

Inventory of Essential Facilities in
Memphis, Tennessee,
St. Louis, Missouri, and
Charleston, South Carolina

By

Joseph E. Dove, Research Professor
Department of Civil and Environmental Engineering
Virginia Polytechnic Institute and State University

(Formerly Research Engineer - Georgia Institute of Technology)

and

James H. Long, Professor
Department of Civil and Environmental Engineering
University of Illinois at Champaign-Urbana

Mid-America Earthquake Center
October 2001

Contents

	Page
1.0 Introduction	
1.1 Purpose and Scope	1
1.2 Methodology	1
1.3 Content and Organization	2
2.0 General Seismicity on the Study Areas	3
2.1 Overall Seismicity	3
2.1.1 Introduction	3
2.1.2 Seismic Hazard in the New Madrid Region	3
2.1.2.1 Memphis, Tennessee	5
2.1.2.2 St. Louis, Missouri	7
2.1.3 Seismic Hazard for Charleston, South Carolina	8
3.0 Inventory of Existing Essential Facilities	12
3.1 Introduction	12
3.1.1 Methodology	12
3.2 Overview of Study Locations and Inventory Data	12
3.2.1 Memphis, Tennessee	12
3.2.2 St. Louis, Missouri	13
3.2.3 Charleston, South Carolina	13
3.3 Results of Inventory in Memphis, Tennessee	14
3.3.1 School Foundations	14
3.3.1.1 Soil Conditions in the Vicinity of Facilities	14
3.3.2 Fire and Police Station Foundations	19
3.3.2.1 Soil Conditions in Vicinity of Facilities	19
3.4 Results of Inventory for St. Louis, Missouri	19
3.4.1 School Foundations	19
3.4.2 Fire Station Foundations	24
3.4.3 Police Station Foundations	24
3.5 Results of Inventory in Charleston, South Carolina	26
3.5.1 School Foundations	26
3.5.1.1 Soil Conditions in Vicinity of Schools	27
3.5.2 Fire and Police Stations	28
3.5.2.1 Soil Conditions in Vicinity of Fire and Police Stations	28
3.6 Summary	33
4.0 References	34

Appendices

Appendix A - Inventory of Essential Facilities in Memphis, TN	A-1
A.1 Building Inventory Sheets for Schools	A-1
A.2 Building Inventory Sheets for Fire Stations	A-23
A.3 Building Inventory Sheets for Police Stations	A-37
Appendix B - Inventory of Essential Facilities in St. Louis, MO	B-1
B.1 Building Inventory Sheets for Schools	B-1
B.2 Building Inventory Sheets for Fire Stations	B-16
B.3 Building Inventory Sheets for Police Stations	B-30
Appendix C - Inventory of Essential Facilities in Charleston, SC	C-1
C.1 Building Inventory Sheets for Schools	C-1
C.2 Building Inventory Sheets for Fire Stations and Police Stations	C-12
Appendix D - Subsurface Conditions in the Vicinity of Essential Facilities	D-1
D.1 - Subsurface Information - Memphis, TN	D-3
D.2 - Subsurface Information - Charleston, SC	D-21

Acknowledgements

The authors thank the following students for their contributions to this guidance document:

Ms. Lois Boxill, M.S., Georgia Tech,
Mr. Tom Hunt, M.S., University of Illinois.
Mr. Boris Leoro, M.S., University of Illinois, and
Ms. Sena Okudzeto, M.S., Georgia Tech.

We also thank the many city and county personnel in Memphis, Tennessee, St. Louis, Missouri, and Charleston, S.C. for access to building records. In Memphis, structural drawings and available soil investigation reports for school buildings were obtained with the assistance of Mr. Bob Harmel, Chief Draftsman of the Memphis City Schools Facilities Planning Office. Access to available drawings for the fire and police stations in Memphis was provided by Mr. Mel Scheuerman, Administrator, and Mr. M.D. Manning, Project Manager, of the City of Memphis Building Design and Construction office located at City Hall. Messrs. John Donovan and Kim Mellecker, Project Manager and Senior Construction Manager, respectively of Parsons Fleming, Inc. provided information regarding the current condition of schools in the city of Memphis, and of the facilities structurally modified (i.e. additions, demolition, or reconstruction.).

Data for St. Louis public schools was provided by Mr. Glen Vandelight. Police and fire inventory data were provided by Mr. Paul Sharkey and Mr. Bob Pauly, respectively. Mr. Tom Cooling of URS Corporation provided valuable information on soil conditions in the St. Louis area.

In Charleston, access to drawings for the schools was provided by Mr. Tommy Townsend, Archives and Records Officer of the Facilities Planning Office at the Charleston City School District headquarters. Access to the available drawings for the fire and police stations were provided by Mr. Matt Compton, Manager of the Charleston Department of Parks. Boring logs used to assess soil conditions in the vicinity of essential facilities were provided from the project files of Soil Consultants, Inc. by their Senior Vice President, Mr. James Duffy.

This project was supported by the National Science Foundation's Mid-America Earthquake Center, by Georgia Tech, and by the University of Illinois under project GT-4, Foundation Remediation for Buildings. This support is gratefully acknowledged.

1.0 INTRODUCTION

1.1 Purpose and Scope

Essential facilities are defined as facilities that must operate after a disaster to support emergency response and disaster management activities. Examples of essential facilities are hospitals, fire stations, police stations, and schools. For instance, in the event of an earthquake, the structural integrity of fire and police stations is required so that response units can execute their assigned tasks in the overall emergency response plan (e.g. search, rescue, evacuation, and maintenance of order). Schools are often used by agencies like the Federal Emergency Management Agency (FEMA) and the Red Cross.

Development of alternative strategies for improving foundation seismic response of existing essential facilities in the central and south eastern United States requires that a study first be made of the existing building inventory. The purpose of this study was to compile a database of foundation and soil condition information for a cross-section of existing essential facilities in the key mid-America population centers of Memphis, Tennessee, St. Louis, Missouri, and Charleston, South Carolina. This information is used to establish a baseline assessment of typical building construction, foundation types and loads. This data was used to develop foundation remediation alternatives most applicable to mid-America building stock.

A companion report (Long and Dove, 2001) is a guidance document to aid consultants, owners, and public officials in selecting comparative strategies for remediation of foundations supporting existing essential facilities. That report provides discussion on both structural and ground modification remedial measures.

The criteria used for rehabilitating essential facilities are that of public health and safety. Typically, buildings are designed using life safety criteria which provides for safe exit from a building, even though the structure is unsafe for long term occupancy and must be demolished. However, for essential facilities, immediate occupancy and operational performance levels are required. These levels mean that limited structural and non-structural damage has occurred and the building can function with limited repair (FEMA-273, 1997). Integrity of the foundation system is critical to overall performance of the building in an earthquake. If design analyses indicate the probable occurrence of foundation failure, a remediation scheme must be implemented.

1.2 Methodology

In order to obtain structural and foundational information for this research effort, assistance from both government archiving and facilities planning offices, and private engineering consulting firms, was required. Inventory data sheets were developed to facilitate data collection. Sheets included entries for building name, address, age, foundation type and size, and subsurface information. Data was collected from readily available drawings and

subsurface reports by students from Georgia Tech and the University of Illinois. When available, information such as existing soil bearing pressures and geotechnical investigation reports was collected.

Foundation type was classified into four categories: strip footings, spread footing, pile foundations and drilled shaft foundations (caissons). In many essential facilities it was difficult to distinguish between structures founded on bearing walls from those founded on strip footings. Therefore, the term "strip footings" encompasses unreinforced and reinforced masonry, stone, or concrete strip footings and bearing walls.

Since foundation type is directly related to building age, an attempt was made to obtain a representative sample of both old and new structures. While the number of facilities that were inventoried may have been as low as 10 percent, a much larger number were reviewed to ensure that a representative sample had been chosen.

1.3 Content and Organization

Chapter 2 provides a brief overview of the seismicity of the study region. This discussion is not exhaustive as many other publications provide detailed treatment. Chapter 3 presents the results of the inventory. Inventories for the facilities presented in this volume were compiled during visits to planning and archiving offices in each city during the months of March, April, and May 1999. Copies of the inventory sheets are provided in Appendices A, B, and C for Memphis, St. Louis and Charleston, respectively. Appendix D contains a summary of available subsurface information collected at the essential facilities inventoried.

2.0 GENERAL SEISMICITY IN THE STUDY AREAS

2.1 Overall Seismicity

2.1.1 Introduction

The seismic events in the New Madrid and Charleston, SC Seismic Zones demonstrated the potential for generation of earthquakes with large surface wave (M_s) magnitudes and peak surface accelerations. In response to the increasing awareness of the seismic hazards that exist in the mid and eastern U.S. regions, the performance of the foundations of existing buildings located in this area during a seismic event has become of concern. This concern is greatest for facilities that would be required to function in support of post-earthquake emergency response and disaster management activities. These structures are classified as essential facilities. Since the effects of significant seismic loads or the occurrence of liquefaction phenomena were not considered in the design of the vast majority of essential facilities in mid and eastern America, an investigation of methods to improve the seismic performance of the soils beneath the foundations of these buildings is required.

2.1.2 Seismic Hazard in the New Madrid Region

The seismicity of the central United States is dominated by the large earthquakes that occurred in the Mississippi River Valley between 1811 and 1812 in much the same way that the seismicity of the southeastern United States is dominated by the Charleston earthquake of 1886. Exclusive of Alaska, these earthquakes that occurred in the Mississippi Valley rank as the largest known shocks in North America in recent recorded history. This sequence of seismic events began with a major earthquake on December 16, 1811 of a surface wave magnitude (M_s) of 8.6 and was followed by numerous aftershocks. Two other principal aftershocks occurred on January 23, 1812 ($M_s=8.4$), and on February 7, 1812 ($M_s=8.7$) (Nuttli, 1974).

Figure 2-1 shows an isoseismal map prepared by Nuttli (1981) indicating the extent of influence for the initial shock. Soil liquefaction, regional subsidence, and uplift were widespread with landslides commonly occurring along the banks of rivers. Moreover, a number of the islands in the Mississippi River disappeared. As may be seen on Figure 2-2, most seismic activity occurs to the northwest of Shelby County along an area that has been referred to as the Reelfoot Rift. The areas of high seismic intensity also correlate to where the most significant sand blows and other features associated with liquefaction occurred. The entire area of major seismic activity in this region is commonly called the New Madrid Seismic Zone (NMSZ).

During the 1811 and 1812 earthquakes, masonry and stone structures located as far as 250 km (150 mi.) from this seismic zone were damaged, with chimneys being destroyed in Louisville, Kentucky 400 km (250 mi.) away. Shocks from these earthquakes were also felt as far south as

the Gulf Coast, southeast to the Atlantic, and as far north as Quebec (Algermissen, 1983). According to Nuttli (1974), the epicenter of the first shock in 1811 was located near Marked Tree, Arkansas which is approximately 60 km (38 mi.) from downtown Memphis, and 40 km (25 mi.) from the northeast corner of Shelby County (Figure 2-2). This site was also the epicenter of a 6.5 moment magnitude earthquake in 1843.

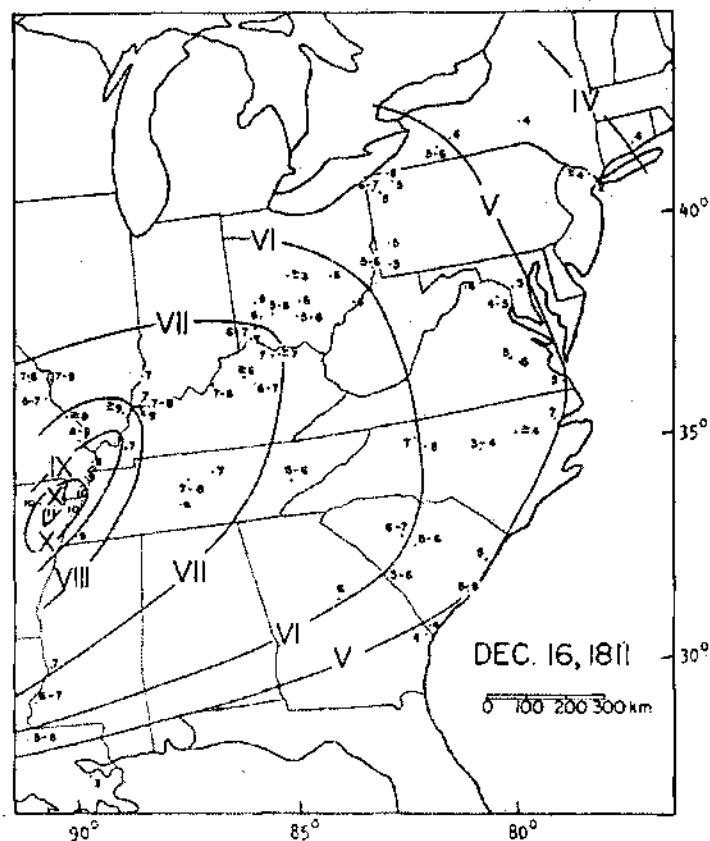


Figure 2-1. Isoseismal map of the December 16, 1811 earthquake in the New Madrid seismic zone (after Nuttli, 1981). The Arabic numbers indicate the Modified Mercalli Intensity at each data point.

The third and largest shock that occurred in February 1812 was located approximately 15 km (9.4 mi.) west of the city of New Madrid in Missouri, and thus provided the name used to describe this seismic region (i.e. the NMSZ). The January 23 event was believed to have occurred roughly equidistant between the first and third shocks, but the location of its epicenter is mainly speculation. These major earthquakes and other subsequent ones, though much smaller in magnitude, clearly show that the mid-continental region is capable of generating devastating earthquake ground motions, and that the study of these earthquakes is essential to the reduction of their associated seismic hazards (Obermeier, 1989).

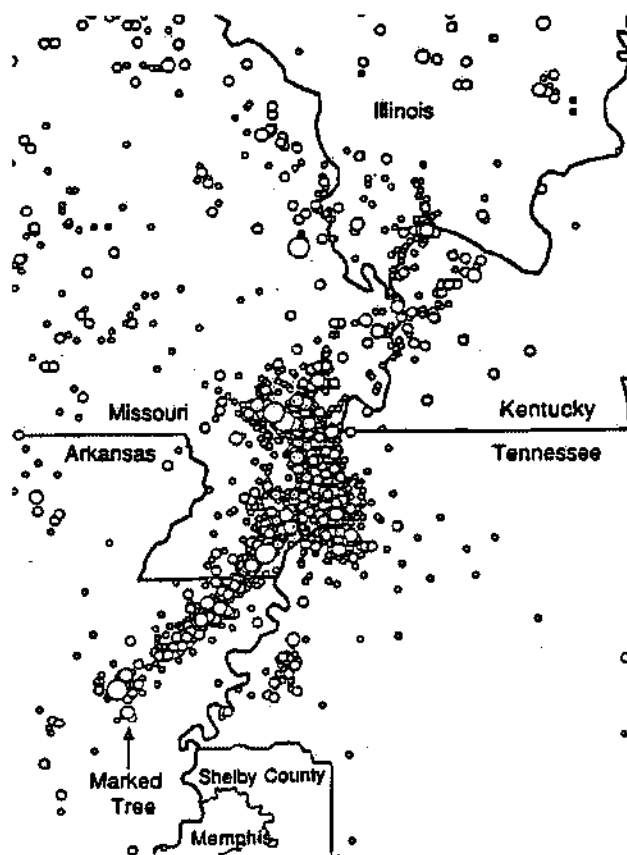


Figure 2-2. Memphis and the New Madrid Seismic Zone (after Hwang et al., 1998).

No surface faults distinctly associated with the 1811-1812 earthquake activity have been identified. This suggests that the large earthquakes originated at depths between 15 and 30 km (9.4 mi. and 19 mi.). Depths greater than about 30 km (19 mi.) for the larger shocks do not seem likely. This conclusion is based on the observation that the larger earthquakes occurring during that time produced a long sequence of aftershocks, which is a characteristic of large shallow earthquakes (Algermissen, 1983). Further evidence that the source of these historic seismic events was shallow is provided in the fact that the focus of many of the small earthquakes of more recent times has been located and is known to occur at depths not exceeding 30 km (19 mi.). Hwang and Huo (1997) used a focal depth of 10 km (6.3 mi) for the development of their attenuation relationships for the NMSZ.

2.1.2.1 Memphis, Tennessee

As may be seen in Figure 2-3, Shelby County, Tennessee is located in the central part of the Mississippi Embayment, which is a syncline that plunges southward along an axis that approximates the course of the Mississippi River. The Paleozoic rock that forms the bedrock floor of the Mississippi Embayment is located about 1000 m (3280 ft) below the surface in the

Shelby county area. As will be further discussed in the following section, the Embayment is filled with sediments of clay, silt, sand, gravel, chalk, and lignite, which range in age from recent times to the Cretaceous period.

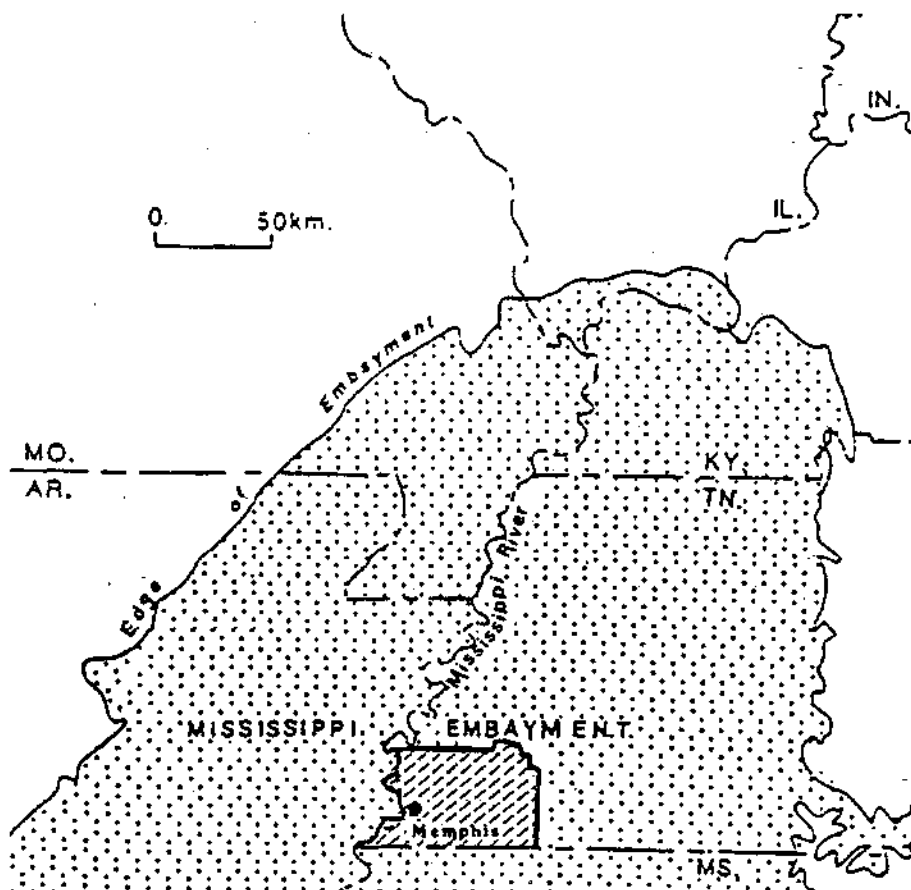


Figure 2-3. Location of Shelby County Within the Mississippi Embayment (after Hwang et al., 1989).

Since the NMSZ is still considered seismically active and is considered by many engineers, seismologists, and public officials to be the most hazardous seismic zone in the central and eastern United States, an evaluation of the performance of the existing foundations and structures in this region is warranted. This is especially important for many of the essential facilities in the region since the design of many of the older structures (i.e. pre 1950's) failed to consider the effects of seismic loading or the occurrence of liquefaction. Discussions with local engineers indicated that almost all structures constructed in Memphis within the last 20 to 25 years are designed to withstand a peak acceleration of 0.2g in general. It should be noted for purposes of comparison that an earthquake of the size of the 1811-1812 events would generate peak accelerations that would easily exceed 0.25g (Nuttli, 1981).

In light of the extensive liquefaction that occurred during the 1811-1812 earthquakes in the region to the northwest of Shelby County, the occurrence of liquefaction was initially of concern in the event of future seismic activity of any significant magnitude. However, as seen on Figure 2-4 produced from the extensive collection and analysis of soil boring logs in the Shelby county region by Hwang et al. (1989, 1999) the regions most likely to be susceptible to the occurrence of liquefaction are located along the western Mississippi river border, and in relatively confined areas on the Loosahatchie and Wolf Rivers, and Nonconnah Creek.

The majority of essential facilities in Memphis are not located in potentially liquefiable and looser alluvial soils (denoted as NEHRP Site Class E). Therefore, for the purpose of investigating the seismic response of essential facilities in Memphis, the effects of strong ground shaking on existing foundations was considered to be of primary importance. Thus, although liquefaction is not a major concern in Shelby county, analysis of the response of the existing foundations is of vital importance since adequate seismic considerations were absent from the structural and foundational designs of many of these essential facilities (especially those constructed prior to 1950). Strong ground shaking can produce overstressing, lateral translation, and uplift of foundation elements.

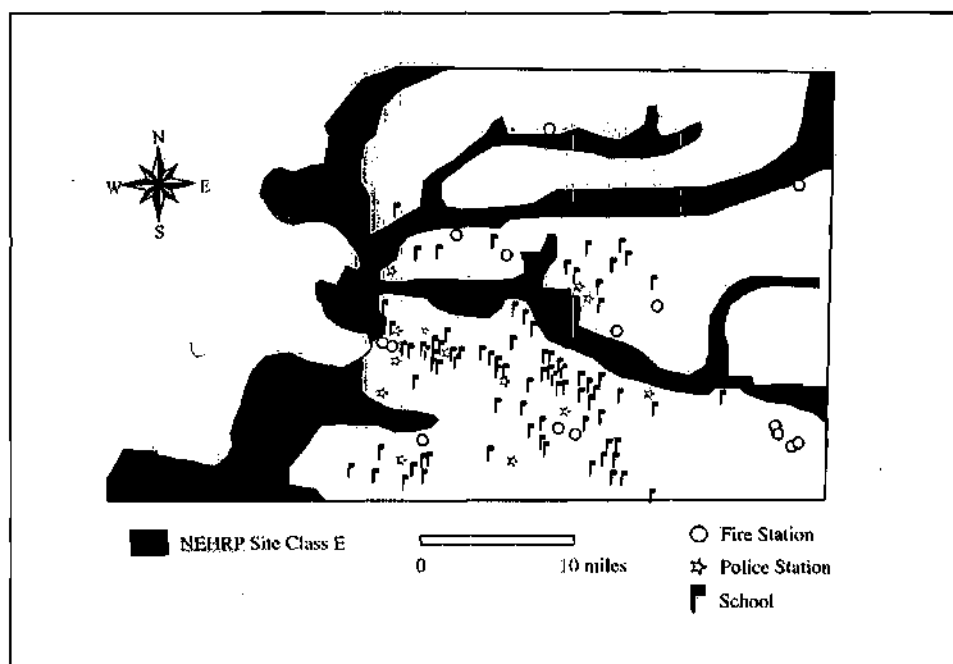


Figure 2-4. Location of Essential Facilities in Shelby County, TN

2.1.2.2 St. Louis, Missouri

Unlike Memphis, an extensive study has not been performed on the subsurface conditions of St. Louis. However correspondence with local engineering companies, along with some soil reports from construction projects of St. Louis schools, provide a general picture of typical soil conditions that would be encountered. The areas of St. Louis that are prone to

liquefaction or amplification of the ground motion are near the Mississippi River and large streams in the St. Louis area. This is due to the thick saturated coarse-grained deposits and soft fine-grained soil deposits located in river basins and former lake basins. Also, structures that are founded on saturated loose uncontrolled fills in the older parts of St. Louis may be susceptible to liquefaction (FEMA, 1990). In downtown St. Louis, liquefiable soils deposited from the Mississippi River extend as far west as Tucker Boulevard (1200W). Structures located in this area may be susceptible to liquefaction if founded on shallow footings. Fortunately, few, if any, essential facilities are located in this region.

2.1.2 Seismic Hazard in Charleston, South Carolina

The reason for seismic activity in this coastal region of the Southeastern continental United States is a much debated and inconclusive area of study. Most agree that the historic seismicity of this region is composed of mostly non-instrumental/felt accounts (Clough and Martin, 1990). Moreover, since the accuracy of locating epicenters for these seismic events depended on population distribution, it is difficult to derive much certainty in the actual location and number of source zones. Any conclusions about the distribution of seismicity in space, time, and size depend strongly on the accuracy and completeness of the database. According to Bollinger (1973), the reporting of earthquakes of intensity V or greater on the Modified Mercalli Intensity (MMI) scale has been fairly consistent since the 1870s.

In South Carolina and Georgia, no Quaternary fault displacements have been recognized, and the seismicity in this region cannot be correlated with any of the well-known major pre-Miocene faults (Lindberg and Harlan, 1988). Although association with some minor inferred faults can be demonstrated, the tectonic significance of these structures is still unknown, therefore leading to much speculation about the responsible seismic-tectonic regime in the Southeastern US.

The Charleston earthquake occurring on August 31, 1886 has been the subject of many research efforts. This earthquake is the largest recorded event in this area and was estimated to be a X on the MMI scale corresponding to a surface wave magnitude (M_s) of approximately 7.7 with a 0.5g to 0.6g peak acceleration. Damage throughout the Charleston region was extensive, however only 60 fatalities were reported. The low number of fatalities is contributed to the low population density, the predominance of single story wood frame houses in the epicentral area, and the timing of the earthquake. Following the earthquake, careful studies were made, with the most well known documentation provided by Dutton (1888), where he noted and others confirmed, the presence of a multitude of sand craters and fissures in the epicentral and surrounding areas. Today, it is quite clear that these observations confirm the occurrence of liquefaction. The first hand accounts further indicated that sand boils and other liquefaction-related ground failures occurred in both natural and "man-made ground" during the 1886 event. However, as was summarized by Martin (1990), the presented evidence suggests that both the magnitude and peak acceleration of the 1886 earthquake were less than the previously proposed values. It was further indicated that for an $M_s=7.5$ event,

peak accelerations in the 0.3g - 0.4g range would produce the observed 1886 liquefaction phenomena.

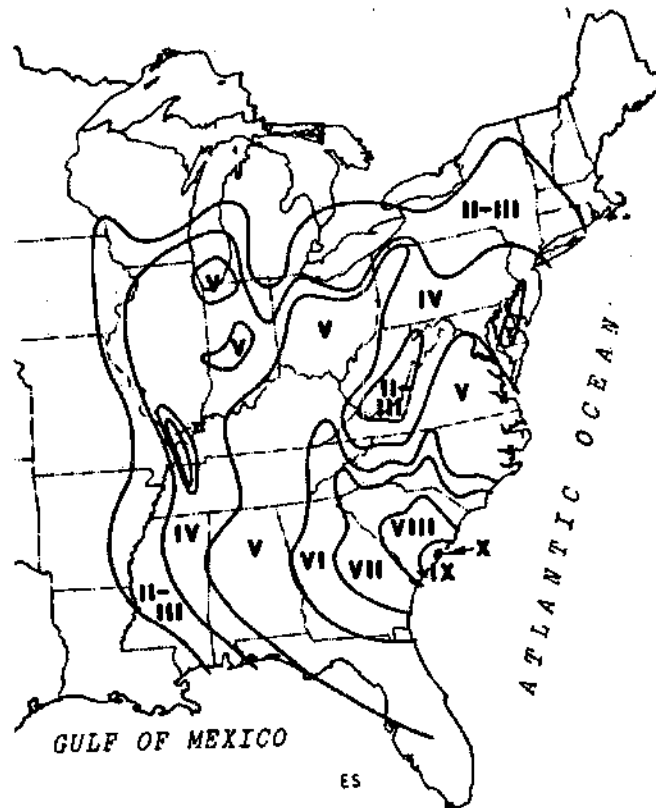


Figure 2-5. Isoseismal Map of the 1886 Earthquake in Charleston, South Carolina (after Bollinger, 1977).

The motions of the 1886 event were felt over a large area of the eastern U.S. as can be seen in Figure 2-5, and were reported to have caused “lamps to sway” in Cuba, and “dishes to topple from shelves” in New York (Dutton, 1888). It was postulated that the epicenter was located near the towns of Summerville and Middle Place, which are approximately 19.2 km (12 mi.) northwest of Charleston, and 29 km (18 mi.) inland from the coast. The relict liquefaction features are located primarily in the sandy and silty soils of two ancient beach ridges that are roughly parallel to the present beach line, with a more limited subset being found in the present beach areas and recent alluvial soils.

The older beach ridge contains soils dating from about 130,000 to 230,000 years, and is approximately 16 km (10 mi.) inland. The second ridge is thought to be about 85,000 years old and lies approximately 8 km (5 mi.) inland. The beach forming processes led to sands and silty soils being concentrated in the highest portions of the beach ridges. It is on the leeward side of these ridges where the water table is the highest and the greatest frequencies of liquefaction features have been found. Located between the crests of the ancient ridges are low, marshy

backbarrier areas composed primarily of organic silts and clays that are typically not subject to liquefaction (Clough and Martin, 1990). According to Martin (1990), many of the soils in these beach ridge deposits remain susceptible to liquefaction at relatively low levels of seismic shaking, even though there is some evidence of progressive densification. Thus, unlike the primarily silty soils in Memphis, the mere presence of these interbedded sands in this region make liquefaction more of a concern in the event of future earthquakes in the Charleston vicinity.

Thus, knowledge of the rate of recurrence of earthquakes in the Charleston area that are large enough to cause liquefaction is refined as more studies are conducted, but according to the work of Obermeier and Weems (1989), the following may be surmised:

1. Earthquake-induced liquefaction has been occurring intermittently for at least the last 30,000 years.
2. The most compelling evidence suggests the recurrence of liquefaction-inducing earthquakes is between 1500 and 1600 years, but recent discoveries can be interpreted to support a recurrence as low as 500 to 600 years.

The seismic hazard has increased due to the expansion of the Charleston peninsula through the use of hydraulic fill and the increased importance of the historic and modern-day port city. More lives and structures are may possibly be adversely affected if an earthquake of any significant magnitude were to occur. In the case of essential facilities, this problem could be of greater significance since most of the structures (especially those constructed prior to 1950) were typically not designed to withstand the effects of strong ground shaking, and the occurrence of liquefaction excluded from foundation design considerations.

Figure 2-6 shows the zones of most probable liquefaction on the Charleston peninsula as determined by Elton and Hadj-Hamou (1990). They indicated that the liquefaction potential for peninsular Charleston ranged from 10 to 62 percent. The likelihood of liquefaction in these areas is due to the presence of primarily loose sands and a high groundwater table.

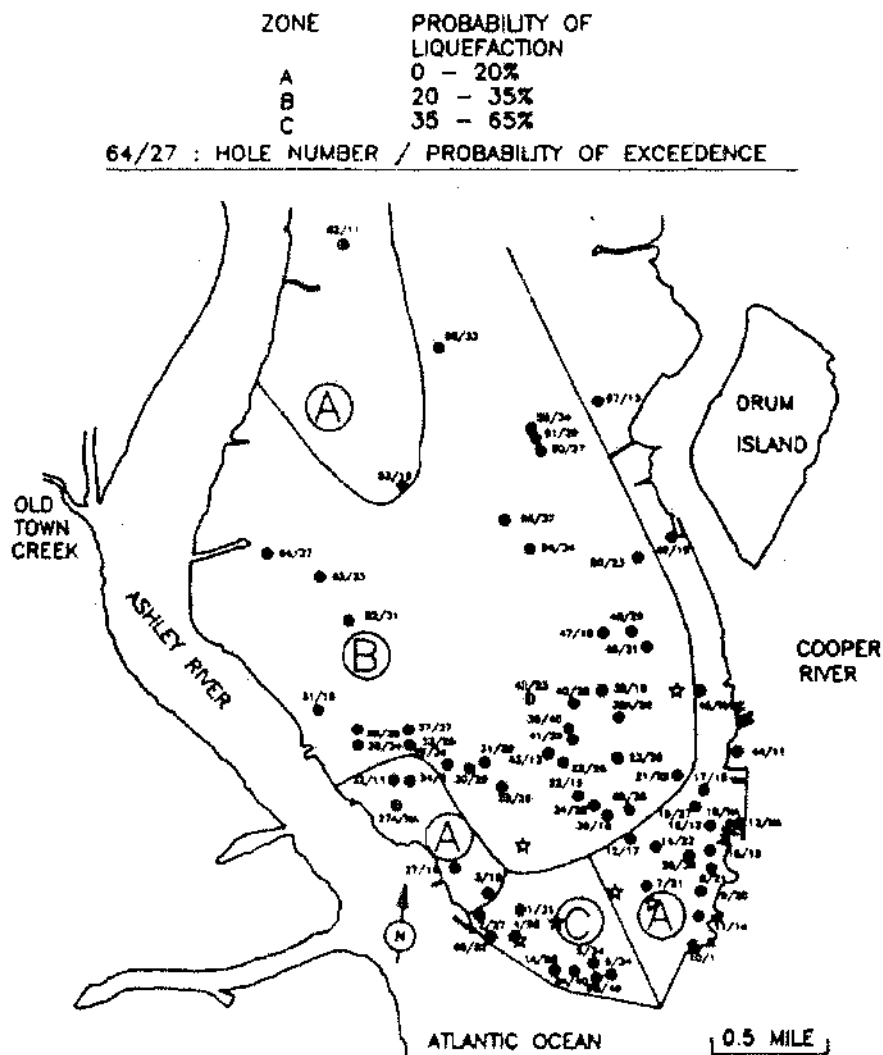


Figure 2-6. Liquefaction Potential Map for the Charleston Peninsula Region: Asterisks indicate sites of liquefaction during the 1886 event (after Elton and Hadj-Hamou, 1990).

3.0 INVENTORY OF EXISTING ESSENTIAL FACILITIES

3.0 Introduction

This chapter presents the results of inventories made of existing essential facilities between February and July, 1999. Investigations to determine typical foundation and soil conditions at schools, fire stations, and police stations in Memphis, Tennessee, St. Louis, Missouri, and Charleston, South Carolina was conducted. The investigations involved multiple site visits with city officials in these cities to record foundation characteristics of the essential facilities. Researchers met with professional engineers and university faculty in each area to supplement information collected on foundation and local subsurface conditions.

3.1.1 Methodology

Information gathered included building name, address, age, foundation type, size, and subsurface conditions. When available, other information such as existing soil bearing pressures and geotechnical investigation reports were collected.

All of the essential facilities in the three cities could not be inventoried because of missing structure and foundation information, and the complexity of locating pertinent information for each structure. Therefore, a target number of 20 structures for each category (school, police station, fire station) was chosen to provide sufficient data to be statistically representative. This target number was not achieved in some cases and a smaller data base was used. Since foundation type is directly related to building age, an attempt was made to obtain a representative sample of both old and new structures. Footing types were classified into four categories: strip footings, spread footings, piles and drilled shafts. In many essential facilities it was difficult to distinguish between structures founded on bearing walls from those founded on strip footings. Therefore, the term "strip footings" encompasses unreinforced and reinforced masonry, stone, or concrete strip footings and bearing walls.

3.2 Overview of Study Localities and Inventory Data Collection

3.2.1 Memphis, TN

The City of Memphis is located in Shelby County, which is located in the southeastern corner of the state of Tennessee. The city was founded in 1819 by three Nashville, Tennessee land speculators, John Overton, James Winchester, and Andrew Jackson, the future 7th President of the United States. It enjoyed a period of growth and prosperity in the 1840's and 1850's after the construction of the Navy shipyard and the Charleston-Memphis Railroad, expanding the booming cotton trade directed through the city. The population had reached 55,000, the sixth largest city in the United States at the time.

For the purpose of this study, only schools, fire stations and police stations in Shelby County, and primarily those within Memphis city limits, were considered. Figure 2-4 in the preceding

chapter provides the spatial distribution of essential facilities throughout Shelby County. The areas on the map designated as Site Class E indicate the presence of alluvial sediments that are primarily found along the banks of the Mississippi River and along the banks of the three primary water courses that flow through the county.

Discussions with local officials indicated that there are presently 162 public schools, 54 fire stations, and 6 police stations in the city of Memphis. Of these facilities, 17 schools, 13 fire stations, and 5 police precincts were inventoried and the results are presented in the subsequent sections of this chapter.

3.2.2 *St. Louis, Missouri*

The City of St. Louis, Missouri was founded in 1763, and incorporated into the State of Missouri in 1822. Throughout the early to mid-1800's, the city grew rapidly. In 1849, a large fire devastated 15 city blocks along the riverfront and destroyed 23 steamboats. While the fire destroyed the City's earliest surviving buildings, which were largely of brick and wood frame construction, it created the opportunity for more substantial rebuilding. Some of the fill material found in downtown St. Louis may be attributed to buildings destroyed in the fire.

The skyscrapers first made their appearance in downtown St. Louis around the early 1890's. Structures over ten stories tall became common with the invention of the elevator. By the 1930's, St. Louis's economy was booming and the population had reached 821,960. However, the depression of the 1930's led to large-scale unemployment and a halt to most building construction. Growth returned in the 1940's, boosted by the WWII generated employment. By 1950, the population had attained another high at 856,796.

Today the population for the city of St. Louis, according to the 1999 Missouri census, is 334,000. The significant decline can be attributed to the movement of residents to the suburbs and the removal of residential areas for transportation networks and urban renewal projects. The overall metropolitan population has continued to show growth, with almost 1 million residents living in St. Louis County in 1999 and 2,569,029 in the entire St. Louis metropolitan area.

There are 105 schools, 30 fire stations, and 25 police stations located in the St. Louis city limits. Of these, 11 schools, 15 fire stations, and 6 police stations were inventoried in detail.

3.2.3 *Charleston, SC*

The historic City of Charleston is located in Charleston County, approximately midway along the South Carolina coastline. Only the schools, fire stations and police stations located within the City of Charleston, South Carolina, were considered. There are a total of 73 schools administered by the school board of the City of Charleston, of which only 7 of the 10 located on the Charleston peninsula (District 20) were inventoried. Of the 15 fire stations located in the city, 9 were inventoried. Because many of the police stations are housed in

buildings that were formerly owned by private businesses, the original owners retained the structural drawings and thus only one of the 5 police stations could be inventoried.

3.3 Results of Inventory in Memphis, Tennessee

3.3.1 School Foundations

The 162 public schools in the city of Memphis incorporate approximately 539 buildings of which 52 percent are unreinforced masonry (URM), 40 percent are reinforced concrete (RC), 6 percent steel (S), and 2 percent wood (W) (see Appendix A for further analysis of the structural types). The types of school foundations include mostly strip footings and spread footings, and occasionally piles or caissons. Most of the school buildings are relatively light structures (less than three stories). The majority of schools in Memphis were built after 1950. For comparison, the majority of schools in St. Louis were constructed before 1950.

Inventories for 20 buildings located at 17 schools were sampled. Figure 3-4 shows their spatial distribution. Tables 3-1 and 3-2 summarize all of the data collected on the inventory sheets found in Appendix A. Soil descriptions found in Table 3-2 were obtained from the boring logs presented in Appendix D.

Of the 20 buildings inventoried, 35 percent were URM, 60 percent RC, and 5 percent steel frame constructed between 1924 and 1979. It should further be noted that all of the RC structures were constructed after 1957, while most URM structures were constructed prior to that year. On average, these facilities were two-story buildings with no significant basement structures.

Most of these structures have a bearing pressure of approximately 125 kPa (2600 psf), and are founded on shallow reinforced isolated column footings with grade beams, or on spread footings (Table 3-1). The average footing depth was 1.2 m (4 ft.). However, in the case of Scenic Hills elementary and Snowden School, deeper reinforced bored piles were used due to the presence of softer surficial soils in these locations (Friels, 1977). The following section provides a more detailed discussion of soil conditions near schools inventoried.

3.3.1.1 Soil Conditions in the Vicinity of Facilities

Soil descriptions were determined from the boring logs presented in Appendix D and are presented in the United Soil Classification System (USCS) format. In general, the upper 6.1 m (20 ft) to 9.1 m (30 ft) of soil at the sites inventoried consist of medium stiff to very stiff clayey silts, and silty clays. These soils were underlain by dense to medium dense silty sands and clayey sands. The average ground water elevation at the locations inventoried exceeded 4.5 m (15 ft). The relatively high water table level at Jackson elementary, Scenic Hills, and Wells Station are believed to be attributed to their proximity to Wolf River.

According to the soils investigation report for the 1979 addition at Snowden school, it was noted that a shallow footing type foundation would not support the structure and would produce settlements exceeding 25 mm (1 in) because of the soft to medium stiff silty clay and clayey silt soil layers near to the surface (Friels, 1977). Thus, at this location, 914 mm (36 in) diameter drilled piers, which would bear on the medium dense to dense gravelly sand present at a depth of 7.5 m to 9.1 m (25 to 30 ft) were recommended and used.

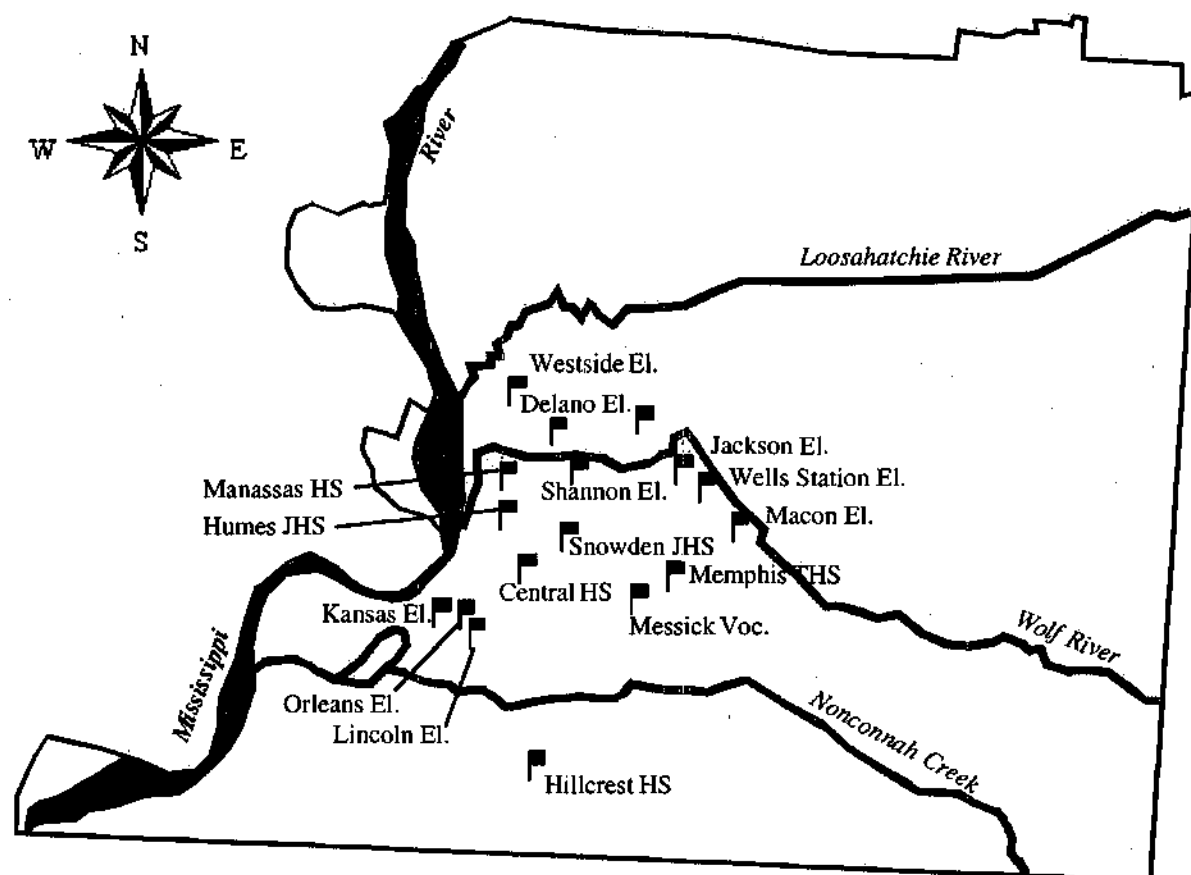


Figure 3-4. Location of Schools Inventoried in Shelby County

Table 3-1. Summary of Inventoried Schools in Shelby County: Superstructural Data

Name	Address	Drawings Available?	Bldg. Type	Year Built	No. of Stories	Floor Area (ft ²)
Central H.S.	306 S. Bellevue Blvd.	Yes	Steel Frame	1949	1	13260
Central H.S.	306 S. Bellevue	Yes	RC	1967	3	126121
Delano Elem.	1716 Delano Rd.	No	RC	1957	2	34000
Hillcrest H.S.	4184 Graceland Dr.	No	RC	1961	2	61150
Humes J.H.S.	659 N. Manassas St.	Yes	URM	1924	3	47326
Humes J.H.S.	659 N. Manassas St.	No	URM	1940	3	32554
Jackson Elem.	3925 Wales Ave.	No	RC	1957	2	33051
¹ Kansas St. Elem.	1353 Kansas St.	Yes	RC	1960	2	13909
Lincoln Elem.	1566 Orleans St.	No	RC	1963	3	46218
Macon Elem.	968 N. Mendenhall Rd.	No	URM	1955	2	33051
Manassas H.S.	781 Firestone Ave.	No	RC	1977	3	6900
Memphis T.H.S.	3294 Poplar Ave.	No	URM	1962	2	33662
Messick Voc. & A.C.	703 S. Greer St.	No	RC	1953	3	12180
Messick Voc. & A.C.	703 S. Greer St.	No	RC (Gym)	1963	1	19590
Orleans Elem.	1400 McMillian St.	No	RC	1965	2	63888
Scenic Hills Elem.	3450 Scenic Hwy.	Yes	RC	1957	2	32168
Shannon Elem.	2248 Shannon Ave.	No	RC	1959	2	54522
Snowden J.H.S.	1870 N. Pkwy	Yes	URM	1979	2	32900
Wells Station Elem.	1610 Wells Station Rd.	No	URM	1953	1	33283
Westside Elem.	3347 Dawn Dr.	No	URM	1956	2	20420

Notes:

1. School will be completely demolished and rebuilt at Kansas St. site under the MCS - Capital Improvement Program (1996-2000)
2. Statistics from Inventory
 No. URM: 7
 No R. C.: 12
 No Steel Frame: 1
3. Subsurface information was available for each structure. See Appendix D for logs of borings.

**Table 3-2. Summary of Inventoried Schools in Shelby County:
Soil and Foundation Conditions**

Name	Foundation Type	Footing Depth (ft)	Bearing Pressure (psf)	Liquefiable Soils Present?	Depth to Water (ft)	Soil Description
Central H.S.	Shallow isolated, square column RC footings tied together with grade beams	3	2000	No	15	0-14ft Stiff (ML-CL); 14-24ft Medium Dense (SM-SC); 24-40ft Medium Dense-Dense (SM)
Central H.S.	Isolated square column RC footings with addit. 5ft of sand fill placed over existing slab (see bsmt. Floor plan)	6	2000	No	15	0-14ft Stiff (ML-CL); 14-24ft Medium Dense (SM-SC); 24-40ft Medium Dense-Dense (SM)
Delano Elem.	Isolated, RC footings	3	1250	Yes	30	0-38ft Medium-Stiff (CL-ML); 38-49ft Medium Dense-Dense (SP); 49-69ft Medium Dense-Stiff (SM-SC-SP); 69-73ft Stiff-Hard (CL)
Hillcrest H.S.	Shallow isolated, square column RC footings	3	2000	No	20	0-32ft Stiff-Very Stiff (CL-ML); 32-45ft Medium Dense (SC)
Humes J.H.S.	Shallow isolated, square column RC footings tied together with grade beams	6	2000	No	25	0-35ft Stiff (CL-SC); 35-70ft Dense-Stiff (SP-CP)
Humes J.H.S.	Shallow isolated, square column RC footings tied together with grade beams	3	2000	No	25	0-35ft Stiff (CL-SC); 35-70ft Dense-Stiff (SP-CP)
Jackson Elem.	Shallow isolated, square column RC footings	2	2000	Yes	3	0-16ft Medium-Stiff (ML)
Kansas St. Elem.	Shallow isolated, square column RC footings	3-13	3000	Yes	34	0-39ft Stiff-Very Stiff (ML-CL); 39-55ft Medium-Very Dense (SM-SC); 55-89ft Dense-Very Dense (SP-SC-GP); 89-135ft Hard (CL)
Lincoln Elem.	Shallow isolated, square column RC footings	3	4000	No	37	0-33ft Medium-Stiff (ML-CL); 33-52ft Medium Dense-Very Dense (SC-SP); 52-61ft Very Dense (SP)
Macon Elem.	Shallow isolated, square column RC footings	2	5000	Yes	17	0-11ft Stiff (ML); 11-19ft Medium Dense (SP-SM); 19-31ft Medium Dense-Dense (SP)
Manassas H.S.	Shallow isolated, square column RC footings	4	2000	No	25	0-23ft Stiff (CL-ML); 23-35ft Medium Dense-Dense (SP-SM)
Memphis T.H.S.	Shallow isolated, square column RC footings	4	2000	No	48	0-30ft Stiff-Very Stiff (CL); 30-39ft Very Stiff (CL); 39-52ft Dense-Very Dense (SP-SM); 52-101ft Dense-Very Dense (SP)

**Table 3-2 (Continued). Summary of Inventoried Schools in Shelby County:
Soil and Foundation Conditions**

Name	Foundation Type	Footings Depth (ft)	Bearing Pressure (psf)	Liquefiable Soils Present?	Depth to Water (ft)	Soil Description
Messick Voc. & A.C.	Shallow isolated, square column RC footings	5	4000	No	40	0-22ft Medium-Stiff (CL-ML); 22-36ft Dense-Very Dense (SC-SM-SP); 36-61ft Dense-Very Dense (SP-GP)
Messick Voc. & A.C.	Shallow isolated, square column RC footings	6	4000	No	40	0-22ft Medium-Stiff (CL-ML); 22-36ft Dense-Very Dense (SC-SM-SP); 36-61ft Dense-Very Dense (SP-GP)
Orleans Elem.	Shallow isolated, square column RC footings	5	2000	No	37	0-25ft Medium-Stiff (ML-CL); 25-52ft Medium Dense-Very Dense (SC-SP); 52-61ft Very Dense (SP)
Scenic Hills Elem.	Reinforced bored piles with belled base (pile detail available)	27	7000	Yes	2	0-4ft (ML); 4-8ft (CL); 8-16ft (ML); 16-24ft (SP); 24-30ft (CH)
Shannon Elem.	Shallow isolated, square column footings (unreinforced)	3	2000	Yes	22	0-22ft Stiff (ML-CL); 22-40ft Medium Dense-Very Dense (SP-GP)
Snowden J.H.S.	Reinforced drilled piers with belled (caisson) base. Top of drilled piers connected by grade beams.	27	7500	No	7-20	0-27ft Medium-Very Stiff (CL-ML); 27-36ft Very Dense (SP-SM)
Wells Station Elem.	Shallow isolated, square column RC footings	4	2000	Yes	3	0-14ft (ML); 14-25ft (SP)
Westside Elem.	Shallow isolated, square column RC footings	4	5000	Yes	15	0-15ft Medium (CL-ML); 15-25ft Medium Stiff (ML); 25-40ft Medium Dense-Dense (SP-SM); 40-55ft Dense (GP-SP); 55-60ft Dense-Very Dense (SM-SP); 60-73ft Very Dense (GP); 73-80ft Very Dense (SM)

Notes:

1. General Footing Type: Isolated concrete footings. Shallow spread footings are located beneath all walls, and grade beams used to tie individual footings together where so indicated.
2. Avg. Bearing Pressure: 2600 psf.
3. Avg. Depth of Shallow Footings: 4 ft.
4. Refer to Appendix D for logs of borings.
5. Basements not present. Below grade boiler rooms located at Kansas St. Elem. (4 ft deep) and Snowden JHS. (10 ft ceiling height).

3.3.2 *Fire and Police Stations in Memphis, TN*

There are 54 fire stations in Memphis where the oldest existing structure still used was constructed in 1958. Of these, the thirteen facilities inventoried are shown on Figure 3-5. Fourteen fire stations were inventoried for a coverage of approximately 25 percent of the structures. The 13 fire stations inventoried were one-story reinforced concrete or steel structures, without basements. They have shallow spread footings with an average bearing pressure of 115 kPa (2400 psf). Occasionally pile foundations were used. Table 3.3 summarizes all of the data collected on the inventory sheets found in Appendix A.

Memphis has 9 main police precinct buildings and an additional 32 police stations throughout the city. Of the 9 precinct buildings, the 5 facilities inventoried are shown on Figure 3-6 and the collected information summarized in Table 3-4. The police precinct buildings were all reinforced concrete structures and were constructed after 1959. With the exception of Central police precinct, which is the police headquarters in the City of Memphis, all of the other precincts were housed in one story buildings without basements, and founded on shallow spread footings with an average depth of 0.6 m (2 ft). All of the police stations inventoried were constructed after 1950, and most were single story.

3.3.2.1 *Soil Conditions in the Vicinity of Facilities*

Since no soil reports could be obtained for the facilities inventoried, their location was cross-referenced with the location of the Class D and Class E site categories previously shown on Figure 2-4. This map suggests that Central Police Precinct is possibly located in potentially liquefiable soils.

3.4 *Results of Inventory in St. Louis, Missouri*

3.4.1 *School Foundations*

There are approximately 105 schools located within the city limits of St. Louis. The types of school foundations include strip footings and spread footings and occasionally piles or drilled piers. This is logical since most of the school buildings are relatively light structures (less than three stories) and located on stiff clay. Since St. Louis is an older city, some of the schools are over 100 years old and the majority (approximately 73 percent) were constructed pre-1950.

An inventory of about 10 percent of the schools, taking representative samples from different decades, shows that almost all of the schools constructed before 1950 used unreinforced strip footings or unreinforced spread footings. In the mid-1950's, the practice of designing new school buildings changed from in-house design by city architects to design by private architects. Design details changed accordingly. For instance, spread and strip footings were tied to columns or bearing walls using reinforcement.

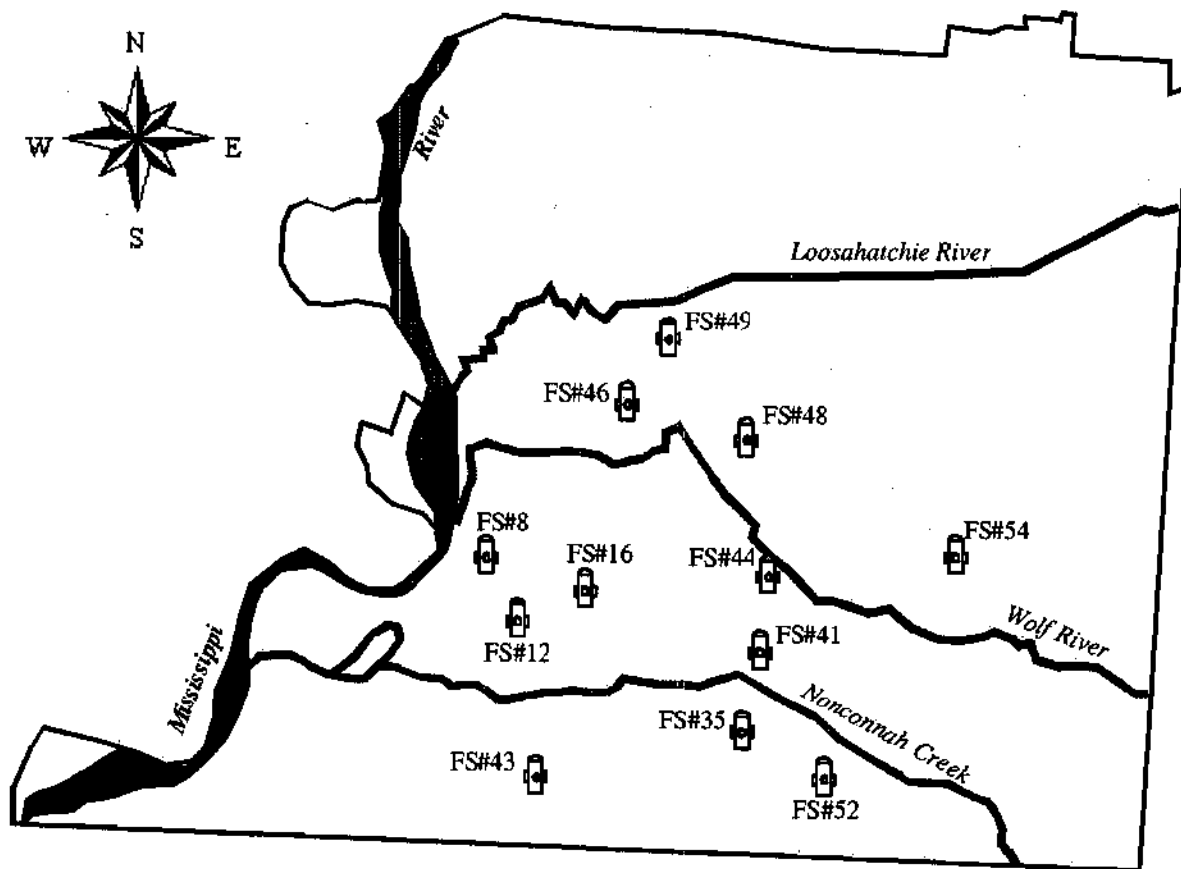


Figure 3-5. Fire Stations Inventoried in Shelby County

Table 3-3. Inventory of Memphis Fire Stations

Fire Station No.	Address	Drawings Available?	Bldg. Type	Year Built	No. of Stories	Foundation Type	Footing Depth (ft)	Bearing Pressure (psf)
8	625 Mississippi Blvd.	No	RC	1974	1	Shallow isolated, square column RC footings	5	2500
12	980 East McLemore Ave.	No	RC	1981	1	Shallow isolated, square column RC footings	2	2000
14	980 East McLemore Ave.	No	RC	1981	1	Shallow isolated, square column RC footings	2	2000
16	1078 E. Parkway South	Yes	RC	1988	1	Shallow isolated, square column RC footings, tied together with RC grade beams running transversely beneath reinforced slab floor	2	2000
35	3305 S. Mendenhall Rd.	No	RC	1965	1	Shallow isolated, square column RC footings	2	4000
41	2161 Ridgeway Rd.	No	RC	1970	1	Steel columns on square column RC footings, with walls placed on RC pads.	3	2500
43	1253 E. Holmes Rd.	No	RC	1958	1	Shallow isolated, square column footings (unreinforced)	2	2000
44	6091 Walnut Grove Rd.	No	Steel Frame	1970	1	Shallow isolated, square column RC footings	3	2000
46	3423 Scenic Hwy.	No	Steel Frame	1970	1	Shallow isolated, square column RC footings	3	2000
48	4985 Raleigh-Lagrange Rd.	Yes	RC	1972	1	Load bearing walls and RC Piles tied together with grade beams	8	2500
49	4351 New Allen Rd.	Yes	RC	1974	1	Load bearing walls, and square column RC footings	2	3000
52	6675 Winchester Rd.	No	RC	1975	1	Slabs turned down over tops of unreinforced square column footings	2	2000
54	599 N. Sanga Rd.	No	Steel Frame	1989	1	Shallow isolated, square column RC footings	2	2500

Notes:

1. General Footing Type: Isolated reinforced concrete footings.
2. No. URM: 0.
3. No. RC: 10.
4. Avg. No of Stories: 1.
5. Yr. Range: 1958-1989.
6. Avg. Bearing Pressure: 2400 psf.
7. Avg. Construction Yr. 1974.
8. Subsurface information was not available for these structures.
9. Liquefiable soils not present.
10. No basements in these structures.

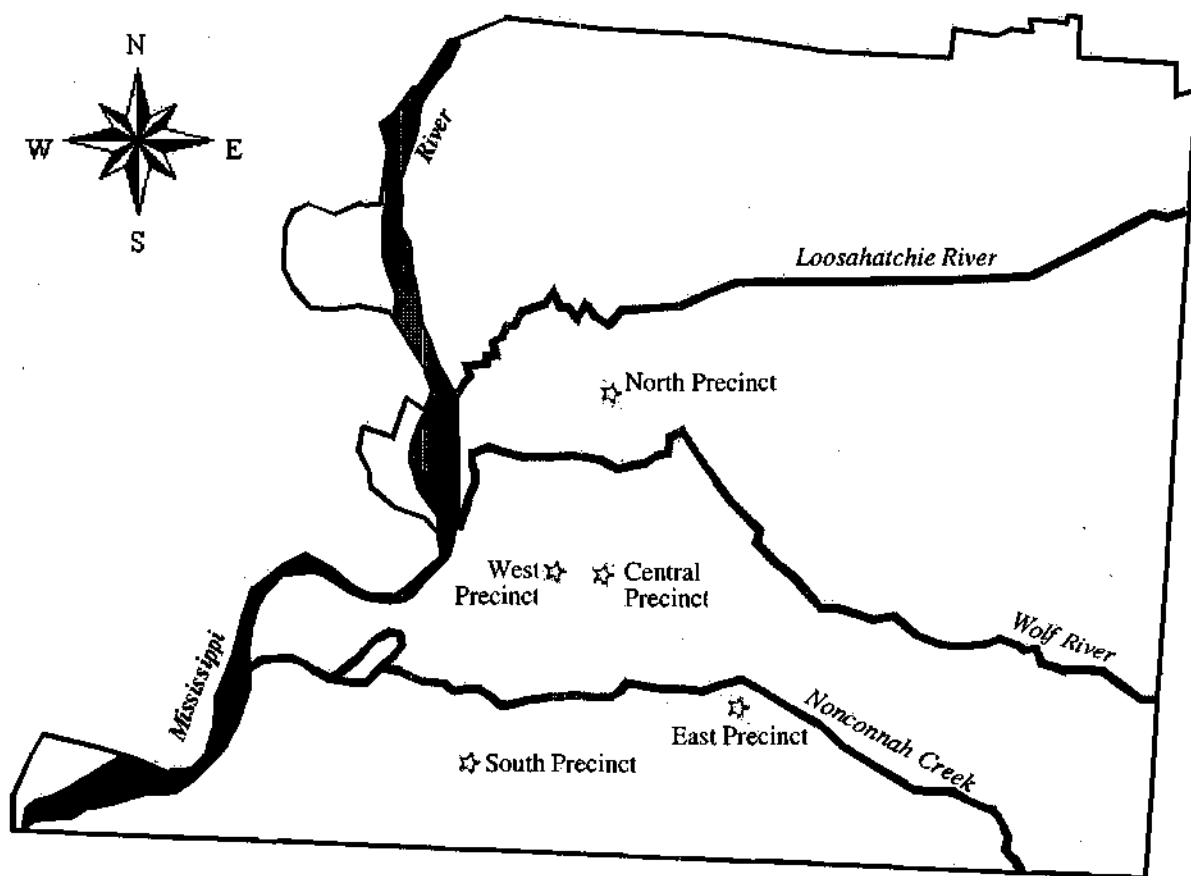


Figure 3-6. Police Stations Inventoried in Shelby County

Table 3-4. Summary of Inventoried Police Stations in Shelby County

Name	Address	Year Built	No. of Stories	Foundation Type ¹	Footing Depth (ft)	Bearing Pressure (psf)	Liquefiable Soils?
North Police Precinct #1	3633 Old Allen Rd.	1975	1	Spread footings running beneath all walls	2	2000	No
South Police Precinct #2	819 E. Raines Rd.	1980	1	Spread footings running beneath all walls supporting slab floor	2	2000	No
East Police Precinct #3	2602 Mt. Moriah Rd.	1979	1	Spread footings running beneath all walls supporting slab floor	2	2000	No
West Police Precinct #4	1925 Union Ave.	1964	1	Spread footings running beneath all walls supporting slab floor	2	2000	No
Central Police Precinct #5	79 South Flicker St.	1959	5	Shallow isolated, square column RC footings	3	3000	Yes

Notes:

1. General Footing Type: Isolated reinforced concrete footings.
2. All structures are reinforced concrete (no. URM or steel frame).
3. Avg. No of Stories: 1.
4. Yr. Range: 1959-1980. Avg. Construction Yr. 1971.
5. Avg. Bearing Pressure: 2000 psf.
6. Avg. Footing Depth 2 ft.
7. Shallow spread footings are located beneath all walls, and grade beams used to tie individual footings together where so indicated.
8. Geotechnical investigation report not available for these structures. Presence of liquefiable soils inferred from cross-referencing building location with available boring log information and liquefaction potential map by Hwang et. al. 1999.
9. No basements in the inventoried structures.

Table 3-5. Summary of Inventoried Schools in St. Louis, MO

Name	Address	Foundation Type	Year Built	No. of Stories
Yeatman Middle	4265 Athlone Ave.	RC strip/RC spread footings	1966	3
Jackson Elementry	1632 Hogan St.	URC strip footings	1899	3
Jackson School - Multi-Purpose Add.	1632 Hogan St.	Drilled shafts	1964	1
Peabody Elementary School	1424 South 14th St.	Concrete piles	1956	3
Shepard Elementary School	3450 Wisconsin Ave.	URC strip footings	1905	2
Lafayette Elementary School	815 Ann Ave.	URC strip footings	1906	3
Webster Middle School	2127 North 11th St.	URC strip footings	1989	2
Webster Middle School - Multi-Purpose Add.	2128 North 11th St.	RC strip footings	1963	1
Clay Elementary School	3820 North 14th St.	URC strip footings	1904	2
Soldan High School	918 North Union Blvd.	URC strip/URC spread footings	1906	3
Roosevelt High School	3230 Hartford Ave.	URC strip/URC spread footings	1922	4
Williams Middle School	3955 St. Ferdinand Ave.	RC strip/RC spread footings	1963	2
Lyon Elementary School	7417 Vermont Ave.	URC strip footings	1910	2

3.4.2 Fire Station Foundations

There are approximately 30 fire stations in St. Louis. Most are two stories high and founded on stiff clay. Strip or spread footings are the common foundation type. Occasionally piles are used in locations where upper soils are relatively weak. An inventory of almost half of the fire stations showed that most of the foundations are unreinforced, especially buildings constructed before the 1950's. The results of the inventory are shown in Table 3-6.

3.4.3 Police Station Foundations

Of the 30-35 police buildings owned by the police in St. Louis, there are 6 primary police buildings that fall within the definition of an essential facility. The main police buildings are the Police Headquarters, the Police Academy, the City Radio Communications Center, and the three Police Substations located in the northwest, central, and south sections of the city. The seven-story Police Headquarters building was constructed in 1927 and is founded on 45

cm (18 in) diameter piles. The Police Academy was also built in 1927 on reinforced concrete piles, approximately 38 to 45 cm (15 to 18 in) diameter and 9.4 m (30 ft) long. There is no reinforcement connecting the piles to the footings.

Table 3-6. Summary of Inventoried Fire Stations in St. Louis, MO

Name	Address	Foundation Type	Year Built	No. Stories
# 5	2123 N. Market	RC Spread/RC Strip Footings	1952	2
# 10	4161 Kennerly	URC Strip Footings	1907	2
# 19	6624 Morganford	URC Spread/URC Strip Footings	1955	2
# 20	5600 Prescott	URC Spread Footings	1959	2
# 23	6500 Michigan	URC Strip Footings	1921	2
# 24	5245 Natural Bridge	URC Strip Footings	1921	2
# 26	4250 Margretta	URC Strip Footings	1916	2
# 27	5435 Partridge	URC Strip Footings	1921	2
# 28	4810 Enright	RC Spread/RC Strip Footings	1959	2
# 30	541 Debaliviere	URC Strip Footings	1956	2
# 33	8300 N. Broadway	URC Strip Footings	1908	2
# 35	5459 Arsenal	URC Strip Footings	1921	2
# 36	5000 S. Kings Hwy.	RC Strip Footings	1926	2

Pre-1986, numerous small police stations located throughout the city existed. However, in the late 1980's, these stations were consolidated into larger substations. The City Radio Communication Center and three substations were all designed using "Special Provisions for Seismic Design," Appendix A of the ACI-318-083 code. The foundations for all three substations were reinforced concrete spread footings. Column reinforcement was tied into the spread footings, but was not spliced to footing base reinforcement. The City Radio Communication Center is three stories high, with no basement. The foundations are designed for bearing pressures of 86.2 kPa (1800 psf) based on the soils report showing moderately firm fine-grained soil. The substations are all one story steel frame buildings with a basement. The buildings were designed for bearing pressures of 120 kPa (2500 psf). The results of the inventory are shown below.

Table 3-7. Inventory of St. Louis Police Stations

Name	Address	Foundation Type	Year Built	No. Stories	Bearing Pressure (psf)
S. Area Command	3157 Sublette Ave.	RC Spread Footings	1988	1	2500
Central Area Command	919 N. Jefferson Ave	RC Spread Footings	1989	1	2500
Northwest Area Command	4014 Union Blvd.	RC Spread Footings	1988	1	1800
Radio Comm. Center	213131313	RC Spread Footings	1986	3	1800
Police Headquarters	1200 Clark	Piles (unknown type)	1927	7	-
Academy (Gymnasium)	315 South Tucker	Piles (RC)	1927	-	-

3.5 Results of Inventory in Charleston, South Carolina

3.5.1 School Foundations

The locations of the 7 District 20 schools (total of 10 buildings) inventoried are shown on Figure 3-7. Tables 3-8 and 3-9 summarize all of the data collected on the inventory sheets found in Appendix C. It should also be noted that the soil descriptions presented in Table 3-9 were obtained from the boring logs presented in Appendix D.

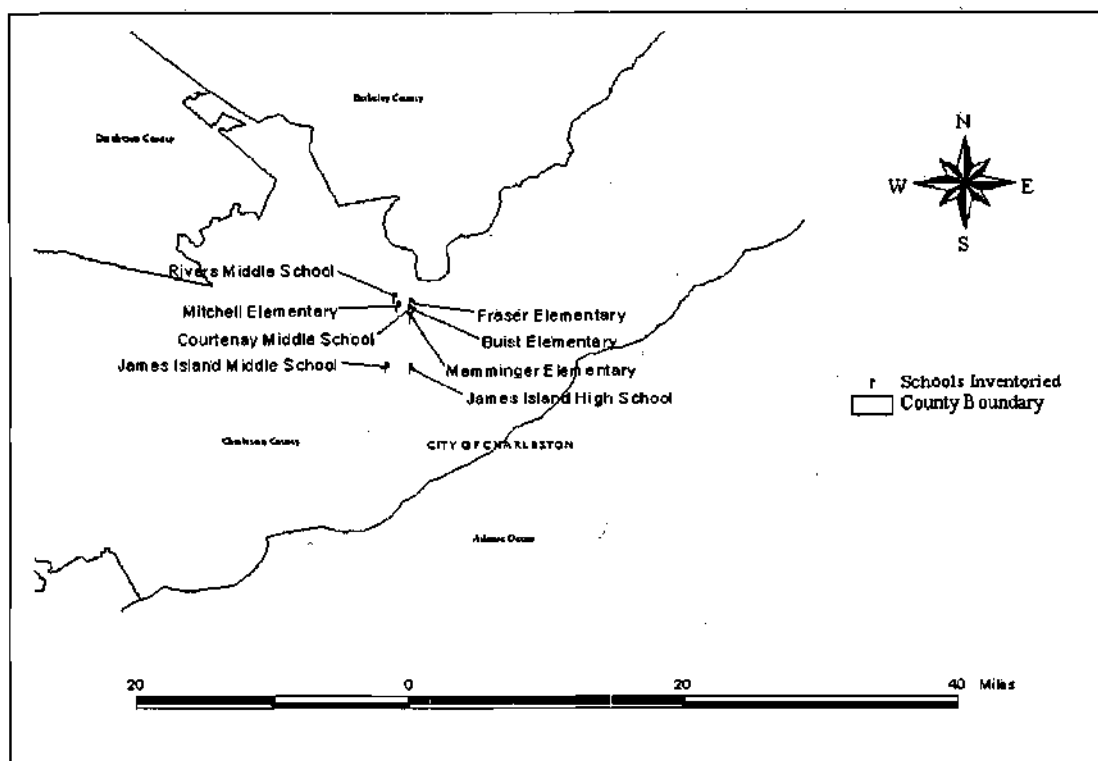


Figure 3-7. Schools Inventoried in Charleston, SC

Table 3-8. Summary of Inventoried Schools in Charleston, SC: Superstructural Data

Name	Address	Building Type	Year Built	No. of Stories ⁵
Buist Elem.	103 Calhoun St. Charleston 29401	URM	1920	3
Buist Elem.	103 Calhoun St. Charleston 29401	URM	1948	3
Courtenay M.S.	382 Meeting St., Charleston 29403	URM	1953	2
Fraser Elem.	63 Columbus St., Charleston 29403	URM	1956	2
Memminger Elem.	20 Beaufain St., Charleston 29403	URM	1938	3
Memminger Elem.	20 Beaufain St., Charleston 29403	URM	1953	2
Mitchell Elem.	2 Perry St. Charleston 29403	RC	1989	2
Rivers M.S.	1002 King St., Charleston 29403	Steel Frame	1984	2
James Is. H.S.	1000 Fort Johnson Rd., Charleston 29412	RC	1982	2
James Is. M.S.	1484 Camp Rd., Charleston 29412	RC	1982	1

Notes:

1. No. URM: 6.
2. Yr. Range: 1920-1969. Avg. Construction Yr: 1954.
3. No. RC: 3.
4. No. Steel Frame: 1.
5. No significant basement structures associated with the facilities inventoried in Charleston, SC.

The structures inventoried were constructed between 1920 and 1989. It may also be seen that the majority of the older schools (constructed prior to 1956) were unreinforced masonry structures, while reinforced concrete and steel frame structures were used at the newer facilities. These facilities are generally housed in two-story buildings without basements, and are founded on spread footings with an average depth of 1 m (3 ft). Deep foundations generally consist of steel H-piles. The average bearing pressure for all of these facilities is approximately 96 kPa (2000 psf) on spread footings.

3.5.1.1 Soil Conditions in the Vicinity of Schools

From Table 3-9 it may be seen that the soils in the vicinity of the schools inventoried consisted of loose silty and clayey sands that extended to a depth of approximately 8.5 m (28 ft), and are underlain by soft to medium stiff low plasticity clay and denser silty sands. The stiff green calcareous clay layer locally known as the Cooper River Marl then underlies the

latter soil. The ground water table is generally 1 m (3 ft) beneath the surface which could possibly lead to liquefaction, especially at those sites where loose sands are present.

3.5.2 *Fire and Police Stations*

Nine of the 15 fire stations and one of the 5 police stations in Charleston were inventoried. Their location is shown on Figure 3-8. Tables 3-10 and 3-11 summarize the data collected on the inventory sheets found in Appendix C.

As may be seen on Table 3-10 the police and fire stations inventoried are single-story reinforced concrete structures constructed between 1971 and 1997. The average bearing pressure of these structures is approximately 96 kPa (2000 psf) and are founded on spread footings with an average depth of 0.6 m (2 ft), unless poor soil conditions required the use of deep foundations, as was the case at fire station No. 7. Many of the older structures for which foundation drawings cannot be accessed are unreinforced masonry structures and are founded on corbelled footings. These consist of a layered system of bricks such that the broadest row of bricks is at the base with each successive layer decreasing in breadth until the proper width desired for the construction of the superstructure is attained.

It should be noted that the primary limitation to making accurate assessments of existing foundation and structural information was the absence of complete sets of structural drawings for these facilities. Where adequate engineering drawings were unavailable, knowledge of construction trends and experience of local building practice possessed by local engineers was sought in order to make estimations of structural and foundation type and thus is primarily an educated/experienced approximation.

3.5.2.2 Soil Conditions in the Vicinity of Police and Fire Stations

As was noted for the schools inventoried, the soils in the vicinity of the police and fire stations inventoried are composed of a layer of primarily loose silty and clayey sands to a depth of approximately 7.6 m (25 ft), underlain by denser clays and sand mixtures, under which the stiffer Cooper River marl may be found. As was found at the schools inventoried, the ground water table was encountered at approximately 1 m (3 ft) beneath the surface, and in combination with looser sands, could potentially present the possibility of liquefaction at these sites.

**Table 3-9. Summary of Inventoried Schools in Charleston, SC:
Soil and Foundation Conditions**

Name	Foundation Type	Footing Depth (ft)	Bearing Pressure (psf)	Liquefiable Soils?	Groundwater Elevation (ft)	Soil Description ³
Buist Elem.	Circular RC piles on a 3-10' spacing beneath walls.	2ft top of pile cap. 40ft pile length	2000	-	-	None Available
Buist Elem.	8" diameter RC piles on a 3-5' spacing beneath walls.	2ft top of pile cap. 40ft pile length	2000	-	-	None Available
Courtenay M.S.	Shallow isolated square column RC footings	1.5	1500	Yes	3.3	0-2ft Loose (SM); 2-4ft Loose (SP); 4-9ft Loose (SC); 9-27ft Very Soft to Med. Dense (CH); 27-33ft Loose (SC); 33-37.5ft Soft (CH); 37.5-42.5ft Stiff (CL); 42.5-48.5ft (SP); 48.5-61ft Stiff (MH-CH)
Fraser Elem.	Spread footings beneath all walls.	3	2000	-	-	Similar to Courtenay's profile above
Memminge r Elem.	Spread footings beneath all walls.	4	2000	-	-	None Available
Memminge r Elem.	Shallow isolated square column RC footings	2	2000	-	-	None Available
Mitchell Elem.	Column RC footings on 98ft long H piles(50ton capacity) connected via grade beams beneath the walls.	100	3000	Yes	4	0-2ft Loose (SM); 2-4ft Loose (ML); 4-6.5ft Med. (CL); 6.5-9ft Loose (ML); 9-22.5ft Med. (CL); 22.5-27ft Stiff (CH); 27-33ft Loose (ML); 33-42.5ft Stiff (CL); 42.5-48.5ft Dense (ML); 48.5-61ft (MH-CH)
Rivers M.S.	Column RC footings on 98ft long H piles(50ton capacity) connected via grade beams beneath the walls.	100	3000	Yes	3.2	0-2ft Very Loose (SP); 2-6.5ft Loose-Very Loose (SP); 6.5-18ft Very Soft (CL); 18-23ft Loose (SM); 23-37ft Med. Dense-Very Loose (SP); 37-53ft Med.-Very Soft (CL); 53-55.5ft Stiff (MH-CH)
James Is. H.S.	Column RC footings on 98ft long H piles(50ton capacity) connected via grade beams beneath the walls.	100	3000	Yes	2.4	0-12ft Very Loose-Loose (SM); 12-19.5ft Very Loose-Loose (SM-SP); 19.5-21.5ft Very Loose (SC)
James Is. M.S.	Spread footings beneath all walls.	4	2000	-	-	None Available

Notes:

1. Avg. Bearing Pressure: 2250 psf. Avg. Depth of Shallow Footings: 3 ft.
2. Shallow spread footings are located beneath all walls. Grade beams tie isolated footings together.
3. Refer to Appendix D for actual Boring Logs used.

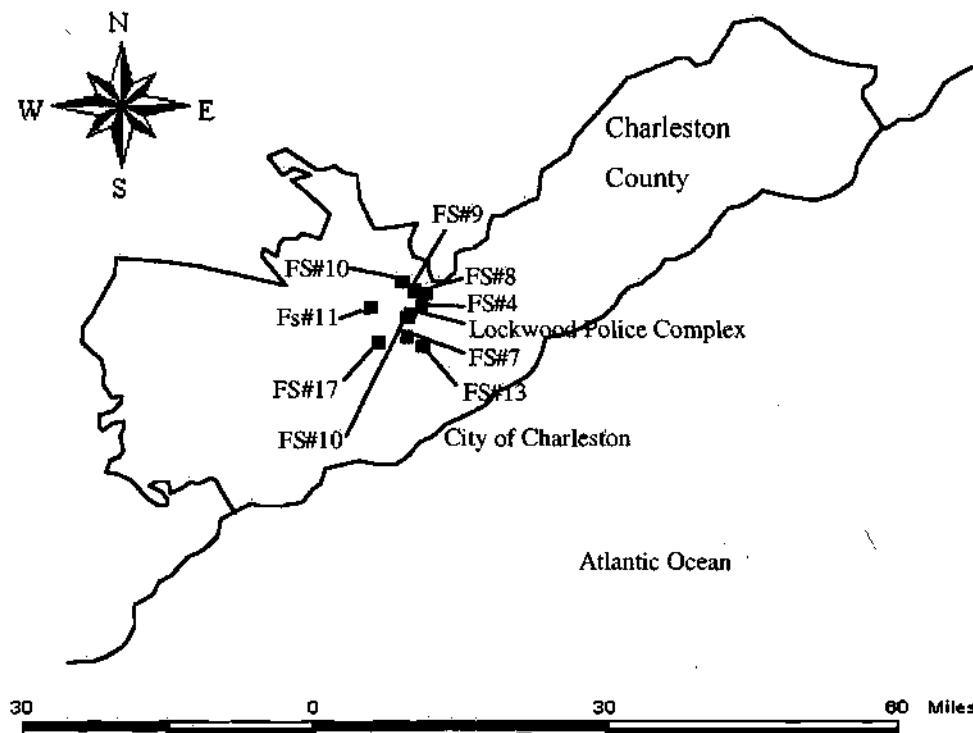


Figure 3-8. Location of Police and Fire Stations Inventoried in Charleston, SC

**Table 3-10. Summary of Inventoried Fire and Police Stations in Charleston, SC:
Superstructural Data**

Name	Address	Building Type	Year Built	No. of Stories ⁵
FS #4	162 Coming St., Charleston 29403	RC	1994	1
FS #7	1173 Fort Johnson, Charleston 29412	RC	1983	1
FS #8	370 Huger St., Charleston 29403	RC	1975	1
FS#9	1451 King St., Charleston 29403	RC	1981	1
FS#10	1 Nicholson Dr., Charleston 29407	RC	1973	1
FS #11	1517 Savannah Hwy, Charleston 29407	RC	1978	1
FS#13	298 Folly Rd., Charleston 29412	RC	1995	1
FS #16	81 Ashley Hall Plantation Rd., Charleston 29407	RC	1983	1
FS #17	1830 Bohicket Rd., Charleston 29455	RC	1997	1
Lockwood Municipal Complex (Police)	14 Lockwood Dr., Charleston 29401	RC	1971	2

Notes:

1. Yr. Range: 1971-1997. Avg. Construction Yr 1983.
2. No. URM: 0.
3. No. RC: 8.
4. No. Steel Frame: 0.
5. There are no significant basement structures associated with the facilities inventoried in Charleston, SC.

Table 3-11. Substructural Data-Inventoried Fire and Police Stations in Charleston, SC:

Name	Foundation Type ¹	Footing Depth (ft)	Bearing Pressure (psf)	Liquefiable Soils?	Groundwater Elevation (ft)	Soil Description ²
FS #4	Spread footings beneath all walls.	2	1500	Yes	3.3	0-2ft Loose (SM); 2-4ft Loose (SP); 4-9ft Loose (SC); 9-27ft Very Soft to Med. Dense (CH); 27-33ft Loose (SC); 33-37.5ft Soft (CH); 37.5-42.5ft Stiff (CL); 42.5-48.5ft (SP); 48.5-61ft Stiff (MH-CH)
FS #7	Spread footings beneath all walls.	2	1500	-	-	None Available
FS #8	Spread footings beneath all walls.	2	1500	Yes	3.2	0-2ft Very Loose (SP); 2-6.5ft Loose-Very Loose (SP); 6.5-18ft Very Soft (CL); 18-23ft Loose (SM); 23-37ft Med. Dense-Very Loose (SP); 37-53ft Med.-Very Soft (CL); 53-55.5ft Stiff (MH-CH)
FS#9	Spread footings beneath all walls.	2	2000	Yes	4.7	0-2ft Loose (SM); 2-4.5ft Very Soft (CL); 4.5-7ft Soft (SC); 7-14.5ft Loose-Very Loose (SM); 14.5-19.5ft Loose-Med. (SM-SP); 19.5-33ft Med.-Loose (SM); 33-53ft Med.-Stiff (CL); 53-63ft Loose-Dense (SM); 63-90.5ft Stiff (MH-CH)
FS#10	Spread footings beneath all walls.	2	1500	-	-	None Available
FS #11	Spread footings beneath all walls.	2	1500	Yes	2.5	0-2ft Loose (SM); 2-4.5ft Very Soft (SC); 4.5-9.5ft Loose-Very Loose (SM); 9.5-27.5ft Loose-Very Loose (SC); 27.5-33ft Med. (CL); 33-34ft Stiff (MH-CH)
FS#13	Shallow isolated square column RC footings on top of 40ft long treated timber piles, tied together by grade beams	43	3000	-	-	None Available
FS #16	Spread footings beneath all walls.	2.5	2500	Yes	3	0-2ft Loose (SM); 2-4.5ft Med. (CL); 4.5-17ft Med.-Loose (SM); 17-21.5ft Very Stiff (MH-CH)
FS #17	Shallow isolated square column RC footings on top of 40ft long treated timber piles	42	2500	Yes	4.2	0-19.5ft Loose-Med. (SM-SP); 19.5-24ft Very Soft (CH); 24-39.5ft Dense (SM-SP); 39.5-51.5ft Stiff (MH-CH)
Lockwood Municipal Complex (Police)	Spread footings beneath all walls.	2	2500	-	-	None Available

3.6 Summary

Inventories from the essential facilities are limited, however they indicate that similarities exist between the structures in each location. In general it may be said that unless soil conditions or large bearing pressures required otherwise, shallow footing foundations were used to accommodate an average bearing pressure of 96 kPa (2000 psf). Moreover, most of the older facilities constructed prior to 1955 utilized unreinforced masonry structures, which typically have a high probability of damage in the event of an earthquake. Therefore the effects of strong ground shaking are of more concern than liquefaction in St. Louis and Memphis.

However, the differences in general soil types suggests that soils in the vicinity of essential facilities in Charleston are the more susceptible to liquefaction, lateral spreading, and large earthquake-induced settlement. Therefore, both the influences of strong ground shaking and liquefaction are important in Charleston.

4.0 REFERENCES

- Algermissen, S.T., 1983. "An Introduction to the Seismicity of the United States", Earthquake Engineering Research Institute Monograph, Berkeley, CA, 148 pgs.
- Bollinger, G.A., 1973. "Seismicity of the Southeastern United States," *Bulletin of the Seismological Society of America*, Vol. 63, No.5, pp.1785-1808.
- Clough, G.W. and Martin, J.R., 1990. "Geotechnical Setting for Liquefaction Events in the Charleston SC Vicinity," presented at the *H.B. Seed Memorial Symposium, University of California Berkeley*, 22 pgs.
- Dutton, C.E., 1888. "The Charleston Earthquake of August 31, 1886," *U.S. Geological Survey Annual Report 1887-1888*, pp.203-528.
- Elton, D. J., and T. Hadj-Hamou, 1990. "Liquefaction Potential Map for Charleston, South Carolina," *Journal of Geotechnical Engineering*, American Society of Civil Engineers, Volume 116, Number 2, 244-265.
- FEMA-273, 1997. "NEHRP Guidelines for the Seismic Rehabilitation of Buildings", Building Seismic Safety Council, Washington, D.C..
- Friels, D., 1977. "Foundation Soils Investigation-Snowden School", TEST, Inc., Job 2861, Memphis, TN.
- Hwang, H, S. Pezeshk, Y.W. Lin, J. He, and J.M. Chiu, 1999. "Generation of Synthetic Ground Motion", *Center for Earthquake Research and Information*, Memphis, TN.
- Hwang, H., J. Jernigan, and Y.W. Lin, 1998. "Evaluation of Seismic Damage to Bridges and Highway Systems in Shelby County, Tennessee", *Center for Earthquake Research and Information*, Memphis, TN.
- Hwang, H. and J. Huo, 1997. "Development of Fragility Curves: Concrete Frame and Shear Wall Buildings," *Loss Assessment of Memphis Buildings*, D. Abrams and M. Shinozuka eds., National Center for Earthquake Engineering Research, Buffalo, NY, 113-137.
- Hwang, H., K. Ng, and T.S. Chang. 1989. "Subsurface Conditions of Memphis and Shelby County", *Technical Report NCEER-89-0021*, Center for Earthquake Research and Information, Memphis, TN.
- Lindberg, C. and M. Harlan, 1988. "An Earthquake Vulnerability Analysis of the Charleston, South Carolina Area", Department of Civil Engineering, The Citadel, Charleston, SC.

- Long, J.H. and Dove, J.E., 2001. "Guidance Document-Foundation Remediation for Essential Facilities in the Mid-America Seismic Regions". *Mid-America Earthquake Center Report*.
- Martin, J.R., 1990. "Implications From a Geotechnical Investigation of Liquefaction Phenomena Associated With Seismic Events in the Charleston, SC Area", Doctoral Dissertation, Virginia Polytechnic Institute, Blacksburg, VA.
- Nuttli, O., 1981. "Evaluation of Past Studies and the Identification of Needed Studies of the Effects of Major Earthquakes Occurring in the New Madrid Fault Zone," *Federal Emergency Management Agency*, Kansas City, KS.
- Nuttli, O., 1974. "The Mississippi Valley Earthquakes of 1811 and 1812," *Earthquake Information Bulletin* 6:2, U.S. Geological Survey.
- Obermeier, S., 1989. "The New Madrid Earthquakes: An Engineering-Geologic Interpretation of Relict Liquefaction Features". *USGS Professional Paper* 1336B, US Government Printing Office, Washington, 114 pgs.
- Obermeier, S. and R. Weems, 1989. "The Charleston Earthquake—An Overview of Geological Studies," Proceedings of 17th Water Reactor Safety Information Meeting, Nuclear Regulatory Commission, Rockville, MD.

APPENDIX A -INVENTORY OF ESSENTIAL FACILITIES IN MEMPHIS, TN

During two, two-day trips to the city of Memphis in March and April of 1999, inventories were completed for several essential facilities (schools, fire stations, police stations) in the city. The selection criteria used to determine which facilities would be inventoried were developed based upon the intended goal of the inventory exercise - to obtain data which would assist in the characterization/determination of typical building and foundation types present in essential facilities in the city of Memphis. Therefore, the buildings inventoried provide a good indication of the age range, structural type, and foundation type that are common in this city. Moreover, the collected data would be helpful in the assessment of the seismic performance of current facilities and aid in the development of any remediation programs involving modifications to the structure or to soils beneath existing foundations in order to improve performance of the structural system in the event of a sizeable earthquake ($> \text{MMI}=5$) in the New Madrid Seismic Zone.

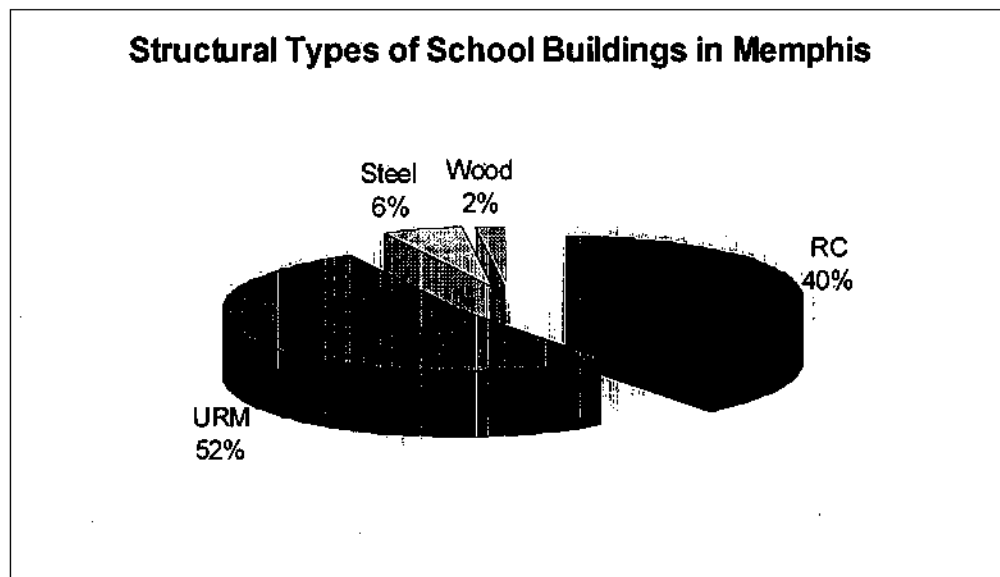
A.1 Building Inventory Sheets for Schools

The schools inventoried were selected based on the following criteria: 1) spatial distribution across the city of Memphis; 2) proximity to potentially liquefiable areas as identified by the liquefaction potential map developed by Hwang et al. 1998 for Shelby county; and 3) building age and structural type as determined from the database for all public school buildings in Memphis as collected and reported by Hwang et al. 1999. Table A-1 and Figure A-1 were produced from an analysis of this database and provide a clear indication of the structural types present at the 162 public schools (539 buildings) administered by the city of Memphis.

The inventories for the twenty schools selected were completed by Ms. Lois Boxill (LB) of the Georgia Institute of Technology, and Messrs. Tom Hunt (TH) and Boris Leoro (BL) of the University of Illinois. The structural drawings housed at the Memphis City Schools Facilities Planning Office (MCS) were utilized for the inventory. The following section contains the information recorded on the inventory sheets for each of the facilities inventoried. All of the recorded data was synthesized to produce the tables in Chapter 3.

**Table A-1. Summary of Building Types at the 162 Public Schools in Memphis:
generated from data gathered by Hwang et al. (1999).**

Building Type	# of Buildings	Modal Construction Year	Year Range of Construction
Reinforced Concrete (RC)	214	1962	1922-1992
Unreinforced Masonry (URM)	284	1959	1903-1994
Steel (S)	30	1960	1943-1985
Wood (W)	11	1950	1933-1958
<i>Total:</i>	539		



**Figure A-1. Summary of Structural Types for Public School Buildings in Memphis:
generated from data gathered by Hwang et al. (1999).**

A.1.1 Central High School Gym**Date:** 4/29/99**Inventor:** LB

Street Address: 306 S. Bellevue, Memphis

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1949

General Building Shape: (Draw small sketch below). – Photocopies made of available drawings.

Number of Stories: 1; 13,260sq. ft.Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Shallow fgs.

Number of Supporting Columns:

Foundation Depth: 3'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

*(If present, attach sketch)*Any important details pertaining to foundation/building performance: First floor elev.: 301.22**Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)**

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.2 Central High School 1967 Addition**Date:** 4/29/99**Inventor:** LB

Street Address: 306 S. Bellevue, Memphis

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1967

General Building Shape: (Draw small sketch below). – Photocopies made of available drawings.

Number of Stories: 3; 126,121sq. ft.Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Square shallow fgs., RC.

Number of Supporting Columns:

Foundation Depth: 6'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.3 Delano Elementary School 1957 Addition**Date:** BL**Inventor:** 4/29/99

Street Address: 1716 Delano Rd.

Information Source: MCS

Type of Info. Available: XBuilding Drawings/Foundation Plans Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1957

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 2Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated RC footings

Number of Supporting Columns:

Foundation Depth: 2'-4'Bearing Pressures Existing: 1250psf design pressure

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: None Present Slope Failure Fault Rupture

A.1.4 Hillcrest High School 1961 Addition**Date:** 4/29/99**Inventor:** LB

Street Address: 4184 Graceland Dr.

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT Data

Age of Building and Any Additions: 1961

General Building Shape: (Draw small sketch below).- Photocopies made, but sheet S-1 with foundation plan is missing.

Number of Stories: 2; 61,150 sq. ft.; RCIs there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: RC, isolated square figs.

Number of Supporting Columns:

Foundation Depth: 3'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.5 Humes Junior High School 1924 Original Building**Date:** 4/29/99**Inventor:** LB

Street Address: 659 N. Manassas St.

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1924 original bldg.

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 3; 47,326sq.ft.Is there a basement: No; Has boiler room. 4' beneath ground elevation at 137'.**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Shallow sq. RC fgs.

Number of Supporting Columns:

Foundation Depth: 6'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.6 Humes Junior High School 1940 Addition

Date: 4/29/99

Inventor: LB

Street Address: 659 N. Manassas St.

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1940

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 3; 32,554sq.ft.Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**

Foundation Type: Shallow fgs. With grade beams. Number of Supporting Columns:

Foundation Depth: 3'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.7 Jackson Elementary School 1957 Addition**Date:** 4/29/99**Inventor:** BL

Street Address: 3925 Wales Ave.

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1957, RC

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 2Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Shallow RC fgs.

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.8 Kansas Street Elementary School 1960 Addition**Date:** 4/29/99**Inventor:** BL

Street Address: 1353 Kansas St.

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1960

General Building Shape: (Draw small sketch below). – Copies of drawings made.

Number of Stories: 2Is there a basement: Subgrade Boiler room.**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated RC figs.

Number of Supporting Columns:

Foundation Depth: 3'-13'Bearing Pressures Existing: 3000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.9 Lincoln Elementary School 1963 Addition

Date: 4/29/99

Inventor: BL

Street Address: 1566 Orleans St.

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1963

General Building Shape: (Draw small sketch below). – Photocopies made of drawings.

Number of Stories: 3Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Shallow, 5'sq. RC fgs.

Number of Supporting Columns:

Foundation Depth: 3'Bearing Pressures Existing: 4000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.10 Macon Elementary School 1955 Addition**Date:** 4/29/99**Inventor:** TH

Street Address: 968 North Mendenhall Rd.

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1955

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 2Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated RC footings.

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 5000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.11 Manassas High School 1977 Addition**Date:** 4/29/99**Inventor:** TH

Street Address: 781 Firestone Ave.

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1977

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 3Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated RC figs, 5'-8' square.

Number of Supporting Columns:

Foundation Depth: 4'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.12 Memphis Technical High School 1962 Addition**Date:** 4/29/99**Inventor:** BL

Street Address: 3924 Poplar Ave.

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1962

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 2Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated RC footings.

Number of Supporting Columns:

Foundation Depth: 4'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.13 Messick Vocational and Adult Center 1953 Addition

Date: 4/29/99

Inventor: BL

Street Address: 703 S. Greer St.

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1953

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 3Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated RC footings.

Number of Supporting Columns:

Foundation Depth: 5'Bearing Pressures Existing: 4000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.14 Messick Vocational and Adult Center Gym**Date:** 4/29/99**Inventor:** TH

Street Address: 703 S. Greer St.

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1963

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated RC footings.

Number of Supporting Columns:

Foundation Depth: 6'Bearing Pressures Existing: 4000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.15 Orleans Elementary School 1965 Addition**Date:** 4/29/99**Inventor:** TH

Street Address: 1400 McMillan St.

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1965

General Building Shape: (Draw small sketch below).- Photocopies made.

Number of Stories: 2Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated RC footings.

Number of Supporting Columns:

Foundation Depth: 5'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.16 Scenic Hills Elementary School 1957 Addition

Date: 4/29/99

Inventor: TH

Street Address: 3450 Scenic Highway

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1957

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 2Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: RC bored piles, w/ 3' grade beams Number of Supporting Columns:Foundation Depth: 25'-30'Bearing Pressures Existing: 7000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.17 Shannon Elementary School 1959 Addition**Date:** 4/29/99**Inventor:** TH

Street Address: 2248 Shannon Ave.

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1959

General Building Shape: (Draw small sketch below). - Photocopies made.

Number of Stories: 2Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Unreinforced concrete ftgs.

Number of Supporting Columns:

Foundation Depth: 2'-5', 3' on avg.Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.18 Snowden Junior High School 1979 Addition

Date: 4/29/99

Inventor: LB

Street Address: 1870 N. Pkwy.

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1979

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 2; 32,900sq.ft.Is there a basement: No, but has elevator pit.**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: RC bored piles, w/ 3' grade beams Number of Supporting Columns:Foundation Depth: 25'-30'Bearing Pressures Existing: 7500psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from 1977 Foundation Soils Investigation report for site.)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.19 Wells Station Elementary School 1953 Addition

Date: 4/29/99

Inventor: LB

Street Address: 1610 Wells Station Rd.

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1953

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 1: 33,283sq. ft.Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Square, isolated RC ftgs.

Number of Supporting Columns:

Foundation Depth: 4'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.1.20 Westside Elementary School 1956 Addition**Date:** 4/29/99**Inventor:** TH

Street Address: 3347 Dawn Drive

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1956

General Building Shape: (Draw small sketch below).

Number of Stories: 2Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated square RC footings.

Number of Supporting Columns:

Foundation Depth: 4Bearing Pressures Existing: 5000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.2 Building Inventory Sheets for Fire Stations

Initially, the Fire Stations inventoried were to be selected based upon spatial distribution across Memphis, proximity to potentially liquefiable soils, and their ability to indicate any trends or changes in the design of structures and foundations for these facilities in the Memphis area. However, during a visit to the Building Design and Construction Office (BDCO) for the City of Memphis in April 1999, only building drawings for thirteen (13) of the fifty-four (54) total fire stations in Memphis were available for access. Therefore, Ms. Boxill (LB) and Messrs. Hunt (TH), and Leoro (BL) completed inventories for the thirteen fire stations with available structural drawings.

The following section contains the information recorded on the inventory sheets for each of the facilities inventoried. Moreover, all of the recorded data is summarized in the tables found in Chapter 3.

A.2.1 Fire Station #8

Date: 4/30/99

Inventor: BL

Street Address: 625 Mississippi Blvd.

Information Source: Building Design & Construction Office (BDCO)

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1974

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated RC footings

Number of Supporting Columns:

Foundation Depth: 5'Bearing Pressures Existing: 2500psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (No subsurface information is available).

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.2.2 Fire Station #12**Date:** 4/30/99**Inventor:** BL

Street Address: 980 E. McLemore Ave.

Information Source: BDCO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1981

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated, square RC ftgs.

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (No subsurface information is available).

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.2.3 Fire Station #14**Date:** 4/30/99**Inventor:** BL

Street Address: 980 E. McLemore Ave.

Information Source: BDCO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1981

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated, square, RC ftgs.

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (No subsurface information is available).

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.2.4 Fire Station #16

Date: 4/30/99

Inventor: BL

Street Address: 1078 E. Pkwy South

Information Source: BDCO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1988

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Iso. Sq. RC figs. & grade beams Number of Supporting Columns:Foundation Depth: 2'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (No subsurface information is available).

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.2.5 Fire Station #35

Date: 4/30/99

Inventor: TH

Street Address: 3305 S. Mendenhall Rd.

Information Source: BDCO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1965

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: RC strip & isol. Ftgs.

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 4000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (No subsurface information is available).

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.2.6 Fire Station #41**Date:** 4/30/99**Inventor:** TH

Street Address: 2161 Ridgeway Rd.

Information Source: BDCO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1970

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated, sq. RC figs.

Number of Supporting Columns:

Foundation Depth: 3'Bearing Pressures Existing: 2500psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: *(No subsurface information is available).*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.2.7 Fire Station #43**Date:** 4/30/99**Inventor:** TH

Street Address: 1253 E. Holmes Rd.

Information Source: BDCO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1958

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Unreinforced sq. ftgs.

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (No subsurface information is available).

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.2.8 Fire Station #44

Date: 4/30/99

Inventor: TH

Street Address: 6091 Walnut Grove Rd.

Information Source: BDCO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1970

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated square RC fgs.

Number of Supporting Columns:

Foundation Depth: 3'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (No subsurface information is available).

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.2.9 Fire Station #46**Date:** 4/30/99**Inventor:** TH

Street Address: 3423 Scenic Hwy.

Information Source: BDCO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1970

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated square RC fgs.

Number of Supporting Columns:

Foundation Depth: 3'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (No subsurface information is available).

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.2.10 Fire Station #48**Date:** 4/30/99**Inventor:** TH

Street Address: 4985 Raleigh-Lagrange Rd.

Information Source: BDCO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1972

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: RC piles with grade beams.

Number of Supporting Columns:

Foundation Depth: 34'Bearing Pressures Existing: 2500psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: *(No subsurface information is available).*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.2.11 Fire Station #49

Date: 4/30/99

Inventor: TH

Street Address: 4351 New Allen Rd.

Information Source: BDCO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1974

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Load bearing walls on RC fgs.

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 2250 psf continuous fgs.3000 psf for pad fgs.

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (No subsurface information is available).

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.2.12 Fire Station #52

Date: 4/30/99

Inventor: TH

Street Address: 6675 Winchester Rd.

Information Source: BDCO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1975

General Building Shape: (Draw small sketch below). -- Photocopies made.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Unreinforced strip fgs.

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: *(No subsurface information is available).*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.2.13 Fire Station #54**Date:** 4/30/99**Inventor:** TH

Street Address: 599 N. Sanga Rd.

Information Source: BDCO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1989

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated, square, RC figs.

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 2500psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (No subsurface information is available).

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.3 Building Inventory Sheets for Police Stations

Structural drawings for each of the five existing police precincts in the city of Memphis were housed at the Building Design and Construction Office (BDCO) located at Memphis City Hall. The recorded notes are presented in the following section.

A.3.1 North Police Precinct**Date:** 4/30/99**Inventor:** LB

Street Address: 3633 Old Allen Rd.

Information Source: BDCO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1975

General Building Shape: (Draw small sketch below). -- Photocopies made.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Spread footings.

Number of Supporting Columns:

Foundation Depth: 2'avg.Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (None available)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.3.2 South Police Precinct**Date:** 4/30/99**Inventor:** LB

Street Address: 819 E. Raines Rd.

Information Source: BDCO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1980

General Building Shape: (Draw small sketch below). – Photocopies made.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Spread footings

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (None available)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.3.3 East Police Precinct**Date:** 4/30/99**Inventor:** LB

Street Address: 2602 Mt. Moriah Rd.

Information Source: BDCO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1979

General Building Shape: (Draw small sketch below). -- Photocopies made.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Spread footings

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (None available)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

A.3.4 West Police Precinct**Date:** 4/30/99**Inventor:** LB

Street Address: 1925 Union Ave.

Information Source: BDCO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1964

General Building Shape: (Draw small sketch below). -- Photocopies made.

** Building was previously John T. Fisher Motor Co. (used car sales).*Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Spread footings

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: *No soil info., but earth fill around all footings and columns made with good firm yellow clay that was well compacted with an automatic tamping machine.*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location: Presence of Geological Hazards: ☐ None Present☐ Slope Failure ☐ Fault Rupture

A.3.5 Central Police Precinct**Date:** 4/30/99**Inventor:** LB

Street Address: 79 S. Flicker St.

Information Source: BDCO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1959

General Building Shape: (Draw small sketch below). -- Photocopies made.

Number of Stories: 5Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated, square RC footings.

Number of Supporting Columns:

Foundation Depth: 3'Bearing Pressures Existing: 3000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (None available)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

APPENDIX B -INVENTORY OF ESSENTIAL FACILITIES IN ST. LOUIS, MO

B.1 Building Inventory for Schools

An inventory of about 10% of the schools, taking representative samples from different decades, shows that almost all of the schools constructed before 1950 used unreinforced strip footings or unreinforced spread footings. In the mid-1950's, the practice of designing school new school buildings changed from in-house design (by city architects) to out-house design (by private architects). Design details changed accordingly. In particular, such as spread and strip footings were tied to columns or bearing walls using reinforcement.

The inventories for the Schools, police and fire stations were compiled by Messrs. Tom Hunt (TH) and Boris Leoro (BL) of the University of Illinois. The following section contains the information recorded on the inventory sheets for each of the facilities inventoried

B.1.1 Kansas Street Elementary School 1960 Addition

Date: 4/29/99

Inventor: BL

Street Address: 1353 Kansas St.

Information Source: MCS

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT Data

Age of Building and Any Additions: 1960

General Building Shape: (Draw small sketch below). – Copies of drawings made.

Number of Stories: 2

Is there a basement: Subgrade Boiler room.**Foundation Information** (attach detailed sketch showing dimensions & other relevant info.):Foundation Type: Isolated RC ftgs.

Number of Supporting Columns:

Foundation Depth: 3'-13'Bearing Pressures Existing: 3000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (determined from Boring Logs collected by Hwang et al. 1989)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.1.2 St. Louis Jackson School

Date: 5/18/99
Inventor: TH

Street Address: 1632 Hogan

Information Source: St. Louis Schools

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT Data

Age of Building and Any Additions: 1899 – Various additions

General Building Shape: (Draw small sketch below).

Number of Stories: 3

Is there a basement: Yes

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):

Foundation Type: Unreinforced Masonry Bearing Walls-see attached

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.1.3 St. Louis Yeatman Middle School

Date: 5/18/99
Inventor: TH

Street Address: 4265 Athlone Ave.

Information Source: St. Louis Schools

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT Data

Age of Building and Any Additions: 1966

General Building Shape: (Draw small sketch below).

Number of Stories: 3

Is there a basement: No

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):

Foundation Type: Reinforced Concrete Strip footing Number of Supporting Columns:
Reinforced Concrete Spread Footing
Piles Connected to Reinforced Concrete Pile Cap

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.1.4 St. Louis Peabody Elementary School

Date: 5/18/99

Inventor: TH

Street Address: 1424 South 14th St.

Information Source: St. Louis Schools

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1956

General Building Shape: (Draw small sketch below).

Number of Stories: 3Is there a basement: Yes**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Reinforced Concrete PilesNumber of Supporting Columns: ≥ 100

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: *See Attached*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.1.5 St. Louis Jackson School Addition (Multi-Purpose Room Addition)

Date: 5/18/99

Inventor: TH

Street Address: 1632 Hogan

Information Source: St. Louis Schools

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1964

General Building Shape: (Draw small sketch below).

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Drilled Piers Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.1.6 St. Louis Shepard Elementary School**Date:** 5/18/99**Inventor:** TH

Street Address: 3540 Wisconsin Ave.

Information Source: St. Louis Schools

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1905

General Building Shape: (Draw small sketch below). – Sketch on original handwritten files.

Number of Stories: 2Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Bearing Walls

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.1.7 St. Louis Lafayette Elementary School**Date:** 8/15/99**Inventor:** TH

Street Address: 815 Ann Ave.

Information Source: St. Louis Schools

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1905

General Building Shape: (Draw small sketch below).

Number of Stories: 2Is there a basement: Yes**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Unreinforced Masonry Strip
Footings (Bearing Walls)

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.1.8 St. Louis Webster Middle School

Date: 8/15/99
Inventor: TH

Street Address: 2127 North 11th St.

Information Source: St. Louis Schools

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT Data

Age of Building and Any Additions: 1906

General Building Shape: (Draw small sketch below).

Number of Stories: 3

Is there a basement: Yes

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):

Foundation Type: Unreinforced Masonry Bearing Walls (Strip Footings) – see attached Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.1.9 St. Louis Webster Middle School – Multi-purpose Addition

Date: 5/18/99

Inventor: TH

Street Address: 2127 North 11th St.

Information Source: St. Louis Schools

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1963

General Building Shape: (Draw small sketch below).

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Reinforced Concrete Strip
Footings – see attached

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.1.10 St. Louis Soldan High School

Date: 5/18/99
Inventor: TH

Street Address: 918 North Union Blvd

Information Source: St. Louis Schools

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT Data

Age of Building and Any Additions: 1906

General Building Shape: (Draw small sketch below).

Number of Stories: 3

Is there a basement: Yes

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):

Foundation Type: Unreinforced Spread & Strip Footings

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.1.11 St. Louis Roosevelt High School

Date: 8/15/99
Inventor: TH

Street Address: 3230 Hartford Ave.

Information Source: St. Louis Schools

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT Data

Age of Building and Any Additions: 1923

General Building Shape: (Draw small sketch below).

Number of Stories: 4

Is there a basement: Partial Basement & Tunnel

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):

Foundation Type: Unreinforced Strip Footings & Spread Footings – Unreinforced & No Connection – see attached

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.1.12 St. Louis Williams Middle School

Date: 8/15/99
Inventor: TH

Street Address: 3955 St. Ferdinand Ave.

Information Source: St. Louis Schools

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT Data

Age of Building and Any Additions: 1963

General Building Shape: (Draw small sketch below).

Number of Stories: 2

Is there a basement: No

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):

Foundation Type: Reinforced Strip & Spread
Footings

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing: 3000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: *Borings Done - See attached*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.1.13 St. Louis Lyon Elementary School

Date: 8/15/99
Inventor: TH

Street Address: 7417 Vermont Ave.

Information Source: St. Louis Schools

Type of Info. Available: ☐ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT Data

Age of Building and Any Additions: 1910

General Building Shape: (Draw small sketch below).

Number of Stories: 2

Is there a basement: Yes

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):

Foundation Type: Unreinforced Strip Footing

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing: 3000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.1.14 St. Louis Clay Elementary School

Date: 8/15/99

Inventor: TH

Street Address: 3820 North 14th St.

Information Source: St. Louis Schools

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT Data

Age of Building and Any Additions: 1904

General Building Shape: (Draw small sketch below).

Number of Stories: 2

Is there a basement: Yes**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Unreinforced Masonry (Bearing Walls) Strip Footings – see attached Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing: 3000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.2 Building Inventory Sheets for Fire Stations

Initially, the Fire Stations inventoried were to be selected based upon spatial distribution across St. Louis, proximity to potentially liquefiable soils, and their ability to indicate any trends or changes in the design of structures and foundations for these facilities in this area. Messrs. Tom Hunt (TH), and Boris Leoro (BL) of the University of Illinois completed inventories for the fire stations with available structural drawings. The following section contains the information recorded on the inventory sheets for each of the facilities inventoried.

B.2.1 St. Louis Fire Station #5**Date:** 04/9/99**Inventor:** Boris & Tom

Street Address: 2123 N. Market

Information Source: City Hall – Board of Public Service

Type of Info. Available: ☐ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1952

General Building Shape: (Draw small sketch below) – Sketch on original handwritten files.

Number of Stories: 2

Is there a basement:

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):Foundation Type: Reinforced Concrete Spread & Strip Footings.

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.2.2 St. Louis Fire Station #10 (old 46)

Date: 04/9/99

Inventor: Boris & Tom

Street Address: 4161 Kennerly

Information Source: City Hall – Board of Public Service

Type of Info. Available: ☐ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1907

General Building Shape: (Draw small sketch below). – Sketch on original handwritten files.

Number of Stories: 2Is there a basement: Partial Basement (8')**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Concrete Load Bearing Walls

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.2.3 St. Louis Fire Station #19

Date: 04/9/99

Inventor: Boris & Tom

Street Address: 6624 Morganford Rd.

Information Source: City hall – Board of Public Service

Type of Info. Available: ☐ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1955

General Building Shape: (Draw small sketch below). – Sketch on original handwritten files.

Number of Stories:

Is there a basement:

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):Foundation Type: Concrete Load Bearing Walls

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.2.4 St. Louis Fire Station #20

Date: 04/9/99

Inventor: Boris & Tom

Street Address: 5600 Prescott

Information Source: City hall – Board of Public Service

Type of Info. Available: ☐ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1959

General Building Shape: (Draw small sketch below).

Number of Stories: 2

Is there a basement:

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):Foundation Type: Various Sizes
Shallow Foundation

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.2.5 St. Louis Fire Station #23(old 23)**Date:** 04/9/99**Inventor:** Boris & Tom

Street Address: 6500 Michigan

Information Source: City Hall – Board of Public Service

Type of Info. Available: ☐ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1921

General Building Shape: (Draw small sketch below). – Sketch on original handwritten files.

Number of Stories: 2

Is there a basement:

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):Foundation Type: Concrete Load Bearing Walls

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.2.6 St. Louis Fire Station #24 (old 53)**Date:** 04/9/99**Inventor:** Boris & Tom

Street Address: 5245 Natural Bridge

Information Source: City Hall – Board of Public Service (Ben Kalhorn)

Type of Info. Available: ☐ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1921

General Building Shape: (Draw small sketch below). – Sketch on original handwritten files.

Number of Stories: 2

Is there a basement:

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):Foundation Type: Load Bearing Walls

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.2.7 St. Louis Fire Station #26 (old 54)**Date:** 04/9/99**Inventor:** Boris & Tom

Street Address: 4250 Margareta

Information Source: City Hall – Board of Public Service

Type of Info. Available: ☐ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT Data

Age of Building and Any Additions: 1916

General Building Shape: (Draw small sketch below). – Sketch on original handwritten files.

Number of Stories: 2

Is there a basement: Partial Basement (8'7")**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Unreinforced Concrete
Bearing Walls

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.2.8 St. Louis Fire Station #27**Date:** 04/9/99**Inventor:** Boris & Tom

Street Address: 5435 Partridge

Information Source: City Hall – Board of Public Service

Type of Info. Available: ☐ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1921

General Building Shape: (Draw small sketch below). – Sketch on original handwritten files.

Number of Stories: 2

Is there a basement:

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):Foundation Type: Concrete Load Bearing Walls

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.2.9 St. Louis Fire Station #28**Date:** 04/9/99**Inventor:** Boris & Tom

Street Address: 4810 Enright

Information Source: City Hall – Board of Public Service

Type of Info. Available: ☐ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1959

General Building Shape: (Draw small sketch below). – Sketch on original handwritten files.

Number of Stories: 2Is there a basement: Partial Basement**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Unreinforced Concrete Footings
& Load Bearing Walls

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.2.10 St. Louis Fire Station #30

Date: 04/9/99

Inventor: Boris & Tom

Street Address: 541 De Baliviere

Information Source: City Hall – Board of Public Service

Type of Info. Available: ☐ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1956

General Building Shape: (Draw small sketch below). – Sketch on original handwritten files.

Number of Stories: 2Is there a basement: Partial Basement (10')**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Concrete Load Bearing Walls

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.2.11 St. Louis Fire Station #33(old 37)**Date:** 04/9/99**Inventor:** Boris & Tom

Street Address: 8300 N. Broadway

Information Source: City Hall – Board of Public Service

Type of Info. Available: ☐ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1908

General Building Shape: (Draw small sketch below). – Sketch on original handwritten files.

Number of Stories: 2Is there a basement: Yes**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Concrete Load Bearing Walls

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.2.12 St. Louis Fire Station #35

Date: 04/9/99

Inventor: Boris & Tom

Street Address: 5459 Arsenal

Information Source: City Hall – Board of Public Service

Type of Info. Available: ☐ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT Data

Age of Building and Any Additions: 1921

General Building Shape: (Draw small sketch below). – Sketch on original handwritten files.

Number of Stories: 2

Is there a basement:

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):Foundation Type: Concrete Foundation & Footing

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.2.13 St. Louis Fire Station #36 (old 56)**Date:** 04/9/99**Inventor:** Boris & Tom

Street Address: 5000 S. Kingshighway

Information Source: City Hall – Board of Public Service

Type of Info. Available: ☐ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1926

General Building Shape: (Draw small sketch below). c

Number of Stories: 2Is there a basement: Yes (8'6")**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Unreinforced Concrete Load
Bearing Walls

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.3 Building Inventory Sheets for Police Stations

B.3.1 St. Louis Police Headquarters Building

Date: 5/18/99

Inventor: TH

Street Address: 1200 Clark

Information Source: Building Division - St. Louis Metropolitan Police Department

Type of Info. Available: ☐ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1927 - Various Additions

General Building Shape: (Draw small sketch below).

Number of Stories: 7Is there a basement: Yes (? Tunnel).**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Multiple Pile CapsNumber of Supporting Columns: 100

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.3.2 St. Louis South Area Police Command Building (Substation 1)

Date: 5/18/99
Inventor: TH

Street Address: 3157 Sublette Ave.

Information Source: Buildings Commission

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT Data

Age of Building and Any Additions: 1988

General Building Shape: (Draw small sketch below). – Sketch on original handwritten files.

Number of Stories: 1

Is there a basement: Yes

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):

Foundation Type: Spread Footing (Reinforced Concrete) & Concrete Slab

Number of Supporting Columns: 11

Foundation Depth:

Bearing Pressures Existing: 2500psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (Done by Brucker & Associates)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.3.3 St. Louis Police Academy Building

Date: 5/18/99
Inventor: TH

Street Address: 1200 Spruce

Information Source: Buildings Commission

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT Data

Age of Building and Any Additions: 1927 - Various Additions

General Building Shape: (Draw small sketch below).

Number of Stories:

Is there a basement:

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):

Foundation Type: Reinforce Concrete Piles

Number of Supporting Columns: 20

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

File Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.3.4 St. Louis Central Area Police Command Building (Substation 2)

Date: 5/18/99
Inventor: TH

Street Address: 919 N. Jefferson

Information Source: Buildings Commission

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT Data

Age of Building and Any Additions: 1989

General Building Shape: (Draw small sketch below).

Number of Stories: 1

Is there a basement: Yes

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):

Foundation Type: Reinforced Concrete Spread Footings

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing: 2500psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance: Exact same as south building

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.3.5 St. Louis Northwest Area Police Command Building (Substation 3)

Date: 5/18/99
Inventor: TH

Street Address: 4014 Union Building

Information Source: Buildings Commission

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT Data

Age of Building and Any Additions: 1988

General Building Shape: (Draw small sketch below). – Identical with the other 2 substations

Number of Stories: 1

Is there a basement: Yes

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):

Foundation Type: Reinforced Concrete Spread Footings

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing:

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: (Done by Brucker & Associates)

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

B.3.6 St. Louis City Radio Communication Center

Date: 5/18/99

Inventor: TH

Street Address:

Information Source: Buildings Commission

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT Data

Age of Building and Any Additions: 1986

General Building Shape: (Draw small sketch below). – Copies of drawings made.

Number of Stories: 3

Is there a basement:

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):Foundation Type: Reinforced Concrete Spread
Footings

Number of Supporting Columns: 4

Foundation Depth:

Bearing Pressures Existing: 1800psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:
(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form? *Moderately firm cohesive soil*

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

APPENDIX C - INVENTORY OF ESSENTIAL FACILITIES IN CHARLESTON, SC

The inventories of all the essential facilities (schools, fire stations, and police stations) in the Charleston peninsular area with available structural drawings were performed by Ms. Lois Boxill (LB) of the Georgia Institute of Technology. The Charleston Parks Department and the Charleston City Schools Facilities Planning office were visited in May 1999. It should however be noted that the limited availability of complete sets of structural drawings for fire and police stations in Charleston may be primarily attributed to the fact that many of the structures housing these facilities were constructed within the first few decades of the century. Most were not originally designed as essential/emergency response facilities (e.g. several of these facilities are housed in converted office space). Moreover, many of the original drawings were retained by the original owners and are not in the possession of public city archivists.

C.1 Building Inventory Sheets for Schools

In order to focus on essential facilities in Charleston, only public schools located within the Charleston city limits, and administered by the City of Charleston School Board were inventoried by the author during a visit to the Charleston City Schools Facilities Planning Office (CFPO). Therefore, inventories of all the public schools located on the Charleston peninsula (District 20) with available drawings were made. Moreover, inventories of 2 schools on James Island within the Charleston City limits also administered by the Charleston School Board (District 3) were also inventoried because of the use of H-piles for the foundation system, which resulted due to the presence of very loose sediments that are found in this area to the west of the peninsula.

The 10 structures inventoried are believed to provide a clear indication of the common structural and foundation types in the Charleston area and the collected information (shown in the following sections, and summarized in the tables in Chapter 3) potentially useful in an assessment of the existing structures and in the development of any seismic modifications to these facilities.

C.1.1 Buist Elementary School 1920 Original Building**Date:** 5/21/99**Inventor:** LB

Street Address: 103 Calhoun St.

Information Source: CFPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1920

General Building Shape: (Draw small sketch below). – Simple rectangular plan. Pile detail available.

Number of Stories: 3; ~9000sq.ft.

Is there a basement:

Foundation Information (attach detailed sketch showing dimensions & other relevant info.):Foundation Type: RC Bored piles

Number of Supporting Columns:

Foundation Depth: 2' thick pile capBearing Pressures Existing: 2000psfDepth of Footings (piles/shafts): 42'

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

*(If present, attach sketch)*Any important details pertaining to foundation/building performance: Piles on a 3.8spacing beneath walls.**Subsurface Information:** *(None available)*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.1.2 Buist Elementary School 1948 Addition

Date: 5/21/99

Inventor: LB

Street Address: 103 Calhoun St.

Information Source: CFPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1948

General Building Shape: (Draw small sketch below).

Number of Stories: 3; ~9300sq.ftIs there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: 8" diam. RC. Bored piles

Number of Supporting Columns:

Foundation Depth: 2' thick pile capBearing Pressures Existing: 2000psfDepth of Footings (piles/shafts): 42'

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

*(If present, attach sketch)*Any important details pertaining to foundation/building performance: Piles on a 3'-5' spacing beneath walls.**Subsurface Information: (None available)**

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.1.3 Courtenay Middle School 1953 Addition**Date:** 5/21/99**Inventor:** LB

Street Address: 382 Meeting St.

Information Source: CFPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1953

General Building Shape: (Draw small sketch below). – Footing detail available.

Number of Stories: 2Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated, square RC footings.

Number of Supporting Columns:

Foundation Depth: 3'Bearing Pressures Existing: 1500psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: - *Obtained from Soil Consultants Inc. (see Appendix F).*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.1.4 Fraser Elementary School 1956 Addition**Date:** 5/21/99**Inventor:** LB

Street Address: 63 Columbus St.

Information Source: CFPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1956

General Building Shape: (Draw small sketch below). – Simple rectangular plan.

Number of Stories: 2Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Spread RC footings.

Number of Supporting Columns:

Foundation Depth: 3' avg. (1'-5')Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: - *Obtained from Soil Consultants Inc. (see Appendix F).*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.1.5 Memminger Elementary School Gym**Date:** 5/21/99**Inventor:** LB

Street Address: 20 Beaufain St.

Information Source: CFPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1938

General Building Shape: (Draw small sketch below). – Simple rectangular plan.

Number of Stories: 3Is there a basement: No; detached boiler room.**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Spread footings.

Number of Supporting Columns:

Foundation Depth: 4'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

*(If present, attach sketch)*Any important details pertaining to foundation/building performance: - Structure damaged during hurricane Hugo in 1989.**Subsurface Information:** *(None available)*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.1.6 Memminger Elementary School 1953 Addition**Date:** 5/21/99**Inventor:** LB

Street Address: 20 Beaufain St.

Information Source: CFPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1953

General Building Shape: (Draw small sketch below).- Simple rectangular plan.

Number of Stories: 2Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Square isolated RC footings.

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: *(None available)*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.1.7 Mitchell Elementary School 1989 Addition**Date:** 5/21/99**Inventor:** LB

Street Address: 2Perry St.

Information Source: CFPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1989

General Building Shape: (Draw small sketch below). – Simple rectangular plan.

Number of Stories: 2Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: RC column fgs. on H piles*

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing: 3000psfDepth of Footings (piles/shafts): 100'Pile Capacity/Design Load: 50tons

Present Condition of Foundations:

Presence of Underground Structures:

*(If present, attach sketch)*Any important details pertaining to foundation/building performance: - Different polygonal shaped pile caps used.
Pile cap plan detail is available.**Subsurface Information:** - *Obtained from Soil Consultants Inc. (see Appendix F). * H-piles connected via grade beams beneath walls. H-piles are HP10x57-98' long.*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.1.8 Rivers Middle School 1984 Addition**Date:** 5/21/99**Inventor:** LB

Street Address: 1002 King St.

Information Source: CFPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1984

General Building Shape: (Draw small sketch below). – Simple rectangular plan.

Number of Stories: 2

Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: RC column fgs. on H piles*

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing: 3000psfDepth of Footings (piles/shafts): 100'Pile Capacity/Design Load: 50tons

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: - *Obtained from Soil Consultants Inc. (see Appendix F). * H-piles connected by 16" grade beams.*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.1.9 James Island High School 1982 Addition**Date:** 5/21/99**Inventor:** LB

Street Address: 1000 Fort Johnson Rd.

Information Source: CFPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1982

General Building Shape: (Draw small sketch below). – Simple rectangular plan.

Number of Stories: 2Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: RC column ftgs. on H piles*

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing: 3000psfDepth of Footings (piles/shafts): 100'Pile Capacity/Design Load: 50tons

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: - *Obtained from Soil Consultants Inc. (see Appendix F). * H-piles connected by 16" grade beams.*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.1.10 James Island Middle School 1982 Addition**Date:** 5/21/99**Inventor:** LB

Street Address: 1484 Camp Rd.

Information Source: CFPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1982

General Building Shape: (Draw small sketch below). – Simple rectangular plan.

Number of Stories: 1: ~3470sq.ft.Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Spread footings.

Number of Supporting Columns:

Foundation Depth: 4'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information:

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.2 Building Inventory Sheets for Fire Stations and Police Stations

Due to the limited availability of complete sets of structural drawings for these types of essential facilities in the city of Charleston, all of the fire stations and police stations with available structural drawings housed at the city of Charleston's Department of Parks Office (CDPO) were inventoried. The nine (9) fire stations inventoried are either on or in close proximity to the Charleston peninsula, and are believed to be representative of the typical structural and foundation types found at this type of essential facility throughout the area. Moreover, in the cases where detailed structural or foundation information was unavailable, the inventories were supplemented with information from discussions with local engineers (identified in Appendix B), with many years of experience and knowledge of local construction practice regarding these essential facilities.

Only one police station had a complete set of engineering drawings, and this was the facility inventoried. As was previously mentioned, the unavailability of structural drawings for more police stations is primarily attributed to the fact that many of the older precincts are housed in structures that were not originally/solely designed to house a police station, and thus many of these drawings have been retained by the original building owners. Thus, it should be noted that more extensive investigation would be required in order to locate the required drawings. Local engineers have indicated that in addition to the fact that such a search would be time consuming, its outcome is doubtful. The recorded inventory notes are presented in the following sections. All of the collected data was summarized to produce the tables found in Section 3.5 of this document.

C.2.1 Fire Station #4**Date:** 5/21/99**Inventor:** LB

Street Address: 162 Coming St.

Information Source: CDPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1994

General Building Shape: (Draw small sketch below). – No foundation drawings available.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Spread footings

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 1500psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: - Provided by boring logs compiled by Soil Consultants Inc. (Appendix F).

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.2.2 Fire Station #7**Date:** 5/21/99**Inventor:** LB

Street Address: 1173 Fort Johnson Rd.

Information Source: CDPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1983

General Building Shape: (Draw small sketch below). – Simple rectangular plan.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Spread footings.

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 1500psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: *-None available.*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.2.3 Fire Station #8**Date:** 5/21/99**Inventor:** LB

Street Address: 370 Huger St.

Information Source: CDPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1975

General Building Shape: (Draw small sketch below). – Simple rectangular plan.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Spread footings.

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 1500psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: - *Provided by boring logs compiled by Soil Consultants Inc. (Appendix F).*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.2.4 Fire Station #9**Date:** 5/21/99**Inventor:** LB

Street Address: 1451 King St.

Information Source: CDPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1981

General Building Shape: (Draw small sketch below). – Simple rectangular plan.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Spread footings.

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 2000psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: - *Provided by boring logs compiled by Soil Consultants Inc. (Appendix F).*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.2.5 Fire Station #10**Date:** 5/21/99**Inventor:** LB

Street Address: 1 Nicholson Dr.

Information Source: CDPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1973

General Building Shape: (Draw small sketch below). – Simple rectangular plan.

Number of Stories: 1; ~2700sq.ft.Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Spread footings.

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 1500psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: -None available.

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.2.6 Fire Station #11**Date:** 5/21/99**Inventor:** LB

Street Address: 1517 Savannah Hwy.

Information Source: CDPO

Type of Info. Available: ☐ Building Drawings/Foundation Plans; ☒ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1978

General Building Shape: (Draw small sketch below).

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Spread footings

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 1500psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: - *Provided by boring logs compiled by Soil Consultants Inc. (Appendix F).*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.2.7 Fire Station #13**Date:** 5/21/99**Inventor:** LB

Street Address: 298 Folly Rd.

Information Source: CDPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1995

General Building Shape: (Draw small sketch below). – Simple rectangular plan.

Number of Stories: 1Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated square RC footings,
on 40' treated timber piles.

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing: 3000psfDepth of Footings (piles/shafts): 43'

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

*(If present, attach sketch)*Any important details pertaining to foundation/building performance: - Grade beams connect tops of isolated footings. Grade beams are side formed. Floor is slab on grade. Foundation detail available.**Subsurface Information:** *-None available.*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.2.8 Fire Station #16**Date:** 5/21/99**Inventor:** LB

Street Address: 81 Ashley Hall Plantation Rd.

Information Source: CDPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1983

General Building Shape: (Draw small sketch below). – Simple rectangular plan.

Number of Stories: 1; ~1551sq. ft.Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Spread footings.

Number of Supporting Columns:

Foundation Depth: 2.5'Bearing Pressures Existing: 2500psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: - *Provided by boring logs compiled by Soil Consultants Inc. (Appendix F).*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.2.9 Fire Station #17**Date:** 5/21/99**Inventor:** LB

Street Address: 1830 Bohicket Rd.

Information Source: CDPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1997

General Building Shape: (Draw small sketch below). – Simple rectangular plan.

Number of Stories: 1; ~6300sq.ft.Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Isolated square RC footings,
on 40' treated timber piles.

Number of Supporting Columns:

Foundation Depth:

Bearing Pressures Existing: 2500psfDepth of Footings (piles/shafts): 42'

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

*(If present, attach sketch)*Any important details pertaining to foundation/building performance: - Piles conform to ASTM D25-91, and have a minimum tip diameter of 8in. Foundation detail available.**Subsurface Information:** - *Provided by boring logs compiled by Soil Consultants Inc. (Appendix F).*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:

Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

C.2.10 Lockwood Municipal Police Complex**Date:** 5/21/99**Inventor:** LB

Street Address: 14 Lockwood Dr.

Information Source: CDPO

Type of Info. Available: ☒ Building Drawings/Foundation Plans ☐ Subsurface: Boring Logs/CPT DataAge of Building and Any Additions: 1971

General Building Shape: (Draw small sketch below). – Simple rectangular plan.

Number of Stories: 2; 21,607sq ft.Is there a basement: No**Foundation Information (attach detailed sketch showing dimensions & other relevant info.):**Foundation Type: Spread footings

Number of Supporting Columns:

Foundation Depth: 2'Bearing Pressures Existing: 2500psf

Depth of Footings (piles/shafts):

Pile Capacity/Design Load:

Present Condition of Foundations:

Presence of Underground Structures:

(If present, attach sketch)

Any important details pertaining to foundation/building performance:

Subsurface Information: *-None available.*

Elev. Of GWT:

Does any Boring/CPT Data Exist?

If yes, can a copy of it be obtained in either electronic/hard copy form?

If no, knowledge of existing soils:
















Liquefaction Potential & Seismic Info. For Location:

Presence of Geological Hazards: ☐ None Present ☐ Slope Failure ☐ Fault Rupture

Appendix D - Subsurface Conditions in the Vicinity of Essential Facilities

The inventories collected on the subsurface conditions in the vicinity of the essential facilities inventoried are presented in this appendix of which there are sections for Memphis, TN and Charleston, SC. Subsurface logs were not available for reproduction in St. Louis, MO. The boring logs presented were used to obtain the soil descriptions entered in the tables displayed in Chapter 3 using the group symbols of the Unified Soil Classification System shown in Table D-1. Section D-1 presents subsurface information in Memphis, TN and Section D-2 presents the collected information for Charleston, SC.

Table D-1: Soil Descriptions and their Associated Group Symbols Used in the Unified Soil Classification System.

UNIFIED SOIL CLASSIFICATION		
LETTER	HATCHING	NAME
GW		Well-graded gravels or gravel-sand mixtures, little or no fines.
GP		Poorly graded gravels or gravel-sand mixtures, little or no fines.
GM		Silty gravels, gravel-sand-silt mixtures.
GC		Clayey gravels, gravel-sand-clay mixtures.
SW		Well-graded or gravelly sands, little or no fines.
SP		Poorly graded sands or gravelly sands, little or no fines.
SM		Silty sands, sand-silt mixtures.
SC		Clayey sands, sand-clay mixtures.
ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, clayey silts with slight plasticity.
CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
OL		Organic silts and organic silt-clays of low plasticity.
MH		Inorganic silts, micaceous or diatomaceous fine or sandy or silty soils, elastic silts.
CH		Inorganic clays of high plasticity, fat clays.
OH		Organic clays of medium to high plasticity, organic silts.
Pt		Peat and other highly organic soils.

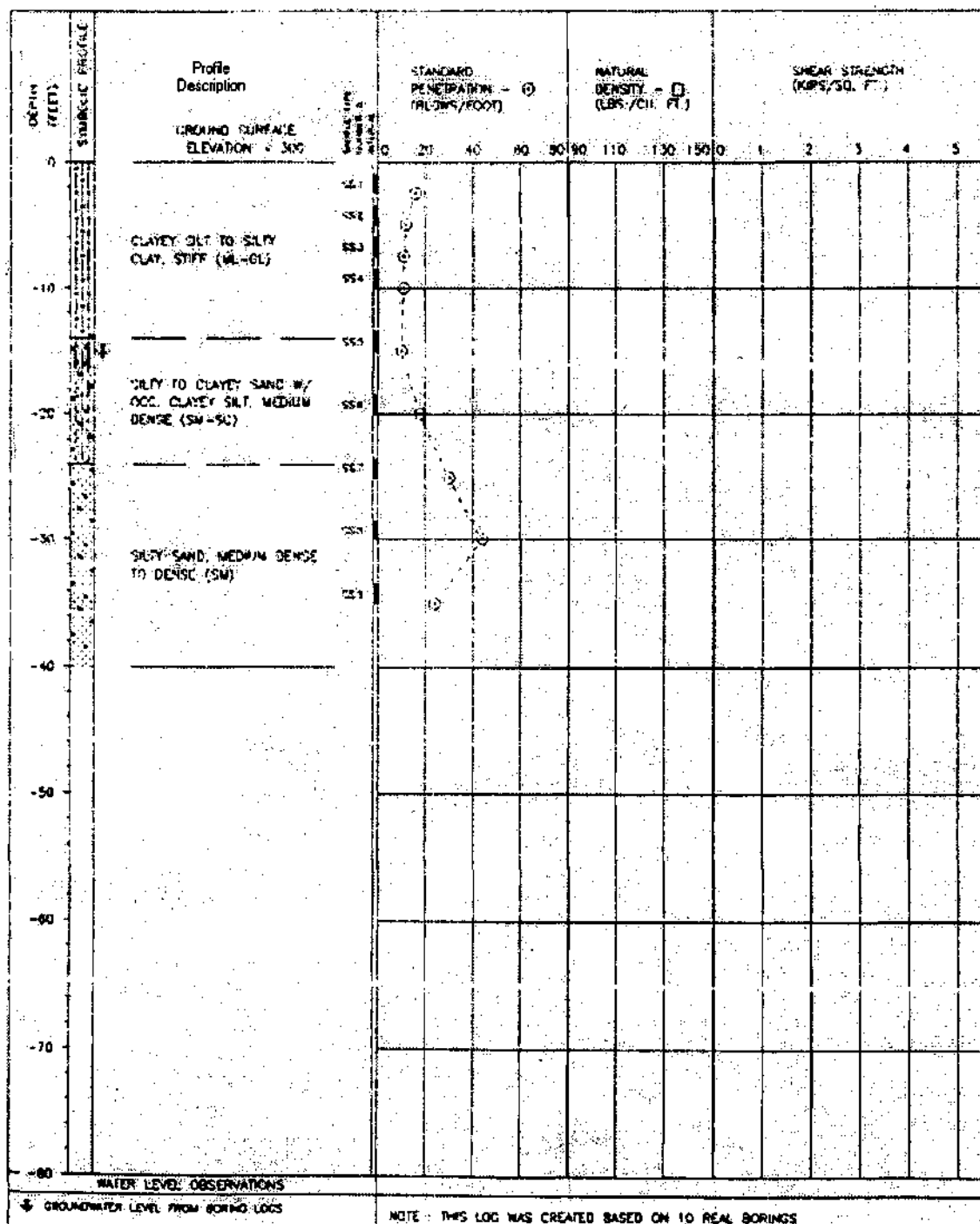
D.1 Subsurface Information - Memphis, TN

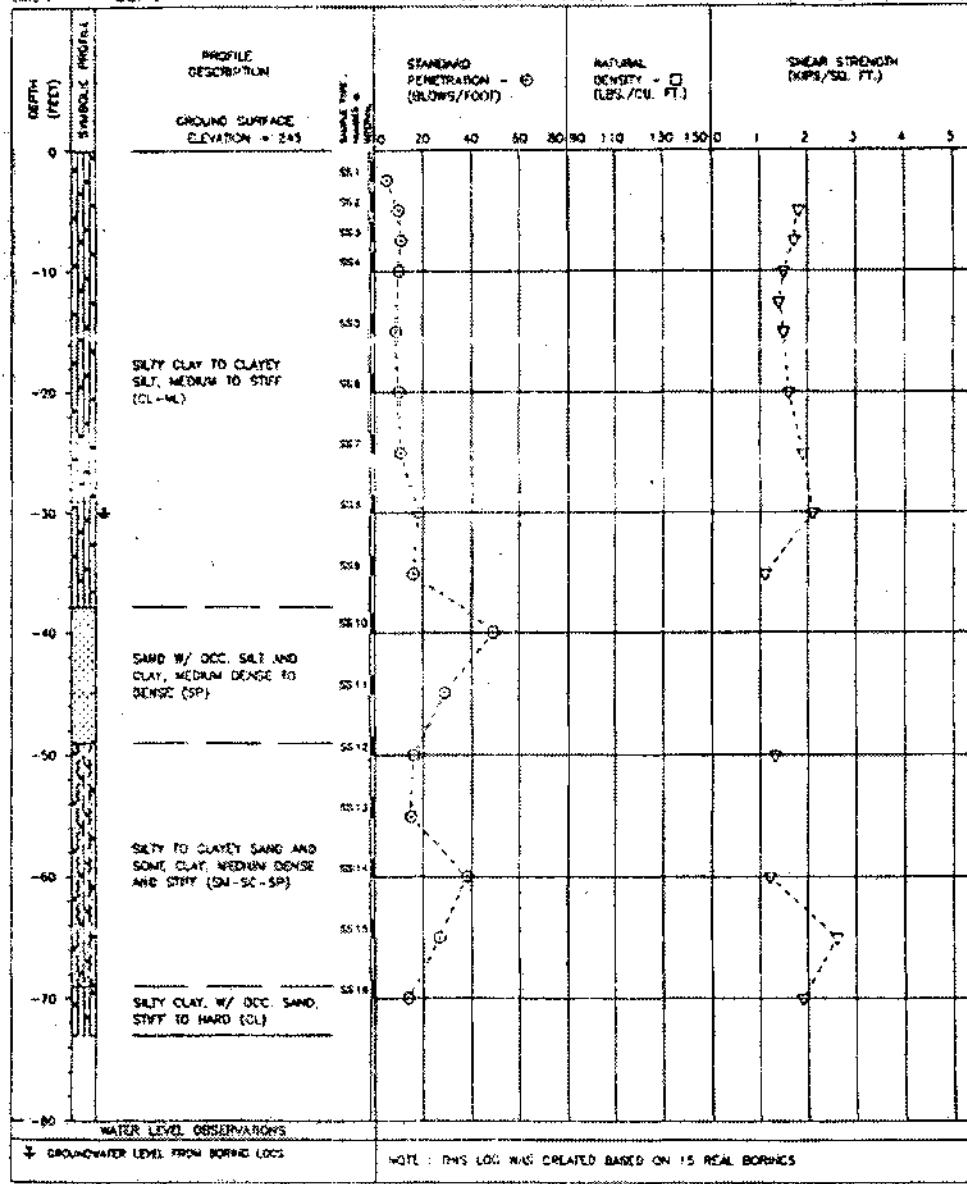
The boring logs presented in this appendix were obtained from the set of 8500 boring logs collected by Hwang et al. (1989) for the Center for Earthquake Research and Information (CERI) located at the University of Memphis. These borings logs correspond to the geographic locations of the essential facilities inventoried in Memphis, TN. Moreover, it should be noted that in the case of Snowden school where the actual soils investigation report was obtained, an actual boring log recorded by the testing company was used.

It should further be noted that the boring logs presented were those available for the sites inventoried and the inability to report a soil description for certain facilities, (primarily the police and fire stations) resulted because of the absence of the associated soil investigation report, or inability to obtain a satisfactory representative log from the CERI records corresponding to the particular location.

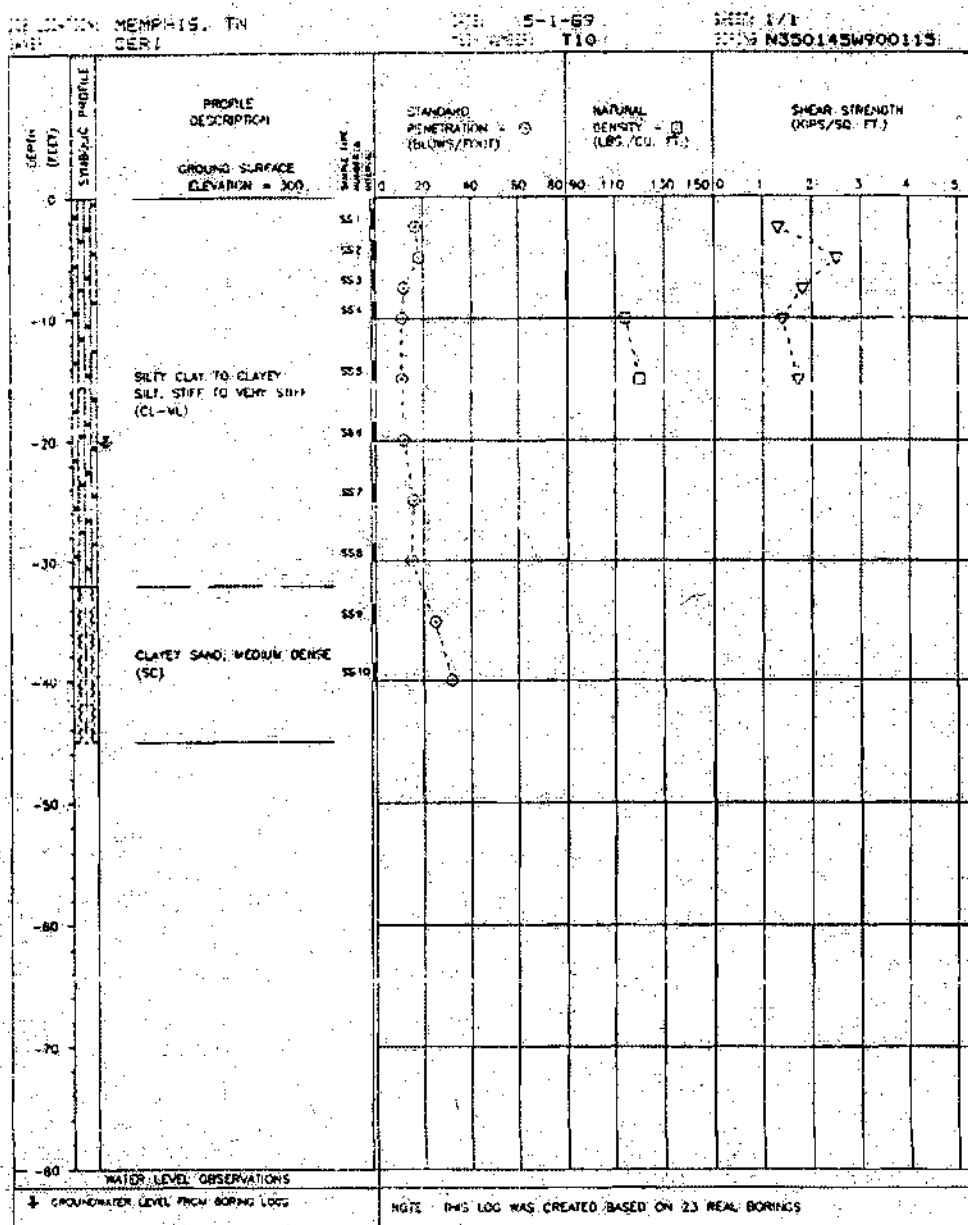
D.1 Boring Logs for Memphis City Schools Inventoried

D.1.1 Central High School

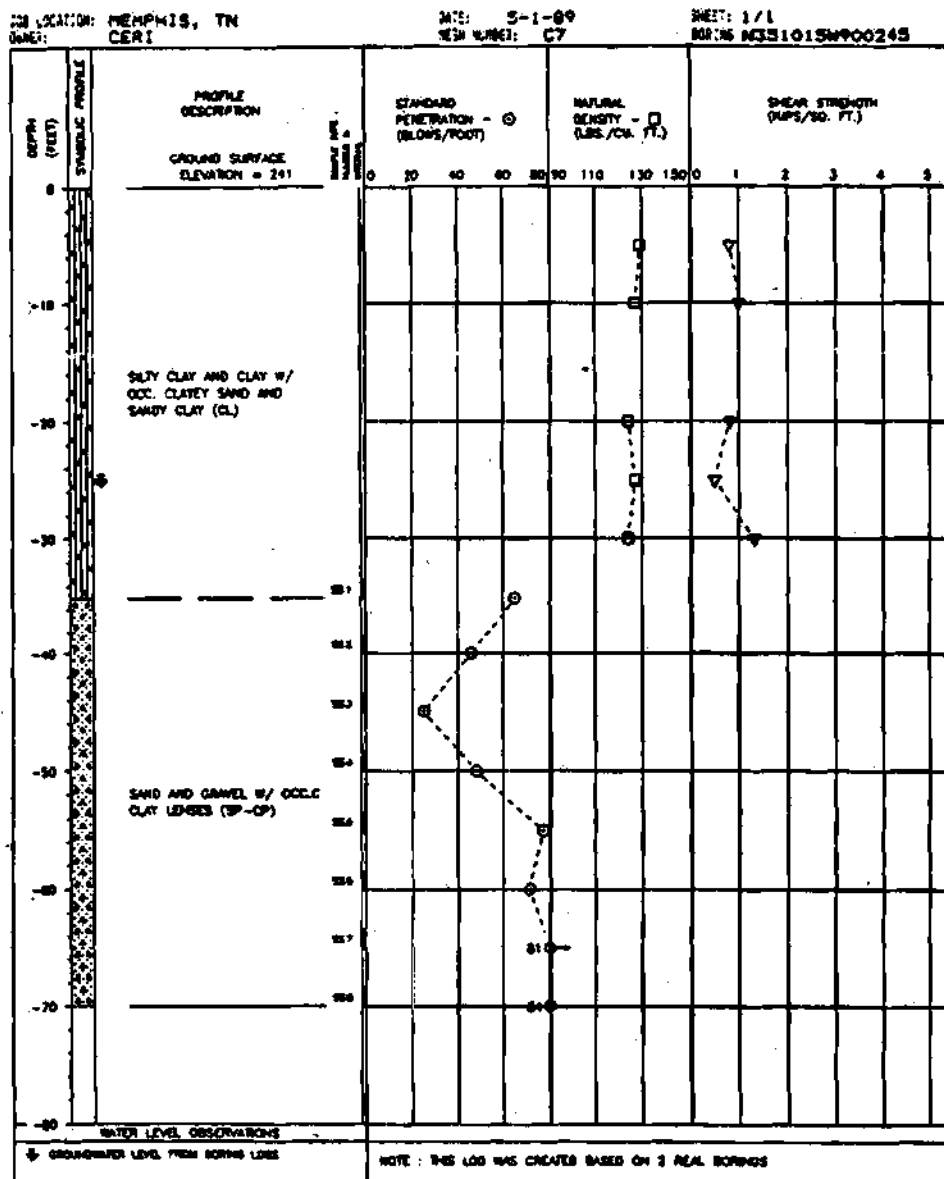


D.1.2 Delano Elementary
 LOCATION: MEMPHIS, TN
 DATE: 5-1-89
 SHEET: 1/1
 CASE: CEF 1
 REF. NO.: AA17
 LOG: N331145MB95745


D.1.3 Hillcrest High School



D.1.4 Humes Junior High School



JOB LOCATION: MEMPHIS, TN
 OWNER: CEPI
 DATE: 7-28-89
 TEST NUMBER: A21
 SHEET: 1/1
 JOB NO: N351113W895545

DEPTH (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION GROUND SURFACE ELEVATION = 250	STANDARD PENETRATION - \odot (BLOWS/FOOT)	NATURAL DENSITY - \square (LBS./CU. FT.)	SHEAR STRENGTH (KIPS/SQ. FT.)										
					0	20	40	60	80	100	120	140	160		
0															
5															
10															
15															
20															
25															
30															
35															
40															
45															
50															
55															
60															
65															
70															
75															
80															
85															
90															
95															
100															

PROFILE DESCRIPTION: SILTY CLAY, MEDIUM TO STIFF (ML)

WATER LEVEL OBSERVATIONS:

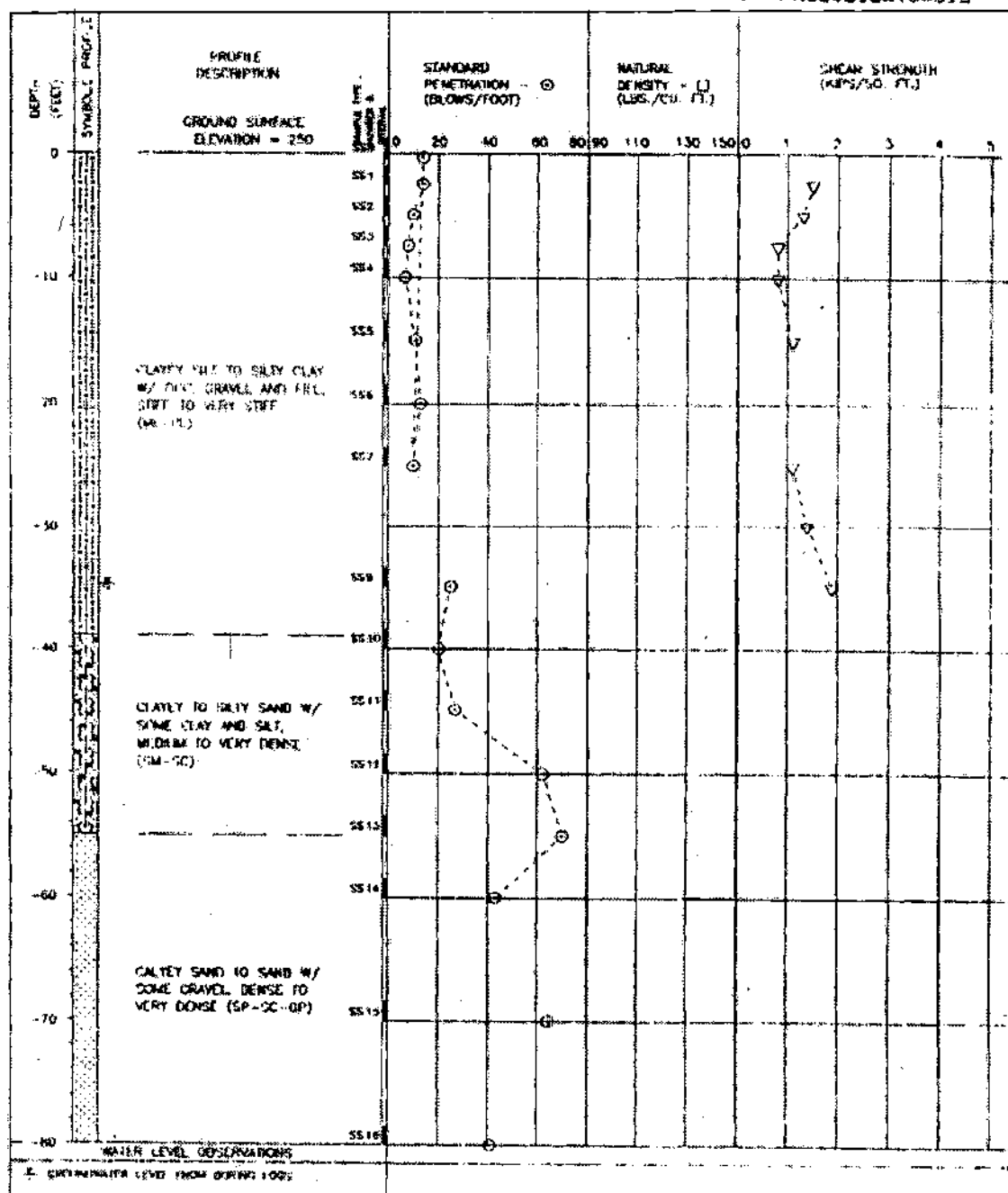
NOTE: THIS LOG WAS CREATED BASED ON 2 REAL BORINGS

D.1.6 Kansas Street Elementary

Location: MEMPHIS, TN
Owner: CERL

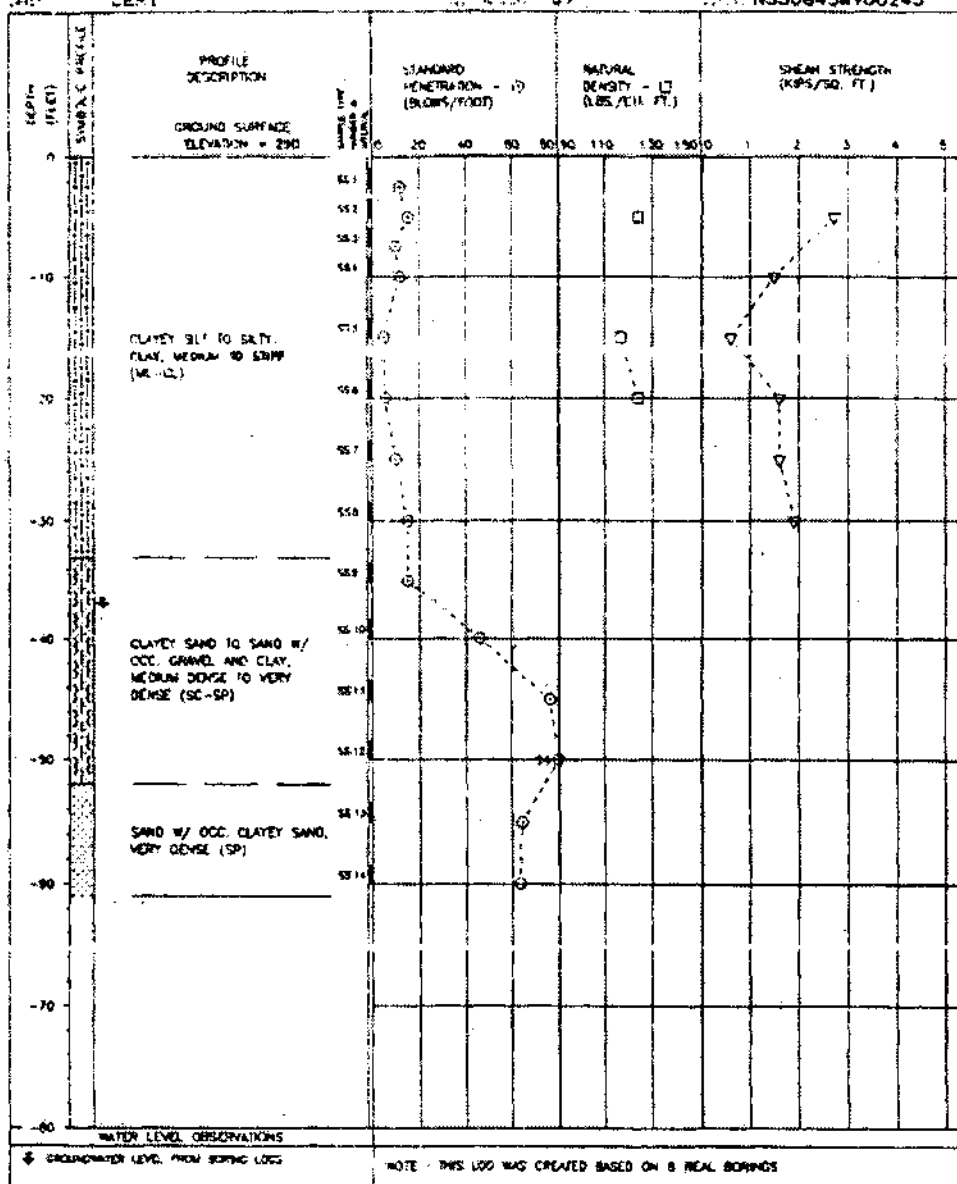
Date: 3-28-89
Ref: 56

Ref: N350815W900315



D.1.7 Lincoln Elementary School
 LOCATION: MEMPHIS, TN
 DATE: CER 1

 DATE: 0-18-89
 NO. BORINGS: J7

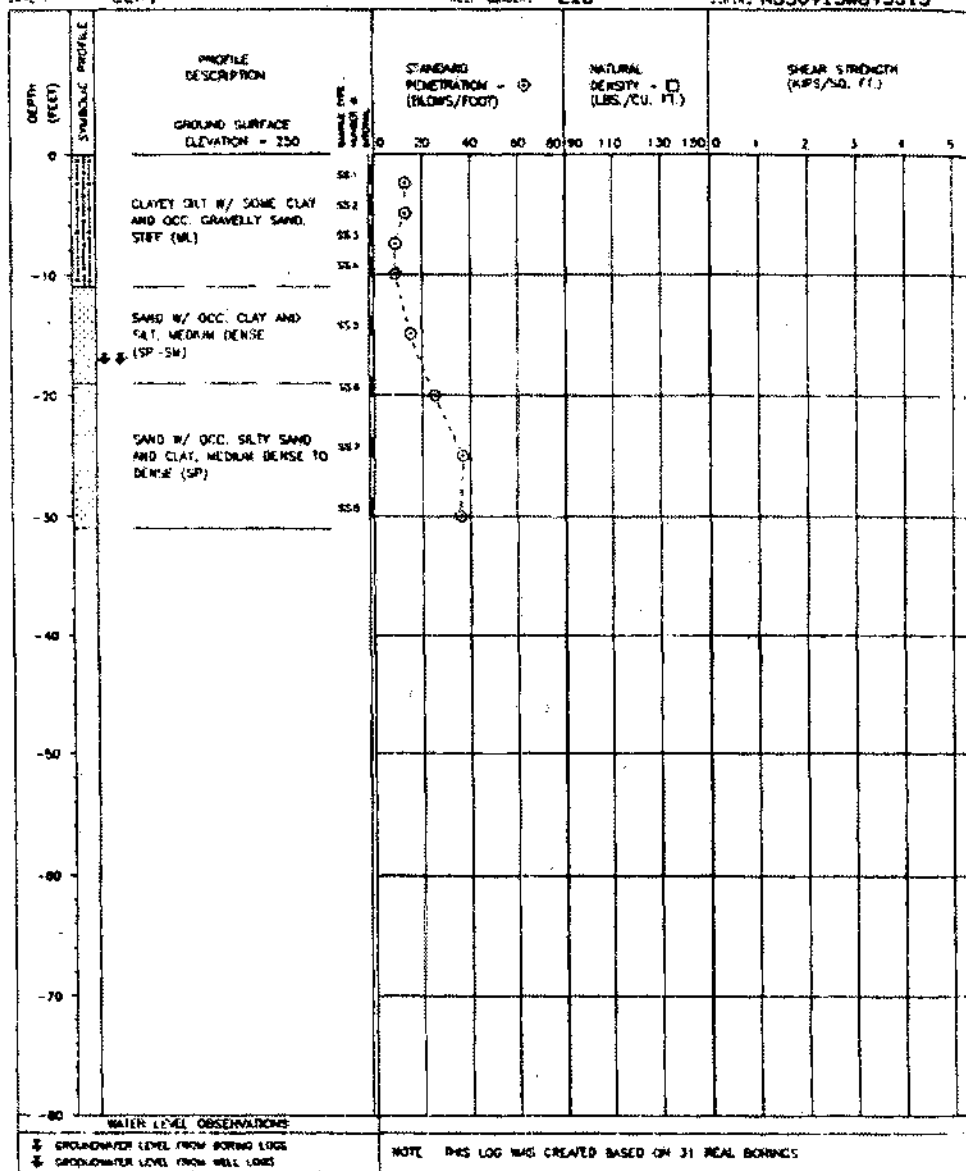
 SHEET: 1/1
 SPEC: N350645W900243


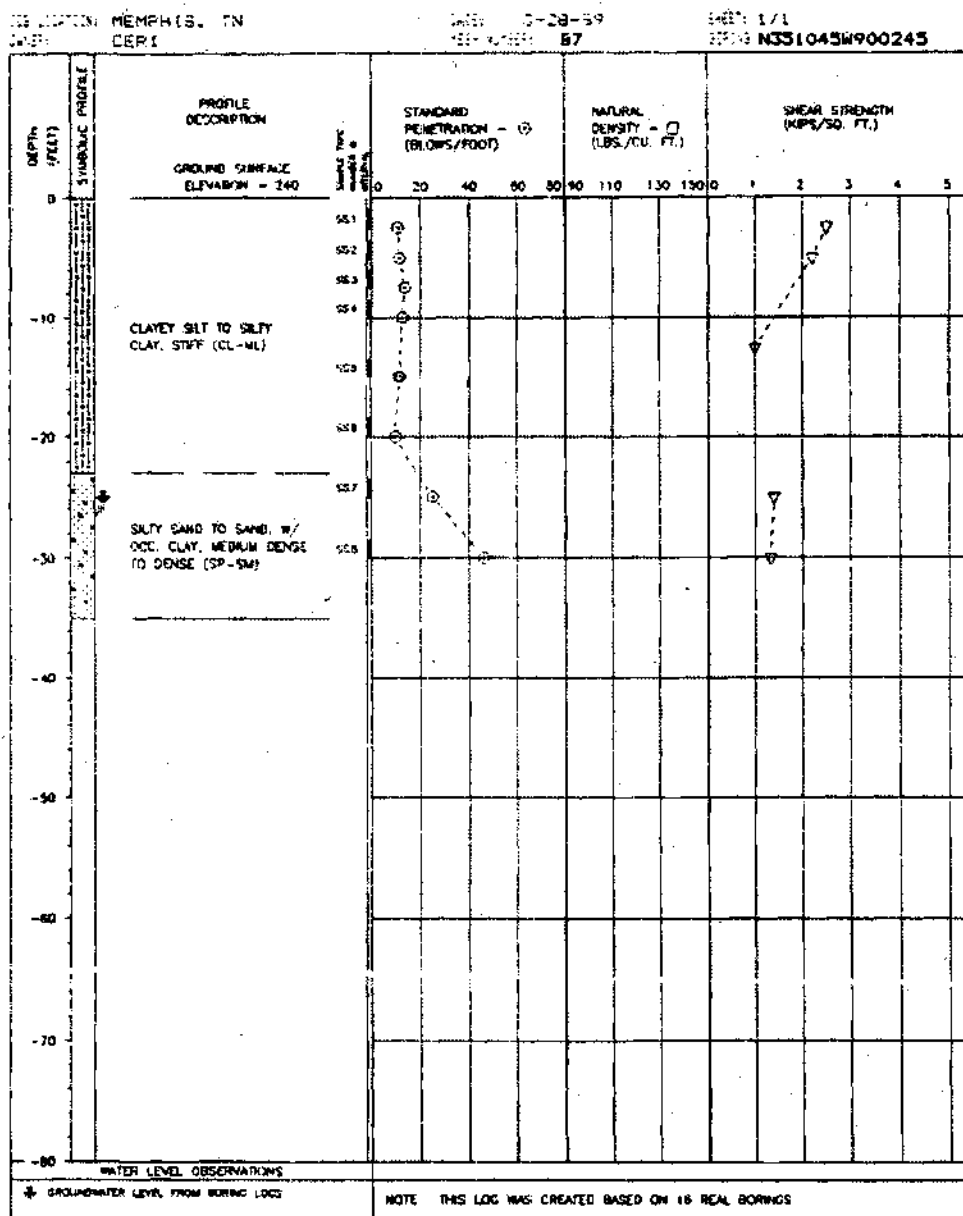
D.1.8 Macon Elementary

MEMPHIS, TN
 CEF1

DATE: 7-28-69
 RES. NUMBER: E26

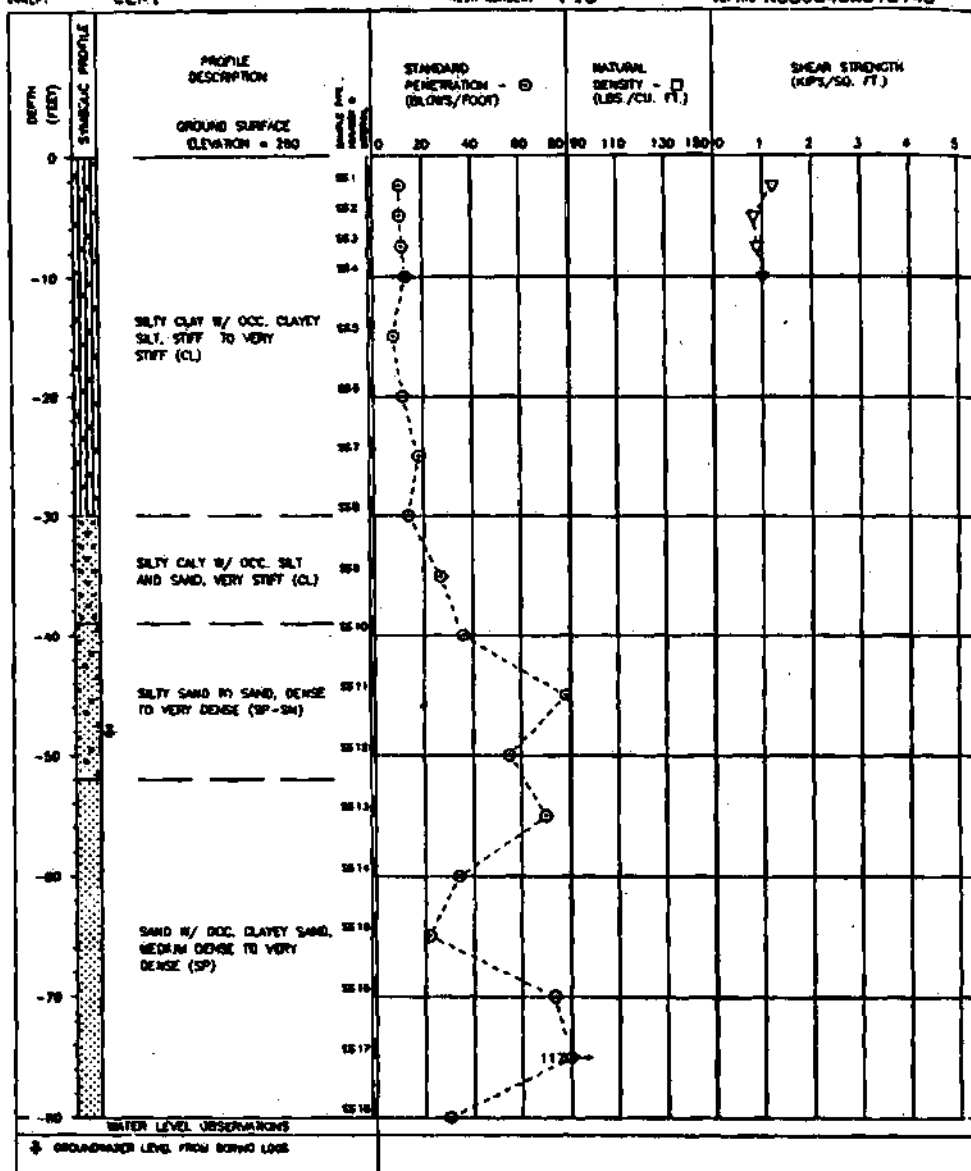
SHEET: 1/1
 EX. NO. N350915W895315



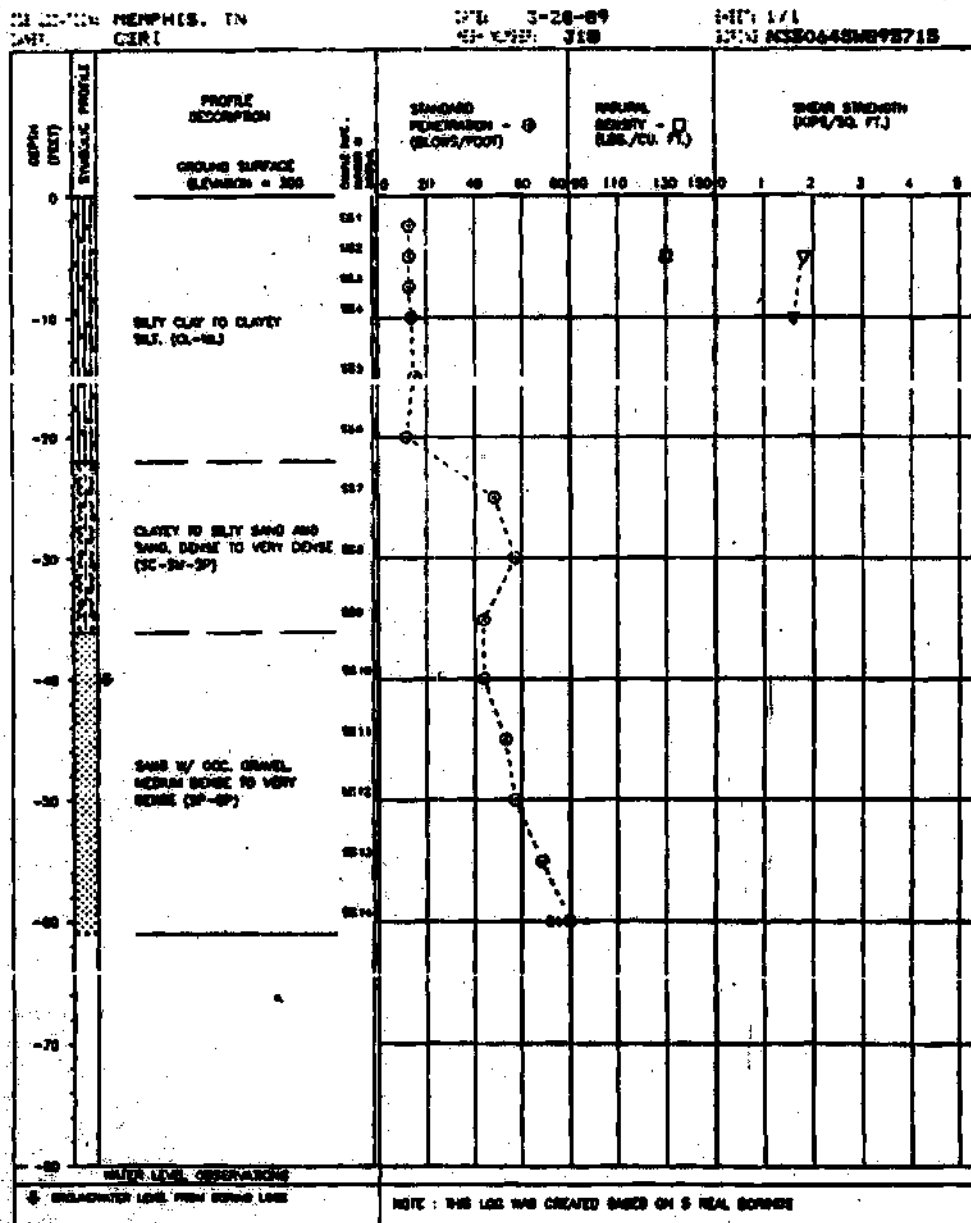
D.1.9 Manassas High School

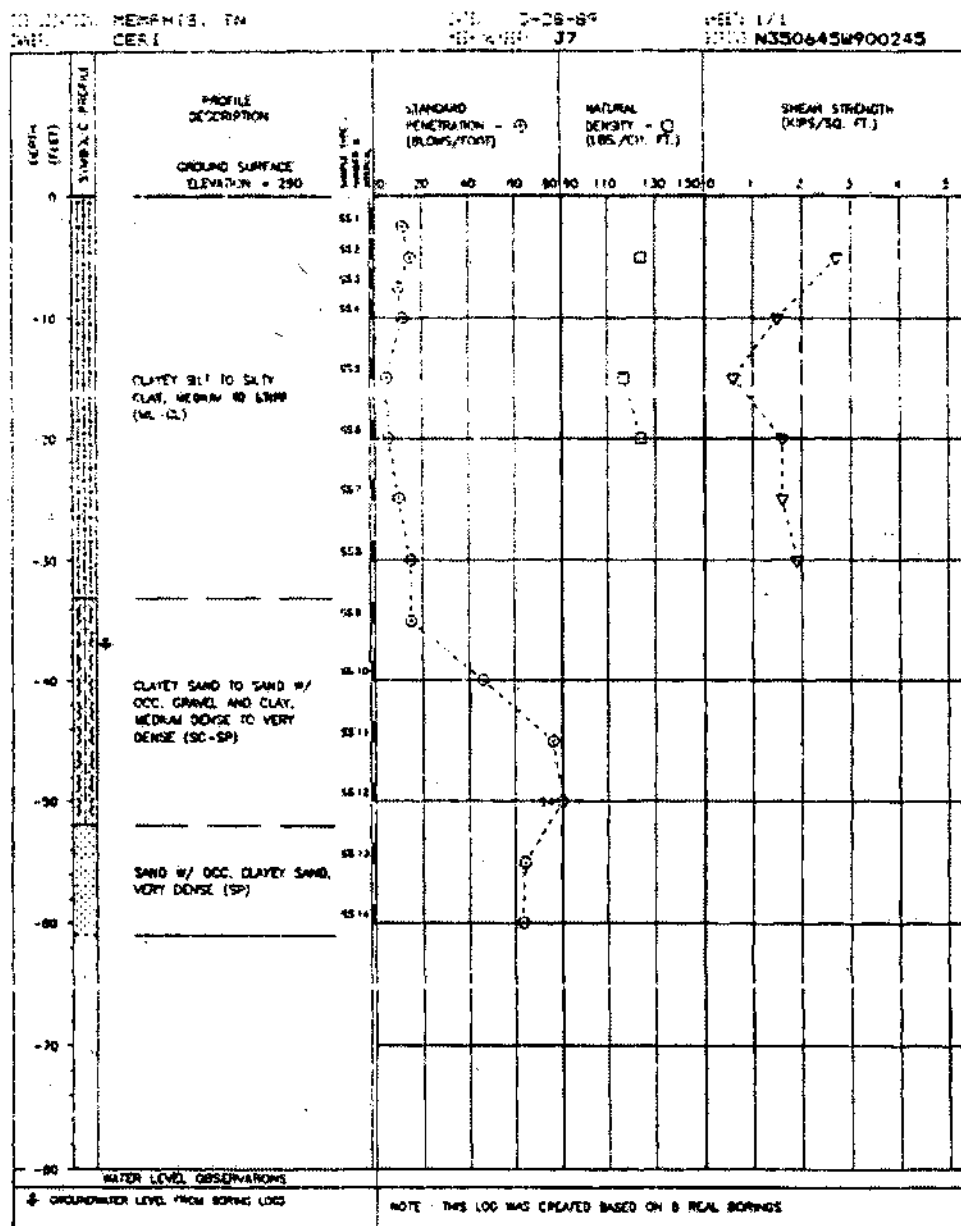
D.1.10 Memphis Technical High School
 JOB LOCATION: MEMPHIS, TN
 GAGE: CER1

 DATE: 3-28-89
 HESH NUMBER: F13

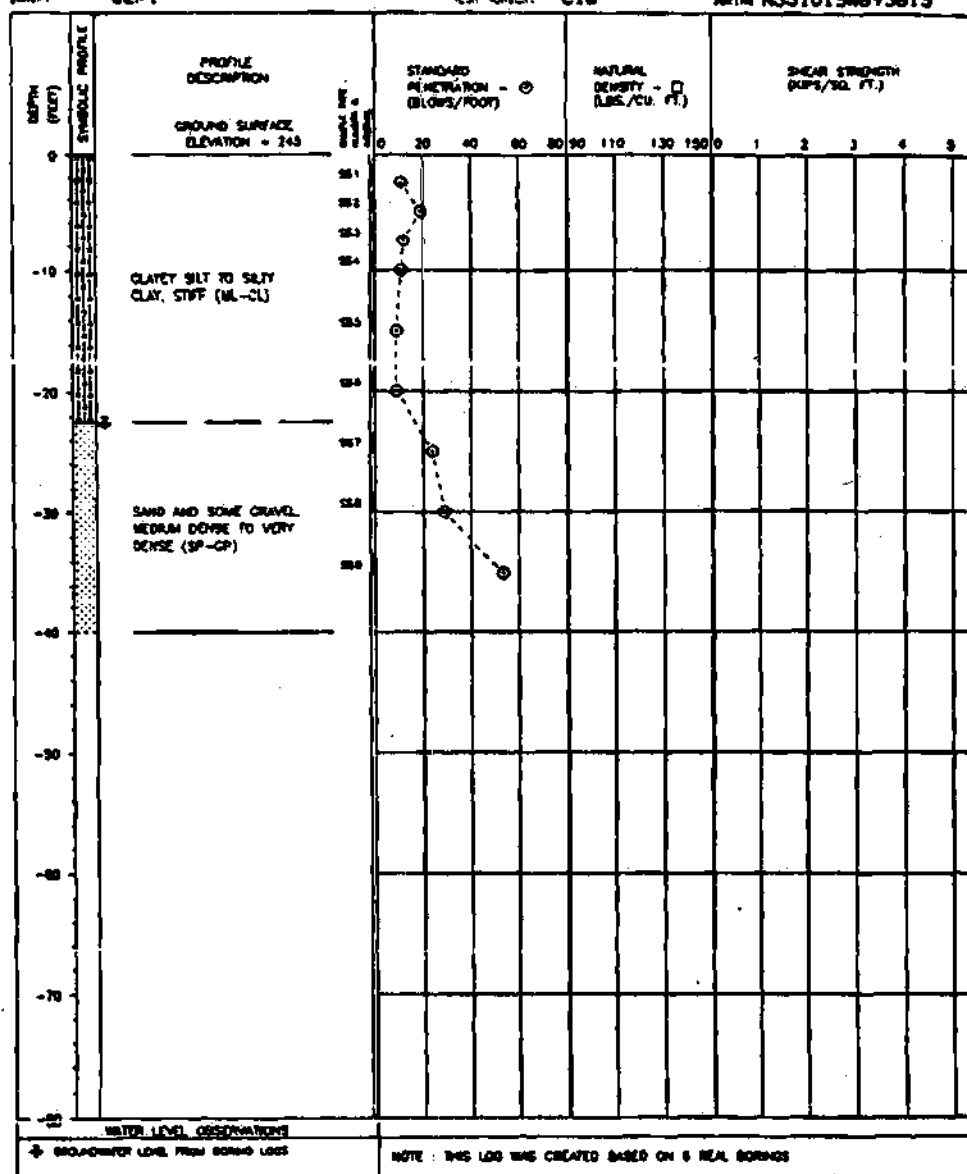
 SHEET: 1/2
 NO. 13 N350845W895945


D.1.11 Messick Vocational and Adult Center



D.1.12 Orleans Elementary School

JOB LOCATION: MEMPHIS, TN		DATE: 5-1-89	SHEET: 1/1															
OWNER: CER1		WELL NUMBER: BB21	BORING: N351215W895545															
DEPTH (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION	STANDARD PENETRATION - \odot (BLOWS/FOOT)		NATURAL DENSITY - \square (LBS./CU. FT.)		SHEAR STRENGTH (KIPS/SQ. FT.)											
			0	20	40	60	80	100	120	140	1	2	3	4	5			
0		GROUND SURFACE ELEVATION = 230																
5		SANDY SILT (ML)																
10		SILTY CLAY (CL)																
15		SANDY SILT (ML)																
20		SAND (SP)																
25		FAT CLAY (CH)																
30																		
35																		
40																		
45																		
50																		
55																		
60																		
65																		
70																		
75																		
80																		
85																		
90																		
95																		
100																		
WATER LEVEL OBSERVATIONS																		
* GROUNDWATER LEVEL FROM BORING LOGS			NOTE: THIS LOG WAS CREATED BASED ON 2 REAL BORINGS															

D.1.14 Shannon Elementary SchoolLOCATION: MEMPHIS, TN
SHEET: CPTDATE: 3-28-89
SHEET: C16SHEET: 1/1
SHEET: NCS1015N895815

D.1.15 Snowden Junior High School

TEST BORING RECORD						
<div style="display: flex; justify-content: space-between;"> <div> <p>INC.</p> <p>4141 RIDGEMORE AVENUE MEMPHIS, TENN. 38118 PHONE 365-1809</p> </div> <div> <p>Date Drilled 11/23/77</p> <p>Project Snowden School Addition Memphis, Tennessee</p> <p>Elev. @ Surface</p> </div> <div> <p>Job No. F2861</p> <p>Boring No. B-6</p> </div> </div>						
DEPTH	LOG	DESCRIPTION	ELEV.	N/6"	w	
0		Stiff Dark Gray & Brown SILTY CLAY, CL		4-5-4	21.7	Vented Cap 4" Clay Seal $q_u = 2.71$ ksf Backfilled with Material from Hole 1.5" Dia. PVC Pipe Clay Seal
2		Medium Stiff Brownish Gray		2-2-2	33.0	
3				2-3-4	24.3	
10		Medium Stiff Grayish Brown CLAYEY SILT, ML	(120)	3-3-4	26.8	LL=27, PI=7 $q_u = 5.79$ ksf LL=17, PI=5 64.8% Sand Gravel Backfill $q_u = 1.36$ ksf 45% Sand 5" Slotted Pipe Bottom Capped @ 35 feet. *Well Reading
15		Stiff Brown SILTY CLAY, CL		4-4-6	23.1	
20		Loose Brown SILTY CLAYEY SAND, SC-SM		6-4-5	18.0	
25		Stiff Brown & Gray SANDY CLAY, CL		3-3-5	18.9	
30		Very Dense Tan SILTY GRAVELLY SAND, SP-SM	(0)	30-62- 38/4"	10.3	
35		Very Dense Light Brown SILTY SAND, SM		19-21-23	25.8	
40		Boring Terminated @ 36.0'				

N = No. Blows for 140-lb. Hammer falling 30 inches

w = Moisture Content, per cent

() Hrs. after completion of Boring for water level

Water Level Water encountered during drilling

Split-Spoon Sample Shelby Tube Sample Sample not recovered

TYPE OF DRILLING:

☒ Hollow-Core Auger

☐ Hydraulic Rotary

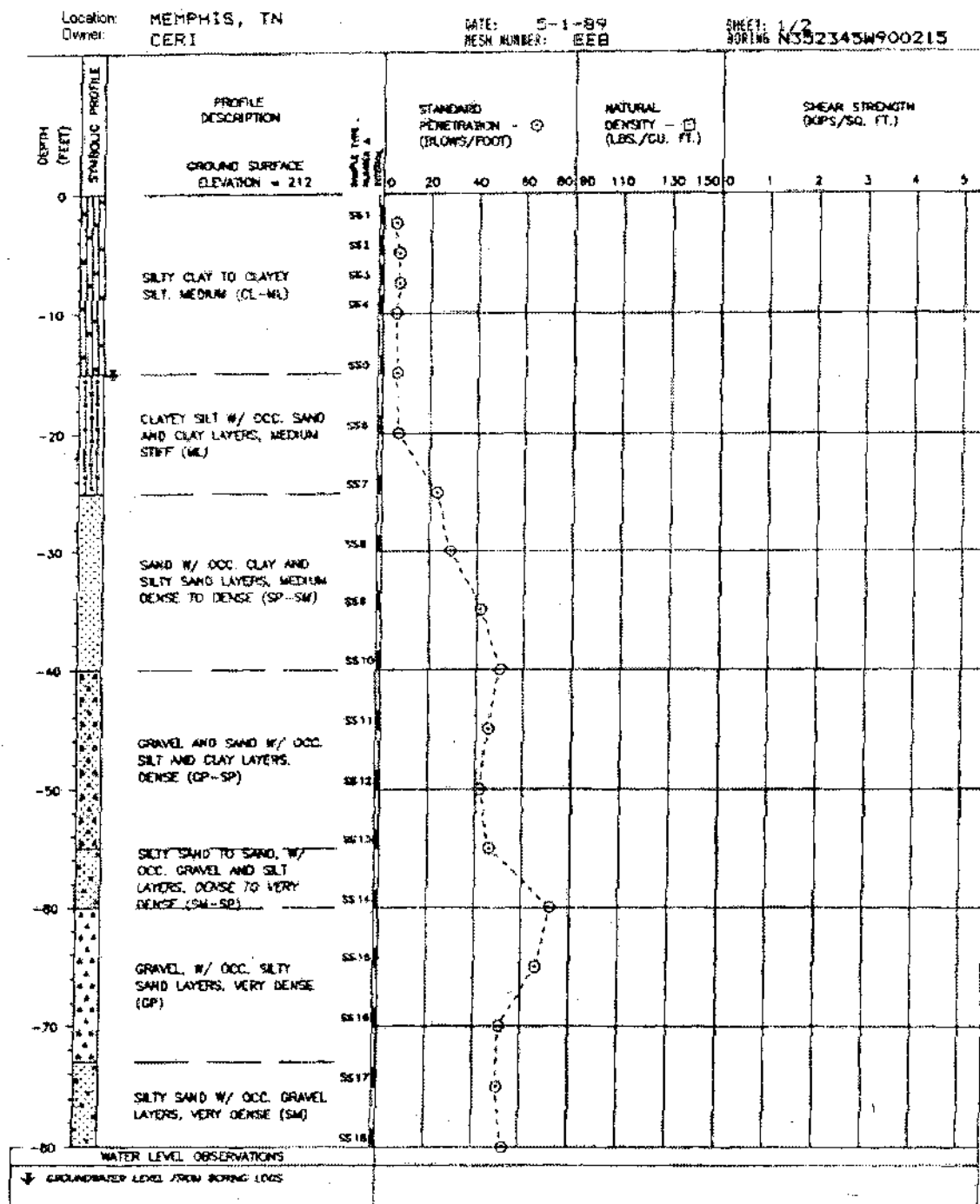
☐ Hand Auger

☐ Wash Boring

☐

D.1.16 Wells Station Elementary

LOCATION: MEMPHIS, TN WELL: CERI		DATE: 5-1-89 WELL NUMBER: C24		SHEET: 1/1 BORING NO: 1015MB93415														
DEPTH (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION	STANDARD PENETRATION - (BLOWS/FOOT)					NATURAL DENSITY - (LBS./CU. FT.)			SHEAR STRENGTH (KIPS/SQ. FT.)							
			0	20	40	60	80	100	110	130	150	1	2	3	4	5		
0		GROUND SURFACE ELEVATION = 235																
-5																		
-10		SILT (ML)																
-15																		
-20		SAND (SP)																
-25																		
-30																		
-35																		
-40																		
-45																		
-50																		
-55																		
-60																		
-65																		
-70																		
-75																		
-80																		
WATER LEVEL OBSERVATIONS																		
+ BENCHMARK LEVEL FROM BORING LOGS			NOTE: THIS LOG WAS CREATED BASED ON 1 REAL BORING															

D.1.17 Westside Elementary School

D.2 Subsurface Information - Charleston, SC

All of the boring logs presented in this appendix are the actual boring logs recorded by the personnel of the Charleston-based soil testing firm Soil Consultants, Inc. at either the actual location of or in very close proximity to the essential facility indicated. With the consent of Soil Consultant's management, copies of the boring records were obtained from the company's project files and assistance provided by the company's Senior Vice President, Mr. James Duffy, in identifying which project boring logs provided the best representation of soil conditions at or in the vicinity of essential facilities in Charleston. In cases where several borings were performed at a single site, the boring log presented provides the best representation of the soil profile at that particular site.

It should further be noted that the inability to report a soil description for some of the Charleston facilities resulted because of the absence of a suitable boring log that would best indicate the soil profile at those locations.

.F.1 Boring Logs for Charleston City Schools Inventoried

.F.1.1 James Island Middle School

SOIL CONSULTANTS, INC.

CHARLESTON, S. C.

SAVANNAH, GA

LOG of BORING

Project: Proposed James Island Fire Station No. 4, James Island, S.C.

Boring No. 2 S. C. I. Project No. 8017 Date 1-17-80

Ground Surface Elev. Assumed 0.0' Datum _____ Gr. Water Elev. 2.2'
(Minimum of 24 hrs. after completion)

[illegible]

Testing and Sampling in accordance with ASTM D. 1586-67 (1976)

Remarks: *Visual Unified Soil Classification

Shovel sample adjacent to boring indicated root to approximately 2' depth.

F.1.2 Mitchell Elementary School

SOIL CONSULTANTS, INC.
CHARLESTON, S. C.

Log of Boring

Name of Project: Proposed Bldg., Immaculate Conception School, Charleston, S. C.Boring No. 1 Field Engineer E. L. Phillips Date 9-27-61Ground Surface Elev. Assumed 0' Datum _____ Gr. Water Elev. 4'0"

Sample No.	SAMPLE Elev. - Feet		STRATUM Elev. - Feet		VISUAL FIELD CLASSIFICATION	Blows Per Foot
	From	To	From	To		
			0'0"		Grayish silty sand with roots,	
				2'0"	brick, glass and other debris,	
1	2'6"	3'6"	2'0"		Loose brownish fine sand with slight	3
				4'0"	traces of organic clay content.	
2	5'0"	6'0"	4'0"		Medium tannish inorganic clay with	8
				6'6"	slight sand content.	
3	7'6"	8'6"	6'6"		Loose tannish fine sand with slight	7
				9'0"	inorganic clay content.	
4	10'0"	11'0"	9'0"		Medium bluish gray organic clay with	5
				12'6"	slight sand content.	
5	15'0"	16'0"	12'6"		Very soft bluish gray organic clay	1
				17'0"	with slight mica & shell content.	
6	20'0"	21'0"	17'0"		Medium bluish gray organic clay	8
				22'6"	with slight sand content.	
7	25'0"	26'0"	22'6"	27'0"	Very soft bluish gray organic clay.	2
8	30'0"	31'0"	27'0"		Loose bluish gray fine sand with	7
				33'0"	high shell and traces of organic	
					clay content.	
9	35'0"	36'0"	33'0"		Soft bluish gray organic clay with	3
				37'6"	slight shell.	
10	40'0"	41'0"	37'6"		Stiff bluish gray organic clay with	9
				43'6"	slight shell, and high sand.	
11	45'0"	46'0"	42'6"	43'6"	Dense grayish fine sand.	34
12	50'0"	51'0"	48'6"		Stiff brownish green calcareous	12
					clay with slight sand content.*	
					CON'T. ON NEXT PAGE.	

Number of blows of 140 lb. hammer dropped 30 in. required to drive 2 in. split-spoon sampler 1 ft. after first being driven 1 in.

* Locally called Marl.

Remarks: _____

F.1.3 Rivers Middle School

SOIL CONSULTANTS, INC.

CHARLESTON, S. C.

Log of Boring

Name of Project: Proposed Addition, James Simons School, Charleston, S. C.Boring No. 2 Field Superintendent Alvin Brown Date 7-10-75Ground Surface Elev. Assumed 0'0" Datum Sea Level Gr. Water Elev. 3'2"
SCI Project 75100 *Minimum of 24 hrs. after completion

Sample No.	SAMPLE Elev. - Feet & Inches		STREAM Elev. - Feet & Inches		VISUAL FIELD CLASSIFICATION	Notes Per 2 inches
	From	To	From	To		
1	0'0"	1'6"	0'0"		Very loose brown fine sand with brick debris content.	1-2-1
2	2'6"	4'0"	2'0"		Loose brown fine sand with brick debris content.	2-2-3
3	5'0"	6'6"	4'6"		Very loose brown fine sand with high brick debris content.	1-2-1
4	7'6"	9'0"	6'6"		Very soft brown inorganic clay with high shell content.	V18"
5	10'0"	11'6"			Very soft gray inorganic clay with high shell content.	1-1-1
6	12'6"	14'0"			Very soft gray inorganic clay with high shell content.	V18"
7	14'0"	16'6"			Very soft gray inorganic clay with high shell content.	2/18"
8	20'0"	21'6"	18'0"		Loose gray fine silty sand with high shell content.	2-2-3
9	24'0"	25'6"	23'0"	27'0"	Medium gray fine sand.	7-10-10
10	29'0"	30'6"	27'0"	32'0"	Very loose gray fine sand.	1-2-2
11	34'0"	35'6"	32'0"	37'0"	Medium gray fine sand.	8-12-16
12	39'0"	40'6"	37'0"	42'0"	Medium gray inorganic clay with fine sand lens content.	1-3-3
13	44'0"	45'6"	42'0"		Very soft gray inorganic clay with shell content.	V18"
14	49'0"	50'6"		53'0"	Very soft gray inorganic clay with fine sand lens.	2/18"

Testing and Sampling in accordance with ASTM D 1586-47

Remarks: Equipment Used: F-250-1*Locally called Marl

.F.2 Boring Logs for Fire Stations Inventoried in Charleston

.F.2.1 FS #4

SOIL CONSULTANTS, INC.
CHARLESTON, S. C.

Log of Boring

Name of Project: Proposed Bldg., Immaculate Conception School, Charleston, S. C.
Boring No. 2 Field Engineer E. L. Phillips Date 9-28-61
Ground Surface Elev. Assumed 0' Datum _____ Gr. Water Elev. 3'4"

Sample No.	SAMPLE Elev. - Feet		STRATUM Elev. - Feet		VISUAL FIELD CLASSIFICATION	Blows Per Foot
	From	To	From	To		
			0'0"	0'8"	Brownish silty sand.	
			0'8"		Blackish silty sand with brick, coal ash and cinders and debris.	
				2'0"		
1	2'6"	3'6"	2'0"		Very soft dark gray silty organic clay.	1
2	5'0"	6'0"			Very soft dark gray silty organic clay.	1
				7'0"		
3	7'8"	8'6"	7'0"		Soft to medium bluish gray organic clay with slight sand.	4
				9'6"		
4	10'0"	11'0"	9'6"		Medium bluish gray organic clay with high sand.	6
				12'0"		
5	13'0"	16'0"	12'0"		Very soft bluish gray organic clay.	1
6	20'0"	21'0"			Very soft dark brown organic clay with slight decayed vegetation.	2
				23'6"		
7	25'0"	26'0"	23'6"		Soft to medium bluish gray organic clay.	4
				28'0"		
8	30'0"	31'0"	28'0"		Loose bluish gray fine sand with slight organic clay and shell content.	6
				32'6"		
9	35'0"	36'0"	32'6"	38'0"	Soft bluish gray organic clay.	3
10	40'0"	41'0"	38'0"		Medium bluish gray fine sand with slight organic clay & shell content.	12
				43'6"		
11	43'0"	46'0"	43'6"		Dense grayish fine sand with slight mica content.	40
				47'6"		
12	50'0"	51'0"	47'6"		Loose grayish fine sand with slight mica content.	20
				52'0"		

Number of blows of 140 lb hammer dropped 30 in. required to drive 2 in. spoon sampler 1 ft. after first being driven 2 in.

Remarks:

F.2.2 FS #8

SOIL CONSULTANTS, INC.
CHARLESTON, S. C.

Log of Boring

Name of Project: Proposed Addition, James Simons School, Charleston, S. C.

Boring No. 2 Field Superintendent Alvin Brown Date 7-10-75

Ground Surface Elev. Assumed 0'0" Datum Gr. Water Elev. * 3'2"
SCI Project 75100 *Minimum of 24 hrs. after completion

Sample No.	SAMPLE Elev. - Feet & Inches		SOUND Elev. - Feet & Inches		VISUAL FIELD CLASSIFICATION	Notes Per 6 inches
	From	To	From	To		
1	0'0"	1'6"	0'0"	2'0"	Very loose brown fine sand with brick debris content.	1-2-1
2	2'6"	4'0"	2'0"	4'6"	Loose brown fine sand with brick debris content.	2-2-3
3	5'0"	6'6"	4'6"	6'6"	Very loose brown fine sand with high brick debris content.	1-2-1
4	7'6"	9'0"	6'6"		Very soft brown inorganic clay with high shell content.	V18"
5	10'0"	11'6"			Very soft gray inorganic clay with high shell content.	1-1-1
6	12'6"	14'0"			Very soft gray inorganic clay with high shell content.	V18"
7	15'0"	16'6"		18'0"	Very soft gray inorganic clay with high shell content.	2/18"
8	20'0"	21'6"	18'0"	23'0"	Loose gray fine silty sand with high shell content.	2-2-3
9	24'0"	25'6"	23'0"	27'0"	Medium gray fine sand.	7-10-10
10	29'0"	30'6"	27'0"	32'0"	Very loose gray fine sand.	5-2-2
11	34'0"	35'6"	32'0"	37'0"	Medium gray fine sand.	8-12-16
12	39'0"	40'6"	37'0"	42'0"	Medium gray inorganic clay with fine sand lens content.	1-3-3
13	44'0"	45'6"	42'0"		Very soft gray inorganic clay with shell content.	V18"
14	49'0"	50'6"		53'0"	Very soft gray inorganic clay with fine sand lens.	2/18"

Testing and Sampling in accordance with ASTM D 1586-67

Remarks: Equipment Used: F-250-1

*Locally called Marl

F.2.3 FS #9

CHARLESTON, S. C.

SOIL CONSULTANTS, INC.

SAVANNAH, GA

LOG of BORING

Project: Proposed Charleston Neck Fire Station,
King and Meriot Streets, Charleston, S.C.

Boring No. 2 S. C. I. Project No. 80267 Date 10-17-80/2-2-81/2-19-8.

Ground Surface Elev. Assumed 0'0" Datum Gr. Water Elev. 4'8"
(Minimum of 24 hrs. after completion)

Sample No.	SAMPLE Elev. - Feet & Inches		STRATUM Elev. - Feet & Inches		VISUAL FIELD CLASSIFICATION	Blows Per 6 Inches
	From	To	From	To		
1	0'0"	1'6"	0'0"	2'0"	Loose brown fine sand with slight granite and gravel and with root in the top 4". (SM w/ root, granite and gravel)*	3-3-3
2	2'6"	4'0"	2'0"	4'6"	Very soft tan inorganic clay with slight sand and very slight hairline root content. (CL w/ root)*	2/18"
3	5'0"	6'6"	4'6"	7'0"	Soft tan and gray inorganic clay with medium sand content. (SC)*	2-2-2
4	7'6"	9'0"	7'0"	9'6"	Loose tan fine sand. (SM)*	2-3-5
5	10'0"	11'6"	9'6"		Very loose tan fine sand with slight inorganic clay content. (SM)*	1-2-1
6	12'6"	14'0"		14'6"	Very loose gray fine sand with slight shell content. (SM w/shell)*	1-2-2
7	15'0"	16'6"	14'6"	17'0"	Loose gray fine sand with very high shell content. (SM/SP)*	3-3-3
8	17'6"	19'0"	17'0"	19'6"	Medium gray fine sand with high shell content. (SM/SP)*	3-6-6
9	20'0"	21'6"	19'6"		Very loose gray fine sand with medium shell content. (SM/SP)*	2-1-2
10	24'0"	25'6"		28'6"	Medium gray silty fine sand with slight shell content. (SM w/shell)*	6-8-8

Testing and Sampling in accordance with ASTM D. 1586-67 (1974)

CONTINUED

Remarks: *Visual Unified Soil Classification

Shovel sample adjacent to boring indicated
varying roots to a depth of approximately 12".

F.2.4 FS #11

SOIL CONSULTANTS, INC.

CHARLESTON, S. C.

SAVANNAH, GA.

LOG of BORING

Project: Proposed Tom Farsell Chevrolet, U.S. Highway 17 South, Chas., S.C.Boring No. 2 S. C. I. Project No. 78127 Date 6-19-78Ground Surface Elev. Assumed 0'0" Datum Gr. Water Elev. 3'9"
(Minimum of 24 hrs. after completion)

Sample No.	SAMPLE Elev. - Feet & Inches		STRATUM Elev. - Feet & Inches		VISUAL FIELD CLASSIFICATION	Blows Per 6 inches
	From	To	From	To		
1	0'0"	1'6"	0'0"	2'0"	Loose brown fine sand with the first 4" to 6" containing root. (SM w/roots)*	2-3-4
2	2'6"	4'0"	2'0"	4'6"	Very soft tannish inorganic clay with high sand content. (SC)*	1-1-1
3	5'0"	6'6"	4'6"	7'0"	Loose tan and gray fine sand. (SM)*	1-1-4
4	7'6"	9'0"	7'0"	9'6"	Very loose tan and gray fine sand. (SM)*	1-1-1
5	10'0"	11'6"	9'6"	12'0"	Soft tan and gray inorganic clay with high sand content. (SC)*	1-1-2
6	12'6"	14'0"	12'0"	14'6"	Very soft gray inorganic clay with high sand and slight shell content. (SC w/shells)*	1-1-1
7	15'0"	16'6"	14'6"	17'0"	Soft gray inorganic clay with high sand and slight shell content. (SC w/shells)*	1-2-2
8	17'6"	19'0"	17'0"		Very soft gray inorganic clay with medium sand and slight shell content. (SC w/shells)*	1/18"
9	20'0"	21'6"		22'6"	Very soft gray inorganic clay with medium sand and slight shell content. (SC w/shells)*	1/18"

Testing and Sampling in accordance with ASTM D. 1586-67 (1974)

Remarks: *Visual Unified Soil Classification
Location as directed by Client.

.F.2.5 FS #16

SOIL CONSULTANTS, INC.

CHARLESTON, S. C.

SAVANNAH, GA.

LOG of BORING

Project: Proposed Fire Station, Ashley Hall Plantation Road, Charleston, SC

Boring No. 3 S. C. I. Project No. 8357 Date 4-14-83

Ground Surface Elev. Assumed 0'0" Datum _____ Gr. Water Elev. 3'8"

(Minimum of 24 hrs. after completion)

[illegible]

testing and sampling in accordance with ASTM D 1364-67 (1974)

Remarks: *Visual Unified Soil Classification

Shovel sample adjacent to boring indicated varying roots to a depth of approximately 8".

Locally called Marl

F.2.6 FS #17

SOIL CONSULTANTS, INC.

ENGINEERS & GEOLOGISTS

CHARLESTON, S.C.

LOG of BORINGProject: PUBLIC SAFETY FACILITY, BOHICKET RD., NEAR MAYBANK HIGHWAY, CHARLESTON, S.C.Boring No. F-2 S. C. I. Project No. 96407 Date 12-16-96Ground Surface Elev. ASSUMED 0'0" Datum _____ Gr. Water Elev. 4'2"
(Minimum of 24 hrs. after completion)

Sample No.	SAMPLE Elev. - Feet & Inches		STRATUM Elev. - Feet & Inches		VISUAL FIELD CLASSIFICATION	Blows Per 6 Inches
	From	To	From	To		
1	0'0"	1'6"	0'0"	1'6"	LOOSE TANNISH BROWN FINE SAND WITH ROOT CONTENT. (SM-SP W/ROOT)*	1-2-3
2	2'6"	4'0"	1'6"		MEDIUM TANNISH BROWN FINE SAND. (SM-SP)*	3-5-11
3	5'0"	6'6"			MEDIUM TAN FINE SAND. (SM-SP)*	5-9-12
4	7'6"	9'0"			MEDIUM TAN FINE SAND. (SM-SP)*	6-12-17
5	10'0"	11'6"		12'0"	MEDIUM TANNISH BROWN FINE SAND. (SM-SP)*	4-9-12
6	12'6"	14'0"	12'0"	14'6"	LOOSE TAN & GRAY FINE SAND. (SM-SP)*	3-4-5
7	15'0"	16'6"	14'6"		MEDIUM TAN & GRAY FINE SAND. (SM-SP)*	3-5-8
8	17'6"	19'0"		19'6"	MEDIUM GRAY FINE SAND. (SM-SP)*	7-10-15
9	20'0"	21'6"	19'6"	24'0"	VERY SOFT GRAY INORGANIC CLAY WITH SLIGHT SAND & SHELL CONTENT. (CH)*	1/18"
10	25'0"	26'6"	24'0"	29'6"	VERY DENSE GRAY FINE SAND WITH SLIGHT SHELL CONTENT. (SM-SP)*	18-30-23
11	30'0"	31'6"	29'6"	35'6"	DENSE GRAY FINE SAND WITH SLIGHT SHELL CONTENT. (SM-SP)*	8-20-20
12	35'0"	36'6"	35'6"	39'6"	DENSE GRAY FINE SAND WITH HIGH SHELL CONTENT. (SM-SP W/SHELL)*	58-22-25
13	40'0"	41'6"	39'6"	43'0"	STIFF TANNISH GRAY CALCAREOUS CLAY WITH SLIGHT SAND CONTENT. (MH)*	4-4-5
14	45'0"	46'6"	43'0"		STIFF BROWNISH GREEN CALCAREOUS CLAY WITH SLIGHT SAND CONTENT. **(MH)*	3-4-5
15	50'0"	51'6"			STIFF BROWNISH GREEN CALCAREOUS CLAY WITH SLIGHT SAND CONTENT, **(MH)*	4-6-8

Testing and Sampling in accordance with ASTM D 1586-84.

Remarks: *VISUAL UNIFIED SOIL CLASSIFICATION.**LOCALLY CALLED MARL.SHOVEL SAMPLE TAKEN ADJACENT TO BORING INDICATED VARYING
ROOT CONTENT TO A DEPTH OF 5"±.