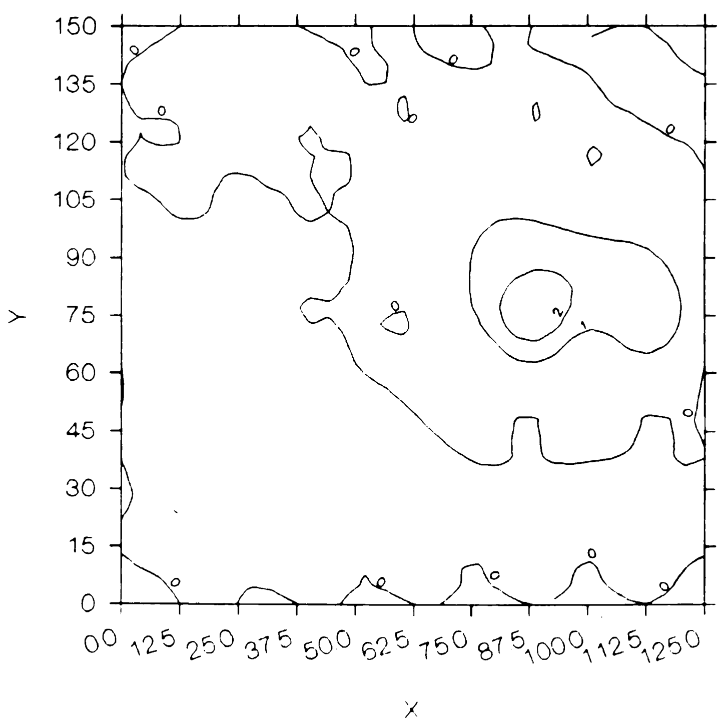
Map 40:
Posthole Contour Map for Unburned Coal



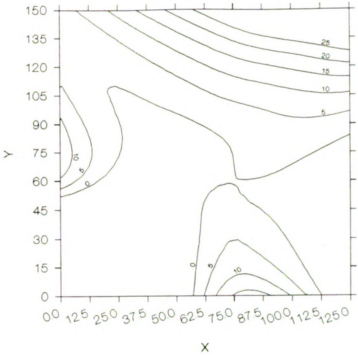
Map 41:
Posthole Contour Map for Chert Flakes



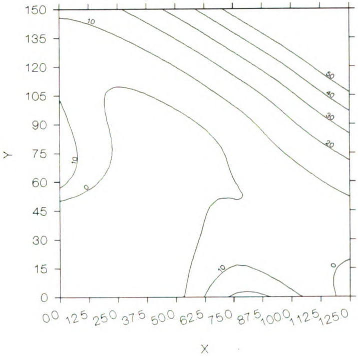
Map 42:
Posthole Contour Map for Square Headed Nails



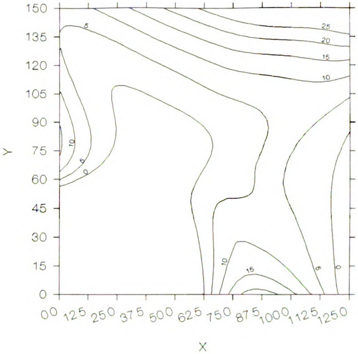
Map 43:
5ft. Unit Contour Map for Wood



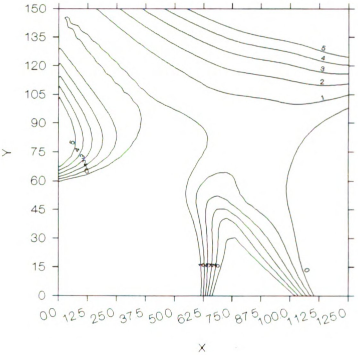
Map 44:
5ft. Unit Contour Map for Square Nails



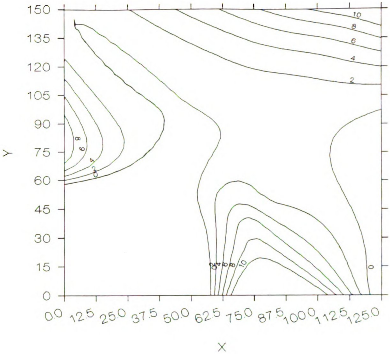
Map 45:
5Ft. Unit Contour Map for Fire Cracked Rock



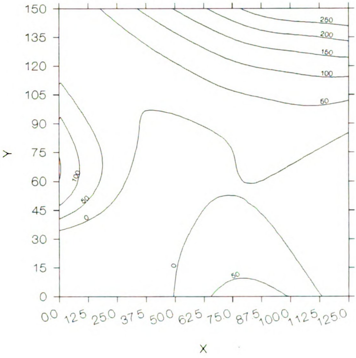
Map 46:
5Ft. Unit Contour Map for Chert Flakes



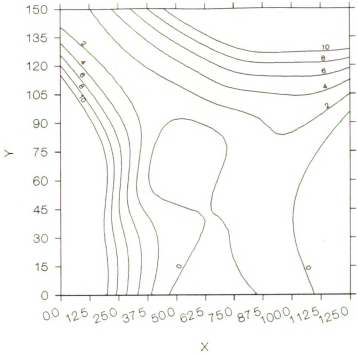
Map 47:
5Ft. Unit Contour Map for Brick



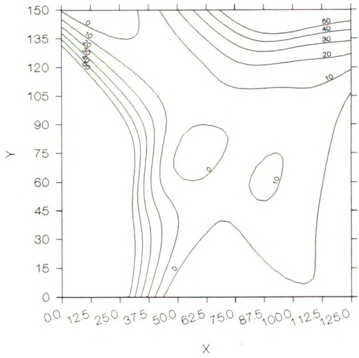
Map 48:
5 Ft. Unit Contour map for Bottle Glass



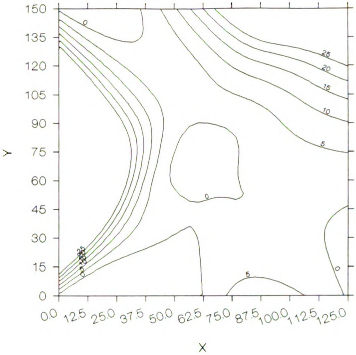
Map 49:
5Ft. Unit Contour Map for Bone



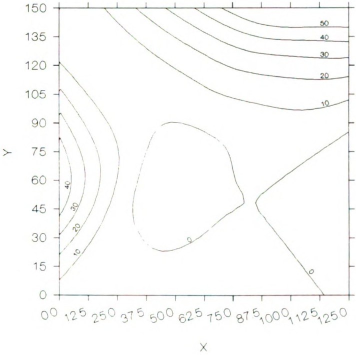
Map 50:
5Ft. Unit Contour Map for Concrete



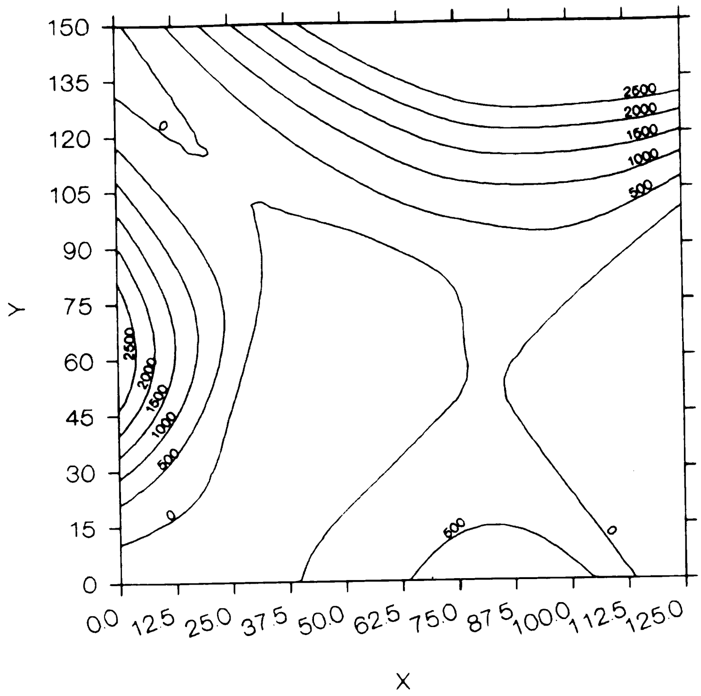
**Map 51:
5Ft. Unit Contour Map for Wire Nails**



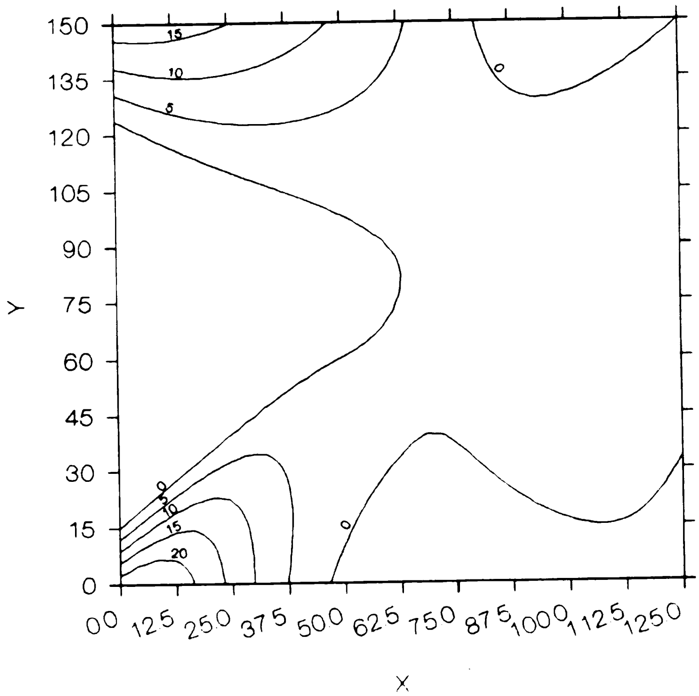
**Map 52:
5Ft. Units Contour Map for Metal**



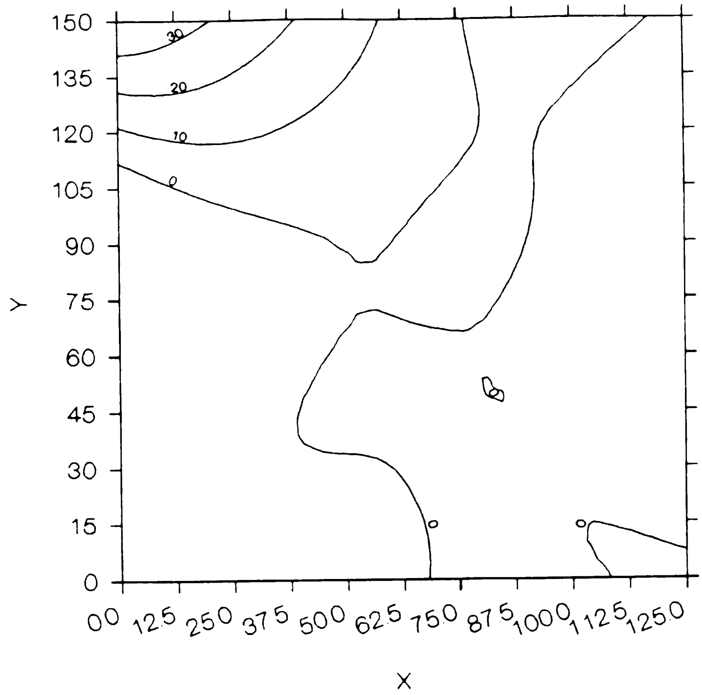
Map 53:
5Ft. Unit Contour Map for Unburned Coal



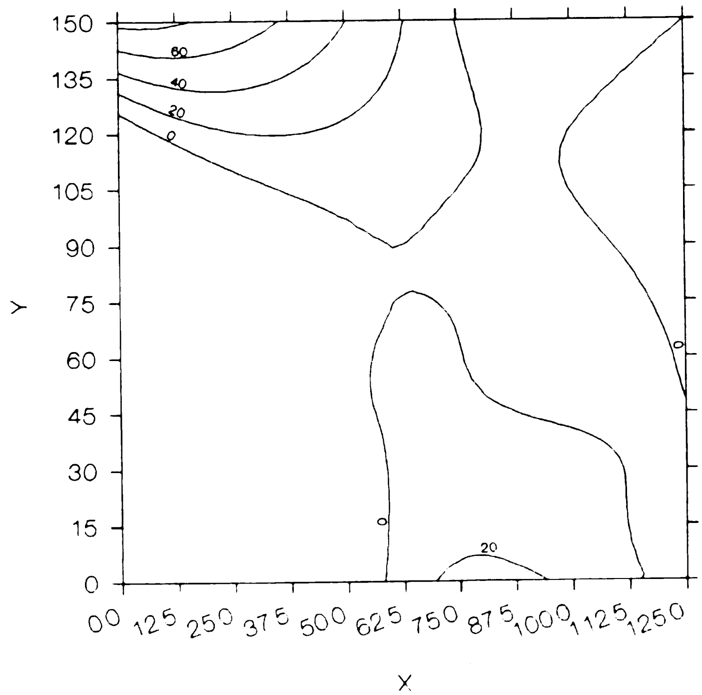
Map 54:
5Ft. Unit Contour Map for Barbed Wire



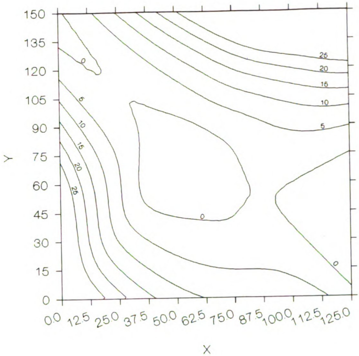
Map 55:
5Ft. Unit Contour Map for Sheet Metal



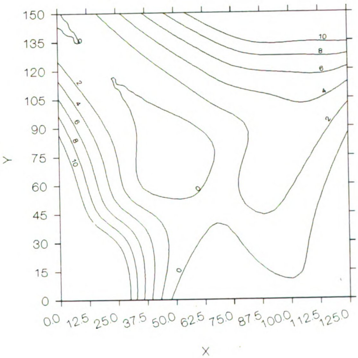
Map 56:
5Ft. Unit Contour Map for Charcoal



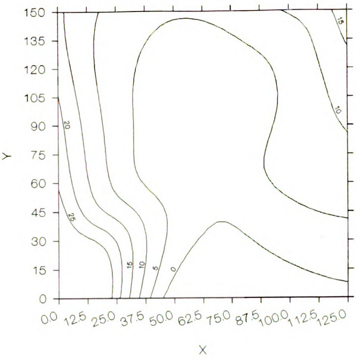
Map 57: 5Ft. Unit Contour Map for Misc. Ceramics



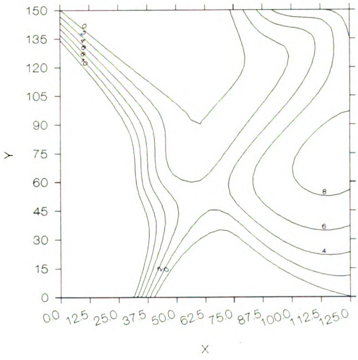
Map 58: 5Ft. Unit Contour Map for Mollusk Shell



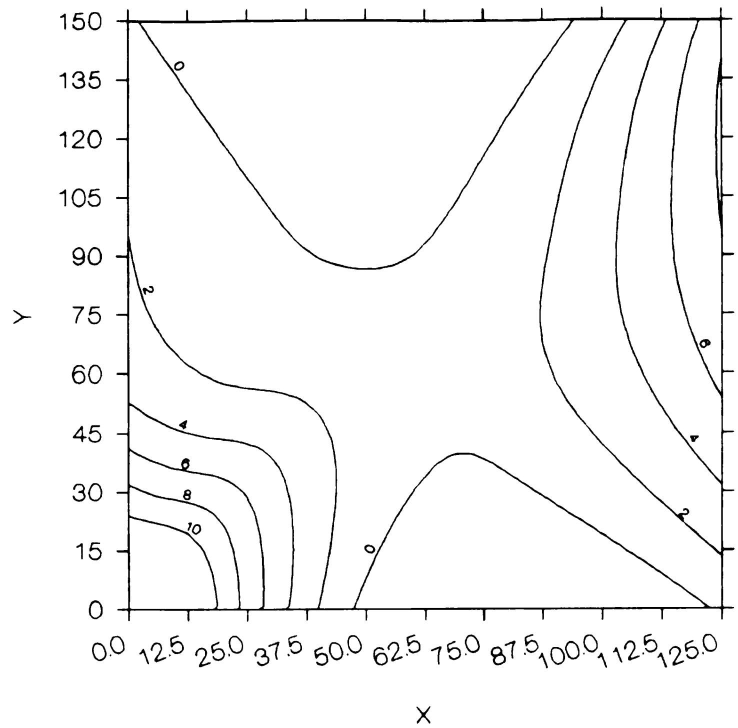
Map 59:
5Ft. Unit Contour Map for Other Artifacts



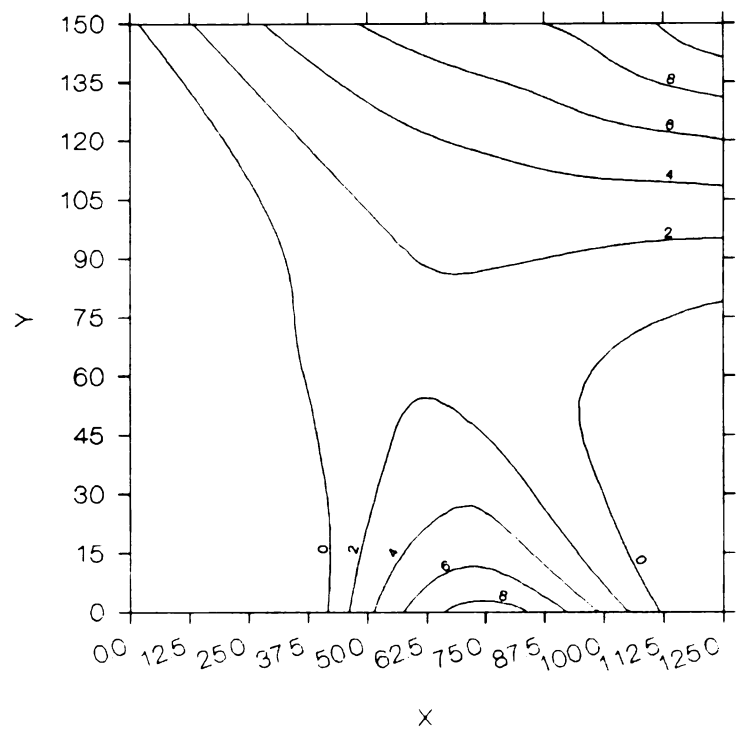
Map 60:
5Ft. Unit Contour Map for Slate



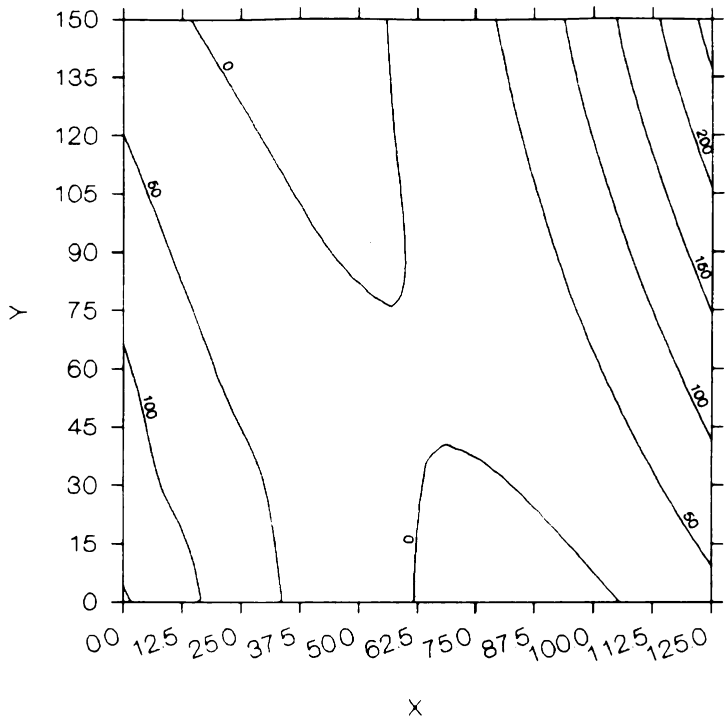
Map 61:
5Ft. Unit Contour Map for Mortar



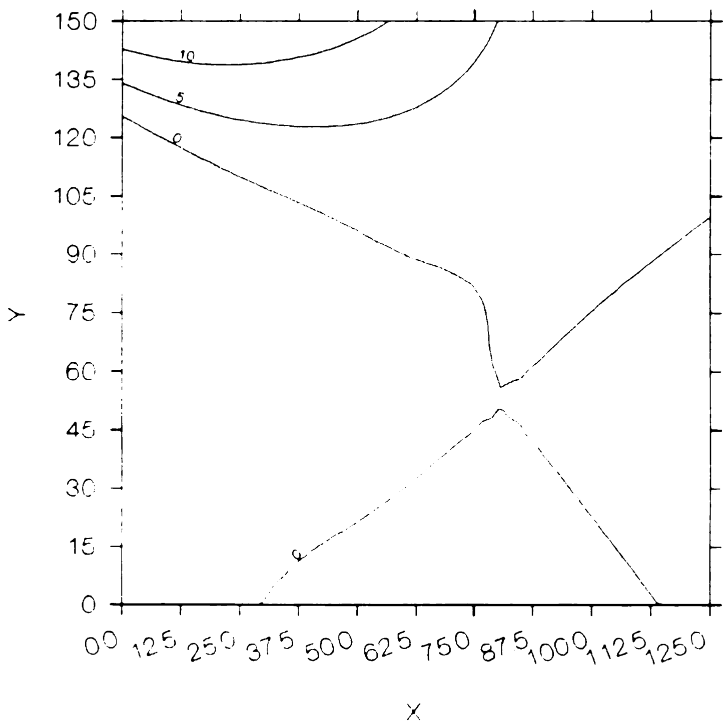
Map 62:
5Ft. Unit Contour Map for Plastic



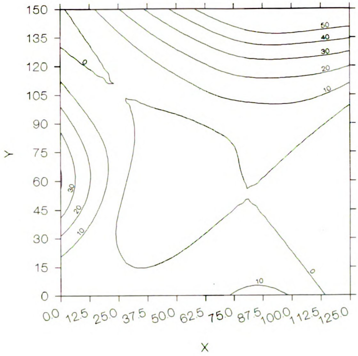
Map 63:
5Ft. Unit Contour Map for Flat Glass



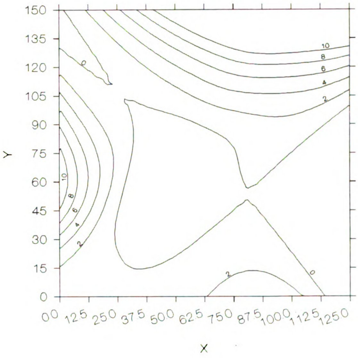
Map 64:
5Ft. Unit Contour Map for Pearl and Transfer Print Ceramics



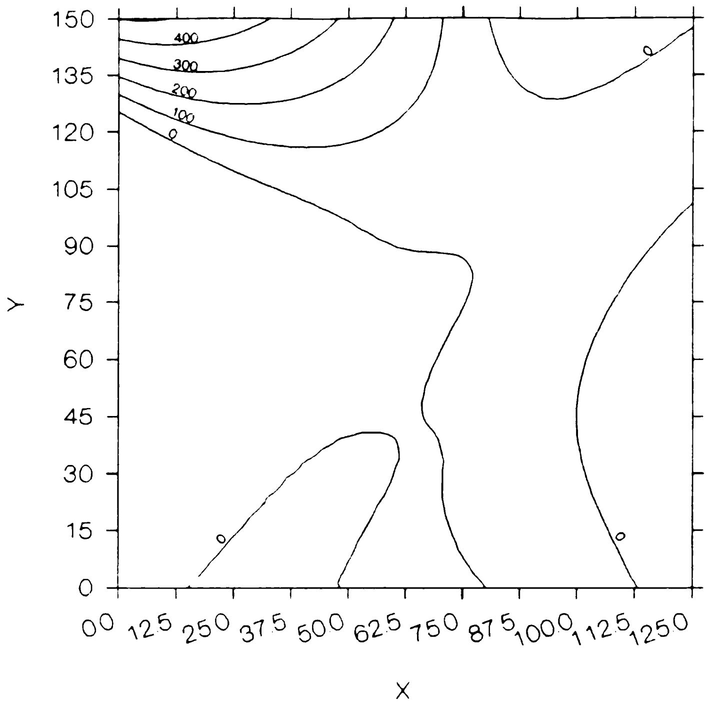
**Map 65:
5Ft. Unit Contour Map for Chalk**



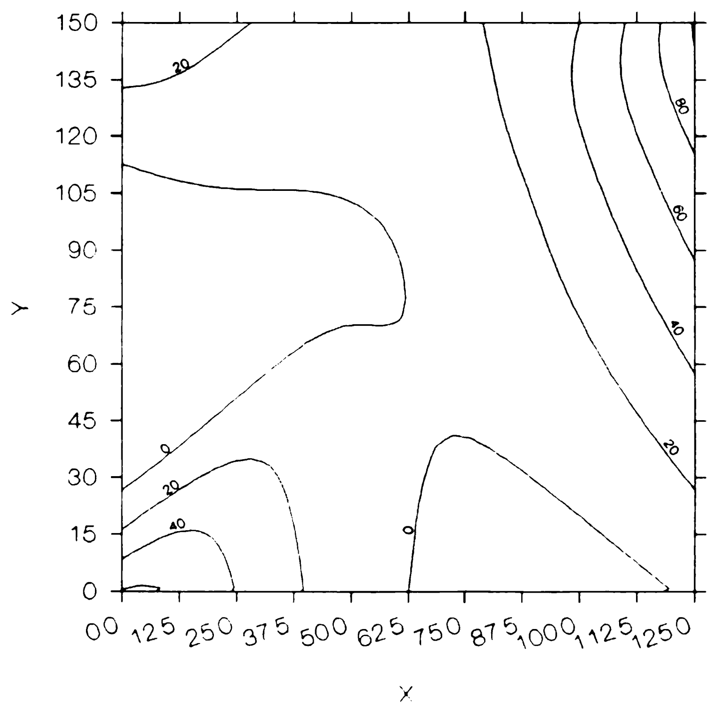
**Map 66:
5Ft. Unit Contour Map for Plaster**



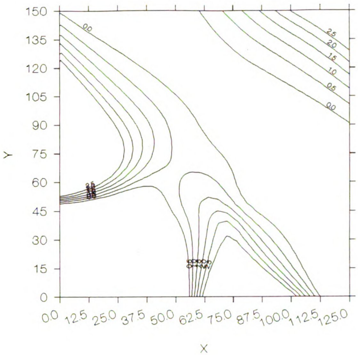
Map 67:
5Ft. Unit Contour Map for Walnut Shells



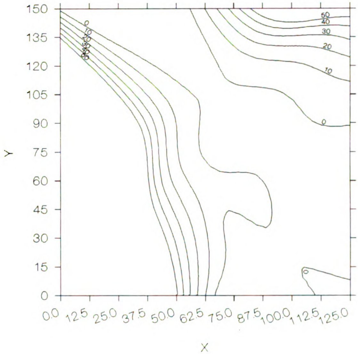
Map 68:
5Ft. Unit Contour Map for Glazed White Ware Ceramic



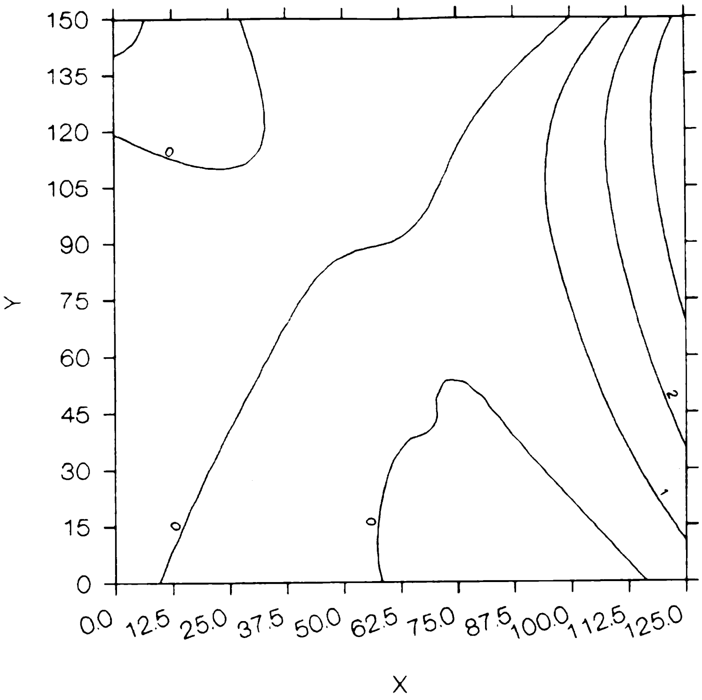
Map 69:
5Ft. Unit Contour Map for Peach Pits



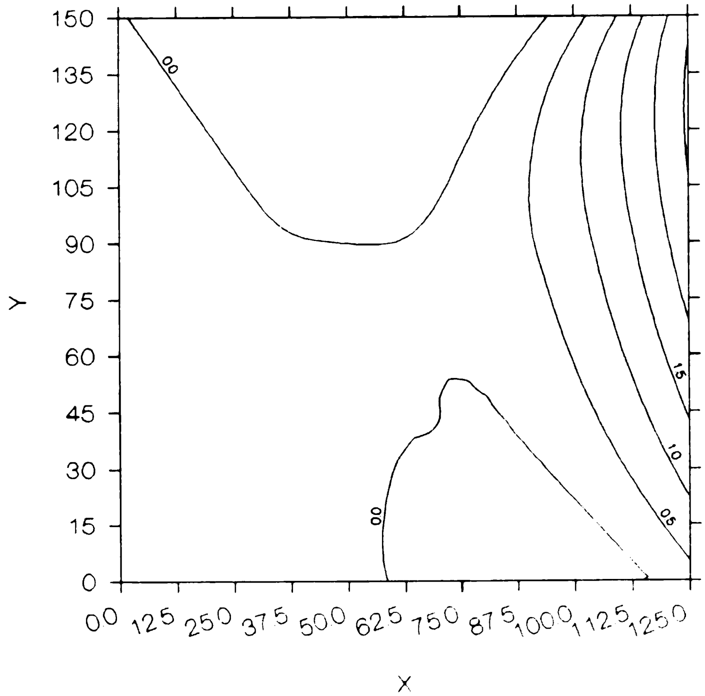
Map 70:
5Ft. Contour Map for Burned Coal



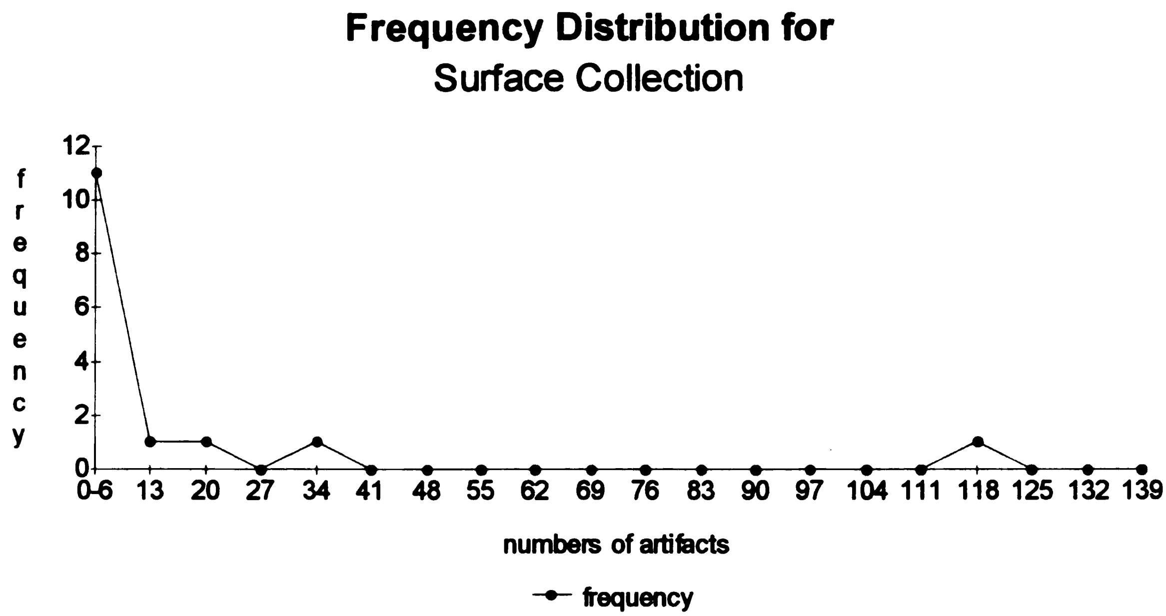
Map 71:
5Ft. Unit Contour Map for Stone Tool Fragments



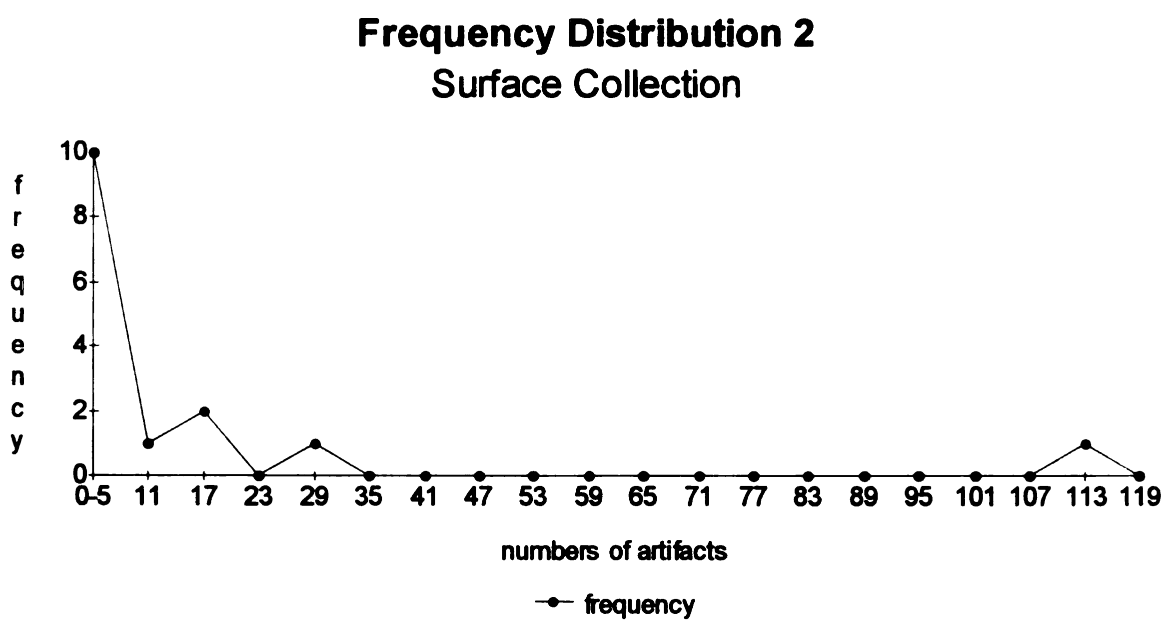
Map 72:
5Ft. Unit Contour Map for Slate Pencils



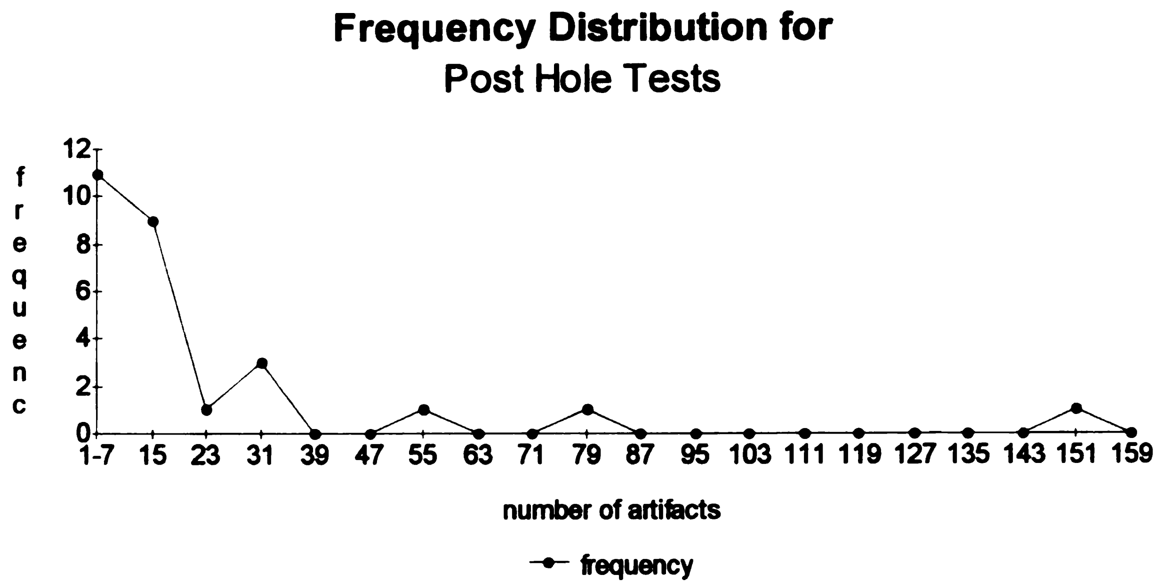
Graph 1:



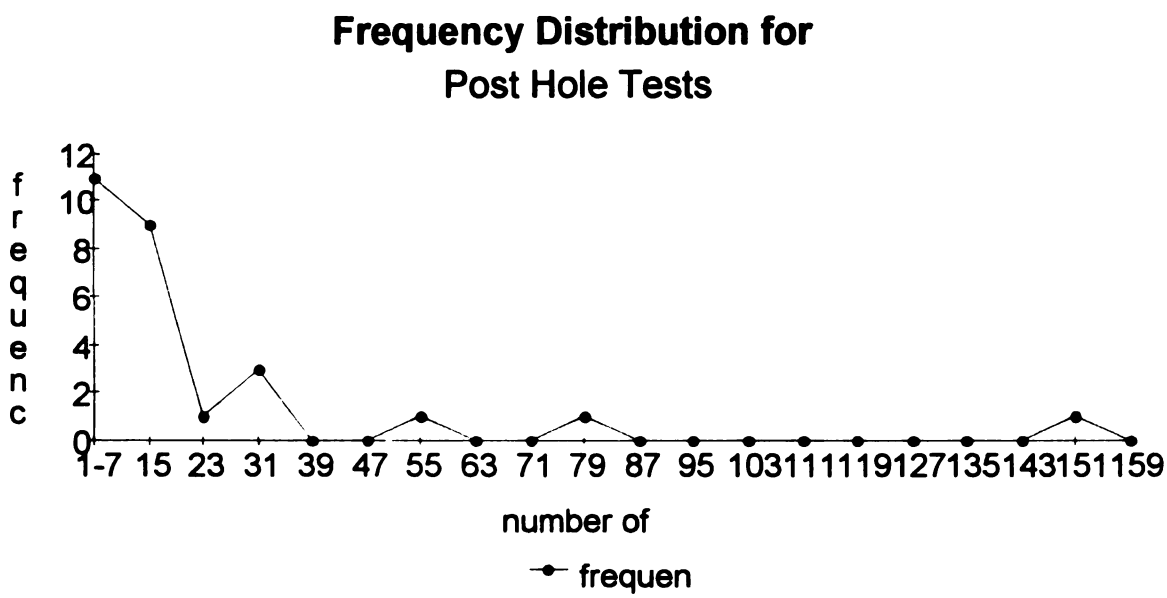
Graph 2:



Graph 3:

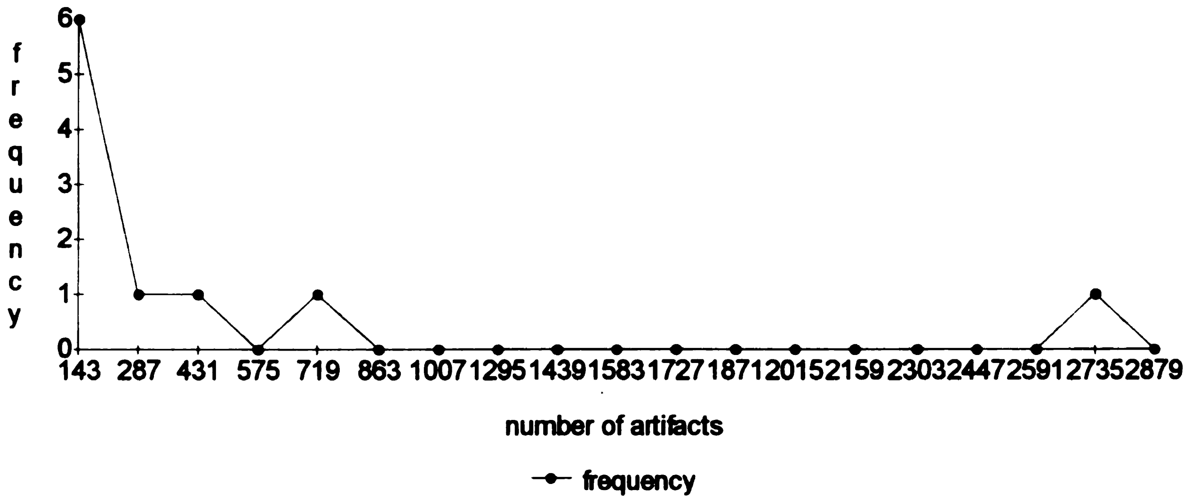


Graph 4:



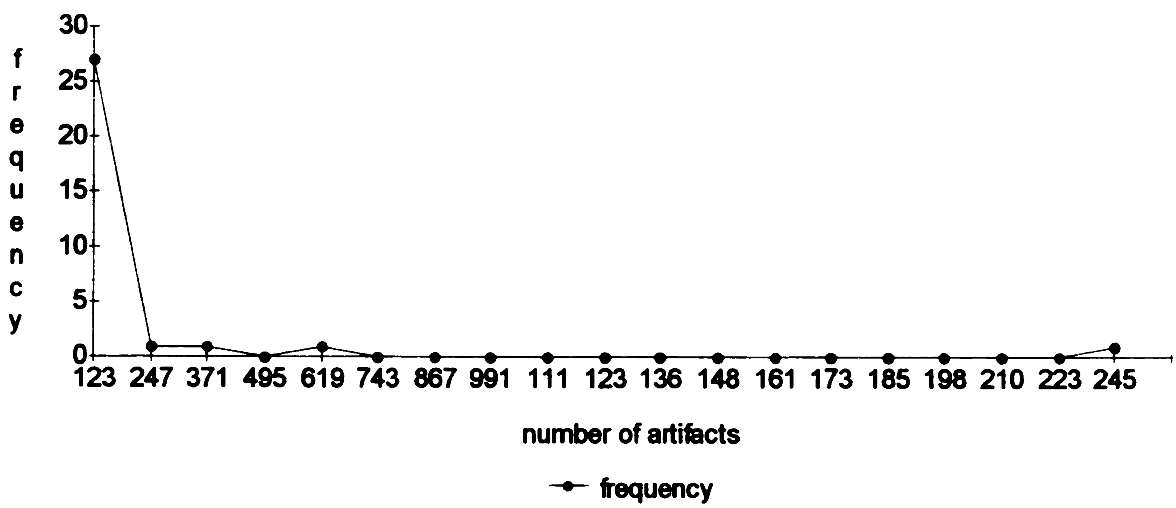
Graph 5:

Frequency Distribution for
5'x5' Test Units

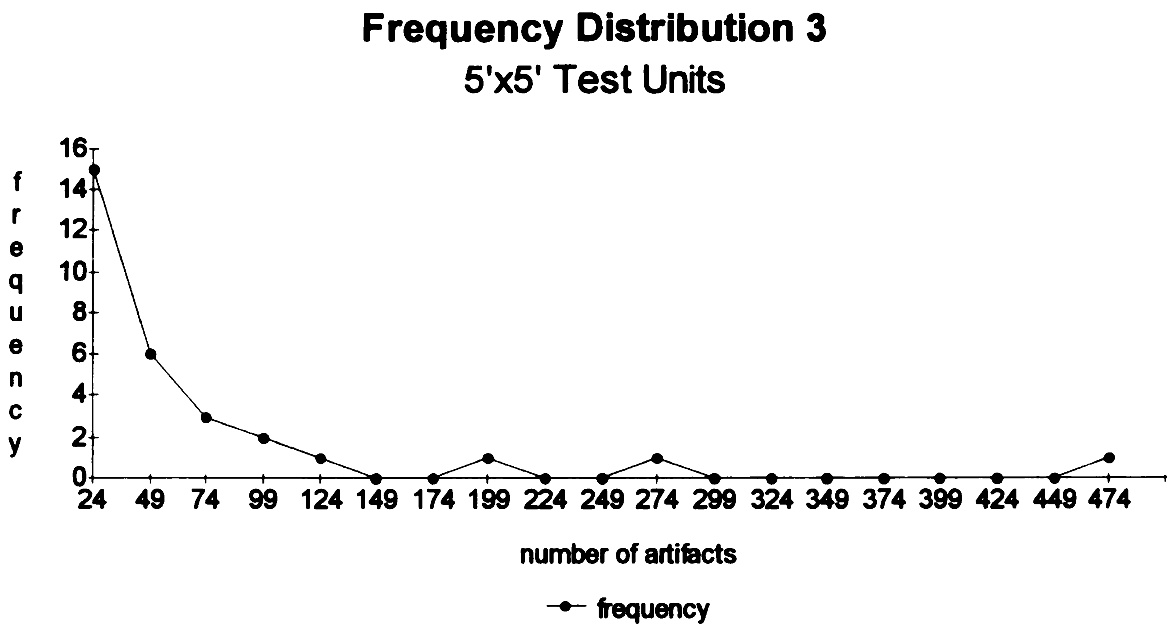


Graph 6:

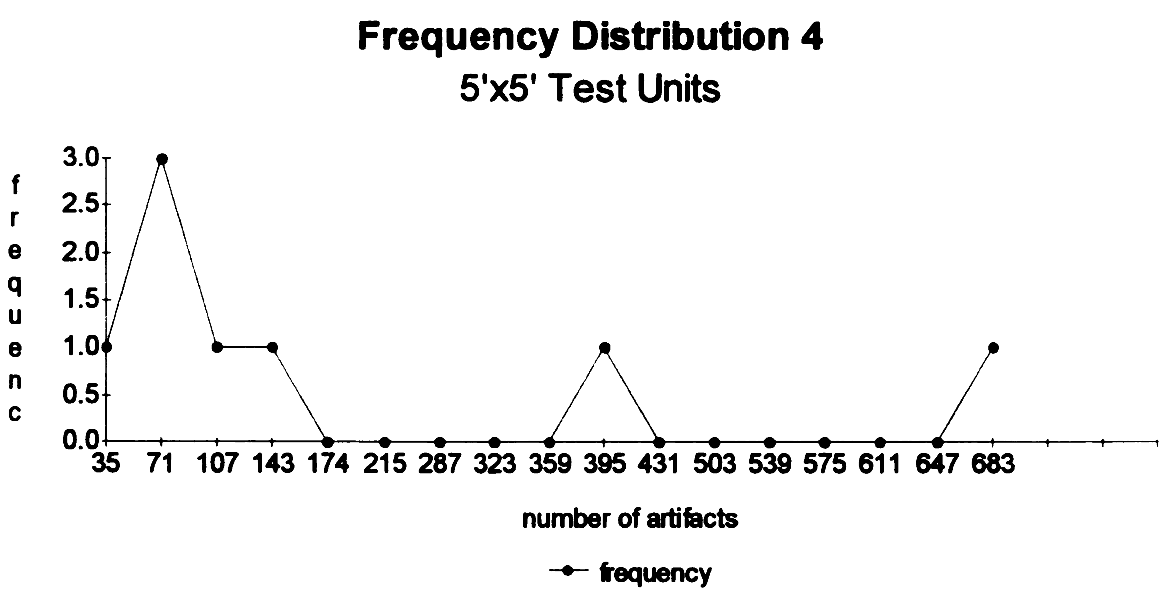
Frequency Distribution 2
5'x5' Test Units



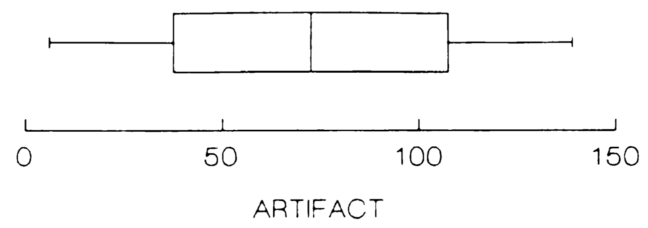
Graph 7:



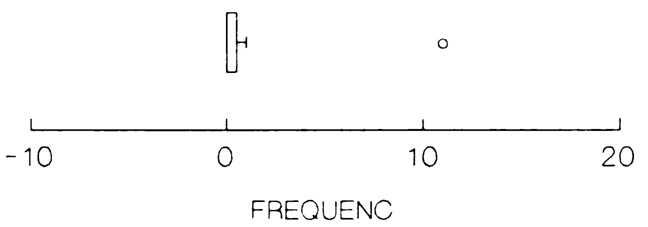
Graph 8:



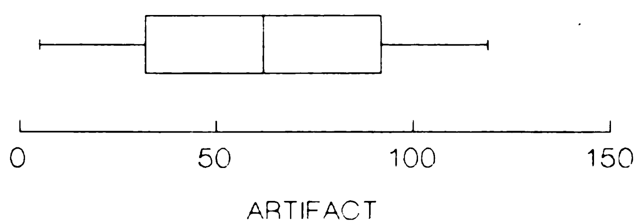
Graph 9: Surface Frequency Distribution 1 Artifacts Box Plot



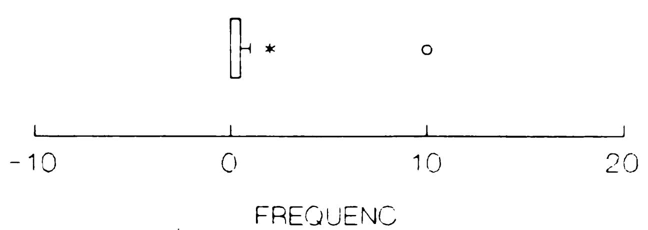
Graph 10: Surface Frequency Distribution 1 Frequency Box Plot



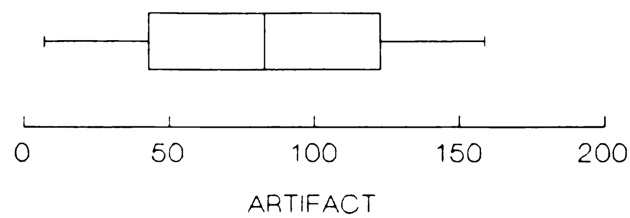
Graph 11: Surface Frequency Distribution 2 Artifacts Box Plot



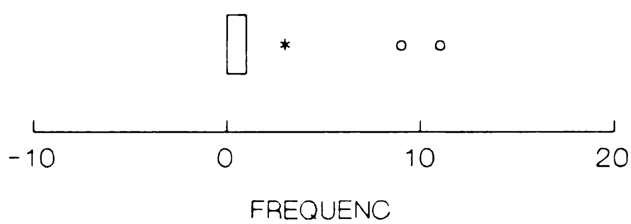
Graph 12: Surface Frequency Distribution 2 Box Plot



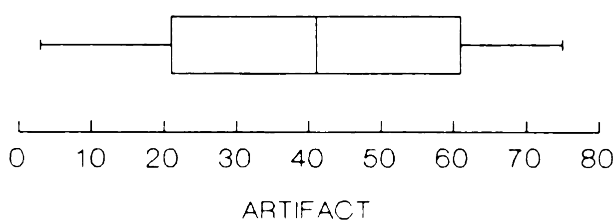
Graph 13: Posthole Frequency Distribution 1 Artifacts Box Plot



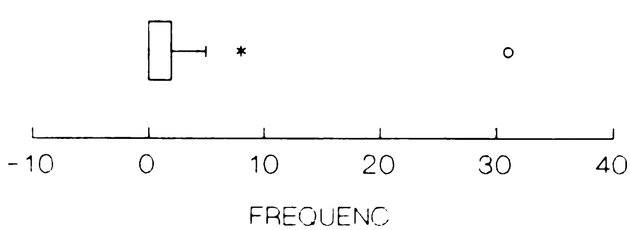
Graph 14: Posthole Frequency Distribution 1 Frequency Box plot



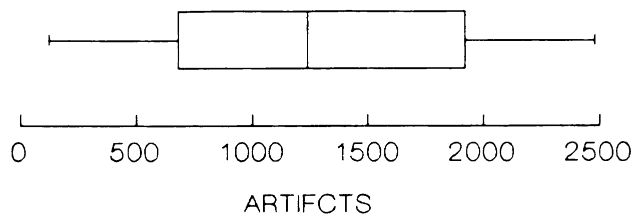
Graph 15: Posthole Frequency Distribution 2 Artifacts Box Plot



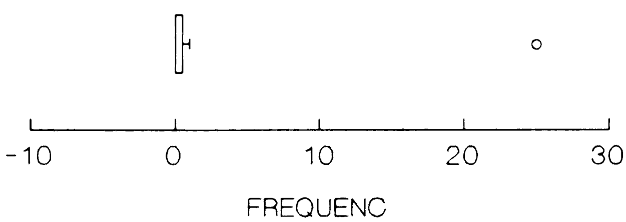
Graph 16: Posthole Frequency Distribution 2 Frequency Box Plot



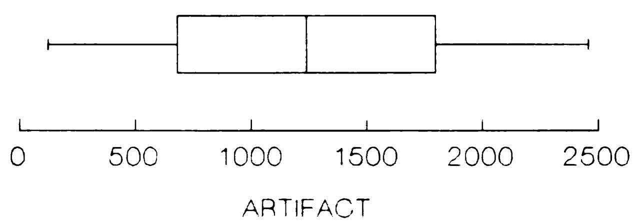
Graph 17: 5Ft.Units Frequency Distribution 1 Artifacts Box Plot



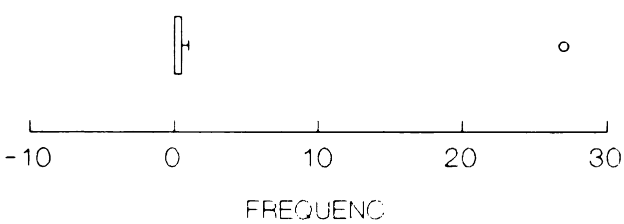
Graph 18: 5Ft. Units Frequency Distribution 1 Frequency Box Plot



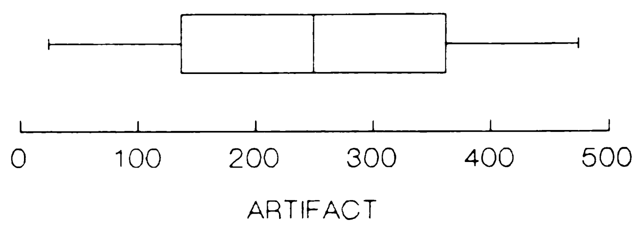
Graph 19: 5Ft. Units Frequency Distribution 2 Artifacts Box Plot



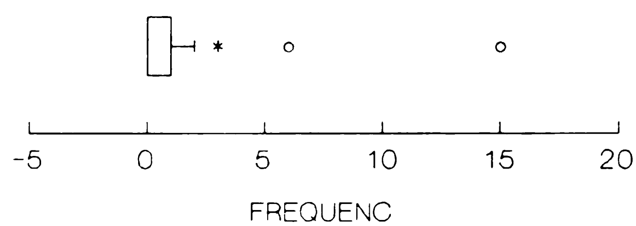
Graph 20: 5Ft. Units Frequency Distribution 2 Frequency Box Plot



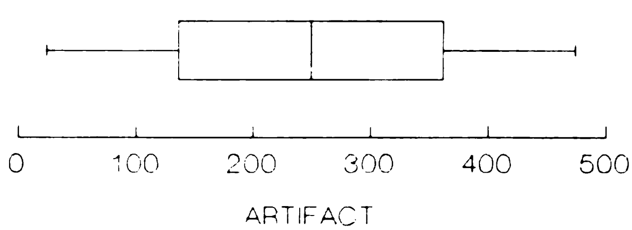
Graph 21: 5Ft. Units Frequency Distribution 3 Artifacts Box Plot



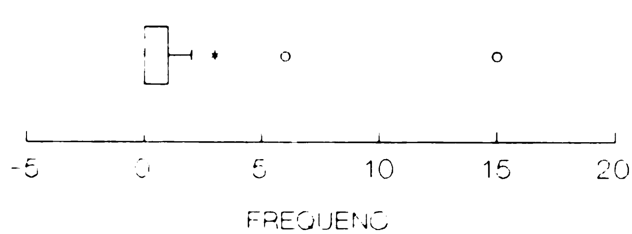
Graph 22: 5Ft. Units Frequency Distribution 3 Frequency Box Plot



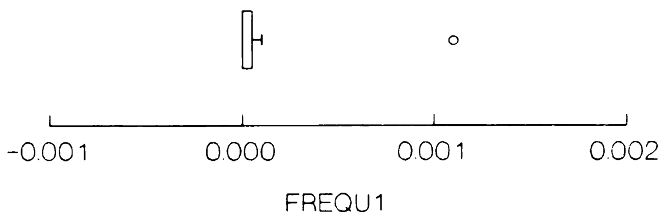
Graph 23: 5Ft. Units Frequency Distribution 4 Artifacts Box Plot



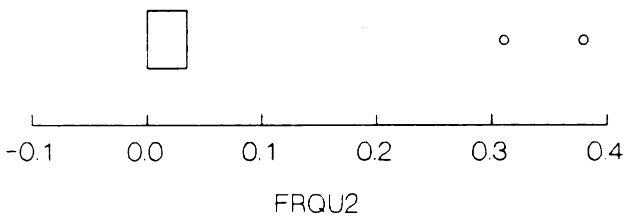
Graph 24: 5 ft. Units Frequency Distribution 4 Frequency Box Plot



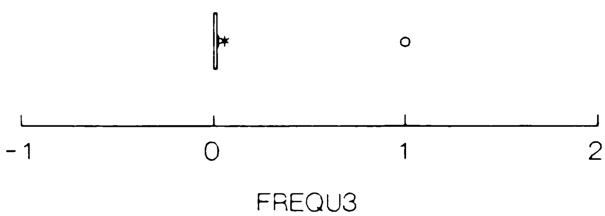
Graph 25: Transformed Surface Collection Frequency Distribution Box Plot



Graph 26: Transformed Posthole Frequency Distribution Box Plot



Graph 27: Transformed 5Ft. Units Frequency Distribution Box Plot



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