Appendix G: Phase IA Archaeological Assessment

Wilmington Riverfront Transportation Infrastructure Project

Wilmington, New Castle County, Delaware

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Abstract

On behalf of the City of Wilmington, RK&K conducted a Phase IA archaeological assessment for the Wilmington Riverfront Transportation Infrastructure Project in Wilmington, New Castle County, Delaware. The purpose of this Phase IA archaeological assessment was to review previously recorded archaeological site data, identify previous surveys in the project vicinity, locate areas with the potential to have unrecorded archaeological sites, and provide recommendations regarding additional archaeological investigations that may be necessary to identify archaeological resources prior to ground disturbing activities. The Study Area is located in Wilmington, Delaware, along South Market Street (U.S. Business Route 13) and is bounded to the north and west by the Christina River, to the east by South Market Street, to the south by Judy Johnson Drive (formerly New Sweden Street) and measures 60.7 acres. The Study Area boundary serves as the archaeological Area of Potential Effect (APE) for this assessment. To remain consistent with the other analyses being conducted as a part of the overall project, this document will use "Study Area" hereafter to refer to the archaeological APE.

RK&K recommends that the Study Area has the potential to contain intact archaeological resources associated with the following periods: Paleoindian (ca. 18,000 to 6,500 BC); Archaic (6,500 to 3,000 BC); Woodland I (3,000 BC to AD 1000); Industrialization and Early Urbanization (1830-1880); Urbanization and Early Suburbanization (1880-1940); and Suburbanization and Early Ex-urbanization (1940-present). RK&K recommends Phase I survey of four survey areas measuring a total of 29.8 acres within the Study Area with the potential to contain intact archaeological resources.

Survey Area No.	Acreage	Potential Assessment	Phase I Testing Recommendations
1	4.4	19th- and 20th-century industrial and residential occupation	Construction monitoring followed by judgmentally placed trenches
2	7.8	Precontact and 19th-century residential occupation	Pedestrian/shovel testing of pervious surfaces and mechanical trenching, as necessary
3	1.1	19th and 20th-century railroad and bridge abutments	Pedestrian survey and shovel testing
4	16.5	Precontact and 20th-century residential occupation	Pedestrian/shovel testing of pervious surfaces and mechanical trenching, as necessary

RK&K recommends pedestrian survey and shovel testing for those portions of the survey areas with pervious surfaces. RK&K recommends mechanical trenching to assess the presence of archaeological features and examine stratigraphy in portions of the survey areas that contain impervious surfaces like pavement or gravel surfaces that cannot be easily hand excavated. RK&K also recommends construction monitoring of the demolition of the Salvation Army building for the presence of intact archaeological features below the extant building. RK&K then recommends the excavation of a series of trenches on this property to assess the presence of subsurface archaeological features. If the results of the shovel testing

demonstrate the potential for deeply buried (beyond 3 feet) cultural deposits, RK&K may develop additional testing recommendations that may include deep trenching, stepped test units, or additional geoarchaeological survey. The number and placement of trenches and need for additional deep testing will be determined in consultation with the Delaware Division of Historical and Cultural Affairs (DCHA). RK&K recommends that the Phase I methodologies for each of the survey areas be developed in consultation with DCHA and that all fieldwork be conducted in accordance with the project's health and safety plans given the potential for hazardous materials throughout the Study Area. And lastly, RK&K recommends the development of a methodology for the Phase I survey of potential submerged archaeological resources be developed in consultation with DCHA following the development of the project's limits of disturbance. RK&K also recommends that the methodology be informed by the results of terrestrial Phase I survey, particularly as it relates to the likelihood of encountering precontact resources along the shore of the Christina River.

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I. Introduction

On November 19, 2021, the City of Wilmington, Delaware was awarded federal funds through a U.S. Department of Transportation FY 2021 Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grant. The Federal Highway Administration (FHWA), as lead Federal agency; the City of Wilmington, Delaware, as project sponsor and joint lead agency; and in partnership with the Riverfront Development Corporation (RDC), are preparing an EA for the Wilmington Riverfront Transportation Infrastructure Project (Project) in Wilmington, Delaware in accordance with the requirements of the National Environmental Policy Act of 1969 (NEPA), as amended (42 United States Code [U.S.C.] 4321, et seq.), Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulations [CFR] 1500 – 1508), FHWA regulations implementing NEPA (23 CFR 771.119), and applicable Federal, state, and local laws and regulations.

The FHWA has determined that this undertaking has the potential to cause effects to historic properties, if any such properties exist in the Study Area. The purpose of this Phase IA archaeological assessment was to review previously recorded archaeological site data, identify previous surveys in the project vicinity, locate areas with the potential to have unrecorded archaeological sites, and provide recommendations regarding additional archaeological investigations that may be necessary to identify archaeological resources prior to ground disturbing activities.

The Project is located in Wilmington, New Castle County, Delaware, along the east Christina riverbank. The Project's study area extends east from the Christina River to South Market Street and is bound on the north by the Christina River and on the south by Judy Johnson Drive (formerly New Sweden Street). The Project is proposed to replicate the City's street grid characteristic of the North Market Street corridor, north of the Christina River within the South Market Street Riverfront East area (**Figure 1** and **Figure 2**).

The Project study area boundary serves as the archaeological Area of Potential Effect (APE) for this assessment. The FHWA and the City of Wilmington, in consultation with the Delaware State Historic Preservation Office (DE SHPO), have defined the APE, or the "geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" (36 CFR 800.16 [d]), as the Study Area. To remain consistent with the other analyses being conducted as a part of the overall project, this document will use "Study Area" hereafter to refer to the archaeological APE.

All work described herein was conducted in accordance with the NEPA of 1969, as amended and Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (54 U.S.C. 306108) and its implementing regulations under 36 CFR Part 800. All methods and techniques for this study were conducted in accordance with the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (Federal Register 48:190:44716–44742) and the Delaware Division of Historical and Cultural Affairs (DHCA) State Historic Preservation Office's (DE SHPO) *Archaeological Survey in Delaware* guidelines (2015). Andrew Weidman, RPA, served as the Principal Investigator for this project and is the primary author of this report, with assistance from co-author Jerry Warner. Jean Cascardi, RPA, provided Geographic Information System (GIS) analysis. Project management and technical oversight was provided by Karen Hutchins-Keim, PhD, RPA. This Phase IA archaeological assessment was completed in December 2023 and was conducted or supervised by staff that meet the Secretary of Interior's (SOI) Professional Standards for archaeologists as specified in 36 CFR §61.

A. Project Background

The existing conditions of the Project Study Area include former industrial buildings and accessory structures, surface parking, former junkyards, miscellaneous uses, and brownfields. This area has been shaped by its history of shipping and manufacturing and was active industrial area until its decline after World War II.

This Project proposes to construct transportation improvements, including: replication of the Wilmington street grid; a Riverwalk; new pedestrian and cyclist accommodations that connect to the existing network pathways; repair of the existing bulkhead; construction of a new bulkhead; additional drainage outfalls and tide control valves; and at least 18 inches of clean fill beneath the proposed transportation improvements. (**Figure 3**).

B. Purpose and Need

The purpose of the Project is to provide transportation infrastructure to further the connectivity of the riverfront area and provide multi-modal resources The needs of the Project are the following:

- An expanded road network branching from South Market Street west into the Project study area;
- Pedestrian and cyclist accommodation on new roadways and a new set of pedestrian and bicycle pathways that connect to the existing network of pathways surrounding the site along the Christina riverbank; and
- Rehabilitate and creative effective stormwater management.

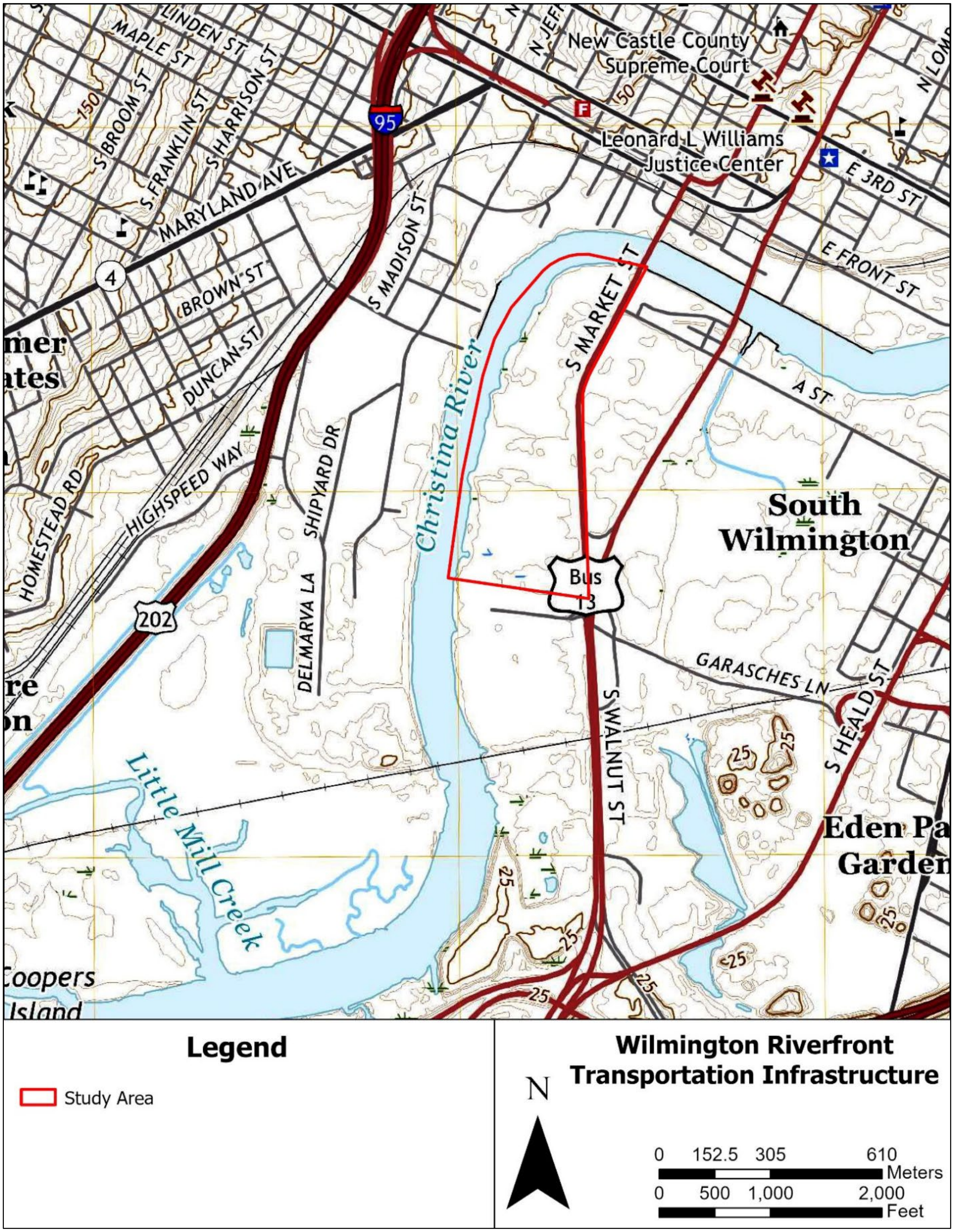

Figure 1: USGS topographic map showing Study Area (USGS 2023).

Figure 2: Aerial imagery showing Study Area (Nearmap 2023).

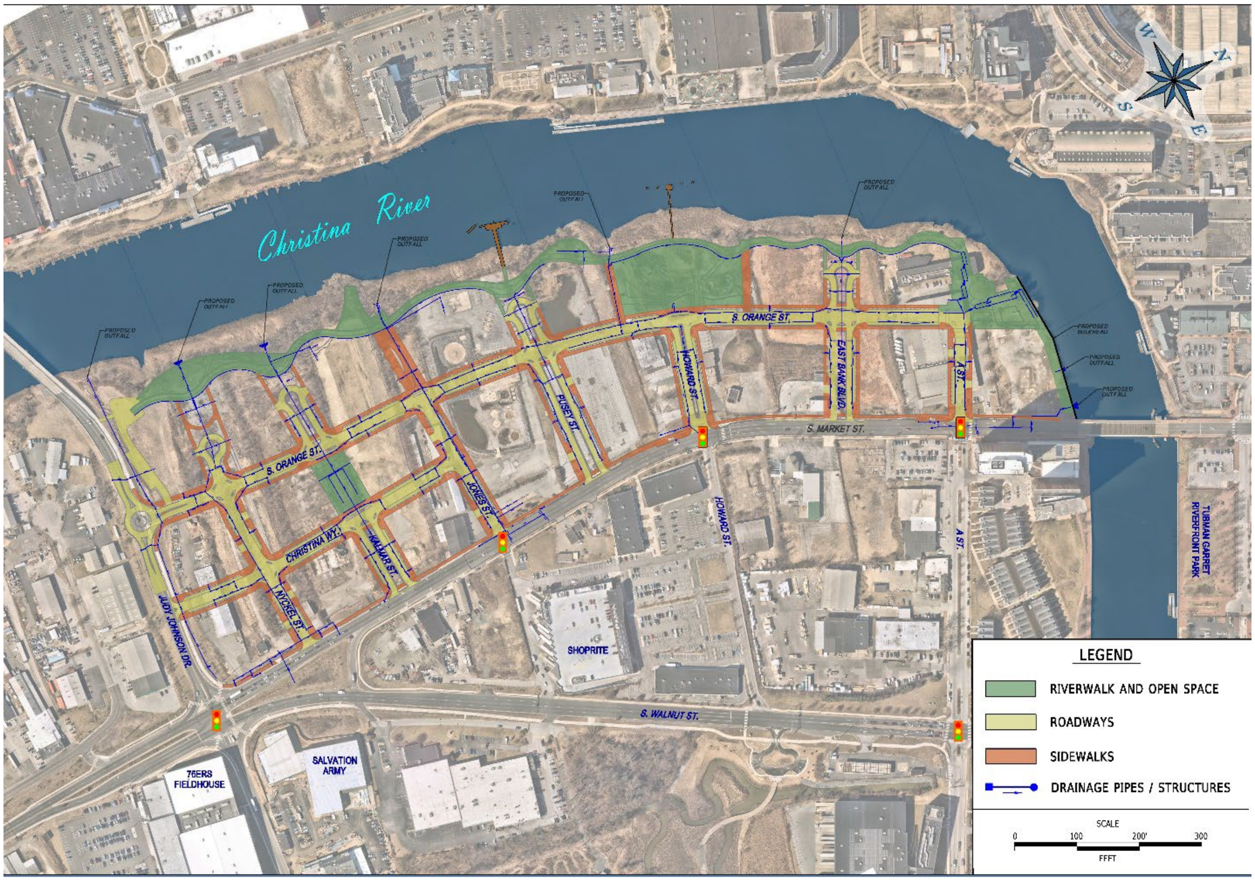

Figure 3: Build Alternative Site Plan

II. Background Research

A. Physical Geography and Environment of the Study Area

The Study Area is located in Wilmington, Delaware, along South Market Street and is bounded to the north and west by the Christina River, to the east by South Market Street, and to the south by Judy Johnson Drive (formerly New Sweden Street) and measures 60.7 acres.

The Study Area lies in the inner portion of the Coastal Plain Physiographic Province, while the Piedmont Province occurs immediately west/northwest of Interstate-95 at elevations above 25 feet (7.6 meters) above sea level (asl) (Ramsey 2005; Schenck et al. 2000). Much of downtown Wilmington is in the Piedmont, over gneiss-dominated bedrock. The Coastal Plain typically consists of unconsolidated sand and gravel deposits. The boundary between the two provinces, the Fall Zone, is an ecologically rich environment where flora and fauna from the Piedmont and Coastal Plain intermix (Ramsey 2005).

The Study Area is located within Christina River Watershed (Delaware Watersheds n.d.). The Study Area is relatively flat with 0 to 5 percent slope and contains scrubby vegetation, small and mature trees, grasses, marsh vegetation, asphalt and gravel parking lots, bare ground, and small to medium-sized commercial and industrial structures. Elevation within the Study Area varies, ranging from between four and twelve feet (1.2 and 3.6 meters) above mean sea level (amsl).

Soils within the Study Area are mapped as Urban Land-Othello complex, 0 to 5 percent slope (USDA-NRCS n.d.) (**Figure 4**). This soil complex is comprised of 60 percent Urban Land, 30 percent Othello, and 10 percent minor components (USDA-NRCS n.d.). Urban Land consists of land used for buildings, streets, and sidewalks, and where soil material has been removed or the soil has been covered by fill material. Fill soils are commonly several feet thick (USDA-SCS 1970). Othello soils are found in lowland flats, swales, drainageways, and depressions and consist of very deep, poorly drained soils formed from silty eolian deposits and/or fluviomarine sediments (USDA-NCSS 2010).

The Study Area has been subjected to continuous and dynamic landscape changes throughout the late Pleistocene through Holocene epochs—the period of human habitation in North America beginning around 15.5 thousand years ago. Progressively rising sea levels initially led to the formation of Delaware Bay and then eventually to the upstream extension of tidal conditions to the Fall Zone. As sea levels rose within the tidal reach of the Delaware River and tributary estuaries during the Holocene, alluvial estuary and marsh sediments may have buried older, previously extant terrestrial landscapes. These rising sea levels expanded marsh conditions and increased flooding along low-lying landforms like the Study Area that may previously not have been prone to flooding (Hayes 2023:2).

The Study Area sits on the Scotts Corners Formation, which predates human habitation and settlement in North America. The Scotts Corners Formation was deposited along the ancestral Delaware Bay during the last interglacial high stand of the sea around 100 thousand years before present. The landform itself is an alluvial construct of fluvial marine sediments topped with a deeply weathered surface soil (Othello silt loam). This soil type includes relatively deep B-horizons with strong pedogenic structure that are indicative of long-term, top-down weathering in good drainage conditions that predated the current Holocene trend regarding rising sea-level and increased groundwater conditions. The present conditions of relatively poor drainage represent the post-weathering effects of rising groundwater conditions (such as gleyed subsoil horizons) (Hayes 2023:2-3).

A recent hazardous materials survey was conducted throughout the entire Study Area on 23 parcels (Brightfields Inc. 2023) (**Figure 5**). The hazardous materials survey determined that three parcels had a low potential to contain hazardous materials in the soil, 17 parcels had a moderate potential to contain hazardous materials in the soil, and four parcels had a high potential to contain hazardous materials in the soil. Within the four sites considered to be a high environmental hazard, the survey identified arsenic, benzene, toluene, ethylbenzene, xylenes, and methyl tertiary butyl in the soils and groundwater exceeding Delaware Department of Natural Resources and Environmental Control (DNREC) screening criteria (Brightfield Inc. 2023).

The existing conditions along South Market Street in the Study Area consist of a one-way, multi-lane roadway with no on-street parking, and only two signalized intersections between the Christina River and I-495 (the Howard Street signalized T-intersection and the newly constructed New Sweden Street four-leg intersection). South Market Street is a one-way, four-lane arterial road that spans approximately 0.6 miles (1.0 kilometer) through the Study Area.

The Study Area land uses are shaped by its history of shipping and manufacturing. It features former industrial buildings and accessory structures, surface parking, former junkyards, miscellaneous uses, and brownfields. The Christina riverbank on the western and northern boundary of the Study Area is marshy and largely inaccessible. Significant differences of elevation between the high and low tide conditions have created a mud flat condition along the northern edge of the Study Area and species indicative of disturbed lands, a result from the Study Area's industrial past, grow along the riverbank.

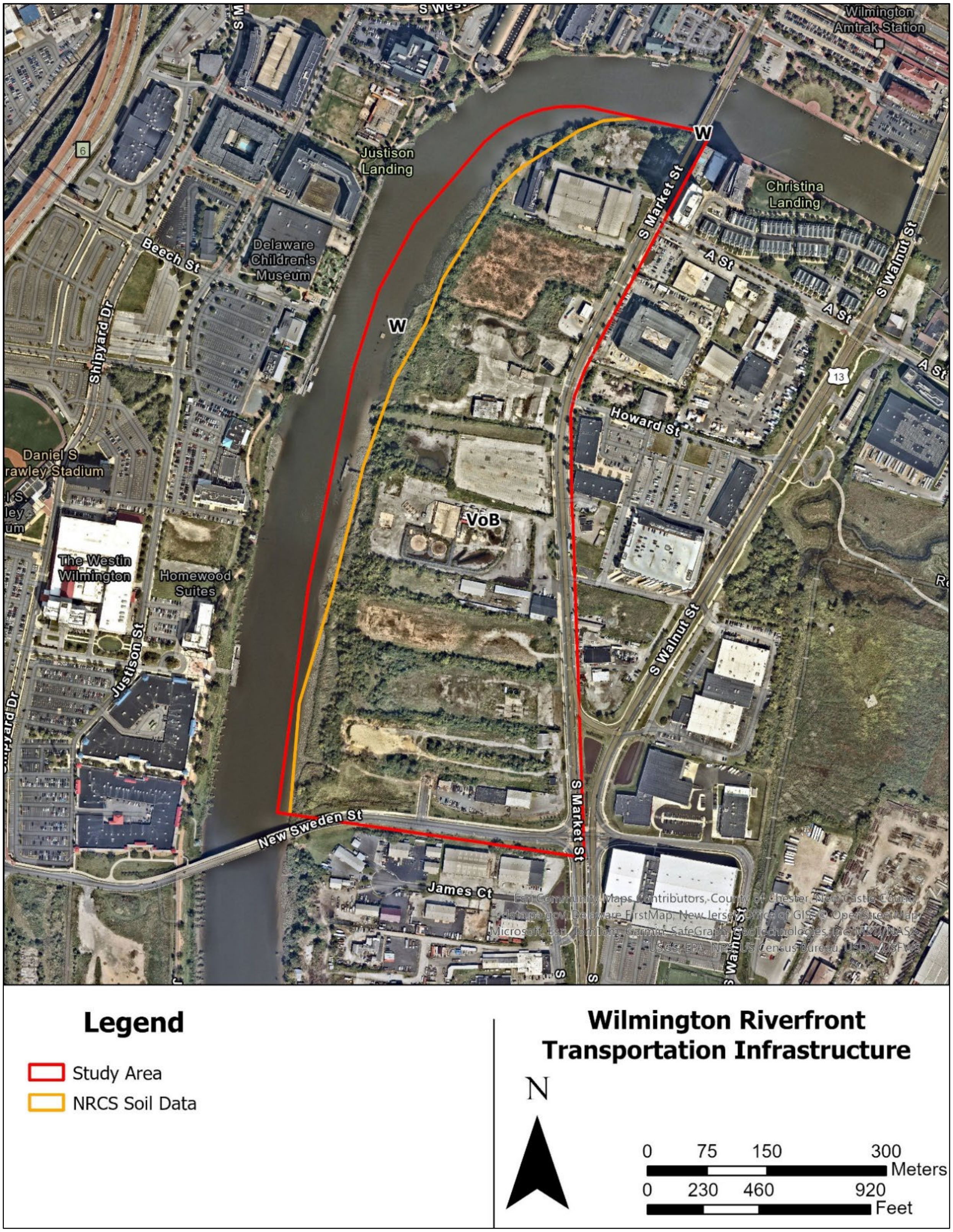

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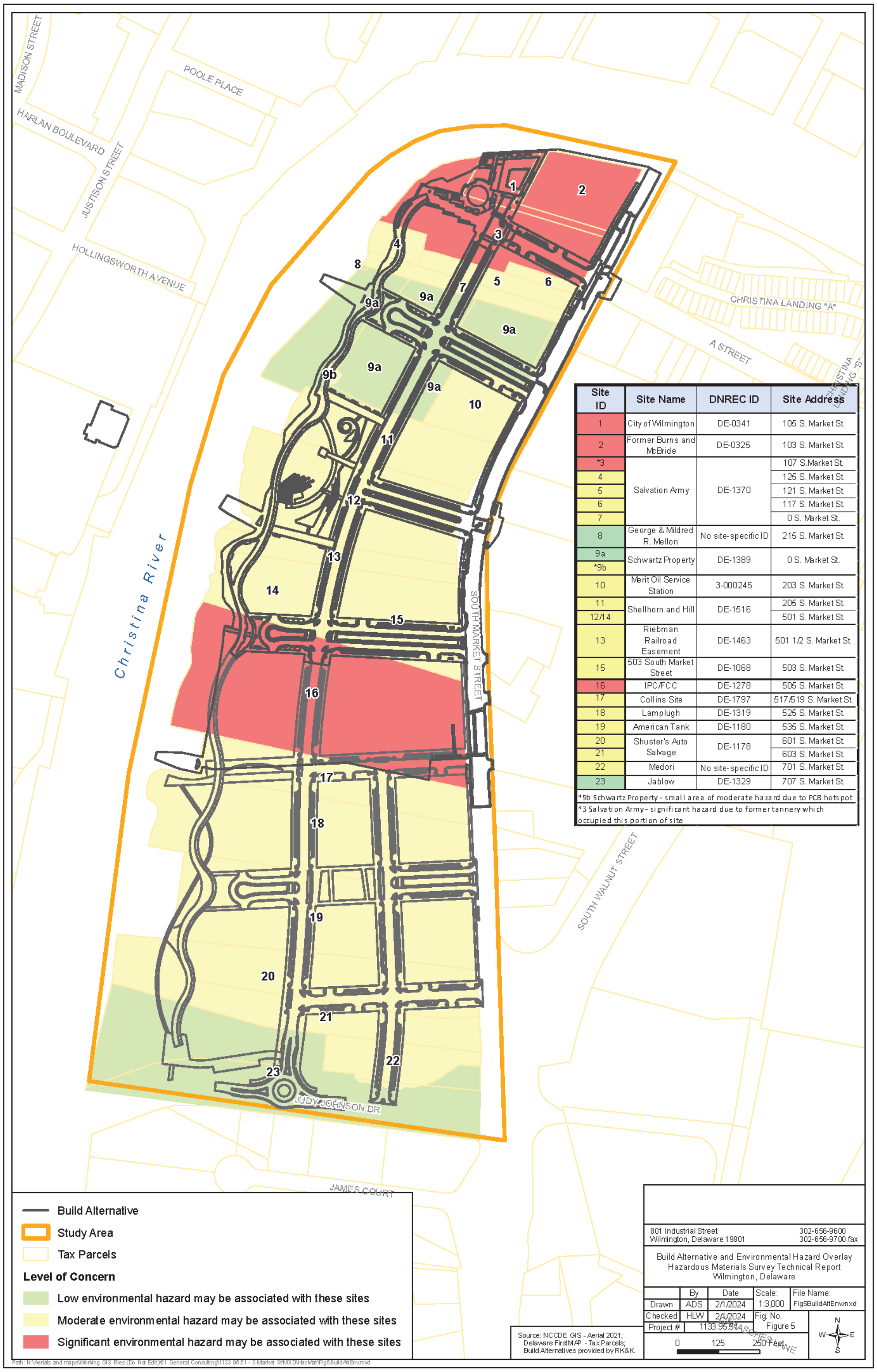
Figure 4: USDA-NRCS soils within the Study Area (USDA-NRCS n.d.).



Site ID	Site Name	DNREC ID	Site Address
🟥 1	City of Wilmington	DE-0341	105 S. Market St.
🟥 2	Former Burns and McBride	DE-0325	103 S. Market St.
🟥 *3	Salvation Army	DE-1370	107 S.Market St.
🟨 4			125 S. Market St.
🟨 5			121 S. Market St.
🟨 6			117 S. Market St.
🟨 7			0 S. Market St.
🟩 8	George & Mildred R. Mellon	No site-specific ID	215 S. Market St.
🟩 9a	Schwartz Property	DE-1389	0 S. Market St.
🟨 *9b			
🟨 10	Merit Oil Service Station	3-000245	203 S. Market St.
🟨 11	Shellhorn and Hill	DE-1516	205 S. Market St.
🟨 12/14			501 S. Market St.
🟨 13	Riebman Railroad Easement	DE-1463	501 1/2 S. Market St.
🟨 15	503 South Market Street	DE-1068	503 S. Market St.
🟥 16	IPC/FCC	DE-1278	505 S. Market St.
🟨 17	Collins Site	DE-1797	517/519 S. Market St.
🟨 18	Lamplugh	DE-1319	525 S. Market St.
🟨 19	American Tank	DE-1180	535 S. Market St.
🟨 20	Shuster's Auto Salvage	DE-1178	601 S. Market St.
🟨 21			603 S. Market St.
🟨 22	Medori	No site-specific ID	701 S. Market St.
🟩 23	Jablow	DE-1329	707 S. Market St.

*9b Schwartz Property - small area of moderate hazard due to PCB hotspot

*3 Salvation Army - significant hazard due to former tannery which occupied this portion of site

Figure 5: Low, medium, and high environmental hazard sites within the Study Area (Brightfields Inc. 2023).

B. Cultural Context

This cultural context was largely drawn from *Phase IA Archaeological Investigation Christina River Bridge New Castle County, Delaware* (LeeDecker et al. 2011) which was informed by the work of Jay Custer (1984, 1989) and has been supplemented with additional sources by the current authors.

1. Precontact Context

Paleoindian Period (ca. 18,000 to 6,500 BC)

The earliest occupation of the eastern woodlands was by Paleoindian groups who may have entered the region around 18,000 BC. The earliest occupation, known as Pre-Clovis, is not well known but has been documented at Meadowcroft Rockshelter (36WH0297) in Pennsylvania (Adovasio et al. 1980) and at the Miles Point Site (18TA365) in Maryland (Lowery 2007; Lowery et al. 2010). Pre-Clovis occupations in the region have also been documented the Cactus Hill Site (44SX0202) in Virginia (McAvoy et al. 1997; Wagner and McAvoy 2004). No Pre-Clovis sites have yet been identified in Delaware. The body of evidence on Pre-Clovis sites suggests that the culture featured small group encampments and a diverse diet, with a toolkit featuring stone blades and nearly triangular lanceolate projectile points (LeeDecker et al. 2011).

Later occupants of the region, known as the Clovis culture, date to ca. 11,000 BC and are represented by numerous finds in Delaware. The Clovis culture arrived at a time of abrupt climate change toward the end of the last ice age. Clovis sites appear to have been focused on well-drained landforms near major streams and inland swamps. Other highly productive habitats were also exploited by Clovis groups; group movement may have centered on sources of high- quality stone for tool making. The Clovis diet included Pleistocene megafauna, such as mastodon and mammoth, but the hunting emphasis was likely on deer, elk, and perhaps caribou. Fish, berries, and other fruits were also parts of the Paleoindian diet. The diagnostic artifact of Clovis culture is the basally fluted lanceolate Clovis point; typically associated tools include scrapers and gravers for working hides and bones (LeeDecker et al. 2011).

With the onset of the Holocene, spruce-dominated boreal vegetation was replaced by the northward expansion of deciduous forests, and large mammals migrated to new ranges or were driven to extinction. An abrupt cold period, known as the Younger Dryas stadial, occurred between 10,800 and 9,500 BC, triggering a number of environmental changes (Wah 2003). This rapid environmental change is coeval with the end of the Clovis culture (LeeDecker et al. 2011).

After 9,500 BC, the lifeways of Native people underwent minor changes. A hunting focus continued, but megafauna species either became extinct or migrated north, necessitating changes in hunting behaviors. Sites from 9,500 to 6,500 BC are more numerous than earlier sites and are more dispersed. Clovis points disappear from site assemblages and are replaced by a diverse set of corner-notched and side-notched point types. The Fall Zone and the Piedmont show particularly noticeable increases in site frequencies during the terminal portion of the Paleoindian period (LeeDecker et al. 2011).

Archaic Period (6,500 to 3,000 BC)

The beginning of the Archaic period roughly corresponds to the Hypsithermal, a climatic episode marked by rising temperatures, decreasing precipitation, and the development of more seasonally variable climate. An oak-hemlock-hickory forest dominated the region, and deer became the dominant large mammal (LeeDecker et al. 2011).

The growing population changed its subsistence-settlement patterns. Sites are larger and more numerous, and a more diverse toolkit implies a broader range of subsistence activities than in the Paleoindian period. During the Archaic period sites begin to appear in locations that had been previously ignored, such as interior ridgetops; however, base camps were still located primarily in the floodplains of major drainages and around wetlands. The appearance of new tool types specifically designed for woodworking, seed grinding, and nut cracking (e.g., axes and adzes, mauls, grinding slabs, and nutting stones) and the location of sites in previously unused areas indicate an increasing reliance on gathered plants for food and other necessities (LeeDecker et al. 2011).

Woodland I Period (3,000 BC to AD 1000)

During the Woodland I period indigenous groups continued to increase their use of gathered plants, particularly tree mast, for food and other needs. Fish and shellfish were also very important to subsistence during this period. Wetland resources were commonly exploited. The number of sites and settings for sites continued to expand, and on the floodplains of major waterways villages and hamlets evolved to sites of nearly year-round occupation. At some sites in Delaware, there are signs of the emergence of stratified societies and engagement in extensive exchange networks (LeeDecker et al. 2011).

Woodland I sites are marked by a suite of narrow-bladed projectile points that accompanied adaptations for exploiting hardwood trees and sylvan resources. Assemblages include a high frequency of grooved axes, adzes, celts, gouges, and grinding stones. Broad-bladed projectile points appeared during the period and are found most commonly on floodplain sites. Although broadspear points are sometimes found in ritual mortuary contexts, they were apparently utilitarian objects, as shown by occasional breakage and edge attrition (Custer 1991).

A noteworthy development during the period is the use of carved soapstone (steatite) bowls. Soapstone was quarried during this period in the Piedmont of Virginia, Maryland, and Pennsylvania. Vessels were apparently carved at the quarries and transported in finished form, probably by canoe (Dent 1995:182-184). Soapstone pots were clearly used for cooking, but it is not yet known what foods they were used to process (fish, meat, seeds, tubers, or nuts). Soapstone vessels are found on sites dating to ca. 1,700 to 800 BC (Sassaman 1999, 2006).

Production of ceramics began in the region beginning ca. 1,200 BC. The earliest vessels imitated the form of flat-bottomed soapstone pots and were tempered with bits of soapstone and other rock (Stewart 1998). These earliest ceramic ware types are known as Marcey Creek and Vinette I and are found throughout the Middle Atlantic region and into New York State (LeeDecker et al. 2011).

Exchange networks developed during this period, linking local tribes to groups to the north, south, and west. Tools made from non-local stone are found in many Woodland I assemblages. Elaborate burials have been found in Delaware dating from around 500 BC to AD 1, with mortuary objects showing links to the Adena and Hopewell cultures in the Ohio Valley. Lithic materials shifted to higher-quality stone and stone from non-local sources ca. 500 BC (Stewart 1989, 1992). This shift in pattern of stone use is seen as additional evidence of the development of regional trade networks (LeeDecker et al. 2011).

Custer has defined prehistoric complexes based on the co-occurrences of certain artifacts and features on sites in similar locations. The Clyde Farm, Black Rock (also known as Wolfe Neck), Carey, and Delaware Park complexes have been defined for the Woodland I period in the Fall Zone. The complexes are temporally sequential to one another, with the Clyde Farm Complex encompassing the period from 3,000to approximately 1,000 BC. The Clyde Farm Complex is marked by broadspear projectile points, steatite vessels, and Hell Island ceramic wares. The Black Rock Complex encompasses the period from 1,000 to ca. 500 BC and is marked by Wolfe Neck or Vinette I ware types, and Rossville projectile point types. The Carey Complex extends from 500 BC to AD 1. The Carey Complex is marked by increased oyster use, Fox Creek projectile points, and shell-tempered ceramics. The Delaware Park Complex extends from AD 1 to 1000 and is marked by base camps with large storage features. Hell Island ceramics and Jacks Reef projectile points are also markers of the Delaware Park Complex (LeeDecker et al. 2011).

Woodland II Period (AD 1000 to 1650)

The Woodland II period began around AD 1000 as Indian groups began living in hamlets and villages and practiced agriculture. At around AD 1000, maize horticulture was adopted by many people, but reliance on maize was variable from group to group. It has been speculated that wild rice, chenopodium, and other wild plants played a bigger role than maize in local diets. Diets continued to include fish, shellfish, deer, and turkey. Sites are typically located in floodplains of higher-order streams and adjacent to high-yield agricultural soils (LeeDecker et al. 2011).

In some parts of Delaware, a dramatic increase in the number of sites coincides with the Woodland II period. Larger sites are commonly on tidal creeks that feed into the Delaware River, with smaller resource extraction sites in a wide variety of environmental settings. The Fall Zone and eastern Piedmont may have been used seasonally as part of the settlement round of groups based on the Coastal Plain (Stewart 1992).

During the Woodland II period regional exchange networks largely ended. Indigenous societies may have fragmented. Prior to AD 1200/1300, settlements were not stockaded (fortified), suggesting that there were minimal inter- and intra-group hostilities (Stewart 1993). Around AD 1200 to 1300, throughout the Middle Atlantic region, population density increased, nucleated settlements and stockaded villages were established, and there is evidence of population movement and displacement (Stewart 1993).

After AD 1200/1300, ranked societies emerged, which developed into the complex tribes and chiefdoms encountered by the Europeans in the late sixteenth and early seventeenth centuries (LeeDecker et al. 2011).

One cultural complex has been defined for the Woodland II in the Fall Zone in Delaware: the Minguannan Complex. This complex is marked by sand-, grit-, or crushed quartz-tempered ceramics that may have incised or cord-impressed surface treatments (LeeDecker et al. 2011).

Contact Period (AD 1524 to 1750)

Indigenous communities were disrupted and frequently in flux throughout the Delaware River basin after European colonization began. Diseases brought by the Europeans ravaged Indian settlements. Warfare and eviction from lands destroyed many other Indian communities. The Indian-Colonist relationship ebbed and flowed, with periods of intermittent conflict and warfare (LeeDecker et al. 2011).

The initial European exploration of the Delaware Bay may have taken place in 1524 by Giovanni da Verrazano, although the account of his explorations is not universally accepted. More concerted exploration and settlement began in 1609 with Henry Hudson’s exploration of the Delaware Bay and River. Hudson sailed for the Dutch, who built an outpost near Lewes (“Zwaanendael”) in 1631. Samuel Argall, an Englishman, explored the Delaware in 1610, but most British settlement came in the middle of the seventeenth century (LeeDecker et al. 2011).

Swedish settlements were established in the early seventeenth century in Delaware. In 1638, Fort Christina was built by the Swedes at the confluence of the Christina and Brandywine rivers, which would later become Wilmington. Swedish settlement grew along both sides of the Delaware River in the middle of the seventeenth century (LeeDecker et al. 2011).

The lower Delaware River and the Delaware Bay were home to several related Indian groups, known collectively to Europeans as “the Delaware Indians”; they called themselves the “Lenni-Lenape” or the “Lenape.” The Lenape had three principal tribes: the Munsee, who lived in the middle and upper reaches of the Delaware River; the Unalachtigo, who may have lived in the Lehigh Valley of Pennsylvania; and the Unami, who lived on the lower section of the Delaware River and the Bay, which includes the Wilmington area (Kraft 2001). The Lenape traded with Swedish and Dutch colonists and were on generally peaceful terms with both colonial powers (LeeDecker et al. 2011).

As recorded by Europeans, Lenape settlement types included stockaded villages, open longhouse villages, and smaller houses at hunting and fishing camps (Goddard 1978). Bands would congregate during the agricultural season and split into small family units during the winter. Indians along the lower section of the Brandywine River are known to have been Unami-speaking Lenape; they were often referred to as “Brandywine Indians” (Weslager 1972).

The Lenape’s rivals were the Susquehannocks, who were located principally in south-central Pennsylvania along the Susquehanna River. The Susquehannocks also controlled the upper parts of the Brandywine drainage. The Susquehannocks waged war against the Lenape between 1630 and 1635, eventually defeating the Lenape and making them their subjects. The Brandywine Indians came to be on generally friendly terms with the Susquehannocks later in the seventeenth century, when they saw a mutual enemy in the British (LeeDecker et al. 2011).

The Brandywine Indians may have never practiced much agriculture beyond cash cropping during the middle of the seventeenth century, and they may not have had substantial villages during any period of their history (Becker 1989). Population estimates for the Lenape during the Contact Period have been quite varied (LeeDecker et al. 2011).

The Dutch and Swedes competed for control of the Delaware River basin during the first two quarters of the seventeenth century. The Dutch tried to assert control of the area by erecting Fort Nassau on the eastern side of the Delaware River in 1623. The Swedish governor subsequently built a fort on the western bank of the river in the Philadelphia area, and Fort Christina in the Wilmington area. In 1651, the Dutch governor built Fort Casmir, located in what is today Newcastle. Violence erupted between the Dutch and Swedes in 1655, and the Dutch emerged in control of “New Netherlands.” Dutch hegemony was short-lived, however, as the English took control of the colony in 1664. The lands eventually came under the control of William Penn and the Pennsylvania colonial government (Reed and Reed 1947).

Many Native people left the Delaware Valley starting in the 1660s, moving north to New York and eventually Ontario, and west to Oklahoma. The Indian-Colonial fur trade was on the wane in this period, and there was increasing tension between the Indians and colonists for land. In addition, the Lenape, who had been struck by a devastating outbreak of smallpox ca. 1635, were struck by another smallpox outbreak in 1661, weakening their communities. There are accounts of Lenape emigrating from Delaware between approximately 1660 and 1750. The Lenape of the Wilmington area, the Brandywine Indians, remained on their lands until ca. 1729, moving north at that time to join the refugee communities of the Seneca-Susquehannock. However, the Lenape Indian Tribe of Delaware persisted in central Delaware and continue to primarily reside in Kent County. They were recognized by the State of Delaware in 2016 (Lenape Indian Nation of Delaware 2010, 29 DE Code § 106 2016, and Weslager 1972).

2. Historic Context

The Study Area is located in the Southbridge neighborhood of Wilmington, the boundaries of which encompass all of the land south of the Christina River to the city's limits west of I-495 (Darsie et al. 1996).

Exploration and Settlement (ca. 1630 to 1730)

Settlement of what is now Wilmington began in 1638 with the establishment of the Swedish colony of Christinaham, which surrounded the present site of Fort Christina Park. The colony, originally consisting of 25 Swedish and Finnish colonists, built a small fort at this location on the Christina River with a small cluster of houses and cultivated fields nearby. The Christinaham colony became the nucleus of small settlement, one of a string of settlements in Delaware established as New Sweden. During the first decade of establishment, the population of the colony remained low with 183 inhabitants and reaching 368 by 1654. In 1655 the Dutch regained control of the area and allowed Fort Christina to fall into ruin. In 1664 the Dutch colonies in Delaware, along with Fort Christina, fell to the British; however, they encouraged the continued settlement of the area by the Swedish, Finnish, and Dutch colonists. The ongoing influence of the Swedish settlers in the Wilmington area is evidenced by the erection of the Old Swede's Church in 1868 near the location of the former Fort Christina. Despite attempts by the Dutch to reclaim its colonies in Delaware in 1673 and 1674, the area remained under the control of the British and settlement of the Wilmington area did not resume until 1731 (Dixon 1992; Guerrant 1983).

In the decades before and after the turn of the eighteenth century, the land between the Brandywine and Christina rivers remained the property of a few farmers. One of the farmers erected a small mill on the southern side of the Brandywine River in the late seventeenth century, which was replaced with a new mill and dam in the 1720s (Guerrant 1983). Herrman and Withinbrook's 1673 map of the region shows that settlement of the Wilmington area was sparse and concentrated along the major waterways in the late seventeenth century (Herrman and Withinbrook 1673) (**Figure 6**).

Intensified and Durable Settlement (ca. 1730 to 1770)

The permanent settlement of Wilmington began in 1731 when Thomas Willing purchased land on high ground between the Christina River and Brandywine Creek from his father-in-law, Andrew Justison. Willing laid out the town lots and built the first dwelling at the northwestern corner of Front and Market streets. The settlement had grown to approximately 30 houses by 1736 between what is now Poplar and Tatnall streets and between the Christina River and Seventh Street. The development of Wilmington was greatly influenced by William Shipley, a Quaker, who purchased land from Willing. He and other Quakers transformed the town into a marketplace for local famers (Dixon 1992).

The new settlement, initially known as Willingtown, was ideally located near the Fall Zone between the Piedmont and Coastal Plain zones, with a protected harbor in the wide, slow-running Christina River (Coastal) and a natural energy source from the narrow, swift running Brandywine River (Piedmont). Willingtown's location was also advantageous for its transportation potential, with easy access from the Christina River to the Delaware River and beyond, as well as its proximity to already established land routes (Guerrant 1983).

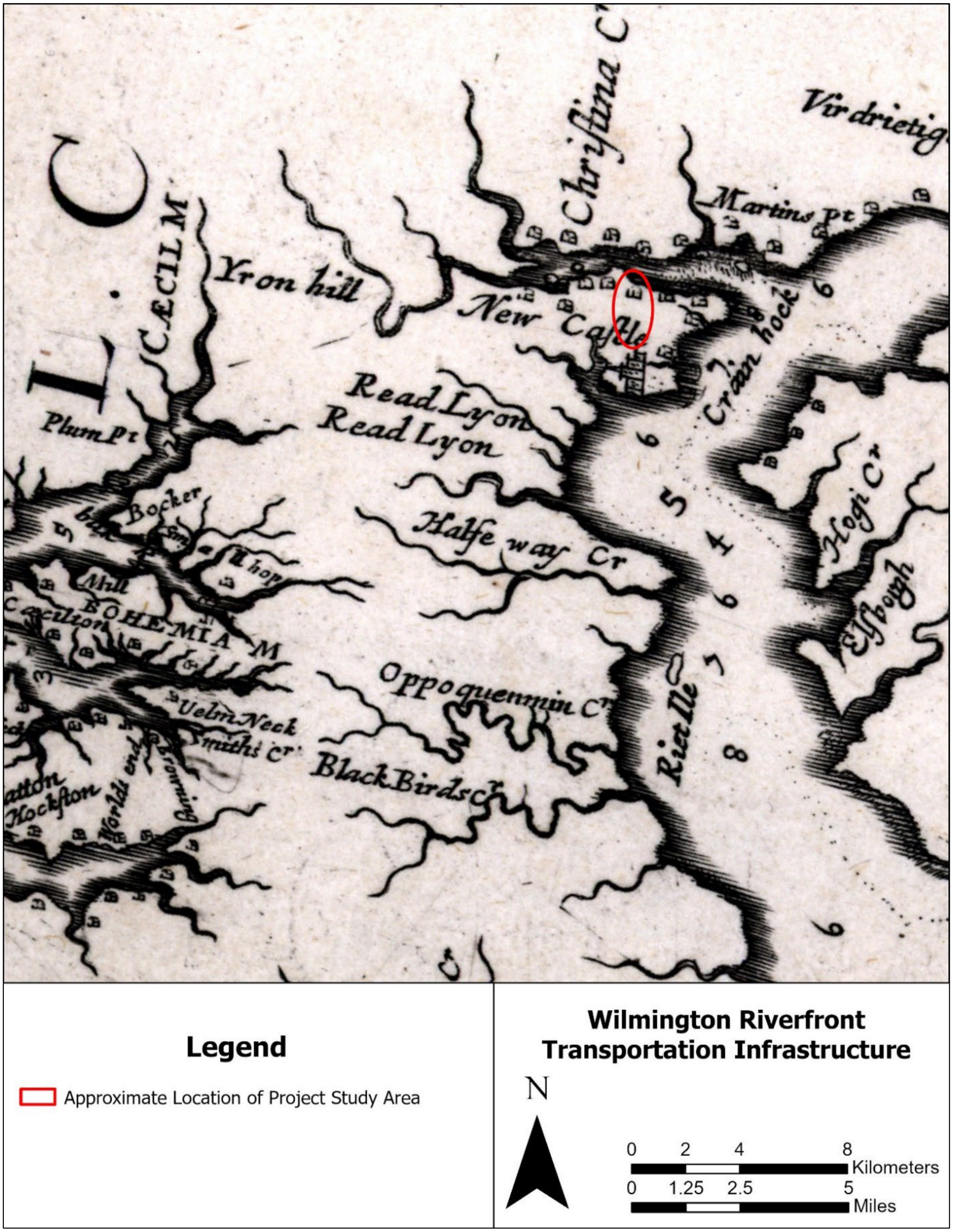


Figure 6: Approximate location of the Study Area depicted on *Virginia and Maryland as it is planted and inhabited this present year 1670* (Herrman and Withinbrook 1673).

Transformation from Colony to State (ca. 1770 to 1830)

Industrial development in Wilmington during the Transformation from Colony to State period included an increased number of mills along the Brandywine and the continuation of shipbuilding and mercantile activities along the Christina brought about by the introduction of improved milling technologies (Dixon 1992).

Wilmington experienced great prosperity between 1780 and 1810 after the American Revolution (1775 to 1783) as a result of the dropping of trade barriers and the rise in the price of flour. Merchants in Wilmington began trading flour directly with the West Indies, setting off the town's first major economic and population growth since the early years of its establishment. Along with the expansion of the Brandywine mills, Wilmington also took advantage of an increased demand for shipping, and several new small-scale manufacturing and craft enterprises were established (Goodwin 1986:13). Wilmington's economic growth is also reflected in its population, which rose from 1,200 in 1785 to more than 5,000 inhabitants in 1820 (Dixon 1992).

Wilmington's prosperity was soon threatened by an overall economic depression and the War of 1812, which interrupted Wilmington's transoceanic shipping. Changes in transportation also endangered the city's existence. Philadelphia merchants, seeking to take advantage of the agricultural wealth of western Pennsylvania, revived the construction a canal that would connect the Delaware River with the Chesapeake Bay. Wilmington residents initially invested in the Chesapeake and Delaware (C&D) Canal as they thought it would terminate at the Christina River; however, a southerly route was chosen, cutting the city off from main trade route across peninsula and ending its monopoly of the portage trade. The impact of the canal is reflected in the stunted growth of Wilmington's population between 1810 and 1835, when it only grew from 4,416 in 1810 to 6,628 in 1830 (Goodwin 1986).

Early historic depictions of the Study Area characterize the landscape on the south side of Christina River as open, undeveloped marshland land (Bromberg 1988). Joseph Scott's 1795 *Delaware* map depicts a single road extending south from Wilmington over the Christina River through the Study Area and south to New Castle (Scott 1795) (**Figure 7**). This road was one of Delaware's early "King's Highways" and present-day South Market Street, which bounds the east side of the Study Area, generally follows the historic alignment of this road (Amott et al. 2006).

The Study Area is located in an area that was known for much of the eighteenth and early nineteenth centuries as the Holland's Creek Marsh, which comprised "all the meadows opposite the city of Wilmington" (Ferris 1846:42). By the late eighteenth and early nineteenth century, marsh reclamation had become a formal process that provided significant financial benefits. Draining and regulation of the marshes allowed farmers the ability to grow traditional crops or to control the harvest of salt hay that grew naturally in the marsh (Fisher 1993:85). Individuals or groups could apply to the Delaware General Assembly for permission to ditch and bank certain areas to create new agricultural land from the fertile soil in the marshes. The marsh companies could levy taxes for the improvement on any landholder whose marsh land benefitted from the work (Fisher 1993:87).

Drainage regulations such as ditches, dikes, and sluices were used throughout the bay and river shores of the Delaware Estuary to manage drainage of the tidal marshes to make the land suitable for agricultural uses such as pasturage and a source of hay for fodder, and to create heathier environmental conditions (Catts 2017:9). Marsh modification by digging ditches and constructing dikes took place as early as the Dutch settlement of the region and continued into the twentieth century. Marsh reclamation was a labor intensive and costly enterprise. The modification of the landscape could involve the alterations of wetlands through relatively minor landscape changes such as ditching. Or it could involve major landscape changes such as the construction of dikes with sluices and embankments to keep tide waters out (Catts 2017:9). A main ditch could measure up to 20 feet across at the top and five feet in depth and drain to the nearest creek or river. Off the main ditch were "prongs" or smaller ditches that ranged from roughly five to ten feet across at the top and three feet in depth. In tidal areas, a dike, or bank was needed to prevent flooding and needed to be roughly three feet above the mean high tide, which along the Delaware River generally meant a height of from six to eight feet (Catts 2017:9).

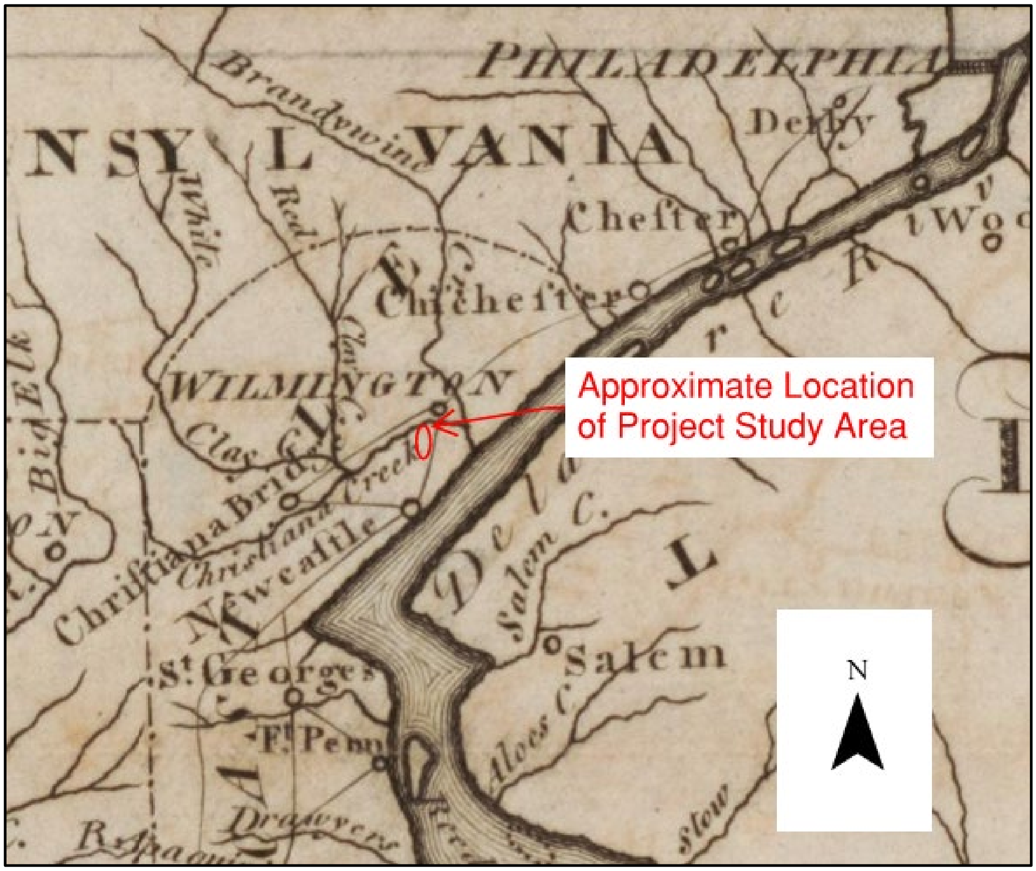


Figure 7: Approximate location of the Study Area depicted on 1795 Delaware map (Scott 1795).

Throughout the eighteenth century, repeated efforts were made to drain land in Holland's Creek Marsh because it was the site of frequently flooding. Benjamin Ferris recounts that, "during the revolutionary war, the great body of meadow land opposite the city, called the 'Holland's Creek Marshes,' was inundated by the breaking of the banks" (Ferris 1846:267). The General Assembly records from the eighteenth and nineteenth centuries discussed the efforts to regulate the Holland's Creek marsh, which included the construction of banks, dams, ditches, and sluices (Bushman et al. 1986:137; Bushman et al. 1988:584; State of Delaware 1895:495). In 1771, inhabitants of Newcastle Hundred petitioned the General Assembly for funds for "embanking, &c. Holland's Creek Marshes" (Bushman et al. 1986:77). Similar petitions were made in 1772 and 1773, when "owners of Marsh on Holland's Creek" petitioned for funds for the "better regulation of the Meadow, Marsh, and Cripple on Holland's Creek" (Bushmen et al. 1986:123, 137). And in 1788 there were additional requests to further regulate cost of and maintenance of "the outside bank, public wharves, and sluices" (Bushman et al. 1988:584). Even as late as 1895, the

Holland's Creek Marsh Company, which became known as the Holland's Creek Land Company, was seeking additional funds to maintain the "banks, dams and sluices in repair" at the Holland Creek Marsh (State of Delaware 1895:495).

The first bridge traversing the Christina River at South Market Street was built in 1808. The previous year the General Assembly passed a law providing funds:

> for the purpose erecting a draw-bridge across the river Christiana, at Wilmington, and opening a road from thence through Holland's creek marsh, in such direction as shall be deemed most eligible and proper to the fast land at or near the house of major Peter Jaquett, of the width of eighty feet, inclusive of an allowance for making a drain on each side of the road, for the purpose of raising the same above the level of said marsh, and for keeping the said bridge and road through the marsh…in good and sufficient repair (State of Delaware 1816:60).

The description of the road extending south from the proposed bridge crossing the Christina suggests that at least some of what became known as the Wilmington Causeway and South Market Street was constructed on marshy land and required drainage and elevation.

Industrialization and Capitalization (ca. 1830 to 1880)

The industrialization and capitalization of Wilmington was propelled by the establishment of the Philadelphia, Wilmington and Baltimore (PW&B) Railroad, in 1835, which traveled south from Philadelphia through Wilmington to Baltimore. When completed in 1837, the railroad paralleled the Delaware River from Philadelphia until a point north of Wilmington, where it traveled south and west along the Christina River toward Maryland. The growth of Wilmington was furthered by the completion of the Wilmington & Northern Railroad (W&N) in 1871, the Delaware and Western Railroad in 1867 (initially the Chester County Railroad, the Wilmington and Western in 1869, and acquired by the Baltimore & Ohio in 1886) (LeeDecker et al. 2011).

The arrival of the railroad in Pennsylvania greatly impacted Wilmington's economy based on grain processing and shipping. The Philadelphia-Columbia Railroad, established in 1833, diverted the city's grain supply from southeastern Pennsylvania to Philadelphia. However, the losses from the grain industry were soon replaced by new manufacturing opportunities made possible by the use of steam power (LeeDecker et al. 2011).

Wilmington's location on the Delaware and Christina rivers was the impetus for its success as an independent manufacturing city. By the early nineteenth century Wilmington and its immediate vicinity had become one of the most important sites for water-powered industry in the United States. Mills of varying types, including paper, textile, flour, black powder, and snuff, stood along the Brandywine and also along tributaries of the Christina, the Red Clay and White Clay creeks. The mills generated capital reserves necessary for the industrialization of Wilmington's economy but also attracted skilled laborers who made the expansion of industrial technology possible. Wilmington's industry was also supported by sources of coal and iron ore that became readily available from Philadelphia and northern Pennsylvania by the new canals, railroads, and river barges, which provided inexpensive transportation and daily routes to and from Philadelphia (Hoffecker 1974).

By the American Civil War (1860-1864), Wilmington hosted a number of industries, including several cotton mills, a match factory, and a fertilizer plant. Shipbuilding, railroad car construction, foundry work, tanning, and carriage construction were the most significant industries in Wilmington by the mid-nineteenth century, and the newly constructed railroad and its proximity to the Christina River allowed the same transportation advantages but on cheaper land than in locations such as New York and Philadelphia. The four largest industrial companies in Wilmington by the end of the Civil War were Harlan & Hollingsworth, Pusey and Jones, the Lobdell Wheel Company, and Jackson & Sharp, all of which were locally owned and involved in railroad equipment manufacturing, among other ventures (Hoffecker 1974).

Although not the largest manufacturing effort in Wilmington, papermaking was in the top 10 leading industries in Wilmington in 1860 and 1880, based on the annual value of products and the number of workers (Hoffecker 1974). Papermaking dropped from the top 10 by the turn of the century, in 1898, but the papermaking industry in Wilmington was still described as the “largest in America” (Clement 1888).

The 1849 Rea and Price *Map of New Castle County, Delaware: from original surveys* shows the Market Street bridge over the Christina River and South Market Street but does not depict any additional development with the Study Area and limited residential development throughout the rest of what would become Southbridge (Rea and Price 1849) (**Figure 8**). The 1808 bridge crossing the Christina River was replaced in 1883 by the City of Wilmington with a metal truss swing span bridge (DelDOT 2005).

By the mid-nineteenth century, some industry had expanded from the downtown core of Wilmington to the southern side of Christina River along South Market Street. The A. Flaglor and Company Coach and Carriage Works is listed in the 1853 Wilmington Directory, which notes that the company had recently constructed an “extensive” factory at a location south of the Wilmington Bridge at the foot of Market Street (Heald 1853) (**Figure 9**). Subsequent Wilmington City Directories for the years 1857 and 1862 refer to the A. Flaglor and Company Coach and Carriage Works at this location. The 1865 *Bird’s Eye View of the City of Wilmington, Delaware* shows a large, three-story rectangular industrial building oriented perpendicular to South Market Street on the south side of the Christina River within the Study Area (E. Sachse & Company 1865) (**Figure 10**). This structure is likely the A. Flaglor and Company Coach and Carriage Works building. Additionally, the 1868 Beers *Atlas of the State of Delaware* depicts an industrial building on the west side of Market Street just south of the Christina River bridge (near the current alignment of the South Market Street Bridge) within the Study Area and in the same location as the industrial building in the 1865 *Bird’s Eye View of the City of Wilmington, Delaware* (Beers 1868) (**Figure 11**). The industrial building on the Beers map is described as the Robinson and Brothers Carriage Factory. Further, an unidentified building is shown south of the Robinson and Brothers Carriage Factory. This building is not labelled, and its function is unknown. It is notable, however, that all other industrial buildings are labelled with the company name and business type on this section of the map, suggesting that this small building was not industrial in nature and is likely residential. Robinson and Brothers Carriage Factory moved into the A. Flaglor and Company Coach and Carriage Works building sometime between 1862 and 1868 (Hutchinson 1862; Beers 1868). In 1874, the Robinson and Brother’s Carriage Factory moved to a new location in Wilmington at 4th Street and Walnut Street, and the Thompson and Paschall Carriage and Coach Makers moved from 1000 Washington Street into the recently vacated Robinson and Brothers factory on South Market Street (Commercial Printing Company 1875).

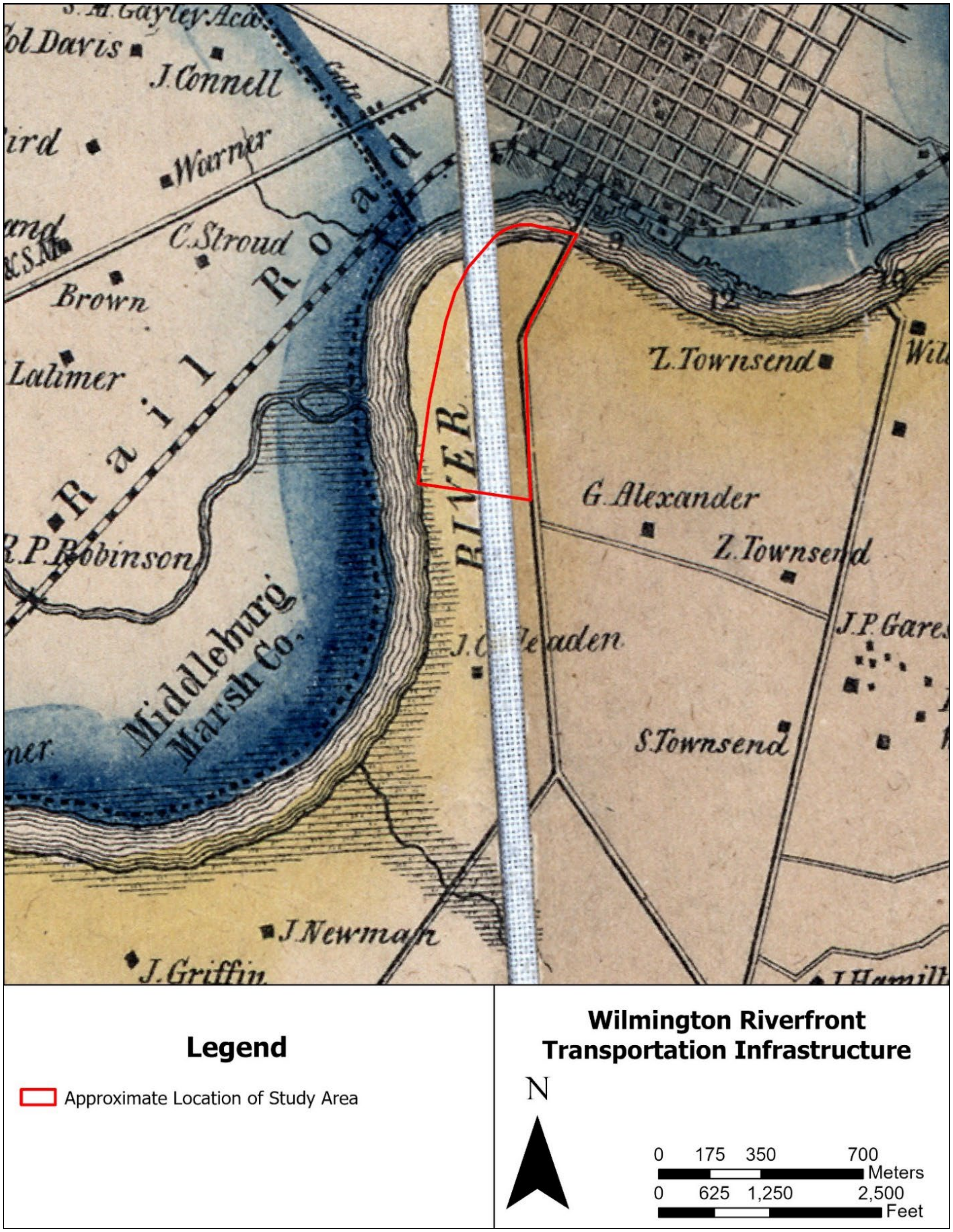


Figure 8: Approximate location of the Study Area depicted on *Map of New Castle County, Delaware: from original surveys* (Rea and Price 1849).

REMOVAL.

A. FLAGLOR, & CO.,

Have removed their extensive Carriage Manufactory, to the South side of the Wilmington Bridge, foot of Market street, To supply the great and rapidly increasing demand for their work, they have been induced to add largely to their establishment, which is now one of the largest in the United States, where they will keep on hand and make to order

COACHES AND LIGHTER CARRIAGES,

of the latest and most approved patterns, which they are enabled to sell low and recommend with confidence. Warranted twelve months. Persons wishing to purchase or order Carriages will do well to call and examine our stock. Old Carriages repaired, or taken in exchange for new ones.

A. FLAGLOR, & Co.
Wilmington, Del.

Figure 9: A. Flaglor, & Co. advertisement in the 1853 *Wilmington City Directory* (Heald 1853).

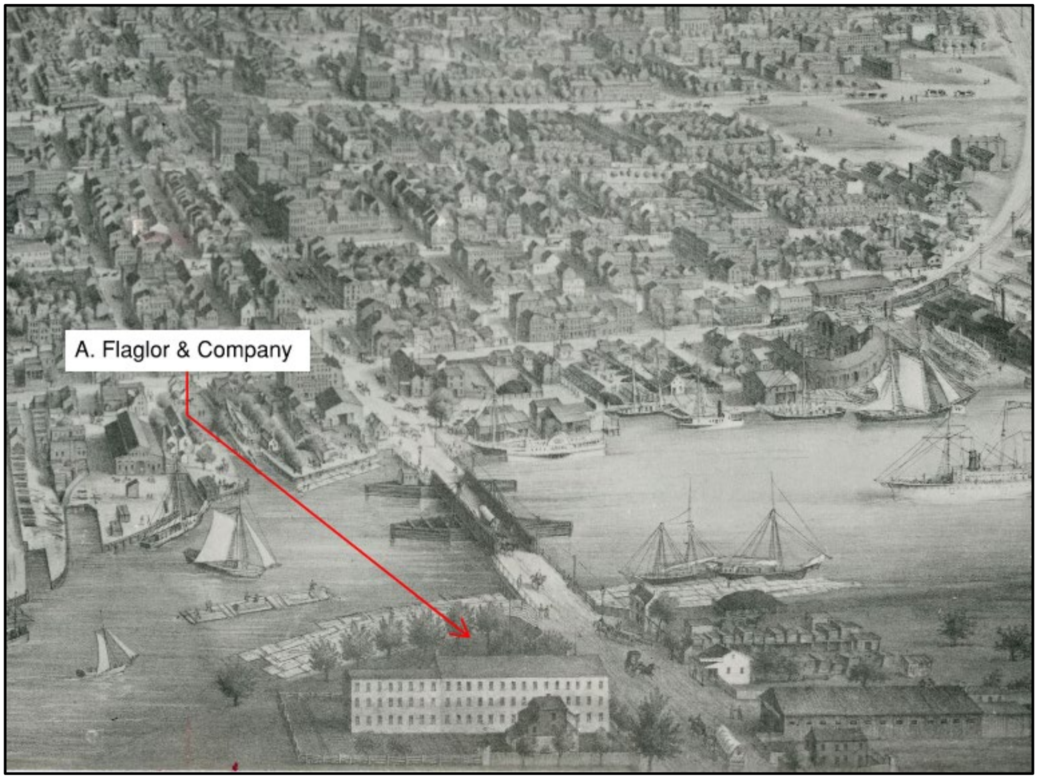


Figure 10: A. Flaglor & Co. ca. 1865 depicted on *Bird's Eye View of the City of Wilmington, Delaware* (bottom, left) (E. Sachse & Company 1865).

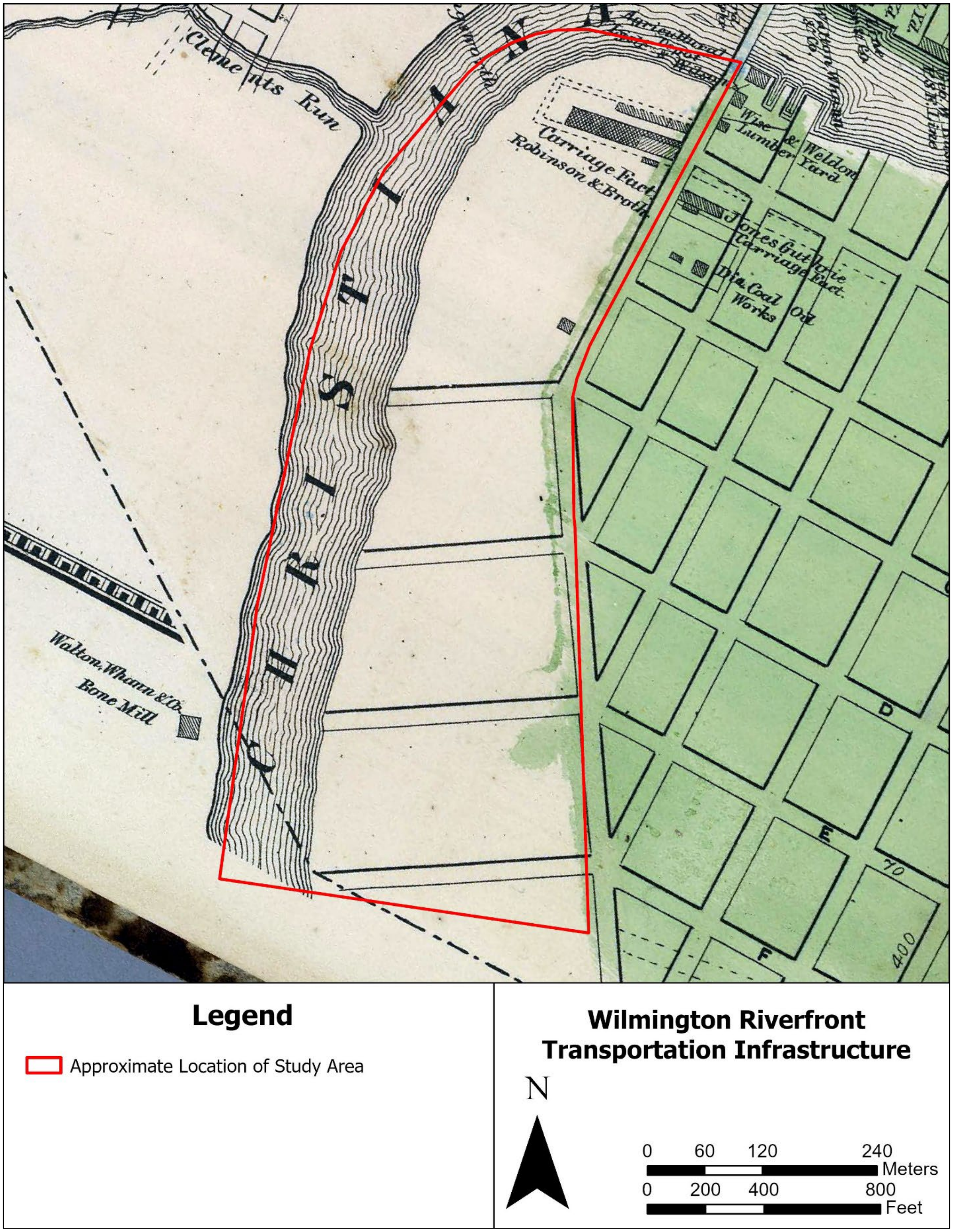


Figure 11: Approximate location of the Study Area depicted on *Atlas of the State of Delaware* (Beers 1868).

Thompson and Paschall Carriage and Coach Makers is shown on the 1874 H. H. Bailey and Company *Wilmington, Del.* map (H. H. Bailey 1874) (**Figure 12**). This map depicts the Thompson and Paschall Carriage and Coach Markers as a complex of industrial buildings that includes a two-story rectangular building perpendicular to South Market Street, a one-story rectangular building, and a three-story rectangular building parallel to and fronting South Market Street. Nine additional buildings are shown on the 1874 map within the Study Area. These structures are not labeled and appear to be a mix of two to three-story houses and one-story outbuildings; seven of the structures are located directly along South Market Street and two possible outbuildings are located west of South Market Street.

In an 1856 account, Harriet Tubman stated that she hid five fugitives with Free Black friends south of the Market Street Bridge until local “station master” Thomas Garrett could arrange their escape north over the Market Street Bridge in wagons with false bottoms (Ames et al. 2009; Bradford 1869). Although the exact location of this community south of the Market Street Bridge is unknown, it is possible that there was small Free Black community in the vicinity of the Study Area and the residential buildings depicted in the 1874 map.

Development along South Market Street, north of the Wilmington and Western Railroad within the Study Area increased during the late 1870s, but land within the Study Area south of the railroad along the Wilmington Causeway appears to have remained undeveloped with the exception of drainage ditches which separated the undeveloped lots (G. M. Hopkins and Co. 1876) (**Figure 13**). The G. M. Hopkins and Co. 1876 *City Atlas of Wilmington, Delaware* depicts the Thompson and Paschall Carriage Works complex just south of the Christina River and a small cluster of unidentified brick and frame buildings just south of

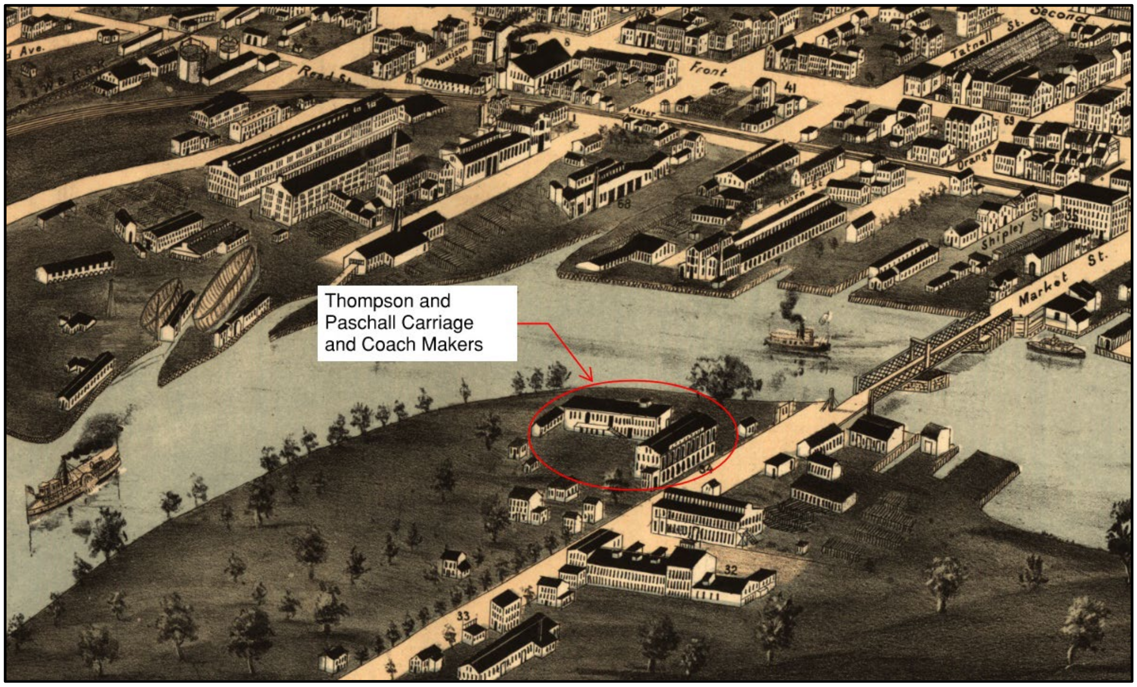


Figure 12: Thompson and Paschall Carriage and Coach Makers factory complex and unidentified structures within the Study Area depicted on *Wilmington, Del.* (H. H. Bailey and Co. 1874).

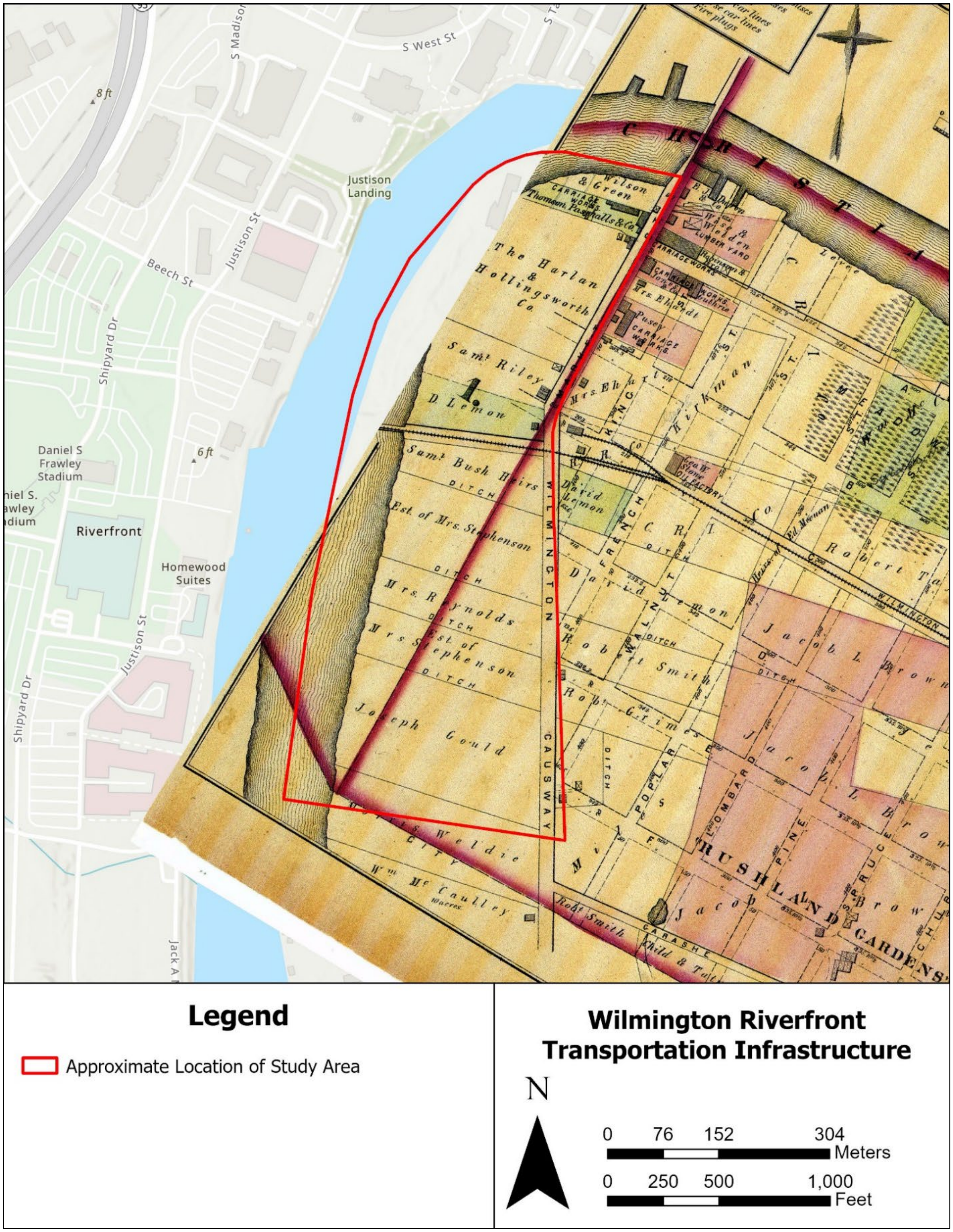


Figure 13: Approximate location of the Study Area depicted on *City Atlas of Wilmington, Delaware* (G. M. Hopkins and Co. 1876).

the Thompson and Paschal carriage works on property owned by the Harlan and Hollingsworth Company, a steamship manufacturer (G. M. Hopkins and Co. 1876). While Harlan and Hollingsworth owned property along South Market Street, the steamship factory was on West Street on the north side of the Christina River (Commercial Printing Company 1875). Further, the Hopkins 1876 map shows three additional structures within the Study Area along South Market Street. One unidentified frame building and one unidentified brick building are located on a parcel owned by Samuel Riley, and one unidentified brick building is located just south of Riley's property on a parcel owned by D. Lemon that abuts the Wilmington and Western Railroad spur. The structures located on the Lemon and Riley parcels likely correspond to the southern-most houses and outbuildings depicted on the H.H. Bailey and Co. 1874 *Wilmington, Del.* map (H. H. Bailey and Co. 1874), and demonstrate that in addition to industrial development, the Study Area was occupied by residences along South Market Street as early as the 1870s.

The Wilmington and Western Railroad was constructed through the Study Area in 1872 and connected Wilmington with southeastern Pennsylvania (Hall 2007; Wilhlem 2016). Though, originally chartered as the Wilmington and Western Railroad Company, the railroad was reformed as the Delaware and Western Railroad in 1877 and was purchased by the Baltimore and Ohio Railroad in 1886 (Wilhelm 2016). With the exception of the Thompson and Paschall Carriage Works complex, all other structures within the Study Area on the Hopkins 1876 map are located directly adjoining the west side of South Market Street (G. M. Hopkins and Co. 1876).

Urbanization and Suburbanization (ca. 1880 to 1940)

Between 1880 and 1900, the population of Wilmington had grown from 42,000 residents to 76,000 (Hoffecker 1974). Urbanization in Wilmington, like most cities at that time, had taxed the city's infrastructure, in particular the water supply and sewage disposal. The lack of proper sewage and water facilities affected residents' health when the city experienced a rise in cholera and diphtheria in the 1870s and a smallpox epidemic in 1881. Although the Wilmington board of trade was particularly concerned about water contamination, it was also alarmed about the effects of sewage in the Christina River. By the end of the nineteenth century, Wilmington's board of trade had focused their efforts on attracting new businesses and believed that improved infrastructure in the city, including parks, sewers, and paved streets, would promote the healthfulness and activeness of Wilmington and would consequently attract new industries (Hoffecker 1974). These concerns led to the dredging of the Christina River beginning in the 1880s and continuing through the early 1900s (Dixon 1992). Soil from dredging may have been used as fill dirt along the Christina River, which created more land suitable for development.

Industrial growth in Wilmington continued during the first few decades of Wilmington's Urbanization and Suburbanization period, but by the turn of the twentieth century, Wilmington experienced an economic downturn caused by a variety of factors, including shifting market requirements and the rise of trusts and large holding corporations (Dixon 1992). In 1900, Wilmington boasted 262 manufacturing businesses and 14,498 wage earners. Five years later, the number of businesses had dropped to 247 and wage earners to 13,554 (Hoffecker 1974).

The turn of the twentieth century brought changes to the industrial waterfront along the Christina River as a number of Wilmington's largest and oldest industries suffered because of competition from large trusts and holding companies that outnumbered Wilmington manufacturers. The shipbuilding and the railcar industries were particularly hard hit, and many were forced to cease operations or become parts of national corporations such as the Diamond State Iron Company, established in 1855, which closed its rolling mill on the Christina River in 1904. Others shifted their manufacturing efforts to other industries including the Jackson & Sharp's railcar and wooden shipbuilding company, founded in the 1830s, which was purchased by the American Car & Foundry Company of St. Louis shortly after the turn of the century. Pusey and Jones, the large shipbuilding company established in 1848, survived by shifting its shipbuilding efforts to manufacturing paper-making machinery in the early years of the twentieth century. In 1904 the Bethlehem Steel corporation trust took over the Harlan & Hollingsworth Corporation, shipbuilders and railcar manufacturers founded in 1836 (Dixon 1992).

While Wilmington's large industries were experiencing a decline, the city's future economic base was unfolding. The largest American producer of gunpowder, the DuPont Powder Company, founded near Wilmington in 1802, moved its headquarters to downtown Wilmington in 1902 after the death of its president, Eugene Du Pont. The move from a location on the Brandywine several miles north of the city was prompted by the company's new leadership, which focused on expanding the company's control of the explosives industry and into related chemical fields. The new 12-story building on Tenth and Market streets housed a centralized staff of 2,500 that would focus on these new efforts. The move downtown had a "momentous effect on Wilmington's development" (Hoffecker 1974:160). After a federal anti-trust suit against DuPont, two new powder companies, Atlas and Hercules, formed and moved their administrative offices to Wilmington. Thus, by 1914 Wilmington had transformed from an industrial city to one of corporate management (Hoffecker 1974).

World War I (1914-1918) sparked Wilmington's economy as the shipyards, foundries, tanneries, and munitions plants increased production for the war effort. The shipyards produced freighters used for shipping cargo overseas, and the tanneries produced leather used in ships, passenger rail cards, uniforms, and shoes. DuPont had a government contract as the sole manufacturer of military gunpowder and supplied more the 40 percent of the gunpowder used by Allied forces. This economic upturn was short-lived, however, and Wilmington's industry entered a decline after the war ended in 1918 that continued through the Great Depression until the onset of World War II. Wilmington's workers saw a loss of 15,000 jobs between 1919 and 1921. Both Jackson & Sharp and the Lobdell Car Wheel Company closed in the early 1930s, and the city's largest shipyard, Bethlehem Steel's Harlan Plant, closed its facilities in 1927 after the Dravo Corporation purchased the southern portion of the site. Dravo, a Pittsburgh-based firm, used the site to expand its steel barge and scow manufacturing business. The Harlan Plant continued to produce railroad cars on the northern portion of the site until World War II (Zug-Gilbert et al. 2011).

Prior to the turn of the twentieth-century development was concentrated in the northern half of the Study Area. By 1881, the Wilmington City line expanded south and encompassed the Study Area (G. M. Hopkins 1881) (**Figure 14**). The 1881 G. M. Hopkins and Co. *Map of New Castle County, Delaware: From Actual Surveys and Records* details South Market Street as well as the Wilmington Causeway, which bounded the west side of the Project Study and the Delaware and Western Railroad spur. The map shows a few structures immediately south of the Christina River but does not document any structures within the Study Area (Hopkins 1881).

The 1884 Sanborn Fire Insurance Map shows three businesses composed of multiple brick and frame structures on the west side of South Market Street within the Study Area (Sanborn Map Company 1884) (**Figure 15**). These businesses include the S. D. Paschall Carriage Works, the John Walters Carriage Works, and the Universal Manufacturing Company. Land on the north side of these buildings is describes as

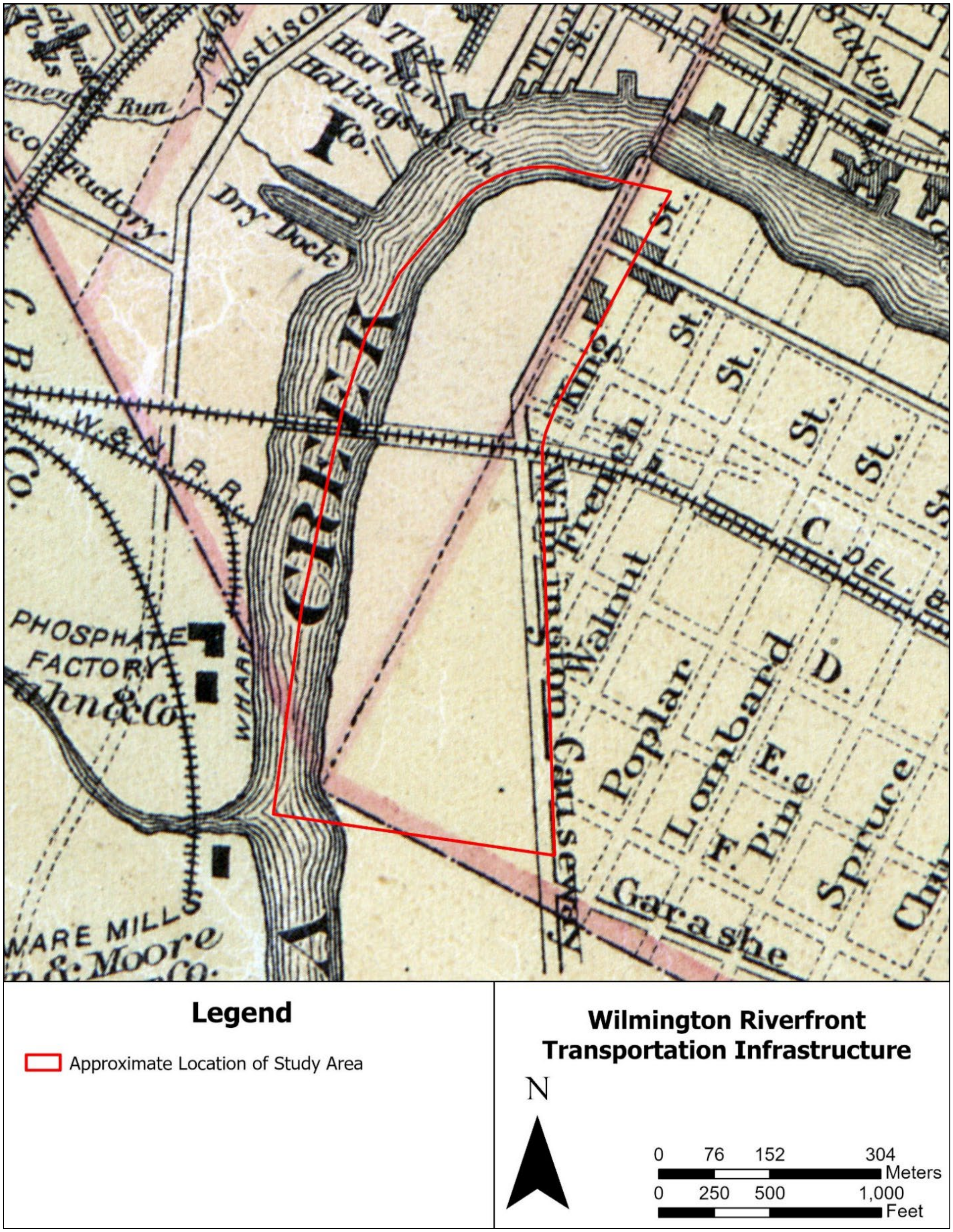


Figure 14: Approximate location of the Study Area depicted on *Map of New Castle County, Delaware: From Actual Surveys and Records* (G. M. Hopkins and Co. 1881).

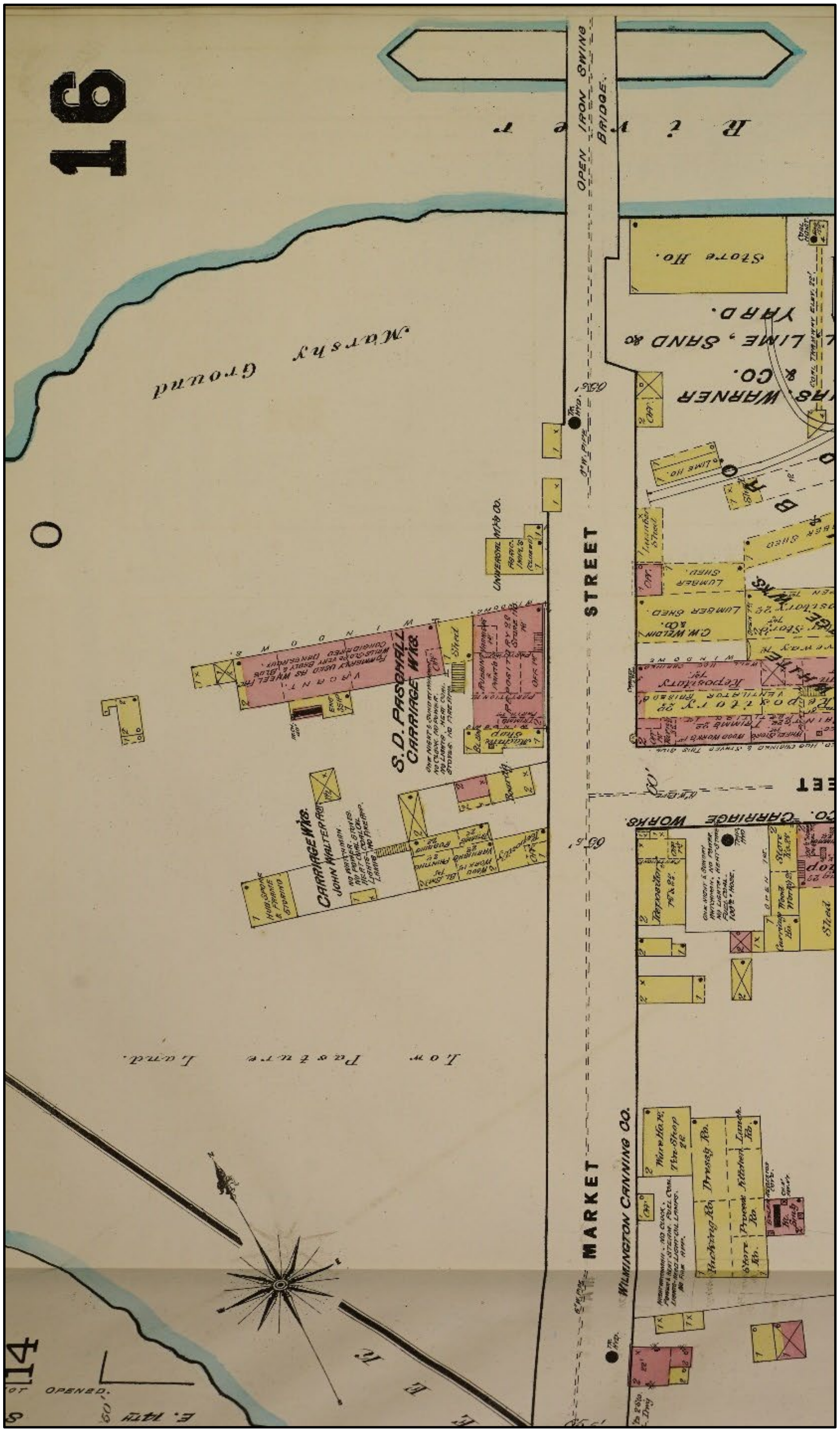


Figure 15: S. D. Paschall Carriage Works, John Walters Carriage Works, and Universal Manufacturing Company depicted on 1884 Sanborn Fire Insurance Map (Sanborn Map Company 1884).

“marshy ground”, while land south of these buildings is undeveloped and described as “low pasture land” (Sanborn Map Company 1884).

The S. D. Paschall Carriage Works had changed its name from Thompson and Paschall to S. D. Paschall between 1875 and 1879 (Ferris Brothers 1879). The 1884 Sanborn Fire Insurance Map depicts the S. D. Paschall Carriage Works as a complex of one- and two-story brick and frame structures. The 1880 Wilmington City Directory describes the S. D. Paschall Carriage Works building as “commodious” containing “all the modern improvements” and notes that the factory is located, “on the site of the old building erected by Flaglor and Co. for a carriage factory, over thirty years ago” (Ferris Brothers 1879). The 1884 Sanborn details a two-story rectangular brick structure west of the main factory building and describes it as “vacant” and “formerly used by a wheel factory walls slope very badly & b’ld’g considered dangerous” (Sanborn Map Company 1884). This description seems consistent with the 1880 City Directory’s descriptions and indicates that the industrial building referred to in the 1853 Wilmington Directory and depicted on the 1865 *Bird’s Eye View of the City of Wilmington, Delaware* and the 1868 *Beers Atlas of the State of Delaware* is likely the same structure depicted on the 1884 Sanborn Fire Insurance Map, which was constructed ca. 1853. S. D. Paschall Carriage Works was in business at the South Market Street location until 1885 (Williamson 1885). A detached, two-story frame building with a one-story frame ell off the north elevation is also depicted on the S. D. Paschall Carriage Works property (Sanborn Company Map 1884). Although not demarcated in the map as a dwelling it is likely that this is a residential dwelling associated with the commercial property.

The John Walters Carriage Works is depicted on the 1884 Sanborn Fire Insurance Map as a complex of one- and two-story frame structures located just south of the S. D. Paschall Carriage Works (Sanborn Map Company 1884). The John Walters Carriage Works is absent from 1875 Wilmington City Directory but is listed in the 1880 Wilmington City Directory, which suggests that the factory was constructed within the Study Area between 1875 and 1879 (Ferris Brothers 1879). The Walters Carriage Works property also contains a detached, two-story frame and brick building demarcated as “board’g”, referring to the use of the property as a multi-room residence (Sanborn Company Map 1884). It is likely that some of the tenants of the building worked at the carriage works.

The Universal Manufacturing Company is depicted on the 1884 Sanborn Fire Insurance Map as a one-story frame structure located north of the S. D. Paschall Carriage Works; the factory produced agricultural tools but was closed when the map was produced (Sanborn Map Company 1884). The Universal Manufacturing Company is not listed in any of Wilmington City Directories from the late nineteenth century.

As industry developed in the Study Area and greater Southbridge neighborhood, a local real estate developer, J.T. Heald, formed the Christina River Improvement Company and purchased land in 1868, not only to build industrial sites, but also to build cheap workers’ housing. By 1880, Southbridge was home to 1,883 people in 374 households—about 400 African Americans comprised 20 percent of the population and 300 European immigrants, mostly from Ireland, comprised 15 percent of the population. The remainder of the Southbridge residents were American born, working-class, and white. African Americans primarily resided in the western part of Southbridge and white residents, including immigrants, in the eastern and central parts (Darsie et al. 1996). The 1886 Wilmington City directory lists 11 men as living along South Market Street, although no street numbers are provided (Williamson 1886). A couple of the South Market Street residents are listed as watchmen for industrial business along South Market Street, including S. D. Paschall, and likely lived in residential accommodations on the commercial properties.

Others likely lived in the residential structures depicted in **Figure 12** and **Figure 13** along South Market Street.

By the turn of the twentieth-century, development was still concentrated in the northern half of the Study Area, but some buildings are depicted south of the Wilmington and Western Railroad, although most of the Study Area is still depicted as marshland (Bromberg 1988; USGS 1904) (**Figure 16**). The configuration of the northern half of the Study Area did not change significantly at the turn of the century. The 1901 Sanborn Fire Insurance Map depicts the former S. D. Paschall Carriage Works/John Walters Carriage Works and John Walter Carriage Works properties are now occupied by the Illinois Leather Company. The Illinois Leather Company operated at this location from 1892 to 1909 (Costa 1892; Eastern Directory Company 1909; Sanborn Map Company 1901) (**Figure 17**). The Illinois Leather Company made a number of changes to the physical layout of property. The store house at the northwest corner of the property remained the same, but the two-story brick wheel factory building listed as in very poor repair in the 1884 Sanborn map had been reconstructed as a two-story frame building within the same footprint. Two boilers were installed on site for the heating of water for use in the tannery. One of the boilers, a horizontal brick boiler, appears to have been retained or installed in the same location as an earlier boiler used for the carriage works. A second boiler was added adjacent to the first. The dwelling that was behind the S. D. Paschall Carriage Works is still on the property in 1901, although the ell has been expanded. The John Walters Carriage Works property has been significantly reconfigured. A long narrow, one-story frame building has been constructed for lime and hair storage and a one-story wagon shed has been constructed immediately adjacent to that building. The boarding house along South Market Street now serves as one of two one-story frame blacksmith shop buildings and a one-story frame building for carriage painting has been constructed in the vicinity of the no longer extant main building of the Walters Carriage Works (Sanborn Map Company 1901) (**Figure 17**).

Aerial imagery of the Study Area from 1925 depicts the Tanners Products Company and the McAllister Brothers Boiler Repairs occupying portions of the former S. D. Paschall Carriage Works/Illinois Leather Company complex (Dallin 1925) (**Figure 18**). Both of these businesses had operated out of the complex since 1918 (Polk 1918). The aerial imagery also shows a baseball field south the McAllister Brothers Boiler Repairs between South Market Street and the Christina River, an undeveloped lot south of the baseball field, an unidentified structure along South Market Street south of the undeveloped lot, and a few unidentified structures and boat docks along the Christina River. With the exception of the former S. D. Paschall Carriage Works/Illinois Leather Company industrial complex none of the buildings depicted within the Study Area on the H. H. Bailey 1874 map or the Hopkins 1876 map appear to be extant in 1925.

A major change to the northern half of the Study Area took place when a baseball field known as Harlan Field was constructed during World War I by the Harlan and Hollingsworth Shipbuilding Company (Duffy 2007) (**Figure 18**). Though most major and minor baseball leagues ceased to operate during World War I, the rapid expansion of the American shipbuilding industry for the war-effort brought thousands of additional workers to shipyards along the Atlantic seaboard. Shipyards created their own baseball teams for their workers and formed shipbuilding baseball leagues (Leeke 2013). The Delaware River Shipbuilding League, established in 1918, included shipbuilding company baseball teams from Chester, Pennsylvania, Camden, New Jersey, Philadelphia, Pennsylvania, and Wilmington, Delaware. Wilmington, Delaware was represented by the Harlan and Hollinsworth “Shipbuilders” whose baseball field was located south of the Market Street Bridge, across the river from the Harlan and Hollingsworth Shipyard (Duffy 2007). The Harlan and Hollingsworth "Shipbuilders” would go on to win the league championship at Harlan Field in

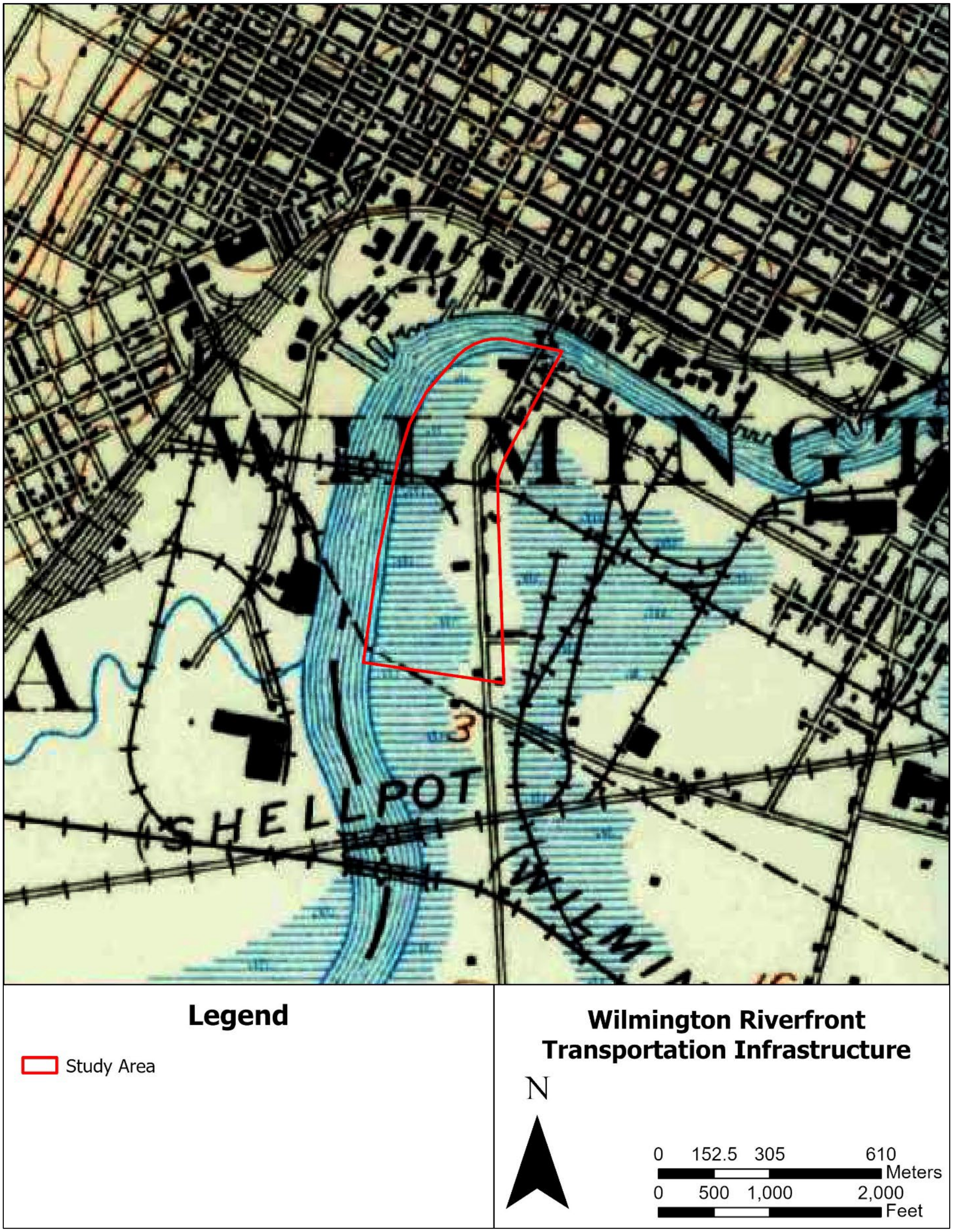


Figure 16: Study Area depicted on 1904 USGS *Wilmington, DE*. Quadrangle (USGS 1904).

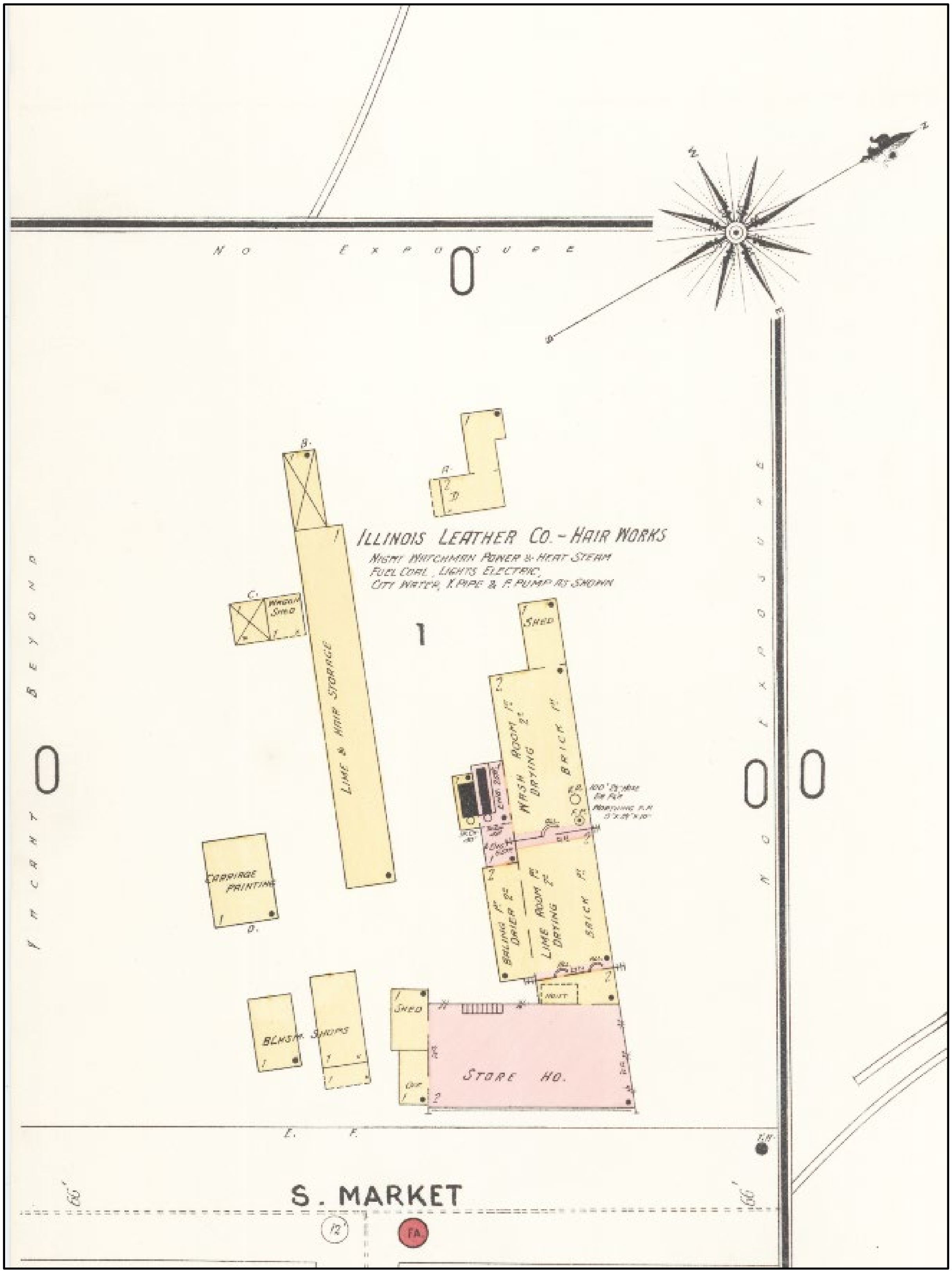


Figure 17: Illinois Leather Company depicted on 1901 Sanborn Fire Insurance Map (Sanborn Map Company 1901).

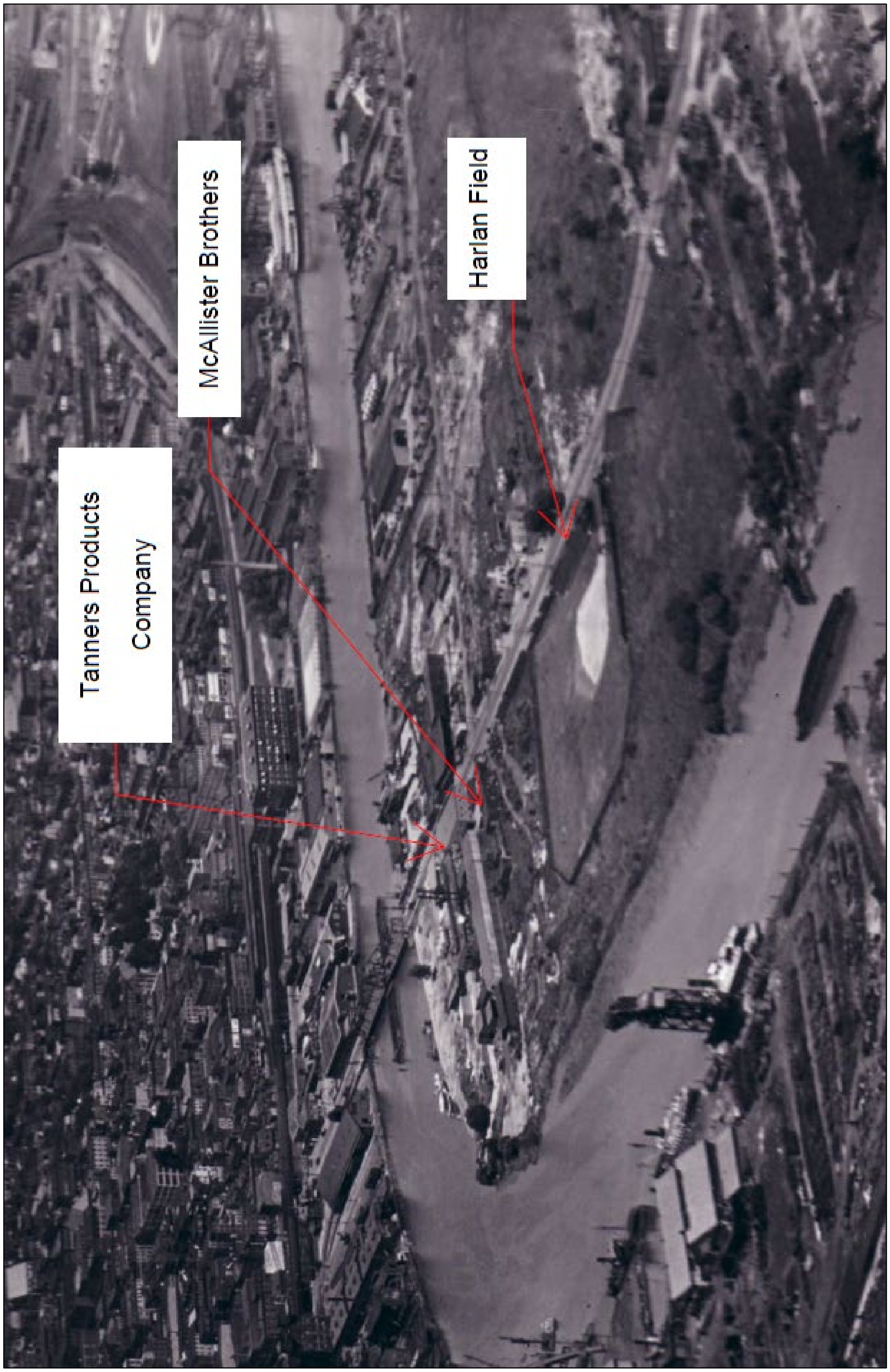


Figure 18: Development within Study Area on 1925 aerial imagery (Dallin 1925).

1918. When World War I ended in November of 1918, shipyards scaled back their operations and the shipbuilding leagues disbanded. However, throughout the 1920s and 1930s, Harlan Field was briefly home to semi-pro and Negro league baseball teams including the “Wilmington Chicks” and the “Rosedales” (Duffy 2007).

Industrial development of the southern half of the Study Area began during the first decades of the twentieth century. The 1904 USGS map depicts two buildings south of the Wilmington and Western Railroad, one in the vicinity of what would become the Victor Pyle Lumber Company and one in the vicinity of what would become the Joseph B. Beste Company (Vapat Incorporated Corporation) (**Figure 16**). A frame building was documented at the Victor Pyle Lumber Company property in a ca. 1920 highway department plan and is presumed to have been built sometime after Victor Pyle purchased the property in 1913 and operated a barrel factory (Zug-Gilbert et al. 2011:89). The frame building was replaced by a two-story brick building, which comprises part of the extant building on the property, on nearly the same footprint sometime between 1920 and 1928 (Zug-Gilbert et al. 2011:89). The parcel of land at the southern extent of the Study Area was developed in the first decades of the twentieth-century, first with a framed barn according to a 1919 roadway plan, and then within the footprint of the barn, a two-story frame barrel factory constructed ca. 1925 as documented in a 1928 road plan (Zug-Gilbert et al. 2011:126). A 1929 aerial photograph also depicts a residential building to the immediate south of the two-story frame building. Joseph B. Beste purchased the property in 1934 and formed the Joseph B. Beste Company, which dealt in the recovery and rendering of animals and also bagged manure and distributed fatty oils (Zug-Gilbert et al. 2011:126).

By the early 1920s, the South Market Street corridor was in very poor condition. A highway department engineer recorded the state of the roadway in a 1925 annual report, “We do not have anywhere in our system of 504 miles of highways a section of road whose surroundings are less attractive, more disreputable, ill-kept and thoroughly disgusting than the South Market Street Causeway in Wilmington” (Buck 1925:25). The engineer recommended the paving of the street from the Market Street Bridge to the city limits and the construction of sidewalks, curbing, and lighting. He predicted that by making these improvements “the many dump heaps, dilapidated shacks and hovels will be [replaced with] stores, show rooms, garages, and other presentable places of business” (Buck 1925:25) (LeeDecker et al. 2011). In 1925, construction began on a new bridge crossing the Christina River. Upon the completion of the bridge in 1927, improvements were made to South Market Street in 1928, including drainage, sidewalks, and curbing as recommended in the 1925 annual report (Zug-Gilbert et al. 2011). These roadway improvements increased development along the transportation corridor.

By the late 1920s, new industries began operations within the Study Area. In the northern half of the Study Area, the 1927 Sanborn map and contemporary aerial photographs depict the Tanners Products Company and McAllister Brothers Boiler Repairs complex as well as an unidentified one-story frame dwelling at the rear of the McAllister Brothers Boiler Repairs and a brick filling station along south Market Street just north of the Tanners Products Company (Sanborn Map Company 1927) (**Figure 18** to **Figure 20**). This gas station is listed in Polk’s 1926 *Wilmington City Directory* as “Joy Gas and Oil Station”, which was located at 105 South Market Street and was constructed between 1925 and 1926 (Polk 1926). The Standard Oil Company Bulk Storage Plant (N14480) began operations along South Market Street sometime between 1925 and 1929, as evidenced by aerial photographs (Polk 1930) (**Figure 18**, **Figure 20**). The Wilmington and Western Railroad tracks that crossed the Christina River on a swing bridge were largely abandoned in the 1920s and the swing bridge was taken out of service in 1930 and removed in the late 1930s (Hall 2007). South of the Wilmington and Western Railroad tracks, the Atlantic Refining

Company storage facility (N12497) was operational by 1929 immediately north of the Victor Pyle Lumber Company (**Figure 20** and **Figure 21**). The Pyle's Lane and Gorman's Lane neighborhoods, situated south of the Atlantic Refining Company and west of the Victor Pyle Lumber Company are present in the 1929 aerial imagery and likely formed in the early 1920s.[1]

Development within the South Market Street corridor during and after the Great Depression continued to be characterized by warehouses and bulk storage business, automotive repair and salvage businesses, automotive filling stations, and petroleum storage plants. The American Hair and Felt Company and later the Allied Kid Company operated out of the former S. D. Paschall Carriage Works/Illinois Leather Company/Tanners Products Company complex throughout the 1930s, Harlan Field was demolished by 1939, and the Standard Oil Gas Station (N14481) was constructed ca. 1939 (Dallin 1939, 1941; Polk 1938) (**Figure 22** to **Figure 24**). The Standard Oil Company Bulk Storage Plant, the Atlantic Refining Company, the Victor Pyle Lumber Company, and the Joseph B. Beste Company continued to operate. And the Pyle's Lane and Gorman's Lane neighborhoods and residences extending south along the Christina River appear to have maintained or grown in size and density (Briggs and Brosnan 2009a; Dallin 1939, 1941) (**Figure 23** and **Figure 24**).

Suburbanization and Early Ex-Urbanization (1940 to Present)

World War II (1939-1945) revived Wilmington's economy by reopening several of the city's closed shipbuilding facilities to help with the war effort. During the war Pusey and Jones built tugboats and freighters, the Harlan Plant built landing naval barges and ramps, and Jackson & Sharp produced several types of naval craft, including barges, dredges, drydocks, and tugboats (Zug-Gilbert et al. 2011).

Wilmington's largest wartime producer and employer was the Dravo Corporation. After the December 1941 attack on Pearl Harbor, the company, located on the western side of the Christina River on the former Bethlehem Steel property, built a state-of-the-art assembly plant for high-speed production of specialized naval craft to meet the Navy's wartime needs. Its work force grew from 400 in 1940 to almost 11,000 in 1943. Between 1940 and 1945, the company built 200 ships, including 48 in 1944 alone (Riverfront Wilmington 2011).

After World War II, the shipbuilding industry suffered a major decline, as its wartime effort had supplied the military with a large number of ships that would remain in service for decades. In Wilmington, the majority of the manufacturers helping to supply the war closed permanently. Dravo, whose work force dropped to 126 after the war, was able to survive by shifting its efforts to river transport, including barges and tugboats as well as steel production (ExplorePAHistory 2011).

Wilmington's industries shifted to chemicals and automobiles between 1948 and 1960; however, the new facilities were located outside the city limits, causing both commercial and residential expansion into the neighboring suburbs. DuPont retained its corporate headquarters in downtown Wilmington but had plants in Newport and Edgemoor, an experimental station along the Brandywine, and a technical facility east of Elsmere, all outside the city limits. General Motors opened its first postwar production plant on Wilmington's outskirts near Elsmere in 1947. Suburban expansion brought new residential communities, improved roads, commercial businesses, and other infrastructure improvements in the vicinity of the new

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[1] Additional discussion of the Pyle's Lane and Gorman's Lane neighborhoods can be found on page 49.

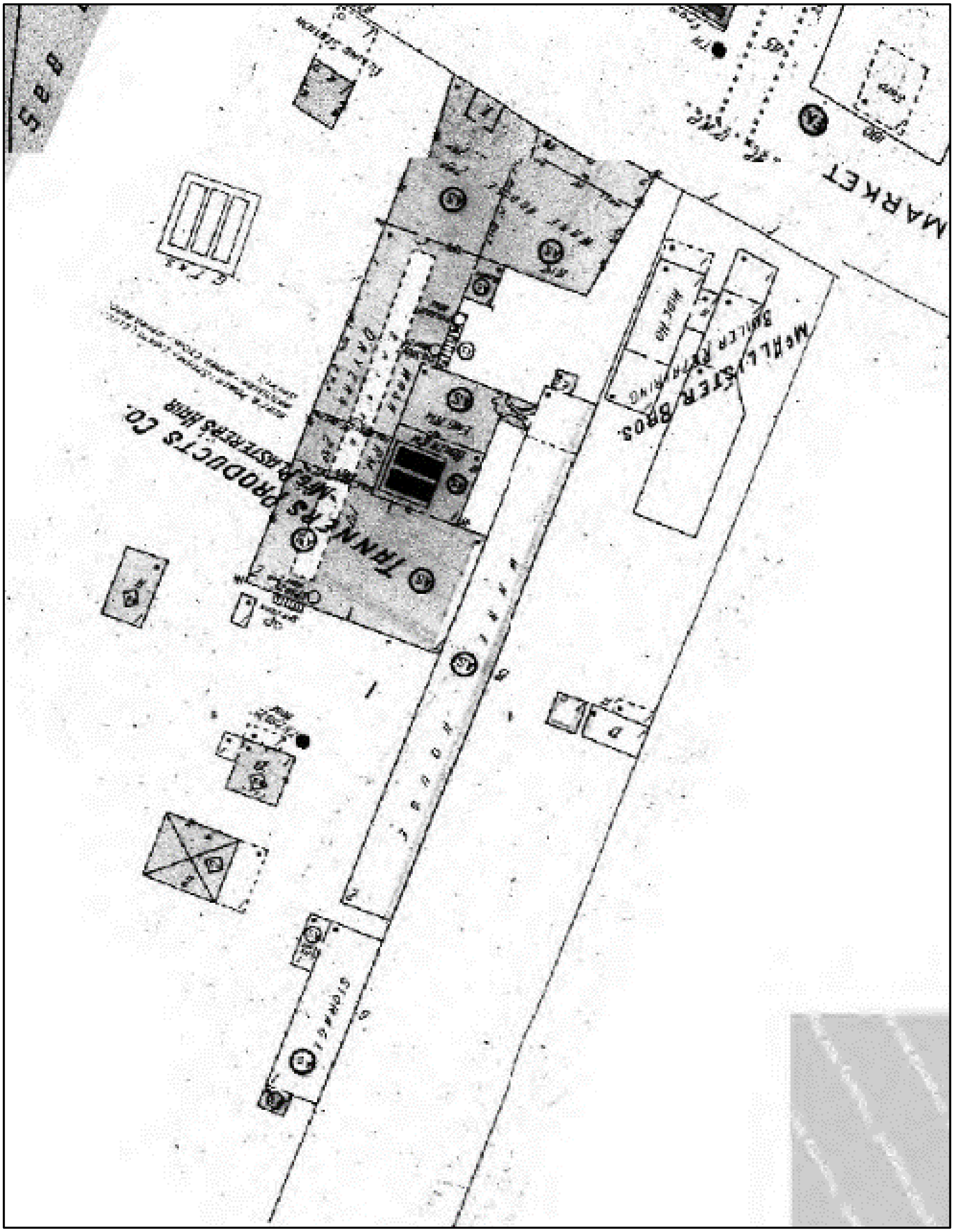

Figure 19: Tanners Products Company and McAllister Brothers Boiler Repairs depicted on 1927 Sanborn Fire Insurance Map (Sanborn Map Company 1927).

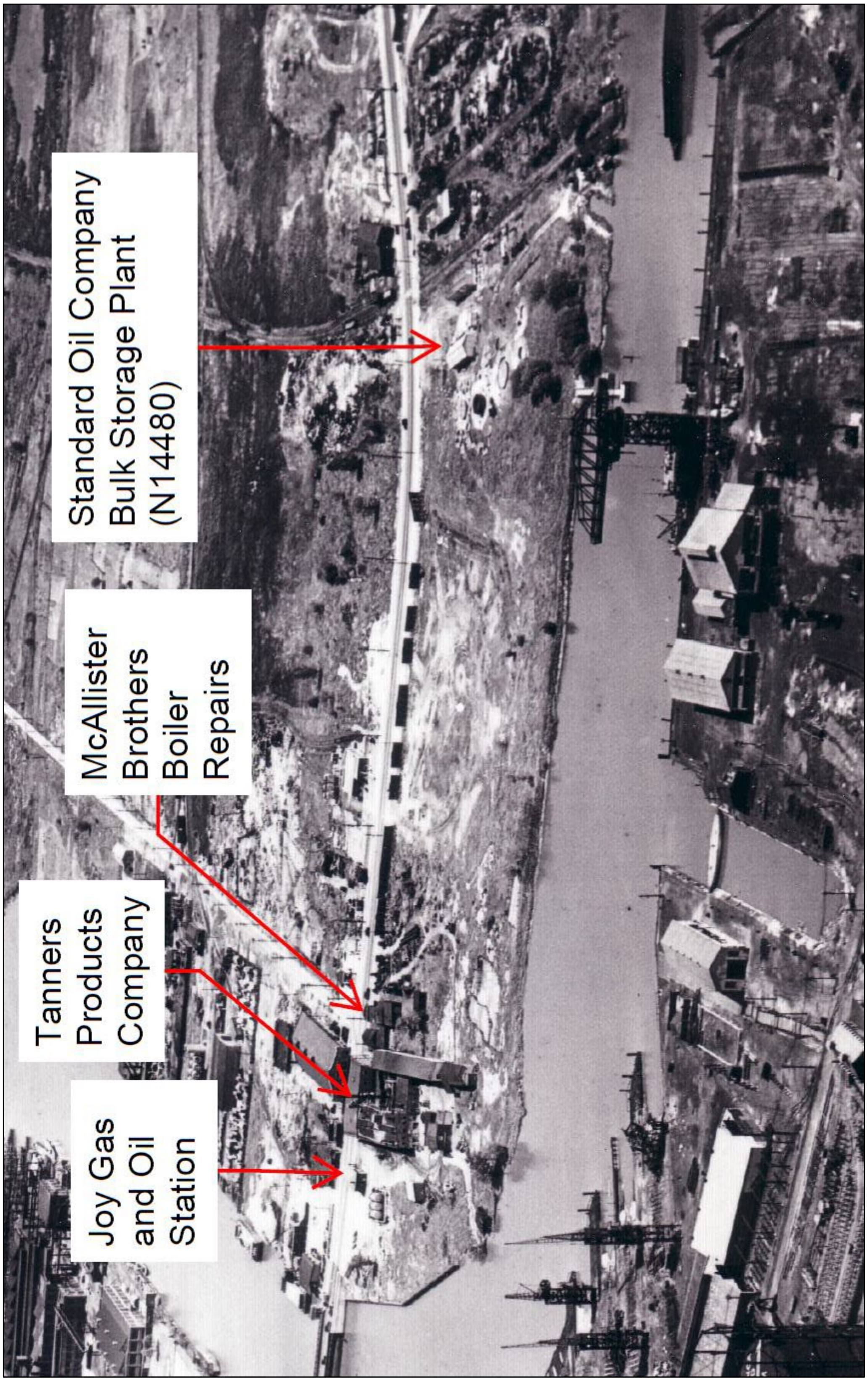

Figure 20: Development within the Study Area on 1929 aerial imagery, view east (Dallin 1929a).

Figure 21: Development within Study Area on 1929 aerial imagery, view north (Dallin 1929b).

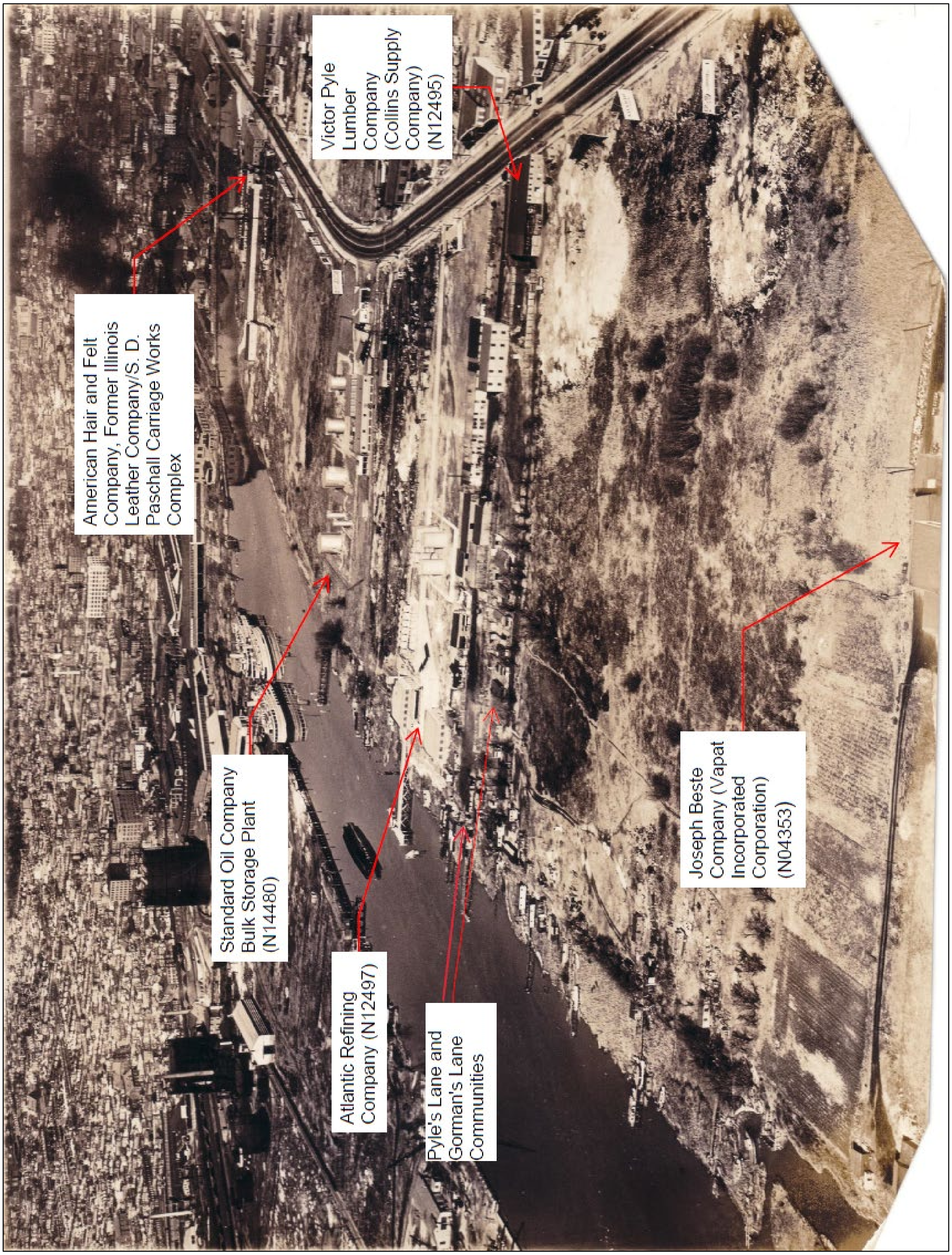

Figure 22: Development within the Study Area on 1931 aerial imagery (Dallin 1931).

Figure 23: Development within the Study Area on 1939 aerial imagery (Dallin 1939).

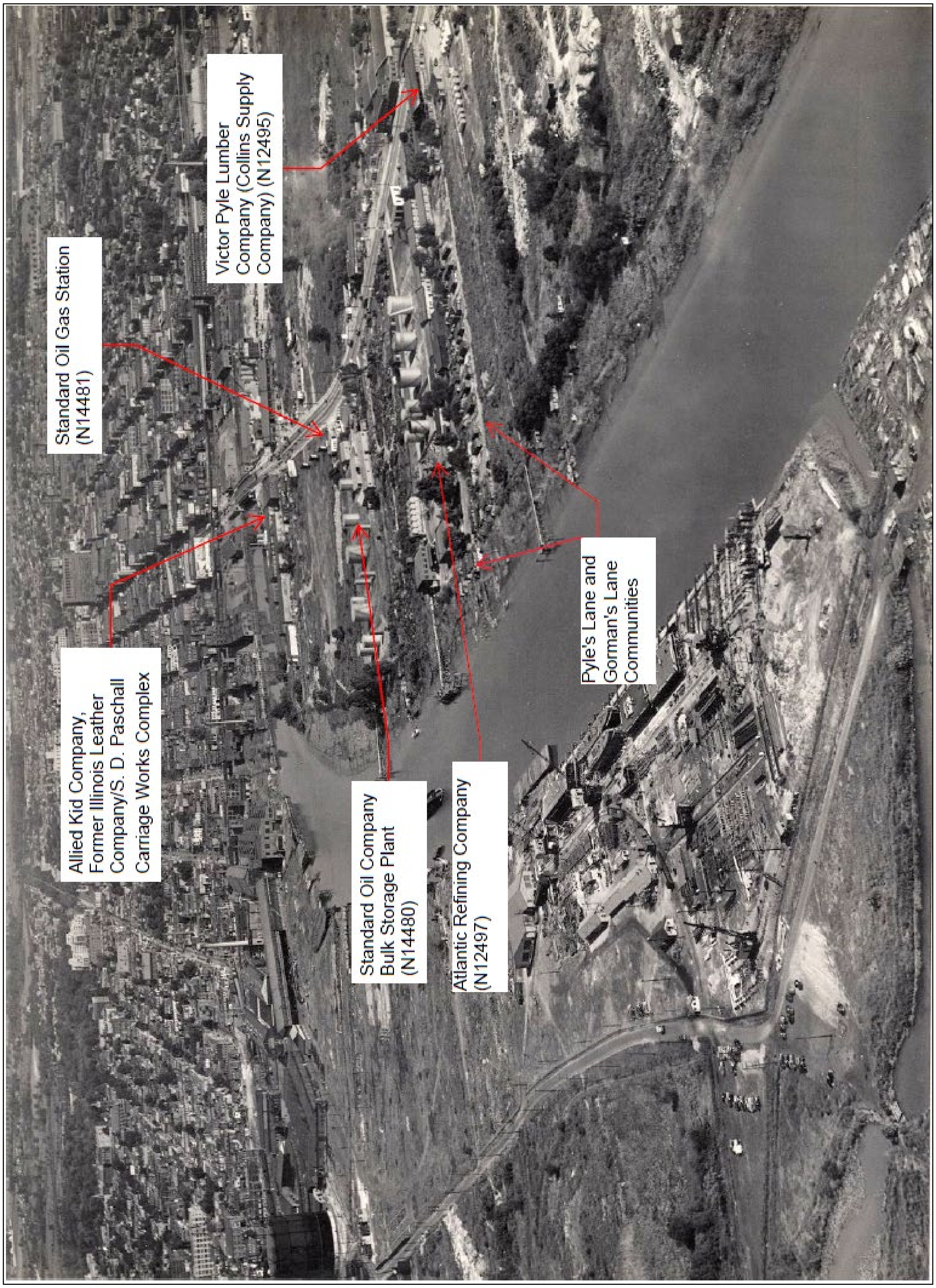

Figure 24: Development within the Study Area on 1941 aerial imagery (Dallin 1941).

facilities. Many of the former industrial buildings along Wilmington's waterfront were subsequently used by smaller businesses for storage and small-scale manufacturing (Zug-Gilbert et al. 2011).

In the later decades of the twentieth century, Wilmington's economy remained based on the chemical industries, small businesses, and corporate headquarters. These businesses required a smaller workforce, resulting in a 16 percent loss in Wilmington's workforce between 1960 and 1970. Continued suburbanization, demographic shifts, and an overall economic depression in the city caused the abandonment, ruin, and demolition of many of Wilmington's nineteenth- and twentieth-century industrial buildings along the waterfront.

During the early 1980s, the State of Delaware passed legislation to attract international and finance corporations. Wilmington's economy subsequently improved, and more than 60 percent of the Fortune 500 companies established headquarters in Delaware. Wilmington earned the moniker "Corporate Capital of the World" because of the large number of corporate headquarters and international banking firms located in the city, including Bank of America, Chase, Barclays, and ING Direct (Zug-Gilbert et al. 2011).

In 1996, Wilmington's former industrial waterfront along the northern side of the Christina River underwent a transformation as a result of a state-funded redevelopment project. Many of the abandoned and dilapidated industrial buildings were demolished or restored for new restaurants, shops, office buildings, theaters, and sports facilities. The Tubman-Garrett Riverfront Park occupies a large portion of the riverfront on the eastern side of the South Market Street Bridge (Zug-Gilbert et al. 2011).

After World War II, South Market Street and the Study Area developed into a busy commercial corridor where large tracts of land were available for auto service businesses and light industries (Zug-Gilbert et al. 2011). The 1948 USGS Wilmington South, DE quadrangle details the post-World War II South Market Street commercial corridor and depicts the Joy Gas and Oil Station and the Allied Kid Company, which continued to occupy the former Illinois Leather Company/S. D. Paschall Carriage Works complex, the Standard Oil Gas Station, the Standard Oil Company Bulk Storage Plant, the Atlantic Refining Company, the Victor Pyle Lumber Company, and the Joseph B. Beste Company (Polk 1948; USGS 1948) (**Figure 25**). Additionally, the 1948 USGS quadrangle illustrates the Pyle's Lane and Gorman's Lane neighborhoods south of the Atlantic Refining Company and shows that in 1948 many of these residences were situated along the north side of an alley that extended west from South Market Street to the Christina River (USGS 1948) (see **Figure 24**).

Within the Study Area, commercial and industrial buildings such as the former Illinois Leather Company/S. D. Paschall Carriage Works complex and the Victor Pyle Lumber Company remained extant, while other commercial structures were rebuilt including the Vapat Incorporated Corporation, which was rebuilt ca. 1953 on the footprint of Joseph B. Beste Company (LeeDecker et al. 2011). The parcels between the former Illinois Leather Company/S. D. Paschall Carriage Works complex and the Esso Standard Oil Company Bulk Storage Plant property, including the parcel that had held Harlan Field, were improved with at least three service stations and a Savery & Cooke iron and steel warehouse by the 1950s (Historic Aerials 1954; Polk 1957). By 1970, both the Esso Standard Oil Company Bulk Storage Plant and the Atlantic Refining Company had expanded the footprints of their plants with additional storage facilities and office spaces, and the Pyle's Lane and Gorman's Lane neighborhoods south of the Atlantic Refining Company were demolished (Briggs and Brosnan 2009b; Historic Aerials 1970). Additionally, by 1970, formerly vacant lots at the southern end of the Study Area were converted into junk yards (Historic Aerials 1970).

Figure 25: Study Area on 1948 USGS *Wilmington South, DE.* Quadrangle (USGS 1948).

Throughout the 1980s, development within the Study Area remained unchanged aside from the expansion of the warehouse occupying the former Harlan Field between the former Illinois Leather Company/S. D. Paschall Carriage Works complex and the Esso Standard Oil Company Bulk Storage Plant. However, by 1992 the former Illinois Leather Company/S. D. Paschall Carriage Works complex was demolished and replaced by the extant Salvation Army Thrift Store and Donation Center and associated parking lot (107 South Market Street) (Historic Aerials 1981, 1991). The construction of the Salvation Army Thrift Store and Donation center on the site of the former Illinois Leather Company/S. D. Paschall Carriage Works complex may have disturbed portions of the subsurface remnants of the mid-nineteenth century factory. More recently, portions of Esso Standard Oil Company Bulk Storage Plant were demolished ca. 2006, and the Atlantic Refining Company was demolished ca. 2019 and is currently a brownfield remediation site (Brightfields 2023; Historic Aerials 2006, 2019). Both the Victor Pyle Lumber Company and the Vapat Incorporated Corporation remain extant.

Pyle's Lane and Gorman's Lane Neighborhoods (ca. 1920 to 1960s)

Amid the industrial development that took place throughout the Study Area during the early and mid-twentieth century developed two neighborhoods known as Pyle's Lane and Gorman's Lane. The 1931 aerial imagery details the presence of residential housing immediately south of the Atlantic Refining Company and west of the Victor Pyle Lumber Company and extending south along the east bank of the Christina River (Dallin 1931) (Zug-Gilbert et al. 2011) (**Figure 26**). Aerial photography and newspaper accounts indicate that residential buildings consisted of one-to-two-story, one-to-multi-room frame buildings and early mobile homes (Hunter 1948) (**Figure 26** to **Figure 28**).

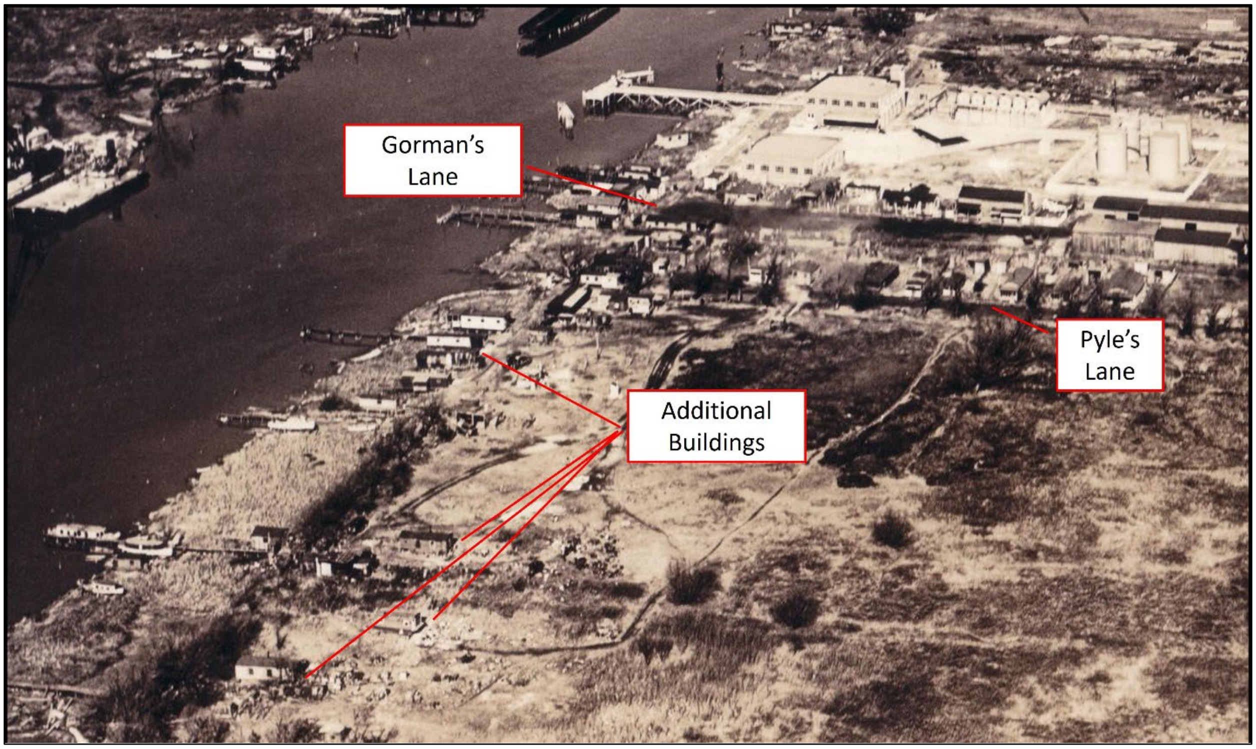

Figure 26: Detail of 1931 aerial imagery depicting Pyle's Lane and Gorman's Lane.

Figure 27: Birds eye view of Victor Pyle Lumber Company (N12495) and Pyle's Lane and Gorman's Lane neighborhoods in the late 1940s (Zug-Gilbert 2011:38).

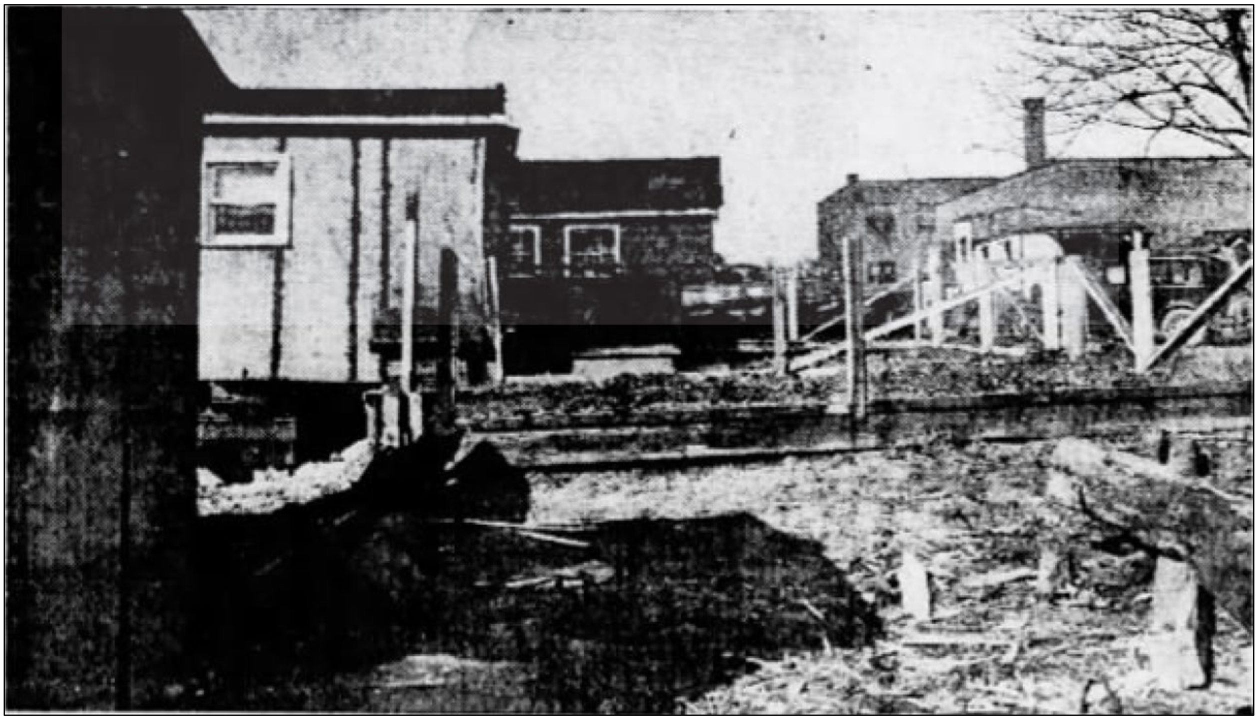

Figure 28: Gorman's Lane in 1948, facing north, with two brick buildings associated with Atlantic Refining Company in background right (Hunter 1948).

Census records and newspaper accounts indicate that the neighborhoods were known as Pyle's Lane and Gorman's Lane. The Pyle's Lane neighborhood extended west along the dirt road immediately south of the Victor Pyle Lumber Company. Newspaper articles reference the Pyle's Lane neighborhood as early as 1929, and it is likely that the neighborhood formed before then (*Wilmington Morning News* 1929). The Gorman's Lane neighborhood appears to have been located immediately south of the Atlantic Refining Company along the Christina River as described in a newspaper account identifying the threat of fire at the refinery following a house fire at Gorman's Lane and depicted in a photograph of the neighborhood with a brick industrial building in the background (Hunter 1948) (**Figure 28**). The Gorman's Lane neighborhood formed around 1921 when Fred L. Carpenter built a small dwelling with a workshop along the Christina River. He then constructed around six small buildings "suitable for homes"; he was then contacted by Dravo Corporation Shipyard employees looking for places to live, having heard he had constructed a community with "no traffic problems, an equitable rental plan, and up-to-the-minute maintenance service" (Hunter 1948).

The Pyle's Lane and Gorman's Lane neighborhoods existed from at least the 1920s through the 1950s. Communications with the property owner in 2011 demonstrated that individuals may have been living there until the late 1960s (Zug-Gilbert 2011). The neighborhoods may have varied in size over time but were well-known in the Wilmington community as evidenced by their reference in numerous newspaper articles (*Wilmington Morning News* 1929, 1933, 1950a, b, 1955a, b; *New Journal* 1933, 1942, 1948, 1953). In 1940, there were at least 99 people living in the Pyle's Lane and Gorman's Lane neighborhoods (U.S. Census 1940). The Gorman's Lane neighborhood comprised twenty-five residents in eleven households living in seven houses and the Pyle's Lane neighborhood comprised 74 residents living in 22 households (the number of houses is not recorded in the Pyle's Lane census data). The residents were all recorded as being American-born and white. Pyle's Lane residents paid a range of 8 to 12 dollars a month in rent and Gorman's Lane residents paid between 2 and 12 dollars a month. Many of the households comprised a male head of household, spouse, and children. Those that were employed worked as laborers, hucksters, carpenters, truck drivers, seamstresses, maids, plumbers, auto mechanics, and machinists (U.S. Census 1940).

The Pyle's Lane and Gorman's Lane neighborhoods consisted of over twenty residential structures. The 1936 Franklin atlas depicts 16 frame buildings along Pyle Lane, five frame buildings running parallel to the Christina River, and then six additional buildings scattered south of Pyle Lane along the Christina River (**Figure 29**). Aerial photographs from 1931 to 1941 depict at least a dozen buildings along Pyle's Lane, at least six buildings north of Pyle's Lane along the Christina River, and at least twelve buildings scattered south of Pyle's Lane along the Christina River (see **Figure 26** to **Figure 31**).

The Pyle's Lane neighborhood had running water and electricity, but no sewer system, as documented in a 1955 *Wilmington Morning News* article reporting on the need to condemn the neighborhood (*Wilmington Morning News* 1955). It suffered extensively from flooding. A storm in August of 1933 forced the evacuation and rescue of Pyle's Lane residents as the flood waters rose high enough to cover the South Market Street causeway (*News Journal* 1933; *Wilmington Morning News* 1933). In 1950, parents who lived in Pyle's Lane, Gorman's Lane, and a nearby trailer camp protested the flooding that occurred any time it rained as it also flooded the intersection of A and South Buttonwood Streets making it impossible for the children to walk to the Palmer School a mile and a half away (*Wilmington Morning* News 1950a). Parents were encouraged to have their children use Garasche's Lane, but parents feared the "lonely stretch" (*Wilmington Morning* News 1950b). Flooding in 1955 brought water up to mid-chair height on the first floor of Mrs. Anne Smallwood, the resident of 3 Pyle's Lane with her husband and three children (*Wilmington Morning News* 1955a). House fires were also commonplace. Stephen Petkovich died in a house fire at 36 Gorman's Lane; the fire also destroyed the house and damaged two other houses at 35 and 37 Gorman's Lane (*News Journal* 1942). A fire in 1948 at 24 Gorman Lane threatened the gasoline and oil stored in tanks at the Atlantic Refining Company only 50 feet away; it was believed an overheated oil stove caused the blaze (*News Journal* 1948).

The Wilmington Board of Health determined six of the Pyle's Lane neighborhood's homes "unfit for human residence" in September 1953 and condemned the buildings owned by the Victor Pyle Lumber Company. The residents of the homes, one of whom had lived there for 30 years, were given 90 days to vacate the property. The Board of Health also tried to issue eviction notices to some in the Gorman's Lane neighborhood. Fred L. Carpenter, the founder of the neighborhood, had several of the inspectors arrested for trespassing when they attempted to notify residents. The residents at Pyle's Lane did not vacate the premises within the required timeframe. Two years later, in August of 1955, severe flooding hit Pyle's Lane and revealed the presence of residents who had previously received eviction notices. The residents had to be rescued by the fire department when water entered their homes. The owner of Pyle's Lumber Company was interviewed as saying he wanted the residents off of his property. One of the residents, Mrs. Anne Smallwood acknowledged the housing was not healthy for her children, but that she did not have anywhere else to go as they relied of government assistance because her husband had a heart condition and was unable to work (*Wilmington Morning News* 1955b).

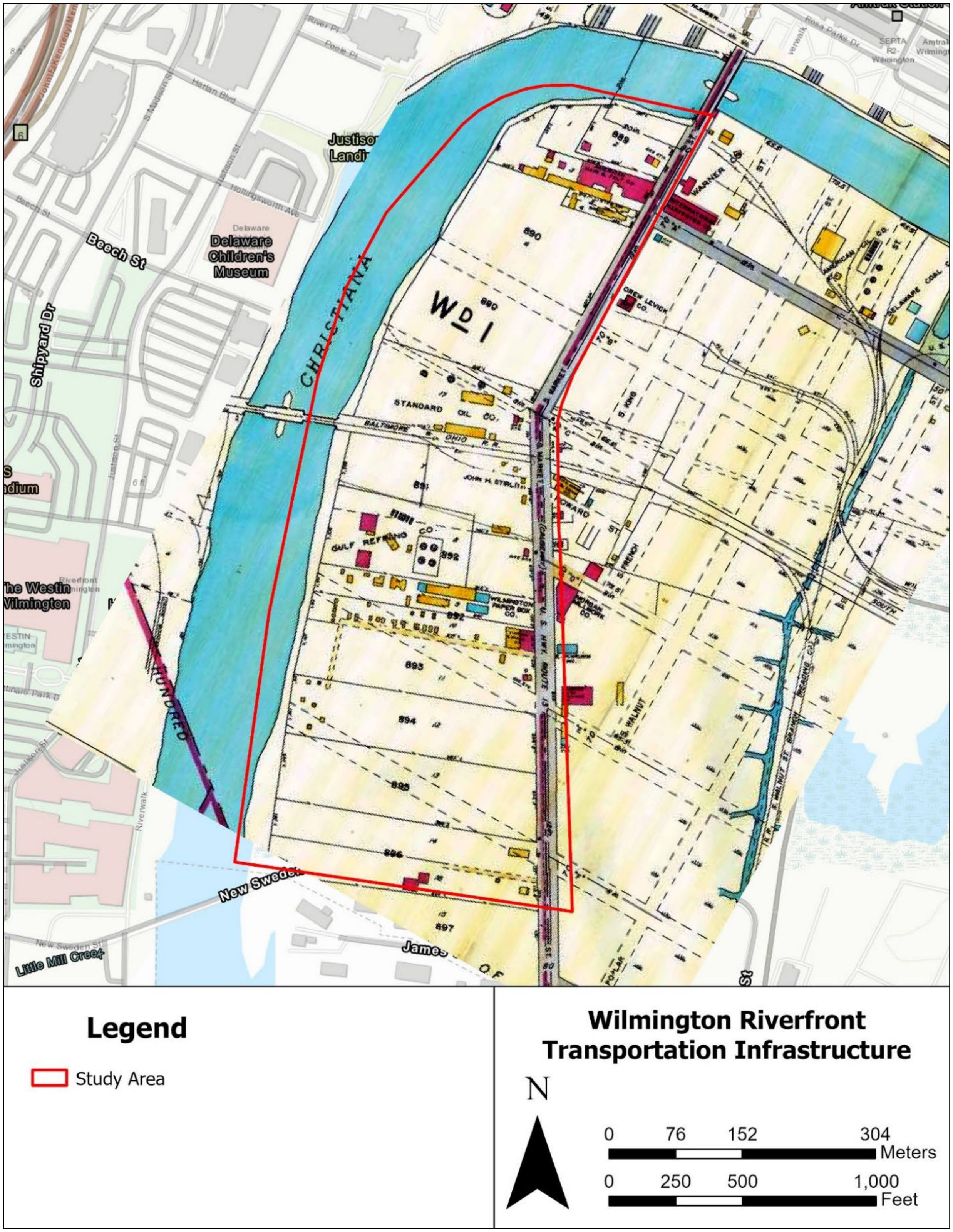

Figure 29: Study Area depicted on *Property Atlas of City of Wilmington, New Castle County, Delaware* (Franklin 1936)

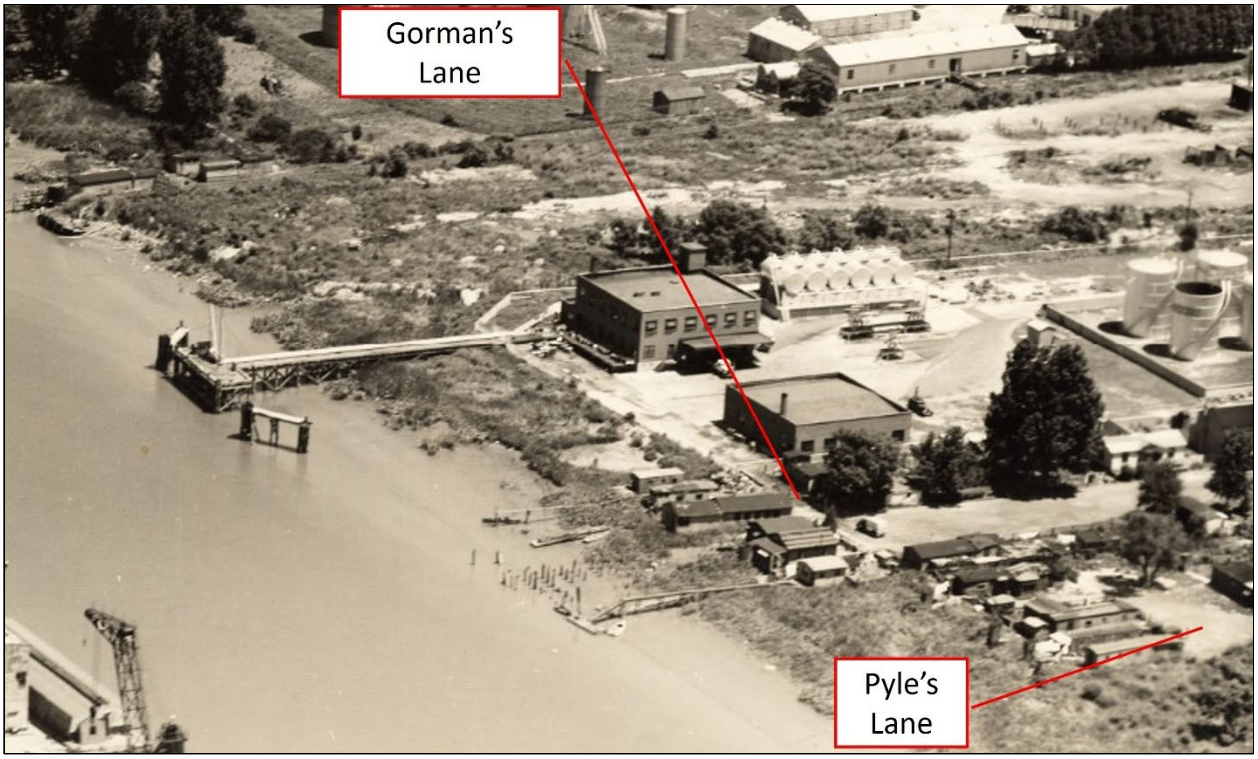

Figure 30: Detail of 1939 aerial imagery depicting Pyle's Lane and Gorman's Lane.

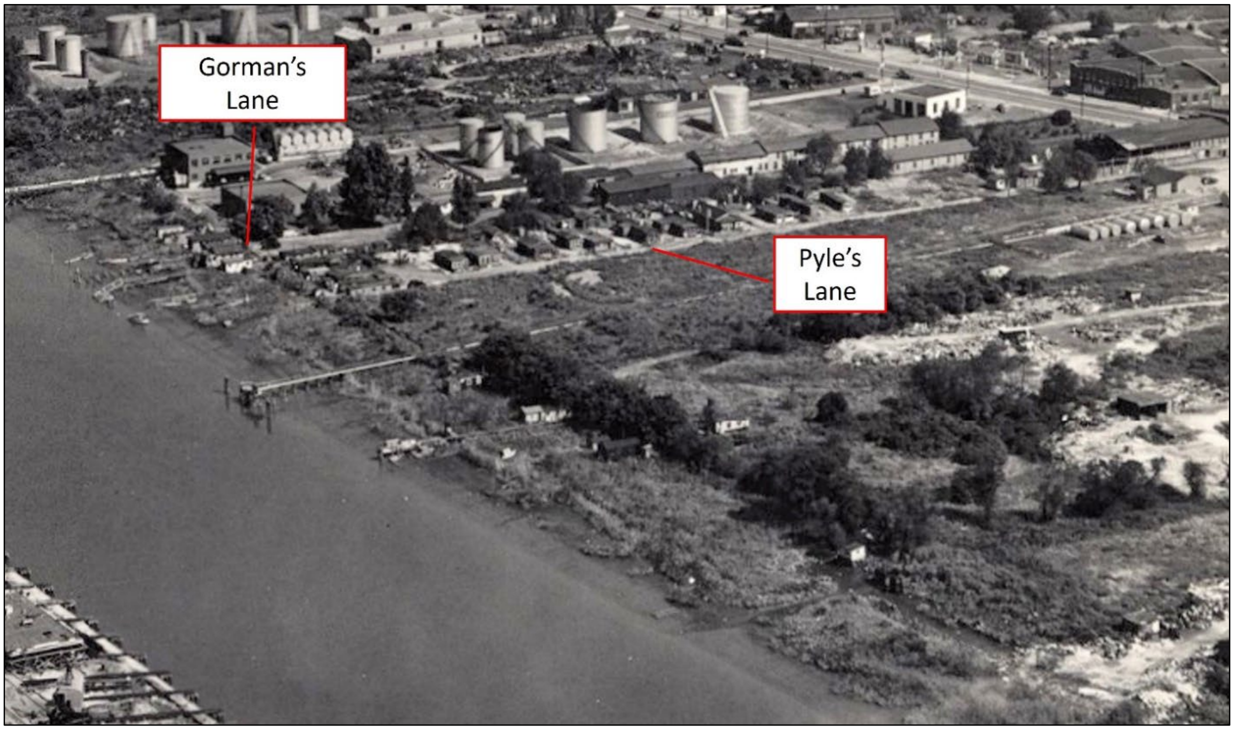

Figure 31: Detail of 1941 aerial imagery depicting Pyle's Lane and Gorman's Lane.

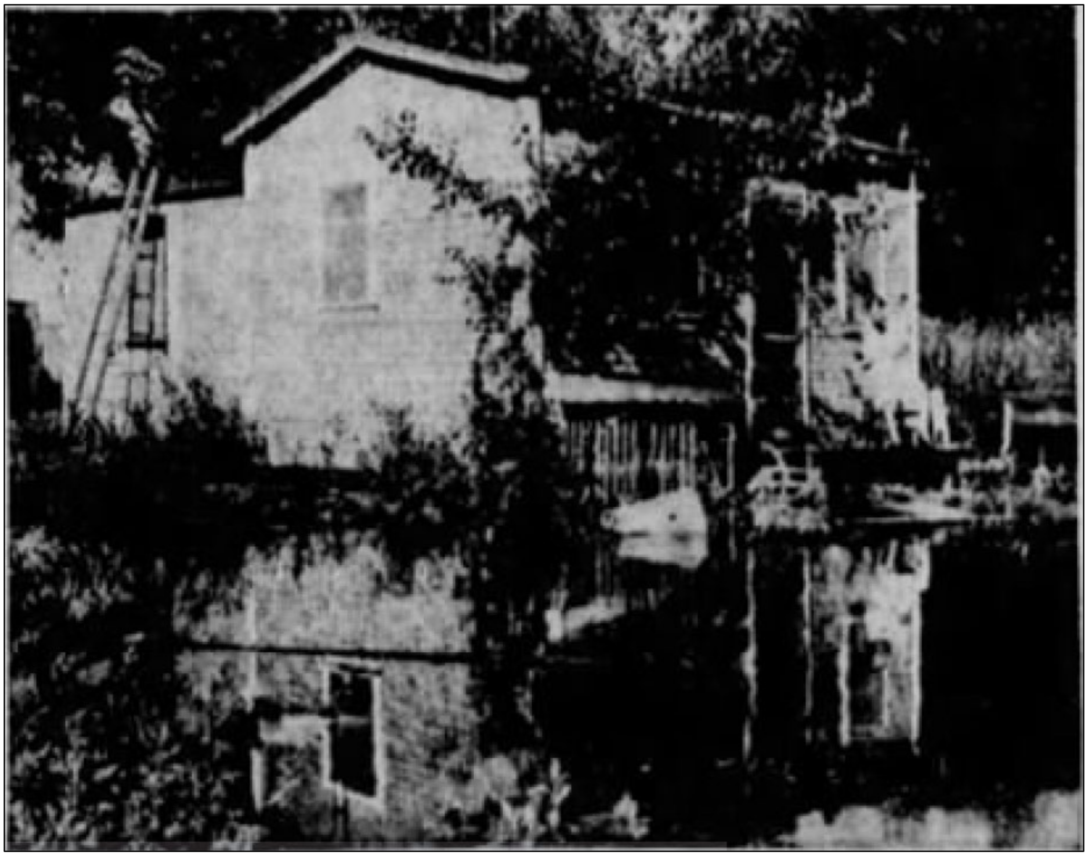

Figure 32: 3 Pyle's Lane after 1955 flooding (*Wilmington Morning News* 1955).

C. Previous Investigations

1. Records Review

A records review was conducted via Delaware Division of Historical and Cultural Affairs' (DHCA) Cultural and Historical Resources Information System (CHRIS) to identify any archaeological surveys or previously identified archaeological sites, cemeteries, above ground resources, or historic properties within the Study Area or within a 0.5-mile (0.8-kilometer) radius of the Study Area. The purpose of this background research was to develop an inventory of known resources and previous investigations to help assess the archaeological potential of the Study Area and to contextualize any archaeological resources encountered within the Study Area at future stages of this project. The site file records review for the project was conducted by RK&K on June 12th and 15th, 2023. Additional background research was conducted through RK&K's archaeological reference library and via additional documents provided by the DE SHPO and the City of Wilmington, Department of Planning.

2. Previously Recorded Archaeological Resources

The records review identified no previously identified archaeological resources or cemeteries within the Study Area. One National Register of Historic Places (NRHP)-listed historic property is partially located within the Study Area—the Market Street, Christina River Bridge (N01434). This resource is located along the northern boundary of the Study Area and was determined eligible in 1982. One NRHP-listed resource is located in the Christina River immediately west of the Study Area—the State of Pennsylvania steamboat wreckage (N04018). This resource was determined eligible in 1978 but has since been demolished and removed from the river.

There are a number of above ground resources recorded within the Study Area. Five of these resources—N14481, N14480, N12495, N04352, and N04353—were assessed and evaluated for the NRHP in Zug-Gilbert et al. (2011). None of these resources were recommended eligible for inclusion in the NRHP. The remaining resource not assessed in this report—N12497—was demolished **Table 1** provides a list of these resources and other pertinent information.

Table 1: Above ground resources within Study Area.

CRS No.	Resource Name and Type	Resource Address	Year(s) Built
N14481	Standard Oil Gas Station/Humble Oil and refinery (Building)	205 S Market Street	ca. 1937
N14480	Esso Standard Oil Company Bulk Storage Plant (Building)	501 S Market Street	ca. 1955; 1953; 1982
N12497	Atlantic Refining Company (demolished c. 2019)	505 S Market Street	late 1920s; ca. 1970
N12495	Victor Pyle Lumber Company	519 S Market Street	1920-1928; 1951
N04352	Hanly, William, Auto Parts and Salvage	603 S Market Street	ca. 1952
N04353	Joseph B. Beste Company; Vapat Incorporated Corporation	701 S Market Street	ca. 1953

3. Previous Cultural Resource Investigations

Twelve archaeological or architectural resource surveys have been conducted within the Study Area.

Table 2 lists and provides details on these resources. The majority (9) of these are strictly devoted to architectural or above ground resources, and several are city-wide surveys that only address the Study Area as a small part of the survey. Two of these surveys specifically address archaeological resources, though they differ greatly in scope and applicability to this assessment. The *Cultural Resources Overview and Sensitivity Analysis for the Delaware River and Bay* by James E. Fitting, Ph.D. (1979) presented a cultural resource overview and sensitivity analysis of the Delaware River and Bay shoreline in Delaware, Pennsylvania, and New Jersey. The analysis determined that Wilmington, including the Study Area, is located in a high probability are for both precontact and historic resources. However, its scale of focus was large and little consideration was given specific to the Study Area.

One previous archaeological survey been conducted partially within the Study Area. In 2011, the Louis Berger Group, Inc. conducted a *Phase IA Archaeological Investigation, Christina River Bridge, New Castle County, Delaware* (LeeDecker et al. 2011). Although the Study Area for this survey overlapped only a small portion of the current Study Area, its larger “Study Area” encompassed the entirety of the current Study Area and contained a great deal of information pertinent to the current study.

4. Previous Historical Research and City Planning Documents

Several historical studies have been conducted on the development of Wilmington and the Wilmington waterfront along the Christina River and provide guidance on assessing the significance of archaeological resources of various types and various ages throughout the city and region. These studies were heavily relied upon to understand the precontact and historic archaeological significance and research potential of the Study Area. These include several citywide planning documents and one Wilmington waterfront-specific planning documents. **Table 3** lists these resources that contributed significantly to this assessment.

Table 2: Previous archaeological and Architectural Investigations within the Study Area

Survey No.	Title	Author	Year
Not Available	Draft Cultural Resource Evaluation on South Market Street Safety Improvement Project and Christina River Bridge Project	Wendy Zug-Gilbert, Melissa Diamanti (Archaeological and Historical Consultants), and Michael C. Hahn DelDOT)	2011
1000140	Phase IA Archaeological Investigation, Christina River Bridge, New Castle County, Delaware	Charles LeeDecker, Patti Kuhn, and Gregory Katz (The Louis Berger Group, Inc.)	2011
1000201	Visual Effect Assessment, Edgemoor to General Motors, 69 KV Rebuild Project (Circuit 6802)	Michael Tomkins and Megan Springate (Richard Grubb & Associates, Inc.)	2011
43474	Delaware's Historic Bridges: Survey and Evaluation of Historic Bridges with Historic Contexts for Highways and Railroads	Lichtenstein Consulting Engineers, Inc.	2000
43542	Cultural Resources Survey of Firehouses in Wilmington, Delaware	Lauren C. Archibald (City of Wilmington Office of Planning)	1992
43258	The Wilmington Waterfront Analysis Area Intensive Level Architectural Survey	Stuart Paul Dixon	1992
43123	Delaware Historic Bridges Survey and Evaluation	P.A.C. Spero and Company	1991
43473	An Architectural Management Plan for South Wilmington Analysis Area	MaryAnna Ralph (City of Wilmington Office of Planning)	1990
43467	Survey Report: Cultural Resource Survey of the Waterfront Analysis Area	Inez R. Hoffman, Dave V. Gula, and Patricia J. Bensinger	1989
43259	Wilmington CRS - Evaluation of Cultural Resources in Browntown/Hedgeville	Randal Baron	1984
43088	Project R.O.W. (reclaim our Waterfront)	Priscilla Thompson and Sara F. O'Byrne	1981
43838	Cultural Resources Overview and Sensitivity Analysis for the Delaware River and Bay	James E. Fitting, PhD	1979
43118	City of Wilmington Survey	David Black	1975

Table 3: Other Historical Research and City Planning Documents

Title	Author	Year
A Management Plan for Delaware's Historical Archaeological Resources.	LuAnn De Cunzo and Wade P. Catts	1990
Archaeological Resources Management Plan, Volume II: Block-by-Block Archaeological Analysis of the Waterfront Management Unit.	Francine W. Bromberg	1988
"Not A Bad Measure of a Man," An Archaeological Resources Management Plan for Wilmington, Delaware, Vol. 3: The Operational Plan	Conrad Goodwin	1987
A Management Plan for Delaware's Prehistoric Cultural Resources	Jay Custer	1986
"Not A Bad Measure of a Man," An Archaeological Resources Management Plan for Wilmington, Delaware, Vol. 1	Conrad Goodwin	1986
Wilmington: A Plan for the City's Historic Archaeological Resources	Alice H. Guerrant	1983

III. Research Design and Methodology

A. Research Objectives

The research design and methodology for this project followed the DHCA DE SHPO *Archaeological Survey in Delaware* guidelines (2015). The purpose of this Phase IA archaeological assessment was to review previously recorded archaeological site data, identify previous surveys in the project vicinity, locate areas with the potential to have unrecorded archaeological sites, and provide recommendations regarding additional archaeological investigations that may be necessary to identify archaeological resources prior to ground disturbing activities. To do this, RK&K conducted extensive research on the environmental history and past use of the Study Area, which involved a variety of resources: soil and surface geology maps and boring data; historic maps; historic aerial photographs; historic sketches and renderings; previous archaeological and historical research; Tribal histories; and additional primary and secondary historical sources.

B. Background and Archival Research

To understand the past use of the Study Area and contextualize the areas of archaeological potential within it, background and archival research was first completed to identify any archaeological surveys or previously identified archaeological sites, cemeteries, historic structures, or NRHP properties within a one-half-mile radius of the Study Area. This research was conducted through DHCA's CHRIS. Background and archival research began with a review of CHRIS to examine relevant archaeological reports, NRHP nomination forms, and site forms for resources within the search radius of the Study Area.

Research for this study focused heavily on documentary and cartographic analysis of the Study Area. A series of historic maps, photographs, and aerial photographs were gathered from a variety of archival and online sources including from the Delaware Public Archives, Delaware Environmental Monitoring and Analysis Center, DHCA digital map, Delaware Historical Society, City of Wilmington's Department of Planning, Hagley Museum Digital Archives, the Library of Congress, and the University of Delaware Digital Collections. Many of these documentary sources were georeferenced using ESRI ArcGIS software and were used to develop a narrative of the historical development and previous precontact and historic use of the Study Area.

United States Department of Agriculture – Natural Resource Conservation Service (USDA-NRCS) soils and surface geology maps were consulted to understand the soils present within the Study Area. In addition, a Geotechnical Data Report prepared by RK&K for the South Market Street Master Plan Area 1 and Area 2 Infrastructure and Parcel Development was consulted (Klein and Roy 2023) and analyzed by geoarchaeologist Daniel Hayes (2023) (**Appendices C and D**).

C. Geoarchaeological Assessment

Geoarchaeologist Daniel Hayes (2023) conducted a desktop geoarchaeological assessment of the Study Area (**Appendix B**). The assessment comprised a review of data assembled from project cultural resource management and geotechnical studies completed to date regarding interpretations of the source, extent, distribution, chronology, and potential significance of project area landform components to better understand the natural and cultural history of the waterfront area. Hayes reviewed the draft *Phase IA Archaeological Assessment South Market Street Redevelopment Project Wilmington, New Castle County, Delaware* (Weidman et al. 2023) and *Geotechnical Data Report South Market Street Master Plan Area 1 and Area 2 Infrastructure and Parcel Development, Wilmington, Delaware* (Klein and Roy 2023 (**Appendix A**).

D. Assessment of Archaeological Potential

The assessment of archaeological potential synthesized the results of the review of the Study Area’s physical geography and environmental setting, precontact and historic context, analysis of historic maps, atlases, aerial photographs, and the results of the geoarchaeological assessment. The primary objective of this assessment was to identify the potential for the presence of intact precontact, historic, or submerged archaeological resources within the Study Area. The assessment took into consideration the anticipated depths of both precontact and historic archaeological resources, extent and nature of historic and modern ground disturbance and development, and the nature of anticipated archaeological resources.

IV. Results of Assessment of Archaeological Potential

The research conducted for this assessment served to build a context for the precontact and historic use of the Study Area, to determine what types of archaeological resources may be present within the Study Area, and to evaluate geomorphological soil borings to determine the depths at which archaeological remains may be present. This section synthesizes the findings of this research and presents a summary of potential archaeological resources within the entirety of the Study Area.

RK&K recommends that the Study Area has the potential to contain intact archaeological resources associated with the following periods: Paleoindian (ca. 18,000 to 6,500 BC); Archaic (6,500 to 3,000 BC); Woodland I (3,000 BC to AD 1,000); Industrialization and Early Urbanization (1830-1880); Urbanization and Early Suburbanization (1880-1940); and Suburbanization and Early Ex-urbanization (1940-present).

A. Geoarchaeological Assessment

Geoarchaeologist Daniel Hayes reviewed the geotechnical survey prepared by Klein and Roy (2023) for the Study Area (Klein and Roy 2023; Hayes 2023) (**Appendices A and B**). The geotechnical report included the results of a 2014 survey by Advance Geoservices that consisted of 11 Standard Penetration Test (SPT) borings and a 2023 survey by Kelly and Roy that consisted of 53 SPT borings (including one duplicate boring). Hayes (2023:5) removed the duplicate boring and two “clearly atypical borings not particularly representative of the overall sample (Borings Lot-A2-16 and-17)” and then synthesized the results of the remaining 61 borings.

Hayes (2023:5) summarizes that ground surface elevations ranged from 5.0-11.0 feet amsl and the thickness of fill ranged from 2.0-15.0 feet below surface. **Figure 33** shows the interpolated depth of fill across the Study Area based on the geotechnical boring data. The depth of fill as identified in the geotechnical report varies across the Study Area. Hayes calculated that the bottom level of the fill as identified in the geotechnical borings extended to or below sea level in 62 percent of the borings. **Figure 34** shows the interpolated elevations at the bottom of fill across the Study Area as presented in the geotechnical report. Hayes (2023:5) suggests that it is unlikely that such a fill extended below sea level in such a high percentage of the borings and that is more likely that soils and sediments identified as fill in the geotechnical reports include “remnant landform surface sediments and soils that would be considered of particular relevance to the archaeological record.” The primary reason for this discrepancy is that the methodology of the geotechnical study, which was performed to “evaluate the physical characteristics of landform sediments for engineering purposes,” are “not adequate for clear identification of any precontact surface and associated relic, near-surface soil development (such as A-E-B soil horizons)” (Hayes 2023:4).

Hayes concludes that with regards to the “prehistory of the [Study] area there is reason to anticipate the project setting as having potential for settlement and archaeological site formation dating back millennia. It may be assumed that any precontact surface may have some potential for inclusion of precontact archaeological resources, with potential inclusions of post-Contact as well.” Although portions of the Study Area may contain nineteenth- and twentieth-century fill, it is likely considerably shallower than may be expected based on the geotechnical borings. Hayes (2023: 5) recommends that the only practical way to assess the depth of fill and confirm the presence of precontact ground surfaces and resources involve subsurface testing. While Hayes (2023:5) does not specify the precise depth at which precontact ground surfaces and resources may be encountered, he concludes that it appears from some of the borings that

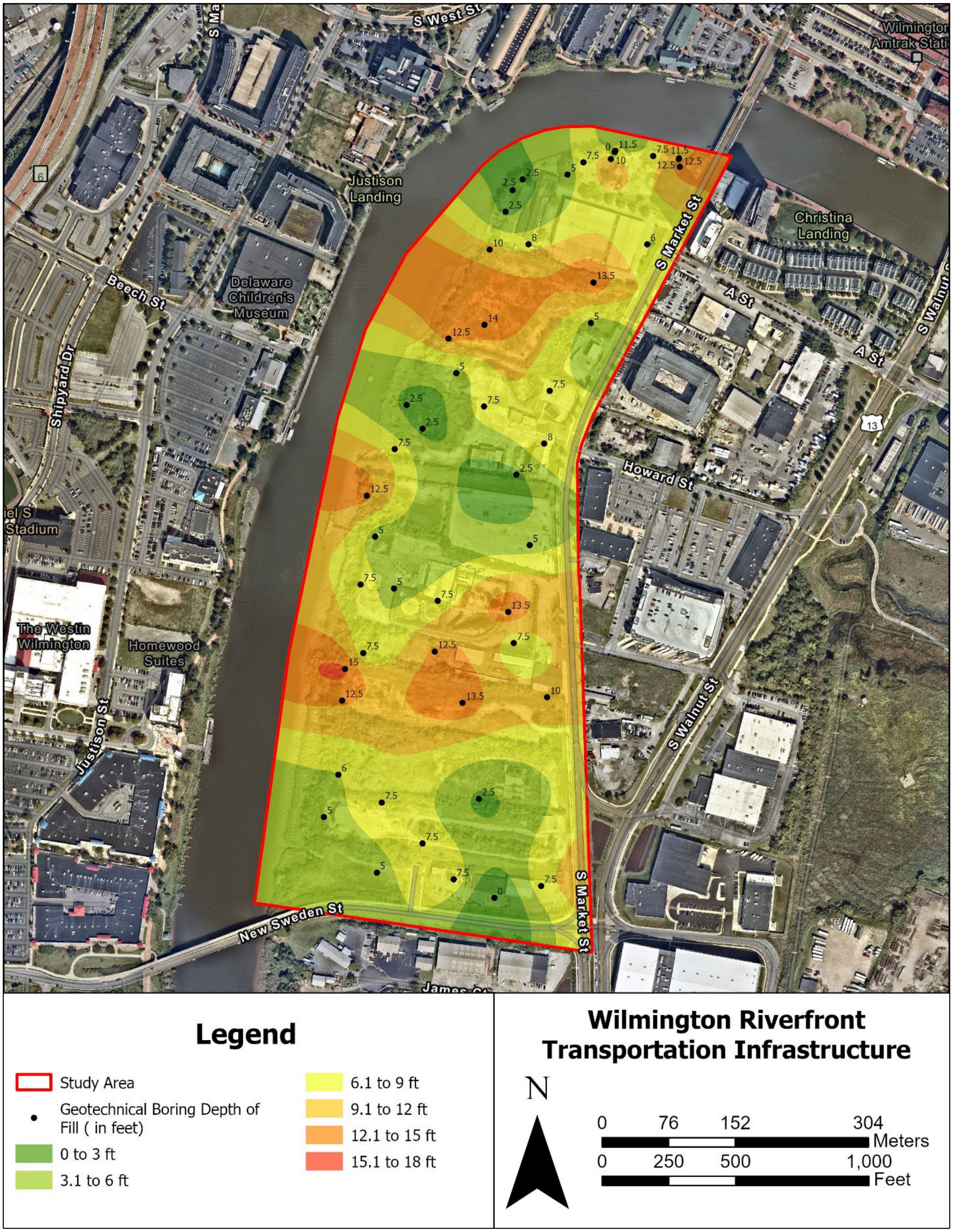

Figure 33: Interpolated fill depth map showing geotechnical boring fill depths.

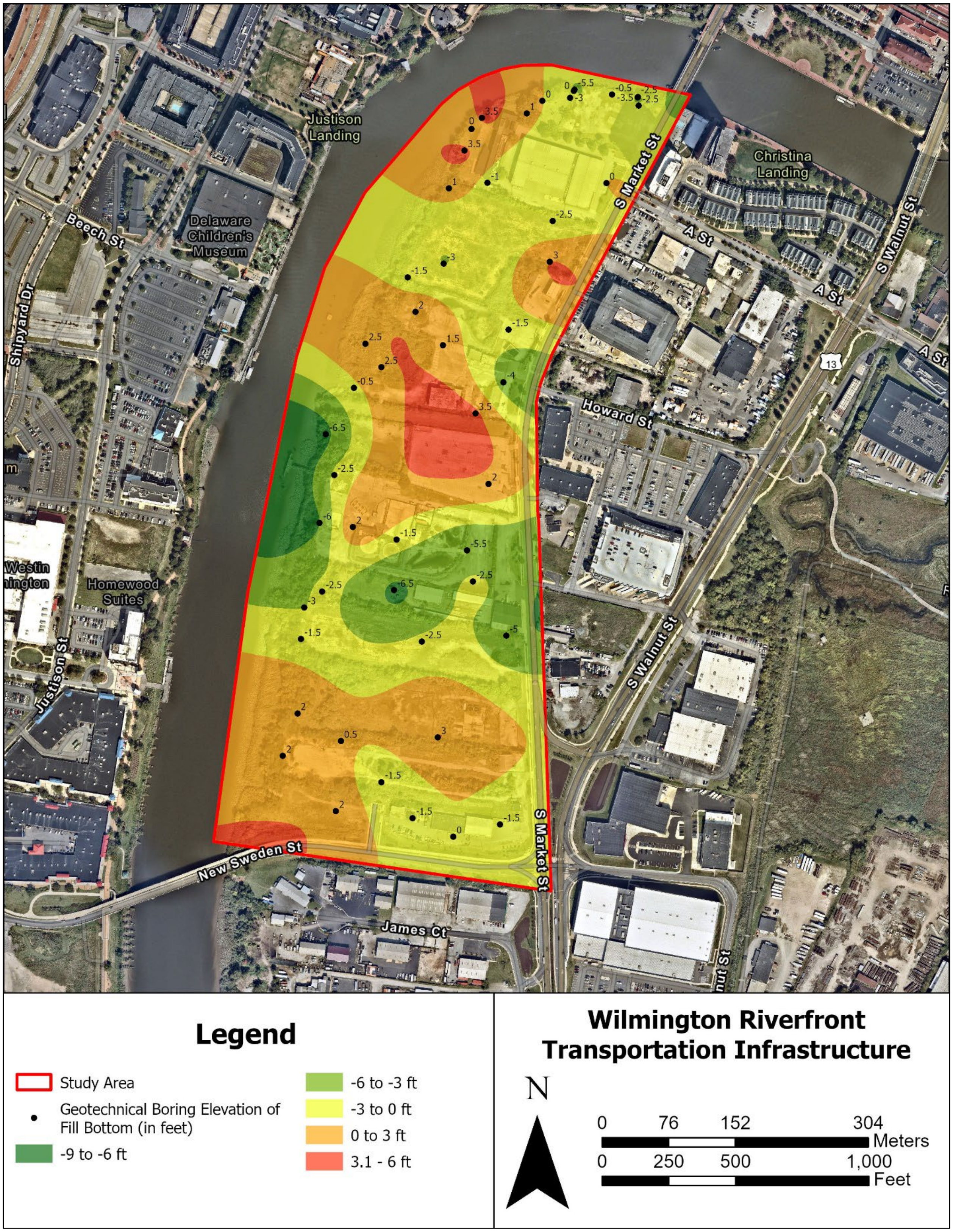

Figure 34: Interpolated elevation at bottom of fill.

the original ground surface may be close to the modern ground surface, while others are capped with non-local fill. He recommends initial subsurface evaluations begin with shovel test survey in the areas considered most likely to represent the precontact landform surface of least disturbance. The results of that survey may inform the need for and means of additional testing.

B. Assessment of Archaeological Potential

1. Precontact Archaeological Resources

The Study Area has the potential to contain intact precontact archaeological resources associated with the Paleoindian, Archaic, and Woodland I periods. Although the Study Area has consisted of poorly drained, marshy land for most of its recent history, the geoarchaeological assessment demonstrates that it was not always poorly drained. The Study Area has been subjected to continuous and dynamic landscape changes throughout the late Pleistocene through Holocene epochs. The marshy conditions present in the eighteenth and nineteenth centuries that shaped the historic development of the Study Area developed as sea levels rose in the Holocene. As sea levels rose, ground water rose, and alluvial estuary and marsh deposits may have buried older, drier landforms suitable for precontact habitation and exploitation (Hayes 2023:2-3). Othello silt loam, the soil type that comprises much of the Study Area, contains relatively deep B-horizons with strong pedogenic structure that are indicative of long-term, top-down weathering in good drainage conditions that predated the current Holocene trend regarding rising sea-level and increased groundwater conditions (Hayes 2023:2). The Study Area is one such landform that, while now marshy, would have been suitable for human habitation until the late Holocene establishment of tidal conditions (Hayes 2023:2-3). And although portions of the Study Area may have been filled to mitigate flooding during the nineteenth and twentieth centuries, buried ground surface sediments and soil are likely to occur at or near the current ground surface (Hayes 2023:5).

Historic development from the eighteenth through twentieth centuries has disturbed portions of the Study Area; however, Marsh regulation measures—the construction of dikes and ditches—begun in the eighteenth century and continuing into the twentieth century may also have disturbed evidence of precontact activity on the landscape prior to European settlement of the region. Later agricultural activities, such as the harvesting of salt hay or growing of traditional crops, may have taken place on drained land within the Study Area potentially disturbing intact precontact resources. Industrial and commercial development during the nineteenth and twentieth centuries also likely disturbed large portions of the Study Area. There is limited potential to find intact precontact archaeological remains in the portions of the Study Area that have been heavily developed during the second half of the nineteenth and into the twentieth centuries.

There is moderate to high potential to encounter precontact archaeological resources in two areas within the Study Area that have been minimally developed in the nineteenth and twentieth centuries (**Figure 35**). Potential resources include Paleoindian through Woodland I period artifacts recovered from disturbed plow zone contexts and intact, buried precontact archaeological deposits and features—such as hearths and pit features—recovered from below plow zone contexts.

Figure 35: Potential for intact precontact archaeological resources within Study Area.

2. Historic Archaeological Resources

Historic maps, atlases, and aerial photographs, as well as other secondary sources, were analyzed to identify areas of historic period occupation within the Study Area. This information, in conjunction with the geotechnical assessment, was used to assess the probability for intact historic period archaeological resources to exist within the Study Area. Historical research has demonstrated that several areas within the Study Area were developed with residential, recreational, and/or industrial properties in the nineteenth and early-to-mid-twentieth centuries (**Figure 36**). RK&K has concluded that the Study Area has the potential to contain intact archaeological resources associated with the Industrialization and Capitalization period (ca. 1830 to 1880), Urbanization and Suburbanization period (ca. 1880 to 1940), and the Suburbanization And Early Ex-Urbanization period (ca. 1940 to present). For organizational purposes, the Study Area has been divided into four areas—A through D— to summarize its historic occupation and assess its archaeological potential.

The historical research also demonstrates that the landscape of the Study Area was modified beginning in the eighteenth and early nineteenth centuries through efforts to regulate the marsh. These efforts, which appear to have included the construction of ditches, dikes or banks, and sluice gates, continued into the late nineteenth century as demonstrated by both General Assembly records and historic maps that show ditches running along property lines in the southern half of the Study Area. There is, however, limited potential to encounter evidence of these early marsh regulation efforts and there is little evidence to suggest that the Study Area was otherwise inhabited or developed in the eighteenth century.

Area A

Area A comprises the northern portion of the Study Area currently occupied by the Salvation Army Building and the vacant lot to the north (**Figure 36**). There is a moderate potential to encounter intact historic archaeological resources associated with both industrial and residential activities dating from the nineteenth to mid-twentieth centuries in Area A. Details supporting this probability assessment are provided below.

Industrial development of the Study Area began in earnest in the mid-nineteenth century with the expansion of industrial growth from the downtown core of Wilmington to the southern side of Christina River along South Market Street. This earliest development was limited to the northern sections of the Study Area along South Market Street. The first industrial development within the Study Area was the A. Flaglor and Company Coach and Carriage Works. Development within the Study Area along South Market Street increased during the late 1870s but remained limited to the areas north of the Wilmington and Western Railroad within the Study Area. The 1876 Hopkins atlas depicts the Thompson and Paschall carriage works complex just south of the Christina River (see **Figure 13**).

By 1884, a second carriage works was established south of the Thompson and Paschall carriage works complex, now S. D. Paschall Carriage Works, and a smaller manufacturer had opened to the north (see **Figure 15**). By 1901, the Illinois Leather Company had taken over both of the carriage works' facilities, expanded, and made repairs to a derelict building (see **Figure 17**). By 1927, the former S. D. Paschall/Illinois Leather Company property was occupied by Tanners Products Company and the former Walters Carriage Works/Illinois Leather Company property was occupied by McAllister Brothers Boiler Repairs; and a brick filling station was located just north of the Tanners Products Company (see **Figure 19**). The Tanners Products Company became American Hair and Felt Company in the 1930s and the Allied

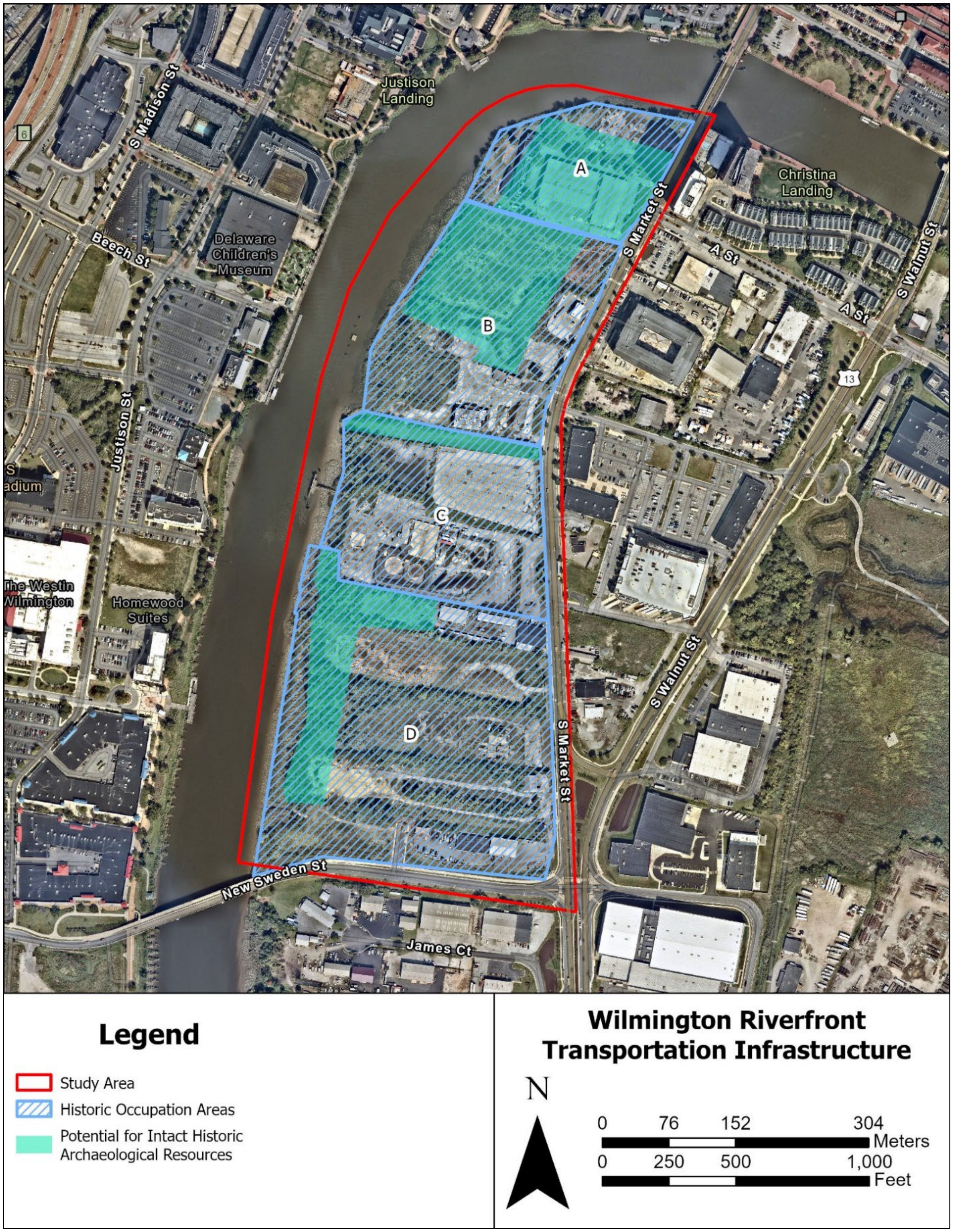

Figure 36: Historic occupation areas and potential for intact historic archaeological resources within Study Area.

Kid Company in the 1940s. Many of the buildings associated with the Tanners Products, American Hair and Felt, and Allied Kid companies and McAllister Brothers Boiler Repairs occupy similar footprints to the earlier industrial buildings and likely utilize some, if not all, of the original buildings as they were renovated, expanded, and repurposed. By 1992, the former Illinois Leather Company/S. D. Paschall Carriage Works complex was demolished and replaced by the extant Salvation Army Thrift Store and Donation Center and associated parking lot (107 South Market Street).

There is the potential to encounter buried architectural remains and cultural features and deposits associated with the nineteenth-century carriage works and early twentieth-century tanneries, although the renovations and expansions of the later twentieth-century industrial properties and the construction of the Salvation Army property in the late twentieth century may have included some subsurface ground disturbance. The geotechnical survey identified between 2.5 and 12.0 feet of fill in Area A (see **Figure 33**). However, Hayes (2023) has concluded this fill is likely to contain buried ground surface sediments and soil. Therefore, it is unknown the depth of fill that was deposited in Area A prior to the construction of the Salvation Army building. If the building's construction involved the deposition of fill to level or elevate the property and limited grading across Area A, it is possible that some below ground features and deposits associated with the industrial development of the property remain. There remains the possibility of intact building foundation walls or footers, waste pits, and pit features like privies and wells. Waste from the various tanneries that operated on the property from 1901 through the 1940s likely included salt and string from hides, trimmings and shavings of leather, finishing residues (scrapings and sludges), and plant floor sweepings and general waste (Conrad et al. 1976).

There is also moderate potential to encounter nineteenth- and early twentieth-century residential archaeological resources in Area A. Sanborn maps from 1884 and 1901 demonstrate the potential for residential archaeological resources associated with the S. D. Paschall Carriage Works and the John Walters Carriage Works, as those properties contained a dwelling and a boarding house, respectively (see **Figure 15** and **Figure 17**). The residential housing present in Area A on the two carriage works properties may have been disturbed by the renovation and expansion of the properties for subsequent industries and by the construction of the Salvation Army property in the late twentieth century. Because the depth of fill deposited throughout Area A during the nineteenth and twentieth centuries is unknown, there remains the potential for intact archaeological remains associated with those buildings and associated activities including deeply buried features like privies and wells that have minimally impacted by the construction of the Salvation Army building.

Area B

Area B comprises the portion of the Study Area south of Area A and north of the former Wilmington and Western Railroad corridor. Area B was occupied by the former Standard Oil Company Bulk Storage Plant and currently contains the Speedway Gas Station at 203 South Market (see **Figure 36**). There is moderate potential to encounter intact historic archaeological resources associated with residential occupation dating from the nineteenth century and a low potential of encountering intact archaeological resources associated with Harlan Field in Area B. Details supporting this probability assessment are provided below.

There is moderate potential to encounter intact historic archaeological resources associated with residential occupation dating from the nineteenth century in Area B. Occupation in Area B likely began in the early to mid-nineteenth century along the Wilmington Causeway. The causeway appears to have been at least partially manmade through ditching and filling in the early nineteenth century. Several nineteenth-century maps demonstrate the presence of residential buildings along South Market Street by the third quarter of the nineteenth century (see **Figure 11** to **Figure 13**). Area B remained minimally developed until Harlan Field was constructed during World War I and the Standard Oil facility was constructed between 1925 and 1929 (see **Figure 18** and **Figure 20**). Between 1937 and 1956, three service stations were constructed along the South Market Street frontage in Area B. The service stations likely contained storage tanks buried between eight to 12 feet below ground, as is typical for the industry. Similarly, the development of the Standard Oil Company Bulk Storage Plant also likely involved ground disturbance associated with the construction and maintenance of storage tanks. The geotechnical survey identified between 2.5 and eight feet of fill in the vicinity of the service stations and Standard Oil Company Bulk Storage Plant (see **Figure 33**). However, Hayes (2023) has concluded this fill is likely to contain buried ground surface sediments and soil. Therefore, the construction of the service stations and storage facilities at the Standard Oil storage plant likely impacted any potential intact nineteenth-century ground surface, deposits, or features, regardless of depth of nineteenth- and twentieth-century fill.

Further west of South Market Street, there was minimal twentieth-century development of Area B. After Harlan Field ceased operation in the 1930s, that portion of the Study Area was developed as the Savery & Cooke iron and steel warehouse and storage yards. The geotechnical survey identified between six and 14 feet thick. However, Hayes (2023) has concluded this fill is likely to contain buried ground surface sediments and soil. It is, therefore, possible that subsurface archaeological features associated with the nineteenth-century residential occupation of Area B, such as wells, privies, or trash pits, if present, may remain intact. Archaeological features associated with nineteenth-century residential archaeological resources in Area B may potentially include building foundation walls, footers, or piers, privy or well features, and trash middens.

There is a low potential to encounter intact archaeological resources associated with Harlan Field within Area B. The Harlan and Hollingsworth Shipbuilding Company constructed the baseball field during World War I (see **Figure 18**). The field served shipyard baseball teams during the war. When World War I ended the shipyards scaled back their operations and the shipbuilding leagues disbanded. However, throughout the 1920s and 1930s, Harlan Field was briefly home to semi-pro and Negro league baseball teams including the “Wilmington Chicks” and the “Rosedales”. Aerial photos from 1939 indicate the baseball field was no longer in use by that time (see **Figure 23**).

The parcel containing Harlan Field was subsequently developed with two service stations along the South Market Street frontage, one of which still stands today at 203 South Market Street, and the Savery & Cooke iron and steel warehouse. Given the ephemeral nature of the baseball field as depicted in the 1920s and 1930s photographs, it is unlikely that any features of the baseball field, which would have included bleachers, the infield and pitcher’s mound, the outfield fence, and trash accumulated by players and spectators alike, remain intact belowground. The infield and home plate were located in the southeastern portion of the parcel in the immediate vicinity of the extant service station, which would have caused substantial ground disturbance during its installation.

Area C

Area C comprises the portion of the Study Area south of Area B and includes the former Wilmington and Western Railroad corridor and the Atlantic Refining Company (see **Figure 36**). There is a moderate potential to encounter intact archaeological remains associated with the historic occupation of Area C. Details supporting this probability assessment are provided below.

The Wilmington and Western Railroad was constructed through Area C in 1872 and crossed the Christina River on a swing bridge. The tracks were largely abandoned in the 1920s and the swing bridge was taken out of service in 1930 and removed in the late 1930s (Hall 2007). The railroad right-of-way has not been developed following the cessation of service in 1930 and there is a moderate potential to encounter intact archaeological resources associated with the railroad, including ballast, tracks, and bridge abutments.

South of the former Wilmington and Western Railroad corridor remained mostly undeveloped land through the nineteenth century (see **Figure 16**). By the late 1920s, however, new industries began operations within Area C, specifically the Atlantic Refining Company storage facility.

Area D

Area D comprises the southernmost portion of the Study Area south of Area C (see **Figure 36**). There is a high potential to encounter intact archaeological resources associated with the Pyle's Lane and Gorman's Lane neighborhoods, and low potential to encounter intact archaeological resources associated with the 1930s the Joseph B. Beste Company animal processing facility and the Victor Pyle Lumber Company within Area D. Details supporting this probability assessment are provided below.

There is a high potential to encounter intact archaeological resources associated with the Pyle's Lane and Gorman's Lane neighborhoods. These neighborhoods occupied the southwestern portion of the Study Area from as early as the 1920s through at least 1960 (see **Figure 26**, **Figure 30** and **Figure 31**). The Pyle's Lane neighborhood extended along the dirt road immediately south of the Victor Pyle Lumber Yard. The Gorman's Lane neighborhood was located immediately south of the Atlantic Refining Company along the Christina River. The Pyle's Lane and Gorman's Lane neighborhoods consisted of over twenty residential structures. The Pyle's Lane neighborhood had running water and electricity, but no sewer system. The neighborhoods suffered extensively from flooding and at least several house fires. Families began to face eviction in 1955, but an interview with a former property owner indicate that some residents may have continued living there into the 1960s.

The parcels containing the Pyle's Lane and Gorman's Lane neighborhoods do not appear to have been developed or improved following the eviction of the residents and archaeological resources associated with the neighborhood may remain mostly intact. The geotechnical survey identified between 5.0 and 15.0 feet of fill in the vicinity of the two neighborhoods (see **Figure 33**). And Hayes (2023) has concluded this fill is likely to contain buried ground surface sediments and soil. It also appears likely that the early- to mid-twentieth-century neighborhoods were built on top of any historic fill given the lack of significant landscape changes evident in aerial photographs from the second half of the twentieth century to the present. Archaeological features and deposits that may be expected include architectural features associated with the residential houses, privies and wells, trash middens, and electric or water utilities.

There is a low potential to encounter intact archaeological resources associated with the Joseph B. Beste Company dating from the 1920s to 1950s. At the southern extent of Area D just north of New Sweden Street stands a ca. 1953 warehouse on the property once occupied by the Joseph B. Beste Company. The property contained a two-story frame barrel making factory in the late 1920s, and by the late 1920s, the Joseph B. Beste Company operated on the property. The Beste company dealt in the recovery and rendering of dead animals and animal parts and sold bagged manure and distributed fatty oils. Vapat Incorporated Corporation purchased the property in 1953, at which point the extant warehouse was constructed and leased to various businesses. Subsurface archaeological remains associated with the original barrel-making factory that also served the Beste Company are unlikely given that the 1953 warehouse was built on the footprint of the original building utilized by the Beste Company. The residential building south of the Beste Company building has since been developed with New Sweden Street in 2020. The rear portion of the Beste Company/Vapat Incorporated Corporation property has been minimally developed throughout the second half of the twentieth century, except as a junk yard, which would have had limited ground disturbance. The construction of New Sweden Street south of the parcel impacted the residential building immediately to the south of Beste Company/Vapat Incorporated Corporation property. Archaeological deposits associated with the Beste Company are likely limited deposits associated the disposal of animal waste products, although since the purpose of animal rendering is to make useful animal waste products not otherwise suitable for human consumption, there might be limited waste disposal on the property.

There is a low potential to encounter intact archaeological resources associated with the Victor Pyle Lumber Company. The first building on the property was a frame shed built between 1913 and 1920 (Zug-Gilbert et al. 2011). The original main warehouse was constructed ca. 1925 on the footprint of the original frame shed and a second lumber storage shed built ca. 1950, which was extended by 1956 to its current size. Additional open-air sheds and outbuildings were constructed between 1965 and the present. Subsurface archaeological remains associated with the original frame shed are unlikely given the construction of the extant warehouse within the shed's footprint.

3. Submerged Archaeological Resources

There is the potential for submerged precontact archaeological resources in the Study Area. No previous submerged archaeological resource studies conducted within or nearby the Study Area have indicated that significant precontact archaeological resources may have been located in the Christina River (Cox 1999). Hayes (2023) has, however, indicated that until the Late Holocene, sea levels would have been lower. Therefore, there is the potential for intact, precontact archaeological resources along the shore of the Christina River.

There is also the potential for submerged historic period resources within the Study Area. Historic maps and imagery show wood docks and piers extending from the shoreline within the Study Area into the river within the Study Area boundary. A portion of the Wilmington and Western Railroad was constructed through Area C in 1872 and crossed the Christina River on a swing bridge. The tracks were abandoned in the 1920s and the swing bridge was taken out of service in 1930 and removed in the late 1930s (Hall 2007). There may also be submerged components associated with that resource within the Study Area.

C. Management Recommendations

RK&K recommends Phase I survey of four survey areas within the Study Area (**Figure 37**).

1. Survey Area 1

Survey Area 1 measures 4.4 acres. In Survey Area 1, RK&K recommends construction monitoring of the demolition of the Salvation Army building for the presence of intact archaeological features associated with the historic industrial and residential occupation of that area. RK&K recommends the mechanical excavation of trenches following the completion of demolition to examine the area for the presence of archaeological features. The number and placement of trenches will be determined in consultation with DCHA and all work will be conducted in accordance with the project's health and safety plan given the potential for hazardous materials in that area.

2. Survey Area 2

Survey Area 2 measures 7.8 acres. In Survey Area 2, RK&K recommends a Phase I survey consisting of pedestrian survey and shovel test survey for areas containing pervious surfaces. For areas of impervious surfaces such as pavement or for gravel surfaces that cannot be easily removed, RK&K recommends the mechanical excavation of trenches following the completion of demolition to examine the area for the presence of archaeological features and to assess the stratigraphy for buried ground surfaces with precontact potential. If the shovel testing demonstrates the potential for deeply buried (beyond 3 feet) cultural deposits, RK&K may develop additional testing recommendations that may include deep trenching, stepped test units, or additional geoarchaeological survey. The number and placement of trenches and need for additional deep testing will be determined in consultation with DCHA.

3. Survey Area 3

Survey Area 3 measures 1.1 acres. In Survey Area 3, RK&K recommends a Phase I survey consisting of pedestrian survey and shovel test survey to document the railroad corridor.

4. Survey Area 4

Survey Area 4 measures 16.5 acres. In Survey Area 4, recommends a Phase I survey consisting of pedestrian survey and shovel test survey for areas containing pervious surfaces. For areas of impervious surfaces such as pavement or for gravel surfaces that cannot be easily removed, RK&K recommends the mechanical excavation of trenches following the completion of demolition to examine the area for the presence of archaeological features and to assess the stratigraphy for buried ground surfaces with precontact potential. If the shovel testing demonstrates the potential for deeply buried (beyond 3 feet) cultural deposits, RK&K may develop additional testing recommendations that may include deep trenching, stepped test units, or additional geoarchaeological survey. The number and placement of trenches and need for additional deep testing will be determined in consultation with DCHA.

5. Submerged Archaeological Survey Recommendations

RK&K recommends the development of a methodology for the Phase I survey of potential submerged archaeological resources be developed in consultation with DCHA following the development of the project’s limits of disturbance. RK&K also recommends that the methodology be informed by the results of terrestrial Phase I survey, particularly as it relates to the likelihood of encountering precontact resources along the shore of the Christina River.

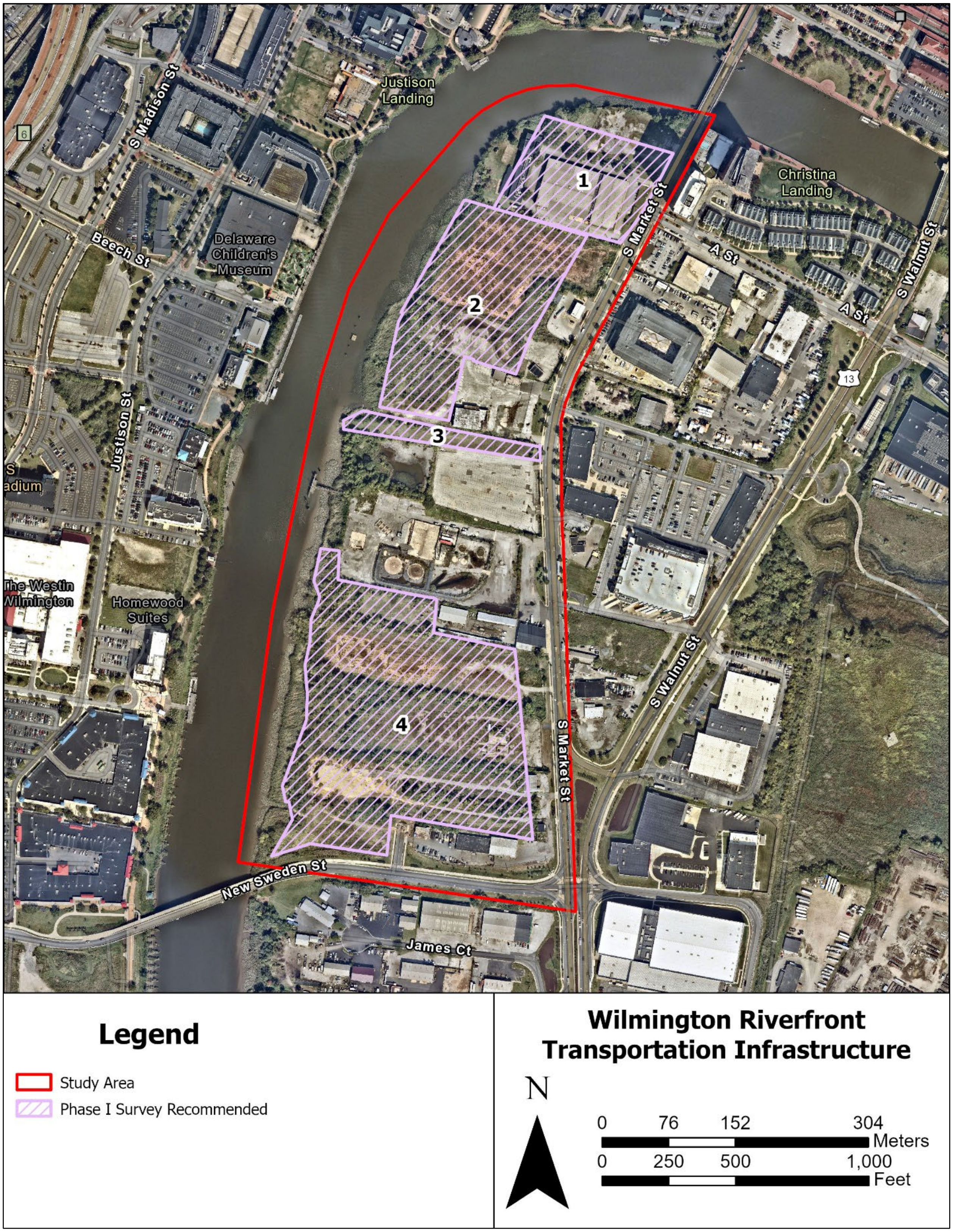

Figure 37: Phase I Survey Recommendations

V. Summary

On behalf of the City of Wilmington, RK&K conducted a Phase IA archaeological assessment for the Wilmington Riverfront Transportation Infrastructure Project in Wilmington, New Castle County, Delaware. The purpose of this Phase IA archaeological assessment was to review previously recorded archaeological site data, identify previous surveys in the project vicinity, locate areas with the potential to have unrecorded archaeological sites, and provide recommendations regarding additional archaeological investigations that may be necessary to identify archaeological resources prior to ground disturbing activities.

The Project study area is located in Wilmington, Delaware, along South Market Street (U.S. Business Route 13) and is bounded to the north and west by the Christina River, to the east by South Market Street, to the south by Judy Johnson Drive (formerly New Sweden Street) and measures 60.7 acres.

RK&K recommends that the Project has the potential to contain intact archaeological resources associated with the following periods: Archaic (6,500 to 3,000 BC); Woodland I (3,000 BC to AD 1,000); Industrialization and Early Urbanization (1830-1880); Urbanization and Early Suburbanization (1880-1940); and Suburbanization and Early Ex-urbanization (1940-present). RK&K recommends Phase I survey of four areas measuring a total of 29.8 acres within the Project study area with the potential to contain intact archaeological resources (**Table 4**).

Table 4: Summary of Phase I Survey Recommendations

Survey Area No.	Acreage	Potential Assessment	Phase I Testing Recommendations
1	4.4	19th- and 20th-century industrial and residential occupation	Construction monitoring followed by judgmentally placed trenches
2	7.8	Precontact and 19th-century residential occupation	Pedestrian/shovel testing of pervious surfaces and mechanical trenching, as necessary
3	1.1	19th and 20th-century railroad and bridge abutments	Pedestrian survey and shovel testing
4	16.5	Precontact and 20th-century residential occupation	Pedestrian/shovel testing of pervious surfaces and mechanical trenching, as necessary

RK&K recommends pedestrian survey and shovel testing for those portions of the survey areas with pervious surfaces. RK&K recommends mechanical trenching to assess the presence of archaeological features and examine stratigraphy in portions of the survey areas that contain impervious surfaces like pavement or gravel surfaces that cannot be easily hand excavated. RK&K also recommends construction monitoring of the demolition of the Salvation Army building for the presence of intact archaeological features below the extant building. RK&K then recommends the excavation of a series of trenches on this property to assess the presence of subsurface archaeological features. If the results of the shovel testing demonstrate the potential for deeply buried (beyond 3 feet) cultural deposits, RK&K may develop additional testing recommendations that may include deep trenching, stepped test units, or additional geoarchaeological survey. The number and placement of trenches and need for additional deep testing will be determined in consultation with DCHA. RK&K recommends that the Phase I methodologies for each of the survey areas be developed in consultation with DCHA and that all fieldwork be conducted in accordance with the project’s health and safety plans given the potential for hazardous materials throughout the Study Area. And lastly, RK&K recommends the development of a methodology for the Phase I survey of potential submerged archaeological resources be developed in consultation with DCHA following the development of the project’s limits of disturbance. RK&K also recommends that the methodology be informed by the results of terrestrial Phase I survey, particularly as it relates to the likelihood of encountering precontact resources along the shore of the Christina River.

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Wilmington Riverfront Transportation Infrastructure Project
Draft Environmental Assessment
Appendix G, Phase IA Archaeological Assessment

GEOTECHNICAL DATA REPORT

South Market Street Master Plan Area 1 and Area 2 Infrastructure and Parcel Development

Wilmington, Delaware

Prepared for:
Riverfront Development Corporation (RDC) of Delaware

Commission No. 20077.004
June 2, 2023

June 2, 2023

Ms. Megan McGlinchey
Executive Director
Riverfront Development Corporation of Delaware
815 S. Justison Street
Wilmington, Delaware 19801

Subject: Subsurface Exploration and Geotechnical Data Report
South Market Street Master Plan
New Castle County, Delaware
Commission No.: 20-077

Dear Ms. Megan McGlinchey:

RK&K is pleased to submit our data report concerning the subsurface exploration and resulting geotechnical data for the proposed transportation infrastructure development and parcel development along Area 1 and Area 2 of the South Market Street corridor located in New Castle County, Delaware. You authorized the study in accordance with our revised proposal dated July 20, 2020.

The report describes the subsurface exploration program and the general site and subsurface conditions encountered.

We appreciate having had the opportunity to provide geotechnical consultation for this project, and we will remain available to answer any questions related to this study. Should you require additional consultation, please do not hesitate to contact our office.

Very truly yours,
RK&K

Eric M Klein
Eric M. Klein, P.E., D.GE
Senior Technical Leader, Geotechnical Engineering Department

Arjun
Arjun Roy, PE
Project Engineer II

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1 INTRODUCTION

In accordance with our revised proposal dated July 20, 2020, RK&K has completed the Subsurface Exploration and Geotechnical Data Report for the Area 1 and Area 2 Infrastructure and Parcels Development for the South Market Street Master Plan Project in Wilmington, Delaware.

The specific scope of our services on this project consisted of exploring the subsurface conditions using soil borings, in situ testing, and laboratory testing, and submitting our findings in a report.

Also included in this report are descriptions of the field and laboratory testing on which this report is based. The results of this work are contained in the appendix of this report.

2 SITE AND PROJECT DESCRIPTION

2.1 SITE DESCRIPTION

The project site is located west of South Market Street from the South Market Street Bridge over the Christina River to New Sweden Street in the City of Wilmington, Delaware as shown in Figure A-1 in Appendix A. Along the Christina River, a marshy riverbank with clusters of trees and shrubs borders the site. The north portion of the project site is fenced and undeveloped. A concrete bulkhead supported on a relieving platform is located along the riverbank on the north end of the site. The bulkhead extends west from the South Market Street Bridge and is approximately 500-ft long along the properties currently owned by the City of Wilmington and BPG Land Partners IV LLC (former Burns & McBride property).

There is an existing utility tunnel that runs underneath the riverbed with the access shafts located along Orange Street on the north side of the river and in the City of Wilmington owned property on the south side of the river. The access shaft is located approximately 35-ft behind the existing concrete bulkhead and approximately 400-ft west of South Market Street. The diameter of the access shaft is 12-ft with a 2-ft thick concrete wall. The diameter of the utility tunnel is 8.5-ft with a 1.5-ft thick concrete wall. The crown of the utility tunnel is located approximately 64-ft below the existing ground surface. Several utilities run through the utility tunnel and exit from the vault located at the top of the access shaft. The utilities exit the vault in various directions and turn east towards Market Street.

A Salvation Army Family Store and Thrift store along with office building is located across A Street, west of South Market Street. The ground surface elevation of this area is about EL + 8. The area south of the Salvation Army facilities is undeveloped and based on historic geotechnical report and google earth imagery recent fill was placed in mid to late 2016 to bring the existing ground surface to around EL 11. The fill was placed as a surcharge load to reduce settlement of previously planned facilities. The elevation of this area varies approximately from EL 11 to EL 12.5. A gas station and convenience store are located at the southeast corner of this area, just west of South Market Street.

The southern portion of the project site contains an assortment of current and former industrial buildings and accessory structures, surface parking lots, former junk yards, and miscellaneous uses.

There is an approximately 700-ft long earth dike along Christina River from New Sweden Street on the western side of the project site. A Brownfield site exists approximately 400-ft north of New Sweden Street which will require soil capping for redevelopment.

2.2 PROJECT DESCRIPTION

The Riverfront Development Corporation, in conjunction with DelDOT, the City of Wilmington and Buccini-Pollin Group developed the South Market Street Master Plan to guide the redevelopment of the South Market Street corridor, along the Christina River.

Project elements include:

- Orange Street, from A Street to New Sweden Street, approximately 2,800-ft.
- A Street, from S. Market Street to Orange Street, approximately 300-ft.
- East Bank Boulevard (1st Street), from S. Market Street to the Christina River, approximately 450-ft.
- Howard Street, from S. Market Street to Orange Street, approximately 330-ft.
- Pusey Street (2nd Street), from S. Market Street to the Christina River, approximately 550-ft.
- Promenade along Christina River and River’s edge treatment, from S. Market Street bridge to north of New Sweden Street, approximately 1,100-ft.
- Central Green Park, approximately 2.4 acres along the Christina River and west of South Orange Street, with considerations for a future pedestrian bridge.
- Howard Street, from S. Market Street to Walnut Street, approximately 860-ft.
- Jones (3rd) Street, from S. Market Street to Orange Street, approximately 600-ft.
- Kalmar (4th) Street, from S. Market Street to the River’s edge, approx. 850-ft.
- Nyckel (5th) Street, from S. Market Street to Orange Street, approximately 750-ft.
- Riverwalk and river’s edge treatment, from Pusey Street to New Sweden Street, approximately 1,500-ft.
- Rough grading for 10 development parcels.

3 FIELD AND LABORATORY WORK

3.1 HISTORIC SUBSURACE DATA

In 2014 Advanced Geo-Services drilled eleven (11) borings on the BPG Land Partners property in the vicinity of the currently proposed East Bank Boulevard (1st Street). The historic geotechnical reports titled “Geotechnical Investigation 201-211 South Market Street Wilmington, Delaware” dated March 12, 2014, and “Surcharge Fill and Settlement Monitoring 201-211 S. Market Street Wilmington, Delaware”, dated March 18, 2014, are included in appendix D of his report.

The borings, as described in the historic report, encountered the following strata:

- Existing Fill
- Fine-grained Alluvium
- Granular Alluvium
- Decomposed Rock
- Rock (Spoon Refusal Material)

The historic report included in Appendix D provides description of the strata encountered in that report.

3.2 FIELD EXPLORATION

The field exploration for this South Market Street project consisted of drilling 53 Standard Penetration Test (SPT) borings, 16 Cone Penetration Test (CPT) soundings and 2 Dilatometer Test (DMT) soundings for the project. Sixteen (16) of the SPT borings were drilled for the development parcels. The subsurface exploration was performed in four phases. The borings were drilled with a Geoprobe 7822DT or Diedrich D50 track-mounted drill rig between July 6 and 9, 2020, for Phase I; between August 31 and September 4, 2020, for Phase II; between April 26 and May 20, 2021, for Phase III; and between September 12 and October 26, 2022, for Phase IV. The test borings and CPT and DMT soundings were performed by Hillis-Carnes Engineering Associates, Inc., whose corporate headquarters is located in Annapolis Junction, Maryland under contract to RK&K. Borings were drilled at the approximate location of the proposed Riverfront improvements. The borings extended to depths of 9 to 75-ft below the existing ground surface. All the CPT and DMT soundings were terminated at refusal depths ranging from 7.1 to 70.4-ft below the existing ground surface. The boring locations were staked using a handheld GPS unit. The as-drilled locations of the boring are reported on the Test Boring Logs in Appendix B in Delaware State Plane coordinates (NAD 83 datum, US survey feet). Tables B-1 and B-2 in Appendix B summarizes the locations and depths of the borings and CPT/DMT soundings performed for the infrastructure improvement and development parcels, respectively. Boring locations are shown in Figure A-2a through A-2g located in Appendix A of this report.

Soil samples were obtained at 2.5 and 5.0-ft intervals in accordance with the SPT method. In general, the SPT consists of advancing a 2-inch outside diameter sampling spoon 18-inches by driving it with a 140-pound hammer falling 30-inches. The values reported on the boring logs are the blows required to advance three successive 6-inch increments. The first 6-inch increment is considered as seating. The sum of the number of blows for the second and third increments is the "N" value.

In addition, a bulk sample was obtained from the auger cuttings from each roadway boring.

The soils were classified in general accordance with the Unified Soil Classification System (USCS). The USCS letter and graphical symbols are shown on the Summary of Boring Data, Figure A-3, located in Appendix A of this report. A RK&K field engineer recorded the classifications, observations, water and cave in depths and field sampling information on the Test Boring Logs contained in Appendix B. Descriptions of the soils classification systems, sample procedures, and rock descriptions are also included in Appendix B.

Depth to groundwater was noted during the drilling operations and groundwater levels were measured at the completion of drilling and, when possible, 24 hours or longer after the completion of drilling. The depth to the bottom of each borehole was also measured after the removal of the drilling augers to determine the susceptibility of the borehole to collapse or cave.

3.3 CONE PENETRATION TEST

The subsurface exploration also consisted of Cone Penetration Test soundings (CPT), with a track mounted CPT rig. The cone penetration test (ASTM D3441 – Standard Method for Deep, Quasi-Static, Cone and Friction-Cone Penetration Tests of Soils) consists of pushing a series of cylindrical rods with a cone at the base into the soil at a constant rate of 2.0-cm/sec. Continuous measurement of penetration resistance on the cone tip (Qc), friction on a friction sleeve (Fs), and pore pressures were recorded during the penetration. Correlations have been developed to estimate the soil behavior types, friction angle, undrained shear strength, SPT N-value, and other parameters from the measured data. The results of the CPT testing are contained in Appendix B of this report.

3.4 FLAT-PLATE DILATOMETER

Flat-Plate Dilatometer testing (DMT) was performed in general accordance with ASTM D 6635, Standard Test Method for Performing the Flat Plate Dilatometer. The DMT consists of pushing a flat blade located at the end of a series of drill rods to a desired test depth. Once the desired test depth was reached, gas pressure was used to expand a circular steel membrane horizontally into the soil. Three pressures are recorded. Pressure A is the pressure on the blade before expansion and Pressure B is the pressure required to produce an expansion of 1 millimeter of the membrane into the soil. The membrane is deflated, and a third pressure is recorded, Pressure C. After the three pressures are recorded, the probes are pushed to the next desired test depth. The thrust required to push the blade was measured using a load cell.

The DMT test results can be used to estimate a wide range of soil properties including the Material Index, undrained shear strength (Su), coefficient of lateral earth pressure at rest (K_o), drained plane strain friction angle (ϕ'_{ps}), preconsolidation pressure (σ_{pc}), dilatometer modulus (E_D), and tangent modulus (M). The results of the DMT sounding are contained within Appendix B of this report.

3.5 LABORATORY TESTING

Laboratory testing for the soil samples was performed by Hillis-Carnes Engineering Associates, Inc., an AASHTO re:source (formerly known as AMRL) accredited laboratory. The laboratory testing consisted of determining the natural moisture content, the grain-size distribution, the Atterberg limits, the modified Proctor moisture-density relationship, and the California Bearing Ratio (CBR) for selected samples. Results of the classification testing are summarized in Table C-1 included in the Appendix C. Natural moisture content results are shown on the Test Boring Logs in Appendix B. Grain-size distribution graphs are included in Appendix C.

Laboratory testing of bulk bag samples consisted of determining the Moisture-Density Relationship Test and the California Bearing Ratio (CBR). Results of the bulk bag sample testing are summarized in Table 3.1. Detailed test results including the moisture-density curve and CBR results are included in Appendix C.

Table 3.1 – Summary of Moisture-Density Relationship Testing

Boring No. / Sample	Depth (ft)	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Natural Moisture Content (%)	CBR
RB-B-01 / Bulk	0.0 – 10.0	113.1	12.0	22.6	2.5
RB-B-02A/ Bulk	0.0 - 10.0	121.9	8.5	35.8	--
RB-B-04/ Bulk	0.0 – 10.0	121.7	9.6	6.3	2.5
RB-B-05/ Bulk	0.0 – 10.0	123.4	8.6	22.9	2.9
RB-B-08 / Bulk	0.5 – 10.0	--	--	30.1	2.0
RB-B-09 / Bulk	0.0 – 10.0	128.3	7.1	10.3	6.6
RB-B-10 / Bulk	0.6 – 10.0	126.0	8.7	11.8	3.6
RB-B-12 / Bulk	0.3 – 10.0	130.1	8.1	11.1	6.6

Notes-
CBR: California Bearing Ratio at 95% Maximum Dry Density
--: Lab results unavailable/ Not Requested

Laboratory testing for the Shelby tube samples consisted of five Direct Shear (DS) tests, ten Consolidated-Undrained Triaxial Compression (CU) tests, and twenty consolidation tests. The results of the DS tests and CU test results are summarized in Tables 3.2 and 3.3, respectively. The results of the DS and CU tests were plotted to determine the effective shear strength parameters. The plots for the DS and CU tests are shown in Figures C.1 and C.2, respectively included in Appendix C.

Table 3.2 - Summary of Shear Strength Testing - Direct Shear Test

Boring No.	Sample	Depth (ft)	Test	NMC	Normal Stress (psi)	Drained Parameters	
						ϕ´ (deg)	c (psf)
LOT-A2-17A	T-1	32.0 – 34.0	DS	54.9	6.9	25.1	264
					13.9		
					27.8		
RB-B-01	T-1	15.0-17.0	DS	52.5	4.1	23.8	138
					8.3		

Table 3.2 - Summary of Shear Strength Testing - Direct Shear Test

Boring No.	Sample	Depth (ft)	Test	NMC	Normal Stress (psi)	Drained Parameters	
						ϕ´ (deg)	c (psf)
					16.7		
RW-B-04	T-1	17.0-19.0	DS	20.4	6.9	19.6	457
					13.9		
					27.8		
RW-B-06	U-1	9.0 - 11.0	DS	40.1	3.4	23.8	138
					10.4		
					17.4		
RW-B-12	T-2	17.5 – 19.5	DS	54.7	4.49	13	280
					8.97		
					17.94		

Notes:
ϕ´ = Drained friction angle **c** = cohesion **NMC**= Natural Moisture Content
DS: Direct Shear

Table 3.3 - Summary of Shear Strength Testing - CU Triaxial Test

Boring No.	Sample	Depth (ft)	NMC	Confining Pressure(psi)	Effective Shear Strength Parameters	
					ϕ´ (deg)	c (psf)
BH-B-01A***	T-1	15.0-17.0	62.6	1.0	46.3	69
			60.7	4.5		
			69.2	5.0		
BH-B-04***	T-1	21.5-23.5	25.9	6.2	17.3	228
			11.6	12.7		
			29.2	27.8		
EMB-B-02	T-1	17.0 – 19.0	55.5	4.17	34.6	361
			57.4	8.33		
			53.1	16.67		
LOT-A2-13	T-1	10.0 – 12.0	59.7	3.13	31.6	305
			57.2	6.25		
			82.8	12.5		
OL-B-01	T-2	17.0-19.0	56.9	4.1	24.9	369

Table 3.3 - Summary of Shear Strength Testing - CU Triaxial Test

Boring No.	Sample	Depth (ft)	NMC	Confining Pressure(psi)	Effective Shear Strength Parameters	
					ϕ´ (deg)	c (psf)
			49.1	8.2		
			46.2	16.4		
RW-B-01	T-1	21.5-23.5	35.1	4.0	33.9	224
			36.9	8.0		
			58.9	16.0		
RW-B-03	T-1	23.5-25.5	45.2	6.9	29.1	368
			58.8	13.9		
			29.2	27.8		
RW-B-08***	T-1	15.0 – 17.0	51.6	5.6	-	-
			65.1	11.1		
RW-B-09	T-1	17.9 – 19.5	51.9	4.1	16.4	575
			50.8	8.3		
			46.5	16.5		
RW-B-10	T-2	24.0 – 26.0	44.8	5.55	31.8	70
			56.0	11.11		
			42.7	22.22		

Notes:
ϕ´ = Drained friction angle **c** = cohesion **NMC**= Natural Moisture Content
CU: Consolidated-Undrained Triaxial
***: Samples may have been disturbed

The results of the consolidation tests are summarized in Table 3.4.

Table 3.4 – Summary of Consolidation Testing

Boring/ Sample	Depth (ft)	Dry Unit Weight (pcf)	NMC (%)	LL	PL	e_0	C_c	C_r	P_c (ksf)	OCR
BH-B-01A/ T-1	15.0-17.0	57.2	54.1	91	41	1.949	0.71	0.08	2	1.7
BH-B-03A/ T-1	15.0-17.0	66.6	58.1	65	34	1.532	0.46	0.06	1.4	1.4
BH-B-04/ T-1	21.5-23.5	54.5	60.9	83	41	2.096	0.78	0.06	0.6	0.5

Table 3.4 – Summary of Consolidation Testing

Boring/ Sample	Depth (ft)	Dry Unit Weight (pcf)	NMC (%)	LL	PL	e_0	C_c	C_r	P_c (ksf)	OCR
EMB-B-01/ T-1	13.0-15.0	68.3	43.7	80	33	1.424	0.73	0.06	1.6	1.6
EMB-B-02 / T-1	17.0 – 19.0	71.3	48.1	83	32	1.319	0.44	0.06	1.6	1.5
LOT-A1-8 / T-1	22.0 – 24.0	76.2	43.5	52	27	1.171	0.11	0.01	0.4	0.3
LOT-A2-12 / T-1	17.0 – 19.0	40.5	103.2	114	49	3.088	1.34	0.13	1	1
LOT-A2-13 / T-1	10.0 – 12.0	47.1	80.6	109	46	2.512	0.82	0.11	1	1.6
LOT-A2-17A/ T-1	32.0 – 34.0	66.8	54.9	97	39	1.478	0.65	0.09	2.2	0.8
OL-B-01/T-2	17.0-19.0	65.2	51.7	64	31	1.536	0.43	0.06	1.4	1.5
RB-B-03/ T-1	23.0-25.0	69.2	57.2	71	31	1.336	0.51	0.05	1.4	1.1
RB-B-06/ U-1	17.5-19.5	92.9	28.8	26	18	2.039	0.5	0.045	2.3	1.7
RB-B-07 / T-1	20.0 – 22.0	59.5	68.7	90	37	1.782	0.66	0.1	1.3	1.2
RB-B-08 / T-1	15.0 – 17.0	50.3	79.3	96	36	2.289	0.72	0.08	1.4	1.5
RB-B-11 / T-1	15.0 – 17.0	49.6	87.5	68	30	2.332	0.99	0.13	1.4	1.5
RW-B-01/ T-1	21.5-23.5	67.3	54.9	70	34	1.459	0.36	0.07	0.5	0.4
RW-B-05/ U-1	15.0-19.0	77.1	40.1	29	NP	1.289	0.26	0.016	1.53	1.8
RW-B-06/ U-1	9.0-11.0	61.8	64.4	46	14	3.626	1.22	0.08	1.8	2.9
RW-B-10 / T-2	24.0 – 26.0	64.8	52.5	47	28	1.555	0.49	0.07	0.8	0.7
RW-B-12 / T-2	17.5 – 19.5	104.7	54.7	66	26	0.58	0.18	0.03	1	1

Notes:
NMC: Natural Moisture Content; **e_0**: Initial Void Ratio; **C_c**: Compression Index; **C_r**: Recompression Index
P_c: Pre-consolidation Pressure; **OCR**: Over-consolidation Ratio; **LL:** Liquid Limit; **PL:** Plastic Limit

Corrosion testing of select soil samples were performed to determine the corrosivity of the foundation soil. Corrosion testing included the following tests: resistivity, pH, redox, chloride, sulfate, and sulfides content. The results of the corrosion tests are summarized in Table 3.5.

Table 3.5 – Summary of Corrosion Testing

Boring No. / Sample	Depth (ft)	Resistivity (ohm-cm)	pH	Redox (mV)	Chloride (ppm)	Sulfate (ppm)	NMC (%)	Sulfides
BH-B-01 / S-2, S-5	2.5-11.5	2,900	7.0	270	<20	<5	29.2	Not Present
BH-B-02 / S-2, S-4	2.5-9.0							
BH-B-01A / S-7, S-8	12.5-20.0	1,300	6.8	265	<20	<5	64.3	Not Present
BH-B-02 / S-6, S-8	12.5-20.0							
BH-B-03A/ T-1	15.0-17.0	2,700	8.2	186	<20	20	58.1	Not Present
LOT-A1-01 / Bulk	0.0-10.0	1,500	7.9	238	45	570	23.7	Not Present
LOT-A2-12 / Grab 1	0.0 – 10.0	42,000	8.6	124	45	270	11.1	Not Present
LOT-A2-18 / Grab 1	0.0 – 10.0	39,000	10.0	68	20	750	6.0	Not Present
RB-B-06 / Grab	0.0-6.0	7,200	7.6	470	45	25	39.0	Not Present
RW-B-01/ C1-4	0.0 – 10.0	670	7.3	276	<20	<5	50.6	Not Present
RW-B-02/ C5-8	10.0-20.0	1,300	6.6	260	<20	<5	64.3	Not Present
RW-B-03 / S-5B, S-6, S-6B, S-7B	10.0-16.5	1,100	7.4	274	200	215	13.0	Not Present
RW-B-05 / Grab	2.0-5.0	13,000	8.1	178	45	<5	18.0	Not Present
RW-B-05 / Grab	14.0-18.0	1,700	7.7	-24	45	310	44.3	Not Present
RW-B-10 / Grab 1	0.0 – 10.0	5,300	9.3	116	20	80	11.5	Not Present
RW-B-11 / Grab 1	10.0 – 20.0	1,900	8.0	92	65	70	36.9	Not Present
RW-B-12 / Grab 1	0.3 – 10.0	2,100	8.2	27	45	240	11.1	Not Present
RW-B-12 / Grab 2	10.0 – 20.0	26,000	6.9	-52	45	< 5	51.3	Not Present
RW-B-13 / Grab	0.0 – 10.0	28,000	8.6	87	45	185	11.1	Not Present

Notes: NMC: Natural Moisture Content

The results of the Organic Content (Loss on Ignition) tests are summarized in Table 3.6.

Table 3.6 – Summary of Organic Content Testing

Boring No. / Sample	Depth (ft)	Organic Content (%)
EMB-B-02 / S-12	38.5 – 40.0	3.70
LOT-A2-11 / S-4	7.5 – 9.0	3.74
LOT-A2-13 / S-6	13.5 – 15.0	16.75
RW-B-13 / S-7	15.0 – 16.5	6.71
SP-B-01 / S-6	12.5 – 14.0	37.60
SP-B-01 / S-7	18.5 – 20.0	8.44

4 SUBSURFACE CONDITIONS

4.1 GEOLOGY

According to the Geologic Map of New Castle County, Delaware, Geologic Map Series No. 13 (Kelvin W. Ramsey, 2005) the site is located in the Atlantic Coastal Plain Physiographic Province where natural soils are mapped as the Scotts Corners Formation of the Upper Pleistocene Epoch underlain by the Potomac Formation, a Cretaceous Period deposit. This in turn overlies residual materials derived in place from the underlying basement rock generally believed to be of the Cambrian to Silurian Periods.

Fill is mapped along the banks of the Christina River at the project site. Fill is described as man-made deposits of natural earth material, including dredge spoil, used to extend shore land and/or to fill low-lying areas such as where a road crosses a valley or marsh. Some construction debris may be incorporated in the unit.

The Scotts Corners Formation is described as a heterogeneous unit of light gray to brown to light yellow, coarse to fine sand, gravelly sand and pebble gravel with rare discontinuous beds of organic-rich clayey silt, and pebble gravel. Scotts Corners Formation is commonly capped by one to two feet of silt to fine sandy silt. Scotts Corners underlies a terrace parallel to the present Delaware River that has elevations less than 25-Ft. This formation is a transgressive unit, that is, it overlaps other geologic deposits due to rising sea levels and it consists of swamp, marsh, estuarine channel, beach, and bay deposits.

The Potomac Formation sediments in northern Delaware are believed to have been deposited in a vast alluvial plain by a network of rivers during the Cretaceous Period. The formation is primarily composed of fine-grained materials in over-bank interfluvial facies, with laterally discontinuous fluvial sand forming a three-dimensional labyrinth in the flood plain muds.

The Potomac Formation has been subjected to high levels of preconsolidation imparted by the weight of younger deposits that have since been eroded away. Characterizing the physical properties of the formation is complicated by the interfluvial mode of deposition, the erratic presence of discontinuous channel and overbank sands, and degradation of the silt and clay properties by weathering processes, which could extend to variable depths.

These Coastal Plain sediments overlay residual soil and bedrock. This bed rock is exposed on the ground surface a few thousand feet west of the site on the left bank of the Christina River.

Residual soils are soils which have formed in place by the weathering of the parent bedrock. Residual soils typically form a profile characterized by a change from soil to decomposed rock to rock with increasing depths below the ground surface.

4.2 SUBSURFACE CONDITIONS

The Summary of Boring Data, in situ probe sounding results and the Test Boring Logs in Appendices A and B provide details related to the subsurface conditions encountered in the various borings. The stratification lines shown on the Summary of Boring Data and Test Boring Logs and the depths shown on the following tables represent approximate transitions between material types. In situ, strata changes could occur gradually or at slightly different levels. Also, the borings depict conditions at particular locations and at the particular times indicated. Some conditions, particularly groundwater conditions between borings, could vary from the conditions encountered at the particular boring locations.

Table 4.1 provides the depth of topsoil encountered at each boring location.

Table 4.1 – Depth of Topsoil Encountered in Test Borings

Boring No.	Topsoil (inches)
BH-B-01	2
BH-B-02	3
BH-B-03	3
BH-B-04	4
BW-B-01	1
EMB-B-01	4
EMB-B-02	3.0
HW-B-01	2
Lot-A1-01	2
Lot-A1-02	6
LOT-A2-11	4.0
LOT-A2-16	3.0 below 1-inch of GAB
LOT-A2-17	2.0
LOT-A2-18	2.0

Table 4.1 – Depth of Topsoil Encountered in Test Borings

Boring No.	Topsoil (inches)
OL-B-01	4
RB-B-06	1
RB-B-07	1.0
RB-B-12	3.0 mixed with GAB
RB-B-13	3.0
RW-B-01	4
RW-B-02	4
RW-B-05	5
RW-B-06	6
RW-B-07	6
RW-B-08	3.0
RW-B-10	4.0
RW-B-11	4.0
RW-B-12	4.0
RW-B-13	3.0
SP-B-01	6

Table 4.2 provides the pavement section encountered at the boring locations.

Table 4.2 – Pavement Section Encountered in Test Borings

Boring No.	Bituminous Concrete (inches)	Portland Cement Concrete (inches)	Base (inches) / Material
LOT-A1-05	4	NE	4 / GAB
LOT-A1-07	2.0	NE	NE
LOT-A1-08	4.0	NE	NE
LOT-A2-12	2.0	6.0	NE
LOT-A2-13	3.0	NE	4.0 / GAB
RB-B-01	5.5	6	NE
RB-B-02	7	NE	3 / GAB
RB-B-03	6	NE	NE
RB-B-05	7	3	2 / GAB
RB-B-07	NE	2.0	NE

Table 4.2 – Pavement Section Encountered in Test Borings			
Boring No.	**Bituminous Concrete (inches)**	**Portland Cement Concrete (inches)**	**Base (inches) / Material**
RB-B-08	4.0	NE	NE
RB-B-09	7.0	NE	NE
RB-B-10	3.0	4.0	NE
RB-B-13	NE	6.0	NE
RW-B-09	4.0	NE	NE
NE: Not Encountered GAB: Graded Aggregate Base			

Table 4.3 summarizes the depth of FILL material encountered in the borings.

Table 4.3– Summary of FILL Depths			
Boring No.	**Ground Surface Elevation**	**Thickness of FILL (ft)**	**Bottom of FILL Elevation**
BH-B-01	9	11.5*	-2.5*
BH-B-01A	9	12.5	-3.5
BH-B-02	10	12.5	-2.5
BH-B-03	6	11.5*	-5.5*
BH-B-04	7	10.0	-3.0
BW-B-01	6	5.0	1.0
EMB-B-01	7	5.0	2.0
EMB-B-02	11.0	12.5	-1.5
HW-B-01	7	7.5	-0.5
HW-B-02	5.0	7.5	-2.5
LOT-A1-01	7	7.5	- 0.5
LOT-A1-02	7	8.0	- 1.0
LOT-A1-03	11	13.5	- 2.5
LOT-A1-04	11	14.0	- 3.0
LOT-A1-05	6	7.5	-1.5
LOT-A1-06	6	2.5	3.5
LOT-A1-07	7.0	5.0	2.0
LOT-A1-08	8.0	13.5	-5.5
LOT-A2-11	7.0	5.0	2.0
LOT-A2-12	6.0	7.5	-1.5

Table 4.3– Summary of FILL Depths

Boring No.	Ground Surface Elevation	Thickness of FILL (ft)	Bottom of FILL Elevation
LOT-A2-13	6.0	7.5	-1.5
LOT-A2-14	8.0	7.5	0.5
LOT-A2-15	5.5	2.5	3.0
LOT-A2-16	5.0	23.5	-18.5
LOT-A2-17	21.0	28.5	-7.5
LOT-A2-18	9.0	13.5	-2.5
OL-B-01	5	2.5	2.5
RB-B-01	7	5.0	2.0
RB-B-02	5	9*	-4.0*
RB-B-03	9	7.5	1.5
RB-B-04	8	5.0	3.0
RB-B-05	6	6.0	0.0
RB-B-06	7.5	7.5	0.0
RB-B-07	6.0	7.5	-1.5
RB-B-08	5.0	7.5	-2.5
RB-B-09	7.0	7.5	-0.5
RB-B-10	5.0	5.0	0.0
RB-B-11	5.0	5.0	0.0
RB-B-12	6.0	7.5	-1.5
RB-B-13	6.0	12.5	-6.5
RW-B-01	6	12.5	-6.5
RW-B-02	5	2.5	2.5
RW-B-03	11	12.5	- 1.5
RW-B-04	11	10.0	1.0
RW-B-05	6	2.5	3.5
RW-B-06	6	2.5	3.5
RW-B-07	6	2.5	3.5
RW-B-08	5.0	5.0	0.0
RW-B-09	5.0	7.5	-2.5
RW-B-10	6.5	12.5	-6.0
RW-B-11	7.0	5.0	2.0
RW-B-12	8.0	6.0	2.0

Table 4.3– Summary of FILL Depths

Boring No.	Ground Surface Elevation	Thickness of FILL (ft)	Bottom of FILL Elevation
RW-B-13	12.0	15	-3.0
SP-B-01	5	10	-5.0

Notes:
* Borehole Terminated within FILL.

Auger refusal was encountered in some of the borings. Auger refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, manmade obstructions in Fill, thin rock seams, or the upper surface of sound continuous rock. Rock coring techniques are required to determine the character and continuity of the refusal materials, and rock coring was not performed for the any of the borings. Table 4.4 summarizes the borings and depths of auger refusal encountered.

Table 4.4 – Summary of Auger & Cone Refusal

Boring No.	Depth to Auger / Spoon / Cone Refusal	Elevation at Auger / Spoon / Cone Refusal
BH-CPT-01	43.4	-33.4
BH-CPT-02	38.4	-30.9
BH-B-01A	73.0	-64.0
BH-B-02	74.5	-64.5
BH-B-03A	58.0	-51.0
BH-B-04	58.0	-51.0
BW-B-01	55.0	-49.0
EMB-CPT-01	30.1	-23.1
EMB-CPT-02	28.3	-19.8
HW-B-02	61.5	-56.5
LOT-A1-02	46.0	-39.0
LOT-A1-03	53.8	-42.8
LOT-A1-05	63.3	-57.3
LOT-A1-07	70.5	-63.5
LOT-A1-08	67.0	-59.0
LOT-A2-14	70.0	-62.0
LOT-A2-15	66.5	-61.0
LOT-A2-18	65.5	-56.5
RB-B-02B	55.5	-50.0
RB-B-07	51.0	-45.0
RB-B-08	65.5	-60.5
RB-B-10	73.5	-68.5

Table 4.4 – Summary of Auger & Cone Refusal

Boring No.	Depth to Auger / Spoon / Cone Refusal	Elevation at Auger / Spoon / Cone Refusal
RB-B-11	67.5	-62.5
RB-B-13	66.4	-60.4
RB-CPT-02	36.6	-28.6
RB-CPT-03	42.1	-36.6
RB-CPT-04	7.1	-2.1
RB-CPT-04A	19.2	-14.2
RB-CPT-04B	34.2	-29.2
RW-B-02	59.5	-54.5
RW-B-04	60.0	-49.0
RW-B-05	45.0	-39.0
RW-B-06	52.0	-46.0
RW-B-07	62.1	-56.1
RW-B-08	54.0	-49.0
RW-B-09	53.3	-48.3
RW-B-13	71.5	-59.5
RW-CPT-01	32.8	-24.8
RW-CPT-02	27.9	-21.9
RW-CPT-03	39.3	-33.3
RW-CPT-04	73.7	-67.7
RW-CPT-05	49.8	-42.8
RW-CPT-06	53.9	-47.9
RW-DMT-01	28.5	-23.5
RW-DMT-02	31.5	-22.5
SP-CPT-01	20.5	-15.5
SP-CPT-01A	21.1	-16.1
SP-CPT-02	44.9	-35.9

4.3 GROUNDWATER

Groundwater was encountered at depths ranging from 1.5- to 12.8-ft below the existing ground surface. Table 4.5 summarizes the groundwater elevations at the boring locations. A more accurate determination of the hydrostatic water table would require the installation of perforated pipes or piezometers, which could be monitored over an extended period of time. The actual level of the hydrostatic water table and the amount and level of perched water should be anticipated to fluctuate throughout the year, depending upon variations in precipitation, surface runoff, infiltration, site topography, and drainage.

It is generally desirable to allow test borings to remain open for at least 24 hours after the completion of drilling and the removal of the drill tools and casing from the borehole. The purpose of this procedure is to allow the groundwater level in each borehole to recover from the effects of the test drilling. In clay soils, the length of time may extend several days before the groundwater level recovers to the pre-drilling elevation.

In addition to groundwater levels, the depth to the bottom of each borehole was measured to determine the susceptibility of the borehole to collapse or cave. This information provides the contractor with information regarding the "stand-up" time of the soil or the ability of the sides of an excavation to remain vertical or near vertical during trench excavation.

It was necessary to grout certain borings immediately after the completion of drilling. In cases where the boring was immediately grouted, the boring logs note the depth where groundwater was observed either within the recovered soil sample, on the split barrel sampler, on the drill rods, or in the soil brought to the surface by the hollow stem augers.

Table 4.5 - Groundwater Levels

Boring No.	Surface Elevation	Initial Groundwater Elevation	Final Groundwater Elevation[1]	Final Caved Elevation
BH-B-01A	9	-2.3	1.4	-35.3
BH-B-02	10	-5.6	0.8	-23.5
BH-B-03A	6	0.2	0.8	-14.7
BH-B-04	7	1.8	--	--
BW-B-01	6	-4.8	1.2	-15.7
EMB-B-01	10	3.8	6.4	-14.7
EMB-B-02	11.0	4.6	--	--
HW-B-01	6	2.8	2.8	-15.5
HW-B-02	5.0	0.0	--	--
LOT-A1-01	7	-2.0	--	--
LOT-A1-02	7	3.2	3.5	1.6
LOT-A1-03	11	-1.8	-2.1	-17.5
LOT-A1-04	11	1.8	--	--
LOT-A1-05	6	2.8	3.5	-25.8
LOT-A1-06	6	-2.9	2.3	-20.7

Table 4.5 - Groundwater Levels

Boring No.	Surface Elevation	Initial Groundwater Elevation	Final Groundwater Elevation[1]	Final Caved Elevation
LOT-A1-07	7.0	4.0	4.4	-14.7
LOT-A1-08	8.0	5.5	6.2	-34.2
LOT-A2-11	7.0	2.0	2.2	-28.0
LOT-A2-12	6.0	-2.5	1.0	-15.0
LOT-A2-13	6.0	2.2	-	-
LOT-A2-14	8.0	3.0	3.1	-24.6
LOT-A2-15	5.5	0.5	-	
LOT-A2-16	5.0	1.7	1.4	-12.3
LOT-A2-17	21.0	-	-2.5	-24.0
LOT-A2-18	9.0	2.5	0.5	-23.0
OL-B-01	5	2.5	2.7	-9.0
RB-B-01	7	3.2	--	--
RB-B-02	5	0.0	--	--
RB-B-02A	5	-2.1	1.2	-18.8
RB-B-03	9	3.8	3.8	-18.7
RB-B-04	11	Dry	-3.0	-29.0
RB-B-05	6	1.5	--	--
RB-B-06	6	1.0	1.1	-13.2
RB-B-07	6.0	2.5	3.1	-2.0
RB-B-08	5.0	3.5	3.5	-20.2
RB-B-09	7.0	2.0	-	-
RB-B-10	5.0	0.0	1.9	-15.0
RB-B-12	6.0	2.0	2.6	-34.7
RB-B-13	6.0	-	4.0	-34.5
RW-B-01	6	0.6	2.6	-45.2
RW-B-02	5	2.9	3.5	-6.0
RW-B-03	11	-1.6	-0.1	-21.3
RW-B-04	11	3.0	-1.4	-9.2
RW-B-05	6	3.0	3.0	1.2
RW-B-06	6	-1.0	2.0	-13.6
RW-B-07	6	3.2	3.2	2.8
RW-B-08	5.0	2.7	-	-
RW-B-09	5.0	3.0	-	-
RW-B-10	6.5	3.0	2.7	-25.5

Table 4.5 - Groundwater Levels

Boring No.	Surface Elevation	Initial Groundwater Elevation	Final Groundwater Elevation[1]	Final Caved Elevation
RW-B-11	7.0	2.1	-	-
RW-B-12	8.0	4.0	-	-
RW-B-13	12.0	1.0	3.8	-18.0
SP-B-01	5	1.5	--	--

Note: -- Borehole grouted upon completion/ Not collected

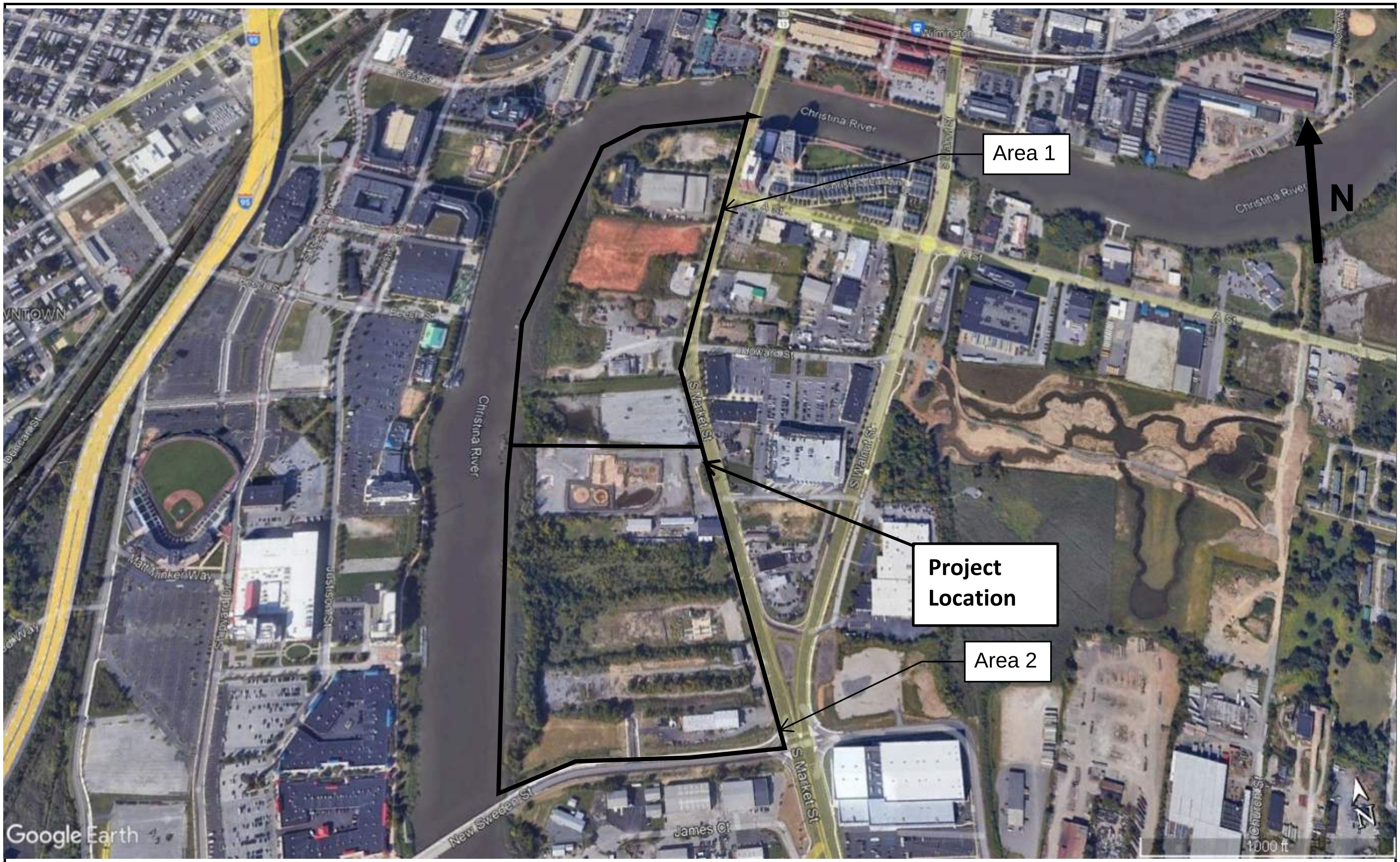
1. Final groundwater elevation measured 24-hr or more after completion of borings.

5 BASIS OF REPORT

This report has been prepared to present the geotechnical conditions encountered at the site. The data contained in this report is based upon our professional judgement and generally accepted principles of geotechnical engineering. It should be noted that the nature and extent of variations between borings might not be evident until construction.

Our professional services have been performed in accordance with generally accepted engineering principles and practices; no other warranty, expressed or implied, is made. RK&K assumes no responsibility for interpretations made by others on the work performed by RK&K.

Appendix A



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South Market Street - Area 1 and Area 2

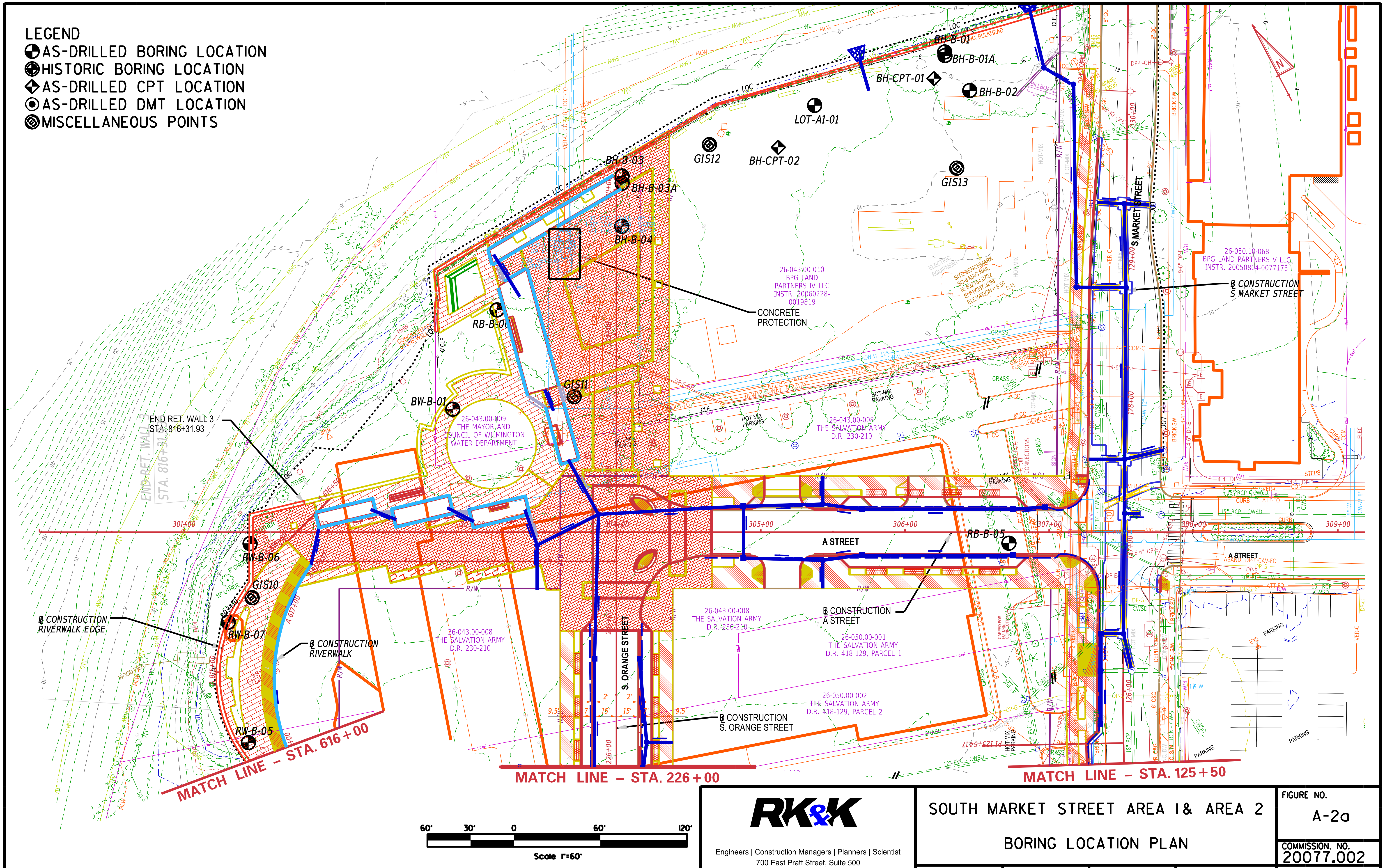
Vicinity Map

Figure No: A-1

DRAWN BY:	APPROVED BY:	SCALE:	DATE:	COMM. NO.
ACR	BBS	NTS	May 2023	20-077

LEGEND

- ◒ AS-DRILLED BORING LOCATION
- ⊕ HISTORIC BORING LOCATION
- ◇ AS-DRILLED CPT LOCATION
- ◉ AS-DRILLED DMT LOCATION
- ◎ MISCELLANEOUS POINTS



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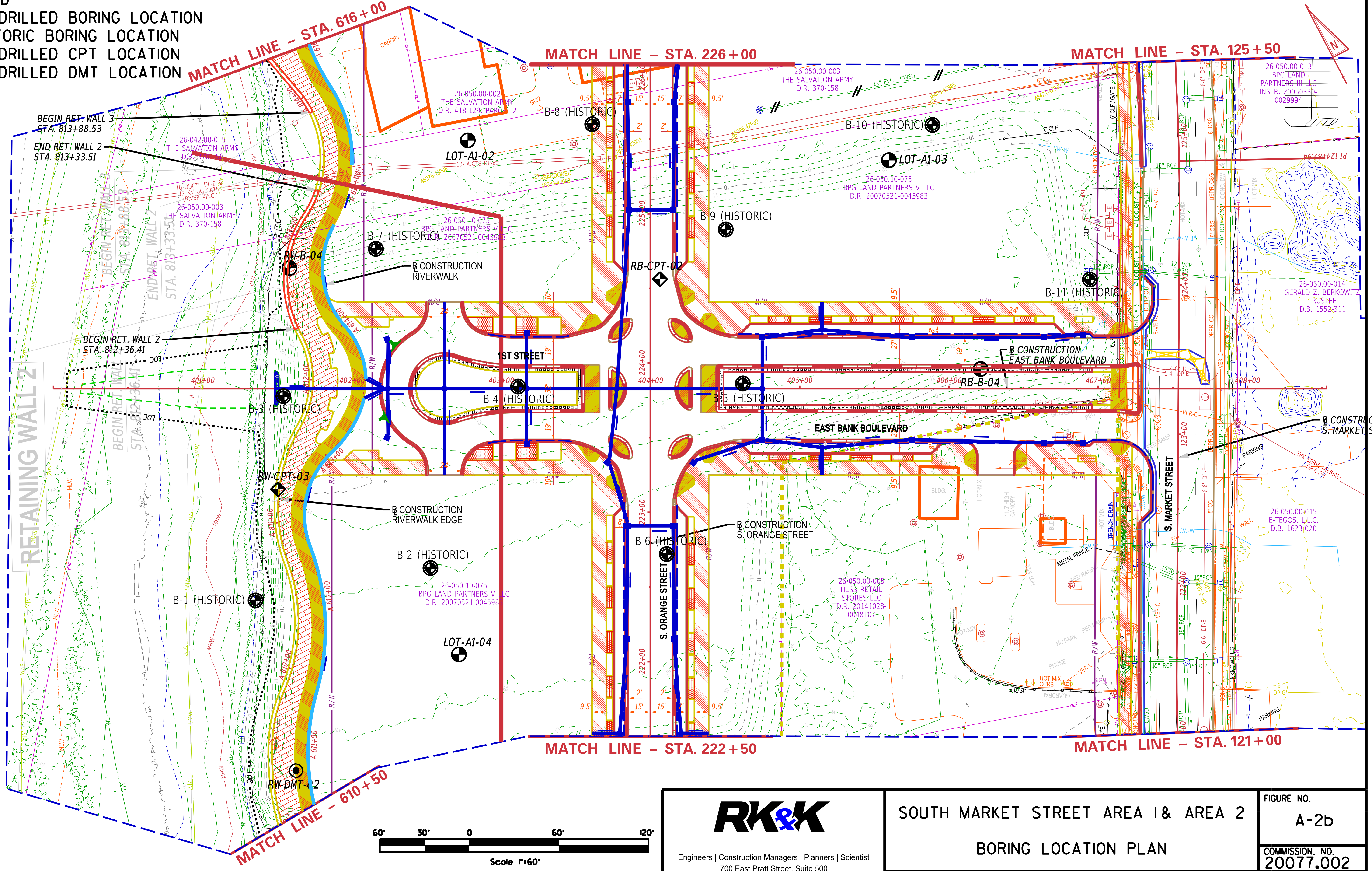
SOUTH MARKET STREET AREA 1& AREA 2

BORING LOCATION PLAN

FIGURE NO.	A-2a
COMMISSION NO.	20077.002
DRAWN BY	TR
APPROVED BY	EMK
SCALE	AS SHOWN
DATE	06/2023
SHEET NO.	01 of 07

$DATE$ $FILE$

LEGEND
- ⊕ AS-DRILLED BORING LOCATION
- ⊕ HISTORIC BORING LOCATION
- ◆ AS-DRILLED CPT LOCATION
- ◉ AS-DRILLED DMT LOCATION



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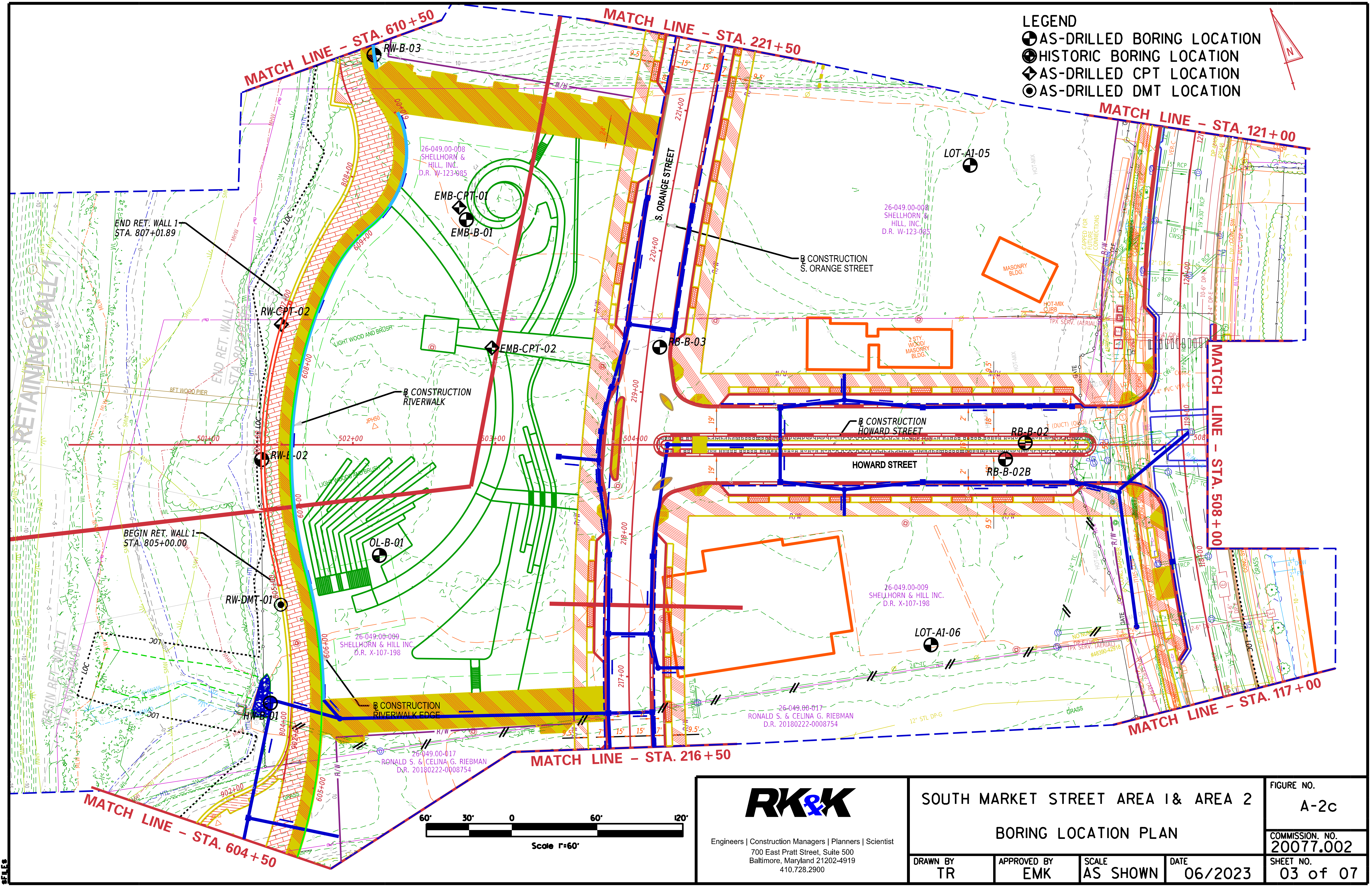
SOUTH MARKET STREET AREA 1& AREA 2

BORING LOCATION PLAN

FIGURE NO.	COMMISSION. NO.	SHEET NO.
A-2b	20077.002	02 of 07

DRAWN BY	APPROVED BY	SCALE	DATE
TR	EMK	AS SHOWN	06/2023



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SOUTH MARKET STREET AREA 1 & AREA 2

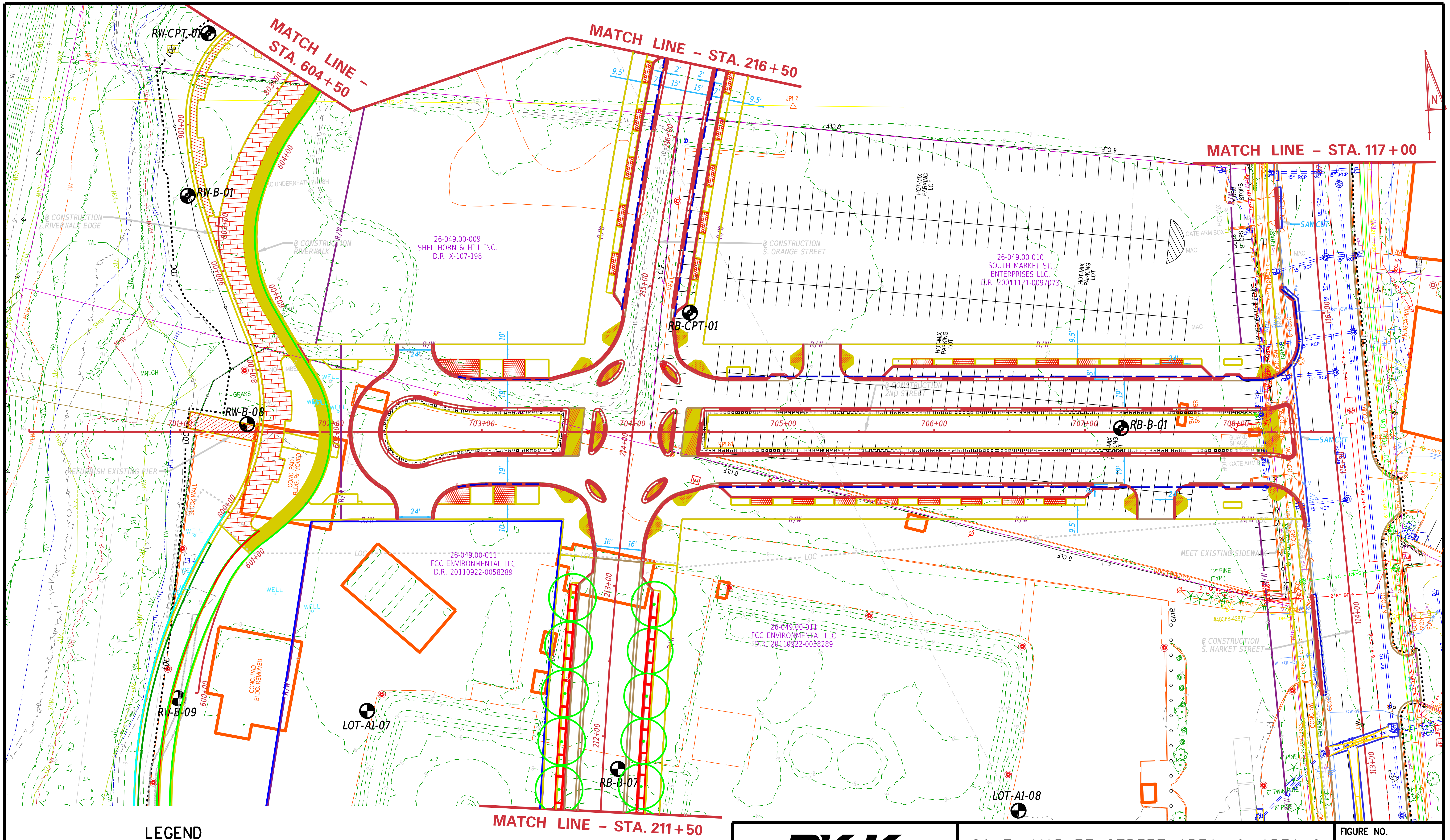
BORING LOCATION PLAN

DRAWN BY TR	APPROVED BY EMK	SCALE AS SHOWN	DATE 06/2023

FIGURE NO.
A-2c

COMMISSION. NO.
20077.002

SHEET NO.
03 of 07



LEGEND
◉ AS-DRILLED BORING LOCATION
◉ HISTORIC BORING LOCATION
◈ AS-DRILLED CPT LOCATION
◎ AS-DRILLED DMT LOCATION

60' 30' 0 60' 120'
Scale 1"=60'

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SOUTH MARKET STREET AREA 1& AREA 2

BORING LOCATION PLAN

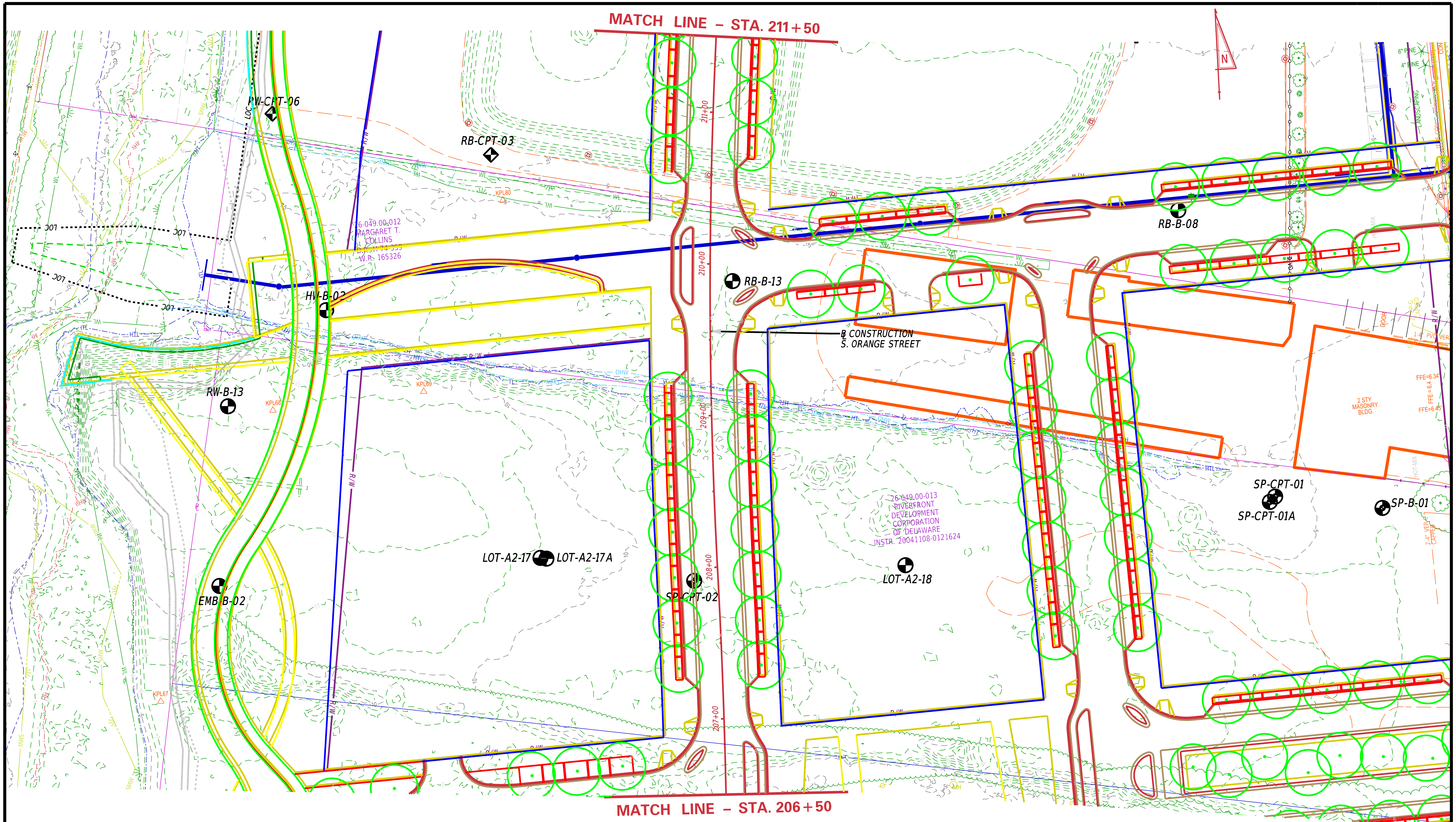
DRAWN BY TR	APPROVED BY EMK	SCALE AS SHOWN	DATE 06/2023

FIGURE NO. A-2d

COMMISSION. NO. 20077.002

SHEET NO. 04 of 07

$DATE$
$FILE$



LEGEND

◐ AS-DRILLED BORING LOCATION

⊕ HISTORIC BORING LOCATION

◆ AS-DRILLED CPT LOCATION

◉ AS-DRILLED DMT LOCATION

60' 30' 0 60' 120'

Scale 1"=60'

$DATE$
$FILE$

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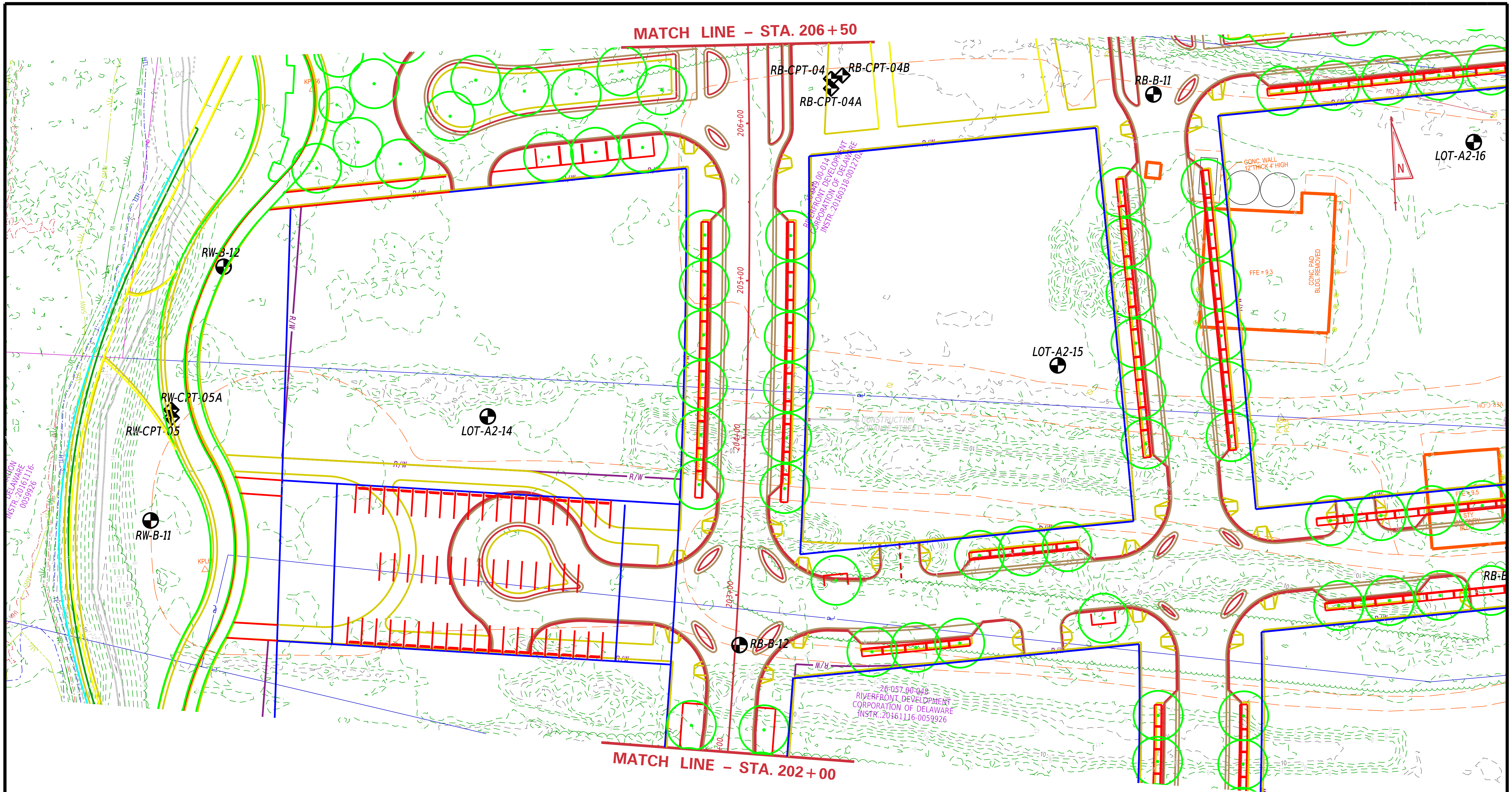
SOUTH MARKET STREET AREA 1& AREA 2

BORING LOCATION PLAN

DRAWN BY TR	APPROVED BY EMK	SCALE AS SHOWN	DATE 06/2023	FIGURE NO. A-2e
				COMMISSION. NO. 20077.002
				SHEET NO. 05 of 07



LEGEND
- ⊕ AS-DRILLED BORING LOCATION
- ⊕ HISTORIC BORING LOCATION
- ◆ AS-DRILLED CPT LOCATION
- ◉ AS-DRILLED DMT LOCATION

60' 30' 0 60' 120'

Scale 1"=60'

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SOUTH MARKET STREET AREA 1& AREA 2

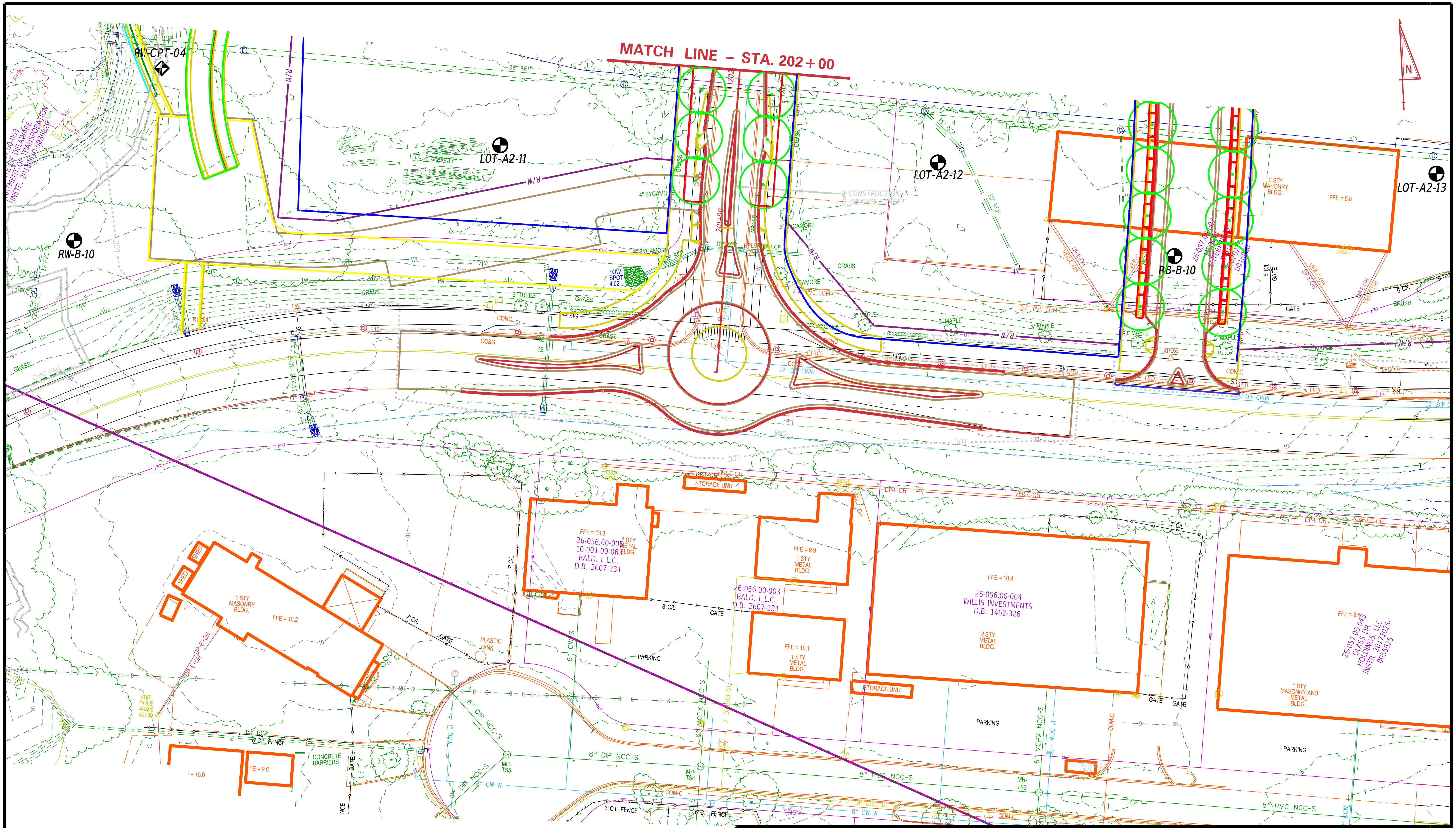
BORING LOCATION PLAN

DRAWN BY	APPROVED BY	SCALE	DATE
TR	EMK	AS SHOWN	06/2023

FIGURE NO.
A-2f

COMMISSION. NO.
20077.002

SHEET NO.
06 of 07



LEGEND

- ◐ AS-DRILLED BORING LOCATION
- ⊕ HISTORIC BORING LOCATION
- ◈ AS-DRILLED CPT LOCATION
- ◉ AS-DRILLED DMT LOCATION

60' 30' 0 60' 120'

Scale 1"=60'

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SOUTH MARKET STREET AREA 1& AREA 2

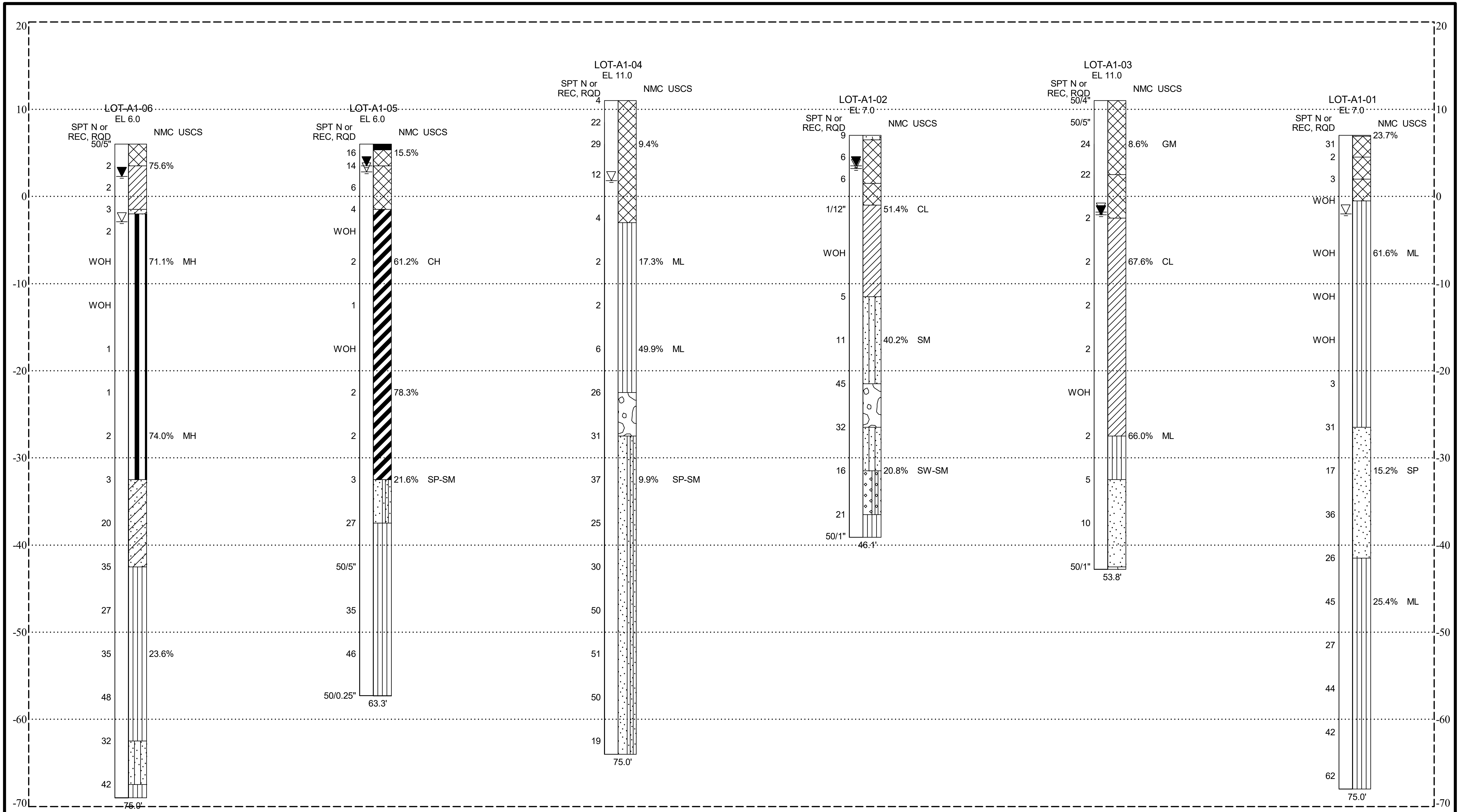
BORING LOCATION PLAN

DRAWN BY	APPROVED BY	SCALE	DATE
TR	EMK	AS SHOWN	06/2023

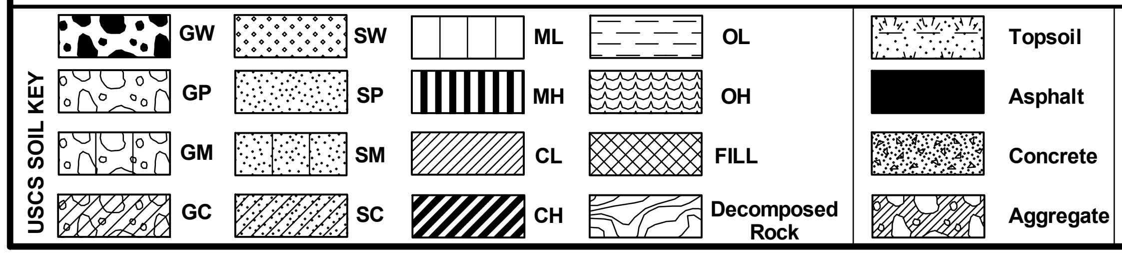
FIGURE NO.
A-2g

COMMISSION. NO.
20077.002

SHEET NO.
07 of 07



USCS SOIL KEY



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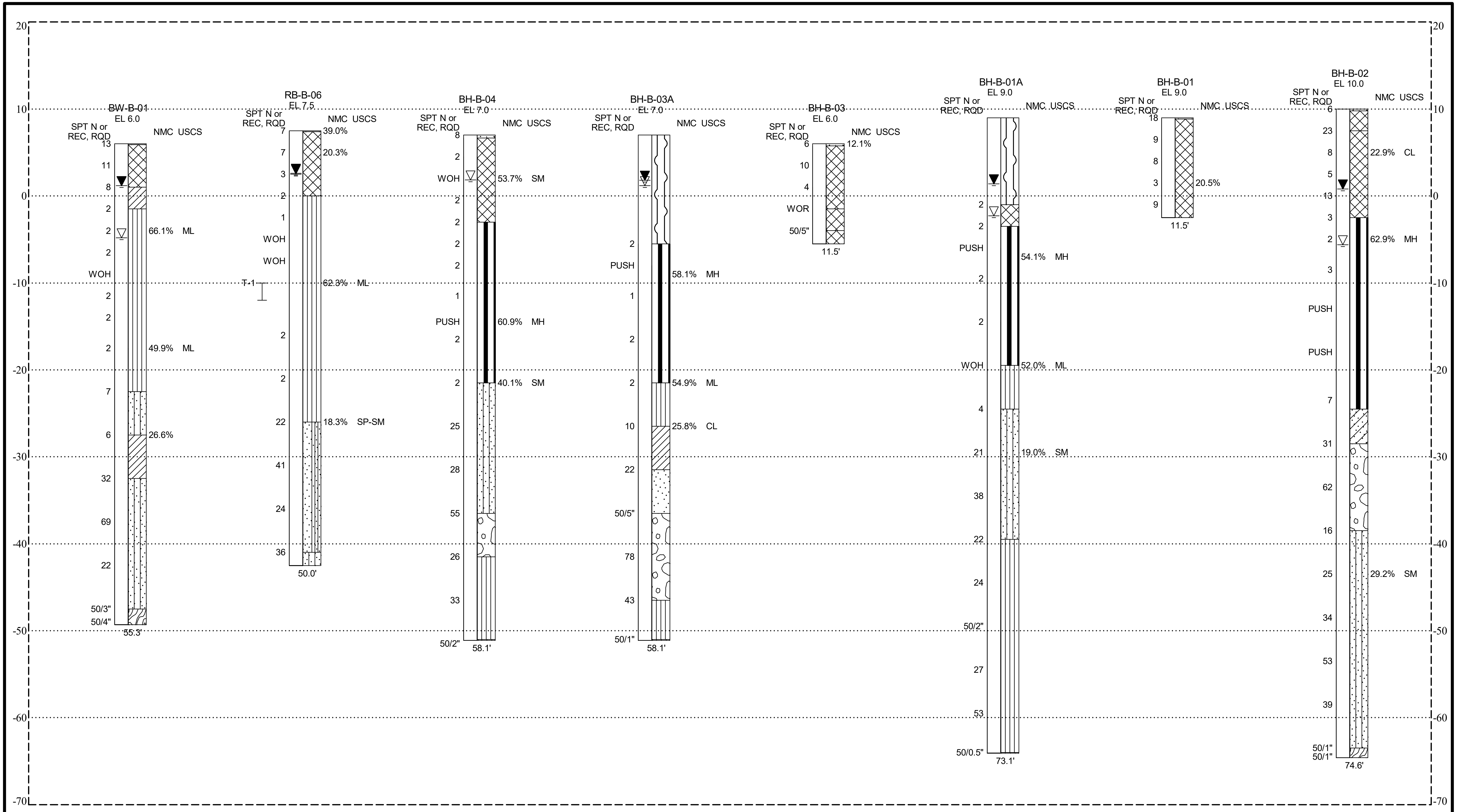
Title:
Summary of Boring Data
South Market Street Area 1
Parcel (LOT) Borings

Drawn: ACR
Approved: EMK
Date: 9/13/21

Figure No.
A-3a

Comm. No. 20077.000



USCS SOIL KEY

GW	SW	ML	OL	Topsoil
GP	SP	MH	OH	Asphalt
GM	SM	CL	FILL	Concrete
GC	SC	CH	Decomposed Rock	Aggregate

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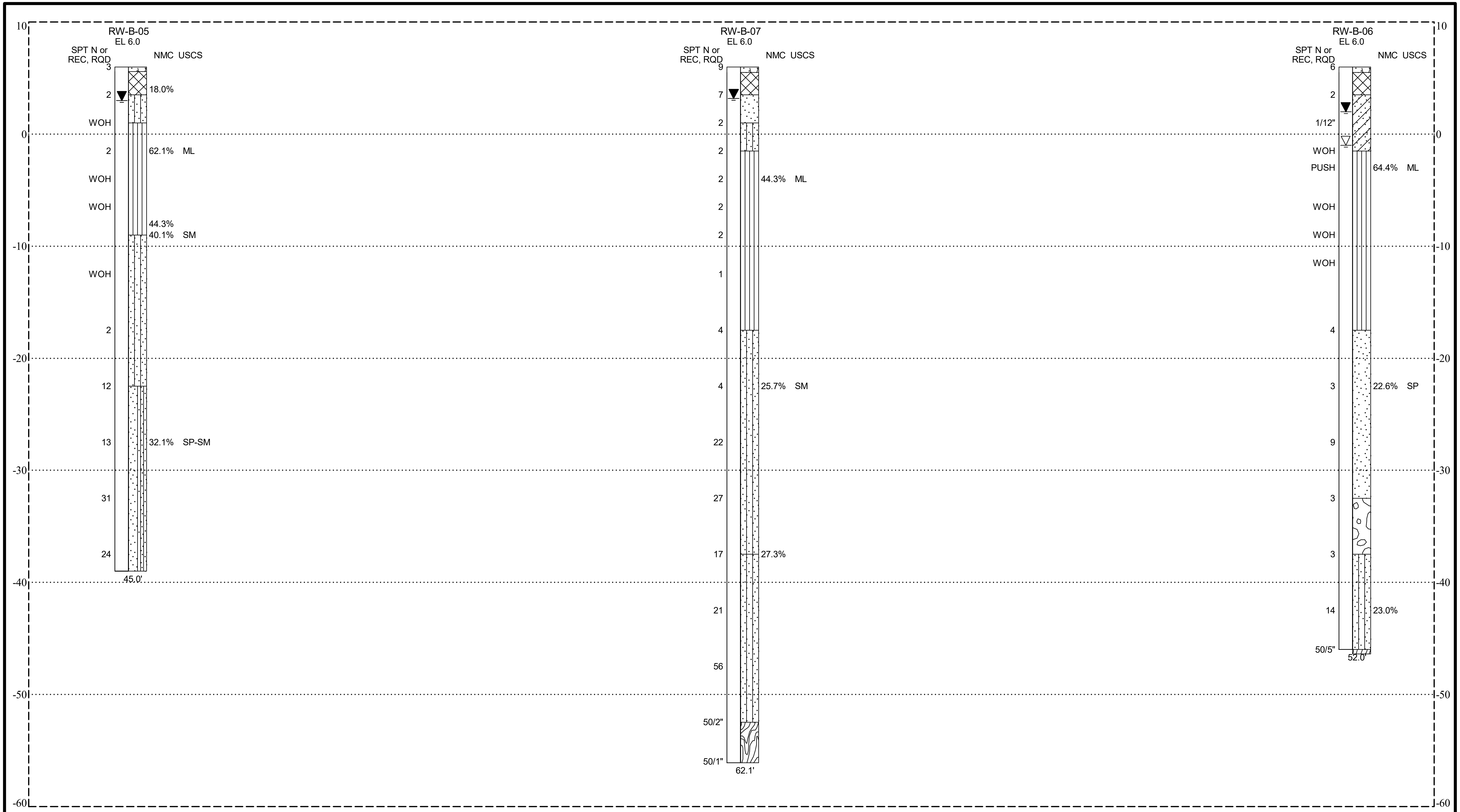
Title:

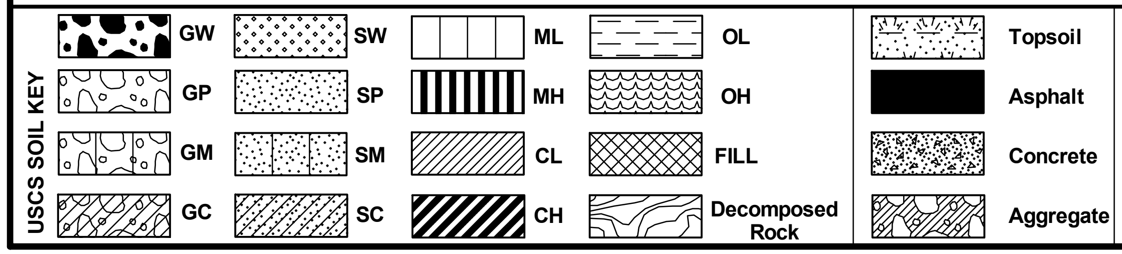
Summary of Boring Data
South Market Street Area 1
Bulkhead and Boardwalk Area

Figure No. A-3b

Drawn: ACR | Approved: EMK | Date: 9/13/21 | Comm. No. 20077.000

RKK FENCE - USCS (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 9/13/21





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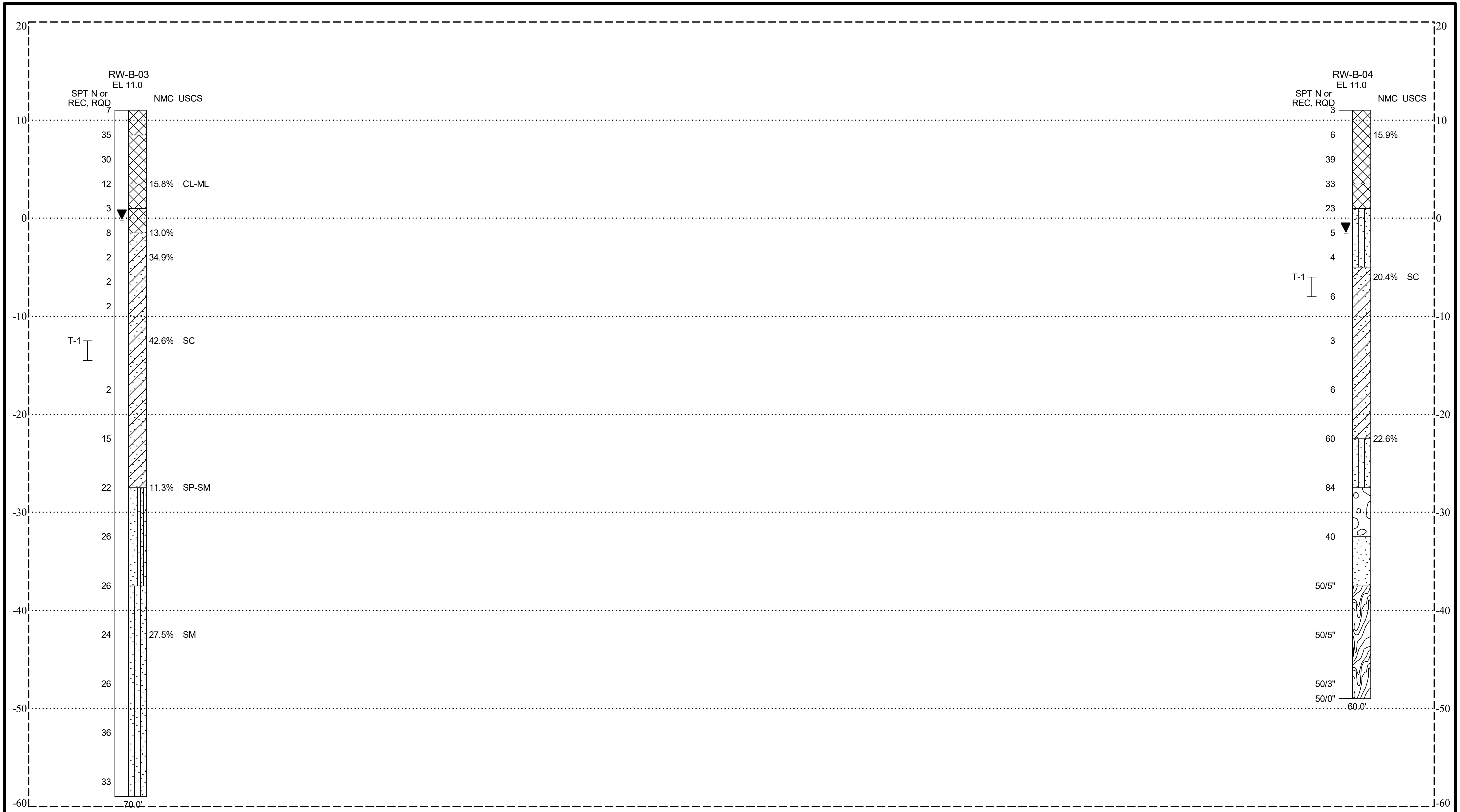
Title: **Summary of Boring Data**
South Market Street Area 1
Retaining Wall No. 3

Figure No. **A-3c**

Drawn: ACR
Approved: EMK
Date: 9/13/21
Comm. No. 20077.000

RKK FENCE - USCS (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 9/13/21



USCS SOIL KEY

GW	SW	ML	OL	Topsoil
GP	SP	MH	OH	Asphalt
GM	SM	CL	FILL	Concrete
GC	SC	CH	Decomposed Rock	Aggregate

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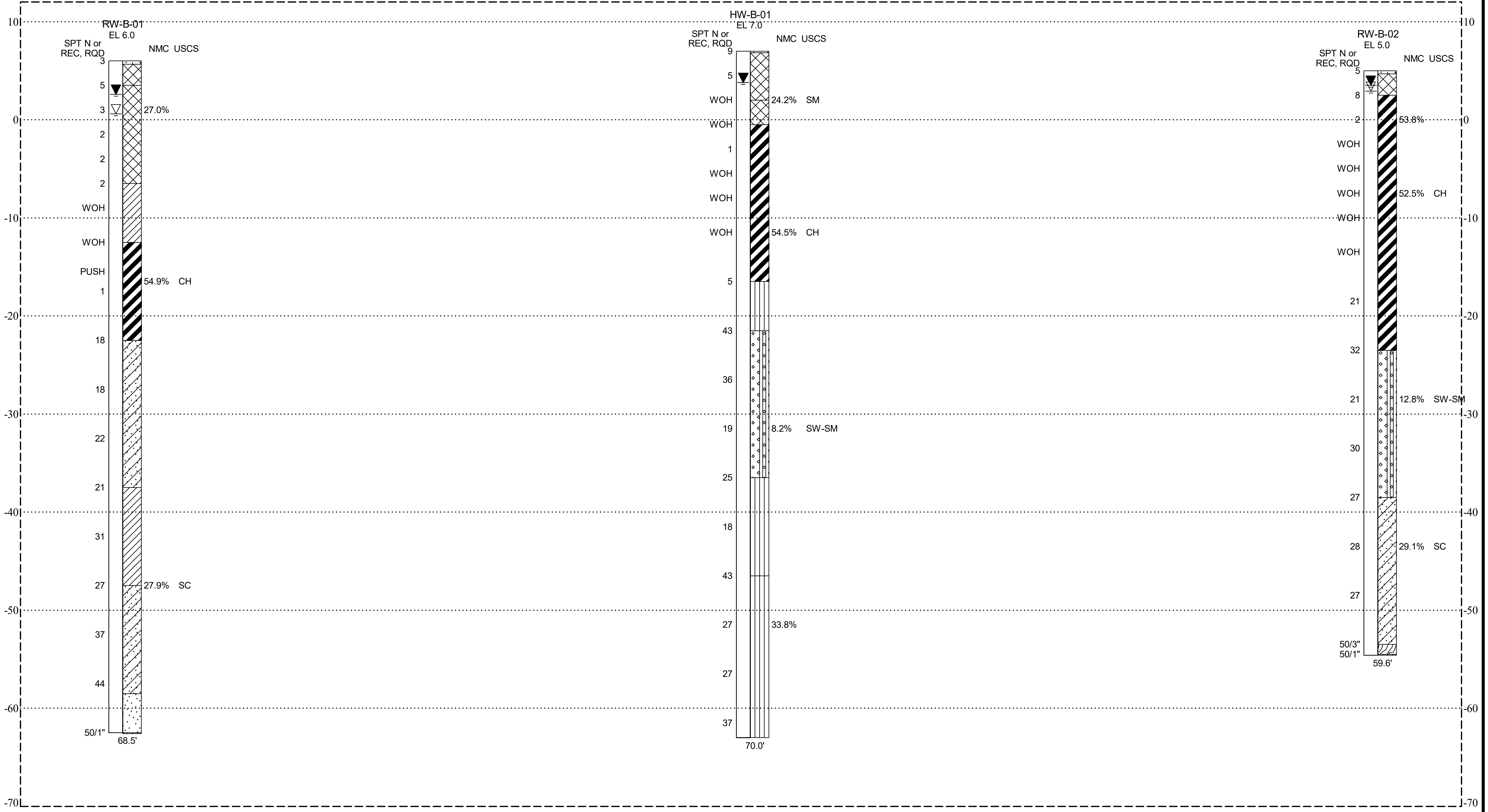
Title: **Summary of Boring Data**
South Market Street Area 1
Retaining Wall No. 2

Figure No. A-3d

Drawn: ACR
Approved: EMK
Date: 9/13/21
Comm. No. 20077.000

RKK FENCE - USCS (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 9/13/21



USCS SOIL KEY

▨	GW	▨	SW	▨	ML	▨	OL	▨	Topsoil
▨	GP	▨	SP	▨	MH	▨	OH	■	Asphalt
▨	GM	▨	SM	▨	CL	▨	FILL	▨	Concrete
▨	GC	▨	SC	▨	CH	▨	Decomposed Rock	▨	Aggregate

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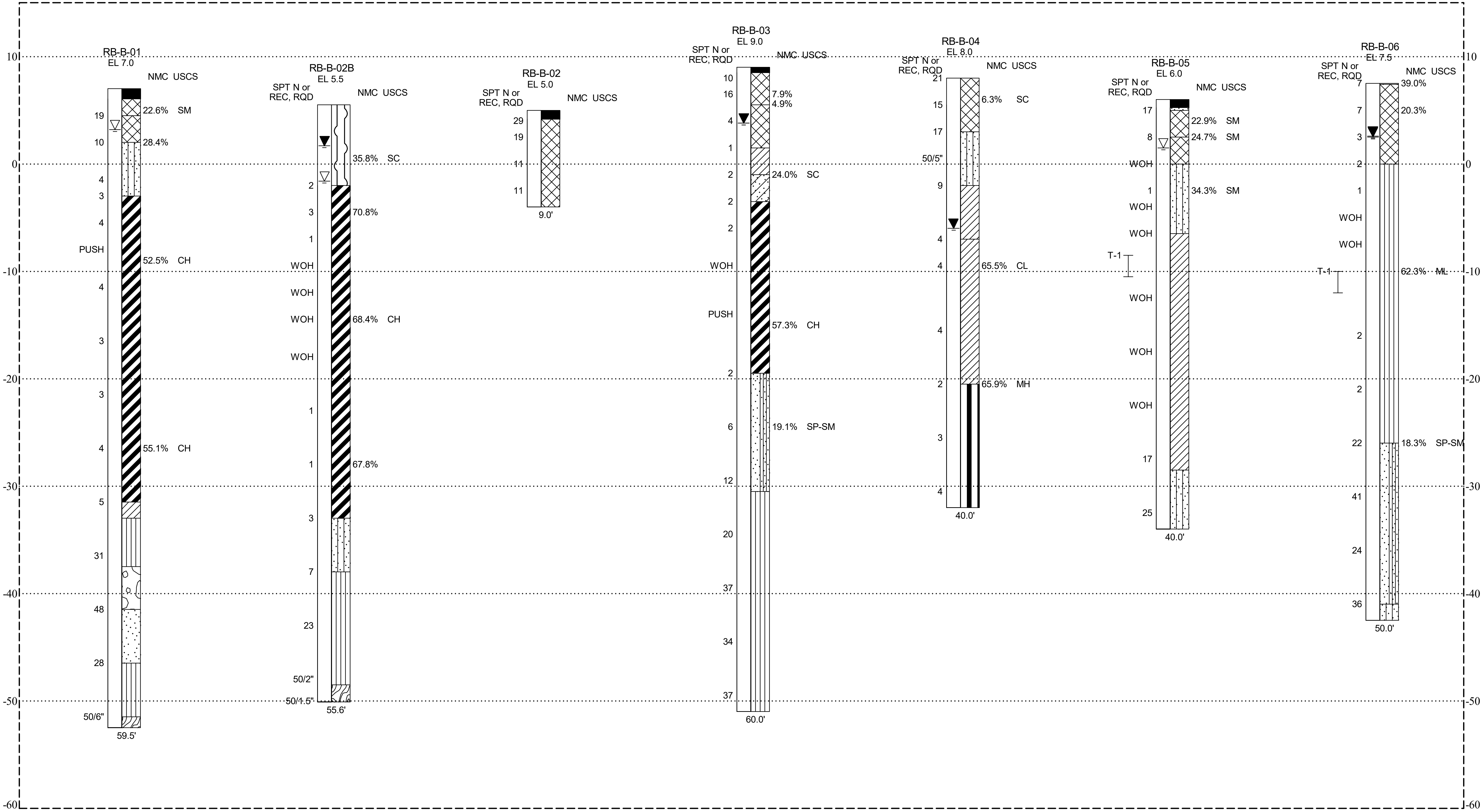
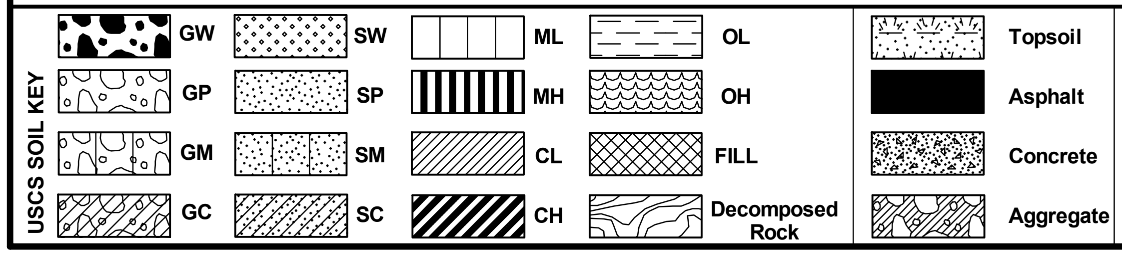
Title: **Summary of Boring Data**
South Market Street Area 1
Retaining Wall No. 01 and Headwall

Figure No. **A-3e**

Drawn: ACR
Approved: EMK
Date: 9/13/21
Comm. No. 20077.000

RKK FENCE - USCS (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 9/13/21





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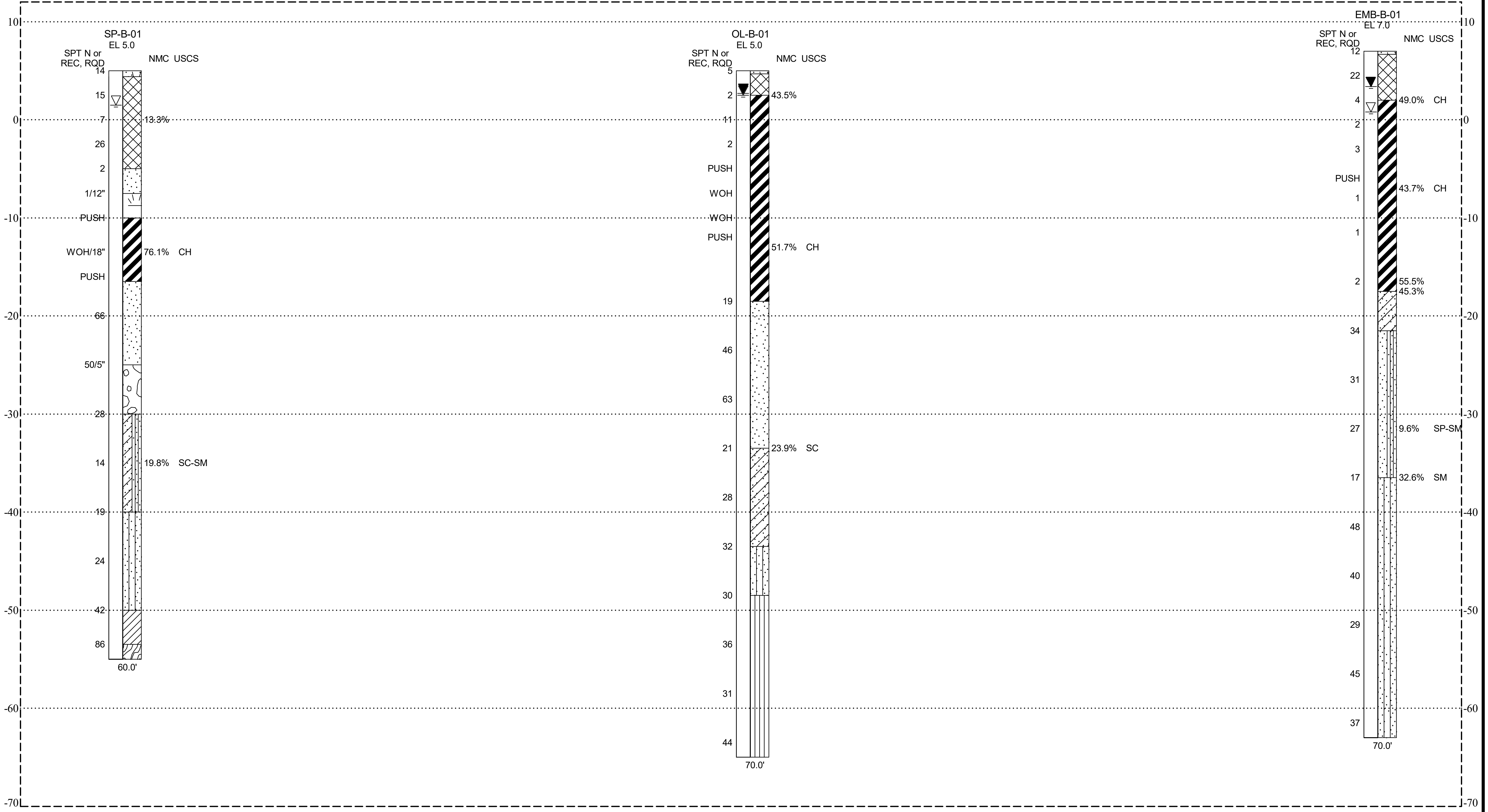
Title: **Summary of Boring Data**
South Market Street Area 1
Roadway Borings

Drawn: ACR
Approved: EMK
Date: 9/13/21

Figure No. **A-3f**

Comm. No. 20077.000

RKK FENCE - USCS (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 9/13/21



USCS SOIL KEY

▨ GW
▨ GP
▨ GM
▨ GC
▨ SW
▨ SP
▨ SM
▨ SC
▨ ML
▨ MH
▨ CL
▨ CH
▨ OL
▨ OH
▨ FILL
▨ Decomposed Rock
▨ Topsoil
■ Asphalt
▨ Concrete
▨ Aggregate

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Title: **Summary of Boring Data**

South Market Street Area 1
Embankment, Overlook and Stockpile Areas

Figure No. **A-3g**

Drawn: ACR
Approved: EMK
Date: 9/13/21
Comm. No. 20077.000

USCS SOIL KEY

- GW
- GP
- GM
- GC
- SW
- SP
- SM
- SC
- ML
- MH
- CL
- CH
- OL
- OH
- FILL
- Decomposed Rock
- Topsoil
- Asphalt
- Concrete
- Aggregate

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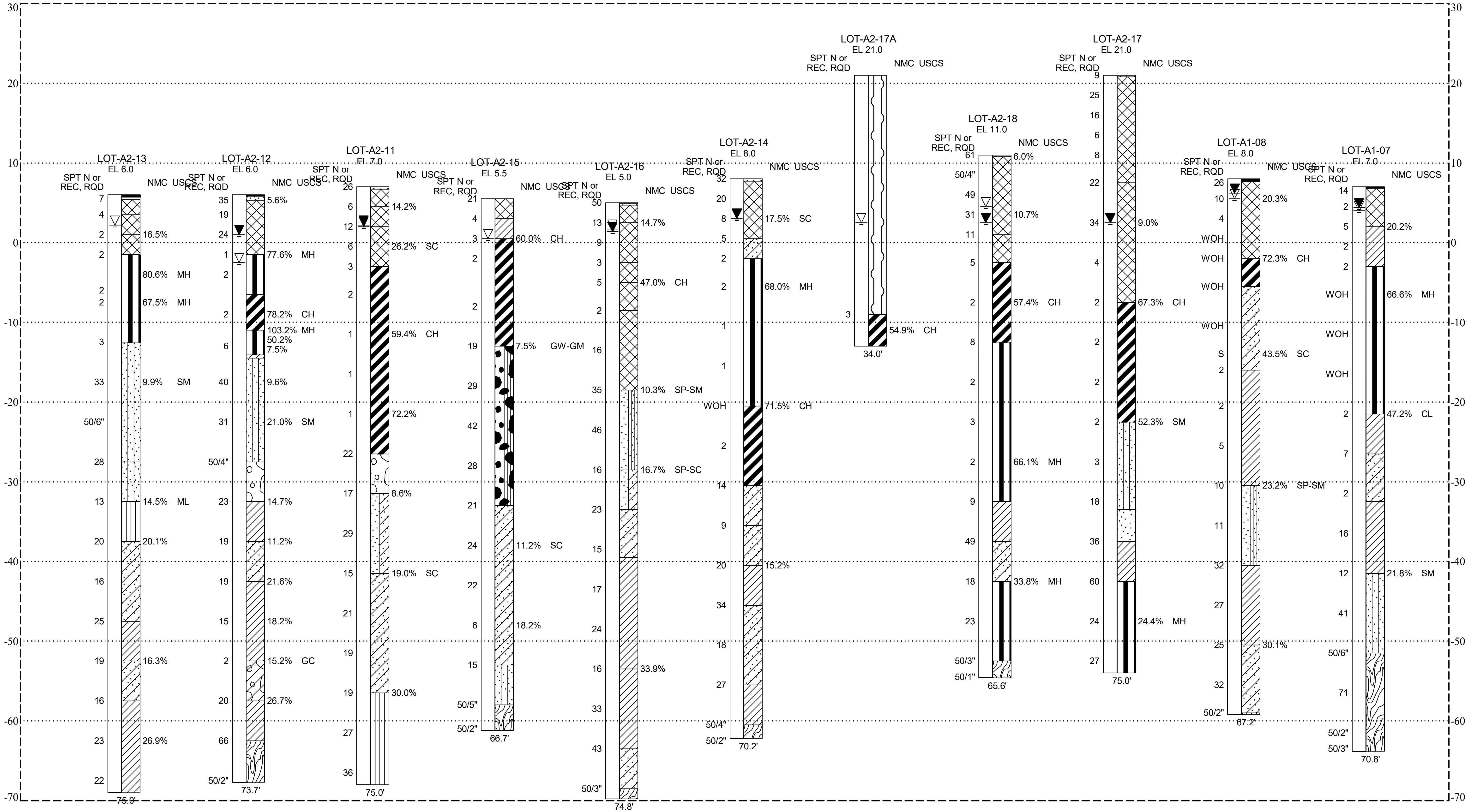
Title: **Summary of Boring Data**
South Market Street Area 2
Embankment and Head Wall Area

Drawn: ACR
Approved: EMK
Date: 5/31/23

Figure No.
A-3h

Comm. No. 20077.000

RKK FENCE - USCS (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 5/31/23



USCS SOIL KEY

●	GW	░	SW	▥	ML	☰	OL	░	Topsoil
○	GP	░	SP	▥	MH	≈	OH	■	Asphalt
○	GM	░	SM	▨	CL	▩	FILL	░	Concrete
▨	GC	▨	SC	▨	CH	≈	Decomposed Rock	▨	Aggregate

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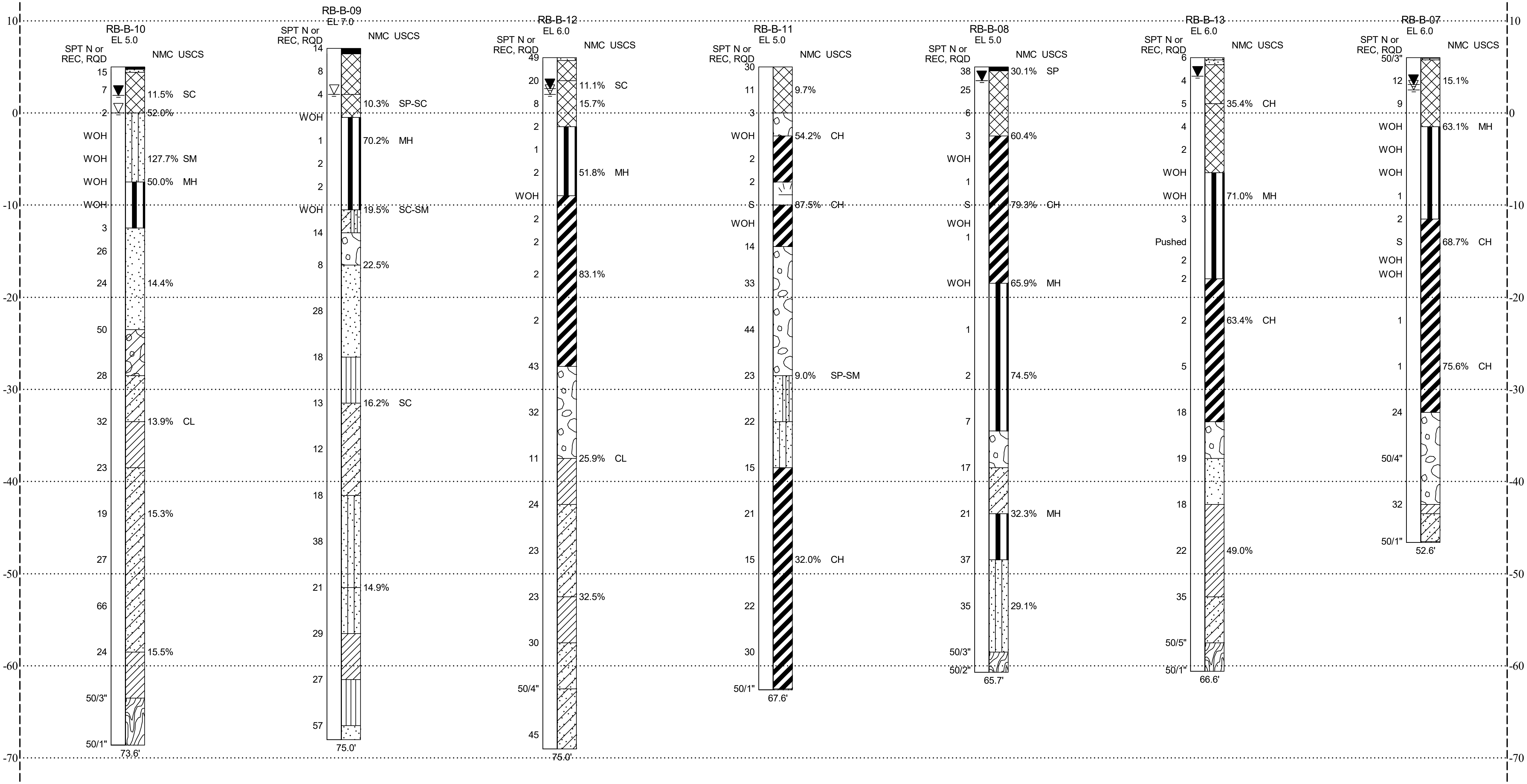
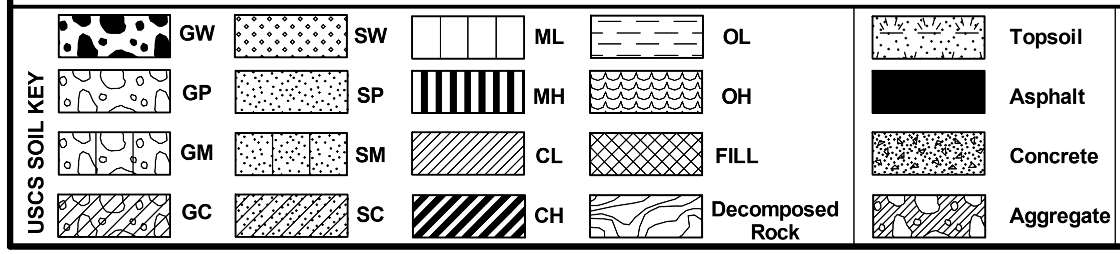
Title:
Summary of Boring Data
South Market Street Area 2
Parcel (LOT) Borings

Figure No.
A-3i

Drawn: ACR
Approved: EMK
Date: 5/31/23
Comm. No. 20077.000

RKK FENCE - USCS (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 5/31/23





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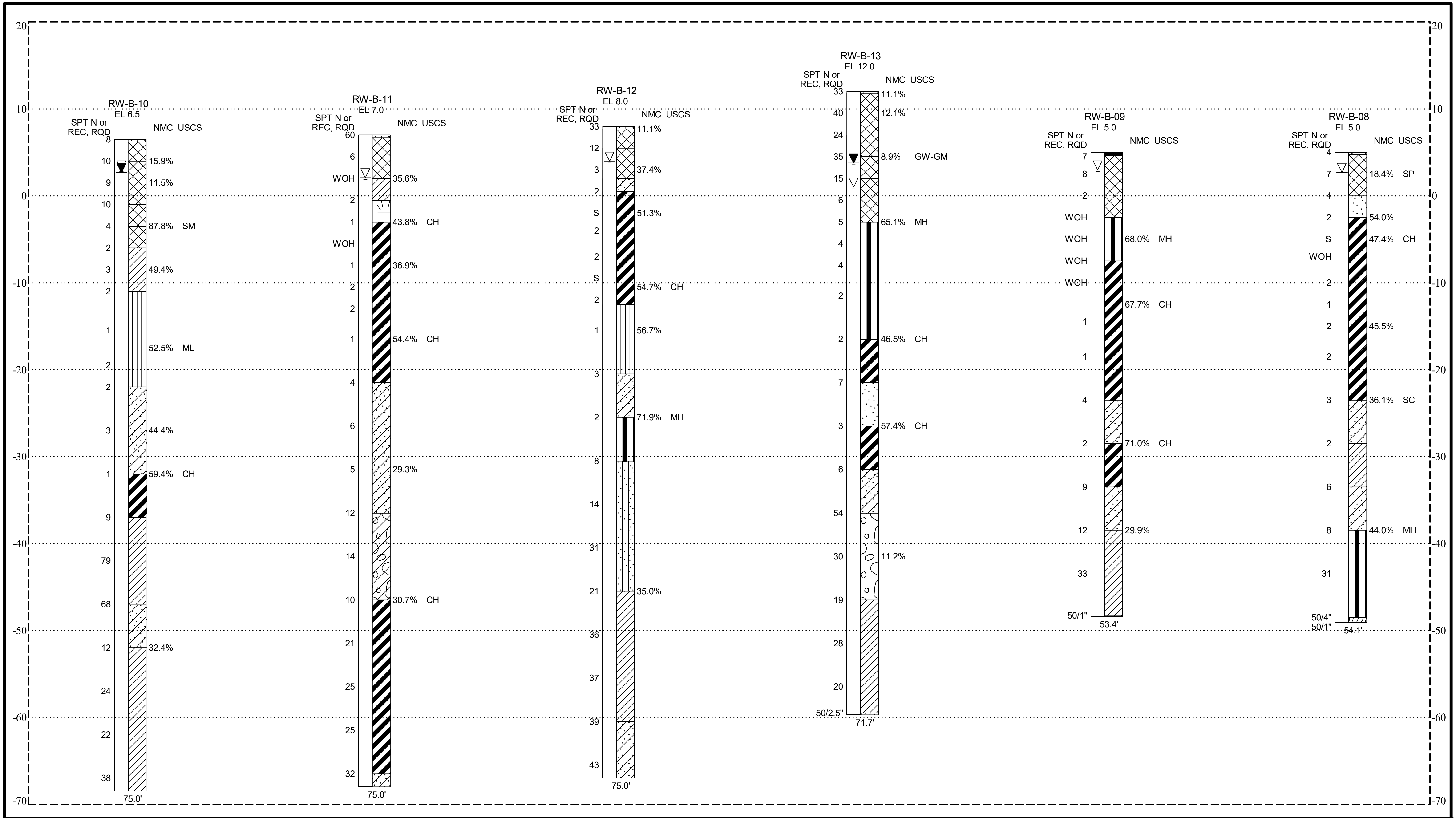
Title: **Summary of Boring Data**
South Market Street Area 2
Roadway Borings

Figure No. **A-3j**

Drawn: ACR	Approved: EMK	Date: 5/31/23	Comm. No. 20077.000

RKK FENCE - USCS (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 5/31/23



USCS SOIL KEY

▨ GW	▨ SW	▨ ML	▨ OL	▨ Topsoil
▨ GP	▨ SP	▨ MH	▨ OH	■ Asphalt
▨ GM	▨ SM	▨ CL	▨ FILL	▨ Concrete
▨ GC	▨ SC	▨ CH	▨ Decomposed Rock	▨ Aggregate

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Title: **Summary of Boring Data**
South Market Street Area 2
Retaining Wall Borings

Figure No. A-3k

Drawn: ACR
Approved: EMK
Date: 5/31/23
Comm. No. 20077.000

RKK FENCE - USCS (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 5/31/23

Appendix B

Table B-1: Summary of Borings and Soundings for Infrastructure Improvement

Boring No.	Test Type	Northing	Easting	Ground Surface Elevation	Depth (ft)
BH-B-01	SPT	632322.36	617322.21	9.0	11.5
BH-B-01A	SPT	632320.08	617321.19	9.0	73.0
BH-B-02	SPT	632290.63	617325.11	10.0	74.6
BH-B-03	SPT	632349.98	617084.16	6.0	11.5
BH-B-03A	SPT	632345.55	617081.84	7.0	58.1
BH-B-04	SPT	632319.21	617067.74	7.0	58.1
BH-CPT-01	CPT	632309.46	617306.97	10.0	43.4
BH-CPT-02	CPT	632317.31	617189.33	7.5	38.4
BW-B-01	SPT	632261.18	616905.14	6.0	55.3
EMB-B-01	SPT	631517.98	616487.99	7.0	70.0
EMB-B-02	SPT	630292.47	616059.73	11.0	66.2
EMB-CPT-01	CPT	631527.73	616485.73	7.0	30.1
EMB-CPT-02	CPT	631426.73	616479.03	8.5	28.3
HW-B-01	SPT	631233.22	616257.74	7.0	70.0
HW-B-02	SPT	630470.47	616139.33	5.0	61.5
OL-B-01	SPT	631310.15	616361.09	5.0	70.0
RB-B-01	SPT	630874.00	616763.00	7.0	59.5
RB-B-02	SPT	631254.00	616818.00	5.0	9.0
RB-B-02A	SPT	631247.00	616801.00	5.5	55.6
RB-B-03	SPT	631393.00	616592.00	9.0	60.0
RB-B-04	SPT	631694.79	617000.04	8.0	40.0
RB-B-05	SPT	632000.01	617203.52	6.0	40.0
RB-B-06	SPT	632307.96	616964.24	7.5	50.0
RB-B-07	SPT	630665.28	616418.36	6.0	52.6
RB-B-08	SPT	630507.46	616703.87	5.0	65.7
RB-B-09	SPT	629784.88	616859.40	7.0	75.0
RB-B-10	SPT	629552.52	616630.54	5.0	73.6
RB-B-11	SPT	630093.39	616641.91	5.0	67.6
RB-B-12	SPT	629757.25	616361.52	6.0	75.0
RB-B-13	SPT	630475.87	616407.94	6.0	66.6
RB-CPT-01	CPT	630964.82	616481.41	8.0	70.4
RB-CPT-02	CPT	630964.82	616481.41	8.0	36.6
RB-CPT-03	CPT	630567.19	616253.11	5.5	42.1
RB-CPT-04	CPT	630113.74	616438.02	5.0	7.1
RB-CPT-04A	CPT	630107.55	616437.73	5.0	19.2
RB-CPT-04B	CPT	630115.55	616445.34	5.0	34.2
RW-B-01	SPT	631059.31	616152.85	6.0	68.5
RW-B-02	SPT	631398.55	616301.50	5.0	59.6
RW-B-03	SPT	631642.08	616428.91	11.0	70.0
RW-B-04	SPT	631983.87	616612.13	11.0	60.0
RW-B-05	SPT	632122.11	616672.31	6.0	45.0
RW-B-06	SPT	632243.85	616737.37	6.0	52.0

Table B-1: Summary of Borings and Soundings for Infrastructure Improvement

Boring No.	Test Type	Northing	Easting	Ground Surface Elevation	Depth (ft)
RW-B-07	SPT	632202.57	616698.63	6.0	62.1
RW-B-08	SPT	630906.06	616184.46	5.0	54.1
RW-B-09	SPT	630726.93	616129.33	5.0	53.4
RW-B-10	SPT	629599.88	615906.46	6.5	75.0
RW-B-11	SPT	629855.46	615992.09	7.0	75.0
RW-B-12	SPT	630014.19	616046.63	8.0	75.0
RW-B-13	SPT	630410.47	616071.45	12.0	71.7
RW-CPT-01	CPT	630950.30	616455.90	8.0	32.8
RW-CPT-02	CPT	631485.38	616342.30	6.0	27.9
RW-CPT-03	CPT	631852.66	616537.60	6.0	39.3
RW-CPT-04	CPT	629710.51	615969.92	6.0	73.7
RW-CPT-05	CPT	629920.00	616008.80	7.0	15.0
RW-CPT-05A	CPT	629925.00	616008.80	7.0	49.8
RW-CPT-06	CPT	630601.65	616110.56	6.0	53.9
RW-DMT-01	DMT	631297.15	616284.81	5.0	28.5
RW-DMT-02	DMT	631709.62	616438.53	5.0	31.5
SP-B-01	SPT	630304.67	616828.34	5.0	60.0
SP-CPT-01	CPT	630315.78	616758.02	5.0	20.5
SP-CPT-01A	CPT	630312.41	616754.34	5.0	21.1
SP-CPT-02	CPT	630279.91	616372.61	9.0	44.9

Datum: NAD 83 State Plane Zone: Delaware Units: US Survey Feet

SPT: Standard Penetration Test CPT: Cone Penetration Test DMT: Dilatometer Test

Table B-2: Summary of Borings for Development Parcels

Boring No.	Test Type	Northing	Easting	Ground Surface Elevation	Depth (ft)
LOT-A1-01	SPT	632331.40	617225.12	7.0	75.0
LOT-A1-02	SPT	632000.62	616758.61	7.0	46.1
LOT-A1-03	SPT	631857.93	617002.46	11.0	53.8
LOT-A1-04	SPT	631698.36	616593.55	11.0	75.0
LOT-A1-05	SPT	631451.73	616837.53	6.0	63.3
LOT-A1-06	SPT	631137.60	616713.41	6.0	75.0
LOT-A1-07	SPT	630712.16	616254.18	7.0	70.8
LOT-A1-08	SPT	630624.06	616682.11	8.0	67.2
LOT-A2-11	SPT	629648.24	616190.34	7.0	75.0
LOT-A2-12	SPT	629622.23	616477.96	6.0	73.7
LOT-A2-13	SPT	629598.09	616805.95	6.0	75.0
LOT-A2-14	SPT	629910.48	616209.32	8.0	70.2
LOT-A2-15	SPT	629924.48	616572.45	5.5	66.7
LOT-A2-16	SPT	630052.64	616843.51	5.0	74.8
LOT-A2-17	SPT	630300.15	616272.09	21.0	75.0
LOT-A2-17A	SPT	630299.41	616276.03	21.0	34.0
LOT-A2-18	SPT	630283.01	616512.26	9.0	65.6

Datum: NAD 83 State Plane Zone: Delaware Units: US Survey Feet

SPT: Standard Penetration Test

SPT Boring Logs

FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

COHESIONLESS SOILS (Silt, Sand, Gravel, and Combinations)

Density

Very Loose	4 blows/ft or less
Loose	5 to 10 blows/ft
Medium Dense	11 to 30 blows/ft
Dense	31 to 50 blows/ft
Very Dense	51 blows/ft or more

Particle Size Identification

Boulders		12 inches diameter or more
Cobbles		3 to 12 inch diameter
Gravel	Coarse:	3/4 to 3 inch diameter
	Fine:	1/4 to 3/4 inch diameter
Sand	Coarse:	2 mm to 1/4 inch (diameter of pencil lead)
	Medium:	0.425 to 2 mm (diameter of broom straw)
	Fine:	0.075 to 0.425 mm (diameter of human hair)
Silt		0.005 to 0.075 mm (Cannot see particles)

Relative Proportions

Descriptive Term	Percent
Trace	1 to 10
Little	11 to 20
Some	21 to 35
And	36 to 50

COHESIVE SOILS (Clay, Silt, and Combinations)

Consistency

Very Soft	2 blows/ft or less
Soft	3 to 4 blows/ft
Medium Stiff	5 to 8 blows/ft
Stiff	9 to 15 blows/ft
Very Stiff	16 to 30 blows/ft
Hard	31 blows/ft or more

Plasticity

Degree of Plasticity	Plasticity Index
No to Slight	0 - 4
Slight	5 - 7
Medium	8 - 22
High to Very High	over 22

Soil Classifications on Test Boring Logs are made by visual-manual inspection of samples. Soil classification symbols using lower case letters are based on a visual-manual classification. Soil classification symbols using upper case letters are based on laboratory testing.

Standard Penetration Test

Driving a 2.0-inch OD, 1 3/8-inch ID sampler a distance of 1.0-foot into undisturbed soil with a 140-lb hammer free falling a distance of 30.0-inches. It is required to drive the spoon 6.0-inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating and making the test are recorded each 6.0-inches of penetration on the Test boring Log (Example 6-8-9, 8+9=17 blows/ft). (ASTM D-1586)

Strata Changes

In the column "Soil Descriptions" on the Test Boring Logs, the horizontal lines represent strata changes. A solid line represents an actually observed change, a dashed line represents an estimated change.

Ground Water

Observations were made at the time indicated. Porosity of soil strata, weather conditions, site topography, etc. may cause changes in the water levels indicated on the Test Boring Log.

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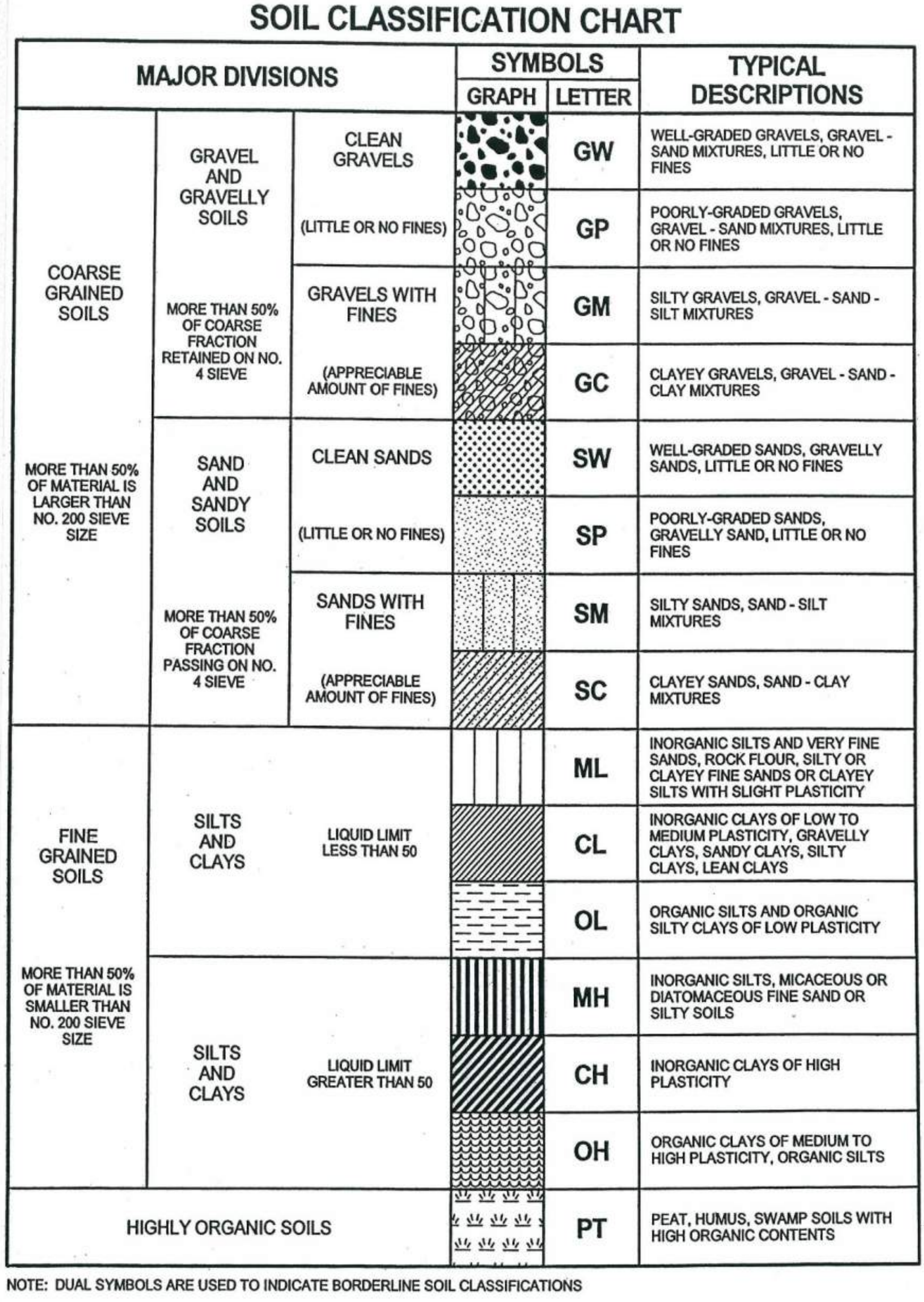
Title:
FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

Figure No: B-1

Drawn:	Approved:	Date:	Comm No:
JJV	GKG	August, 2015	General



SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS	●	GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)	○	GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES	○	GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)	▨	GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS	⁘	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(LITTLE OR NO FINES)	░	SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES	▥	SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)	▨	SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	▥	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR 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 SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	▥	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			▨	CH	INORGANIC CLAYS OF HIGH PLASTICITY
			▦	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			⁂	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

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Title: UNIFIED SOIL CLASSIFICATION SYSTEM

Figure No: B-2

Drawn: KPR

Approved: SAB

Date: January 2019

Comm No: General

AASHTO SOIL CLASSIFICATION CHART

GENERAL CLASSIFICATION	SOIL TYPE	SYMBOLS		GRADING REQUIREMENTS	PHYSICAL CHARACTERISTICS
		GRAPH	LETTER		
GRANULAR MATERIALS (35 percent or less of total sample passing No. 200)	GRAVEL & SAND	●	A-1-a	Sieve analysis % passing No. 10 = 50 max No. 40 = 30 max No. 200 = 15 max	P.I. = 6 max
		⁘	A-1-b	Sieve analysis % passing No. 40 = 50 max No. 200 = 25 max	P.I. = 6 max
	FINE SAND	░	A-3	Sieve analysis % passing No. 40 = 51 min No. 200 = 10 max	Non-plastic
	SILTY OR CLAYEY GRAVEL & SAND	▥	A-2-4	Sieve analysis % passing No. 200 = 35 max	L.L. = 40 max P.I. = 10 max
		▥	A-2-5	Sieve analysis % passing No. 200 = 35 max	L.L = 41 min P.I. = 10 max
		▨	A-2-6	Sieve analysis % passing No. 200 = 35 max	L.L. = 40 max P.I. = 11 min
		▨	A-2-7	Sieve analysis % passing No. 200 = 35 max	L.L. = 41 min P.I. = 11 min
SILT-CLAY MATERIALS (More than 35 oercent of total sample passing No. 200)	SILTY SOILS	▥	A-4	Sieve analysis % passing No. 200 = 36 min	L.L. = 40 max P.I. = 10 max
		▥	A-5	Sieve analysis % passing No. 200 = 36 min	L.L. = 41 min P.I. = 10 max
	CLAYEY SOILS	▨	A-6	Sieve analysis % passing No. 200 = 36 min	L.L. = 40 max P.I. = 11 min
		▧	A-7-5	Sieve analysis % passing No. 200 = 36 min	L.L. = 41 min P.I. = 11 min
		▨	A-7-6	Sieve analysis % passing No. 200 = 36 min	L.L. = 41 min P.I. = 11 min
	PEAT OR MUCK	⁂	A-8	Based on Visual Classification	

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

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Title:			Figure No:
AASHTO SOIL CLASSIFICATION SYSTEM			B-3
Drawn: JJV	Approved: EMK	Date: August, 2015	Comm No: General

TEST BORING LOG

Boring No. BH-B-01
Page 1 of 1

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 632322
EAST: 617322
ELEVATION: 9 - ft
START DATE: 4/26/2021
END DATE: 4/26/2021
DRILLER: Mark
LOGGED BY: JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	⊠	0	11 10 8					EL 8.8 0.2		2-Inches TOPSOIL Sample S-1: No Recovery	Composite Sample (BH-B-01 and -02; 2 to 12-ft): pH: 7.0, As-Is Resistivity (ohm-cm): 2,900, Wetted Resistivity (ohm-cm): 1,800, Sulfate Content (ppm): <5, Oxidation Reduction (mV): 270, Chloride (ppm): <20, Sulfides: Not Present Sample S-3: Contained a piece of 1-Inch brick fragment VOC = 62.9 ppm Spoon was sliding, probably at edge of existing bulkhead Grouted upon completion
S-2	⊠	6	6 5 4							FILL Sampled As: Moist, Stiff, Reddish Brown, CLAY, Little Medium to Fine Sand, Trace Root Fragments	
S-3	⊠	6	5 4 4				5			Sample S-3: Medium Stiff, Brown, Trace Brick Fragments	
S-4	⊠	7	1 1 2	20.5%						Sample S-4: Soft, Dark Brown, Some Medium to Fine Sand, Little Wood Fragments	
S-5	⊠	9	8 7 2				10	EL -2.5		Sample S-5: Gray/Brown, Trace Medium to Fine Sand	
								11.5		Bottom of Boring @ 11.5 ft	
							15				
							20				
							25				
							30				
							35				

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
⊠ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
◫ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
⊠ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
■ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

TEST BORING LOG

Boring No. BH-B-01A
Page 1 of 2

PROJECT: South Market Street - RDC
SITE: New Castle County , Delaware
DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 632320
EAST: 617321
ELEVATION: 9 - ft
START DATE: 4/26/2021
END DATE: 4/26/2021
DRILLER: Mark
LOGGED BY: JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
4/26/2021	8:42:00 AM	11.3	-	47.2
4/27/2021	9:50:00 AM	7.6	-	44.3

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Blank Auger from 0-ft to 10-ft	
							5				
							▼				
S-6	☒	2	2 1 1				10 ▽	EL -1.0 10.0		FILL Sampled As: Moist, Very Soft, Black, CLAY, Trace Brick Fragments	CIUC Test (Sample T-1) Test Results: Cohesion: 69-psf, Drained Friction Angle: 46.3-deg
S-7	☒	12	1 1 1					EL -3.5 12.5		Moist, Very Soft, Dark Gray, Highly Plastic SILT, Some Clay, Some Medium to Fine Sand (MH) [A-7-5 (43)]	
T-1	▥	24	PUSH	54.1%	91	50	15			Sample T-1: Wet	Consolidation Test: Preconsolidation Pressure (tsf): 1.0, Compression Index: 0.71, Recompression Index: 0.08, Initial Void Ratio: 1.949
S-8	☒	18	1 1 1				20			Sample S-8: Little Medium to Fine Sand	Composite Sample (BH-B-01A and -02; 12 to 20-ft): pH: 6.8, As-Is Resistivity (ohm-cm): 1,300, Wetted Resistivity (ohm-cm): 1,300, Sulfate Content (ppm): <5, Oxidation Reduction (mV): 265, Chloride (ppm): <20, Sulfides: Not Present
S-9	☒	18	WOH 1 1				25			Sample S-9: Trace Fine Sand	
S-10	☒	18	1 WOH WOH	52%	48	19	30	EL -19.5 28.5		Moist, Very Soft, Dark Gray, Medium Plasticity SILT, Some Fine Sand, Trace Mica (ML) [A-7-6(14)]	Wet Spoon at 28.5-ft
S-11	☒	18	4 1 3				35	EL -24.5 33.5		Wet, Very Loose, Dark Brown, Black, Coarse to Fine SAND, Little Silt (SM) [A-1-b]	

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
☰ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
31-50	DENSE	9-15	STIFF	AND	36 TO 50
OVER 50	VERY DENSE	16-30	VERY STIFF		
		OVER 30	HARD		

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Wet, Very Loose, Dark Brown, Black, Coarse to Fine SAND, Little Silt (SM) [A-1-b]	
S-12	☒	10	15 9 12	19%	NP	NP	40			Sample S-12: Medium Dense	
S-13	☒	18	19 22 16				45			Sample S-13: Dense, Light Brown, Trace Fine Gravel	
								EL -39.5 48.5		Moist, Very Stiff, Greenish Gray, SILT, Little Medium to Fine Sand (Residual Soil) (ml) [a-4]	
S-14	☒	18	8 8 14				50				
S-15	☒	18	6 13 11				55			Sample S-15: Orangish Gray	
S-16	☒	14	13 45 50/2"				60			Sample S-16: Hard	
S-17	☒	18	11 12 15				65			Sample S-17: Some Medium to Fine Sand	
S-18	☒	18	27 30 23				70			Sample S-18: Hard, Micaceous	
S-19		0.5	50/0.5"					EL -64.0 73.0 EL -64.1 73.1		COMPLETELY WEATHERED ROCK Sampled As: Moist, Greenish Gray, GRAVEL-SIZED ROCK FRAGMENTS, Little Medium to Fine Sand Bottom of Boring @ 73.1 ft	Auger Refusal at 73-ft Grouted after final groundwater reading
							75				
							80				

TEST BORING LOG

Boring No. BH-B-02
Page 1 of 2

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	632291
EAST:	617325
ELEVATION:	10 - ft
START DATE:	4/27/2021
END DATE:	4/27/2021
DRILLER:	Mark
LOGGED BY:	JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
4/27/2021	9:45:00 AM	15.6	-	35.7
4/30/2021	8:40:00 AM	9.2	-	33.5

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	7	3 3 3					EL 9.8 0.2		3-Inches TOPSOIL FILL Sampled As: Moist, Loose, Dark Brown, Medium to Fine SAND, Some Silt, Trace Bricks and Roots Fragments	
								EL 7.5 2.5		FILL Sampled As: Moist, Very Stiff, Brown/Gray, CLAY, Little Medium to Fine Sand, Trace Gravel, Trace Brick Fragments	
S-2	☒	7	6 11 12								
S-3	☒	12	4 2 6	22.9%	30	13	5			Sample S-3: Medium Stiff, Some Coarse to Fine Sand	Sample S-3: VOC = 14.2 ppm
S-4	☒	15	1 3 2				▼			Sample S-4: Medium Stiff, Trace Medium to Fine Sand	Sample S-4: VOC = 19.8 ppm Composite Sample (BH-B-01 and -02; 2 to 12-ft): pH: 7.0, As-Is Resistivity (ohm-cm): 2,900, Wetted Resistivity (ohm-cm): 1,800, Sulfate Content (ppm): <5, Oxidation Reduction (mV): 270, Chloride (ppm): <20, Sulfides: Not Present Composite Sample (BH-B-01A and -02; 12 to 20-ft): pH: 6.8, As-Is Resistivity (ohm-cm): 1,300, Wetted Resistivity (ohm-cm): 1,300, Sulfate Content (ppm): <5, Oxidation Reduction (mV): 265, Chloride (ppm): <20, Sulfides: Not Present
S-5	☒	12	2 11 2				10			Sample S-5: Stiff, Some Medium to Fine Sand, Trace Wood Fragments	
								EL -2.5 12.5		Moist, Soft, Brown/Black, High Plasticity SILT (MH) [A-7-6(54)]	
S-6	☒	15	3 1 2								
S-7	☒	15	3 1 1	62.9%	87	48	∇ 15			Sample S-7: Very Soft, Trace Medium to Fine Sand	
S-8	☒	12	1 2 1				20				
T-1	▥	0	PUSH				25				
T-2	▥	0	PUSH				30				
S-9	☒	18	4 4 3							Sample S-9a: Medium Stiff	
							35	EL -24.5 34.5		Moist, Loose, Grayish Black, Medium to Fine SAND, Little Clay (sc) [a-2-6]	

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

RKK NORTH/EAST (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 5/31/23

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
									Moist, Loose, Grayish Black, Medium to Fine SAND, Little Clay (sc) [a-2-6]	
S-10	☒	8	11 12 19				40	EL -28.5 38.5	Wet, Dense, Brown, Coarse to Fine Angular GRAVEL, Some Coarse to Fine Sand (gp) [a-1-a]	
S-11	☒	12	50 40 22				45		Sample S-11: Very Dense, Little Clay	
S-12	☒	15	11 10 6				50	EL -38.5 48.5	Moist, Medium Dense, Greenish Gray, Coarse to Fine SAND, Some Silt, Trace Mica (Residual Soil) (SM) [A-2-7(1)]	
S-13	☒	18	10 12 13	29.2%	50	19	55			
S-14	☒	18	12 17 17				60		Sample S-14: Dense	
S-15	☒	18	10 31 22				65		Sample S-15: Very Dense	
S-16	☒	18	15 15 24				70		Sample S-16: Dense	
S-17	☒	6	50 50/1"					EL -63.5 73.5	COMPLETELY WEATHERED ROCK Sampled As: Moist, Greenish Gray, SILT, Some Medium to Fine Sand	
S-18		1	50/1"				75	EL -64.6 74.6	Sample S-18: Some Gravel-Sized Rock Fragments Bottom of Boring @ 74.6 ft	Auger Refusal at 74.5-ft Grouted after final groundwater reading
							80			

TEST BORING LOG

Boring No. BH-B-03
Page 1 of 1

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	632350
EAST:	617084
ELEVATION:	6 - ft
START DATE:	4/28/2021
END DATE:	4/28/2021
DRILLER:	Mark
LOGGED BY:	ACR

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	8	2 3 3	12.1%				EL 5.8 0.3		3-Inches TOPSOIL FILL Sampled As: Moist, Loose, Black, Brown, Coarse to Fine SAND, Little Clay, Trace Fine Gravel	
S-2	☒	4	3 5 5								
S-3	☒	0	1 2 2				5			Sample S-3: Very Loose, No Recovery	
S-4	☒	4	WOR WOR WOR					EL -1.5 7.5		FILL Sampled As: Wet, Very Soft, Brownish Gray, CLAY, Little Coarse to Fine Sub-Angular Gravel	
S-5	☒	12	1 1 50/5"				10	EL -4.0 10.0 EL -5.5 11.5		FILL Sampled As: Wet, Very Dense, Black, Coarse to Fine Angular GRAVEL, Some Clay Bottom of Boring @ 11.5 ft	Auger going sideways. Boring terminated at 11.5-ft Grouted upon completion
							15				
							20				
							25				
							30				
							35				

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
☰ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

Boring No. BH-B-03

RKK NORTH/EAST (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 5/31/23

TEST BORING LOG

Boring No. BH-B-03A
Page 1 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	632346
EAST:	617082
ELEVATION:	7 - ft
START DATE:	4/28/2021
END DATE:	4/29/2021
DRILLER:	Mark
LOGGED BY:	JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
4/29/2021	9:58:00 AM	5.8	-	22.4
4/30/2021	8:52:00 AM	5.2	-	20.7

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS: NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
							5 ▼ ▽		≀	Blank Auger from 0 to 12.5-ft	
							10				
S-1	⊠	18	1 1 1					EL -5.5 12.5	▮	Moist, Very Soft, Dark Gray, Highly Plastic SILT, Some Clay, Little Medium to Fine Sand (MH) [A-7-5 (30)]	
T-1	▥	23	PUSH	58.1%	65	31	15			Sample T-1: Wet	Combined Sample (10 to 17-ft): pH: 8.2, As-Is Resistivity (ohm-cm): 2,700, Wetted Resistivity (ohm-cm): 2,500, Sulfate Content (ppm): 20, Oxidation Reduction (mV): 186, Chloride (ppm): <20, Sulfides: Not Present Consolidation Test: Preconsolidation Pressure (tsf): 0.7, Compression Index: 0.46, Recompression Index: 0.06, Initial Void Ratio: 1.532
S-2	⊠	18	WOH WOH 1				20				
S-3	⊠	18	WOH 1 1				25				
S-4	⊠	15	1 1 1	54.9%	47	13	30	EL -21.5 28.5	‖	Moist, Very Soft, Black, SILT, And Fine Sand (ML) [A-7-5(8)]	
S-5	⊠	18	4 4 6	25.8%	37	15	35	EL -26.5 33.5	▨	Moist, Stiff, Gray, CLAY, Trace Fine Sand (CL) [A-6(15)]	

SAMPLE IDENTIFICATION	DRILLING METHOD
⊠ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
⊠ - D - DENISON	MD - MUD DRILLING
◧ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY
0-4	VERY LOOSE	0-2	VERY SOFT
5-10	LOOSE	3-4	SOFT
11-30	MEDIUM DENSE	5-8	MEDIUM STIFF
31-50	DENSE	9-15	STIFF
OVER 50	VERY DENSE	16-30	VERY STIFF
		OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)

TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

Boring No. BH-B-03A

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
									▨	Moist, Stiff, Gray, CLAY, Trace Fine Sand (CL) [A-6(15)]	
S-6	☒	18	3 8 14				40	EL -31.5 38.5	⁘	Moist, Medium Dense, Grayish Brown, Coarse to Fine SAND, Little Fine Angular Gravel, Trace Silt (sp) [a-1-b]	
S-7	☒	17	34 25 50/5"				45	EL -36.5 43.5	○	Wet, Very Dense, Gray, Coarse to Fine Sub-Angular GRAVEL, Some Coarse to Fine Sand (gp) [a-1-a]	
S-8	☒	4	34 33 45				50		○		Sample S-8: Gravel on tip of spoon
S-9	☒	18	29 26 17				55	EL -46.5 53.5	‖	Moist, Hard, Greenish Gray, SILT, Little Medium to Fine Sand, Trace Gravel (Residual Soil) (ml) [a-4]	
S-10		1	50/1"				60	EL -51.0 58.0 EL -51.1 58.1		COMPLETELY WEATHERED ROCK Sampled As: Moist, Greenish Gray, GRAVEL-SIZED ROCK FRAGMENTS, Little Clay, Trace Medium to Fine Sand Bottom of Boring @ 58.1 ft	Auger Refusal at 58-ft Grouted after final groundwater reading
							65				
							70				
							75				
							80				

TEST BORING LOG

Boring No. BH-B-04
Page 1 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	632319
EAST:	617068
ELEVATION:	7 - ft
START DATE:	4/29/2021
END DATE:	4/29/2021
DRILLER:	Mark
LOGGED BY:	JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
4/29/2021	8:40:00 AM	5.167	-	38.6

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	10	3 4 4					EL 6.7 0.3		4-Inches TOPSOIL FILL Sampled As: Moist, Loose, Brown, Coarse to Fine SAND, Some Silt, Trace Roots and Bricks Fragments	
S-2	☒	6	2 1 1							Sample S-2: Very Loose	
S-3	☒	10	1 WOH WOH	53.7%	NP	NP	▽5			Sample S-3: Very Loose, Some Fine Gravel	
S-4	☒	6	1 1 1							Sample S-4: Very Loose, Little Gravel, Pieces of Steel	
S-5	☒	12	1 1 1				10	EL -3.0 10.0		Moist, Very Soft, Dark Gray, Highly Plastic SILT, Some Clay, Little Fine Sand (MH) [A-7-5 (42)]	
S-6	☒	10	1 1 1							Sample S-6: Dark Gray, Black	
S-7	☒	18	WOH 1 1				15				
S-8	☒	18	WOH WOH 1				20				CIUC Test (Sample T-1) Results: Cohesion: 228-psf, Drained Friction Angle: 17.3-deg
T-1	▥	24	PUSH	60.9%	83	42				Sample T-1: Wet	Consolidation Test: Preconsolidation Pressure (tsf): 0.3, Compression Index: 0.78, Recompression Index: 0.06, Initial Void Ratio: 2.096
S-9	☒	18	WOH 1 1				25				
S-10	☒	18	WOH 1 1	40.1%	NP	NP	30	EL -21.5 28.5		Moist, Very Loose, Grayish Black, Medium to Fine SAND, And Silt (SM) [A-4(0)]	
S-11	☒	18	15 13 12				35			Sample S-11: Medium Dense, Greenish Gray, Some Coarse to Fine Sub-Angular Gravel	

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
◨ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)

TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Very Loose, Grayish Black, Medium to Fine SAND, And Silt (SM) [A-4(0)]	
S-12	☒	18	10 16 12				40			Sample S-12: Medium Dense, Brown, Little Coarse to Fine Angular Gravel	
S-13	☒	18	26 22 33				45	EL -36.5 43.5		Wet, Very Dense, Greenish Gray/Brown, Coarse to Fine Angular GRAVEL, Some Coarse to Fine Sand (gp) [a-1-a]	
S-14	☒	18	11 12 14				50	EL -41.5 48.5		Moist, Very Stiff, Green, SILT, Little Medium to Fine Sand (Residual Soil) (ml) [a-4]	Running sands at 48.5-ft
S-15	☒	6	12 15 18				55			Sample S-15: Hard	
S-16	☒	2	50/2"				60	EL -51.0 58.0 EL -51.1 58.1		COMPLETELY WEATHERED ROCK Sampled As: Moist, Greenish Gray, GRAVEL-SIZED ROCK FRAGMENTS, Little Clay, Little Medium to Fine Sand Bottom of Boring @ 58.1 ft	Auger Refusal at 58-ft Grouted upon completion
							65				
							70				
							75				
							80				

TEST BORING LOG

Boring No. BW-B-01
Page 1 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 632261
EAST: 616905
ELEVATION: 6 - ft
START DATE: 7/7/2020
END DATE: 7/8/2020
DRILLER: Mark
LOGGED BY: BAW

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
7/7/2020	2:30:00 PM	10.8	-	-
7/8/2020	7:00:00 AM	4.8		21.7

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	15	4 6 7					EL 5.9 0.1		1-Inch TOPSOIL FILL Sampled As: Moist, Medium Dense, Black, Red, Brown, Coarse to Fine SAND, Some Coarse to Fine Gravel, Some Clay, Little Silt	
S-2	☒	12	6 5 6								
S-3	☒	9	4 5 3				▼ 5	EL 1.0 5.0		Moist, Medium Stiff, Dark Gray, Black, CLAY, Some Coarse to Fine Sand, Some Silt (cl) [a-6]	
S-4	☒	18	1 1 1					EL -1.5 7.5		Wet, Very Soft, Dark Gray, SILT, Little Clay, Trace Medium to Fine Sand (ML) [A-7-6 (20)]	
S-5	☒	18	1 1 1	66.1%	46	17	10 ▽				
S-6	☒	10	1 1 1								
S-7	☒	18	1 1 WOH				15				
S-8	☒	12	1 1 1								
S-9	☒	18	1 1 1				20				
S-10	☒	18	1 1 1	49.9%	35	NP	25			Sample S-10: And Medium to Fine Sand [A-4 (0)]	
S-11	☒	16	4 4 3				30	EL -22.5 28.5		Wet, Loose, Dark Gray, Coarse to Fine SAND, Some Silt (sm) [a-4]	
S-12	☒	12	3 3 3	26.6%			35	EL -27.5 33.5		Moist, Medium Stiff, CLAY, Little Fine Sand (cl) [a-6]	

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
◫ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
☒ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
■ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

TEST BORING LOG

Boring No. BW-B-01
Page 2 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
								EL -32.5 38.5		Moist, Medium Stiff, CLAY, Little Fine Sand (cl) [a-6]	
S-13	☒	17	6 13 19				40			Wet, Dense, Dark Brown, Gray, Coarse to Fine SAND, Little Silt (Residual Soil) (sm) [a-4]	
S-14	☒	13	20 36 33				45			Sample S-14: Very Dense	
S-15	☒	14	8 9 13				50	EL -47.5 53.5		Sample S-15: Moist, Medium Dense, And Silt	
S-16	☒	10	20 50/3"					EL -49.3 55.3		COMPLETELY WEATHERED ROCK Sampled As: Moist, Bluish Gray, SILT, Little Medium to Fine Sand	
S-17	☒	4	50/4"				55			Bottom of Boring @ 55.3 ft	Auger Refusal at 55.0-ft. Grouted after Final Groundwater Reading
							60				
							65				
							70				
							75				
							80				

TEST BORING LOG

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 631518
EAST: 616488
ELEVATION: 7 - ft
START DATE: 5/10/2021
END DATE: 5/10/2021
DRILLER: Mark
LOGGED BY: JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
5/11/2021	10:20:00 AM	6.2	-	24.7
5/18/2021	1:59:00 PM	3.6	-	24.7

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	10	9 6 6					EL 6.7 0.3		4-Inches TOPSOIL FILL Sampled As: Moist, Stiff, Orange, SILT, Little Medium to Fine Sand, Trace Gravel	
S-2	☒	6	4 4 18				▼			Sample S-2: Very Stiff, Black	
S-3	☒	10	3 2 2	49%	79	46	5 ▽	EL 2.0 5.0		Moist, Soft, Brown/Dark Gray, High Plasticity CLAY, And Silt, Trace Fine Sand (CH) [A-7-5(47)]	
S-4	☒	18	3 1 1							Sample S-4: Very Soft	Sample S-4: VOC = 7.8 ppm
S-5	☒	18	2 1 2				10			Sample S-5: Greenish Gray	
T-1	▥	11	PUSH	43.7%	80	47				Sample T-1: A-7-5(56)	Consolidation Test: Preconsolidation Pressure (tsf): 0.80, Compression Index: 0.73, Recompression Index: 0.06, Initial Void Ratio: 1.424
S-6	☒	18	WOH WOH 1				15			Sample S-6: Very Soft, And Silt	
S-7	☒	18	WOH WOH 1				20			Sample S-7: Very Soft, And Silt, Little Medium to Fine Sand	
S-8	☒	18	WOH 1 1	55.5% 45.3%			25	EL -17.5 24.5		Sample S-8a: Very Soft, Some Medium to Fine Sand Moist, Very Loose, Grayish Brown, Medium to Fine SAND, Some Clay (sc) [a-2-6]	
S-9	☒	18	6 13 21				30	EL -21.5 28.5		Moist, Dense, Coarse to Fine SAND, Little Silt, Some Fine Gravel (SP-SM) [A-1-a]	
S-10	☒	18	15 15 16				35			Sample S-10: Dense, Little Clay, Little Gravel	

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
⊠ - D - DENISON	MD - MUD DRILLING
◨ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)

TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Dense, Coarse to Fine SAND, Little Silt, Some Fine Gravel (SP-SM) [A-1-a]	
S-11	☒	15	23 14 13	9.6%	NP	NP				Sample S-11: Medium Dense	
							40				
S-12	☒	18	6 8 9	32.6%	57	23		EL -36.5 43.5		Moist, Medium Dense, Greenish Gray, Coarse to Fine SAND, And Silt, Trace Fine Gravel (Residual Soil) (SM) [A-7-5(4)]	
							45				
S-13	☒	18	21 22 26							Sample S-13: Dense, Reddish, Some Medium to Fine Sand	
							50				
S-14	☒	18	12 17 23							Sample S-14: Dense, Some Medium to Fine Sand	
							55				
S-15	☒	18	9 13 16							Sample S-15: Trace Medium to Fine Sand	
							60				
S-16	☒	18	12 19 26							Sample S-16: Dense	
							65				
S-17	☒	18	12 16 21							Sample S-17: Dense, Some Medium to Fine Sand	
							70	EL -63.0 70.0		Bottom of Boring @ 70.0 ft	Grouted after final groundwater reading
							75				
							80				

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 630292
EAST: 616060
ELEVATION: 11 - ft
START DATE: 10/24/2022
END DATE: 10/24/2022
DRILLER: Brian
LOGGED BY: JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
10/25/2022	12:20:00 PM	6.4	--	32.0

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	15	6 16 10					EL 10.8 0.2	3-Inches TOPSOIL FILL Sampled As: Moist, Medium Dense, Brown, Orange, Coarse to Fine SAND, Some Coarse to Fine Gravel-Sized Rock Fragments, Little Clay, Contains Root, Concrete, and Wood Fragments	
S-2	☒	3	6 24 16	7.1%				EL 8.5 2.5	FILL Sampled As: Moist, Dense, Brown, Orange, Coarse to Fine GRAVEL-Sized Rock Fragments, Some Clay, Little Coarse to Fine Sand	
S-3	☒	18	23 17 17				5	EL 6.0 5.0	FILL Sampled As: Moist, Dense, Dark Brown/Orange, Coarse to Fine SAND, And Clay, Little Coarse to Fine Gravel, Contains Brick and Concrete Fragments	Hard augering at 4.5-ft
							▽			
S-4	☒	8	4 10 15	14.2%	NP	NP			Sample S-4: Medium Dense, Brown/Gray, Some Fine Angular Gravel, Some Silt	
S-5	☒	4	3 3 3				10	EL 1.0 10.0	FILL Sampled As: Moist, Medium Stiff, Brown, CLAY, Some Coarse to Fine Sand, Trace Coarse to Fine Gravel	
S-6	☒	12	4 3 4					EL -1.5 12.5	Moist, Loose, Black, Coarse to Fine SAND, And Clay (sc) [a-6]	Wet spoon at 12.5-ft.
S-7	☒	18	3 3 1				15	EL -4.0 15.0	Moist, Soft, Gray, High Plasticity CLAY, Little Medium to Fine Sand (CH) [A-7-5(49)]	
T-1	▥	20							Sample T-1: Trace Fine Gravel	
				48.1%	83	51				Consolidation Test: Preconsolidation Pressure (tsf): 0.80, Compression Index: 0.44, Recompression Index: 0.06, Initial Void Ratio: 1.319
S-8	☒	18	WOH 1 1				20		Sample S-8: Very Soft	
S-9	☒	18	1 1 2	58.2%			25			
S-10	☒	18	1 1 1				30		Sample S-10: Very Soft	
S-11	☒	18	WOH 1 2	49.3%			35	EL -22.5 33.5	Moist, Soft, Dark Gray, High Plasticity CLAY, Little Medium to Fine Sand, Trace Organic Fragments (CH) [A-7-5(46)]	

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
☒ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
◧ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

TEST BORING LOG

Boring No. EMB-B-02
Page 2 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Soft, Dark Gray, High Plasticity CLAY, Little Medium to Fine Sand, Trace Organic Fragments (CH) [A-7-5(46)]	
S-12	☒	18	1 1 2	64%	117	86	40			Sample S-12: And Coarse to Fine Sand, Trace Organic Fragments	Sample S-12: Organic Content (LOI) = 3.7%
S-13	☒	18	1 1 4							Sample S-13: Medium Stiff, Trace Organic Fragments	
							45	EL -33.5 44.5		Moist, Loose, Gray/Brown, Coarse to Fine SAND, Little Clay, Little Coarse to Fine Rounded Gravel (sc)	
								EL -37.5 48.5		Moist, Medium Dense, Gray/Orange, Pink, Coarse to Fine SAND, Some Silt (Residual Soil) (sm) [a-2-4]	
S-14	☒	18	7 12 12				50				
S-15	☒	18	10 8 9							Sample S-15: Green/Gray	
							55	EL -43.5 54.5		Moist, Very Stiff, Orange/Red, CLAY, Little Coarse to Fine Sand (Residual Soil) (cl) [a-7-5]	
S-16	☒	18	1 6 8	28.5%			60			Sample S-16: Stiff, Little Medium to Fine Sand	
S-17	☒	18	9 14 45				65	EL -52.5 63.5		Moist, Very Dense, Green/Gray/Light Brown/Orange, Coarse to Fine SAND, Little Clay (Residual Soil) (sc) [a-2-7]	
S-18	☒	2	50/2"					EL -55.0 66.0 EL -55.2 66.2		COMPLETELY WEATHERED ROCK Sampled As: Moist, Green, Coarse to Fine SAND, Little Clay Bottom of Boring @ 66.2 ft	Auger refusal at 66-ft Grouted with bentonite mix upon completion
							70				
							75				
							80				

TEST BORING LOG

Boring No. HW-B-01
Page 1 of 2

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 631233
EAST: 616258
ELEVATION: 7 - ft
START DATE: 5/5/2021
END DATE: 5/5/2021
DRILLER: Mark
LOGGED BY: JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
5/6/2021	8:50:00 AM	3.2	-	27.4
5/18/2021	2:06:00 PM	3.2	-	21.5

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
								EL 6.8 0.2	2-Inches TOPSOIL	
S-1	☒	10	12 5 4						FILL Sampled As: Moist, Stiff, Brown, CLAY, Little Medium to Fine Sand, Little Gravel, Trace Root Fragments	
S-2	☒	6	3 3 2				▼		Sample S-2: Medium Stiff, Trace Gravel	
							5	EL 2.0 5.0		
S-3	☒	6	2 1 WOH	24.2%	NP	NP			FILL Sampled As: Moist, Very Loose, Brown, Coarse to Fine SAND, Some Coarse to Fine Gravel, Little Silt, Trace Clay	Sample S-3: Petroleum odor, VOC = 130 ppm
								EL -0.5 7.5		
S-4	☒	18	2 1 WOH						Moist, Very Soft, Dark Gray, High Plasticity CLAY (CH) [A-7-6(48)]	
							10			
S-5	☒	18	WOH WOH 1							Sample S-5: VOC = 30.1 ppm
S-6	☒	18	WOH WOH WOH							
							15			
S-7	☒	18	WOH WOH WOH						Sample S-7: Some Medium to Fine Sand	Sample S-7: VOC = 6.8 ppm
S-8	☒	18	WOH WOH WOH	54.5%	79	45			Sample S-8: Trace Fine Sand	Sample S-8: VOC = 16.9 ppm
							20			
								EL -16.5 23.5		
S-9	☒	18	WOH 1 4						Moist, Medium Stiff, Dark Gray, SILT, Some Medium to Fine Sand (ml) [a-4]	
							25			
								EL -21.5 28.5		
S-10	☒	18	22 23 20						Moist, Dense, Brown, Coarse to Fine SAND, Some Coarse to Fine Sub-Angular Gravel, Little Clay (SW-SM) [A-1-a]	Running sands at 28.5-ft
							30			
S-11	☒	18	20 19 17						Sample S-11: Trace Clay	
							35			

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
◫ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

Boring No. HW-B-01

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Dense, Brown, Coarse to Fine SAND, Some Coarse to Fine Sub-Angular Gravel, Little Clay (SW-SM) [A-1-a]	
S-12	☒	18	18 9 10	8.2%	NP	NP	40			Sample S-12: Wet, Medium Dense, And Coarse to Fine Sub-angular Gravel, Trace Silt	
S-13	☒	18	9 11 14				45	EL -36.5 43.5		Moist, Very Stiff, Grayish Brown, SILT, Little Medium to Fine Sand (ml) [a-4]	
S-14	☒	18	7 7 11				50			Sample S-14: Greenish Gray, Trace Medium to Fine Sand	
S-15	☒	18	12 13 30				55	EL -46.5 53.5		Moist, Hard, Greenish Gray, SILT, Little Medium to Fine Sand (Residual Soil) (ml) [a-4]	
S-16	☒	18	10 13 14	33.8%			60			Sample S-16: Very Stiff	
S-17	☒	18	9 12 15				65			Sample S-17: Very Stiff	
S-18	☒	18	12 16 21							Sample S-18: Yellowish Gray	
							70	EL -63.0 70.0		Bottom of Boring @ 70.0 ft	Grouted after final groundwater reading
							75				
							80				

TEST BORING LOG

Boring No. HW-B-02
Page 1 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 630470
EAST: 616139
ELEVATION: 5.0 - ft
START DATE: 10/26/2022
END DATE: 10/26/2022
DRILLER: Brian
LOGGED BY: JV

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
10/26/2022	2:00:00 PM	5	-	29

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	7	6 4 50/2"							FILL Sampled As: Wet, Red/Brown, Very Dense, RUBBLE (Brick, Glass, Wood)	
S-2	☒	15	7 11 14	22.9%				EL 2.5 2.5		FILL Sampled As: Wet, Brown, Medium Dense, Coarse to Fine SAND, Little Silt, Little Gravel-Sized Rubble Fragments	
S-3	☒	7	3 2 2				∇5	EL 0.0 5.0		FILL Sampled As: Wet, Brown/Black, Very Loose, Gravel-Sized RUBBLE, And Coarse to Fine Sand, Little Silt	
S-4	☒	18	WOH 1 1	51.4%	79	45		EL -2.5 7.5		Moist, Very Soft, Dark Gray, High Plasticity CLAY, Trace Medium to Fine Sand (CH) [A-7-5(48)]	
S-5	☒	18	1 WOH WOH				10				
S-6	☒	18	WOH/18"								
S-7	☒	18	WOH WOH 1				15				
S-8	☒	18	WOH/18"	54.7%	64	38				Sample S-8: And Silt, Little Coarse to Fine Sand [A-7-6(36)]	
							20				
S-9	☒	18	1 1 1				25			Sample S-9: Little Coarse to Fine Sand	
S-10	☒	18	3 4 4	65.5%			30			Sample S-10: Medium Stiff, Some Coarse to Fine Sand	Bentonite added to HSA
S-11	☒	18	1 1 1				35			Sample S-11: Little Sand	

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
☒ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
◧ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

RKK NORTH/EAST (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 6/1/23

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Very Soft, Dark Gray, High Plasticity CLAY, Trace Medium to Fine Sand (CH) [A-7-5(48)]	
S-12	☒	18	2 1 2	25.2%	88	61	40	EL -33.5 38.5		Moist, Very Loose, Dark Gray, Coarse to Fine SAND, Little Fine Gravel, Little Clay (SC) [A-2-7(1)]	
S-13	☒		5 12 12				45	EL -38.5 43.5		Moist, Medium Dense, Blue/Green, Gray, Coarse to Fine SAND, Some Clay (Residual Soil) (SC) [A-2-6(2)]	
S-14	☒	18	6 8 9	20.7%	40	21	50			Sample S-14: Blue/Green, Brown, Red	
S-15	☒	18	13 11 10				55				
S-16	☒	1	50/3"				60	EL -53.5 58.5		COMPLETELY WEATHERED ROCK Sampled As: Moist, Blue/Green, Brown, Red, Very Dense, Coarse to Fine SAND, And Silt	
S-17	☒	0	50/0"					EL -56.5 61.5		Sample S-17: No Recovery Bottom of Boring @ 61.5 ft	Backfilled with dry cement mix and auger cuttings upon completion
							65				
							70				
							75				
							80				

TEST BORING LOG

Boring No. LOT-A1-01
Page 1 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Geoprobe 7822DT Track/Auto

COMMISSION NO.: 20077.000
NORTH: 632331
EAST: 617225
ELEVATION: 7 - ft
START DATE: 9/3/2020
END DATE: 9/4/2020
DRILLER: Justin
LOGGED BY: BAW

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
9/4/2020	12:00:00 PM	9	-	32

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
				23.7%				EL 6.9 0.1		2-Inches TOPSOIL	Bulk bag B-1 taken from auger cuttings 0.0-ft to 10.0-ft Bulk Sample (0.0 to 10-ft): pH: 7.9, As-Is Resistivity (ohm-cm): 1,500, Wetted Resistivity (ohm-cm): 1,100, Sulfate Content (ppm): 570, Oxidation Reduction (mV): 238, Chloride (ppm): 45, Sulfides: Not Present
S-1	☒	10	7 16 15							FILL Sampled As: Moist, Medium Dense, Black, Red, Coarse to Fine SAND, And Coarse to Fine GRAVEL, Little Silt, Trace Clay, Brick Fragments	
S-2	☒	12	3 1 1					EL 4.5 2.5		FILL Sampled As: Moist, Very Soft, Black, CLAY, Some Coarse to Fine Sand, Little Fine Gravel, Trace Silt	
S-3	☒	6	3 2 1				5	EL 2.0 5.0		FILL Sampled As: Moist, Soft, Reddish Brown, CLAY, Some Coarse to Fine Gravel, Little Medium to Fine Sand, Trace Silt	
S-4	☒	12	3 WOH WOH				∇	EL -0.5 7.5		Wet, Very Soft, Dark Gray, SILT, Little Clay, Trace Coarse to Fine Sand (ML) [A-7-5 (20)]	
							10				
S-5	☒	18	WOH WOH WOH	61.6%	48	17	15				
S-6	☒	18	1 WOH WOH				20				
S-7	☒	18	WOH WOH WOH				25				
S-8	☒	18	1 2 1				30			Sample S-8: Moist, Soft	
S-9	☒	18	4 10 21				35	EL -26.5 33.5		Moist, Dense, Dark Gray, Coarse to Fine SAND, Little Coarse to Fine Gravel, Trace Silt (SP) [A-1-b]	

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
◧ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Geoprobe 7822DT Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Dense, Dark Gray, Coarse to Fine SAND, Little Coarse to Fine Gravel, Trace Silt (SP) [A-1-b]	
S-10	☒	18	3 8 9	15.2%	NP	NP	40			Sample S-10: Medium Dense, Brown, Dark Gray, Trace Fine Gravel	
S-11	☒	18	5 10 26				45			Sample S-11: Brown, Dark Gray	
								EL -41.5 48.5		Moist, Very Stiff, Bluish Green, White, SILT, And Coarse to Fine Sand, Trace Clay (Residual Soil) (ML) [A-4 (0)]	
S-12	☒	18	7 16 10				50				
S-13	☒	18	10 19 26	25.4%	39	NP	55			Sample S-13: Hard	
S-14	☒	16	5 13 14				60				
S-15	☒	16	8 21 23				65			Sample S-15: Hard, Reddish Brown, White	
S-16	☒	18	12 19 23				70			Sample S-16: Hard, Reddish Brown, White	
S-17	☒	18	26 32 30							Sample S-17: Hard, Reddish Brown, White	
							75	EL -68.0 75.0		Bottom of Boring @ 75.0 ft	Grouted upon completion
							80				

TEST BORING LOG

PROJECT: South Market Street - RDC

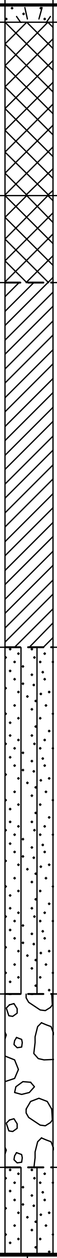
SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D 50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 632001
EAST: 616759
ELEVATION: 7 - ft
START DATE: 9/1/2020
END DATE: 9/1/2020
DRILLER: Mark S.
LOGGED BY: ACR

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
9/1/2020	1:00:00 PM	3.8	-	15.1
9/2/2020	12:00:00 PM	3.5	-	5.4

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-



SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS			DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
				NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX					
S-1	☒	12	1 3 6					EL 6.5 0.5		6-Inches TOPSOIL FILL Sampled As: Moist, Loose, Gray, Brown, Dark Gray, Coarse to Fine SAND, Some Silt, Trace Fine Gravel	Bulk bag B-1 taken from auger cuttings 0.0-ft to 10.0-ft
S-2	☒	10	2 2 4				▽			Sample S-2: Wet, Trace Fabric/ Cloth	
S-3	☒	18	4 4 2				5	EL 1.5 5.5		Sample S-3: Wet, Little Gravel Sized Brick Fragments FILL Sampled As: Wet, Loose, Gray, Brown, Dark Gray, Coarse to Fine SAND, Some Silt, Little Gravel Sized Brick Fragments, Trace Fine Gravel	
S-4	☒	18	1 1/12"	51.4%	40	16	10	EL -1.0 8.0		Wet, Very Soft, Gray, Dark Gray, CLAY, And Silt, Trace Medium to Fine Sand (CL) [A-6 (17)]	
S-5	☒	18	WOH WOH WOH				15				
S-6	☒	3	2 2 3				20	EL -11.5 18.5		Moist, Loose, Gray, Coarse to Fine SAND, And Silt, Trace Fine Gravel, Trace Mica (SM) [A-4 (0)]	
S-7	☒	18	4 5 6	40.2%	NP	NP	25			Sample S-7: Wet, Medium Dense	A piece of 1" Gravel at 23.5-ft
S-8	☒	12	16 21 24				30	EL -21.5 28.5		Wet, Dense, Gray, Coarse to Fine Angular GRAVEL, Some Coarse to Fine Sand, Trace Silt (gp) [a-1-b]	Difficult drilling at 30.0-ft
S-9	☒	5	15 17 15				35	EL -26.5 33.5		Wet, Dense, Gray, Coarse to Fine SAND, Some Silt, Trace Coarse to Fine Rounded Gravel (sm) [a-2-4]	

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
☰ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
☒ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
■ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D 50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Wet, Dense, Gray, Coarse to Fine SAND, Some Silt, Trace Coarse to Fine Rounded Gravel (sm) [a-2-4]	
S-10	☒	14	13 10 6	20.8%	NP	NP	40	EL -31.5 38.5		Moist, Medium Dense, Light Brown, Coarse to Fine SAND, Trace Fine Gravel, Trace Silt (SW-SM) [A-1-b]	
S-11	☒	6	8 8 13				45	EL -36.5 43.5		Moist, Very Stiff, Greenish Gray, SILT, And Medium to Fine SAND (Residual Soil) (ml) [a-4]	
S-12		1	50/1"					EL -39.1 46.1		Sample S-12: Spoon Refusal Bottom of Boring @ 46.1 ft	Auger Refusal at 46.0-ft. Grouted after final groundwater reading.
							50				
							55				
							60				
							65				
							70				
							75				
							80				

TEST BORING LOG

Boring No. LOT-A1-03

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D 50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	631858
EAST:	617002
ELEVATION:	11 - ft
START DATE:	9/1/2020
END DATE:	9/2/2020
DRILLER:	Mark S.
LOGGED BY:	ACR

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
9/2/2020	11:40:00 AM	12.8	-	31.5
9/3/2020	12:00:00 PM	13.1	-	28.5

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	8	8 14 50/4"						▩	FILL Sampled As: Moist, Very Dense, Light Gray, Brown, Coarse to Fine Angular GRAVEL, Little Sand	Bulk bag B-1 taken from auger cuttings 0.0-ft to 10.0-ft Recent fill from 0.0-ft to 8.5-ft
S-2	☒	9	14 50/5"						▩		
S-3	☒	12	9 12 12	8.6%	24	NP	5		▩	Sample S-3: Medium Dense, Fine GRAVEL, Some Coarse to Fine Sand, Little Silt (GM) [A-1-a]	
S-4	☒	8	23 11 11				10	EL 2.5 8.5	▩	FILL Sampled As: Moist, Medium Dense, Gray, Brown, Coarse to Fine SAND, Some Coarse to Fine Sub-Angular Gravel, Some Silt	Old fill from 8.5-ft to 13.5-ft
							▼		▩		
S-5	☒	18	3 1 1				15	EL -2.5 13.5	▨	Moist, Very Soft, Dark Gray, CLAY, Trace Medium to Fine Sand, Trace Mica (CL) [A-7-6 (21)]	
S-6	☒	12	3 1 1	67.6%	46	19	20		▨	Sample S-6: Wet, Trace Organics	Wet Spoon at 18.5-ft
S-7	☒	18	1 1 1				25		▨	Sample S-7: Wet, Trace Organics	
S-8	☒	18	1 1 1				30		▨	Sample S-8: Some Fine Sand	
S-9	☒	18	WOH WOH WOH				35		▨		

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
◧ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D 50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
									▨	Moist, Very Soft, Dark Gray, CLAY, Trace Medium to Fine Sand, Trace Mica (CL) [A-7-6 (21)]	
S-10	☒	18	WOH WOH 2	66%	47	15	40	EL -27.5 38.5		Wet, Very Soft, Black, Gray, SILT, Trace Medium to Fine Sand (ML) [A-7-5 (19)]	
S-11	☒	12	3 3 2				45	EL -32.5 43.5		Wet, Loose, Gray, Coarse to Fine SAND, And Coarse to Fine Sub-Angular Gravel, Trace Silt (sp) [a-1-b]	
S-12	☒	18	3 4 6				50				Used water to flush boring at 52.0-ft
S-13		1	50/1"				55	EL -42.5 53.5 EL -42.8 53.8		Wet, Very Dense, Gray, 2 Pieces of Angular GRAVEL SIZED ROCK FRAGMENTS (gp) [a-1-a] Bottom of Boring @ 53.8 ft	Auger Refusal at 53.8-ft Grouted after final groundwater reading
							60				
							65				
							70				
							75				
							80				

TEST BORING LOG

Boring No. LOT-A1-04

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D 50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 631698
EAST: 616594
ELEVATION: 11 - ft
START DATE: 9/2/2020
END DATE: 9/3/2020
DRILLER: Mark S.
LOGGED BY: ACR

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
9/3/2020	11:00:00 AM	9.2	-	31.5

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	14	1 1 3							FILL Sampled As: Moist, Very Loose, Reddish Brown, Coarse to Fine SAND, Some Clay, Trace Gravel	Bulk bag B-1 taken from auger cuttings 0.0-ft to 10.0-ft
S-2	☒	10	7 10 12							Sample S-2: Medium Dense, Gray, Brown, Red, Trace Clay, Little Coarse to Fine Angular Gravel, Trace Brick Fragments	
S-3	☒	18	9 14 15	9.4%			5			Sample S-3: Medium Dense, Trace Clay	
S-4	☒	12	5 5 7				∇ 10			Sample S-4: Medium Dense	
S-5	☒	18	3 2 2				15	EL -3.0 14.0		Moist, Soft, Dark Gray, Black, SILT, And Clay, Trace Medium to Fine Sand, Trace Organics (ML) [A-7-5 (19)]	
S-6	☒	18	WOH WOH 2	17.3%	46	15	20			Sample S-6: Very Soft	
S-7	☒	18	1 1 1				25			Sample S-7: Wet, Very Soft, Trace Mica	
S-8	☒	18	WOH 3 3	49.9%	39	11	30			Sample S-8: Wet, Medium Stiff, Trace Mica [A-6 (12)]	
S-9	☒	18	6 12 14				35	EL -22.5 33.5		Wet, Medium Dense, Gray, Coarse to Fine Sub-Angular GRAVEL, Some Coarse to Fine SAND, Trace Silt (gp) [a-1-a]	

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
☒ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
■ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D 50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Wet, Medium Dense, Gray, Coarse to Fine Sub-Angular GRAVEL, Some Coarse to Fine SAND, Trace Silt (gp) [a-1-a]	
S-10	☒	14	14 13 18				40	EL -27.5 38.5		Wet, Dense, Gray, Coarse to Fine SAND, Little Silt, Trace Fine Gravel (Residual Soil) (SP-SM) [A-1-b]	Used water to flush boring at 38.0-ft
S-11	☒	18	15 16 21	9.9%	NP	NP	45			Sample S-11: Moist	
S-12	☒	18	6 11 14				50			Sample S-12: Medium Dense	
S-13	☒	14	6 14 16				55			Sample S-13: Moist	
S-14	☒	14	16 22 28				60			Sample S-14: Moist	
S-15	☒	16	15 23 28				65			Sample S-15: Moist, Very Dense, Bluish Gray	
S-16	☒	14	15 22 28				70			Sample S-16: Moist, Greenish Gray, Bluish Gray	
S-17	☒	18	6 9 10							Sample S-17: Medium Dense, Greenish Gray, Purple, Bluish Gray	
							75	EL -64.0 75.0		Bottom of Boring @ 75.0 ft	Grouted upon completion
							80				

TEST BORING LOG

Boring No. LOT-A1-05

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D 50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 631452
EAST: 616838
ELEVATION: 6 - ft
START DATE: 5/11/2021
END DATE: 5/11/2021
DRILLER: Mark
LOGGED BY: JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
5/11/2021	3:12:00 PM	3.2	-	6.3
5/18/2021	1:50:00 PM	2.5	-	31.8

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
								EL 5.3 0.7		4-Inches Bituminous Concrete 4-Inches Aggregate Base	
S-1	☒	12	8 9 7	15.5%			▼			FILL Sampled As: Moist, Very Stiff, Brown, SILT, Little Medium to Fine Sand, Little Clay	
S-2	☒	2	6 8 6				▽	EL 3.5 2.5		FILL Sampled As: Moist, Medium Dense, Brown, Medium to Fine SAND, Some Coarse to Fine Angular Gravel, Little Silt	
S-3	☒	10	5 4 2				5			Sample S-3: Wet, Loose, Some Silt, Little Coarse to Fine Angular Gravel	Wet Spoon at 5-ft
S-4	☒	18	6 3 1					EL -1.5 7.5		Moist, Soft, Black, High Plasticity CLAY, And Silt, Trace Medium to Fine Sand (CH) [A-7-6(42)]	
S-5	☒	18	1 1 WOH				10			Sample S-5: Very Soft, Dark Gray	
S-6	☒	18	1 1 1	61.2%	68	39	15			Sample S-6: Very Soft, Dark Gray	
S-7	☒	18	WOH WOH 1				20			Sample S-7: Very Soft, Dark Gray	
S-8	☒	18	1 1 WOH				25			Sample S-8: Very Soft, Dark Gray	
S-9	☒	18	WOH 1 1	78.3%			30			Sample S-9: Very Soft, Dark Gray	
S-10	☒	18	1 1 1				35			Sample S-10: Very Soft, Dark Gray	

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
⊞ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY
0-4	VERY LOOSE	0-2	VERY SOFT
5-10	LOOSE	3-4	SOFT
11-30	MEDIUM DENSE	5-8	MEDIUM STIFF
31-50	DENSE	9-15	STIFF
OVER 50	VERY DENSE	16-30	VERY STIFF
		OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D 50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Soft, Black, High Plasticity CLAY, And Silt, Trace Medium to Fine Sand (CH) [A-7-6(42)]	
S-11	☒	18	1 1 2	21.6%	NP	NP	40	EL -32.5 38.5		Moist, Very Loose, Yellow-Brown, Coarse to Fine SAND, Little Fine Gravel, Trace Silt (SP-SM) [A-1-b]	Running Sands at 38.5-ft
S-12	☒	18	7 13 14				45	EL -37.5 43.5		Moist, Very Stiff, Green, SILT, And Medium to Fine Sand, Little Clay (Residual Soil) (ml) [a-4]	
S-13	☒	17	11 13 50/5"				50			Sample S-13: Hard	
S-14	☒	18	15 13 22				55			Sample S-14: Hard, Yellow-Brown, Little Medium to Fine Sand	
S-15	☒	10	24 29 17				60			Sample S-15: Hard, Trace Gravel-Sized Rock Fragments	
S-16		0.25	50/0.25"				65	EL -57.3 63.3 EL -57.3 63.3		COMPLETELY WEATHERED ROCK Sampled As: Moist, Gray, GRAVEL-SIZED ROCK FRAGMENTS, Little Medium to Fine Sand, Little Silt Bottom of Boring @ 63.3 ft	Auger Refusal at 63.3-ft Grouted after final groundwater reading
							70				
							75				
							80				

TEST BORING LOG

Boring No. LOT-A1-06
Page 1 of 2

RK&K

PROJECT: South Market Street - RDC
SITE: New Castle County , Delaware
DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	631138
EAST:	616713
ELEVATION:	6 - ft
START DATE:	5/13/2021
END DATE:	5/13/2021
DRILLER:	Mark
LOGGED BY:	JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
5/13/2021	2:27:00 PM	8.9	-	20.4
5/18/2021	1:37:00 PM	3.7	-	26.7

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	5	50/5"							FILL Sampled As: Moist, Very Dense, Gray, Fine Angular GRAVEL, Some Medium to Fine Sand, Little Silt	
S-2	☒	18	1 1 1	75.6%			▼	EL 3.5 2.5		Moist, Very Soft, Black, CLAY, Trace Medium to Fine Sand (cl) [a-6]	Sample S-2: Strong Petroleum Odor, VOC = 363.8 ppm
							5				
S-3	☒	18	WOH 1 1								
S-4	☒	18	1 2 1				▽	EL -1.5 7.5 EL -2.0 8.0		Moist, Very Loose, Black, Medium to Fine SAND, Little Clay, Trace Gravel (sc) [a-2-6] Moist, Soft, Black, High Plasticity SILT, Some Clay, Trace Medium to Fine Sand (MH) [A-7-5 (45)]	Sample S-4: VOC = 325.4 ppm
							10				
S-5	☒	18	WOH 1 1							Sample S-5: Very Soft	
S-6	☒	18	WOH WOH WOH	71.1%	76	40				Sample S-6: Very Soft	
							15				
S-7	☒	18	WOH WOH WOH							Sample S-7: Very Soft	
							20				
S-8	☒	18	WOH WOH 1							Sample S-8: Very Soft	
							25				
S-9	☒	18	WOH WOH 1							Sample S-9: Very Soft	
							30				
S-10	☒	18	WOH 1 1	74%	97	50				Sample S-10: Very Soft, And Medium to Fine Sand [A-7-5 (27)]	
							35				

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
◫ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
☰ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
		0-2	VERY SOFT		
0-4	VERY LOOSE	3-4	SOFT	TRACE	1 TO 10
5-10	LOOSE	5-8	MEDIUM STIFF	LITTLE	11 TO 20
11-30	MEDIUM DENSE	9-15	STIFF	SOME	21 TO 35
31-50	DENSE	16-30	VERY STIFF	AND	36 TO 50
OVER 50	VERY DENSE	OVER 30	HARD		

TEST BORING LOG

Boring No. LOT-A1-06
Page 2 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Soft, Black, High Plasticity SILT, Some Clay, Trace Medium to Fine Sand (MH) [A-7-5 (45)]	
S-11	☒	18	1 1 2				40	EL -32.5 38.5		Moist, Very Loose, Gray, Medium to Fine SAND, Little Clay (sc) [a-2-6]	
S-12	☒	18	10 10 10				45			Sample S-12: Wet, Medium Dense, Little Gravel	Running Sands at 43.5-ft
S-13	☒	18	11 14 21				50	EL -42.5 48.5		Moist, Hard, Brown, SILT, Some Medium to Fine Sand (Residual Soil) (ml) [a-4]	
S-14	☒	18	8 12 15				55			Sample S-14: Very Stiff, Greenish Gray, Little Clay, Little Medium to Fine Sand	
S-15	☒	18	10 14 21	23.6%			60			Sample S-15: Little Medium to Fine Sand	
S-16	☒	18	11 16 32				65			Sample S-16: Greenish Gray, Little Clay, Little Medium to Fine Sand	
S-17	☒	18	10 11 21				70	EL -62.5 68.5		Moist, Dense, Brown/Green, Coarse to Fine SAND, Some Silt (Residual Soil) (sm) [a-2-4]	
S-18	☒	18	15 20 22					EL -67.5 73.5		Moist, Hard, Greenish Gray, SILT, And Fine Sand (Residual Soil) (ml) [a-4]	
							75	EL -69.0 75.0		Bottom of Boring @ 75.0 ft	Grouted after final groundwater reading
							80				

TEST BORING LOG

Boring No. LOT-A1-07
Page 1 of 2

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 630712
EAST: 616254
ELEVATION: 7.0 - ft
START DATE: 9/15/2022
END DATE: 9/15/2022
DRILLER: Brian
LOGGED BY: JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
9/15/2022	2:50:00 PM	3.0	--	39.0
9/16/2022	2:30:00 PM	2.6	--	21.7

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	15	10 9 5					EL 6.8 0.2		2-Inches Bituminous Concrete FILL Sampled As: Moist, Medium Dense, Dark Brown, Gray, Coarse to Fine SAND, Some Clay	Sample S-1: Strong Petroleum Odor
S-2	☒	4	1 1 1				▼ ▽			Sample S-2: Very Loose, Trace Fine Gravel	
S-3	☒	6	3 2 3	20.2%			5	EL 2.0 5.0		Moist, Medium Stiff, Dark Gray, Black, CLAY, Some Coarse to Fine Sand (cl) [a-6]	Sample S-3: Strong Petroleum Odor
S-4	☒	16	WOH 1 1							Sample S-4: Very Soft, Little Medium to Fine Sand	Wet Spoon at 5-ft
S-5	☒	18	1 1 1				10	EL -3.0 10.0		Wet, Very Soft, Dark Gray/Black, Highly Plastic SILT, And Clay, Little Medium to Fine Sand (MH) [A-7-5 (53)]	
S-6	☒	18	WOH WOH WOH	66.6%	89	44	15			Sample S-6: Trace Coarse to Fine Sand	
S-7	☒	18	WOH WOH WOH				20				
S-8	☒	18	WOH WOH WOH				25			Sample S-8: Some Medium to Fine Sand	
S-9	☒	18	WOH 1 1	47.2%	41	16	30	EL -21.5 28.5		Wet, Very Soft, Dark Gray/Black, Medium Plasticity CLAY, And Coarse to Fine Sand, And Silt (CL) [A-7-6 (8)]	
S-10	☒	10	2 3 4				35	EL -26.5 33.5		Moist, Loose, Gray, Coarse to Fine SAND, Some Clay (sc) [a-2-6]	Running Sands at 33.5-ft

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
◫ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

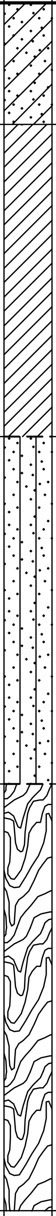
Boring No. LOT-A1-07

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50
Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
									Moist, Loose, Gray, Coarse to Fine SAND, Some Clay (sc) [a-2-6]	
S-11	☒	18	WOH 1 1						Sample S-11A: Very Loose	
							40	EL -32.5 39.5	Moist, Very Soft, Dark Gray, CLAY, Little Medium to Fine Sand (cl) [a-6]	
S-12	☒	0	19 8 8				45		Sample S-12: Very Stiff, No Recovery	
								EL -41.5 48.5	Moist, Medium Dense, Green, Brown, Coarse to Fine SAND, Some Clay, Trace Silt (Residual Soil) (SM) [A-2-4]	
S-13	☒	10	4 5 7	21.8%	23	NP	50			
S-14	☒	0	11 17 24				55		Sample S-14: Dense, No Recovery	
								EL -51.5 58.5	COMPLETELY WEATHERED ROCK Sampled As: Moist, Green, Coarse to Fine SAND, Little Silt	
S-15	☒	18	23 34 50/6"				60			
S-16	☒	18	47 43 28				65		Sample S-16: Greenish Gray	
S-17	☒	2	50/2"						Sample S-17: Greenish Gray, Some Coarse to Fine Gravel-Sized Rock Fragments	
							70			
S-18	☒	3	50/3"					EL -63.8 70.8	Sample S-18: Greenish Gray, Some Coarse to Fine Gravel-Sized Rock Fragments	Auger Refusal at 70.5-ft Grouted with bentonite mix after final groundwater reading
									Bottom of Boring @ 70.8 ft	
							75			
							80			



TEST BORING LOG

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 630624
EAST: 616682
ELEVATION: 8.0 - ft
START DATE: 9/12/2022
END DATE: 9/13/2022
DRILLER: Brian
LOGGED BY: JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
9/13/2022	2:10:00 PM	2.5	--	43.3
9/14/2022	3:02:00 PM	1.8	--	42.2

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
								EL 7.7 0.3	■	4-Inches Bituminous Concrete	
S-1	⊠	12	11 15 11				▼ ▽		▩	FILL Sampled As: Moist, Medium Dense, Brown, Black, Coarse to Fine SAND, Some Clay, Trace Coarse to Fine Gravel-Sized Rock Fragments, Contains Brick Fragments	
S-2	⊠	8	14 6 4	20.3%						Sample S-2: Loose, Dark Brown, Gray, Little Coarse to Fine Gravel-Sized Rock Fragments, Contains Glass Fragments	Sample S-2: Petroleum Odor
S-3	⊠	2	8 3 1				5			Sample S-3: Very Loose	Wet Spoon at 5-ft. Sample S-3: A 1.5-inch Piece of gravel at tip of spoon
S-4	⊠	0	1 WOH WOH							Sample S-4: Very Loose, No Recovery	
S-5	⊠	18	1 WOH WOH	72.3%	120	89	10	EL -2.0 10.0	▨	Wet, Very Soft, Dark Gray, High Plasticity CLAY, And Silt, Trace Coarse to Fine Sand, Contains Root Fragments (CH) [A-7-5(96)]	
S-6	⊠	4	WOH WOH WOH				15	EL -5.5 13.5	▧	Wet, Very Loose, Dark Gray, Coarse to Fine SAND, Some Silt, Little Fine Gravel, Little Clay (SC) [A-7-6 (8)]	
S-7	⊠	3	WOH WOH WOH				20			Sample S-7: Trace Coarse to Fine Gravel	
T-1	▥	18	P U S H	43.5%	52	25					Consolidation Test: Preconsolidation Pressure (tsf): 0.2, Compression Index: 0.11, Recompression Index: 0.01, Initial Void Ratio: 1.171
S-8	⊠	18	WOH 1 1				25	EL -16.0 24.0	▨	Moist, Very Soft, Dark Gray, Black, CLAY, Little Medium to Fine Sand (cl) [a-6]	
S-9	⊠	18	1 1 1				30				
S-10	⊠	18	1 2 3				35			Sample S-10: Medium Stiff, Brown, Gray, Some Coarse to Fine Sand	

SAMPLE IDENTIFICATION	DRILLING METHOD
⊠ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
☰ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
⊠ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

RKK NORTH/EAST (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 5/31/23

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
									Moist, Very Soft, Dark Gray, Black, CLAY, Little Medium to Fine Sand (cl) [a-6]	
S-11	☒	15	3 5 5	23.2%	NP	NP	40	EL -30.5 38.5	Moist, Loose, Dark Brown, Gray, Coarse to Fine SAND, Trace Fine Rounded Gravel, Trace Silt (SP-SM) [A-1-b]	
S-12	☒	12	5 5 6				45		Sample S-12: Medium Dense, Little Silt	Running Sands at 43.5-ft
S-13	☒	18	15 16 16				50	EL -40.5 48.5	Moist, Hard, Red, Green, CLAY, Some Coarse to Fine Sand (Residual Soil) (cl) [a-6]	
S-14	☒	18	27 12 15				55		Sample S-14: Very Stiff	
S-15	☒	18	9 11 14	30.1%			60	EL -50.5 58.5	Moist, Medium Dense, Green, Brown, Coarse to Fine SAND, Some Clay (Residual Soil) (sc) [a-2-6]	
S-16	☒	18	11 15 17				65		Sample S-16: Dense	
S-17	☒	2	50/2"					EL -59.0 67.0 EL -59.2 67.2	COMPLETELY WEATHERED ROCK Sampled As: Moist, Brown, Coarse to Fine GRAVEL-SIZED ROCK FRAGMENTS, Little Coarse to Fine Sand	Auger Refusal at 67-ft Grouted with bentonite mix after final groundwater reading
							70		Bottom of Boring @ 67.2 ft	
							75			
							80			

TEST BORING LOG

PROJECT: South Market Street - RDC
SITE: New Castle County , Delaware
DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 629648
EAST: 616190
ELEVATION: 7.0 - ft
START DATE: 10/14/2022
END DATE: 10/14/2022
DRILLER: Brian
LOGGED BY: JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
10/15/2022	10:15:00 AM	5.0	--	37.0
10/15/2022	2:00:00 PM	4.8	--	35.0

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	15	5 10 16					EL 6.7 0.3		4-Inches TOPSOIL FILL Sampled As: Moist, Medium Dense, Dark Brown/Orange, Coarse to Fine SAND, Some Clay, Little Coarse to Fine Gravel, Contains Brick and Root Fragments	
S-2	☒	12	13 3 3	14.2%				EL 4.5 2.5		FILL Sampled As: Moist, Loose, Black/Gray, Coarse to Fine Angular GRAVEL, Some Coarse to Fine Sand, Little Clay	
S-3	☒	10	2 5 7				▽ 5	EL 2.0 5.0		FILL Sampled As: Moist, Medium Dense, Brown/Black, Coarse to Fine SAND, Some Clay, Contains Brick, Wood, and Root Fragments	
S-4	☒	11	6 4 2	26.2%	68	40				Sample S-4: Loose, Some Fine Gravel	Wet Spoon at 7.5-Ft Sample S-4: Organic Content (LOI) = 3.7%
S-5	☒	0	2 1 2				10	EL -3.0 10.0		Moist, Very Soft, Dark Brown, Dark Gray, High Plasticity CLAY, And Silt, Trace Medium to Fine Sand, Trace Organics (CH) [A-7-5(51)]	
S-6	☒	18	WOH 1 1				15				
S-7	☒	18	WOH WOH 1	59.4%	80	46	20				
S-8	☒	18	WOH WOH 1				25				
S-9	☒	18	WOH WOH 1	72.2%			30				
S-10	☒	10	9 11 11				35	EL -26.5 33.5		Moist, Medium Dense, Brown, Coarse to Fine Subangular GRAVEL, And Coarse to Fine Sand, Little Clay (gp) [a-1-b]	Bentonite added to HSA

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Medium Dense, Brown, Coarse to Fine Subangular GRAVEL, And Coarse to Fine Sand, Little Clay (gp) [a-1-b]	
								EL -31.5 38.5		Wet, Medium Dense, Brown, Coarse to Fine SAND, Some Coarse to Fine Gravel, Little Clay (sp-sc) [a-2-6]	
S-11	☒	18	12 9 8	8.6%			40				
S-12	☒	18	12 15 14				45			Sample S-12: Brown/Gray, Some Clay, Trace Fine Gravel	
								EL -41.5 48.5		Moist, Medium Dense, Red, Gray, Green, Coarse to Fine SAND, Some Clay (SC) [A-2-6(2)]	
S-13	☒	15	3 6 9	19%	38	23	50				
S-14	☒	17	3 8 13				55				
S-15	☒	18	8 9 10				60				
								EL -56.5 63.5		Moist, Very Stiff, Red, SILT, Little Coarse to Fine Sand (Residual Soil) (ml) [a-4]	
S-16	☒	18	6 7 12	30%			65				
S-17	☒	18	7 10 17				70			Sampe S-17: Green/Gray, Red, Some Medium to Fine Sand	
S-18	☒	18	13 16 20							Sample S-18: Hard, Green/Brown, Some Medium to Fine Sand	
							75	EL -68.0 75.0		Bottom of Boring @ 75.0 ft	Grouted with bentonite mix after final groundwater reading
							80				

TEST BORING LOG

Boring No. LOT-A2-12

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D 50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	629622
EAST:	616478
ELEVATION:	6.0 - ft
START DATE:	10/20/2022
END DATE:	10/20/2022
DRILLER:	Brian
LOGGED BY:	JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
10/20/2022	5:15:00 PM	8.5	--	21.0
10/21/2022	8:25:00 AM	5.0	--	21.0

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
								EL 5.8		2-Inches Bituminous Concrete	pH: 8.6, As-Is Resistivity (ohm-cm): 42,000, Wetted Resistivity (ohm-cm): 2,800, Sulfate Content (ppm): 270, Oxidation Reduction (mV): 124, Chloride (ppm): 45, Sulfides: Not Present
S-1	☒	6	23 21 14	5.6%				0.2 EL 5.3 0.7		6-Inches Portland Cement Concrete FILL Sampled As: Moist, Dense, Brown/Black, Coarse to Fine SAND, Little Silt, Little Fine Gravel	
S-2	☒	15	10 9 10							Sample S-2: Medium Dense, Brown/Gray, Some Silt, Sme Coarse to Fine Angular Gravel	
S-3	☒	7	13 16 8				▼ 5			Sample S-3: Medium Dense, Brown, Light Brown, Little Clay, Trace Silt, Little Coarse to Fine Gravel	
S-4	☒	18	WOH WOH 1	77.6%	103	59	▽	EL -1.5 7.5		Moist, Very Soft, Black/Gray, High Plasticity SILT, Little Medium to Fine Sand (MH) [A-7-5(60)]	Wet spoon at 7.6-ft
S-5	☒	18	WOH 1 1				10				
T-1	▥	5						EL -6.5 12.5		Moist, Dark Brown/Black, High Plasticity CLAY, Little Coarse to Fine Sand, Contains Organic and Wood Fragments (CH) [A-7-6(54)]	Tube discarded
S-6	☒	18	1 1 1	78.2%	91	62	15			Sample S-6: Very Soft	
T-2	▥	9		103.2%	114	65		EL -11.0 17.0		Moist, Dark Brown/Black, High Plasticity SILT, And Coarse to Fine Sand, Little Fine Gravel (MH) [A-7-5(29)]	Consolidation Test: Preconsolidation Pressure (tsf): 0.50, Compression Index: 1.34, Recompression Index: 0.13, Initial Void Ratio: 3.088
S-7	☒	10	3 2 4	50.2% 7.5%			20	EL -14.0 20.0 EL -14.5 20.5		Moist, Medium Stiff, Brown, CLAY, Some Coarse to Fine Sand (cl) [a-6] Moist, Loose, Brown, Coarse to Fine SAND, Some Silt, Little Coarse to Fine Gravel (SM) [A-2-4(0)]	
S-8	☒	18	13 17 23	9.6%			25			Sample S-8: Dense, And Coarse to Fine Rounded Gravel, Little Clay	
S-9	☒	18	6 15 16	21%	NP	NP	30			Sample S-9: Wet, Dense, Little Silt, Trace Fine Gravel	
											Hard augering at 32-ft
S-10	⊠	3	50/4"				35	EL -27.5 33.5		Moist, Very Dense, Brown/Gray, Coarse to Fine Rounded GRAVEL, Some Coarse to Fine Sand, Trace Clay (gp) [a-1-a]	

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
⊠ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY
0-4	VERY LOOSE	0-2	VERY SOFT
5-10	LOOSE	3-4	SOFT
11-30	MEDIUM DENSE	5-8	MEDIUM STIFF
31-50	DENSE	9-15	STIFF
OVER 50	VERY DENSE	16-30	VERY STIFF
		OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

Boring No. LOT-A2-12

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D 50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Very Dense, Brown/Gray, Coarse to Fine Rounded GRAVEL, Some Coarse to Fine Sand, Trace Clay (gp) [a-1-a]	
S-11	☒	18	10 9 14	14.7%			40	EL -32.5 38.5		Moist, Very Stiff, Green/Light Brown, Red, CLAY, Little Medium to Fine Sand (Residual Soil) (cl) [a-6]	
S-12	☒	18	5 10 9	11.2%			45	EL -37.5 43.5		Moist, Medium Dense, Green/Brown, Coarse to Fine SAND, Some Clay (Residual Soil) (sc) [a-2-6]	
S-13	☒	18	4 6 13	21.6%			50	EL -42.5 48.5		Moist, Very Stiff, Red/Gray, Green, CLAY, Little Medium to Fine Sand (Residual Soil) (cl) [a-6]	
S-14	☒	18	3 6 9	18.2%			55			Sample S-14: Stiff	
S-15	☒	5	1 1 1	15.2%	52	40	60	EL -52.5 58.5		Moist, Very Loose, Red/Gray, Coarse to Fine GRAVEL-SIZED ROCK FRAGMENTS, And Clay, Some Coarse to Fine Sand (Residual Soil) (GC) [A-7-6(10)]	Piece of rock at tip of spoon
S-16	☒	18	5 8 12	26.7%			65	EL -57.5 63.5		Moist, Very Stiff, Red/Gray, Green, CLAY, Little Medium to Fine Sand (Residual Soil) (cl) [a-6]	
S-17	☒	18	8 19 47				70	EL -62.5 68.5		COMPLETELY WEATHERED ROCK Sampled As: Moist, Green/Brown, Medium to Fine SAND, Little Silt	
S-18		2	50/2"				75	EL -67.7 73.7		Sample S-18: Little Coarse to Fine Gravel-Sized Rock Fragments Bottom of Boring @ 73.7 ft	Grouted with bentonite mix after final groundwater reading
							80				

TEST BORING LOG

Boring No. LOT-A2-13
Page 1 of 2

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	629598
EAST:	616806
ELEVATION:	6.0 - ft
START DATE:	10/18/2022
END DATE:	10/18/2022
DRILLER:	Brian
LOGGED BY:	JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
10/18/2022	5:30:00 PM	3.8		20

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
								EL 5.7 0.3		3-Inches Bituminous Concrete	
S-1	☒	14	5 4 3					EL 5.4 0.6		4-Inches Graded Aggregate Base	
										FILL Sampled As: Moist, Medium Stiff, Orange, Coarse to Fine SAND, Some Clay, Trace Fine Gravel	
S-2	☒	2	2 1 3				▽	EL 3.5 2.5		FILL Sampled As: Moist, Very Loose, Black, Coarse to Fine GRAVEL-Sized Rock Fragments, Little Coarse to Fine Sand	
S-3	☒	10	1 1 1	16.5%			5	EL 1.0 5.0		FILL Sampled As: Moist, Very Soft, Orange/Red/Brown, CLAY, Some Medium to Fine Sand, Contains Glass Fragments	
S-4	☒	18	WOH 1 1					EL -1.5 7.5		Moist, Very Soft, Dark Gray/Dark Brown, High Plasticity SILT, And Clay, Little Medium to Fine Sand (MH) [A-7-5(61)]	Wet spoon at 7.5-ft
T-1	▥	24		80.6%	109	63	10				Consolidation Test: Preconsolidation Pressure (tsf): 0.50, Compression Index: 0.82, Recompression Index: 0.11, Initial Void Ratio: 2.512
S-5	☒	18	WOH 1 1								
S-6	☒	18	WOH 1 1	67.5%	148	70	15			Sample S-6: Dark Brown, Some Coarse Gravel, Contains Wood and Organic Fragments [A-7-5(48)]	Sample S-6: Organic Content (LOI) = 16.8%
S-7	☒	5	1 1 2				20	EL -12.5 18.5		Wet, Very Loose, Brown, Coarse to Fine SAND, Some Fine Rounded Gravel, Little Silt (SM) [A-1-b]	Bentonite added to HSA
S-8	☒	18	10 15 18	9.9%	NP	NP	25			Sample S-8: Dense, Brown, Light Brown	
S-9	☒	18	7 13 50/6"				30			Sample S-9: Very Dense, Brown/Gray	
S-10	☒	18	8 13 15				35	EL -27.5 33.5		Moist, Medium Dense, Brown, Medium to Fine SAND, Some Silt (sm) [a-4]	

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
☰ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)

TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Medium Dense, Brown, Medium to Fine SAND, Some Silt (sm) [a-4]	
S-11	☒	18	3 5 8	14.5%	22	NP	40	EL -32.5 38.5		Moist, Stiff, Light Brown/Gray, SILT, And Medium to Fine Sand (Residual Soil) (ML) [A-4(0)]	
S-12	☒	18	2 7 13	20.1%			45	EL -37.5 43.5		Moist, Medium Dense, Light Brown/Gray, Medium to Fine SAND, Some Clay (Residual Soil) (sc) [a-2-6]	
S-13	☒	18	2 6 10				50			Sample S-13: Wet, Orange/Red, Coarse to Fine Sand	
S-14	☒	18	8 9 16				55	EL -47.5 53.5		Moist, Very Stiff, Red, CLAY, Trace Fine Sand (Residual Soil) (cl) [a-7-5]	
S-15	☒	18	4 8 11	16.3%			60	EL -52.5 58.5		Moist, Medium Dense, Green/Light Brown, Coarse to Fine SAND, Some Clay (Residual Soil) (sc) [a-2-6]	
S-16	☒	18	4 6 10				65	EL -57.5 63.5		Moist, Very Stiff, Red, CLAY, Little Medium to Fine Sand (Residual Soil) (cl) [a-6]	
S-17	☒	18	6 10 13	26.9%			70			Sample S-17: Green/Red, Some Medium to Fine Sand	
S-18	☒	18	7 10 12							Sample S-18: Green/Red, Some Coarse to Fine Sand	
							75	EL -69.0 75.0		Bottom of Boring @ 75.0 ft	Grouted with bentonite mix after final groundwater reading
							80				

TEST BORING LOG

Boring No. LOT-A2-14

Page 1 of 2

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 629910
EAST: 616209
ELEVATION: 8.0 - ft
START DATE: 10/10/2022
END DATE: 10/10/2022
DRILLER: Brian
LOGGED BY: JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
10/11/2022	9:40:00 AM	5.0	--	35.0
10/12/2022	10:01:00 AM	4.9	--	32.6

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	⊠	5	18 15 17					EL 7.7 0.3	3-Inches TOPSOIL FILL Sampled As: Moist, Dense, Black, Coarse to Fine SAND, Some Coarse to Fine Gravel, Little Clay, Contains Brick and Glass Fragments	
S-2	⊠	12	5 10 10						Sample S-2: Medium Dense, Brown, Some Clay, Contains Brick Fragments	
S-3	⊠	6	4 4 4	17.5%	29	19	▼ 5		Sample S-3: Loose, Brown, Some Clay, Little Fine Gravel	Wet Spoon at 5-ft
S-4	⊠	8	1 3 2					EL 0.5 7.5	Moist, Loose, Black/Gray, Coarse to Fine SAND, Some Clay (sc) [a-2-6]	
S-5	⊠	18	WOH 1 1				10	EL -2.0 10.0	Moist, Very Soft, Dark Brown, High Plasticity SILT, Little Medium to Fine Sand (MH) [A-7-5(62)] Sample S-5: Contains Root Fragments	Grab sample collected from 10.0-ft to 20.0-ft
S-6	⊠	18	WOH 1 1	68%	108	54	15			
S-7	⊠	18	WOH WOH 1				20			
S-8	⊠	18	WOH WOH 1				25			
S-9	⊠	18	WOH WOH WOH	71.5%	95	57	30	EL -20.5 28.5	Moist, Very Soft, Dark Brown, High Plasticity CLAY, Trace Medium to Fine Sand (CH) [A-7-5(61)]	
S-10	⊠	18	WOH 1 1				35			

SAMPLE IDENTIFICATION	DRILLING METHOD
⊠ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
☰ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
⊠ - D - DENISON	MD - MUD DRILLING
◧ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
31-50	DENSE	9-15	STIFF	AND	36 TO 50
OVER 50	VERY DENSE	16-30	VERY STIFF		
		OVER 30	HARD		

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS			DEPTH	ELEV. DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
				NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX					
										Moist, Very Soft, Dark Brown, High Plasticity CLAY, Trace Medium to Fine Sand (CH) [A-7-5(61)]	
S-11	☒	18	2 5 9				40	EL -30.5 38.5		Moist, Medium Dense, Brown/Gray, Coarse to Fine SAND, Some Clay, Little Coarse to Fine Gravel-Sized Rock Fragments (sc) [a-2-6]	Running Sands at 40-ft
S-12	☐	18	5 4 5				45	EL -35.5 43.5		Moist, Loose, Brown/Light Gray, Coarse to Fine SAND, Some Clay, Trace Coarse to Fine Gravel-Sized Rock Fragments (Residual Soil) (sc) [a-2-6]	
S-13	☒	18	4 7 13	15.2%			50	EL -40.5 48.5		Moist, Very Stiff, Red/Green, CLAY, Some Medium to Fine Sand (Residual Soil) (cl) [a-6]	
S-14	☒	18	3 16 18				55	EL -45.5 53.5		Moist, Dense, Green/Brown, Coarse to Fine SAND, Some Clay (Residual Soil) (sc) [a-2-6]	
S-15	☒	18	8 8 10				60			Sample S-15: Medium Dense	
S-16	☒	18	9 11 16				65	EL -55.5 63.5		Moist, Very Stiff, Red, CLAY, Little Medium to Fine Sand (Residual Soil) (cl) [a-6]	
S-17	☒	4	50/4"					EL -60.5 68.5		COMPLETELY WEATHERED ROCK Sampled As: Moist, Brown/Green, Coarse to Fine SAND, Little Clay, Little Coarse to Fine Gravel-Sized Rock Fragments	
S-18	☒	2	50/2"				70	EL -62.2 70.2		Bottom of Boring @ 70.2 ft	Auger refusal at 70-ft Grouted with bentonite mix after final groundwater reading
							75				
							80				

TEST BORING LOG

Boring No. LOT-A2-15
Page 1 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 629924
EAST: 616572
ELEVATION: 5.5 - ft
START DATE: 9/30/2022
END DATE: 9/30/2022
DRILLER: Brian
LOGGED BY: JV

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
9/30/2022	12:15:00 PM	5.0	--	16.0

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
1	⊠	12	8 12 9							FILL Sampled As: Dry, Medium Dense, Brown, Coarse to Fine SAND, Trace Fine Gravel, Trace Silt, Trace Organics	
2	⊠	18	3 2 2					EL 3.0 2.5		Moist, Soft, Brown, CLAY, Some Coarse to Fine sand (cl) [a-6]	
3	⊠	12	1 1 2	60%	85	53	∇5	EL 0.5 5.0		Moist, Soft, Black, High Plasticity CLAY, And Silt, Little Coarse to Fine Sand, Little organics (CH) [A-7-5(50)]	
4	⊠	12	1 WOH 2							Sample S-4: Very Soft	
1	▥	9					10				
5	⊠	18	WOH 1 1				15			Sample S-5: Wet, Very Soft, Trace Organics	
6	⊠	8	3 9 10	7.5%	NP	NP	20	EL -13.0 18.5		Wet, Medium Dense, Black, Coarse to Fine GRAVEL, And Coarse to Fine Sand, Trace Silt (GW-GM) [A-1-a]	
7	⊠	18	10 14 15				25			Sample S-7: Gray/Brown	Bentonite added to HSA at 25-ft
8	⊠	12	6 18 24				30			Sample S-8: Dense, Gray/Brown	
9	⊠	3	18 17 11				35			Sample S-9: Gray/Brown	

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
⊠ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
⊠ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
■ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

Boring No. LOT-A2-15

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Wet, Medium Dense, Black, Coarse to Fine GRAVEL, And Coarse to Fine Sand, Trace Silt (GW-GM) [A-1-a]	
10	☒	3	3 8 13				40	EL -33.0 38.5		Wet, Medium Dense, Red-Brown, Medium to Fine SAND, And Clay (Residual Soil) (SC) [A-6(4)]	
11	☒	12	7 9 15	11.2%	32	19	45				
12	☒	18	3 8 14				50				
13	☒	18	WOH 2 4	18.2%			55			Sample S-13: Loose, Green/Blue	
14	☒	18	4 6 9				60	EL -53.0 58.5		Moist, Medium Dense, Blue-Green, Coarse to Fine SAND, Some Silt (Residual Soil) (sm) [a-4]	
15	☒	17	11 21 50/5"				65	EL -58.0 63.5		COMPLETELY WEATHERED ROCK Sampled As: Moist, Blue-Green, Coarse to Fine SAND, Some Silt	
16	☒	0	50/2"					EL -61.2 66.7		Bottom of Boring @ 66.7 ft	Auger refusal at 66.5 ft Grouted with bentonite mix upon completion
							70				
							75				
							80				

TEST BORING LOG

Boring No. LOT-A2-16

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 630053
EAST: 616844
ELEVATION: 5.0 - ft
START DATE: 9/28/2022
END DATE: 9/28/2022
DRILLER: Brian
LOGGED BY: JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
9/28/2022	3:43:00 PM	3.3	--	10.0
9/29/2022	8:00:00 AM	3.6		17.3

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	10	11 30 20					EL 4.9 0.1 EL 4.7 0.3	1-Inch GRADED AGGREGATE BASE 3-Inches TOPSOIL FILL Sampled As: Moist, Dense, Gray/Brown, Coarse to Fine SAND, Some Silt, Little Coarse to Fine Rounded Gravel	
S-2	☒	15	13 7 6	14.7%			▼	EL 2.5 2.5	FILL Sampled As: Moist, Medium Dense, Brown/Gray, Coarse to Fine SAND, Some Clay, Some Coarse to Fine Rounded Gravel	
S-3	☒	0	6 5 4				5		Sample S-3: Loose, No Recovery	Wet Spoon at 5-ft
S-4	☒	3	3 2 1					EL -2.5 7.5	FILL Sampled As: Wet, Very Loose, Brown, Coarse to Fine Subangular Gravel, Some Clay, Trace Brick Fragments	
S-5	☒	6	1 2 3	47%	51	23	10	EL -5.0 10.0	FILL Sampled As: Wet, Medium Stiff, Dark Gray, High Plasticity CLAY, Some Fine Gravel-sized Brick Fragments, Little Coarse to Fine Sand	
S-6	☒	18	WOH 1 1					EL -8.5 13.5	FILL Sampled As: Moist, Very Soft, Dark Brown, CLAY, Some Medium to Fine Sand, Contains Wood Fragments	
							15			
S-7	☒	6	2 10 6						Sample S-7: Wet, Very Stiff, Little Coarse to Fine Gravel, Contains Brick Fragments	
							20			
S-8	☒	18	8 15 20	10.3%	NP	NP		EL -18.5 23.5	Moist, Dense, Brown, Coarse to Fine SAND, And Fine Rounded Gravel, Trace Silt (SP-SM) [A-1-a]	
							25			
S-9	☒	18	8 16 30							
							30			
S-10	☒	18	4 5 11	16.7%	27	15		EL -28.5 33.5	Moist, Medium Dense, Green/Brown, Coarse to Fine SAND, Trace Clay (SP-SC) [A-2-6]	
							35			

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
☰ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
◧ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Medium Dense, Green/Brown, Coarse to Fine SAND, Trace Clay (SP-SC) [A-2-6]	
S-11	☒	10	3 10 13				40	EL -33.5 38.5		Moist, Medium Dense, Brown/Orange, Coarse to Fine SAND, Some Clay (sc) [a-2-6]	
S-12	☒	18	7 8 7				45	EL -39.5 44.5		Moist, Stiff, Orange, CLAY, Little Coarse to Fine Sand (Residual Soil) (cl) [a-6]	
S-13	☒	18	5 6 11				50			Sample S-13: Very Stiff, Orange/Brown, And Coarse to Fine Sand	
S-14	☒	6	7 11 13				55			Sample S-14: Very Stiff, Orange/Red	
S-15	☒	18	5 6 10	33.9%			60	EL -53.5 58.5		Moist, Very Stiff, Red, CLAY, Little Medium to Fine Sand (Residual Soil) (cl) [a-6]	
S-16	☒	18	10 16 17				65			Sample S-16: Hard, And Coarse to Fine Sand	
S-17	☒	18	6 15 28				70	EL -63.5 68.5		Moist, Dense, Green/Brown, Coarse to Fine SAND, Some Clay (Residual Soil) (sc) [a-2-6]	
S-18	☒	15	10 15 50/3"					EL -68.5 73.5		COMPLETELY WEATHERED ROCK Sampled As: Moist, Green/Gray, Coarse to Fine SAND, Some Clay	
							75	EL -69.8 74.8		Bottom of Boring @ 74.8 ft	Grouted with bentonite mix after final groundwater reading
							80				

TEST BORING LOG

Boring No. LOT-A2-17
Page 1 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	630300
EAST:	616272
ELEVATION:	21 - ft
START DATE:	9/26/2022
END DATE:	9/27/2022
DRILLER:	Brian
LOGGED BY:	JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
9/26/2022	11:00:00 AM	--	21.5	--
9/27/2022	3:40:00 PM	18.5	--	45.0

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	⊠	18	5 4 5					EL 20.8 0.2		2-Inches TOPSOIL FILL Sampled As: Moist, Stiff, Orange/Red, CLAY, Some Coarse to Fine Sand, Trace Coarse to Fine Gravel	
S-2	⊠	9	2 2 23							Sample S-2: Very Stiff	Hard Augering at 4-ft
S-3	⊠	0	18 12 4				5			Sample S-3: Very Stiff, No Recovery	
S-4	⊠	6	4 3 3							Sample S-4: Medium Stiff, And Coarse to Fine Sand	
S-5	⊠	4	1 3 5				10			Sample S-5: Medium Stiff	
S-6	⊠	18	24 11 11				15	EL 7.5 13.5		FILL Sampled As: Moist, Medium Dense, Coarse to Fine SAND, And Clay, Little Coarse to Fine Gravel, Contains Brick and Wood Fragments	Strong Petroleum Odor at 13.5-ft
S-7	⊠	18	6 17 17	9%			▼ 20			Sample S-7: Dense, Some Coarse to Fine Gravel	
S-8	⊠	0	1 2 2				25			Sample S-8: Very Loose, No Recovery	
S-9	⊠	16	WOH 1 1	67.3%	104	65	30	EL -7.5 28.5		Wet, Very Soft, Gray/Brown/Green, High Plasticity CLAY, And Silt, Little Medium to Fine Sand (CH) [A-7-5 (68)]	
S-10	⊠	0	WOH 1 1				35			Sample S-10: No Recovery	

SAMPLE IDENTIFICATION	DRILLING METHOD
⊠ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
☰ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
⊠ - D - DENISON	MD - MUD DRILLING
◼ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Wet, Very Soft, Gray/Brown/Green, High Plasticity CLAY, And Silt, Little Medium to Fine Sand (CH) [A-7-5 (68)]	
S-11	☒	18	WOH 1 1							Sample S-11: Dark Gray	
							40				
								EL -22.5 43.5		Wet, Very Loose, Dark Gray, Coarse to Fine SAND, Some Silt (SM) [A-2-7 (4)]	
S-12	☒	18	1 1 1	52.3%	73	36					
							45				
S-13	☒	18	1 2 1								
							50				
S-14	☒	18	5 7 11							Sample S-14A: Medium Dense, Dark Gray	
								EL -33.5 54.5		Moist, Medium Dense, Gray, Coarse to Fine SAND, Some Coarse to Fine Rounded Gravel, Little Clay (sp) [a-1-a]	
							55				
								EL -37.5 58.5		Moist, Hard, Dark Gray, CLAY, Some Coarse to Fine Rounded Gravel, Little Medium to Fine Sand (cl) [a-6]	
S-15	☒	6	10 15 21								
							60				
								EL -42.5 63.5		Moist, Hard, Orange/Green, High Plasticity SILT, Trace Medium to Fine Sand (Residual Soil) (MH) [A-7-5(33)]	
S-16	☒	5	13 31 29								
							65				
S-17	☒	18	7 11 13	24.4%	65	30				Sample S-17: Very Stiff, Red/Green	
							70				
S-18	☒	12	8 10 17							Sample S-18: Very Stiff, Green, Light Brown	
							75	EL -54.0 75.0		Bottom of Boring @ 75.0 ft	Grouted with bentonite mix after final groundwater reading
							80				

TEST BORING LOG

Boring No. LOT-A2-17A
Page 1 of 1

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	630299
EAST:	616276
ELEVATION:	21 - ft
START DATE:	10/21/2022
END DATE:	10/21/2022
DRILLER:	Brian
LOGGED BY:	JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
10/21/2022	11:45:00 AM	18.5		32

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Blank Auger to 32.0-ft	
							5				
							10				
							15				
							∇				
							20				
							25				
S-1	☒	18	3 2 1				30	EL -9.0 30.0	▨	Moist, Soft, Dark Gray, High Plasticity CLAY, And Silt, Trace Coarse to Fine Sand (CH) [A-7-5(67)]	
T-1	▥	24		54.9%	97	58			▨		DS Test Results: Cohesion: 264-psf, Drained Friction Angle: 25.1-deg Consolidation Test: Preconsolidation Pressure (tsf): 1.1, Compression Index: 0.65, Recompression Index:0.09 , Initial Void Ratio: 1.478 Grouted with bentonite mix upon completion
								EL -13.0 34.0		Bottom of Boring @ 34.0 ft	
							35				
							40				
							45				

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
◧ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)

TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

Boring No. LOT-A2-17A

TEST BORING LOG

Boring No. LOT-A2-18
Page 1 of 2

PROJECT: South Market Street - RDC
SITE: New Castle County , Delaware
DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 630299
EAST: 616276
ELEVATION: 11.0 - ft
START DATE: 9/26/2022
END DATE: 9/26/2022
DRILLER: Brian
LOGGED BY: JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
9/26/2022	2:30:00 PM	6.5	--	36.0
9/27/2022	4:50:00 PM	8.5	--	32.0

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	15	19 24 37	6%				EL 10.8 0.2	▨	2-Inches TOPSOIL FILL Sampled As: Moist, Very Dense, Brown/Light Brown, Black, Coarse to Fine SAND, Some Silt, Some Coarse to Fine Angular Gravel, Contains Asphalt Fragments	pH: 10.0, As-Is Resistivity (ohm-cm): 39,000, Wetted Resistivity (ohm-cm): 2,100, Sulfate Content (ppm): 750, Oxidation Reduction (mV): 68, Chloride (ppm): 20, Sulfides: Not Present
S-2	☒	12	20 48 50/4"						▨	Sample S-2: Gray/Black	
S-3	☒	18	38 30 19				5 ∇		▨	Sample S-3: Dense, Brown, Gray, Orange, Contains Brick and Wood Fragments	
S-4	☒	18	14 15 16	10.7%			▼		▨	Sample S-4: Dense, Orange/Brown/Black, Little Coarse to Fine Gravel, Contains Brick and Wood Fragments	
S-5	☒	18	13 6 5				10	EL 1.0 10.0	▨	FILL Sampled As: Moist, Medium Dense, Black, Gray, Coarse to Fine SAND, Some Clay, Little Coarse to Fine Gravel, Contains Ash Fragments	Wet Spoon at 10-ft
S-6	☒	3	5 2 3				15	EL -2.5 13.5	▧	Wet, Medium Stiff, Dark Brown, High Plasticity CLAY (CH) [A-7-5(66)]	
S-7	☒	18	1 1 1	57.4%	90	54	20		▧	Sample S-7: Very Soft, Contains Root Fragments	
S-8	☒	6	5 4 4				25	EL -12.5 23.5	▥	Wet, Very Soft, Dark Brown, High Plasticity SILT, Little Clay, Trace Fine Sand (MH) [A-7-5 (65)] Sample S-8: Medium Stiff, Contains Wood And Root Fragments	
S-9	☒	18	1 1 1				30		▥		
S-10	☒	10	1 1 2				35		▥	Sample S-10: Soft, Contains Wood Fragments	

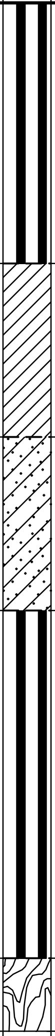
SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
☒ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
■ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto



SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Wet, Very Soft, Dark Brown, High Plasticity SILT, Little Clay, Trace Fine Sand (MH) [A-7-5 (65)]	
S-11	☒	15	1 1 1	66.1%	106	53	40			Sample S-11: Contains Wood Fragments	
S-12	☒	12	4 4 5				45	EL -32.5 43.5		Moist, Stiff, Brown, Gray, Red, CLAY, And Coarse to Fine Sand (cl) [a-6]	
S-13	☒	18	28 27 22				50	EL -37.5 48.5		Moist, Dense, Brown, Coarse to Fine SAND, Some Clay (sc) [a-2-6]	Hard Augering at 50-ft Running Sands at 50-ft
S-14	☒	18	5 8 10	33.8%	63	30	55	EL -42.5 53.5		Moist, Very Stiff, Red, High Plasticity SILT, Little Medium to Fine Sand, Trace Fine Gravel (Residual Soil) (MH) [A-7-5(30)]	
S-15	☒	12	7 12 11				60			Sample S-15: Red/Green, Some Medium to Fine Sand	
S-16	☒	9	29 50/3"				65	EL -52.5 63.5		COMPLETELY WEATHERED ROCK Sampled As: Moist, Green/Brown, Coarse to Fine Sand, Trace Coarse to Fine Gravel-Sized Rock Fragments	
S-17	☒	1	50/1"					EL -54.6 65.6		Sample S-17: Green/Gray, GRAVEL-SIZED ROCK FRAGMENTS, Some Coarse to Fine Sand, Trace Clay Bottom of Boring @ 65.6 ft	Auger refusal at 65.5-ft Grouted with bentonite mix after final groundwater reading
							70				
							75				
							80				

TEST BORING LOG

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 630283
EAST: 616512
ELEVATION: 9.0 - ft
START DATE: 5/6/2021
END DATE: 5/6/2021
DRILLER: Mark
LOGGED BY: JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
5/7/2021	8:50:00 AM	2.5	-	15
5/18/2021	2:10:00 PM	2.3	-	14

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	⊠	8	1 2 3					EL 8.7 0.3	⊠	4-Inches TOPSOIL FILL Sampled As: Moist, Medium Stiff, Brown, SILT, Some Medium to Fine Sand, Trace Wood Fragments	
S-2	⊠	8	1 1 1	43.5%			▽	EL 6.5 2.5	▨	Moist, Very Soft, Brown/Black, Highly Plastic CLAY, Little Medium to Fine Sand (CH) [A-7-5(34)]	
S-3	⊠	15	3 7 4				5		▨	Sample S-3: Stiff, Trace Medium to Fine Sand	Sample S-3: VOC = 72.8 ppm
S-4	⊠	15	1 1 1						▨	Sample S-4: Dark Gray, Trace Medium to Fine Sand, Trace Gravel	Wet Spoon at 7.5-ft
T-1	▥	4	PUSH				10		▨	Sample T-1: And SILT, Little Fine Sand	
S-5	⊠	18	WOH 1 WOH						▨	Sample S-5: Some Silt, Trace Medium to Fine Sand	
S-6	⊠	18	WOH WOH WOH				15		▨	Sample S-6: Trace Medium to Fine Sand	CIUC Test (Sample T-2) Results: Cohesion: 369-psf, Drained Friction Angle: 24.9-deg
T-2	▥	24	PUSH						▨		
				51.7%	64	33			▨		Consolidation Test: Preconsolidation Pressure (tsf): 0.70, Compression Index: 0.43, Recompression Index: 0.06, Initial Void Ratio: 1.536
							20		▨		
S-7	⊠	18	9 11 8				25	EL -14.5 23.5	⁘	Moist, Medium Dense, Brown, Coarse to Fine SAND, Some Coarse to Fine Sub-Angular Gravel, Little Silt (sp) [a-1-b]	
S-8	⊠	18	12 22 24				30		⁘	Sample S-8: Dense	
S-9	⊠	10	28 33 30				35		⁘	Sample S-9: Very Dense	

SAMPLE IDENTIFICATION	DRILLING METHOD
⊠ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
☰ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
⊠ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Medium Dense, Brown, Coarse to Fine SAND, Some Coarse to Fine Sub-Angular Gravel, Little Silt (sp) [a-1-b]	
								EL -29.5 38.5		Moist, Medium Dense, Greenish Gray, Coarse to Fine SAND, Some Clay, Trace Fine Gravel (Residual Soil) (SC) [A-7-6(4)]	
S-10	☒	18	7 10 11	23.9%	48	26	40				
S-11	☒	18	8 13 15				45				
								EL -39.5 48.5		Moist, Dense, Greenish Gray, Medium to Fine SAND, Some Silt (Residual Soil) (sm) [a-2-4]	
S-12	☒		10 14 18				50				
								EL -44.5 53.5		Moist, Very Stiff, Greenish Gray, SILT, Some Medium to Fine Sand (Residual Soil) (ml) [a-4]	
S-13	☒	18	9 14 16				55				
S-14	☒	18	14 16 20				60			Sample S-14: Hard	
S-15	☒	18	9 13 18				65			Sample S-15: Hard	
S-16	☒	18	13 20 24							Sample S-16: Hard, Reddish Gray	
							70	EL -61.0 70.0		Bottom of Boring @ 70.0 ft	Grouted after final groundwater reading
							75				
							80				

TEST BORING LOG

Boring No. RB-B-01
Page 1 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Mobil B31 Truck/Safety

COMMISSION NO.:	20077.000
NORTH:	630874
EAST:	616763
ELEVATION:	7 - ft
START DATE:	5/3/2021
END DATE:	5/3/2021
DRILLER:	John
LOGGED BY:	ACR

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
5/4/2021	1:55:00 PM	3.8	-	59

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. ——— DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
								EL 6.0 1.0	■	5.5-Inches Bituminous Concrete 6-Inches Portland Cement Concrete	
G-1									⊠	FILL Sampled As: Moist, Dark Gray, Brown, Black, Coarse to Fine SAND, Some Fine Angular Gravel, Trace Brick Fragments	Bulk sample obtained from 0.0-ft to 10.0-ft MDD = 113.1-pcf OMC = 12% CBR @ 95% = 2.5
S-1	☒	18	2 4 15	22.6%	NP	NP	▽	EL 4.5 2.5	⊠	Moist, Very Stiff, Brown, CLAY, Little Coarse to Fine Sand (cl) [a-6]	
S-2	☒	18	3 4 6	28.4%			5	EL 2.0 5.0	⊠	FILL Sampled As: Moist, Loose, Grayish Brown, Coarse to Fine SAND, And Silt, Trace Brick Fragments	
S-3	☒	10	2 2 2					EL -1.5 8.5	░	Moist, Very Loose, Coarse to Fine SAND, Little Silt (sm) [a-4]	
S-4	☒	15	1 1 2				10	EL -3.0 10.0	▨	Moist, Soft, Black, High Plasticity CLAY, Trace Medium to Fine Sand (CH) [A-7-5(16)]	
S-5	☒	18	1 2 2						▨		
T-1	▥	18	PUSH	52.5%	69	38	15		▨	Sample T-1: And Coarse to Fine Sand, Trace Fine Gravel	DS Test Results: Cohesion: 138-psf, Drained Friction Angle: 23.8-deg
S-6	☒	18	1 2 2				20		▨		
S-7	☒	18	1 2 1				25		▨		
S-8	☒	18	2 1 2				30		▨		
S-9	☒	18	2 2 2	55.1%	65	37	35		▨	Sample S-9: And Silt [A-7-5(43)]	

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
⊠ - D - DENISON	MD - MUD DRILLING
◧ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
31-50	DENSE	9-15	STIFF	AND	36 TO 50
OVER 50	VERY DENSE	16-30	VERY STIFF		
		OVER 30	HARD		

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Mobil B31 Truck/Safety

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Soft, Black, High Plasticity CLAY, Trace Medium to Fine Sand (CH) [A-7-5(16)]	
S-10	☒	18	3 2 3					EL -31.5 38.5		Moist, Medium Stiff, Dark Gray, Organic CLAY, Trace Coarse Round Gravel (cl) [a-6]	Sample S-10: Sandy silt at tip of spoon
							40	EL -33.0 40.0		Wet, Hard, Gray, SILT, Some Medium to Fine Sand (ml) [a-4]	
S-11	☒	18	15 16 15				45	EL -37.5 44.5		Wet, Dense, Gray, Coarse to Fine Sub-Angular GRAVEL, And Coarse to Fine Sand, Trace Silt (gp) [a-1-a]	
S-12	☒	18	16 21 27				50	EL -41.5 48.5		Wet, Dense, Gray, Coarse to Medium SAND, Trace Fine Sand, Trace Fine Gravel (sp) [a-1-b]	
S-13	☒	18	7 12 16				55	EL -46.5 53.5		Moist, Very Stiff, Brown, Green, Gray, SILT, Little Fine Sand (Residual Soil) (ml) [a-4]	
S-14	☒	12	19 50/6"					EL -51.5 58.5		COMPLETELY WEATHERED ROCK Sampled As: Moist, Very Dense, Brown, Green, Gray, SILT, And Fine Sand	
							60	EL -52.5 59.5		Bottom of Boring @ 59.5 ft	Grouted upon completion
							65				
							70				
							75				
							80				

TEST BORING LOG

Boring No. RB-B-02
Page 1 of 1

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 631254
EAST: 616818
ELEVATION: 5 - ft
START DATE: 5/18/2021
END DATE: 5/18/2021
DRILLER: Mark
LOGGED BY: JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
								EL 4.2 0.8	■	7-Inches Bituminous Concrete 3-Inches Aggregate Base	
S-1	☒	10	10 17 12						▨	FILL Sampled As: Moist, Medium Dense, Brown/Gray, Coarse to Fine SAND, Some Gravel, Little Silt	
S-2	☒	0	38 10 9						▨	Sample S-2: No Recovery	Gravel on tip of spoon Hard Augering 2.5-ft to 5-ft
S-3	☒	3	10 9 2				5		▨	Sample S-3: And Gravel	Wet Spoon at 5-ft Hard Augering 5-ft to 9-ft
S-4	☒	8	1 2 9					EL -4.0	▨	Sample S-4: Wet, Some Silt, Little Gravel	Sample S-4: Petroleum Odor
								9.0		Bottom of Boring @ 9.0 ft	Grouted upon completion
							10				
							15				
							20				
							25				
							30				
							35				

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
☒ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
■ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

TEST BORING LOG

Boring No. RB-B-02B
Page 1 of 2

PROJECT: South Market Street - RDC
SITE: New Castle County , Delaware
DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	631247
EAST:	616801
ELEVATION:	5.5 - ft
START DATE:	5/18/2021
END DATE:	5/18/2021
DRILLER:	Mark
LOGGED BY:	JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
5/18/2021	2:44:00 PM	7.1	-	22.3
5/19/2021	8:40:00 AM	3.8	-	23.8

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Blank Auger from 0 to 7.5-ft	Bulk Bag B-1 taken from auger cuttings 0.0-ft to 10.0-ft
							▼				
				35.8%	39	16	5				MDD = 121.9-pcf OMC = 8.5%
							▽	EL -2.0 7.5			
S-1	⊠	2	1 1 1							Moist, Very Soft, Black, High Plasticity CLAY, Some Medium to Fine Sand, Trace Gravel (CH) [A-7-5(80)]	Sample S-1: Strong Petroleum Odor
S-2	⊠	12	1 1 2	70.8%			10			Sample S-2: Soft, Trace Medium to Fine Sand	
S-3	⊠	18	WOH WOH 1							Sample S-3: Trace Medium to Fine Sand	
S-4	⊠	18	WOH WOH WOH				15			Sample S-4: Trace Medium to Fine Sand	
S-5	⊠	18	WOR WOH WOH							Sample S-5: Trace Medium to Fine Sand	
S-6	⊠	18	WOH WOH WOH	68.4%	105	70	20			Sample S-6: Trace Medium to Fine Sand	
S-7	⊠	18	WOH WOH WOH				25			Sample S-7: Trace Medium to Fine Sand	
S-8	⊠	18	WOH WOH 1				30			Sample S-8: Trace Medium to Fine Sand	
S-9	⊠	18	WOH WOH 1	67.8%			35			Sample S-9: Trace Medium to Fine Sand	

SAMPLE IDENTIFICATION	DRILLING METHOD
⊠ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
◫ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
⊠ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Very Soft, Black, High Plasticity CLAY, Some Medium to Fine Sand, Trace Gravel (CH) [A-7-5(80)]	
								EL -33.0 38.5			
S-10	☒	10	1 1 2				40			Wet, Very Loose, Brown, Medium to Fine SAND, Some Silt (sm) [a-2-4]	
								EL -38.0 43.5			
S-11	☒	6	7 3 4				45			Moist, Medium Stiff, Green, SILT, Some Medium to Fine Sand (Residual Soil) (ml) [a-4]	Running Sands at 45-ft
S-12	☒	18	8 12 11				50			Sample S-12: Very Stiff, Trace Mica	
S-13	☒	8	24 50/2"							Sample S-13: Hard, Little Medium to Fine Sand	
								EL -48.5 54.0		COMPLETELY WEATHERED ROCK Sampled As: Moist, Gray, GRAVEL-SIZED ROCK FRAGMENTS, Some Coarse to Fine Sand, Little Silt	
							55	EL -50.1 55.6			Auger Refusal at 55.5-ft Grouted after final groundwater reading
S-14		1.5	50/1.5"							Bottom of Boring @ 55.6 ft	
							60				
							65				
							70				
							75				
							80				

TEST BORING LOG

Boring No. RB-B-03
Page 1 of 2

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	631393
EAST:	616592
ELEVATION:	9 - ft
START DATE:	5/12/2021
END DATE:	5/12/2021
DRILLER:	Mark
LOGGED BY:	JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
5/12/2021	1:59:00 PM	5.2	-	27.8
5/19/2021	12:20:00 PM	5.2	-	27.7

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
								EL 8.5 0.5		6-Inches Bituminous Concrete	
S-1	☒	10	6 5 5							FILL Sampled As: Moist, Stiff, Brown, SILT, And Medium to Fine Sand, Trace Gravel	
S-2	☒	12	3 9 7	7.88% 4.87%						Sample S-2a: Orangish Brown	Sample S-2: Petroleum Odor, VOC = 2.5 ppm
								EL 5.5 3.5		FILL Sampled As: Moist, Medium Dense, Brown, Coarse to Fine SAND, Little Silt, Trace Gravel (sm) [a-2-4]	
S-3	☒	10	3 3 1				▼5			Sample S-3: Very Loose	Sample S-3: VOC = 65 ppm
S-4	☒	2	WOH WOH 1					EL 1.5 7.5		Moist, Very Soft, Black, CLAY, Little Fine Angular Gravel (cl) [a-7-6]	Sample S-4: Strong Petroleum Odor, VOC = 70 ppm
S-5	☒	12	1 1 1	24%	49	24	10	EL -1.0 10.0		Moist, Very Soft, Coarse to Fine SAND, Little Clay, Trace Silt, Trace Fine Angular Gravel (SC) [A-2-7(1)]	Sample S-5: VOC = 24.7 ppm
S-6	☒	18	WOH 1 1					EL -3.5 12.5		Moist, Very Soft, Black, Highly Plastic CLAY, Trace Fine Angular Gravel (CH) [A-7-5(44)]	Sample S-6: VOC = 11.8 ppm
S-7	☒	18	WOH 1 1				15				
S-8	☒	18	WOH WOH WOH				20				
T-1	▥	24	PUSH	57.3%	71	40	25				Consolidation Test: Preconsolidation Pressure (tsf): 0.70, Compression Index: 0.51, Recompression Index: 0.05, Initial Void Ratio: 1.336
S-9	☒	18	1 1 1				30	EL -19.5 28.5		Moist, Very Loose, Gray, Coarse to Fine SAND, Trace Silt (SP-SM) [A-1-b]	
S-10	☒	18	1 2 4	19.1%	NP	NP	35			Sample S-10: Loose	

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)

TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Very Loose, Gray, Coarse to Fine SAND, Trace Silt (SP-SM) [A-1-b]	
S-11	☒	18	6 8 4				40	EL -30.5		Sample S-11a: Medium Dense, Brown	
								39.5		Moist, Stiff, Brown, Greenish Gray, SILT, Little Medium to Fine Sand (Residual Soil) (ml) [a-4]	
S-12	☒	18	6 9 11				45			Sample S-12: Very Stiff, Some Medium to Fine Sand	
S-13	☒	18	12 16 21				50			Sample S-13: Hard, And Coarse to Fine Sand	
S-14	☒	15	13 15 19				55			Sample S-14: Hard, And Medium to Fine Sand	
S-15	☒	18	12 16 21					EL -51.0		Sample S-15: Hard, And Coarse to Fine Sand	
							60	60.0		Bottom of Boring @ 60.0 ft	Grouted after final groundwater reading
							65				
							70				
							75				
							80				

TEST BORING LOG

Boring No. RB-B-04
Page 1 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D 50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 631695
EAST: 617000
ELEVATION: 8 - ft
START DATE: 7/7/2020
END DATE: 7/8/2020
DRILLER: Mark
LOGGED BY: BAW

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
7/7/2020	1:00:00 PM	-	Dry	-
7/8/2020	2:00:00 PM	14	-	40

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	24	5 10 11 8							FILL Sampled As: Moist, Very Stiff, Reddish Brown, CLAY, Some Medium to Fine Sand, Trace Silt (SC) [A-2-6 (0)]	Bulk bag B-1 taken from auger cuttings 0.0-ft to 10.0-ft
S-2	☒	18	3 5 10	6.3%	27	11				Sample S-2: Stiff	MDD = 121.7-pcf OMC = 9.6% CBR @ 95% = 2.5
							5	EL 3.0 5.0			
S-3	☒	12	9 10 7							Moist, Medium Dense, Dark Gray, Medium to Fine SAND, And Silt, Micaceous (sm) [a-4]	
S-4	☒	5	50/5"							Sample S-4: Very Dense	
							10	EL -2.0 10.0			
S-5	☒	18	4 4 5							Moist, Stiff, Black, CLAY, Little Medium to Fine Sand, Trace Coarse to Fine Gravel (cl) [a-7-6]	Difficult drilling at 10.0-ft due to cobbles
							▼				
							15	EL -7.0 15.0			
S-6	☒	18	3 2 2							Wet, Soft, Dark Gray, CLAY, And Medium to Fine Sand (CL) [A-7-6 (8)]	
S-7	☒	18	2 2 2	65.5%	49	21					
							20				
S-8	☒	18	1 2 2								
							25				
								EL -20.5 28.5			
S-9	☒	18	WOH 1 1	65.9%	50	20				Wet, Very Soft, Dark Gray, SILT, And Clay, Trace Coarse to Fine Sand (MH) [A-7-5 (22)]	
							30				
S-10	☒	18	1 1 2							Sample S-10: Soft	
							35				

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
◫ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
☒ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
■ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

Boring No. RB-B-04

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D 50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Wet, Very Soft, Dark Gray, SILT, And Clay, Trace Coarse to Fine Sand (MH) [A-7-5 (22)]	
S-11	☒	18	2 2 2							Sample S-11: Soft	
							40	EL -32.0 40.0		Bottom of Boring @ 40.0 ft	Grouted after final groundwater reading.
							45				
							50				
							55				
							60				
							65				
							70				
							75				
							80				

TEST BORING LOG

Boring No. RB-B-05
Page 1 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Geoprobe 7822DT Track/Auto

COMMISSION NO.:	20077.000
NORTH:	632000
EAST:	617204
ELEVATION:	6 - ft
START DATE:	9/3/2020
END DATE:	9/3/2020
DRILLER:	Justin
LOGGED BY:	BAW

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
9/3/2020	11:18:00 AM	4.5	-	21

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
								EL 5.3 0.8		7-Inches Asphalt 2-Inches Subbase	Bulk bag B-1 taken from auger cuttings 0.0-ft to 10.0-ft
S-1	☒	12	6 9 8	22.9%	19	NP		EL 5.0 1.0		3-Inches Concrete FILL Sampled As: Moist, Medium Dense, Brown, Coarse to Fine SAND, Trace Silt	MDD = 123.4-pcf OMC = 8.6% CBR @ 95% = 2.9
S-2	☒	18	4 4 4	24.7%	NP	NP	▽ 5	EL 2.5 3.5		FILL Sampled As: Moist, Loose, Black, Brown, Coarse to Fine SAND, Some Silt, Some Coarse to Fine Gravel (SM) [A-2-4]	
S-3	☒	18	1 1 WOH					EL 0.0 6.0		Moist, Very Loose, Black, Coarse to Fine SAND, Some Silt (SM) [A-4 (0)]	
S-4	☒	18	2 WOH 1	34.3%	34	6				Sample S-4: Wet, And Silt, Some Coarse to Fine Gravel	
S-5	☒	7	WOH WOH WOH				10			Sample S-5: Wet, Little Silt	
S-6	☒	18	WOH WOH WOH					EL -6.5 12.5		Wet, Very Soft, Black, CLAY (cl) [a-6]	
T-1	▥	4					15				Shelby tube attempt at 14.5-ft, only 4" recovery. Tube discarded
S-7	☒	18	WOH WOH WOH				20				
S-8	☒	18	WOH WOH WOH				25				
S-9	☒	18	WOH WOH WOH				30				
S-10	☒	18	2 11 6				35	EL -28.5 34.5		Wet, Medium Dense, Dark Gray, Coarse to Fine SAND, Some Coarse to Fine Gravel, Little Silt (sm) [a-2-4]	

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
☒ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
◧ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Geoprobe 7822DT Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS			DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
				NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX					
									▨	Wet, Medium Dense, Dark Gray, Coarse to Fine SAND, Some Coarse to Fine Gravel, Little Silt (sm) [a-2-4]	
S-11	☒	18	14 12 13				40	EL -34.0 40.0		Bottom of Boring @ 40.0 ft	Grouted upon completion
							45				
							50				
							55				
							60				
							65				
							70				
							75				
							80				

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D 50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 632308
EAST: 616964
ELEVATION: 7.5 - ft
START DATE: 7/6/2020
END DATE: 7/8/2020
DRILLER: Mark
LOGGED BY: BAW

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
7/7/2020	2:30:00 PM	5	-	-
7/8/2020	7:15:00 AM	4.9		19.2

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	12	7 5 2	39%				EL 7.4 0.1		1-Inch TOPSOIL FILL Sampled As: Moist, Loose, Brown, Black, Coarse to Fine SAND, Some Coarse to Fine Gravel, Little Clay, Little Silt	Corrosion sample G1 taken from auger cuttings 0-ft to 6-ft pH: 7.6, As-Is Resistivity (ohm-cm): 7,200, Wetted Resistivity (ohm-cm): 1,600, Sulfate Content (ppm): 25, Oxidation Reduction (mV): 470, Chloride (ppm): 45, Sulfides: Not Present Wet Spoon at 7.5-ft Petroleum Odor at 7.5-ft
S-2	☒	12	5 4 3	20.3%							
S-3	☒	12	3 2 1				▼5			Sample S-3: Very Loose	
S-4	☒	18	1 1 1					EL 0.0 7.5		Wet, Very Soft, Black, SILT, Trace Medium to Fine Sand (ML) [A-7-6 (18)]	
S-5	☒	18	1 WOH 1				10				
S-6	☒	18	WOH WOH WOH								
S-7	☒	18	WOH WOH WOH				15				
T-1	▥	21		62.3%	43	16					Consolidation Test: Preconsolidation Pressure (tsf): 1.15, Compression Index: 0.50, Recompression Index: 0.045, Initial Void Ratio: 2.039
							20				
S-8	☒	18	1 1 1				25				
S-9	☒	18	1 1 1				30				
S-10	☒	18	10 10 12	18.3%	NV	NP	35	EL -26.0 33.5		Moist, Medium Dense, Dark Brown, Coarse to Fine SAND, Little Coarse to Fine Gravel, Trace Silt (SP-SM) [A-1-b]	Running Sands encountered at 33.5-ft

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
⊠ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
■ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

TEST BORING LOG

Boring No. RB-B-06
Page 2 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D 50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Medium Dense, Dark Brown, Coarse to Fine SAND, Little Coarse to Fine Gravel, Trace Silt (SP-SM) [A-1-b]	
S-11	☒	18	21 22 19							Sample S-11: Dense	
							40				
S-12	☒	18	21 11 13								
							45				
								EL -41.0 48.5			
S-13	☒	18	20 16 20							Wet, Dense, Brown, Coarse to Fine SAND, Some Silt (Residual Soil) (sm) [a-4]	
							50	EL -42.5 50.0		Bottom of Boring @ 50.0 ft	Grouted upon completion
							55				
							60				
							65				
							70				
							75				
							80				

TEST BORING LOG

Boring No. RB-B-07
Page 1 of 2

RK&K

PROJECT: South Market Street - RDC
SITE: New Castle County , Delaware
DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 630665
EAST: 616418
ELEVATION: 6.0 - ft
START DATE: 9/19/2022
END DATE: 9/20/2022
DRILLER: Brian
LOGGED BY: JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
9/20/2022	9:05:00 AM	3.5	--	10.0
9/21/2022	8:52:00 AM	2.9	--	8.0

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	3	50/3"					EL 5.9 0.1 EL 5.8 0.3	1-Inch TOPSOIL 2-Inches Portland Cement Concrete FILL Sampled As: Moist, Medium Dense, Brown/Gray, Coarse to Fine SAND, And Clay, Little Coarse to Fine Gravel, Contains Brick Fragments	
S-2	☒	18	2 7 5	15.1%			▼ ▽			Petroleum Odor at 2.5-ft
S-3	☒	12	1 6 3				5		Sample S-3: Loose, Dark Brown/Black, Some Clay	
S-4	☒	18	1 WOH WOH	63.1%	76	39		EL -1.5 7.5	Wet, Very Soft, Dark Gray/Black, High Plasticity SILT, And Clay, Trace Fine Sand (MH) [A-7-5(48)]	Wet Spoon at 7.5-ft
S-5	☒	18	WOH WOH WOH				10		Sample S-5: Little Medium to Fine Sand	
S-6	☒	18	1 1 WOH						Sample S-6: Little Medium to Fine Sand, Contains Root Fragments	
S-7	☒	18	WOH WOH 1				15		Sample S-7: Little Medium to Fine Sand, Contains Root Fragments	
S-8	☒	18	WOH 1 1					EL -11.5 17.5	Wet, Very Soft, Dark Gray/Black, High Plasticity CLAY, And Silt (CH) [A-7-5 (66)]	
T-1	▥	24	P U S H	68.7%	90	53	20			Consolidation Test: Preconsolidation Pressure (tsf): 0.7, Compression Index: 0.66, Recompression Index: 0.10, Initial Void Ratio: 1.782
S-9	☒	18	WOH WOH WOH							
S-10	☒	18	WOH WOH WOH				25			
S-11	☒	18	WOH WOH 1				30			
S-12	☒	18	WOH WOH 1	75.6%	97	60	35			

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
☰ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
⋈ - D - DENISON	MD - MUD DRILLING
◨ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

RKK NORTH/EAST (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 5/31/23

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS			DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
				NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX					
										Wet, Very Soft, Dark Gray/Black, High Plasticity CLAY, And Silt (CH) [A-7-5 (66)]	
S-13	☒	18	12 13 11				40	EL -32.5 38.5		Moist, Medium Dense, Brown, Orange, Gray, Coarse to Fine Rounded GRAVEL, Some Coarse to Fine Sand, Little Clay (gp) [a-1-a]	Running Sands encountered at 40-ft
S-14	☒	18	14 17 50/4"				45			Sample S-14: Very Dense, Some Clay	
S-15	☒	18	6 12 20					EL -42.5 48.5		Moist, Hard, Red/Green, CLAY, Little Medium to Fine Sand (Residual Soil) (cl) [a-6]	
							50	EL -43.5 49.5		Moist, Dense, Green/Light Brown, Coarse to Fine SAND, Some Clay (Residual Soil) (sc) [a-2-6]	Hard Augering at 51-ft
S-16		1	50/1"					EL -46.5 52.5		COMPLETELY WEATHERED ROCK Sampled As: Moist, Gray/Red, Coarse to Fine SAND, Some Clay	Grouted with bentonite mix after final groundwater reading
								EL -46.6 52.6		Bottom of Boring @ 52.6 ft	
							55 60 65 70 75 80				

TEST BORING LOG

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D 50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	630507
EAST:	616704
ELEVATION:	5.0 - ft
START DATE:	9/14/2022
END DATE:	9/14/2022
DRILLER:	Brian
LOGGED BY:	JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
9/14/2022	3:02:00 PM	1.5	--	27.0
9/15/2022	3:20:00 PM	1.5	--	25.2

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
								EL 4.6 0.4		5-Inches Bituminous Concrete	
S-1	☒	18	34 23 15	30.1%	24	NP	▼			FILL Sampled As: Moist, Dense, Gray/Brown, Orange, Coarse to Fine SAND, Some Coarse to Fine Gravel-Sized Rock Fragments, Trace Silt	MDD = 132.2-pcf OMC = 8% CBR @ 95% = 2
S-2	☒	10	13 13 12							Sample S-2: Medium Dense, And Coarse to Fine Gravel	
S-3	☒	0	4 3 3				5			Sample S-3: Loose, No Recovery	Bulk bag collected from 0.5-ft to 10.0-ft Wet Spoon at 5-ft
S-4	☒	6	1 2 1	60.4%				EL -2.5 7.5		Wet, Soft, Dark Gray/Black, High Plasticity CLAY, And Silt, Some Coarse to Fine Sand (CH) [A-7-5 (52)]	
S-5	☒	7	1 1 WOH				10			Sample S-5: Very Soft	
S-6	☒	6	WOH WOH 1							Sample S-6: Very Soft, Trace Root Fragments	
T-1	▥	21	P U S H	79.3%	96	60	15				Consolidation Test: Preconsolidation Pressure (tsf): 0.7, Compression Index: 0.72, Recompression Index: 0.08, Initial Void Ratio: 2.289
S-7	☒	18	WOH WOH WOH							Sample S-7: Very Soft, Trace Root Fragments	
S-8	☒	18	WOH WOH 1							Sample S-8: Very Soft, Trace Medium to Fine Sand	
							20				
S-9	☒	18	WOH WOH WOH	65.9%	90	43	25	EL -18.5 23.5		Wet, Very Soft, Dark Gray/Black, High Plasticity SILT, And Clay, Trace Medium to Fine Sand, Contains Roots and Wood Fragments (MH) [A-7-5 (54)]	
S-10	☒	18	WOH WOH 1				30				
S-11	☒	6	WOH 1 1	74.5%			35			Sample S-11: Little Medium to Fine Sand	

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
⊠ - D - DENISON	MD - MUD DRILLING
◧ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D 50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Wet, Very Soft, Dark Gray/Black, High Plasticity SILT, And Clay, Trace Medium to Fine Sand, Contains Roots and Wood Fragments (MH) [A-7-5 (54)]	
S-12	☒	6	WOH 2 5					EL -34.5		Sample S-12: Moist, Medium Stiff, Some Coarse to Fine Sand	
							40	39.5		Moist, Loose, Gray/Brown, Coarse to Fine Rounded GRAVEL, Some Coarse to Fine Sand, Little Clay (gp) [a-1-a]	
S-13	☒	18	10 9 8				45	EL -38.5 43.5		Moist, Medium Dense, Brown/Blue, Coarse to Fine SAND, Some Clay (Residual Soil) (sc) [a-2-6]	Running Sands at 43.5-ft
S-14	☒	18	7 9 12	32.3%	69	34	50	EL -43.5 48.5		Moist, Very Stiff, Red, Highly Plastic SILT, And Clay, Little Coarse to Fine Sand (Residual Soil) (MH) [A-7-5 (31)]	
S-15	☒	12	7 13 24				55	EL -48.5 53.5		Moist, Dense, Green/Brown, Coarse to Fine SAND, Some Silt (Residual Soil) (sm) [a-2-6]	
S-16	☒	18	10 13 22	29.1%			60			Sample S-16: Green/Red, And Silt	
S-17	☒	5	17 50/3"				65	EL -58.5 63.5		COMPLETELY WEATHERED ROCK Sampled As: Moist, Green/Brown, Coarse to Fine SAND, Little Clay	
S-18	☒	2	50/2"					EL -60.7 65.7		Sample S-18: Some Clay, Little Coarse to Fine Gravel-Sized Rock Fragments Bottom of Boring @ 65.7 ft	Auger Refusal at 65.5-ft Grouted with bentonite mix after final groundwater reading
							70				
							75				
							80				

TEST BORING LOG

RK&K

PROJECT: South Market Street - RDC

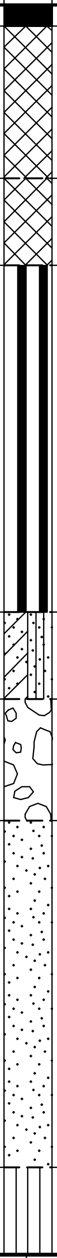
SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D 50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 629785
EAST: 616859
ELEVATION: 7.0 - ft
START DATE: 10/5/2022
END DATE: 10/5/2022
DRILLER: Brian
LOGGED BY: ACR

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
10/6/2022	8:40:00 AM	5.0	--	24.0

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-



SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	7	11 8 6					EL 6.4 0.6		7-Inches Bituminous Concrete FILL Sampled As: Moist, Medium Dense, Dark Gray, Coarse to Fine SAND, And Gravel-sized Concrete Fragments, Little Clay	Bulk bag collected from 1.0-ft to 10.0-ft.
S-2	☒	11	8 4 4							Sample S-2: Loose	Wet Spoon at 5-ft.
S-3	☒	2	2 2 2	10.3%	28	12	▽ 5	EL 2.0 5.0		FILL Sampled As: Moist, Very Loose, Dark Gray, Coarse to Fine SAND, Some Clay, Trace Concrete Fragments	MDD = 128.3-pcf OMC = 7.1% CBR @ 95% = 6.6
S-4	☒	16	1 WOH WOH					EL -0.5 7.5		Wet, Very Soft, Dark Gray, High Plasticity SILT, Some Coarse to Fine Sand, Trace Fine Gravel (MH) [A-7-5(54)]	
S-5	☒	18	WOH WOH 1	70.2%	103	60	10			Sample S-5: Trace Organics	
S-6	☒	18	1 1 1							Sample S-6: Trace Organics	
S-7	☒	4	WOH 1 1				15			Sample S-7: 2-Inch Layer of Peat (Fibrous) at Bottom of Spoon	
S-8	☒	18	WOH WOH WOH	19.5%	17	6		EL -10.5 17.5		Wet, Very Loose, Brown/Gray, Medium to Fine SAND, Little Silt, Little Clay (SC-SM) [A-4]	
S-9	☒	8	WOH 2 12				20	EL -13.0 20.0		Wet, Medium Dense, Brown/Gray, Coarse to Fine Sub-Rounded GRAVEL, Some Coarse to Fine Sand (gp) [a-1-a]	Bentonite added to HSA at 20-ft depth.
S-10	☒	18	2 4 4	22.5%			25	EL -16.5 23.5		Wet, Loose, Gray, Coarse to Fine SAND, Some Fine Sub-Rounded Gravel (sp) [a-1-b]	
S-11	☒	18	5 11 17				30			Sample S-11: Medium Dense, Little Fine Sub-Angular Gravel	
S-12	☒	18	3 8 10				35	EL -26.5 33.5		Moist, Very Stiff, Brown, SILT, Little Clay, Little Fine Sand (ml) [a-4]	

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
☒ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
■ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D 50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Very Stiff, Brown, SILT, Little Clay, Little Fine Sand (ml) [a-4]	
S-13	☒	18	2 4 9	16.2%	30	19	40	EL -31.5 38.5		Moist, Medium Dense, Gray, Brown, Coarse to Fine SAND, And Clay, Relict Structure (Residual Soil) (SC) [A-6(4)]	
S-14	☒	18	3 5 7				45			Sample S-14: Green- to Brown-Gray	
S-15	☒	18	4 7 11				50	EL -41.5 48.5		Moist, Medium Dense, Gray, Brown, Fine SAND, Some Silt (Residual Soil) (sm) [a-2-4]	
S-16	☒	18	9 20 18				55			Sample S-16: Dense, Blue/Gray, Gray	
S-17	☒	18	7 10 11	14.9%			60	EL -51.5 58.5		Wet, Medium Dense, Gray, Coarse to Fine SAND, Some Silt, Little Clay (Residual Soil) (sm) [a-2-4]	
S-18	☒	16	8 9 20				65	EL -56.5 63.5		Moist, Very Stiff, Dark Brown, CLAY (Residual Soil) (cl) [a-6]	
S-19	☒	18	9 10 17				70	EL -61.5 68.5		Moist, Very Stiff, Brown, Pink, SILT, Little Fine Sand, Relict Structure (Residual Soil) (ml) [a-4]	
S-20	☒	18	10 24 33					EL -66.5 73.5		Moist, Very Dense, Blue/Gray, Medium to Fine SAND, Some Silt (Residual Soil) (sm) [a-2-4]	
							75	EL -68.0 75.0		Bottom of Boring @ 75.0 ft	Grouted with bentonite mix upon completion
							80				

TEST BORING LOG

RK&K

PROJECT: South Market Street - RDC
SITE: New Castle County , Delaware
DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	629553
EAST:	616631
ELEVATION:	5.0 - ft
START DATE:	10/19/2022
END DATE:	10/19/2022
DRILLER:	Brian
LOGGED BY:	JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
10/19/2022	5:00:00 PM	5.0	--	21.0
10/20/2022	8:30:00 AM	3.1	--	20.0

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
								EL 4.8 0.3	3-Inches Bituminous Concrete	
S-1	☒	18	13 8 7					EL 4.4 0.6	4-Inches Portland Cement Concrete FILL Sampled As: Moist, Medium Dense, Brown, Red, Green, Coarse to Fine SAND, Some Clay, Some Coarse to Fine Gravel, Contains Wood, Organics, and Glass Fragments	
S-2	☒	8	3 4 3	11.5%	34	14	▼		Sample S-2: Loose	Strong Petroleum odor
S-3	☒	18	WOH 1 1	52%			▽ 5	EL 0.0 5.0	Moist, Very Loose, Gray, Medium to Fine SAND, Some Clay, Little Silt (SM) [A-2-7(18)]	Wet spoon at 5-ft
S-4	☒	0	WOH WOH WOH						Sample S-4: No Recovery	
S-5	☒	18	WOH WOH WOH	127.7%	194	98	10			
S-6	☒	18	WOH WOH WOH	50%	157	83		EL -7.5 12.5	Moist, Very Soft, Dark Brown, High Plasticity SILT, Some Coarse to Fine Sand, Trace Fine Gravel, Contains Wood and Organic Fragments (MH) [A-7-5(65)]	
S-7	☒	0	WOH WOH WOH				15		Sample S-7: No Recovery	
S-8	☒	18	WOH WOH 3					EL -12.5 17.5	Wet, Very Loose, Brown, Coarse to Fine SAND, Some Coarse to Fine Rounded Gravel, Little Clay (sp) [a-1-b]	
S-9	☒	18	5 8 18				20		Sample S-9: Medium Dense	
S-10	☒	7	15 13 11	14.4%					Sample S-10: Medium Dense, And Coarse to Fine Angular Gravel	
							25			
S-11	☒	5	13 22 28					EL -23.5 28.5	Wet, Dense, Brown, Coarse to Fine Rounded Gravel, Some Coarse to Fine Sand, Little Clay (gc) [a-1-b]	
							30			
S-12	☒	18	7 14 14					EL -28.5 33.5	Moist, Medium Dense, Light Brown, Medium to Fine SAND, Some Clay (sc) [a-2-6]	
							35			

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)

TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Medium Dense, Light Brown, Medium to Fine SAND, Some Clay (sc) [a-2-6]	
S-13	☒	18	5 11 21	13.9%	30	16	40	EL -33.5 38.5		Moist, Hard, Green, Brown, Medium Plasticity CLAY, And Coarse to Fine Sand (CL) [A-6(5)]	
S-14	☒	6	2 13 10				45	EL -38.5 43.5		Moist, Medium Dense, Green/Light Brown, Coarse to Fine SAND, Some Clay, Trace Fine Gravel (Residual Soil) (sc) [a-2-6]	
S-15	☒	18	6 9 10	15.3%			50				
S-16	☒	18	4 11 16				55			Sample S-16: Light Gray, Pink, Little Clay	
S-17	☒	18	13 34 32				60			Sample S-17: Very Dense, Green/Brown, Little Clay	
S-18	☒	18	6 9 15	15.5%			65	EL -58.5 63.5		Moist, Very Stiff, Orange/Red, CLAY, Little Coarse to Fine Sand (Residual Soil) (cl) [a-6]	
S-19	☒	15	7 23 50/3"				70	EL -63.5 68.5		COMPLETELY WEATHERED ROCK Sampled As: Moist, Green, Brown, Medium to Fine SAND, Little Silt	
S-20		1	50/1"				75	EL -68.6 73.6		Bottom of Boring @ 73.6 ft	Grouted with bentonite mix after final groundwater reading
							80				

TEST BORING LOG

Boring No. RB-B-11
Page 1 of 2

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D 50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	630093
EAST:	616642
ELEVATION:	5.0 - ft
START DATE:	9/29/2022
END DATE:	9/29/2022
DRILLER:	Brian
LOGGED BY:	JV

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	16	12 17 13						▩	FILL Sampled As: Moist, Medium Dense, Gray, Coarse to Fine SAND, Some Coarse to Fine Gravel-sized Rock Fragments, Little Silt, Trace Organics	
S-2	☒	6	4 5 6	9.7%					▩		
							5	EL 0.0 5.0		FILL Sampled As: Wet, Very Loose, Coarse to Fine GRAVEL, And Coarse to Fine Sand, Trace Silt (gp) [a-1-b]	
S-3	☒	3	5 2 1								
								EL -2.5 7.5	▨	Wet, Very Soft, Black, High Plasticity CLAY, Trace Medium to Fine Sand (CH) [A-7-6 (36)]	
S-4	☒	18	WOH WOH WOH	54.2%	62	35			▨		
							10				
S-5	☒	3	WOH 1 1						▨		
								EL -7.5 12.5		Wet, Very Soft, Black, PEAT (pt)	
S-6	☒	18	WOH WOH 2								
							15	EL -10.0 15.0	▨	Wet, Very Soft, Black, High Plasticity CLAY, And Silt, Trace Fine Sand (CH) [A-7-5(45)]	
T-1	▥	24	P U S H	87.5%	68	38			▨		Consolidation Test: Preconsolidation Pressure (tsf): 0.7, Compression Index: 0.99, Recompression Index: 0.13, Initial Void Ratio: 2.332 Bentonite added to HSA
S-7	☒	18	WOH WOH WOH						▨	Sample S-7: Brown, And Coarse to Fine Sand, Trace Organics	
								EL -14.5 19.5		Wet, Medium Dense, Coarse to Fine Subangular GRAVEL, Little Coarse to Fine Sand (gp) [a-1-a]	
S-8	☒	12	2 5 9				20				
S-9	☒	3	20 14 19							Sample S-9: Dense	
							25				
S-10	☒	12	10 19 25							Sample S-10: Dense, Some Coarse to Fine Sand	
							30				
								EL -28.5 33.5		Wet, Medium Dense, Coarse to Fine SAND, And Coarse to Fine Gravel, Trace Silt (SP-SM) [A-1-a]	
S-11	☒	18	11 13 10	9%	18	3					
							35				

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY
0-4	VERY LOOSE	0-2	VERY SOFT
5-10	LOOSE	3-4	SOFT
11-30	MEDIUM DENSE	5-8	MEDIUM STIFF
31-50	DENSE	9-15	STIFF
OVER 50	VERY DENSE	16-30	VERY STIFF
		OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)

TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

Boring No. RB-B-11
Page 2 of 2

RK&K **PROJECT:** South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D 50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Wet, Medium Dense, Coarse to Fine SAND, And Coarse to Fine Gravel, Trace Silt (SP-SM) [A-1-a]	
S-12	☒	12	4 6 16				40	EL -33.5 38.5		Wet, Medium Dense, Coarse to Fine SAND, And Silt (sm) [a-4]	
S-13	☒	18	6 6 9				45	EL -38.5 43.5	▨	Moist, Stiff, Red, Brown, Gray, High Plasticity CLAY, Some Medium to Fine Sand (Residual Soil) (CH) [A-7-6(27)]	
S-14	☒	18	3 5 16				50		▨	Sample S-14: Very Stiff And Fine Sand	
S-15	☒	18	4 5 10	32%	58	36	55		▨		
S-16	☒	18	7 9 13				60		▨	Sample S-16: Very Stiff	
S-17	☒	18	11 12 18				65		▨	Sample S-17: Very Stiff	
S-18		1	50/1"					EL -62.5 67.5 EL -62.6 67.6		COMPLETELY WEATHERED ROCK Sampled As: Moist, Blue/Green, Coarse to Fine SAND, And Fine Gravel, Trace Silt Bottom of Boring @ 67.6 ft	Auger Refusal at 67.5-ft Grouted with bentonite mix after final groundwater reading
							70				
							75				
							80				

TEST BORING LOG

Boring No. RB-B-12
Page 1 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D 50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 629757
EAST: 616362
ELEVATION: 6.0 - ft
START DATE: 10/7/2022
END DATE: 10/7/2022
DRILLER: Brian
LOGGED BY: JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
10/7/2022	1:50:00 PM	4.0	--	44.0
10/10/2022	11:00:00 AM	3.35	--	40.7

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	⊠	5	33 24 25					EL 5.7 0.3		3-Inches TOPSOIL/GRADED AGGREGATE BASE FILL Sampled As: Moist, Dense, Black/Gray, Coarse to Fine SAND, Some Clay, Little Coarse to Fine Gravel	Bulk bag collected from 0.3-ft to 10.0-ft
S-2	⊠	15	5 10 10	11.1%	23	10	▼ ▽	EL 3.5 2.5		FILL Sampled As: Moist, Medium Dense, Black, Coarse to Fine SAND, Some Clay, Contains Brick Fragments	MDD = 130.1-pcf OMC = 8.1% CBR @ 95% = 6.6
S-3	⊠	10	3 3 5	15.7%			5			Sample S-3: Loose, Orange	
S-4	⊠	18	1 1 1					EL -1.5 7.5		Moist, Very Soft, Dark Gray, High Plasticity SILT, Some Coarse to Fine Sand, Little Fine Gravel, Contains Root Fragments (MH) [A-7-5(39)]	Wet Spoon at 7-ft
S-5	⊠	0	WOH WOH 1				10			Sample S-5: No Recovery	
S-6	⊠	18	1 1 1 1	51.8%	131	77				Sample S-6: Dark Brown	
S-7	⊠	18	WOH WOH WOH				15	EL -9.0 15.0		Moist, Very Soft, Dark Gray, High Plasticity CLAY, Some Medium to Fine Sand (ch) [a-7-5]	
S-8	⊠	18	1 1 1							Sample S-8: Little Medium to Fine Sand	
S-9	⊠	18	1 1 1				20			Sample S-9: Little Medium to Fine Sand	
S-10	⊠	18	1 1 1	83.1%			25			Sample S-10: Little Medium to Fine Sand	
S-11	⊠	0	1 1 1				30			Sample S-11: No Recovery	
S-12	⊠	18	7 16 27				35	EL -27.5 33.5		Moist, Dense, Brown/Orange, Coarse to Fine Subrounded GRAVEL, Some Coarse to Fine Sand (gp) [a-1-a]	Running Sands at 35-ft

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
⊠ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
⊠ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
◧ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

TEST BORING LOG

Boring No. RB-B-12
Page 2 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D 50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
									○	Moist, Dense, Brown/Orange, Coarse to Fine Subrounded GRAVEL, Some Coarse to Fine Sand (gp) [a-1-a]	
S-13	☒	10	13 17 15				40		○	Sample S-13: Wet	
S-14	☒	12	5 4 7	25.9%	47	23	45	EL -37.5 43.5	▨	Moist, Stiff, Gray/Brown, High Plasticity CLAY, Some Coarse to Fine Sand, Trace Fine Gravel (Residual Soil) (CL) [A-7-6(15)]	
S-15	☒	18	8 10 14				50	EL -42.5 48.5	▨	Moist, Medium Dense, Green/Orange, Medium to Fine SAND, Some Silt (Residual Soil) (sm) [a-4]	
S-16	☒	18	4 11 12				55		▨	Sample S-16: Green/Brown, Coarse to Fine Sand	
S-17	☒	18	8 10 13	32.5%			60	EL -52.5 58.5	▨	Moist, Very Stiff, Red, CLAY, Little Medium to Fine Sand (Residual Soil) (cl) [a-6]	
S-18	☒	18	8 13 17				65	EL -57.5 63.5	▨	Moist, Medium Dense, Green/Brown, Coarse to Fine SAND, Some Clay (Residual Soil) (sc) [a-2-6]	
S-19	☒	10	31 50/4"				70	EL -62.5 68.5	▨	Moist, Very Dense, Green, Coarse to Fine SAND, Little Clay, Little Coarse to Fine Gravel-Sized Rock Fragments (Residual Soil) (sc) [a-2-6]	
S-20	☒	18	19 19 26						▨	Sample S-20: Dense	
							75	EL -69.0 75.0		Bottom of Boring @ 75.0 ft	Grouted with bentonite mix after final groundwater reading
							80				

TEST BORING LOG

Boring No. RB-B-13
Page 1 of 2

PROJECT: South Market Street - RDC
SITE: New Castle County , Delaware
DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 630476
EAST: 616408
ELEVATION: 6.0 - ft
START DATE: 9/22/2022
END DATE: 9/22/2022
DRILLER: Brian
LOGGED BY: JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
9/22/2022	3:30:00 PM	--	12.5	--
9/23/2022	10:30:00 AM	2.0	--	40.5

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	1	23 4 2					EL 5.8 0.3		3-Inches TOPSOIL	
							▼	EL 5.3 0.8		6-Inches Portland Cement Concrete	
S-2	☒	0	4 3 1							FILL Sampled As: Moist, Loose, Orange/Gray, Coarse to Fine SAND, Some Coarse to Fine Rounded Gravel, Little Silt Sample S-2: Very Loose, No Recovery	Wet Spoon at 2.5-ft Hard Augering at 3-ft
S-3	☒	15	6 3 2	35.4%	57	33	5	EL 1.0 5.0		FILL Sampled As: Moist, Medium Stiff, Dark Brown, High Plasticity CLAY, Little Medium to Fine Sand, Contains Root Fragments	
S-4	☒	12	5 3 1							Sample S-4: Wet, Soft, And Coarse to Fine Sand, Trace Coarse to Fine Gravel	
S-5	☒	12	2 1 1				10			Sample S-5: Very Soft, Some Coarse to Fine Sub-Rounded Gravel, Little Medium to Fine Sand	
S-6	☒	18	1 WOH WOH					EL -6.5 12.5		Wet, Very Soft, Dark Gray/Dark Brown, High Plasticity SILT, Some Clay, Trace Coarse to Fine Sand, Contains Roots and Wood Fragments (MH) [A-7-5 (58)]	
S-7	☒	18	1 WOH WOH	71%	92	48	15				
S-8	☒	10	1 1 2							Sample S-8: Soft, Some Medium to Fine Sand	
T-1		0	Pushed				20			Sample T-1: No Recovery	
S-9	☒	15	WOH 1 1								
S-10	☒	15	2 1 1				25	EL -18.0 24.0		Wet, Very Soft, Dark Gray/Dark Brown, High Plasticity CLAY, Trace Fine SAND (CH) [A-7-5(73)]	
S-11	☒	18	WOH 1 1	63.4%	103	63	30			Sample S-11: Contains Root Fragments	
S-12	☒	12	2 2 3				35			S-12: Medium Stiff	

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
☰ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
☒ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
■ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

RKK NORTH/EAST (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 5/31/23

TEST BORING LOG

Boring No. RB-B-13
Page 2 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LABORATORY TEST RESULTS LIQUID LIMIT	LABORATORY TEST RESULTS PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Wet, Very Soft, Dark Gray/Dark Brown, High Plasticity CLAY, Trace Fine SAND (CH) [A-7-5(73)]	
S-13	☒	12	1 7 11							Sample 13A: Very Stiff, Little Coarse to Fine Sand	
							40	EL -33.5 39.5		Moist, Medium Dense, Light Brown, Coarse to Fine Rounded GRAVEL, Little Coarse to Fine Sand, Little Clay (gp) [a-1-a]	Running Sands encountered at 40-ft
S-14	☒	15	15 10 9				45	EL -37.5 43.5		Moist, Medium Dense, Light Brown, Coarse to Fine SAND, Trace Clay (sp) [a-1-b]	
S-15	☒	15	27 9 9				50	EL -42.5 48.5		Moist, Very Stiff, Red/Green/Orange, CLAY, Little Coarse to Fine Sand, Trace Coarse to Fine Gravel (Residual Soil) (cl) [a-6]	
S-16	☒	18	6 9 13	49%			55			Sample S-16: Some Coarse to Fine Sand	
S-17	☒	18	12 13 22				60	EL -52.5 58.5		Moist, Dense, Green/Light Brown, Coarse to Fine SAND, Some Clay (Residual Soil) (sc) [a-2-6]	
S-18	☒	5	50/5"				65	EL -57.5 63.5		COMPLETELY WEATHERED ROCK Sampled As: Moist, Dark Green, Coarse to Fine SAND, Some Clay, Little Coarse to Fine Gravel-Sized Rock Fragments	
S-19	☒	1	50/1"					EL -60.6 66.6		Sample S-19: Angular Gravel-sized Rock Fragments Bottom of Boring @ 66.6 ft	Auger Refusal at 66.5-ft Grouted with bentonite mix after final groundwater reading
							70				
							75				
							80				

TEST BORING LOG

Boring No. RW-B-01
Page 1 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	631059
EAST:	616153
ELEVATION:	6 - ft
START DATE:	5/4/2021
END DATE:	5/4/2021
DRILLER:	Mark
LOGGED BY:	JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
5/4/2021	2:02:00 PM	5.4	-	51.2
3/5/2021	8:30:00 AM	3.4	-	51.2

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										4-Inches TOPSOIL	
S-1	☒	6	2 2 1					EL 5.7 0.3		FILL Sampled As: Moist, Very Loose, Brown, Coarse to Fine SAND, Some Clay	Sample S-1: Pieces of glass encountered
S-2	☒	5	4 3 2				▼	EL 3.5 2.5		FILL Sampled As: Moist, Medium Stiff, Brown, CLAY, Some Medium to Fine Sand, Little Brick Fragments	Combined Sample (0.0 to 12-ft): pH: 7.3, As-Is Resistivity (ohm-cm): 670, Wetted Resistivity (ohm-cm): 640, Sulfate Content (ppm): <5, Oxidation Reduction (mV): 276, Chloride (ppm): <20, Sulfides: Not Present
S-3	☒	6	3 1 2	27%			∇ 5			Sample S-3: Soft, Trace Gravel	
S-4	☒	3	3 1 1							Sample S-4: Very Soft, A 1-Inch Brick Fragment	Sample S-4: Petroleum Odor, VOC = 108 ppm
S-5	☒	0	1 1 1				10			Sample S-5: Very Soft, No Recovery	
S-6	☒	18	1 1 1					EL -6.5 12.5		Moist, Very Soft, Black, CLAY, Little Medium to Fine Sand (cl) [a-6]	
S-7	☒	18	WOH WOH WOH				15			Sample S-7: Trace Medium to Fine Sand	
S-8	☒	18	WOH WOH WOH				20	EL -12.5 18.5		Moist, Very Soft, Dark Gray, High Plasticity CLAY, Little Medium to Fine Sand (CH) [A-7-5(30)]	CIUC Test (Sample T-1) Results: Cohesion: 224-psf, Drained Friction Angle: 33.9-deg Consolidation Test: Preconsolidation Pressure (tsf): 0.25 Compression Index: 0.36, Recompression Index: 0.07, Initial Void Ratio: 1.459
T-1	◫	24	PUSH							Sample T-1: And Silt, Some Medium to Fine Sand	
				54.9%	70	36					
S-9	☒	18	WOH WOH 1				25			Sample S-10: Some Medium to Fine Sand	
S-10	☒	18	4 9 9				30	EL -22.5 28.5		Wet, Medium Dense, Brown, Coarse to Fine SAND, Little Clay, Trace Gravel (sc) [a-2-6]	
S-11	☒	18	14 10 8				35			Sample S-11: Little Gravel, Trace Clay, Micaceous	

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
◫ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
◼ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

RKK NORTH/EAST (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 5/31/23

TEST BORING LOG

Boring No. RW-B-01
Page 2 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
									▨	Wet, Medium Dense, Brown, Coarse to Fine SAND, Little Clay, Trace Gravel (sc) [a-2-6]	
S-12	☒	15	21 15 7				40		▨	Sample S-12: Some Coarse to Fine Sub-Rounded Gravel, Trace Clay	Running sands at 38.5-ft
S-13	☒	18	9 10 11				45	EL -37.5 43.5	▨	Moist, Very Stiff, Red/Green, SILT, Little Medium to Fine Sand (cl) [a-6]	
S-14	☒	18	8 15 16				50		▨	Sample S-14: Hard	
S-15	☒	18	10 13 14	27.9%	55	30	55	EL -47.5 53.5	▨	Moist, Medium Dense, Greenish Gray, Medium to Fine SAND, Some Clay (Residual Soil) (SC) [A-2-7(3)]	
S-16	☒	18	11 16 21				60		▨	Sample S-16: Dense, Little Medium to Fine Sand	
S-17	☒	18	15 23 21						▨	Sample S-17a: Dense, Little Medium to Fine Sand	
							65	EL -58.5 64.5	▨	Moist, Dense, Grayish Brown, Coarse to Fine SAND, Some Gravel-Sized Rock Fragments, Little Silt (Residual Soil) (sm) [a-2-4]	
S-18		1	50/1"				70	EL -62.5 68.5 EL -62.6 68.6		COMPLETELY WEATHERED ROCK Sampled As: Moist, Grayish Brown, Coarse to Fine SAND, Little Gravel-Sized Rock Fragments, Little Silt Bottom of Boring @ 68.5 ft	Grouted after final groundwater reading
							75				
							80				

TEST BORING LOG

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 631399
EAST: 616302
ELEVATION: 5 - ft
START DATE: 5/7/2021
END DATE: 5/7/2021
DRILLER: Mark
LOGGED BY: JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
5/10/2021	8:35:00 AM	2.1	-	6
5/18/2021	2:16:00 PM	1.5	-	11

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	6	3 2 3				▼ ▽	EL 4.7 0.3		4-Inches TOPSOIL FILL Sampled As: Moist, Medium Stiff, Brown, SILT, Some Medium to Fine Sand, Trace Gravel	
								EL 2.5 2.5		Moist, Medium Stiff, Brown, High Plasticity CLAY, Some Medium to Fine Sand (CH) [A-7-5(55)]	
S-2	☒	18	1 4 4								Sample S-2: VOC = 90.6 ppm
S-3	☒	18	1 1 1	53.8%			5			Sample S-3: Very Soft, Little Medium to Fine Sand	Sample S-3: VOC = 66.2 ppm Combined Sample (10.0 to 20-ft): pH: 6.6, As-Is Resistivity (ohm-cm): 1,300, Wetted Resistivity (ohm-cm): 1,300, Sulfate Content (ppm): <5, Oxidation Reduction (mV): 260, Chloride (ppm): <20, Sulfides: Not Present
S-4	☒	18	WOH WOH WOH							Sample S-4: Very Soft, Trace Medium to Fine Sand	
S-5	☒	18	WOH WOH WOH				10			Sample S-5: Very Soft, Dark Gray, Trace Medium to Fine Sand	
S-6	☒	18	WOH WOH WOH	52.5%	80	47				Sample S-6: Very Soft, And Silt, Trace Fine Sand	
S-7	☒	18	WOH WOH WOH				15			Sample S-7: Very Soft, Dark Gray, Fine Sand	
S-8	☒	18	WOH WOH WOH				20			Sample S-8: Very Soft, And Fine Sand	
S-9	☒	18	WOH 13 8				25			Sample S-9: Very Stiff	
								EL -23.5 28.5		Moist, Dense, Brown, Coarse to Fine SAND, Little Silt, Little Fine Gravel (SW-SM) [A-1-b]	
S-10	☒	18	10 14 18				30				
S-11	☒	15	10 11 10	12.8%	NP	NP	35			Sample S-11: Medium Dense, Some Fine Gravel, Trace Silt	

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
⧖ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
■ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

TEST BORING LOG

Boring No. RW-B-02
Page 2 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Dense, Brown, Coarse to Fine SAND, Little Silt, Little Fine Gravel (SW-SM) [A-1-b]	
S-12	☒	18	16 16 14							Sample S-12: Medium Dense, Some Silt	
							40				
								EL -38.5 43.5		Moist, Medium Dense, Greenish Gray, Coarse to Fine SAND, Some Clay (Residual Soil) (SC) [A-2-7(1)]	
S-13	☒	18	9 14 13								
							45				
S-14	☒	18	10 12 16	29.1%	45	20					
							50				
S-15	☒	18	8 12 15							Sample S-15: Reddish Gray	
							55				
								EL -53.5 58.5		COMPLETELY WEATHERED ROCK Sampled As: Moist, Greenish Gray, SILT, Some Medium to Fine Sand	
S-16	☒	3	50/3"								
S-17	☒	1	50/1"					EL -54.5 59.5		COMPLETELY WEATHERED ROCK Sampled As: Moist, Brown/Gray, GRAVEL-SIZED ROCK FRAGMENTS, Little Medium to Fine Sand	Auger Refusal at 59.5-ft. Grouted after final groundwater reading
							60	EL -54.6 59.6		Bottom of Boring @ 59.6 ft	
							65				
							70				
							75				
							80				

TEST BORING LOG

Boring No. RW-B-03

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	631642
EAST:	616429
ELEVATION:	11 - ft
START DATE:	7/8/2020
END DATE:	7/9/2020
DRILLER:	Mark
LOGGED BY:	ACR

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
7/8/2020	7:30:00 AM	-	12.6	-
7/9/2020	8:25:00 AM	11.1	-	32.3

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	7	4 5 2							FILL Sampled As: Moist, Medium Stiff, Reddish Brown, CLAY, Some Coarse to Fine Sand, Trace Gravel	
S-2	☒	18	12 15 20					EL 8.5 2.5		FILL Sampled As: Moist, Dense, Grayish Brown, Coarse to Fine SAND, Some Clay, Trace Gravel	
S-3	☒	14	3 14 16				5			Sample S-3: Medium Dense	
S-4	☒	18	6 6 6	15.8%	25	5		EL 3.5 7.5		FILL Sampled As: Moist, Medium Dense, Gray, CLAY, And Silt, Some Coarse to Fine Sand, Trace Fine Gravel (CL-ML) [A-4 (1)]	Corrosion samples S-5A, S-6A, S-7A from 10-ft to 16.5-ft pH: 7.4, As-Is Resistivity (ohm-cm): 1,100, Wetted Resistivity (ohm-cm): 1,000, Sulfate Content (ppm): 215, Oxidation Reduction (mV): 274, Chloride (ppm): 200, Sulfides: Not Present
S-5	☒	9	2 1 2				10 ▼	EL 1.0 10.0		FILL Sampled As: Moist, Soft, Dark Gray, Black, CLAY, Trace Wood Fragments	
S-6	☒	18	1 1 7	13%				EL -1.5 12.5		Moist, Loose, Gray, Coarse to Fine SAND, And Clay (SC) [A-7-6 (5)]	
S-7	☒	18	2 1 1	34.9%			15			Sample S-7: Very Loose	
S-8	☒	18	1 1 1							Sample S-8: Very Loose	
S-9	☒	18	1 1 1				20			Sample S-9: Very Loose	
T-1	▥	24		42.6%	53	29	25				CIUC Test (Sample T-1) Results: Cohesion: 368-psf, Drained Friction Angle: 29.1-deg
S-10	☒	18	1 1 1				30			Sample S-10: Very Loose	
S-11	☒	18	3 6 9				35			Sample S-11: Medium Dense	

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
☒ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
◘ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
								EL -27.5		Moist, Loose, Gray, Coarse to Fine SAND, And Clay (SC) [A-7-6 (5)]	
S-12	☒	15	9 10 12	11.3%	NP	NP	40	38.5		Moist, Medium Dense, Gray, Coarse to Fine SAND, And Coarse to Fine Sub-angular Gravel, Trace Silt (SP-SM) [A-1-a]	
S-13	☒	18	12 13 13				45	EL -37.5			
S-14	☒	6	14 13 13				50	48.5		Moist, Medium Dense, Gray, Yellow, Coarse to Fine SAND, Little Silt (Residual Soil) (SM) [A-1-b]	
S-15	☒	14	9 11 13	27.5%	NP	NP	55				
S-16	☒	18	10 11 15				60			Sample S-16: Greenish Gray	
S-17	☒	18	11 14 22				65			Sample S-17: Dense, Greenish Gray	
S-18	☒	18	7 12 21					EL -59.0		Sample S-18: Dense, Greenish Gray	
							70	70.0		Bottom of Boring @ 70.0 ft	Tremie grouted after final groundwater reading
							75				
							80				

RKK NORTH/EAST (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 5/31/23

TEST BORING LOG

Boring No. RW-B-04
Page 1 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Truck Mobile B31/Manual

COMMISSION NO.: 20077.000
NORTH: 631984
EAST: 616612
ELEVATION: 11 - ft
START DATE: 7/8/2020
END DATE: 7/9/2020
DRILLER: John
LOGGED BY: ACR

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
7/8/2020	4:05:00 PM	-	8	-
7/9/2020	9:30:00 AM	12.4	-	20.2

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	2	2 2 1						FILL Sampled As: Moist, Soft, Reddish Brown, CLAY, Some Coarse to Fine Sand	
S-2	☒	15	3 3 3	15.9%					Sample S-2: Medium Stiff	
S-3	☒	12	5 12 27				5		Sample S-3: Hard	
S-4	☒	18	12 17 16					EL 3.5 7.5	FILL Sampled As: Moist, Dense, Brown, Coarse to Fine SAND, Some Silt, Little Angular Gravel, Micaceous	
S-5	☒	18	8 11 12				10	EL 1.0 10.0	Moist, Medium Dense, Gray, Medium to Fine SAND, Little Silt, Slightly Micaceous (sm) [a-4]	
							▼			
S-6	☒	3	1 2 3						Sample S-6: Loose, Coarse to Fine SAND, Trace Fine Gravel	Strong Petroleum Odor at 12.5-ft.
S-7	☒	6	1 1 3				15	EL -5.0 16.0	Sample S-7B: Very Loose, Coarse to Fine SAND, Little Coarse to Fine Gravel, Trace Silt Moist, Very Loose, Black, Coarse to Fine SAND, And Clay, Trace Fine Gravel, Trace Organics (SC) [A-7-6 (4)]	Wet Spoon at 15.0-ft. CIUC Test (Sample T-1) Results: Cohesion: 457-psf, Drained Friction Angle: 19.6-deg DS Test: C = 456-psf ϕ = 19.6-deg
T-1	▥	20		20.4%	44	22				
S-8	☒	18	3 3 3				20		Sample S-8: Loose	
S-9	☒	18	1 1 2				25		Sample S-9: Very Loose, Dark Gray	
S-10	☒	18	2 2 4				30		Sample S-10: Loose, Dark Gray	
S-11	☒	12	6 20 40	22.6%			35	EL -22.5 33.5	Wet, Very Dense, Gray, Coarse to Fine SAND, Little Silt, Trace Fine Angular Gravel (sm) [a-4]	

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
☰ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

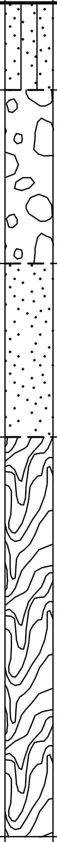
Boring No. RW-B-04

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Truck Mobile B31/Manual

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS			DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
				NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX					
										Wet, Very Dense, Gray, Coarse to Fine SAND, Little Silt, Trace Fine Angular Gravel (sm) [a-4]	
S-12	☒	18	17 41 43				40	EL -27.5 38.5		Wet, Very Dense, Gray, Coarse to Fine Subangular GRAVEL, Some Coarse to Fine Sand (gp) [a-1-b]	
S-13	☒	6	11 16 24				45	EL -32.5 43.5		Wet, Very Dense, Gray, Coarse to Fine SAND, Some Subrounded Coarse to Fine Gravel, Trace Silt (sp) [a-1-b]	
S-14	☒	11	27 50/5"				50	EL -37.5 48.5		COMPLETELY WEATHERED ROCK Sampled As: Moist, Greenish Gray, Fine SAND, And Silt, Little Coarse to Fine Subrounded Gravel	
S-15	☒	2	50/5"				55				
											Auger chattering at 57.0-ft.
S-16	☒	6	23 50/3"								
S-17		0	50/0"				60	EL -49.0 60.0		Sample S-17: No Recovery Bottom of Boring @ 60.0 ft	Spoon Refusal at 60.0-ft Tremie grouted after final groundwater reading
							65				
							70				
							75				
							80				

TEST BORING LOG

Boring No. RW-B-05
Page 1 of 2

PROJECT: South Market Street - RDC
SITE: New Castle County , Delaware
DRILLING CO.: HCEA **RIG/HAMMER:** Geoprobe 7822DT Track/Auto

COMMISSION NO.: 20077.000
NORTH: 632122
EAST: 616672
ELEVATION: 6 - ft
START DATE: 9/1/2020
END DATE: 9/1/2020
DRILLER: Justin
LOGGED BY: BAW

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
9/1/2020	3:15:00 PM	3		4
9/2/2020	12:30:00 PM	3		4.8

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	⊠	12	1 1 2					EL 5.6 0.4	5-inches Topsoil Fill Sampled As: Moist, Very Dense, Tan, Brown, Black, Coarse to Fine SAND, Little Coarse Fine GRAVEL, Trace Silt	Corrosion sample G1 taken from auger cuttings 2-ft to 5-ft pH: 8.1, As-Is Resistivity (ohm-cm): 13,000, Wetted Resistivity (ohm-cm): 13,000, Sulfate Content (ppm): <5, Oxidation Reduction (mV): 178, Chloride (ppm): 45,Sulfides: Not Present
S-2	⊠	18	3 1 1	18%			▼	EL 3.5 2.5	Wet, Very Loose, Black, Brown, Coarse to Fine SAND, Little Silt (sm) [a-2-4]	
S-3	⊠	1	1 WOH WOH				5	EL 1.0 5.0	Wet, Very Soft, Black, Dark Gray, SILT, Little Medium to Fine Sand (ML) [A-4 (6)]	
S-4	⊠	18	WOH 1 1	62.1%	34	6				
S-5	⊠	18	WOH WOH WOH				10			
S-6	⊠	18	WOH WOH WOH	44.3%						Corrosion sample G2 taken from auger cuttings 14-ft to 18-ft pH: 7.7, As-Is Resistivity (ohm-cm): 1,700, Wetted Resistivity (ohm-cm): 1,700, Sulfate Content (ppm): 310, Oxidation Reduction (mV): -24, Chloride (ppm): 45, Sulfides: Not Present Consolidation Test: Preconsolidation Pressure (tsf): 0.76, Compression Index: 0.26, Recompression Index: 0.016, Initial Void Ratio: 1.289
T-1	▥	24		40.1%	29	NP	15	EL -9.0 15.0	Wet, Very Loose, Black, Coarse to Fine SAND, Little Clay, Trace Silt, Trace Fine Gravel (SM) [A-2-4 (0)]	
S-7	⊠	18	1 1 WOH				20			
S-8	⊠	18	1 1 1				25			
S-9	⊠	18	5 6 6				30	EL -22.5 28.5	Wet, Medium Dense, Black to Brown, Medium to Fine SAND, Trace Silt (SP-SM) [A-3]	
S-10	⊠	18	4 6 7	32.1%	NP	NP	35			

SAMPLE IDENTIFICATION	DRILLING METHOD
⊠ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
⊠ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Geoprobe 7822DT Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS			DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
				NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX					
										Wet, Medium Dense, Black to Brown, Medium to Fine SAND, Trace Silt (SP-SM) [A-3]	
S-11	☒	18	7 10 21				40			Sample S-11: Dense	
S-12	☒	18	10 12 12							Sample S-12: Medium Dense	
							45	EL -39.0 45.0		Bottom of Boring @ 45.0 ft	Auger refusal at 45-ft Grouted after final groundwater reading
							50				
							55				
							60				
							65				
							70				
							75				
							80				

TEST BORING LOG

Boring No. RW-B-06
Page 1 of 2

PROJECT: South Market Street - RDC

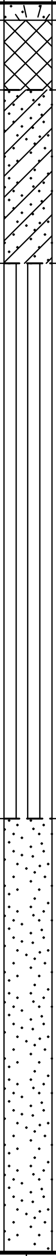
SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Geoprobe 7822DT Track/Auto

COMMISSION NO.:	20077.000
NORTH:	632244
EAST:	616737
ELEVATION:	6 - ft
START DATE:	8/31/2020
END DATE:	9/1/2020
DRILLER:	Justin
LOGGED BY:	ACR

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
9/1/2020		7	-	22.5
9/2/2020	12:00:00 PM	4	-	19.6

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-



SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	14	2 3 3					EL 5.5 0.5		6-Inches TOPSOIL FILL Sampled As: Moist, Loose, Gray, Dark Gray, Coarse to Fine SAND, Little Clay, Trace Fine Gravel	Corrosion sample G1 taken from auger cuttings 1-ft to 7-ft
								EL 3.5 2.5		Moist, Very Loose, Reddish Brown, Coarse to Fine SAND, Some Clay (sc) [a-2-6]	
S-2	☒	18	1 1 1				▼				
S-3	☒	0	1 1/12"				5			Sample S-3: No Recovery	
							∇				
S-4	☒	18	WOH WOH WOH					EL -1.5 7.5		Moist, Very Soft, Dark Gray, SILT, Some Clay, Trace Coarse to Fine Sand, Trace Organics (ML) [A-7-5 (18)]	
T-1	▥	24	PUSH	64.4%	46	14	10				T-1: Silty clay at bottom Consolidation Test: Preconsolidation Pressure (tsf): 0.9, Compression Index: 1.22, Recompression Index: 0.014, Initial Void Ratio: 3.626 DS Test Results: Cohesion: 0-psf, Drained Friction Angle: 27.9-deg
S-5	☒	18	WOH WOH WOH								
							15				
S-6	☒	18	WOH WOH WOH								
S-7	☒	18	WOH WOH WOH								
							20				
								EL -17.5 23.5		Wet, Very Loose, Gray, Medium to Fine SAND, Trace Silt, Trace Mica (SP) [A-3]	
S-8	☒	18	1 2 2								
							25				
S-9	☒	18	2 2 1	22.6%	NP	NP					
							30				
S-10	☒	18	4 4 5							Sample S-10: Loose, Trace Gravel	
							35				

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
☒ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
▮ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

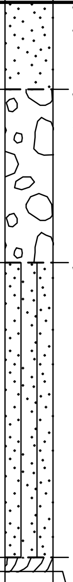
TEST BORING LOG

Boring No. RW-B-06
Page 2 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Geoprobe 7822DT Track/Auto



SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
									Wet, Very Loose, Gray, Medium to Fine SAND, Trace Silt, Trace Mica (SP) [A-3]	
S-11	☒	18	4 2 1				40	EL -32.5 38.5	Wet, Very Loose, Light Gray, Fine Sub-Angular GRAVEL, Some Coarse to Fine Sand, Trace Silt (gp) [a-1-b]	
S-12	☒	18	3 2 1				45	EL -37.5 43.5	Wet, Very Loose, Gray, Coarse to Fine SAND, Some Silt (Residual Soil) (sm) [a-4]	
S-13	☒	18	4 5 9	23%			50		Sample S-13: Medium Dense	
S-14	☒	5	50/5"					EL -46.0 52.0	COMPLETELY WEATHERED ROCK Sampled As: Wet, Greenish Gray, Coarse to Fine SAND, Some Silt	Auger Refusal at 52.0-ft. Grouted after final groundwater reading.
								EL -46.4 52.4	Bottom of Boring @ 52.0 ft	
							55			
							60			
							65			
							70			
							75			
							80			

TEST BORING LOG

Boring No. RW-B-07
Page 1 of 2

RK&K **PROJECT:** South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.:	20077.000
NORTH:	632203
EAST:	616699
ELEVATION:	6 - ft
START DATE:	8/31/2020
END DATE:	9/2/2020
DRILLER:	Mark S.
LOGGED BY:	ACR

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
9/1/2020	8:30:00 AM	2.8	-	-
9/2/2020	12:00:00 PM	2.8	-	3.2

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	⊠	7	4 4 5					EL 5.5 0.5	6-Inches TOPSOIL FILL Sampled As: Moist, Loose, Brown, Coarse to Fine SAND, Little Clay, Little Coarse to Fine Gravel	
S-2	⊠	15	5 4 3				▼	EL 3.5 2.5	Wet, Loose, Light Brown, Coarse to Fine SAND, Little Fine Angular Gravel, Little Silt, Trace Mica (sp) [a-1-b]	
S-3	⊠	10	2 1 1				5	EL 1.0 5.0	Wet, Very Loose, Dark Gray, Black, Coarse to Fine SAND, Some Silt (sm) [a-2-4]	Corrosion sample S-3A taken at 5.0-ft
S-4	⊠	18	1 1 1					EL -1.5 7.5	Moist, Very Soft, Dark Gray to Brown, SILT, Trace Coarse to Fine Sand, Trace Organics (ML) [A-7-6 (21)]	Corrosion sample S-4A taken at 7.5-ft
S-5	⊠	18	1 1 1	44.3%	49	20	10		Sample S-5: Wet	
S-6	⊠	18	1 1 1							
S-7	⊠	18	1 1 1				15			
S-8	⊠	18	WOH WOH 1				20		Sample S-8: Some Fine Sand, Trace Mica	
S-9	⊠	5	4 2 2				25	EL -17.5 23.5	Wet, Very Loose, Dark Gray, Coarse to Fine SAND, Little Silt, Trace Fine Gravel, Trace Mica (SM) [A-2-4 (0)]	
S-10	⊠	18	2 1 3	25.7%	NP	NP	30			
S-11	⊠	13	4 13 9				35		Sample S-11: Medium Dense, Little Coarse to Fine Sub-Angular Gravel	

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
⊠ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
◫ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
⊠ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
■ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

Boring No. RW-B-07

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Wet, Very Loose, Dark Gray, Coarse to Fine SAND, Little Silt, Trace Fine Gravel, Trace Mica (SM) [A-2-4 (0)]	
S-12	☒	12	13 10 17				40			Sample S-12: Medium Dense, Little Coarse to Fine Angular Gravel	
								EL -37.5 43.5		Moist, Medium Dense, Yellowish Brown, Coarse to Fine SAND, Some Silt (Residual Soil) (sm) [a-4]	
S-13	☒	18	21 11 6	27.3%			45				
S-14	☒	15	16 9 12				50				Sample S-14: not representative
S-15	☒	12	14 26 30				55			Sample S-15: Very Dense, Yellowish Brown, Greenish Gray, Little Angular Gravel-Sized Rock Fragments	Sample S-15: Mix of residual soil and completely weathered rock
S-16	☒	2	50/2"				60	EL -52.5 58.5		COMPLETELY WEATHERED ROCK Sampled As: Moist, Greenish Gray, Coarse to Fine SAND, Little Gravel-Sized Rock Fragments	
S-17	☒	1	50/1"					EL -56.1 62.1		Sample S-17: Two Pieces of Gravel Sized Rock Fragments Bottom of Boring @ 62.1 ft	Auger Refusal at 62.1-ft. Grouted after final groundwater reading
							65				
							70				
							75				
							80				

TEST BORING LOG

Boring No. RW-B-08
Page 1 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 630906
EAST: 616184
ELEVATION: 5.0 - ft
START DATE: 9/16/2022
END DATE: 9/16/2022
DRILLER: Brian
LOGGED BY: JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
9/19/2022	7:40:00 AM	2.3	--	22.2

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	3	3 2 2					EL 4.8 0.3		3-Inches TOPSOIL FILL Sampled As: Moist, Very Loose, Brown, Coarse to Fine SAND, Little Fine Gravel, Trace Silt, Trace Glass Fragments	
S-2	☒	6	3 3 4	18.4%	NP	NP	▽			Sample S-2: Wet, Loose, Gray, Dark Brown	Sample S-2: Strong Petroleum Odor. Wet Spoon at 2.5-ft
S-3	☒	5	2 3 1				5	EL 0.0 5.0		Wet, Very Loose, Black, Dark Brown, Coarse to Fine SAND, And Coarse to Fine Subangular Gravel (sp) [a-1-a]	
S-4	☒	18	1 1 1	54%				EL -2.5 7.5		Wet, Very Soft, Black, Dark Brown, High Plasticity CLAY, And Silt, Some Coarse to Fine Sand, Trace Fine Gravel (CH) [A-7-6 (21)]	
T-1	▥	21	P U S H	47.4%	58	34	10				
S-5	☒	18	WOH WOH WOH								
S-6	☒	18	WOH 1 1				15				
S-7	☒	18	WOH WOH 1								
S-8	☒	18	WOH 1 1	45.5%			20				
S-9	☒	18	WOH 1 1				25			Sample S-9: Dark Gray	
S-10	☒	5	WOH 1 2	36.1%	47	25	30	EL -23.5 28.5		Moist, Very Loose, Dark Gray, Medium to Fine SAND, Little Silt, Little Clay (SC) [A-7-6 (3)]	Running Sands at 30-ft
S-11	☒	18	WOH 1 1				35	EL -28.5 33.5		Moist, Very Soft, Dark Gray, CLAY, Little Medium to Fine Sand (cl) [a-6]	

SAMPLE IDENTIFICATION	DRILLING METHOD	BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS	0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS	5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING	11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
☒ - D - DENISON	MD - MUD DRILLING	31-50	DENSE	9-15	STIFF	AND	36 TO 50
■ - RC - ROCK CORE	HA - HAND AUGER	OVER 50	VERY DENSE	16-30	VERY STIFF		
				OVER 30	HARD		

RKK NORTH/EAST (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 5/31/23

TEST BORING LOG

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS			DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
				NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX					
										Moist, Very Soft, Dark Gray, CLAY, Little Medium to Fine Sand (cl) [a-6]	
S-12	☒	2	5 3 3				40	EL -33.5 38.5		Moist, Loose, Dark Gray, Coarse to Fine SAND, Some Coarse to Fine Gravel, Little Clay (sc) [a-2-6]	
S-13	☒	18	4 3 5	44%	65	26	45	EL -38.5 43.5		Moist, Medium Stiff, Green, Brown, High Plasticity SILT, And Clay, Little Coarse to Fine Sand (Residual Soil) (MH) [A-7-5 (29)]	
S-14	☒	8	19 16 15				50			Sample S-14: Hard, Dark Brown	
S-15	☒	4	50/4"					EL -48.5 53.5		COMPLETELY WEATHERED ROCK Sampled As: Moist, Green, Red, CLAY, Some Coarse to Fine Sand, Little Coarse to Fine Gravel	
S-16		1	50/1"				55	EL -49.1 54.1		Sample S-16: Wet, Brown, GRAVEL-SIZED ROCK FRAGMENTS Bottom of Boring @ 54.1 ft	Grouted with bentonite mix upon completion
							60				
							65				
							70				
							75				
							80				

RKK NORTH/EAST (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 5/31/23

TEST BORING LOG

Boring No. RW-B-09
Page 1 of 2

PROJECT: South Market Street - RDC
SITE: New Castle County , Delaware
DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 630727
EAST: 616129
ELEVATION: 5.0 - ft
START DATE: 9/20/2022
END DATE: 9/21/2022
DRILLER: Brian
LOGGED BY: JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
9/21/2022	10:10:00 AM	2.0	--	5.0

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	8	5 4 3				▽	EL 4.7 0.3		4-Inches Bituminous Concrete FILL Sampled As: Moist, Loose, Dark Brown/Black/Orange, Coarse to Fine SAND, Some Clay, Little Coarse to Fine Rounded Gravel, Contains Brick Fragments	Strong Petroleum Odor at 0.5-ft
S-2	☒	10	4 4 4							Sample S-2: Trace Coarse to Fine Rounded Gravel	Wet Spoon at 4-ft
S-3	☒	2	3 1 1				5			Sample S-3: Wet, Very Loose, Trace Coarse to Fine Rounded Gravel	
S-4	☒	12	1 WOH WOH					EL -2.5 7.5		Wet, Very Soft, Dark Gray/Black, High Plasticity SILT, Trace Coarse Sand, Contains Root Fragments (MH)[A-7-5(49)]	
S-5	☒	18	WOH WOH WOH	68%	77	41	10				
S-6	☒	18	WOH WOH WOH					EL -7.5 12.5		Wet, Very Soft, Black/Dark Gray, Highly Plastic CLAY, And Silt, Some Medium to Fine Sand, Micaceous (CH) [A-7-6 (36)]	
S-7	☒	18	WOH WOH WOH				15				
T-1	◫	24		67.7%	72	43					
S-8	☒	18	WOH WOH 1				20			Sample S-8: Gray	
S-9	☒	18	WOH WOH 1				25			Sample S-9: And Medium to Fine Sand	
S-10	☒	4	WOH 1 3				30	EL -23.5 28.5		Moist, Very Loose, Dark Gray, Coarse to Fine SAND, Some Clay (sc) [a-2-6]	Running Sands encountered at 30-ft
S-11	☒	18	1 1 1	71%	95	63	35	EL -28.5 33.5		Wet, Very Soft, Dark Gray, High Plasticity CLAY, And Silt, Trace Fine Sand (CH) [A-7-5 (74)]	

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
◫ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
◧ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

RKK NORTH/EAST (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 5/31/23

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: Hillis-Carnes **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
									▨	Wet, Very Soft, Dark Gray, High Plasticity CLAY, And Silt, Trace Fine Sand (CH) [A-7-5 (74)]	
S-12	☒	6	1 2 7				40	EL -33.5 38.5	▨	Wet, Loose, Gray/Dark Brown, Coarse to Fine SAND, Some Coarse to Fine Rounded Gravel, Little Clay (sc) [a-2-6]	
S-13	☒	8	3 5 7	29.9%			45	EL -38.5 43.5	▨	Moist, Stiff, Green/Red, CLAY, Little Coarse to Fine Sand (Residual Soil) (cl) [a-6]	
S-14	☒	0	7 14 19				50		▨	Sample S-14: Hard, No Recovery	Piece of Gravel in tip of spoon
S-15		1	50/1"				55	EL -48.3 53.3 EL -48.4 53.4		COMPLETELY WEATHERED ROCK Sampled As: Moist, Red/Brown, Coarse to Fine GRAVEL-Sized Rock Fragments, Some Coarse to Fine Sand, Little Clay Bottom of Boring @ 53.4 ft	Grouted with bentonite mix upon completion
							60				
							65				
							70				
							75				
							80				

TEST BORING LOG

Boring No. RW-B-10
Page 1 of 2

RK&K

PROJECT: South Market Street - RDC
SITE: New Castle County , Delaware
DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 629600
EAST: 615906
ELEVATION: 6.5 - ft
START DATE: 10/17/2022
END DATE: 10/18/2022
DRILLER: Brian
LOGGED BY: JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
10/17/2022	4:30:00 PM	3.5	--	31.0
10/18/2022	8:15:00 AM	3.8	--	32.0

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	18	3 4 4					EL 6.2 0.3		4-Inches TOPSOIL FILL Sampled As: Moist, Loose, Orange, Brown, Coarse to Fine SAND, Some Clay, Little Coarse to Fine Rounded Gravel	pH: 9.3, As-Is Resistivity (ohm-cm): 5,300, Wetted Resistivity (ohm-cm): 3,100, Sulfate Content (ppm): 80, Oxidation Reduction (mV): 116, Chloride (ppm): 20, Sulfides: Not Present Wet spoon at 5-ft.
S-2	☒	18	4 4 6	15.9%			▼	EL 4.0 2.5		FILL Sampled As: Moist, Stiff, Brown/Orange, CLAY, Some Coarse to Fine Sand, Trace Coarse to Fine Angular Gravel, Contains Brick and Wood Fragments (cl)	
S-3	☒	18	6 6 3	11.5%			5			Sample S-3: Wet	
S-4	☒	2	11 6 4					EL -1.0 7.5		FILL Sampled As: Moist, Loose, Brown/Gray, Coarse to Fine GRAVEL-Sized Rock Fragments, Little Clay, Little Coarse to Fine Sand, Contains Wood and Brick Fragments	
S-5	☒	12	3 2 2	87.8%	75	18	10	EL -3.5 10.0		FILL Sampled As: Moist, Very Loose, Black, Coarse to Fine Sand, Some Silt, Contains Glass and Plastic Fragments	Grab sample collected from 10.0-ft to 20.0-ft
S-6	☒	5	1 1 1					EL -6.0 12.5		Moist, Very Soft, Dark Gray, CLAY, Little Coarse to Fine Sand (cl) [a-6]	
S-7	☒	18	1 2 1	49.4%			15			Sample S-7: Soft	
S-8	☒	6	WOH 1 1					EL -11.0 17.5		Moist, Very Soft, Gray, Medium Plasticity SILT, Little Coarse to Fine Sand, Trace Fine Gravel (ML) [A-7-6(16)]	
T-1	▥	5					20			Sample T-1: Little Medium to Fine Sand	
S-9	☒	18	WOH WOH 1								
T-2	▥	24		52.5%	47	19	25				Consolidation Test: Preconsolidation Pressure (tsf): 0.40, Compression Index: 0.49, Recompression Index: 0.07, Initial Void Ratio: 1.555
S-10	☒	18	WOH 1 1								
S-11	☒	18	1 1 1				30	EL -22.0 28.5		Moist, Very Loose, Gray, Medium to Fine SAND, Some Silt (sm) [a-2-4]	Bentonite added to HSA
S-12	☒	10	1 1 2	44.4%			35			Sample S-12: Coarse to Fine Sand	

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

Boring No. RW-B-10
Page 2 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS			DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
				NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX					
									▨	Moist, Very Loose, Gray, Medium to Fine SAND, Some Silt (sm) [a-2-4]	
S-13	☒	18	WOH WOH 1	59.4%	52	29	40	EL -32.0 38.5	■	Moist, Very Soft, Gray, High Plasticity CLAY, Some Coarse to Fine Sand, Trace Fine Gravel (CH) [A-7-6(20)]	
S-14	☒	18	8 4 5				45	EL -37.0 43.5	▨	Moist, Stiff, Orange/Red/Gray, CLAY, Little Medium to Fine Sand (Residual Soil) (cl) [a-6]	
S-15	☒	0	33 48 31				50		▨	Sample S-15: Hard, No Recovery	Rock at tip of spoon
S-16	☒	18	21 33 35				55	EL -47.0 53.5	▨	Wet, Very Dense, Green, Light Brown, Coarse to Fine SAND, Little Silt (Residual Soil) (sm) [a-2-4]	
S-17	☒	18	3 4 8	32.4%			60	EL -52.0 58.5	▨	Moist, Stiff, Orange/Red/Yellow, CLAY, Little Medium to Fine Sand (Residual Soil) (cl) [a-6]	
S-18	☒	10	11 12 12				65		▨	Sample S-18: Very Stiff, Trace Gravel-Sized Rock Fragments	
S-19	☒	18	3 10 12				70		▨	Sample S-19: Very Stiff. Some Medium to Fine Sand	
S-20	☒	18	6 18 20						▨	Sample S-20: Hard, Some Coarse to Fine Sand	
							75	EL -68.5 75.0		Bottom of Boring @ 75.0 ft	Grouted with bentonite mix after final groundwater reading
							80				

TEST BORING LOG

Boring No. RW-B-11

PROJECT: South Market Street - RDC

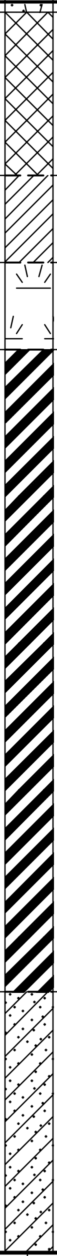
SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 629855
EAST: 615992
ELEVATION: 7.0 - ft
START DATE: 10/11/2022
END DATE: 10/11/2022
DRILLER: Brian
LOGGED BY: JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
10/12/2022	8:30:00 AM	4.9	--	30.8

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-



SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	12	18 37 23					EL 6.7 0.3		4-Inches TOPSOIL FILL Sampled As: Moist, Very Dense, Black, Coarse to Fine SAND, Some Loose Asphalt Concrete Mix	Strong Petroleum Odor, VOC = 20-ppm
S-2	☒	4	3 3 3							Sample S-2: Loose, Trace Coarse to Fine Gravel, Contains Brick and Glass Fragments	Strong Petroleum Odor, VOC = 33.5-ppm
S-3	☒	15	1 WOH WOH	35.6%			▽ 5	EL 2.0 5.0		Wet, Very Soft, Black, CLAY, Little Medium to Fine Sand (cl) [a-6]	Wet spoon at 5-ft
S-4	☒	2	1 1 1					EL -0.5 7.5		Wet, Very Soft, Black, PEAT, Some Medium to Fine Sand, Contains Wood Fragments (pt)	
S-5	☒	18	1 WOH 1	43.8%	68	37	10	EL -3.0 10.0		Moist, Very Soft, Dark Gray, High Plasticity CLAY, Trace Coarse to Fine Sand (CH) [A-7-5(40)]	pH: 8.0, As-Is Resistivity (ohm-cm): 1,900, Wetted Resistivity (ohm-cm): 1,900, Sulfate Content (ppm): 70, Oxidation Reduction (mV): 92, Chloride (ppm): 65, Sulfides: Not Present
S-6	☒	0	1 1 WOH							Sample S-6: No Recovery	
S-7	☒	18	WOH WOH 1	36.9%			15				
S-8	☒	18	WOH 1 1								
S-9	☒	18	1 1 1				20			Sample S-9: Little Silt	
S-10	☒	18	WOH WOH 1	54.4%	93	53	25			Sample S-10: Little Medium to Fine Sand [A-7-5(55)]	
S-11	☒	18	2 2 2				30	EL -21.5 28.5		Moist, Very Loose, Gray, Coarse to Fine SAND, Some Clay (sc) [a-2-6]	Running Sands at 30-ft
S-12	☒	10	2 3 3				35			Sample S-12: Loose	

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
◫ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

RKK NORTH/EAST (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 5/31/23

TEST BORING LOG

Boring No. RW-B-11
Page 2 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Very Loose, Gray, Coarse to Fine SAND, Some Clay (sc) [a-2-6]	
S-13	☒	18	2 2 3	29.3%			40			Sample S-13: Loose	
S-14	☒	4	2 5 7				45	EL -36.5 43.5		Moist, Medium Dense, Brown, Coarse to Fine Rounded GRAVEL, Some Coarse to Fine Sand, Little Clay (gc) [a-2-7]	
S-15	☒	0	16 8 6				50			Sample S-15: No Recovery	
S-16	☒	18	3 4 6	30.7%	71	37	55	EL -46.5 53.5		Moist, Stiff, Red/Gray, High Plasticity CLAY, And Coarse to Fine Sand (Residual Soil) (CH) [A-7-5(19)]	
S-17	☒	18	6 9 12				60			Sample S-17: Very Stiff, Red/Orange, Little Medium to Fine Sand	
S-18	☒	18	6 11 14				65			Sample S-18: Very Stiff, Little Medium to Fine Sand	
S-19	☒	18	7 10 15				70			Sample S-19: Very Stiff	
S-20	☒	12	26 13 19					EL -66.5 73.5		Moist, Dense, Green/Red, Coarse to Fine SAND, Some Clay, Trace Coarse to Fine Gravel (Residual Soil) (sc) [a-2-6]	
							75	EL -68.0 75.0		Bottom of Boring @ 75.0 ft	Boring grouted with bentonite mix after final groundwater reading
							80				

TEST BORING LOG

Boring No. RW-B-12
Page 1 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 630014
EAST: 616047
ELEVATION: 8.0 - ft
START DATE: 10/12/2022
END DATE: 10/12/2022
DRILLER: Brian
LOGGED BY: JG

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
10/12/2022	5:25:00 PM	4.0	--	27.5

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	15	5 12 21	11.1%				EL 7.7 0.3		4-Inches TOPSOIL FILL Sampled As: Moist, Dense, Gray, Coarse to Fine SAND, Some Coarse to Fine Angular Gravel, Little Silt	pH: 8.2, As-Is Resistivity (ohm-cm): 2,100, Wetted Resistivity (ohm-cm): 1,800, Sulfate Content (ppm): 240, Oxidation Reduction (mV): 27, Chloride (ppm): 45, Sulfides: Not Present Strong Petroleum Odor, VOC = 39-ppm Hard Augering at 2-ft Strong Petroleum Odor, VOC = 34-ppm Wet spoon at 7.5-ft
S-2	☒	10	4 7 5				▽	EL 5.5 2.5		FILL Sampled As: Moist, Stiff, Black, Orange, CLAY, Some Coarse to Fine Sand, Trace Coarse to Fine Gravel, Contains Brick Fragments	
S-3	☒	10	4 2 1	37.4%			5			Sample S-3: Soft Contains Wood Fragments	
								EL 2.0 6.0		Moist, Very Loose, Black, Coarse to Fine SAND, Little Clay (sc) [a-2-6]	
S-4	☒	9	1 1 1					EL 0.5 7.5		Moist, Very Soft, Dark Brown, High Plasticity CLAY, And Silt, Trace Coarse to Fine Sand, Trace Fine Gravel (CH) [A-7-6(39)]	
T-1	▥	7	P U S H	51.3%			10				
S-5	☒	3	1 1 1								
S-6	☒	6	1 1 1				15				pH: 6.9, As-Is Resistivity (ohm-cm): 26,000, Wetted Resistivity (ohm-cm): 26,000, Sulfate Content (ppm): <5, Oxidation Reduction (mV): -52, Chloride (ppm): 45, Sulfides: Not Present DS Test Results: Cohesion: 280-psf, Drained Friction Angle: 13-deg Consolidation Test: Preconsolidation Pressure (tsf): 0.5, Compression Index: 0.18, Recompression Index: 0.03, Initial Void Ratio: 0.580
T-2	▥	16	P U S H	54.7%	66	40					
S-7	☒	18	WOH 1 1				20	EL -12.5 20.5		Moist, Very Soft, Dark Brown, SILT, Some Medium to Fine Sand (ml) [a-4]	
S-8	☒	18	WOH WOH 1	56.7%			25			Sample S-8: Little Clay	
S-9	☒	6	1 1 2				30	EL -20.5 28.5		Wet, Very Loose, Dark Gray, Coarse to Fine SAND, Some Clay (sc) [a-2-6]	
S-10	☒	18	WOH 1 1	71.9%	86	47	35	EL -25.5 33.5		Moist, Very Soft, Dark Gray, High Plasticity SILT, Little Coarse to Fine Sand (MH) [A-7-5(44)]	

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
☰ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
☒ - D - DENISON	MD - MUD DRILLING
■ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY	BLOWS/FT	CONSISTENCY	SAMPLE PROPORTIONS (PERCENT)	
0-4	VERY LOOSE	0-2	VERY SOFT	TRACE	1 TO 10
5-10	LOOSE	3-4	SOFT	LITTLE	11 TO 20
11-30	MEDIUM DENSE	5-8	MEDIUM STIFF	SOME	21 TO 35
31-50	DENSE	9-15	STIFF	AND	36 TO 50
OVER 50	VERY DENSE	16-30	VERY STIFF		
		OVER 30	HARD		

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Very Soft, Dark Gray, High Plasticity SILT, Little Coarse to Fine Sand (MH) [A-7-5(44)]	
S-11	☒	18	2 5 3				40	EL -30.5 38.5		Moist, Loose, Dark Gray, Coarse to Fine SAND, Some Silt, Trace Coarse to Fine Gravel (sm) [a-4]	
S-12	☒	18	13 6 8				45			Sample S-12: Medium Dense, Brown, Little Coarse to Fine Rounded Gravel	
S-13	☒	18	7 16 15				50			Sample S-13: Dense, Gray	
S-14	☒	18	5 9 12	35%			55	EL -45.5 53.5		Moist, Very Stiff, Red, Green, CLAY, Little Medium to Fine Sand (Residual Soil) (cl) [a-6]	
S-15	☒	18	6 17 19				60			Sample S-15: Hard	
S-16	☒	18	8 17 20				65			Sample S-16: Hard, Some Medium to Fine Sand	
S-17	☒	18	10 16 23				70	EL -60.5 68.5		Moist, Dense, Green/Gray, Coarse to Fine SAND, Little Clay, Trace Coarse to Fine Gravel-Sized Rock Fragments (Residual Soil) (sc) [a-2-6]	
S-18	☒	18	11 18 25								
							75	EL -67.0 75.0		Bottom of Boring @ 75.0 ft	Boring grouted with bentonite mix after final groundwater reading
							80				

RKK NORTH/EAST (DEFAULT) 20077 SOUTH MARKET STREET - RDC.GPJ RKK_CURRENT.GDT 5/31/23

TEST BORING LOG

Boring No. RW-B-13
Page 1 of 2

RK&K

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

COMMISSION NO.: 20077.000
NORTH: 630410
EAST: 616071
ELEVATION: 12.0 - ft
START DATE: 10/21/2022
END DATE: 10/24/2022
DRILLER: Brian
LOGGED BY: JG

GROUNDWATER DATA (ft)

Date	Time	Water	Casing	Cave-In
10/24/2022	1:15:00 PM	11.0	--	30.0
10/25/2022	1:28:00 PM	8.2	--	30.0

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	⊠	5	12 16 17	11.1%				EL 11.8 0.2	▩	3-Inches TOPSOIL FILL Sampled As: Moist, Dense, Brown/Gray, Coarse to Fine SAND, Some Coarse to Fine Gravel-Sized Rock Fragments, Some Silt	pH: 8.6, As-Is Resistivity (ohm-cm): 28,000, Wetted Resistivity (ohm-cm): 4,300, Sulfate Content (ppm): 185, Oxidation Reduction (mV): 87, Chloride (ppm): 45, Sulfides: Not Present Hard augering at 4.5-ft
S-2	⊠	18	4 15 25	12.1%					▩		
S-3	⊠	8	16 13 11				5		▩	Sample S-3: Medium Dense, And Silt, Little Coarse to Fine Gravel	
S-4	⊠	15	23 21 14	8.9%	22	NP	▼	EL 4.5 7.5	▩	Fill Sampled As: Moist, Dense Light Brown/Orange/Brown, Coarse to Fine Gravel, And Coarse to Fine SAND, Trace Silt, Contains Brick and Concrete	
S-5	⊠	4	3 7 8				10 ▽	EL 2.0 10.0	▩	Fill Sampled As: Moist, Medium Dense, Brown/Gray, Coarse to Fine SAND, Some Coarse to Fine Gravel, Trace Silt, Contains Wood Fragments	
S-6	⊠	0	7 4 2						▩	Sample S-6: Loose	Wet spoon at 12-ft
S-7	⊠	18	1 2 3	65.1%	110	57	15	EL -3.0 15.0	▥	Moist, Medium Stiff, Dark Brown, High Plasticity SILT, Little Coarse to Fine Sand, Contains Organics (MH) [A-7-5(61)]	Sample S-7: Organic Content (LOI) = 6.7%
S-8	⊠	0	1 2 2						▥	Sample S-8: Soft, No Recovery	
S-9	⊠	10	1 2 2				20		▥	Sample S-9: Wet, Soft	
S-10	⊠	18	WOH 1 1				25		▥	Sample S-10: Very Soft, Some Medium to Fine Sand	
S-11	⊠	18	1 1 1	46.5%	67	35	30	EL -16.5 28.5	▨	Moist, Very Soft, Gray, High Plasticity CLAY, Little Medium to Fine Sand (CH) [A-7-5(34)]	
S-12	⊠	10	2 3 4				35	EL -21.5 33.5	⁘	Moist, Loose, Gray, Coarse to Fine Sand, Little Fine Gravel, Trace Silt (sp) [a-2-4]	

SAMPLE IDENTIFICATION	DRILLING METHOD
⊠ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
⊠ - D - DENISON	MD - MUD DRILLING
▮ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)

TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Diedrich D50 Track/Auto

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
										Moist, Loose, Gray, Coarse to Fine Sand, Little Fine Gravel, Trace Silt (sp) [a-2-4]	
S-13	☒	18	1 1 2	57.4%	91	60	40	EL -26.5 38.5		Moist, Soft, Dark Gray, High Plasticity CLAY, Trace Medium to Fine Sand [A-7-5(64)]	
S-14	☒	15	2 3 3				45	EL -31.5 43.5		Moist, Loose, Gray, Coarse to Fine SAND, Some Clay (sc) [a-2-6]	
S-15	☒	5	18 29 25				50	EL -36.5 48.5		Moist, Very Dense, Brown/Gray, Coarse to Fine Rounded GRAVEL, Some Coarse to Fine Sand, Little Clay (gp) [a-1-a]	
S-16	☒	18	15 14 16	11.2%			55			Sample S-16: Medium Dense	
S-17	☒	18	5 9 10				60	EL -46.5 58.5		Moist, Very Stiff, Orange/Red, CLAY, Little Medium to Fine Sand (Residual Soil) (cl) [a-6]	
S-18	☒	18	7 14 14				65			Sample S-18: Green/Brown/Gray, Some Medium to Fine Sand	
S-19	☒	18	8 9 11				70			Sample S-19: Green/Light Brown, Red	
S-20	☒	2.5	50/2.5"					EL -59.5 71.5 EL -59.7 71.7		COMPLETELY WEATHERED ROCK Sampled As: Moist, Green/Brown, Coarse to Fine Gravel-Sized Rock Fragments, Some Coarse to Fine Sand, Trace Clay Bottom of Boring @ 71.7 ft	Auger refusal at 71.5-ft. Grouted with bentonite mix after final groundwater reading
							75				
							80				

TEST BORING LOG

Boring No. SP-B-01
Page 1 of 2

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

DRILLING CO.: HCEA **RIG/HAMMER:** Mobil B31 Truck/Safety

COMMISSION NO.: 20077.000
NORTH: 630305
EAST: 616828
ELEVATION: 5 - ft
START DATE: 4/29/2021
END DATE: 4/30/2021
DRILLER: John
LOGGED BY: ACR

GROUNDWATER DATA (ft)				
Date	Time	Water	Casing	Cave-In
4/30/2021	11:30:00 AM	3.5	-	5

EQUIPMENT	CASING	SAMPLER	CORE
TYPE	HSA		
SIZE, ID (in)	3.25	1.375	
HAMMER WT. (lb)		140	-
HAMMER FALL (in)		30	-

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
S-1	☒	8	1 3 11					EL 4.4		6-Inches TOPSOIL	
								0.6		FILL Sampled As: Moist, Medium Dense, Brown, Black, Coarse to Fine SAND, Some Coarse to Fine Angular Gravel, Little Silt	
S-2	☒	14	5 8 7				∇			Sample S-2: Gray	Sample S-2: Strong petroleum odor, VOC = 99.9 ppm
S-3	☒	7	2 4 3	13.3%			5			Sample S-3: Loose, Gray, Little Coarse to Fine Angular Gravel	
S-4	☒	8	4 23 3							Sample S-4: Gray, Black, And Coarse to Fine Sub-Angular Gravel	Wet Spoon at 7.5-ft
							10	EL -5.0 10.0			
S-5	☒	2	1 1 1							Wet, Very Loose, Gray, Coarse to Fine SAND, Little Coarse to Fine Sub-Angular Gravel (sp) [a-1-b]	
								EL -7.5 12.5			
S-6	☒	8	1 1/12"							Moist, Very Soft, Gray, Brown, Fibrous PEAT (pt) [a-8]	Sample S-6: Organic Content (LOI) = 37.6%
							15	EL -10.0 15.0			
T-1	▥	9	PUSH							Wet, Gray, High Plasticity CLAY, Little Medium to Fine Sand (CH) [A-7-6(35)]	
S-7	☒	18	WOH/18"	76.1%	57	37				Sample S-7: Very Soft	Sample S-7: Organic Content (LOI) = 8.44%
							20				
T-2	▥	0	PUSH					EL -16.5 21.5		Wet, Very Dense, Brownish Gray, Coarse to Fine SAND, And Coarse to Fine Sub-Angular Gravel, Little Silt (sm) [a-2-4]	
							25				
S-8	☒	18	22 34 32								
							30	EL -25.0 30.0			
S-9	☒	3	50/5"							Wet, Very Dense, Gray, Brown, Coarse to Fine Sub-Angular GRAVEL, And Coarse to Fine Sand, Trace Silt (gp) [a-1-a]	
							35	EL -30.0 35.0			
S-10	☒	8	12								

SAMPLE IDENTIFICATION	DRILLING METHOD
☒ - S - SPLIT SPOON	HSA - HOLLOW STEM AUGERS
▥ - T - THIN WALL TUBE	SSA - SOLID STEM AUGERS
▤ - SS - 3" SPLIT SPOON	DC - DRIVING CASING
⊠ - D - DENISON	MD - MUD DRILLING
◨ - RC - ROCK CORE	HA - HAND AUGER

BLOWS/FT	DENSITY
0-4	VERY LOOSE
5-10	LOOSE
11-30	MEDIUM DENSE
31-50	DENSE
OVER 50	VERY DENSE

BLOWS/FT	CONSISTENCY
0-2	VERY SOFT
3-4	SOFT
5-8	MEDIUM STIFF
9-15	STIFF
16-30	VERY STIFF
OVER 30	HARD

SAMPLE PROPORTIONS (PERCENT)	
TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

Boring No. SP-B-01

TEST BORING LOG

PROJECT: South Market Street - RDC

SITE: New Castle County , Delaware

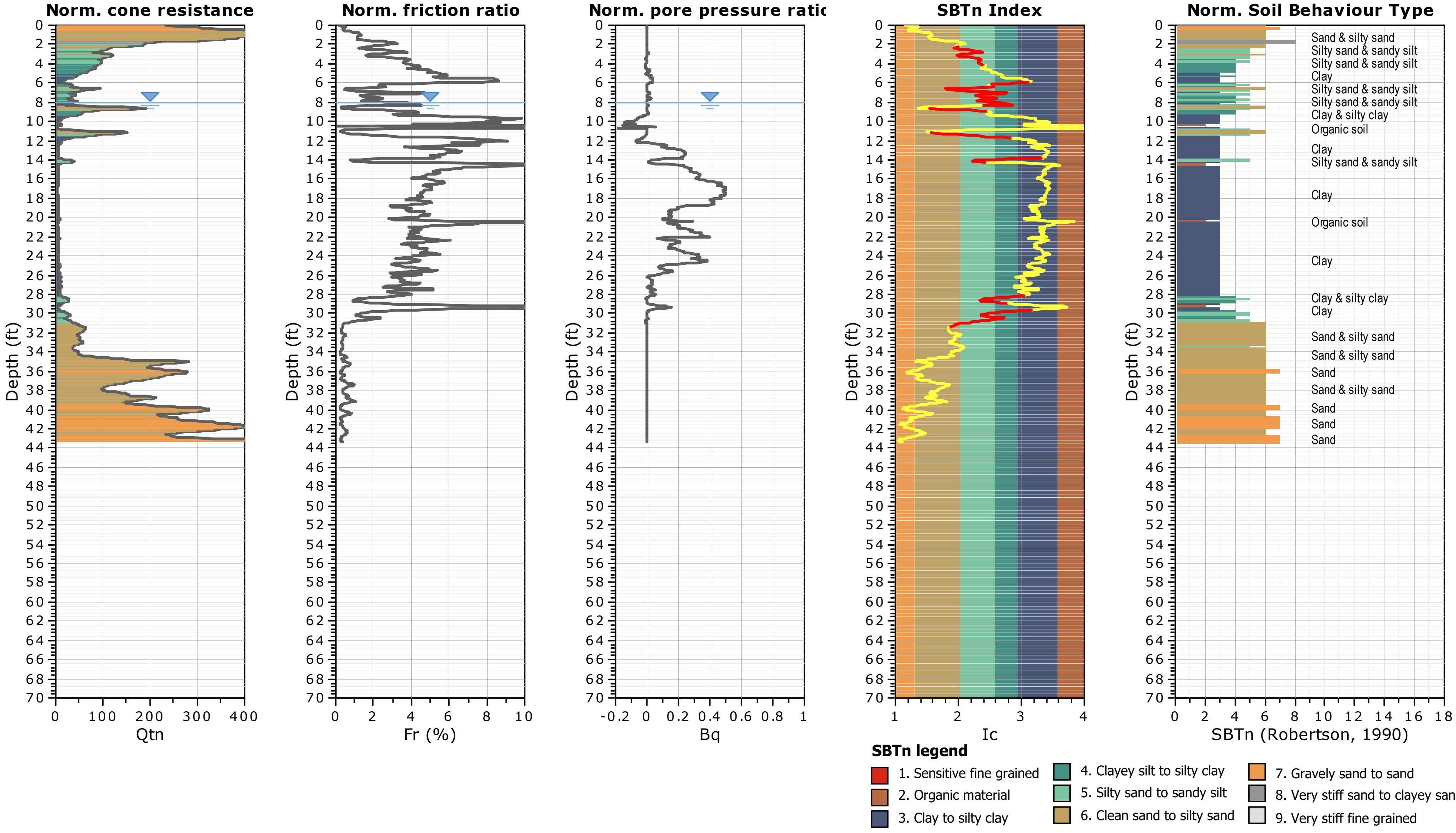
DRILLING CO.: HCEA **RIG/HAMMER:** Mobil B31 Truck/Safety

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE RECOVERY (in)	BLOWS/6" (% RQD)	LABORATORY TEST RESULTS NMC/ Frac. Freq.	LIQUID LIMIT	PLASTICITY INDEX	DEPTH	ELEV. / DEPTH	GRAPHIC	DESCRIPTION AND CLASSIFICATION (moisture, density, color, proportions, etc.)	NOTES:
	☒		12 16							Wet, Medium Dense, Brownish Gray, Medium to Fine SAND, Trace Coarse Sand, Little Silt, Trace Fine Gravel (SC-SM) [A-4(0)]	
S-11	☒	12	3 5 9	19.8%	23	5	40			Sample S-11: Medium to Fine SAND, Little Silt, Little Clay	
S-12	☒	18	6 11 8				45	EL -40.0 45.0		Wet, Medium Dense, Brownish Gray, Coarse to Fine SAND, Little Silt, Trace Fine Angular Gravel (sm) [a-2-4]	
S-13	☒	18	9 9 15				50			Sample S-13: Medium to Fine SAND	Sample S-13: 2" Clay seam
S-14	☒	18	13 17 25				55	EL -50.0 55.0		Moist, Hard, Dark Brown, CLAY, Little Fine Sand (Residual Soil) (cl) [a-6]	
S-15	☒	11	17 36 50					EL -53.5 58.5		COMPLETELY WEATHERED ROCK Sampled As: Moist, Very Dense, Light Gray, SILT, Some Medium to Fine Sand	
							60	EL -55.0 60.0		Bottom of Boring @ 60.0 ft	Grouted upon completion
							65				
							70				
							75				
							80				

CPT Reports

CPT: S Market BH-CPT-01
Total depth: 43.37 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

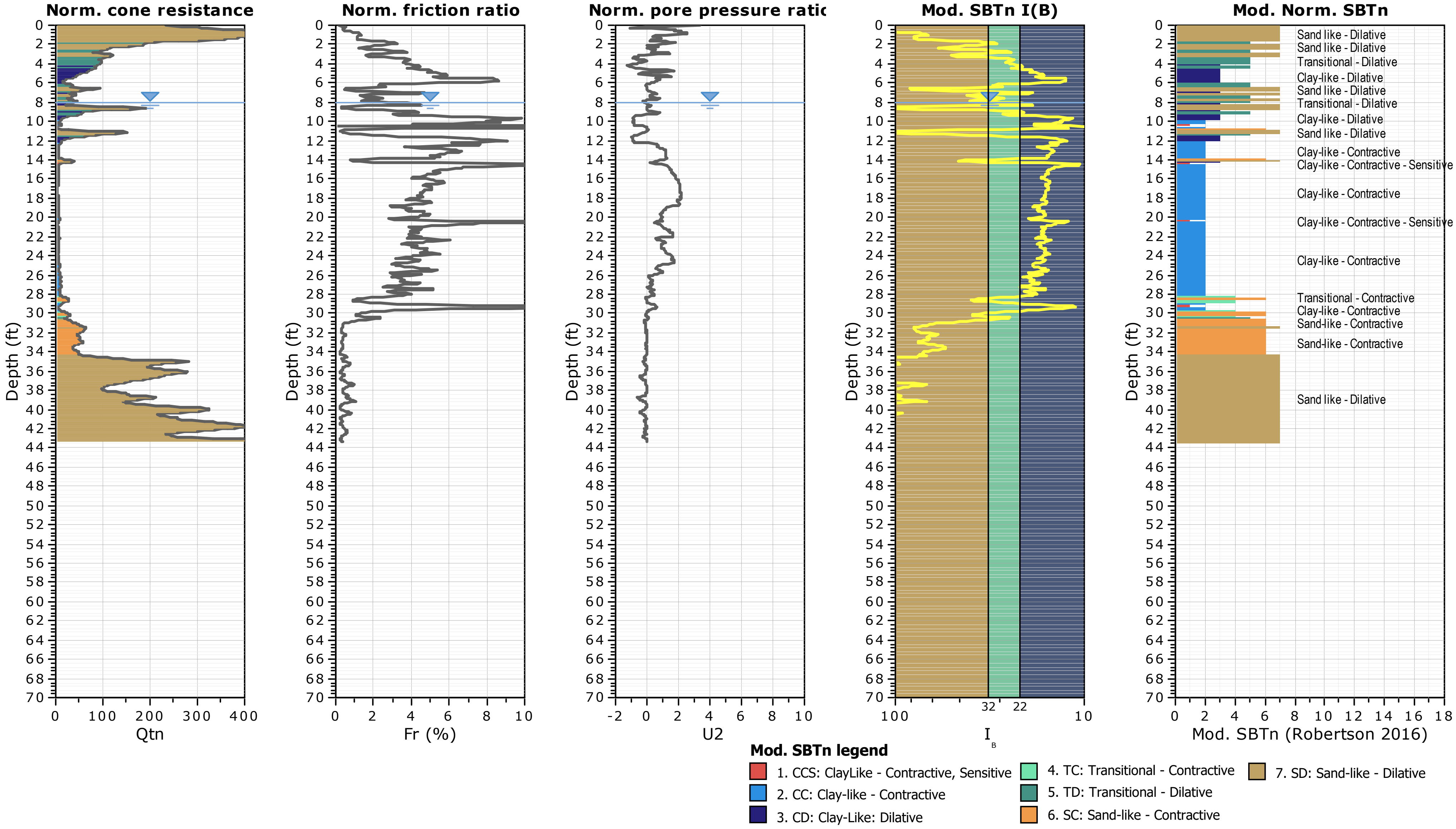
Project: **S Market - RK&K**
Location: **New Castle, DE**



HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
Delmar, Maryland
http://www.HCEA.com

CPT: S Market BH-CPT-01
Total depth: 43.37 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

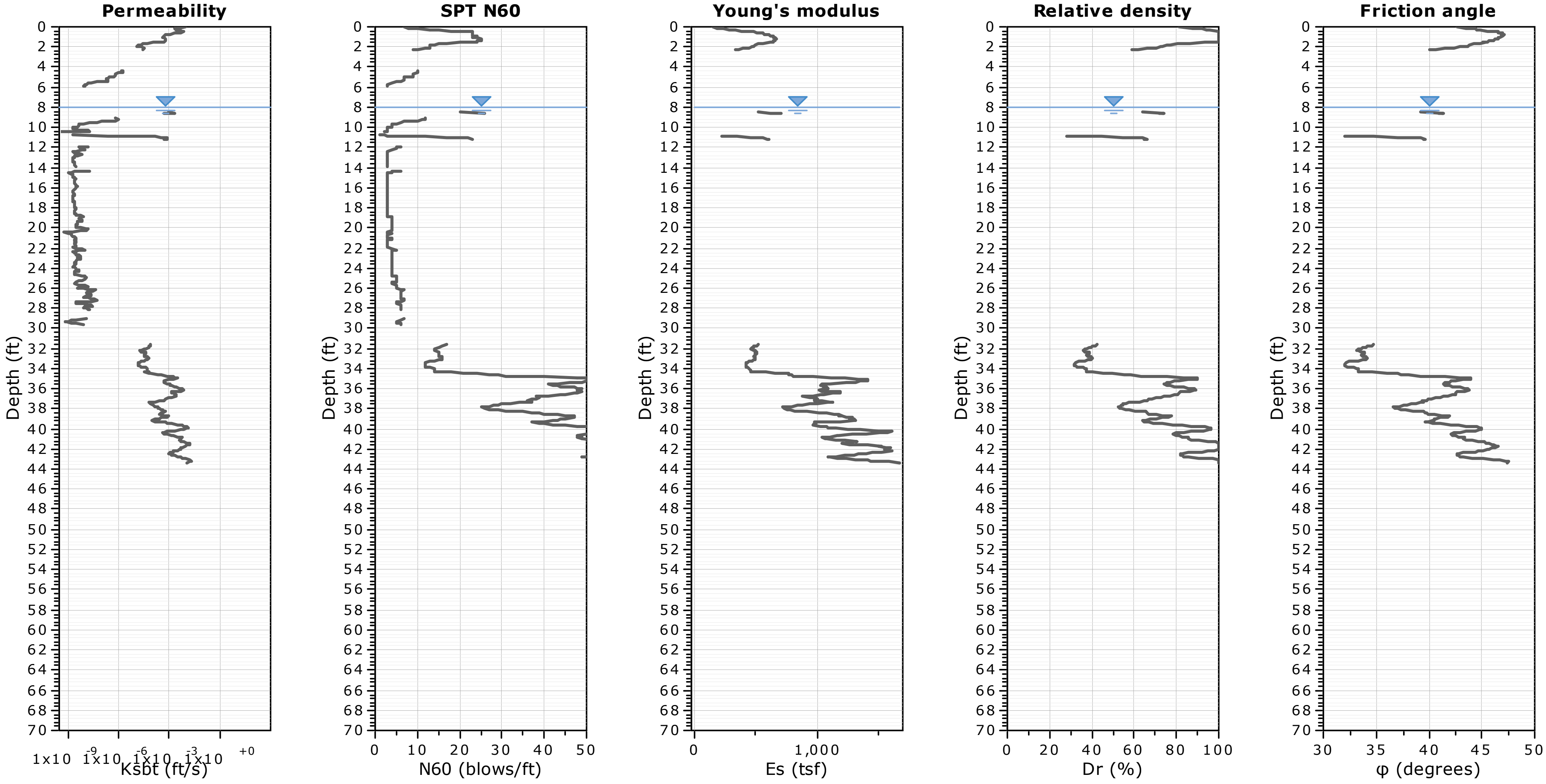
Project: **S Market - RK&K**
Location: **New Castle, DE**



HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
Delmar, Maryland
http://www.HCEA.com

CPT: S Market BH-CPT-01
Total depth: 43.37 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



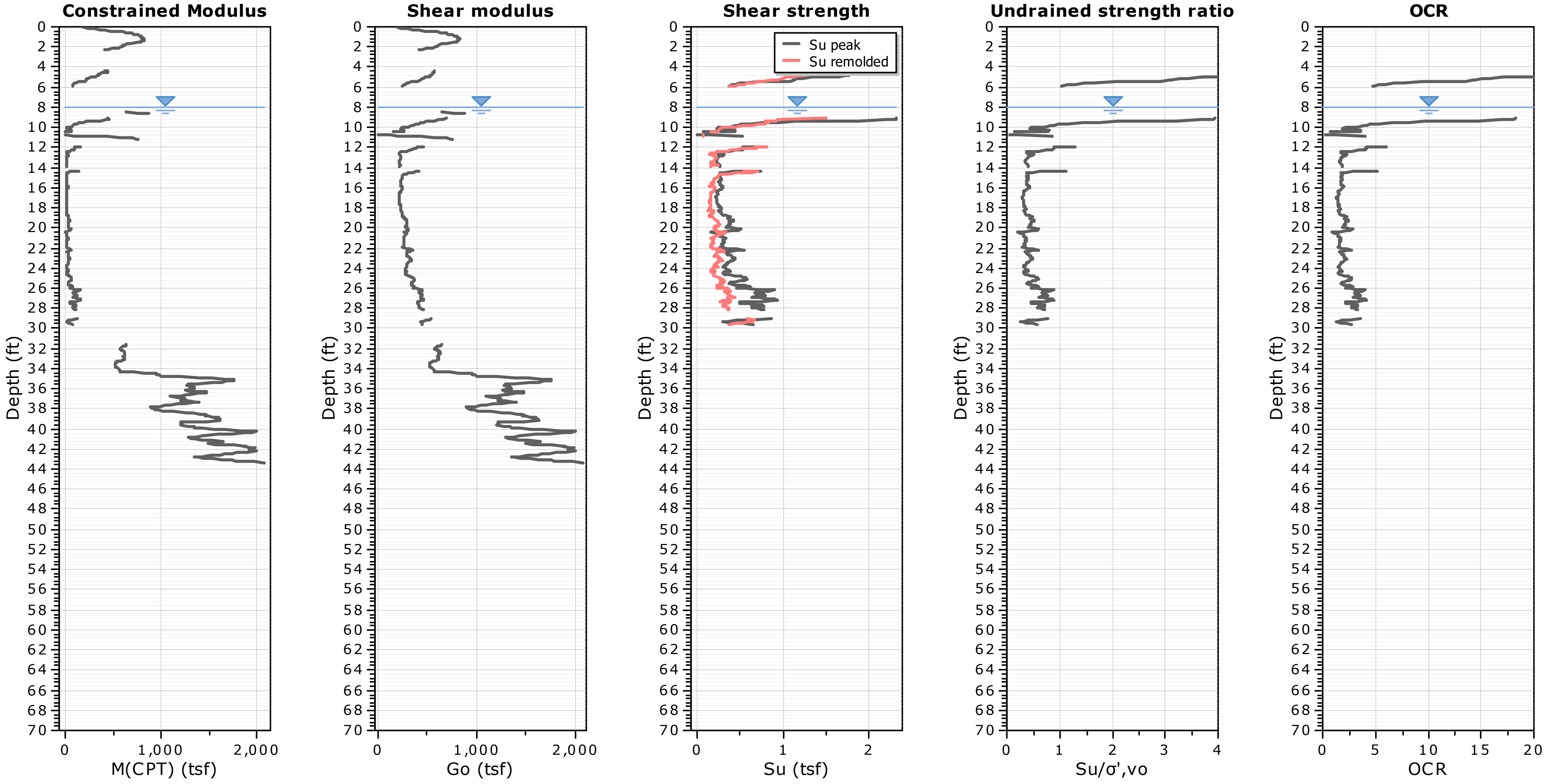
Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
● User defined estimation data

CPT: S Market BH-CPT-01
Total depth: 43.37 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33
● User defined estimation data
● Flat Dilatometer Test data

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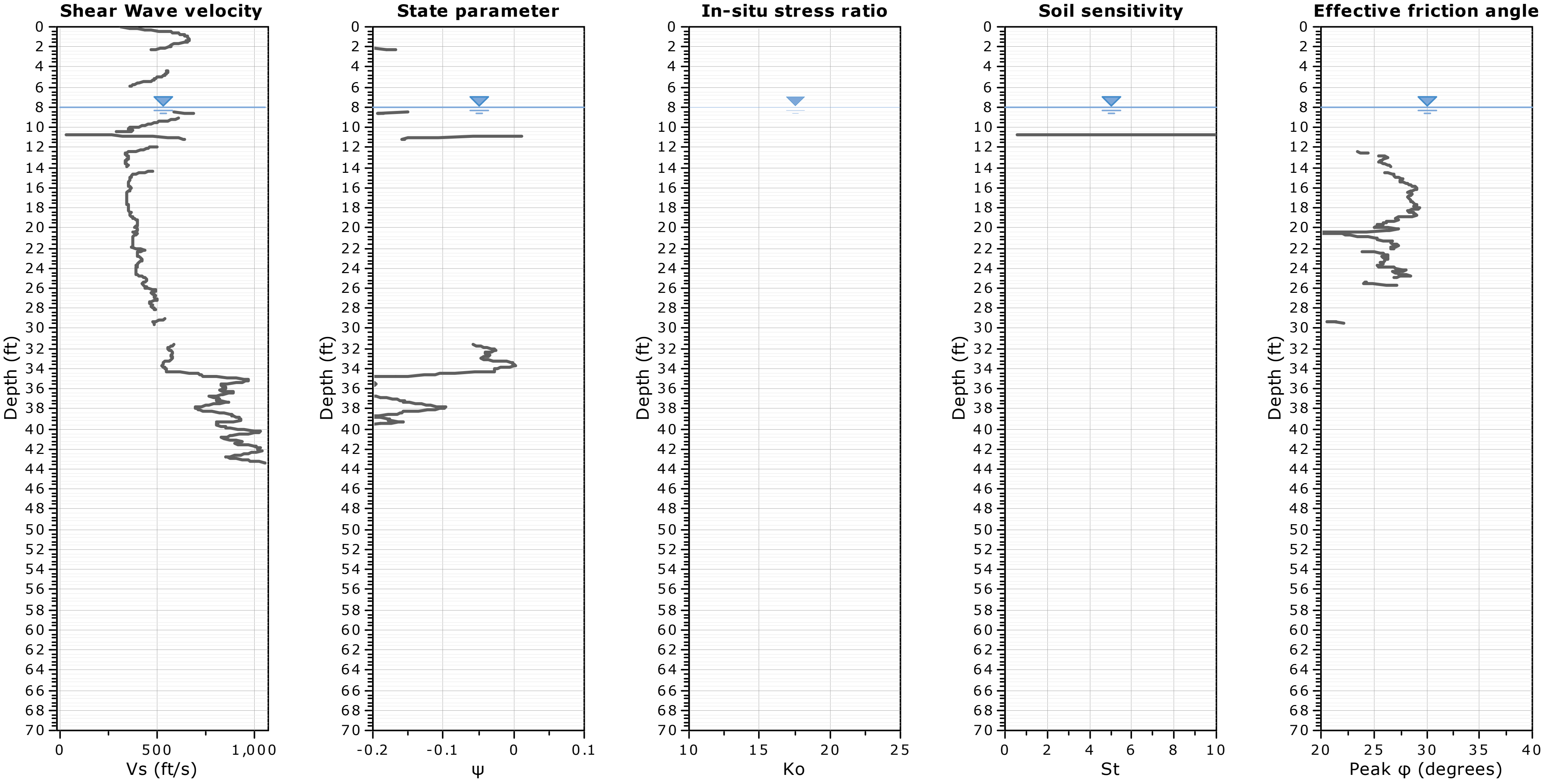
CPT: S Market BH-CPT-01
Total depth: 43.37 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

Soil Sensitivity factor, N_S: 350.00

●— User defined estimation data

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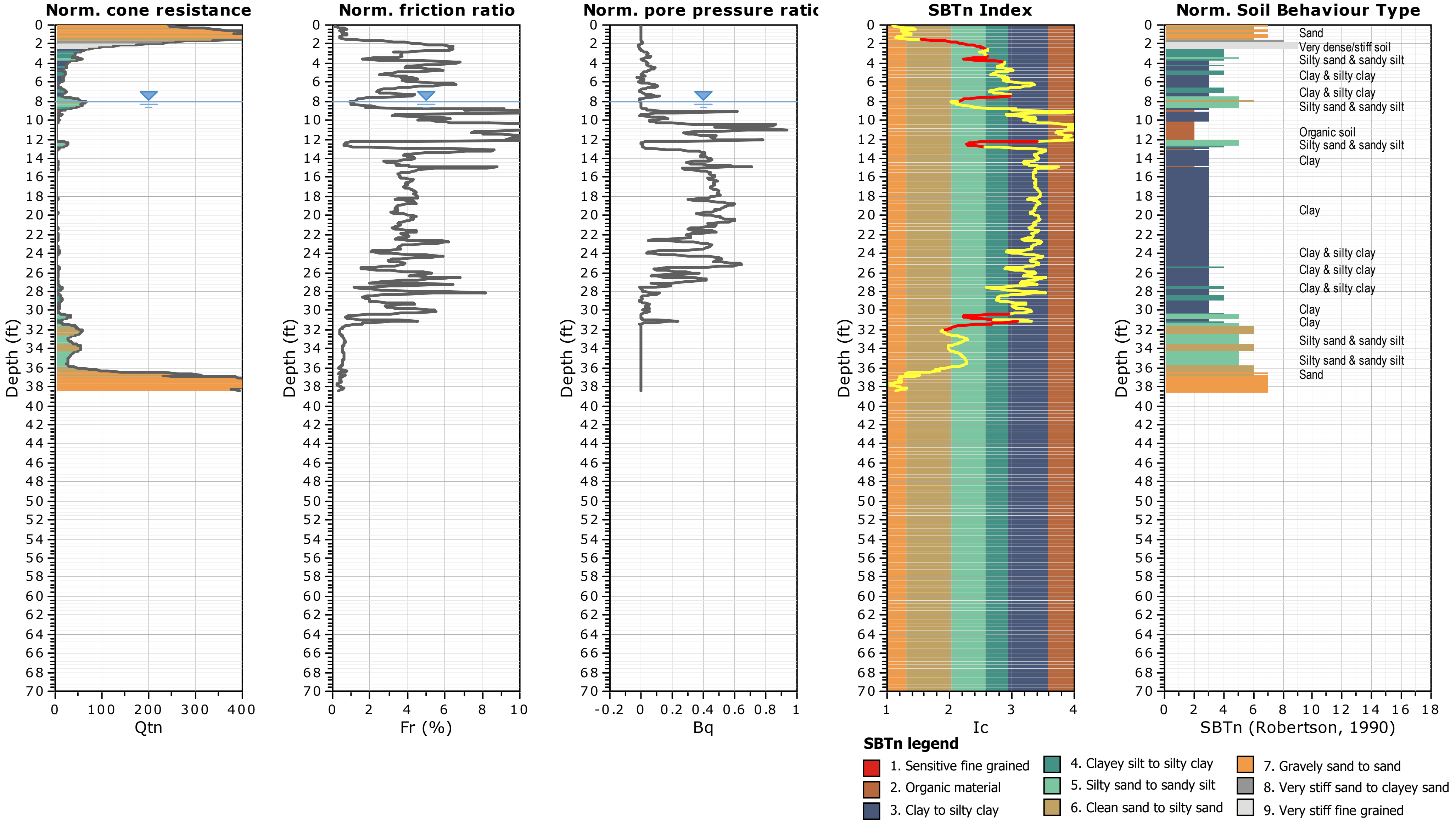
Delmar, Maryland
http://www.HCEA.com

CPT: S Market BH-CPT-02
Total depth: 38.39 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



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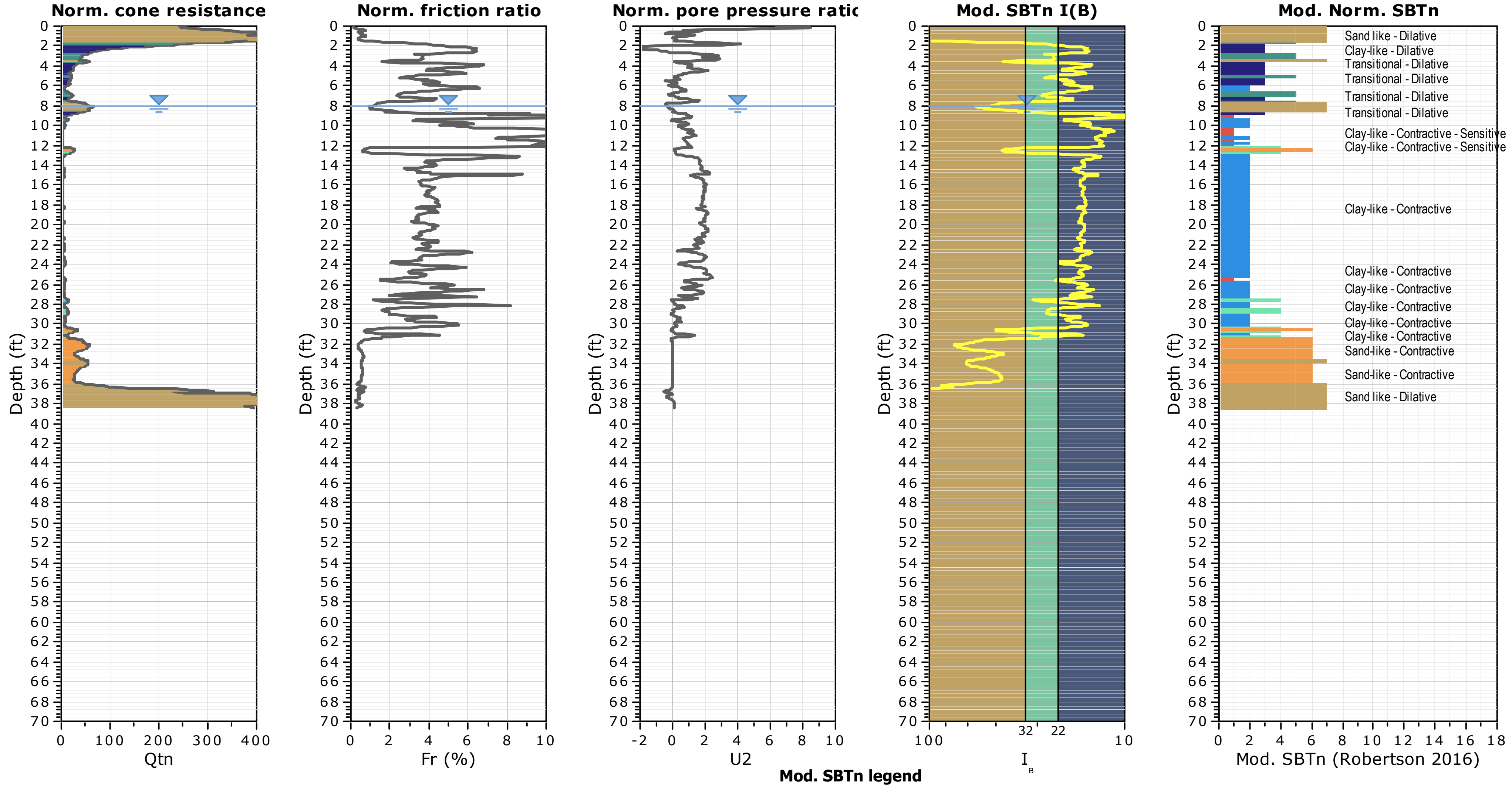
http://www.HCEA.com

Project: **S Market - RK&K**
Location: **New Castle, DE**

CPT: S Market BH-CPT-02
Total depth: 38.39 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

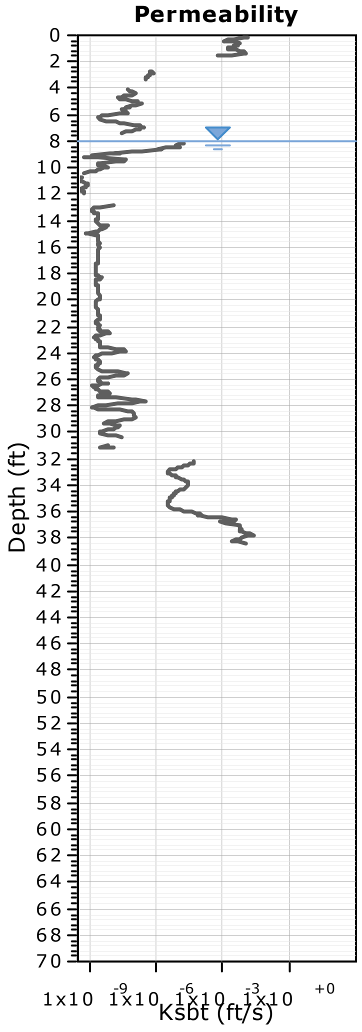


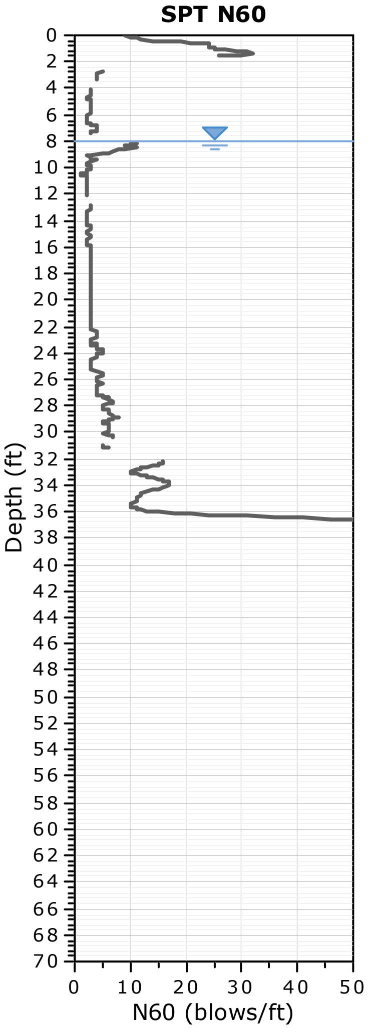
Mod. SBTn legend

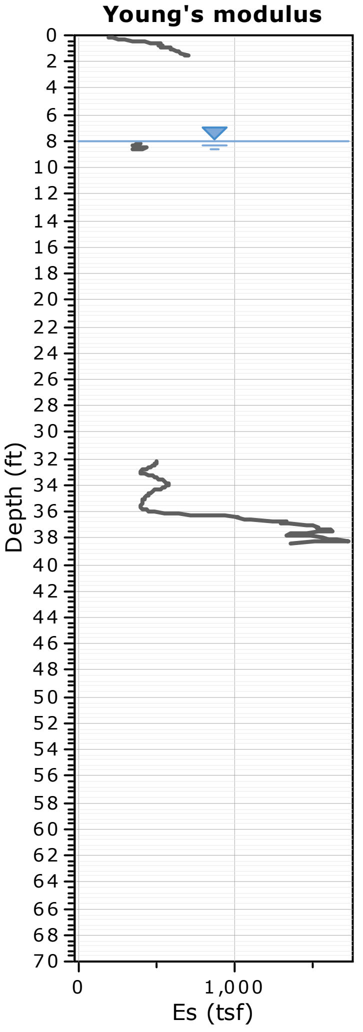
- 🟥 1. CCS: ClayLike - Contractive, Sensitive
- 🟦 2. CC: Clay-like - Contractive
- 🟦 3. CD: Clay-Like: Dilative
- 🟩 4. TC: Transitional - Contractive
- 🟩 5. TD: Transitional - Dilative
- 🟧 6. SC: Sand-like - Contractive
- 🟫 7. SD: Sand-like - Dilative

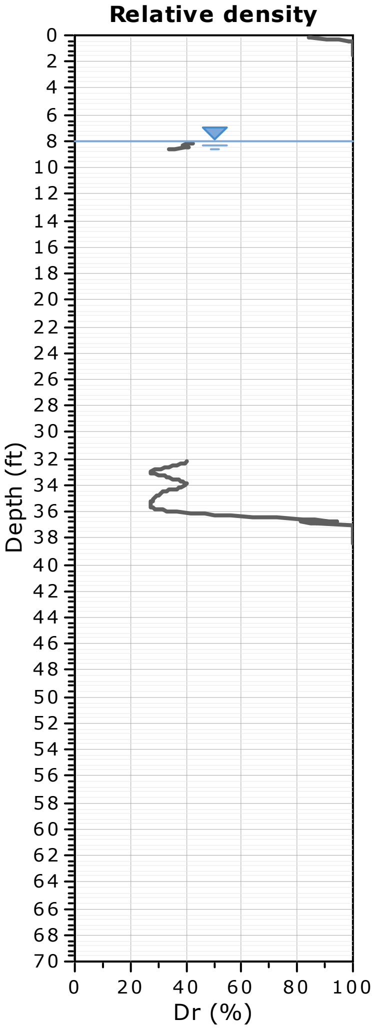
CPT: S Market BH-CPT-02
Total depth: 38.39 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

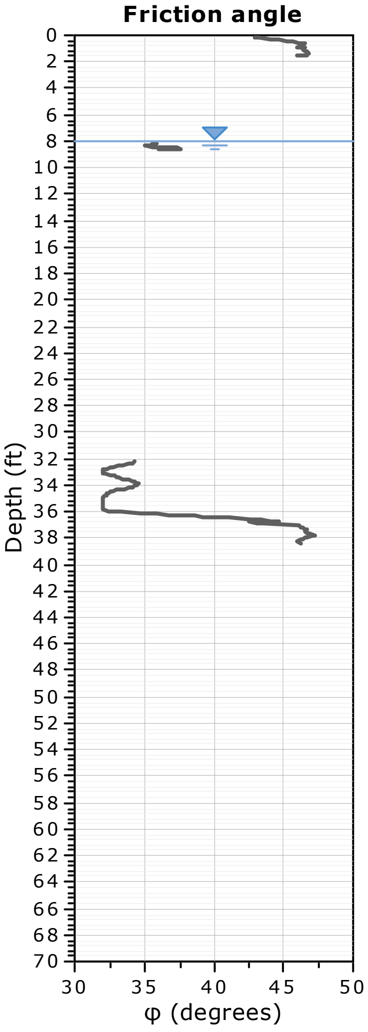
Project: **S Market - RK&K**
Location: **New Castle, DE**











Calculation parameters

Permeability: Based on SBT_n

SPT N_{60}: Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr}: 350.0

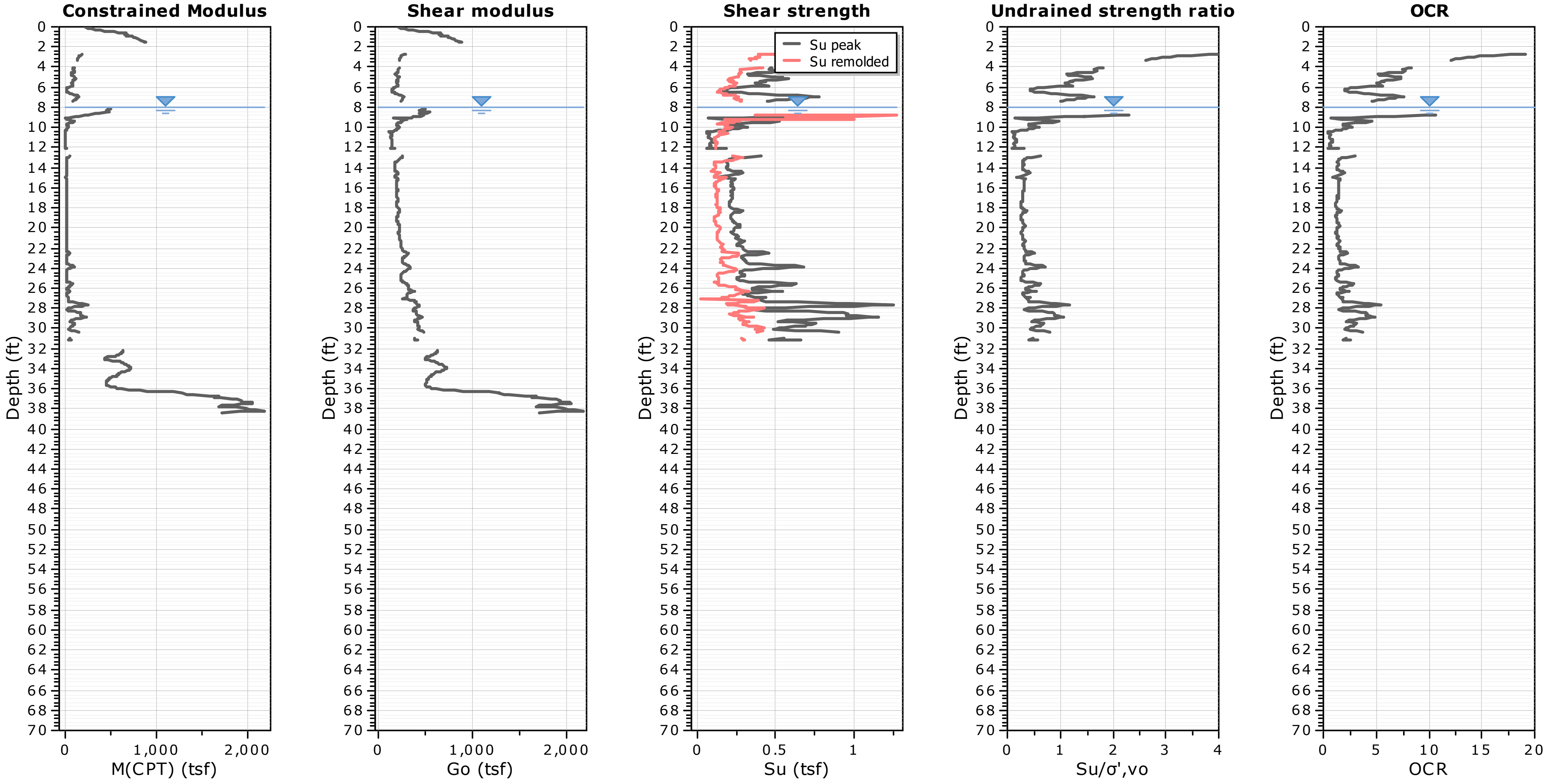
Phi: Based on Kulhawy & Mayne (1990)

—●— User defined estimation data

HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
Delmar, Maryland
http://www.HCEA.com

CPT: S Market BH-CPT-02
Total depth: 38.39 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



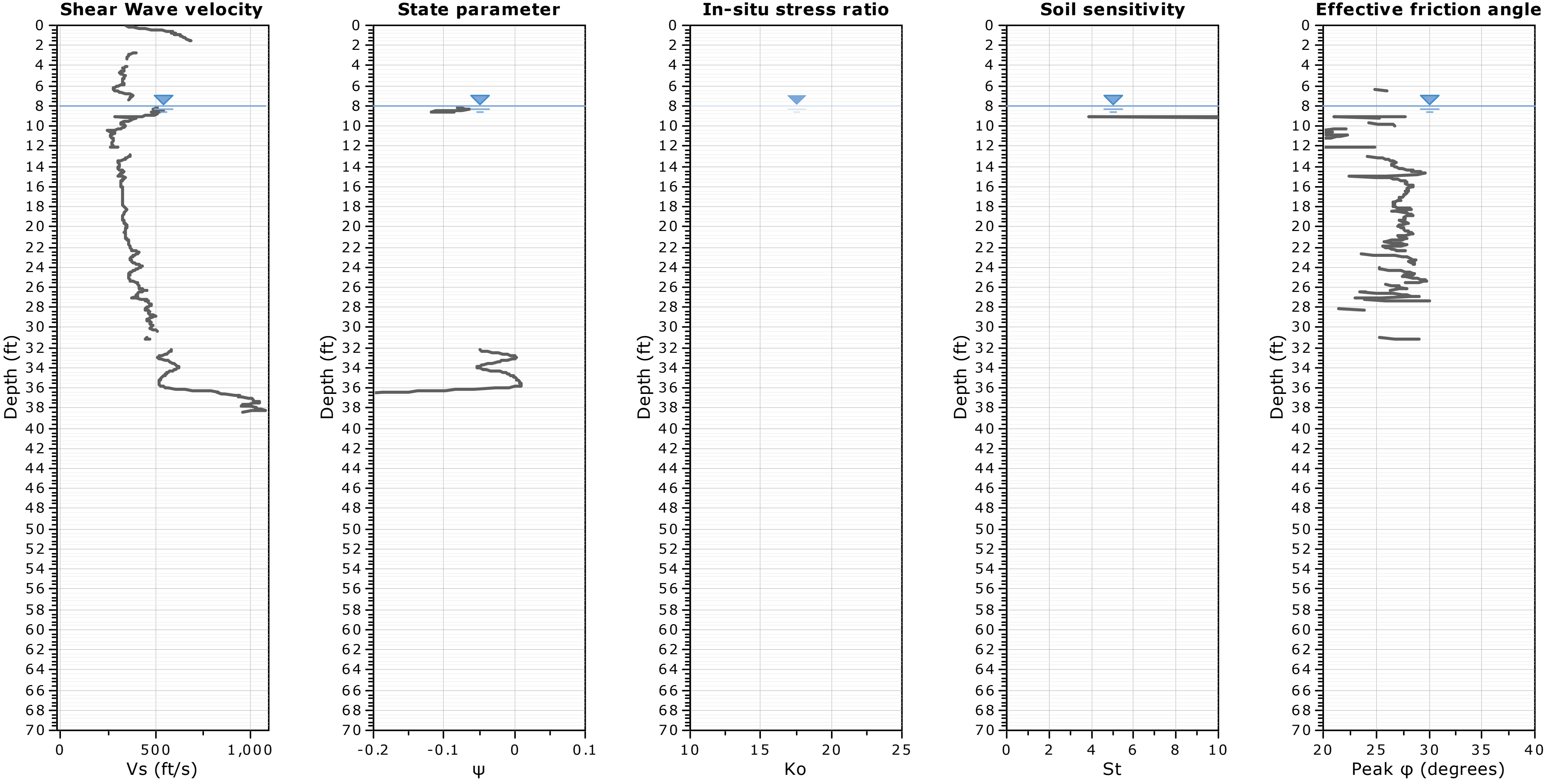
Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33
● User defined estimation data
● Flat Dilatometer Test data

CPT: S Market BH-CPT-02
Total depth: 38.39 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

Soil Sensitivity factor, N_S: 350.00

● User defined estimation data

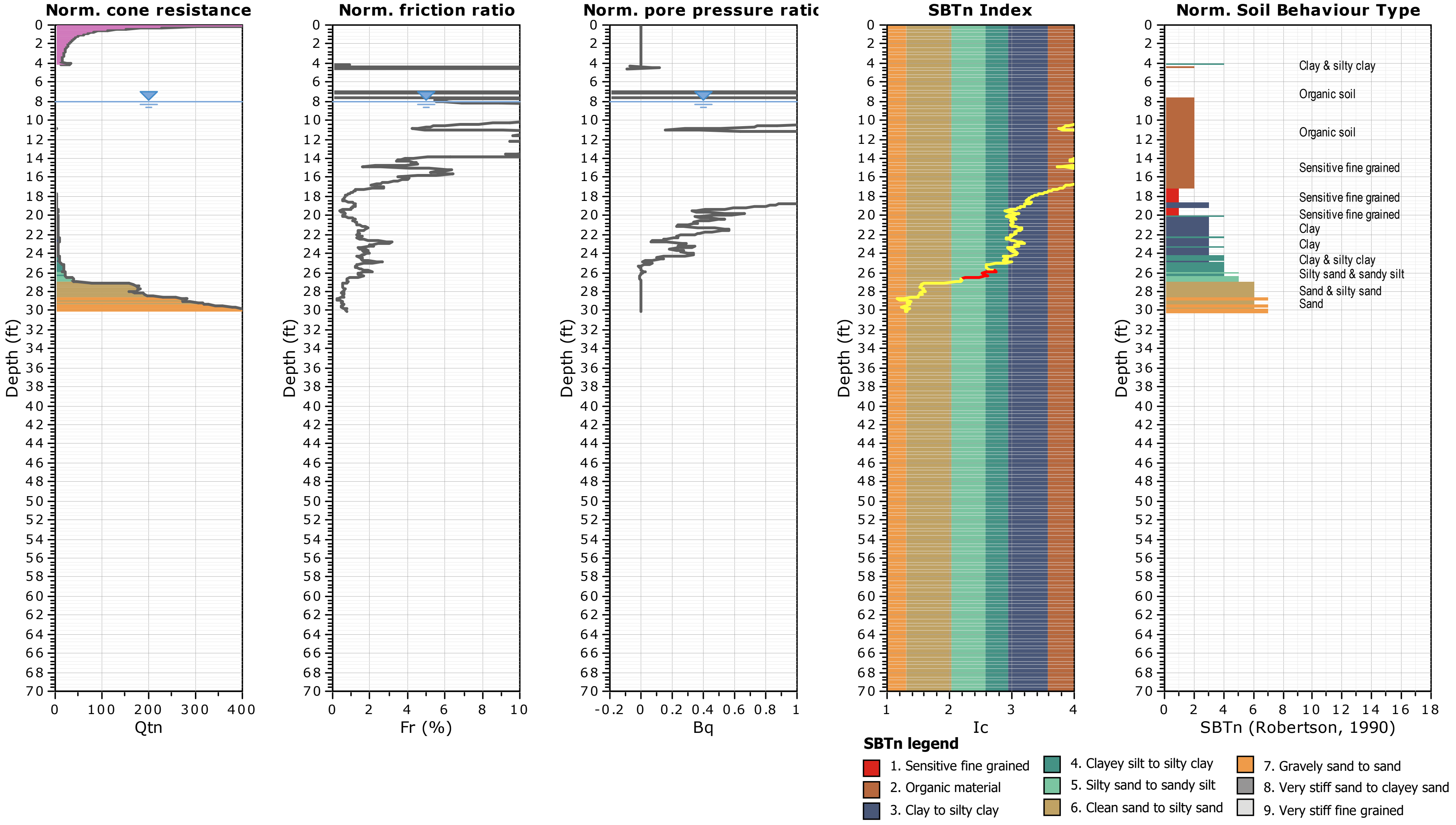
HILLIS-CARNES
ENGINEERING ASSOCIATES

HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
Delmar, Maryland
http://www.HCEA.com

CPT: S Market EMB-CPT-01

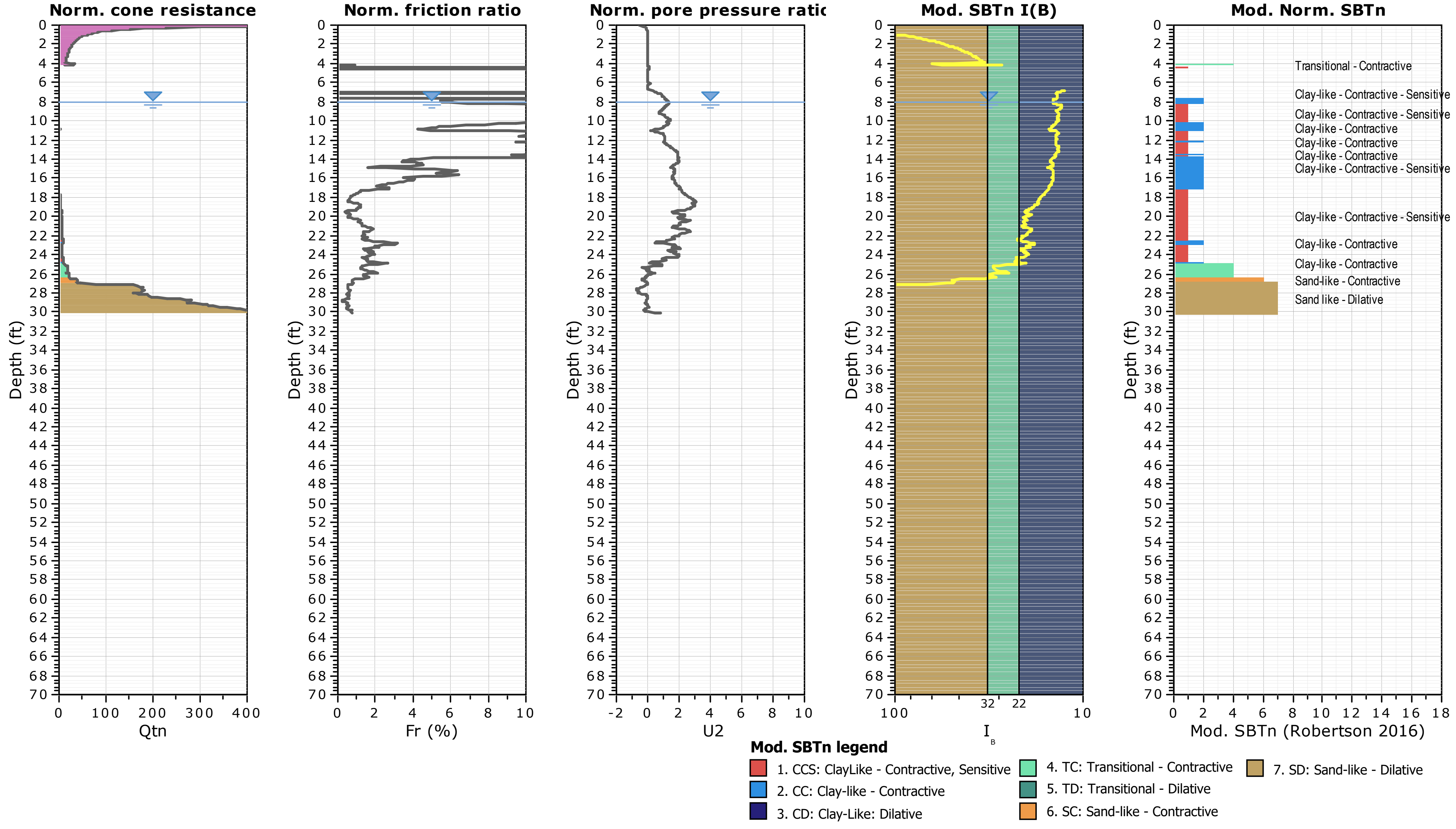
Total depth: 30.12 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: S Market - RK&K
Location: New Castle, DE



CPT: S Market EMB-CPT-01
Total depth: 30.12 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



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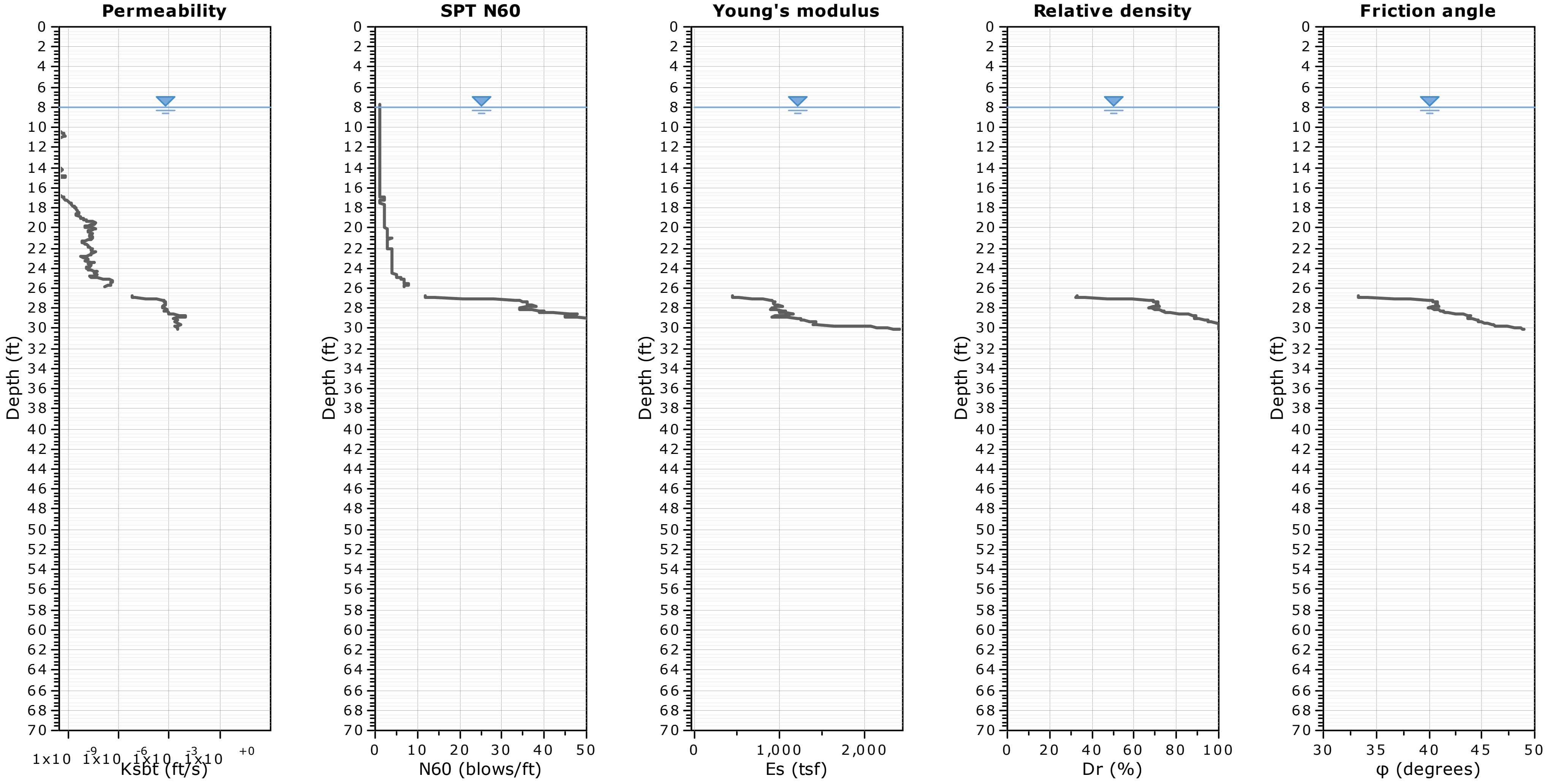
Delmar, Maryland
http://www.HCEA.com

CPT: S Market EMB-CPT-01
Total depth: 30.12 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

Permeability: Based on SBT_n

SPT N_{60}: Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

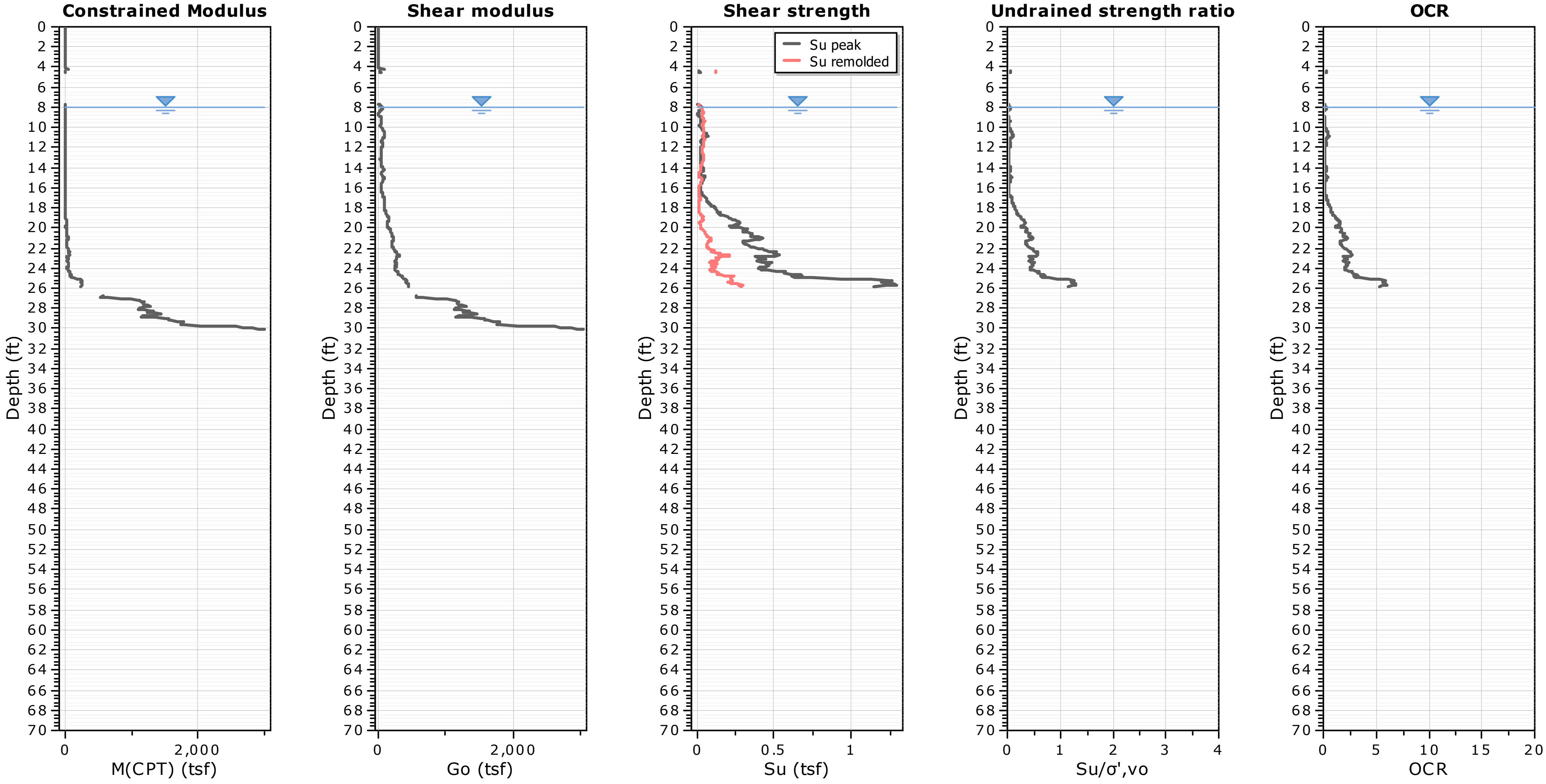
Relative density constant, C_{Dr}: 350.0

Phi: Based on Kulhawy & Mayne (1990)

—●— User defined estimation data

CPT: S Market EMB-CPT-01
Total depth: 30.12 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: S Market - RK&K
Location: New Castle, DE



Calculation parameters

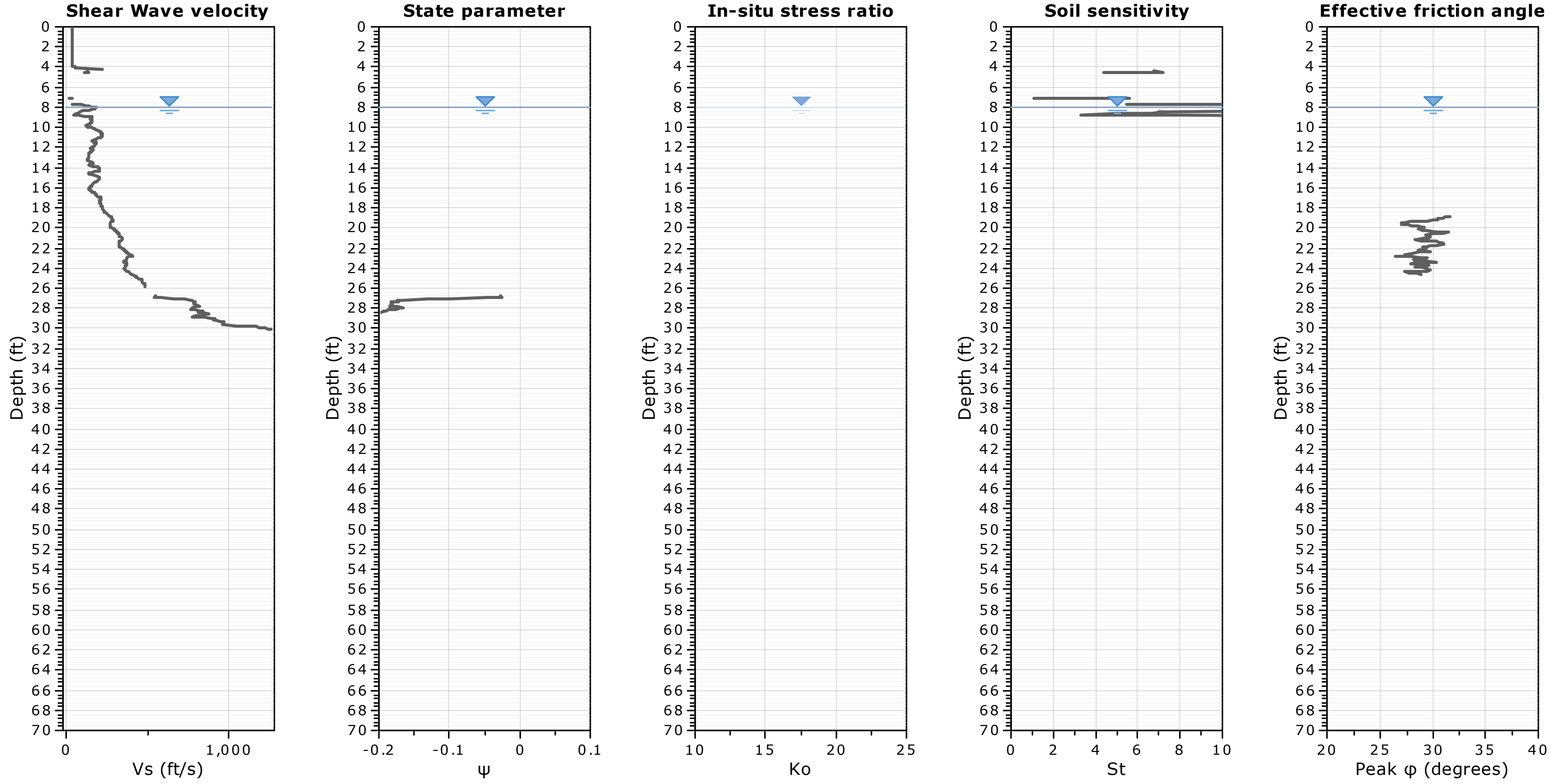
Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33
● User defined estimation data
● Flat Dilatometer Test data

HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
Delmar, Maryland
http://www.HCEA.com

CPT: S Market EMB-CPT-01
Total depth: 30.12 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**


Shear Wave velocity
State parameter
In-situ stress ratio
Soil sensitivity
Effective friction angle

Calculation parameters

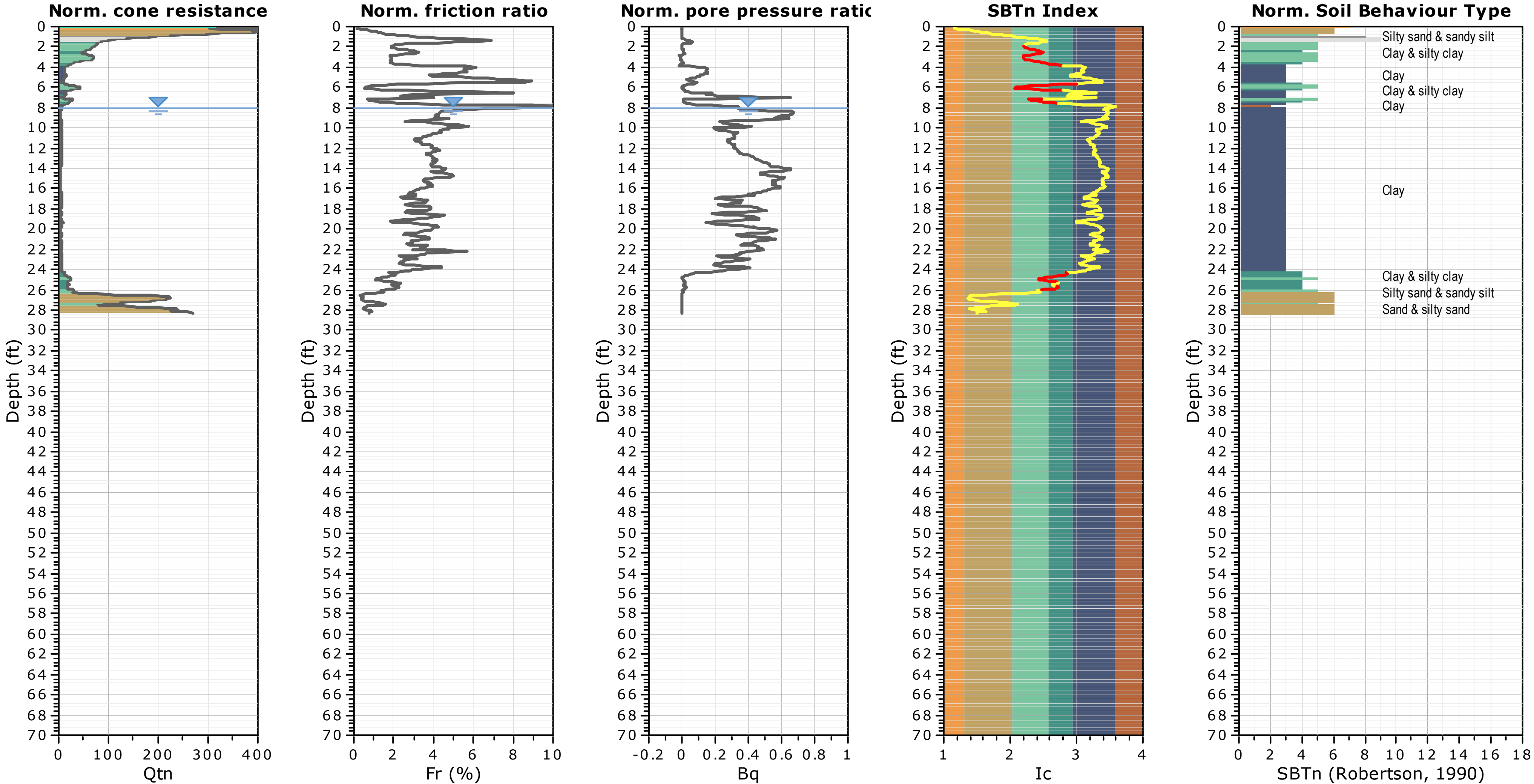
Soil Sensitivity factor, N_S: 350.00

● User defined estimation data

HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
Delmar, Maryland
http://www.HCEA.com

CPT: S Market EMB-CPT-02
Total depth: 28.28 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



SBTn legend

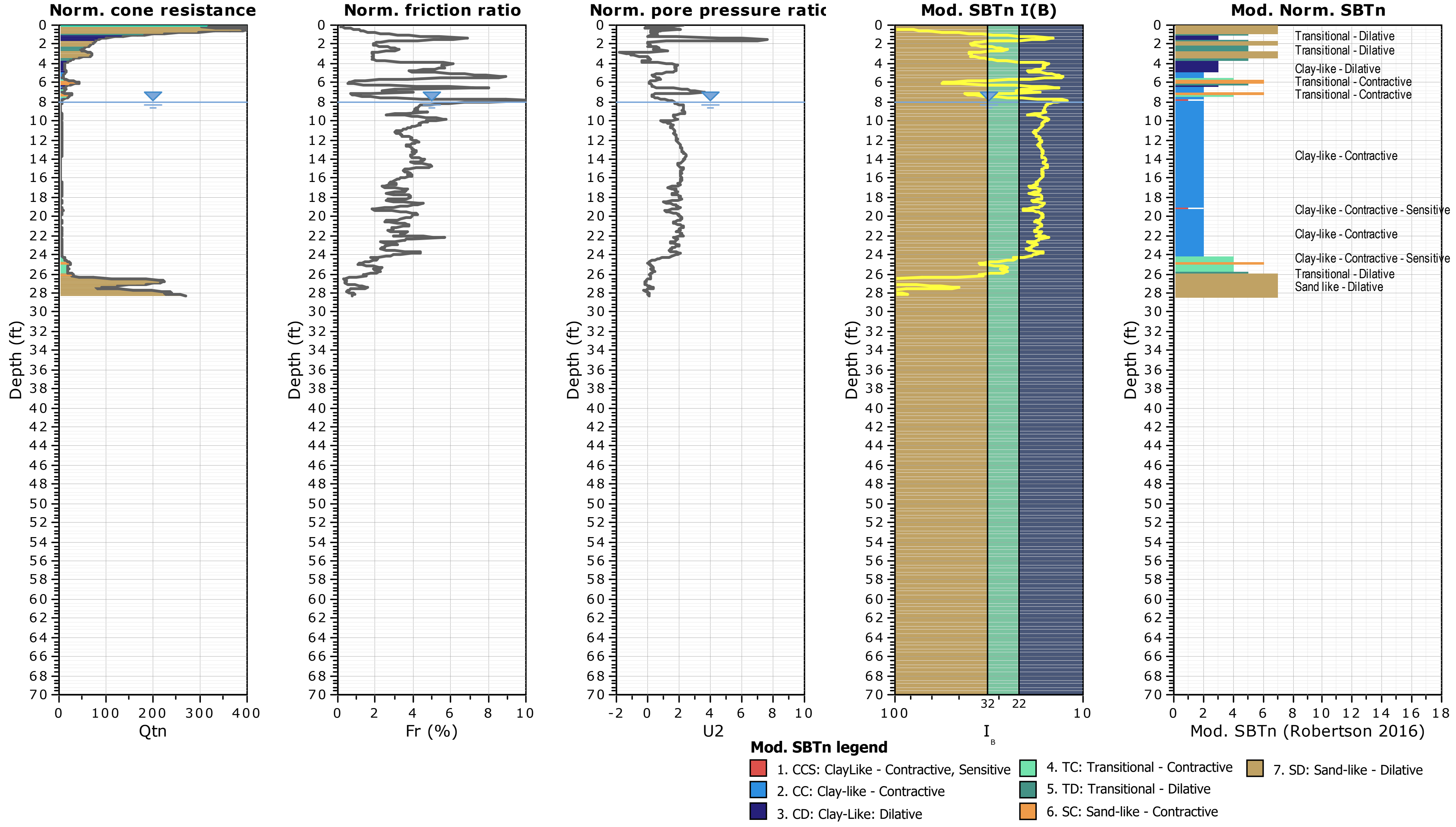
🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty clay	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to clayey sand
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
Delmar, Maryland
http://www.HCEA.com

Project: **S Market - RK&K**
Location: **New Castle, DE**

CPT: S Market EMB-CPT-02

Total depth: 28.28 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.



HILLIS - CARNES ENGINEERING ASSOCIATES
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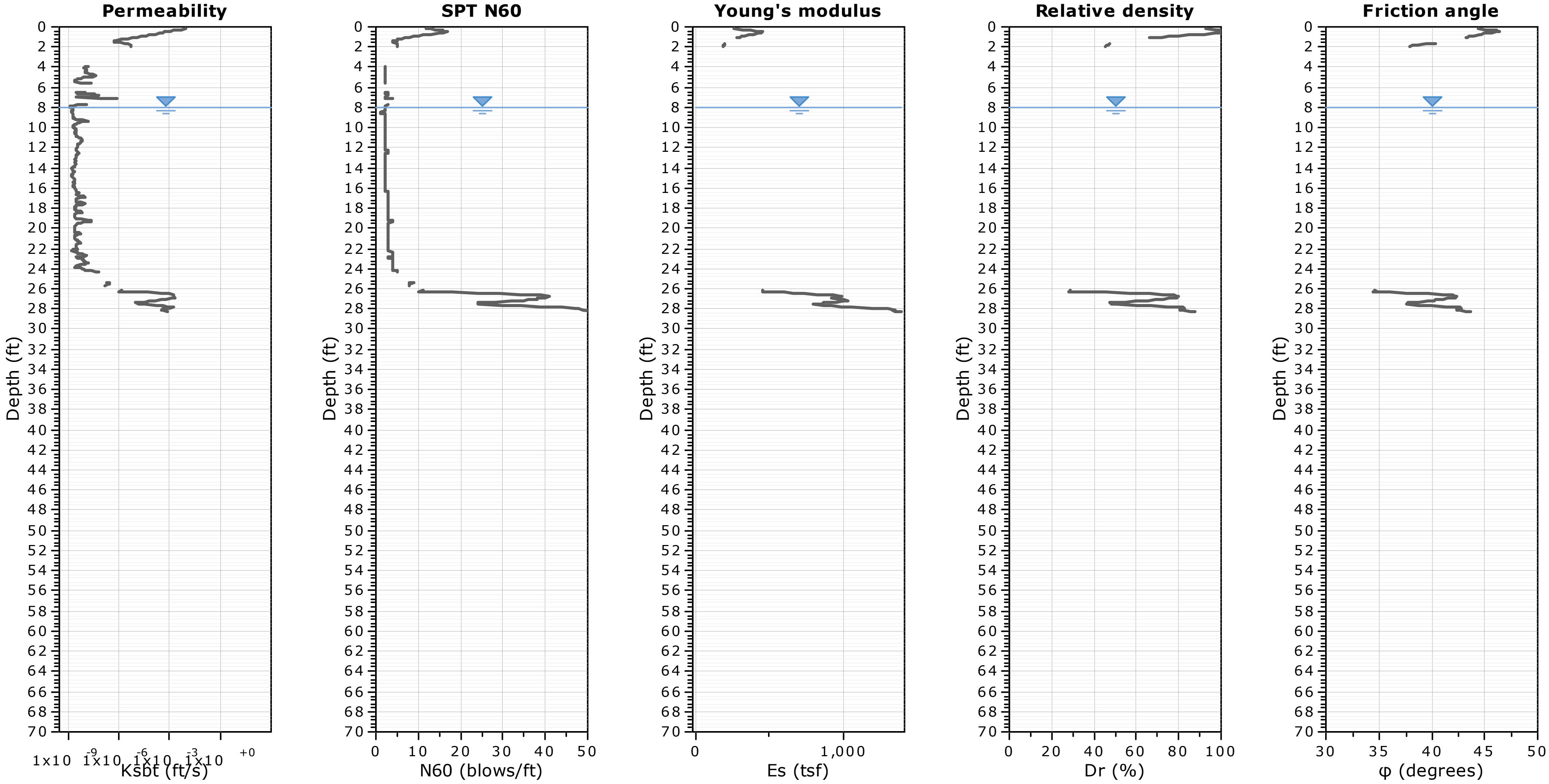
CPT: S Market EMB-CPT-02
Total depth: 28.28 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
●— User defined estimation data

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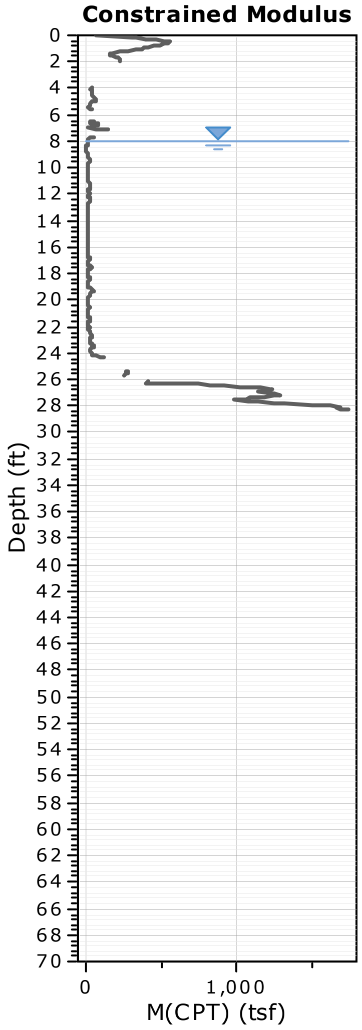
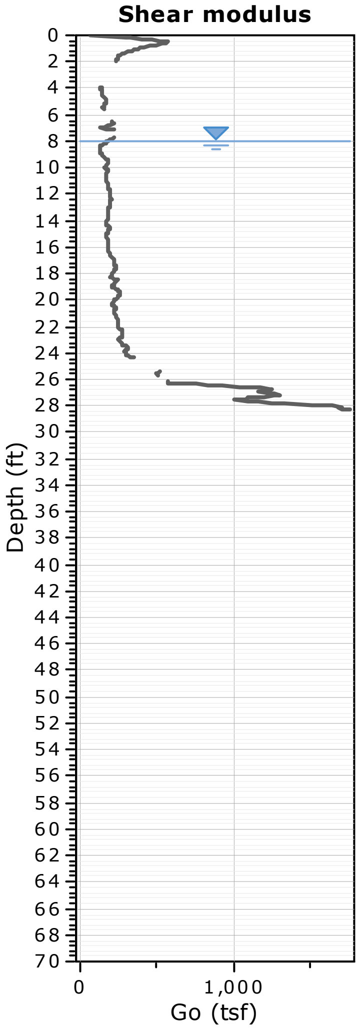
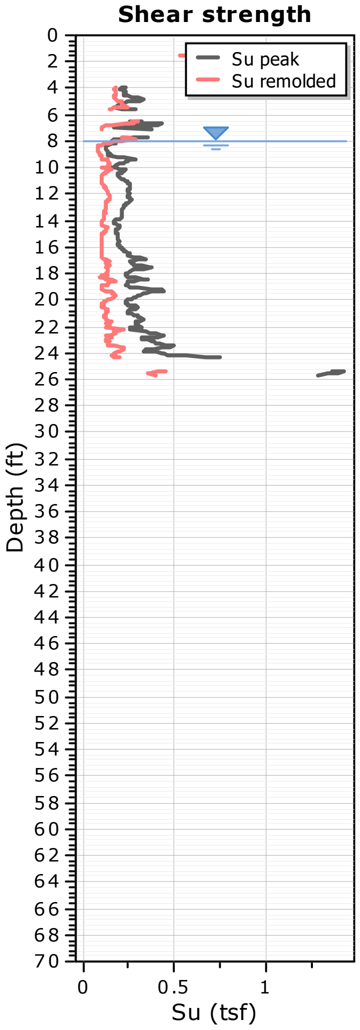
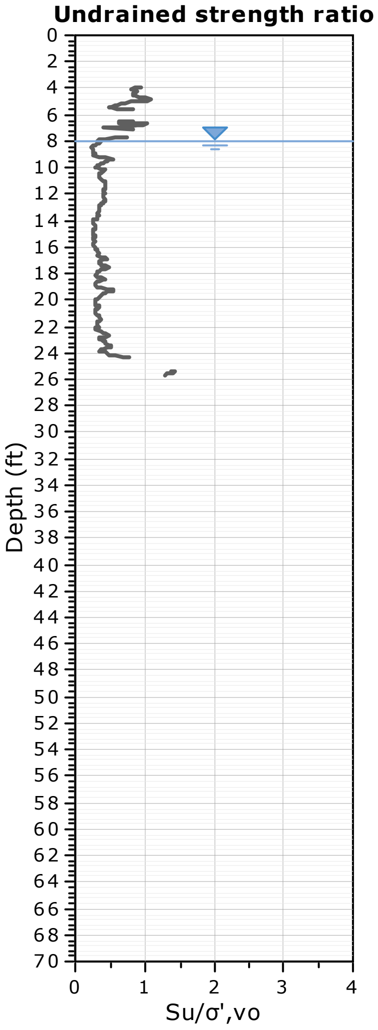
CPT: S Market EMB-CPT-02
Total depth: 28.28 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

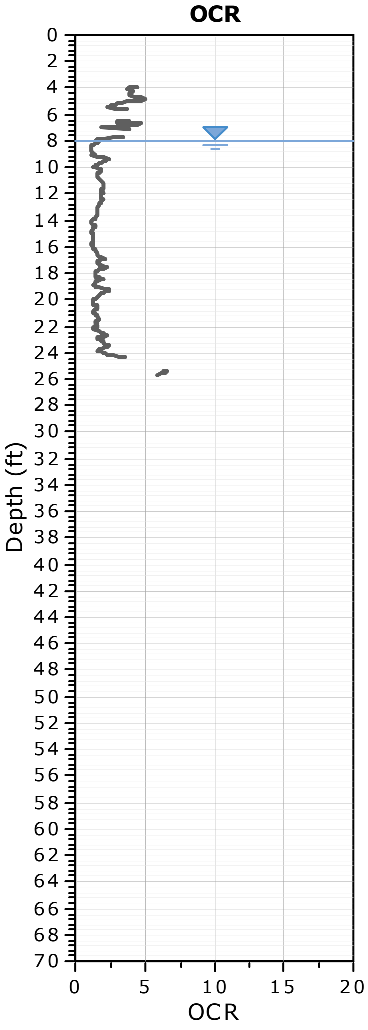
Project: **S Market - RK&K**
Location: **New Castle, DE**


Constrained Modulus


Shear modulus


Shear strength


Undrained strength ratio


OCR

Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33
● User defined estimation data
● Flat Dilatometer Test data

HILLIS - CARNES ENGINEERING ASSOCIATES
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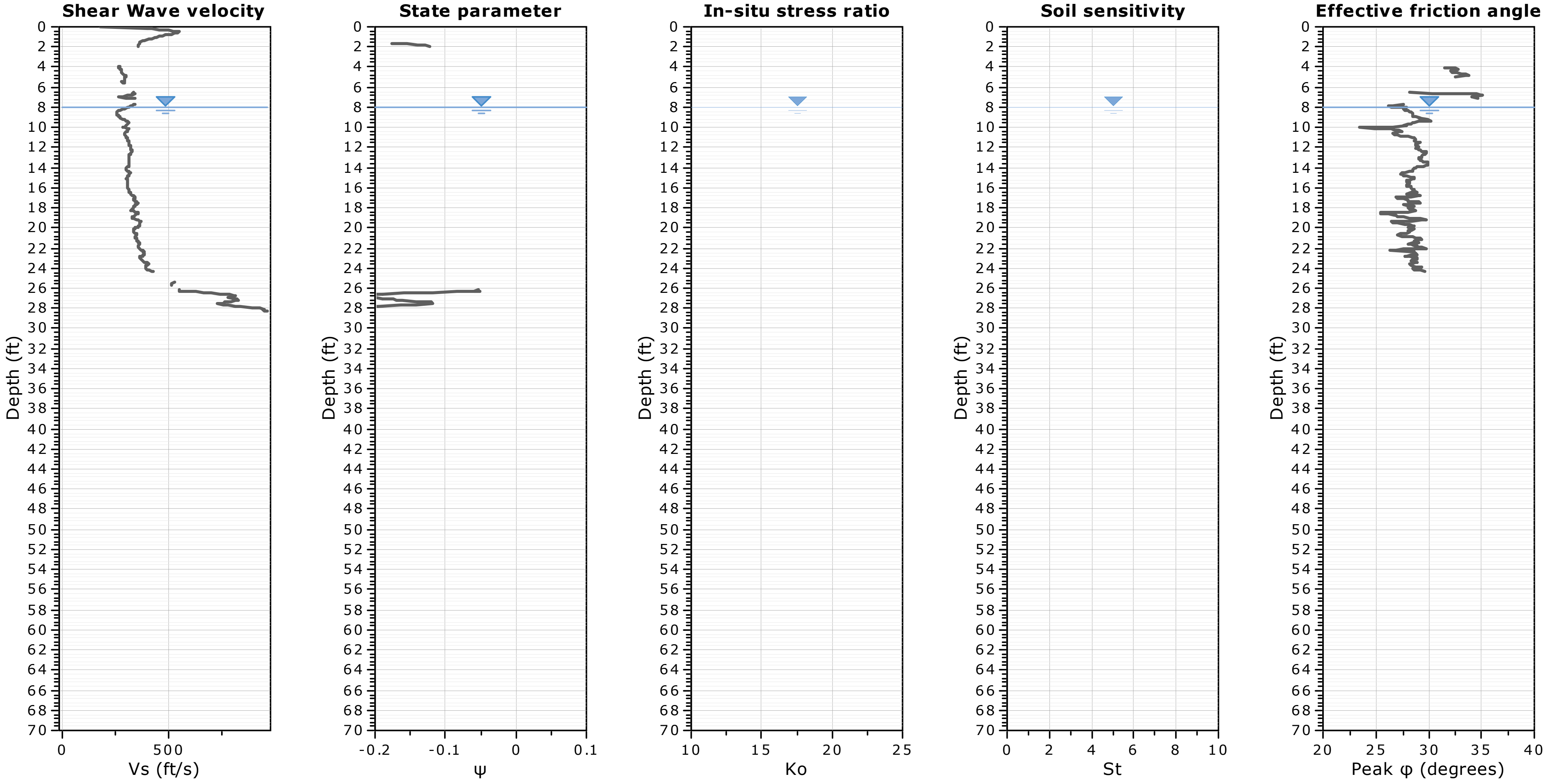
http://www.HCEA.com

CPT: S Market EMB-CPT-02
Total depth: 28.28 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: S Market - RK&K
Location: New Castle, DE



Calculation parameters

Soil Sensitivity factor, N_S: 350.00

● User defined estimation data

HILLIS - CARNES ENGINEERING ASSOCIATES
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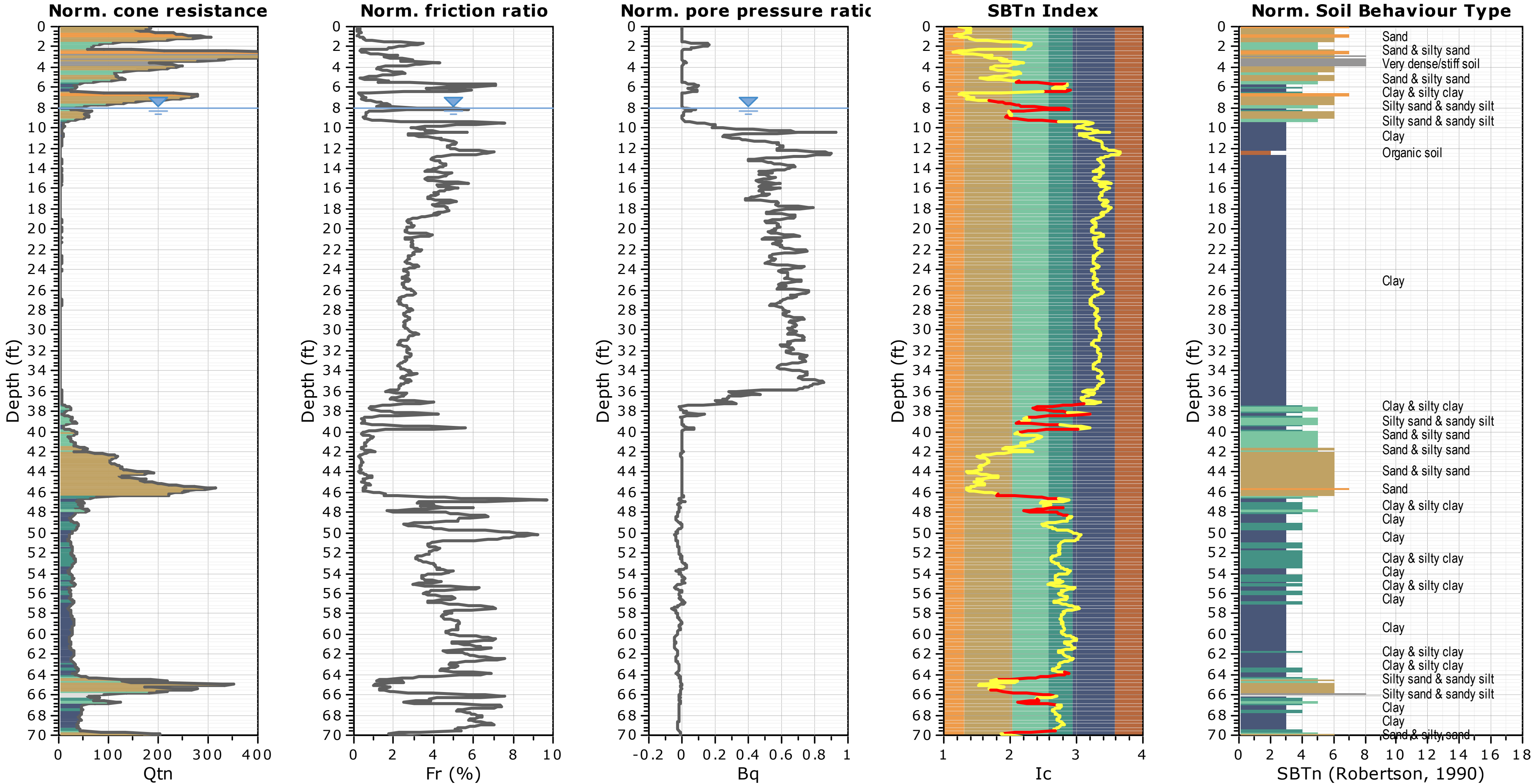
http://www.HCEA.com

CPT: S Market RB-CPT-01
Total depth: 70.41 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



SBTn legend

🟥 1. Sensitive fine grained	4. Clayey silt to silty clay	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

HILLIS - CARNES ENGINEERING ASSOCIATES
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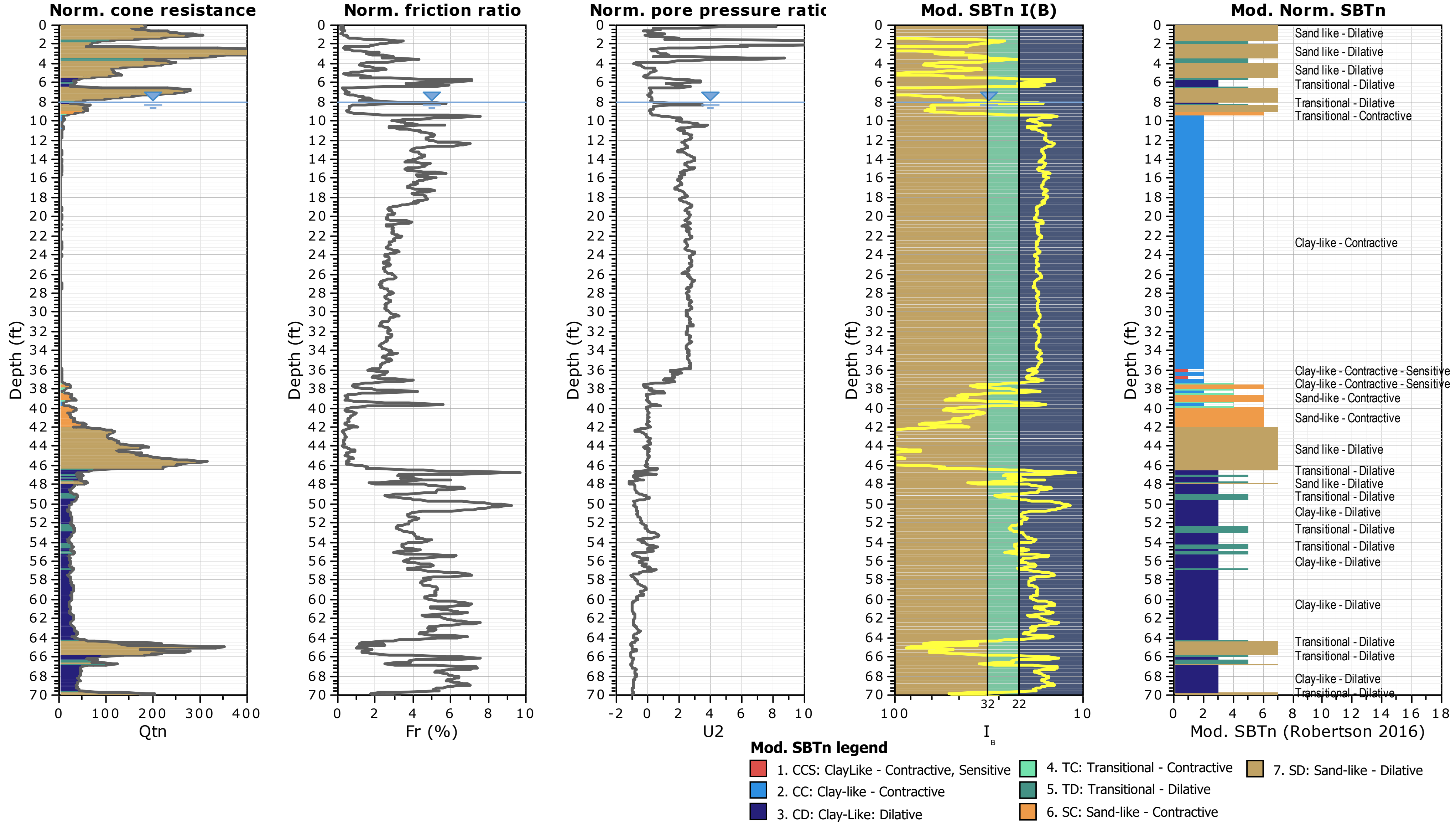
Project: **S Market - RK&K**
Location: **New Castle, DE**

CPT: S Market RB-CPT-01
Total depth: 70.41 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.



CPeT-IT v.3.5.4.9 - CPTU data presentation & interpretation software - Report created on: 6/30/2021, 3:58:05 PM
Project file: \\salisbury\vol1\Salisbury Project Files\2020\S20131 S. Market Street - RDC\CPT-DMT 2021\S Market CPT Analysis.cpt

HILLIS - CARNES ENGINEERING ASSOCIATES
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CPT: S Market RB-CPT-01
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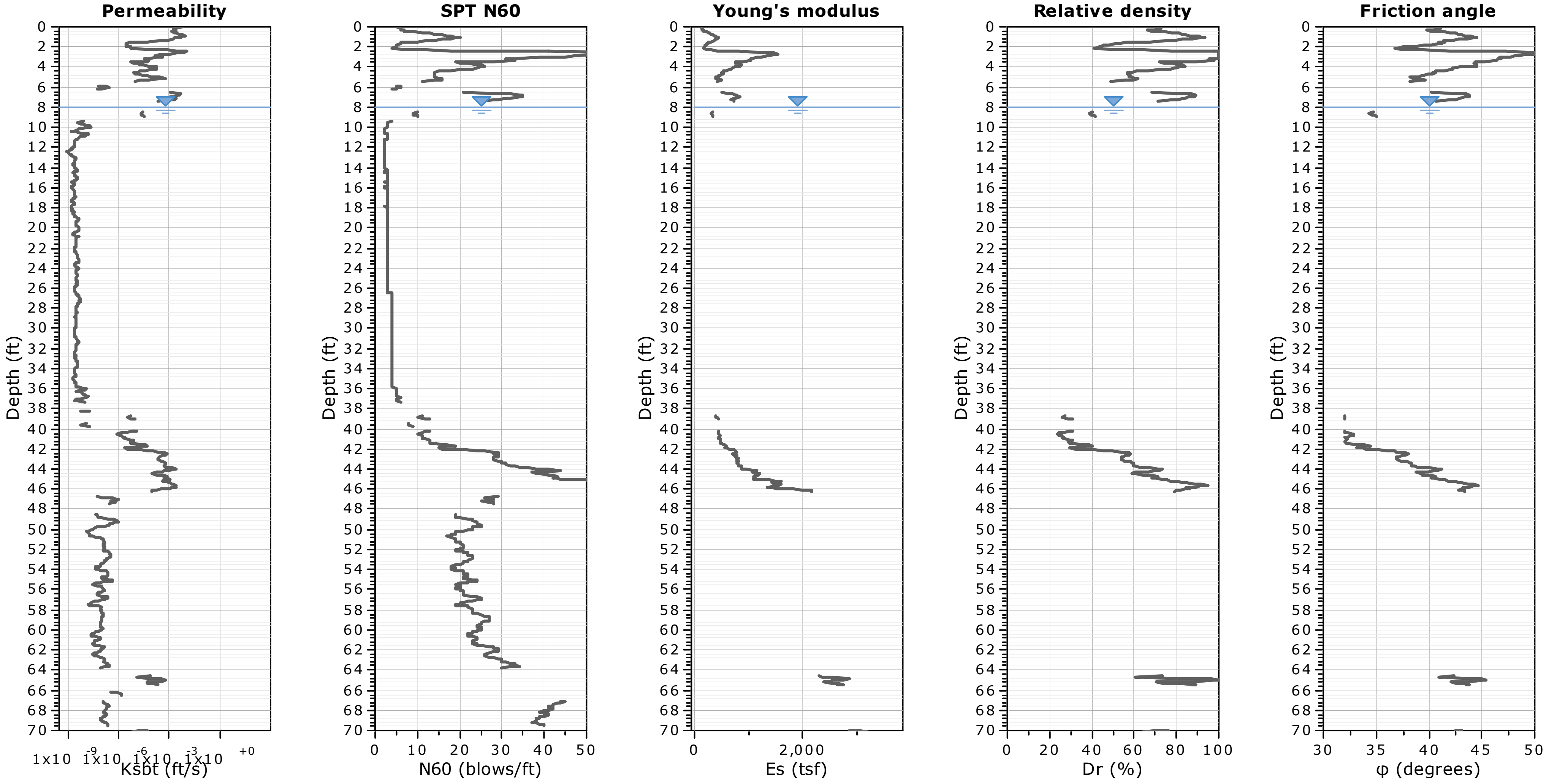
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative density constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
—●— User defined estimation data

HILLIS - CARNES ENGINEERING ASSOCIATES
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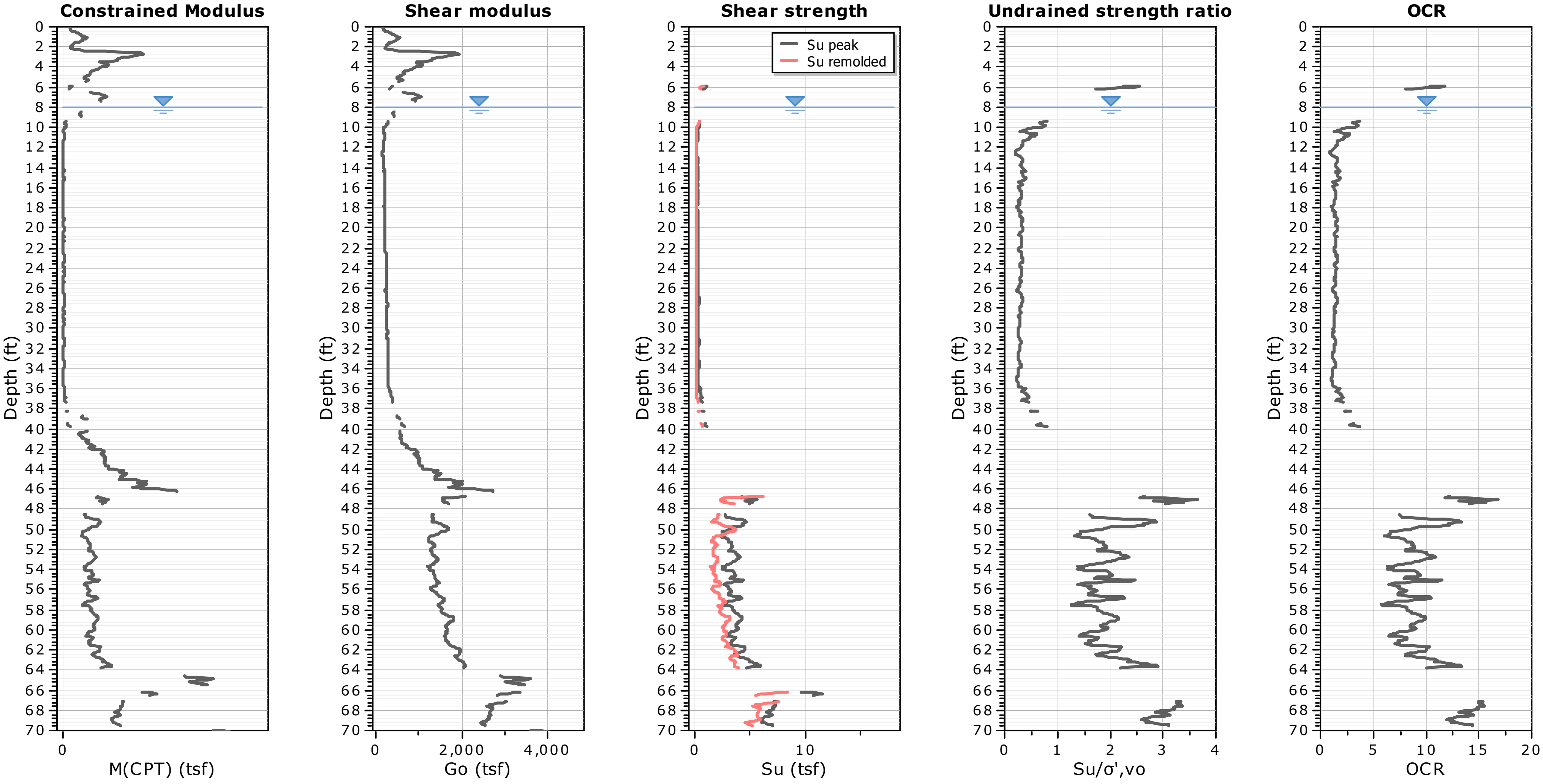
CPT: S Market RB-CPT-01
Total depth: 70.41 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



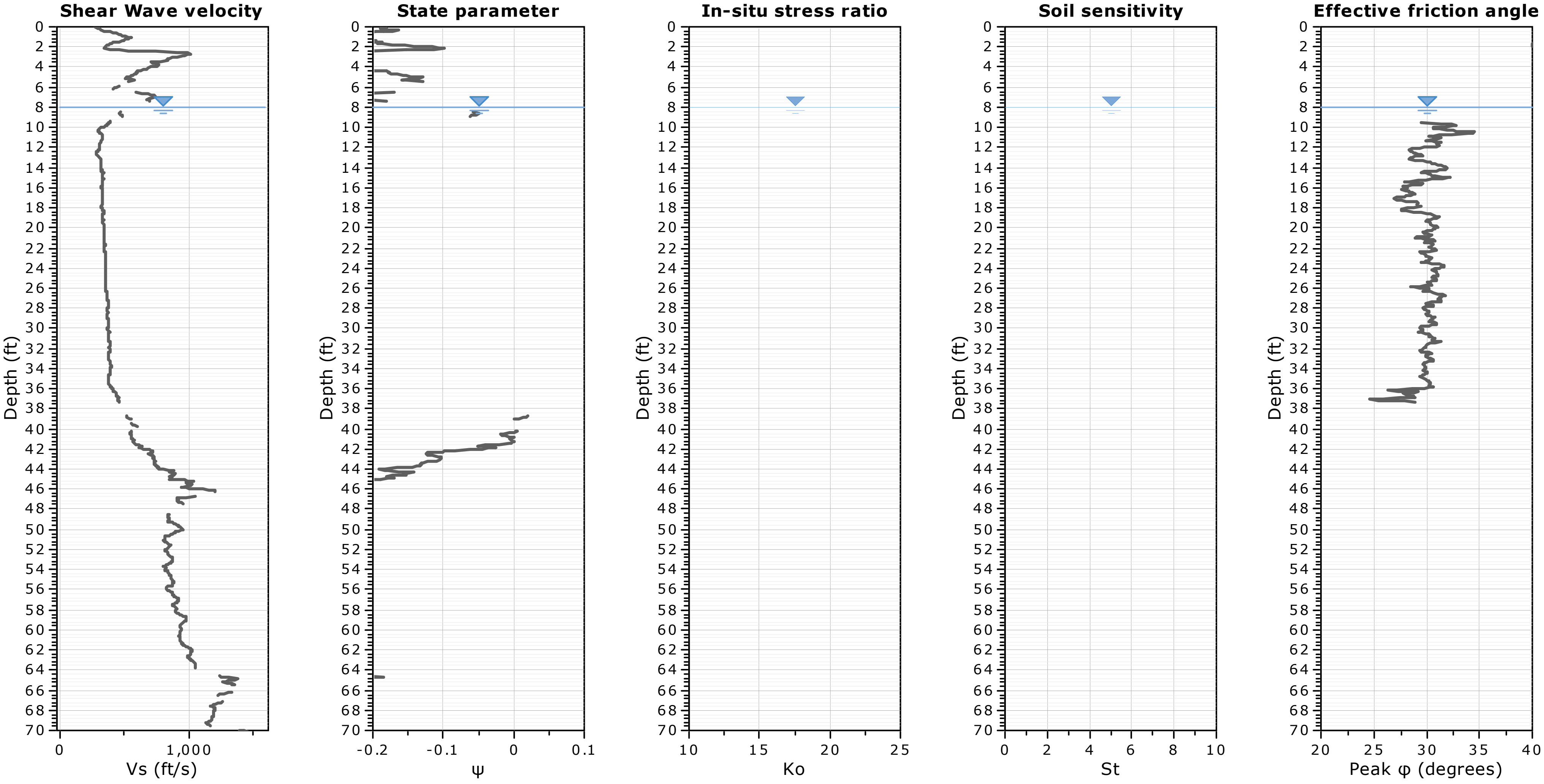
Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33
● User defined estimation data
● Flat Dilatometer Test data

CPT: S Market RB-CPT-01
Total depth: 70.41 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

Soil Sensitivity factor, N_S: 350.00

● User defined estimation data

HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
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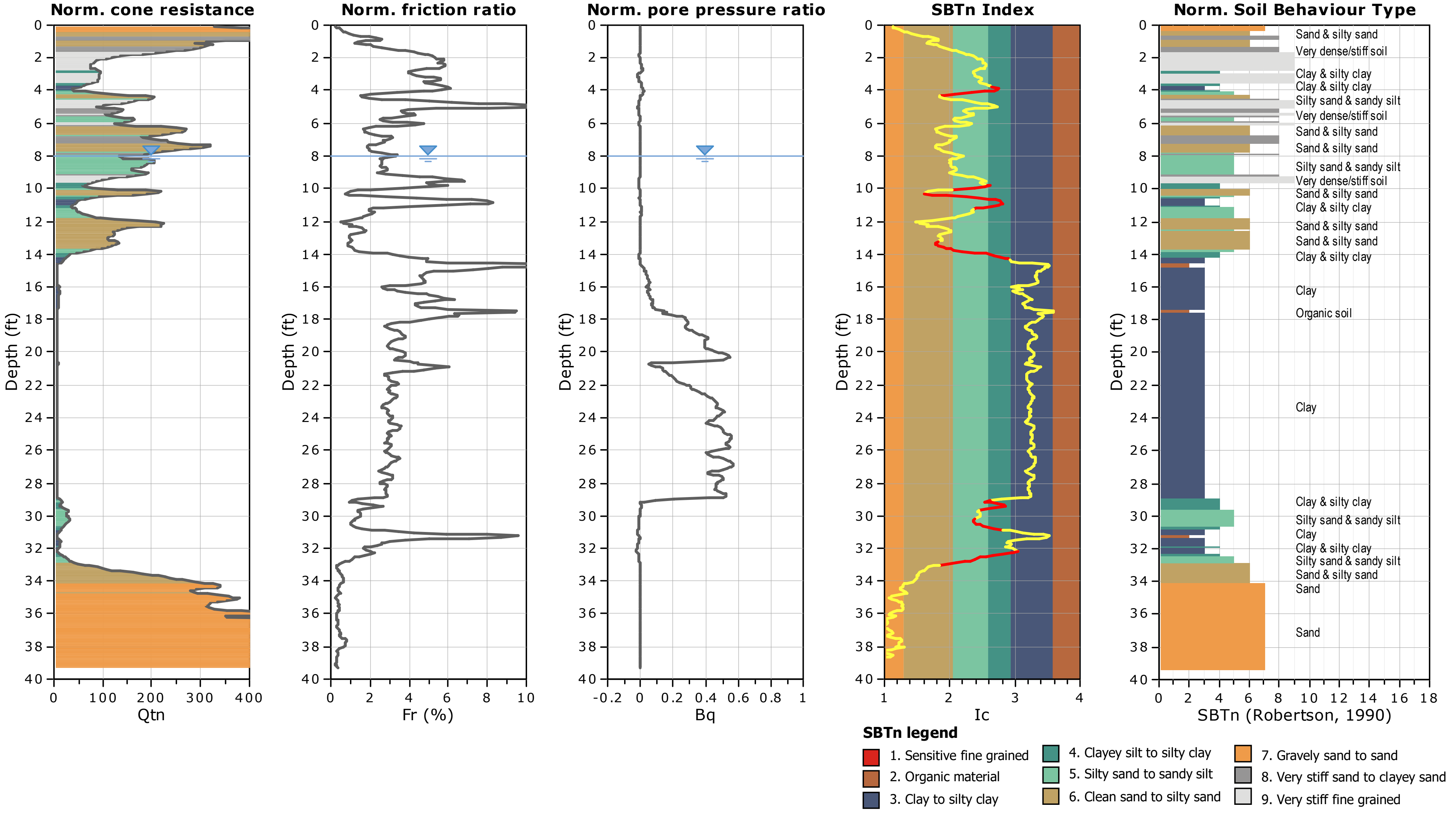
http://www.HCEA.com

CPT: S Market RB-CPT-02
Total depth: 39.30 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: S Market - RK&K
Location: New Castle, DE



HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
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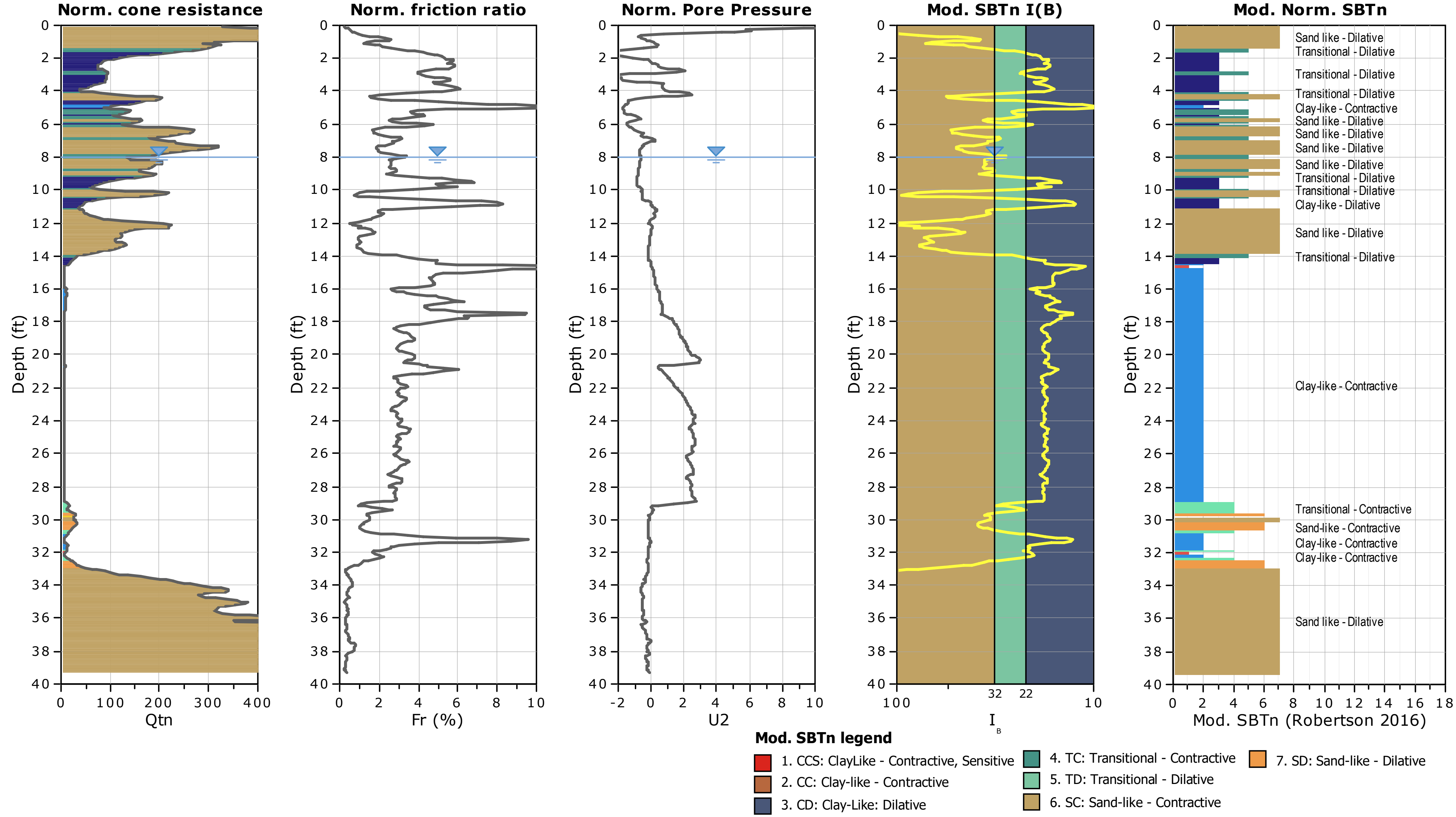
http://www.HCEA.com

CPT: S Market RB-CPT-02
Total depth: 39.30 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



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HILLIS - CARNES ENGINEERING ASSOCIATES
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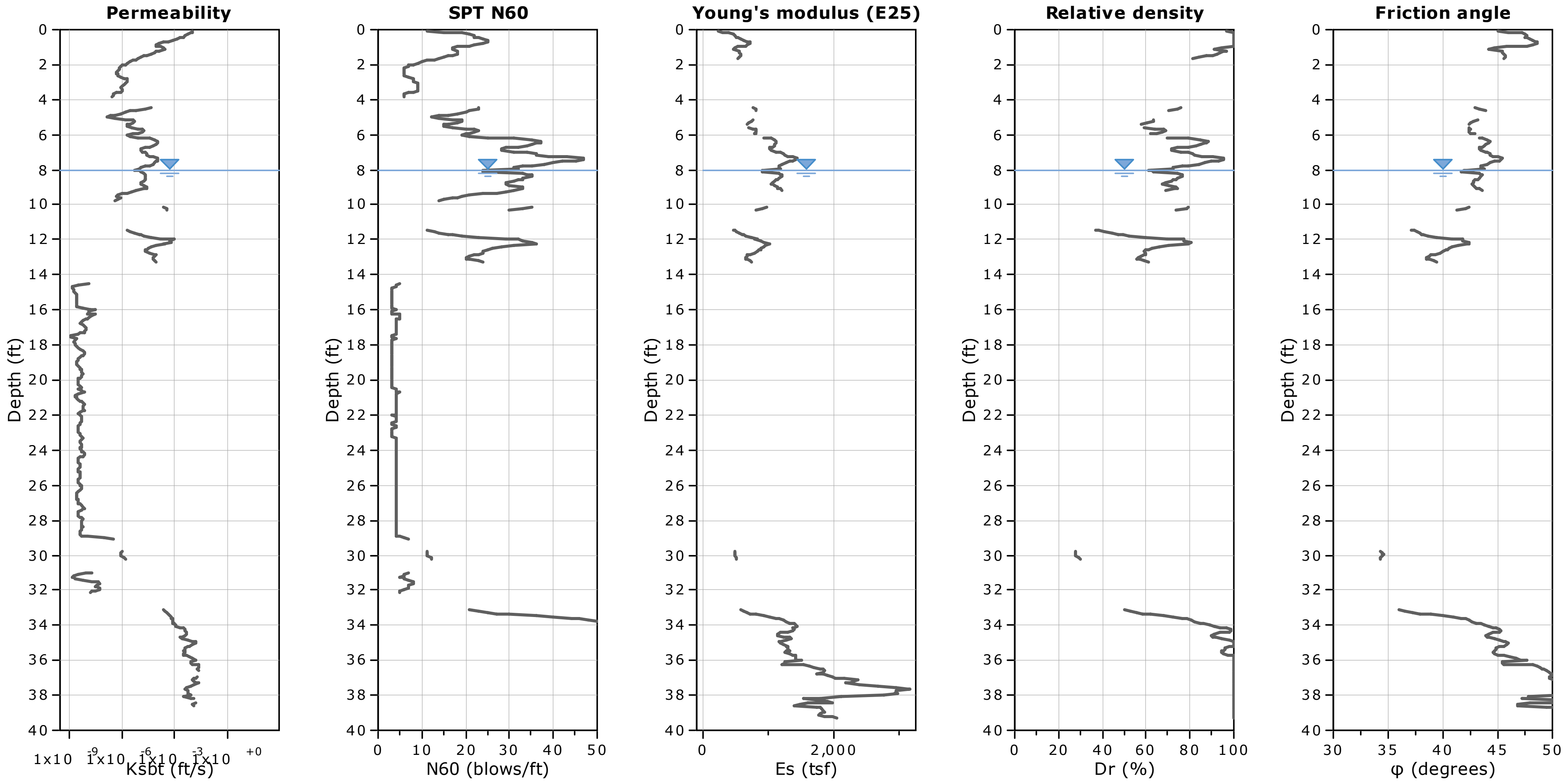
CPT: S Market RB-CPT-02
Total depth: 39.30 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

Permeability: Based on SBT_n

SPT N_{60}: Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative desnisty constant, C_{Dr}: 350.0

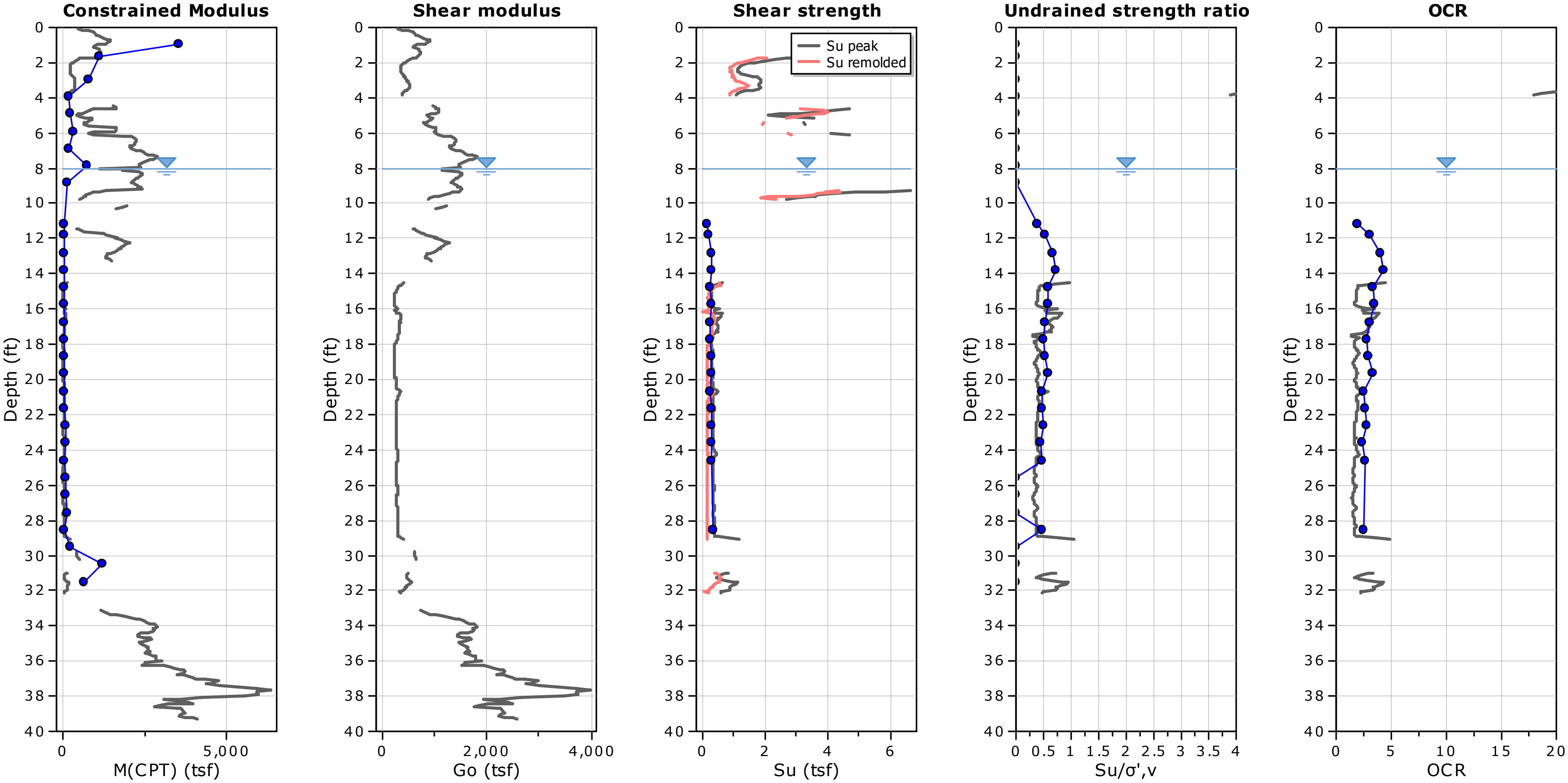
Phi: Based on Kulhawy & Mayne (1990)

—●— User defined estimation data

HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
Delmar, Maryland
http://www.HCEA.com

Project: **S Market - RK&K**
Location: **New Castle, DE**

CPT: S Market RB-CPT-02
Total depth: 39.30 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.



Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33
● User defined estimation data
● Flat Dilatometer Test data

HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
Delmar, Maryland
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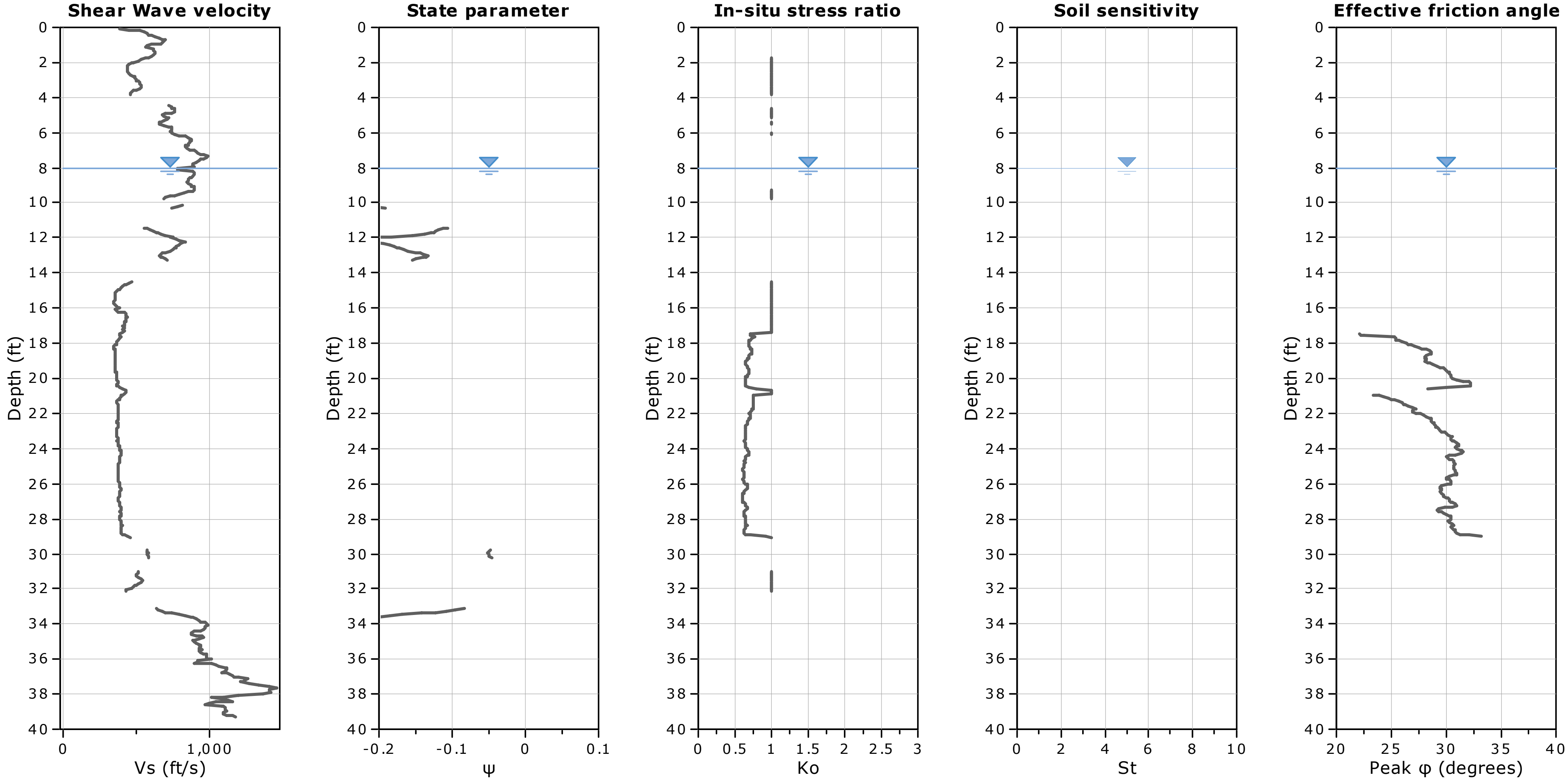
CPT: S Market RB-CPT-02
Total depth: 39.30 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

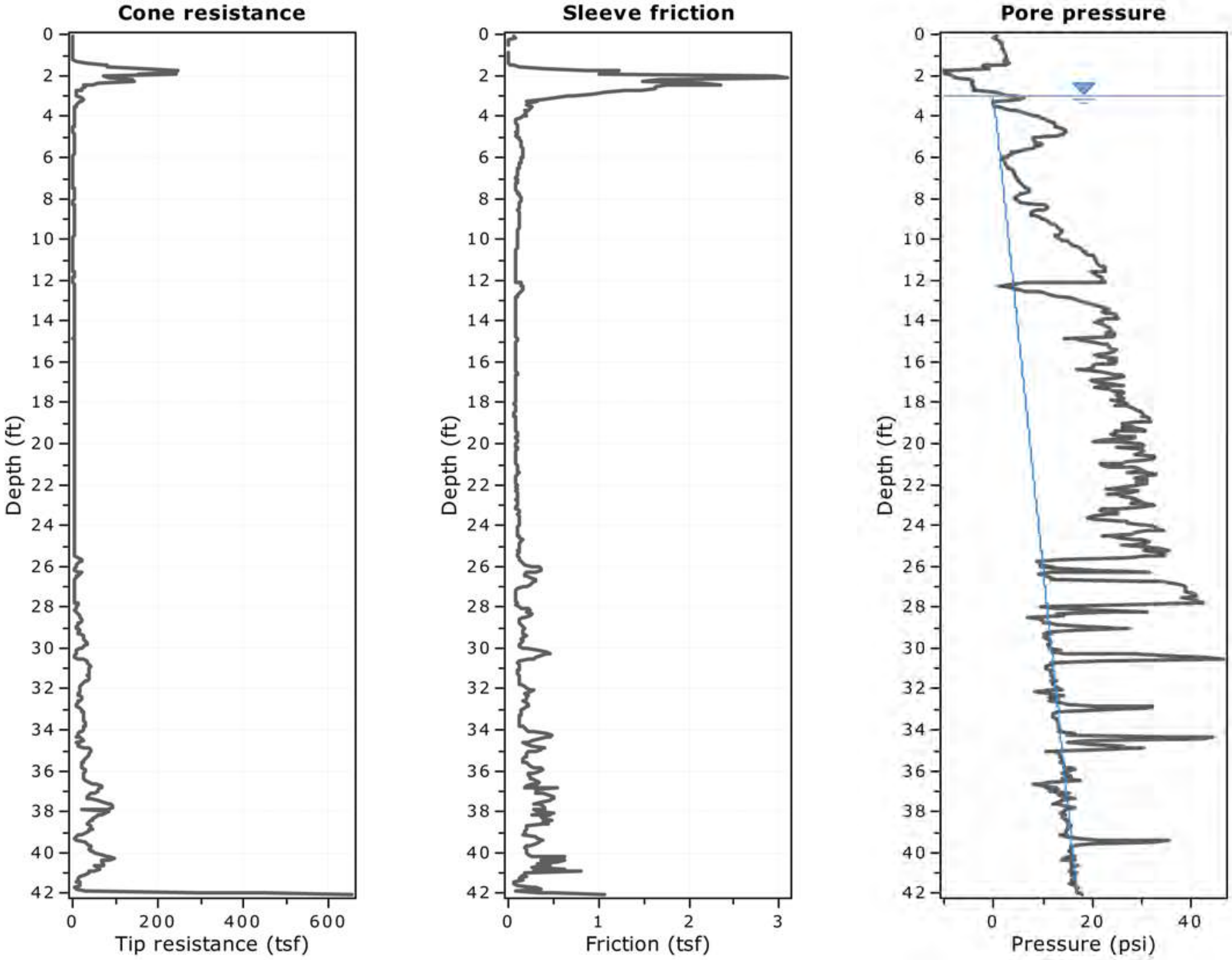
Soil Sensitivity factor, N_S: 350.00

● User defined estimation data

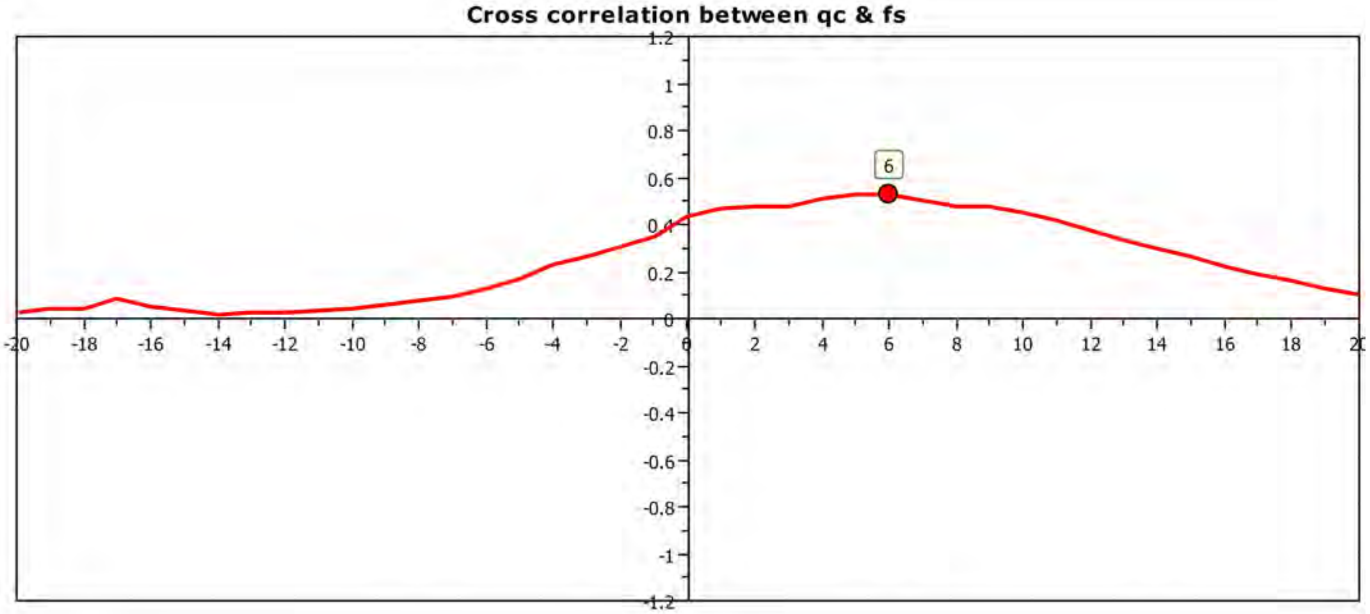
HILLIS-CARNES
ENGINEERING ASSOCIATES

Project: **South Market Street**
Location: **Wilmington, DE**

CPT: RB-CPT-3
Total depth: 42.06 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



CPT: RB-CPT-3

Total depth: 42.06 ft, Date: 10/12/2022

Surface Elevation: 0.00 ft

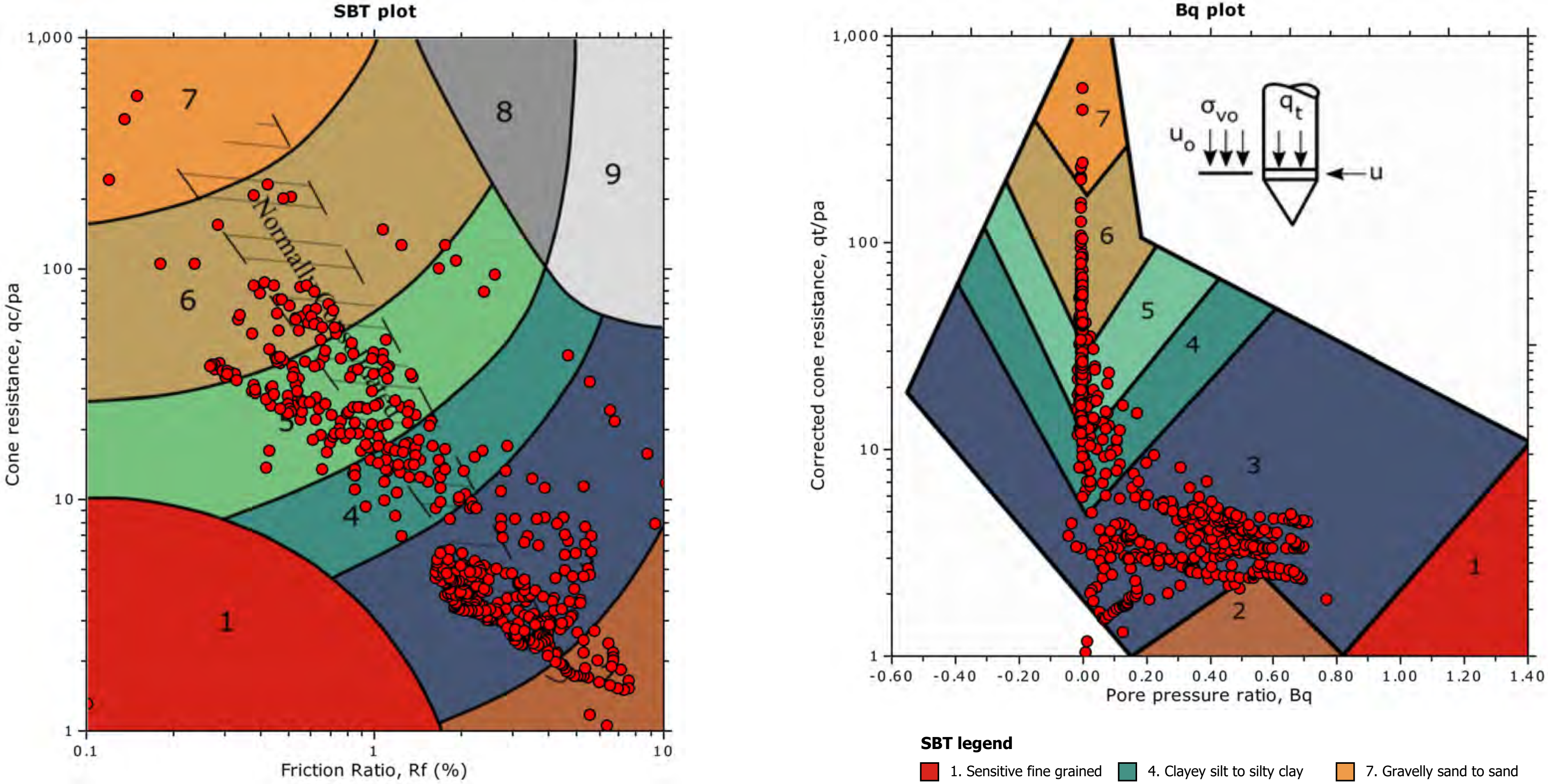
Cone Type:

Cone Operator:

Project: **South Market Street**

Location: **Wilmington, DE**

SBT - Bq plots



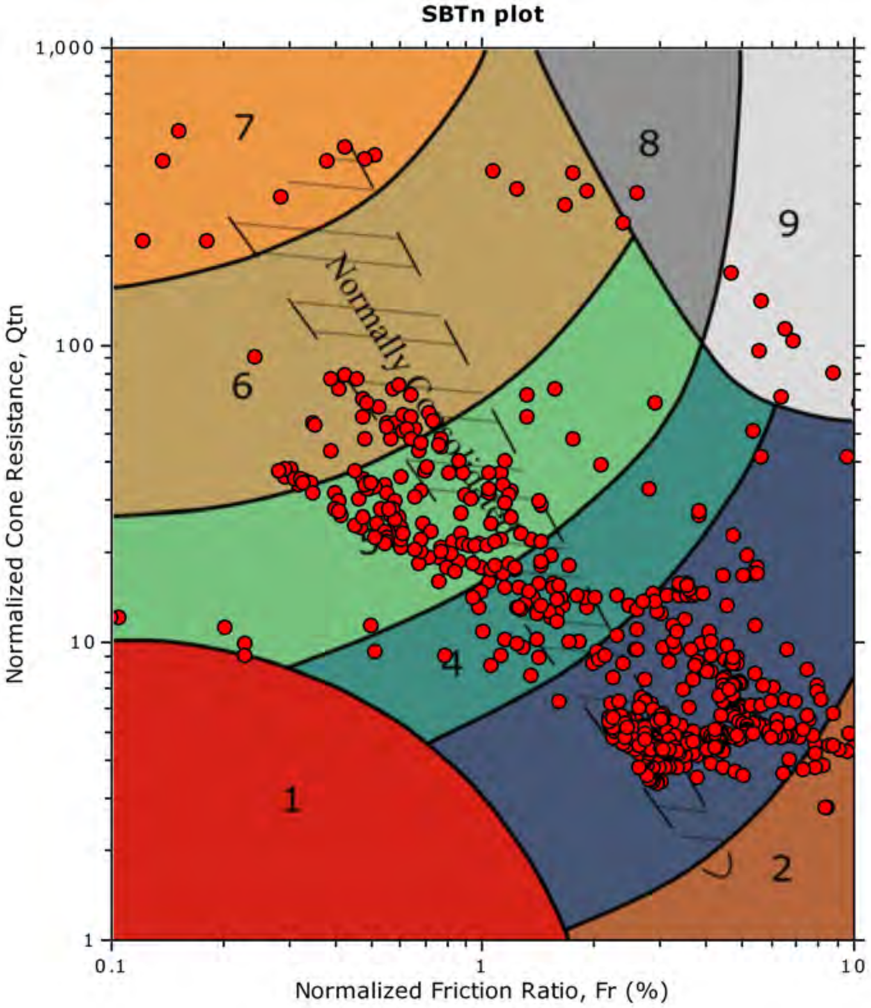
SBT legend

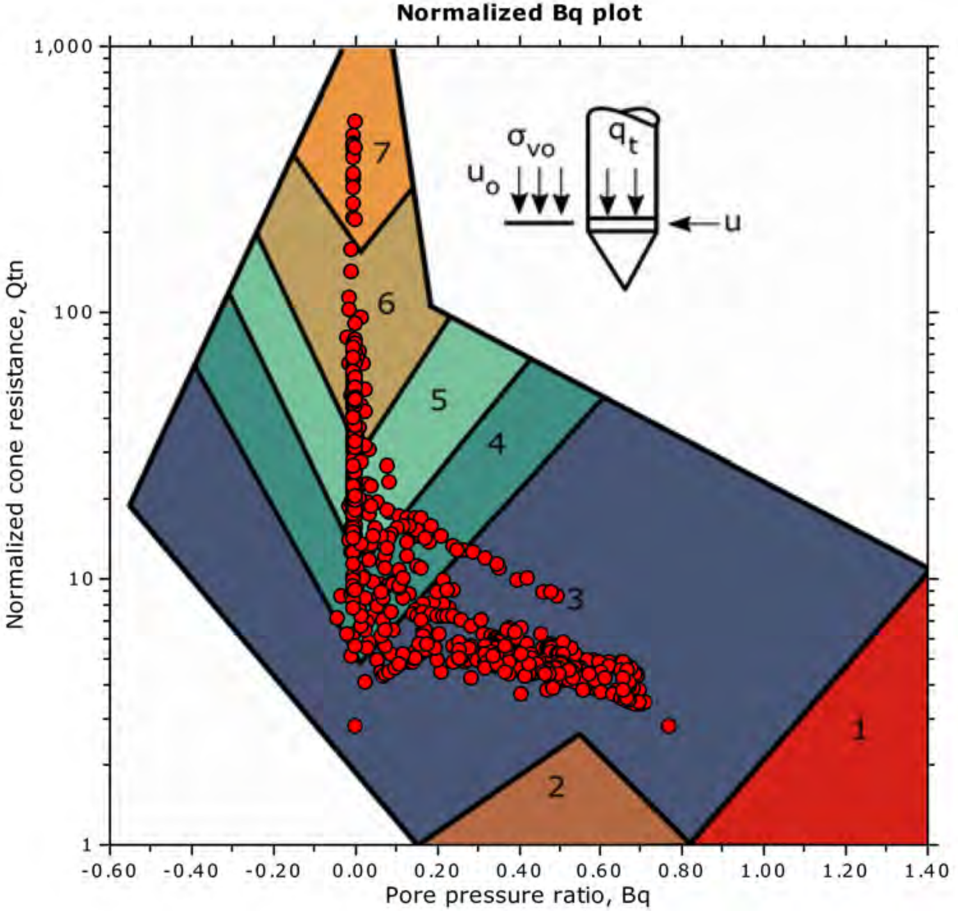
🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty clay	🟧 7. Gravelly sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to clayey sand
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

Project: **South Market Street**
Location: **Wilmington, DE**

CPT: RB-CPT-3
Total depth: 42.06 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

SBT - Bq plots (normalized)





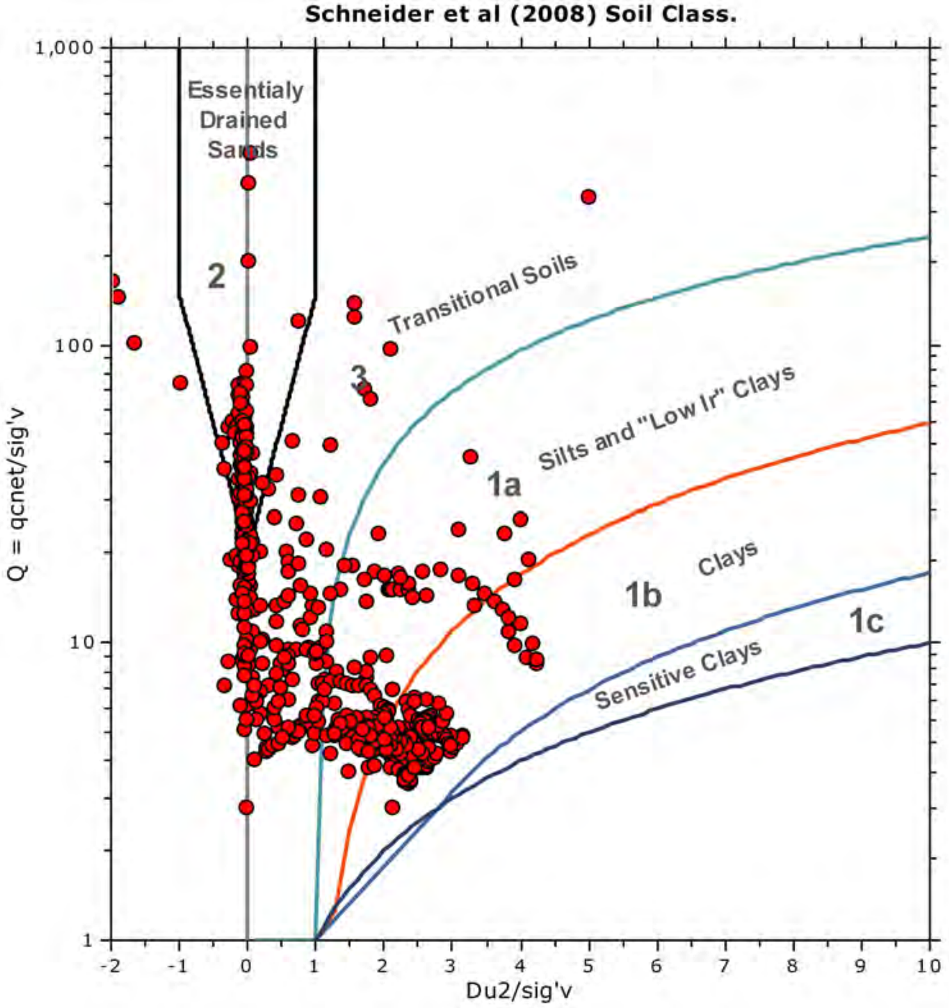
SBTn legend

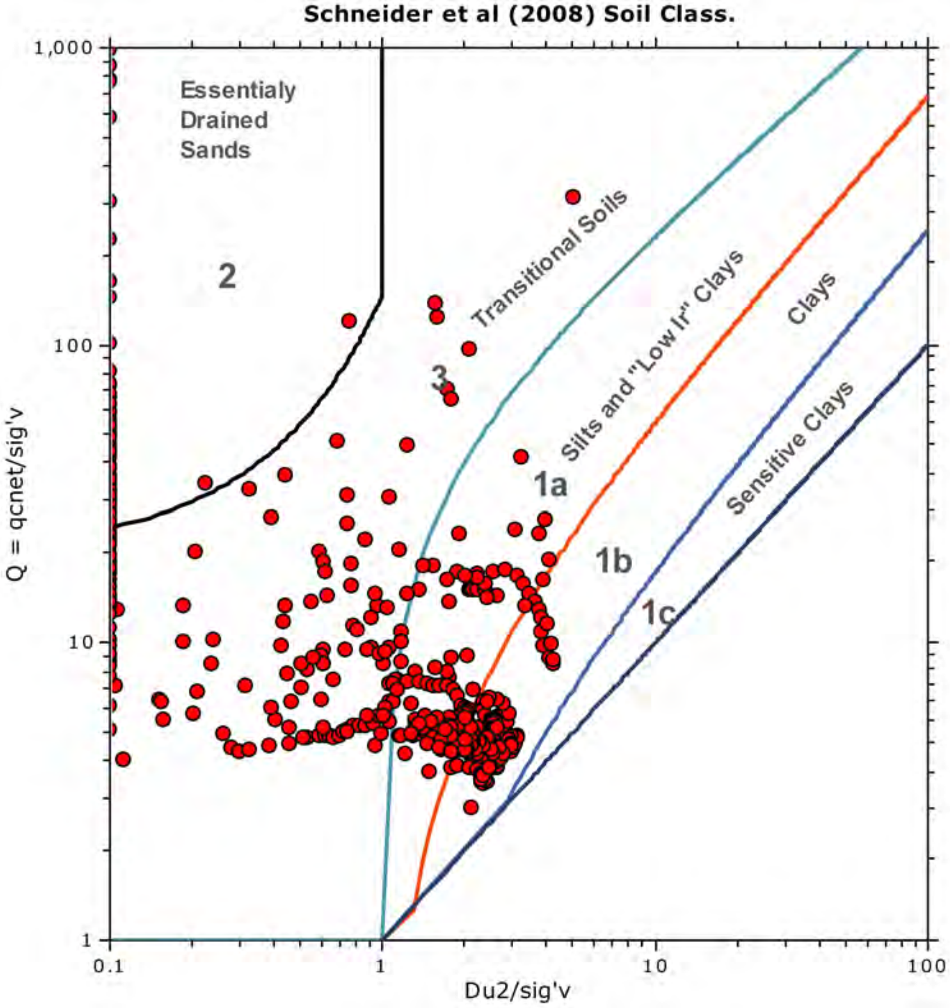
🟥 1. Sensitive fine grained	🟦 4. Clayey silt to silty clay	🟧 7. Gravelly sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to clayey sand
🟦 3. Clay to silty clay	🟫 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

Project: **South Market Street**
Location: **Wilmington, DE**

CPT: RB-CPT-3
Total depth: 42.06 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

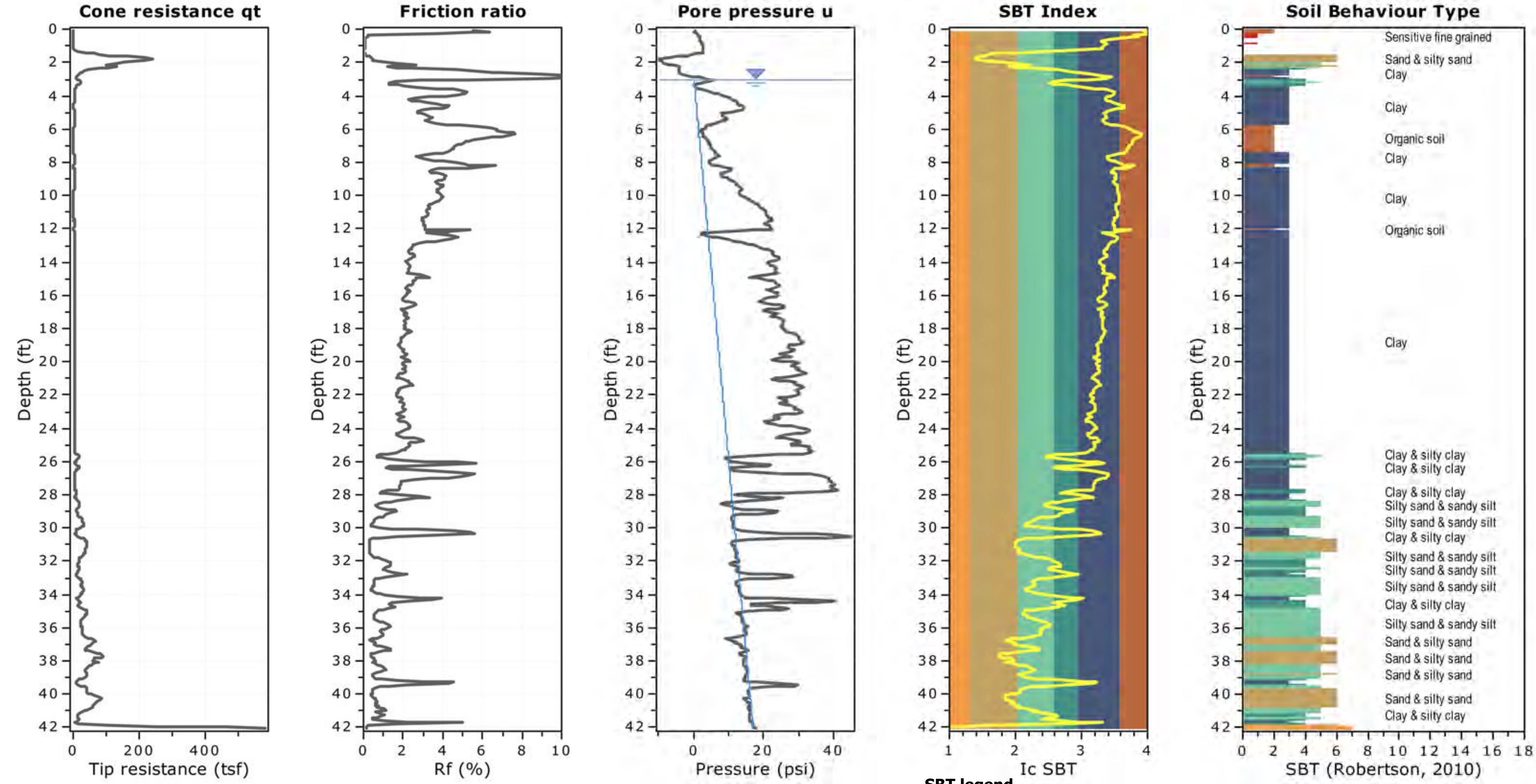
Bq plots (Schneider)





CPT: RB-CPT-3
Total depth: 42.06 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**



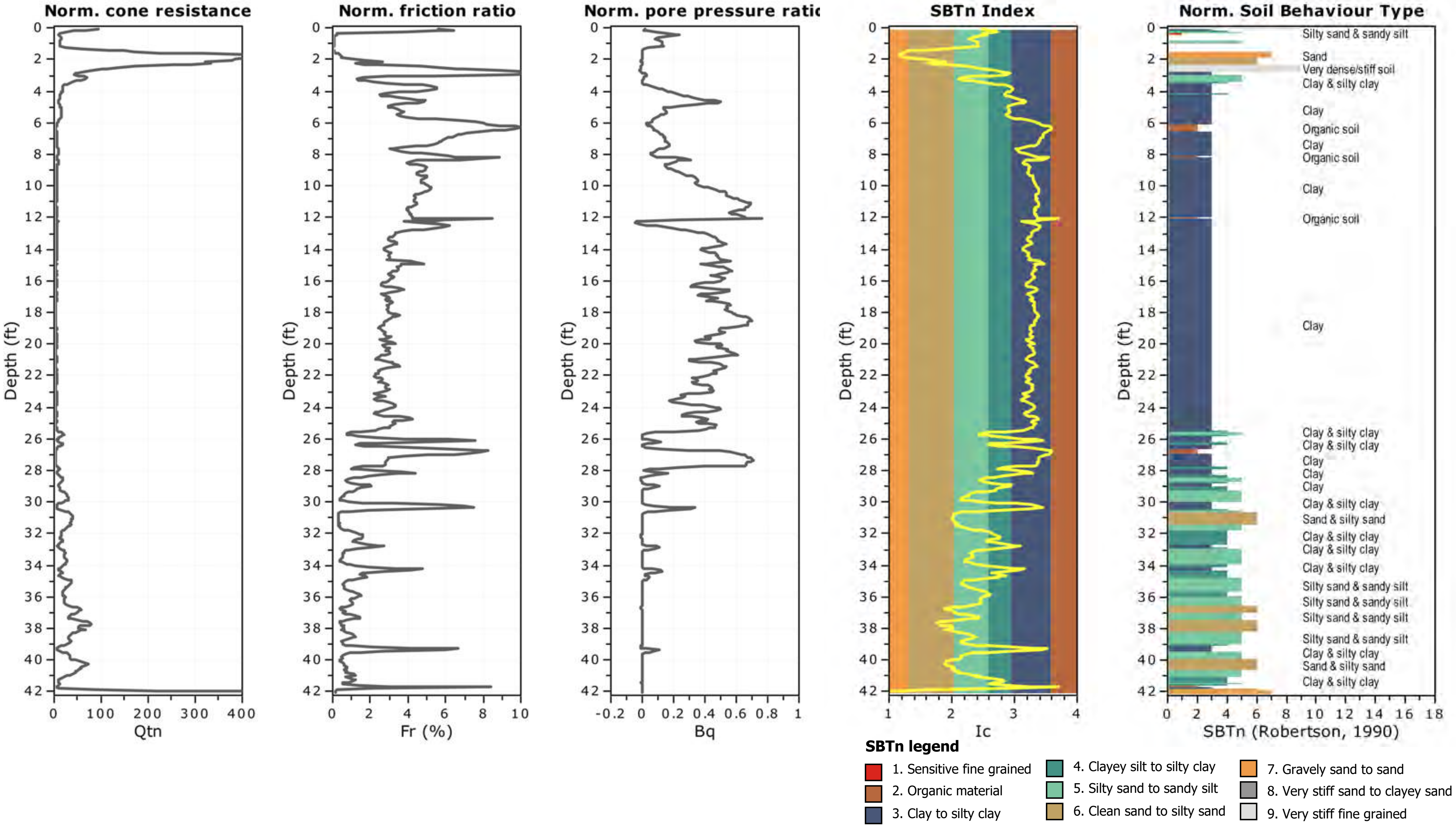
SBT legend

🟥 1. Sensitive fine grained
🟫 2. Organic material
🟦 3. Clay to silty clay
🟩 4. Clayey silt to silty clay
🟩 5. Silty sand to sandy silt
🟫 6. Clean sand to silty sand
🟧 7. Gravely sand to sand
⬜ 8. Very stiff sand to clayey sand
⬜ 9. Very stiff fine grained

HILLIS-CARNES
ENGINEERING ASSOCIATES

Project: **South Market Street**
Location: **Wilmington, DE**

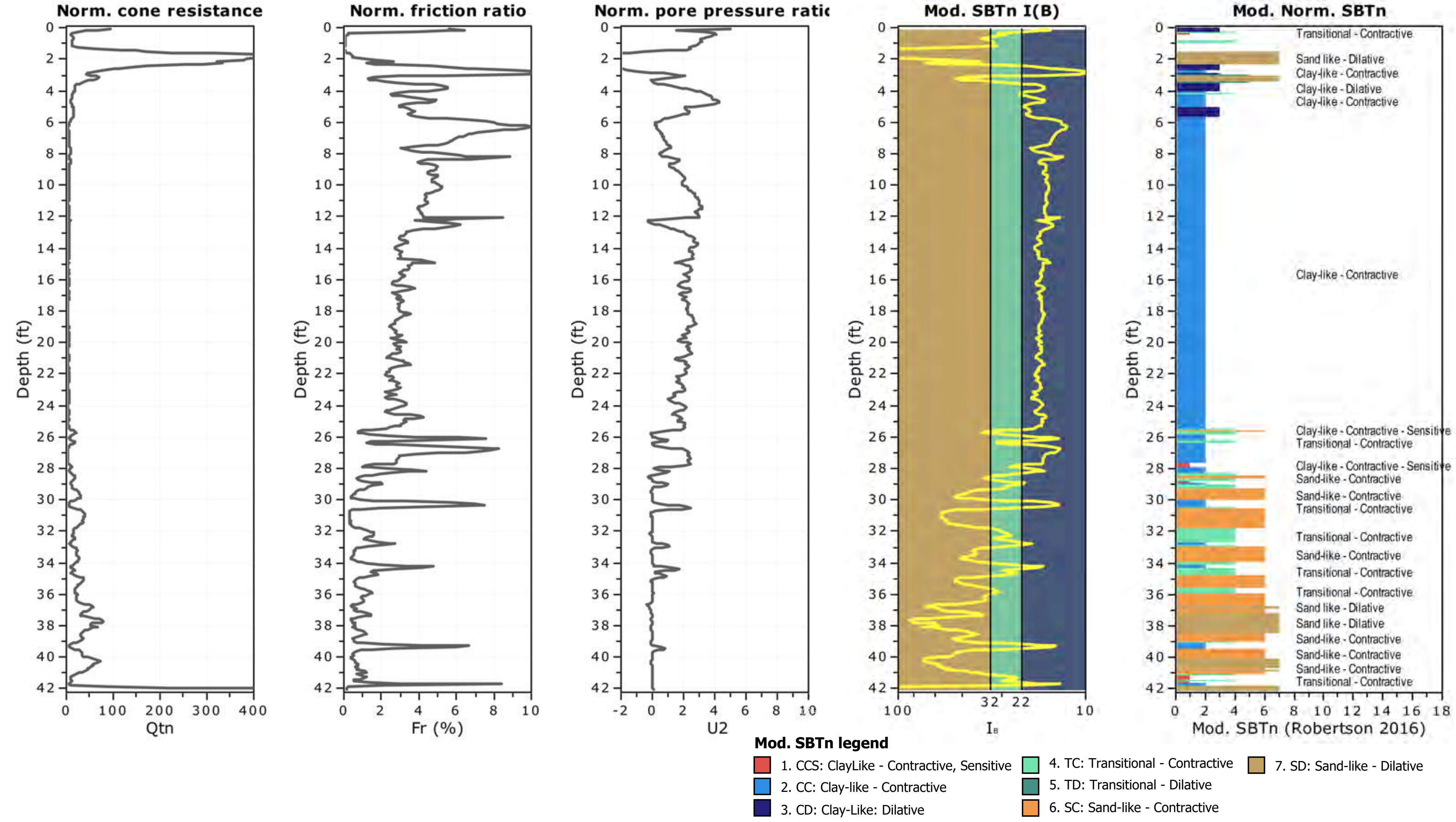
CPT: RB-CPT-3
Total depth: 42.06 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:



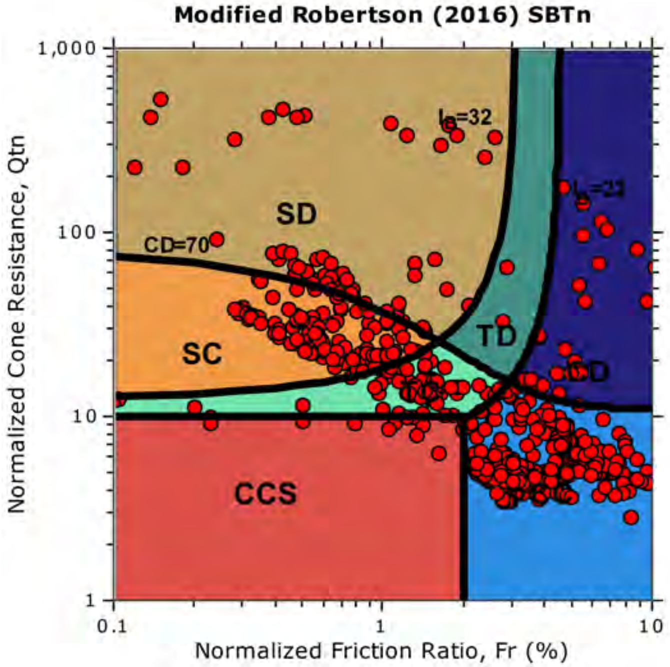
HILLIS-CARNES
ENGINEERING ASSOCIATES

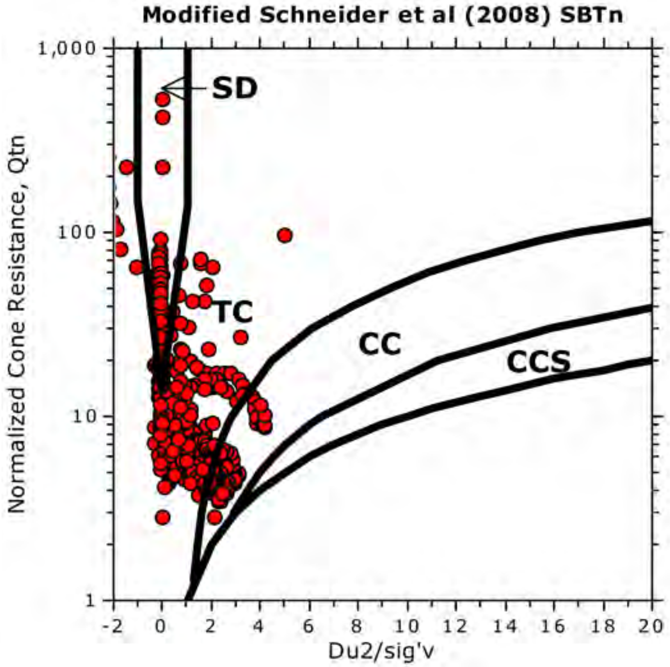
CPT: RB-CPT-3
Total depth: 42.06 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

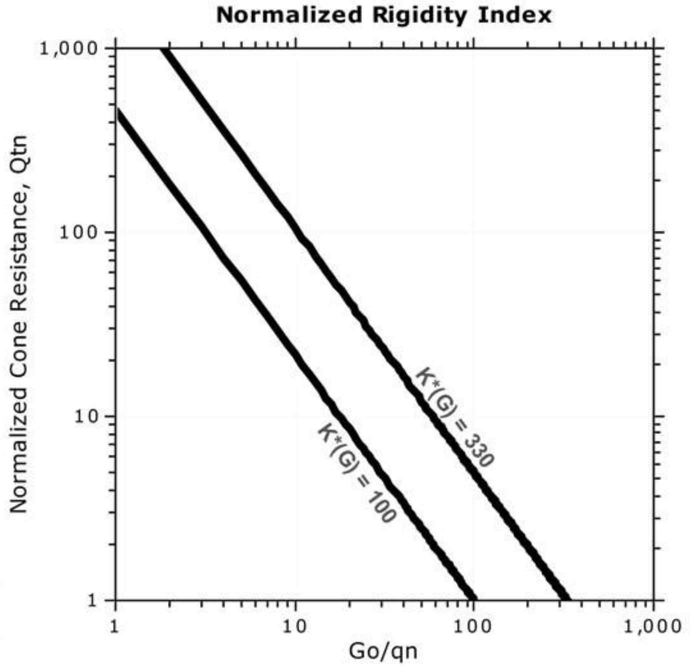
Project: **South Market Street**
Location: **Wilmington, DE**



Updated SBTn plots


Modified Robertson (2016) SBTn


Modified Schneider et al (2008) SBTn


Normalized Rigidity Index

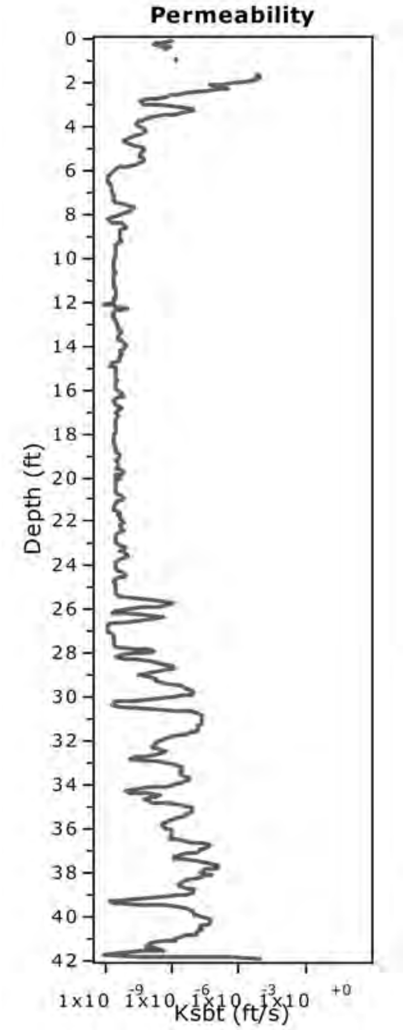
CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

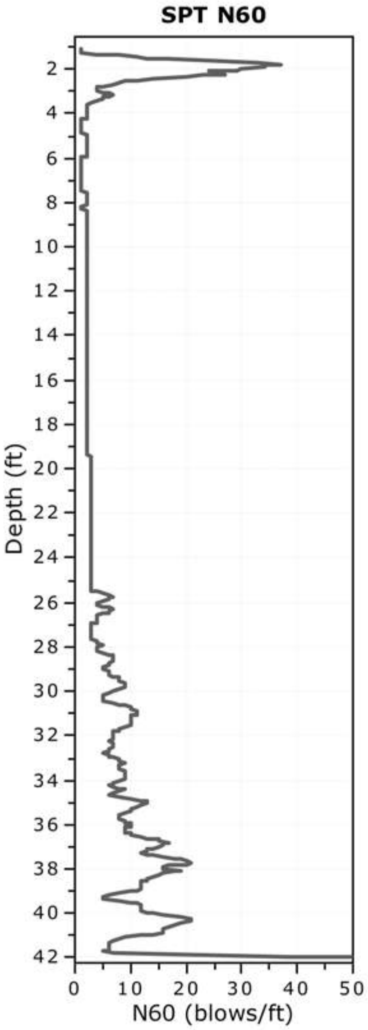
K(G) > 330: Soils with significant microstructure
(e.g. age/cementation)

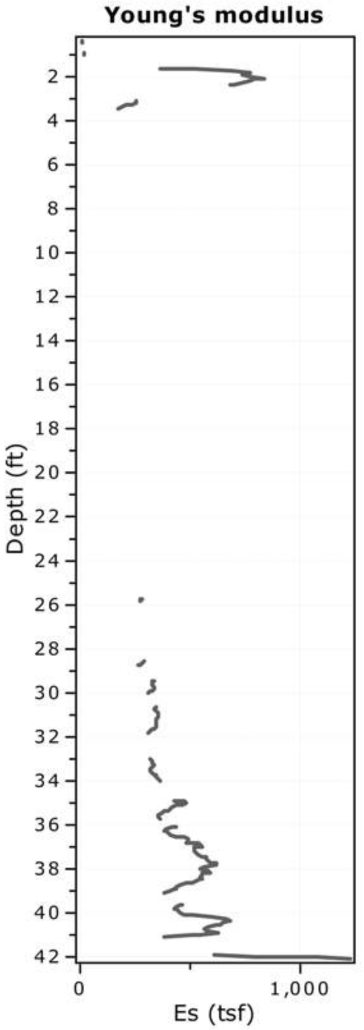
CPT: RB-CPT-3

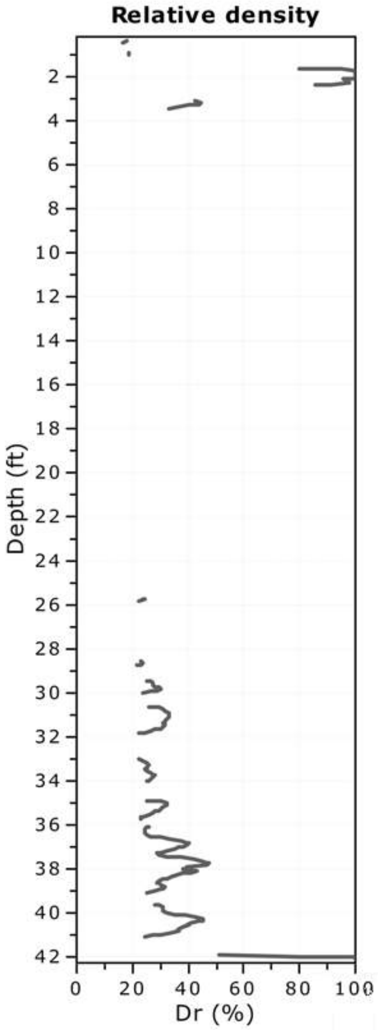
Total depth: 42.06 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

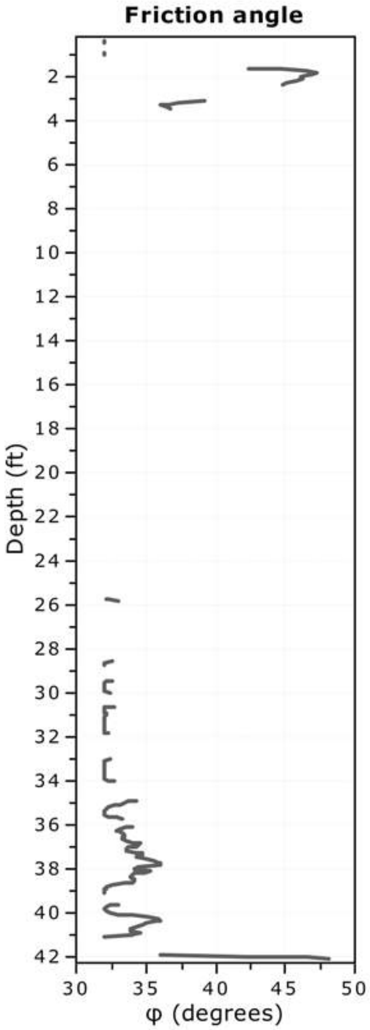
Project: **South Market Street**
Location: **Wilmington, DE**











Calculation parameters

Permeability: Based on SBT_n

SPT N_{60}: Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

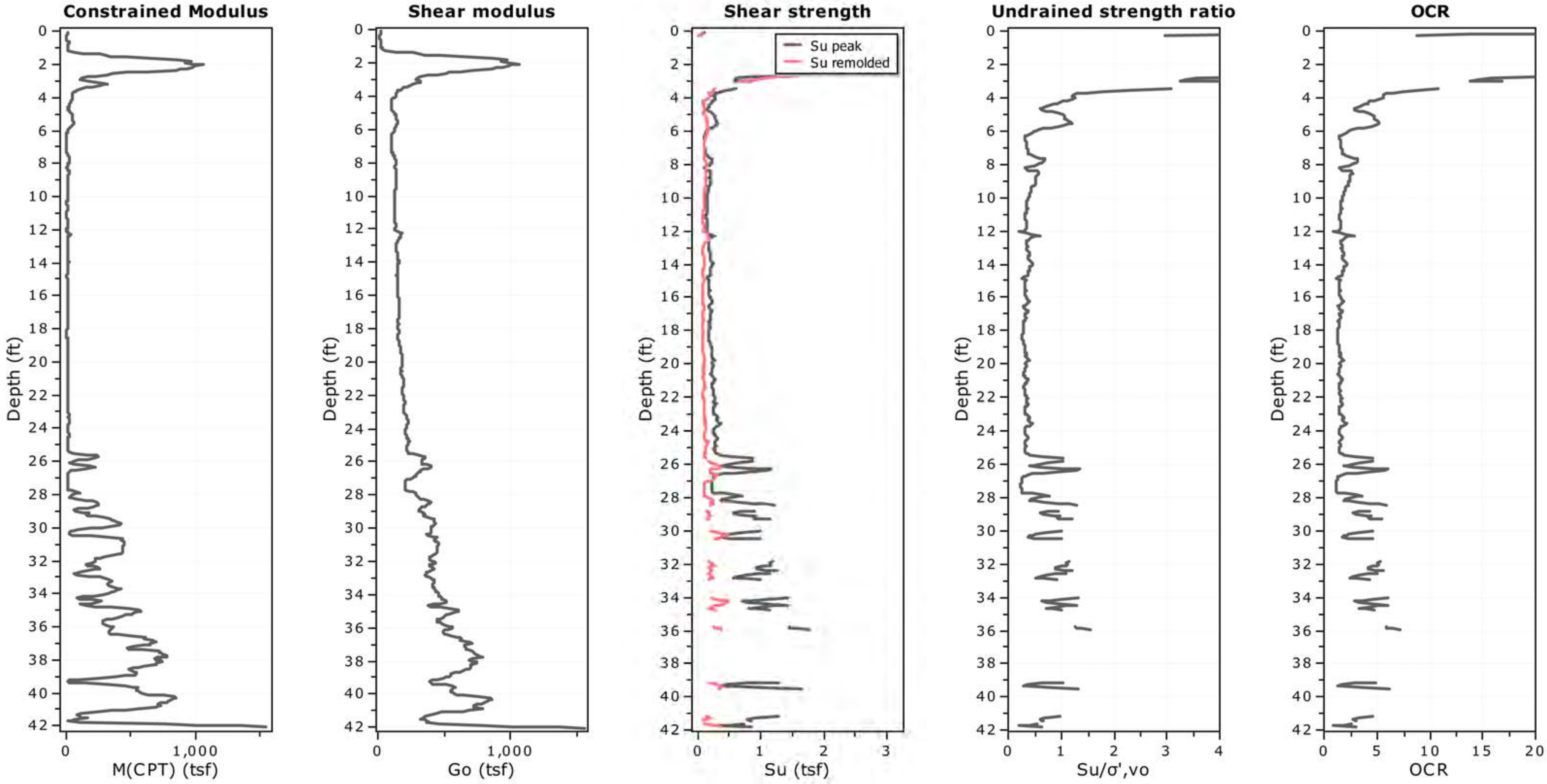
Relative density constant, C_{Dr}: 350.0

Phi: Based on Kulhawy & Mayne (1990)

CPT: RB-CPT-3

Total depth: 42.06 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**


Constrained Modulus
Shear modulus
Shear strength
Undrained strength ratio
OCR

Calculation parameters

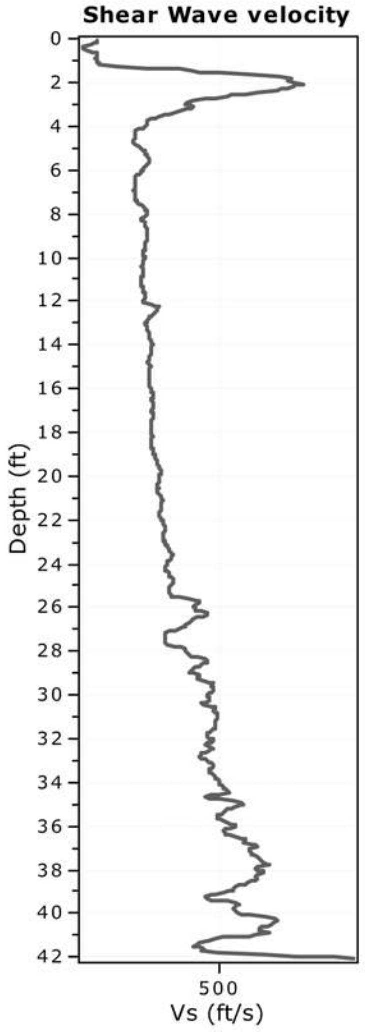
Constrained modulus: Based on variable alpha using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable alpha using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

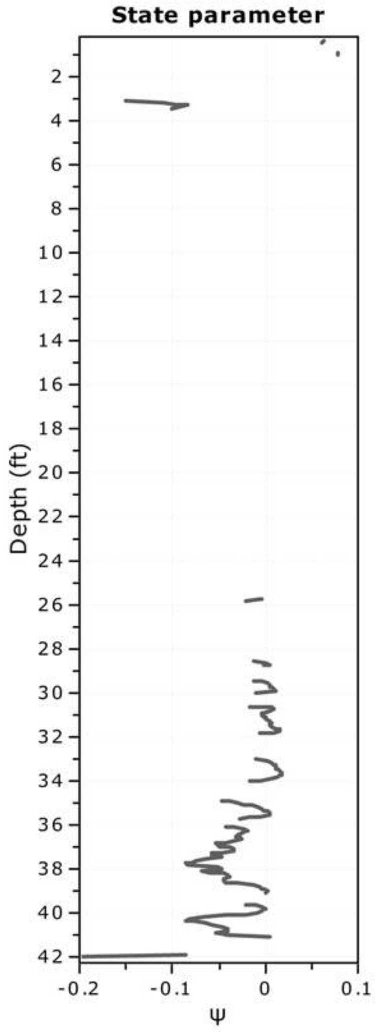
OCR factor for clays, N_{kt}: 0.33
—●— Flat Dilatometer Test data

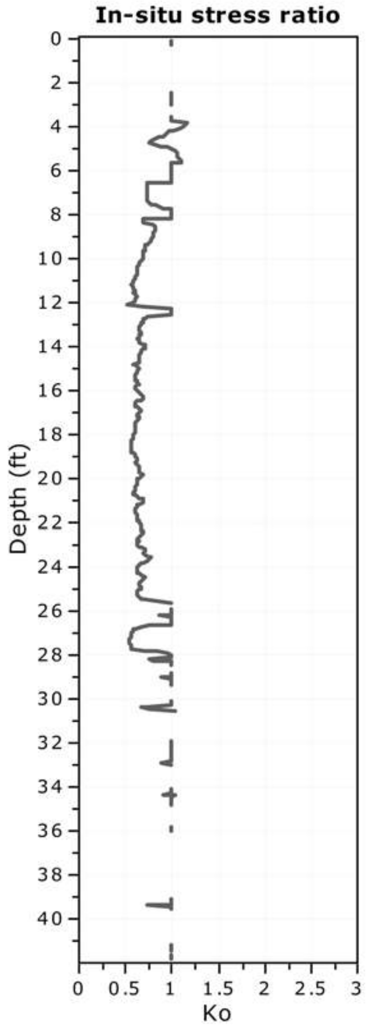
HILLIS-CARNES
ENGINEERING ASSOCIATES

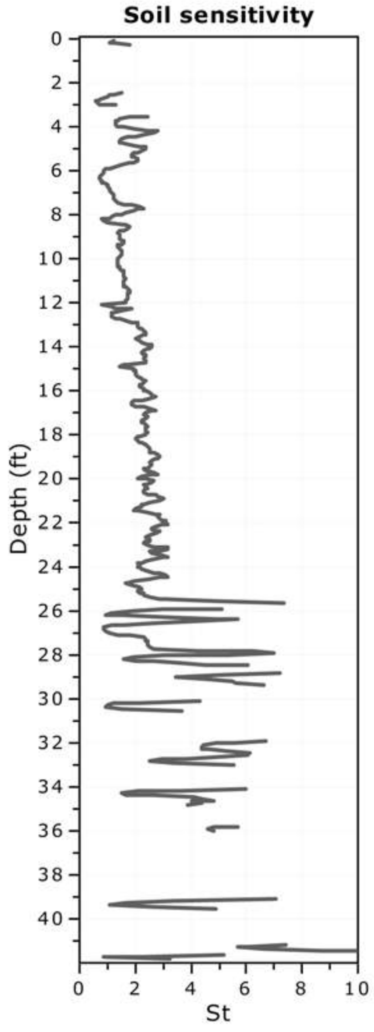
CPT: RB-CPT-3
Total depth: 42.06 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

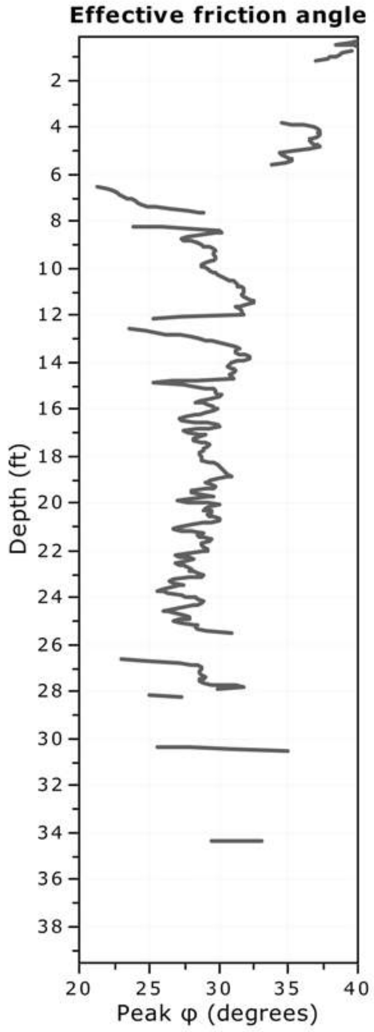
Project: **South Market Street**
Location: **Wilmington, DE**


Shear Wave velocity


State parameter


In-situ stress ratio


Soil sensitivity


Effective friction angle

Calculation parameters

Soil Sensitivity factor, N_S: 7.00

CPT: RB-CPT-3

Total depth: 42.06 ft, Date: 10/12/2022

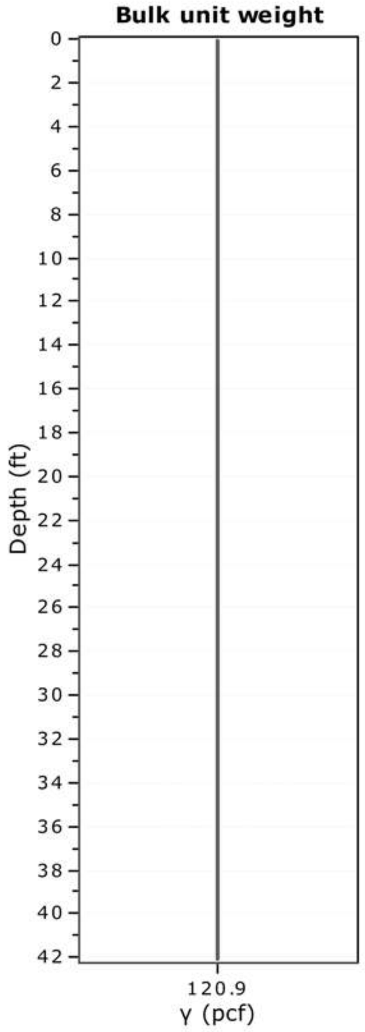
Surface Elevation: 0.00 ft

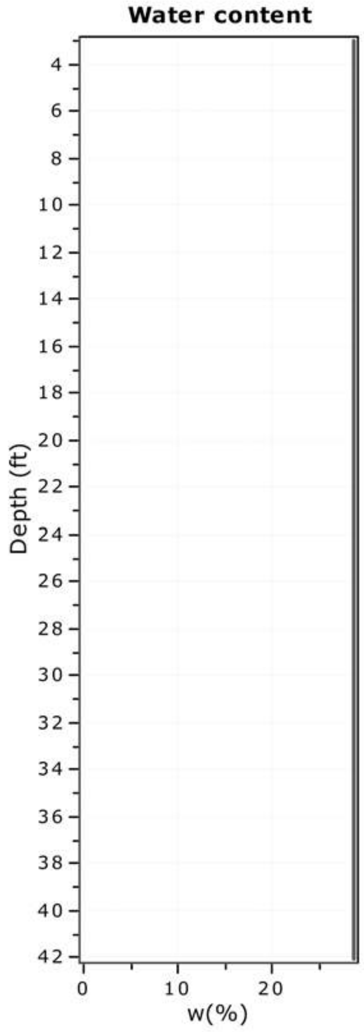
Cone Type:

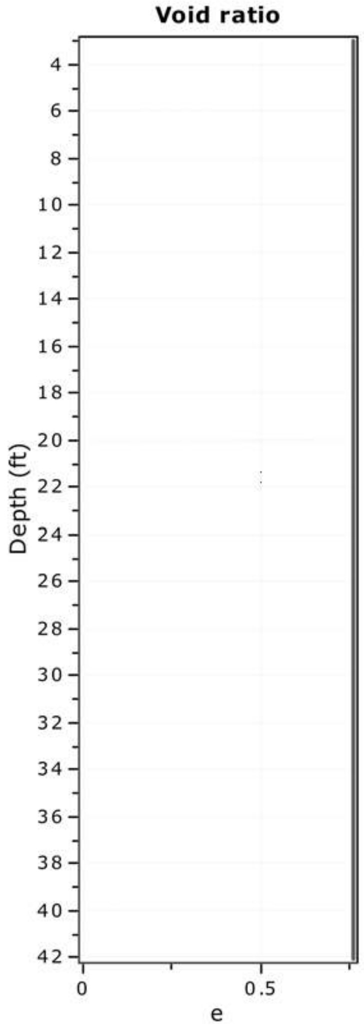
Cone Operator:

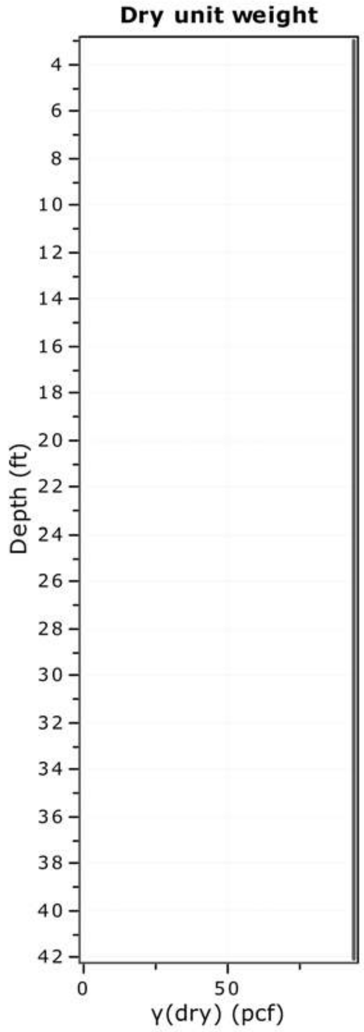
Project: **South Market Street**

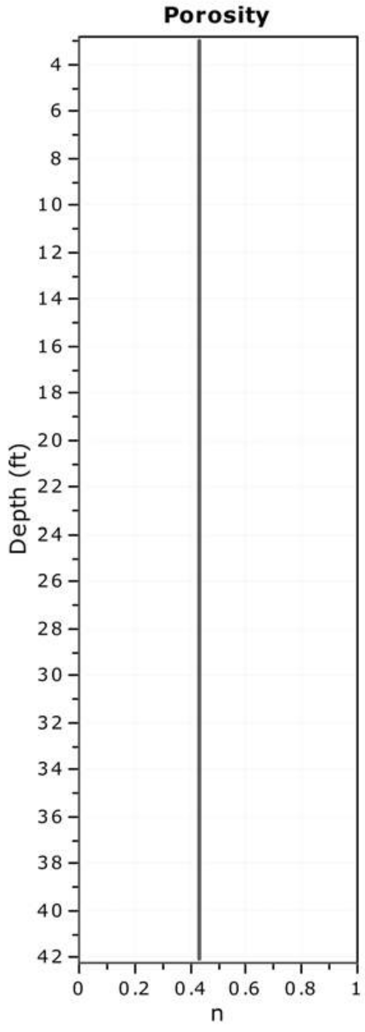
Location: **Wilmington, DE**







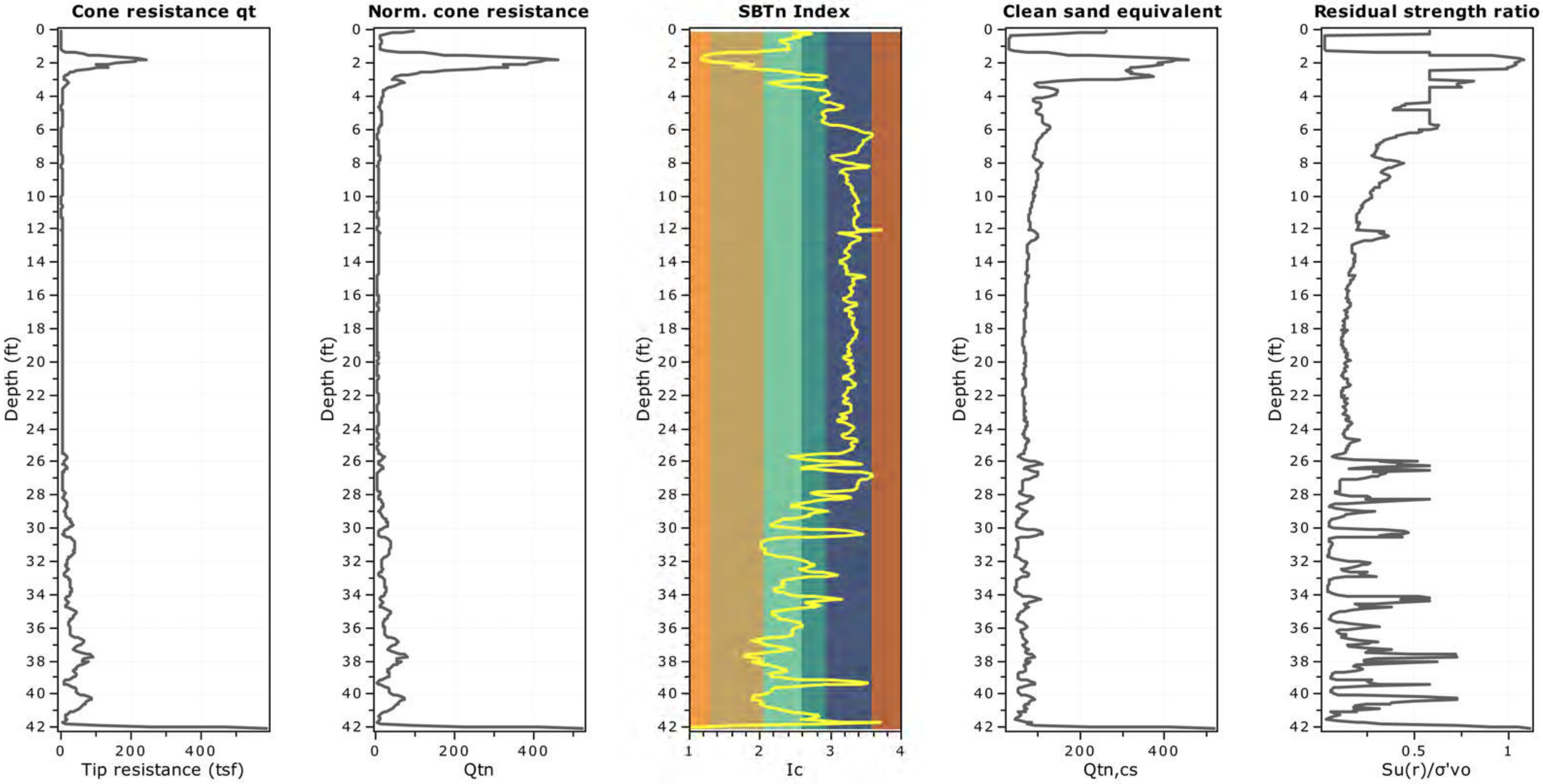




HILLIS-CARNES
ENGINEERING ASSOCIATES

Project: **South Market Street**
Location: **Wilmington, DE**

CPT: RB-CPT-3
Total depth: 42.06 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:


Cone resistance qt

Norm. cone resistance

SBTn Index

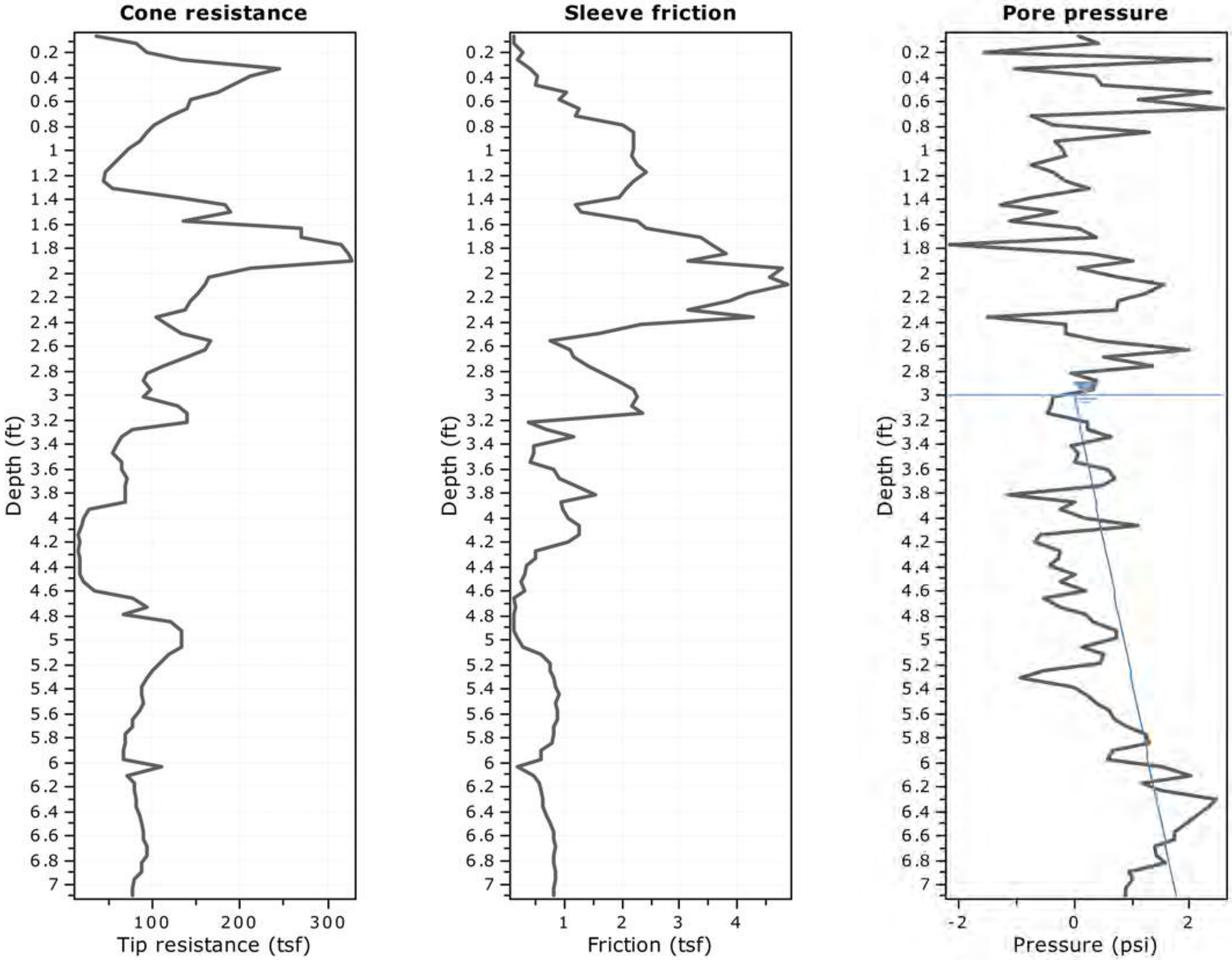
Clean sand equivalent

Residual strength ratio

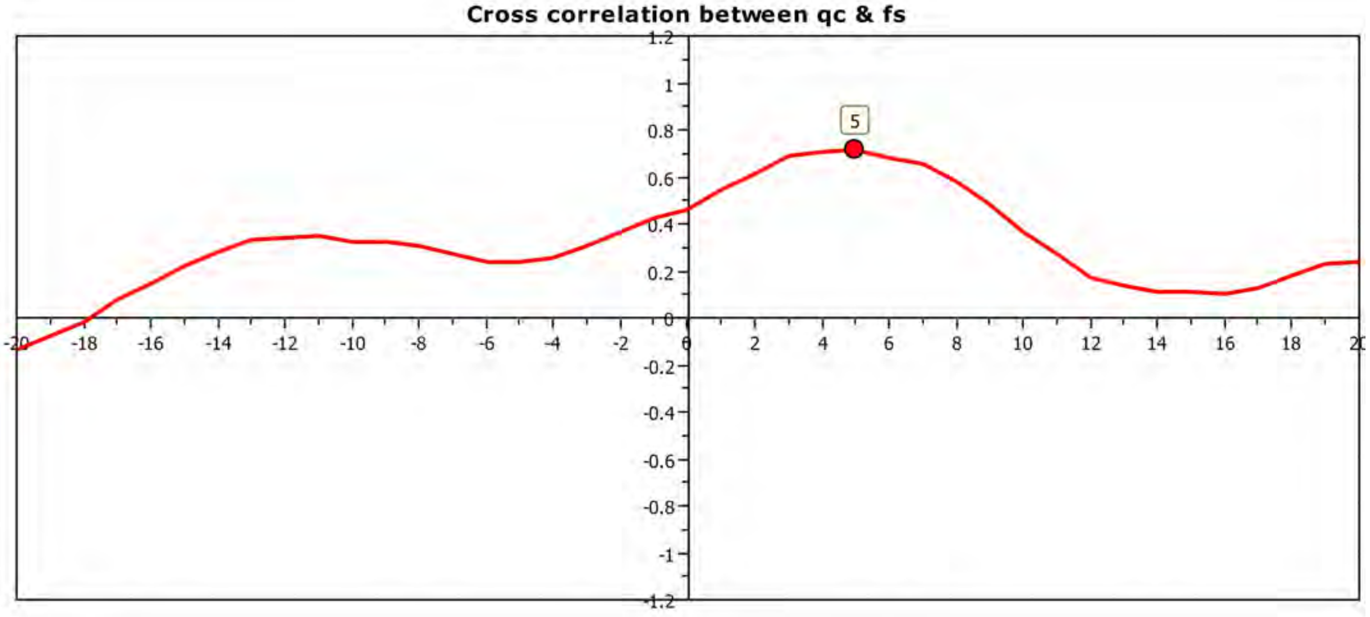
CPT: RB-CPT-4

Total depth: 7.09 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**



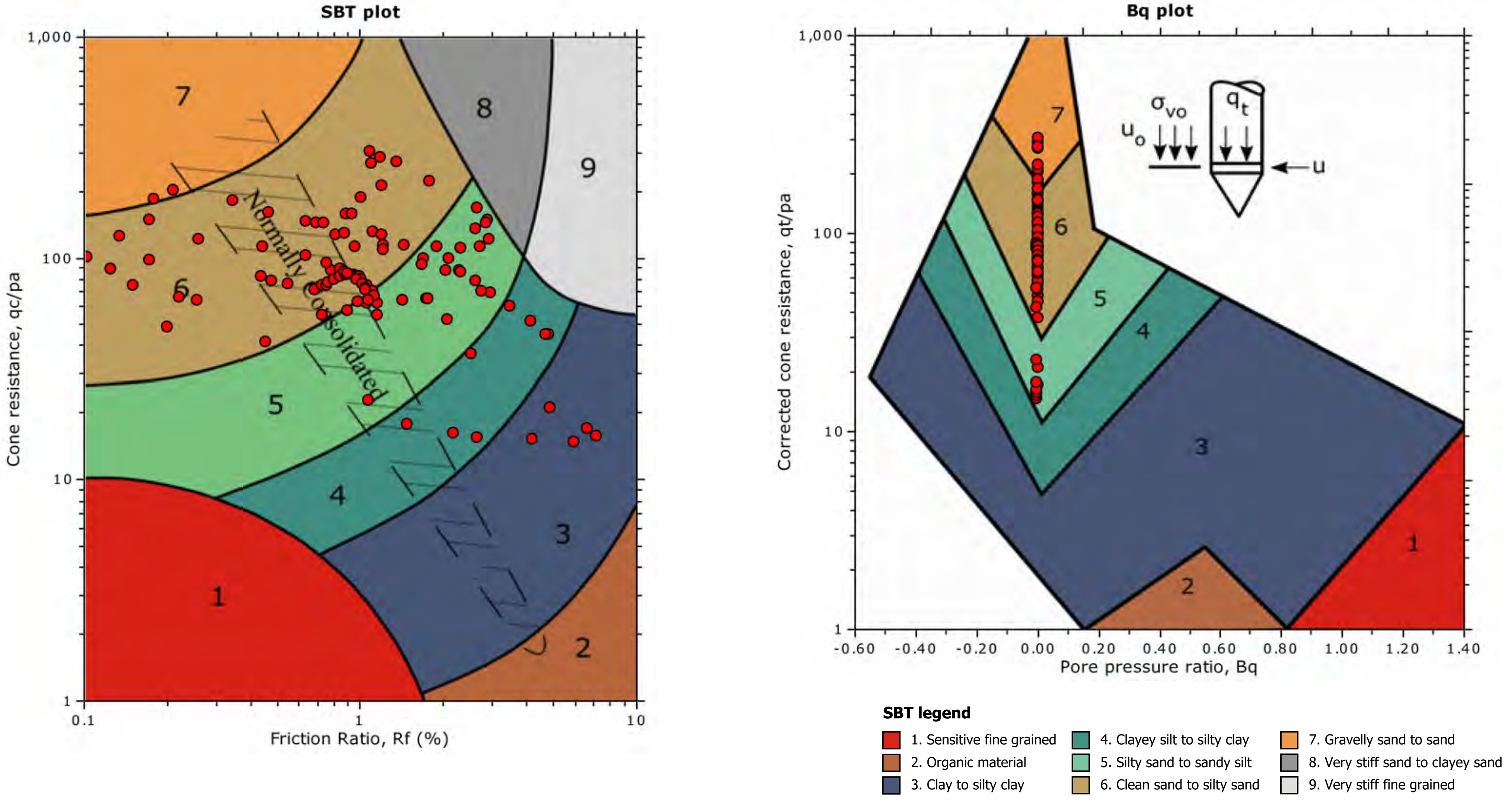
The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



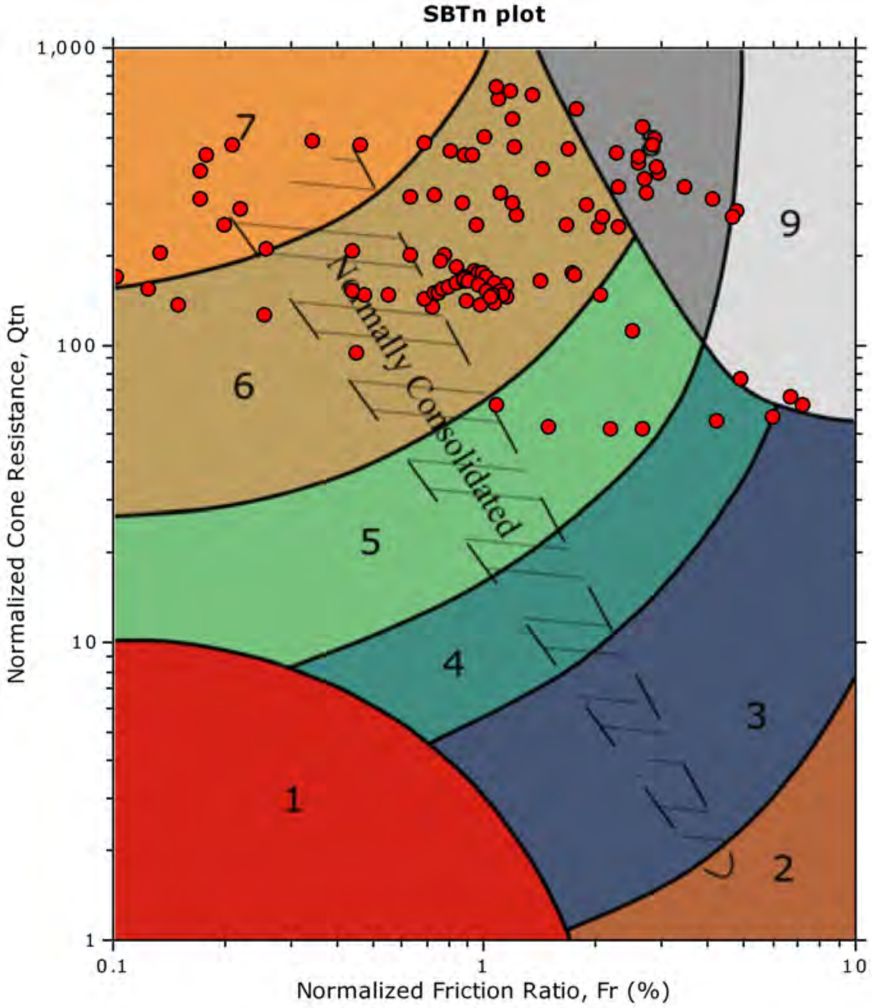
CPT: RB-CPT-4
Total depth: 7.09 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

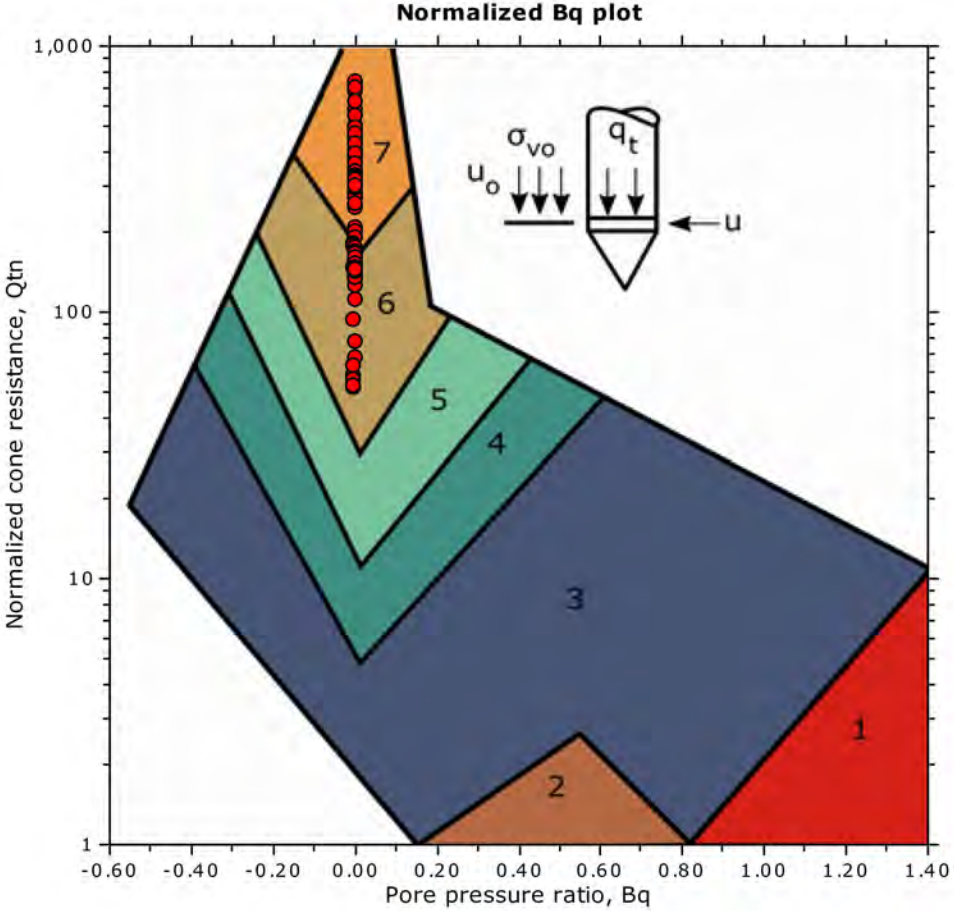
Project: **South Market Street**
Location: **Wilmington, DE**

SBT - Bq plots



SBT - Bq plots (normalized)

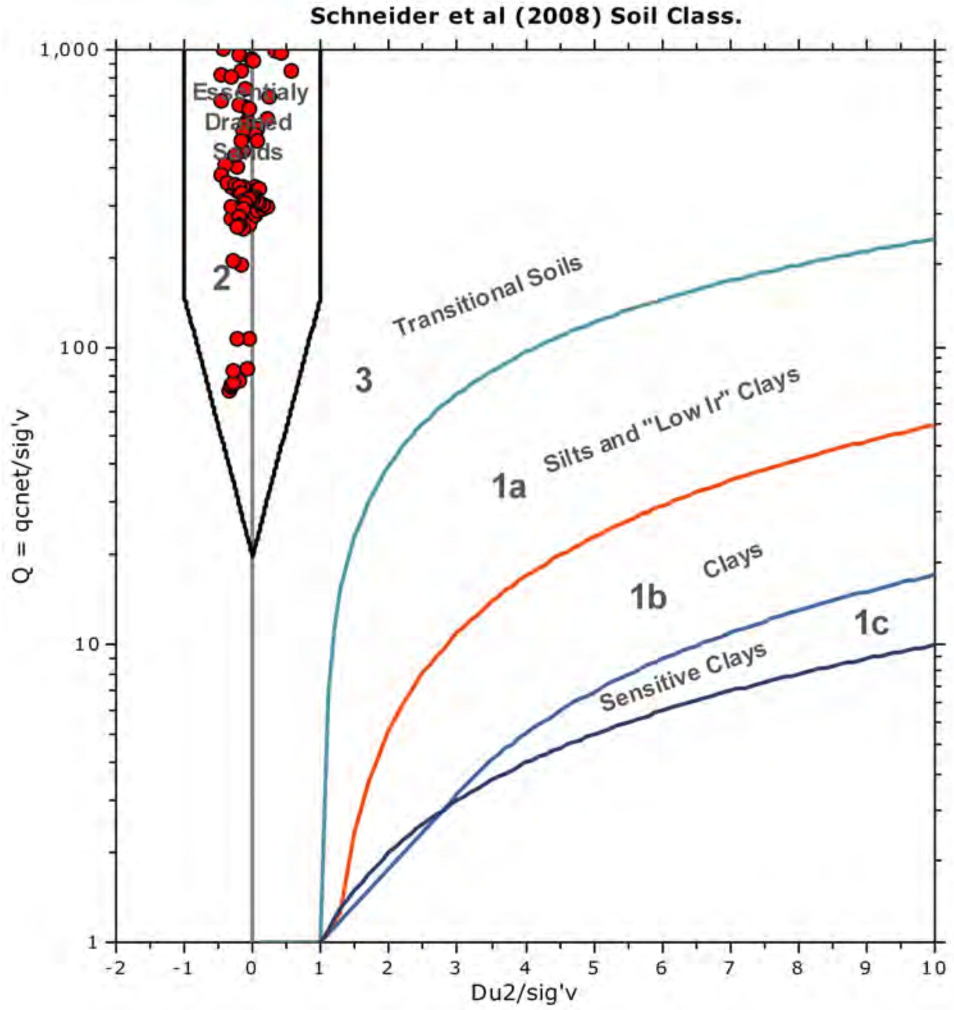


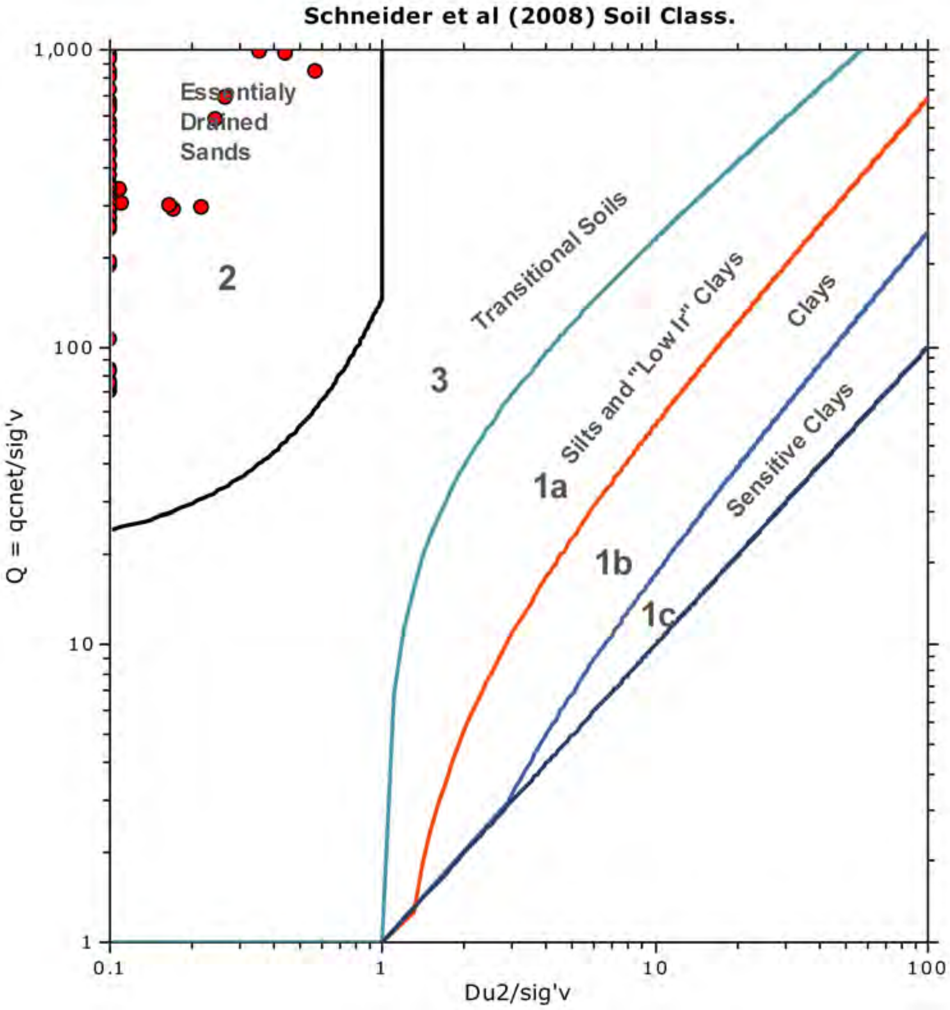


SBTn legend

🟥 1. Sensitive fine grained
🟫 2. Organic material
🟦 3. Clay to silty clay
🟩 4. Clayey silt to silty clay
🟩 5. Silty sand to sandy silt
🟨 6. Clean sand to silty sand
🟧 7. Gravelly sand to sand
⬛ 8. Very stiff sand to clayey sand
⬜ 9. Very stiff fine grained

Bq plots (Schneider)

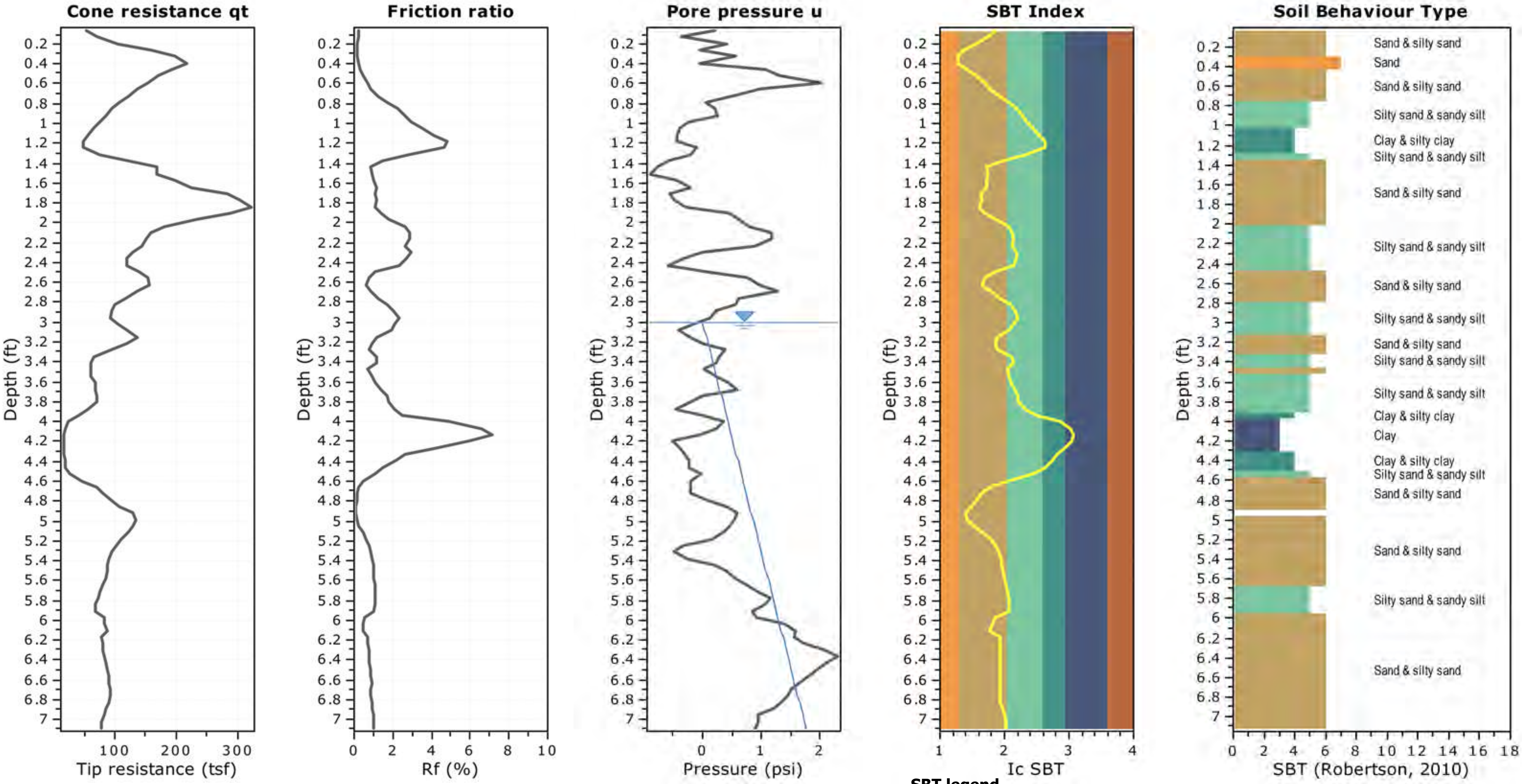




HILLIS-CARNES
ENGINEERING ASSOCIATES

CPT: RB-CPT-4
Total depth: 7.09 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**



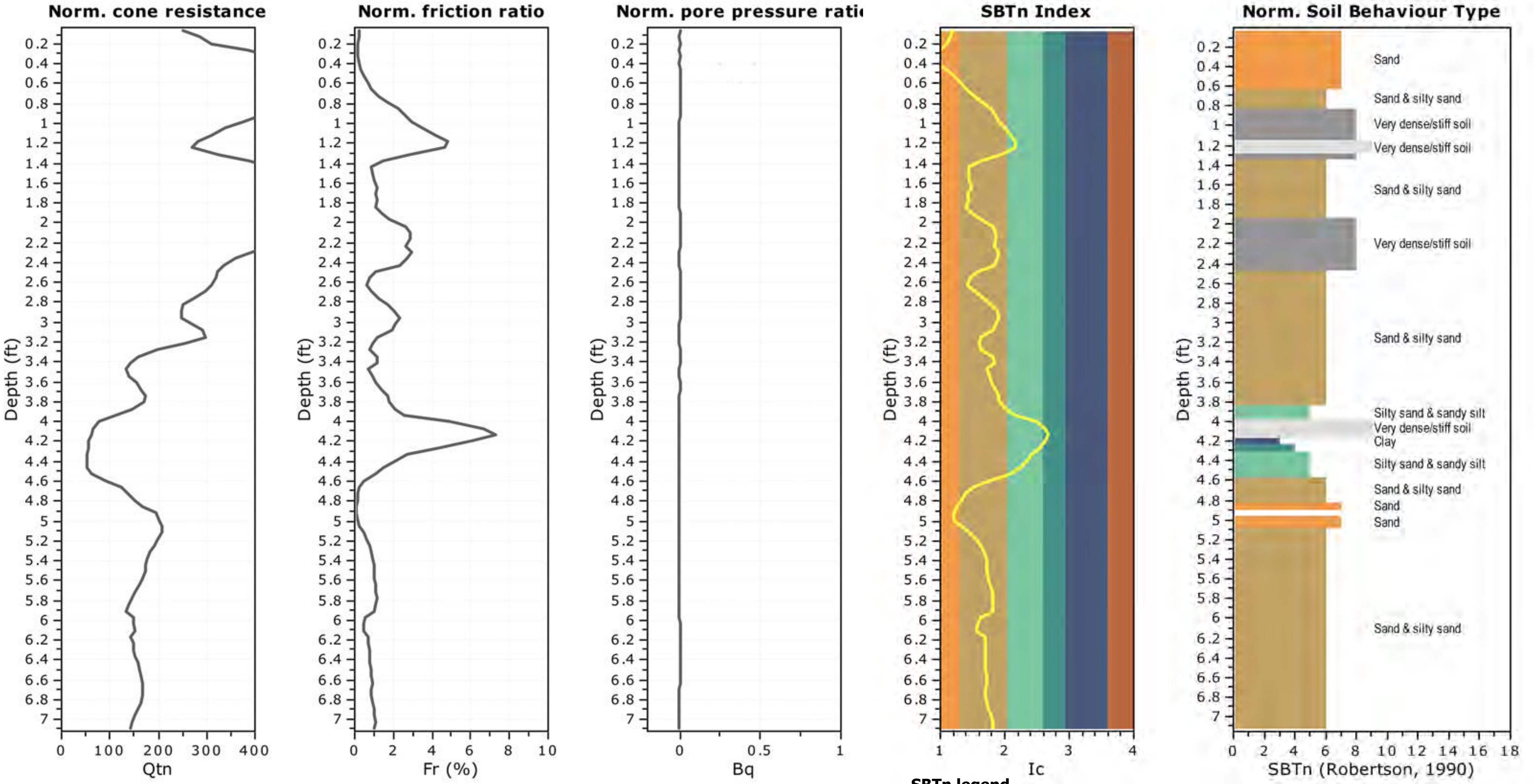
SBT legend

🟥 1. Sensitive fine grained
🟫 2. Organic material
🟦 3. Clay to silty clay
🟩 4. Clayey silt to silty clay
🟩 5. Silty sand to sandy silt
🟨 6. Clean sand to silty sand
🟧 7. Gravely sand to sand
⬛ 8. Very stiff sand to clayey sand
⬜ 9. Very stiff fine grained

HILLIS-CARNES
ENGINEERING ASSOCIATES

Project: **South Market Street**
Location: **Wilmington, DE**

CPT: RB-CPT-4
Total depth: 7.09 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:



SBTn legend

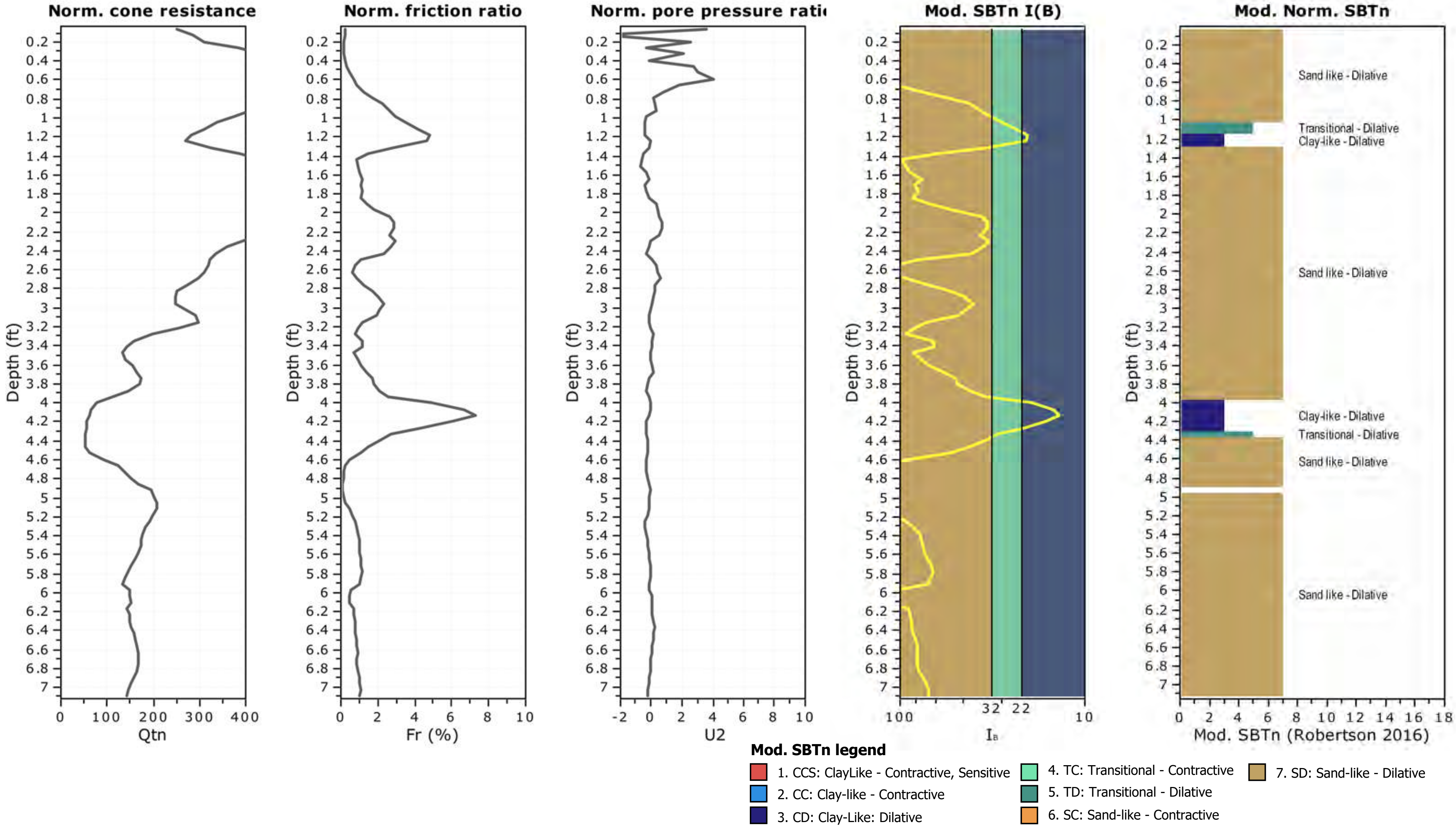
🟥 1. Sensitive fine grained
🟫 2. Organic material
🟦 3. Clay to silty clay
🟩 4. Clayey silt to silty clay
🟩 5. Silty sand to sandy silt
🟫 6. Clean sand to silty sand
🟧 7. Gravely sand to sand
⬛ 8. Very stiff sand to clayey sand
⬜ 9. Very stiff fine grained

HILLIS-CARNES
ENGINEERING ASSOCIATES

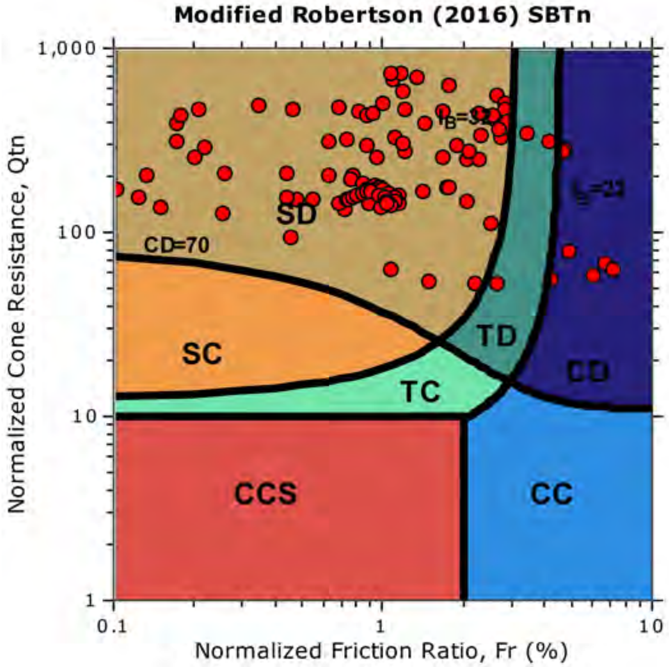
CPT: RB-CPT-4

Total depth: 7.09 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

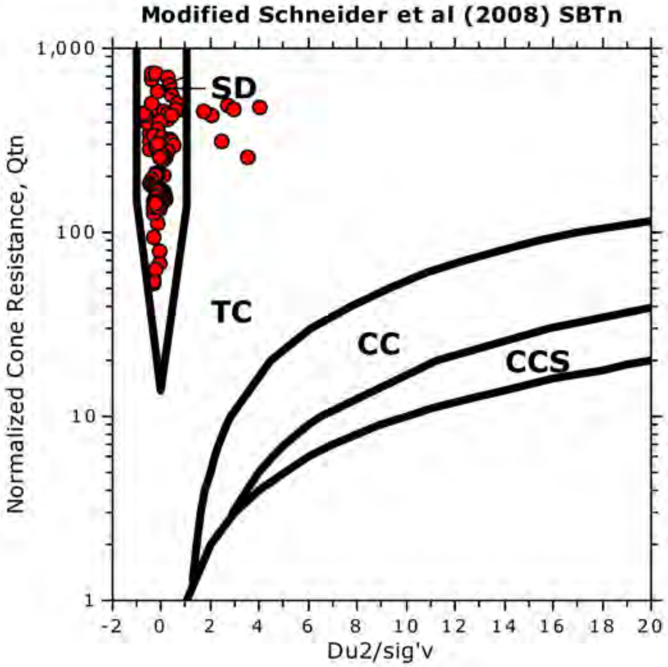
Project: **South Market Street**
Location: **Wilmington, DE**



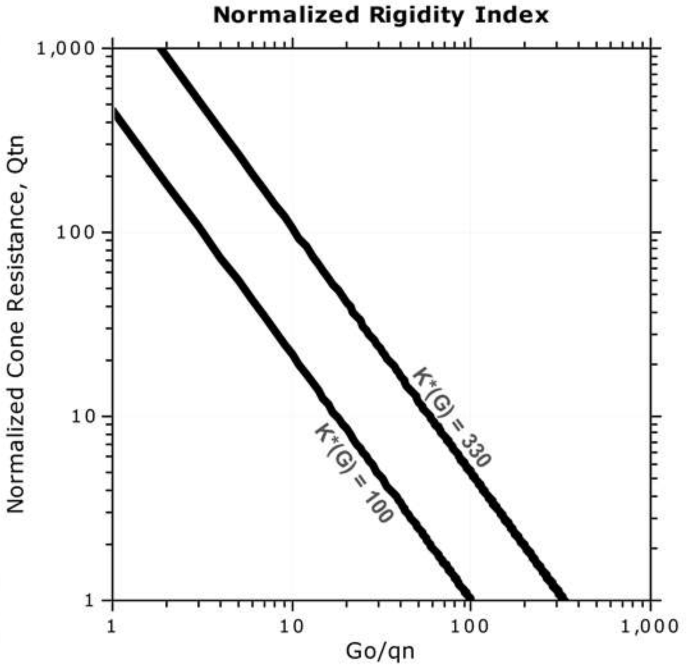
Updated SBTn plots



Modified Robertson (2016) SBTn



Modified Schneider et al (2008) SBTn



Normalized Rigidity Index

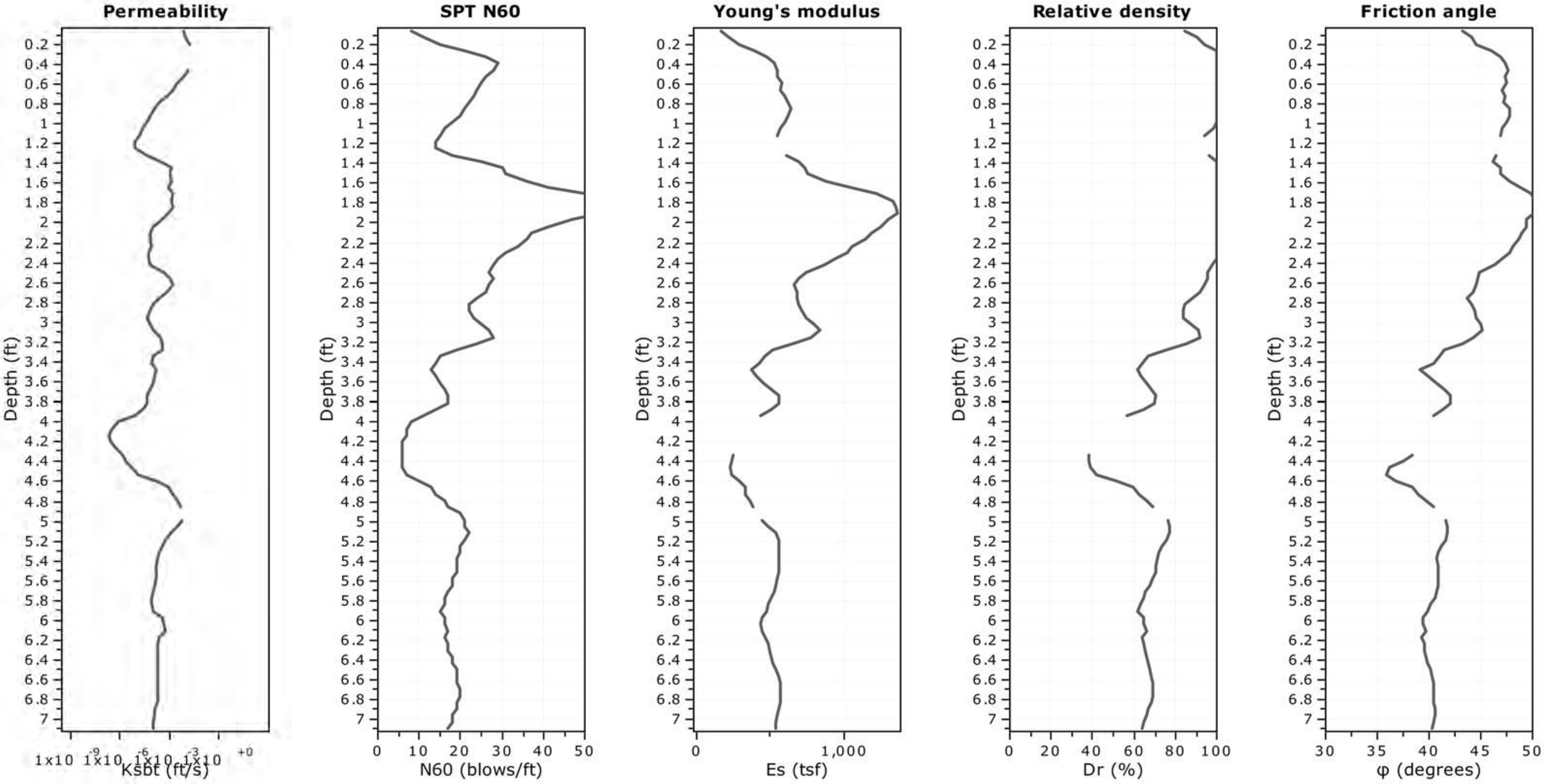
CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

HILLIS-CARNES
ENGINEERING ASSOCIATES

CPT: RB-CPT-4
Total depth: 7.09 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**



Calculation parameters

Permeability: Based on SBT_n

SPT N_{60}: Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

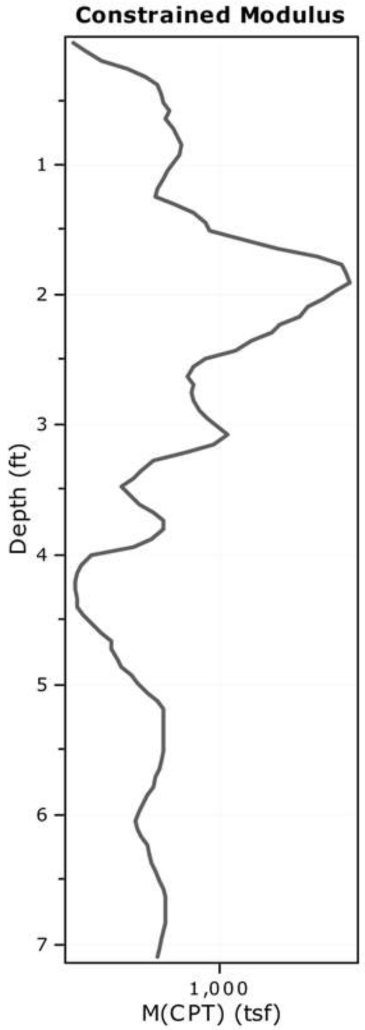
Relative density constant, C_{Dr}: 350.0

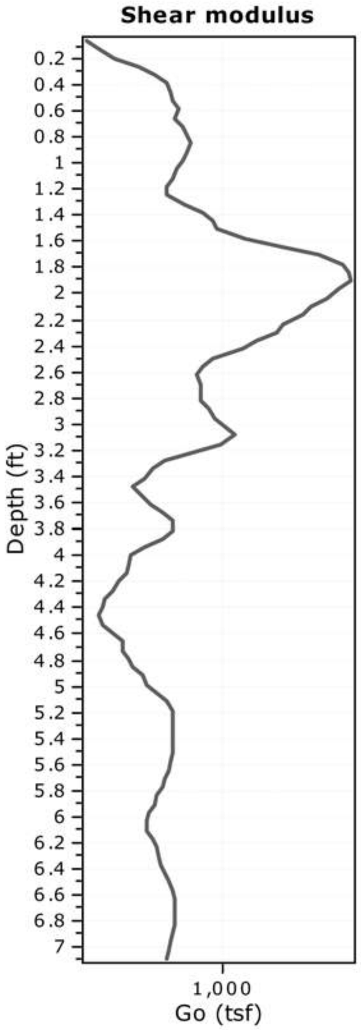
Phi: Based on Kulhawy & Mayne (1990)

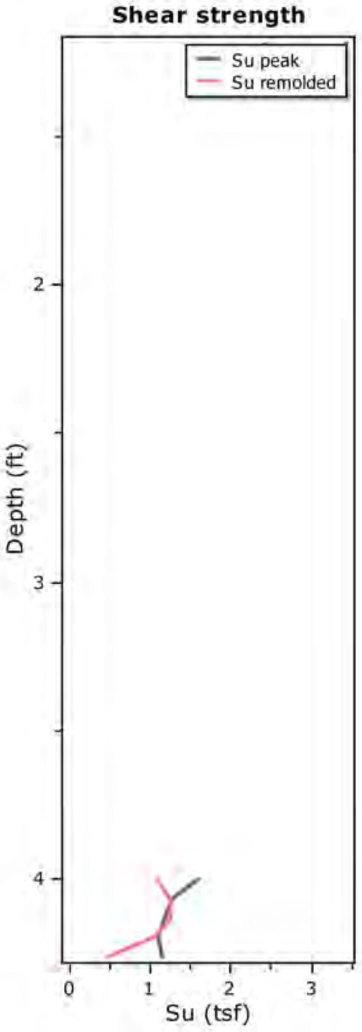
CPT: RB-CPT-4

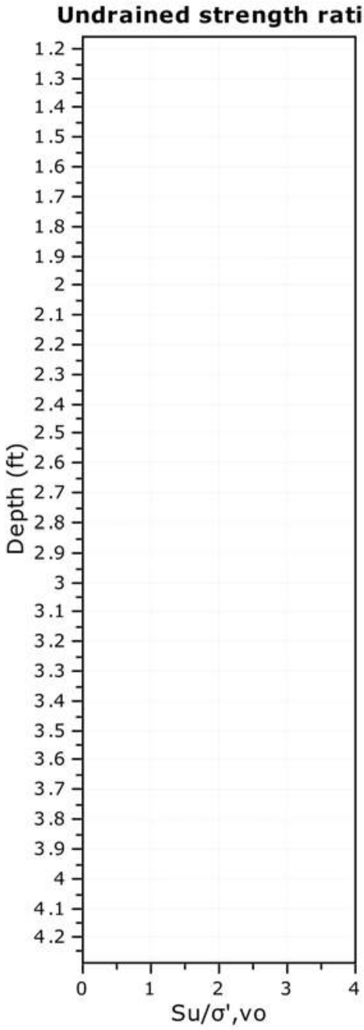
Total depth: 7.09 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

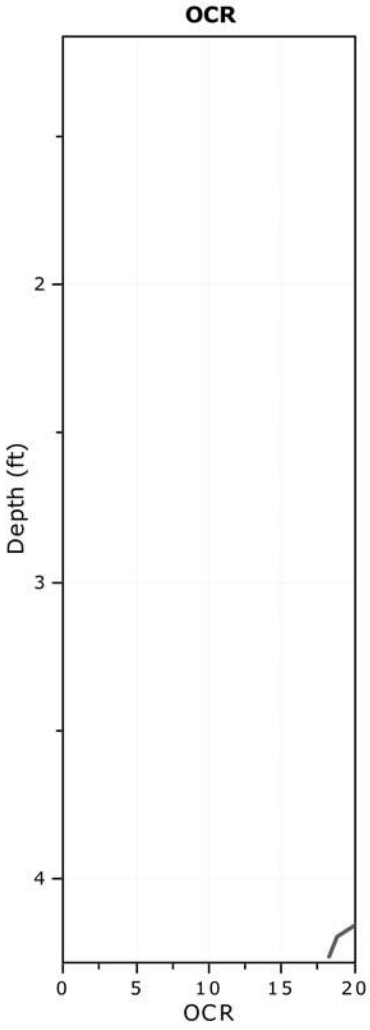
Project: **South Market Street**
Location: **Wilmington, DE**


Constrained Modulus


Shear modulus


Shear strength


Undrained strength ratio


OCR

Calculation parameters

Constrained modulus: Based on variable alpha using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable alpha using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33
● Flat Dilatometer Test data

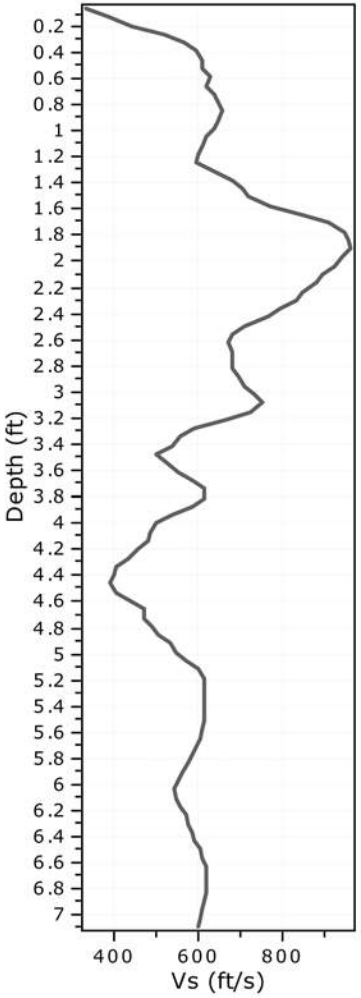
HILLIS-CARNES
ENGINEERING ASSOCIATES

CPT: RB-CPT-4

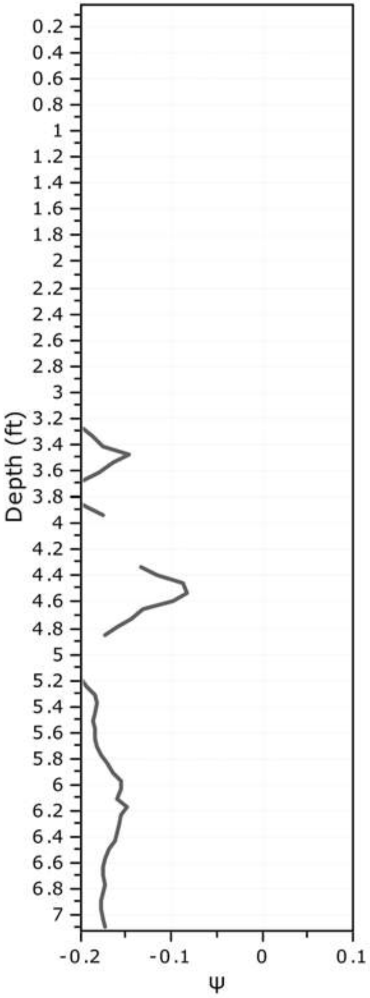
Total depth: 7.09 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**

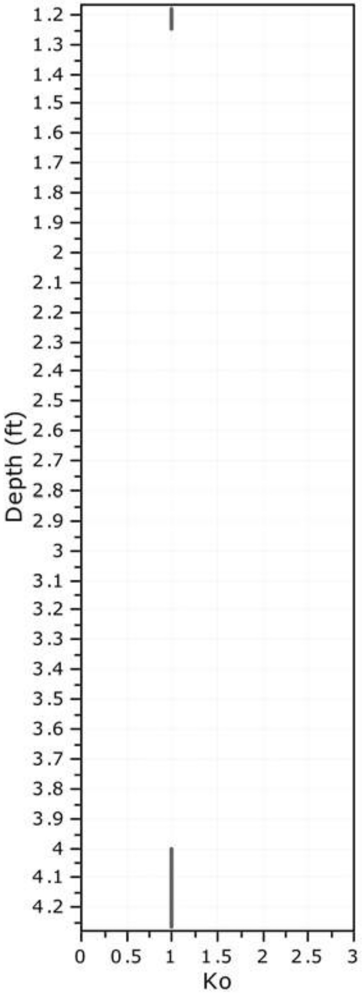
Shear Wave velocity



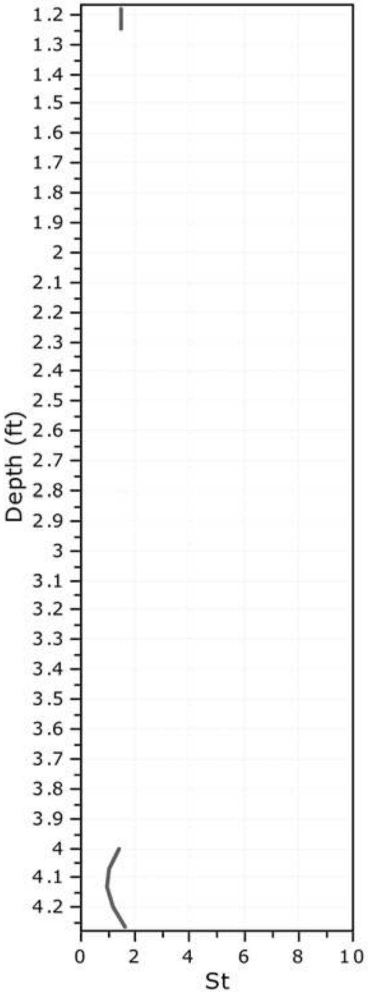
State parameter



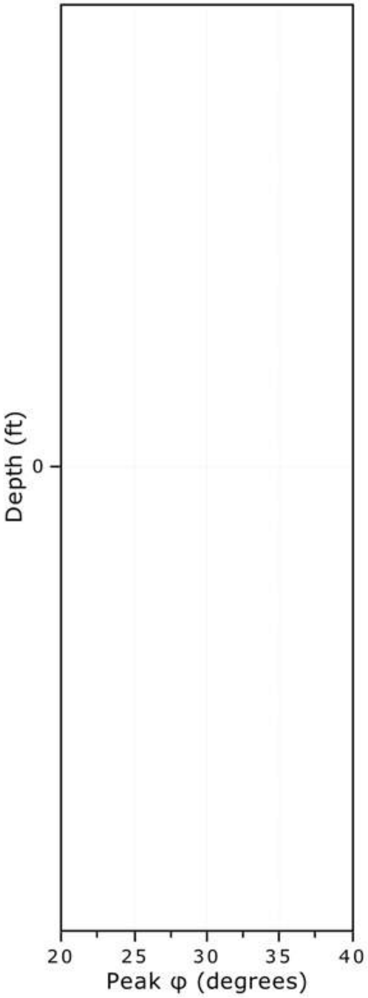
In-situ stress ratio



Soil sensitivity



Effective friction angle



Calculation parameters

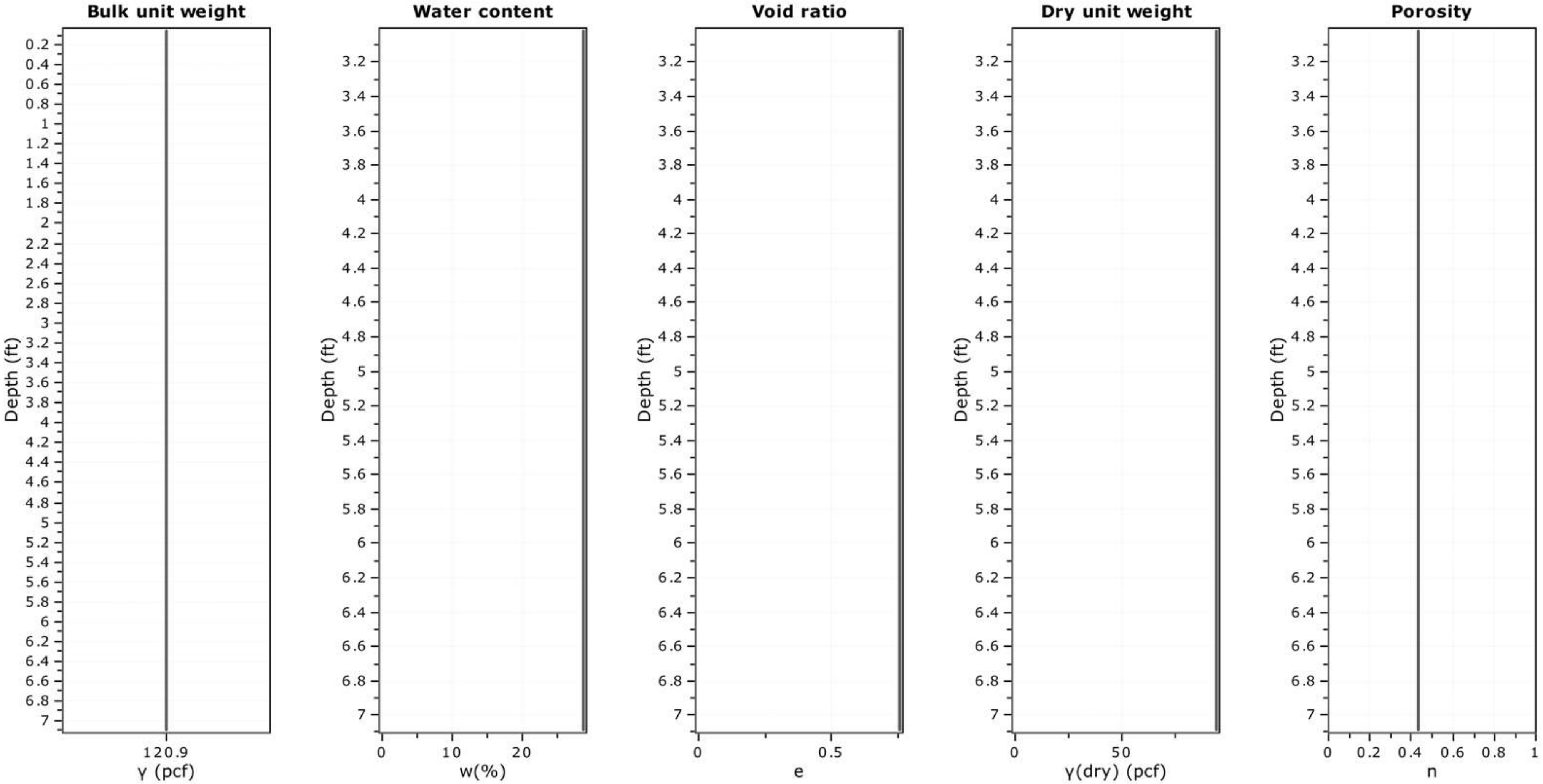
Soil Sensitivity factor, N_S: 7.00

HILLIS-CARNES
ENGINEERING ASSOCIATES

CPT: RB-CPT-4

Total depth: 7.09 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

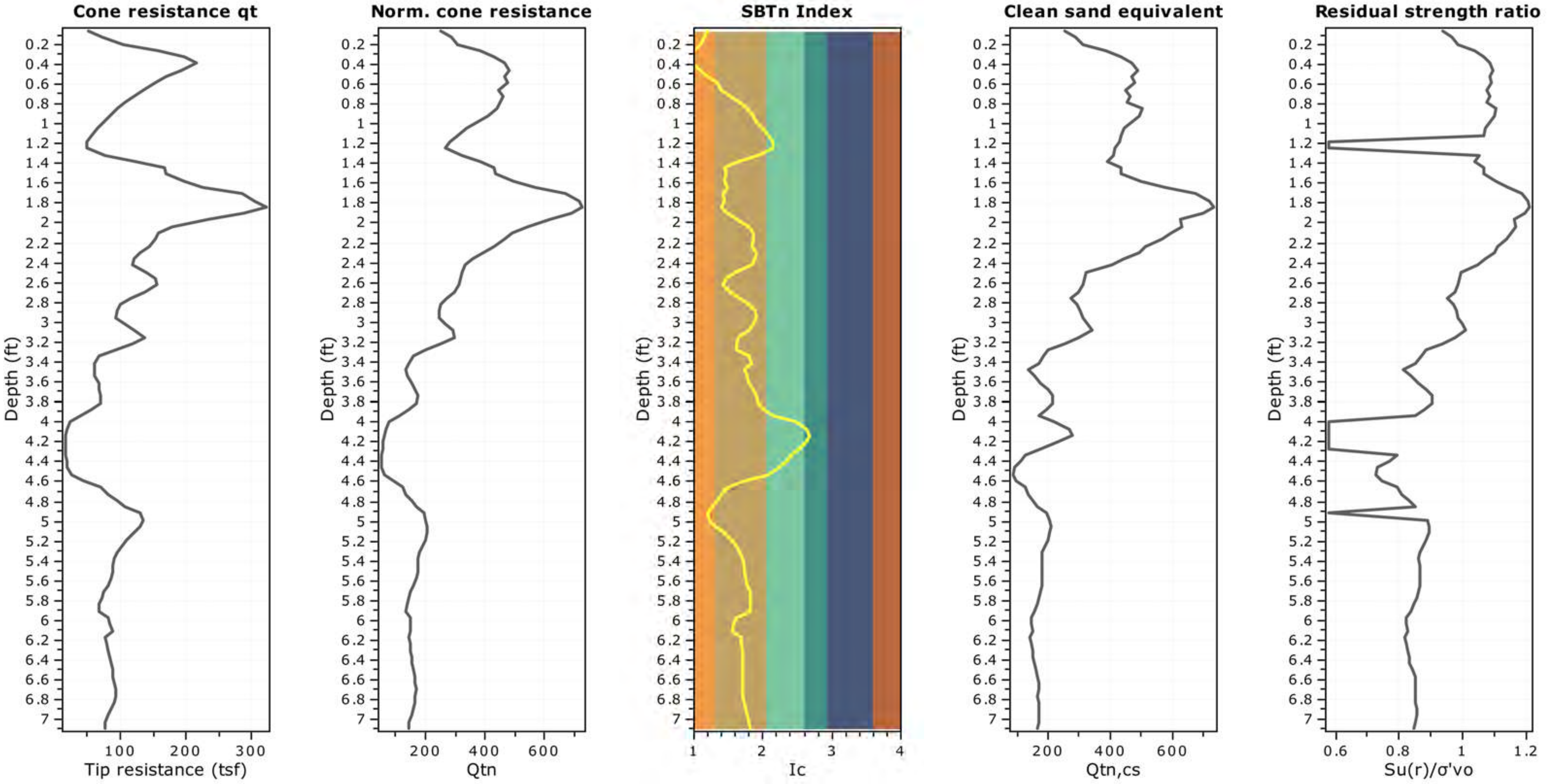
Project: **South Market Street**
Location: **Wilmington, DE**



CPT: RB-CPT-4

Total depth: 7.09 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**

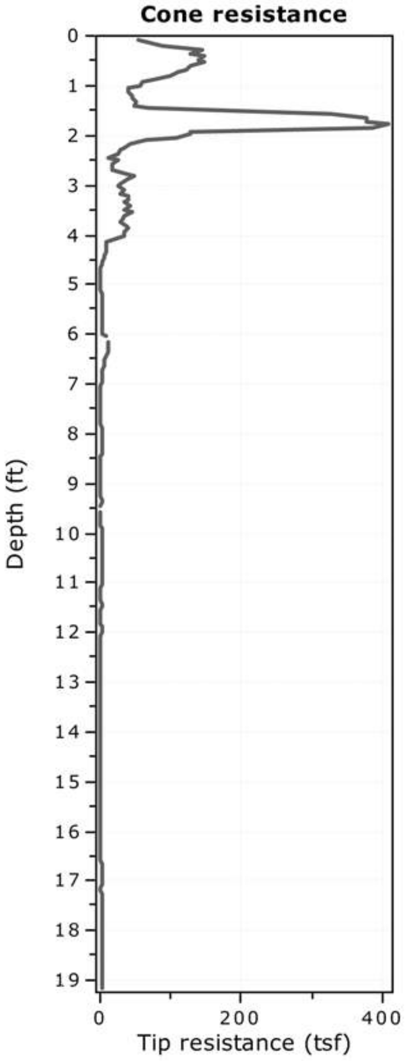


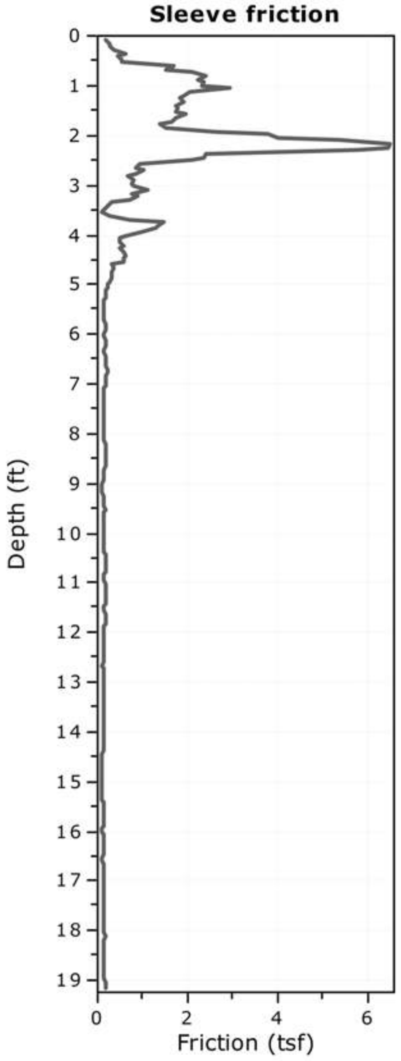
HILLIS-CARNES
ENGINEERING ASSOCIATES

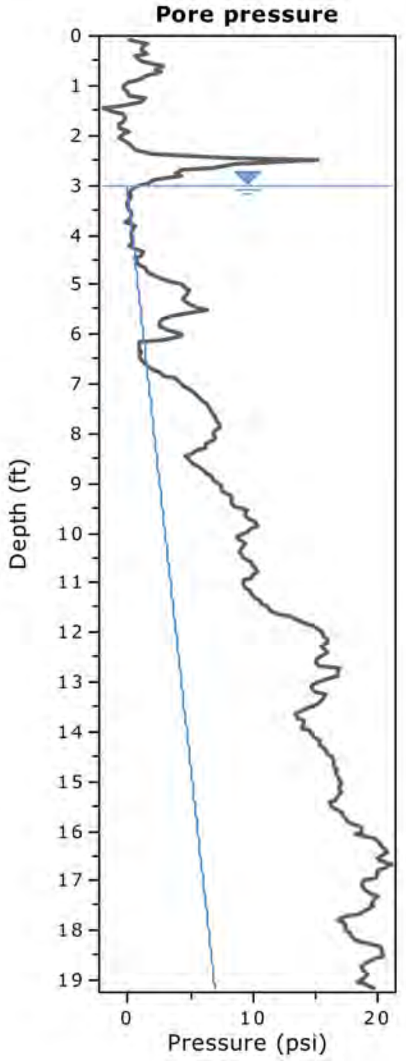
CPT: RB-CPT-4A

Total depth: 19.16 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

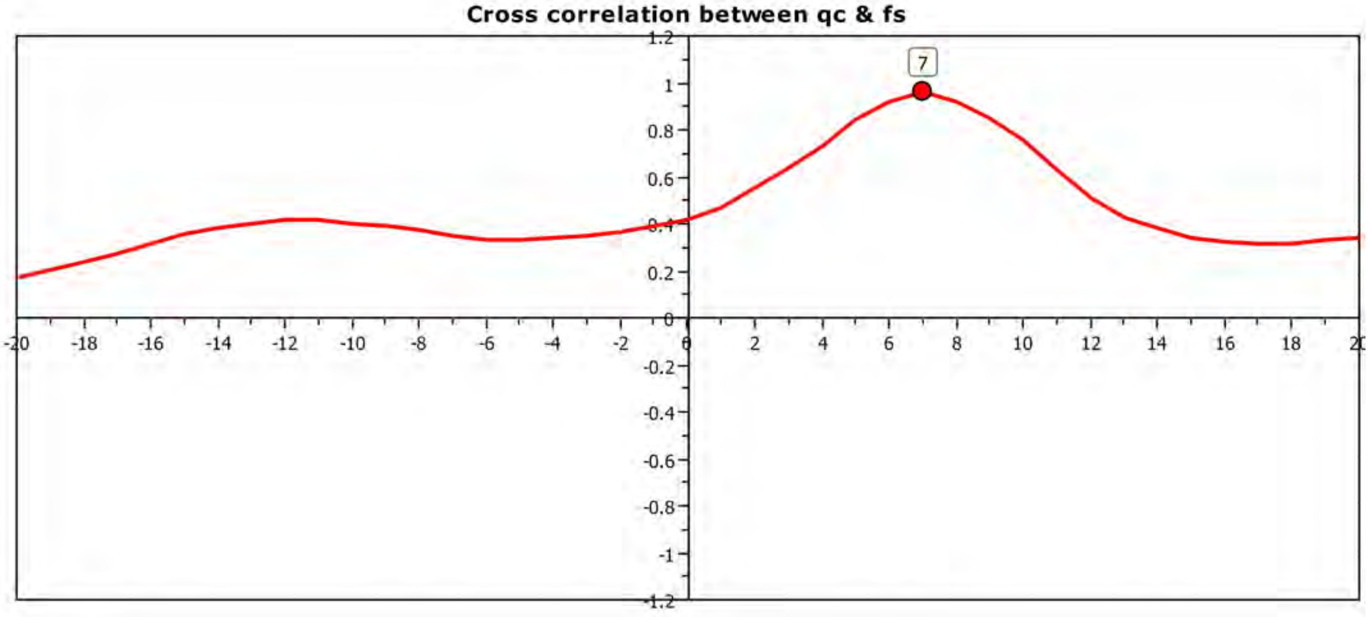
Project: **South Market Street**
Location: **Wilmington, DE**



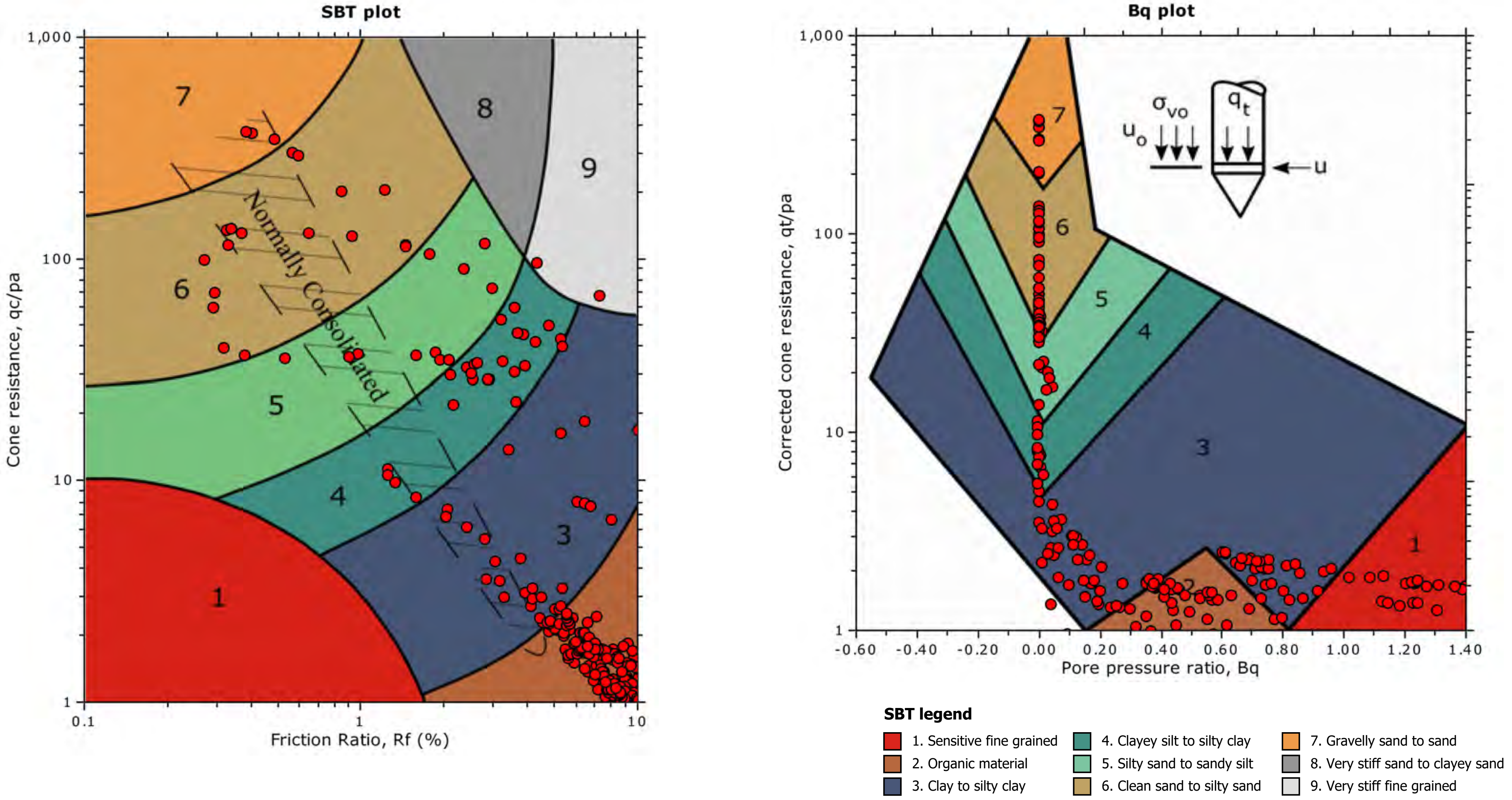




The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



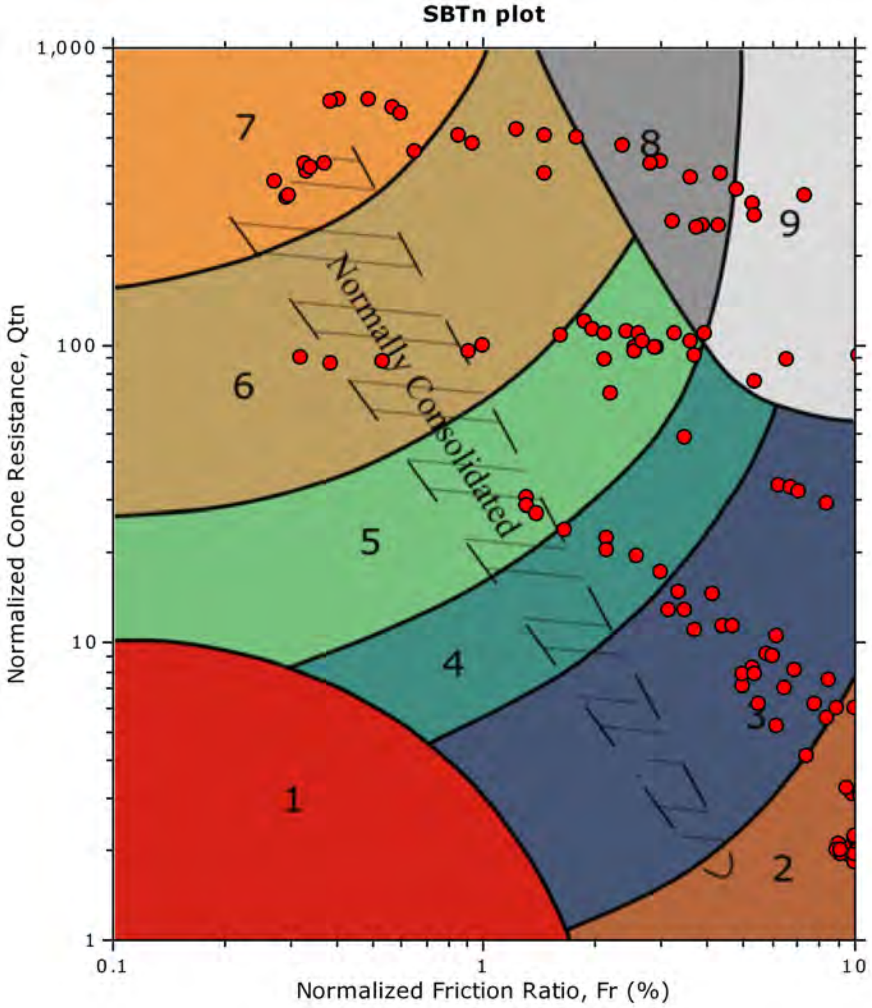
SBT - Bq plots

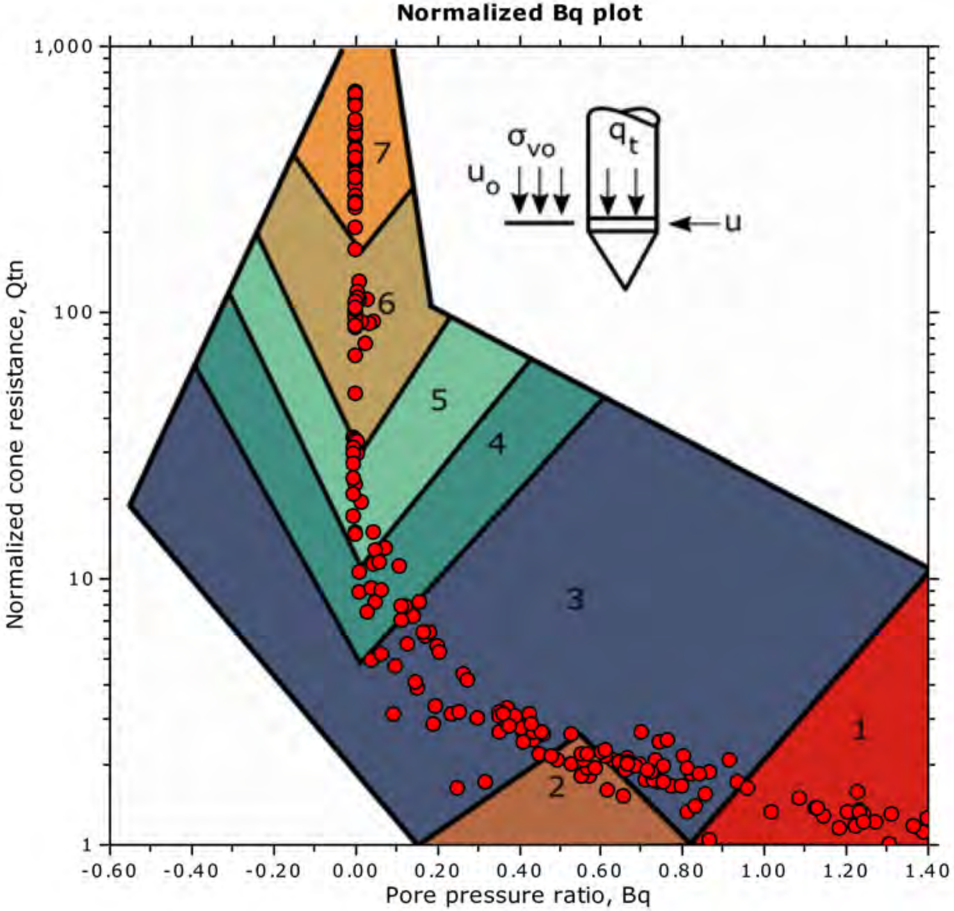

SBT plot
Cone resistance, qc/pa
1,000
100
10
1
0.1
1
10
Friction Ratio, Rf (%)
7
8
9
6
5
4
3
2
1
Normally Consolidated
Bq plot
Corrected cone resistance, qt/pa
1,000
100
10
1
-0.60
-0.40
-0.20
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
Pore pressure ratio, Bq
σvo
uo
qt
u
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravelly sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

CPT: RB-CPT-4A
Total depth: 19.16 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**

SBT - Bq plots (normalized)

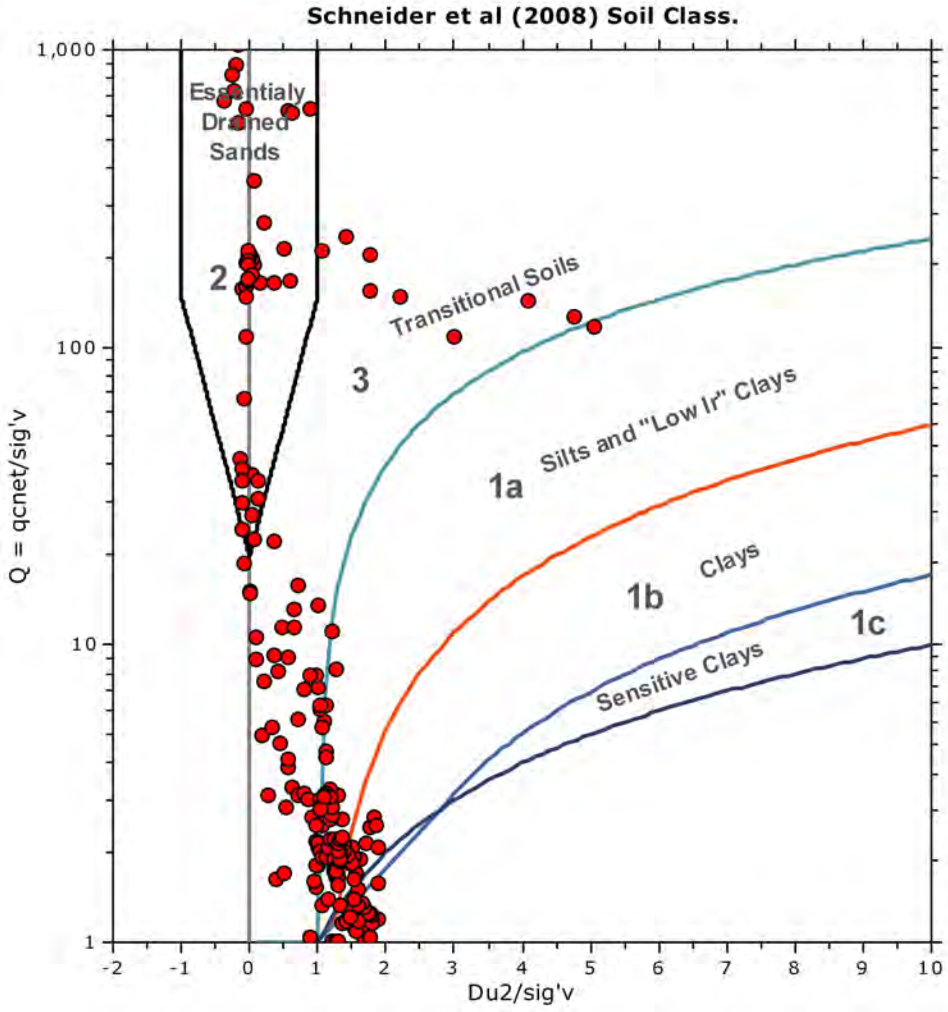


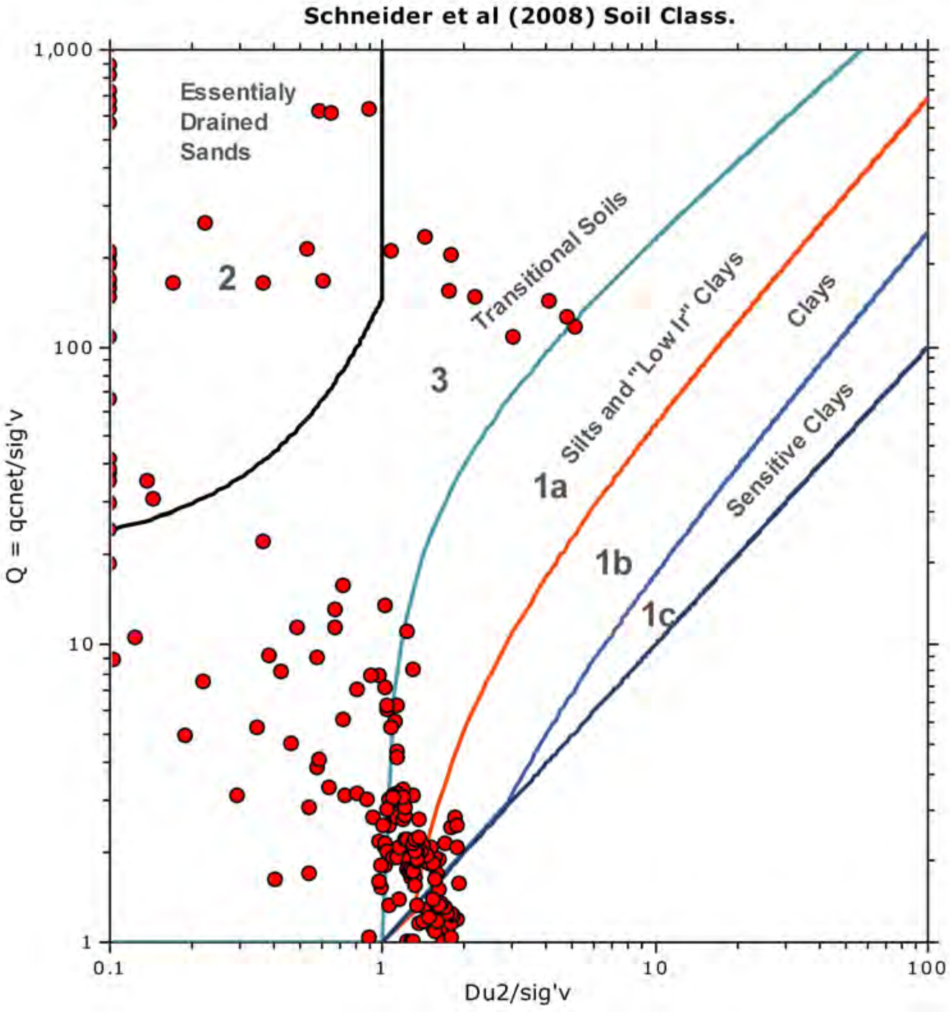


SBTn legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty clay	🟧 7. Gravelly sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬜ 8. Very stiff sand to clayey sand
🟦 3. Clay to silty clay	🟫 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

Bq plots (Schneider)





CPT: RB-CPT-4A

Total depth: 19.16 ft, Date: 10/12/2022

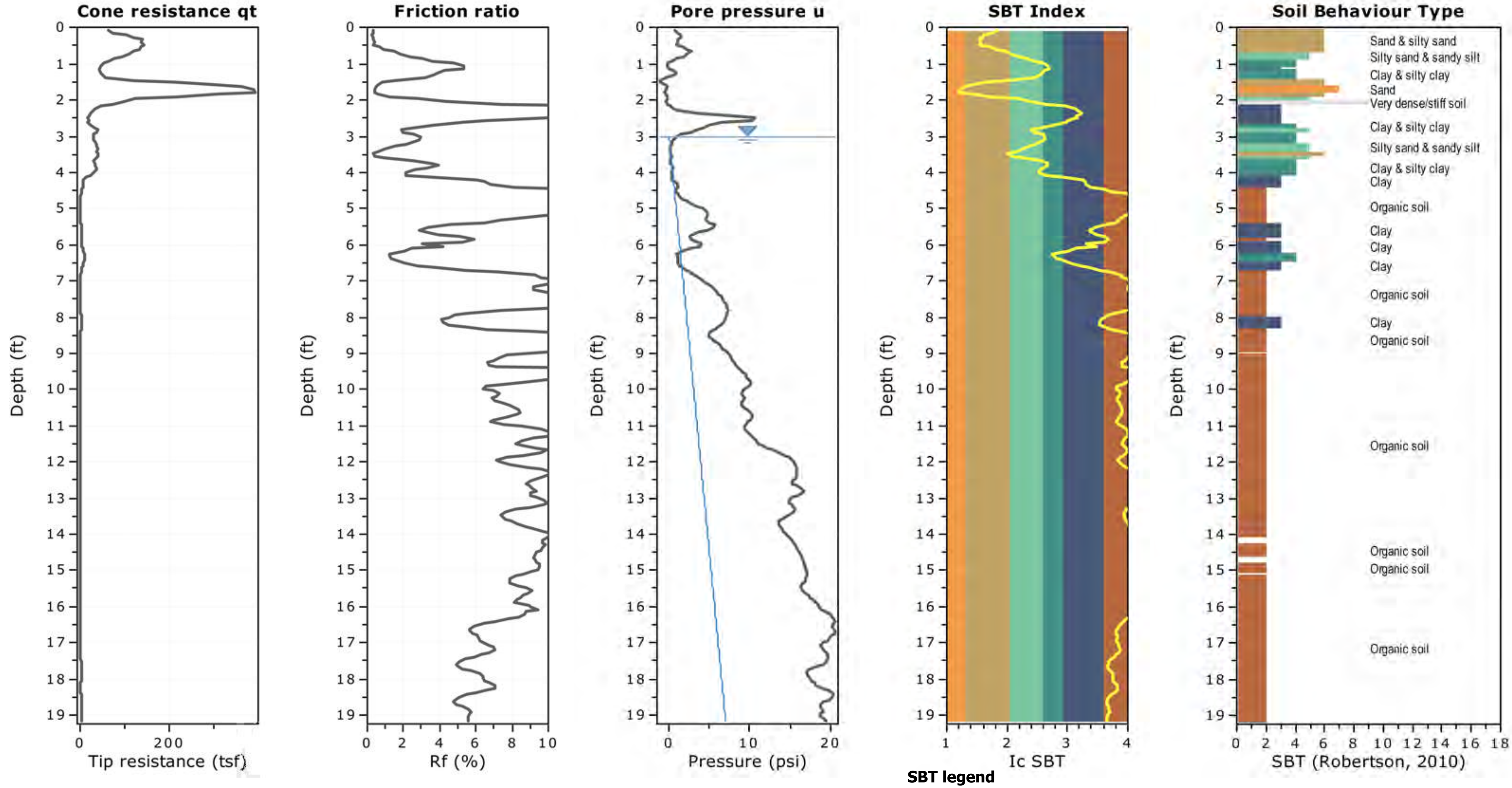
Surface Elevation: 0.00 ft

Cone Type:

Cone Operator:

Project: **South Market Street**

Location: **Wilmington, DE**



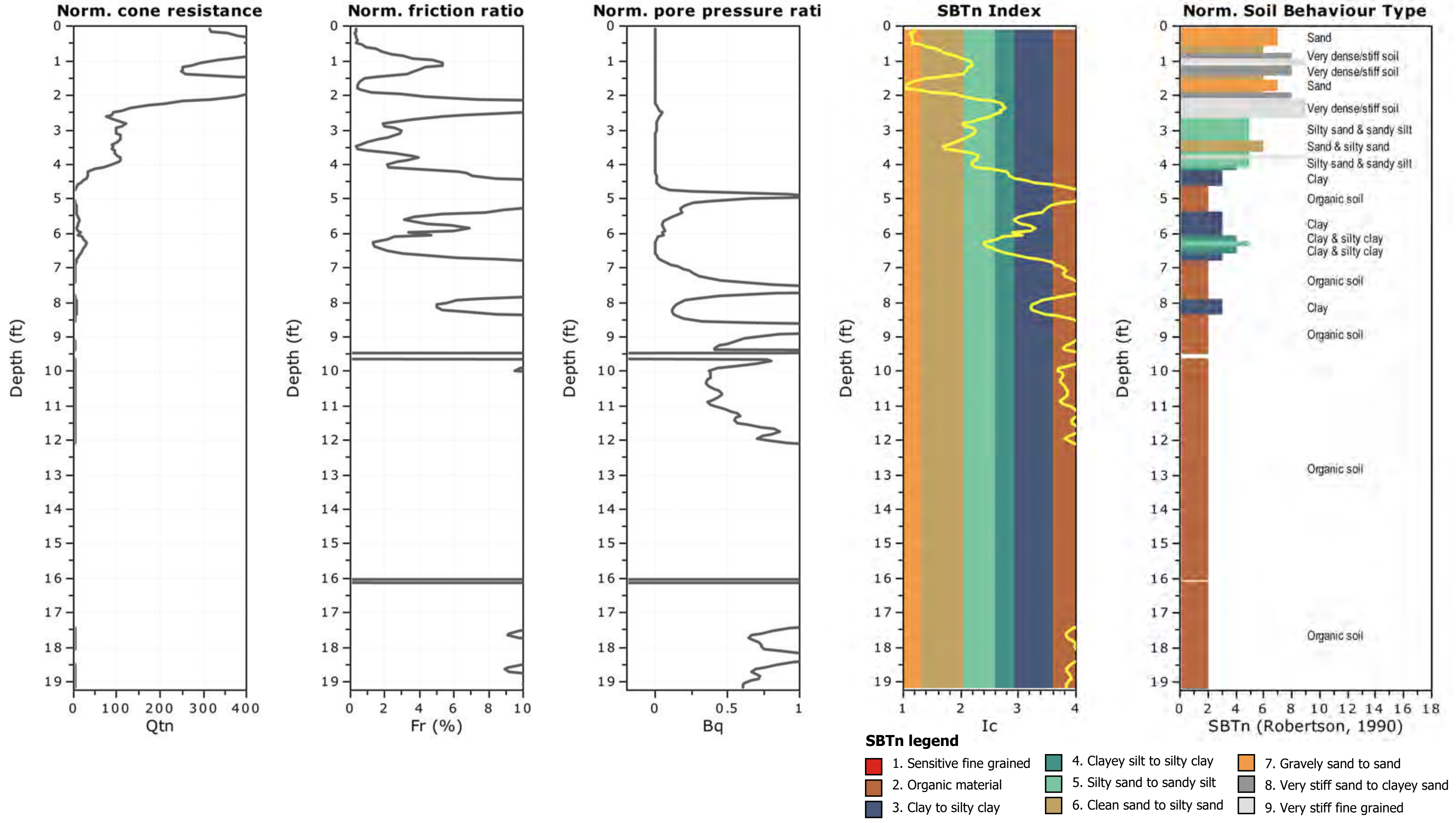
SBT legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty clay	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬜ 8. Very stiff sand to clayey sand
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

HILLIS-CARNES
ENGINEERING ASSOCIATES

Project: **South Market Street**
Location: **Wilmington, DE**

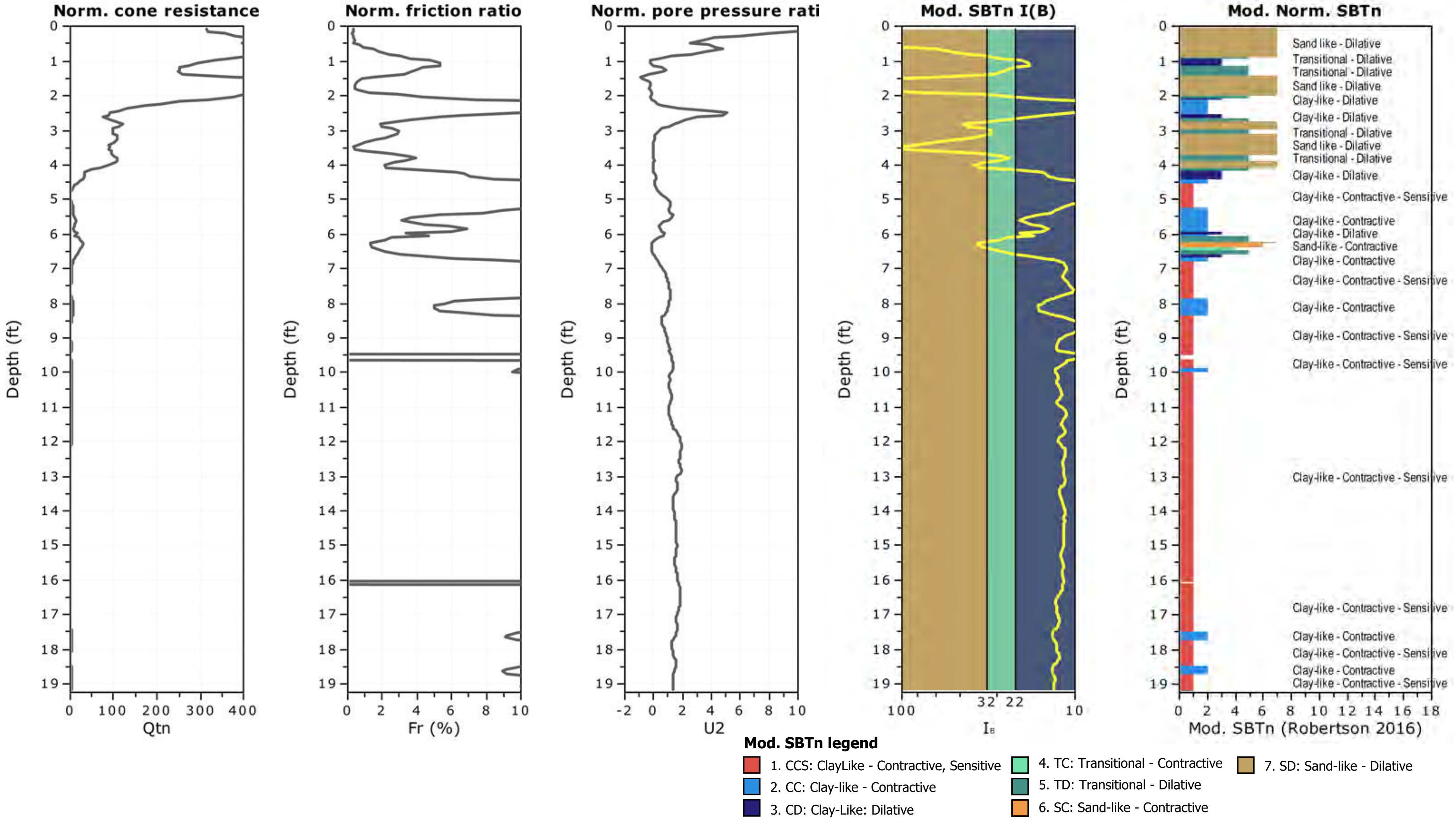
CPT: RB-CPT-4A
Total depth: 19.16 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:



HILLIS-CARNES
ENGINEERING ASSOCIATES

Project: **South Market Street**
Location: **Wilmington, DE**

CPT: RB-CPT-4A
Total depth: 19.16 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:



CPT: RB-CPT-4A

Total depth: 19.16 ft, Date: 10/12/2022

Surface Elevation: 0.00 ft

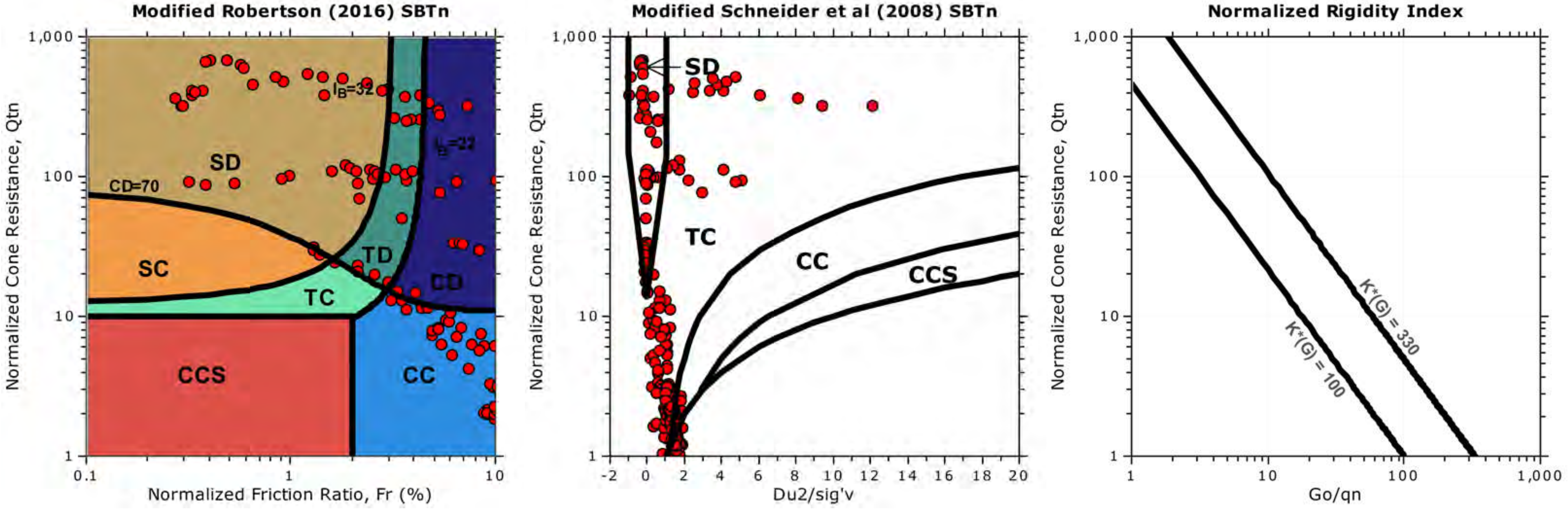
Cone Type:

Cone Operator:

Project: **South Market Street**

Location: **Wilmington, DE**

Updated SBTn plots



CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

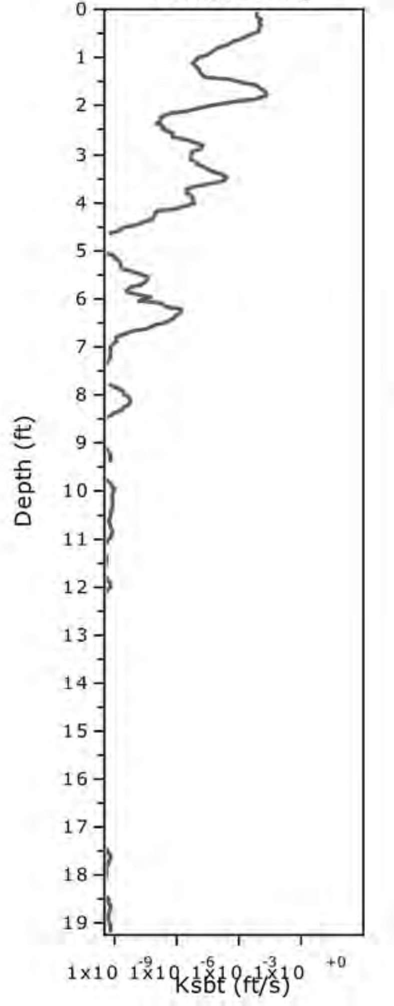
K(G) > 330: Soils with significant microstructure (e.g. age/cementation)

CPT: RB-CPT-4A

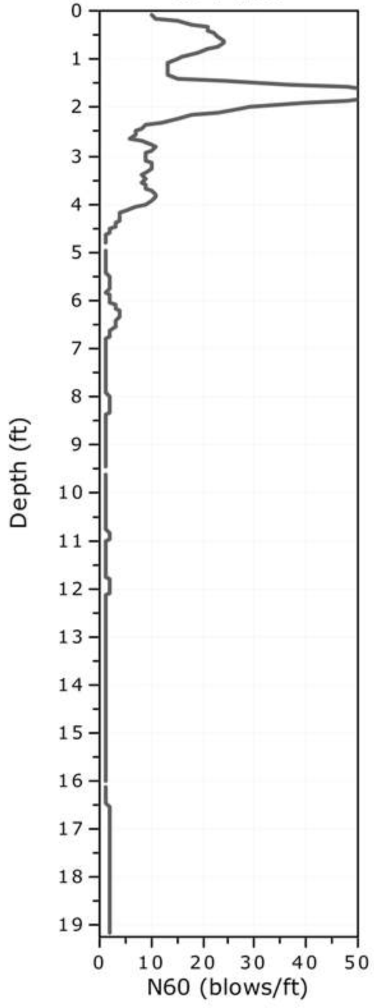
Total depth: 19.16 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**

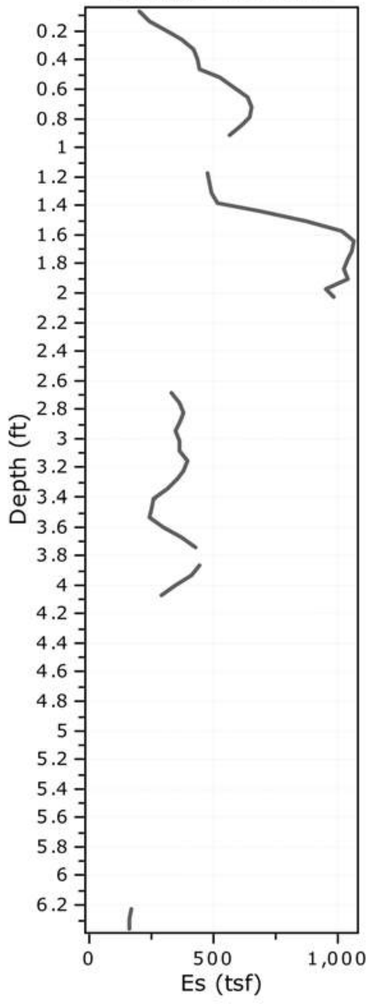
Permeability



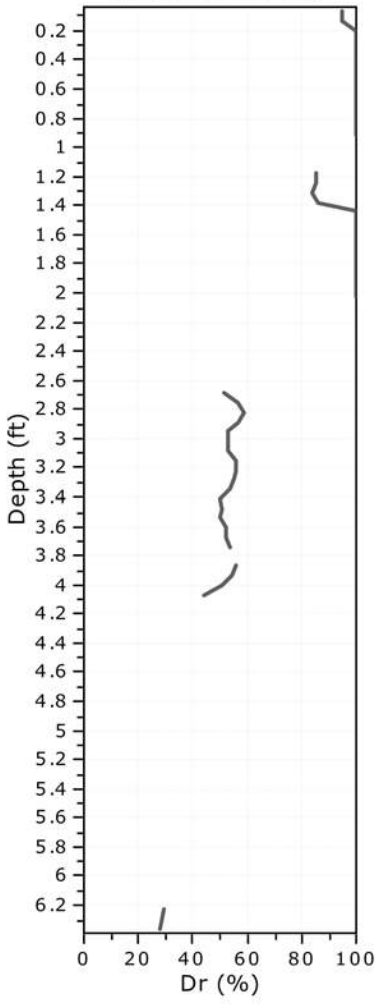
SPT N60



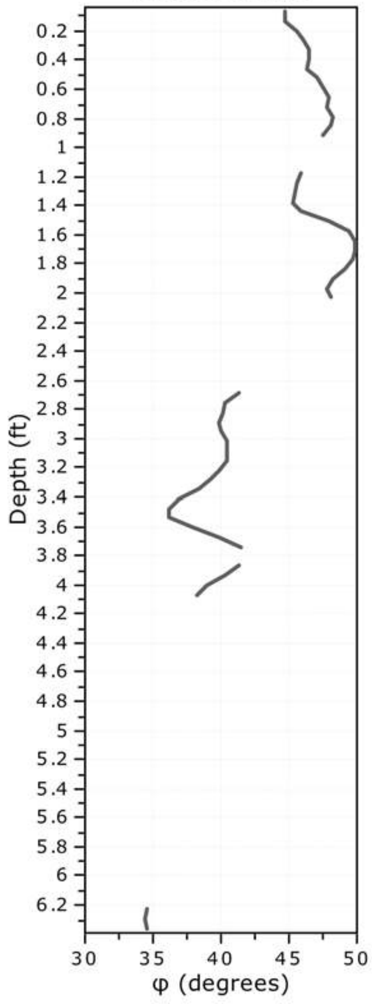
Young's modulus



Relative density



Friction angle



Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young’s modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)

CPT: RB-CPT-4A

Total depth: 19.16 ft, Date: 10/12/2022

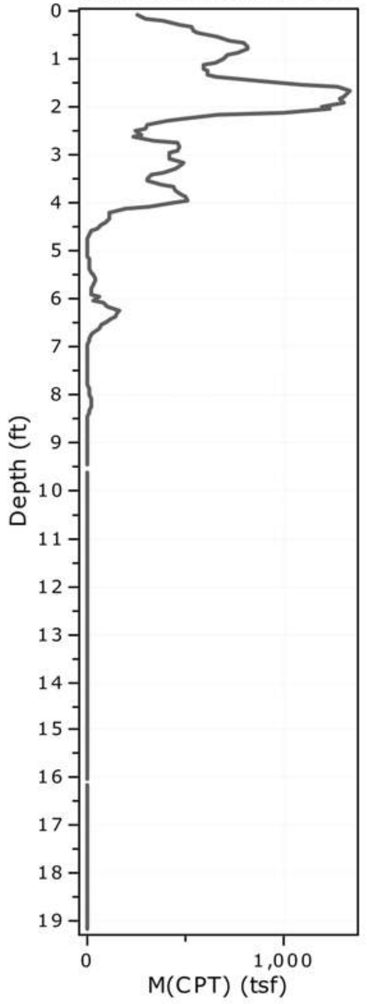
Surface Elevation: 0.00 ft

Cone Type:

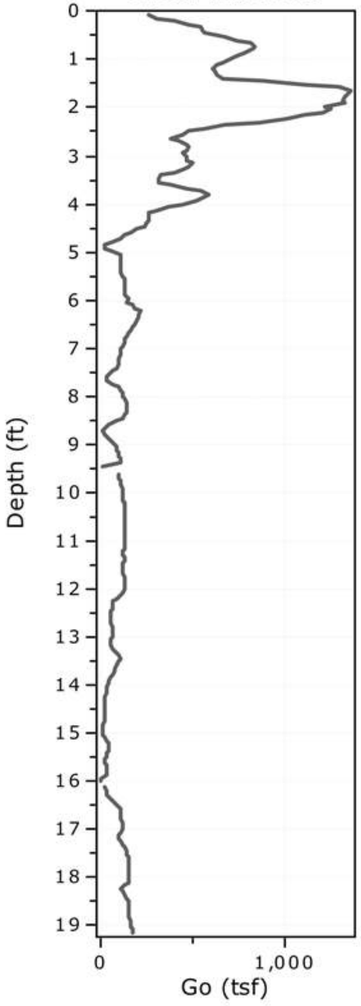
Cone Operator:

Project: **South Market Street**

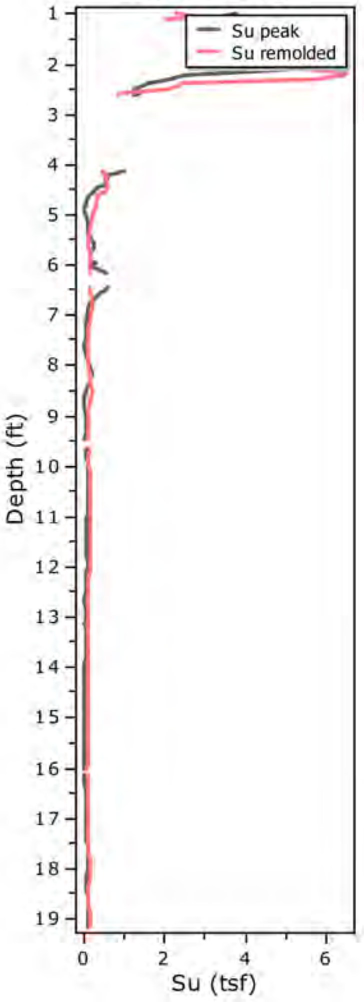
Location: **Wilmington, DE**



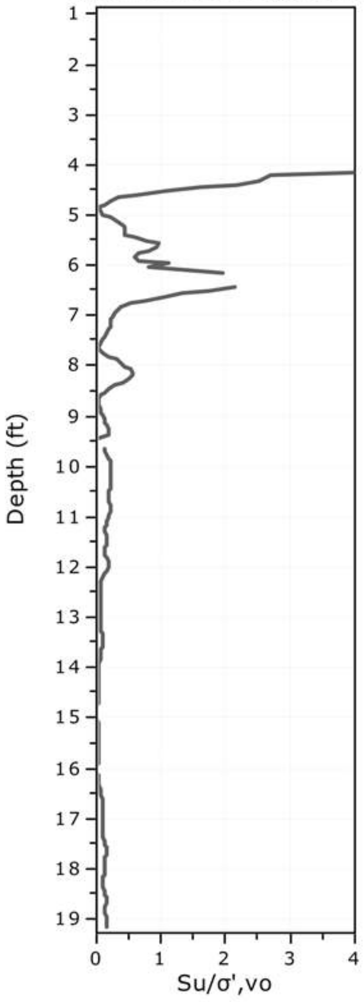
Constrained Modulus



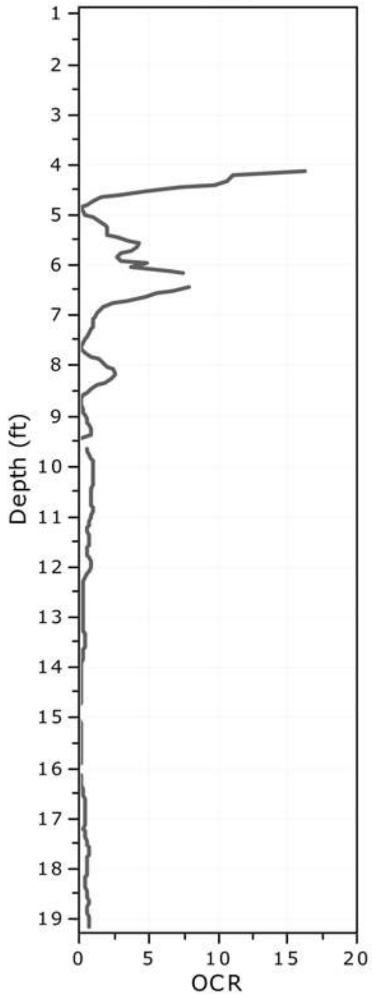
Shear modulus



Shear strength



Undrained strength ratio



OCR

Calculation parameters

Constrained modulus: Based on variable alpha using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable alpha using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33

—●— Flat Dilatometer Test data

CPT: RB-CPT-4A

Total depth: 19.16 ft, Date: 10/12/2022

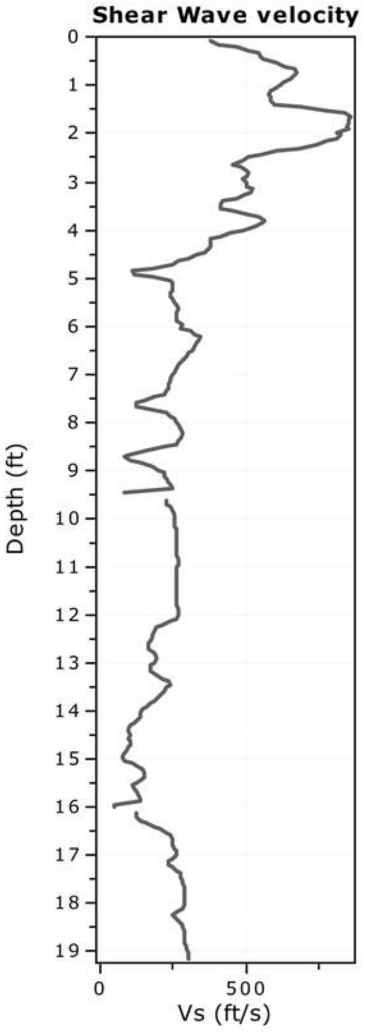
Surface Elevation: 0.00 ft

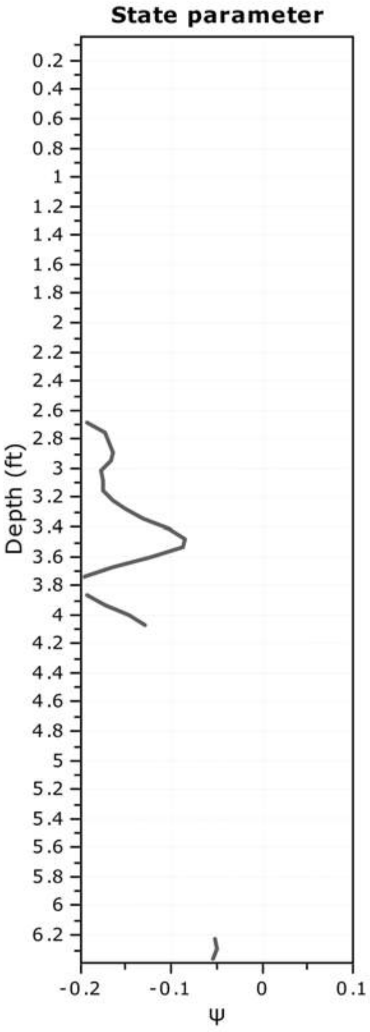
Cone Type:

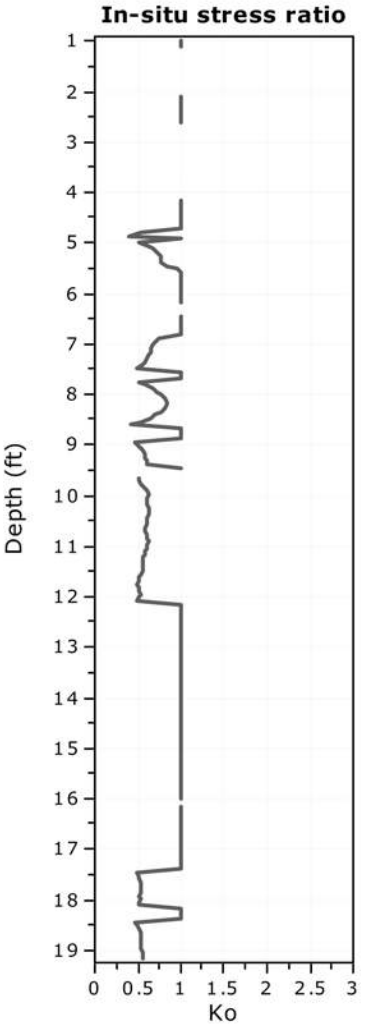
Cone Operator:

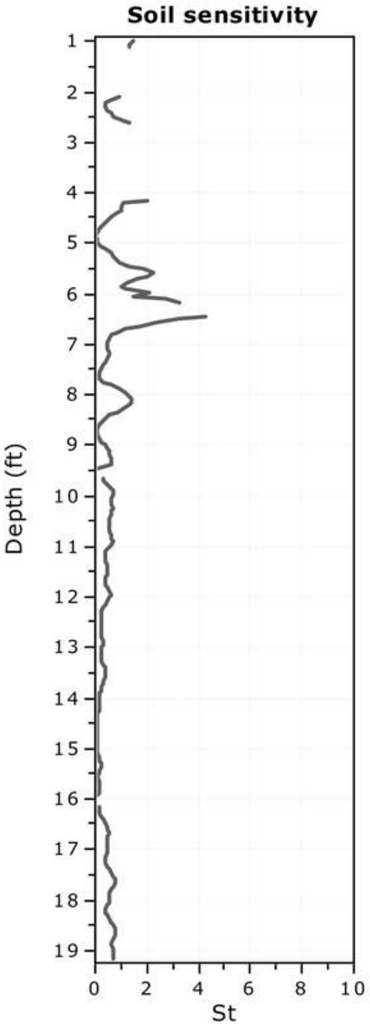
Project: **South Market Street**

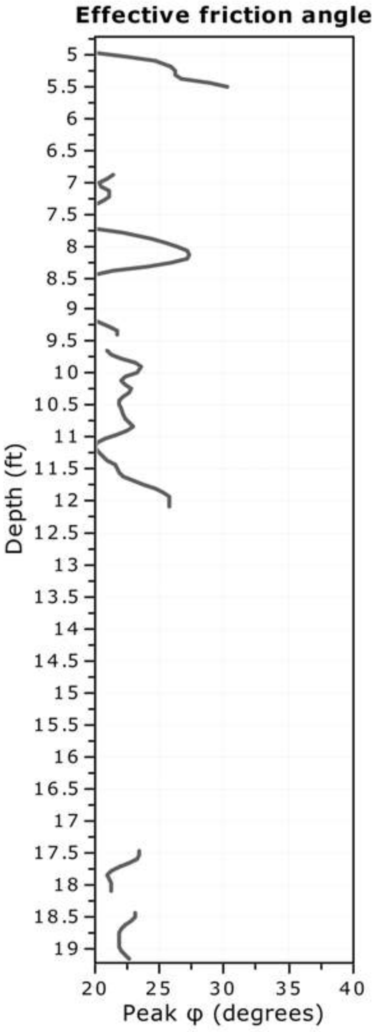
Location: **Wilmington, DE**











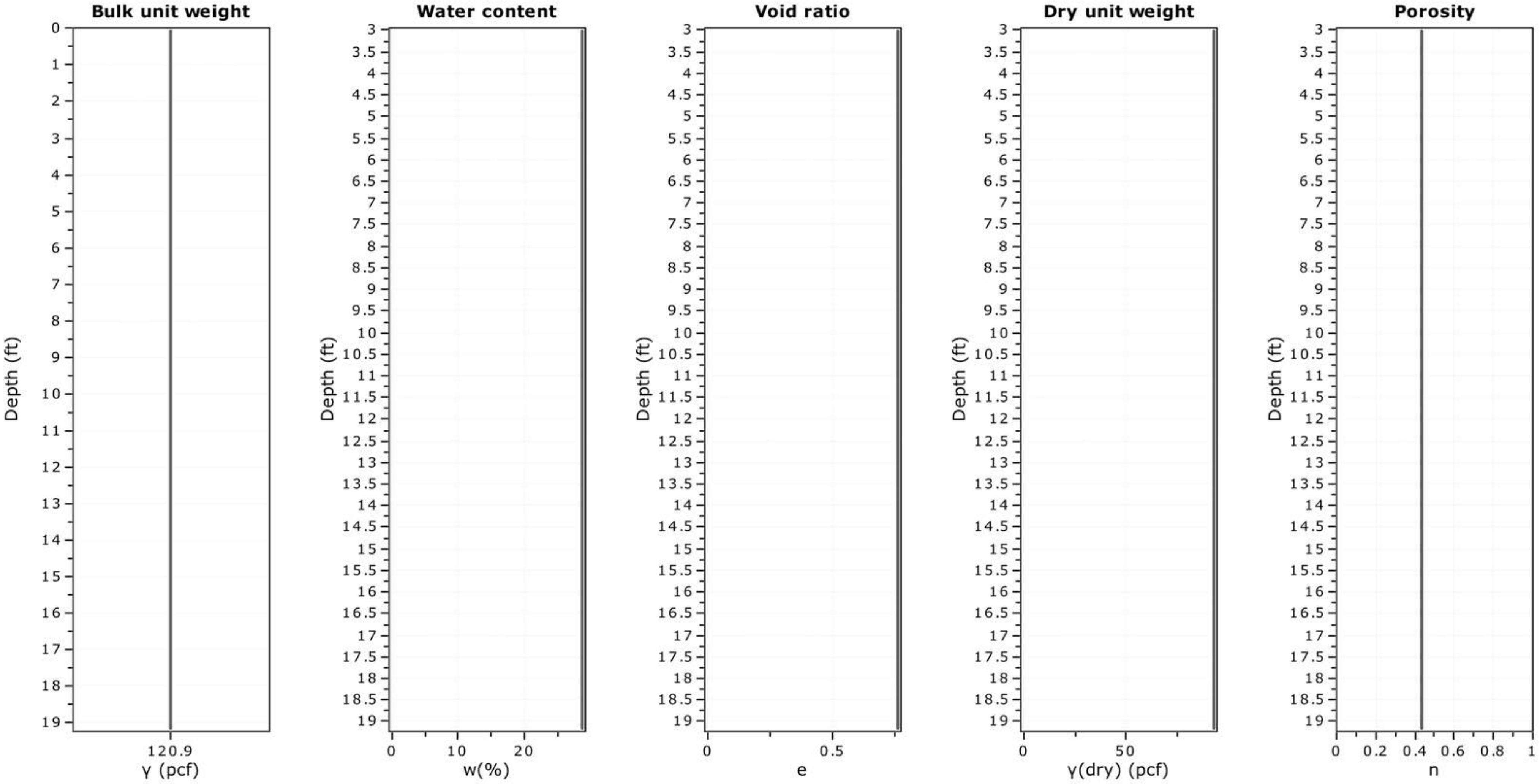
Calculation parameters

Soil Sensitivity factor, N_S: 7.00

CPT: RB-CPT-4A

Total depth: 19.16 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

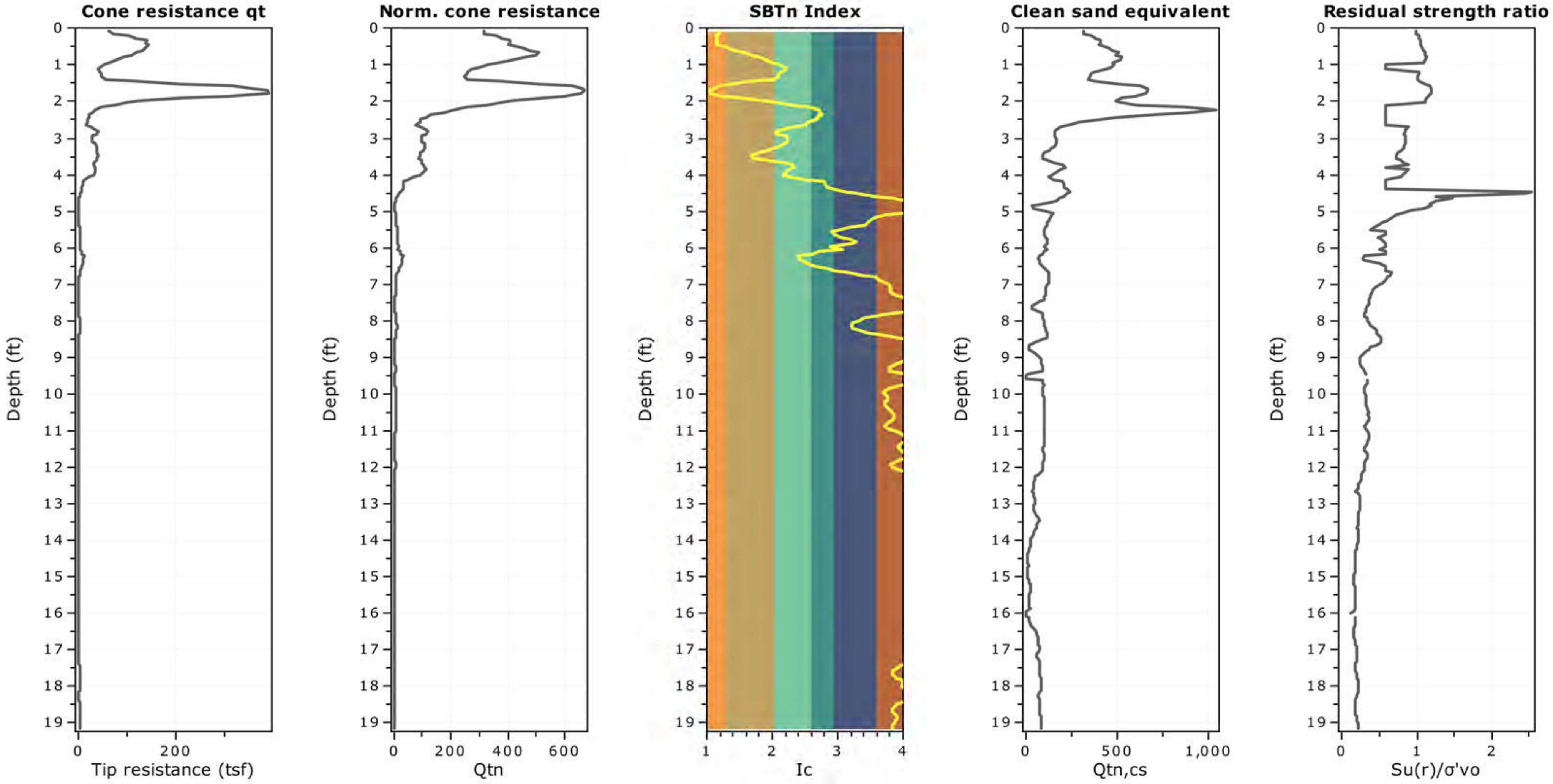
Project: South Market Street
Location: Wilmington, DE



CPT: RB-CPT-4A

Total depth: 19.16 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

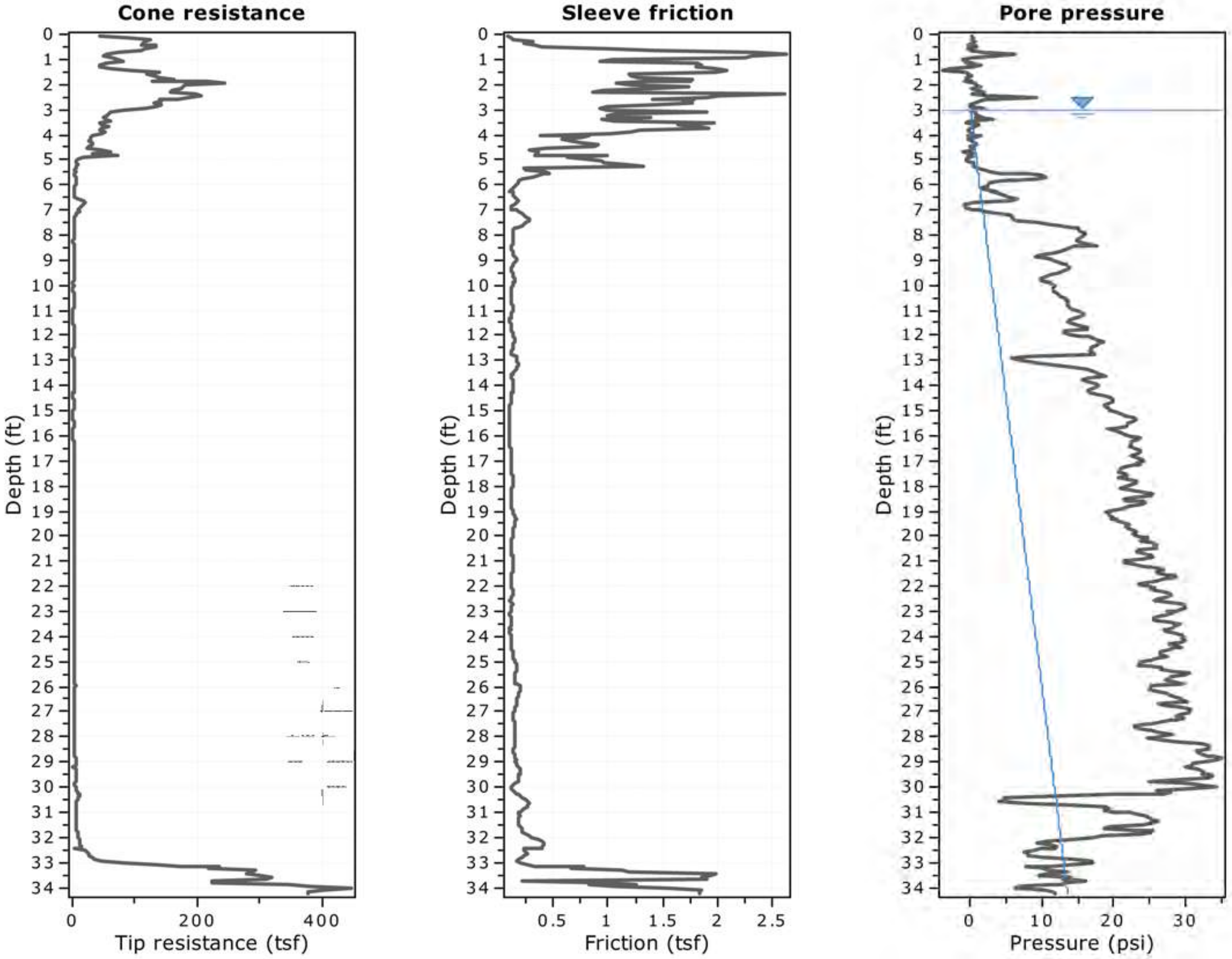
Project: **South Market Street**
Location: **Wilmington, DE**



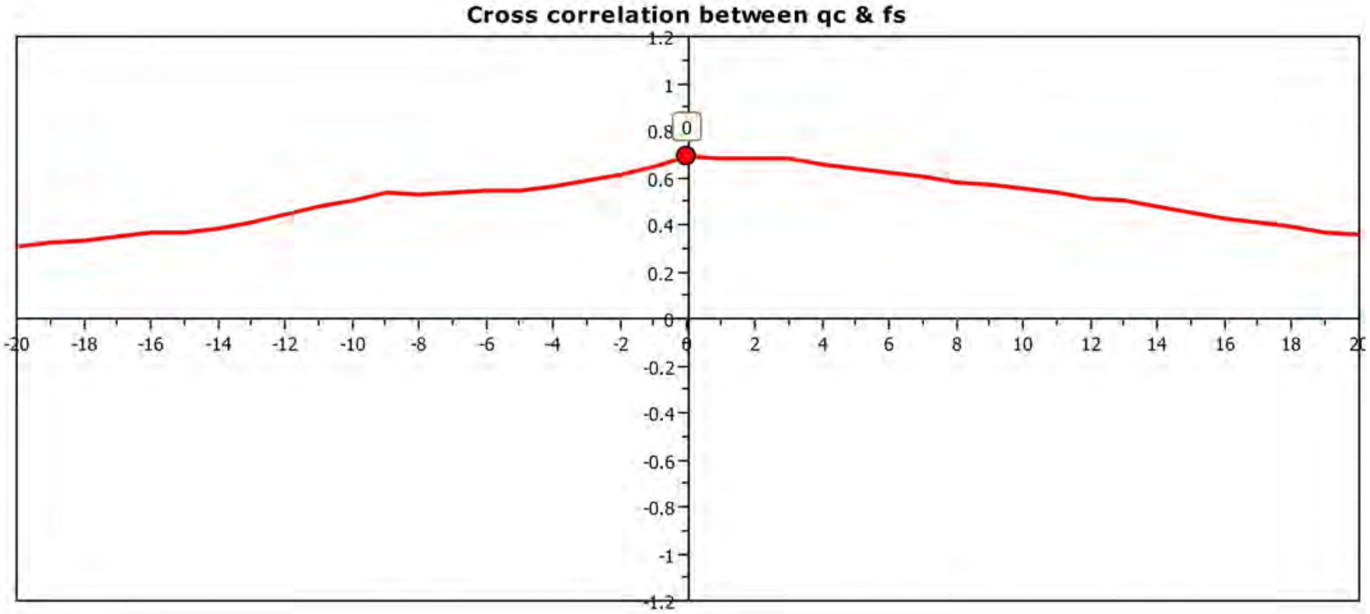
CPT: RB-CPT-4B

Total depth: 34.25 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**



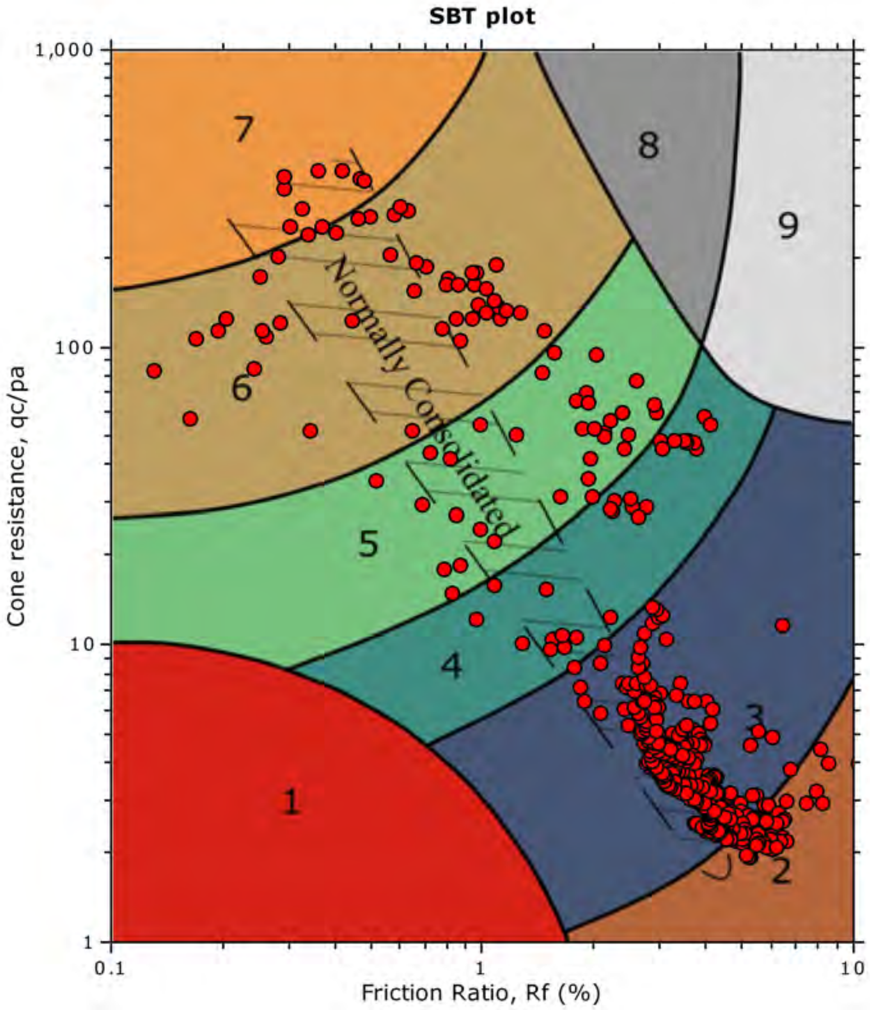
The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

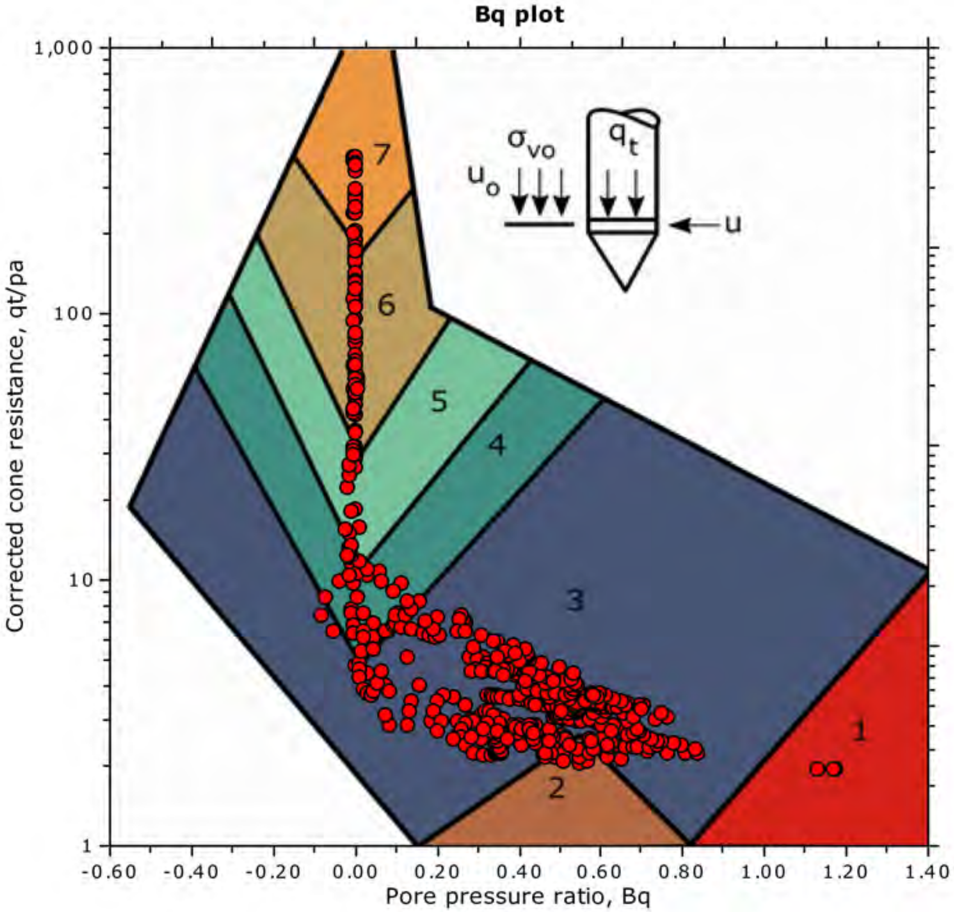


CPT: RB-CPT-4B
Total depth: 34.25 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**

SBT - Bq plots



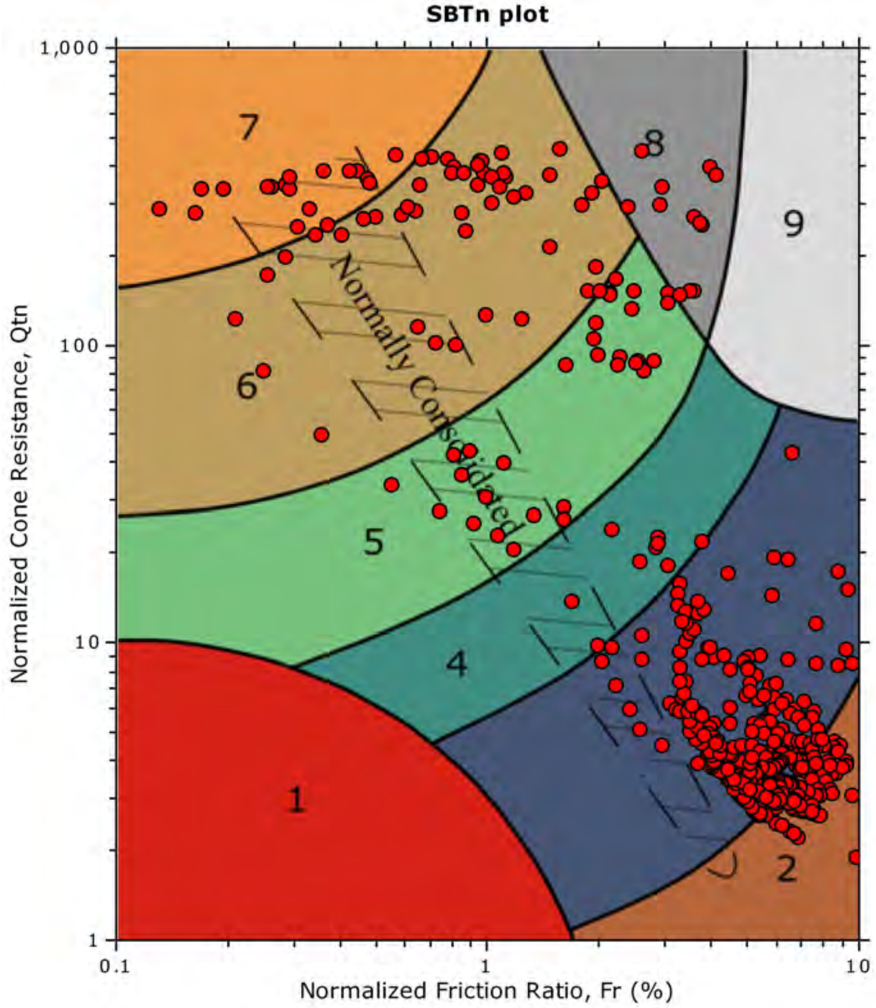


SBT legend

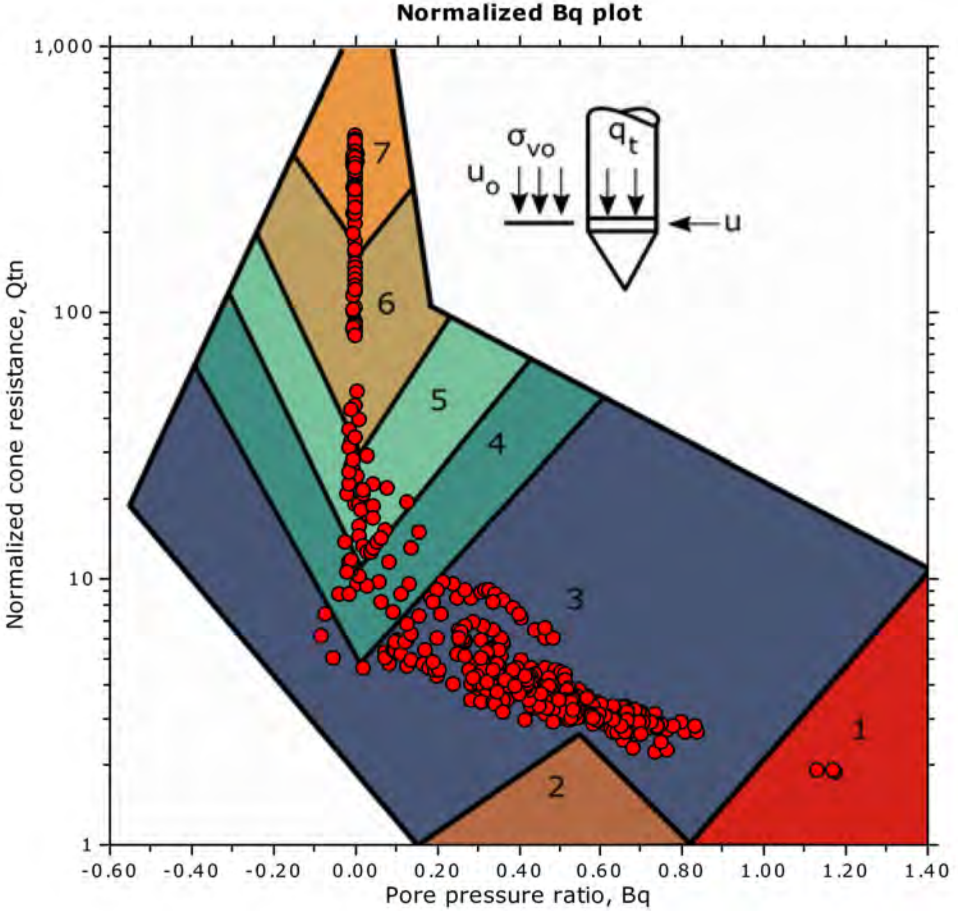
- 🟥 1. Sensitive fine grained
- 🟫 2. Organic material
- 🟦 3. Clay to silty clay
- 🟩 4. Clayey silt to silty clay
- 🟩 5. Silty sand to sandy silt
- 🟫 6. Clean sand to silty sand
- 🟧 7. Gravelly sand to sand
- ⬜ 8. Very stiff sand to clayey sand
- ⬜ 9. Very stiff fine grained

SBT - Bq plots (normalized)

SBTn plot



Normalized Bq plot



SBTn legend

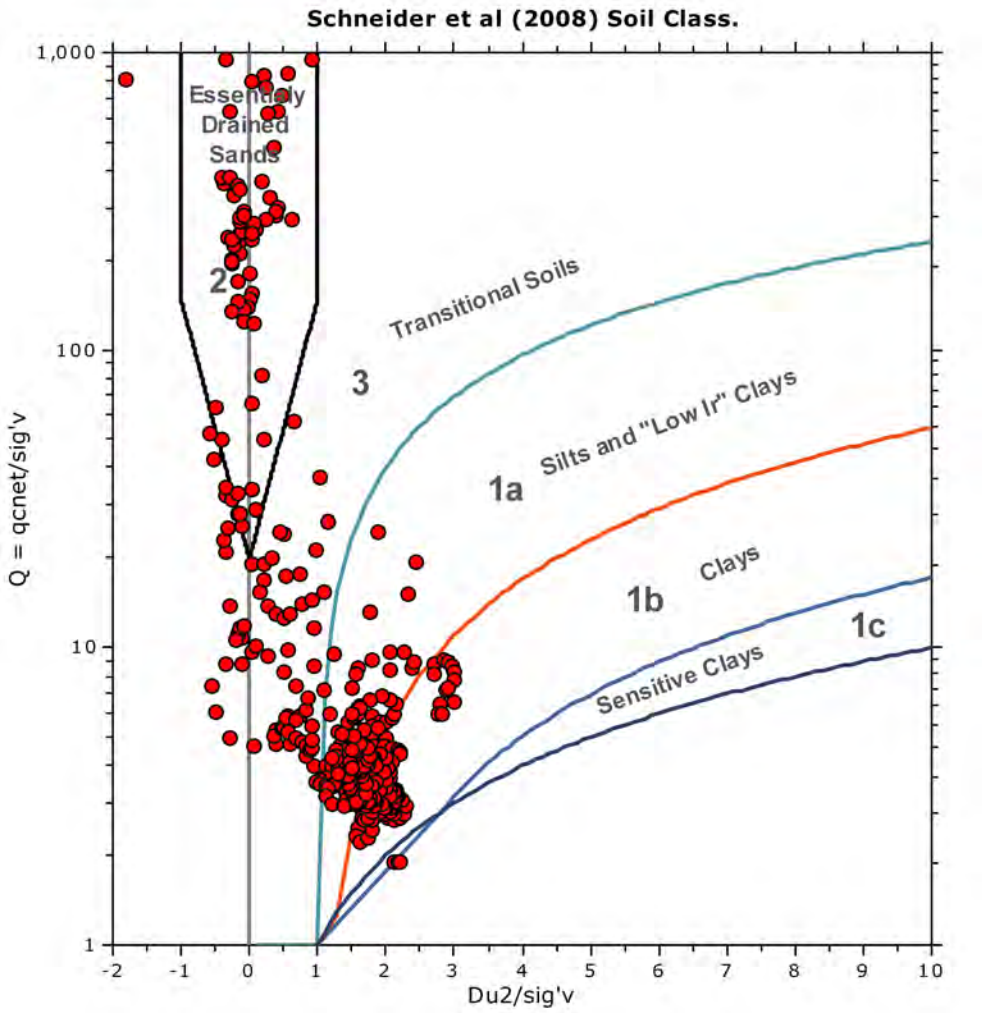
🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty clay	🟧 7. Gravelly sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to clayey sand
🟦 3. Clay to silty clay	🟫 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

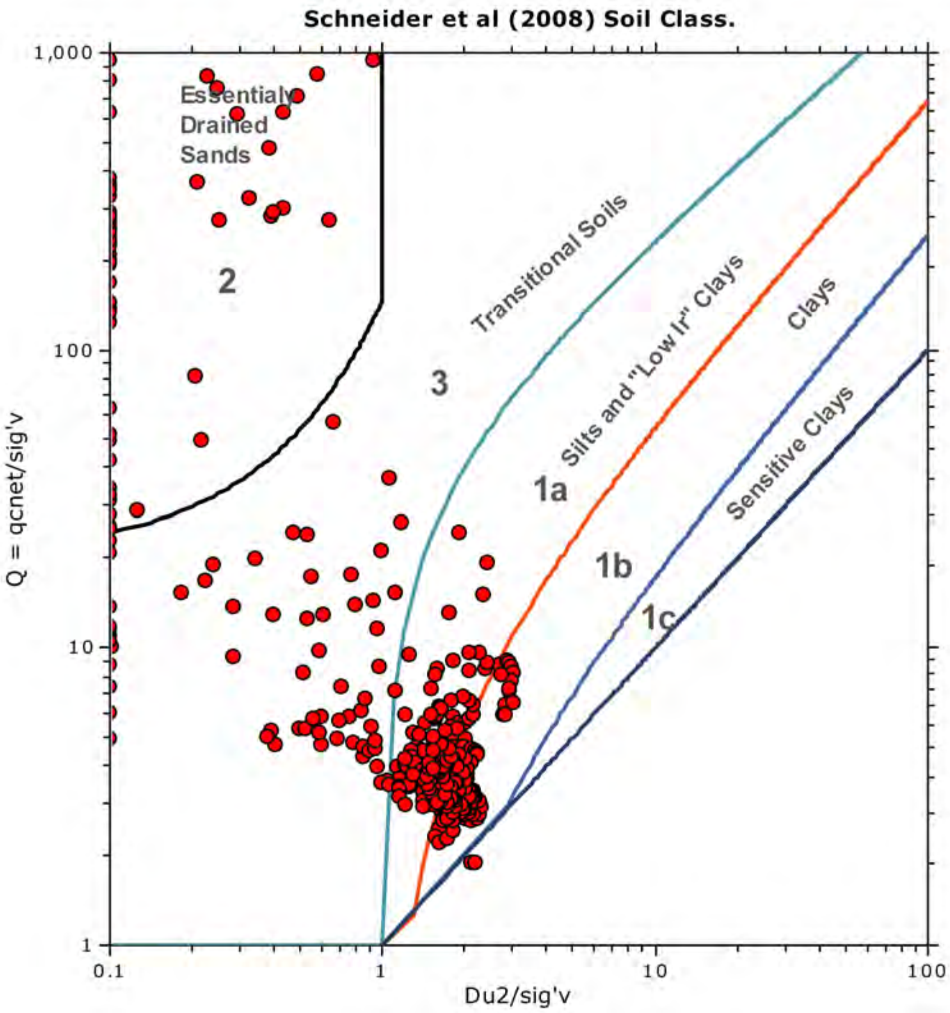
HILLIS-CARNES
ENGINEERING ASSOCIATES

Project: **South Market Street**
Location: **Wilmington, DE**

CPT: RB-CPT-4B
Total depth: 34.25 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Bq plots (Schneider)

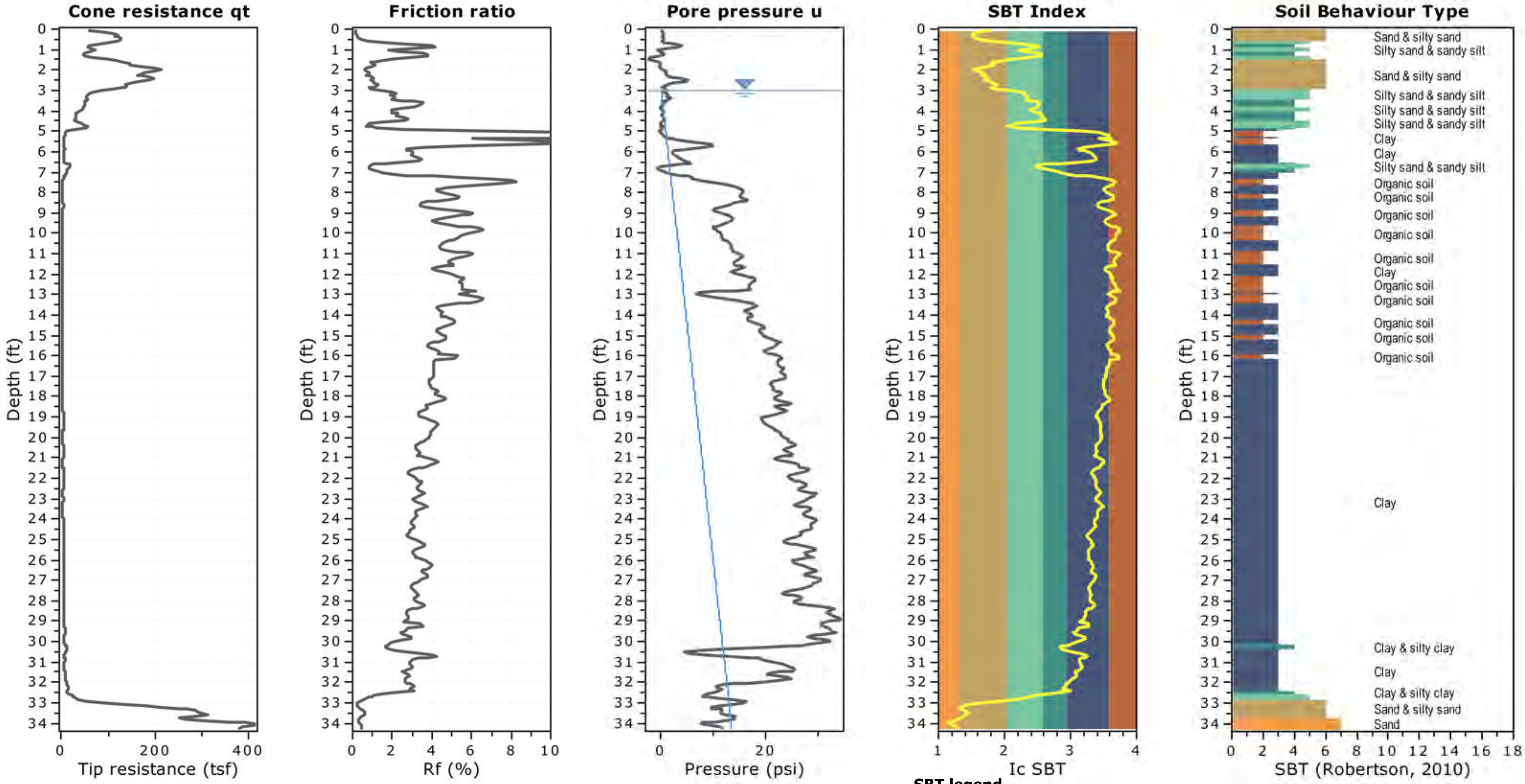




HILLIS-CARNES
ENGINEERING ASSOCIATES

Project: **South Market Street**
Location: **Wilmington, DE**

CPT: RB-CPT-4B
Total depth: 34.25 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:



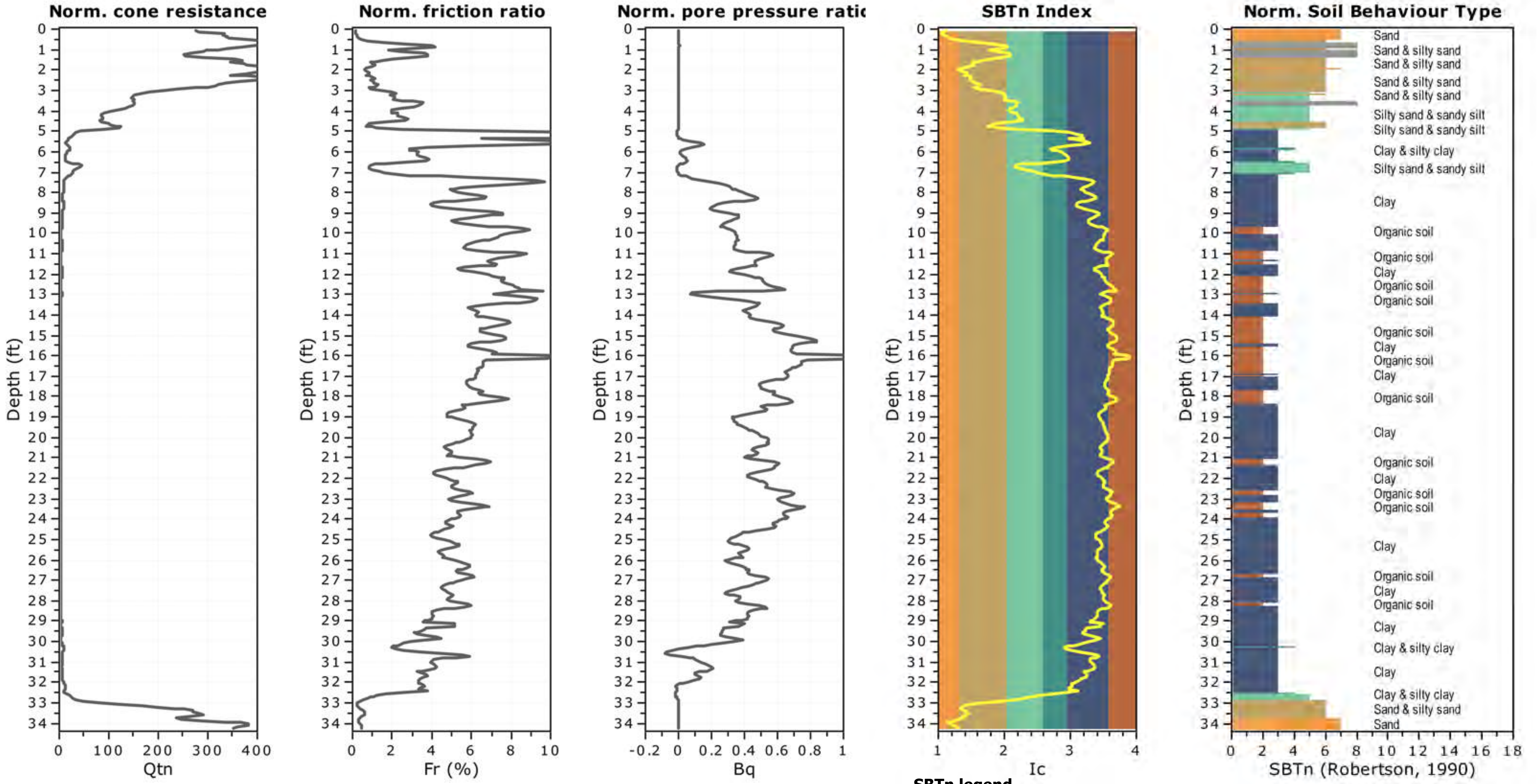
SBT legend

- 🟥 1. Sensitive fine grained
- 🟫 2. Organic material
- 🟦 3. Clay to silty clay
- 🟩 4. Clayey silt to silty clay
- 🟩 5. Silty sand to sandy silt
- 🟨 6. Clean sand to silty sand
- 🟧 7. Gravely sand to sand
- ⬛ 8. Very stiff sand to clayey sand
- ⬜ 9. Very stiff fine grained

HILLIS-CARNES
ENGINEERING ASSOCIATES

CPT: RB-CPT-4B
Total depth: 34.25 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**



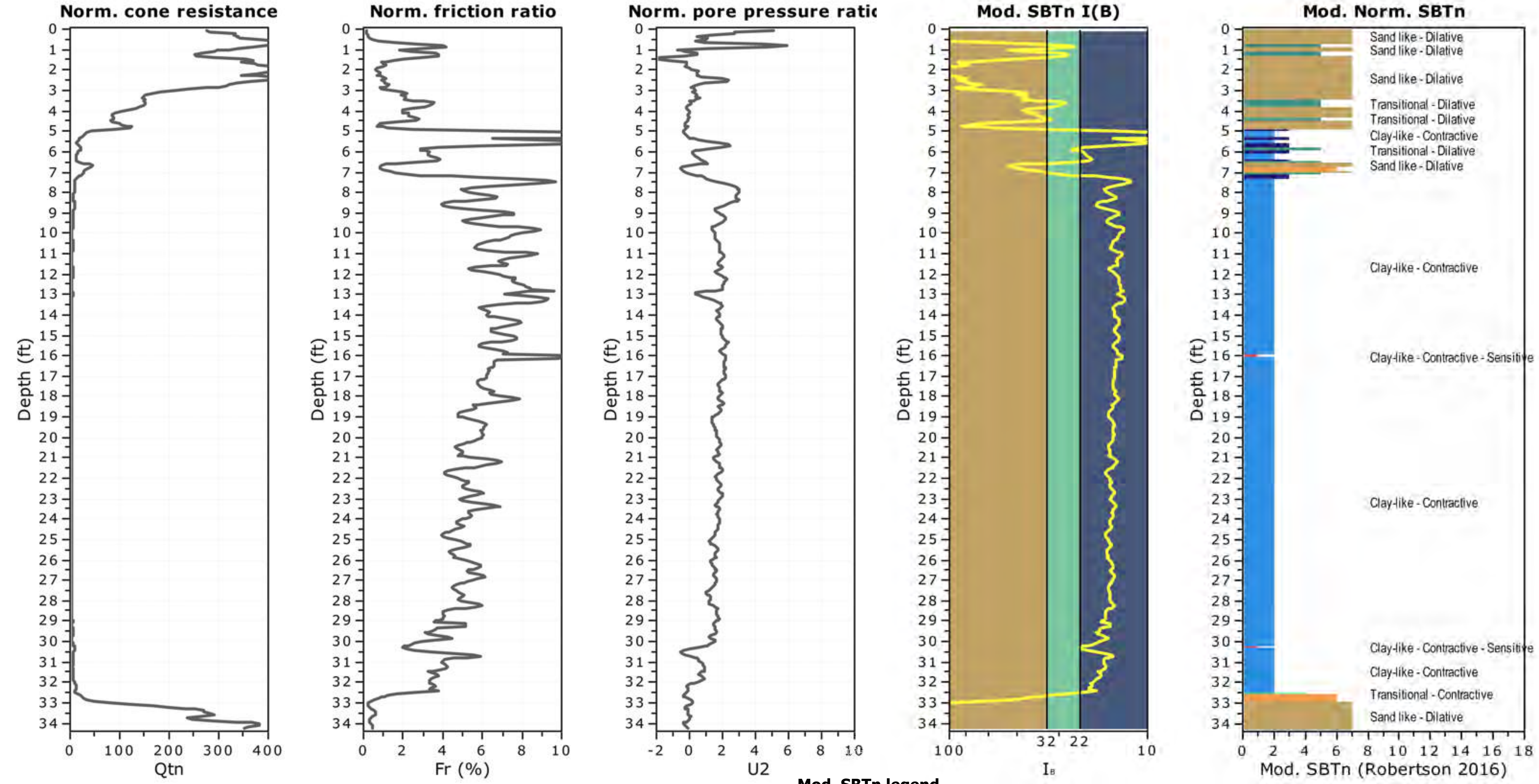
SBTn legend

- 🟥 1. Sensitive fine grained
- 🟫 2. Organic material
- 🟦 3. Clay to silty clay
- 🟩 4. Clayey silt to silty clay
- 🟩 5. Silty sand to sandy silt
- 🟫 6. Clean sand to silty sand
- 🟧 7. Gravely sand to sand
- ⬛ 8. Very stiff sand to clayey sand
- ⬜ 9. Very stiff fine grained

CPT: RB-CPT-4B

Total depth: 34.25 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

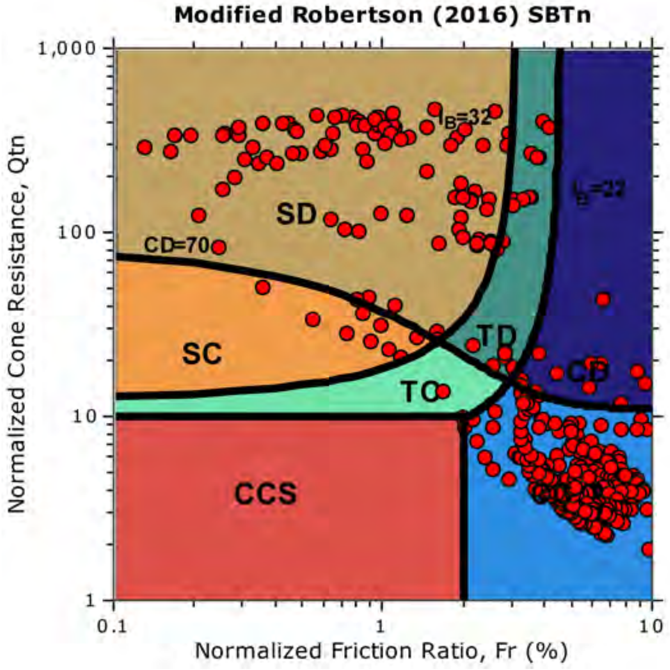
Project: **South Market Street**
Location: **Wilmington, DE**

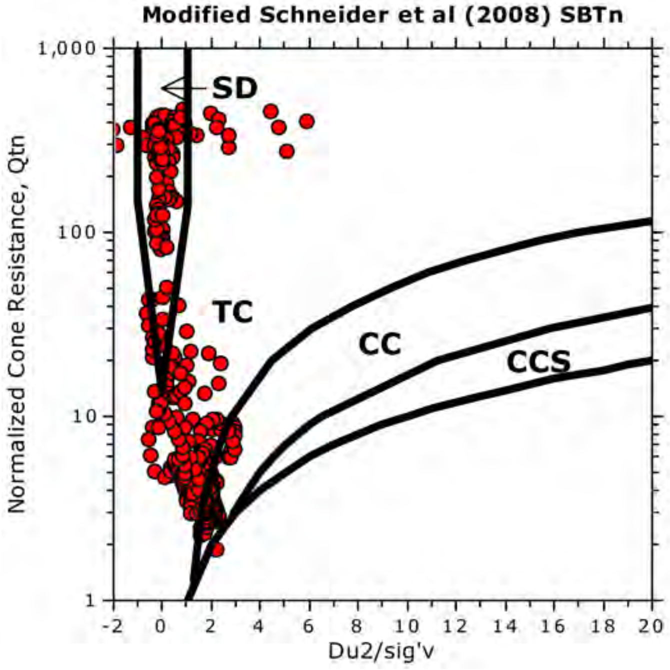


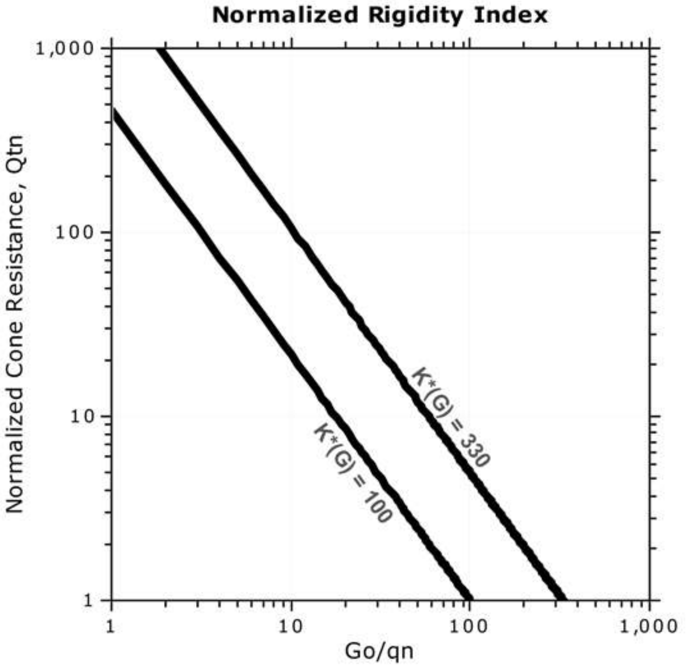
Mod. SBTn legend

- 🟥 1. CCS: ClayLike - Contractive, Sensitive
- 🟦 2. CC: Clay-like - Contractive
- 🟦 3. CD: Clay-Like: Dilative
- 🟩 4. TC: Transitional - Contractive
- 🟩 5. TD: Transitional - Dilative
- 🟧 6. SC: Sand-like - Contractive
- 🟫 7. SD: Sand-like - Dilative

Updated SBTn plots


Modified Robertson (2016) SBTn


Modified Schneider et al (2008) SBTn


Normalized Rigidity Index

CCS: Clay-like - Contractive - Sensitive
CC: Clay-like - Contractive
CD: Clay-like - Dilative
TC: Transitional - Contractive
TD: Transitional - Dilative
SC: Sand-like - Contractive
SD: Sand-like - Dilative

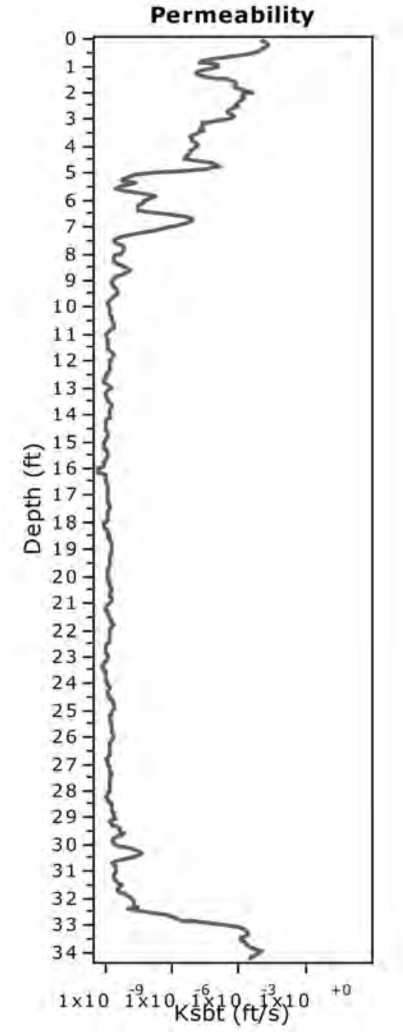
K(G) > 330: Soils with significant microstructure
(e.g. age/cementation)

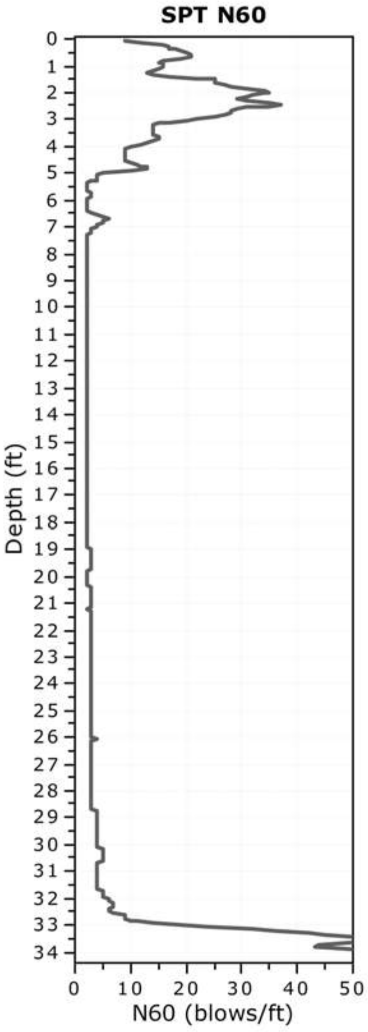
HILLIS-CARNES
ENGINEERING ASSOCIATES

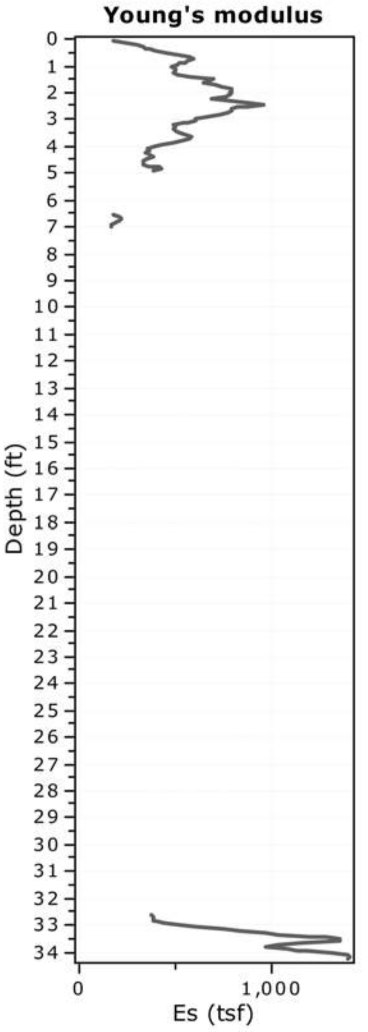
CPT: RB-CPT-4B

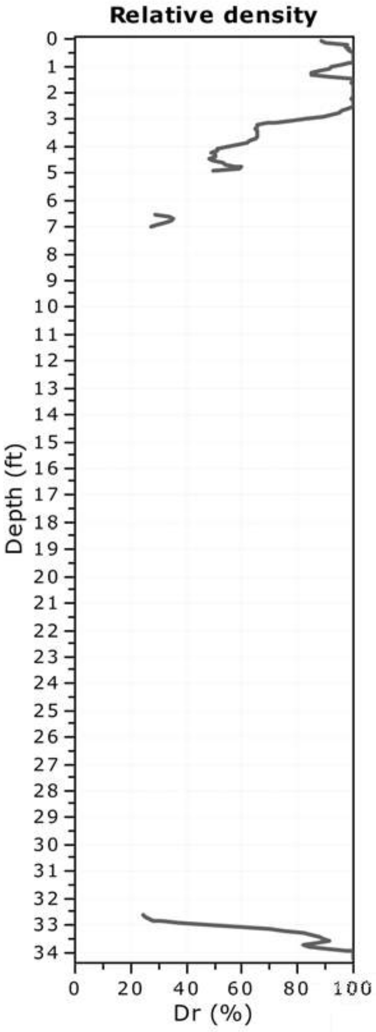
Total depth: 34.25 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

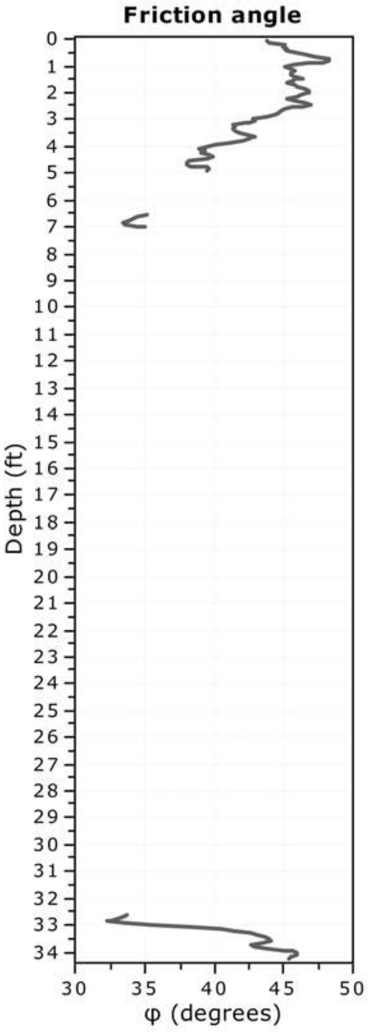
Project: **South Market Street**
Location: **Wilmington, DE**











Calculation parameters

Permeability: Based on SBT_n

SPT N_{60}: Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr}: 350.0

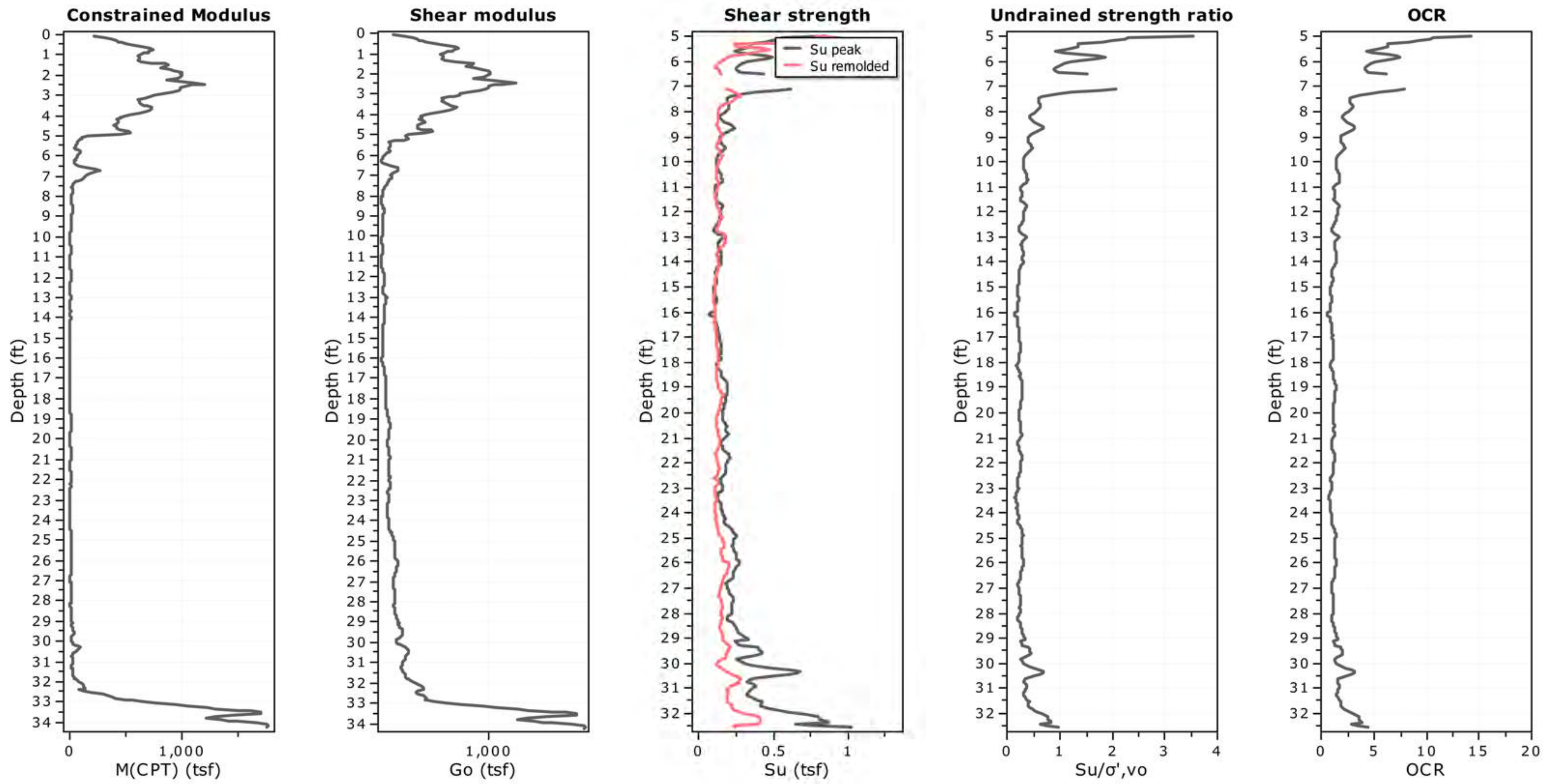
Phi: Based on Kulhawy & Mayne (1990)

HILLIS-CARNES
ENGINEERING ASSOCIATES

CPT: RB-CPT-4B

Total depth: 34.25 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**



Calculation parameters

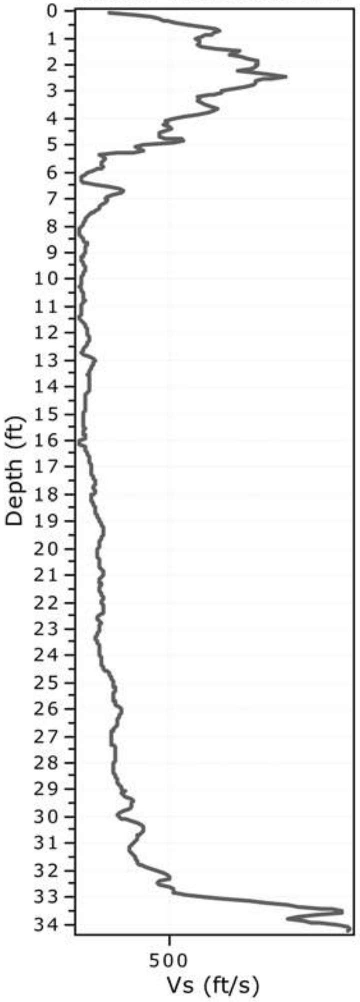
Constrained modulus: Based on variable alpha using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable alpha using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

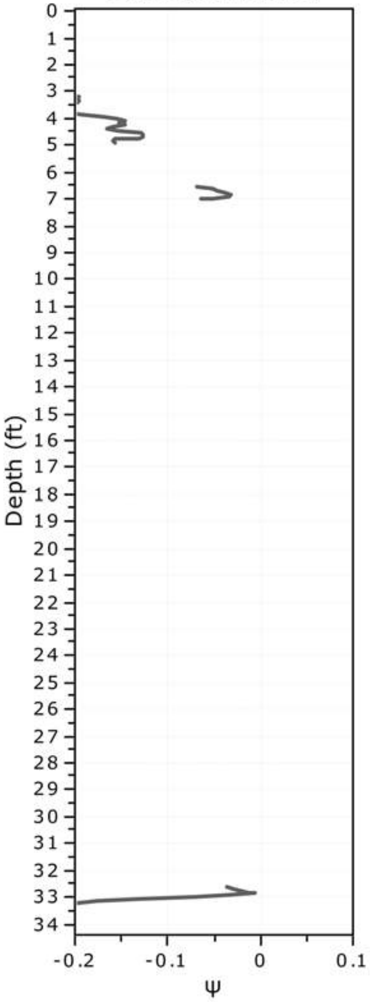
OCR factor for clays, N_{kt}: 0.33
—●— Flat Dilatometer Test data

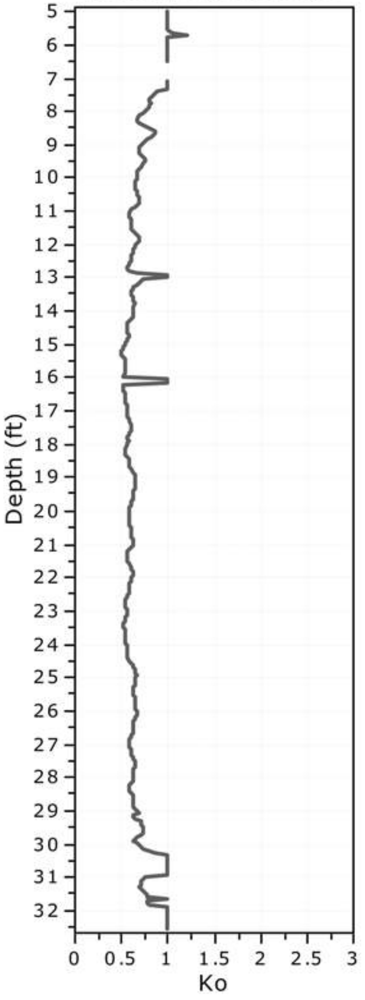
CPT: RB-CPT-4B

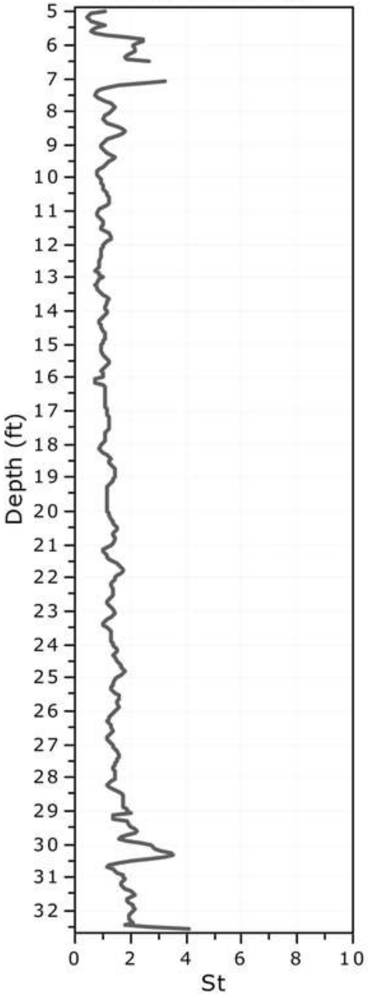
Total depth: 34.25 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

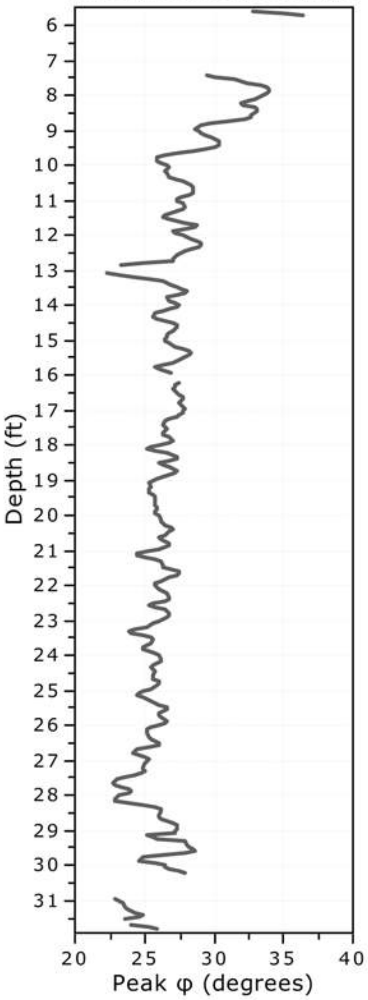
Project: **South Market Street**
Location: **Wilmington, DE**


Shear Wave velocity


State parameter


In-situ stress ratio


Soil sensitivity


Effective friction angle

Calculation parameters

Soil Sensitivity factor, N_S: 7.00

HILLIS-CARNES
ENGINEERING ASSOCIATES

CPT: RB-CPT-4B

Total depth: 34.25 ft, Date: 10/12/2022

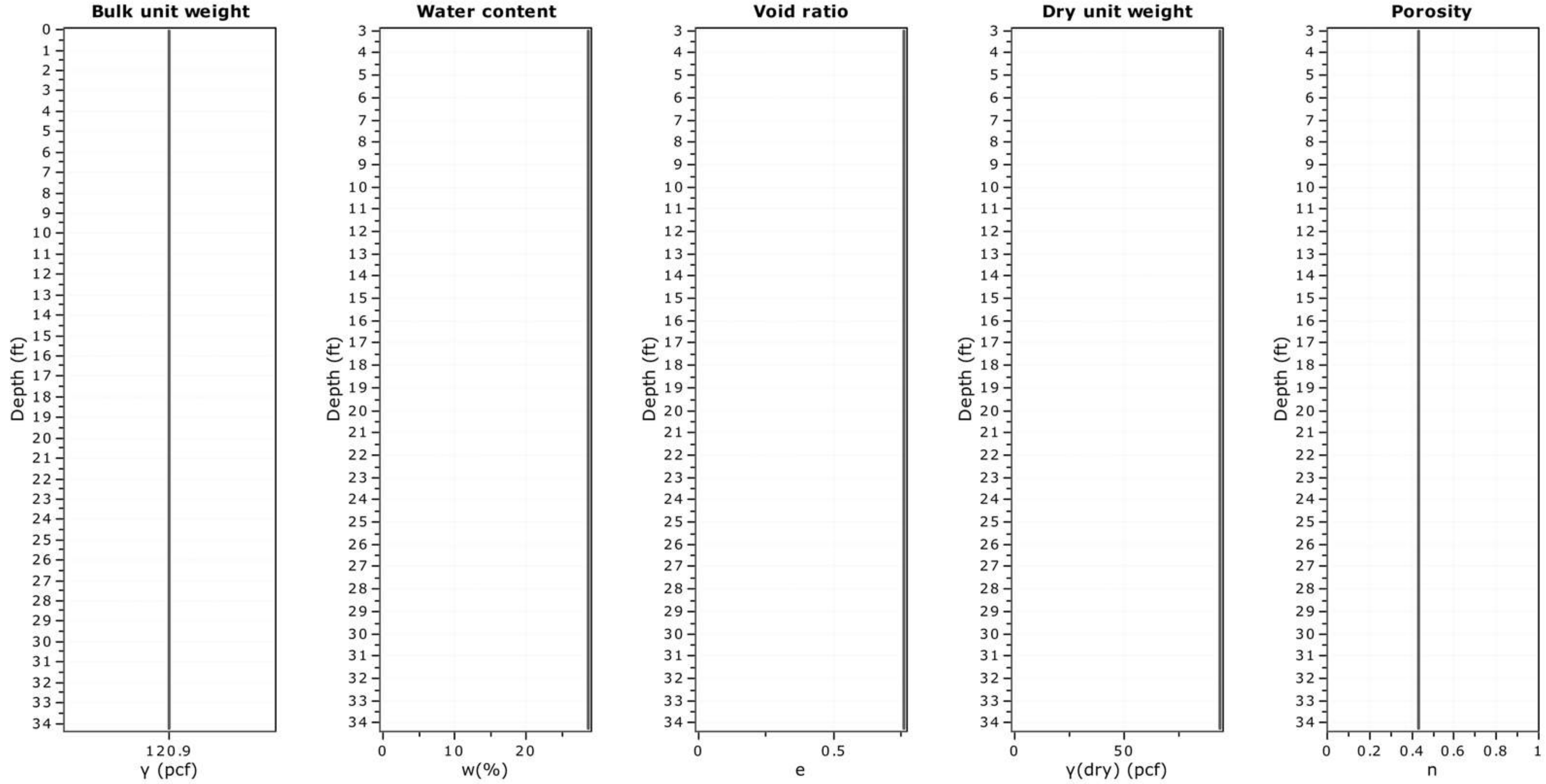
Surface Elevation: 0.00 ft

Cone Type:

Cone Operator:

Project: **South Market Street**

Location: **Wilmington, DE**

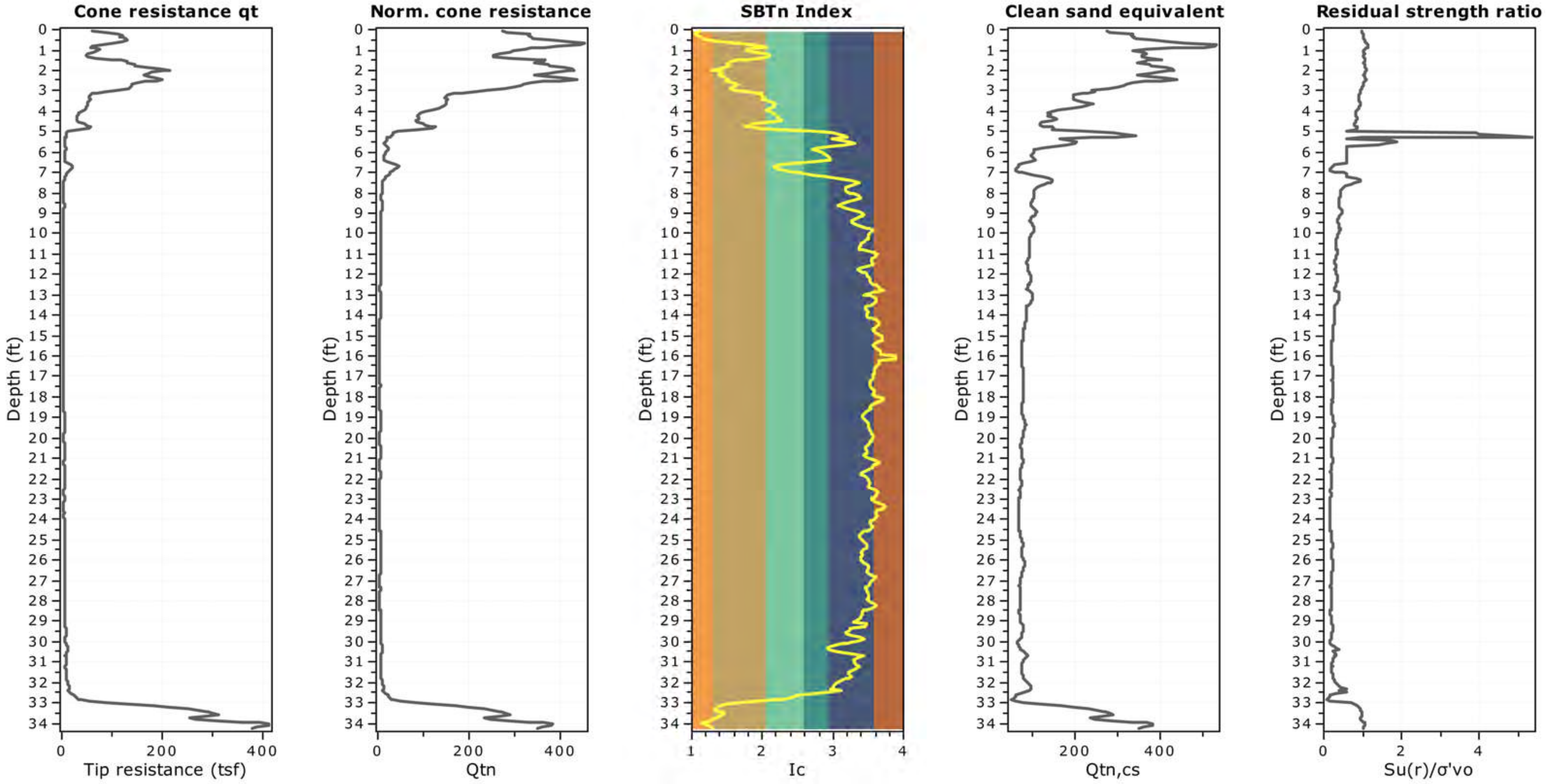


HILLIS-CARNES
ENGINEERING ASSOCIATES

CPT: RB-CPT-4B

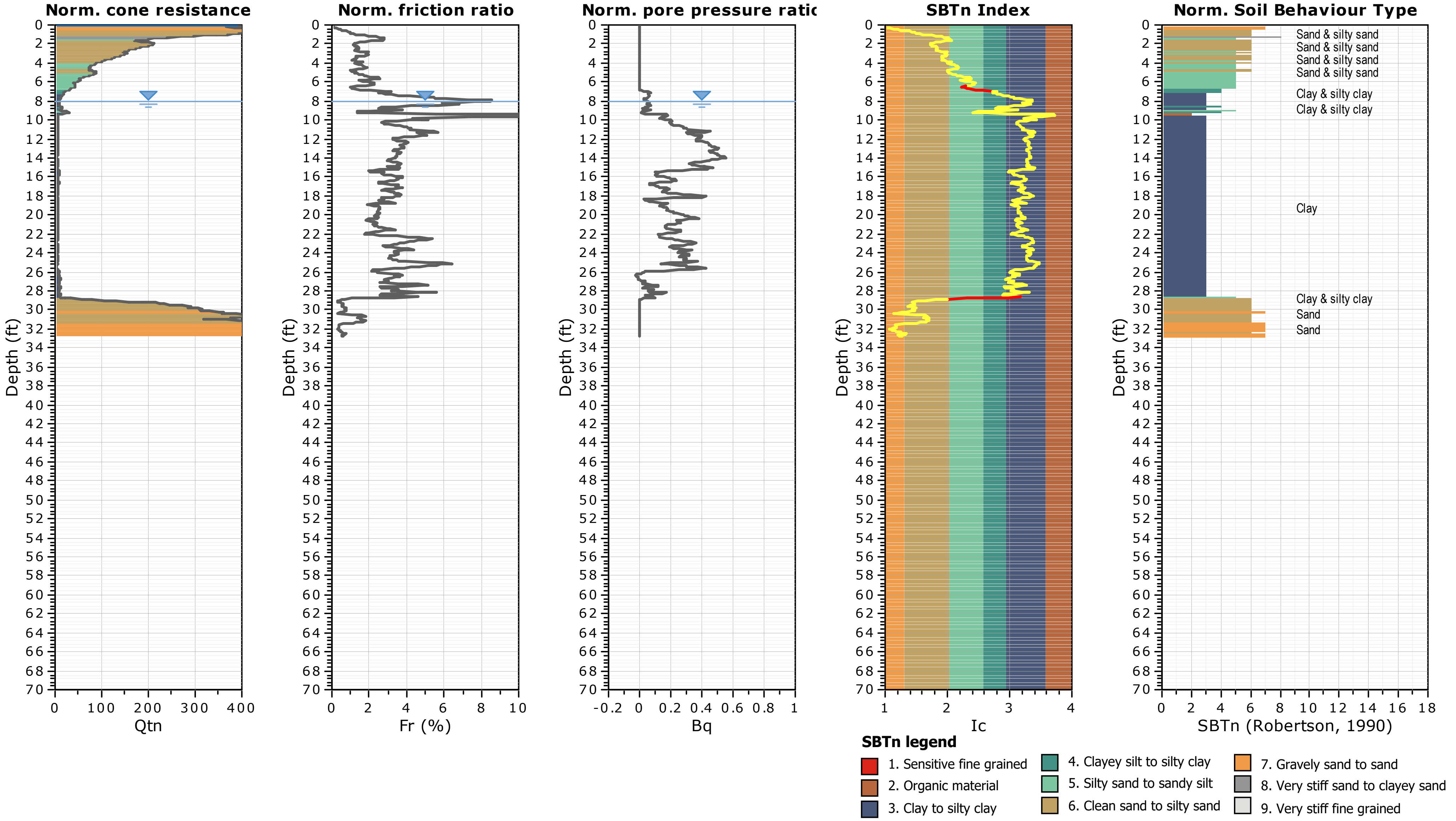
Total depth: 34.25 ft, Date: 10/12/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**



CPT: S Market RW-CPT-01
Total depth: 32.81 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

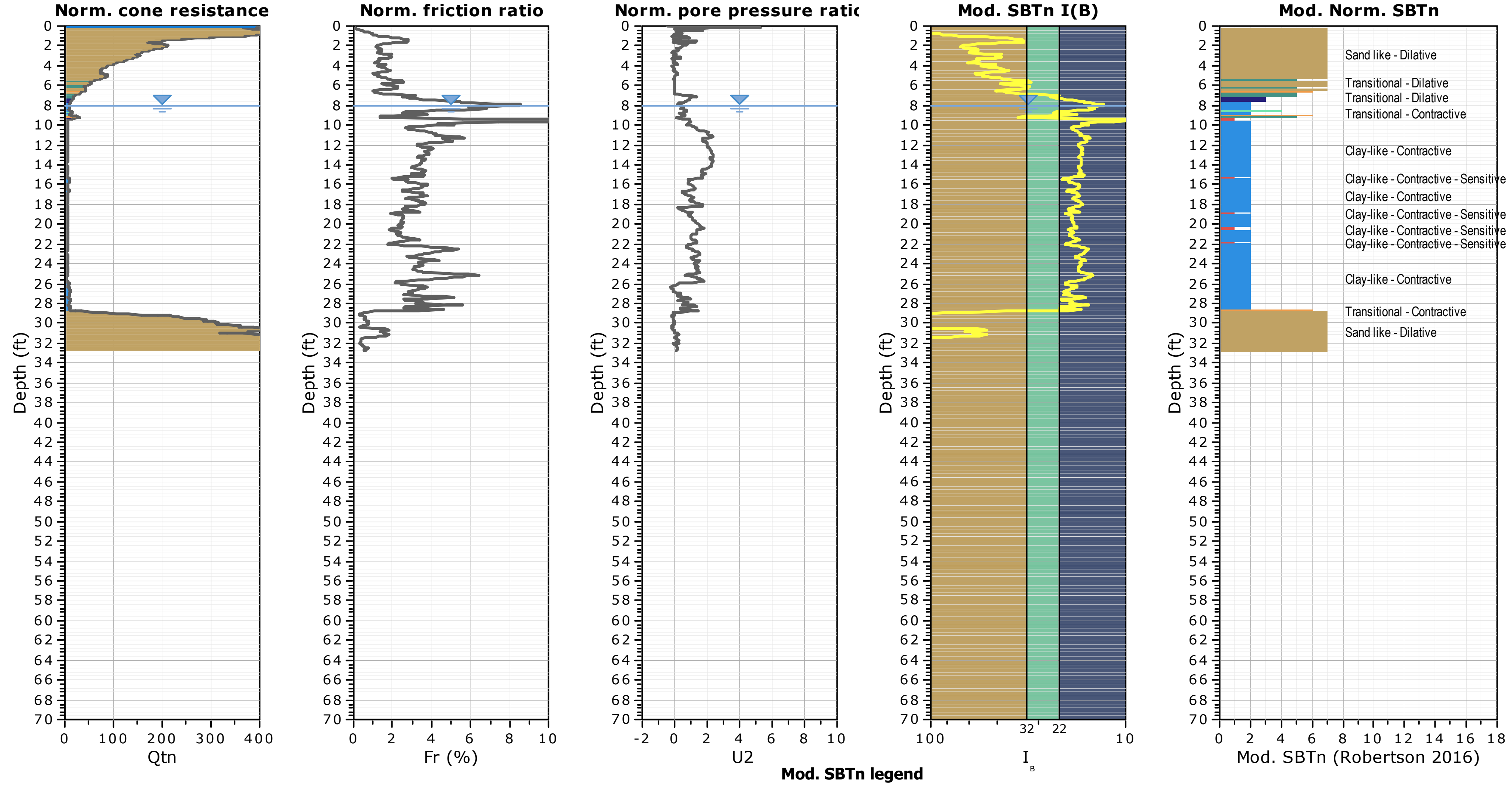
Project: **S Market - RK&K**
Location: **New Castle, DE**



HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
Delmar, Maryland
http://www.HCEA.com

CPT: S Market RW-CPT-01
Total depth: 32.81 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Mod. SBTn legend

- 🟥 1. CCS: ClayLike - Contractive, Sensitive
- 🟦 2. CC: Clay-like - Contractive
- 🟦 3. CD: Clay-Like: Dilative
- 🟩 4. TC: Transitional - Contractive
- 🟩 5. TD: Transitional - Dilative
- 🟧 6. SC: Sand-like - Contractive
- 🟫 7. SD: Sand-like - Dilative

HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
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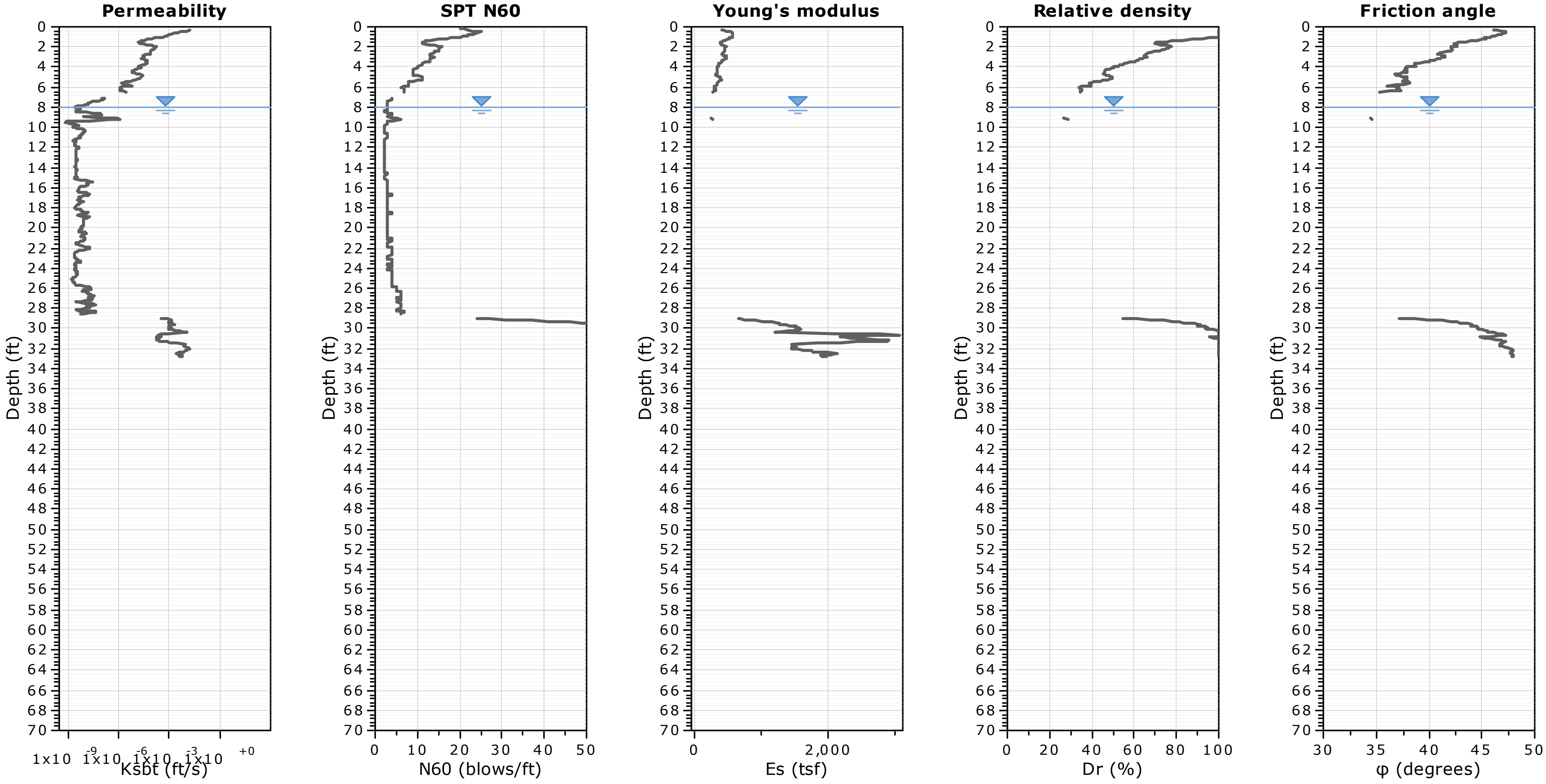
CPT: S Market RW-CPT-01
Total depth: 32.81 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

Permeability: Based on SBT$_n$
SPT N$_{60}$: Based on I$_c$ and q$_t$
Young's modulus: Based on variable alpha using I$_c$ (Robertson, 2009)

Relative density constant, C$_{Dr}$: 350.0
Phi: Based on Kulhawy & Mayne (1990)
—●— User defined estimation data

HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
Delmar, Maryland
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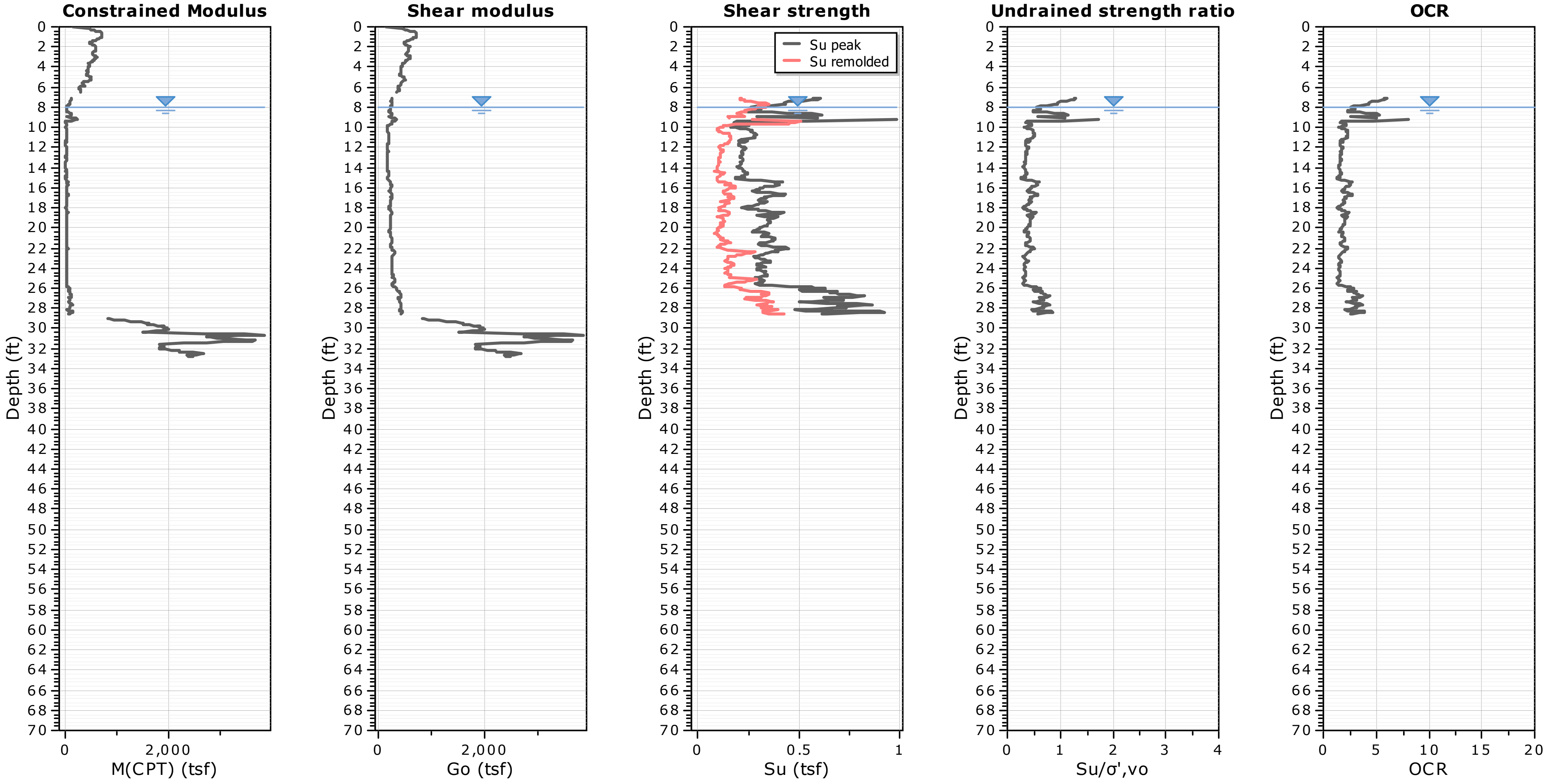
CPT: S Market RW-CPT-01
Total depth: 32.81 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



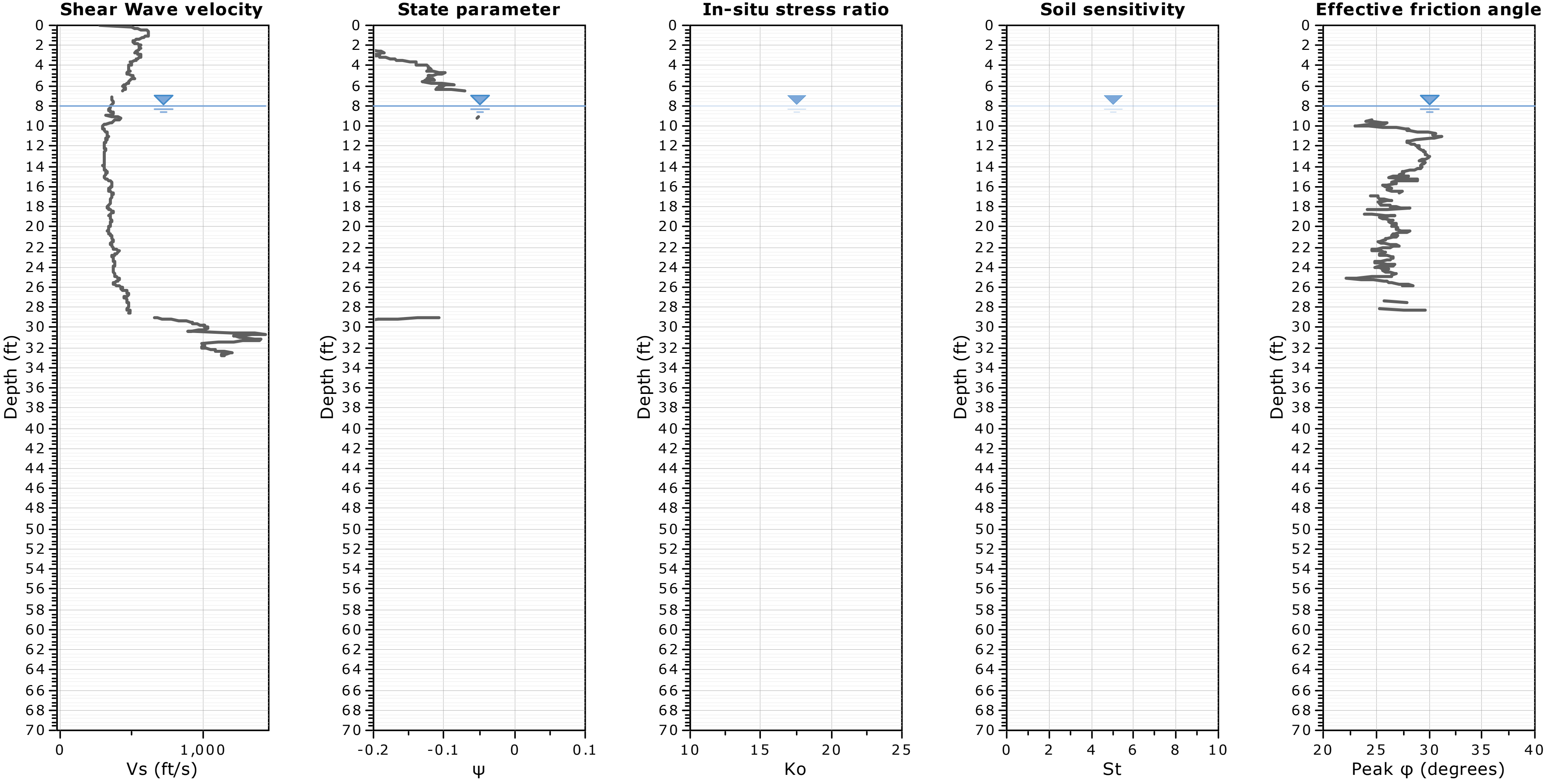
Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33
● User defined estimation data
● Flat Dilatometer Test data

CPT: S Market RW-CPT-01
Total depth: 32.81 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

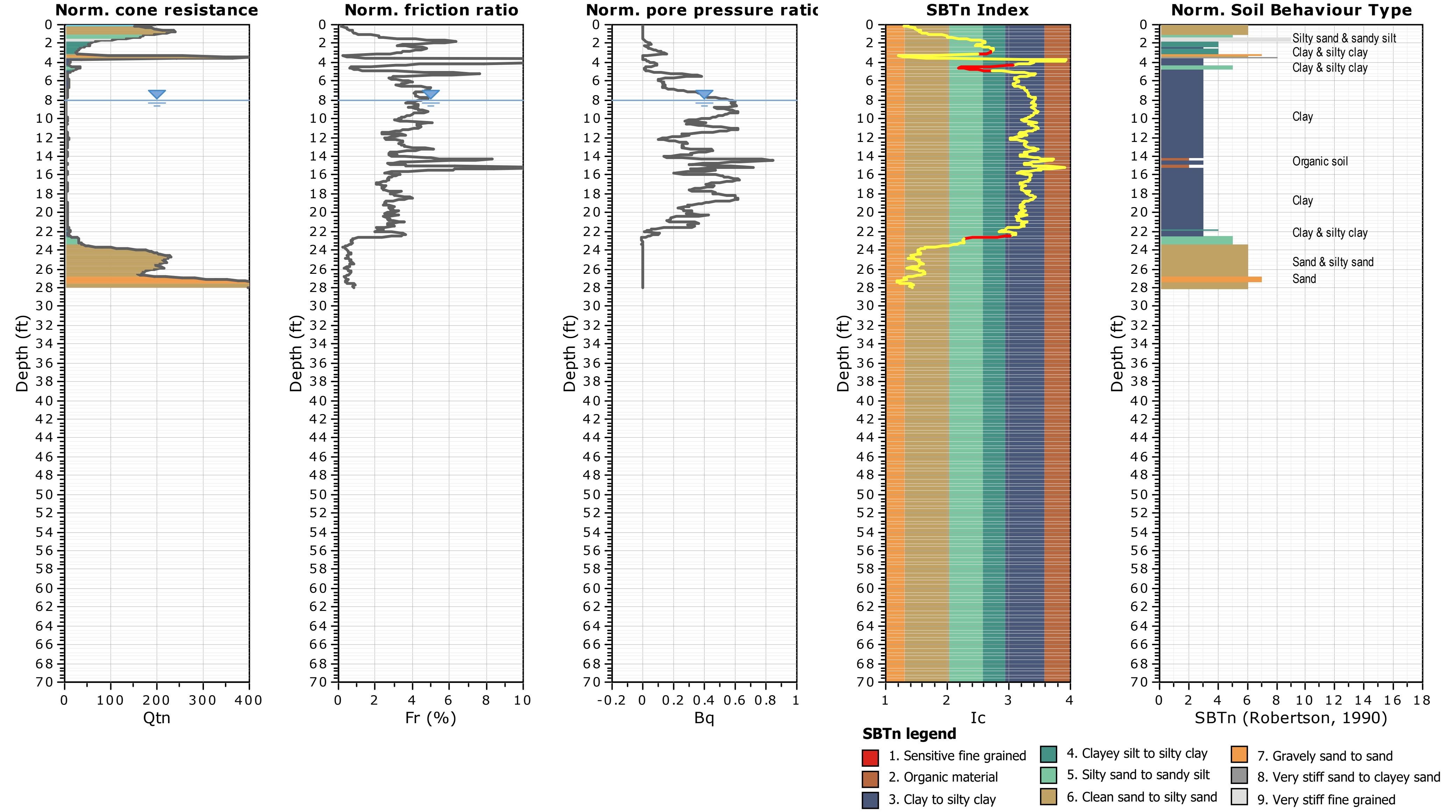
Soil Sensitivity factor, N_S: 350.00

● User defined estimation data

HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
Delmar, Maryland
http://www.HCEA.com

CPT: S Market RW-CPT-02
Total depth: 27.95 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

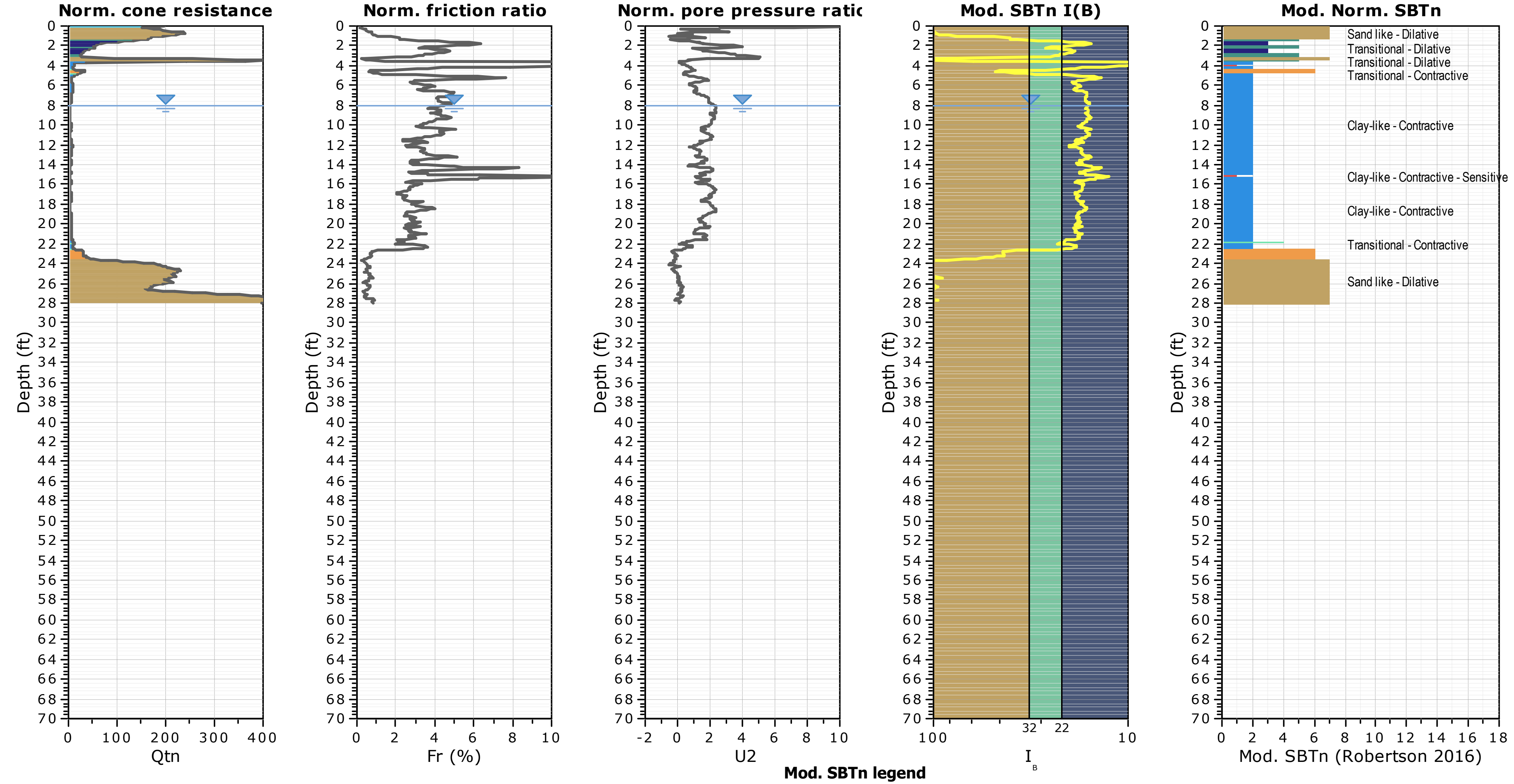
Project: **S Market - RK&K**
Location: **New Castle, DE**



HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
Delmar, Maryland
http://www.HCEA.com

CPT: S Market RW-CPT-02
Total depth: 27.95 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**

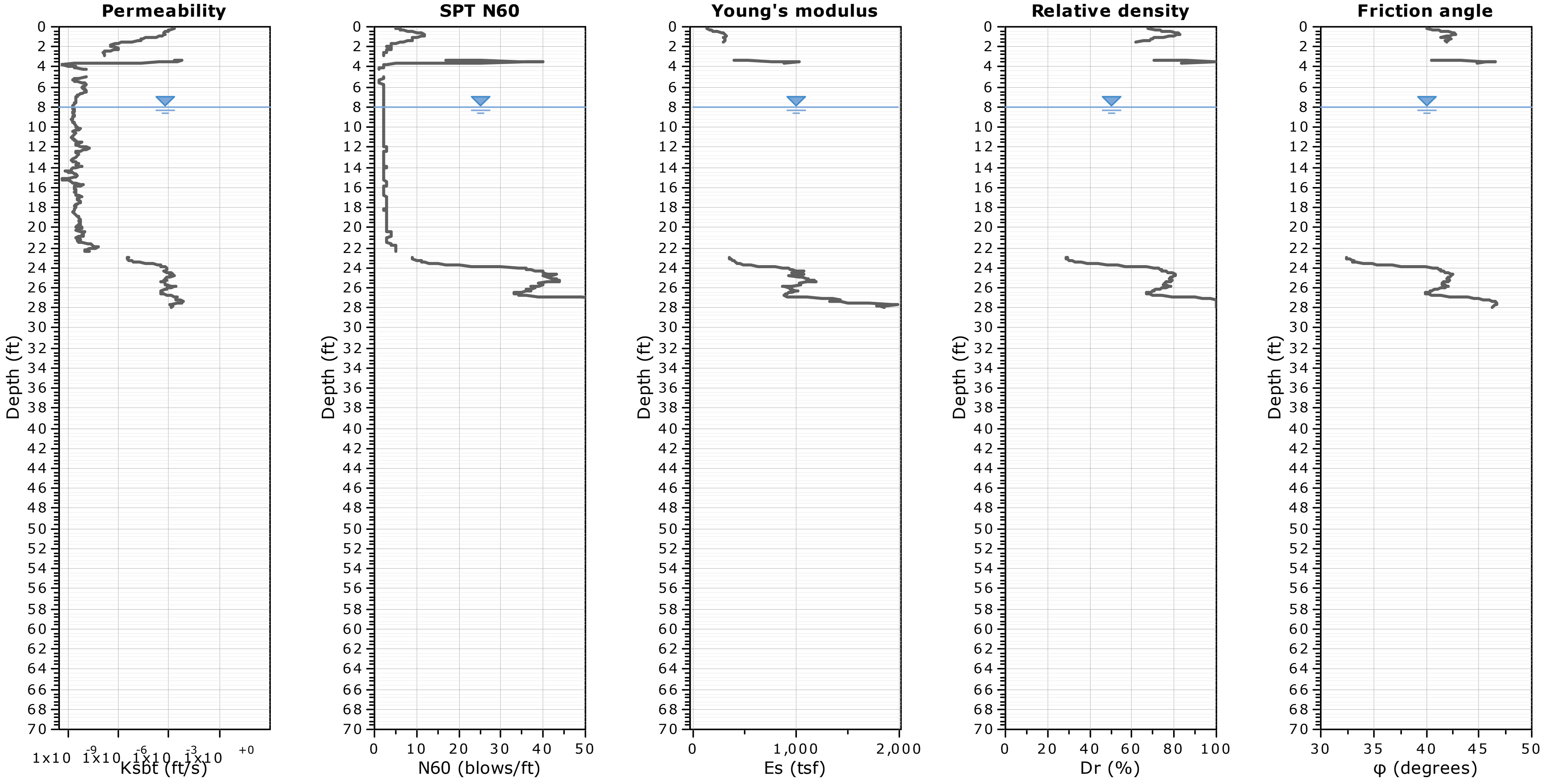


Mod. SBTn legend

🟥 1. CCS: ClayLike - Contractive, Sensitive
🟦 2. CC: Clay-like - Contractive
■ 3. CD: Clay-Like: Dilative
🟩 4. TC: Transitional - Contractive
🟩 5. TD: Transitional - Dilative
🟧 6. SC: Sand-like - Contractive
🟫 7. SD: Sand-like - Dilative

CPT: S Market RW-CPT-02
Total depth: 27.95 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
—●— User defined estimation data

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CPT: S Market RW-CPT-02
Total depth: 27.95 ft, Date: 7/13/2020
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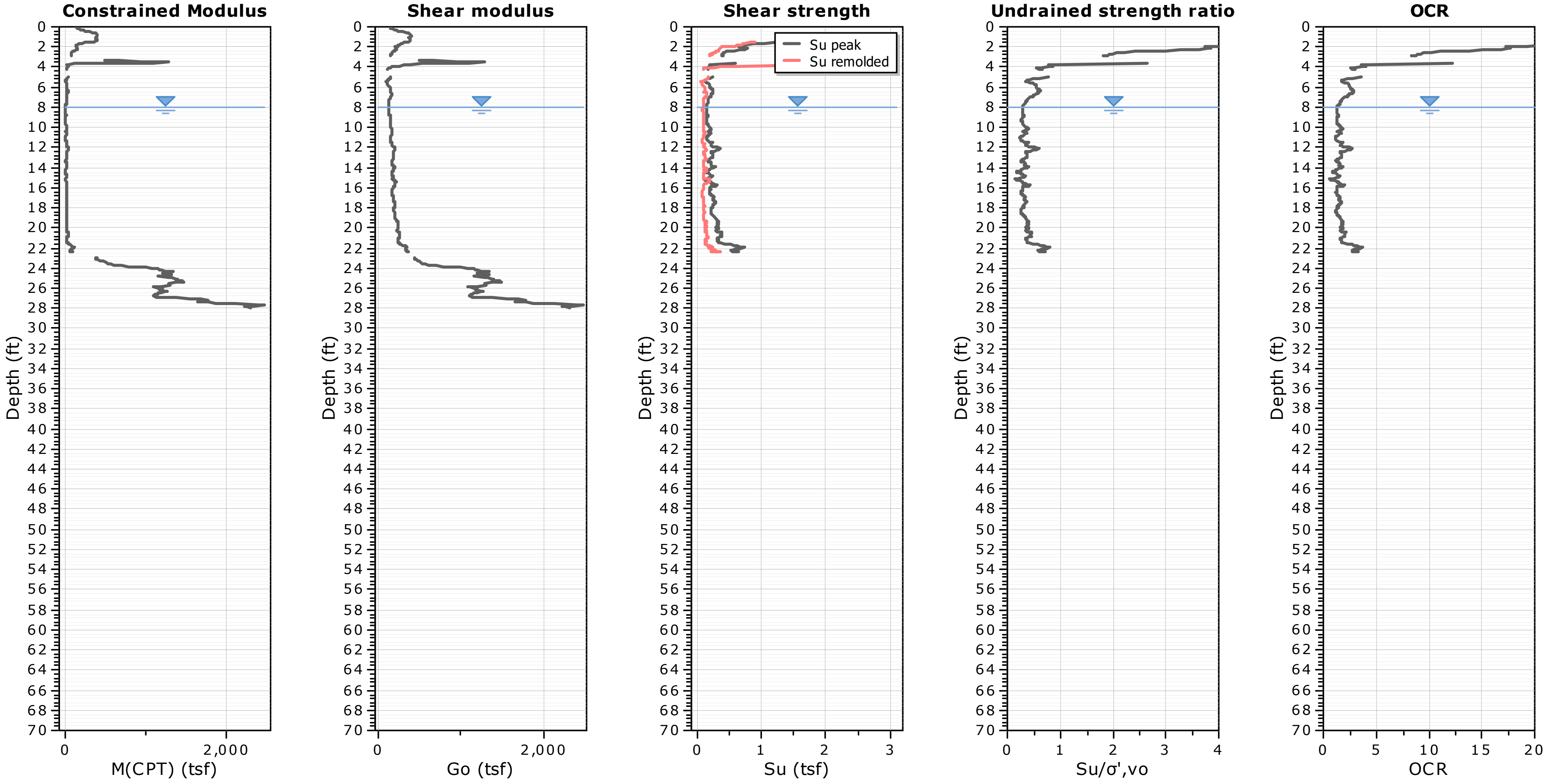
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable *alpha* using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33

● User defined estimation data

● Flat Dilatometer Test data

HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
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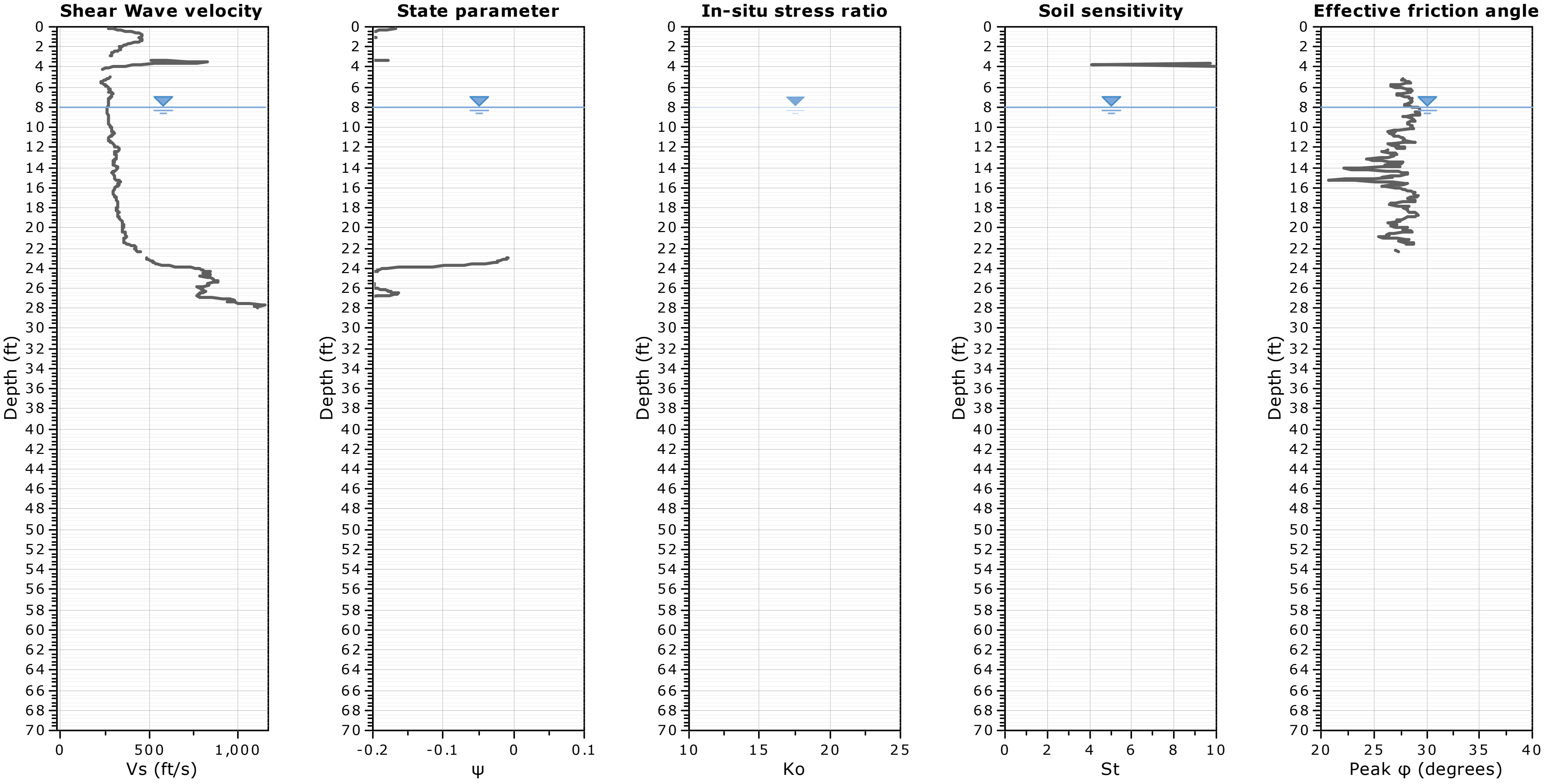
CPT: S Market RW-CPT-02
Total depth: 27.95 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

Soil Sensitivity factor, N_S: 350.00

● User defined estimation data

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417 Maryland Avenue
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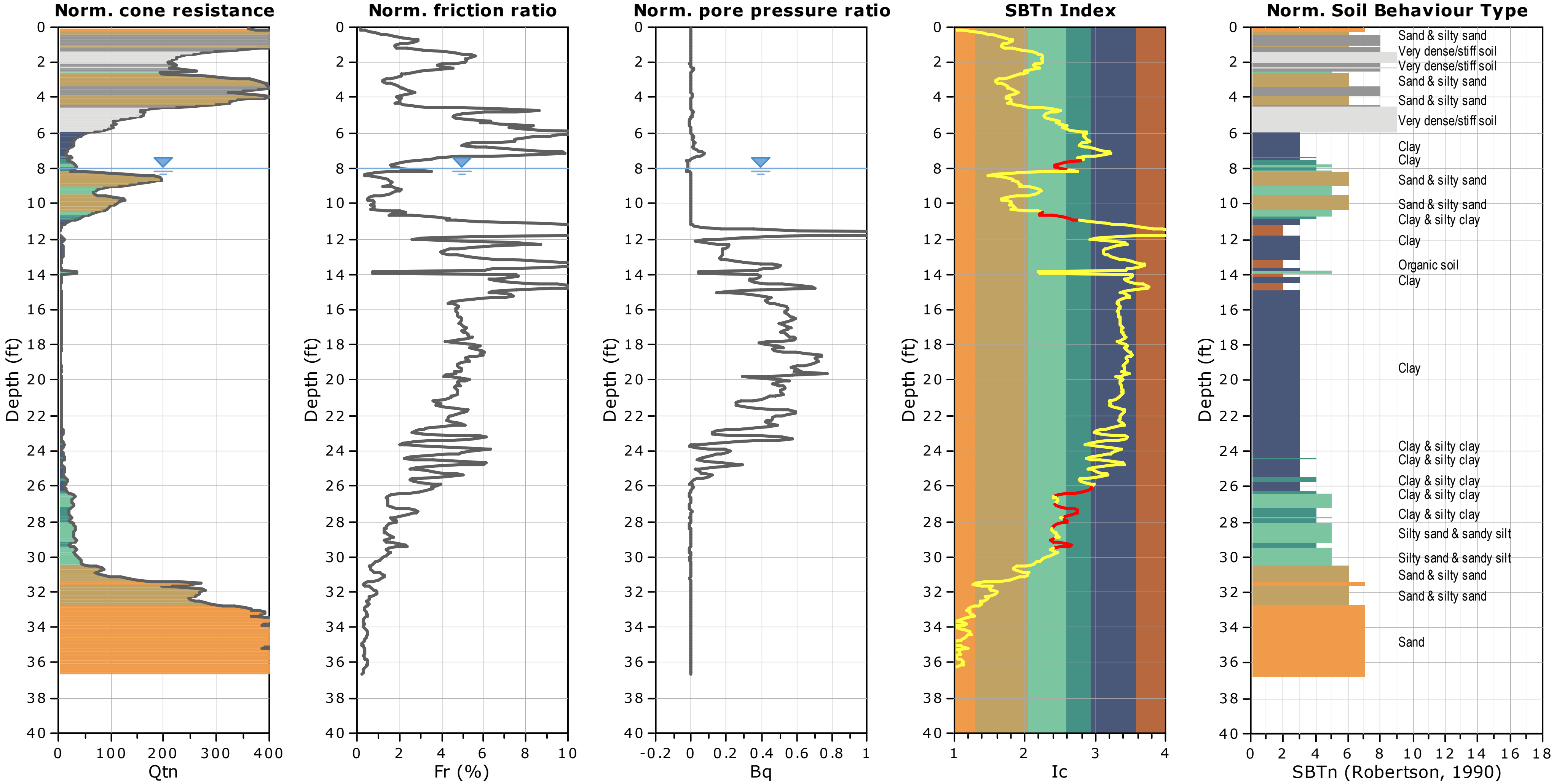
CPT: S Market RW-CPT-03
Total depth: 36.61 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



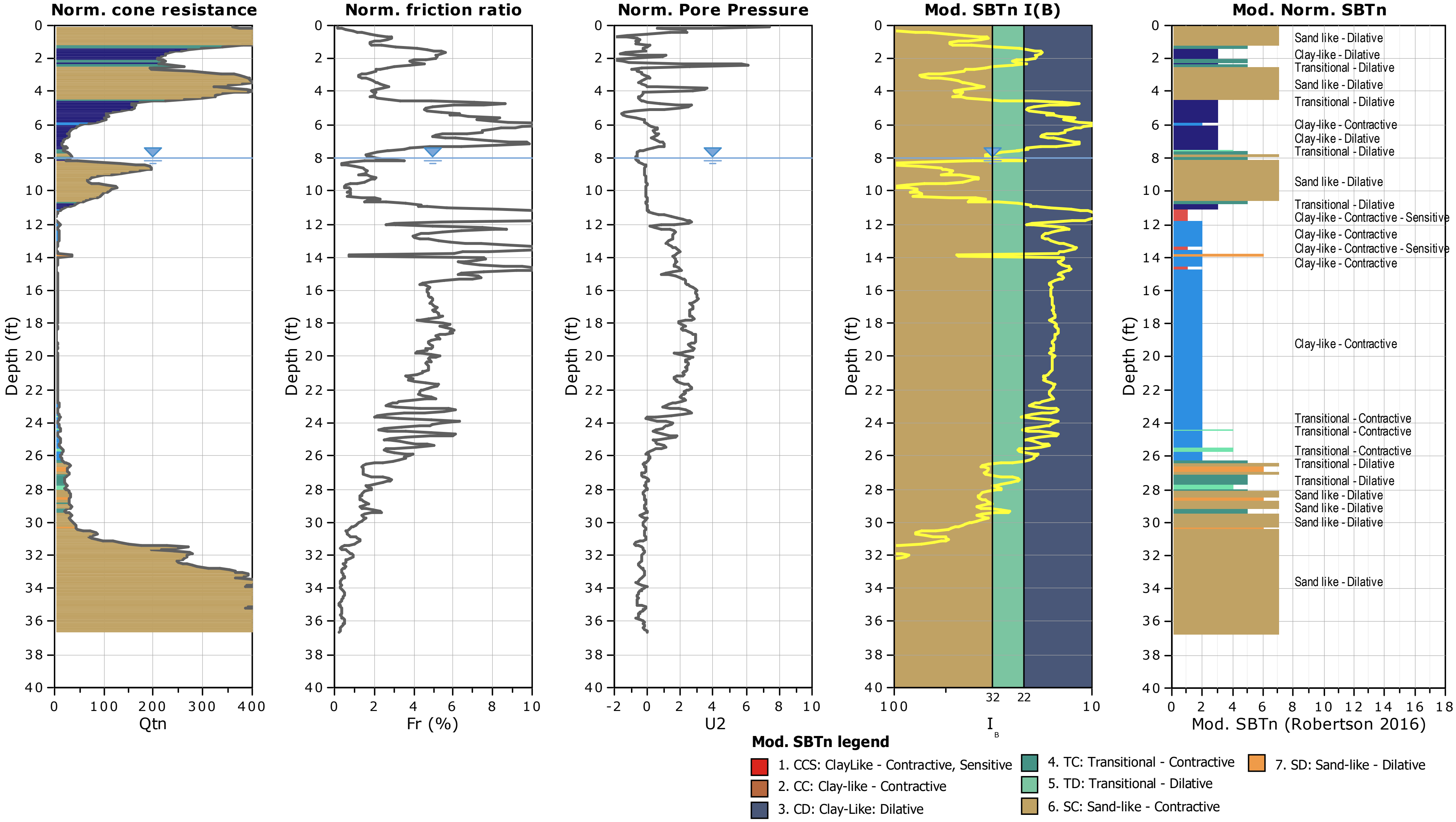
SBTn legend

🟥 1. Sensitive fine grained
🟫 2. Organic material
🟦 3. Clay to silty clay
🟩 4. Clayey silt to silty clay
🟩 5. Silty sand to sandy silt
🟨 6. Clean sand to silty sand
🟧 7. Gravely sand to sand
⬛ 8. Very stiff sand to clayey sand
⬜ 9. Very stiff fine grained

HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
Delmar, Maryland
http://www.HCEA.com

CPT: S Market RW-CPT-03
Total depth: 36.61 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



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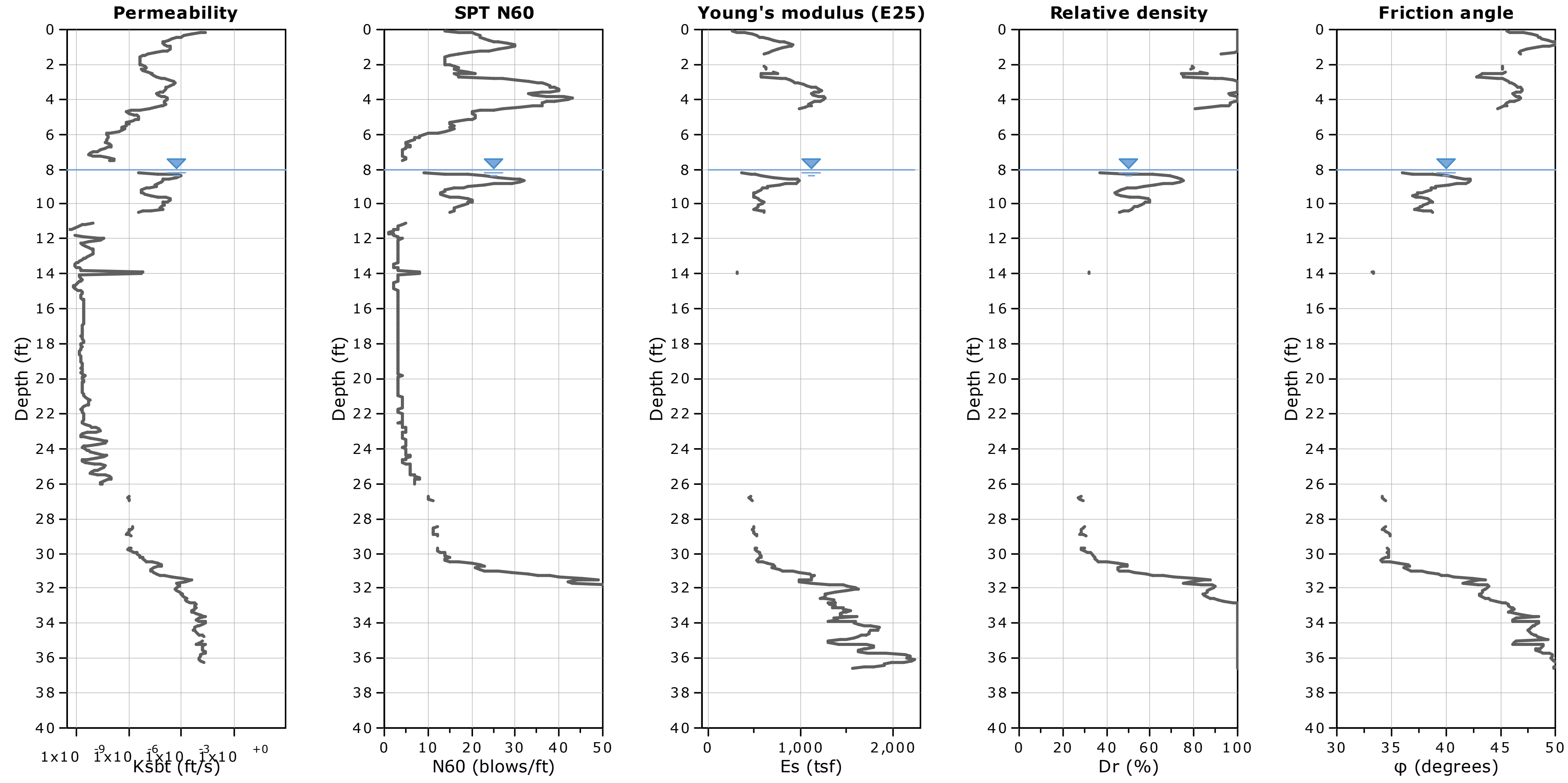
417 Maryland Avenue
Delmar, Maryland
http://www.HCEA.com

Project: **S Market - RK&K**
Location: **New Castle, DE**

CPT: S Market RW-CPT-03
Total depth: 36.61 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.



Calculation parameters

Permeability: Based on SBT_n

SPT N_{60}: Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative desnisty constant, C_{Dr}: 350.0

Phi: Based on Kulhawy & Mayne (1990)

—●— User defined estimation data

HILLIS - CARNES ENGINEERING ASSOCIATES
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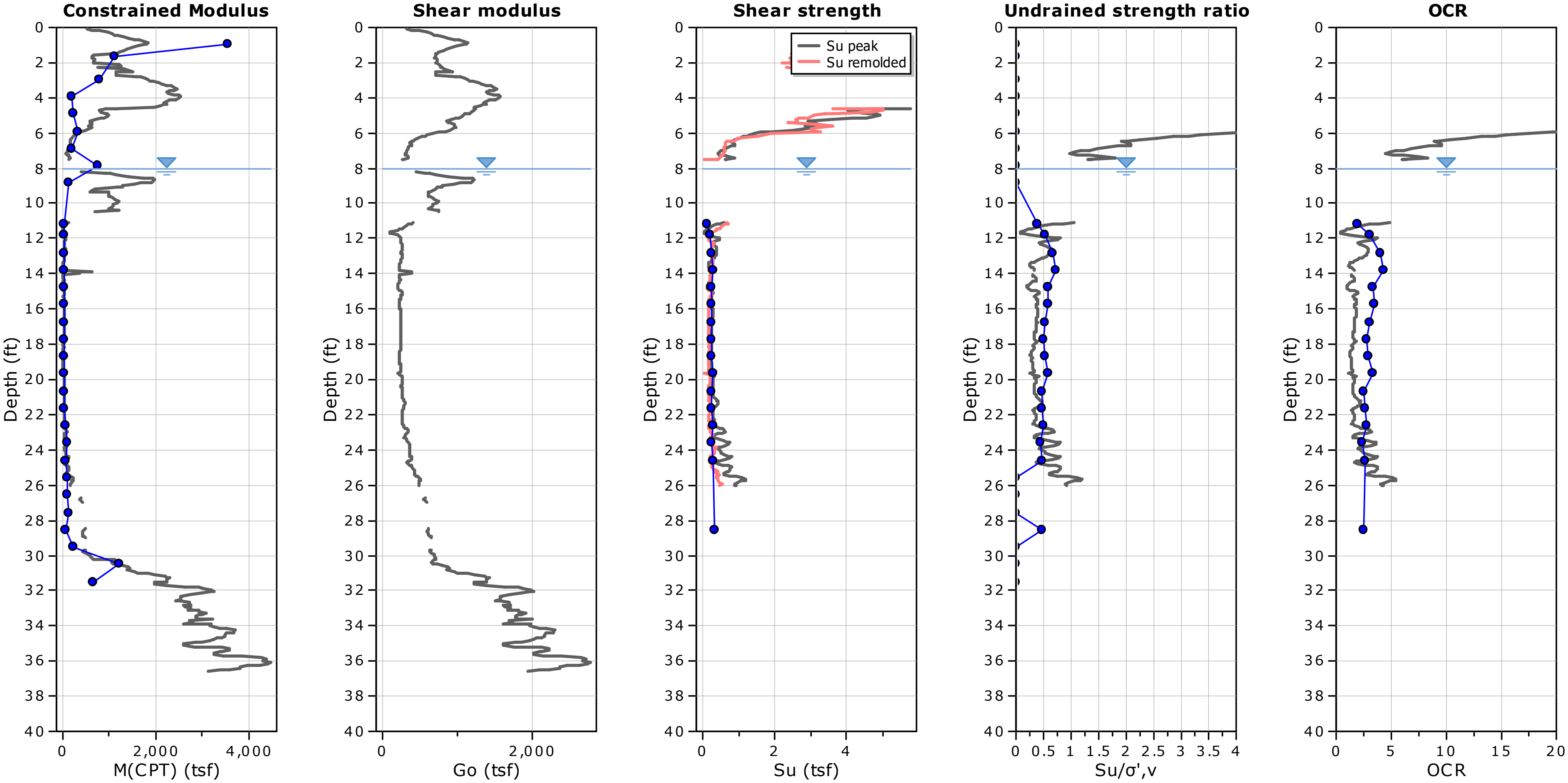
CPT: S Market RW-CPT-03
Total depth: 36.61 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable *alpha* using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33

🔴 User defined estimation data

🔵 Flat Dilatometer Test data

HILLIS - CARNES ENGINEERING ASSOCIATES
417 Maryland Avenue
Delmar, Maryland
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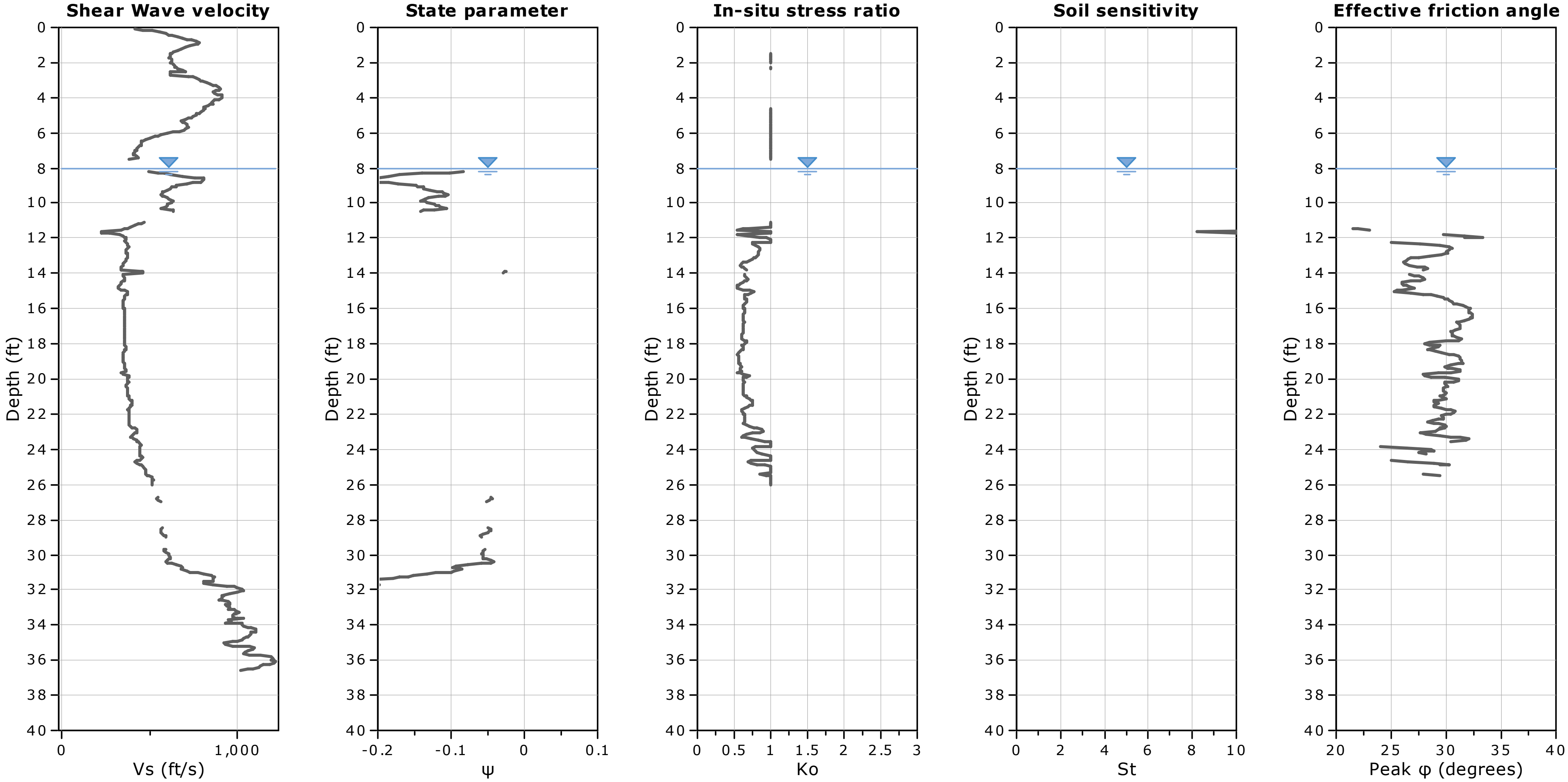
CPT: S Market RW-CPT-03
Total depth: 36.61 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

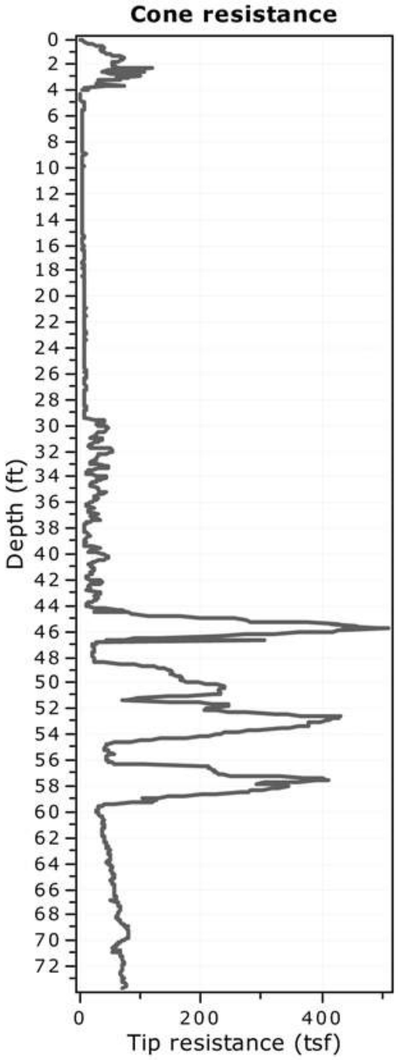
Soil Sensitivity factor, N_S: 350.00

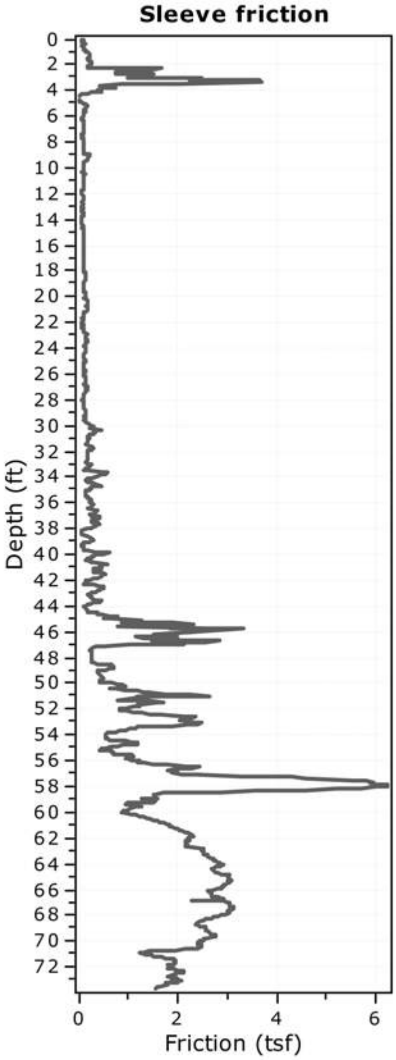
●— User defined estimation data

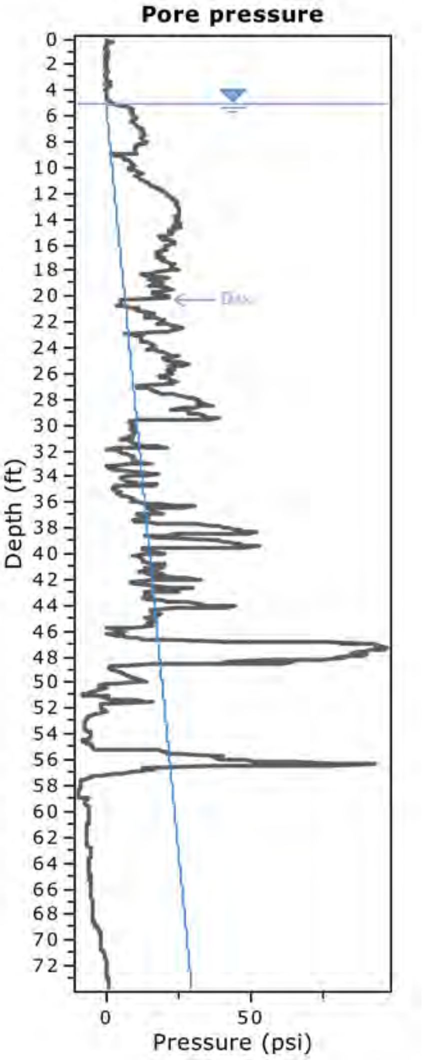
HILLIS-CARNES
ENGINEERING ASSOCIATES

CPT: RW-CPT-04
Total depth: 73.69 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

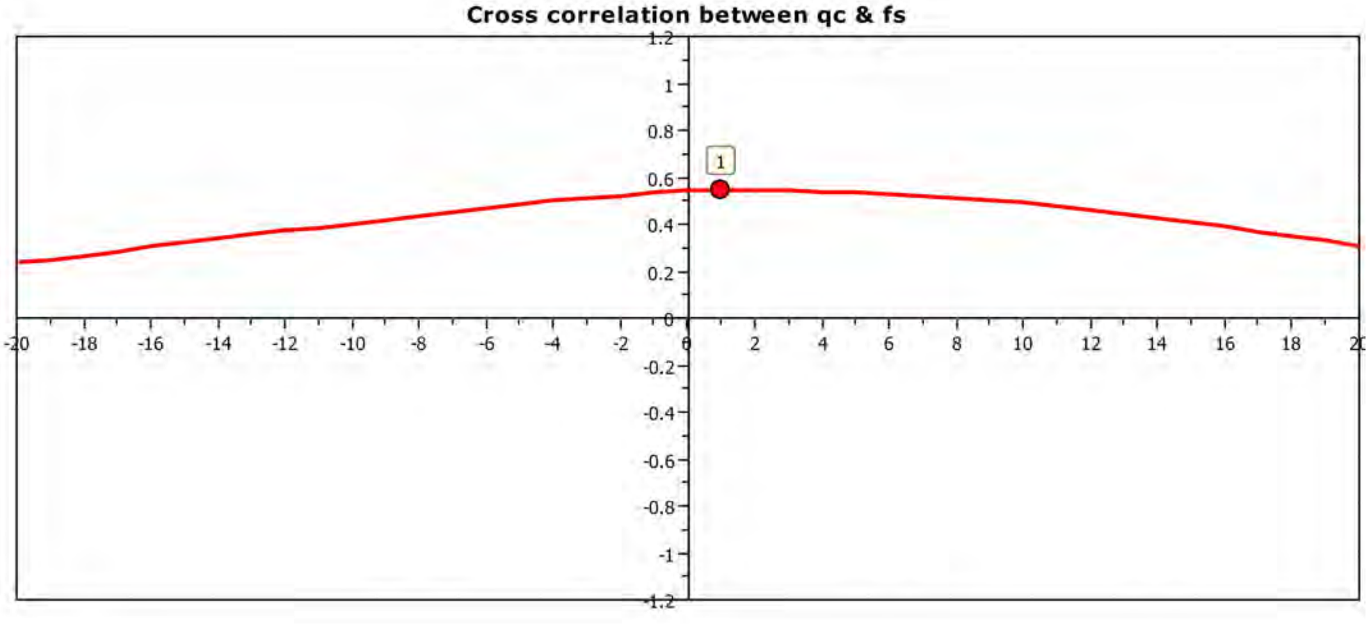
Project: **South Market Street**
Location: **Wilmington, DE**


Cone resistance


Sleeve friction


Pore pressure

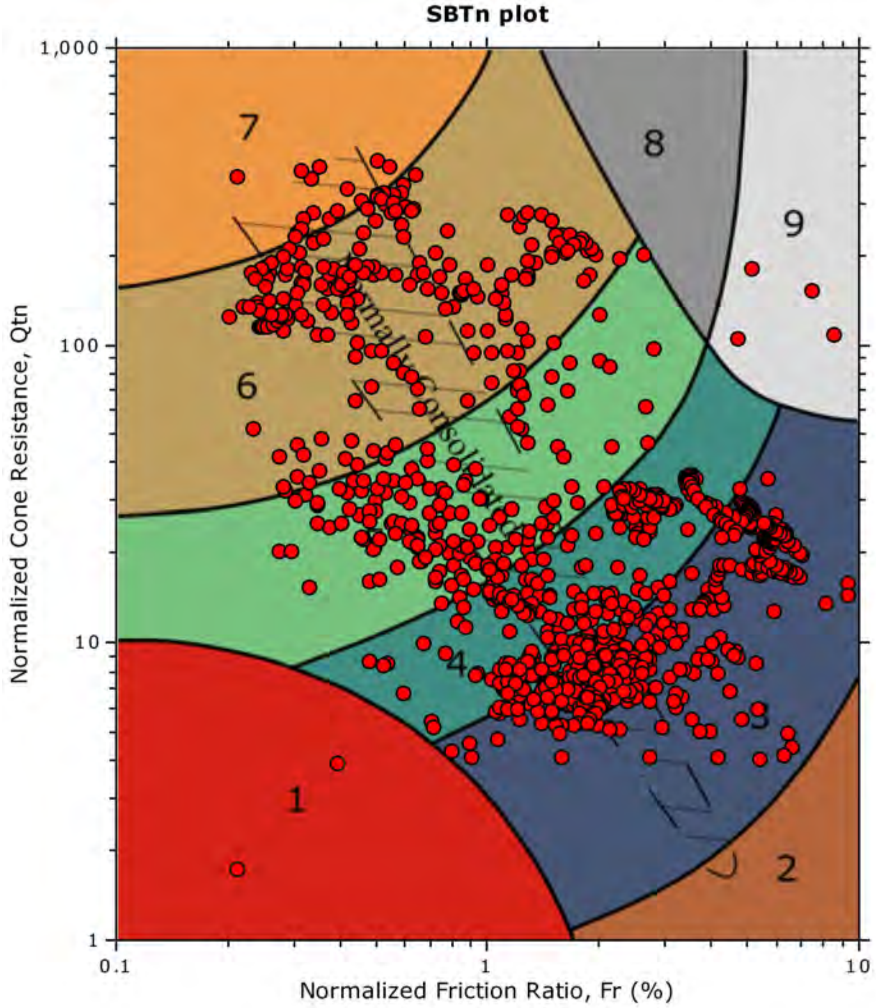
The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

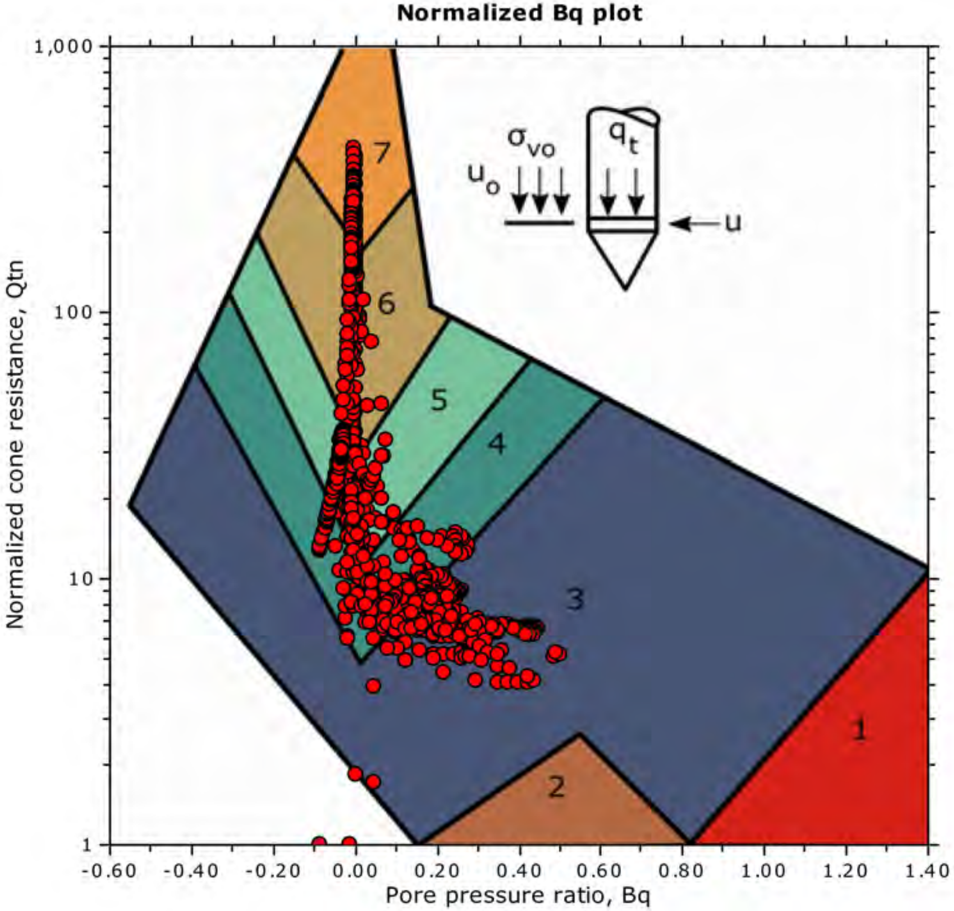

Cross correlation between qc & fs

CPT: RW-CPT-04
Total depth: 73.69 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**

SBT - Bq plots (normalized)


SBTn plot


Normalized Bq plot

SBTn legend

🟥 1. Sensitive fine grained
🟫 2. Organic material
🟦 3. Clay to silty clay
🟩 4. Clayey silt to silty clay
🟩 5. Silty sand to sandy silt
🟫 6. Clean sand to silty sand
🟧 7. Gravelly sand to sand
⬛ 8. Very stiff sand to clayey sand
⬜ 9. Very stiff fine grained

CPT: RW-CPT-04

Total depth: 73.69 ft, Date: 10/21/2022

Surface Elevation: 0.00 ft

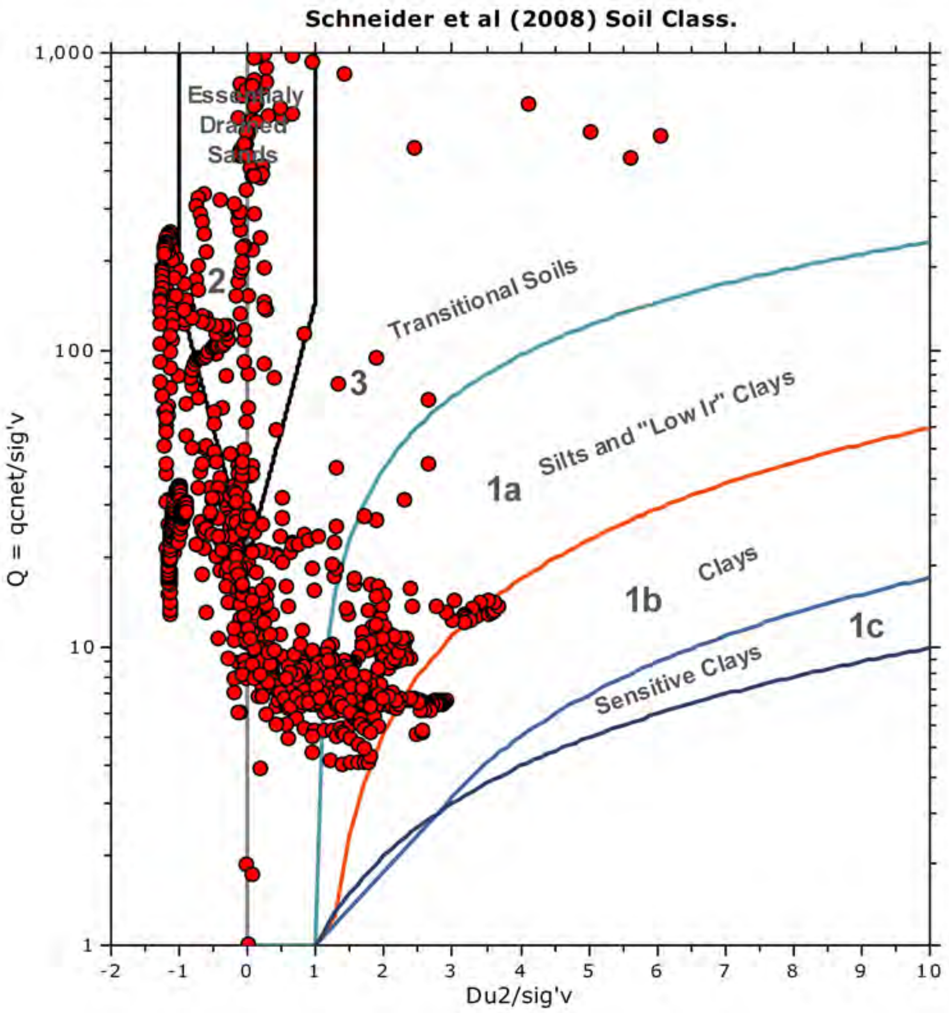
Cone Type:

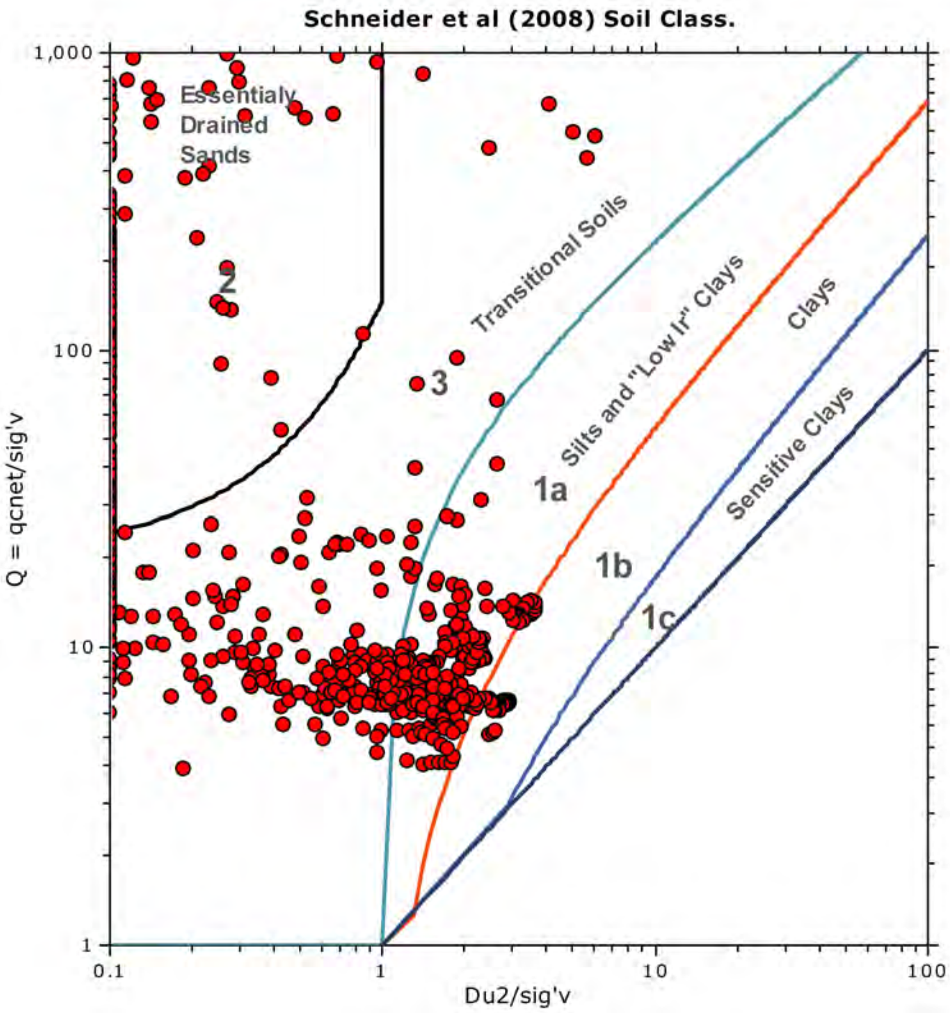
Cone Operator:

Project: **South Market Street**

Location: **Wilmington, DE**

Bq plots (Schneider)

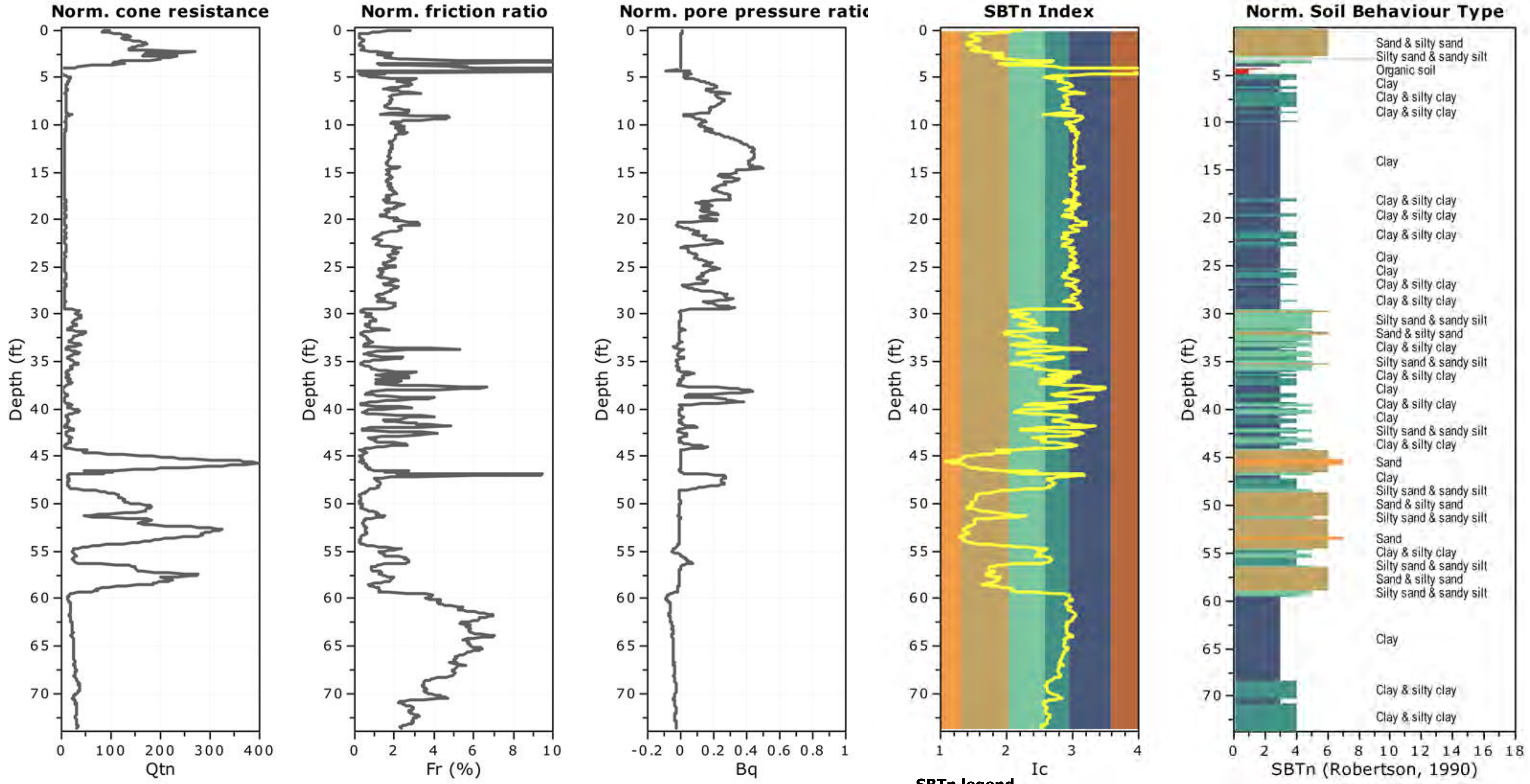




HILLIS-CARNES
ENGINEERING ASSOCIATES

Project: **South Market Street**
Location: **Wilmington, DE**

CPT: RW-CPT-04
Total depth: 73.69 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:



SBTn legend

🟥 1. Sensitive fine grained
🟫 2. Organic material
🟦 3. Clay to silty clay
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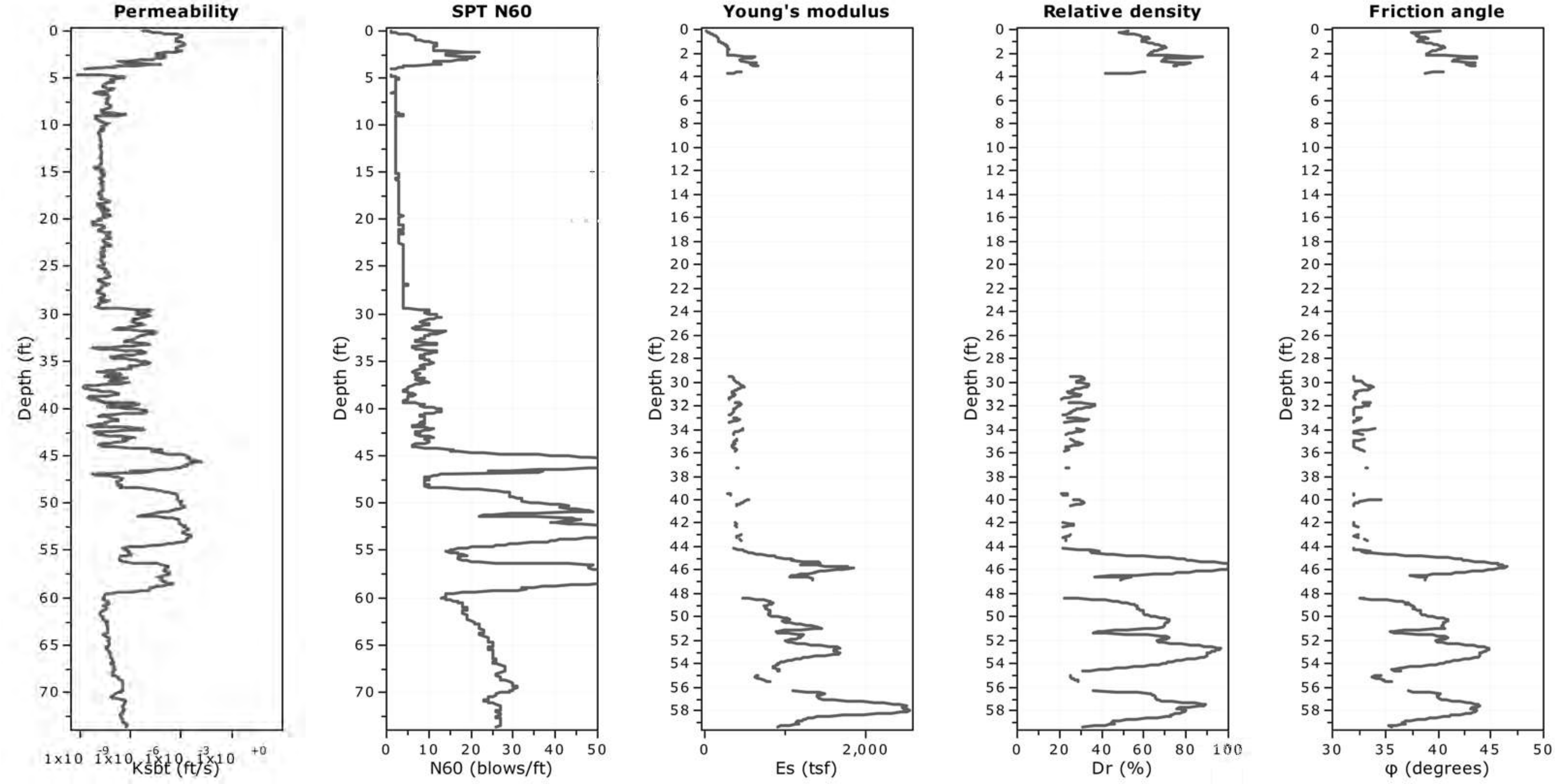
🟩 5. Silty sand to sandy silt
🟫 6. Clean sand to silty sand
🟧 7. Gravely sand to sand
⬜ 8. Very stiff sand to clayey sand
⬜ 9. Very stiff fine grained

HILLIS-CARNES
ENGINEERING ASSOCIATES

CPT: RW-CPT-04
Total depth: 73.69 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**



Calculation parameters

Permeability: Based on SBT_n

SPT N_{60}: Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

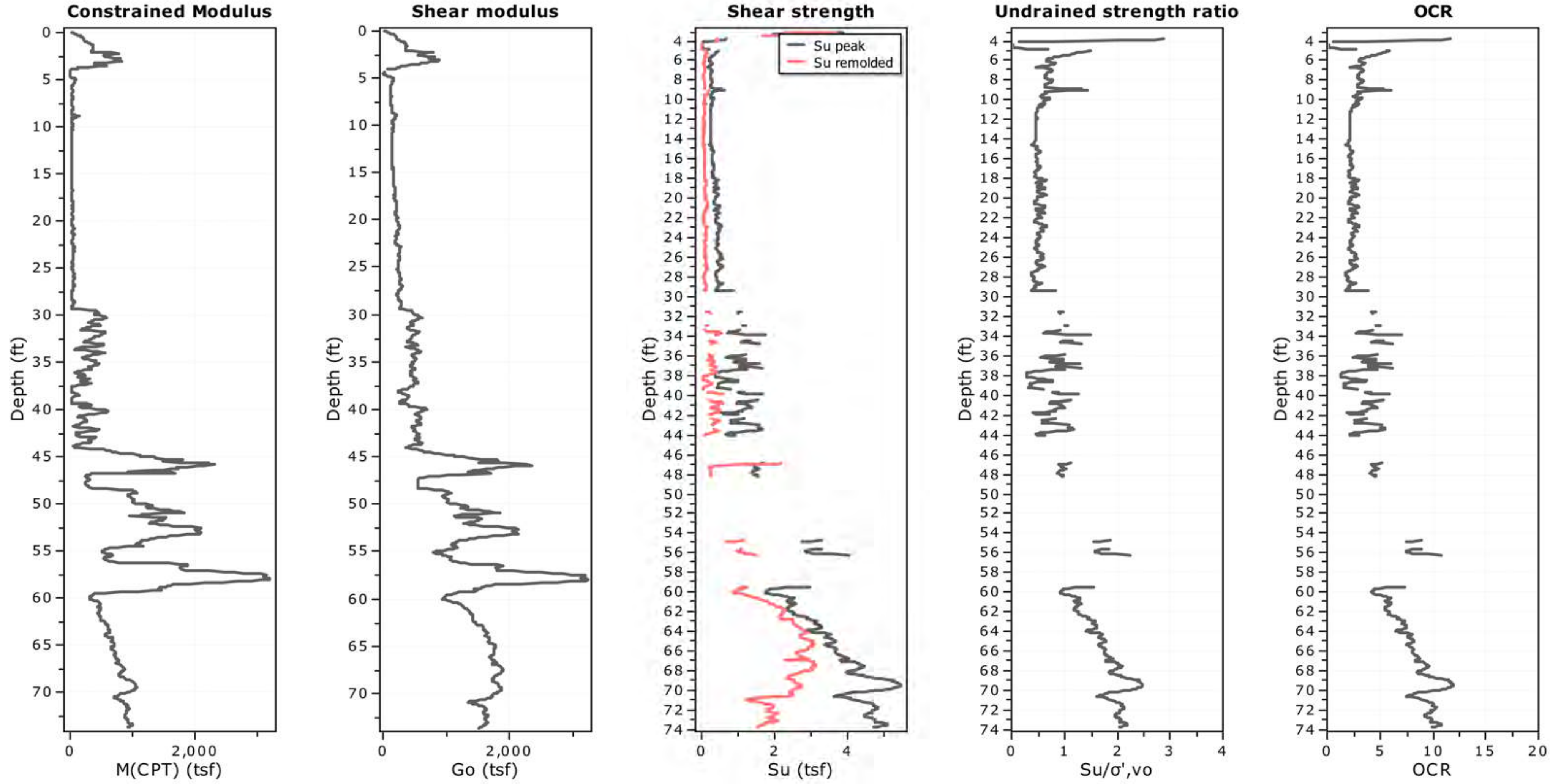
Relative density constant, C_{Dr}: 350.0

Phi: Based on Kulhawy & Mayne (1990)

CPT: RW-CPT-04

Total depth: 73.69 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: South Market Street
Location: Wilmington, DE



Calculation parameters

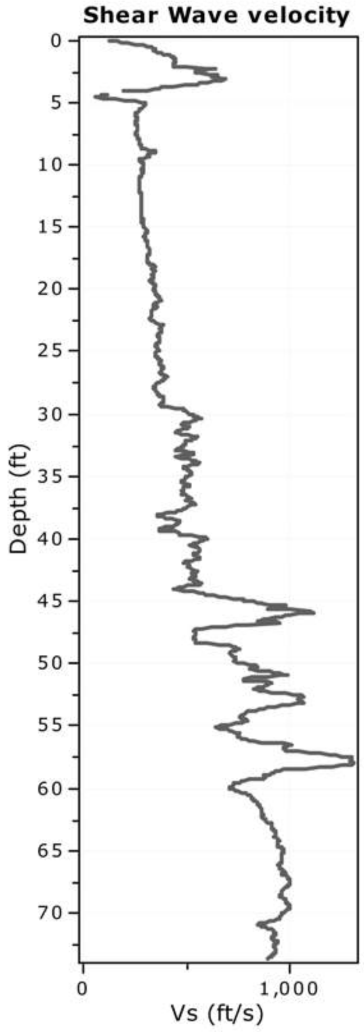
Constrained modulus: Based on variable alpha using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable alpha using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

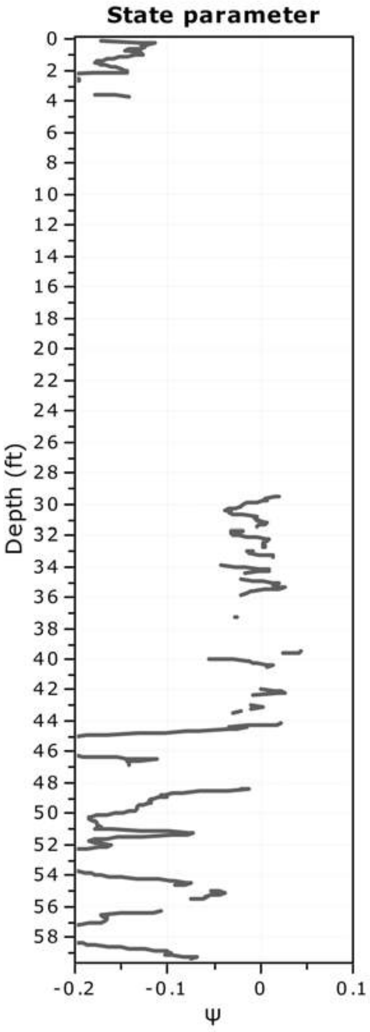
OCR factor for clays, N_{kt}: 0.33
—●— Flat Dilatometer Test data

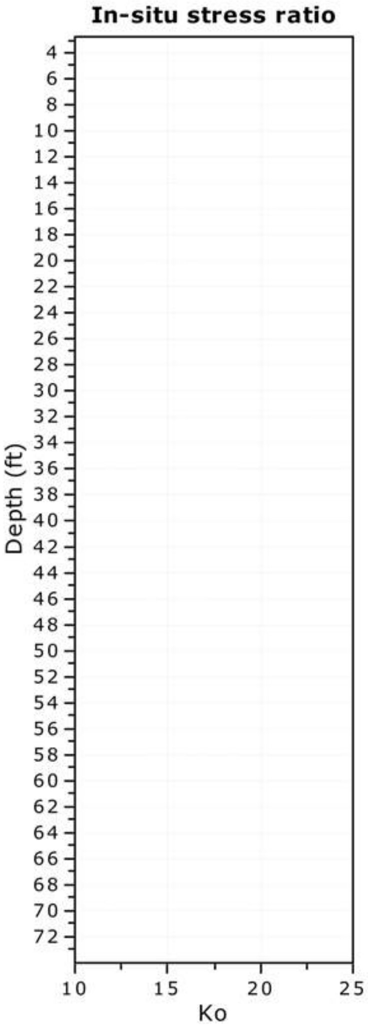
HILLIS-CARNES
ENGINEERING ASSOCIATES

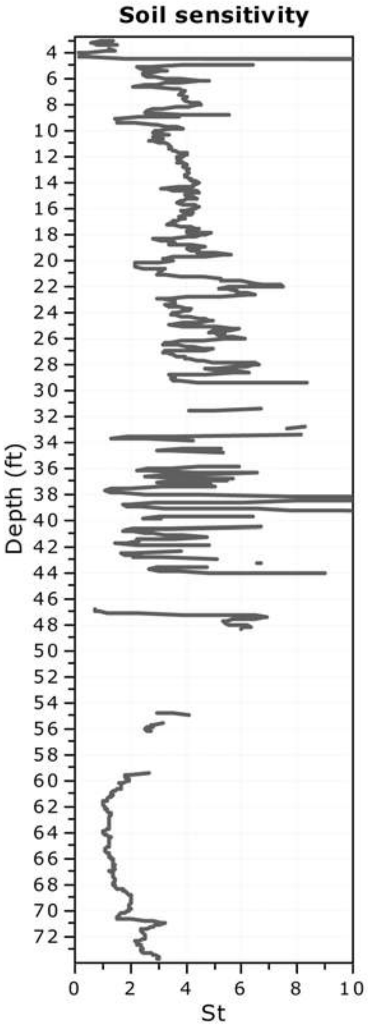
Project: **South Market Street**
Location: **Wilmington, DE**

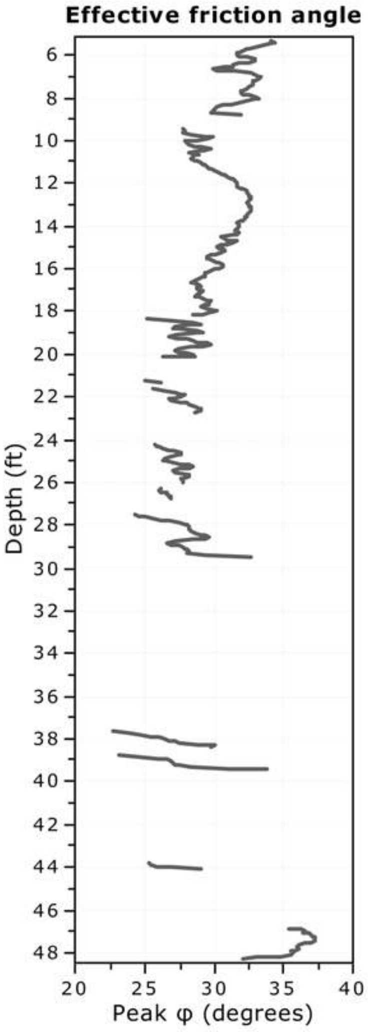
CPT: RW-CPT-04
Total depth: 73.69 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:











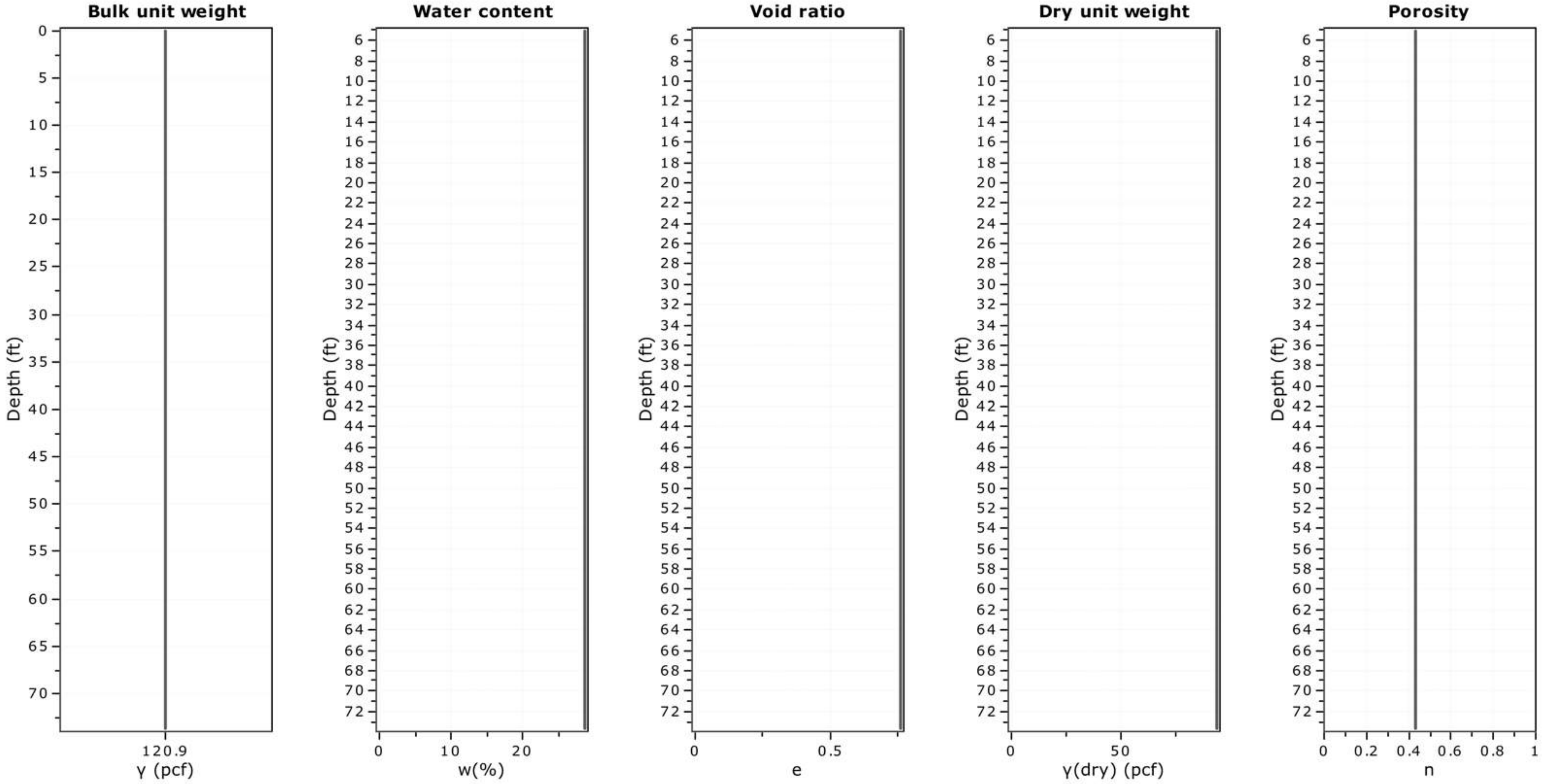
Calculation parameters

Soil Sensitivity factor, N_S: 7.00

CPT: RW-CPT-04

Total depth: 73.69 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**



HILLIS-CARNES
ENGINEERING ASSOCIATES

CPT: RW-CPT-04

Total depth: 73.69 ft, Date: 10/21/2022

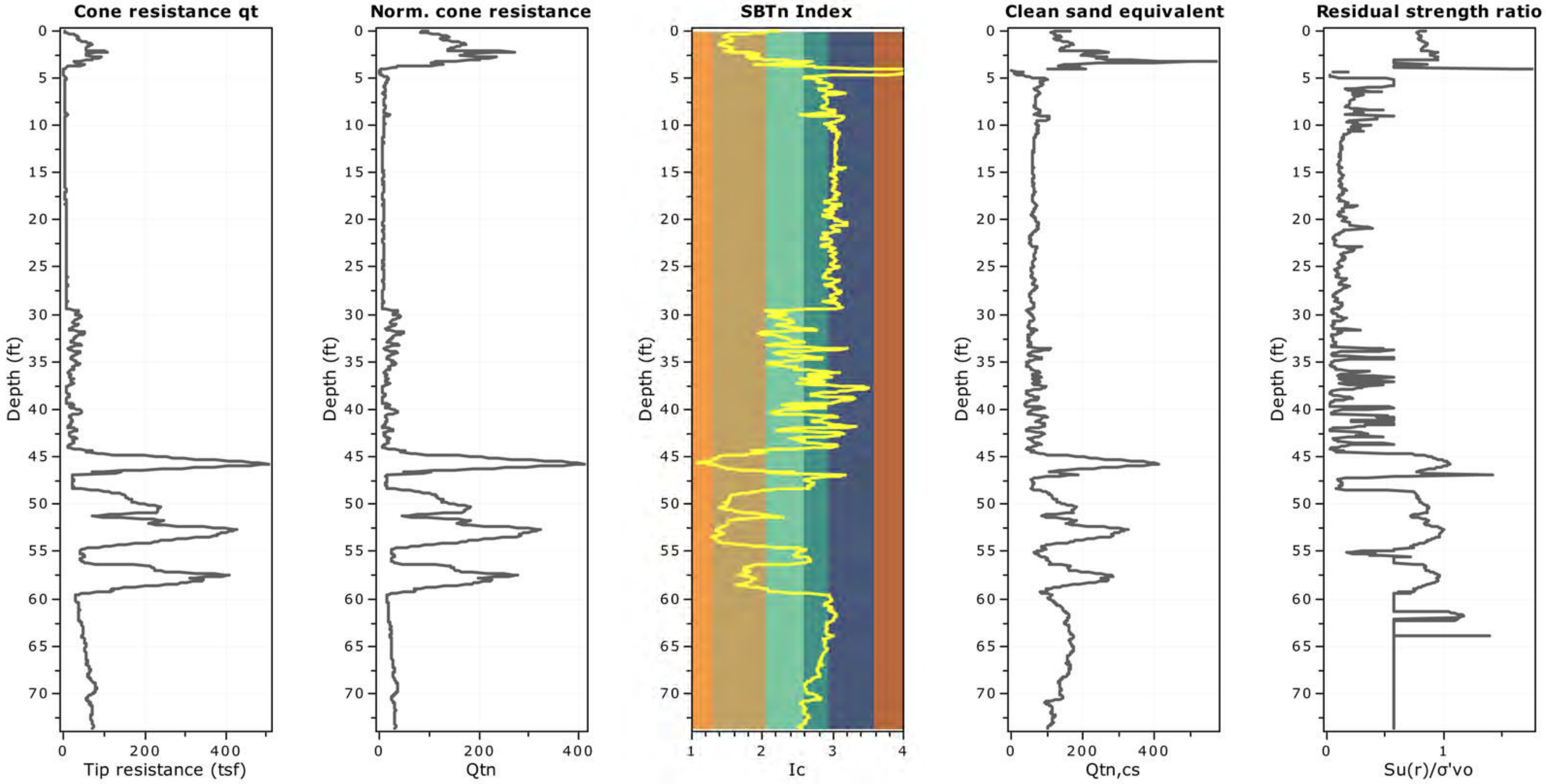
Surface Elevation: 0.00 ft

Cone Type:

Cone Operator:

Project: **South Market Street**

Location: **Wilmington, DE**



Cone resistance qt

Norm. cone resistance

SBTn Index

Clean sand equivalent

Residual strength ratio

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

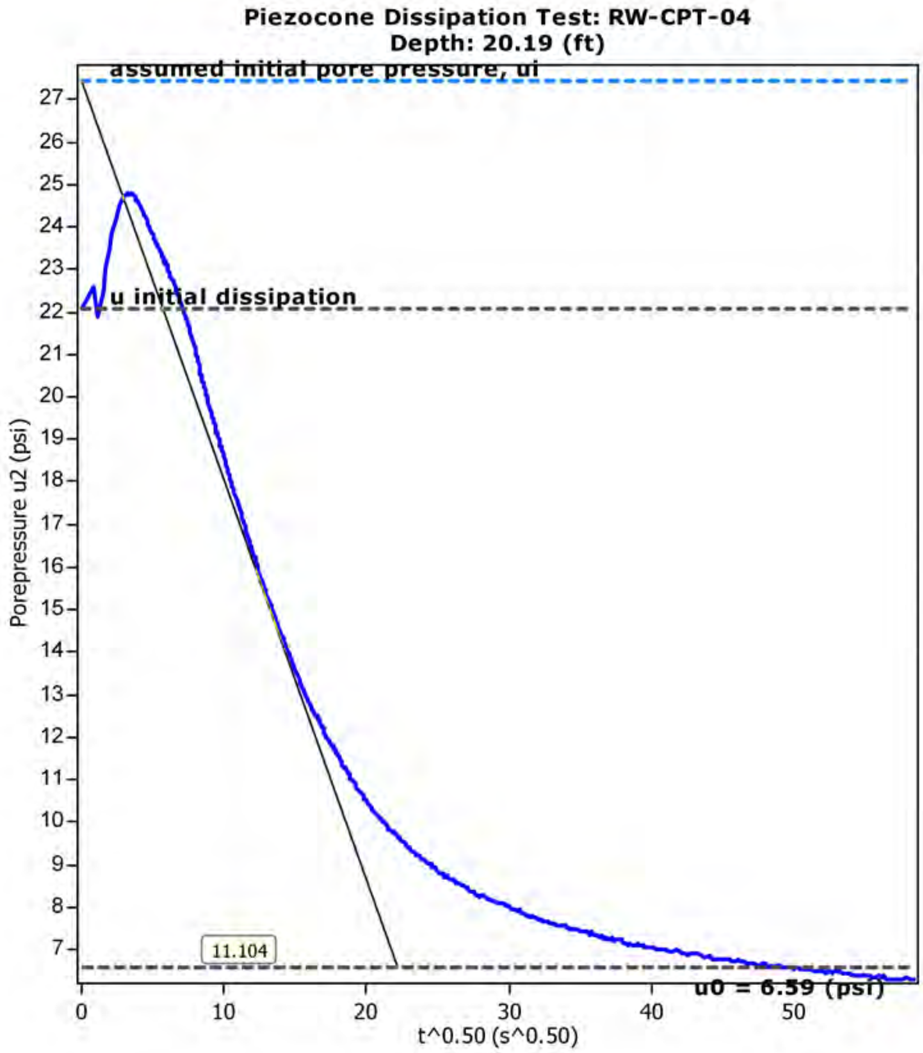
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

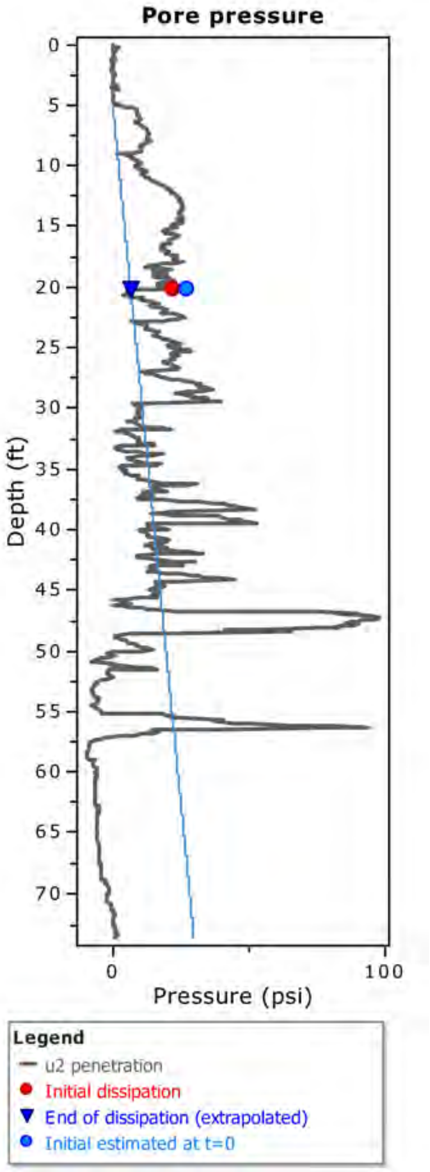
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (ft)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (ft^2/s)	c_h ($ft^2/year$)	M (tsf)	k_h (ft/s)
RW-CPT-04	20.19	11.1	123	3.91E-006	570211.94	5.03E-004	15847	42.07	3.73E-007

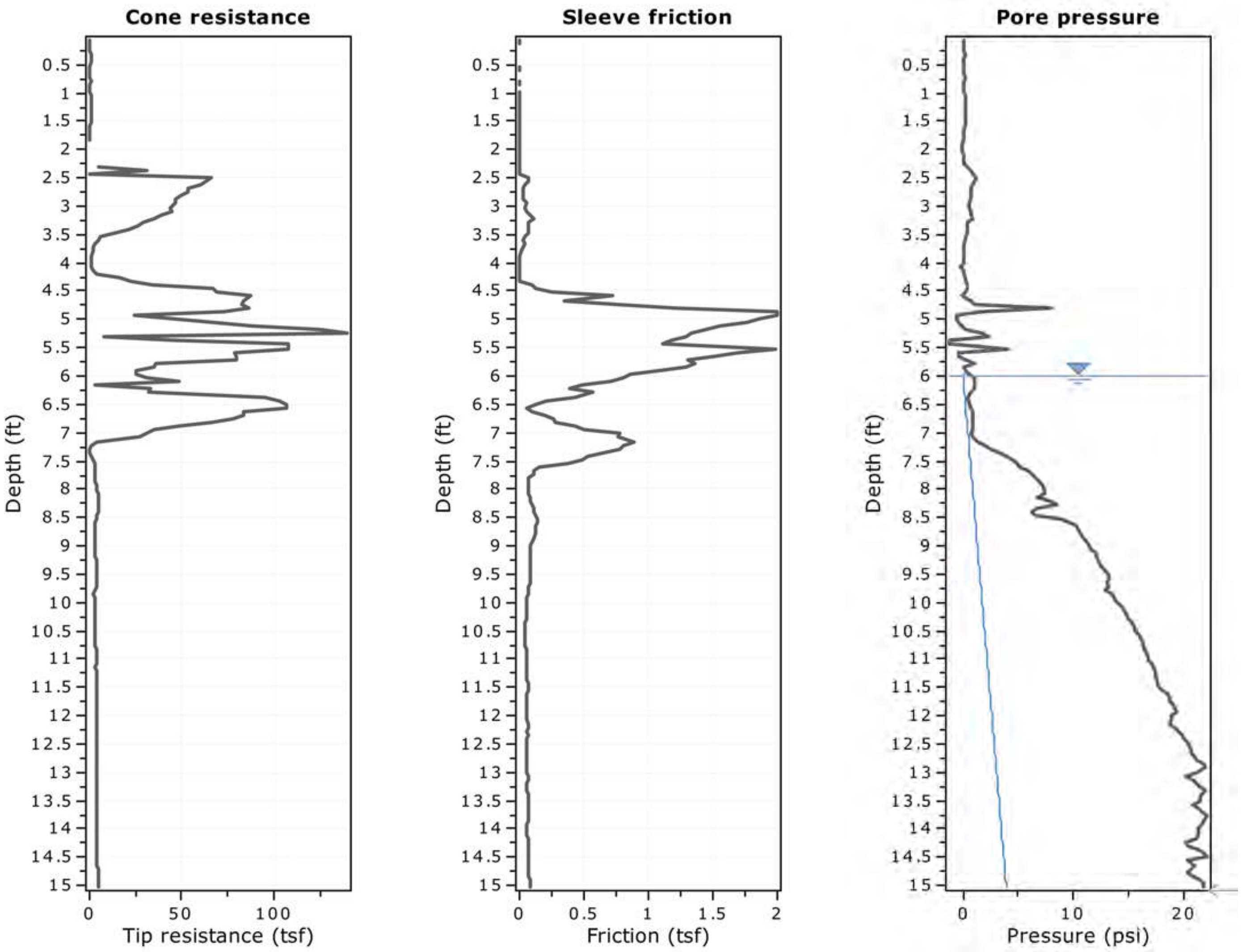

Piezocone Dissipation Test: RW-CPT-04
Depth: 20.19 (ft)
assumed initial pore pressure, ui
u initial dissipation
11.104
u0 = 6.59 (psi)
Porepressure u2 (psi)
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
0
10
20
30
40
50
t^0.50 (s^0.50)


Pore pressure
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Depth (ft)
0
100
Pressure (psi)
Legend
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

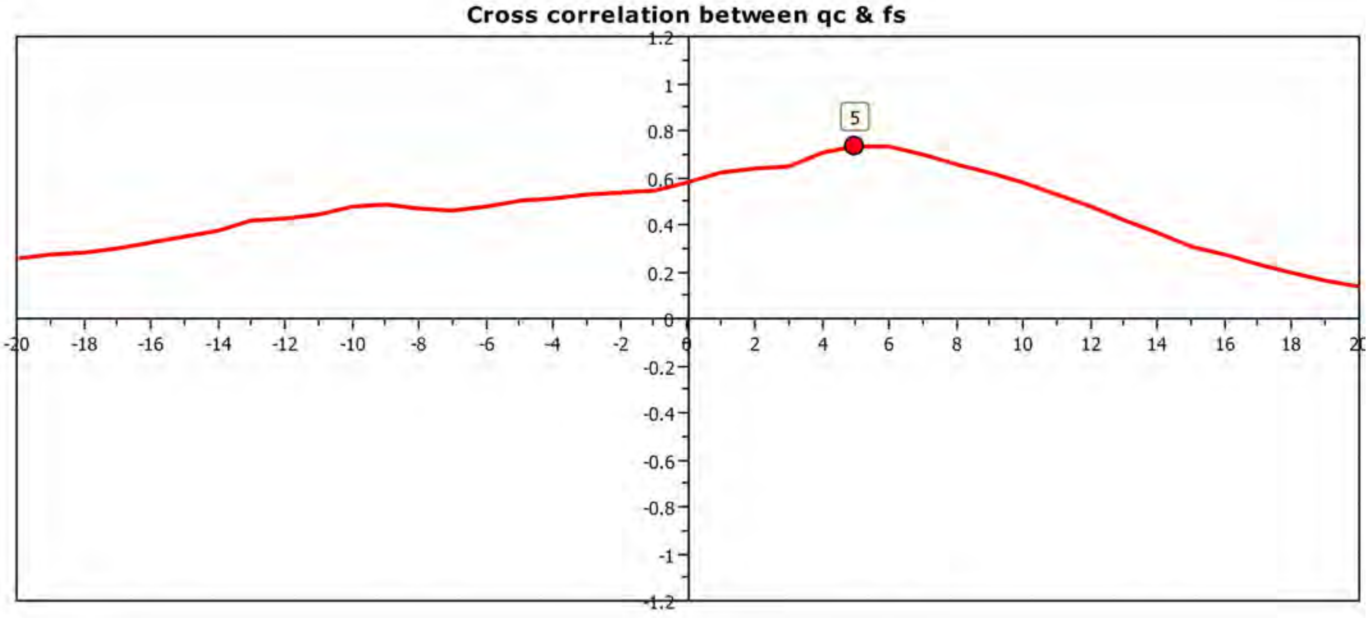
CPT: RW-CPT-05

Total depth: 15.03 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

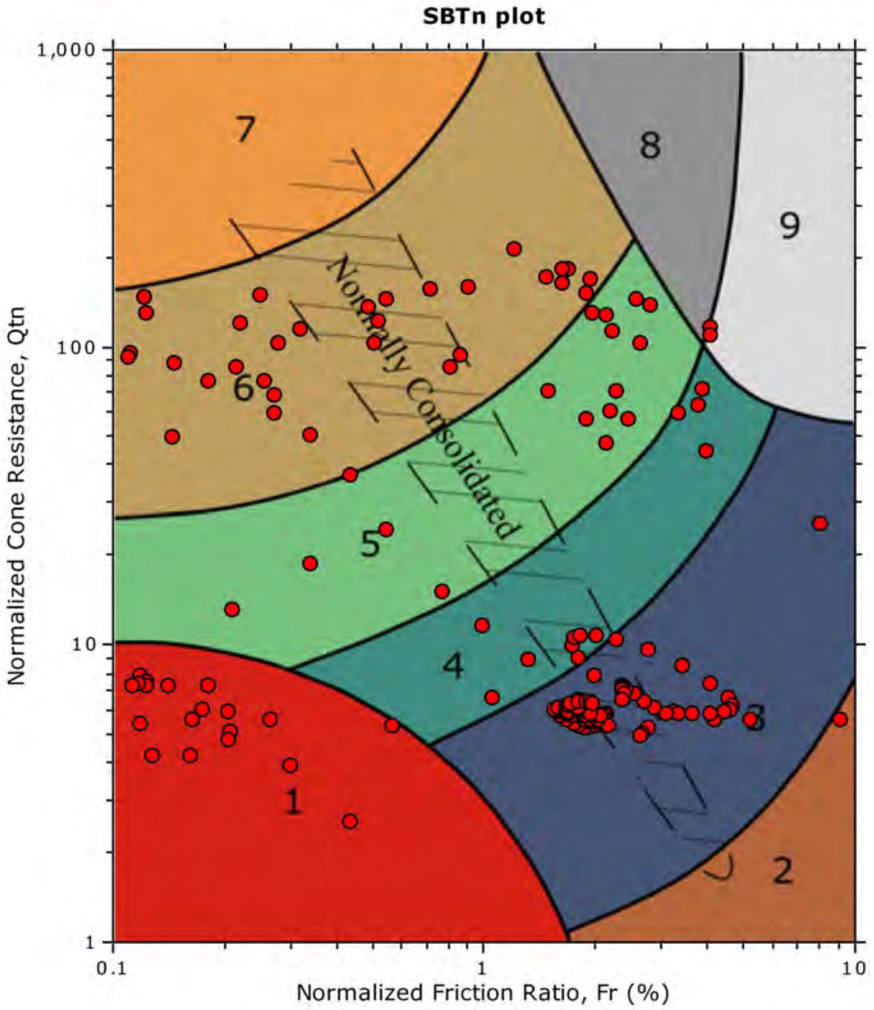
Project: **South Market Street**
Location: **Wilmington, DE**

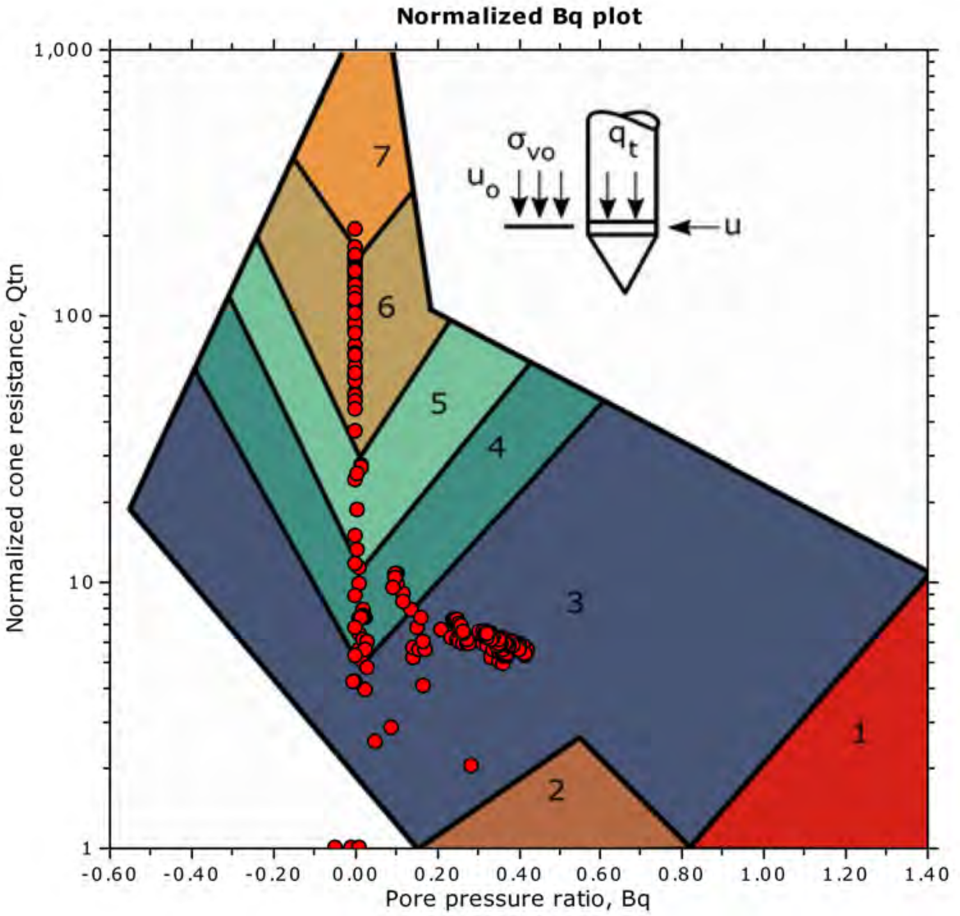


The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).



SBT - Bq plots (normalized)

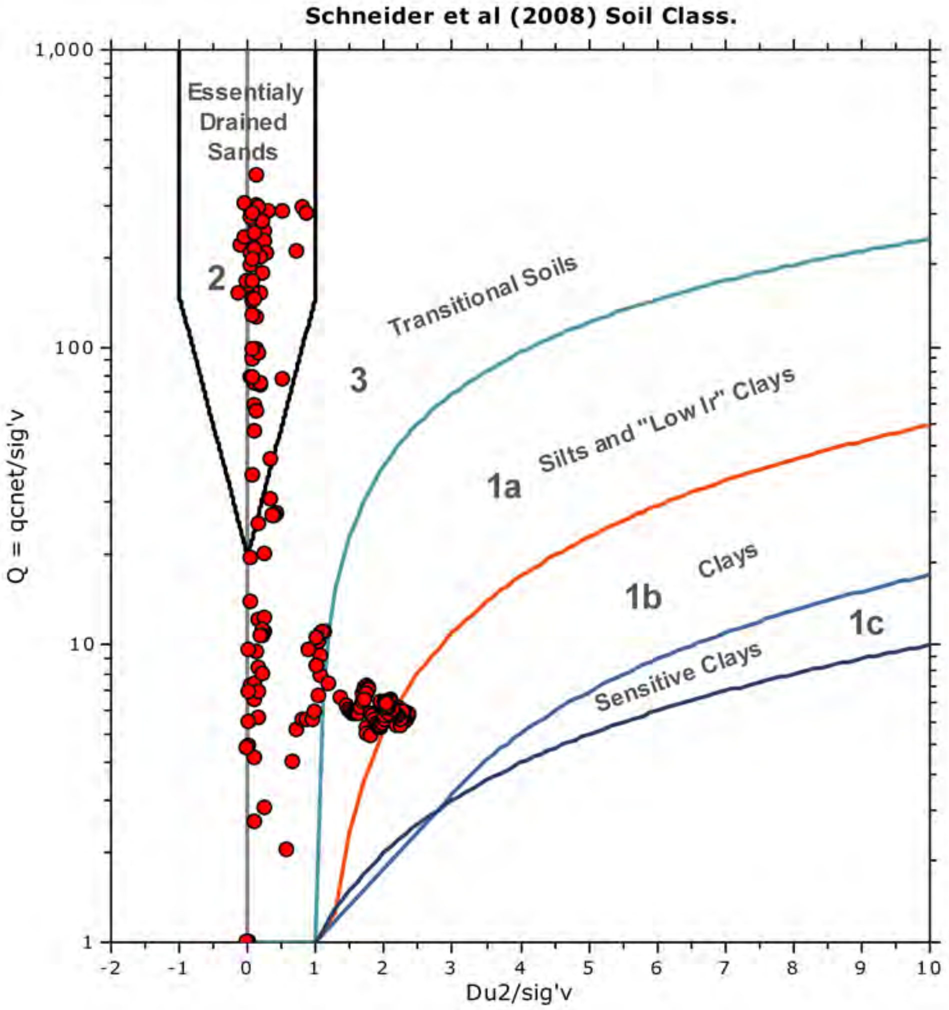


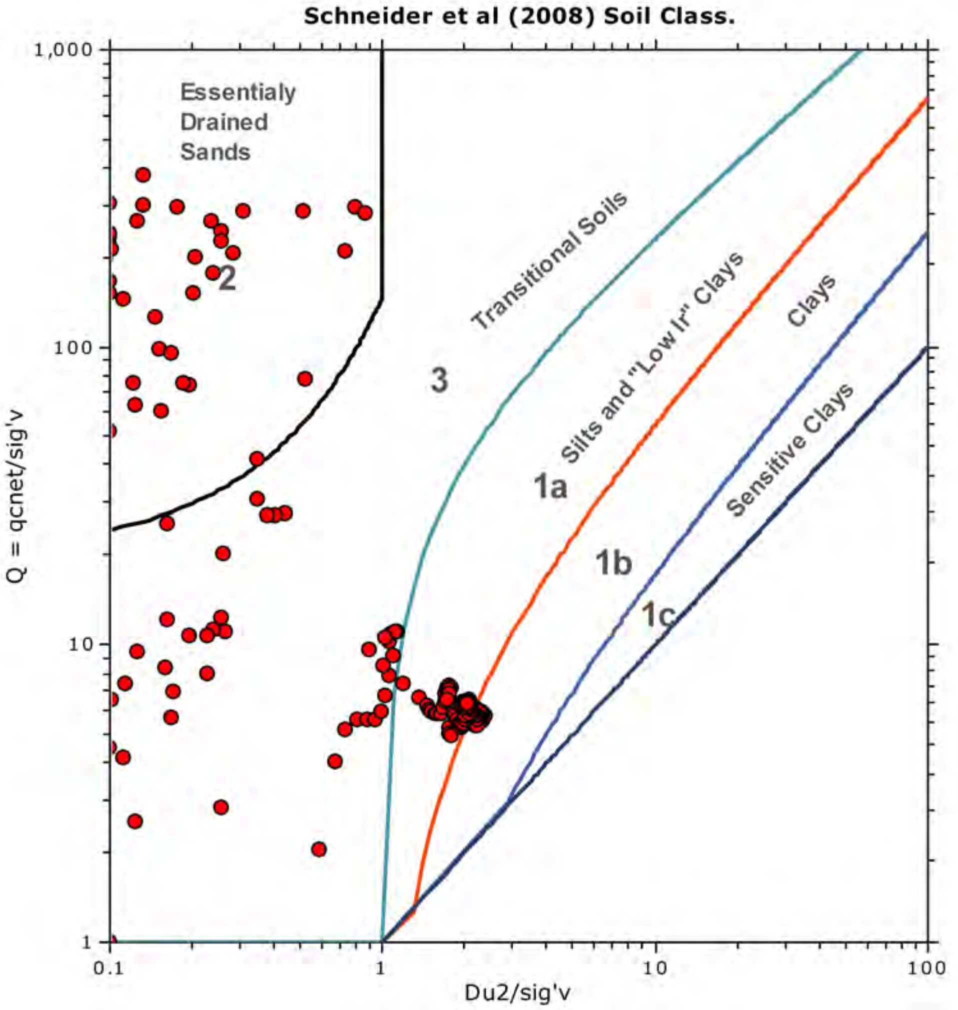


SBTn legend

🟥 1. Sensitive fine grained
🟫 2. Organic material
🟦 3. Clay to silty clay
🟩 4. Clayey silt to silty clay
🟩 5. Silty sand to sandy silt
🟫 6. Clean sand to silty sand
🟧 7. Gravelly sand to sand
⬛ 8. Very stiff sand to clayey sand
⬜ 9. Very stiff fine grained

Bq plots (Schneider)

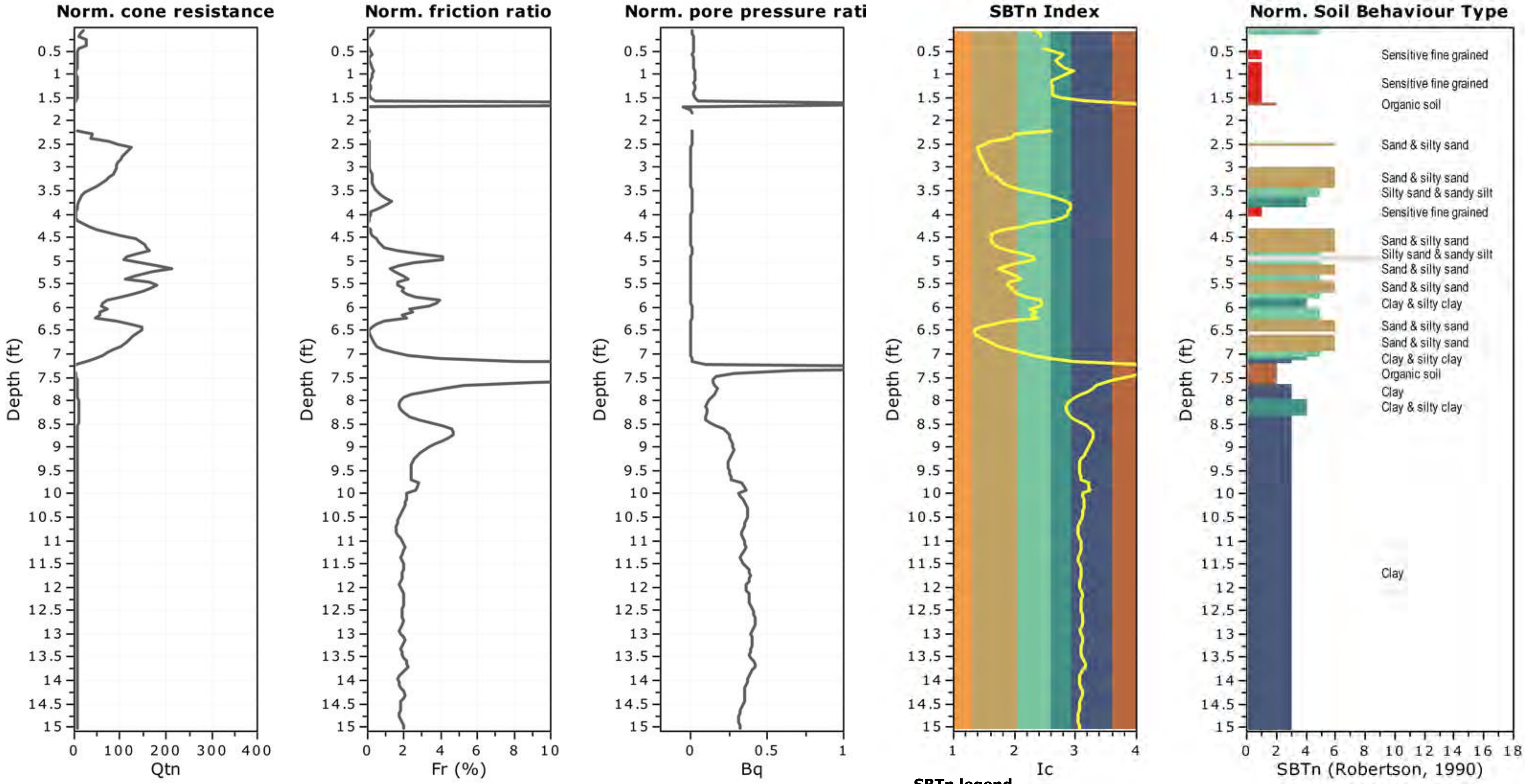




HILLIS-CARNES
ENGINEERING ASSOCIATES

Project: **South Market Street**
Location: **Wilmington, DE**

CPT: RW-CPT-05
Total depth: 15.03 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:



SBTn legend

🟥 1. Sensitive fine grained
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🟦 3. Clay to silty clay
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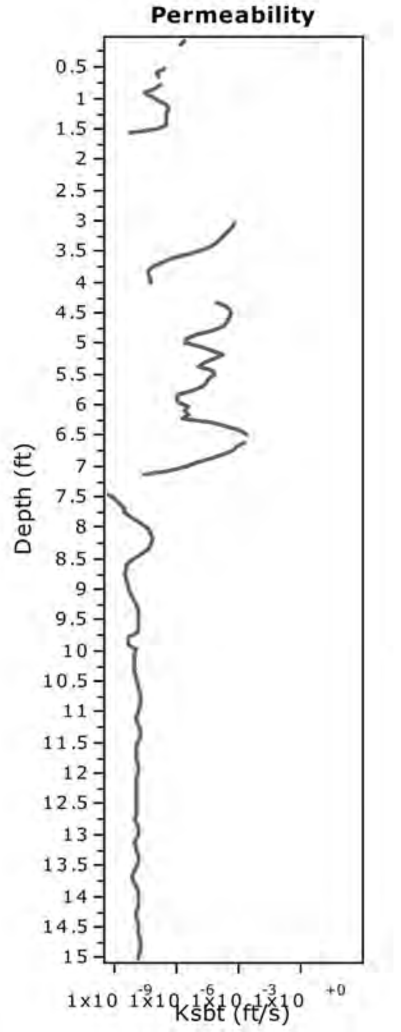
🟨 6. Clean sand to silty sand
🟧 7. Gravely sand to sand
⬜ 8. Very stiff sand to clayey sand
⬜ 9. Very stiff fine grained

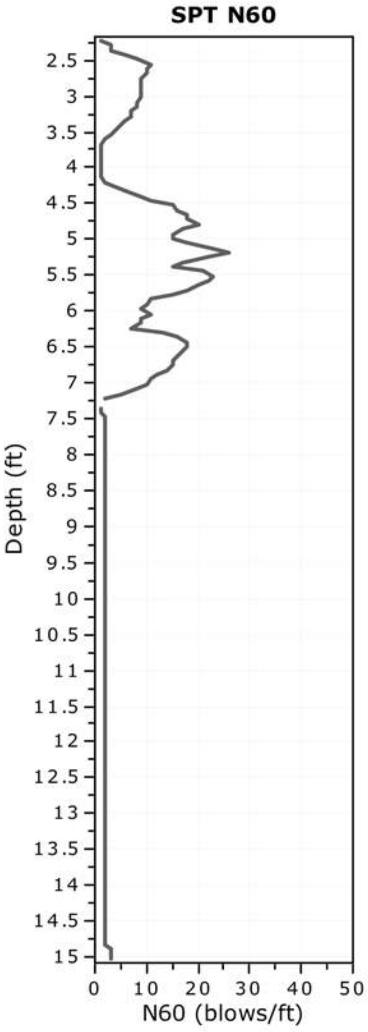
HILLIS-CARNES
ENGINEERING ASSOCIATES

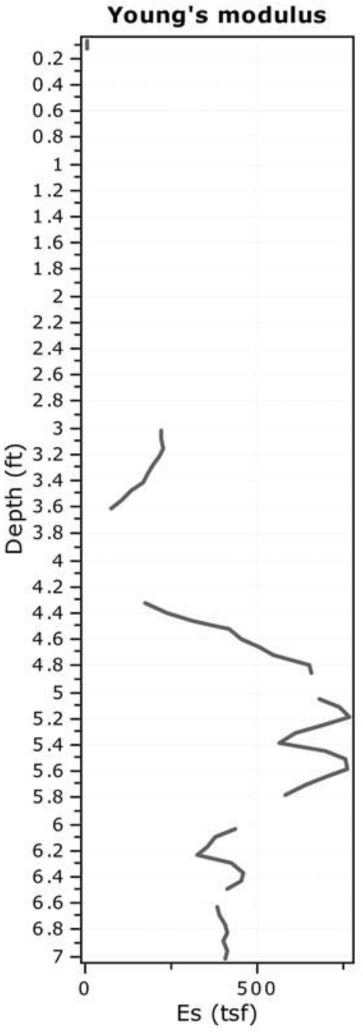
CPT: RW-CPT-05

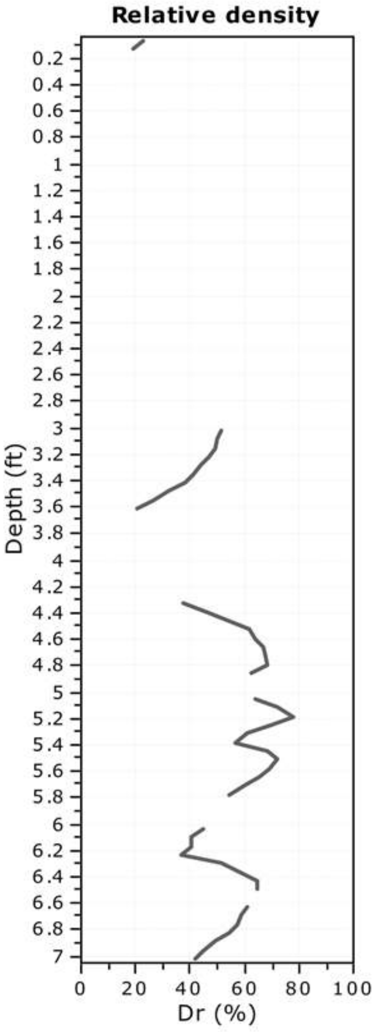
Total depth: 15.03 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

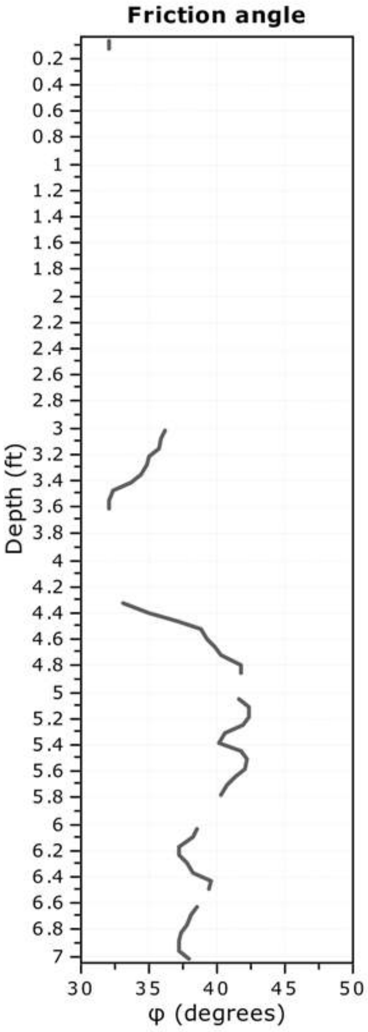
Project: **South Market Street**
Location: **Wilmington, DE**











Calculation parameters

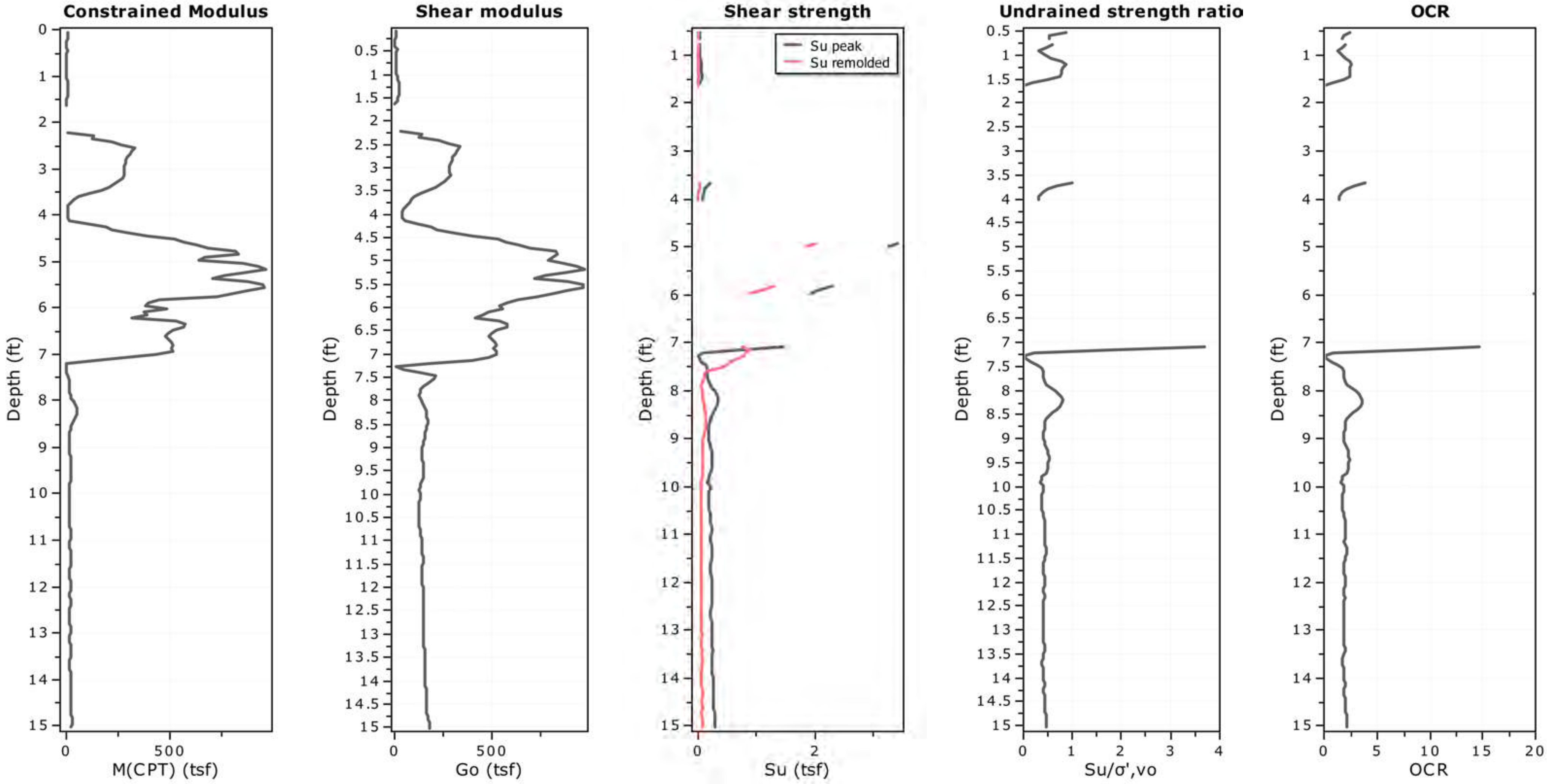
Permeability: Based on SBT$_n$
SPT N$_{60}$: Based on I$_c$ and q$_t$
Young's modulus: Based on variable alpha using I $_c$ (Robertson, 2009)

Relative density constant, C $_{Dr}$: 350.0
Phi: Based on Kulhawy & Mayne (1990)

CPT: RW-CPT-05

Total depth: 15.03 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**



Calculation parameters

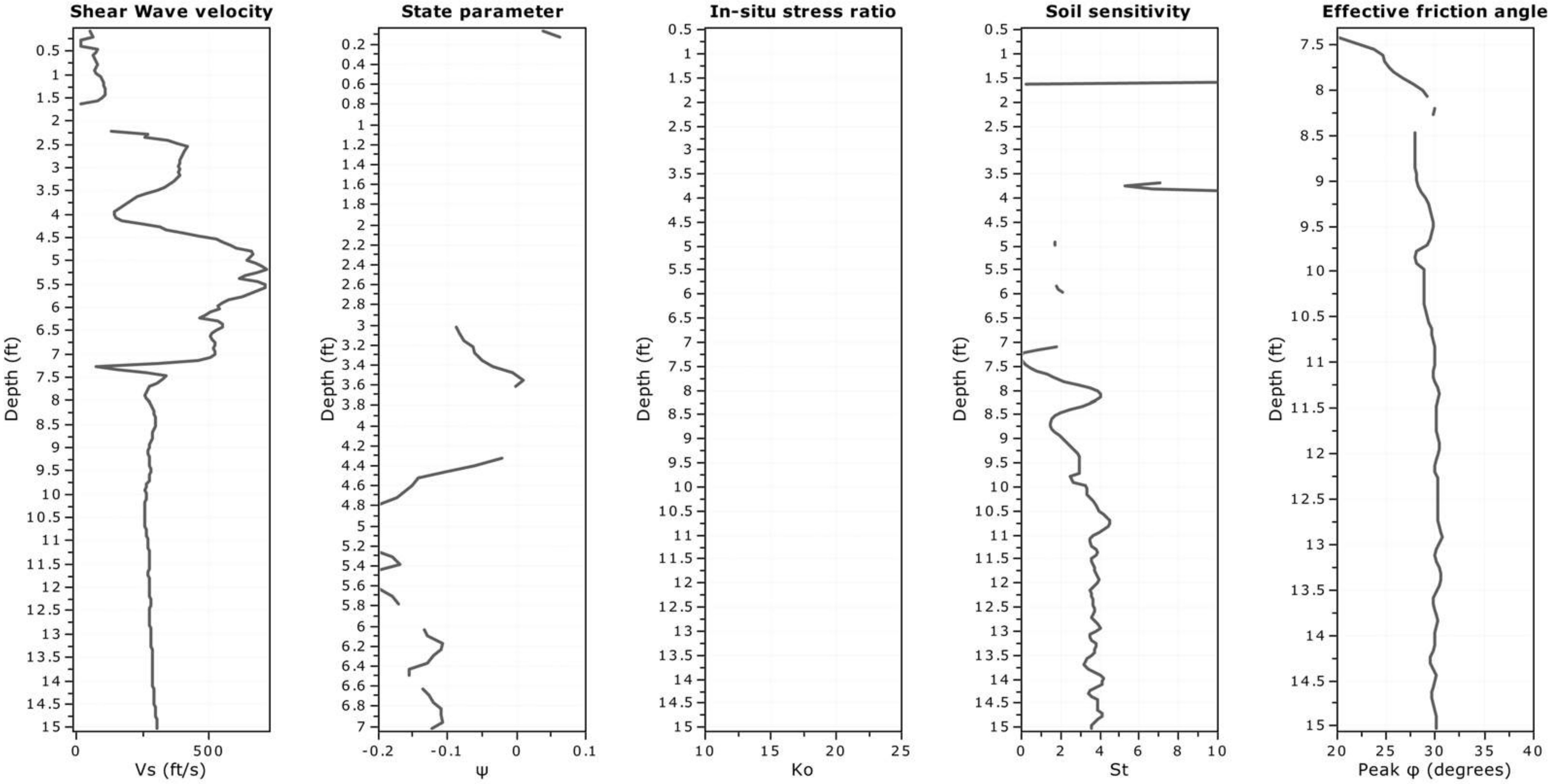
Constrained modulus: Based on variable alpha using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable alpha using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33
—●— Flat Dilatometer Test data

CPT: RW-CPT-05

Total depth: 15.03 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**



Calculation parameters

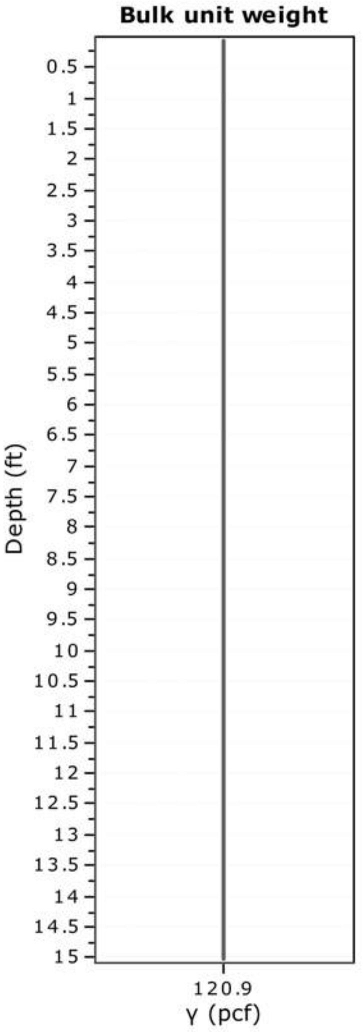
Soil Sensitivity factor, N_S: 7.00

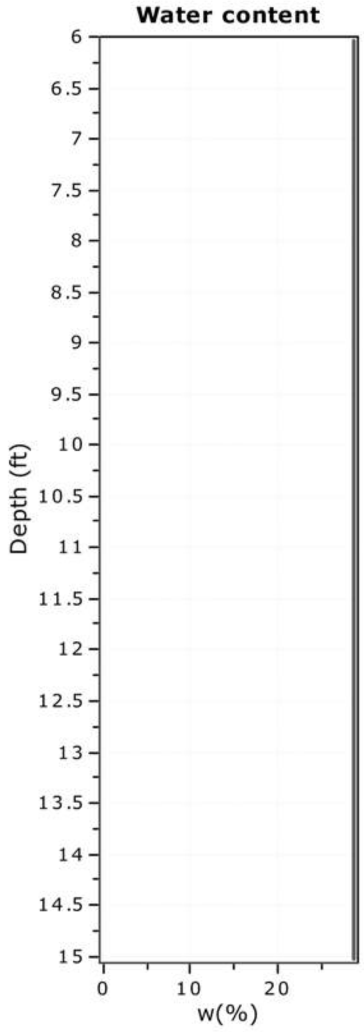
HILLIS-CARNES
ENGINEERING ASSOCIATES

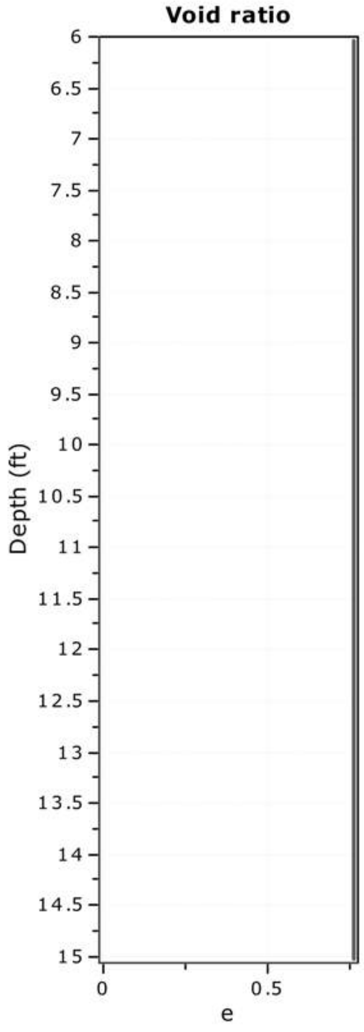
CPT: RW-CPT-05

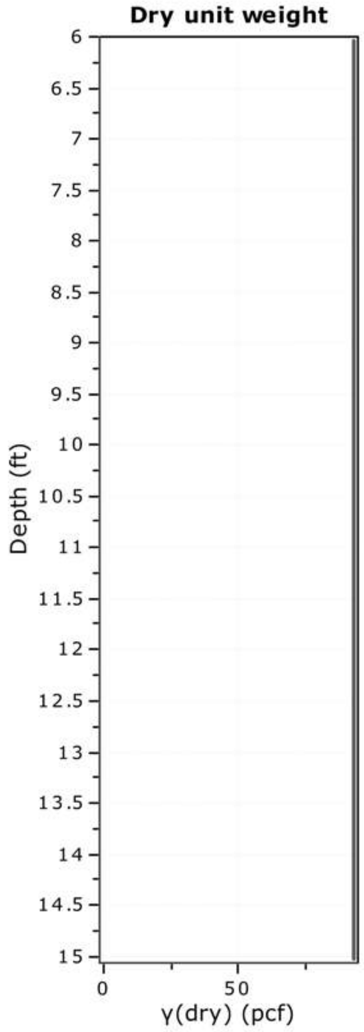
Total depth: 15.03 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

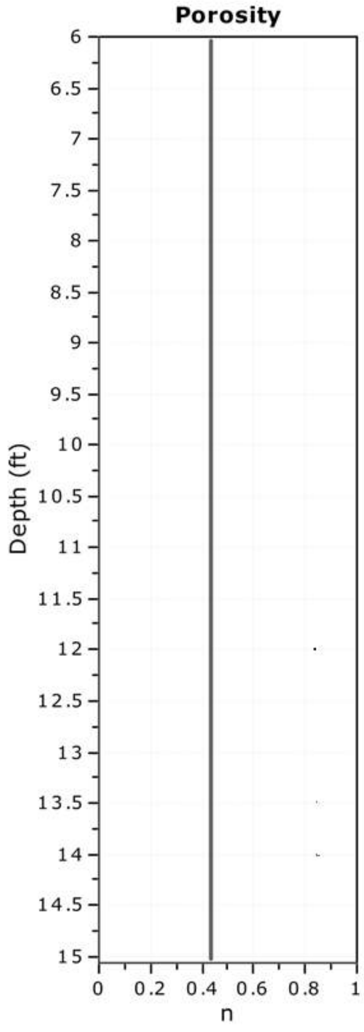
Project: **South Market Street**
Location: **Wilmington, DE**







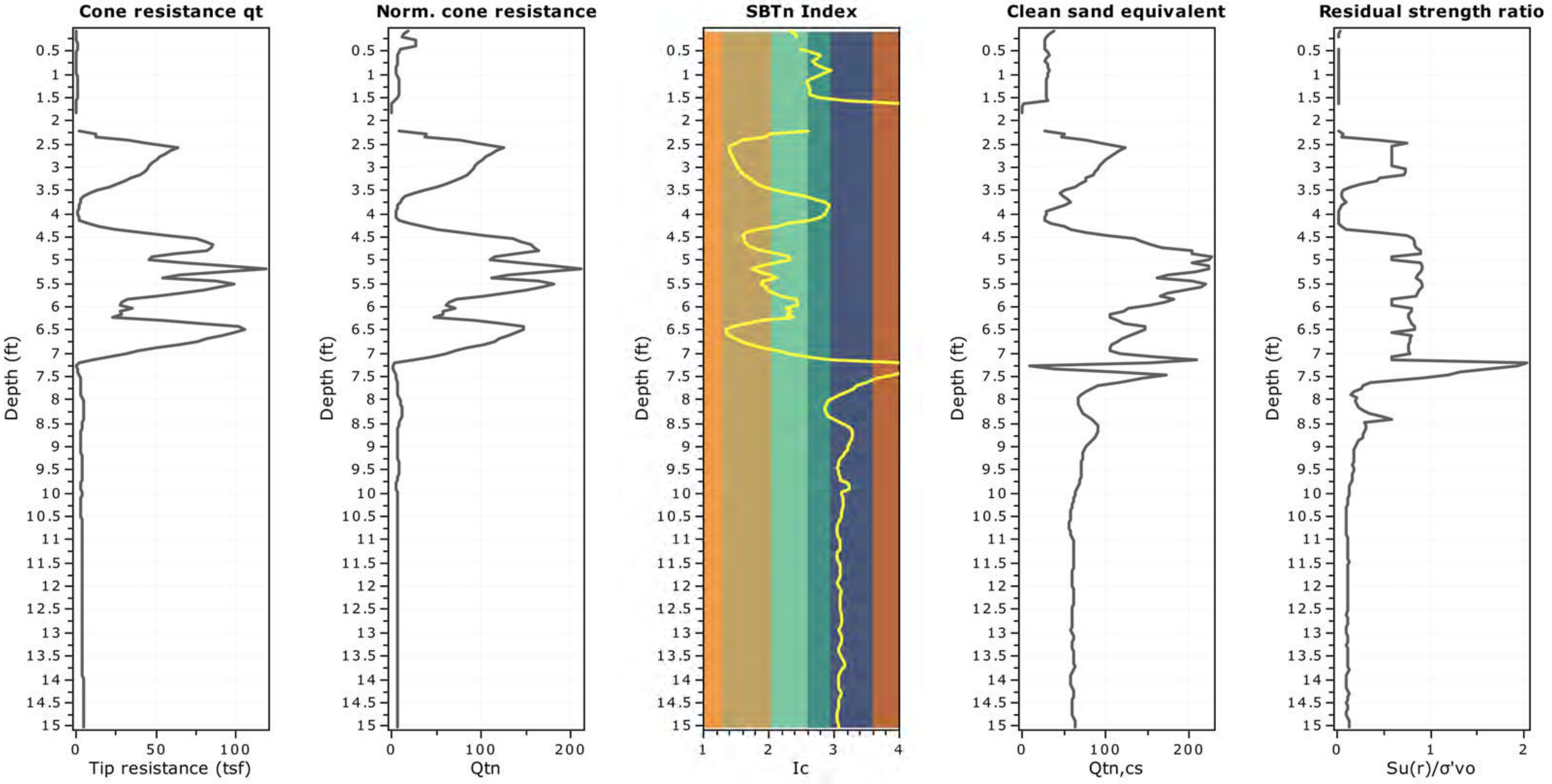




HILLIS-CARNES
ENGINEERING ASSOCIATES

Project: **South Market Street**
Location: **Wilmington, DE**

CPT: RW-CPT-05
Total depth: 15.03 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:



Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

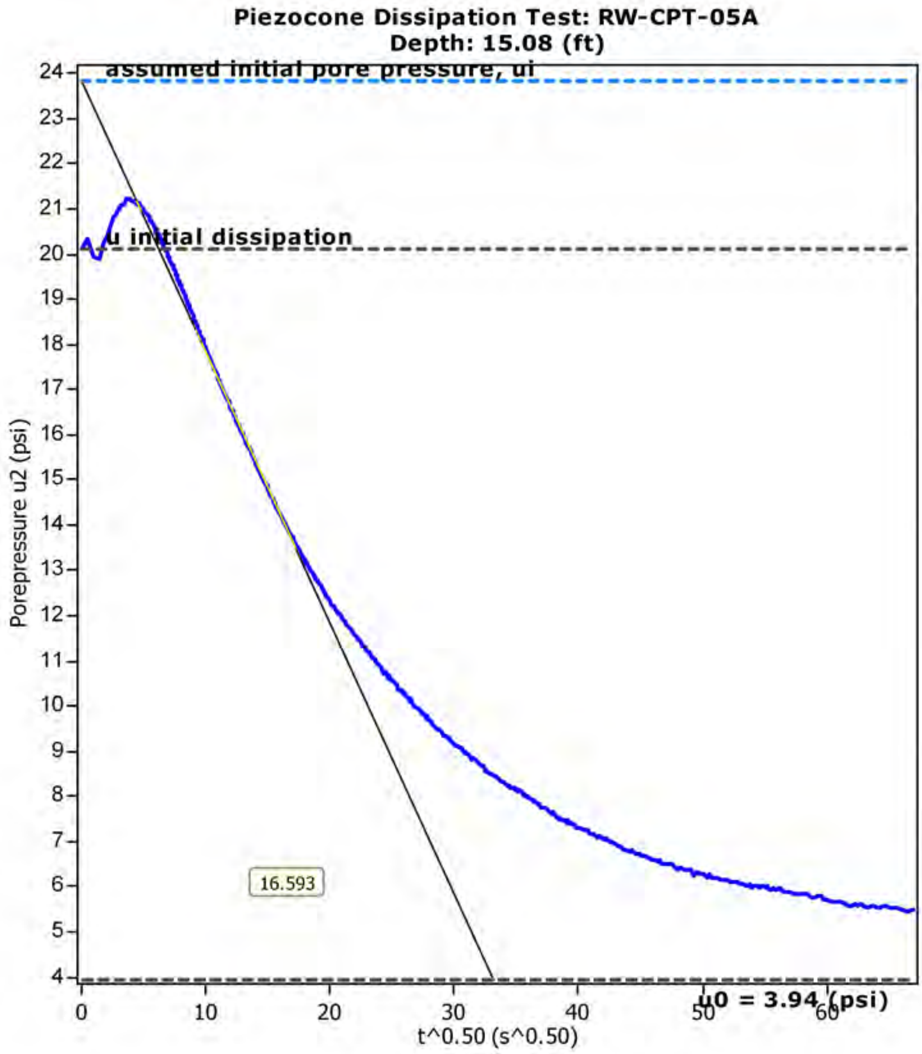
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

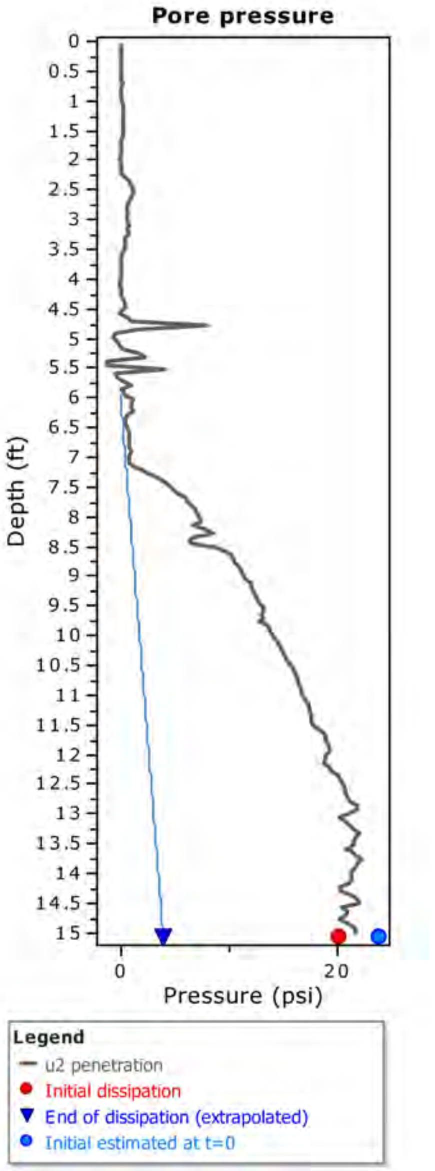
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (ft)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (ft^2/s)	c_h ($ft^2/year$)	M (tsf)	k_h (ft/s)
RW-CPT-05A	15.08	16.6	275	8.73E-006	618084.00	2.34E-004	7389	25.65	2.85E-007

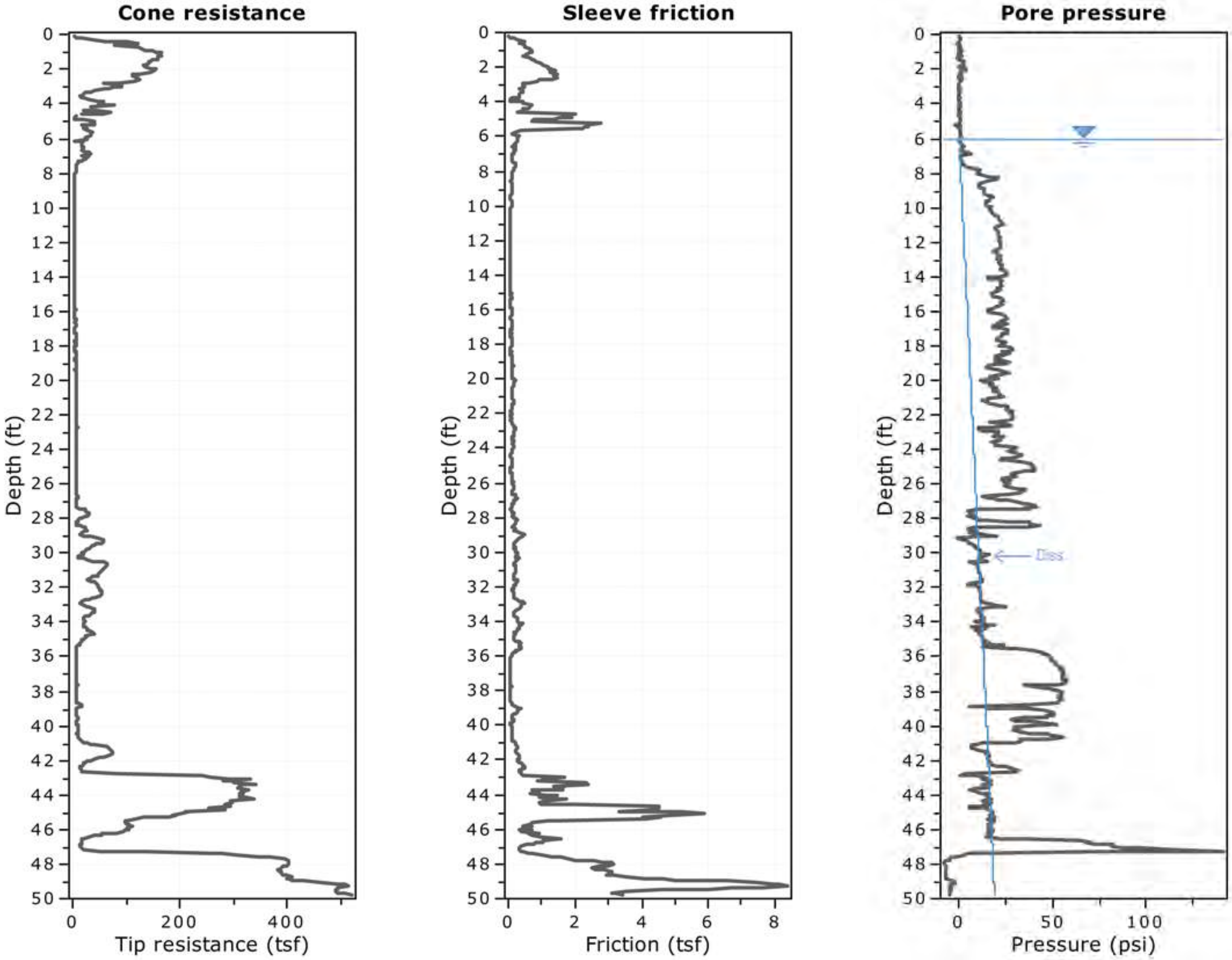

Piezocone Dissipation Test: RW-CPT-05A
Depth: 15.08 (ft)
assumed initial pore pressure, ui
u initial dissipation
16.593
u0 = 3.94 (psi)
Porepressure u2 (psi)
t^0.50 (s^0.50)
0
10
20
30
40
50
60
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24


Pore pressure
Depth (ft)
Pressure (psi)
0
20
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
7.5
8
8.5
9
9.5
10
10.5
11
11.5
12
12.5
13
13.5
14
14.5
15
Legend
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

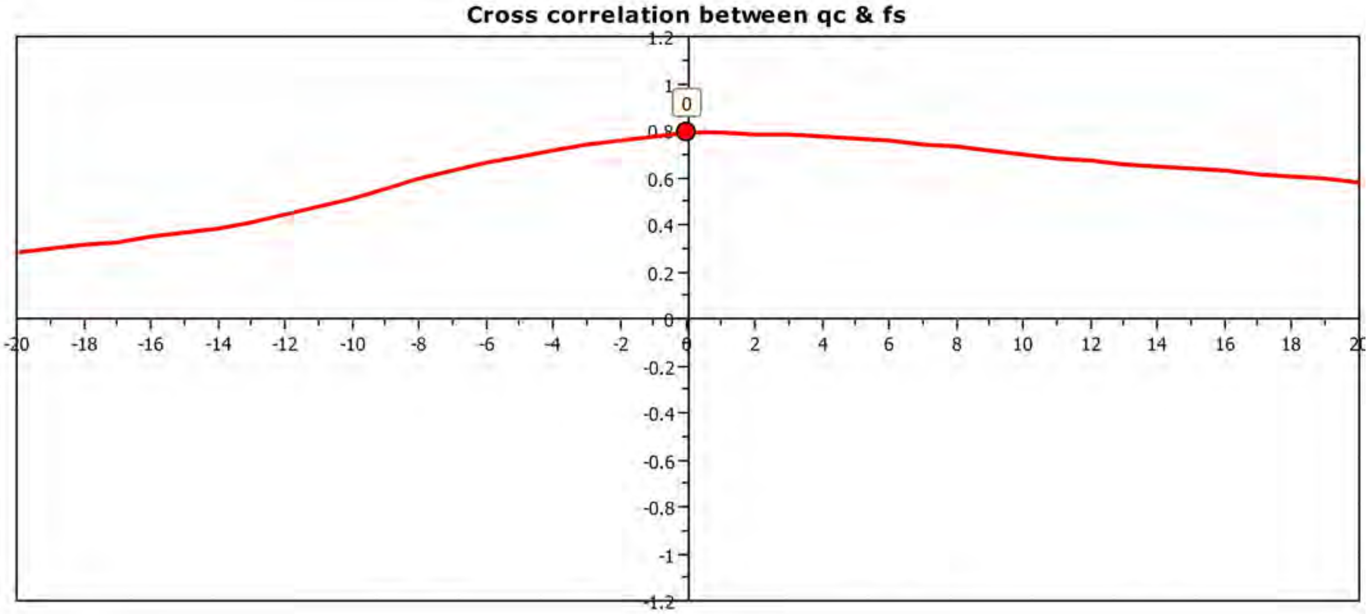
HILLIS-CARNES
ENGINEERING ASSOCIATES

CPT: RW-CPT-05A
Total depth: 49.80 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

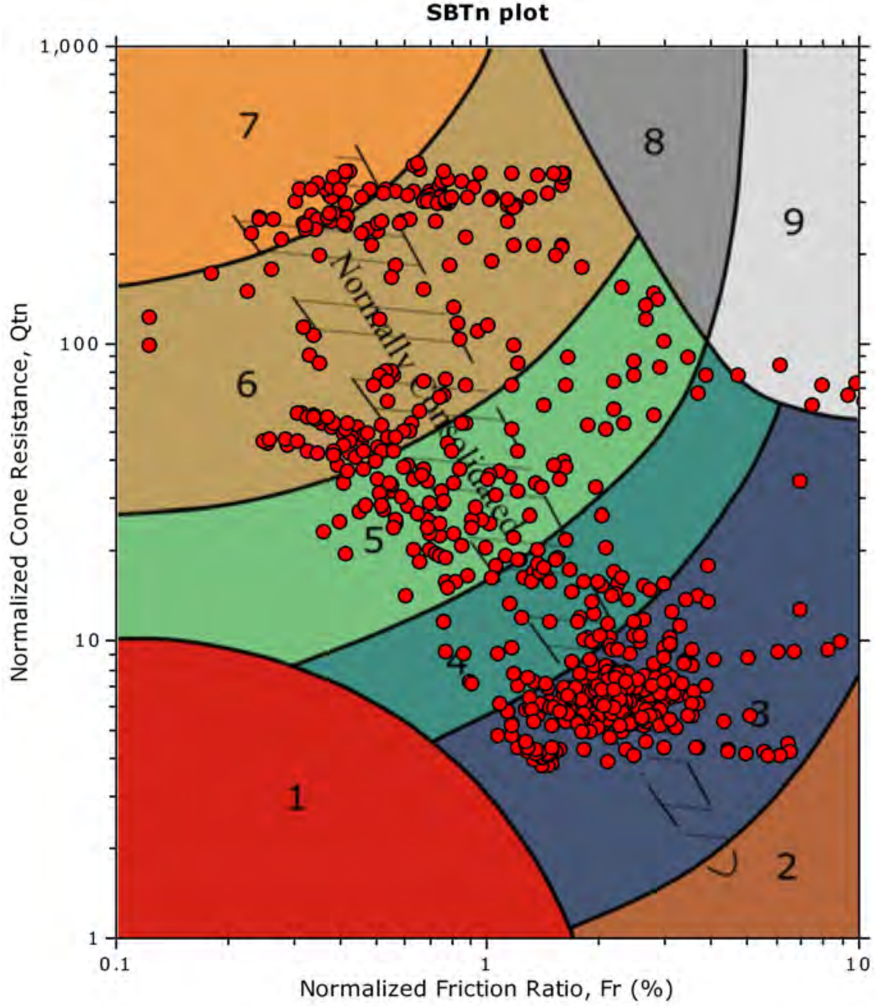


CPT: RW-CPT-05A
Total depth: 49.80 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

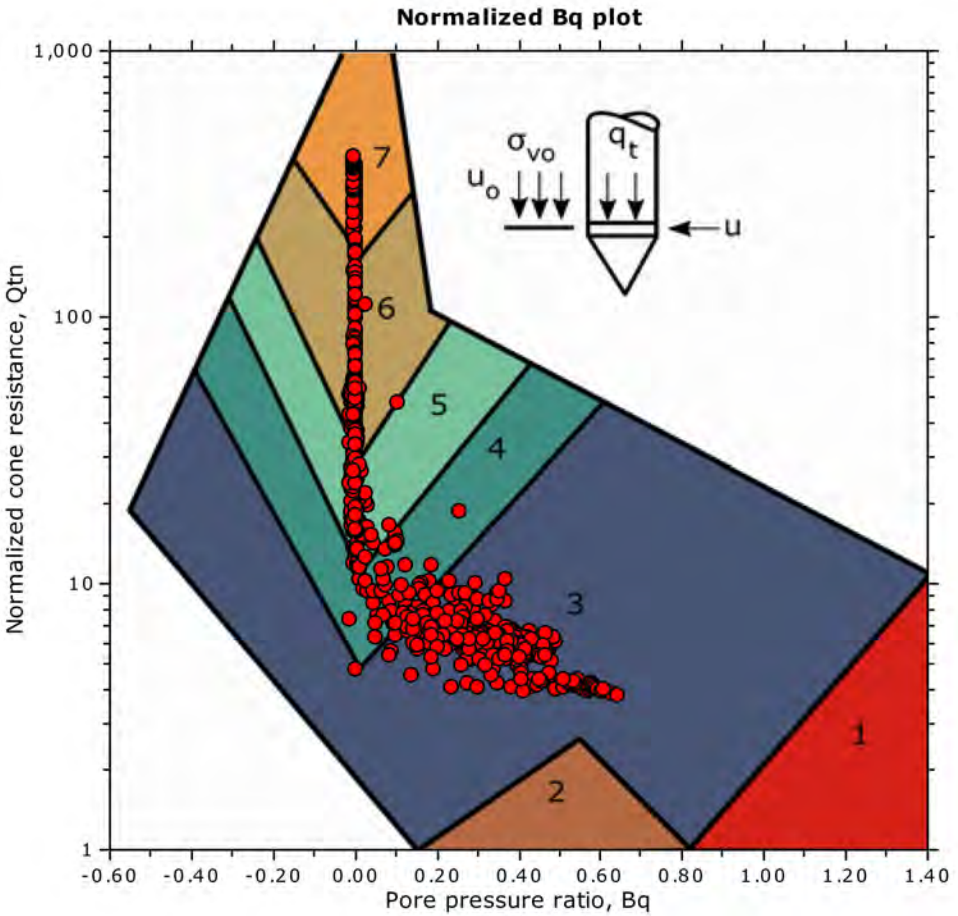
Project: **South Market Street**
Location: **Wilmington, DE**

SBT - Bq plots (normalized)

SBTn plot



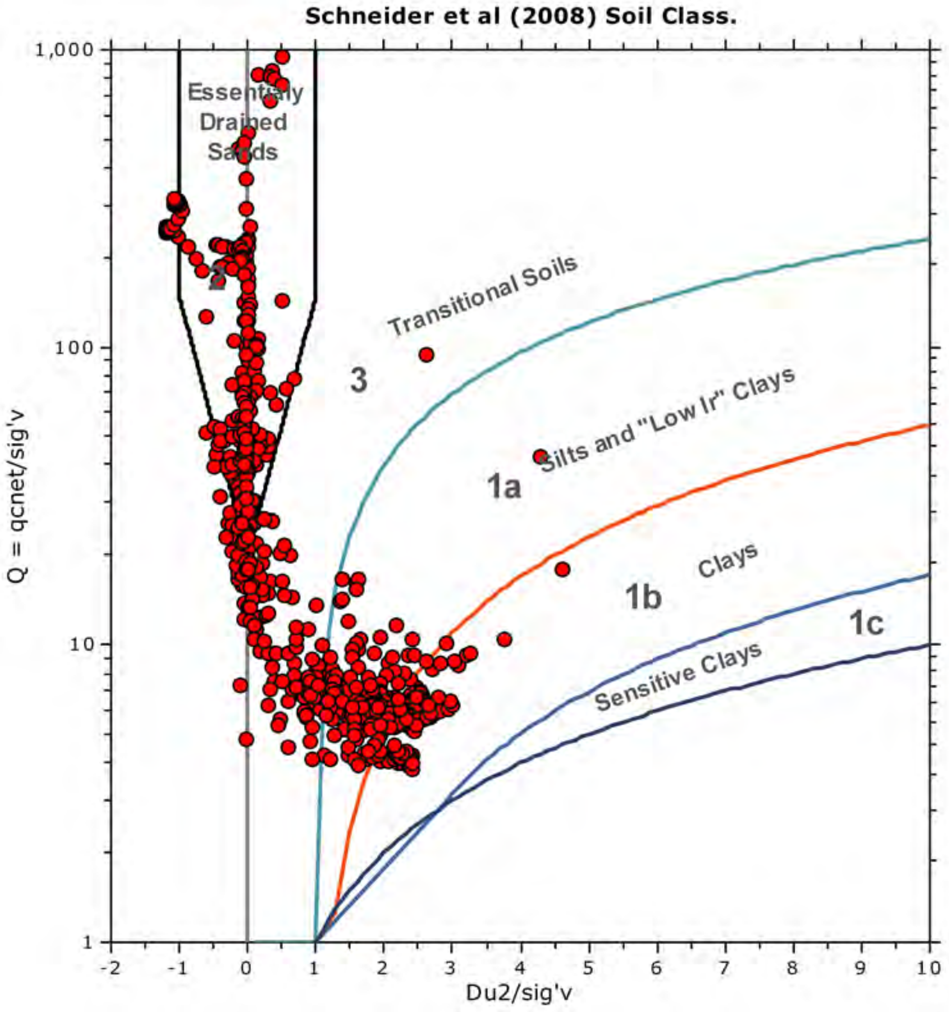
Normalized Bq plot

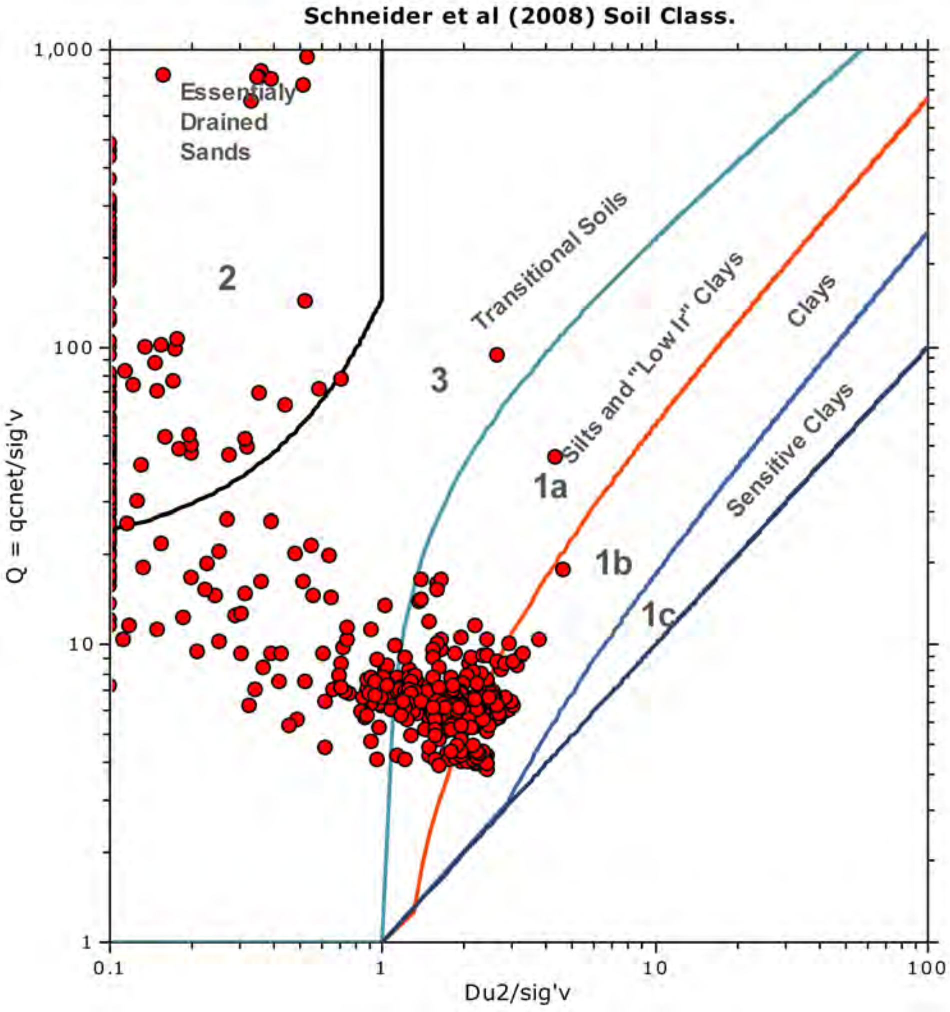


SBTn legend

- 🟥 1. Sensitive fine grained
- 🟫 2. Organic material
- 🟦 3. Clay to silty clay
- 🟩 4. Clayey silt to silty clay
- 🟩 5. Silty sand to sandy silt
- 🟨 6. Clean sand to silty sand
- 🟧 7. Gravelly sand to sand
- ⬛ 8. Very stiff sand to clayey sand
- ⬜ 9. Very stiff fine grained

Bq plots (Schneider)



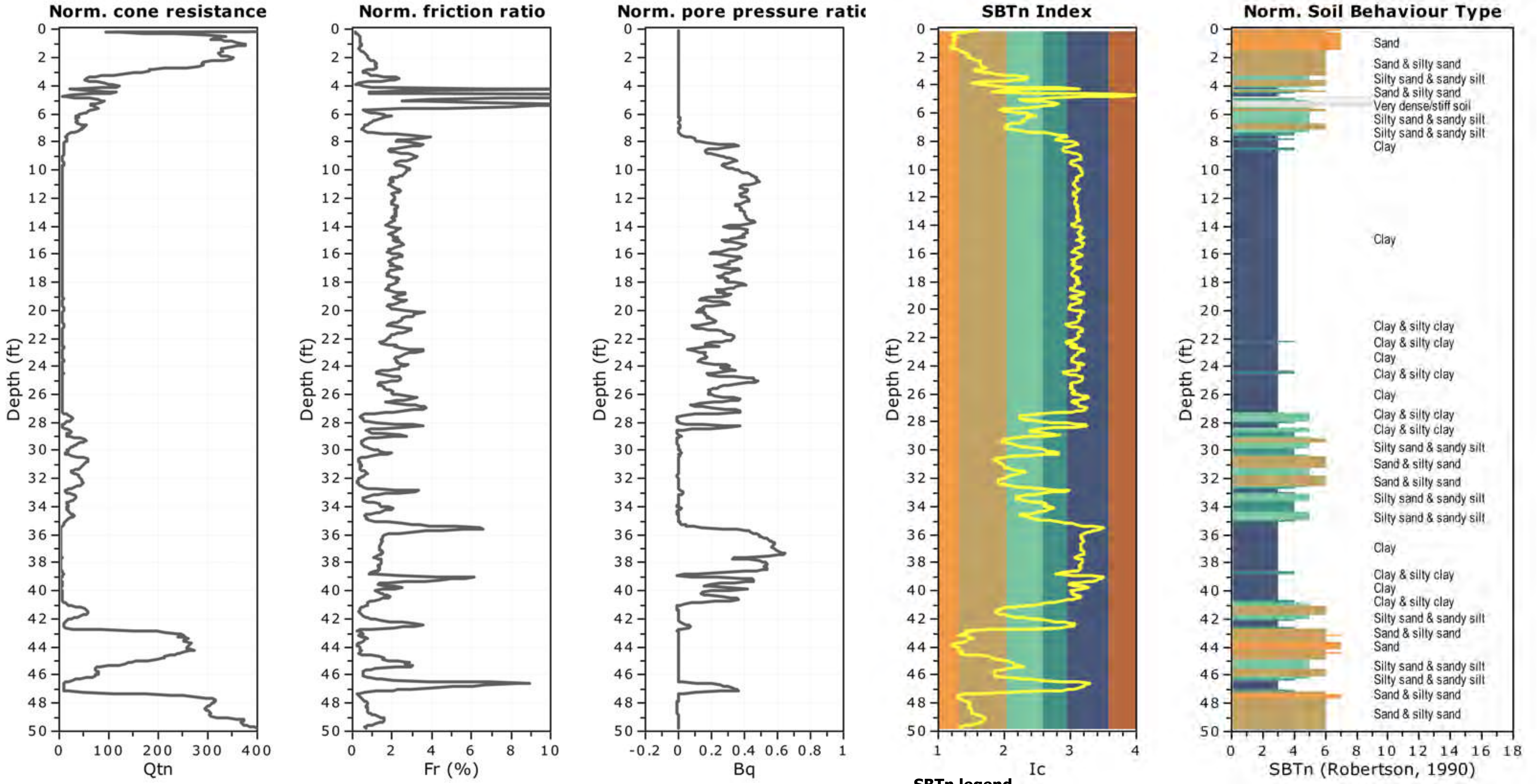


HILLIS-CARNES
ENGINEERING ASSOCIATES

CPT: RW-CPT-05A

Total depth: 49.80 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**



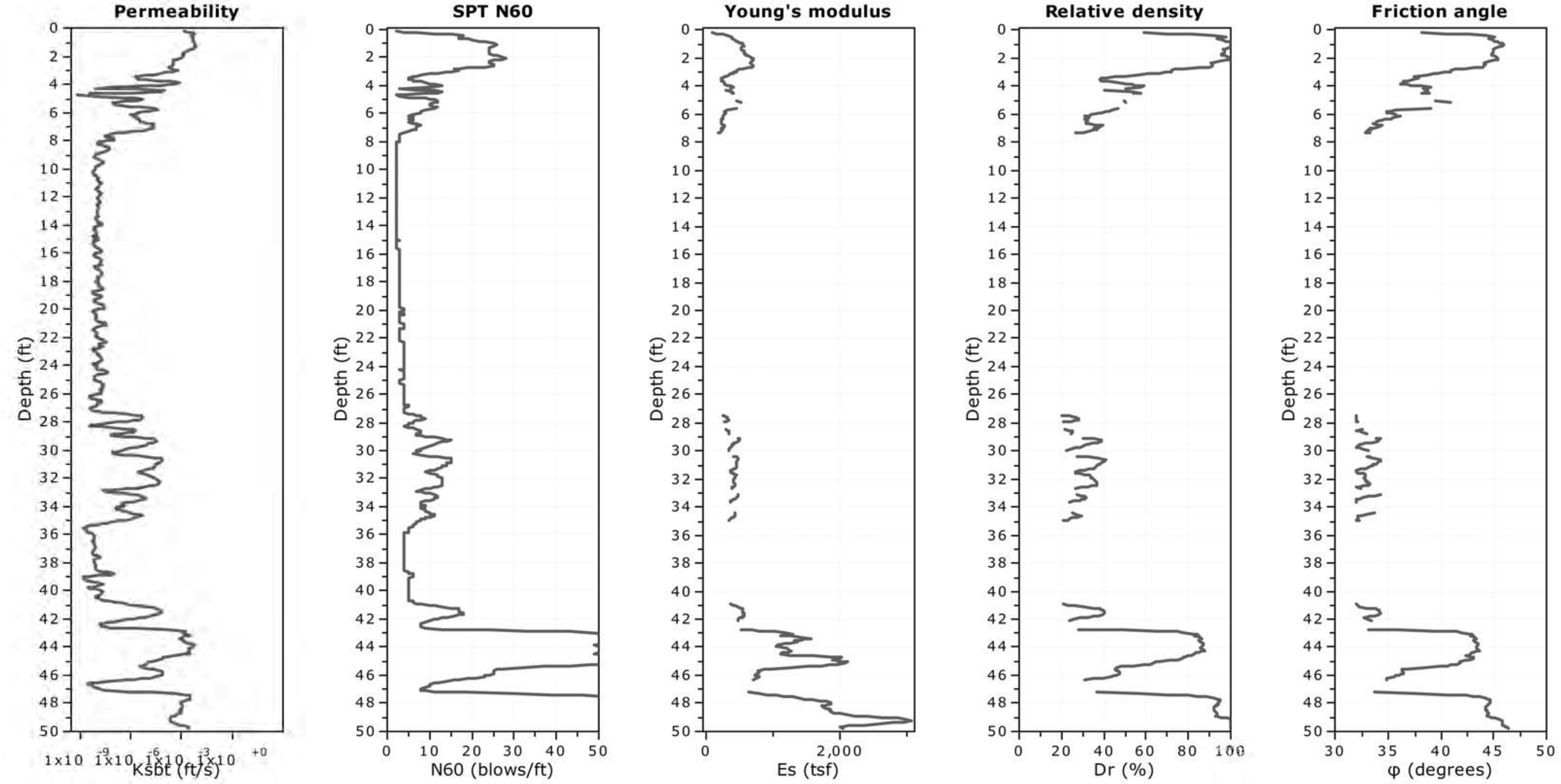
SBTn legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty clay	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to clayey sand
🟦 3. Clay to silty clay	🟫 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

CPT: RW-CPT-05A

Total depth: 49.80 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**



Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative density constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)

HILLIS-CARNES
ENGINEERING ASSOCIATES

CPT: RW-CPT-05A

Total depth: 49.80 ft, Date: 10/21/2022

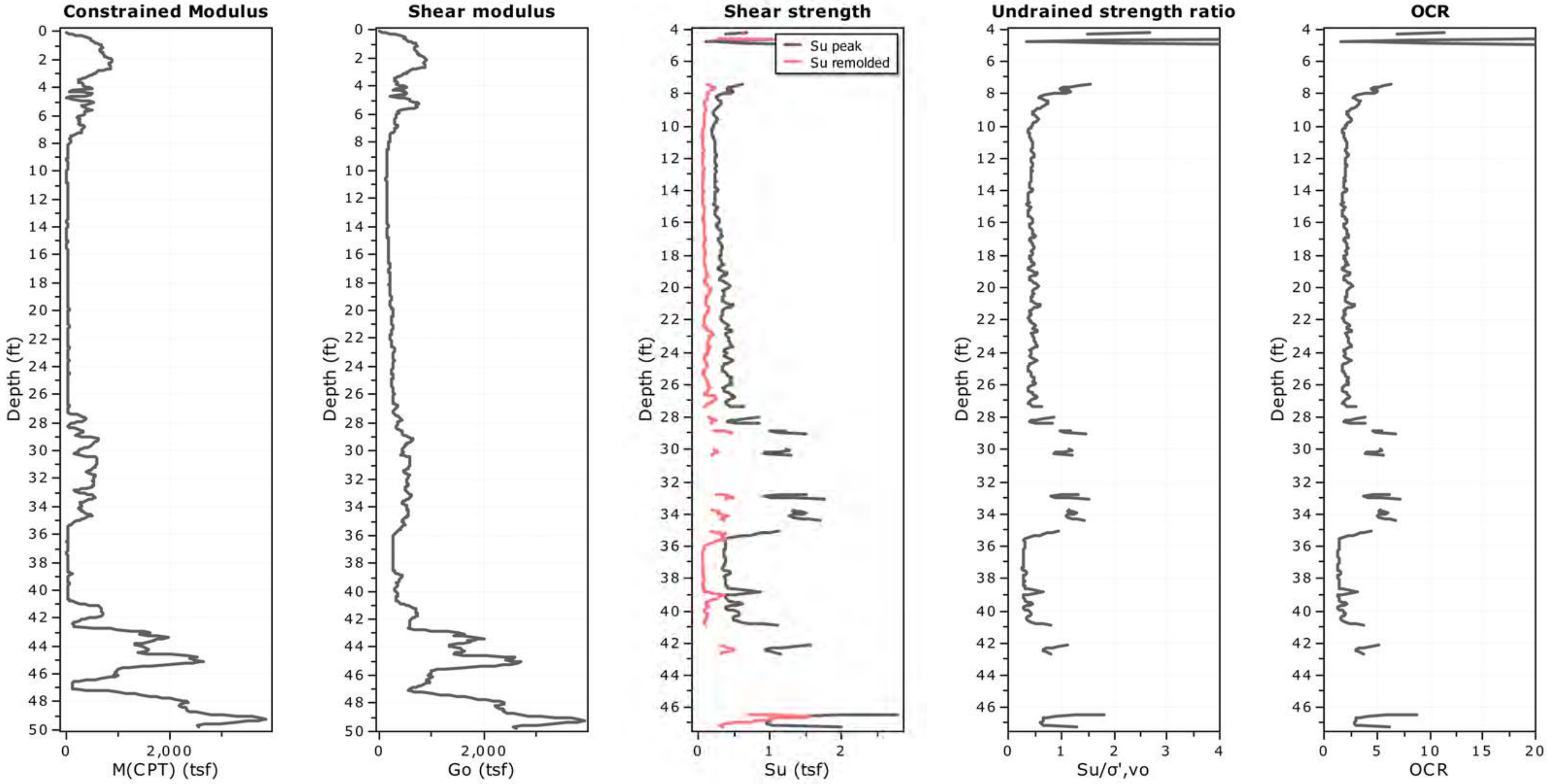
Surface Elevation: 0.00 ft

Cone Type:

Cone Operator:

Project: **South Market Street**

Location: **Wilmington, DE**



Calculation parameters

Constrained modulus: Based on variable alpha using I_c and Q_{tn} (Robertson, 2009)

Go: Based on variable alpha using I_c (Robertson, 2009)

Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33

—●— Flat Dilatometer Test data

CPT: RW-CPT-05A

Total depth: 49.80 ft, Date: 10/21/2022

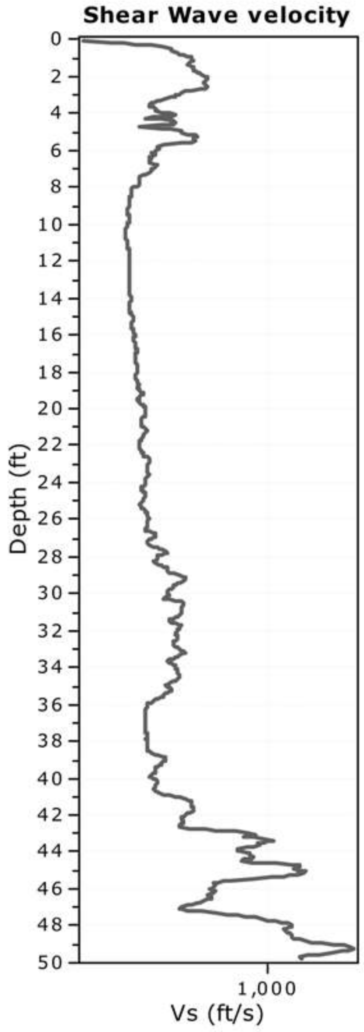
Surface Elevation: 0.00 ft

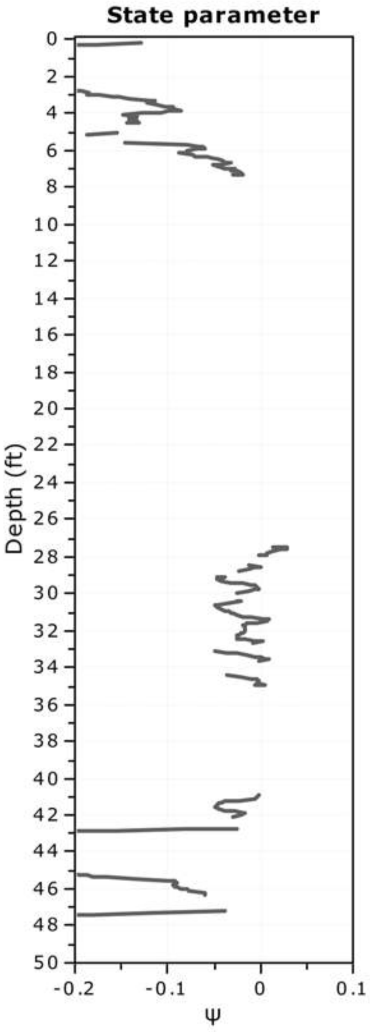
Cone Type:

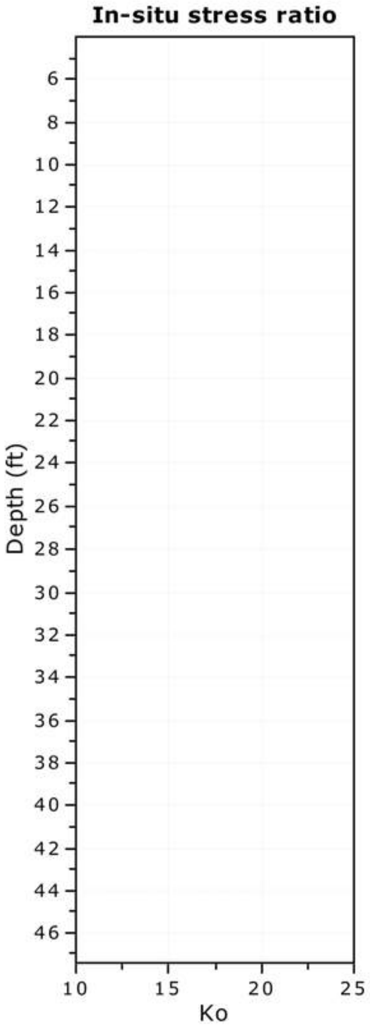
Cone Operator:

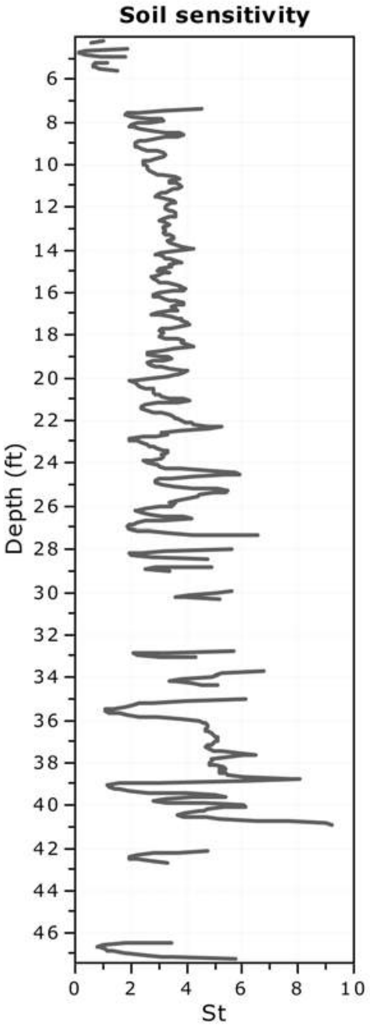
Project: **South Market Street**

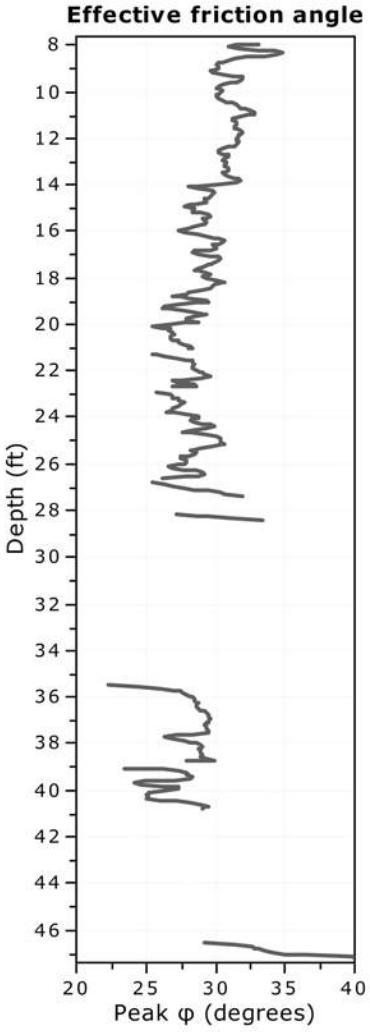
Location: **Wilmington, DE**









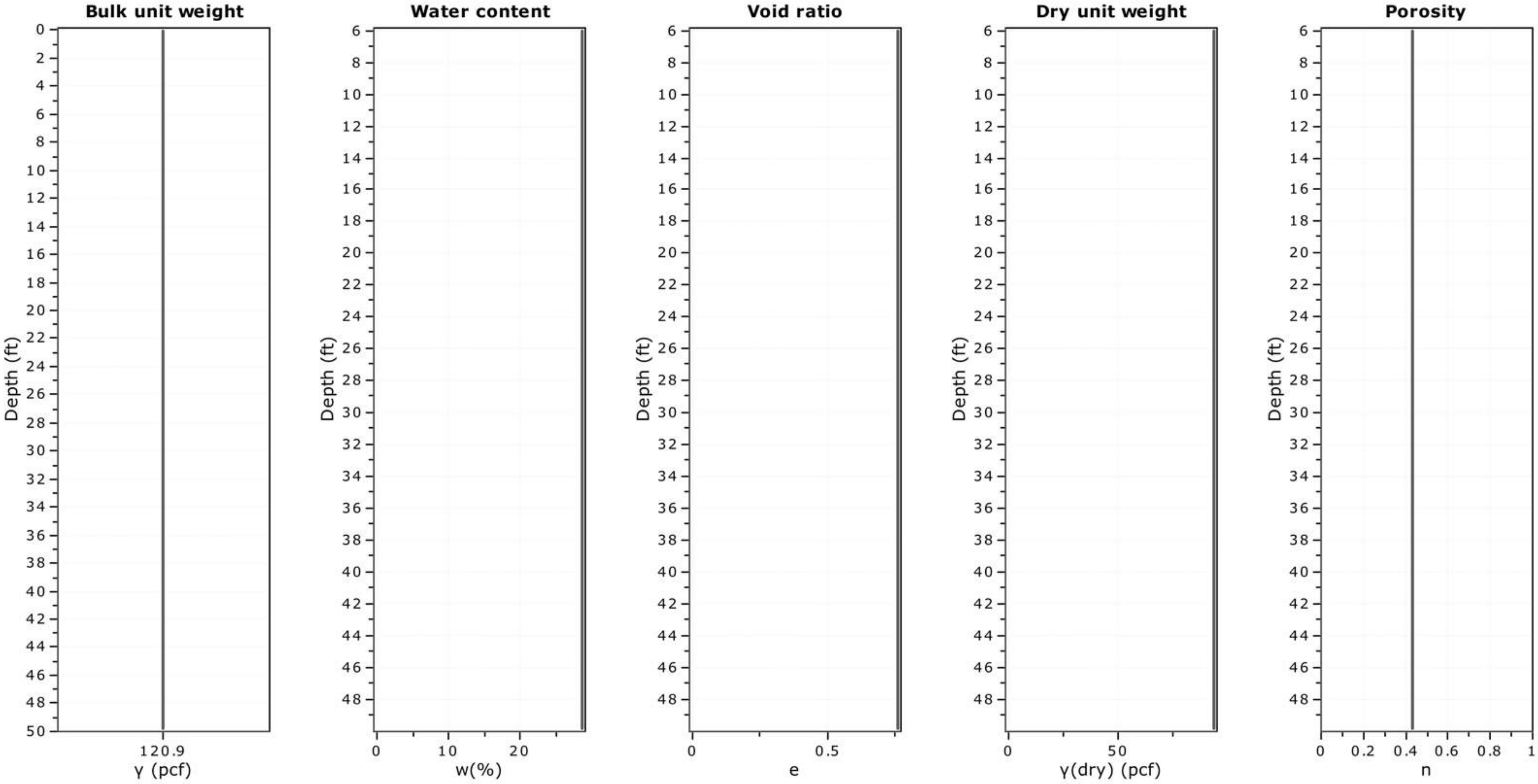


Calculation parameters

Soil Sensitivity factor, N_S: 7.00

Project: **South Market Street**
Location: **Wilmington, DE**

CPT: RW-CPT-05A
Total depth: 49.80 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

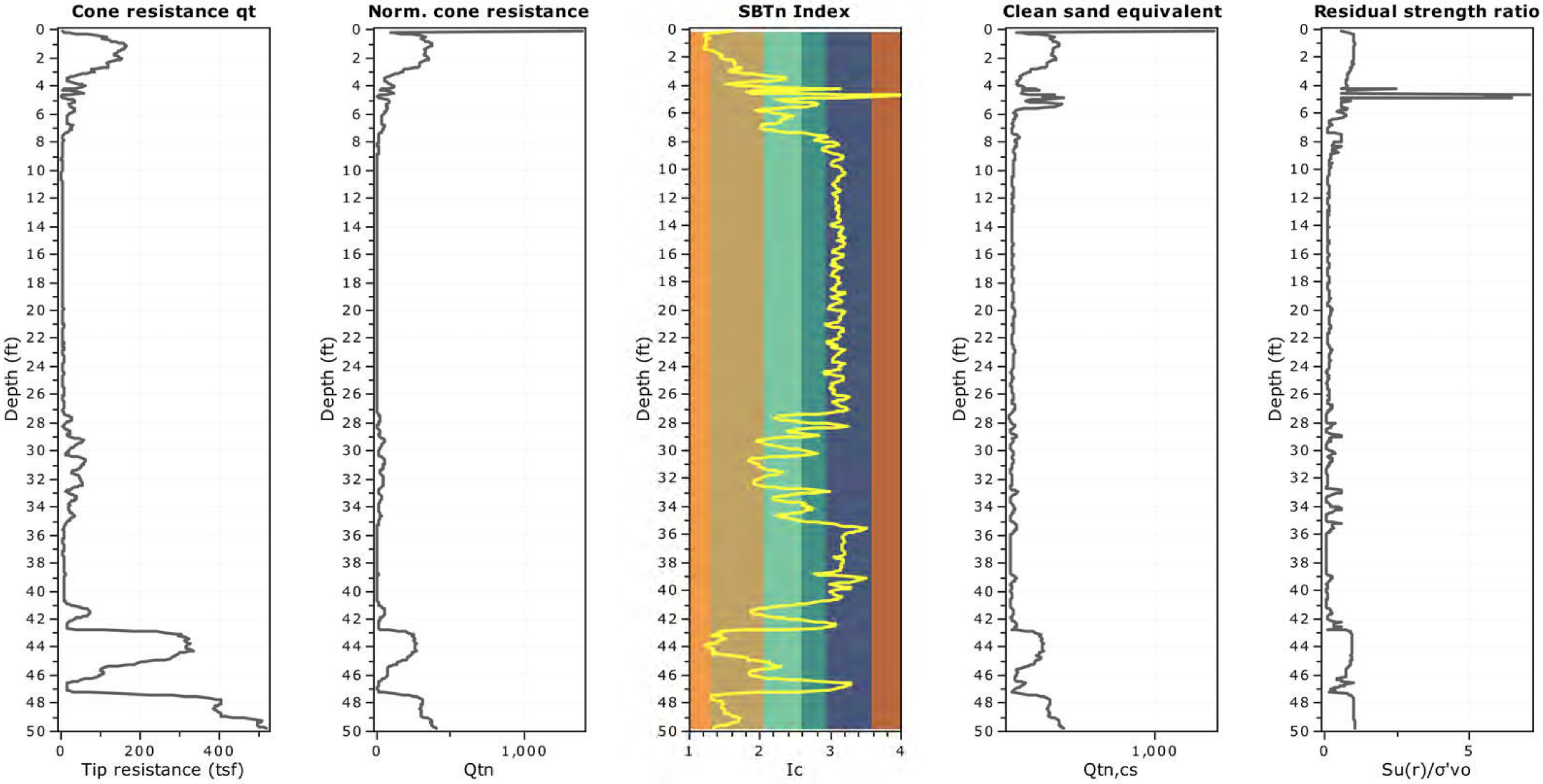


HILLIS-CARNES
ENGINEERING ASSOCIATES

CPT: RW-CPT-05A

Total depth: 49.80 ft, Date: 10/21/2022
Surface Elevation: 0.00 ft
Cone Type:
Cone Operator:

Project: **South Market Street**
Location: **Wilmington, DE**



Dissipation Tests Results

Dissipation tests

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where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
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The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

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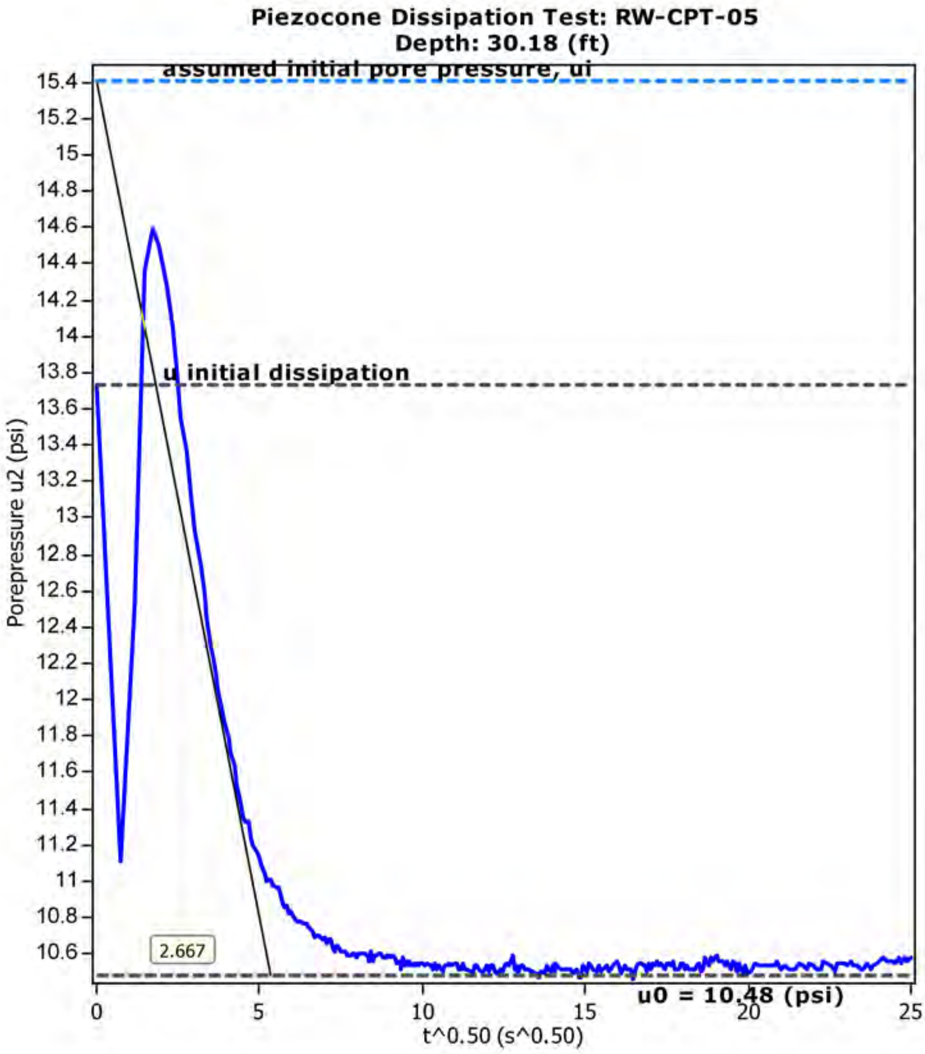
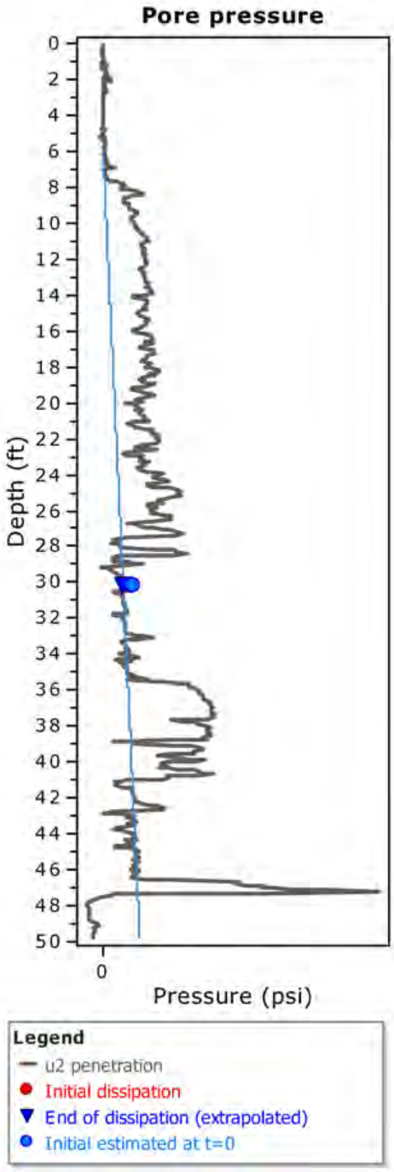
where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (ft)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (ft^2/s)	c_h ($ft^2/year$)	M (tsf)	k_h (ft/s)
RW-CPT-05	30.18	2.7	7	2.26E-007	397491.75	7.27E-003	229344	218.93	1.04E-006


Piezocone Dissipation Test: RW-CPT-05
Depth: 30.18 (ft)
assumed initial pore pressure, ui
u initial dissipation
2.667
u0 = 10.48 (psi)
Porepressure u2 (psi)
t^0.50 (s^0.50)
15.4
15.2
15
14.8
14.6
14.4
14.2
14
13.8
13.6
13.4
13.2
13
12.8
12.6
12.4
12.2
12
11.8
11.6
11.4
11.2
11
10.8
10.6
0
5
10
15
20
25


Pore pressure
Depth (ft)
Pressure (psi)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
0
Legend
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

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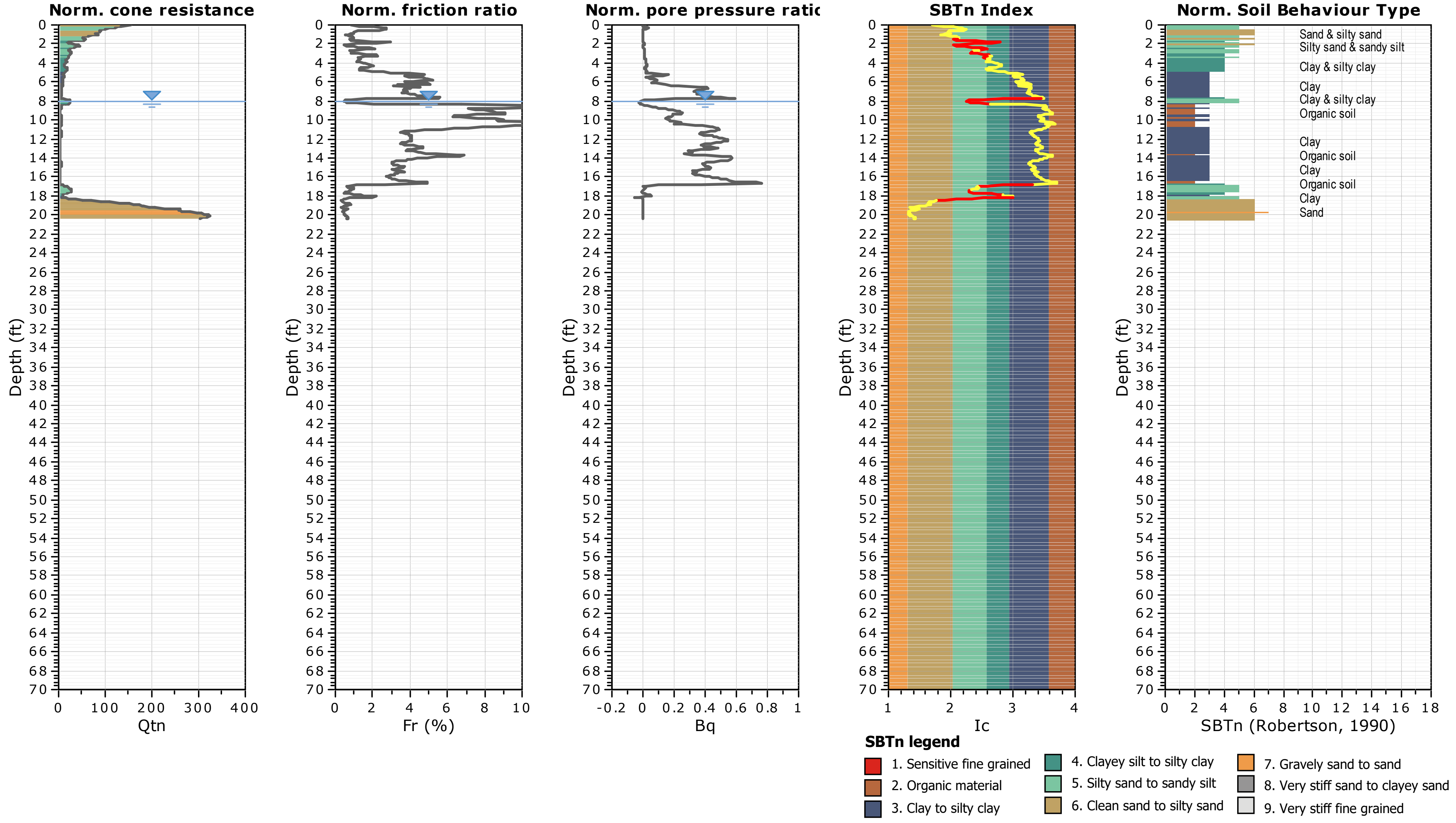
http://www.HCEA.com

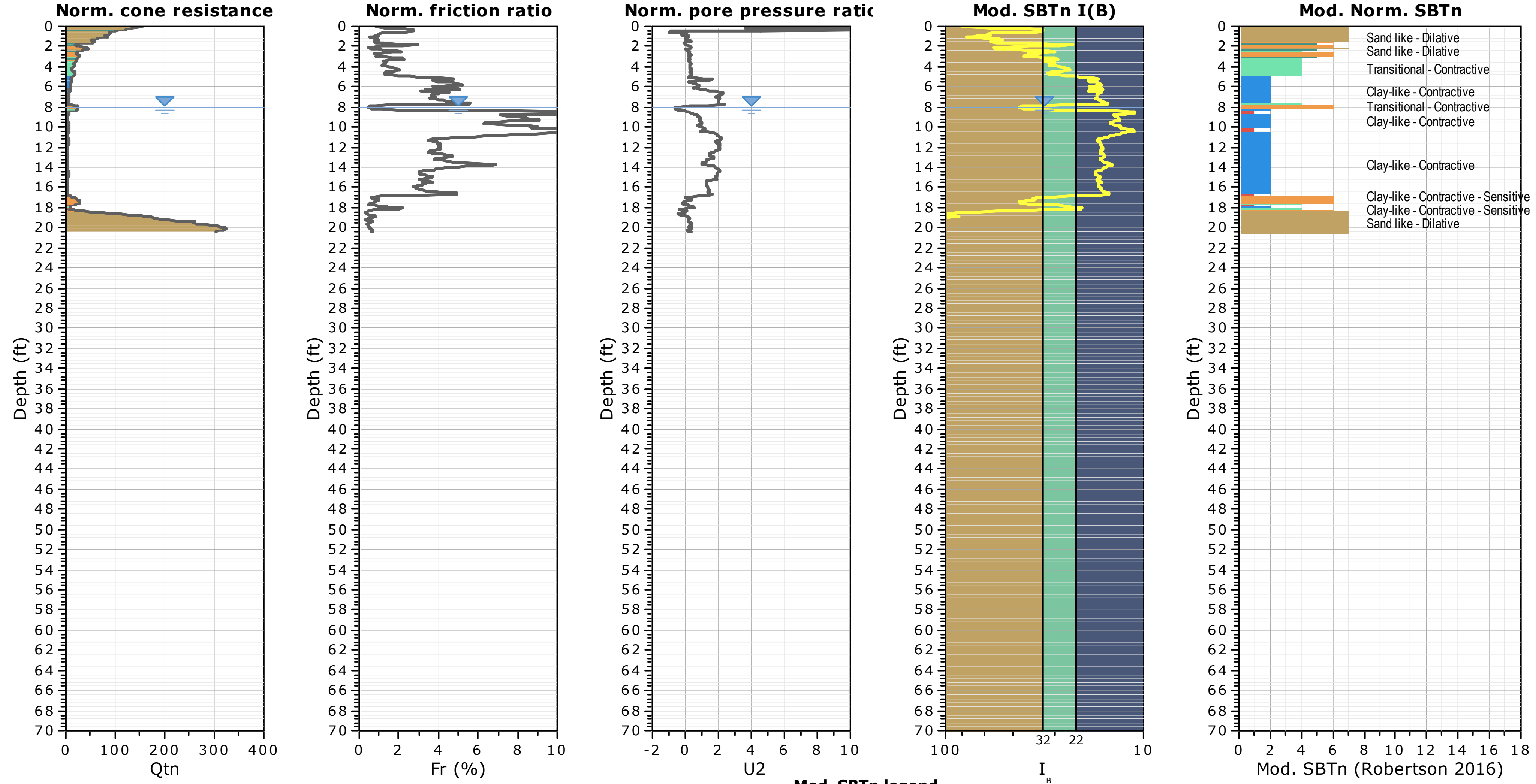
CPT: S Market SP-CPT-01
Total depth: 20.47 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: S Market - RK&K
Location: New Castle, DE



CPT: S Market SP-CPT-01
Total depth: 20.47 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Mod. SBTn legend

- 🟥 1. CCS: ClayLike - Contractive, Sensitive
- 🟦 2. CC: Clay-like - Contractive
- ■ 3. CD: Clay-Like: Dilative
- 🟩 4. TC: Transitional - Contractive
- 🟩 5. TD: Transitional - Dilative
- 🟧 6. SC: Sand-like - Contractive
- 🟫 7. SD: Sand-like - Dilative

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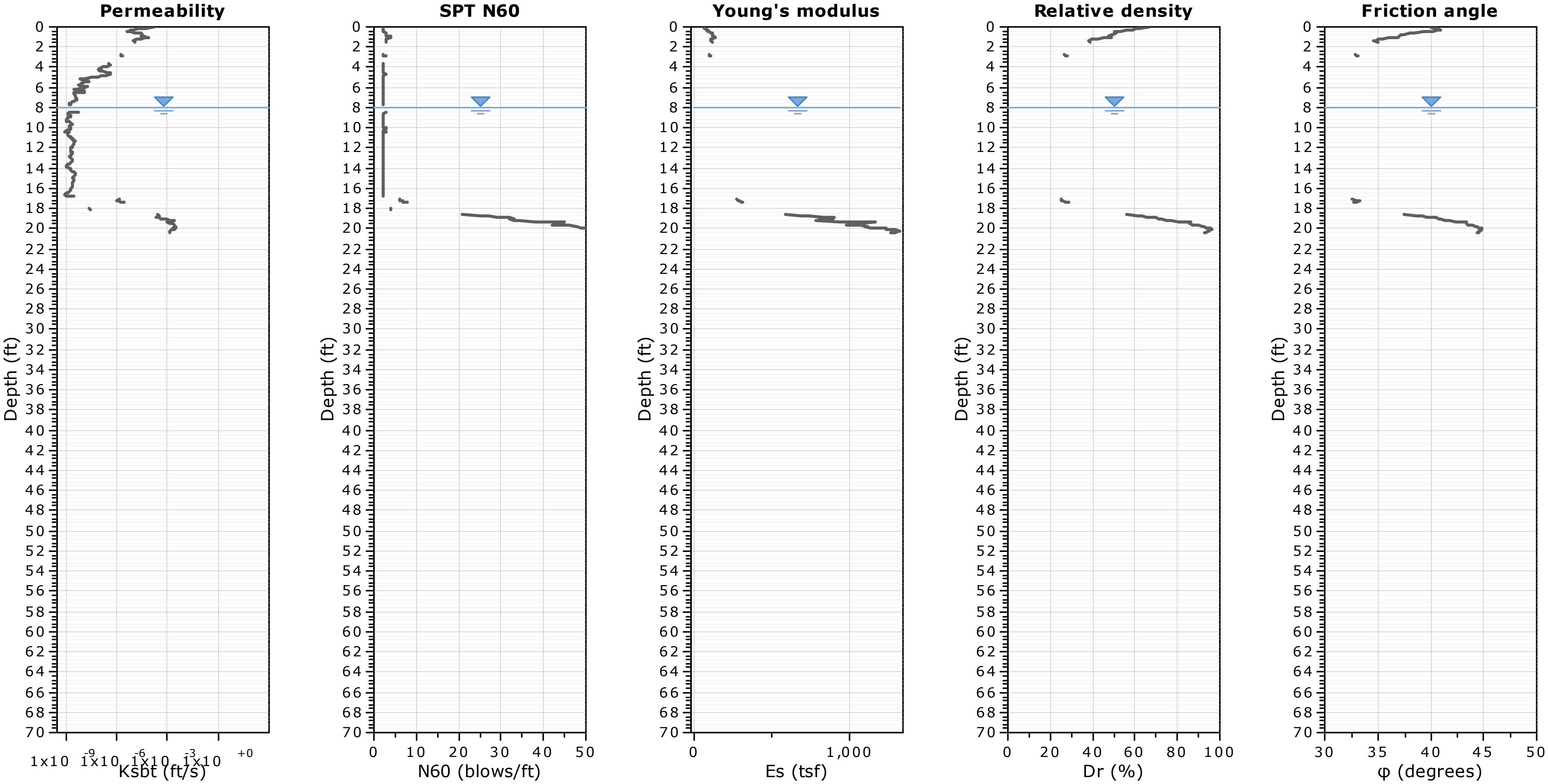
CPT: S Market SP-CPT-01
Total depth: 20.47 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: S Market - RK&K
Location: New Castle, DE



Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)
Relative density constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
● User defined estimation data

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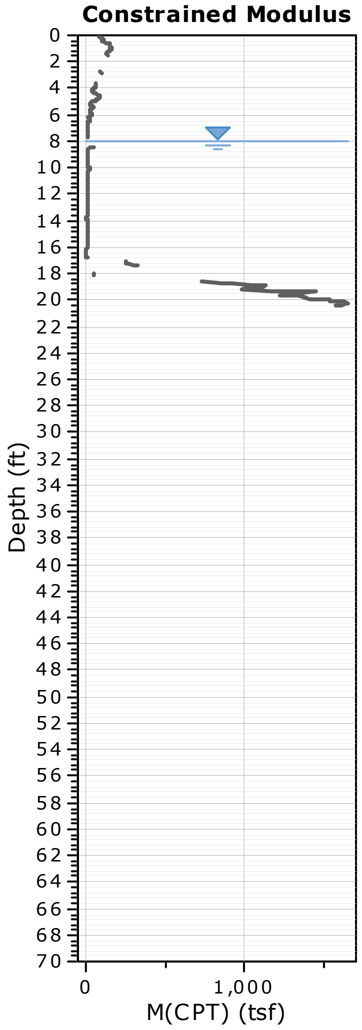
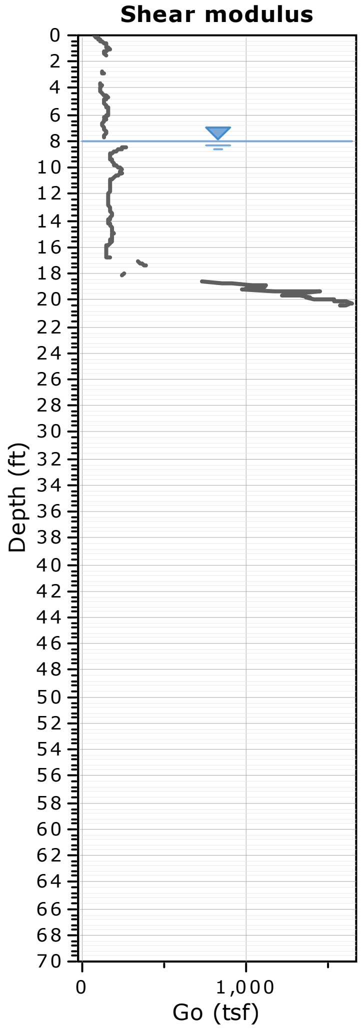
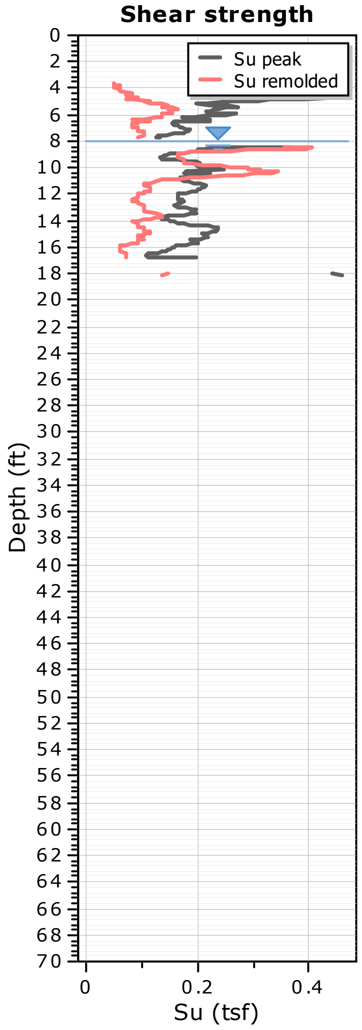
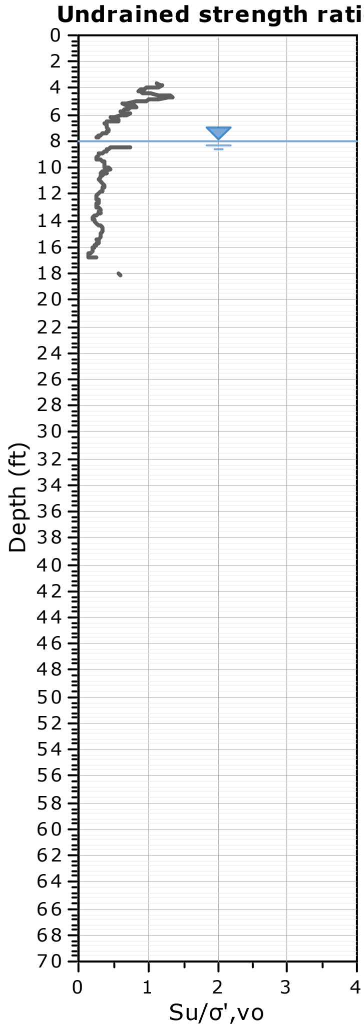
CPT: S Market SP-CPT-01
Total depth: 20.47 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

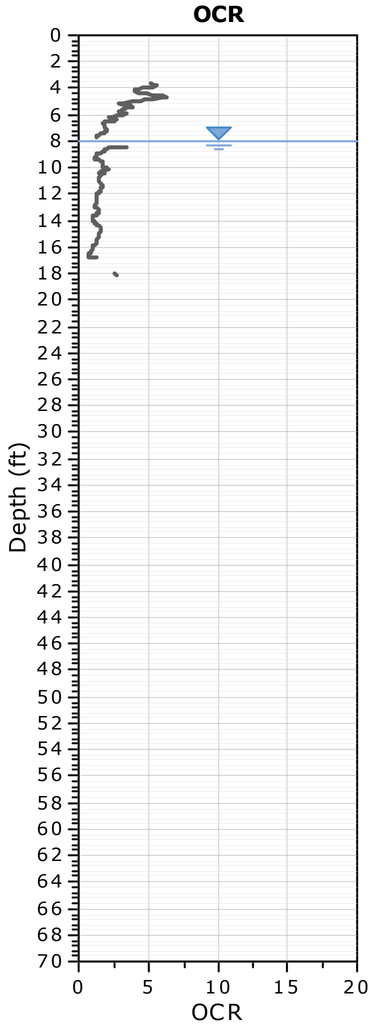
Project: **S Market - RK&K**
Location: **New Castle, DE**


Constrained Modulus


Shear modulus


Shear strength


Undrained strength ratio


OCR

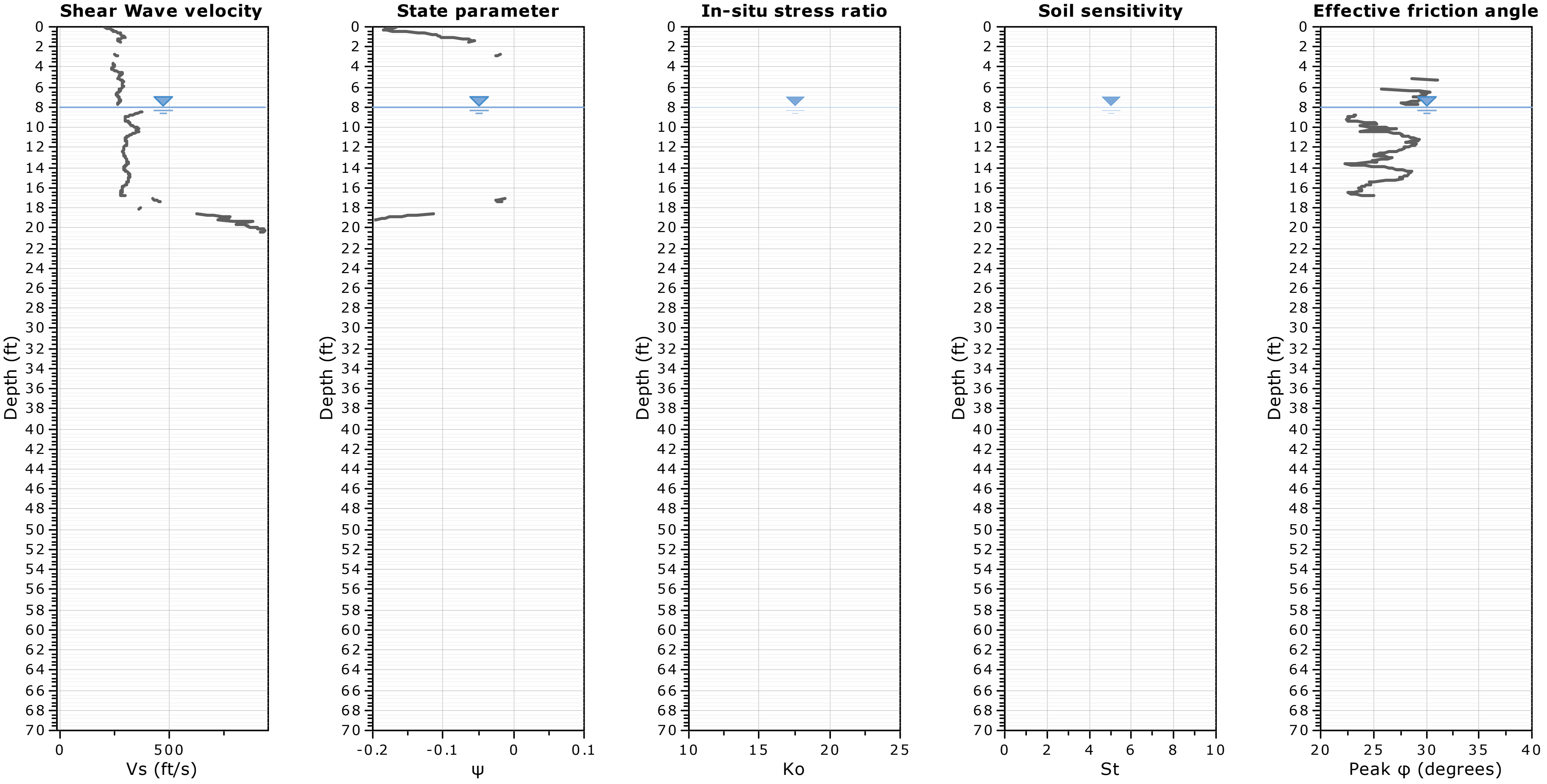
Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33
● User defined estimation data
● Flat Dilatometer Test data

CPT: S Market SP-CPT-01
Total depth: 20.47 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

Soil Sensitivity factor, N_S: 350.00

—●— User defined estimation data

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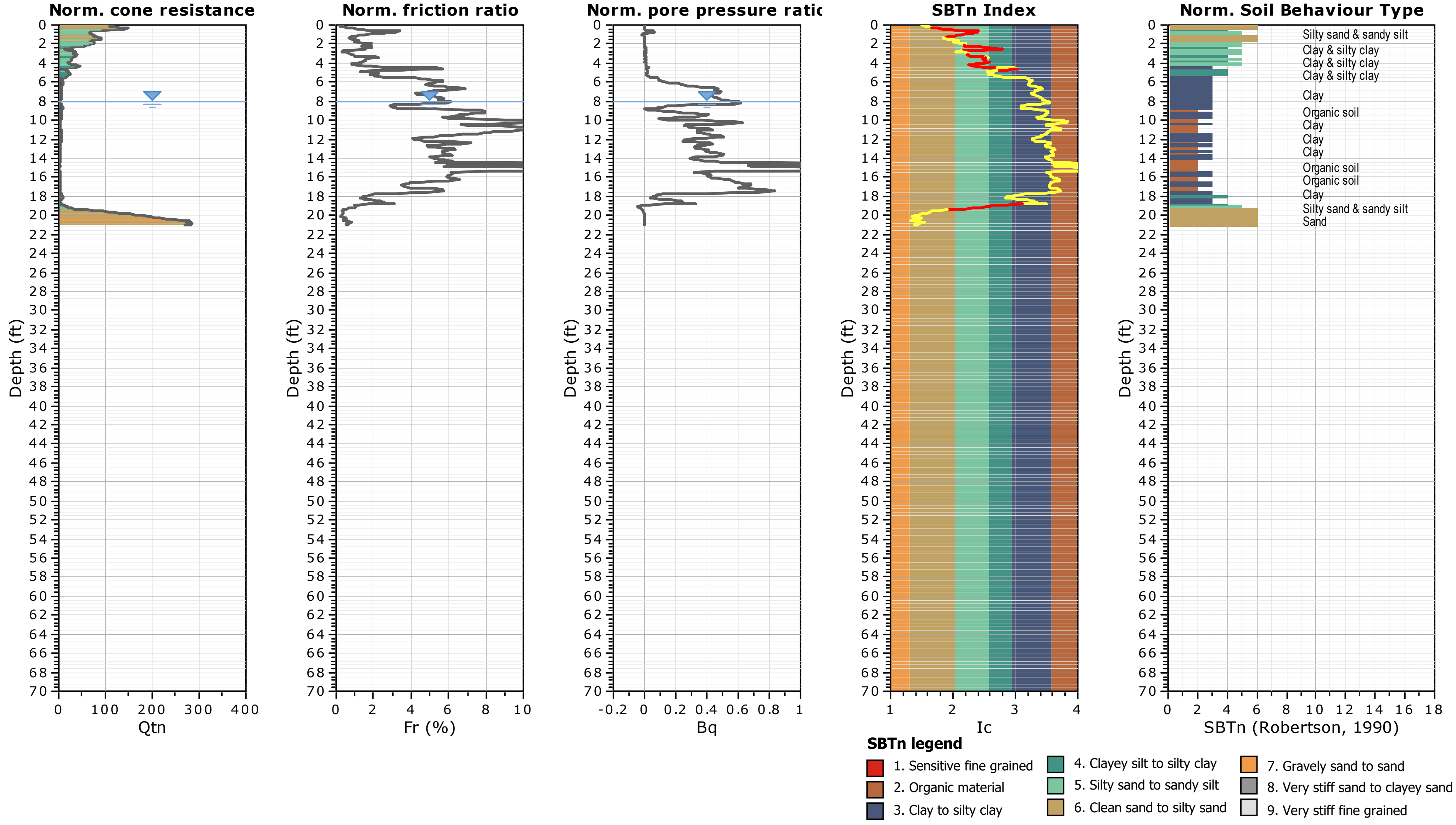
CPT: S Market SP-CPT-01OFFSET
Total depth: 21.06 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



HILLIS - CARNES ENGINEERING ASSOCIATES
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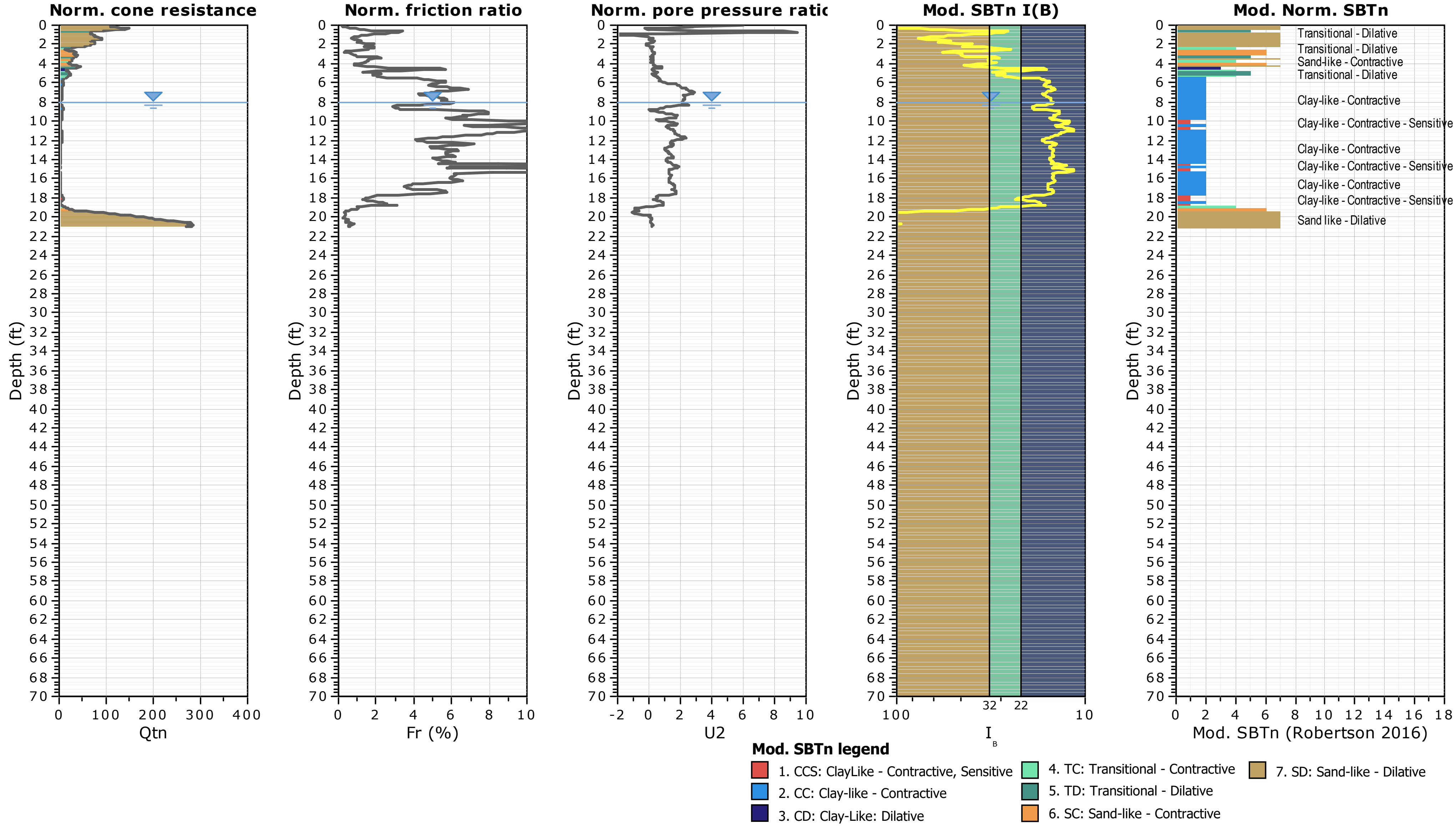
CPT: S Market SP-CPT-01OFFSET
Total depth: 21.06 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



HILLIS - CARNES ENGINEERING ASSOCIATES
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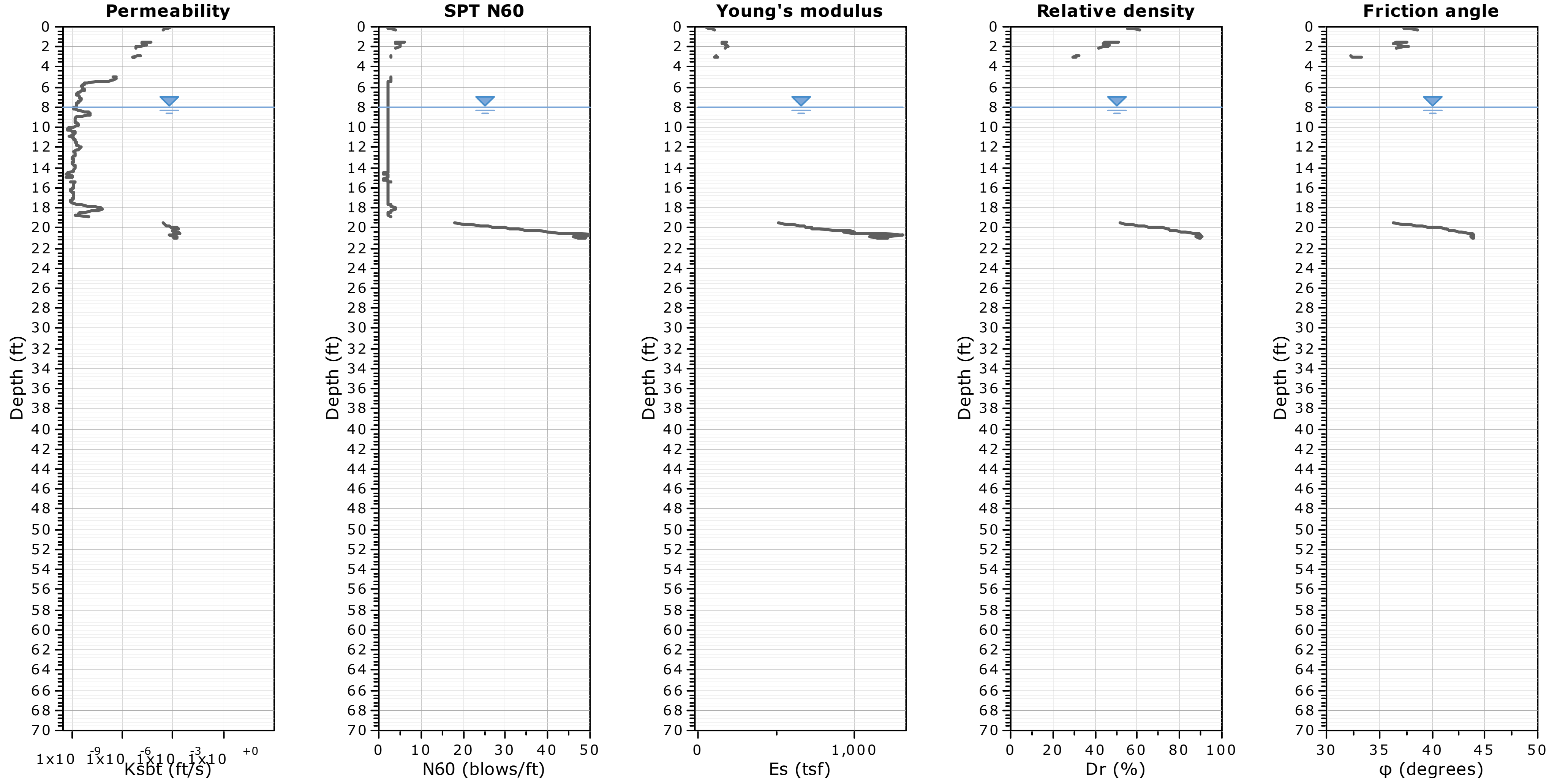
http://www.HCEA.com

CPT: S Market SP-CPT-01OFFSET
Total depth: 21.06 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



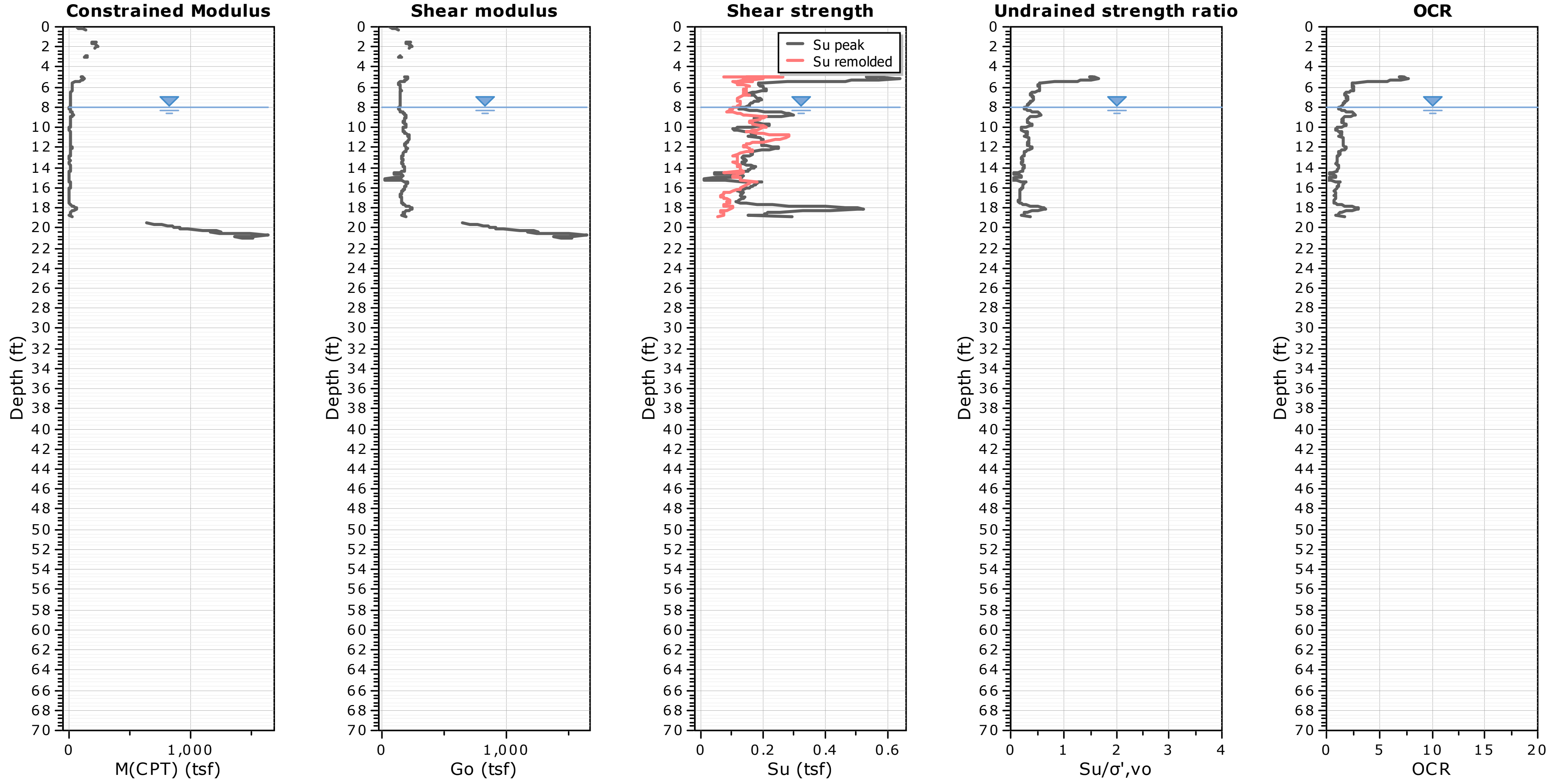
Calculation parameters

Permeability: Based on SBT_n
SPT N_{60}: Based on I_c and q_t
Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr}: 350.0
Phi: Based on Kulhawy & Mayne (1990)
—●— User defined estimation data

CPT: S Market SP-CPT-01OFFSET
Total depth: 21.06 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



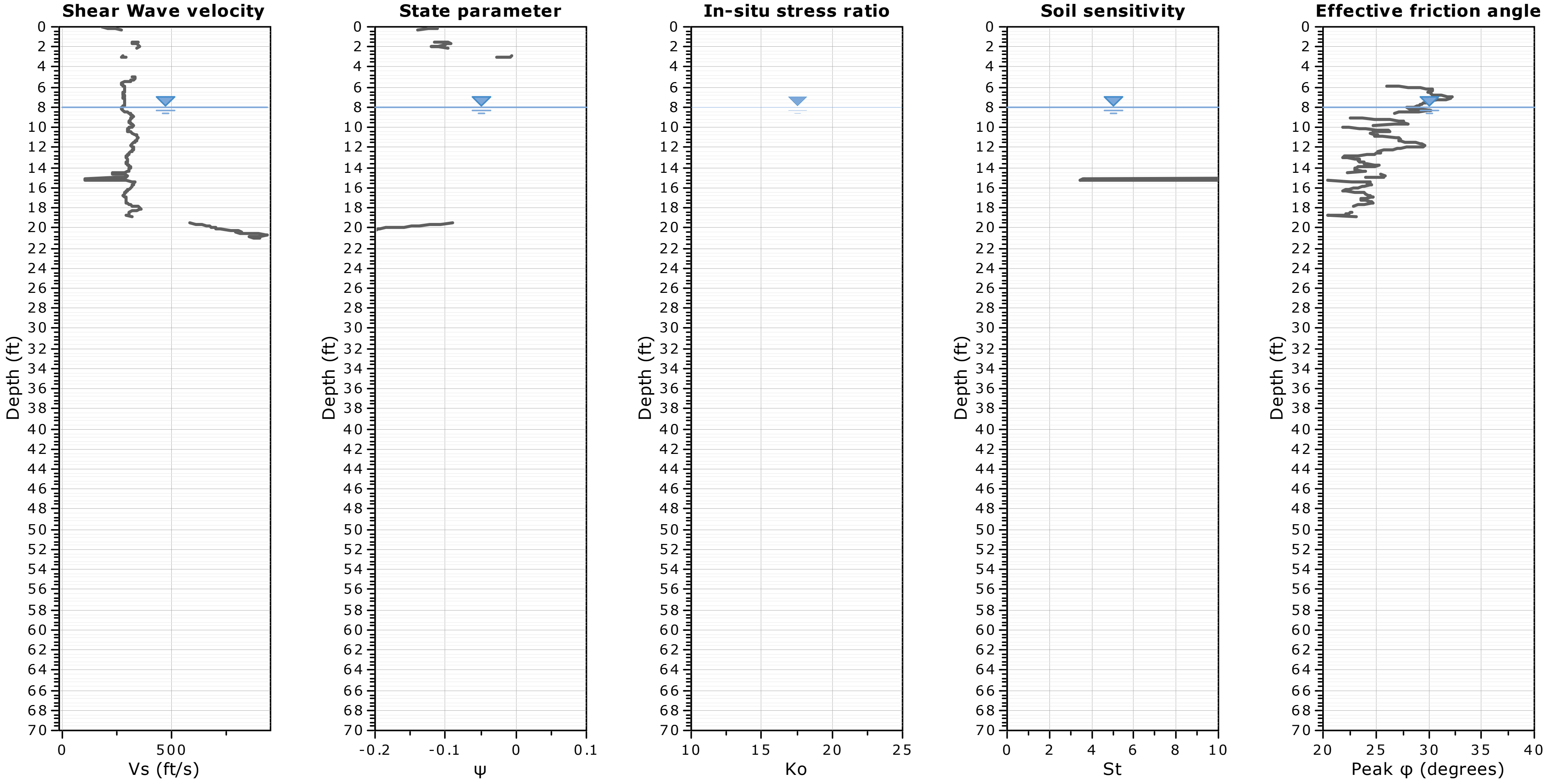
Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33
● User defined estimation data
● Flat Dilatometer Test data

CPT: S Market SP-CPT-01OFFSET
Total depth: 21.06 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**

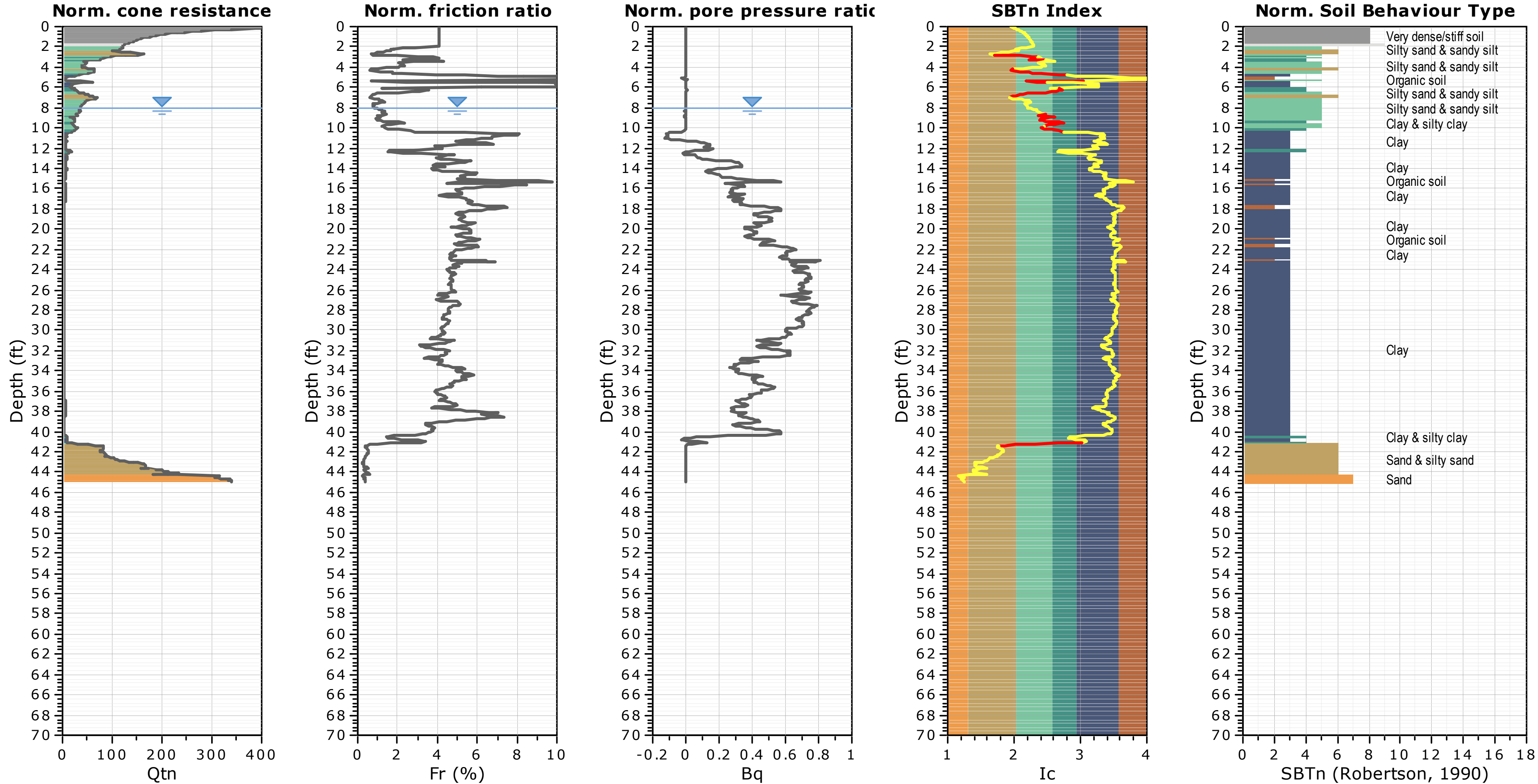


Calculation parameters

Soil Sensitivity factor, N_S: 350.00
● User defined estimation data

CPT: S Market SP-CPT-02
Total depth: 44.95 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



SBTn legend

🟥 1. Sensitive fine grained
🟫 2. Organic material
🟦 3. Clay to silty clay
🟩 4. Clayey silt to silty clay
🟩 5. Silty sand to sandy silt
🟨 6. Clean sand to silty sand
🟧 7. Gravely sand to sand
⬜ 8. Very stiff sand to clayey sand
⬜ 9. Very stiff fine grained

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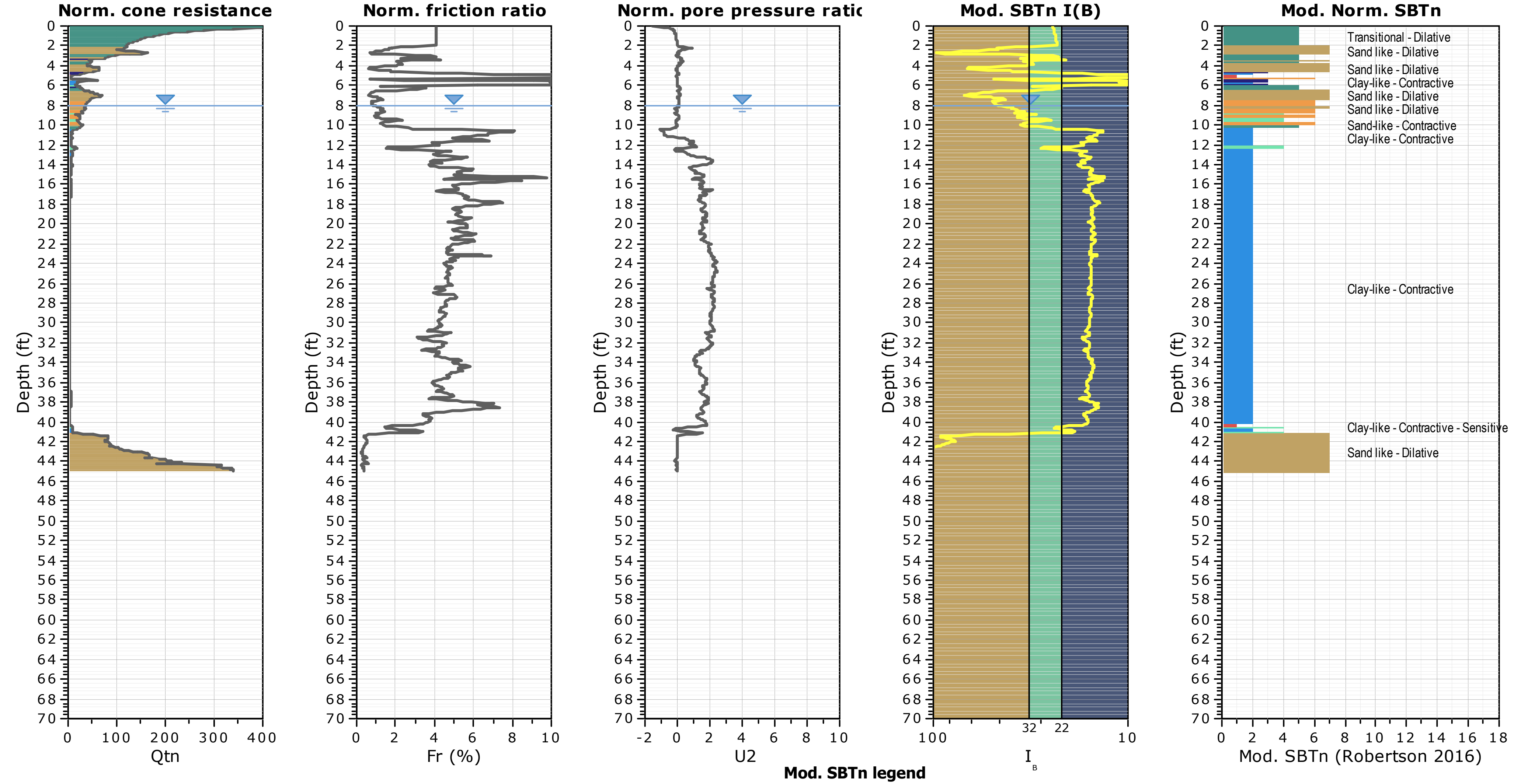
CPT: S Market SP-CPT-02
Total depth: 44.95 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: S Market - RK&K
Location: New Castle, DE

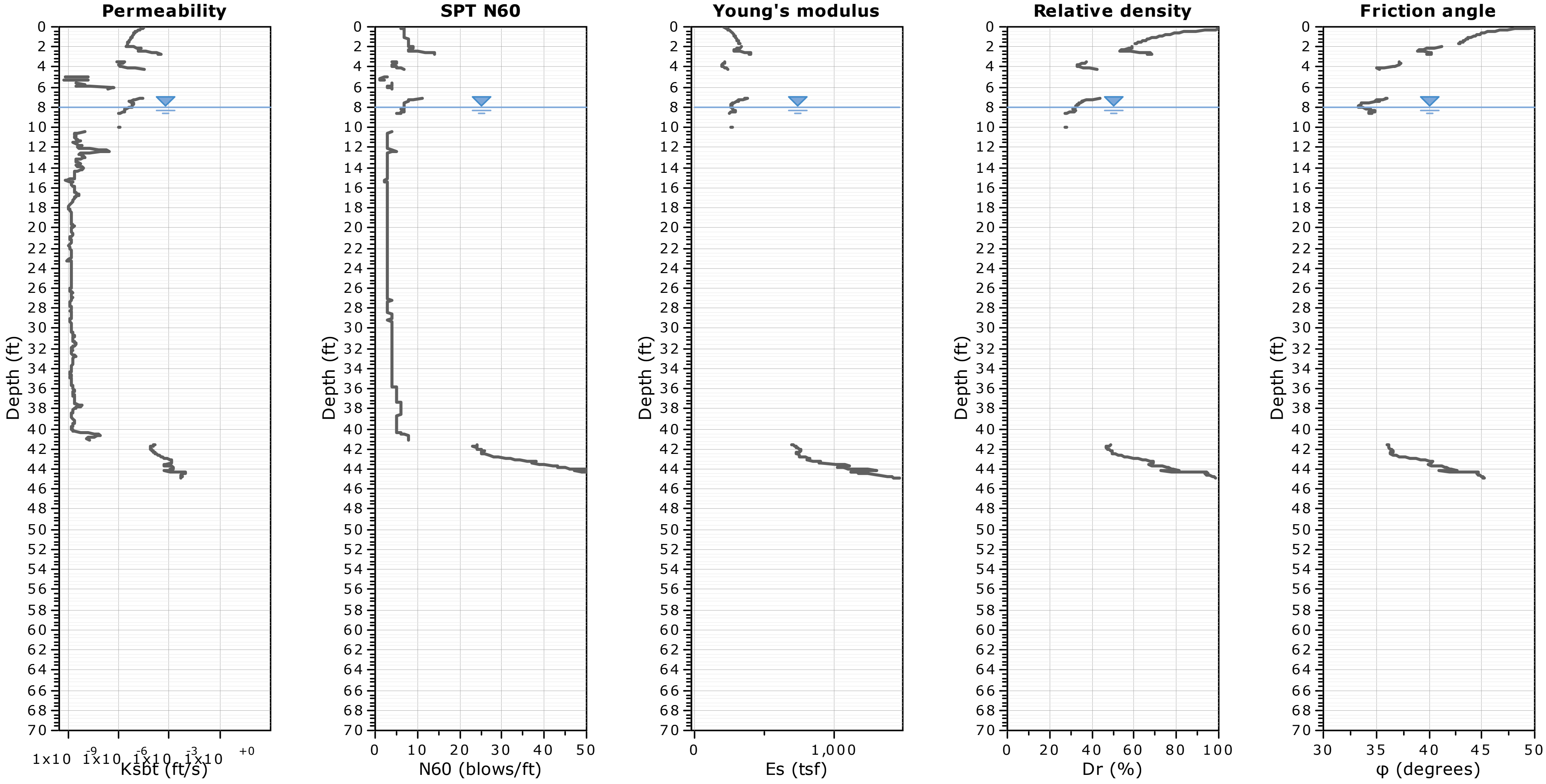


Mod. SBTn legend

🟥 1. CCS: ClayLike - Contractive, Sensitive
🟦 2. CC: Clay-like - Contractive
🟦 3. CD: Clay-Like: Dilative
🟩 4. TC: Transitional - Contractive
🟩 5. TD: Transitional - Dilative
🟧 6. SC: Sand-like - Contractive
🟫 7. SD: Sand-like - Dilative

CPT: S Market SP-CPT-02
Total depth: 44.95 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



Calculation parameters

Permeability: Based on SBT_n

SPT N_{60}: Based on I_c and q_t

Young's modulus: Based on variable alpha using I_c (Robertson, 2009)

Relative density constant, C_{Dr}: 350.0

Phi: Based on Kulhawy & Mayne (1990)

—●— User defined estimation data

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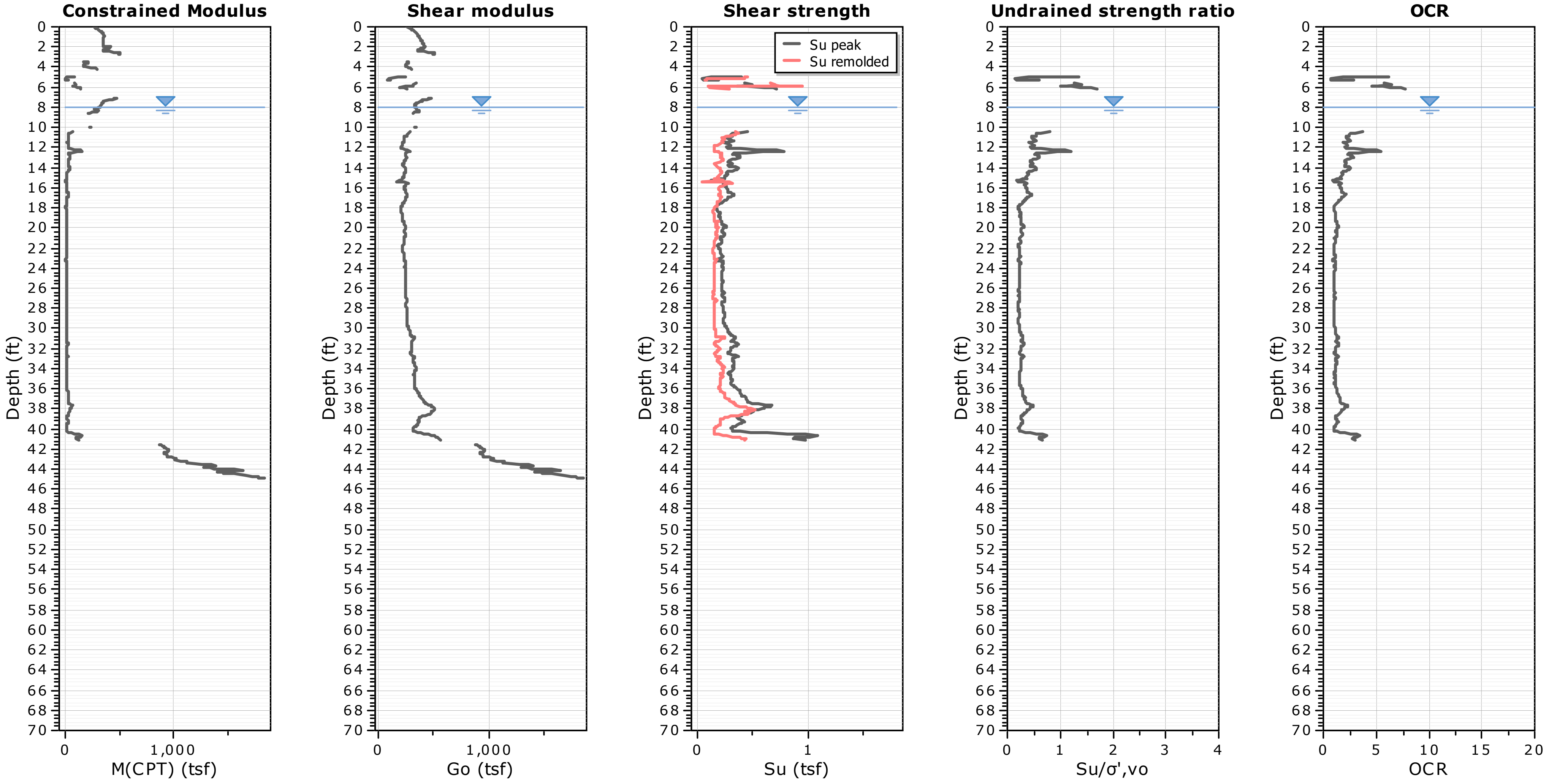
CPT: S Market SP-CPT-02
Total depth: 44.95 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: **S Market - RK&K**
Location: **New Castle, DE**



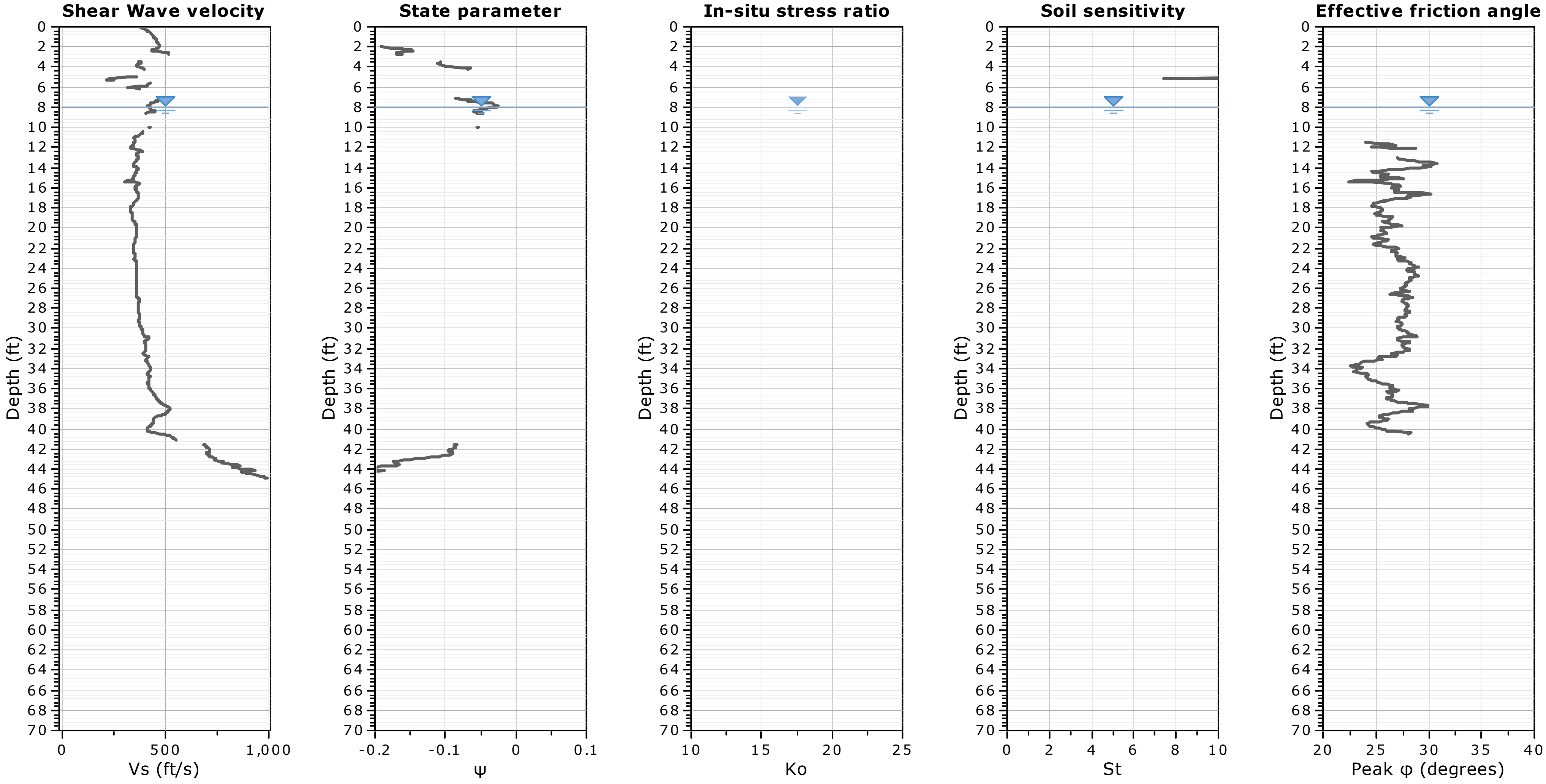
Calculation parameters

Constrained modulus: Based on variable *alpha* using I_c and Q_{tn} (Robertson, 2009)
Go: Based on variable *alpha* using I_c (Robertson, 2009)
Undrained shear strength cone factor for clays, N_{kt}: 14

OCR factor for clays, N_{kt}: 0.33
● User defined estimation data
● Flat Dilatometer Test data

CPT: S Market SP-CPT-02
Total depth: 44.95 ft, Date: 7/13/2020
Surface Elevation: 8.00 ft
Coords: X:0.00, Y:0.00
Cone Type: NOVA U2
Cone Operator: R. Ward, P.E.

Project: S Market - RK&K
Location: New Castle, DE



Calculation parameters

Soil Sensitivity factor, N_S: 350.00

● User defined estimation data

CPT Reports
(Dissipation Test Results)

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

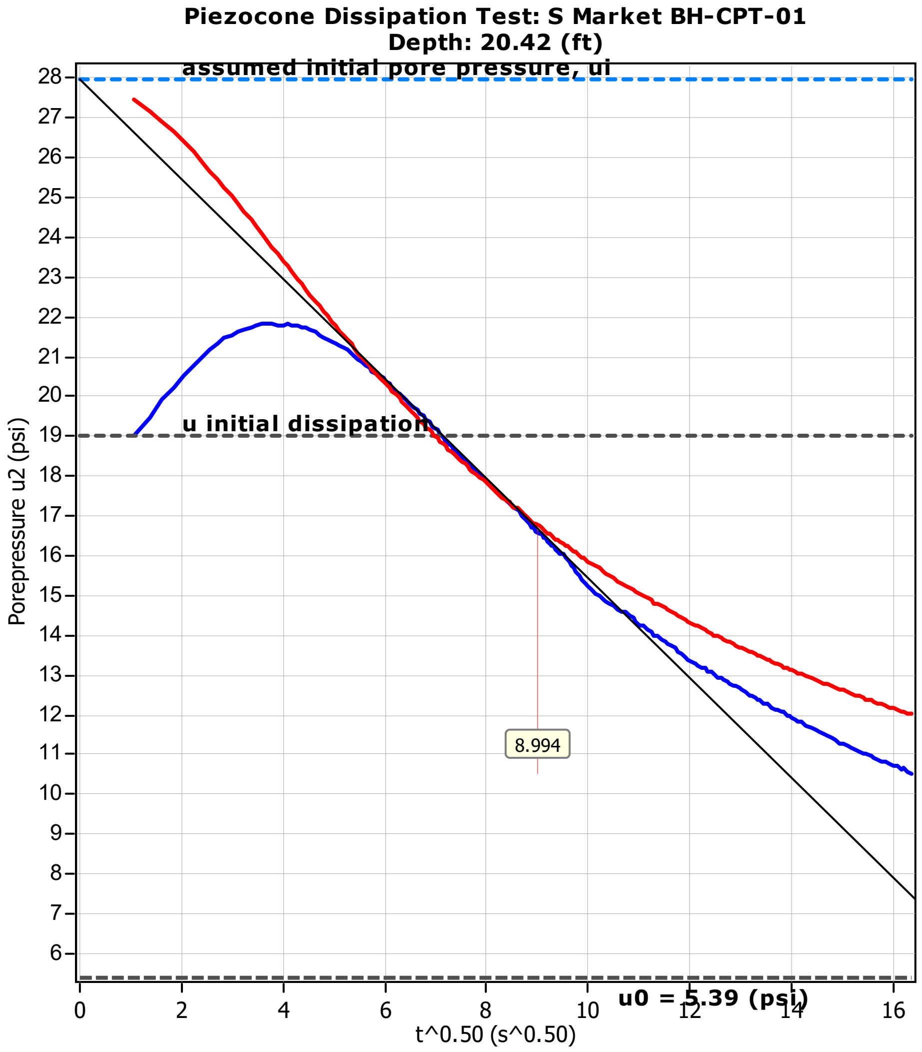
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

$$k_h = c_h \times \gamma_w / M$$

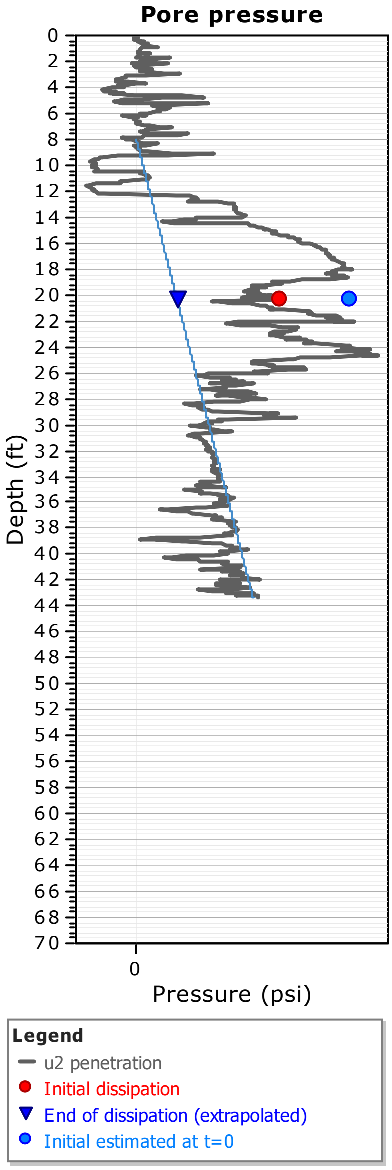
where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (ft)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (ft^2/s)	c_h (ft^2/year)	M (tsf)	k_h (ft/s)
S Market BH-CPT-01	20.42	9.0	81	2.57E-006	1476976.13	1.23E-003	38870	7.33	5.25E-006



Piezocone Dissipation Test: S Market BH-CPT-01
Depth: 20.42 (ft)



Pore pressure

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

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The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

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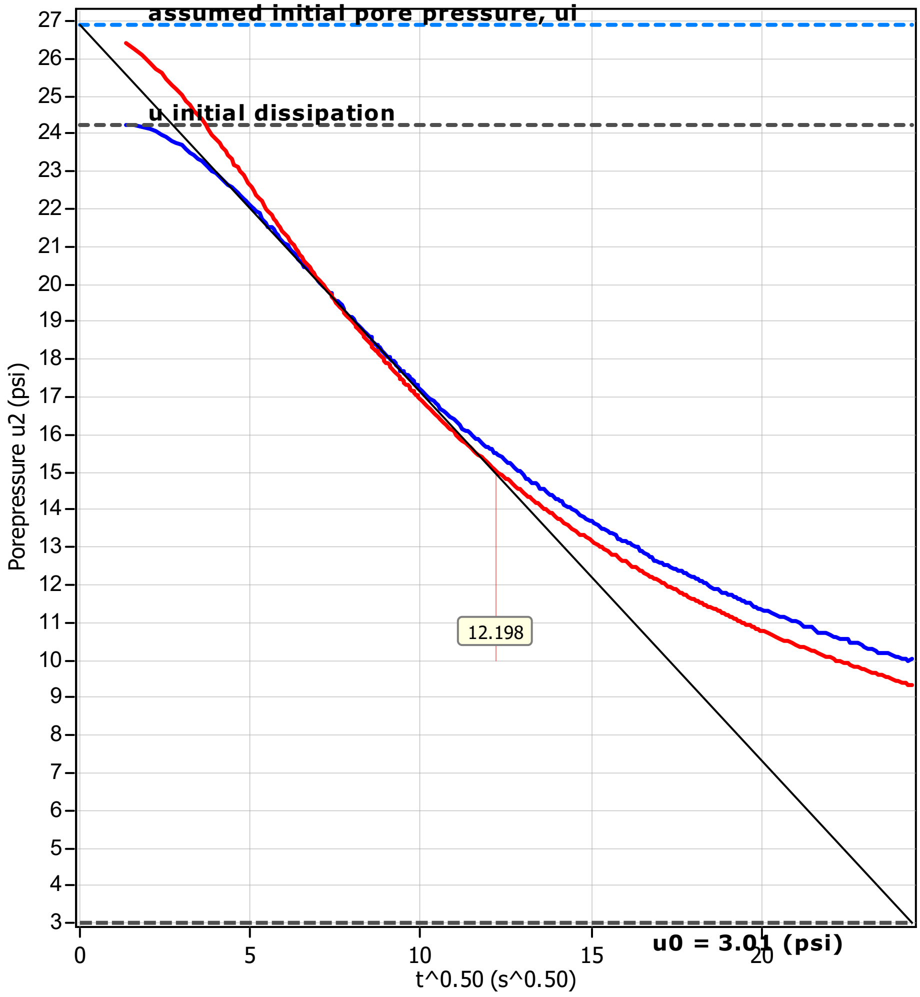
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

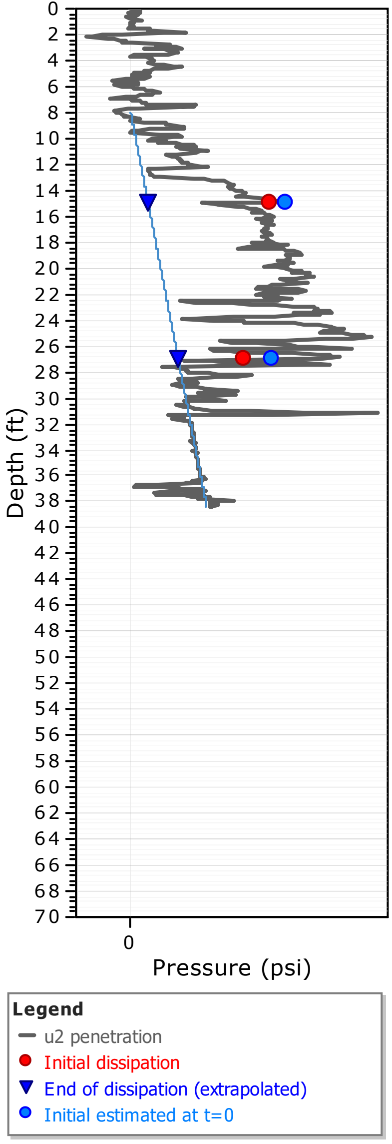
Tabular results

CPTU Borehole	Depth (ft)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (ft^2/s)	c_h ($ft^2/year$)	M (tsf)	k_h (ft/s)
S Market BH-CPT-02	14.95	12.2	149	4.72E-006	1325251.38	6.35E-004	20019	4.82	4.11E-006
S Market BH-CPT-02	27.03	3.9	15	4.80E-007	695375.44	4.52E-003	142620	34.92	4.04E-006

Piezocone Dissipation Test: S Market BH-CPT-02
Depth: 14.95 (ft)



Pore pressure



Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

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$$c_h = \frac{T \times r^2 \times I_r^{\ 0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

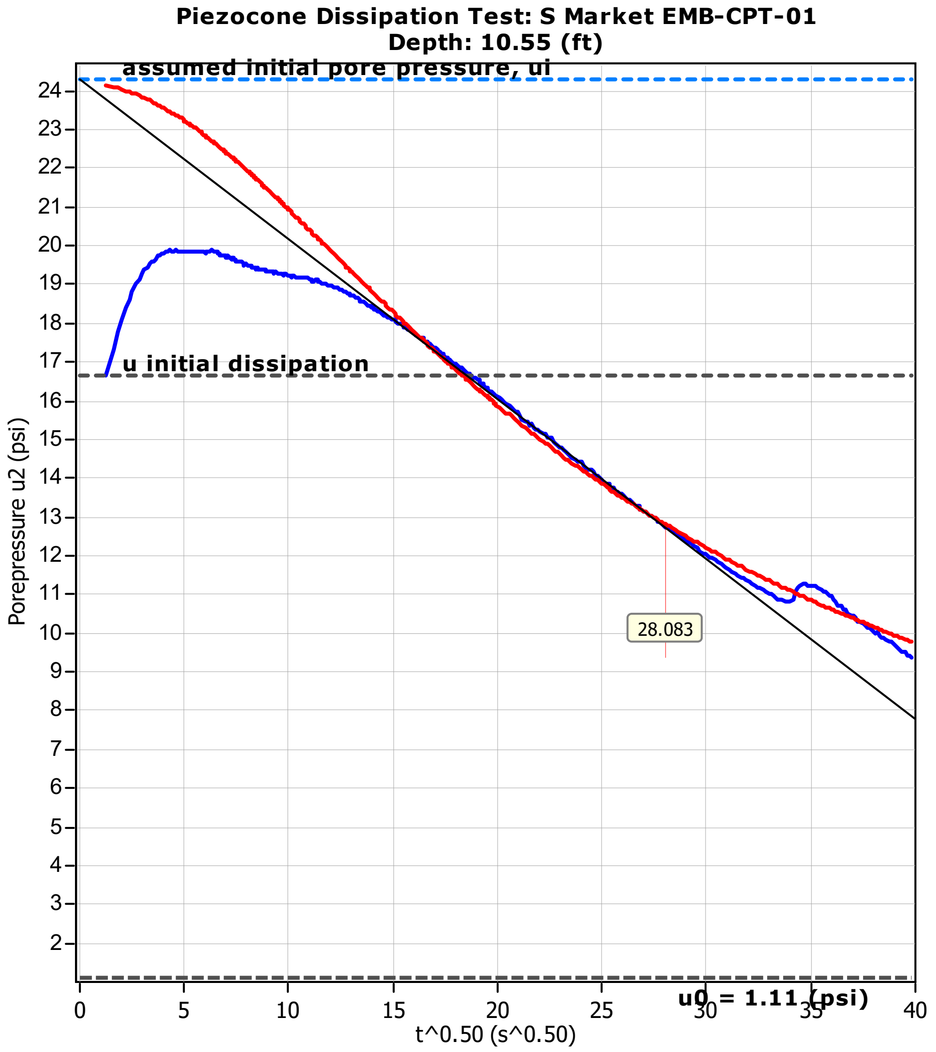
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

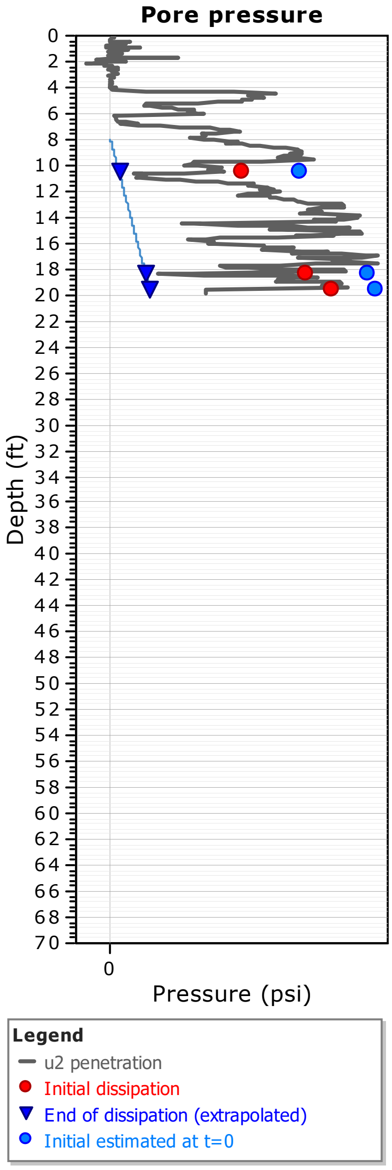
$$k_h = c_h \times \gamma_w / M$$

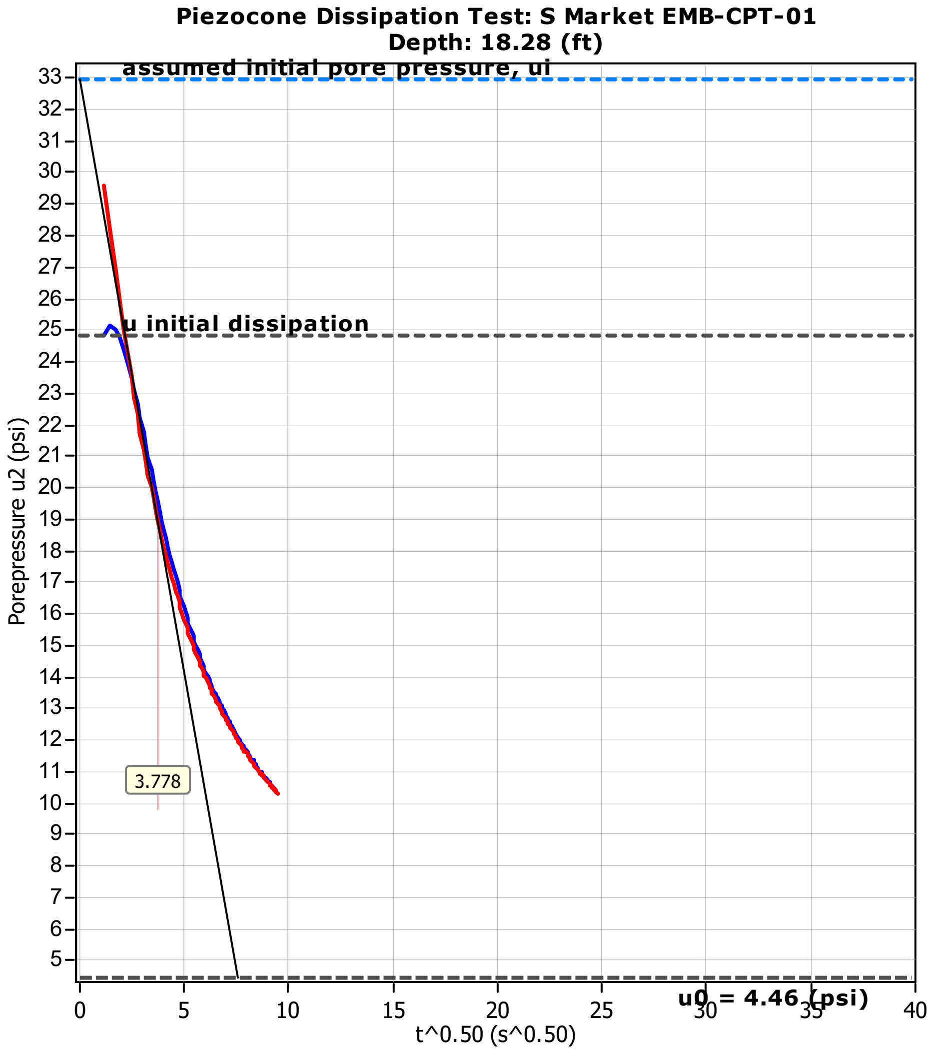
where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

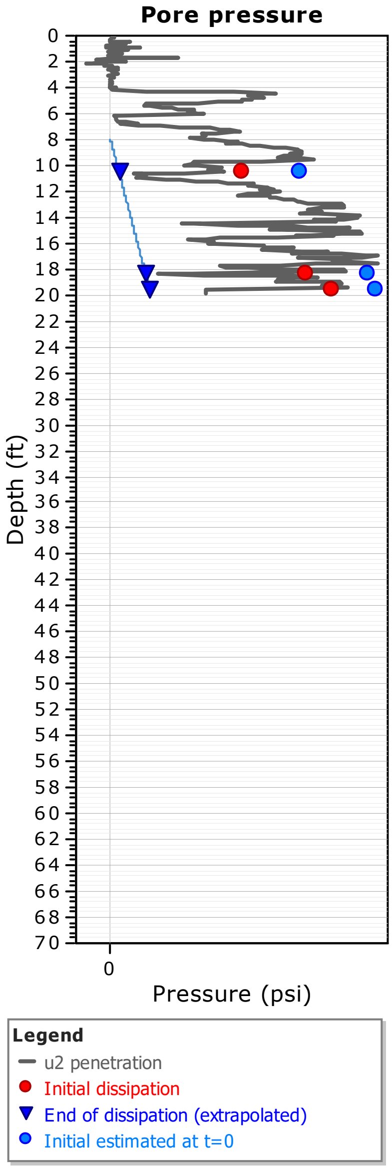
CPTU Borehole	Depth (ft)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (ft^2/s)	c_h (ft^2/year)	M (tsf)	k_h (ft/s)
S Market EMB-CPT-01	10.55	28.1	789	2.50E-005	503648.75	7.38E-005	2328	89.84	2.57E-008
S Market EMB-CPT-01	18.28	3.8	14	4.53E-007	670266.31	4.70E-003	148376	37.29	3.94E-006
S Market EMB-CPT-01	19.53	7.2	52	1.66E-006	741647.50	1.35E-003	42503	18.14	2.32E-006


Piezocone Dissipation Test: S Market EMB-CPT-01
Depth: 10.55 (ft)
assumed initial pore pressure, ui
u initial dissipation
28.083
u0 = 1.11 (psi)
Porepressure u2 (psi)
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
0
5
10
15
20
25
30
35
40
t^0.50 (s^0.50)

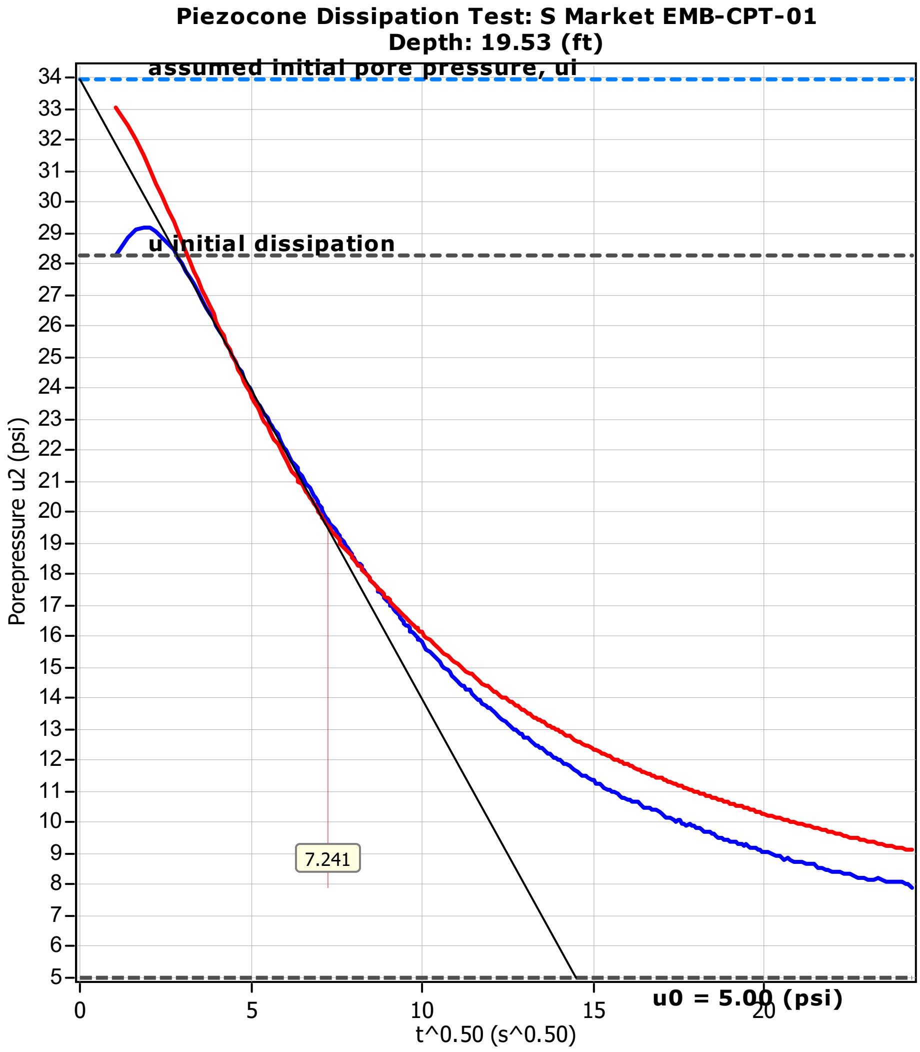

Pore pressure
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
0
Pressure (psi)
Legend
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

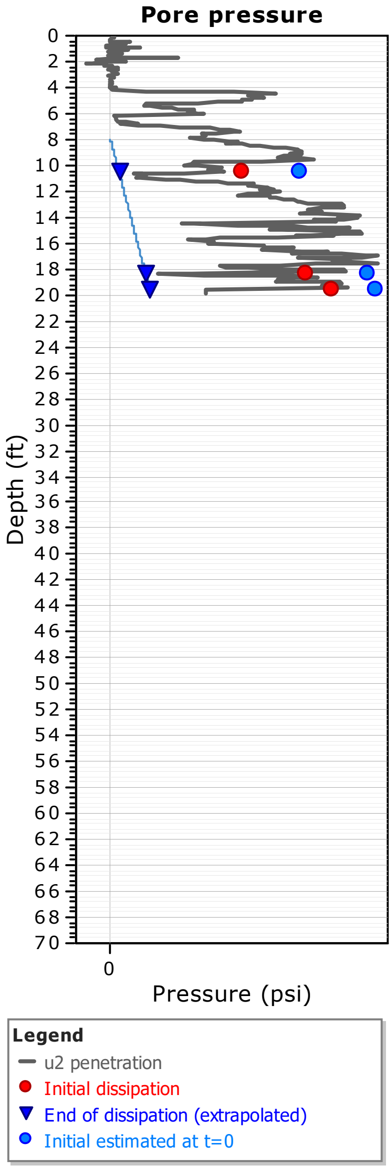


Piezocone Dissipation Test: S Market EMB-CPT-01
Depth: 18.28 (ft)



Pore pressure


Piezocone Dissipation Test: S Market EMB-CPT-01
Depth: 19.53 (ft)
assumed initial pore pressure, ui
u initial dissipation
7.241
u0 = 5.00 (psi)
Porepressure u2 (psi)
t^0.50 (s^0.50)
34
33
32
31
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
0
5
10
15
20


Pore pressure
Depth (ft)
Pressure (psi)
0
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
Legend
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

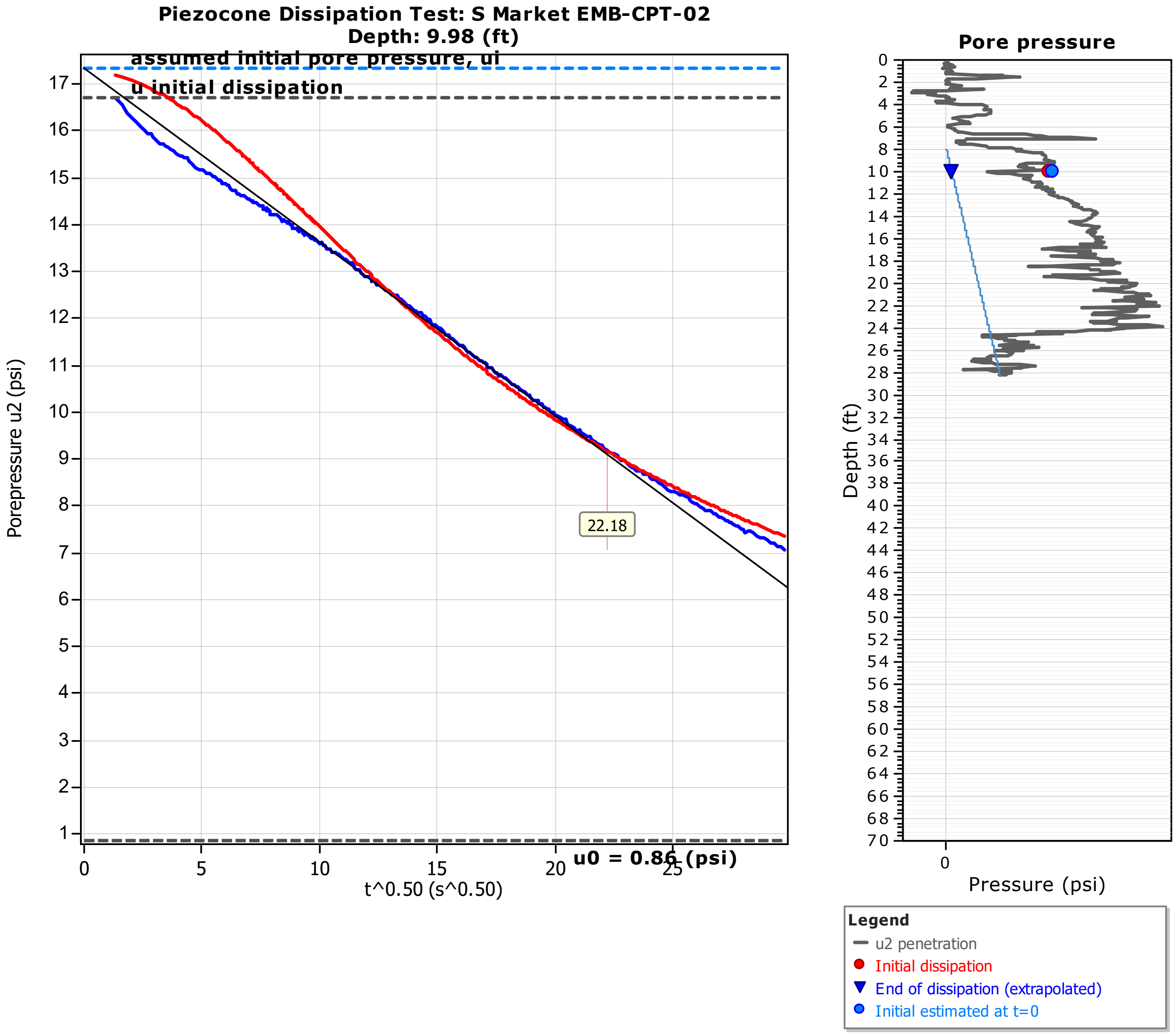
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

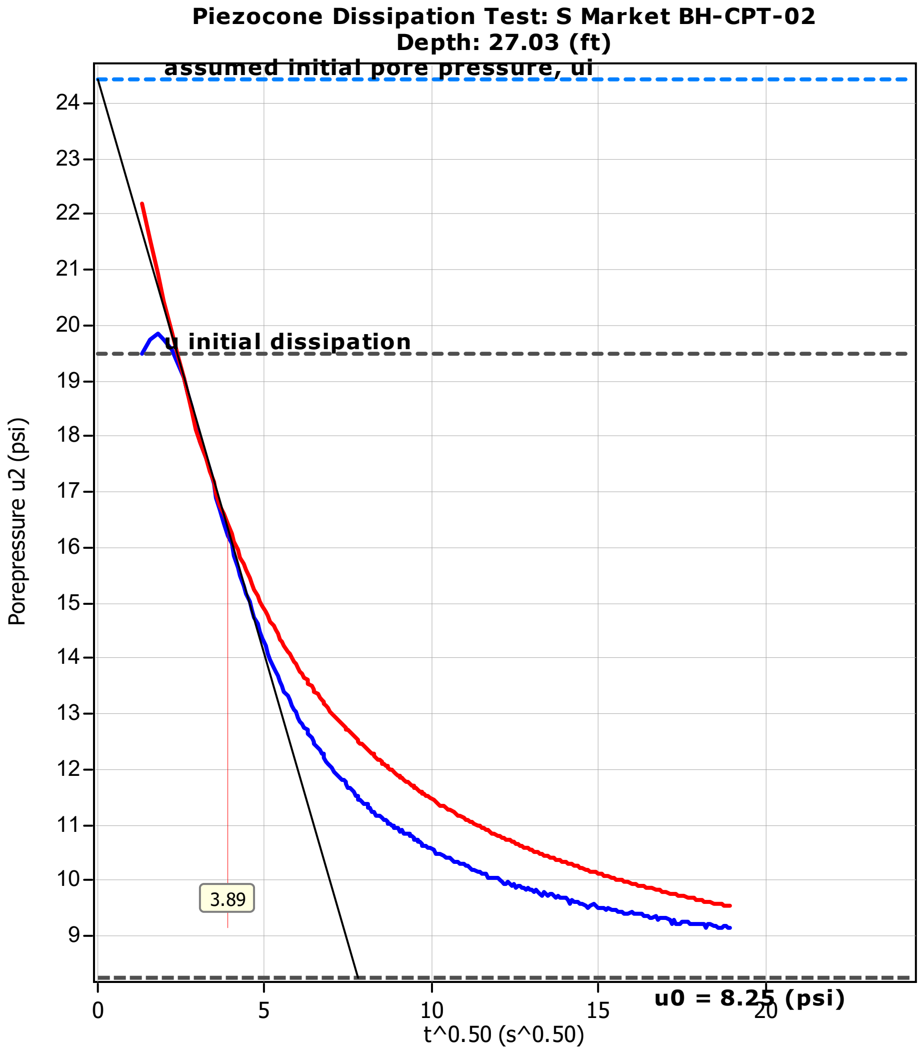
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

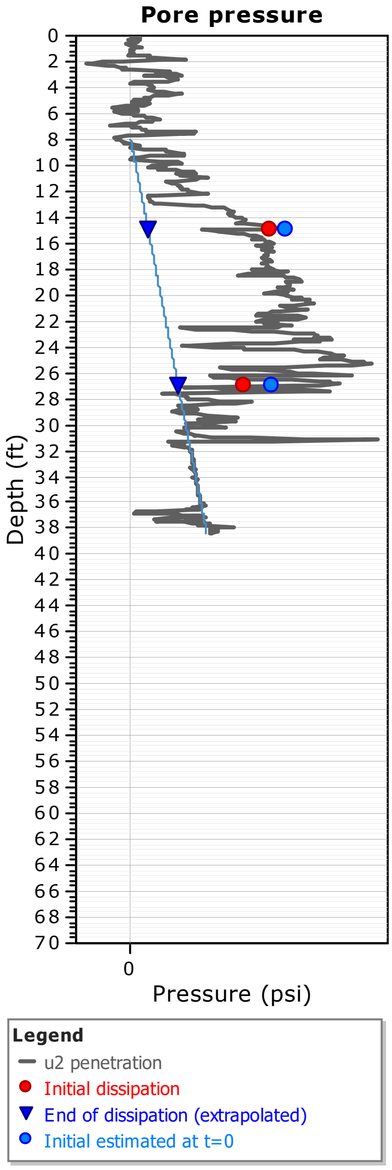
Tabular results

CPTU Borehole	Depth (ft)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (ft^2/s)	c_h ($ft^2/year$)	M (tsf)	k_h (ft/s)
S Market EMB-CPT-02	9.98	22.2	492	1.56E-005	950960.25	1.63E-004	5129	9.75	5.21E-007


Piezocone Dissipation Test: S Market EMB-CPT-02
Depth: 9.98 (ft)
assumed initial pore pressure, ui
u initial dissipation
Porepressure u2 (psi)
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
5
10
15
20
25
t^0.50 (s^0.50)
22.18
u0 = 0.86 (psi)
Pore pressure
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
0
Pressure (psi)
Legend
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0



Piezocone Dissipation Test: S Market BH-CPT-02
Depth: 27.03 (ft)



Pore pressure

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{\,0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

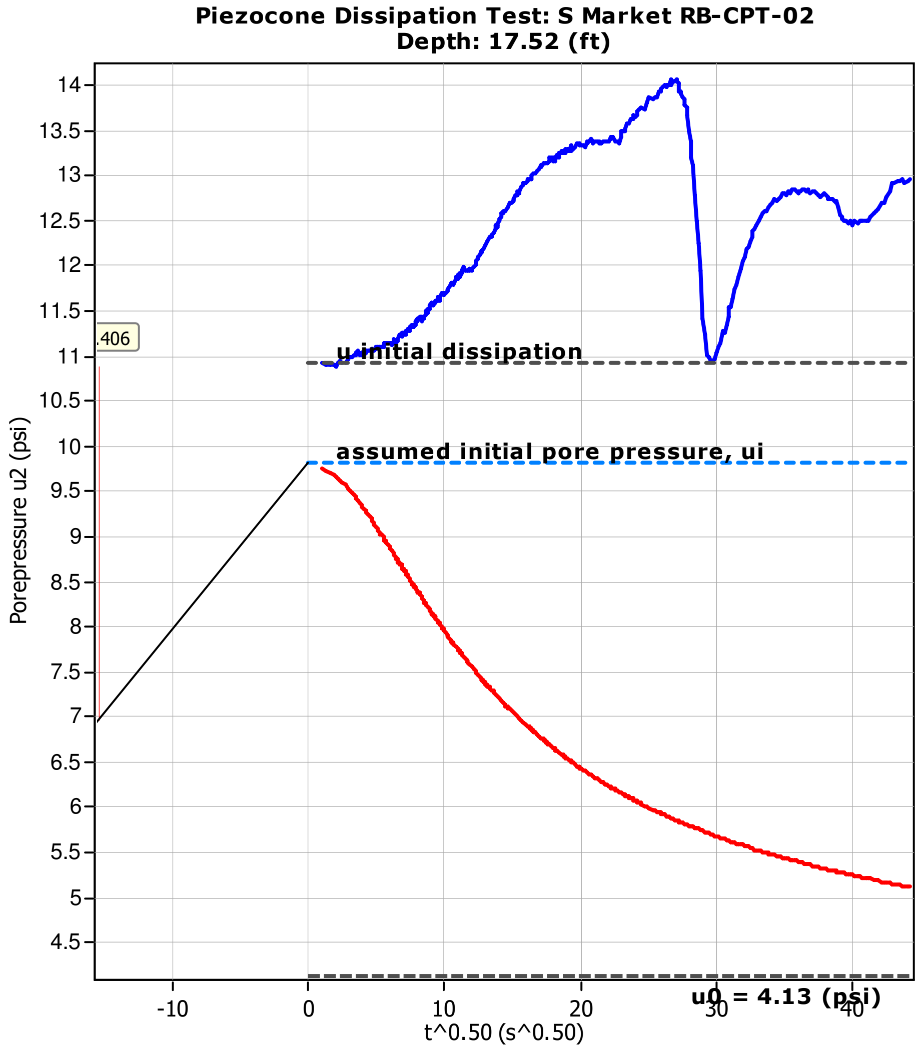
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

$$k_h = c_h \times \gamma_w / M$$

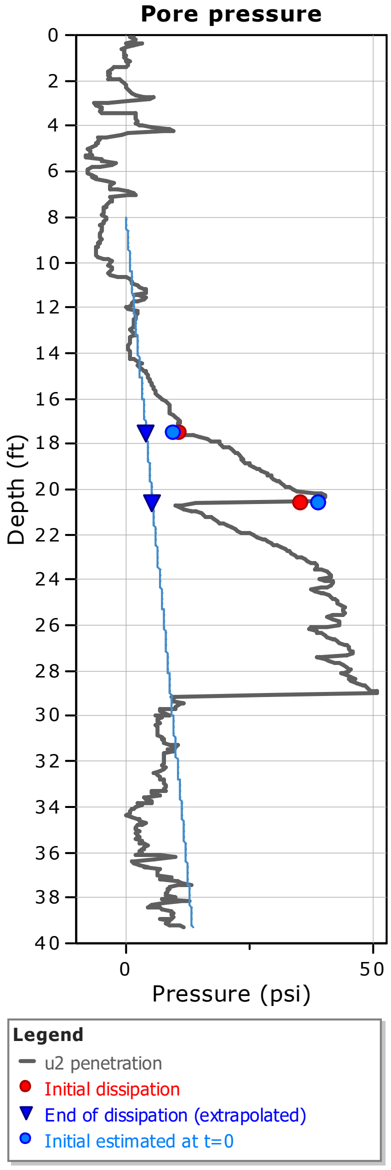
where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

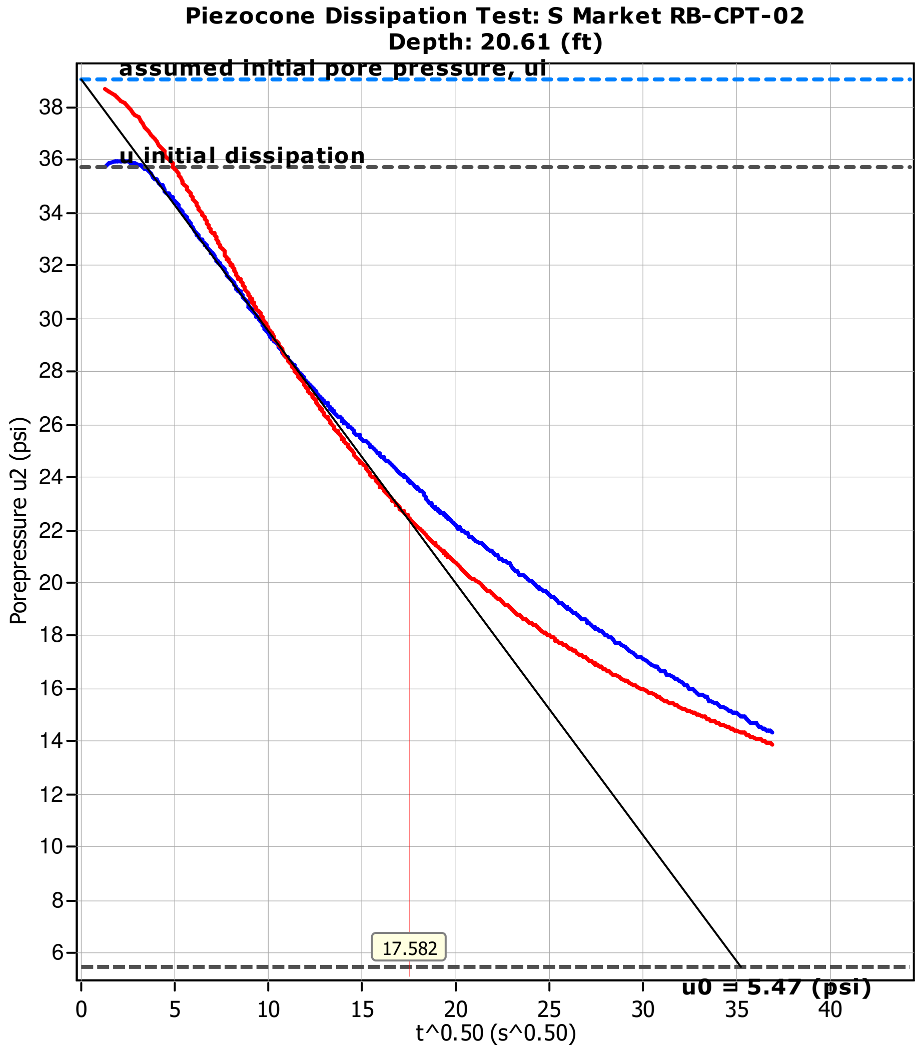
CPTU Borehole	Depth (ft)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (ft^2/s)	c_h ($ft^2/year$)	M (tsf)	k_h (ft/s)
S Market RB-CPT-02	17.52	15.4	237	7.53E-006	1153013.50	3.71E-004	11706	15.52	7.47E-007
S Market RB-CPT-02	20.61	17.6	309	9.80E-006	728325.31	2.27E-004	7144	42.77	1.65E-007

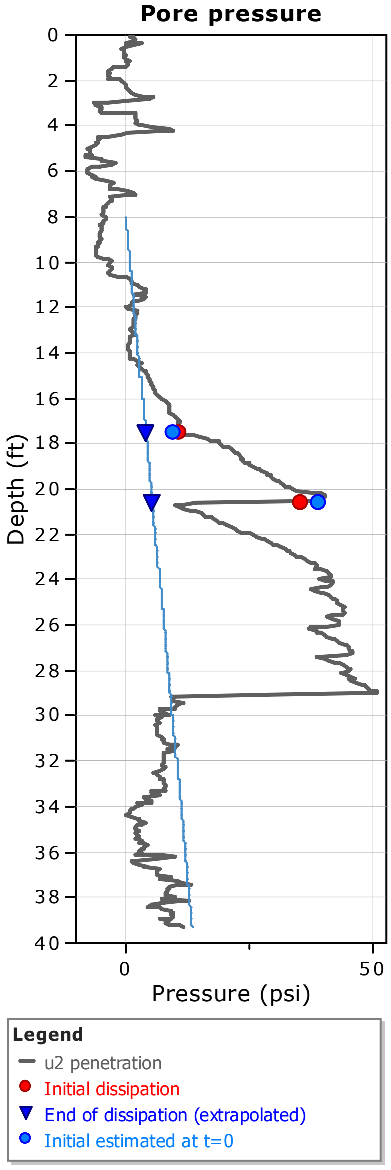


Piezocone Dissipation Test: S Market RB-CPT-02
Depth: 17.52 (ft)



Pore pressure


Piezocone Dissipation Test: S Market RB-CPT-02
Depth: 20.61 (ft)
assumed initial pore pressure, ui
u initial dissipation
17.582
u0 = 5.47 (psi)
Porepressure u2 (psi)
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
0
5
10
15
20
25
30
35
40
t^0.50 (s^0.50)


Pore pressure
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
0
50
Pressure (psi)
Legend
— u2 penetration
● Initial dissipation
▼ End of dissipation (extrapolated)
● Initial estimated at t=0

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

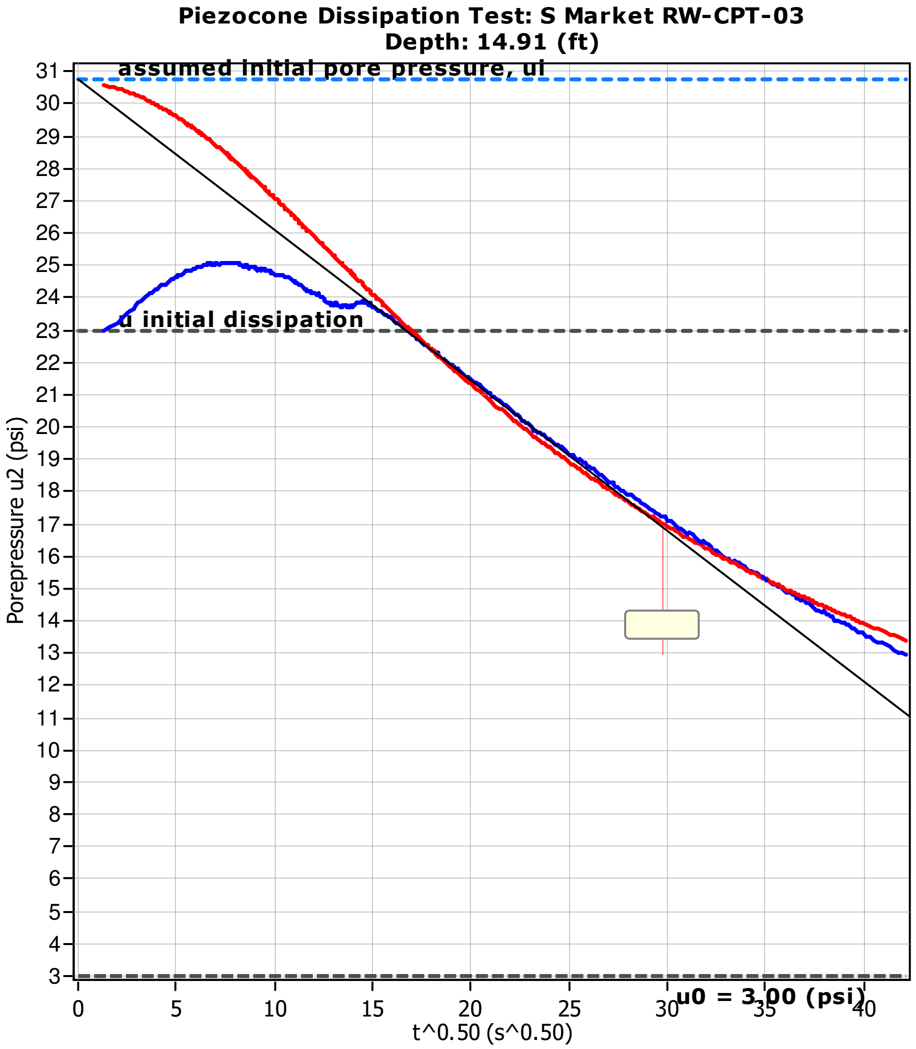
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

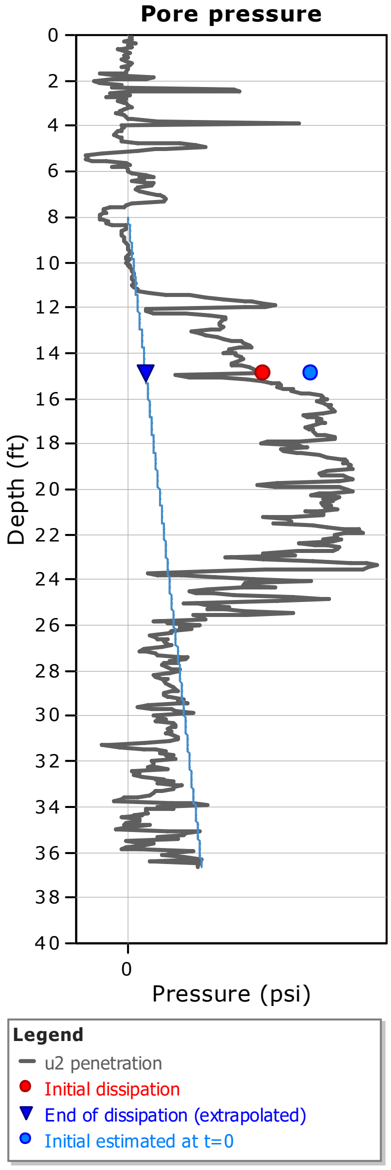
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (ft)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (ft^2/s)	c_h ($ft^2/year$)	M (tsf)	k_h (ft/s)
S Market RW-CPT-03	14.91	29.8	888	2.82E-005	1136862.25	9.85E-005	3107	10.82	2.84E-007


Piezocone Dissipation Test: S Market RW-CPT-03
Depth: 14.91 (ft)
assumed initial pore pressure, ui
u initial dissipation
u0 = 3.00 (psi)
Porepressure u2 (psi)
t^0.50 (s^0.50)
31
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
0
5
10
15
20
25
30
35
40


Pore pressure
Depth (ft)
Pressure (psi)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
0
Legend
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

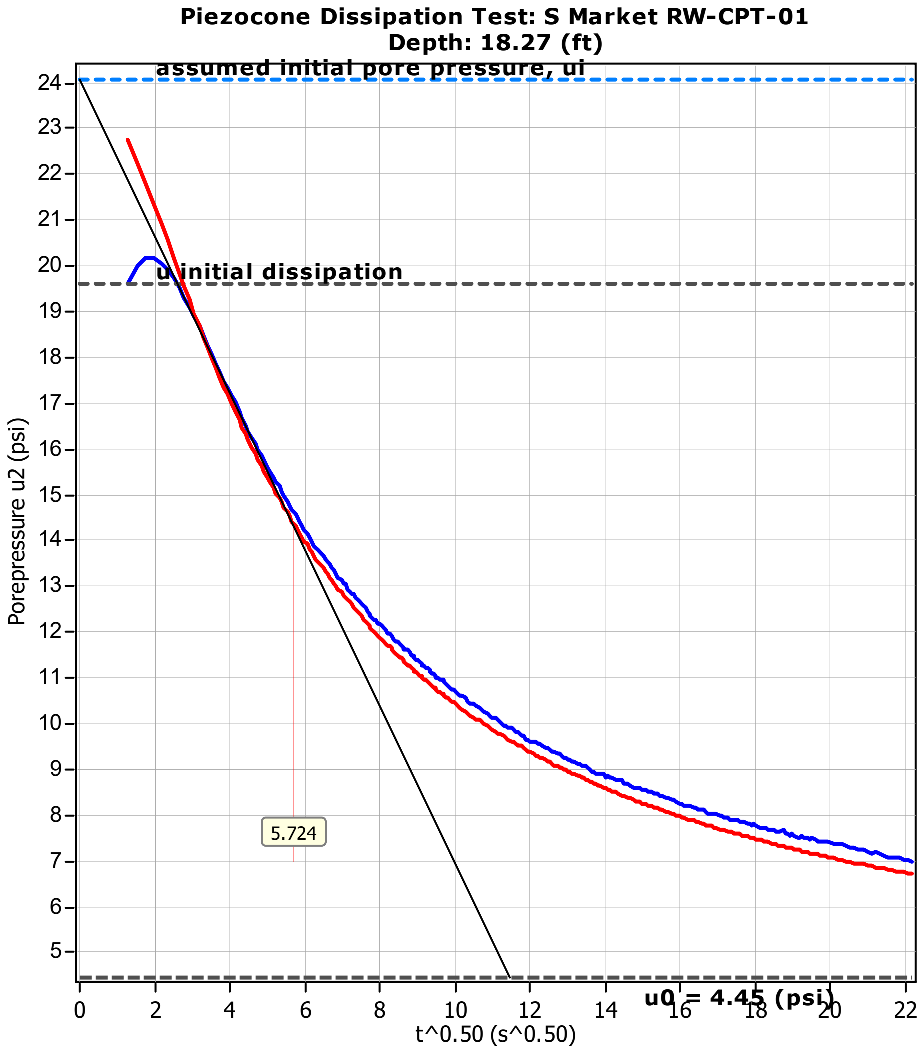
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

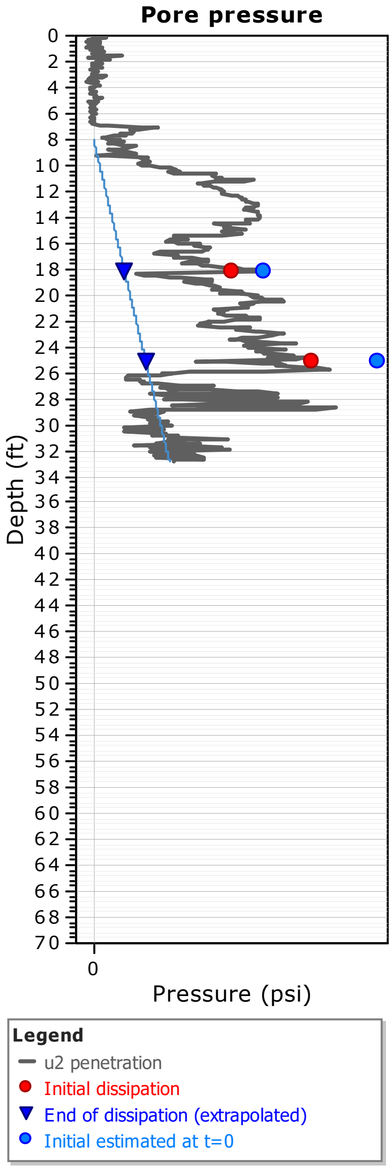
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

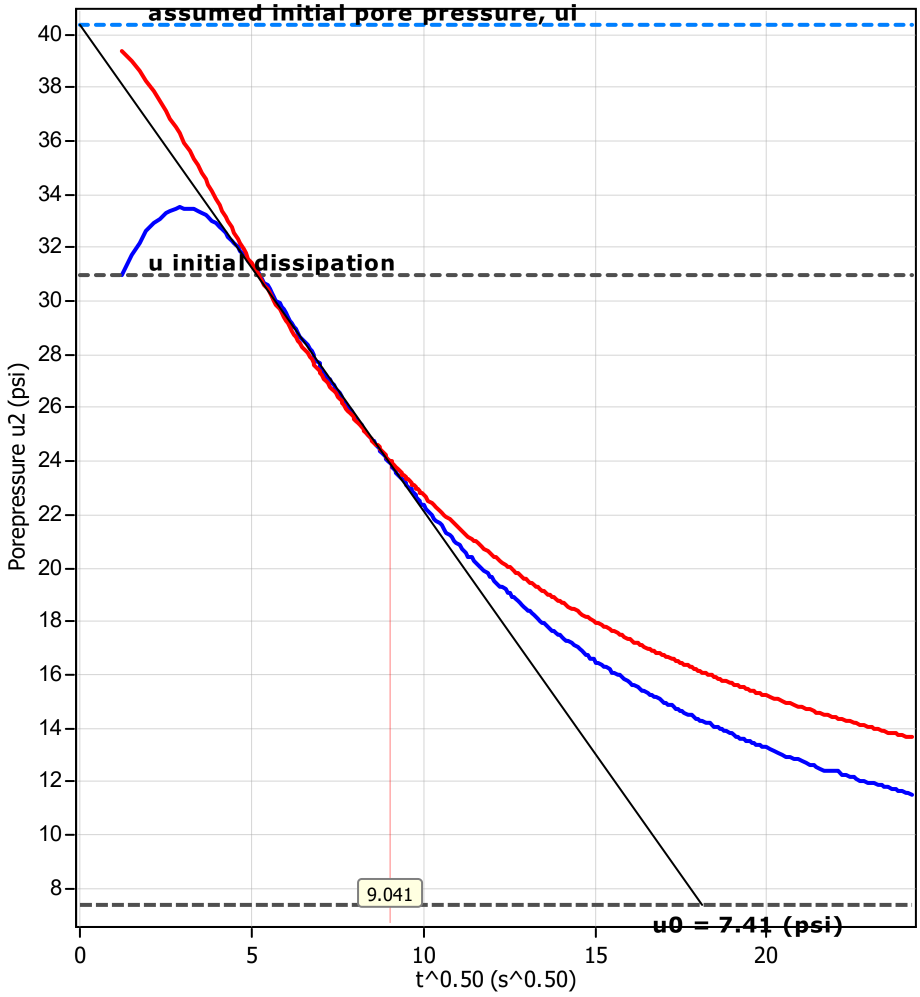
Tabular results

CPTU Borehole	Depth (ft)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (ft^2/s)	c_h (ft^2/year)	M (tsf)	k_h (ft/s)
S Market RW-CPT-01	18.27	5.7	33	1.04E-006	699450.38	2.09E-003	66041	25.54	2.56E-006
S Market RW-CPT-01	25.08	9.0	82	2.59E-006	968217.38	9.88E-004	31146	20.38	1.51E-006

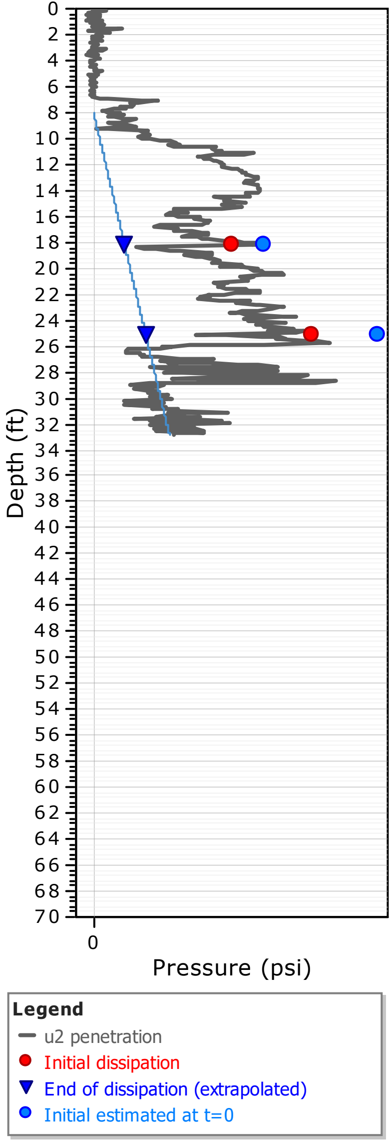

Piezocone Dissipation Test: S Market RW-CPT-01
Depth: 18.27 (ft)
assumed initial pore pressure, ui
u initial dissipation
5.724
u0 = 4.45 (psi)
Porepressure u2 (psi)
t^0.50 (s^0.50)
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
0
2
4
6
8
10
12
14
16
18
20
22


Pore pressure
Depth (ft)
Pressure (psi)
0
Legend
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

Piezocone Dissipation Test: S Market RW-CPT-01
Depth: 25.08 (ft)



Pore pressure



Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

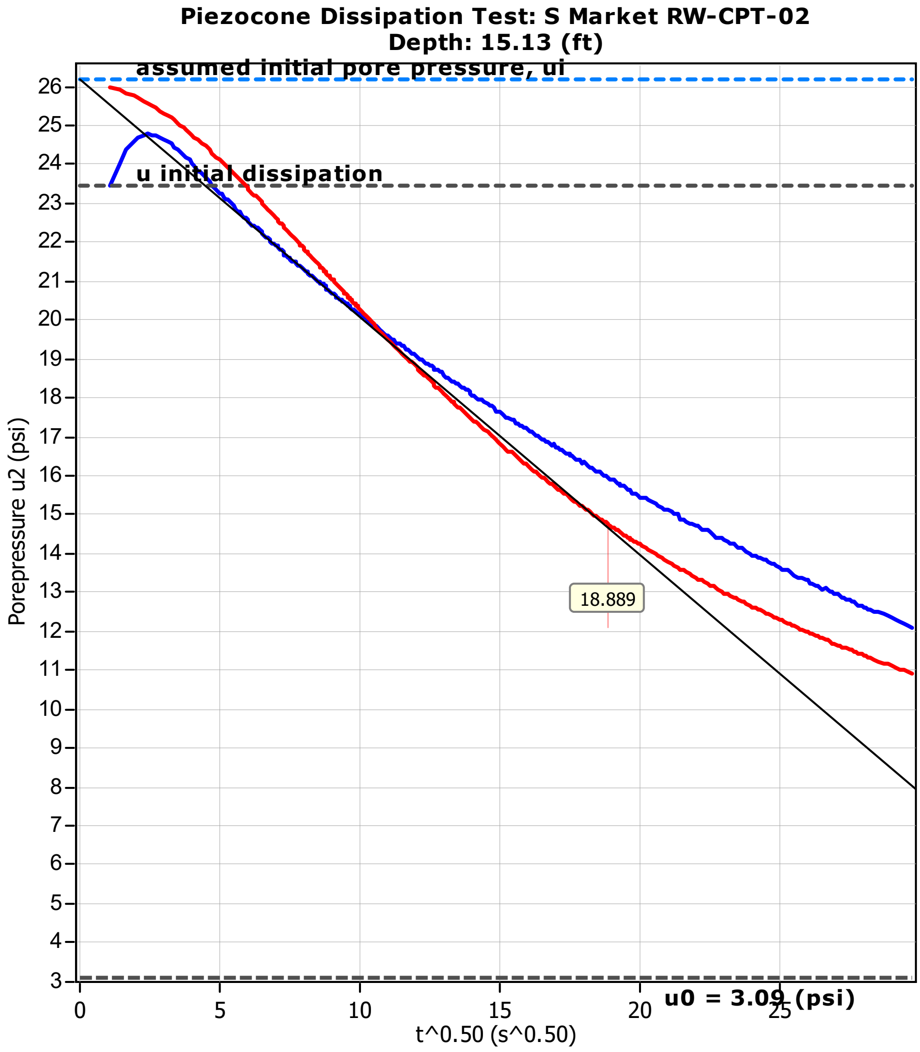
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

$$k_h = c_h \times \gamma_w / M$$

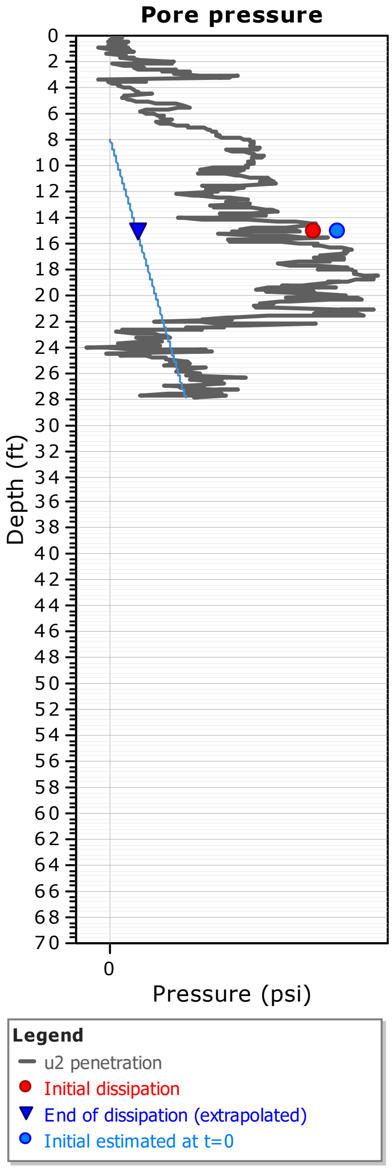
where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (ft)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (ft^2/s)	c_h ($ft^2/year$)	M (tsf)	k_h (ft/s)
S Market RW-CPT-02	15.13	18.9	357	1.13E-005	1239684.25	2.56E-004	8074	5.76	1.39E-006



Piezocone Dissipation Test: S Market RW-CPT-02
Depth: 15.13 (ft)



Pore pressure

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

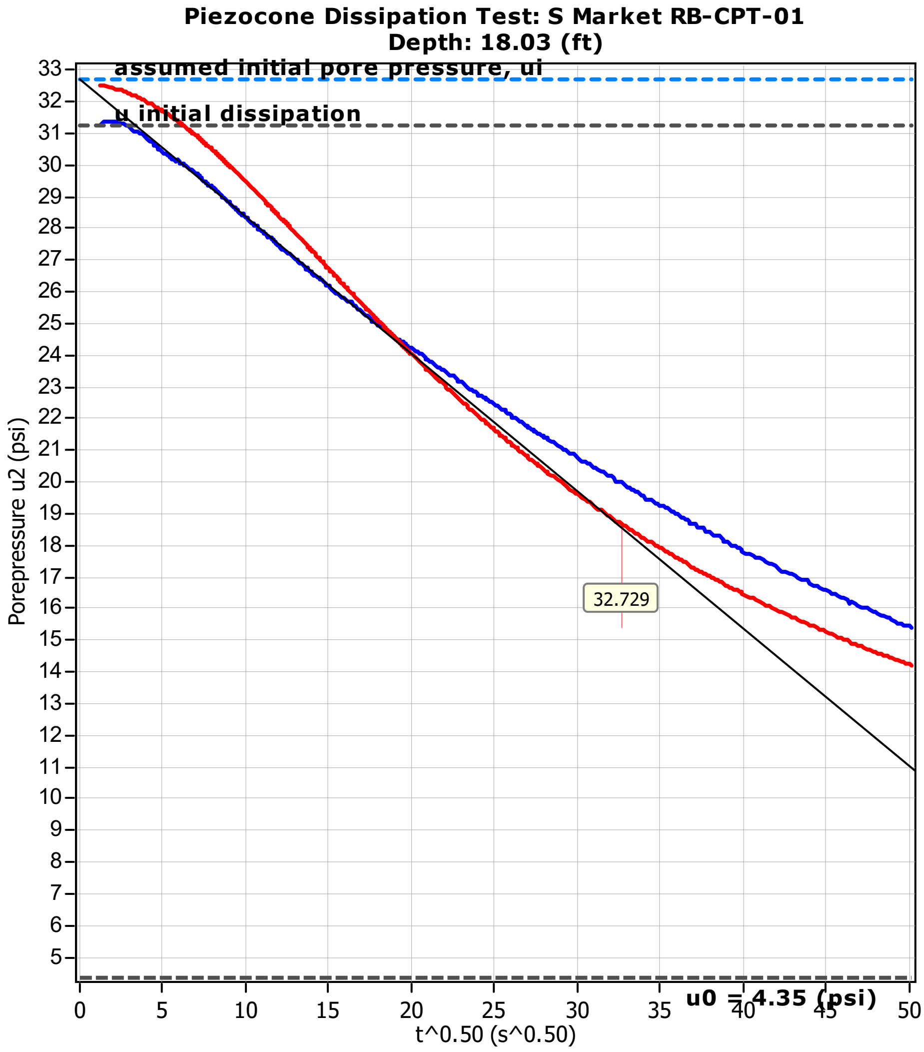
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

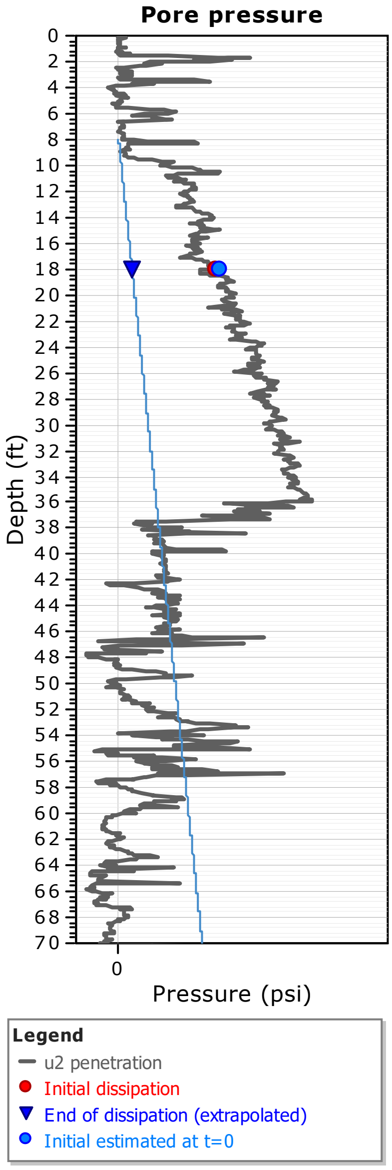
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	Depth (ft)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (ft^2/s)	c_h ($ft^2/year$)	M (tsf)	k_h (ft/s)
S Market RB-CPT-01	18.03	32.7	1071	3.40E-005	1058103.75	7.88E-005	2485	8.74	2.81E-007


Piezocone Dissipation Test: S Market RB-CPT-01
Depth: 18.03 (ft)
assumed initial pore pressure, ui
u initial dissipation
32.729
u0 = 4.35 (psi)
Porepressure u2 (psi)
t^0.50 (s^0.50)
33
32
31
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
0
5
10
15
20
25
30
35
40
45
50


Pore pressure
Depth (ft)
Pressure (psi)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
0
Legend
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{\ 0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

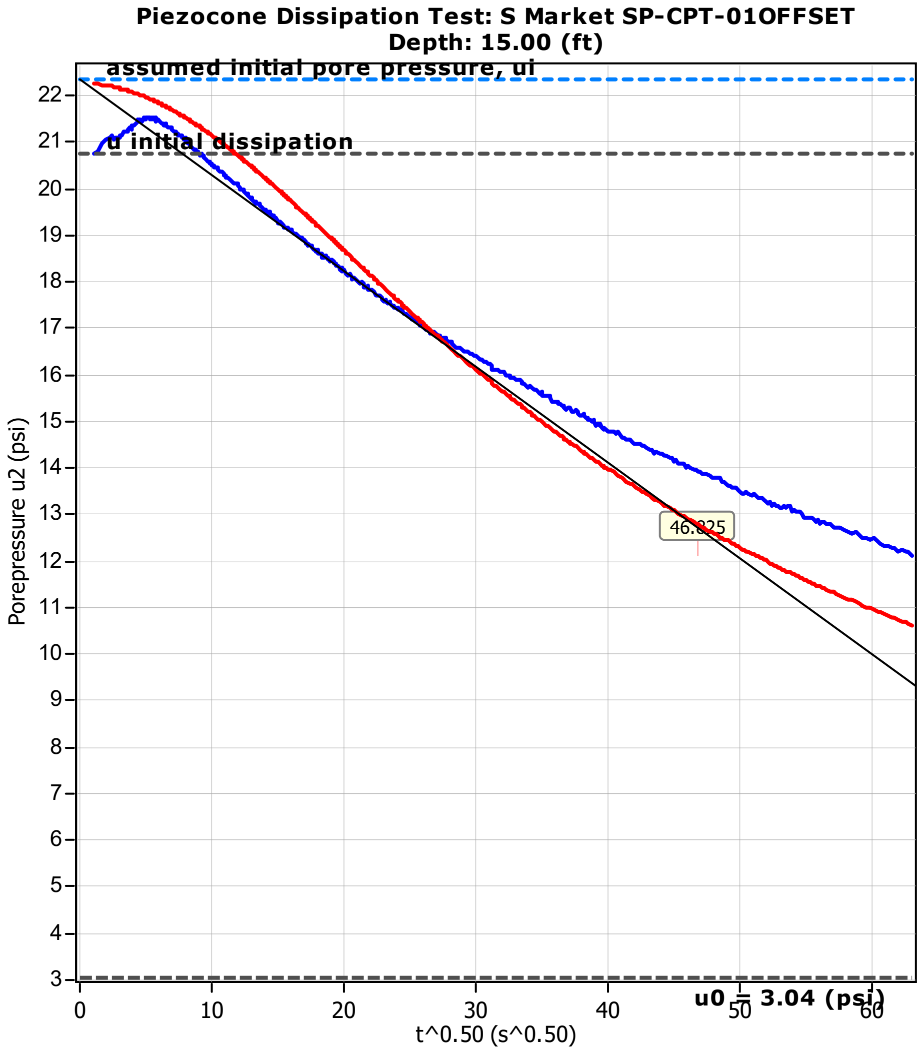
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

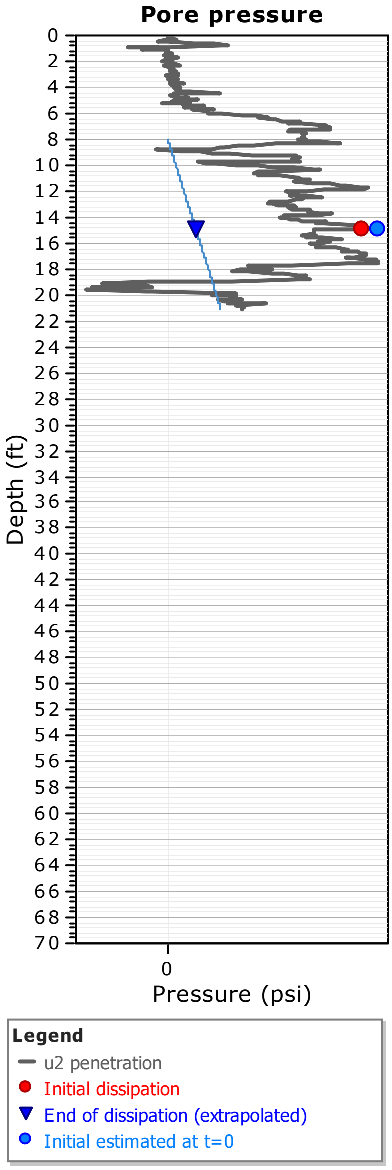
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

Tabular results

CPTU Borehole	**Depth (ft)**	**$(t_{50})^{0.50}$**	**t_{50} (s)**	**t_{50} (years)**	**G/S_u**	**c_h (ft^2/s)**	**c_h ($ft^2/year$)**	**M (tsf)**	**k_h (ft/s)**
S Market SP-CPT-01OFF	15.00	46.8	2193	6.95E-005	1706904.50	4.89E-005	1542	2.75	5.55E-007


Piezocone Dissipation Test: S Market SP-CPT-01OFFSET
Depth: 15.00 (ft)
assumed initial pore pressure, ui
u initial dissipation
46.825
u0 = 3.04 (psi)
Porepressure u2 (psi)
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
0
10
20
30
40
50
60
t^0.50 (s^0.50)


Pore pressure
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
Depth (ft)
0
Pressure (psi)
Legend
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

Dissipation Tests Results

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50}, which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position
r: piezocone radius
I_r: stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).
t_{50}: time corresponding to 50% consolidation

Permeability estimates based on dissipation test

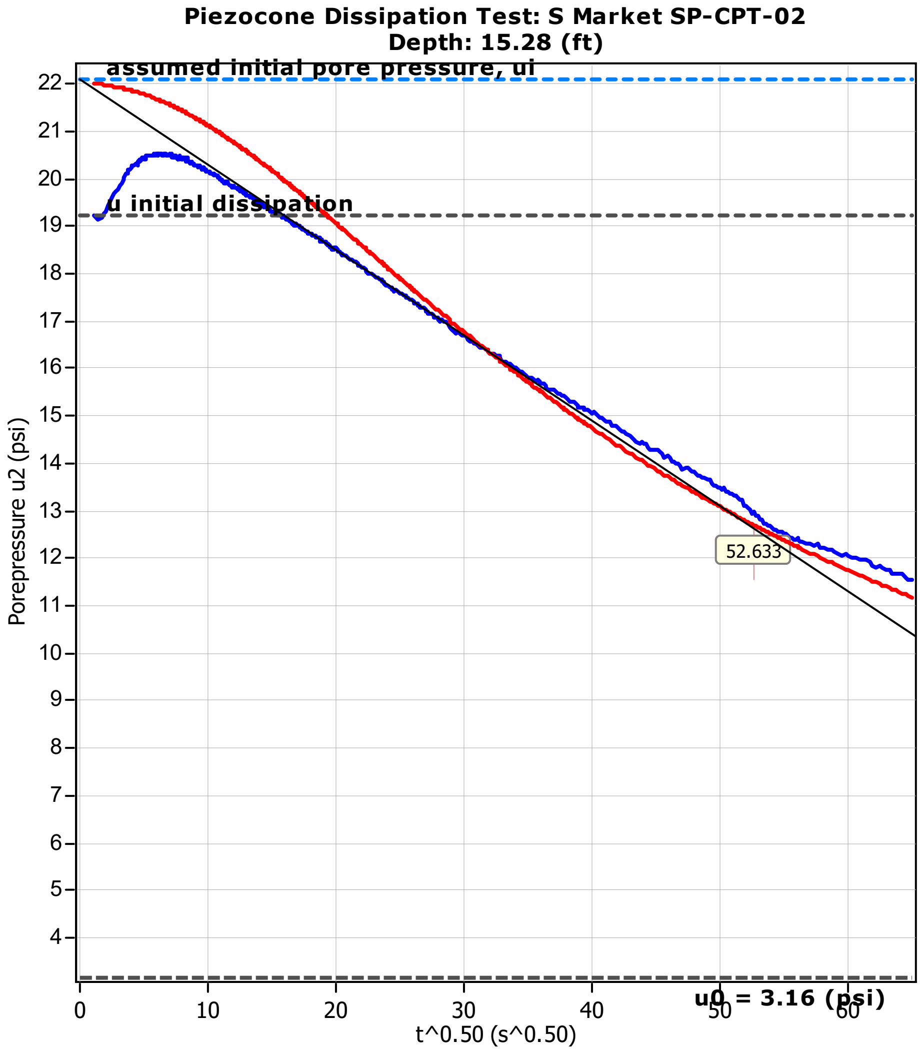
The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

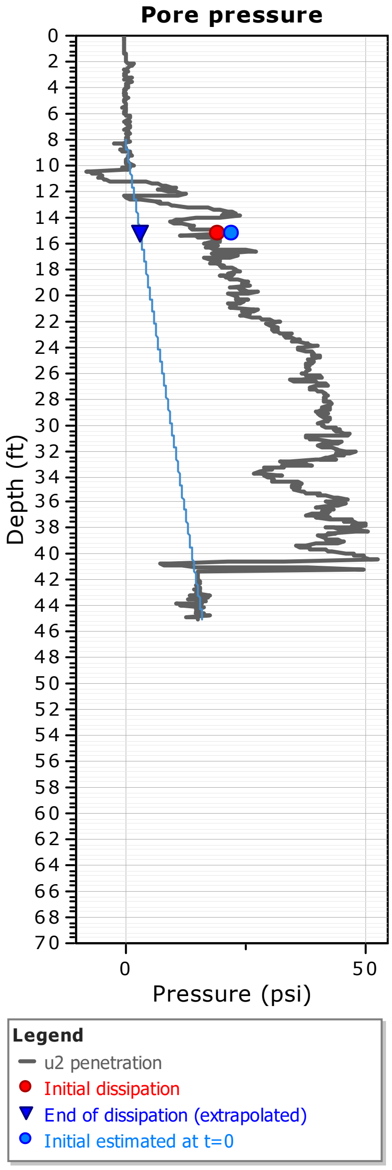
$$k_h = c_h \times \gamma_w / M$$

where: M is the 1-D constrained modulus and γ_w is the unit weight of water, in compatible units.

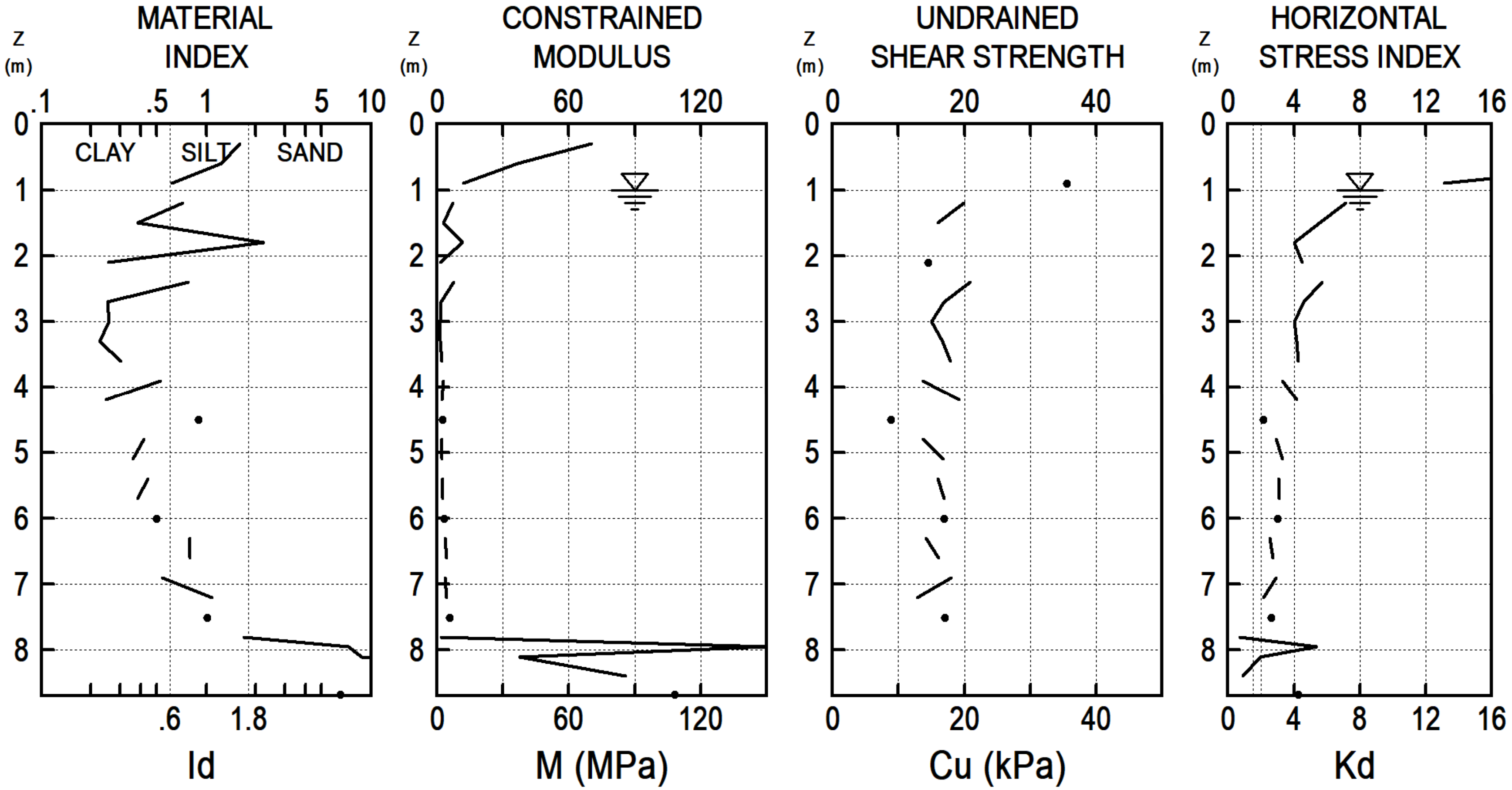
Tabular results

CPTU Borehole	Depth (ft)	$(t_{50})^{0.50}$	t_{50} (s)	t_{50} (years)	G/S_u	c_h (ft^2/s)	c_h ($ft^2/year$)	M (tsf)	k_h (ft/s)
S Market SP-CPT-02	15.28	52.6	2770	8.78E-005	1332829.38	3.42E-005	1078	7.07	1.51E-007


Piezocone Dissipation Test: S Market SP-CPT-02
Depth: 15.28 (ft)
assumed initial pore pressure, ui
u initial dissipation
52.633
u0 = 3.16 (psi)
Porepressure u2 (psi)
t^0.50 (s^0.50)
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
0
10
20
30
40
50
60


Pore pressure
Depth (ft)
Pressure (psi)
0
50
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
62
64
66
68
70
Legend
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

DMT Reports



HILLIS CARNES ENGINEERING ASSOCI RK&K

S. Market St. Wilmington DE

INTERPRETED GEOTECHNICAL PARAMETERS

TEST

RW-DMT-01

7 MAY 2021

HILLIS CARNES ENGINEERING ASSOCI RK&K

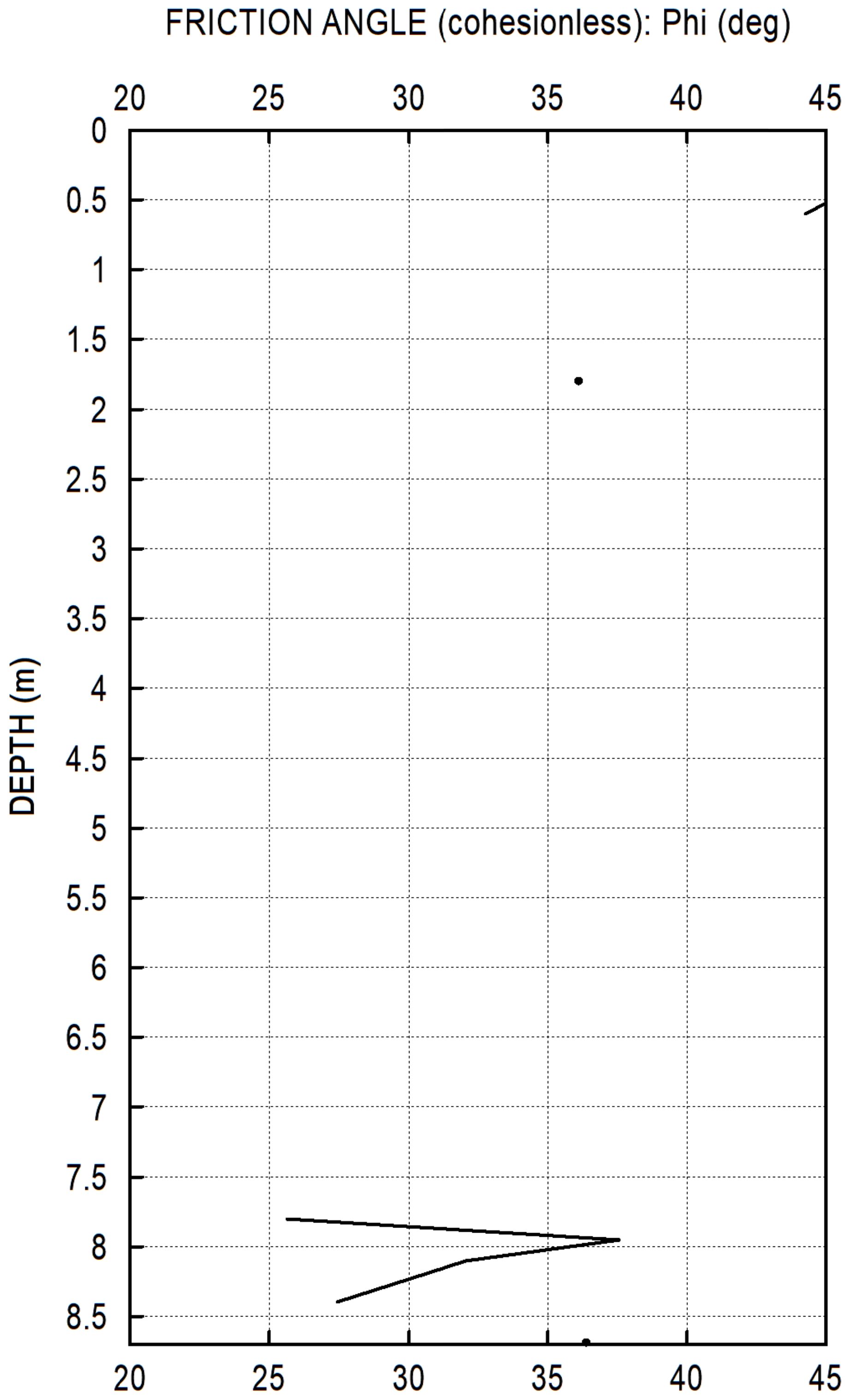
S. Market St. Wilmington DE

INTERPRETED GEOTECHNICAL PARAMETERS

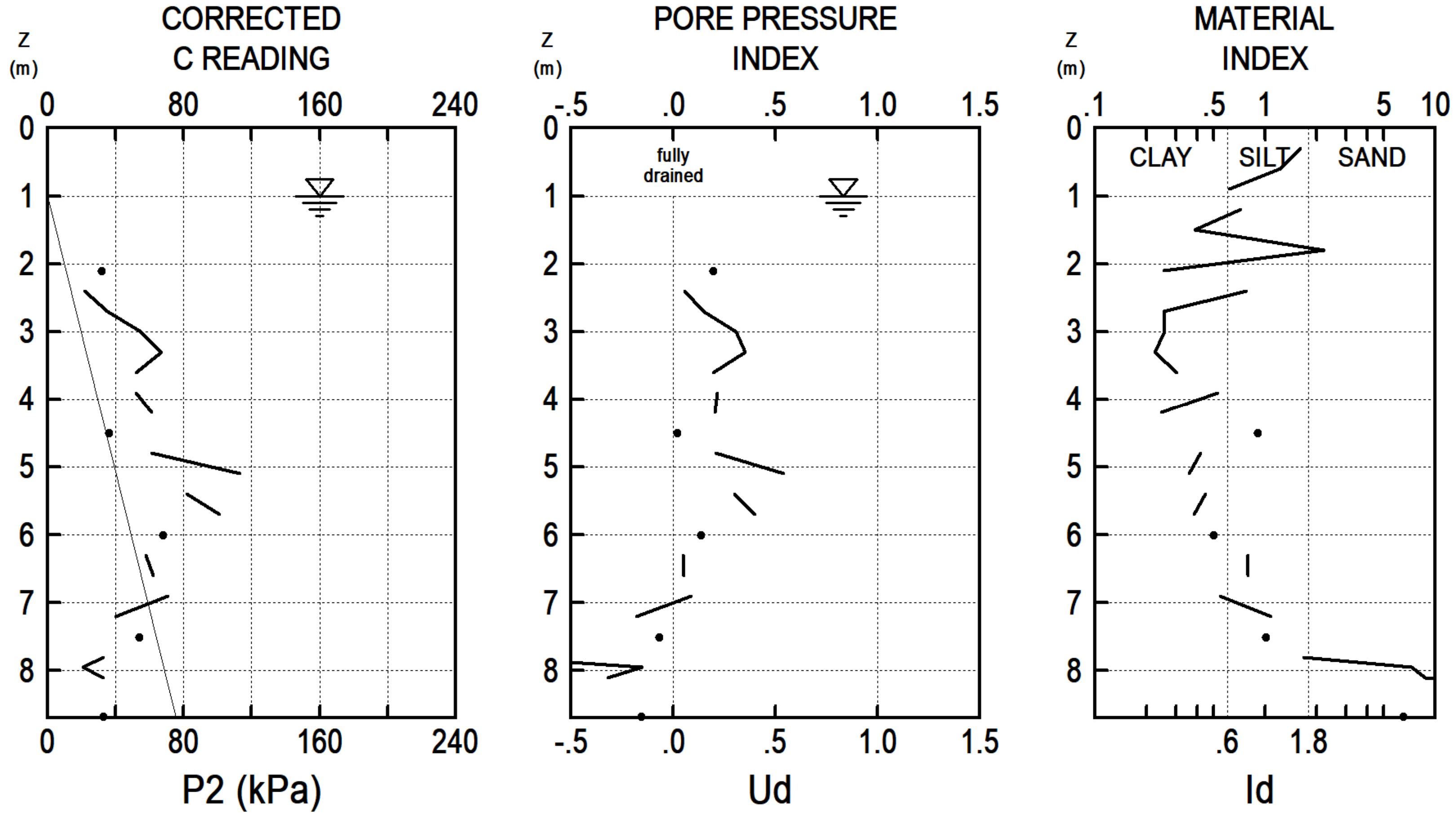
TEST

RW-DMT-01

7 MAY 2021



DILATOMETER TEST (D M T)



HILLIS CARNES ENGINEERING ASSOCI RK&K

S. Market St. Wilmington DE

INTERPRETED GEOTECHNICAL PARAMETERS

TEST

RW-DMT-01

7 MAY 2021

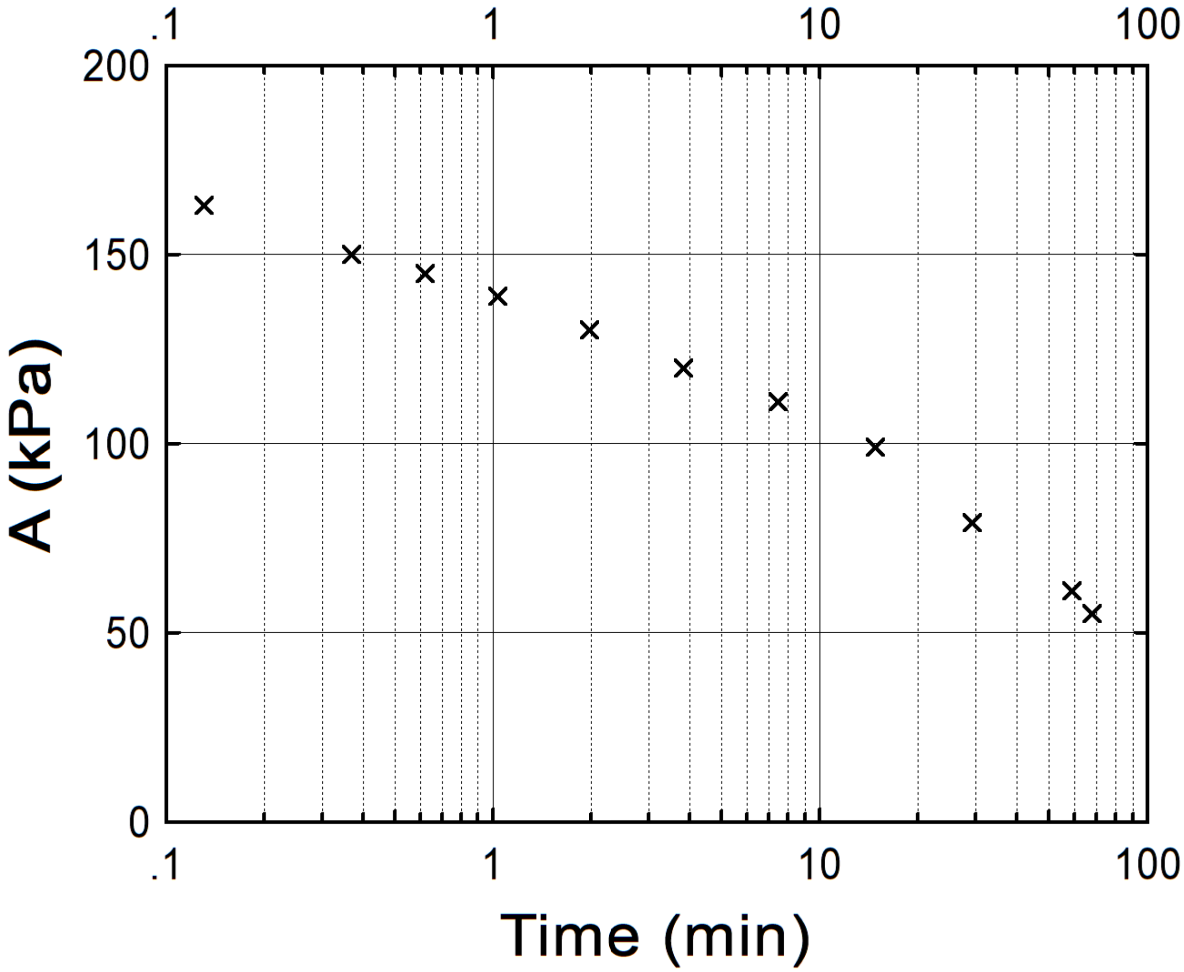
HILLIS CARNES ENGINEERING ASSOCI RK&K
S. Market St. Wilmington DE

DISSIPATION TEST 'DMT A'

7 MAY 2021
RW-DMT-01
Zd = 4.80 m

DISSIPATION TEST DEPTH = 4.80 m

Uo,equil = 0 kPa



S-shape insufficiently defined to identify Tflex

RW-DMT-01

7 MAY 2021

HILLIS CARNES ENGINEERING ASSOCI
RK&K
S. Market St.
Wilmington DE

LEGEND
Z = Depth Below Ground Level
Po,P1,P2 = Corrected A,B,C readings
Id = Material Index
Ed = Dilatometer Modulus
Ud = Pore Press. Index = (P2-Uo)/(Po-Uo)
Gamma = Bulk unit weight
Sigma' = Effective overb. stress
Uo = Pore pressure

INTERPRETED PARAMETERS
Phi = Safe floor value of Friction Angle
Ko = In situ earth press. coeff.
M = Constrained modulus (at Sigma')
Cu = Undrained shear strength
Ocr = Overconsolidation ratio
(OCR = 'relative OCR'- generally realistic. If accurate independent OCR available, apply suitable factor)

GENERAL PARAMETERS
DeltaA = 5 kPa
DeltaB = 62 kPa
GammaTop = 17.0 kN/m^3
FactorEd = 34.7
ZMCal = 0.0 kPa
ZMAB = 0.0 kPa
ZMC = 0.0 kPa
Zabs = 0.0 m
Zw = 1.0 m

WaterTable at 1.00 m
Reduction formulae according to Marchetti, ASCE Geot.Jnl.Mar. 1980, Vol.109, 299-321; Phi according to TC16 ISSMGE, 2001

Z (m)	A (kPa)	B (kPa)	C (kPa)	Po (kPa)	P1 (kPa)	P2 (kPa)	Gamma (kN/m^3)	Sigma' (kPa)	Uo (kPa)	Id	Kd	Ed (MPa)	Ud	Ko	Ocr	Phi (Deg)	M (MPa)	Cu (kPa)	RW-DMT-01 DESCRIPTION
0.3	320	848		302	786		17.7	5	0	1.60	59.2	16.8				47	70.3		SANDY SILT
0.6	265	633		255	571		16.7	10	0	1.24	24.5	11.0				44	36.7		SANDY SILT
0.9	203	388		202	326		16.7	15	0	0.61	13.1	4.3		2.2	18.9		11.9	36	CLAYEY SILT
1.2	133	290		134	228		15.7	18	2	0.72	7.1	3.3		1.5	7.3		7.1	20	CLAYEY SILT
1.5	114	222		117	160		15.7	20	5	0.38	5.5	1.5		1.2	4.9		2.8	16	SILTY CLAY
1.8	101	355		97	293		16.7	22	8	2.21	4.0	6.8				36	11.4		SILTY SAND
2.1	115	208	27	119	146	32	14.7	24	11	0.25	4.5	0.9	0.20	1.1	3.5		1.6	15	MUD
2.4	160	335	17	160	273	22	15.7	26	14	0.78	5.7	3.9	0.06	1.3	5.2		7.6	21	CLAYEY SILT
2.7	138	235	30	142	173	35	14.7	27	17	0.25	4.6	1.1	0.15	1.1	3.6		1.9	17	MUD
3.0	131	226	50	135	164	55	14.7	29	20	0.26	4.0	1.0	0.31	0.98	3.0		1.6	15	MUD
3.3	145	239	62	149	177	67	14.7	30	23	0.22	4.2	1.0	0.35	1.0	3.2		1.6	17	MUD
3.6	157	263	47	160	201	52	15.7	32	26	0.30	4.2	1.4	0.20	1.0	3.2		2.3	18	CLAY
3.9	136	258	47	138	196	52	15.7	33	28	0.53	3.3	2.0	0.21	0.84	2.2		2.7	14	SILTY CLAY
4.2	174	275	56	177	213	61	15.7	35	31	0.24	4.1	1.2	0.20	1.0	3.1		2.0	19	CLAY
4.5	112	247	31	114	185	36	15.7	37	34	0.90	2.1	2.5	0.02	0.58	1.1		2.4	9	SILT
4.8	148	260	56	151	198	61	15.7	39	37	0.42	2.9	1.6	0.21	0.77	1.8		2.0	14	SILTY CLAY
5.1	172	285	108	175	223	113	15.7	41	40	0.36	3.3	1.7	0.54	0.85	2.2		2.3	17	SILTY CLAY
5.4	171	293	77	173	231	82	15.7	42	43	0.44	3.1	2.0	0.30	0.80	2.0		2.6	16	SILTY CLAY
5.7	181	298	96	184	236	101	15.7	44	46	0.38	3.1	1.8	0.40	0.81	2.0		2.4	17	SILTY CLAY
6.0	186	319	63	188	257	68	15.7	46	49	0.50	3.0	2.4	0.14	0.79	1.9		3.1	17	SILTY CLAY
6.3	173	332	53	173	270	58	15.7	48	52	0.80	2.6	3.4	0.05	0.68	1.5		3.7	14	CLAYEY SILT
6.6	190	359	57	190	297	62	15.7	49	55	0.79	2.7	3.7	0.05	0.73	1.6		4.4	16	CLAYEY SILT
6.9	206	350	66	207	288	71	15.7	51	58	0.54	2.9	2.8	0.09	0.77	1.8		3.5	18	SILTY CLAY
7.2	176	361	35	175	299	40	15.7	53	61	1.08	2.2	4.3	-0.18	0.59	1.1		4.2	13	SILT
7.5	210	416	49	208	354	54	15.7	55	64	1.01	2.6	5.1	-0.07	0.70	1.5		5.9	17	SILT
7.8	104	234	28	106	172	33	15.7	56	67	1.69	0.7	2.3	-0.86			26	2.0		SANDY SILT
7.95	478	2673	16	377	2611	21	19.6	57	68	7.24	5.4	77.5	-0.15			38	152.1		SAND
8.1	227	1251	28	184	1189	33	17.7	59	70	8.78	1.9	34.9	-0.32			32	37.6		SAND
8.4	209	3100		128	3038		17.7	61	73	52.14	0.9	101.0				27	85.8		SAND
8.7	426	2177	28	347	2115	33	18.6	63	76	6.52	4.3	61.4	-0.16			36	108.1		SAND

DISSIPATION TEST

Vertical: RW-DMT-01

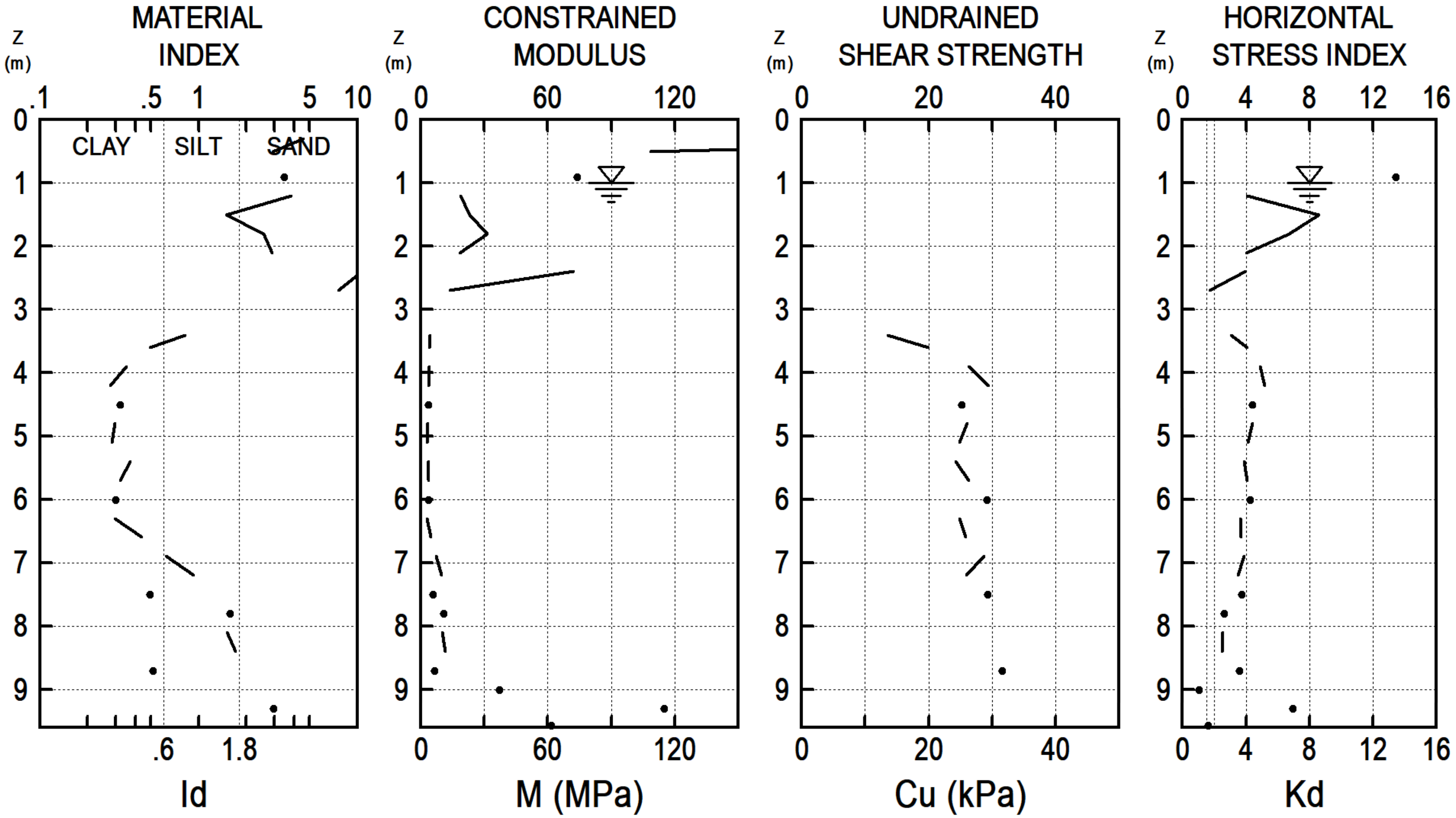
Test Depth Zd = 4.80 m

```
FIRM = HILLIS CARNES ENGINEERING ASSOCI
CUSTOMER = RK&K
JOB = S. Market St.
LOCATION = Wilmington DE
TEST = RW-DMT-01
START DATE = 7 May 2021
START TIME = 08:30:53
ZD = 4.80 m
DELTAA = 5 kPa
DELTAB = 62 kPa

T =  0.13 min, A =  163 kPa
T =  0.37 min, A =  150 kPa
T =  0.62 min, A =  145 kPa
T =  1.03 min, A =  139 kPa
T =  1.97 min, A =  130 kPa
T =  3.83 min, A =  120 kPa
T =  7.45 min, A =  111 kPa
T = 14.73 min, A =   99 kPa
T = 29.32 min, A =   79 kPa
T = 58.60 min, A =   61 kPa
T = 67.77 min, A =   55 kPa

S-shape insufficiently defined to identify Tflex
```

DILATOMETER TEST (D M T)



HILLIS CARNES ENGINEERING ASSOCI RK&K

S. Market St. Wilmington DE

INTERPRETED GEOTECHNICAL PARAMETERS

TEST

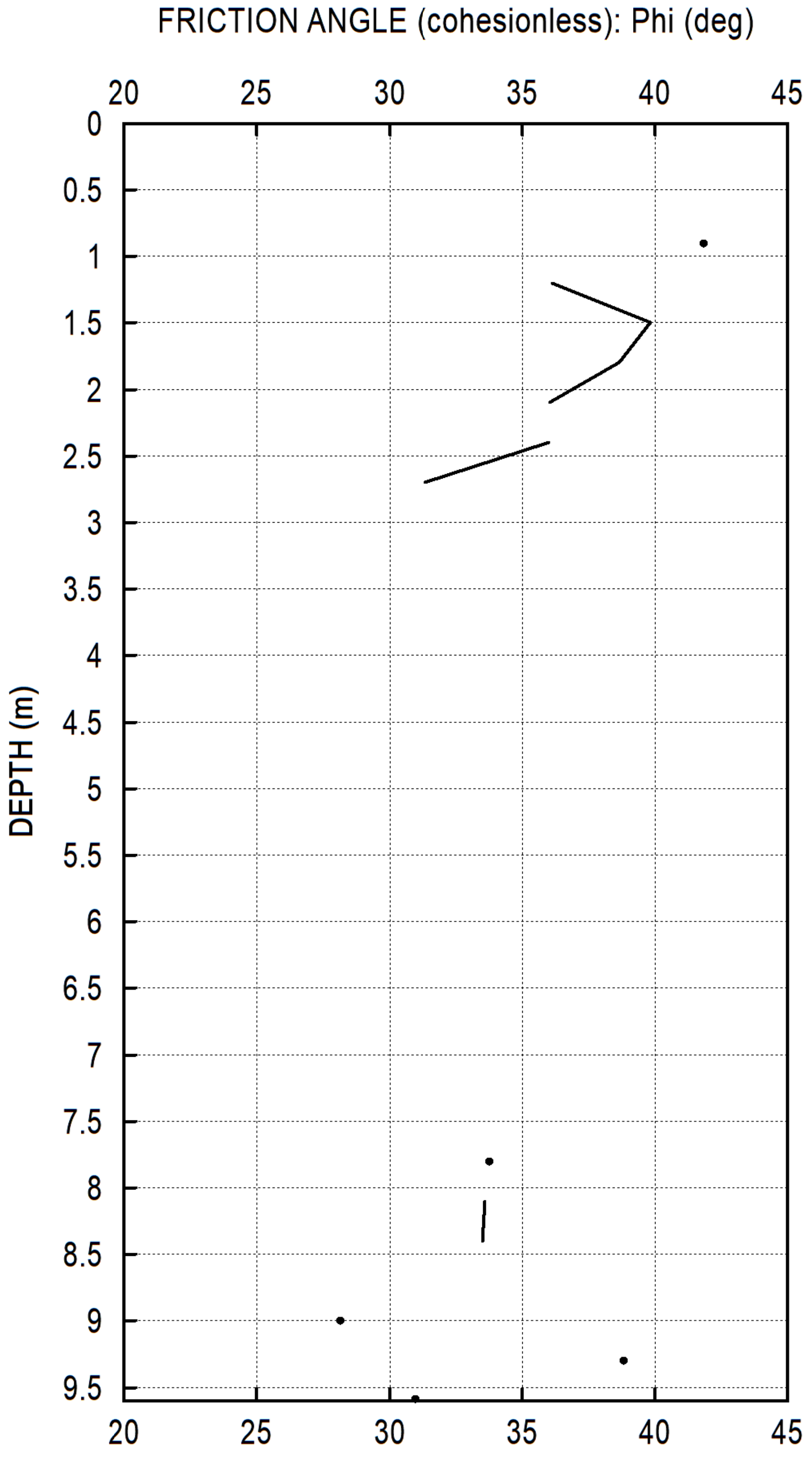
RW-DMT-02

6 JUL 2020

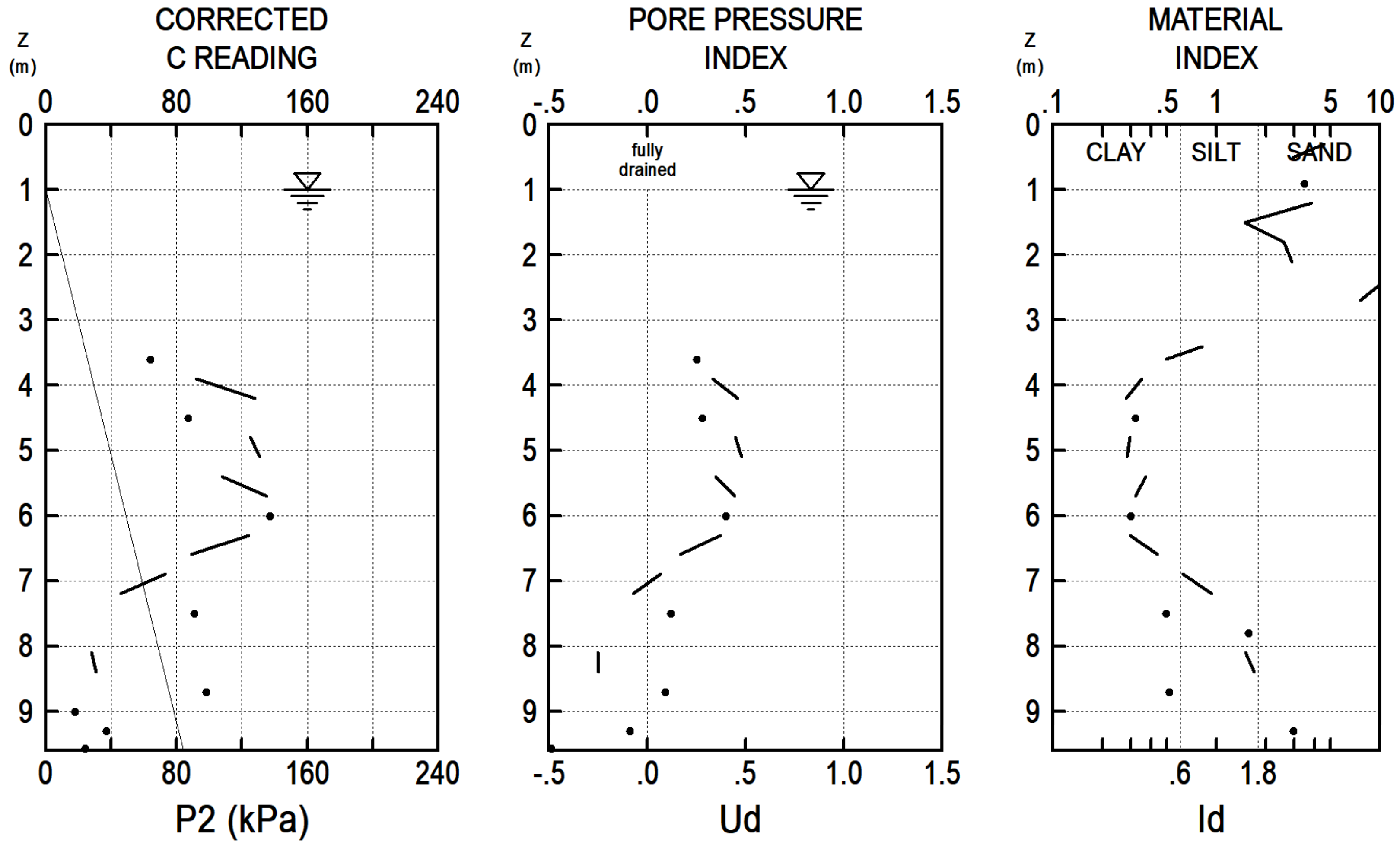
HILLIS CARNES ENGINEERING ASSOCI RK&K
S. Market St. Wilmington DE

TEST
RW-DMT-02
6 JUL 2020

INTERPRETED GEOTECHNICAL PARAMETERS



DILATOMETER TEST (D M T)



HILLIS CARNES ENGINEERING ASSOCI RK&K

S. Market St. Wilmington DE

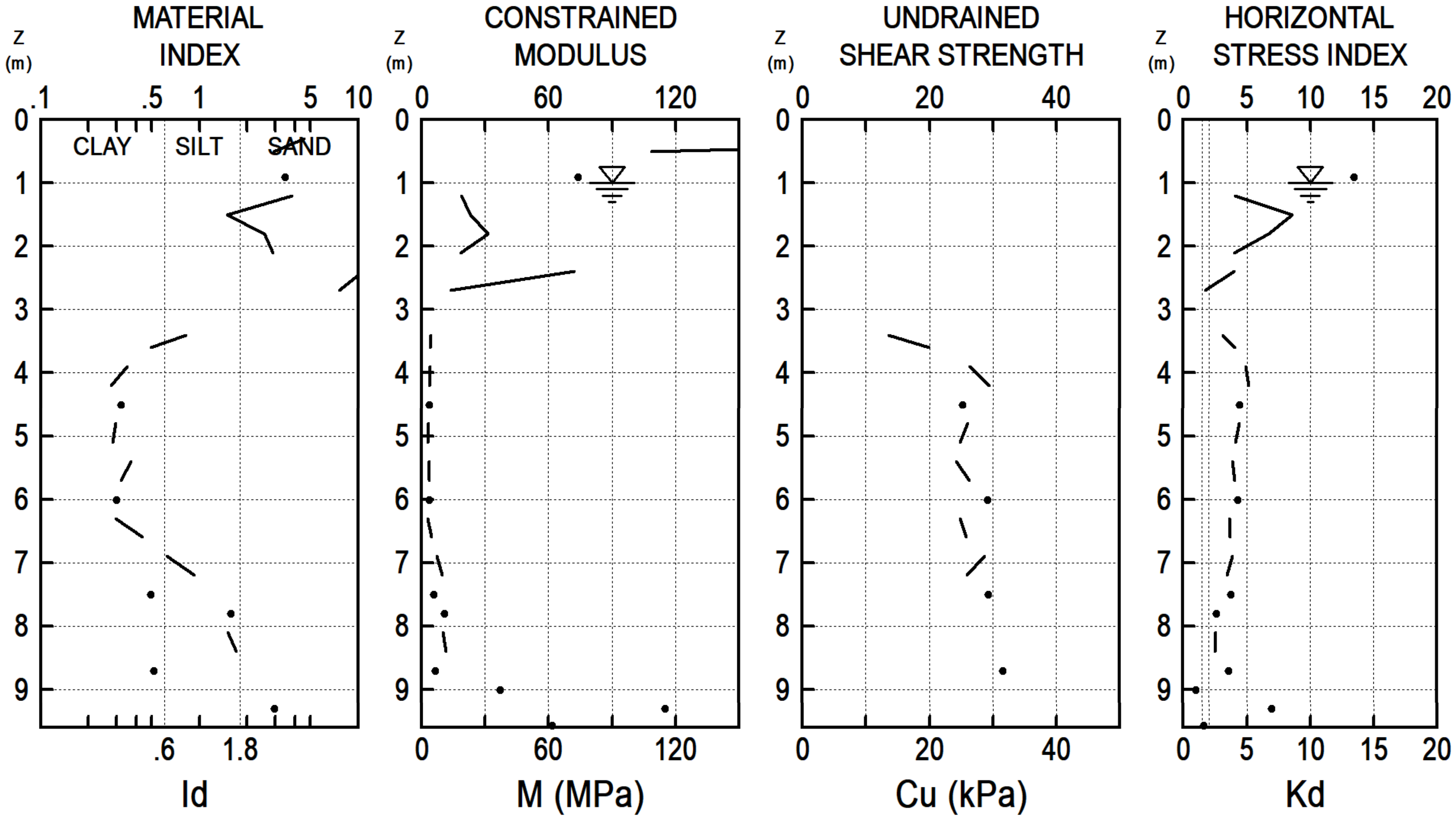
INTERPRETED GEOTECHNICAL PARAMETERS

TEST

RW-DMT-02

6 JUL 2020

DILATOMETER TEST (D M T)



HILLIS CARNES ENGINEERING ASSOCI RK&K

S. Market St. Wilmington DE

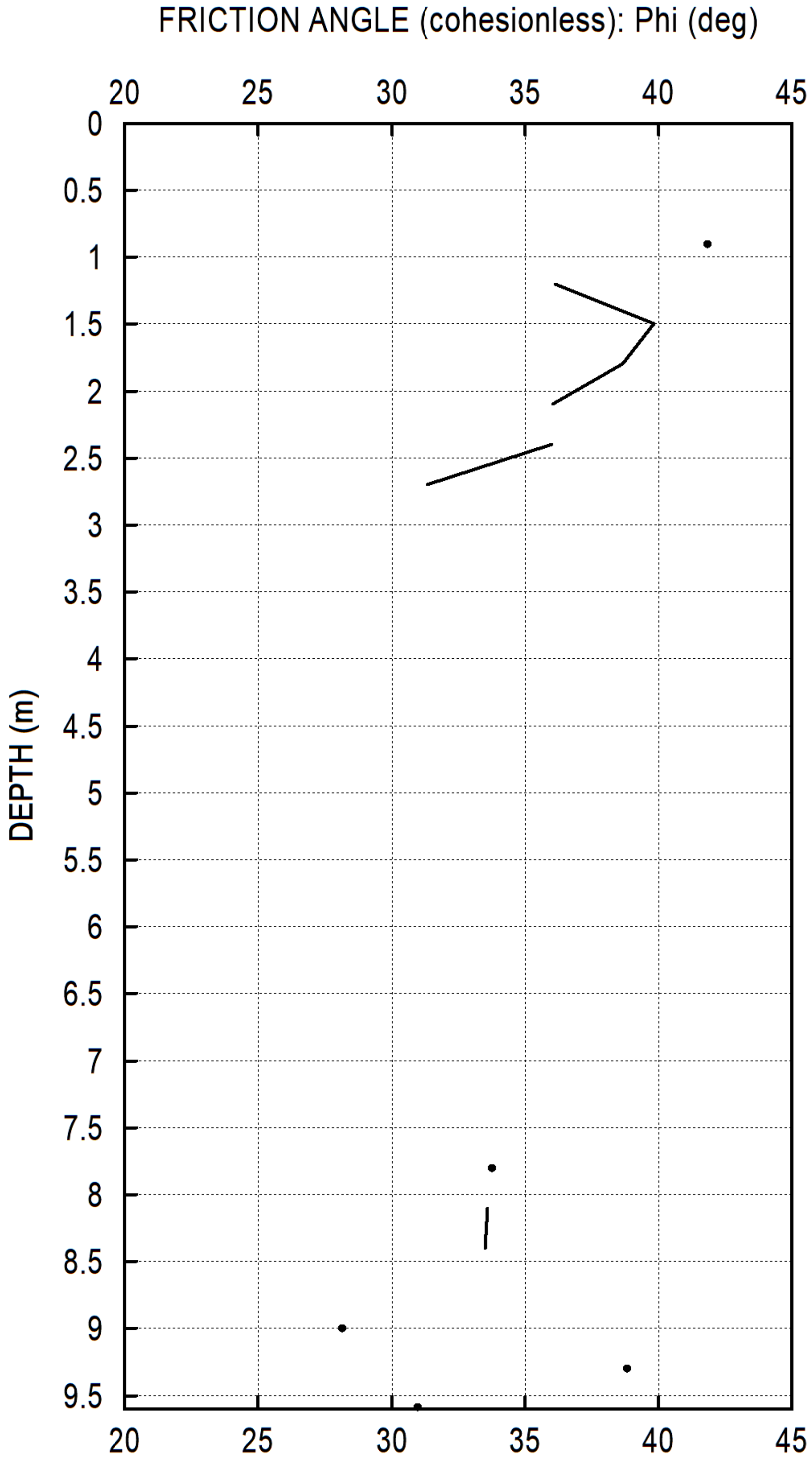
INTERPRETED GEOTECHNICAL PARAMETERS

TEST
RW-DMT-02

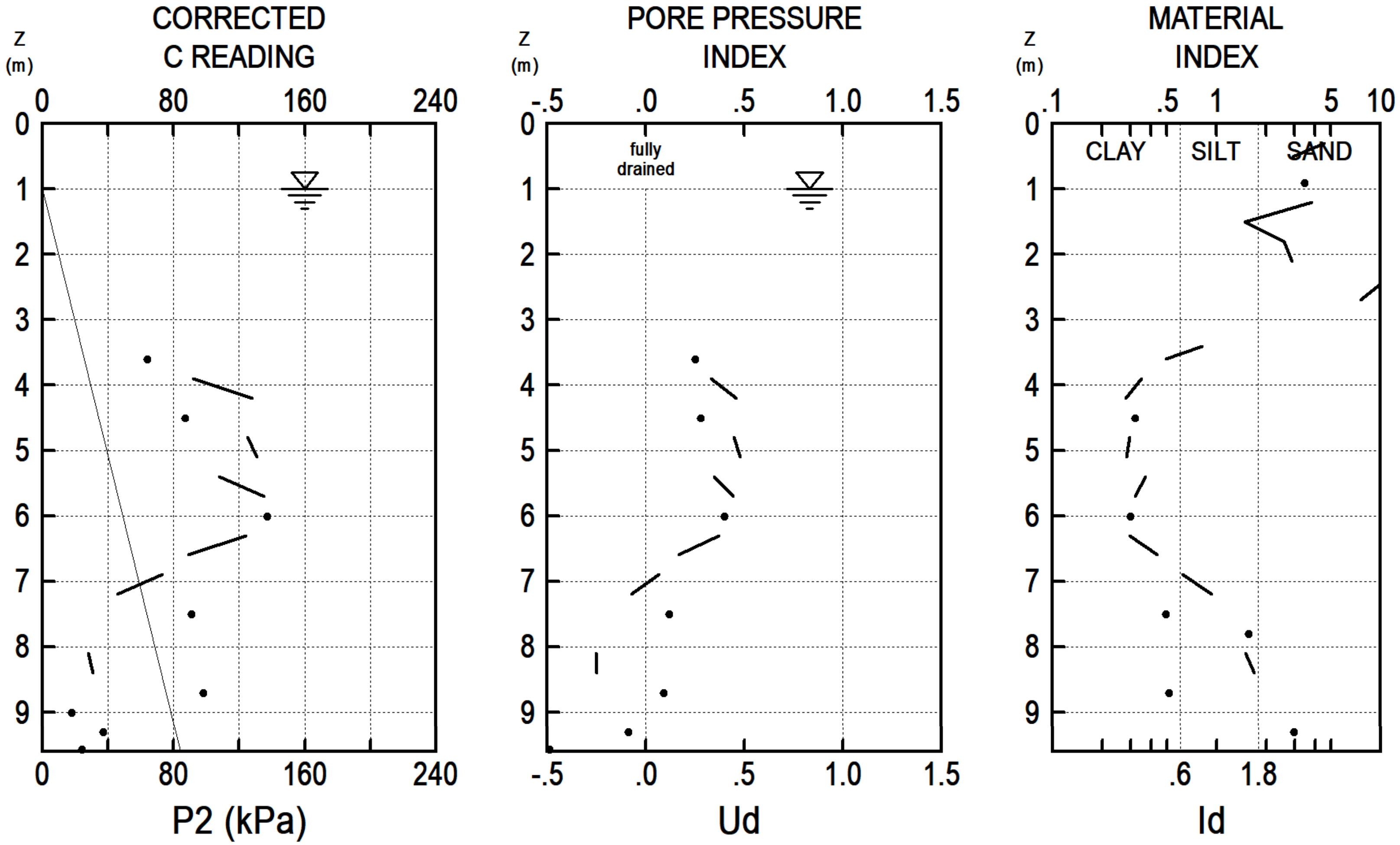
6 JUL 2020

DILATOMETER TEST (D M T)

HILLIS CARNES ENGINEERING ASSOCI	RK&K	TEST
S. Market St.	Wilmington DE	RW-DMT-02
INTERPRETED GEOTECHNICAL PARAMETERS		6 JUL 2020



DILATOMETER TEST (D M T)



HILLIS CARNES ENGINEERING ASSOCI RK&K

S. Market St. Wilmington DE

INTERPRETED GEOTECHNICAL PARAMETERS

TEST

RW-DMT-02

6 JUL 2020

RW-DMT-02

6 JUL 2020

HILLIS CARNES ENGINEERING ASSOCI
RK&K
S. Market St.
Wilmington DE

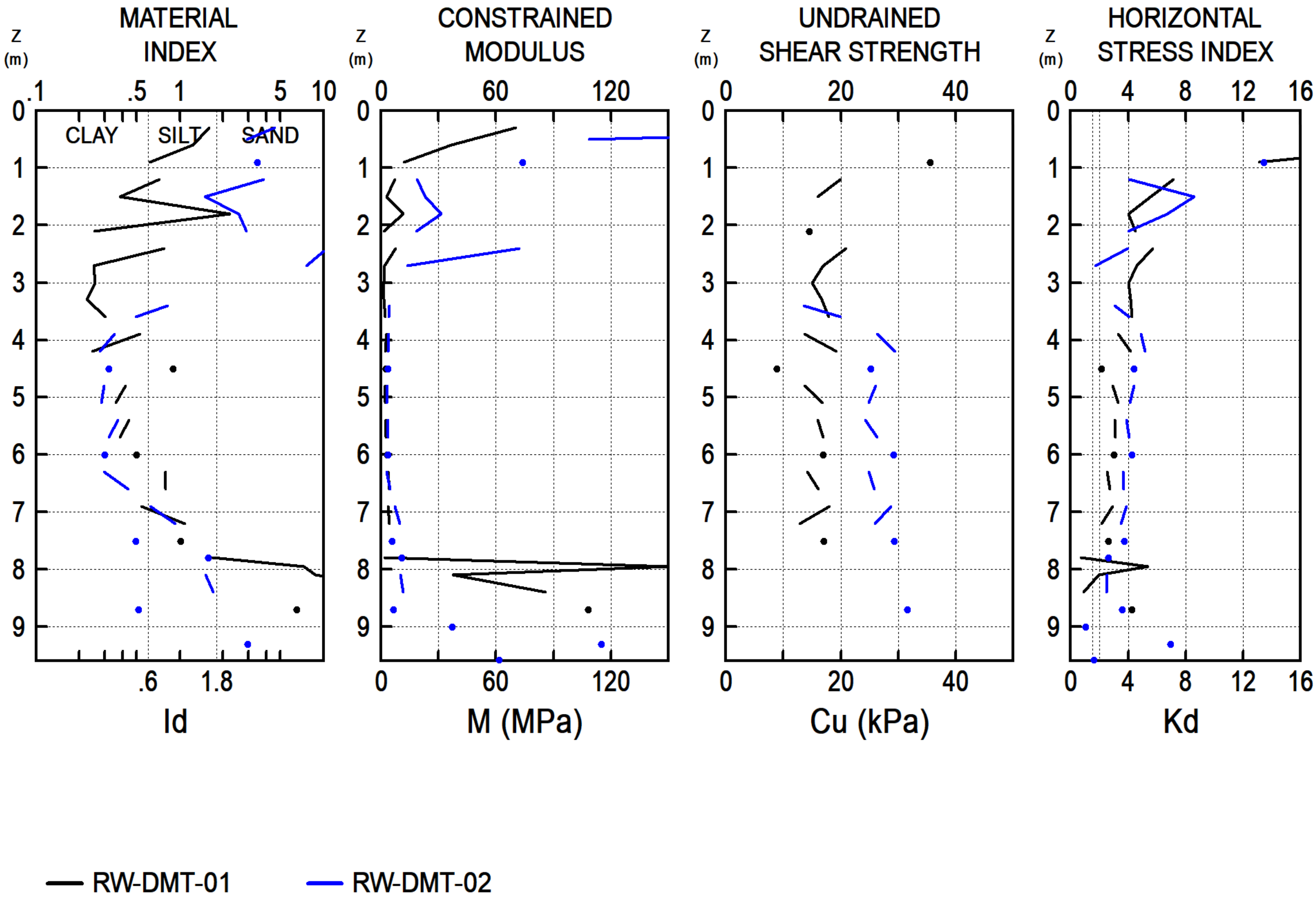
LEGEND
Z = Depth Below Ground Level
Po,P1,P2 = Corrected A,B,C readings
Id = Material Index
Ed = Dilatometer Modulus
Ud = Pore Press. Index = (P2-Uo)/(Po-Uo)
Gamma = Bulk unit weight
Sigma' = Effective overb. stress
Uo = Pore pressure

INTERPRETED PARAMETERS
Phi = Safe floor value of Friction Angle
Ko = In situ earth press. coeff.
M = Constrained modulus (at Sigma')
Cu = Undrained shear strength
Ocr = Overconsolidation ratio
(OCR = 'relative OCR'- generally realistic. If accurate independent OCR available, apply suitable factor)

GENERAL PARAMETERS
DeltaA = 10 kPa
DeltaB = 48 kPa
GammaTop = 17.0 kN/m^3
FactorEd = 34.7
ZMCal = 0.0 kPa
ZMAB = 0.0 kPa
ZMC = 0.0 kPa
Zabs = 0.0 m
Zw = 1.0 m

WaterTable at 1.00 m
Reduction formulae according to Marchetti, ASCE Geot.Jnl.Mar. 1980, Vol.109, 299-321; Phi according to TC16 ISSMGE, 2001

Z (m)	A (kPa)	B (kPa)	C (kPa)	Po (kPa)	P1 (kPa)	P2 (kPa)	Gamma (kN/m^3)	Sigma' (kPa)	Uo (kPa)	Id	Kd	Ed (MPa)	Ud	Ko	Ocr	Phi (Deg)	M (MPa)	Cu (kPa)	RW-DMT-02 DESCRIPTION
0.3	573	2709		479	2661		19.6	5	0	4.55	93.9	75.7				49	349.9		SAND
0.5	326	1206		295	1158		18.6	9	0	2.93	32.7	29.9				45	108.5		SILTY SAND
0.9	248	1035		222	987		18.6	16	0	3.45	13.4	26.6				42	73.8		SAND
1.2	89	447		84	399		16.7	20	2	3.84	4.1	10.9				36	18.8		SAND
1.5	199	528		195	480		16.7	22	5	1.49	8.6	9.9				40	23.2		SANDY SILT
1.8	181	640		171	592		17.7	24	8	2.58	6.7	14.6				39	31.3		SILTY SAND
2.1	122	475		117	427		17.7	27	11	2.91	4.0	10.7				36	18.3		SILTY SAND
2.4	177	1400		129	1352		17.7	29	14	10.64	4.0	42.4				36	72.1		SAND
2.7	80	526		71	478		16.7	31	17	7.56	1.7	14.1				31	13.8		SAND
3.4	129	274		135	226		15.7	36	24	0.82	3.1	3.2		0.80	2.0		4.2	14	SILT
3.6	171	300	54	177	252	64	15.7	37	26	0.49	4.1	2.6	0.25	1.0	3.0		4.1	20	SILTY CLAY
3.9	213	335	82	220	287	92	15.7	39	28	0.35	4.9	2.3	0.33	1.1	4.1		4.1	26	SILTY CLAY
4.2	235	349	118	242	301	128	15.7	41	31	0.28	5.2	2.0	0.46	1.2	4.4		3.7	29	CLAY
4.5	215	330	77	222	282	87	15.7	43	34	0.32	4.4	2.1	0.28	1.1	3.4		3.5	25	CLAY
4.8	225	338	115	232	290	125	15.7	44	37	0.30	4.4	2.0	0.45	1.1	3.4		3.3	26	CLAY
5.1	222	331	121	229	283	131	15.7	46	40	0.28	4.1	1.9	0.48	1.0	3.1		2.9	25	CLAY
5.4	223	347	98	230	299	108	15.7	48	43	0.37	3.9	2.4	0.35	0.97	2.8		3.7	24	SILTY CLAY
5.7	240	359	125	247	311	135	15.7	50	46	0.32	4.0	2.2	0.44	0.99	3.0		3.5	26	CLAY
6.0	262	383	127	269	335	137	15.7	51	49	0.30	4.3	2.3	0.40	1.0	3.3		3.7	29	CLAY
6.3	239	352	114	246	304	124	15.7	53	52	0.30	3.7	2.0	0.37	0.92	2.6		2.9	25	CLAY
6.6	251	393	79	257	345	89	15.7	55	55	0.44	3.7	3.1	0.17	0.92	2.6		4.5	26	SILTY CLAY
6.9	275	464	63	278	416	73	16.7	57	58	0.62	3.9	4.8	0.07	0.96	2.8		7.3	29	CLAYEY SILT
7.2	265	505	36	266	457	46	16.7	59	61	0.93	3.5	6.6	-0.07	0.89	2.4		9.6	26	SILT
7.5	287	452	81	292	404	91	16.7	61	64	0.49	3.7	3.9	0.12	0.94	2.7		5.8	29	SILTY CLAY
7.8	234	539		232	491		16.7	63	67	1.57	2.6	9.0				34	10.9		SANDY SILT
8.1	237	533	18	235	485	28	16.7	65	70	1.51	2.5	8.7	-0.25			34	10.2		SANDY SILT
8.4	244	573	21	240	525	31	16.7	67	73	1.70	2.5	9.9	-0.25			33	11.7		SANDY SILT
8.7	320	500	88	324	452	98	16.7	69	76	0.52	3.6	4.4	0.09	0.91	2.5		6.5	32	SILTY CLAY
9.0	201	1461	8	151	1413	18	17.7	71	78	17.43	1.0	43.8	-0.84			28	37.2		SAND
9.3	655	2158	27	593	2110	37	19.6	73	81	2.97	7.0	52.6	-0.09			39	115.0		SILTY SAND
9.6	290	2198	14	208	2150	24	18.6	76	84	15.78	1.6	67.4	-0.49			31	61.6		SAND



HILLIS CARNES ENGINEERING ASSOCI RK&K

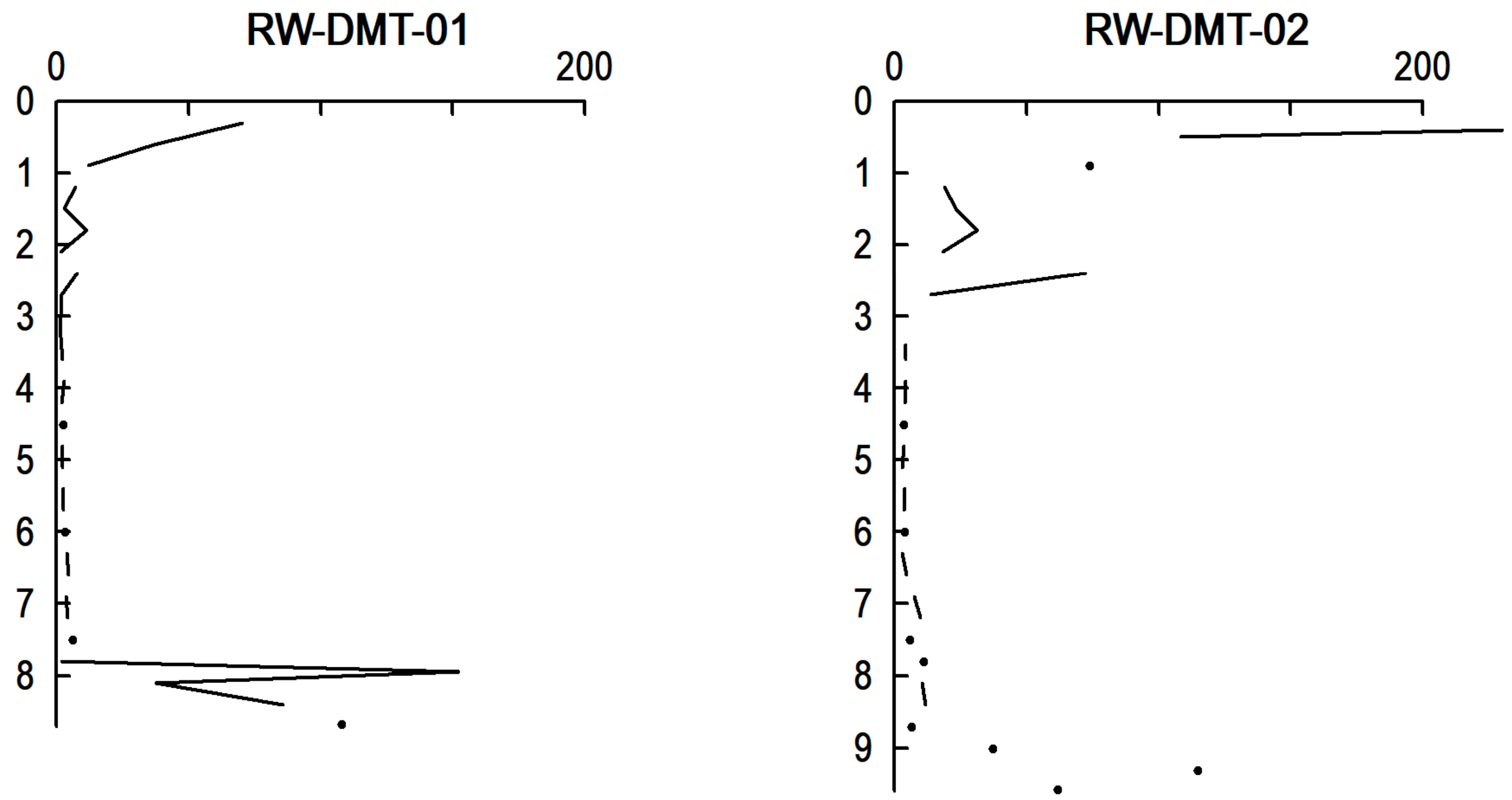
S. Market St.

Wilmington DE

SUPERIMPOSED TEST RESULTS

HILLIS CARNES ENGINEERING ASSOCI RK&K
S. Market St. Wilmington DE

CROSS SECTION OF CONSTRAINED MODULUS M (MPa)



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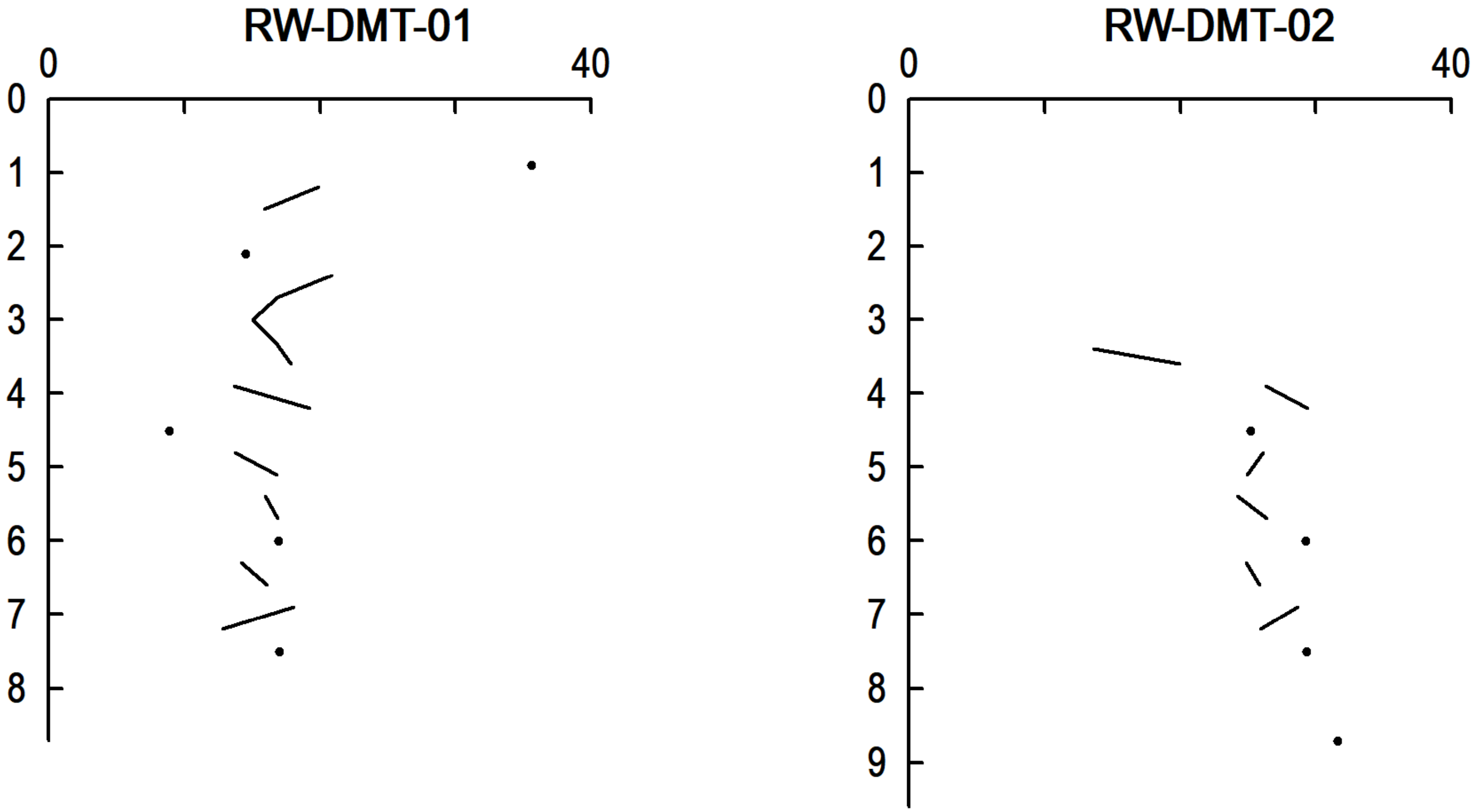
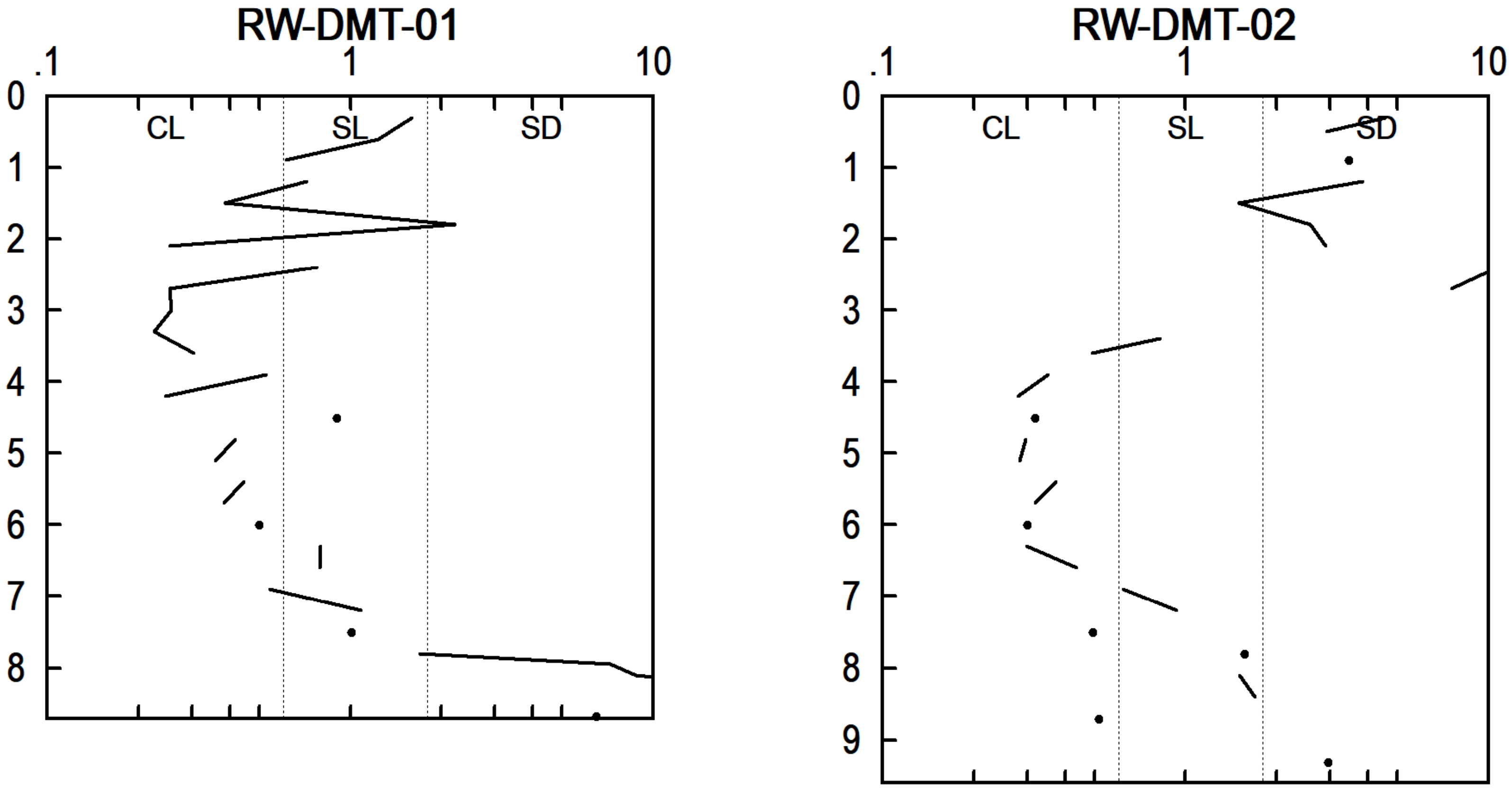
S. Market St. Wilmington DE

CROSS SECTION OF UNDRAINED SHEAR STRENGTH Cu (kPa)

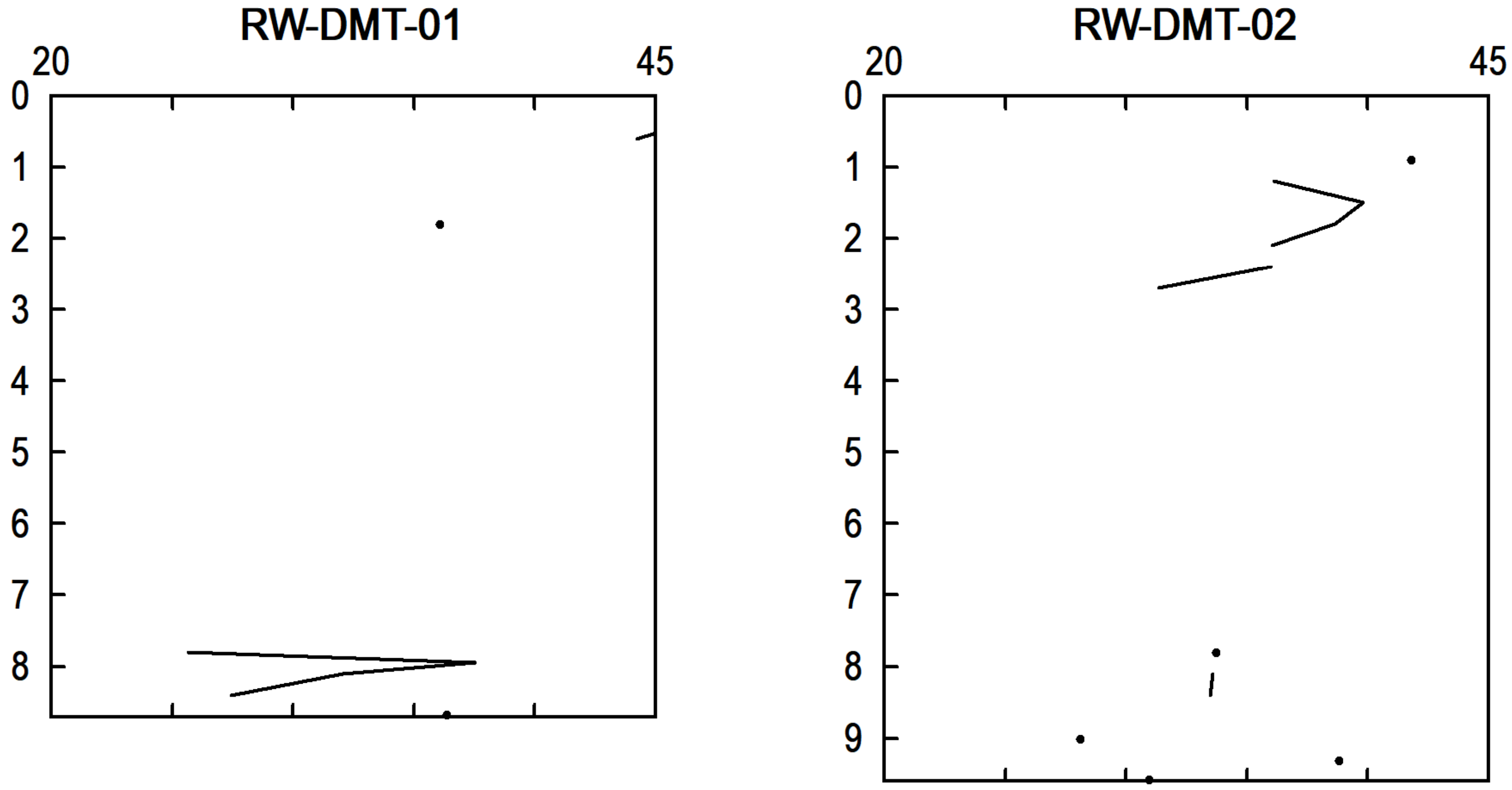


HILLIS CARNES ENGINEERING ASSOCI RK&K
S. Market St. Wilmington DE

CROSS SECTION OF MATERIAL INDEX Id



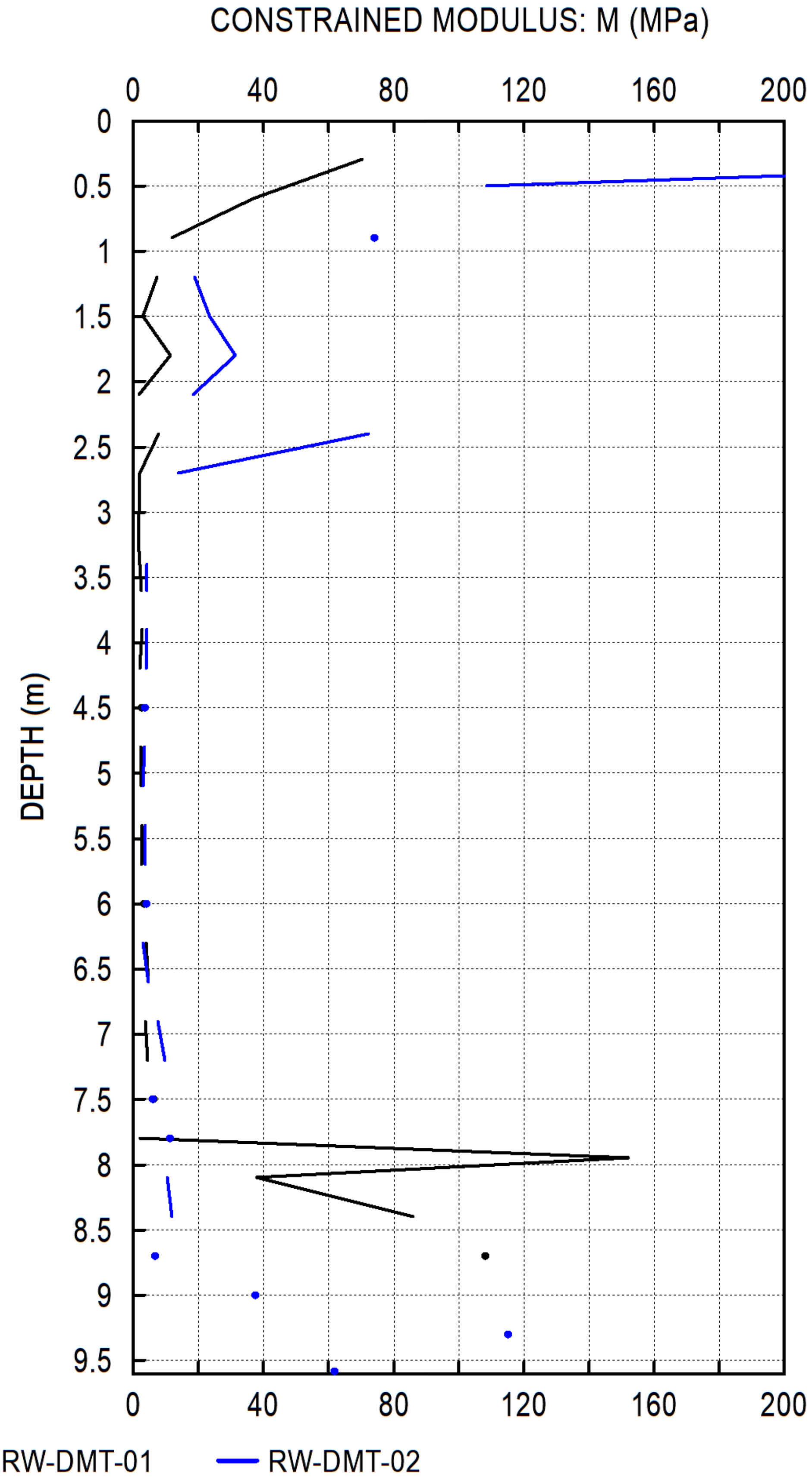
CROSS SECTION OF FRICTION ANGLE (cohesionless) Phi (deg)



HILLIS CARNES ENGINEERING ASSOCI RK&K

S. Market St. Wilmington DE

SUPERIMPOSED TEST RESULTS



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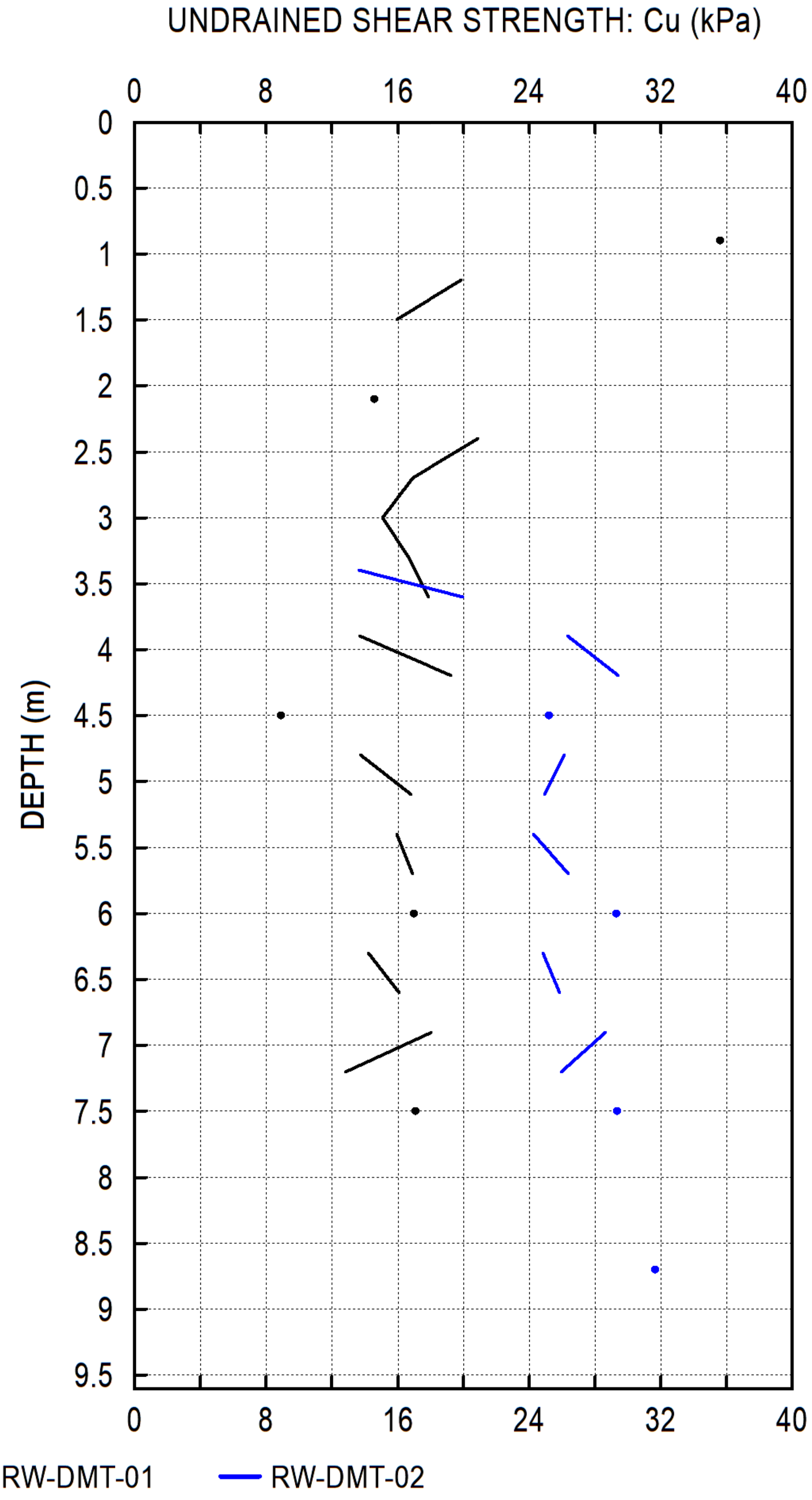
S. Market St. Wilmington DE

SUPERIMPOSED TEST RESULTS



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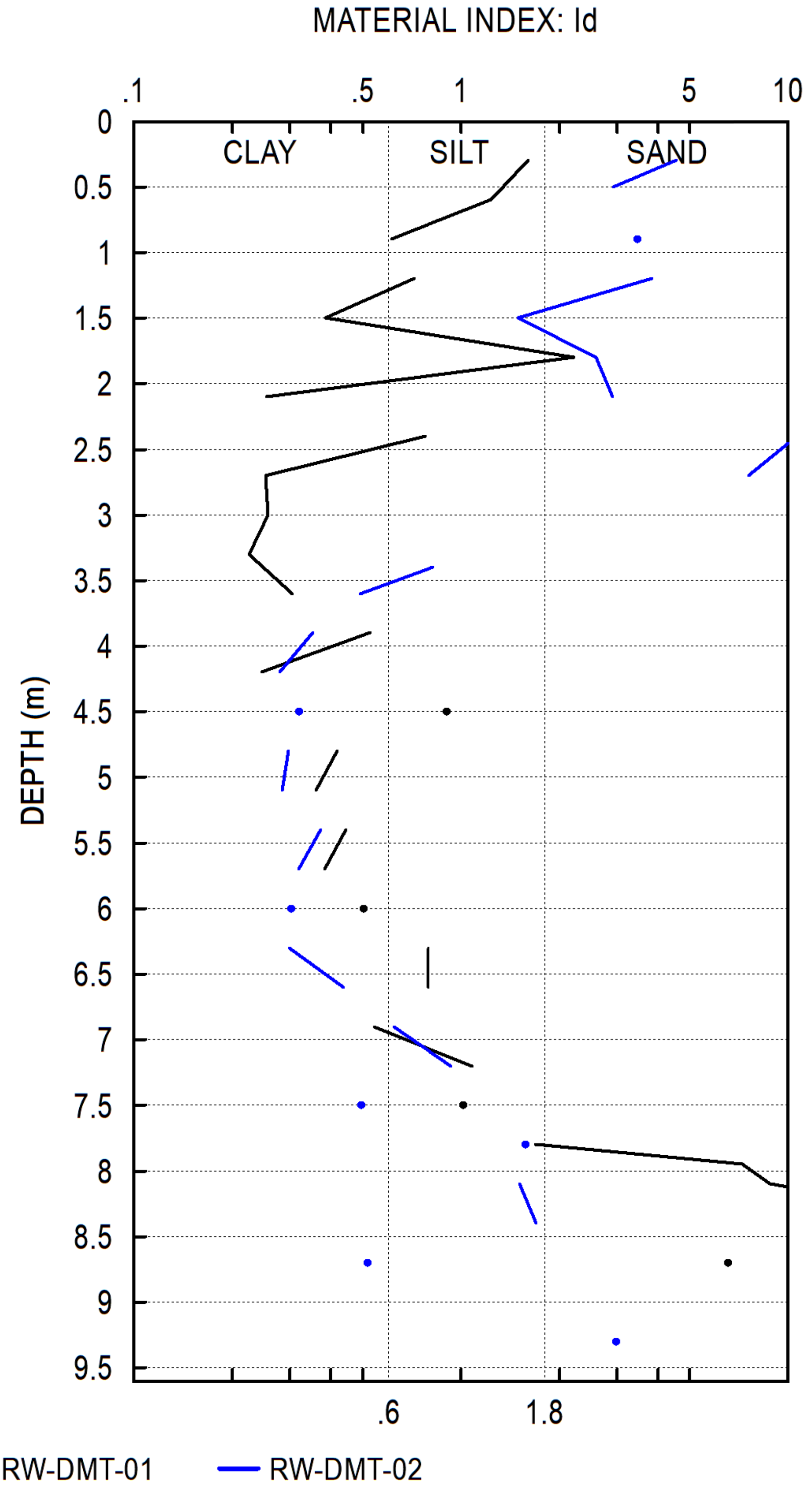
S. Market St. Wilmington DE

SUPERIMPOSED TEST RESULTS



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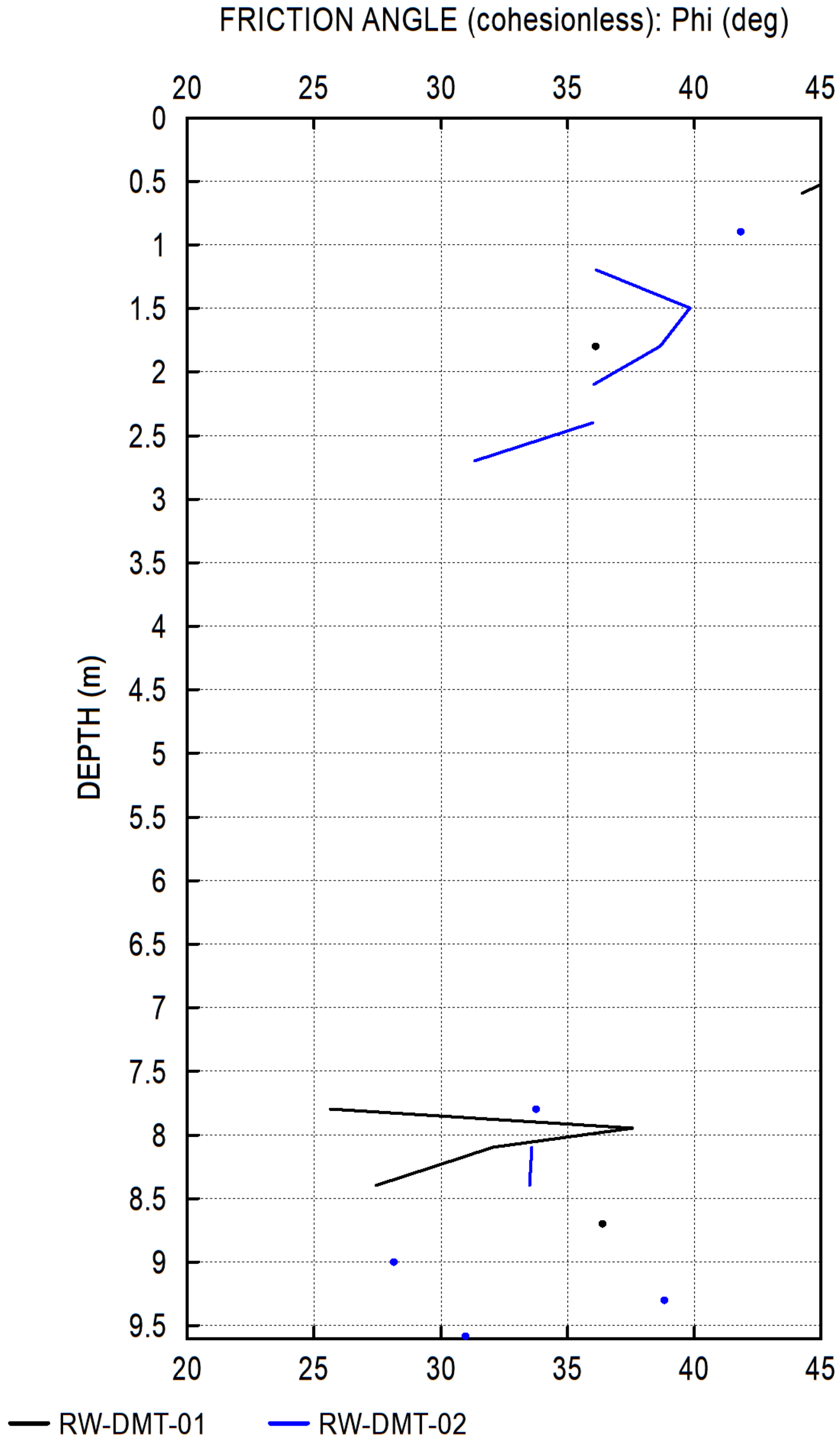
S. Market St. Wilmington DE

SUPERIMPOSED TEST RESULTS



Appendix C

Table C-1: Summary of Laboratory Classification Testing

Boring No. / Sample	Depth (ft)	Description	NMC (%)	LL	PL	% Fines	USCS	AASHTO
BH-B-01A / T-1	15.0-17.0	Elastic SILT with Sand	54.1	91	41	75.6	MH	A-7-5 (43)
BH-B-01A / S-10	28.5-30.0	SILT with Sand	52	48	29	72.4	ML	A-7-6(14)
BH-B-01A / S-12	38.5-40.0	Silty SAND	19	NP	NP	14	SM	A-1-b
BH-B-02 / S-3	5.0-6.5	Lean CLAY with Sand	22.9	30	17	73.8	CL	A-6(7)
BH-B-02 / S-7	15.0-16.5	Black CLAY	62.9	87	39	91.8	MH	A-7-6(54)
BH-B-02 / S-13	53.5-55.0	Silty SAND	29.2	50	31	23.2	SM	A-2-7(1)
BH-B-03A / T-1	15.0-17.0	Elastic SILT with Sand	58.1	65	34	84	MH	A-7-5 (30)
BH-B-03A / S-4	28.5-30.0	Sandy SILT	54.9	47	34	63.9	ML	A-7-5(8)
BH-B-03A / S-5	33.5-35.0	Lean CLAY	25.8	37	22	95.6	CL	A-6(15)
BH-B-04 / S-3	5.0-6.5	Silty SAND with Gravel	53.7	NP	NP	34	SM	A-2-4(0)
BH-B-04 / T-1	21.5-23.5	Elastic SILT with Sand	60.9	83	41	84	MH	A-7-5 (42)
BH-B-04 / S-10	28.5-30.0	Silty SAND	40.1	NP	NP	41.2	SM	A-4(0)
BW-B-01/ S-5	10.0-11.5	CLAY	66.1	46	29	96.2	ML	A-7-6(20)
BW-B-01/ S-10	23.5-25.0	Silty SAND	49.9	35	NP	60.3	ML	A-4(0)
EMB-B-01 / T-1	13.0-15.0	Fat CLAY	43.7	80	33	97.5	CH	A-7-5(56)
EMB-B-01 / S-3	5.0-6.5	Fat CLAY	49.0	79	33	32.1	CH	A-7-5(47)
EMB-B-01 / S-11	38.5-40.0	Poorly Graded SAND with Silt and Gravel	9.6	NP	NP	11.6	SP-SM	A-1-a
EMB-B-01 / S-12	43.5-45.0	Silty SAND	32.6	57	34	38.1	SM	A-7-5(4)
EMB-B-02 / S-4	7.5–9.0	Silty SAND with Gravel	14.2	NP	NP	33.5	SM	A-2-4
EMB-B-02 / T-1	17.0–19.0	Fat CLAY with Sand	48.1	83	32	83.5	CH	A-7-5(49)
EMB-B-02 / S-12	38.5-40.0	Sandy Fat CLAY	64.0	117	31	58.4	CH	A-7-5(46)
HW-B-01 / S-3	5.0-6.5	Silty SAND with Gravel	24.2	NP	NP	21.1	SM	A-1-b
HW-B-01 / S-8	18.5-20.0	Fat CLAY	54.5	79	34	90.4	CH	A-7-6(48)
HW-B-01 / S-12	38.5-40.0	Well Graded SAND with Silt and Gravel	8.2	NP	NP	5.6	SW-SM	A-1-a
HW-B-02 / S-4	7.5-9.0	Fat CLAY	51.4	79	34	89.6	CH	A-7-5(48)
HW-B-02 / S-8	17.5-19.0	Fat CLAY	54.7	64	26	86.4	CH	A-7-6(36)
HW-B-02 / S-12	38.5-40.0	Clayey SAND with Gravel	25.2	88	27	16.3	SC	A-2-7(1)
HW-B-02 / S-14	48.5-50.0	Clayey SAND	20.7	40	19	29.8	SC	A-2-6(2)
LOT-A1-01/ S-5	13.5-15.0	SILT	61.6	48	31	94.3	ML	A-7-5(20)
LOT-A1-01/ S-10	38.5-40.0	Poorly Graded SAND	15.2	NP	NP	4.1	SP	A-1-b
LOT-A1-01/ S-13	53.5-55.0	Sandy SILT	25.4	39	NP	52.9	ML	A-4(0)
LOT-A1-02/ S-4	8.5-10.0	Lean CLAY	51.4	40	24	95.7	CL	A-6(17)
LOT-A1-02/ S-7	23.5-25.0	Silty SAND	40.2	NP	NP	41.9	SM	A-4(0)
LOT-A1-02/ S-10	38.5-40.0	Well-graded SAND with Silt	20.8	NP	NP	9.4	SW-SM	A-1-b
LOT-A1-03/ S-3	5.0-6.5	Silty GRAVEL with Sand	8.6	24	NP	15.1	GM	A-1-a

Table C-1: Summary of Laboratory Classification Testing								
Boring No. / Sample	Depth (ft)	Description	NMC (%)	LL	PL	% Fines	USCS	AASHTO
LOT-A1-03/ S-6	18.5-20.0	Lean CLAY	67.6	46	27	94.5	CL	A-7-6(21)
LOT-A1-03/ S-10	38.5-40.0	SILT	66	47	32	98.4	ML	A-7-5(19)
LOT-A1-04/ S-6	18.5-20.0	CLAY	17.3	46	31	98.0	ML	A-7-5 (19)
LOT-A1-04/ S-8	28.5-30.0	SILT	49.9	39	28	95.4	ML	A-6 (12)
LOT-A1-04/ S-11	43.5-45.0	Poorly Graded SAND with Silt	9.9	NP	NP	11.9	SP-SM	A-1-b
LOT-A1-05 / S-6	13.5-15.0	Fat CLAY	61.2	68	29	93.2	CH	A-7-6(42)
LOT-A1-05/ S-11	38.5-40.0	Poorly Graded SAND with Silt	21.6	NP	NP	10.0	SP-SM	A-1-b
LOT-A1-06 / S-6	13.5-15.0	Elastic SILT	71.1	76	36	92.4	MH	A-7-5(45)
LOT-A1-06/ S-10	33.5-35.0	Sandy Elastic SILT	74.0	97	47	55.5	MH	A-7-5(27)
LOT-A1-07 / S-6	13.5-15.0	Elastic SILT	66.6	89	45	94.4	MH	A-7-5 (53)
LOT-A1-07 / S-9	28.5-30.0	Sandy Lean CLAY	47.2	41	25	61.9	CL	A-7-6 (8)
LOT-A1-07 / S-13	48.5-50.0	Silty SAND	21.8	23	NP	31.3	SM	A-2-4
LOT-A1-08 / S-5	10.0-11.5	Fat CLAY	72.3	120	31	93.4	CH	A-7-5 (96)
LOT-A1-08 / T-1	22.0-24.0	Clayey SAND	43.5	52	27	46.2	SC	A-7-6 (8)
LOT-A1-08 / S-11	38.5-40.0	Poorly Graded SAND with Silt	23.2	NP	NP	5.9	SP-SM	A-1-b
LOT-A2-11 / S-4	7.5-9.0	Clayey SAND with Gravel	26.2	68	28	25.3	SC	A-2-7(3)
LOT-A2-11 / S-7	18.5-20.0	Fat CLAY	59.4	80	34	92.1	CH	A-7-5(51)
LOT-A2-11 / S-13	48.5-50.0	Clayey SAND	19.0	38	15	29.5	SC	A-2-6(2)
LOT-A2-12 / S-4	7.5-9.0	Elastic SILT with Sand	77.6	103	44	85.2	MH	A-7-5(60)
LOT-A2-12 / S-6	15.0-16.5	Fat CLAY with Sand	78.2	91	29	80.3	CH	A-7-6(54)
LOT-A2-12 / T-2	17.0-19.0	Sandy Elastic SILT	103.2	114	49	50.6	MH	A-7-5(29)
LOT-A2-12 / S-9	28.5-30.0	Silty SAND	21.0	NP	NP	13.0	SM	A-2-4(0)
LOT-A2-12 / S-15	58.5-60.0	Clayey GRAVEL with Sand	15.2	52	12	42.0	GC	A-7-6(10)
LOT-A2-13 / T-1	10.0-12.0	Elastic SILT with Sand	80.6	109	46	81.8	MH	A-7-5(61)
LOT-A2-13 / S-6	13.5-15.0	Gravelly Elastic SILT	67.5	148	78	62.0	MH	A-7-5(48)
LOT-A2-13 / S-8	23.5-25.0	Silty SAND with Gravel	9.9	NP	NP	13.5	SM	A-1-b
LOT-A2-13 / S-11	38.5-40.0	Sandy SILT	14.5	22	NP	NP	ML	A-4(0)
LOT-A2-14 / S-3	5.0-6.5	Clayey SAND with Gravel	17.5	29	10	29.1	SC	A-2-6(1)
LOT-A2-14 / S-6	13.5-15.0	CLAY	68.0	108	54	89.3	MH	A-7-5(62)
LOT-A2-14 / S-9	28.5-30.0	Fat CLAY	71.5	95	38	90.5	CH	A-7-5(61)
LOT-A2-15 / S-3	5.0-6.5	Fat CLAY with Sand	60.0	85	32	83.1	CH	A-7-5(50)

Table C-1: Summary of Laboratory Classification Testing

Boring No. / Sample	Depth (ft)	Description	NMC (%)	LL	PL	% Fines	USCS	AASHTO
LOT-A2-15 / S-6	18.5-20.0	Well Graded GRAVEL with Silt and Sand	7.5	NP	NP	6.8	GW-GM	A-1-a
LOT-A2-15 / S-11	43.5-45.0	Clayey SAND	11.2	32	13	41.6	SC	A-6(4)
LOT-A2-16 / S-5	10.0-11.5	Gravelly Fat CLAY	47.0	51	28	61.6	CH	A-7-6(13)
LOT-A2-16 / S-8	23.5-25.0	Poorly Graded SAND with Silt and Gravel	10.3	NP	NP	5.6	SP-SM	A-1-a
LOT-A2-16 / S-10	33.5-35.0	Poorly Graded SAND with Clay	16.7	27	12	10.3	SP-SC	A-2-6(0)
LOT-A2-17 / S-9	28.5-30.0	Fat CLAY	67.3	104	39	88.5	CH	A-7-5(68)
LOT-A2-17 / S-12	43.5-45.0	Silty SAND	52.3	73	37	30.8	SM	A-2-7(4)
LOT-A2-17 / S-17	68.5-70.0	Elastic SILT	24.4	65	35	89.7	MH	A-7-5(33)
LOT-A2-17A / T-1	32.0-34.0	Fat CLAY	54.9	97	39	94.1	CH	A-7-5(67)
LOT-A2-18 / S-7	18.5-20.0	Fat CLAY	57.4	90	36	98.7	CH	A-7-5(66)
LOT-A2-18 / S-11	38.5-40.0	Elastic SILT	66.1	106	53	94.2	MH	A-7-5(65)
LOT-A2-18 / S-14	53.5-55.0	Elastic SILT with Sand	33.8	63	33	85.4	MH	A-7-5(30)
OL-B-01 / T-2	17.0-19.0	Fat CLAY	51.7	64	31	87.7	CH	A-7-5(34)
OL-B-01 / S-10	38.5-40.0	Clayey SAND	23.9	48	22	35.8	SC	A-2-7(3)
RB-B-01 / T-1	15.0-17.0	Sandy Fat CLAY	52.5	69	31	50.8	CH	A-7-5(16)
RB-B-01 / Bulk	0.0-10.0	Silty SAND	22.6	NP	NP	41.4	SM	A-4(0)
RB-B-01 / S-9	33.5-35.0	Fat CLAY	55.1	65	28	99.0	CH	A-7-5(43)
RB-B-02A / Bulk	0.0-10.0	Clayey SAND	35.8	39	23	45.3	SC	A-6(4)
RB-B-02A / S-6	20.0-21.5	Fat CLAY	68.4	105	35	95.0	CH	A-7-5(80)
RB-B-03 / S-5	10.0-11.5	Clayey SAND	24.0	49	25	21.3	SC	A-2-7(1)
RB-B-03 / T-1	23.0-25.0	Fat CLAY	57.3	71	31	93.2	CH	A-7-5(44)
RB-B-03 / S-10	33.5-35.0	Poorly Graded SAND with Silt	19.1	NP	NP	5.5	SP-SM	A-1-b
RB-B-04/ Bulk	0.0-10.0	Silty SAND with Gravel	6.3	27	16	17	SC	A-2-6(0)
RB-B-04/ S-7	17.5-19.0	CLAY	65.5	49	28	50.4	CL	A-7-6(8)
RB-B-04/ S-9	28.5-30.0	SILT	65.9	50	30	93.4	MH	A-7-5(22)
RB-B-05/ Bulk	0.0-10.0	Silty SAND	22.9	19	NP	29.8	SM	A-2-4 (0)
RB-B-05/ S-2	3.5-5.0	Silty SAND with Gravel	24.7	NP	NP	26	SM	A-2-4 (0)
RB-B-05/ S-4	8.5-10.0	Silty SAND with Gravel	34.3	34	28	40.4	SM	A-4 (0)
RB-B-06/ U-1	17.5-19.5	SILT	62.3	43	27	96.6	ML	A-7-6(18)
RB-B-06/ S-10	33.5-35.0	SAND	18.3	NV	NP	5.2	SP-SM	A-1-b

Table C-1: Summary of Laboratory Classification Testing								
Boring No. / Sample	Depth (ft)	Description	NMC (%)	LL	PL	% Fines	USCS	AASHTO
RB-B-07 / S-4	7.5-9.0	Elastic SILT	63.1	76	37	97.9	MH	A-7-5 (48)
RB-B-07 / T-1	20.0-22.0	Black Fat CLAY	68.7	90	37	99.6	CH	A-7-5 (66)
RB-B-07 / S-12	33.5-35.0	Fat CLAY	75.6	97	37	99.5	CH	A-7-5 (74)
RB-B-08 / Bulk	0.5-10.0	Poorly Graded SAND with Gravel	30.1	24	NP	2.8	SP	A-1-b
RB-B-08 / T-1	15.0-17.0	Fat CLAY with Sand	79.3	96	36	77.5	CH	A-7-5 (52)
RB-B-08 / S-9	23.5-25.0	Elastic SILT	65.9	90	47	95.6	MH	A-7-5 (54)
RB-B-08 / S-14	48.5-50.0	Elastic SILT with Sand	32.3	69	35	80.4	MH	A-7-5 (31)
RB-B-09 / Bulk	1.0-10.0	Poorly Graded SAND with Clay and Gravel	10.3	28	16	10.9	SP-SC	A-2-6(0)
RB-B-09 / S-5	10.0-11.5	Elastic SILT with Sand	70.2	103	43	78.1	MH	A-7-5(54)
RB-B-09 / S-8	17.5-19.0	Silty Clayey SAND	19.5	17	11	38.5	SC-SM	A-4
RB-B-09 / S-13	38.5-40.0	Clayey SAND	16.2	30	11	43.4	SC	A-6(4)
RB-B-10 / Bulk	0.6-10.0	Clayey SAND with Gravel	11.5	34	20	29.5	SC	A-2-6(1)
RB-B-10 / S-5	10.0-11.5	Silty SAND	127.7	194	96	34.9	SM	A-2-7(18)
RB-B-10 / S-6	12.5-14.0	Sandy Elastic SILT	50.0	157	74	68.0	MH	A-7-5(65)
RB-B-10 / S-13	38.5-40.0	Sandy Lean CLAY	13.9	30	14	53.3	CL	A-6(5)
RB-B-11 / S-4	7.5-9.0	Fat CLAY	54.2	62	27	90.2	CH	A-7-6(36)
RB-B-11 / T-1	15.0-17.9	Fat CLAY	87.5	68	30	98.6	CH	A-7-5(45)
RB-B-11 / S-11	33.5-35.0	Poorly Graded SAND with Silt and Gravel	9	18	15	7.8	SP-SM	A-1-a
RB-B-11 / S-15	53.5-55.0	Fat CLAY with Sand	32	58	22	74.5	CH	A-7-6(27)
RB-B-12 / Bulk	0.3-10.0	Clayey SAND	11.1	23	13	22.9	SC	A-2-4
RB-B-12 / S-6	12.5-14.0	Sandy Elastic SILT	51.8	131	54	54.5	MH	A-7-5(39)
RB-B-12 / S-14	43.5-45.0	Sandy Lean CLAY	25.9	47	24	67.6	CL	A-7-6(15)
RB-B-13 / S-3	5.0-6.5	Fat CLAY	35.4	57	24	91.1	CH	A-7-6(33)
RB-B-13 / S-7	15.0-16.5	Elastic SILT	71.0	92	44	95.0	MH	A-7-5 (58)
RB-B-13 / S-11	28.5-30.0	Fat CLAY	63.4	103	40	95.1	CH	A-7-5(73)
RW-B-01 / T-1	21.5-23.5	Fat CLAY with Sand	54.9	70	34	75.6	CH	A-7-5(30)
RW-B-01 / S-15	53.5-55.0	Clayey SAND	27.9	55	25	29.7	SC	A-2-7(3)
RW-B-02 / S-6	12.5-14.0	Fat CLAY	52.5	80	33	96.7	CH	A-7-5(55)
RW-B-02 / S-11	33.5-35.0	Well Graded SAND with Silt and Gravel	12.8	NP	NP	8.8	SW-SM	A-1-b
RW-B-02 / S-14	48.5-50.0	Clayey SAND	29.1	45	25	24.7	SC	A-2-7(1)
RW-B-03/ S-4	7.5-9.0	Silty CLAY	15.8	25	20	61.3	CL-ML	A-4(1)
RW-B-03/ T-1	23.5-25.5	Clayey SAND	42.6	53	24	37.6	SC	A-7-6(5)
RW-B-03/ S-12	38.5-40.0	Poorly Graded SAND with Silt and Gravel	11.3	NP	NP	6.3	SP-SM	A-1-a

Table C-1: Summary of Laboratory Classification Testing

Boring No. / Sample	Depth (ft)	Description	NMC (%)	LL	PL	% Fines	USCS	AASHTO
RW-B-03/ S-15	53.5-55.0	Silty SAND	27.5	NP	NP	15	SM	A-1-b
RW-B-04/ T-1	17.0-19.0	Clayey SAND	20.4	44	22	38.9	SC	A-7-6(4)
RW-B-05/ S-4	7.5-9.0	SILT	62.1	34	28	86	ML	A-4 (6)
RW-B-05/ U-1	15.0-17.0	Silty SAND	40.1	29	NP	22.9	SM	A-2-4 (0)
RW-B-05/ S-10	33.5-35.0	Poorly Graded SAND with Silt	32.1	NP	NP	7.7	SP-SM	A-3
RW-B-06/ U-1	9.0-11.0	SILT	64.4	46	32	97.1	ML	A-7-5 (18)
RW-B-06/ S-9	28.5-30.0	Poorly Graded SAND	22.6	NP	NP	4.1	SP	A-3
RW-B-07/ S-5	10.0-11.5	SILT	44.3	49	29	88.8	ML	A-7-6 (21)
RW-B-07/ S-10	28.5-30.0	Silty SAND	25.7	NP	NP	12.6	SM	A-2-4 (0)
RW-B-08 / S-2	2.5-4.0	Poorly Graded SAND with Gravel	18.4	NP	NP	4.7	SP	A-1-b
RW-B-08 / T-1	10.0-12.0	Sandy Fat CLAY	47.4	58	24	64.6	CH	A-7-6 (21)
RW-B-08 / S-10	28.5-30.0	Clayey SAND	36.1	47	22	36.3	SC	A-7-6 (3)
RW-B-08 / S-13	43.5-45.0	Elastic SILT	44.0	65	39	88.0	MH	A-7-5 (29)
RW-B-09 / S-5	10.0-11.5	Elastic SILT	68.0	77	36	97.3	MH	A-7-5 (49)
RW-B-09 / T-1	17.5-19.5	Fat CLAY with Sand	68.7	72	29	77.6	CH	A-7-6 (36)
RW-B-09 / S-11	33.5-35.0	Fat CLAY	71.0	95	32	98.5	CH	A-7-5 (74)
RW-B-10 / S-5	10.0-11.5	Silty SAND	87.8	75	57	26.1	SM	A-2-7(1)
RW-B-10 / T-2	24.0-26.0	SILT with Sand	52.5	47	28	78.2	ML	A-7-6(16)
RW-B-10 / S-13	38.5-40.0	Fat CLAY with Sand	59.4	52	23	72.1	CH	A-7-6(20)
RW-B-11 / S-5	10.0-11.5	Fat CLAY	43.8	68	31	91.4	CH	A-7-5(40)
RW-B-11 / S-10	23.5-25.0	Fat CLAY	54.4	93	40	86.7	CH	A-7-5(55)
RW-B-11 / S-16	53.5-55.0	Sandy Fat CLAY	30.7	71	34	56.1	CH	A-7-5(19)
RW-B-12 / T-2	17.5-19.5	Fat CLAY	54.7	66	26	86.8	CH	A-7-6(39)
RW-B-12 / S-10	33.5-35.0	Elastic SILT with Sand	71.9	86	39	80.9	MH	A-7-5(44)
RW-B-13 / S-4	7.5-9.0	Well-graded GRAVEL with Silt and Sand	8.9	22	NP	8.7	GW-GM	A-1-a
RW-B-13 / S-7	15.0-16.5	Elastic SILT	65.1	110	53	86.0	MH	A-7-5(61)
RW-B-13 / S-11	28.5-30.0	Fat CLAY with Sand	46.5	67	32	84.4	CH	A-7-5(34)
RW-B-13 / S-13	38.5-40.0	Fat CLAY	57.4	91	31	92.3	CH	A-7-5(64)
SP-B-01 / S-7	18.5-20.0	Fat CLAY	76.1	57	20	89.0	CH	A-7-6(35)
SP-B-01 / S-11	40.0-41.5	Silty Clayey SAND	19.8	23	18	37.6	SC-SM	A-4(0)

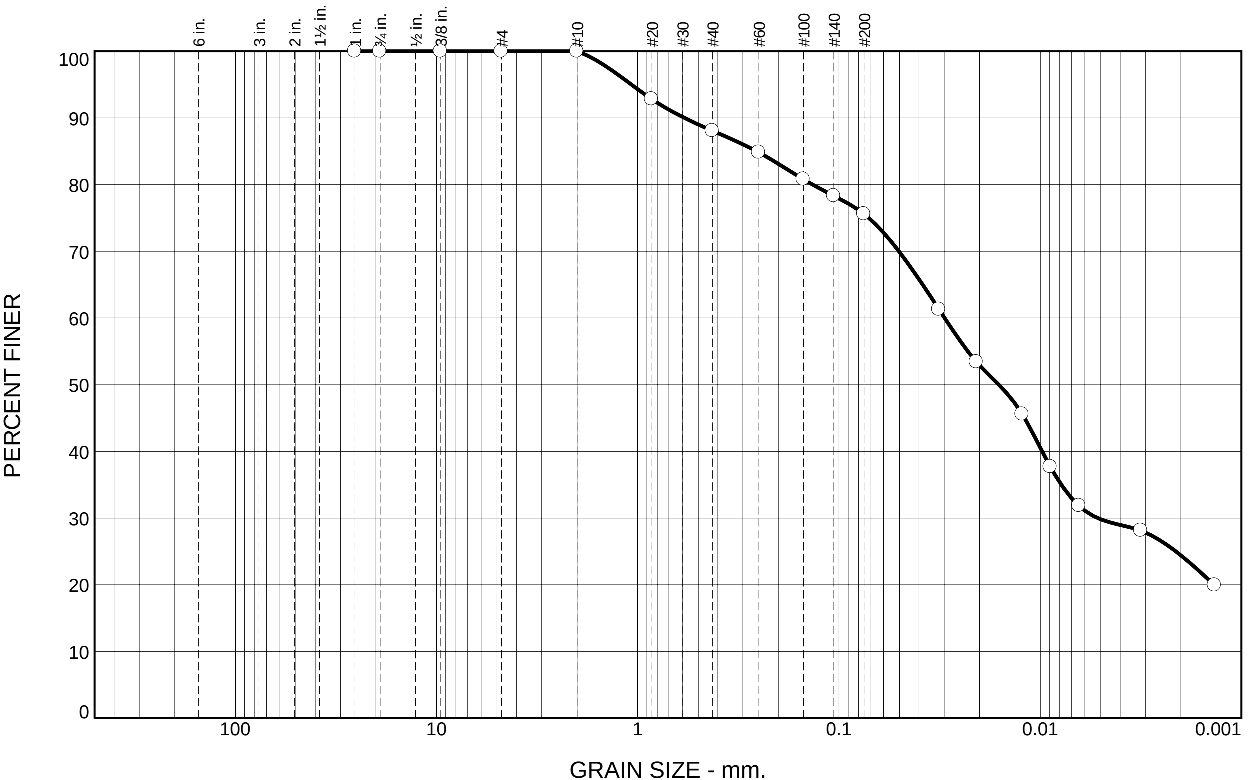
USCS: Unified Soil Classification System

AASHTO: American Association of State Highway and Transportation Officials

NMC: Natural Moisture Content (%) **LL:** Liquid Limit **PL:** Plastic Limit **% Fines:** Percent of Material Passing No. 200 Sieve

Particle Size Distribution Reports

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	11.9	12.5	45.8	29.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	100.0		
.375	100.0		
#4	100.0		
#10	100.0		
#20	92.8		
#40	88.1		
#60	84.8		
#100	80.8		
#140	78.3		
#200	75.6		

* (no specification provided)

Material Description

Elastic Silt w/ sand

Atterberg Limits

PL= 41 LL= 91 PI= 50

Coefficients

D_{90}= 0.5842 D_{85}= 0.2559 D_{60}= 0.0298
D_{50}= 0.0161 D_{30}= 0.0052 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(43)

Remarks

Nat moisture = 54.1%

Location: BH-B-01A
Sample Number: 01A **Depth:** 15-17' **Date:**

HILLIS-CARNES ENGINEERING ASSOCIATES

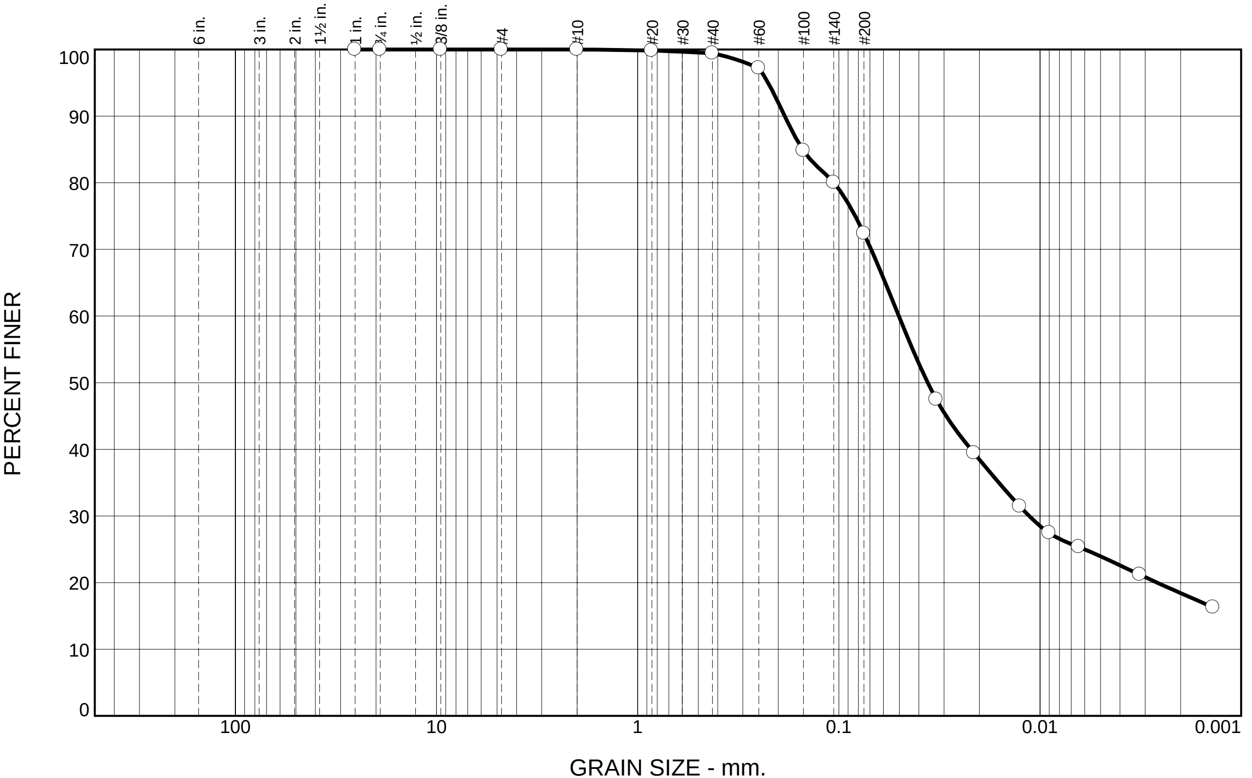
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: ACD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.6	27.0	48.5	23.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	100.0		
.375	100.0		
#4	100.0		
#10	100.0		
#20	99.8		
#40	99.4		
#60	97.2		
#100	84.8		
#140	80.0		
#200	72.4		

* (no specification provided)

Material Description

Silt w/sand

Atterberg Limits

PL= 29 LL= 48 PI= 19

Coefficients

D_{90}= 0.1857 D_{85}= 0.1514 D_{60}= 0.0503
D_{50}= 0.0362 D_{30}= 0.0113 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-7-6(14)

Remarks

Nat moisture = 52.0%

Source of Sample: BH-B-01A **Depth:** 28.5-30
Sample Number: S-10 **Date:** 7/16

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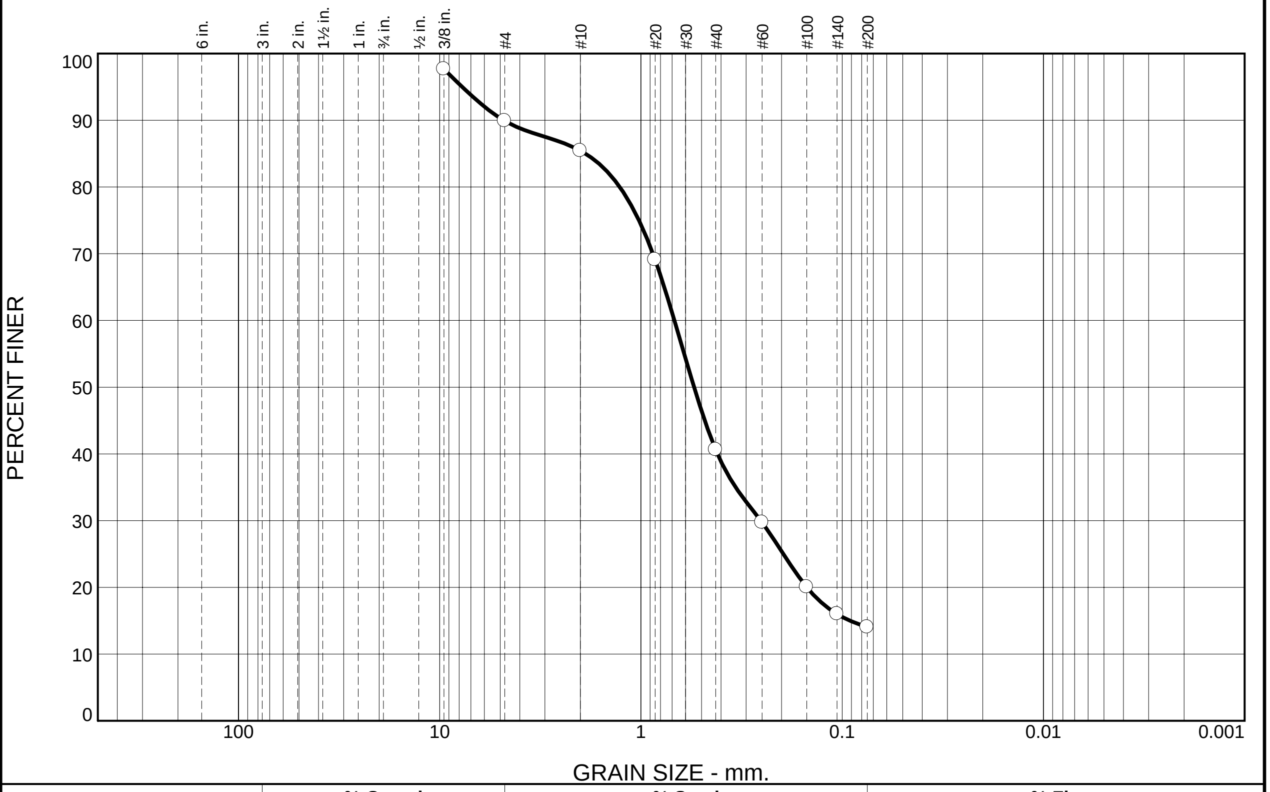
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: ACD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
			4.5	44.8	26.6	14.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	97.7		
#4	89.9		
#10	85.4		
#20	69.1		
#40	40.6		
#60	29.7		
#100	20.0		
#140	16.0		
#200	14.0		

* (no specification provided)

Material Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 4.8044 D_{85}= 1.8893 D_{60}= 0.6817
D_{50}= 0.5442 D_{30}= 0.2540 D_{15}= 0.0914
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Nat moisture = 19.0%

Source of Sample: BH-B-01A **Depth:** 38.5-40
Sample Number: S-12 **Date:** 6/29

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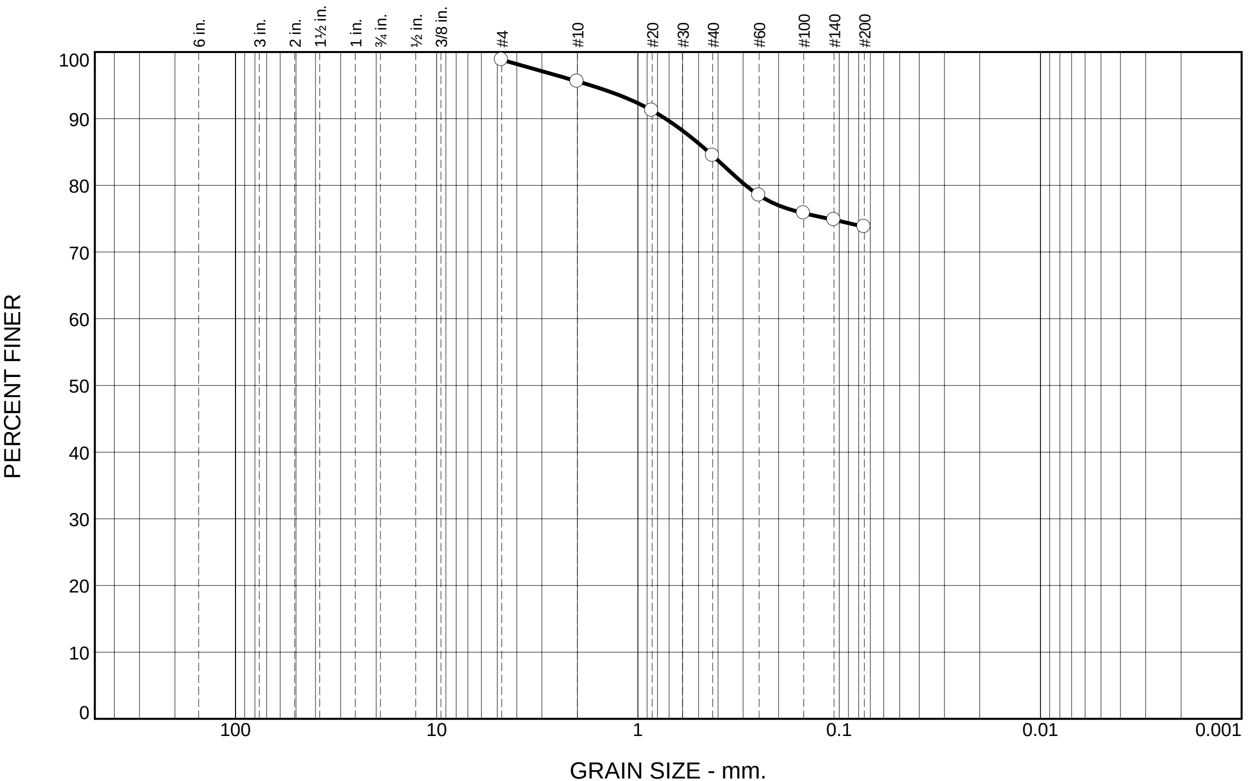
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: ACD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
			3.2	11.1	10.7	73.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	98.8		
#10	95.6		
#20	91.2		
#40	84.5		
#60	78.5		
#100	75.8		
#140	74.8		
#200	73.8		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.7284 D_{85}= 0.4447 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Nat mositure = 22.9%

Source of Sample: BH-B-02 **Depth:** 5-6.5
Sample Number: S-3 **Date:** 6/29

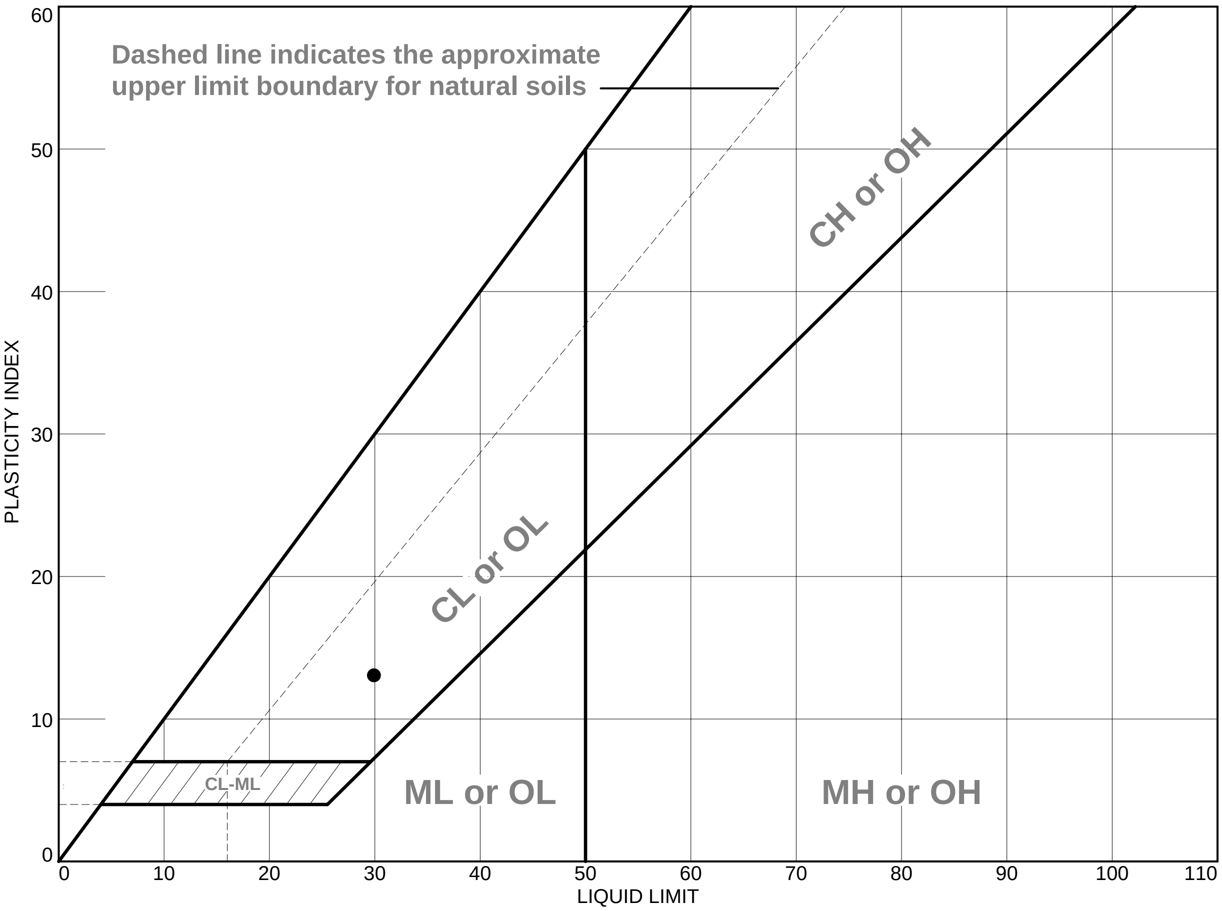
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: ACD

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean clay w/sand	30	17	13	84.5	73.8	CL

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

●**Source of Sample:** BH-B-02 **Depth:** 5-6.5 **Sample Number:** S-3

Remarks:

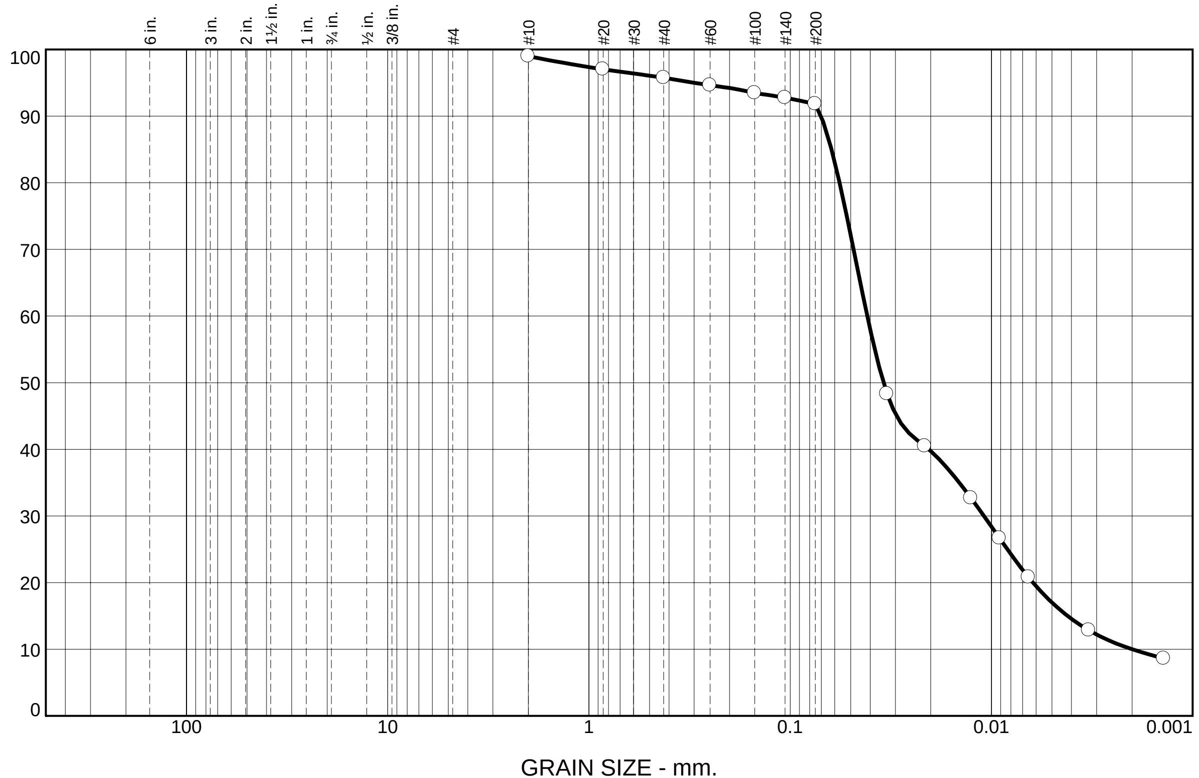
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Figure

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
				3.2	4.0	74.8	17.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	99.0		
#20	97.0		
#40	95.8		
#60	94.6		
#100	93.5		
#140	92.8		
#200	91.8		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0702 D_{85}= 0.0623 D_{60}= 0.0414
D_{50}= 0.0344 D_{30}= 0.0109 D_{15}= 0.0042
D_{10}= 0.0020 C_u= 20.70 C_c= 1.43

Classification

USCS= AASHTO=

Remarks

Nat moisture = 62.9%

Source of Sample: BH-B-02 **Depth:** 15-16.5
Sample Number: S-7
Date: 6/15

HILLIS-CARNES ENGINEERING ASSOCIATES

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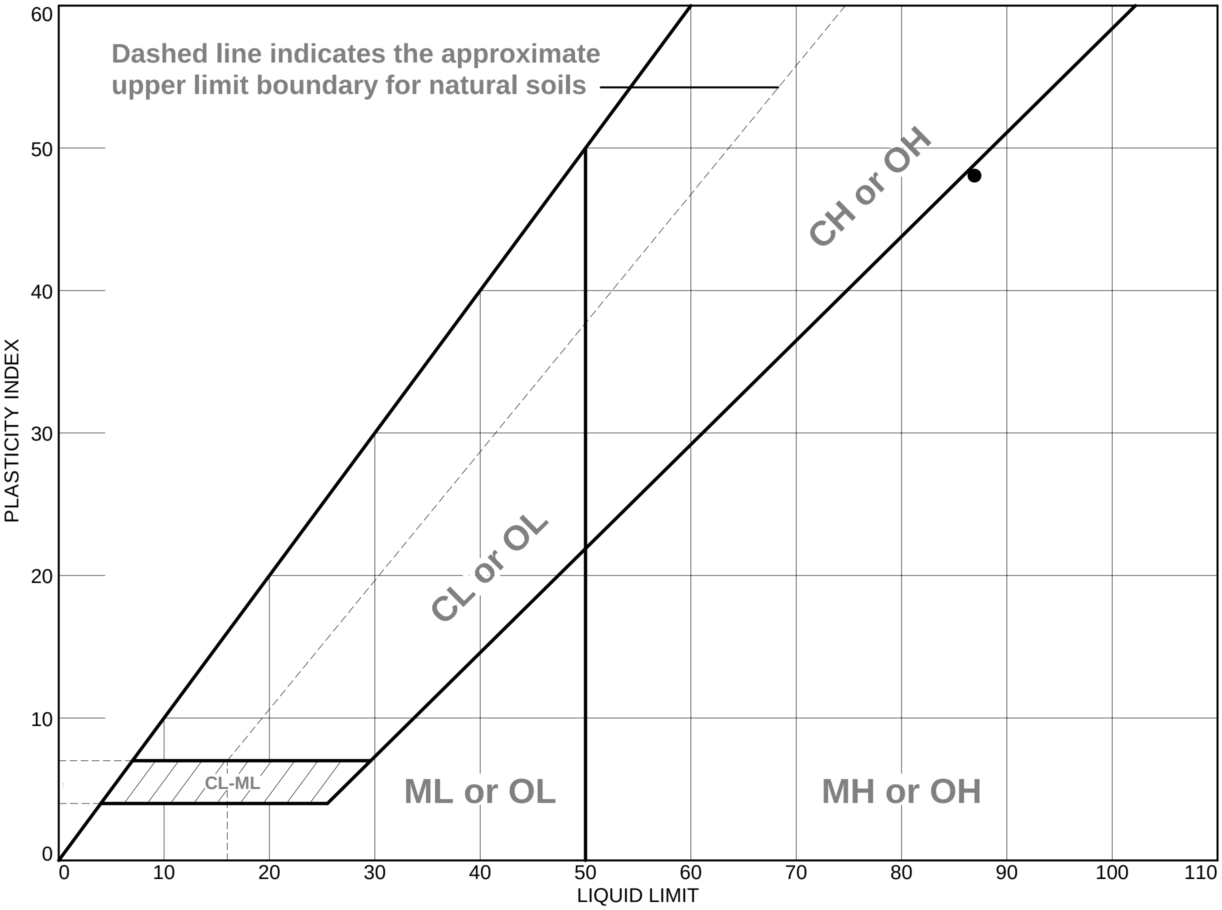
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: cs

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Black clay	87	39	48	95.8	91.8	

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

●**Source of Sample:** BH-B-02 **Depth:** 15-16.5 **Sample Number:** S-7

Remarks:

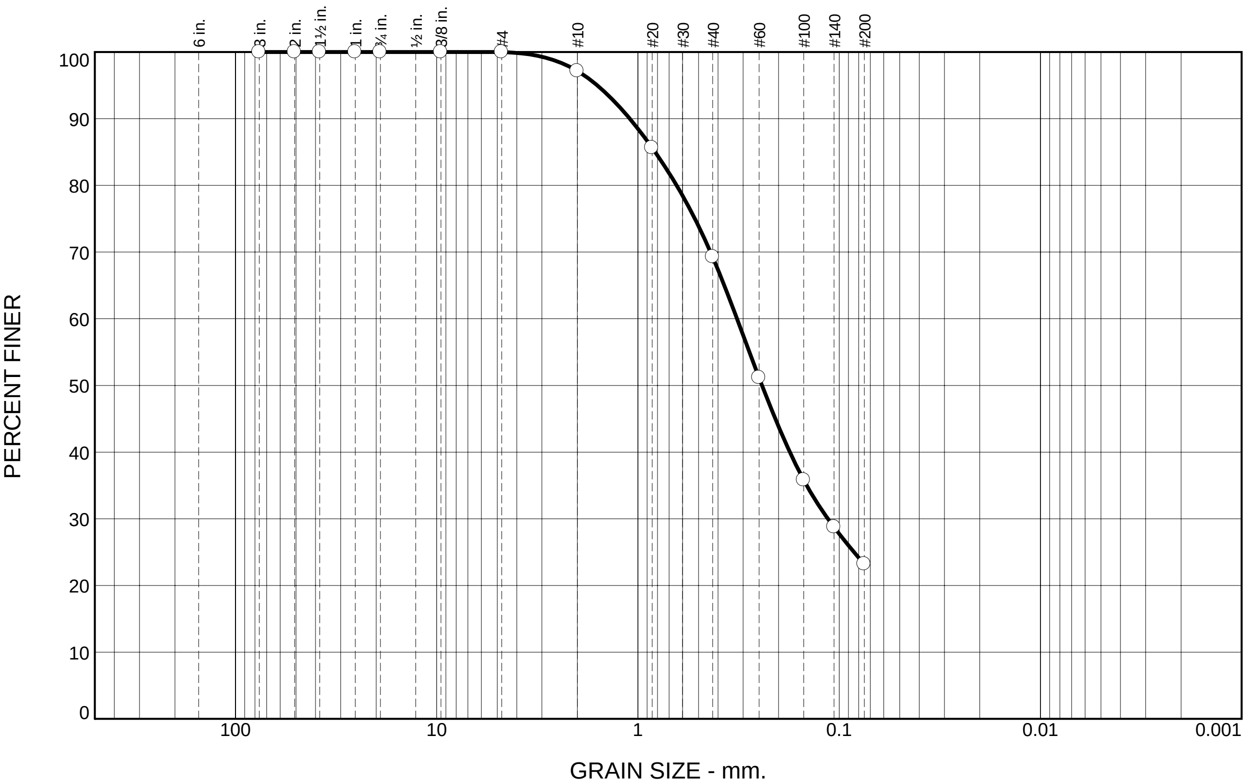
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Figure

Tested By: ad

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	2.8	27.9	46.1	23.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	100.0		
.375	100.0		
#4	100.0		
#10	97.2		
#20	85.6		
#40	69.3		
#60	51.1		
#100	35.8		
#140	28.8		
#200	23.2		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

$D_{90}=$ 1.0976 $D_{85}=$ 0.8213 $D_{60}=$ 0.3219

$D_{50}=$ 0.2418 $D_{30}=$ 0.1137 $D_{15}=$

$D_{10}=$ $C_u=$ $C_c=$

Classification

USCS= AASHTO=

Remarks

Nat mositure = 29.2%

Source of Sample: BH-B-02 **Depth:** 53.5-55

Sample Number: S-13 **Date:** 6/29

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K

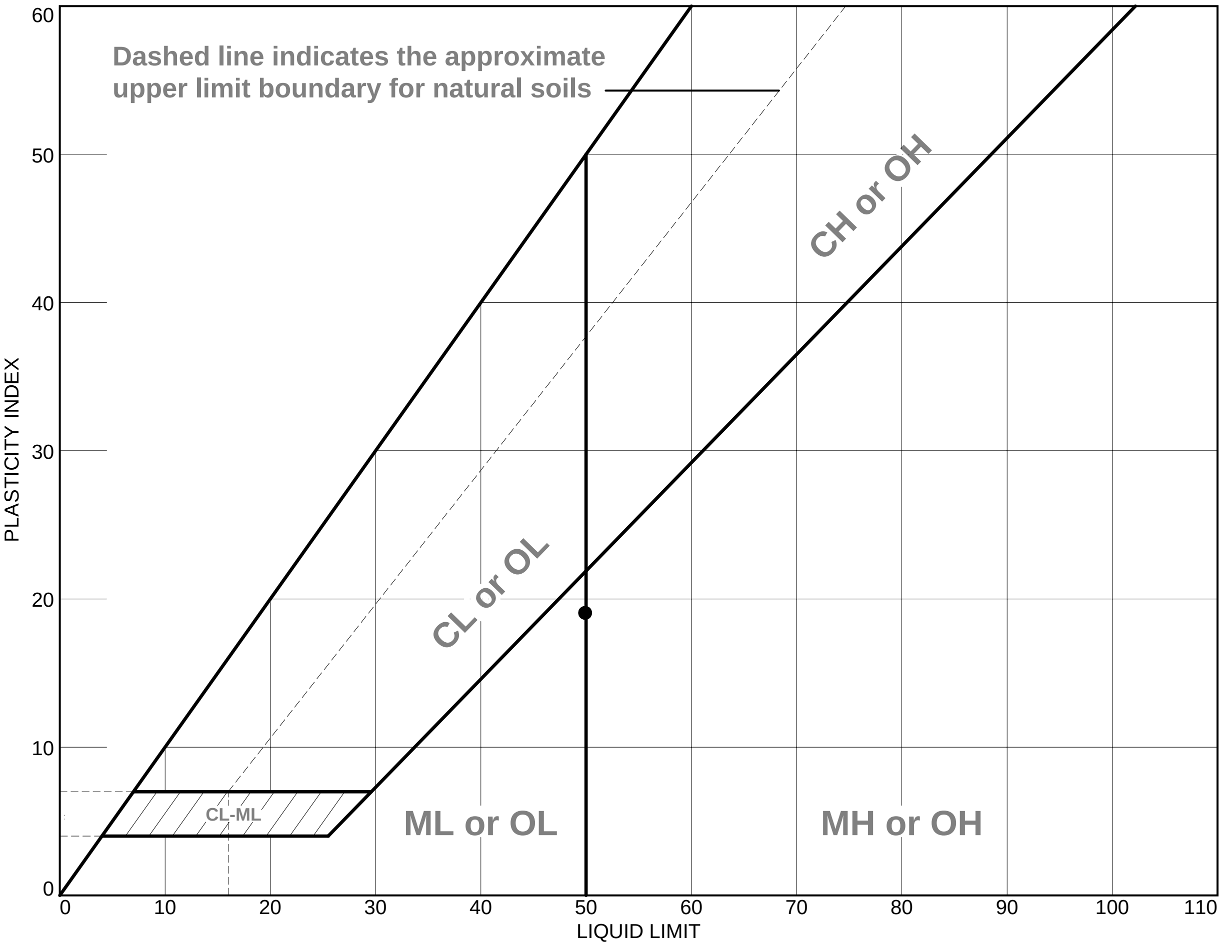
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: ACD

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand	50	31	19	69.3	23.2	SM

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

● **Source of Sample:** BH-B-02 **Depth:** 53.5-55 **Sample Number:** S-13

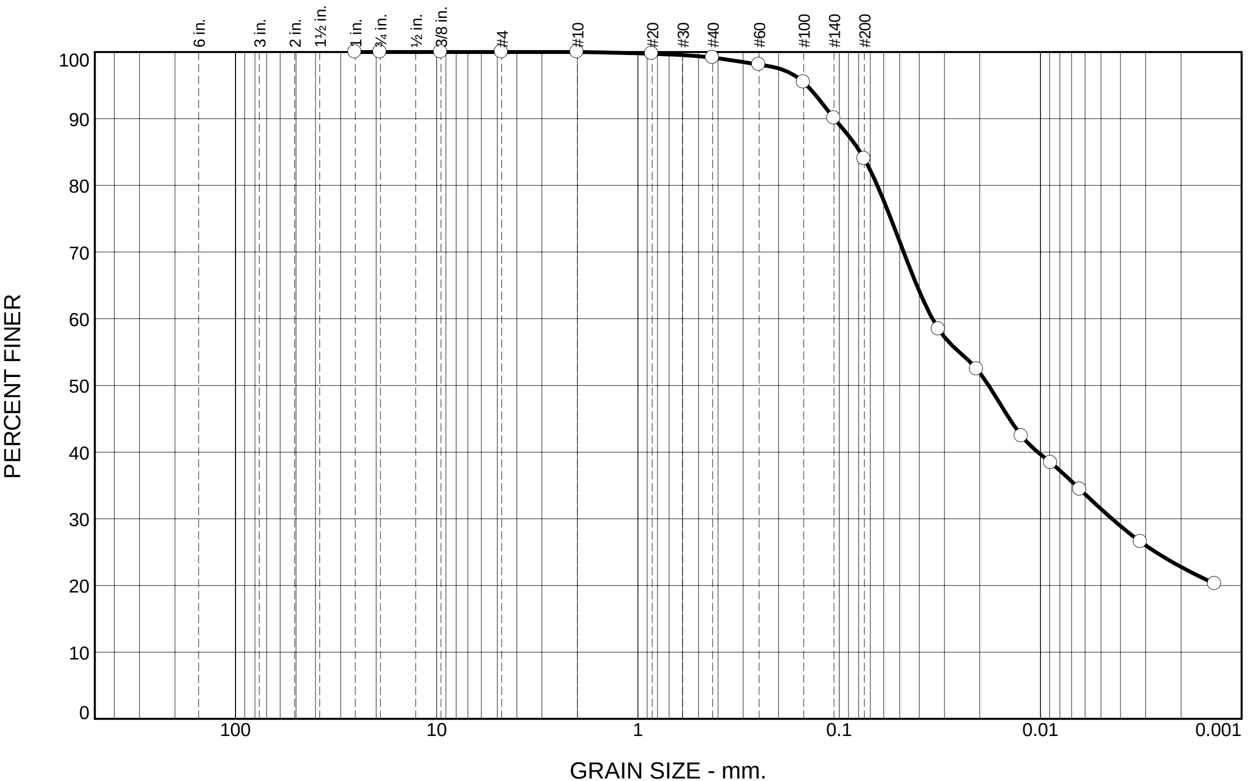
Remarks:

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Figure

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.8	15.2	52.5	31.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	100.0		
.375	100.0		
#4	100.0		
#10	100.0		
#20	99.7		
#40	99.2		
#60	98.1		
#100	95.5		
#140	90.1		
#200	84.0		

* (no specification provided)

Material Description

Elastic Silt w/ sand

Atterberg Limits

PL= 34 LL= 65 PI= 31

Coefficients

D_{90}= 0.1056 D_{85}= 0.0785 D_{60}= 0.0344
D_{50}= 0.0181 D_{30}= 0.0044 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(30)

Remarks

Nat moisture = 58.1%

Location: BH-B-03A
Sample Number: 03A **Depth:** 15-17' **Date:**

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

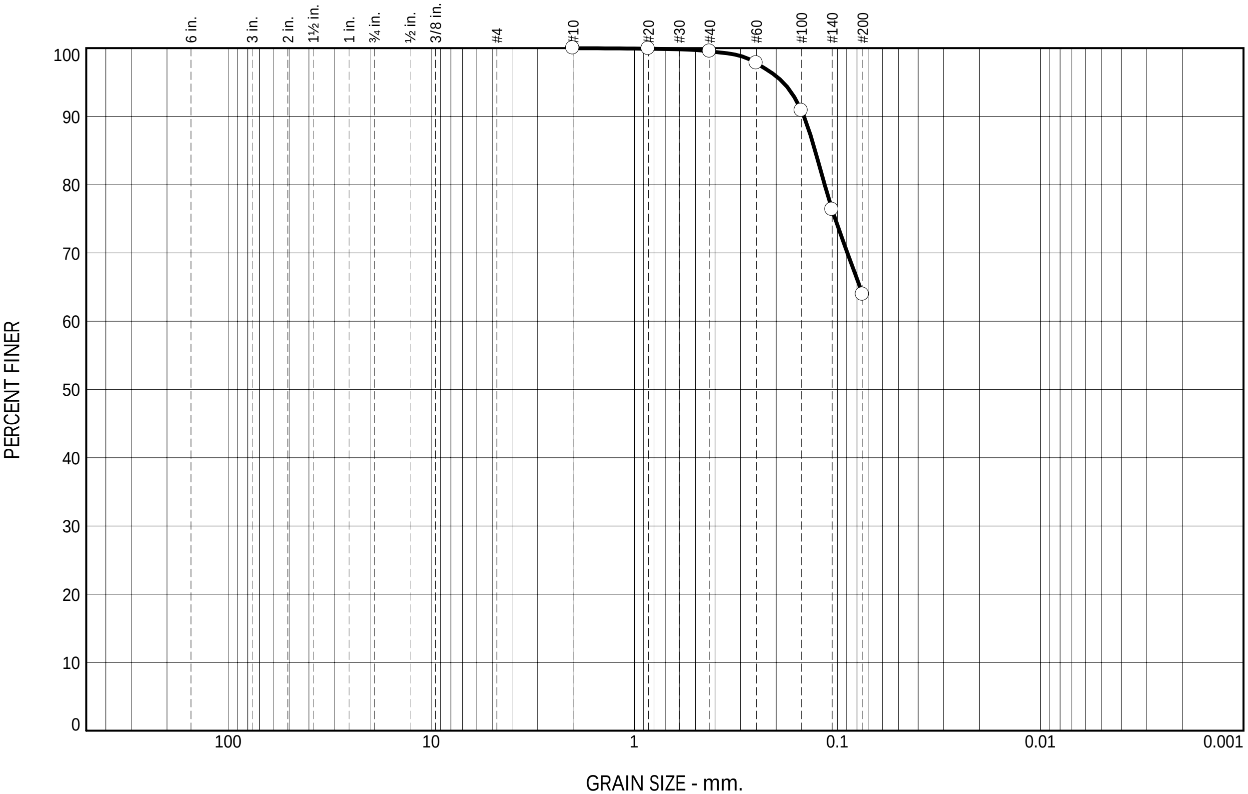
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: ACD

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Particle Size Distribution Report

ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.5	35.6	63.9	

Test Results (ASTM D422)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
#10	100.0			
#20	99.9			
#40	99.5			
#60	97.8			
#100	90.8			
#140	76.3			
#200	63.9			

* (no specification provided)

Material Description

Sandy silt

Atterberg Limits

PL= 34 LL= 47 PI= 13

Coefficients

D_{90}= 0.1459 D_{85}= 0.1287 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-7-5(8)

Test Remarks

Nat moisture = 54.9%

Source of Sample: BH-B-03A
Sample Number: S4
Sample Date: 6/23

HILLIS-CARNES ENGINEERING ASSOCIATES

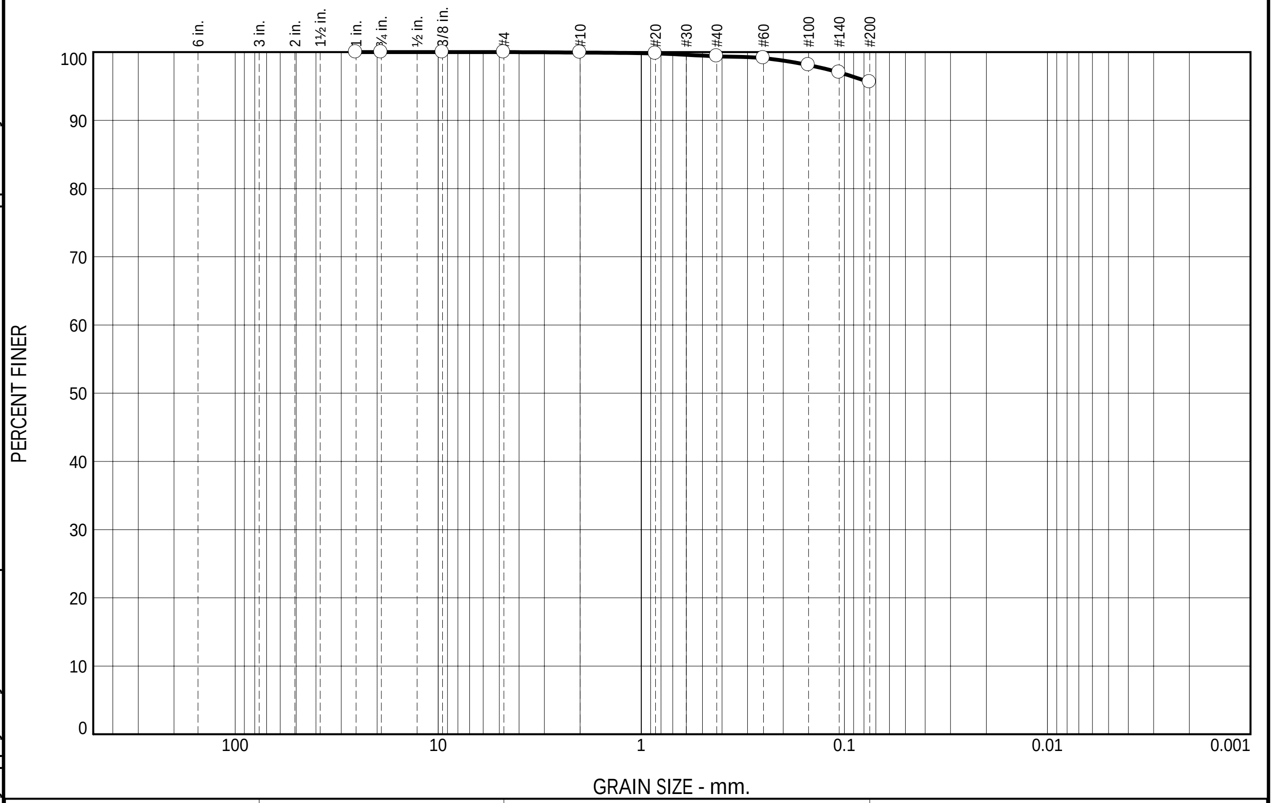
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 Figure

Tested By: ACD

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.5	3.8	95.6	

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
1	100.0			
.75	100.0			
.375	100.0			
#4	100.0			
#10	99.9			
#20	99.8			
#40	99.4			
#60	99.1			
#100	98.1			
#140	97.0			
#200	95.6			

* (no specification provided)

Material Description

Lean clay

Atterberg Limits

PL= 22
LL= 37
PI= 15

Coefficients

D_{90}=
D_{85}=
D_{60}=
D_{50}=
D_{30}=
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= CL
AASHTO= A-6(15)

Test Remarks

Nat moisture = 25.8%

Source of Sample: BH-B-03A
Sample Number: S5
Sample Date: 6/23

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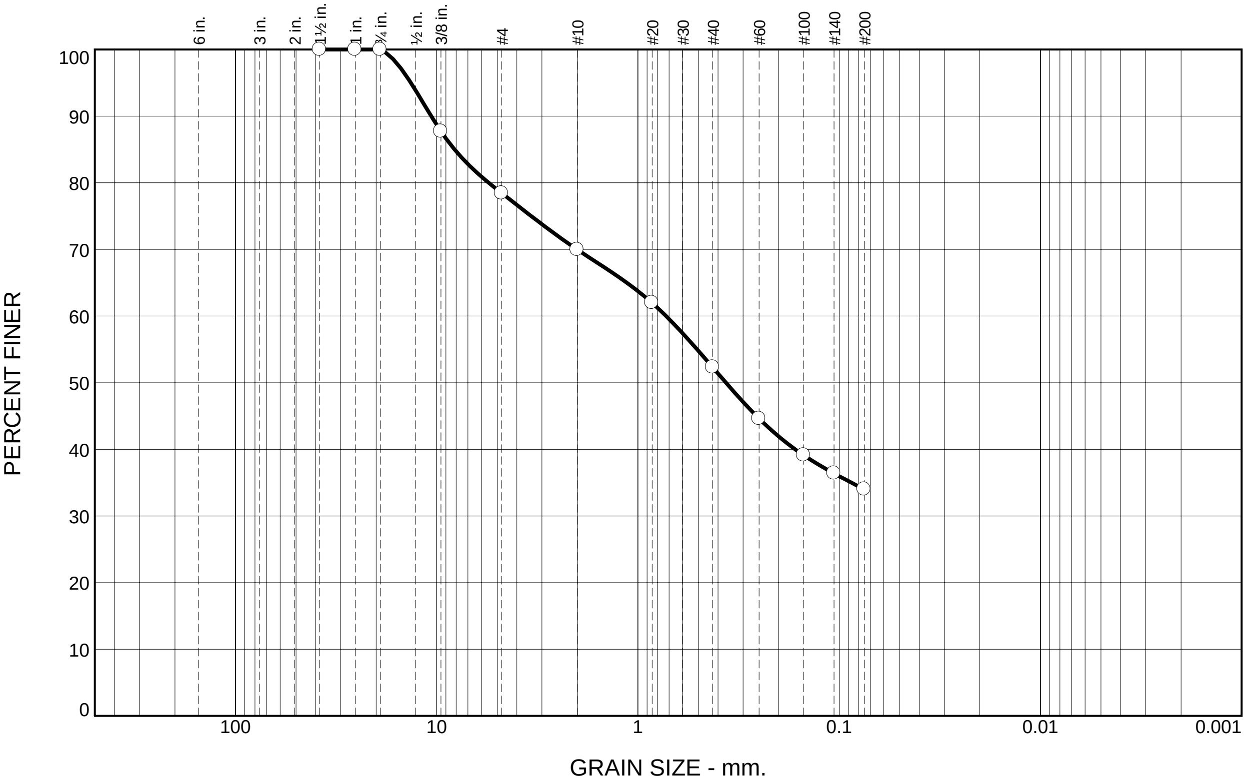
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051
Figure

Tested By: ACD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	21.6	8.4	17.7	18.3	34.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	100.0		
.75	100.0		
.375	87.7		
#4	78.4		
#10	70.0		
#20	62.0		
#40	52.3		
#60	44.6		
#100	39.1		
#140	36.4		
#200	34.0		

* (no specification provided)

Material Description

Silty sand w/gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 10.6483 D_{85}= 8.1522 D_{60}= 0.7247
D_{50}= 0.3653 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Nat mositure = 53.7%

Source of Sample: BH-B-04 **Depth:** 5-6.5
Sample Number: S-3 **Date:** 6/29

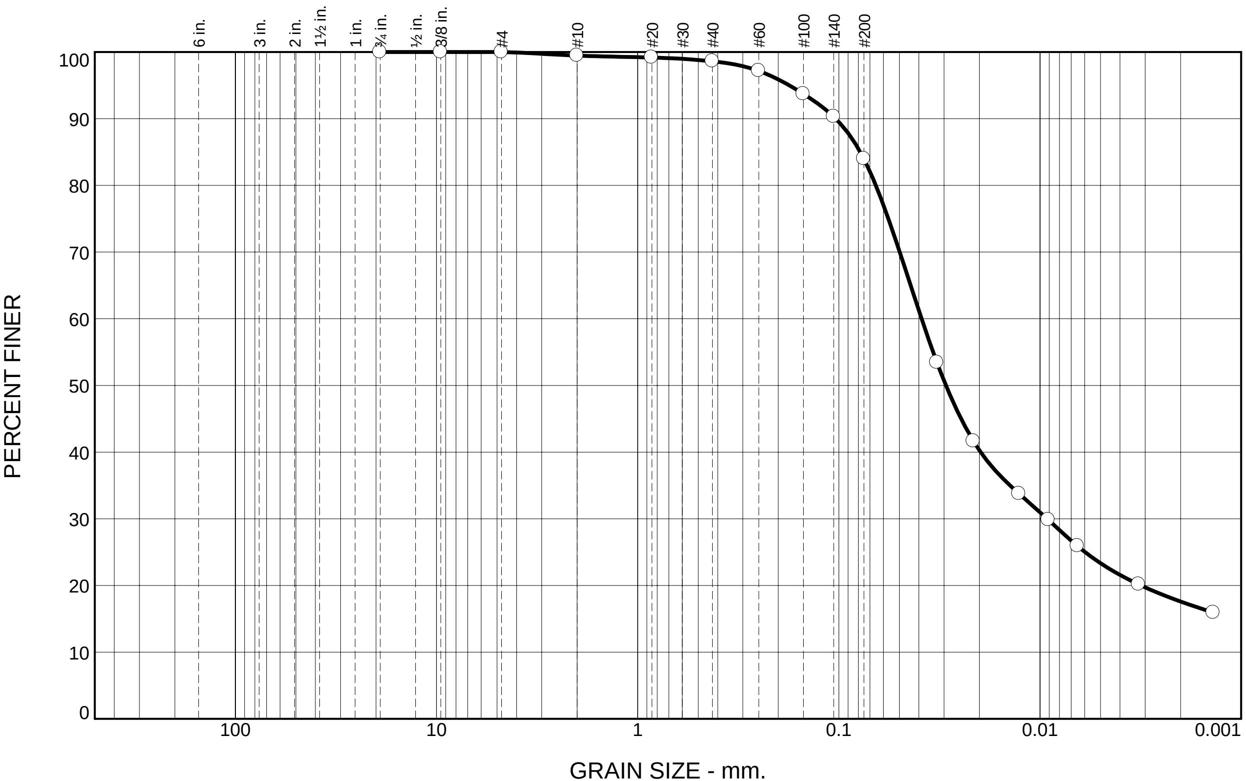
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: ACD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.5	0.9	14.6	60.7	23.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	100.0		
#4	100.0		
#10	99.5		
#20	99.2		
#40	98.6		
#60	97.2		
#100	93.7		
#140	90.3		
#200	84.0		

* (no specification provided)

Material Description

Elastic Silt w/ sand

Atterberg Limits

PL= 41
LL= 83
PI= 42

Coefficients

D_{90}= 0.1037
D_{85}= 0.0782
D_{60}= 0.0388
D_{50}= 0.0294
D_{30}= 0.0092
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= MH
AASHTO= A-7-5(42)

Remarks

Nat moisture = 60.9%

Location: BH-B-04
Sample Number: 04 **Depth:** 21.5-23.5' **Date:**

HILLIS-CARNES ENGINEERING ASSOCIATES

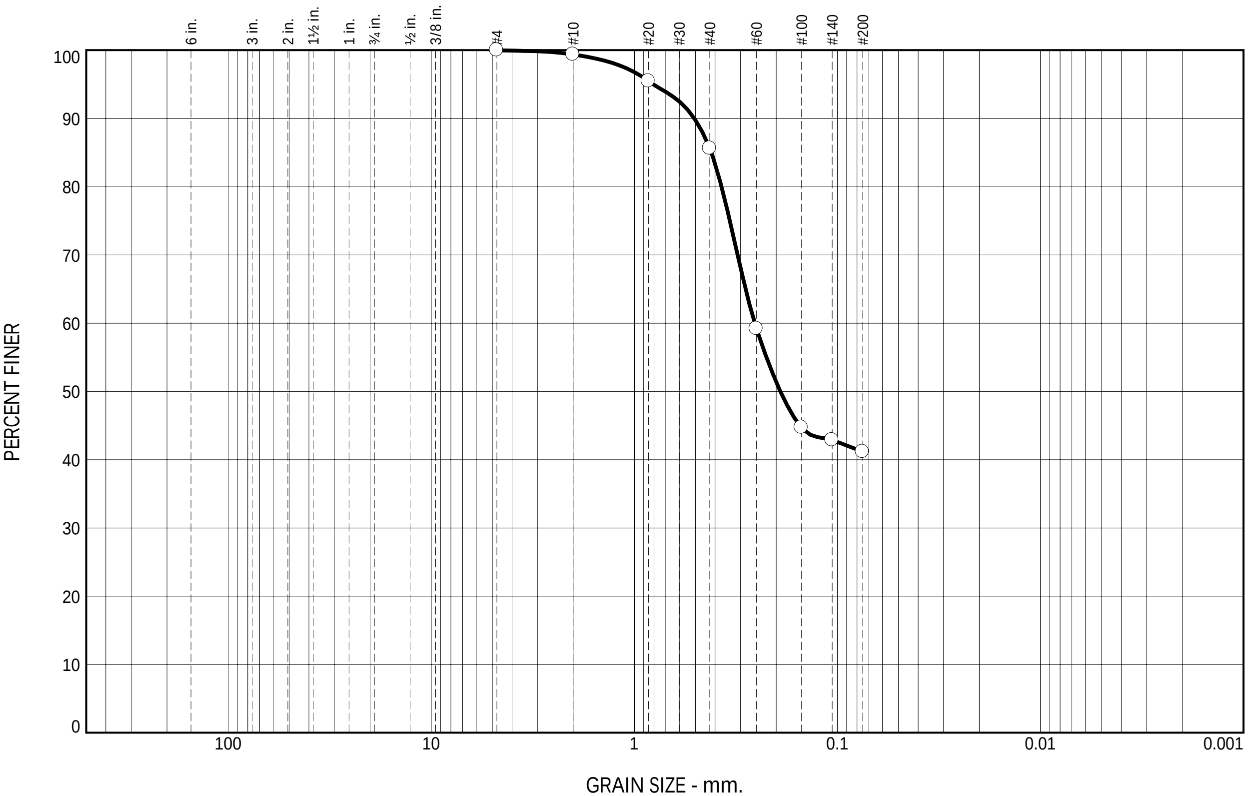
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: ACD

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.6	13.8	44.4	41.2	

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
#4	100.0			
#10	99.4			
#20	95.5			
#40	85.6			
#60	59.2			
#100	44.7			
#140	42.9			
#200	41.2			

* (no specification provided)

Material Description

Silty sand

Atterberg Limits

PL= NP
LL= NP
PI= NP

Coefficients

D_{90}= 0.5062
D_{85}= 0.4173
D_{60}= 0.2550
D_{50}= 0.1909
D_{30}=
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= SM
AASHTO= A-4(0)

Test Remarks

Nat moisture = 40.1%

Source of Sample: BH-B-04
Sample Number: S10
Sample Date: 6/23

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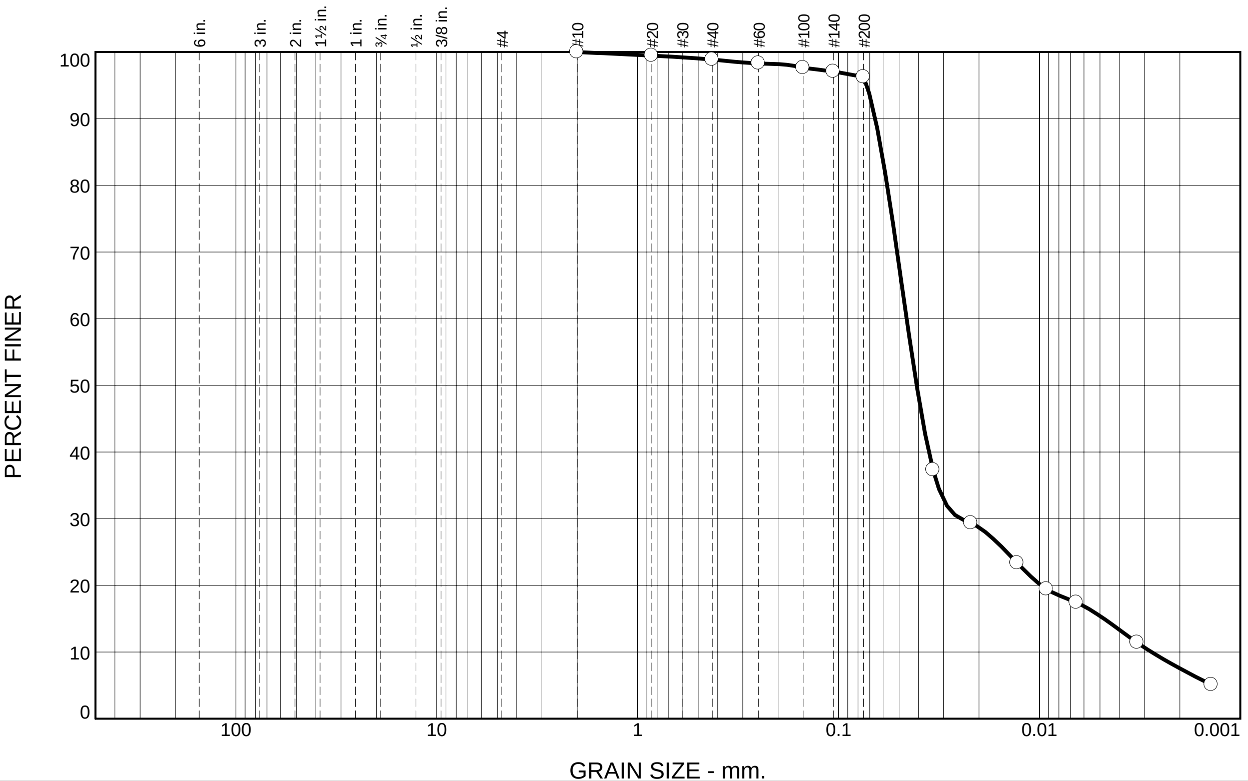
Project: South Market Street Lab Testing
Project No: P20051
Figure

Tested By: ACD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.1	2.7	80.8	15.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.5		
#40	98.9		
#60	98.3		
#100	97.6		
#140	97.1		
#200	96.2		

* (no specification provided)

Material Description

Grey clay

Atterberg Limits

PL= 29   LL= 46   PI= 17

Classification

USCS= ML   AASHTO= A-7-6(20)

Remarks

Nat moisture = 66.1%

Source of Sample: BW-B-01   **Depth:** 10.0
Sample Number: S-5   **Date:** 7/13

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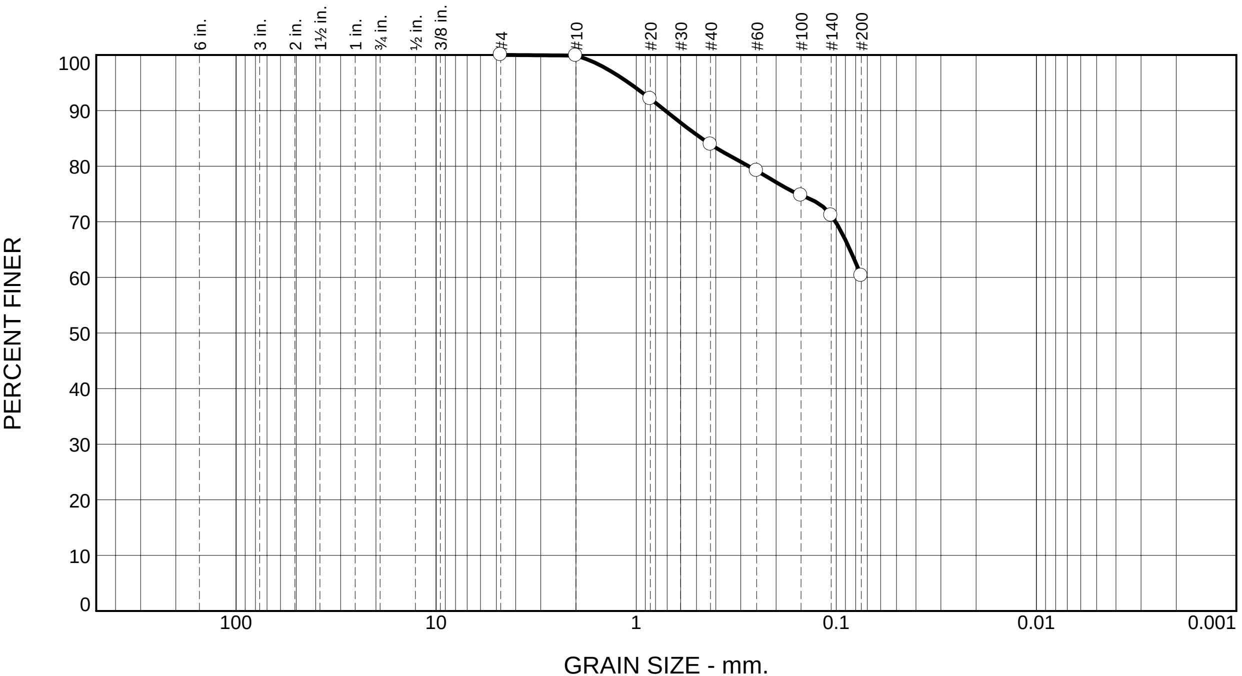
Client:
Project: South Market Street Lab Testing

Project No: P20051   **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	16.0	23.6	60.3	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.9		
#20	92.1		
#40	83.9		
#60	79.2		
#100	74.8		
#140	71.2		
#200	60.3		

* (no specification provided)

Material Description

Grey silty sand

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** 35 **PI=** NP

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.7158 D_{85}= 0.4711 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Nat moisture = 49.9%

Date Received: 7/17 **Date Tested:** 7/24
Tested By: cs
Checked By:
Title:

Source of Sample: BW-B-01 **Depth:** 23.5 **Date Sampled:** 7/13
Sample Number: S-10

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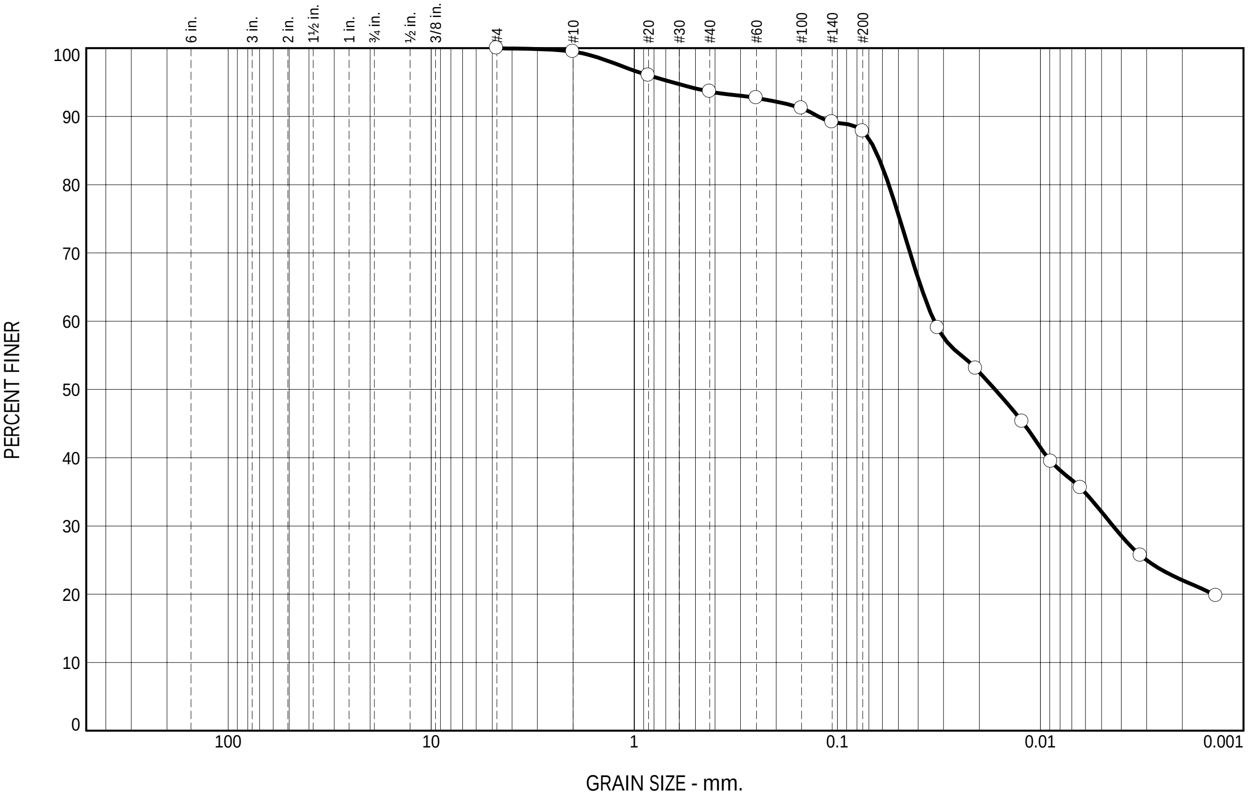
Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.5	5.9	5.8	55.7	32.1

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
#4	100.0			
#10	99.5			
#20	96.0			96.5
#40	93.6			94.1
#60	92.7			93.2
#100	91.2			91.7
#140	89.2			89.6
#200	87.8			88.3
0.0321 mm.	59.0			
0.0208 mm.	53.1			
0.0123 mm.	45.3			
0.0089 mm.	39.4			
0.0063 mm.	35.6			
0.0032 mm.	25.7			
0.0014 mm.	19.8			

* (no specification provided)

Material Description

Fat clay

Atterberg Limits

PL= 33　LL= 79　PI= 46

Coefficients

D_{90}= 0.1241　D_{85}= 0.0649　D_{60}= 0.0333
D_{50}= 0.0167　D_{30}= 0.0044　D_{15}=
D_{10}=　C_u=　C_c=

Classification

USCS= CH　AASHTO= A-7-5(47)

Test Remarks

Nat moisture = 49.0%

Source of Sample: EMB-B-01　Depth: 5-6.5
Sample Number: S3　Sample Date: 6/23

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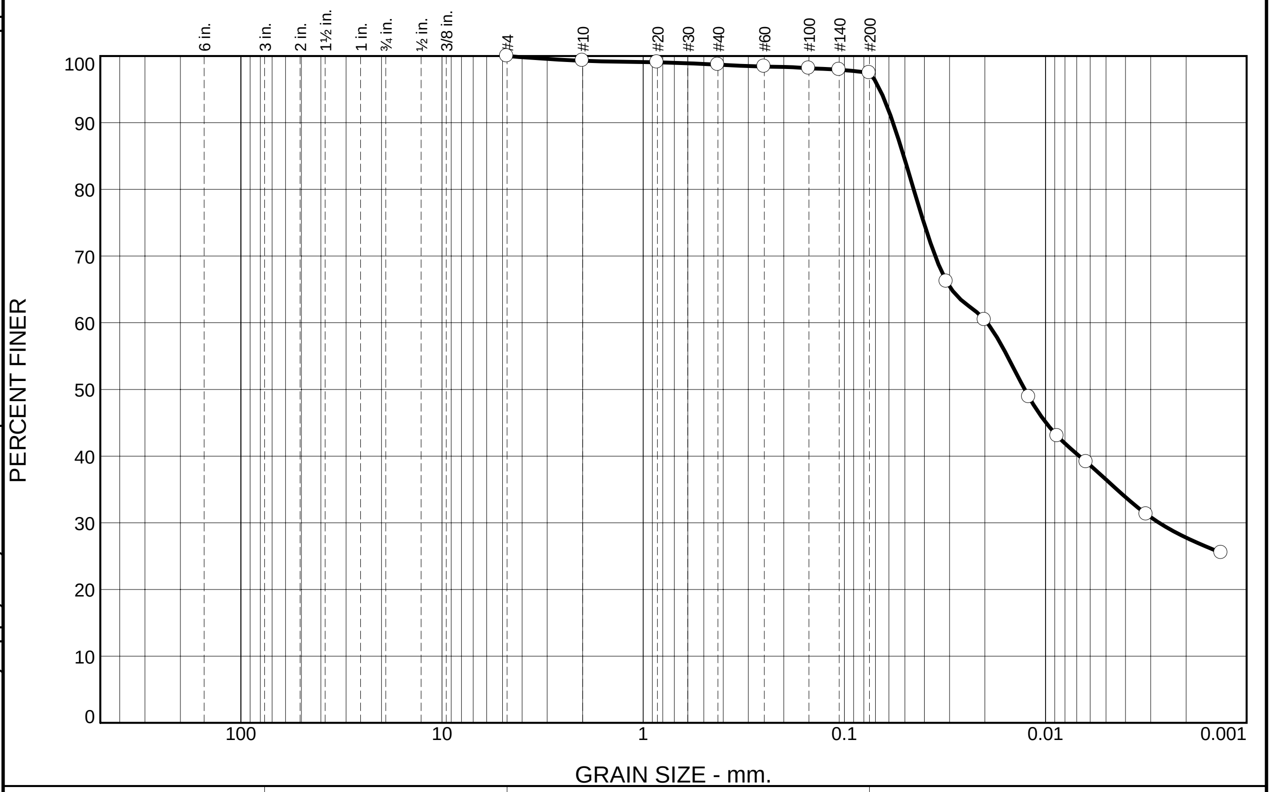
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051　Figure

Tested By: ACD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.7	0.6	1.2	61.0	36.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.3		
#20	99.1		
#40	98.7		
#60	98.4		
#100	98.1		
#140	97.9		
#200	97.5		

* (no specification provided)

Material Description

Black fat clay

Atterberg Limits

PL= 33 LL= 80 PI= 47

Coefficients

D_{90}= 0.0572 D_{85}= 0.0507 D_{60}= 0.0195
D_{50}= 0.0127 D_{30}= 0.0027 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(56)

Remarks

Nat moisture = 43.7%

Source of Sample: EMB-B-01 **Depth:** 13-15
Sample Number: T-1 **Date:** 7/7

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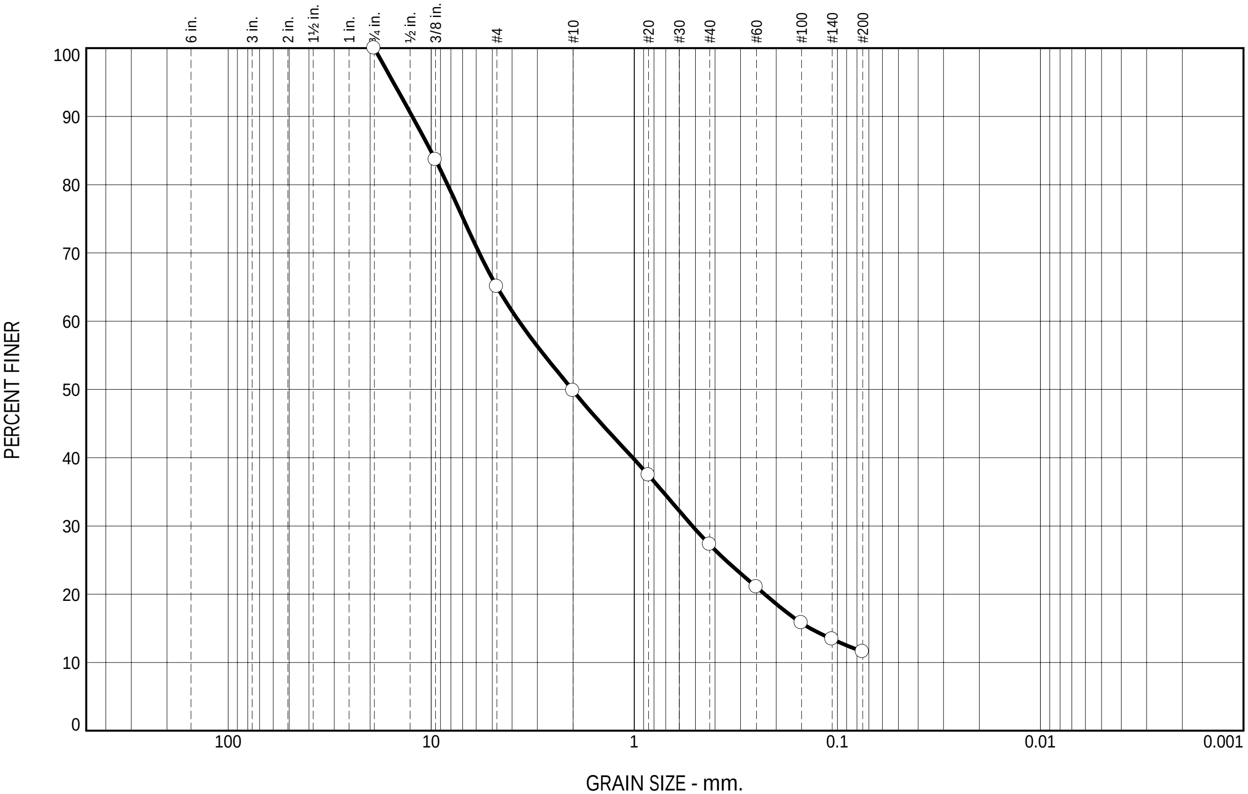
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: ACD

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	34.9	15.3	22.5	15.7	11.6	

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
.75	100.0			
.375	83.6			
#4	65.1			
#10	49.8			
#20	37.4			
#40	27.3			
#60	21.0			
#100	15.8			
#140	13.4			
#200	11.6			

* (no specification provided)

Material Description

Poorly graded sand w/silt and gravel

Atterberg Limits

PL= NP	LL= NP	PI= NP

Coefficients

D_{90}= 12.3915	D_{85}= 10.0628	D_{60}= 3.7002
D_{50}= 2.0238	D_{30}= 0.5174	D_{15}= 0.1360
D_{10}=	C_u=	C_c=

Classification

USCS= SP-SM AASHTO= A-1-a

Test Remarks

Nat moisture = 9.6%

Source of Sample: EMB-B-01
Sample Number: S11

Sample Date: 7/23

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Philadelphia, Pennsylvania

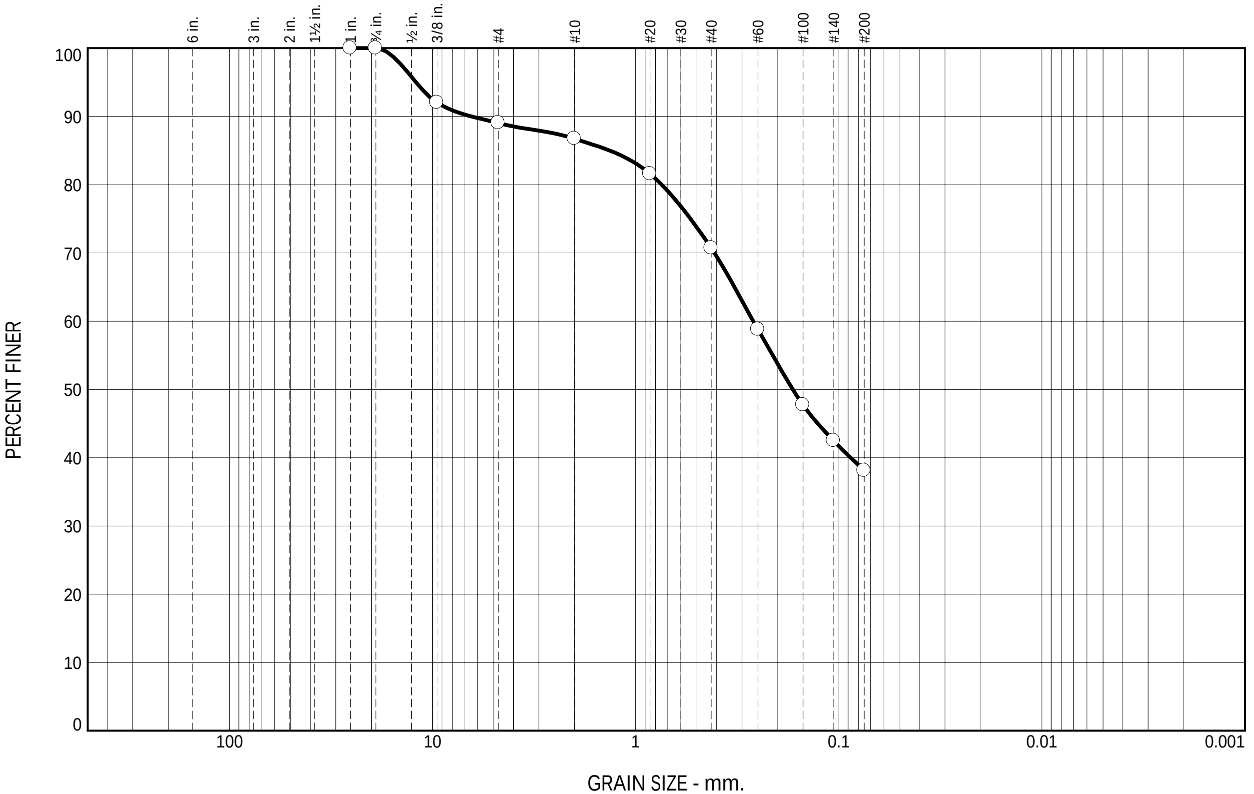
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051

Figure

Tested By: ACD

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	11.0	2.3	16.0	32.6	38.1	

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
1	100.0			
.75	100.0			
.375	92.0			
#4	89.0			
#10	86.7			
#20	81.6			
#40	70.7			
#60	58.8			
#100	47.7			
#140	42.5			
#200	38.1			

* (no specification provided)

Material Description

Silty sand

Atterberg Limits

PL= 34 LL= 57 PI= 23

Coefficients

D_{90}= 6.4610 D_{85}= 1.3425 D_{60}= 0.2640
D_{50}= 0.1686 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-7-5(4)

Test Remarks

Nat moisture = 32.6%

Source of Sample: EMB-B-01
Sample Number: S12
Sample Date: 6/23

HILLIS-CARNES ENGINEERING ASSOCIATES

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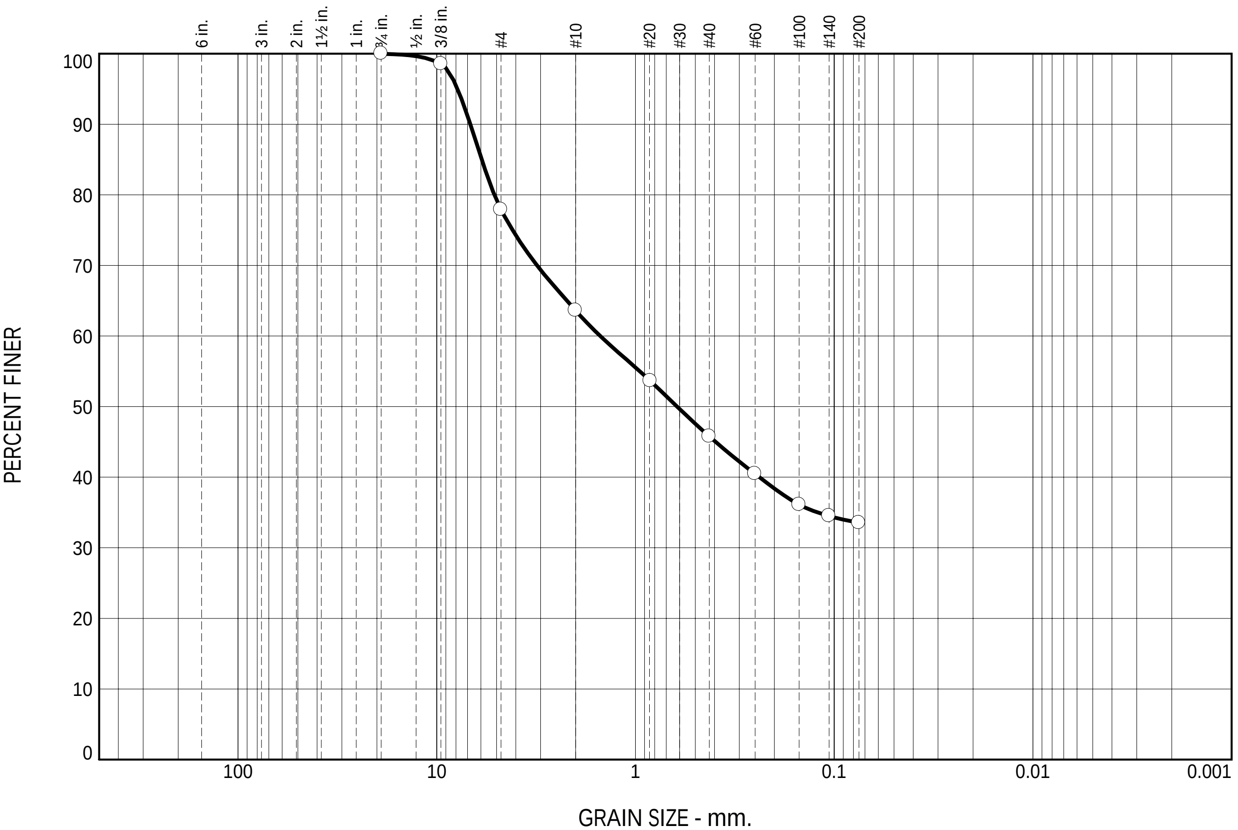
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 Figure

Tested By: ACD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	22.1	14.3	17.8	12.3	33.5	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	98.5		
#4	77.9		
#10	63.6		
#20	53.6		
#40	45.8		
#60	40.5		
#100	36.1		
#140	34.5		
#200	33.5		

* (no specification provided)

Soil Description

Sily Sand w/gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 6.7735 D_{85}= 5.9341 D_{60}= 1.5035
D_{50}= 0.6168 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Natural Moisture = 14.2%

Source of Sample: EMB-B-02 Depth: 7.5-9.0
Sample Number: S-4 Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

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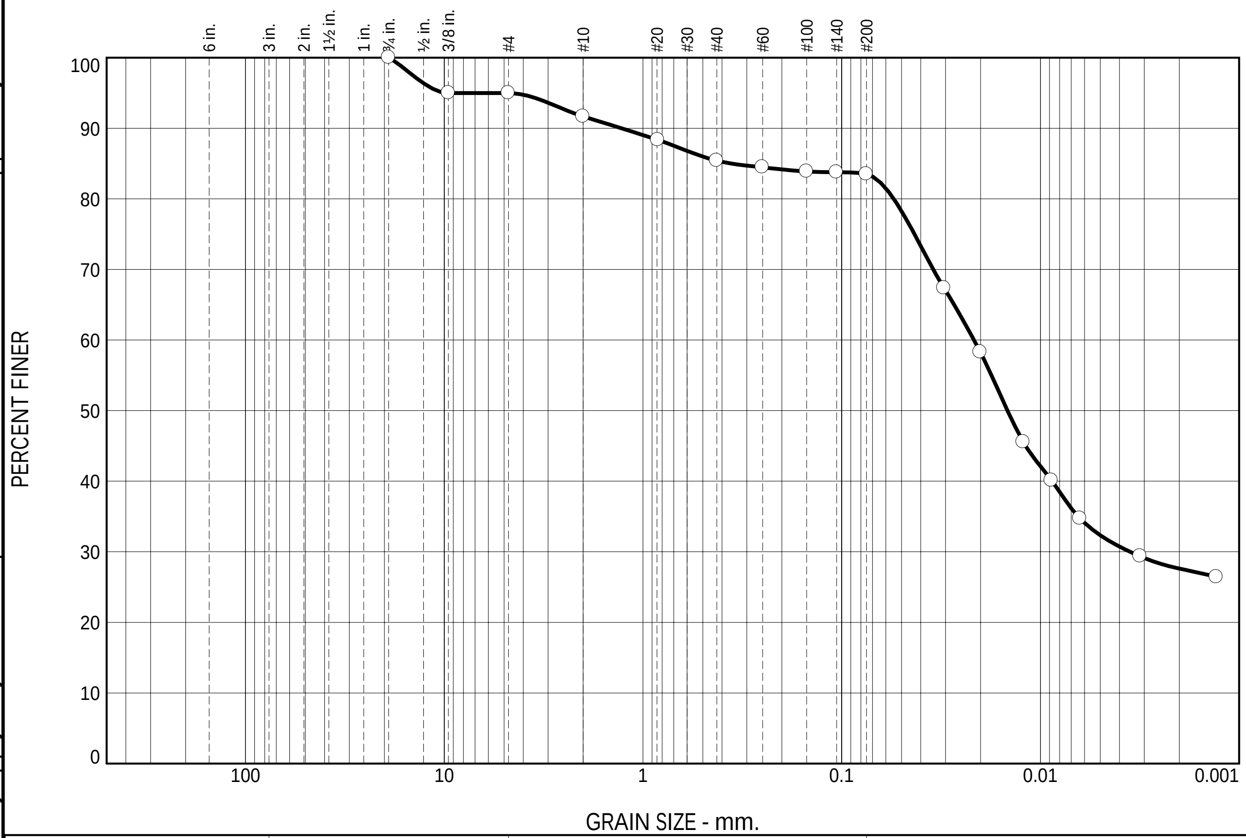
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.0	3.3	6.3	1.9	51.2	32.3

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	95.0		
#4	95.0		
#10	91.7		
#20	88.3		
#40	85.4		
#60	84.5		
#100	83.9		
#140	83.8		
#200	83.5		
0.0305 mm.	67.4		
0.0201 mm.	58.3		
0.0122 mm.	45.6		
0.0088 mm.	40.1		
0.0063 mm.	34.7		
0.0031 mm.	29.4		
0.0013 mm.	26.4		

* (no specification provided)

Soil Description

Fat Clay w/sand

Atterberg Limits

PL= 32 LL= 83 PI= 51

Coefficients

D_{90}= 1.2858 D_{85}= 0.3604 D_{60}= 0.0216
D_{50}= 0.0146 D_{30}= 0.0035 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(49)

Remarks

Natural Moisture = 48.1%

Source of Sample: EMB-B-02 Depth: 17.0
Sample Number: T-1
Date: 1/25

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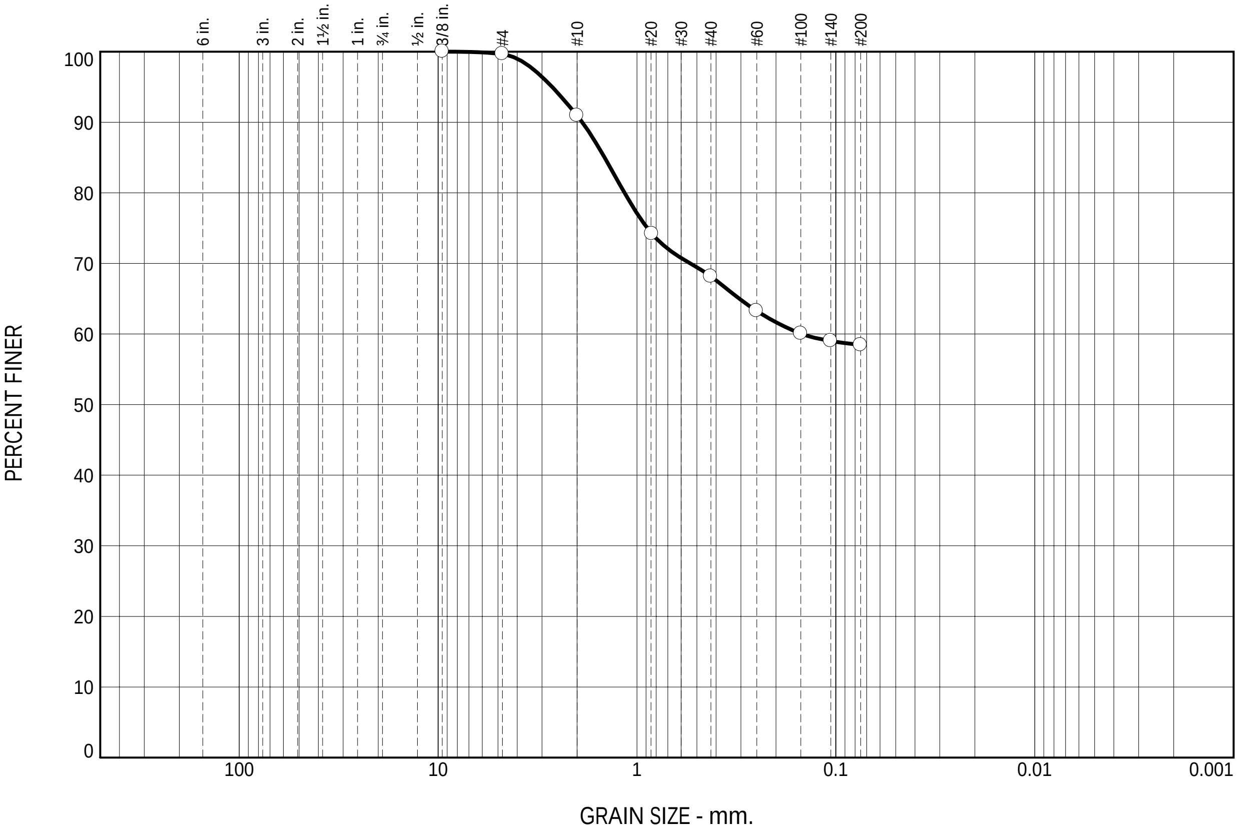
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	8.8	22.8	9.7	58.4	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.7		
#10	90.9		
#20	74.2		
#40	68.1		
#60	63.3		
#100	60.1		
#140	59.0		
#200	58.4		

* (no specification provided)

Soil Description

Sandy Fat Clay

Atterberg Limits

PL= 31 LL= 117 PI= 86

Coefficients

D_{90}= 1.8824 D_{85}= 1.4549 D_{60}= 0.1483
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(46)

Remarks

Natural Moisture = 64.0%

Source of Sample: EMB-B-02 Depth: 38.5-40.0
Sample Number: S-12
Date:

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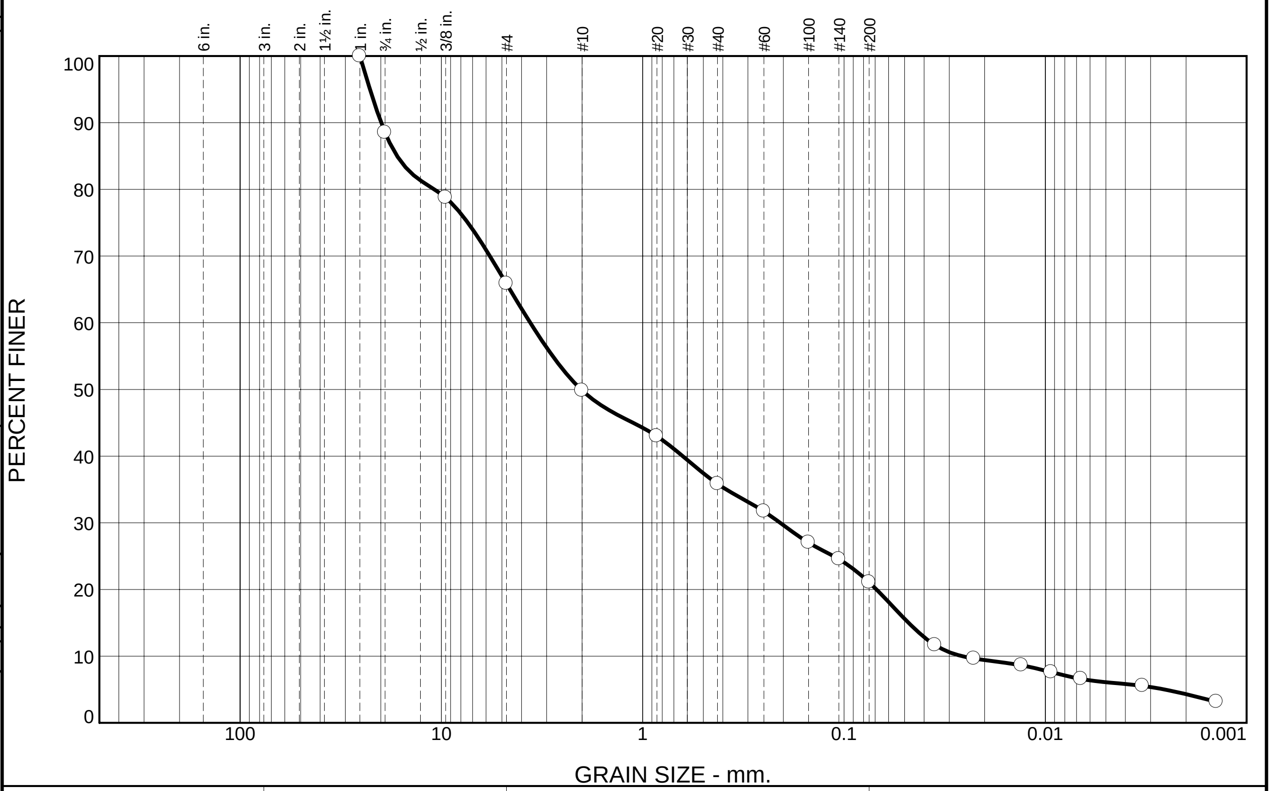
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.5	22.6	16.1	14.0	14.7	15.0	6.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	88.5		
.375	78.8		
#4	65.9		
#10	49.8		
#20	43.0		
#40	35.8		
#60	31.7		
#100	27.0		
#140	24.5		
#200	21.1		

* (no specification provided)

Material Description

Silty sand with gravel Strong organic odor

Atterberg Limits

PL= NP
LL= NP
PI= NP

Coefficients

D_{90}= 19.9171
D_{85}= 16.5923
D_{60}= 3.6182
D_{50}= 2.0255
D_{30}= 0.2077
D_{15}= 0.0478
D_{10}= 0.0259
C_u= 139.65
C_c= 0.46

Classification

USCS= SM
AASHTO= A-1-b

Remarks

Nat mositure = 24.2%

Source of Sample: HW-B-01 **Depth:** 5-6.5
Sample Number: S-3
Date: 7/9

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Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051
Figure

Tested By: ACD

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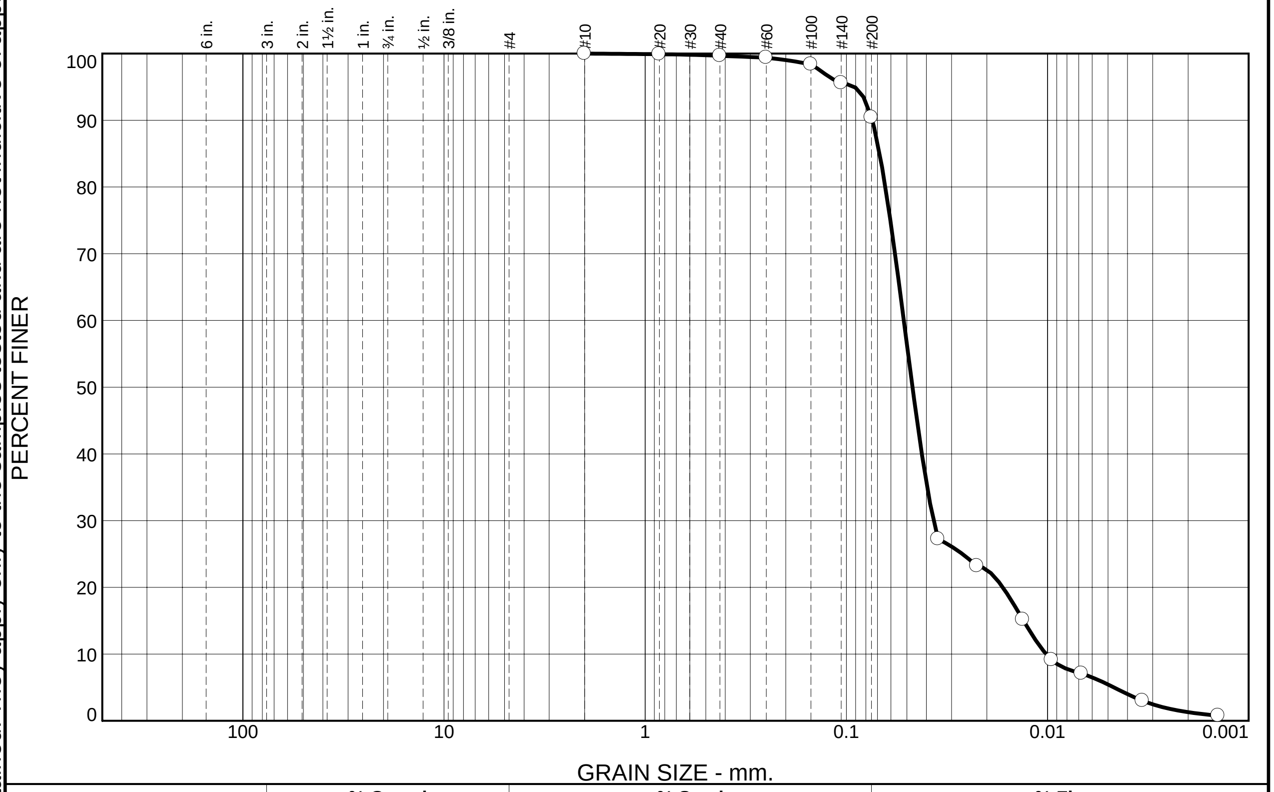
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.3	9.3	85.0	5.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.9		
#40	99.7		
#60	99.4		
#100	98.4		
#140	95.6		
#200	90.4		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0743 D_{85}= 0.0683 D_{60}= 0.0518
D_{50}= 0.0469 D_{30}= 0.0369 D_{15}= 0.0132
D_{10}= 0.0102 C_u= 5.10 C_c= 2.58

Classification

USCS= AASHTO=

Remarks

Nat moisture = 54.5%

Source of Sample: HW-B-01 **Depth:** 18.5-20
Sample Number: S-8 **Date:** 6/29

HILLIS-CARNES ENGINEERING ASSOCIATES

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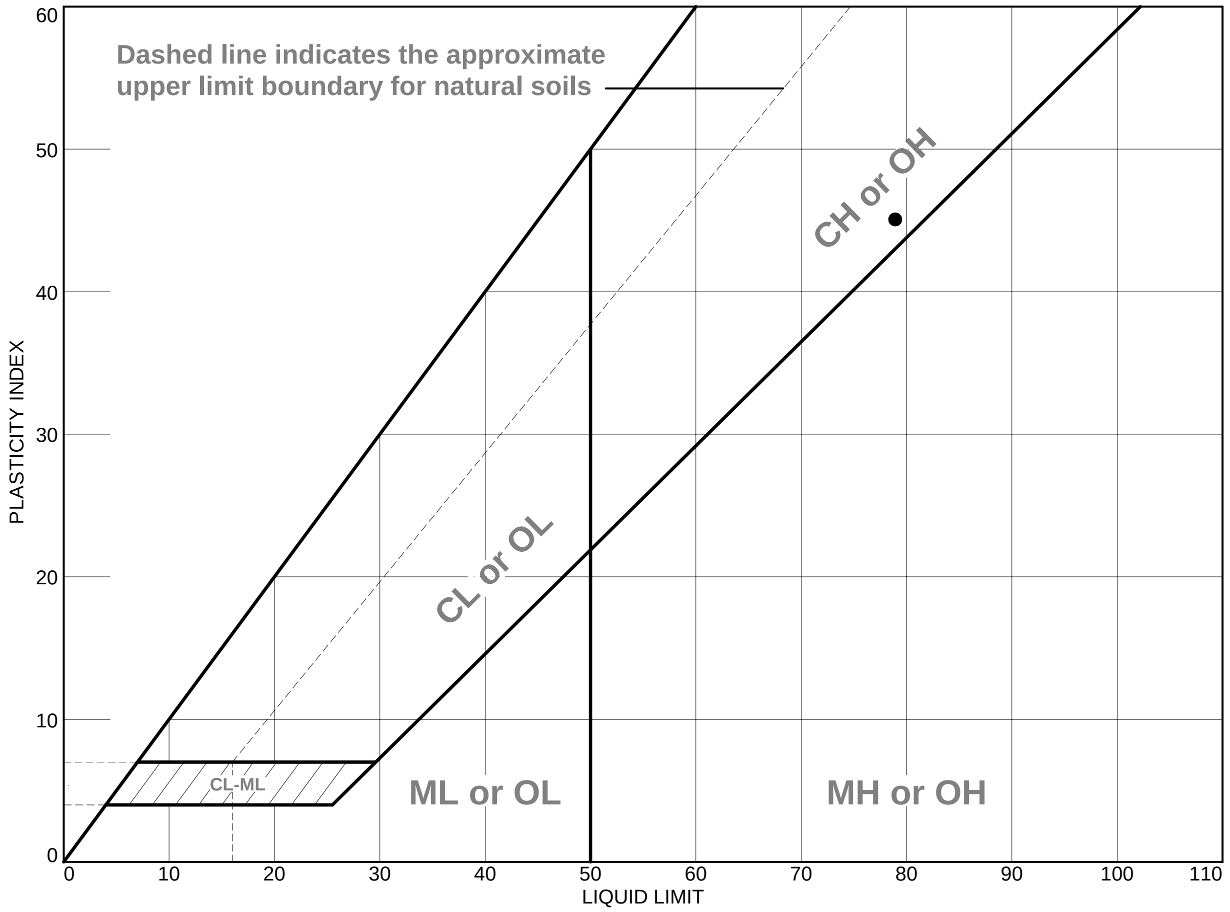
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: cs

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Fat clay	79	34	45	99.7	90.4	CH

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

●**Source of Sample:** HW-B-01 **Depth:** 18.5-20 **Sample Number:** S-8

Remarks:

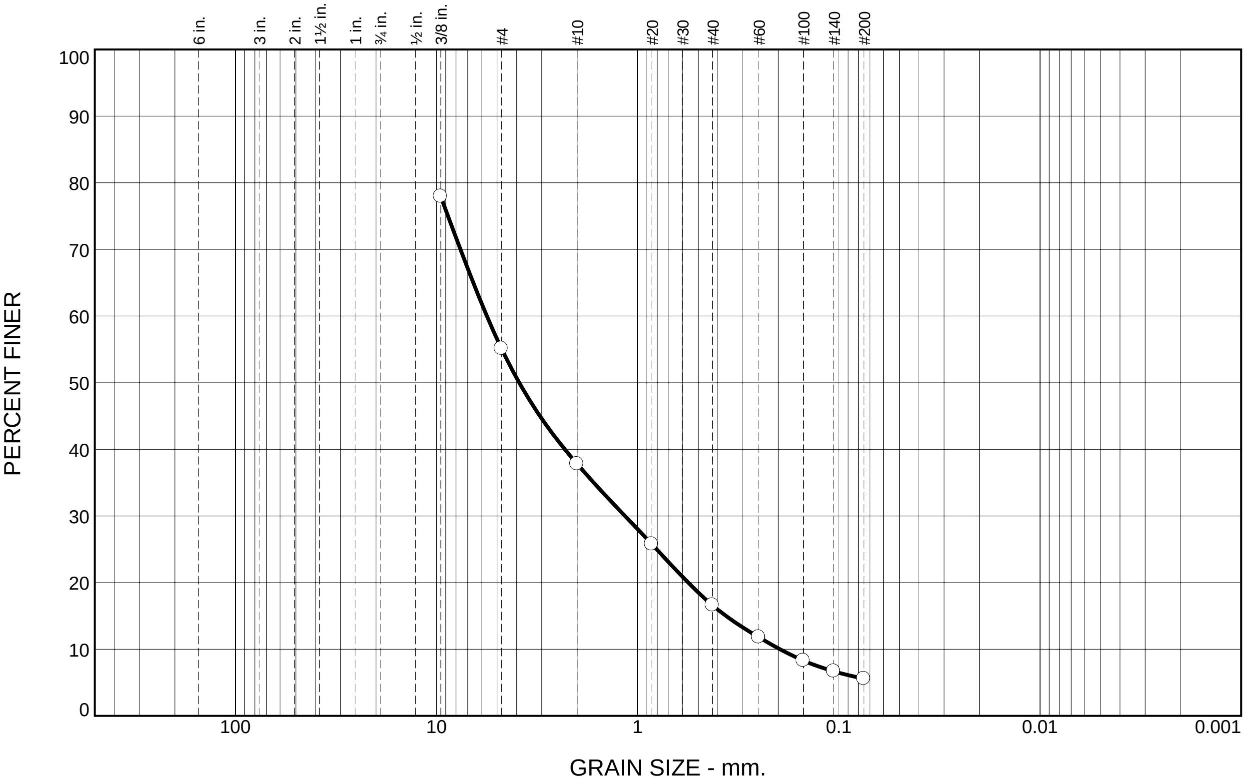
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Figure

Tested By: ad

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
		44.9	17.3	21.2	11.0	5.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	77.9		
#4	55.1		
#10	37.8		
#20	25.8		
#40	16.6		
#60	11.8		
#100	8.3		
#140	6.7		
#200	5.6		

* (no specification provided)

Material Description

Well graded sand w/silt and gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}=	D_{85}=	D_{60}= 5.6181
D_{50}= 3.8814	D_{30}= 1.1565	D_{15}= 0.3640
D_{10}= 0.1962	C_u= 28.64	C_c= 1.21

Classification

USCS= SW-SM AASHTO= A-1-a

Remarks

Nat moisture = 8.2%

Source of Sample: HW-B-01 **Depth:** 38.5-40
Sample Number: S-12 **Date:** 6/29

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: ACD

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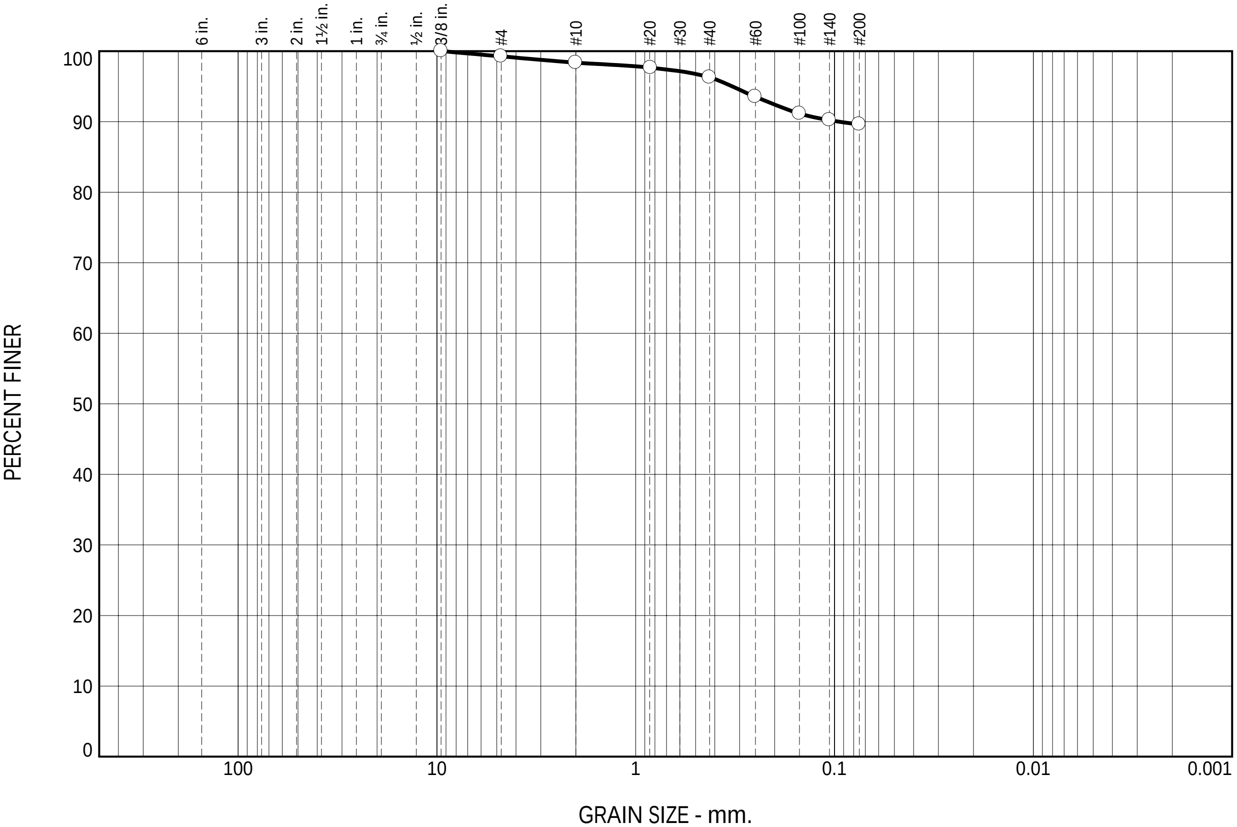
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	0.9	2.1	6.7	89.6	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.3		
#10	98.4		
#20	97.6		
#40	96.3		
#60	93.5		
#100	91.1		
#140	90.2		
#200	89.6		

* (no specification provided)

Soil Description

Fat Clay

Atterberg Limits

PL= 34 LL= 79 PI= 45

Coefficients

D_{90}= 0.0954 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(48)

Remarks

Natural Moisture = 51.4%

Source of Sample: HW-B-02 Depth: 7.5-9.0
Sample Number: S-4 Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

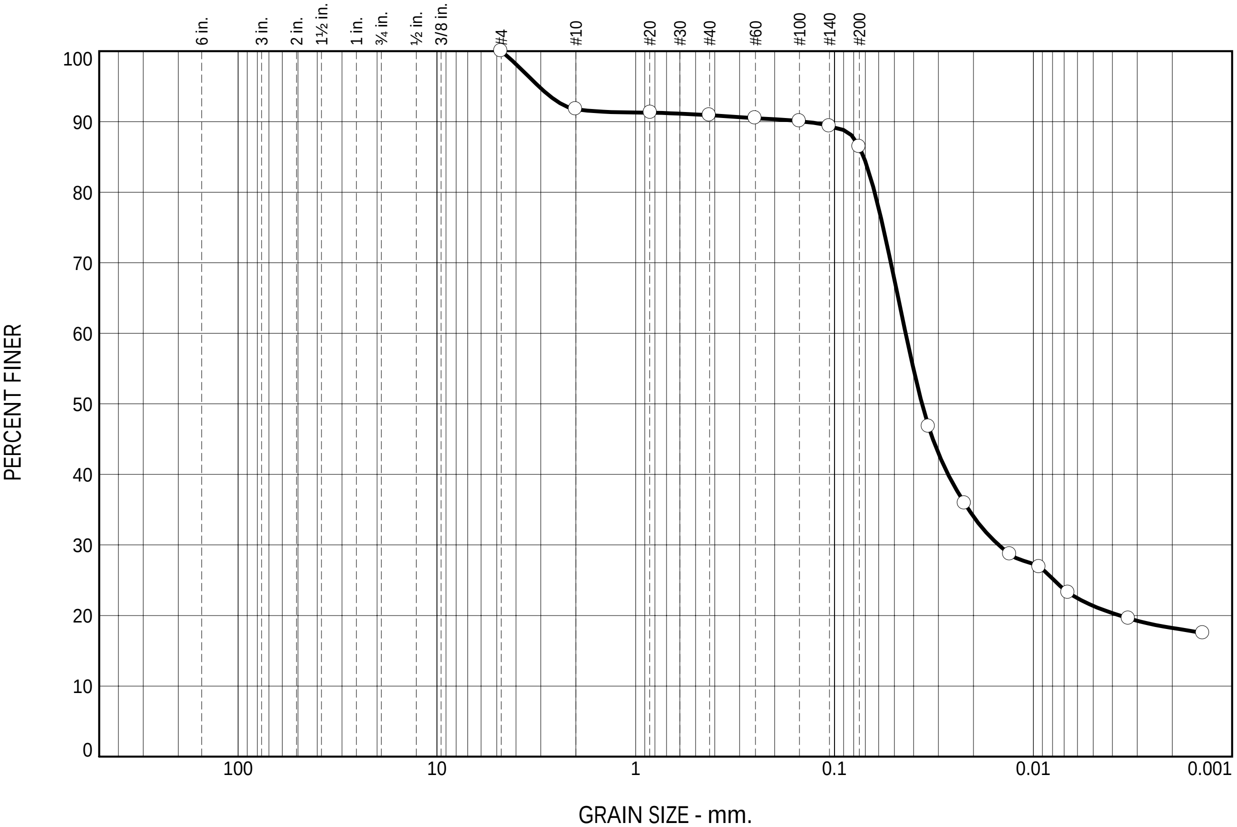
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	8.2	0.9	4.5	65.0	21.4

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	91.8		
#20	91.3		
#40	90.9		
#60	90.5		
#100	90.1		
#140	89.3		
#200	86.4		
0.0336 mm.	46.8		
0.0222 mm.	35.9		
0.0131 mm.	28.7		
0.0093 mm.	26.9		
0.0067 mm.	23.3		
0.0033 mm.	19.6		
0.0014 mm.	17.5		

* (no specification provided)

Soil Description

Fat Clay

Atterberg Limits

PL= 26 LL= 64 PI= 38

Coefficients

D_{90}= 0.1435	D_{85}= 0.0713	D_{60}= 0.0439
D_{50}= 0.0363	D_{30}= 0.0149	D_{15}=
D_{10}=	C_u=	C_c=

Classification

USCS= CH AASHTO= A-7-6(36)

Remarks

Natural Moisture = 54.7%

Source of Sample: HW-B-02 Depth: 17.5-19.0
Sample Number: S-8
Date:

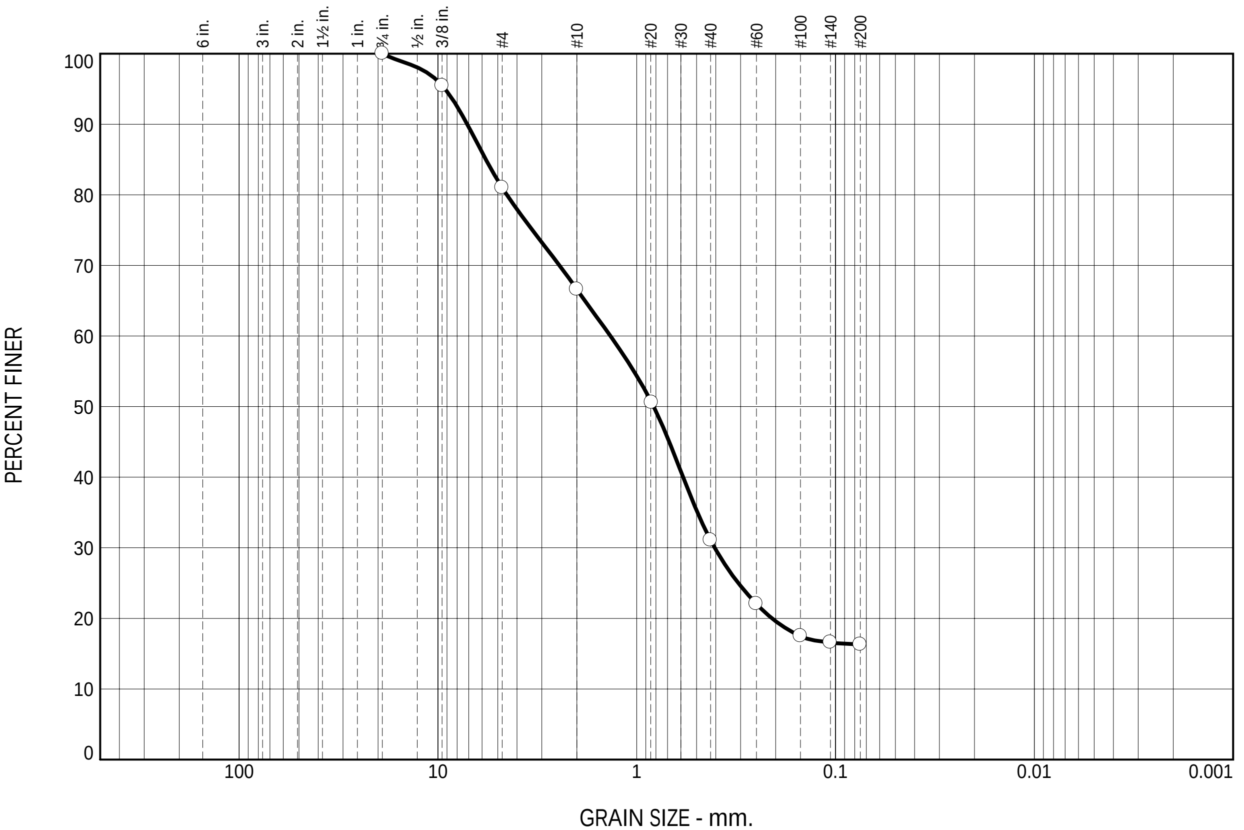
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	19.0	14.4	35.5	14.8	16.3	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	95.4		
#4	81.0		
#10	66.6		
#20	50.6		
#40	31.1		
#60	22.1		
#100	17.5		
#140	16.6		
#200	16.3		

* (no specification provided)

Soil Description

Clayey Sand w/gravel

Atterberg Limits

PL= 27 LL= 88 PI= 61

Coefficients

D_{90}= 7.1211 D_{85}= 5.7369 D_{60}= 1.3555
D_{50}= 0.8215 D_{30}= 0.4053 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-7(1)

Remarks

Natural Moisture = 25.2%

Source of Sample: HW-B-02 Depth: 38.5-40.0
Sample Number: S-12
Date:

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Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

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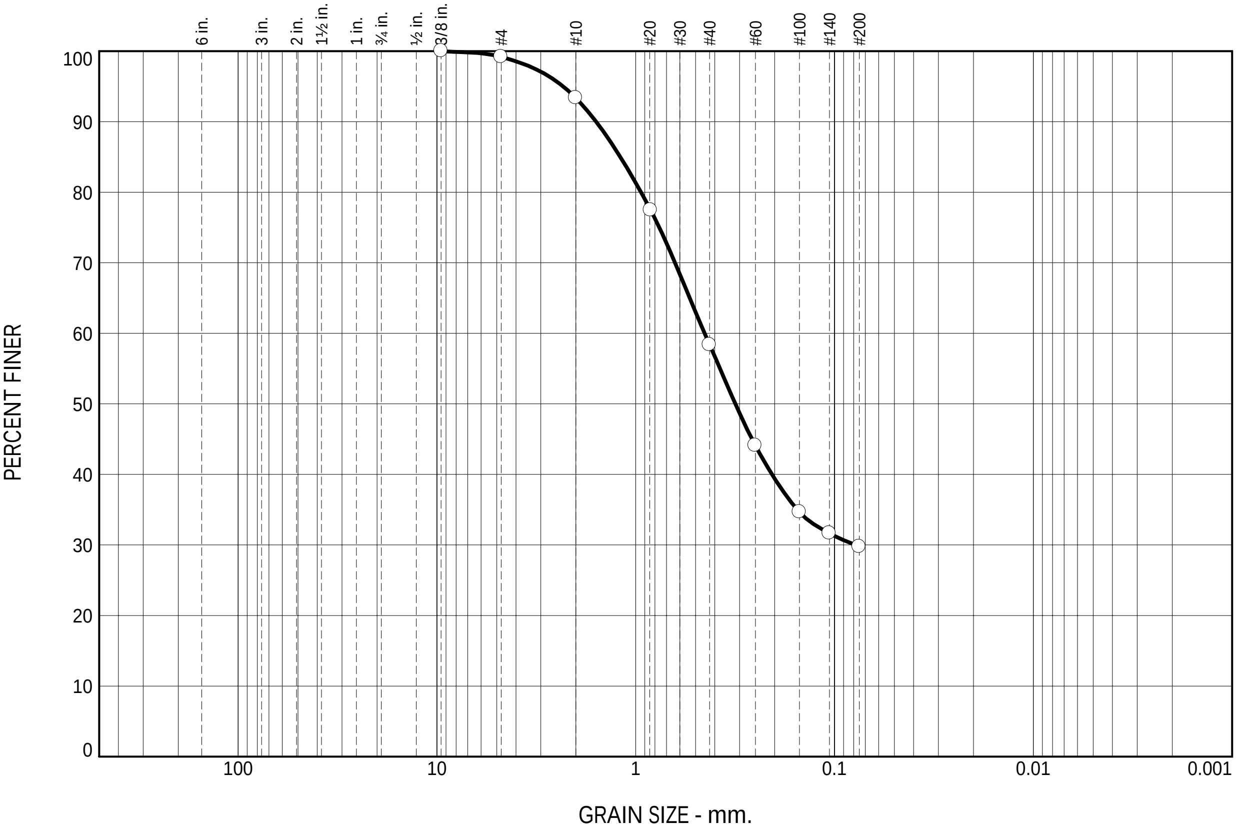
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.8	5.9	34.9	28.6	29.8	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.2		
#10	93.3		
#20	77.5		
#40	58.4		
#60	44.1		
#100	34.7		
#140	31.7		
#200	29.8		

* (no specification provided)

Soil Description

Clayey Sand

Atterberg Limits

PL= 19
LL= 40
PI= 21

Coefficients

D_{90}= 1.5826
D_{85}= 1.1955
D_{60}= 0.4506
D_{50}= 0.3154
D_{30}= 0.0785
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= SC
AASHTO= A-2-6(2)

Remarks

Natural Moisture = 20.7%

Source of Sample: HW-B-02 Depth: 48.5-50.0
Sample Number: S-14
Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

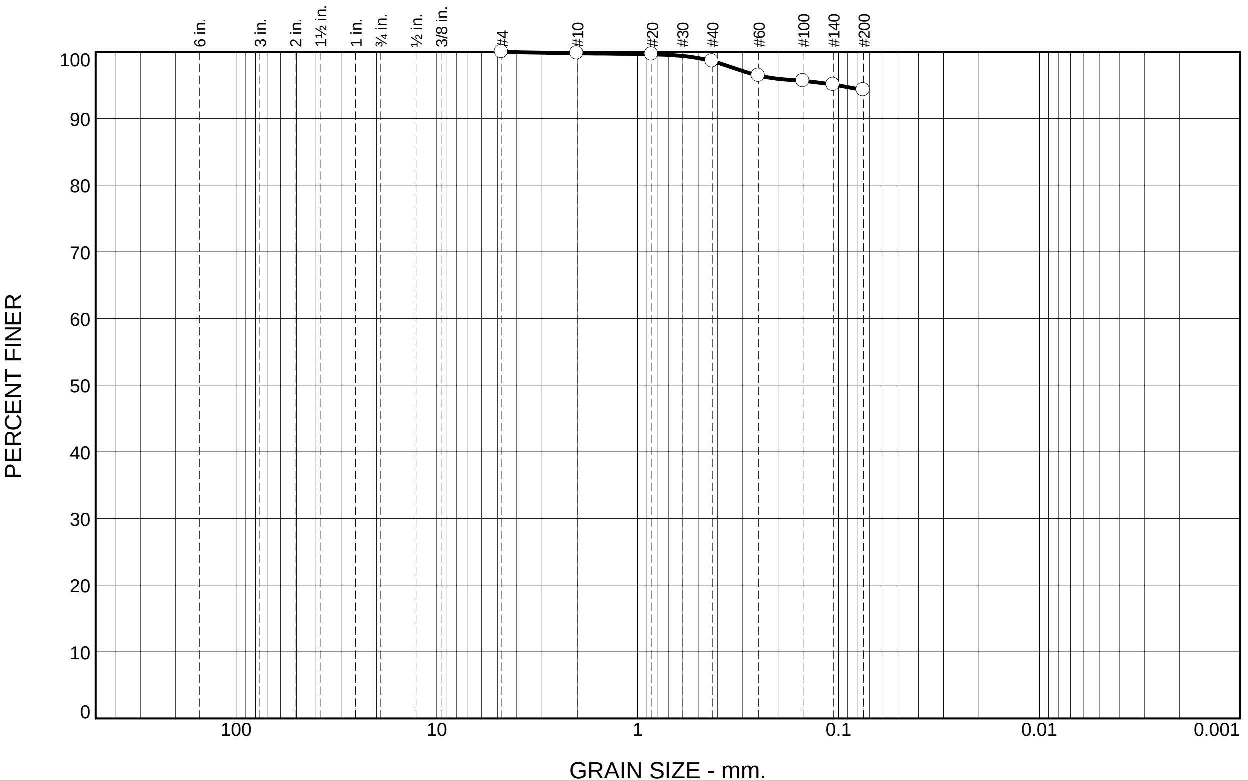
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: cs/ad

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	1.2	4.3	94.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	99.6		
#40	98.6		
#60	96.4		
#100	95.6		
#140	95.1		
#200	94.3		

* (no specification provided)

Material Description

Grey silt

Atterberg Limits

PL= 31 LL= 48 PI= 17

Classification

USCS= ML AASHTO= A-7-5(20)

Remarks

Nat moisture = 61.6%

Source of Sample: LOT-A1-01 **Depth:** 13.5
Sample Number: S-5 **Date:**

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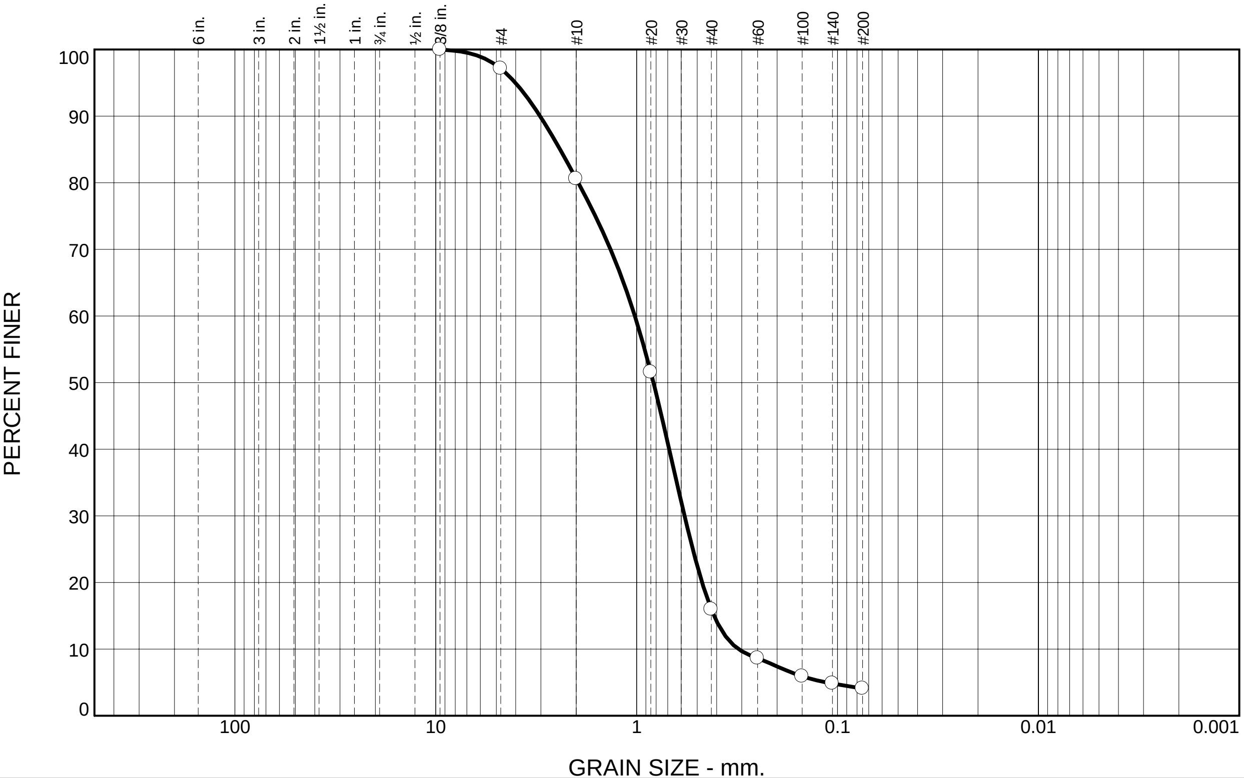
Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.9	16.5	64.6	11.9	4.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	97.1		
#10	80.6		
#20	51.6		
#40	16.0		
#60	8.6		
#100	5.9		
#140	4.8		
#200	4.1		

* (no specification provided)

Material Description

Grey, brown poorly graded sand

Atterberg Limits

PL= NP LL= NP PI= NP

Classification

USCS= SP AASHTO= A-1-b

Remarks

Nat moisture = 15.2%

Source of Sample: LOT-A1-01 **Depth:** 38.5
Sample Number: S-10 **Date:** 9/14

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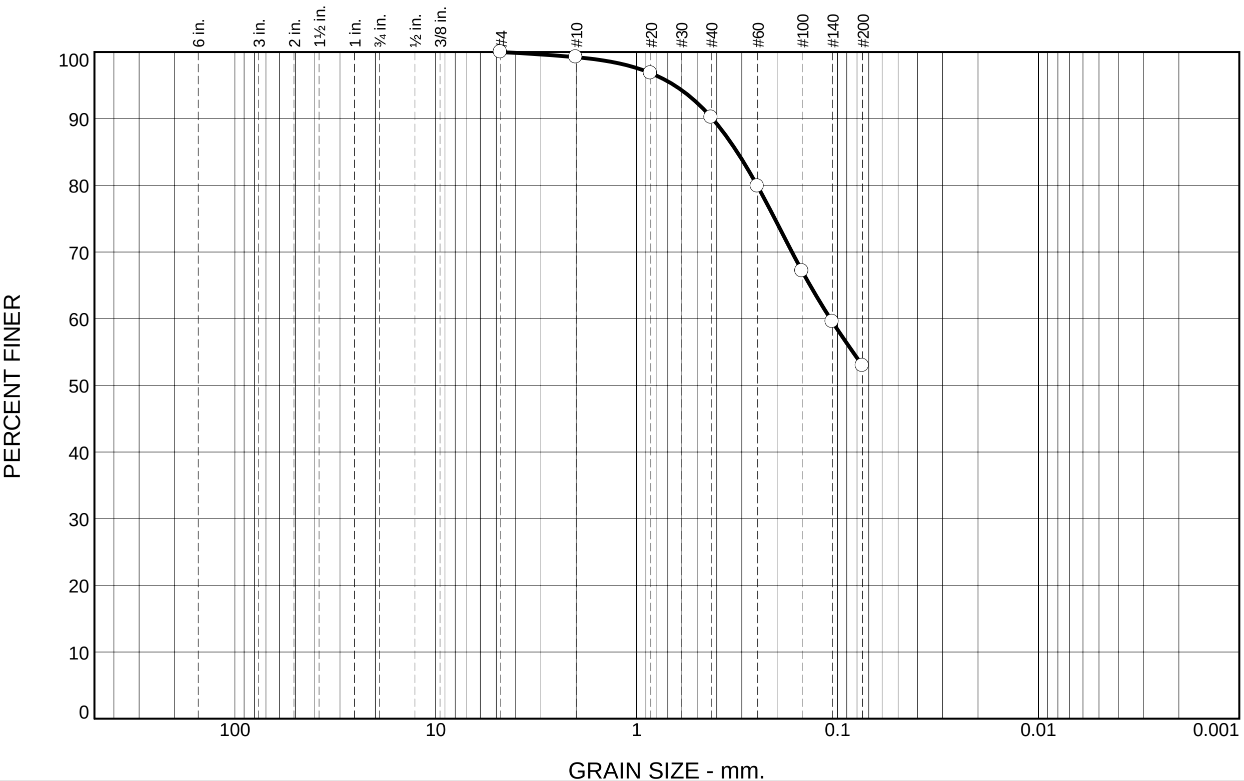
Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.8	9.0	37.3	52.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.2		
#20	96.8		
#40	90.2		
#60	79.9		
#100	67.1		
#140	59.5		
#200	52.9		

* (no specification provided)

Material Description

Grey, brown, blue sandy silt

Atterberg Limits

PL= NP LL= 39 PI= NP

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Nat moisture = 25.4%

Source of Sample: LOT-A1-01 **Depth:** 53.5
Sample Number: S-13 **Date:** 9/14

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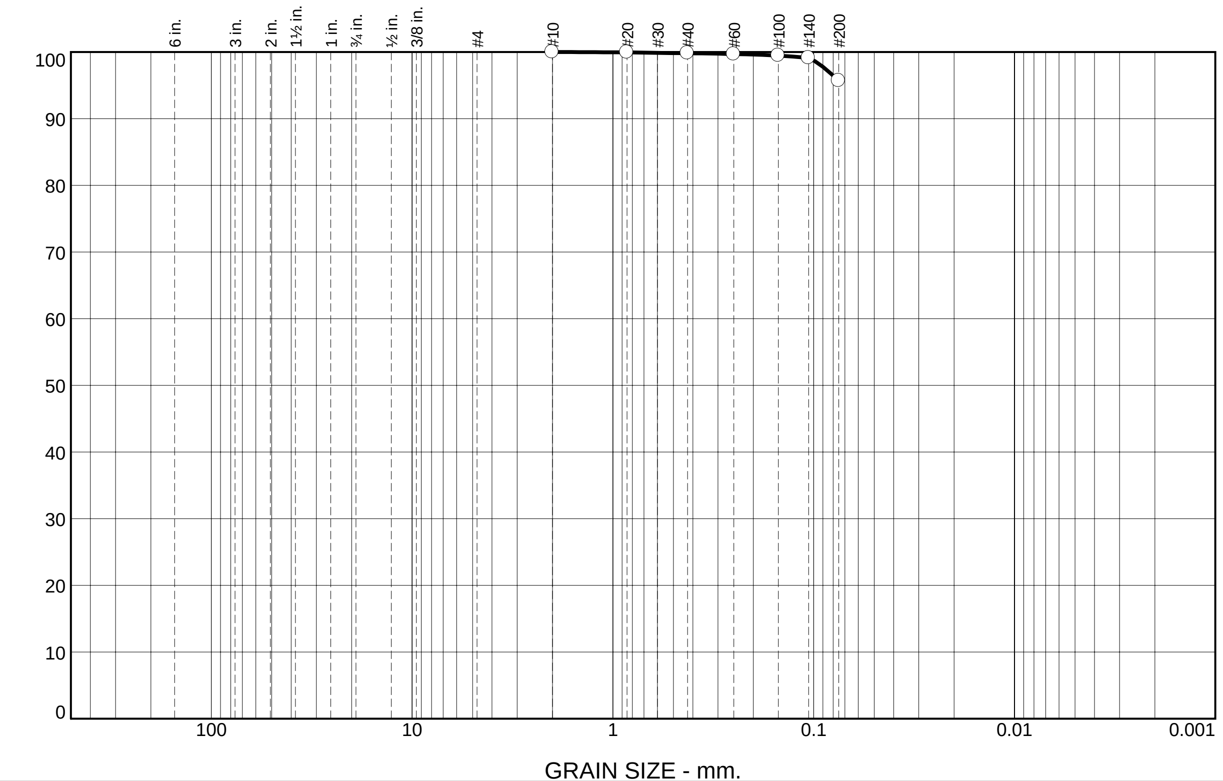
Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	4.1	95.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.9		
#40	99.8		
#60	99.7		
#100	99.5		
#140	99.1		
#200	95.7		

* (no specification provided)

Material Description

Grey lean clay

Atterberg Limits

PL= 24 LL= 40 PI= 16

Classification

USCS= CL AASHTO= A-6(17)

Remarks

Nat moisture = 51.4%

Source of Sample: LOT-A1-02 **Depth:** 8.5
Sample Number: S-4 **Date:**

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Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

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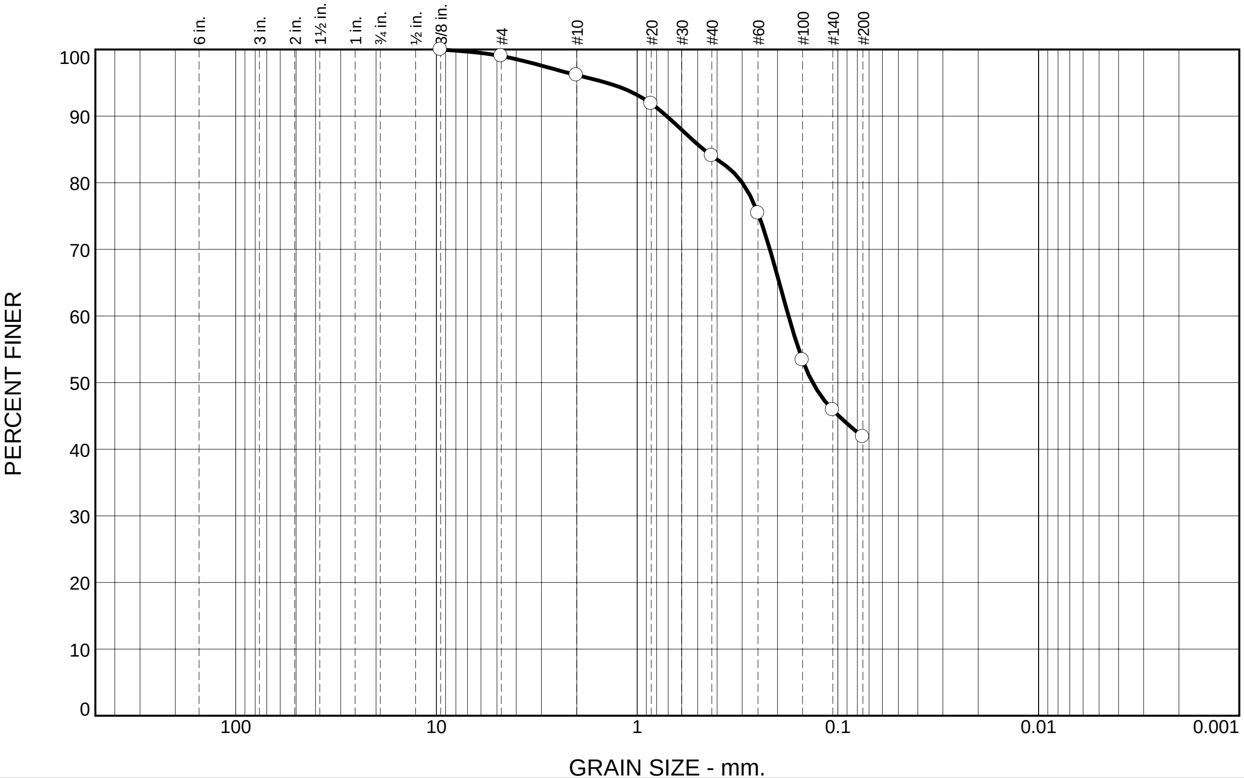
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.0	2.8	12.2	42.1	41.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.0		
#10	96.2		
#20	91.9		
#40	84.0		
#60	75.4		
#100	53.4		
#140	45.9		
#200	41.9		

* (no specification provided)

Material Description

Black silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Classification

USCS= SM AASHTO= A-4(0)

Remarks

nat moisture = 40.2%

Source of Sample: LOT-A1-02 **Depth:** 23.5
Sample Number: S-7 **Date:**

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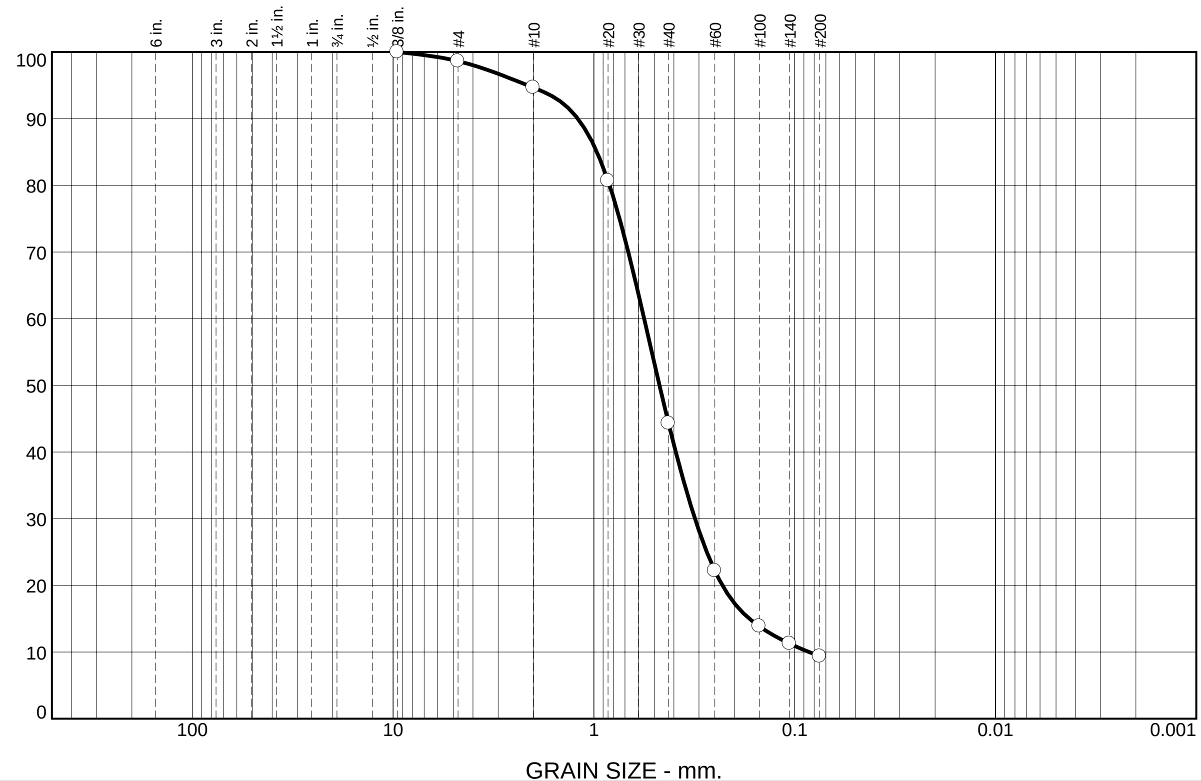
Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.4	3.9	50.4	34.9	9.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	98.6		
#10	94.7		
#20	80.7		
#40	44.3		
#60	22.2		
#100	13.9		
#140	11.3		
#200	9.4		

* (no specification provided)

Material Description

Grey, Brown well-graded sand with silt

Atterberg Limits

PL= NP LL= NP PI= NP

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

Nat moisture = 20.8%

Source of Sample: LOT-A1-02 **Depth:** 38.5
Sample Number: S-10 **Date:**

HILLIS-CARNES ENGINEERING ASSOCIATES

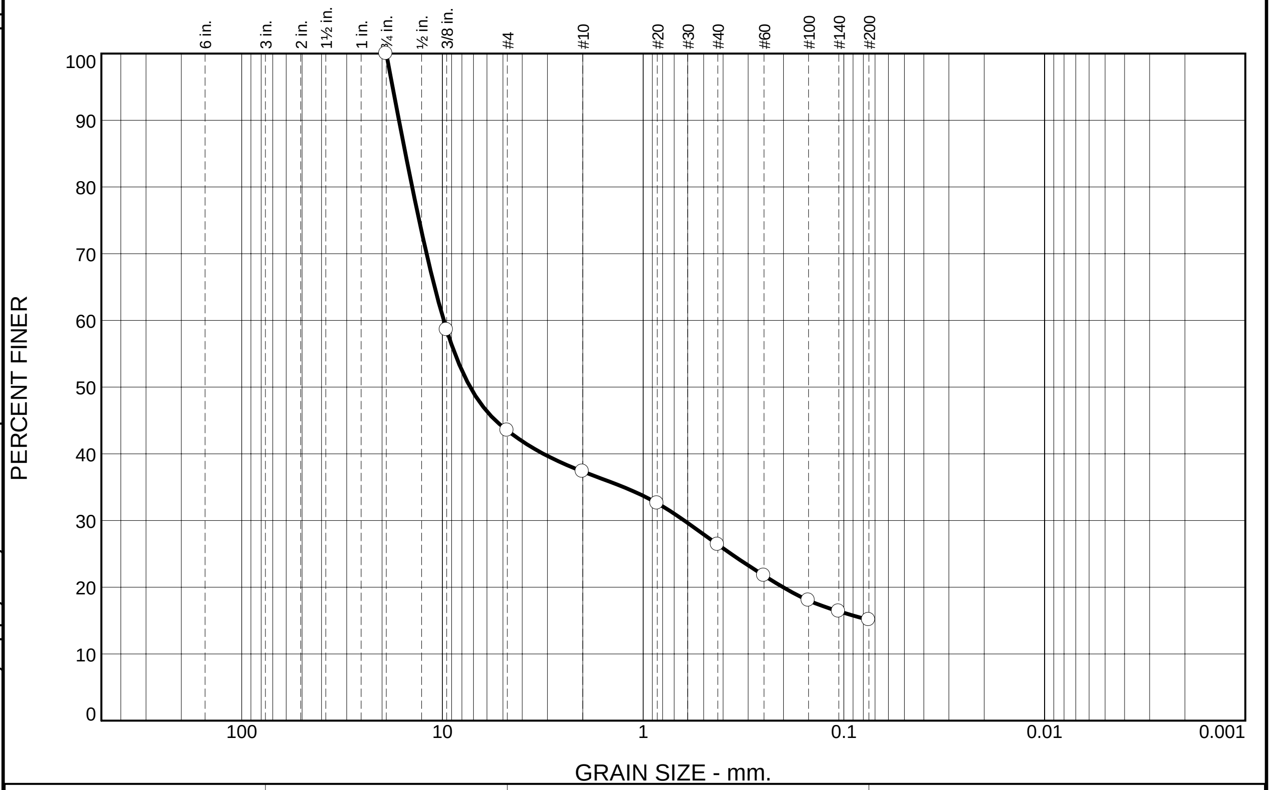
Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	56.5	6.2	10.9	11.3	15.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	58.6		
#4	43.5		
#10	37.3		
#20	32.6		
#40	26.4		
#60	21.8		
#100	18.0		
#140	16.4		
#200	15.1		

* (no specification provided)

Material Description

red silty gravel w/sand

Atterberg Limits

PL= NP LL= 24 PI= NP

Classification

USCS= GM AASHTO= A-1-a

Remarks

Nat moisture = 8.6%

Source of Sample: LOT-A1-03 **Depth:** 5.0
Sample Number: S-3 **Date:**

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Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

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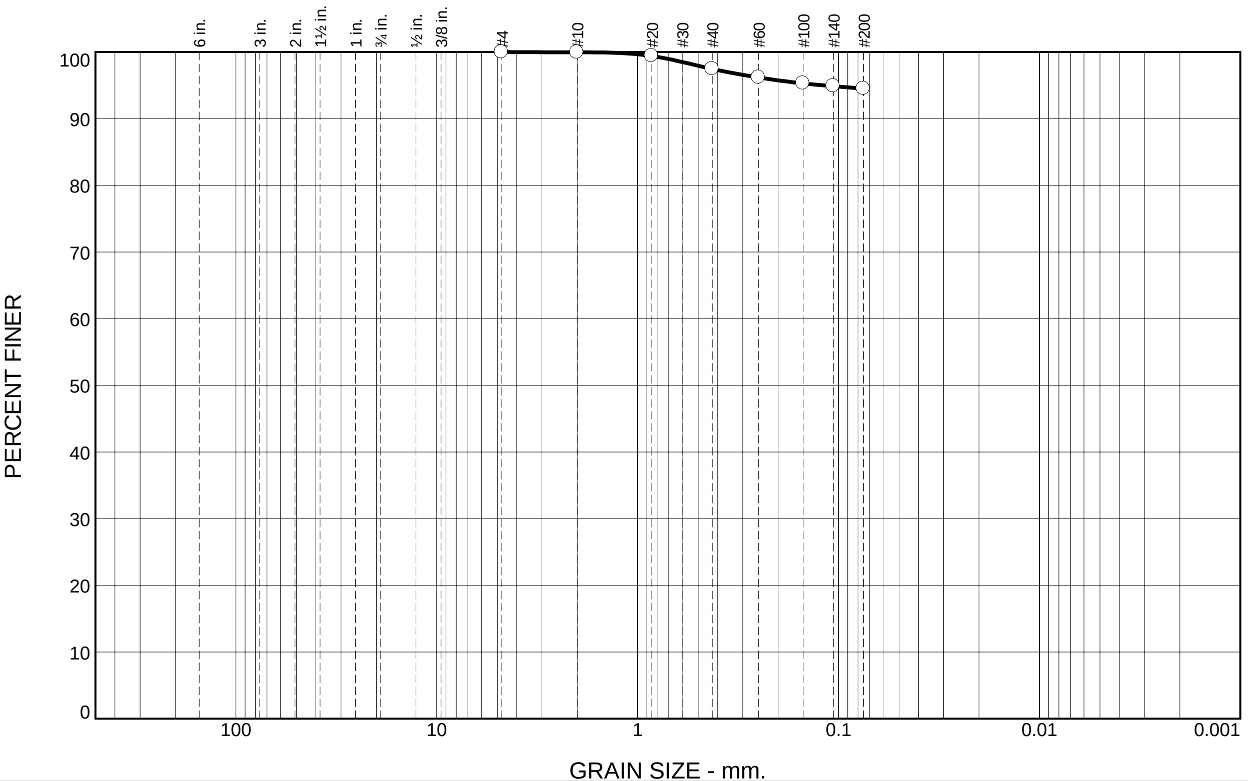
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	2.5	3.0	94.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.4		
#40	97.5		
#60	96.2		
#100	95.3		
#140	94.9		
#200	94.5		

* (no specification provided)

Material Description

black lean clay

Atterberg Limits

PL= 27 LL= 46 PI= 19

Classification

USCS= CL AASHTO= A-7-6(21)

Remarks

N at moisture = 67.6%

Source of Sample: LOT-A1-03 **Depth:** 18.5
Sample Number: S-6 **Date:**

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Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: cs

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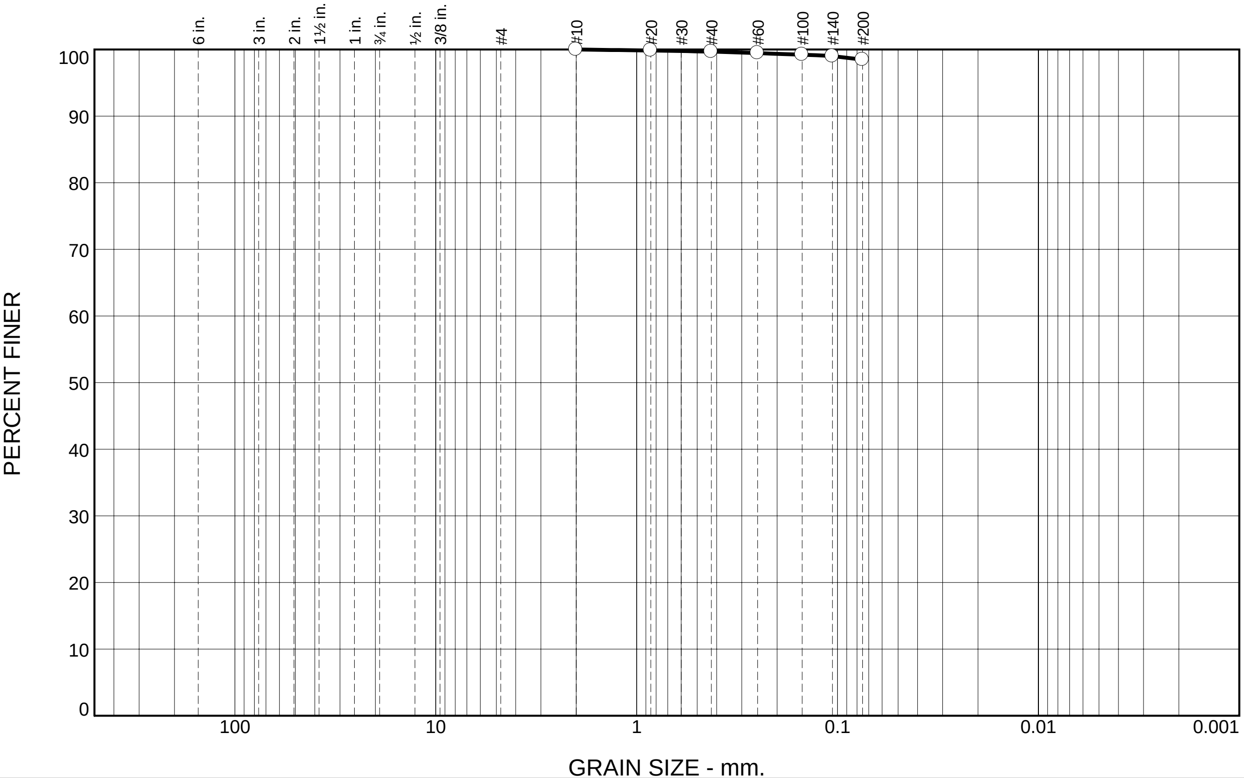
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.3	1.3	98.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.8		
#40	99.7		
#60	99.5		
#100	99.2		
#140	99.0		
#200	98.4		

* (no specification provided)

Material Description

black/grey silt

Atterberg Limits

PL= 32 LL= 47 PI= 15

Classification

USCS= ML AASHTO= A-7-5(19)

Remarks

Nat moisture = 66.0%

Source of Sample: LOT-A1-03 **Depth:** 38.5
Sample Number: S-10 **Date:**

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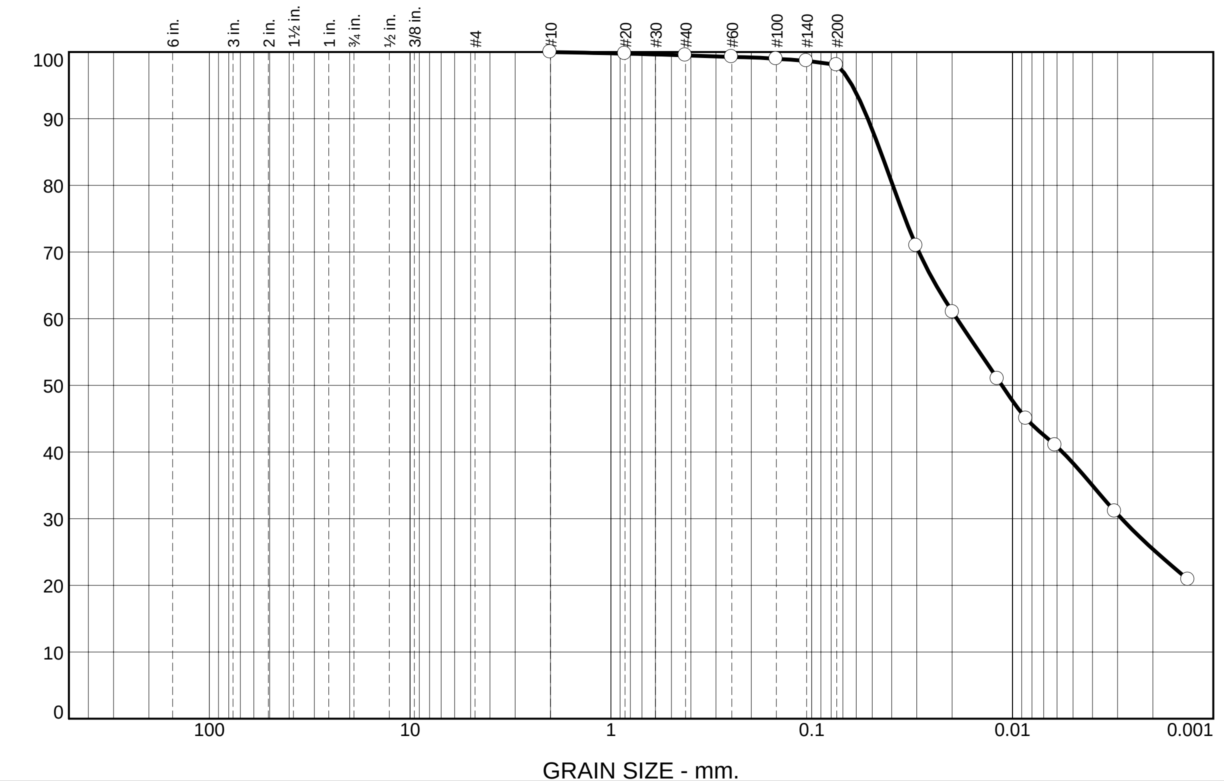
Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.5	1.5	59.7	38.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.8		
#40	99.5		
#60	99.3		
#100	99.0		
#140	98.7		
#200	98.0		

* (no specification provided)

Material Description

black clay

Atterberg Limits

PL= 31 LL= 46 PI= 15

Classification

USCS= ML AASHTO= A-7-5(19)

Remarks

Nat moisture = 17.3%

Source of Sample: LOT-A1-04 **Depth:** 18.5
Sample Number: S-6 **Date:**

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: cs

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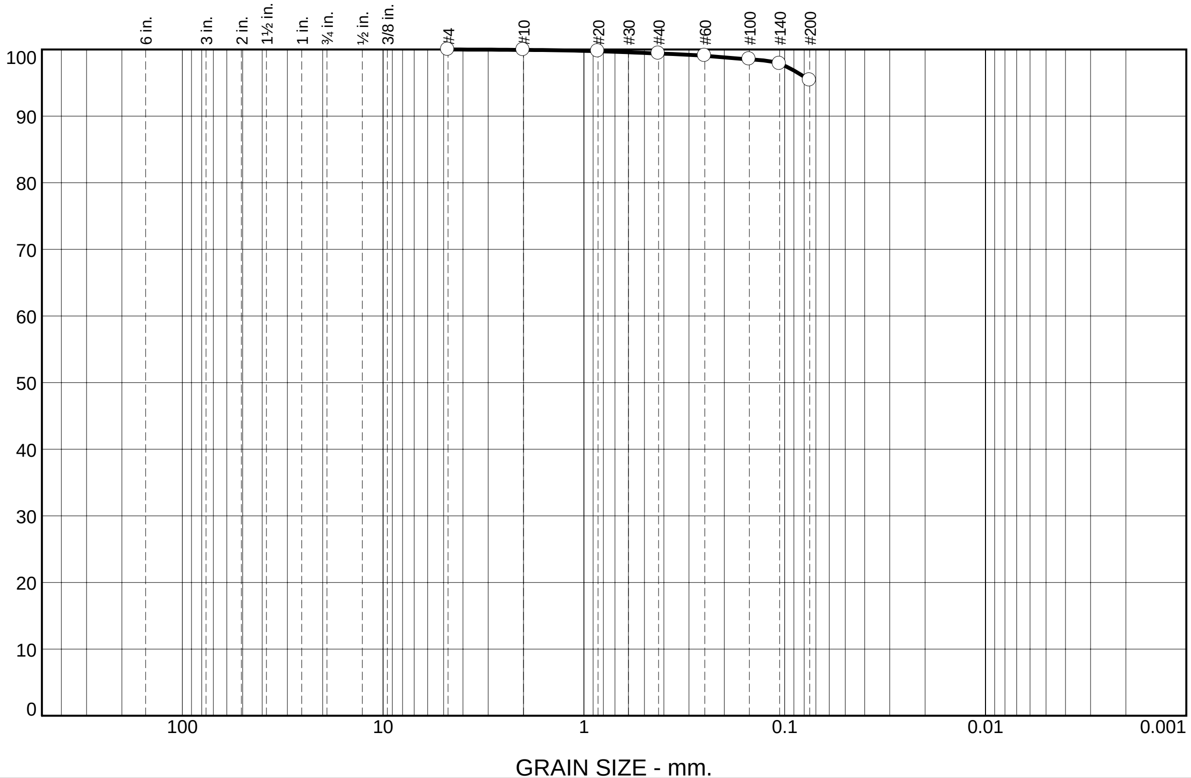
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.5	4.0	95.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.7		
#40	99.4		
#60	99.1		
#100	98.5		
#140	97.8		
#200	95.4		

* (no specification provided)

Material Description

black, gray silt

Atterberg Limits

PL= 28 LL= 39 PI= 11

Classification

USCS= ML AASHTO= A-6(12)

Remarks

Nat moisture = 49.9%

Source of Sample: LOT-A1-04 **Depth:** 28.5
Sample Number: S-8 **Date:** 9/14

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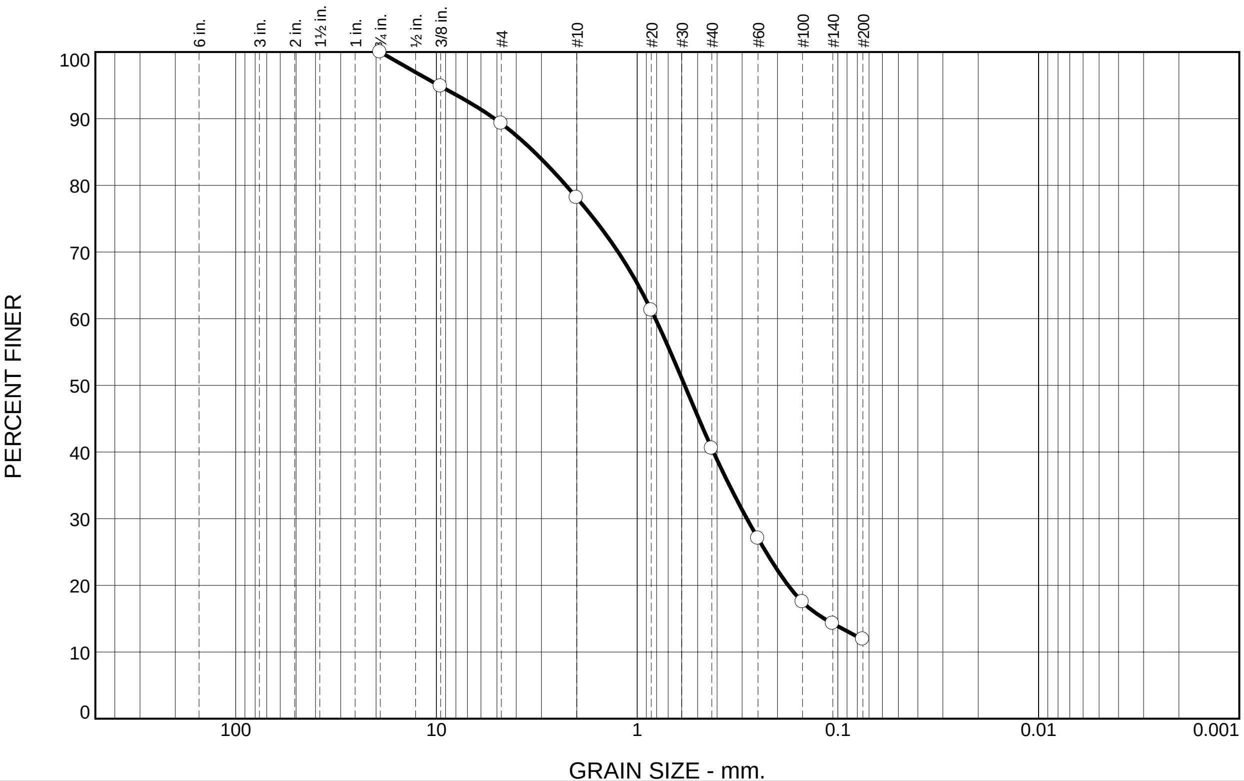
Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	10.7	11.2	37.5	28.7	11.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	94.9		
#4	89.3		
#10	78.1		
#20	61.3		
#40	40.6		
#60	27.0		
#100	17.5		
#140	14.3		
#200	11.9		

* (no specification provided)

Material Description

gray poorly graded sand w/silt

Atterberg Limits

PL= NP LL= NP PI= NP

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Nat moisture = 9.9%

Source of Sample: LOT-A1-04 **Depth:** 43.5
Sample Number: S-11 **Date:**

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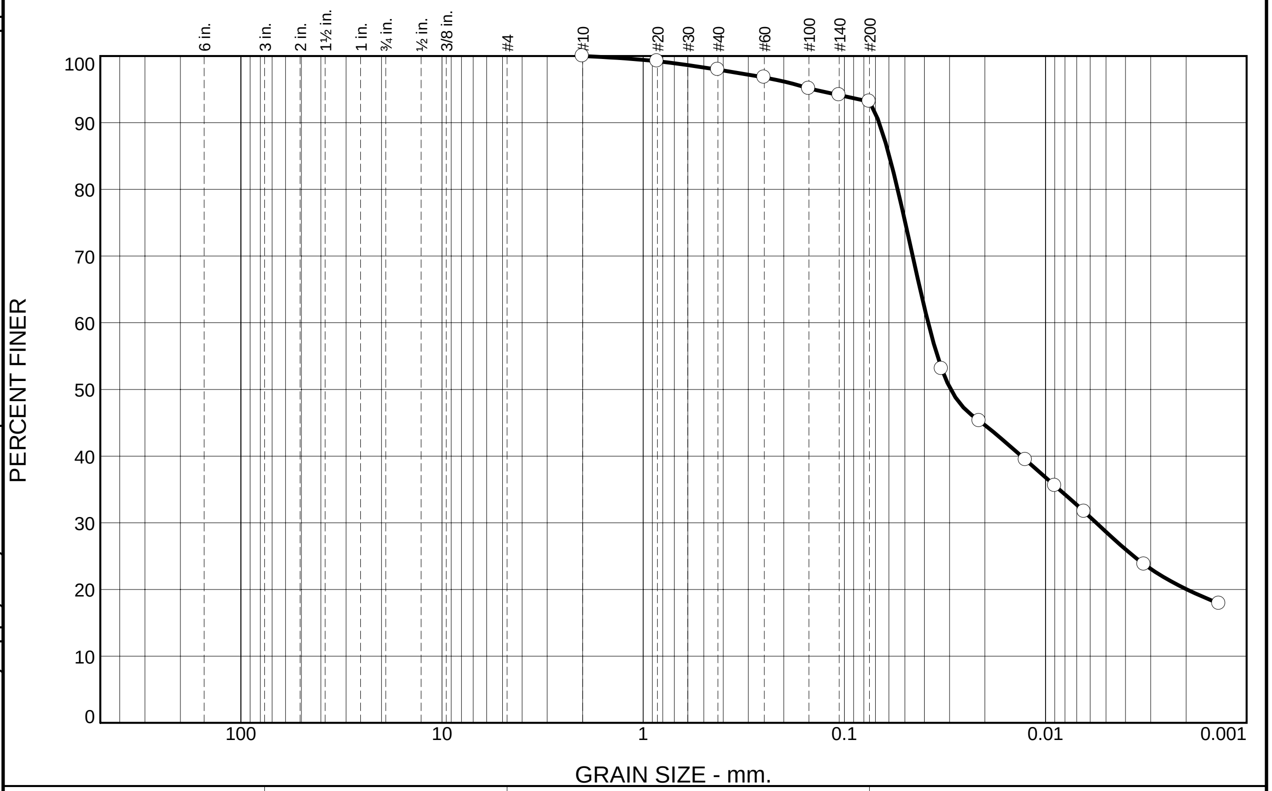
Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	2.0	4.8	64.6	28.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.2		
#40	98.0		
#60	96.8		
#100	95.1		
#140	94.1		
#200	93.2		

* (no specification provided)

Material Description

Fat clay

Atterberg Limits

PL= 29	LL= 68	PI= 39

Coefficients

D_{90}= 0.0671	D_{85}= 0.0597	D_{60}= 0.0383
D_{50}= 0.0296	D_{30}= 0.0056	D_{15}=
D_{10}=	C_u=	C_c=

Classification

USCS= CH AASHTO= A-7-6(42)

Remarks

Nat moisture= 61.2%

Source of Sample: LOT-A1-05 **Depth:** 13.5-15
Sample Number: S6 **Date:** 7/19

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Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: ad

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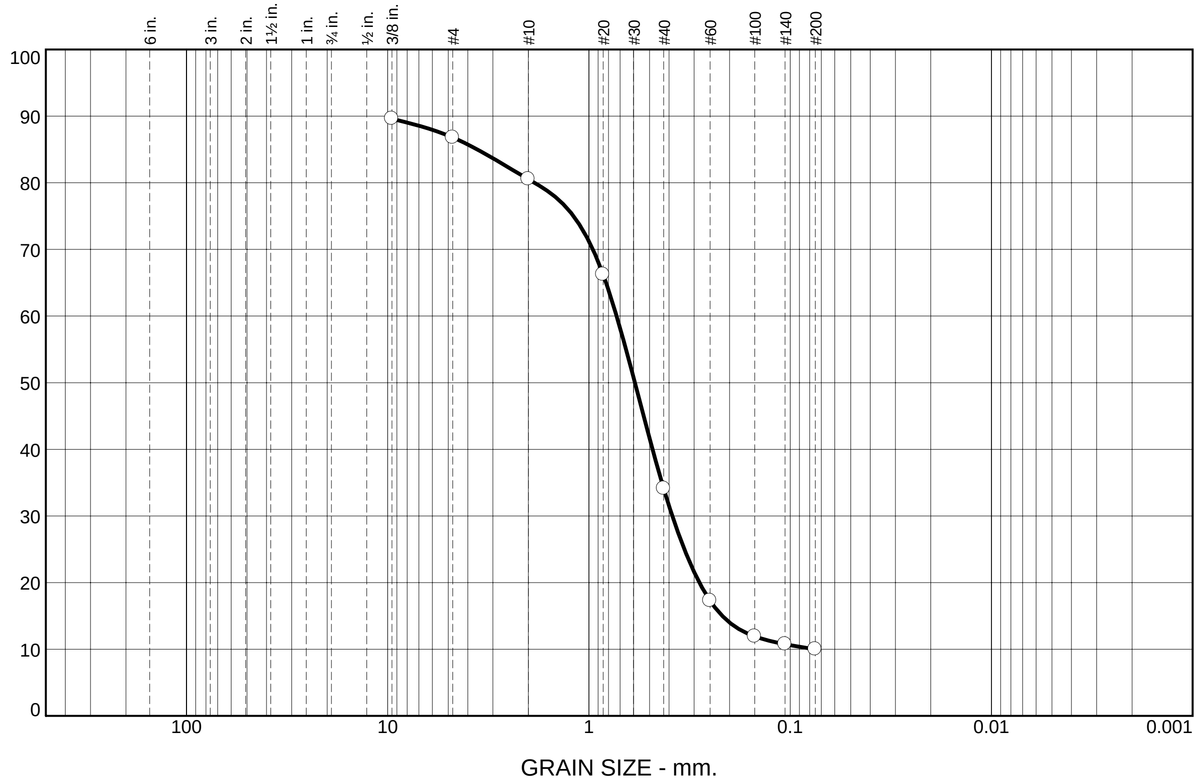
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
		13.2	6.3	46.4	24.1	10.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	89.6		
#4	86.8		
#10	80.5		
#20	66.2		
#40	34.1		
#60	17.3		
#100	11.9		
#140	10.7		
#200	10.0		

* (no specification provided)

Material Description

poorly graded sand w/silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}=
D_{85}= 3.5871
D_{60}= 0.7285
D_{50}= 0.5907
D_{30}= 0.3852
D_{15}= 0.2175
D_{10}=
C_u=
C_c=

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Nat moisture = 21.6%

Source of Sample: LOT-A1-05 **Depth:** 38.5-40
Sample Number: S11 **Date:** 7/19

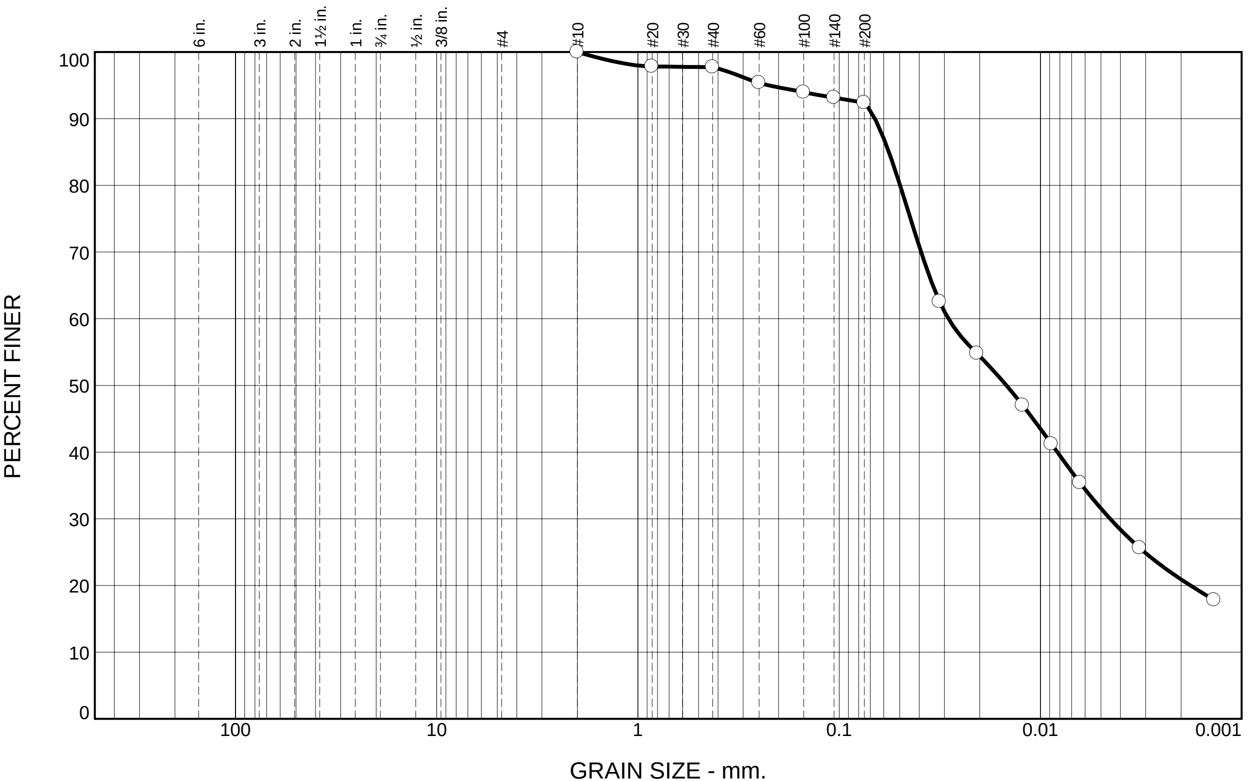
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: ACD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	2.3	5.3	60.9	31.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	97.8		
#40	97.7		
#60	95.4		
#100	94.0		
#140	93.2		
#200	92.4		

* (no specification provided)

Material Description

elastic silt

Atterberg Limits

PL= 36 LL= 76 PI= 40

Coefficients

D_{90}= 0.0664 D_{85}= 0.0566 D_{60}= 0.0286

D_{50}= 0.0148 D_{30}= 0.0045 D_{15}=

D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(45)

Remarks

Nat moisture = 71.1%

Source of Sample: LOT-A1-06 **Depth:** 13.5-15

Sample Number: S6 **Date:** 7/19

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Philadelphia, Pennsylvania

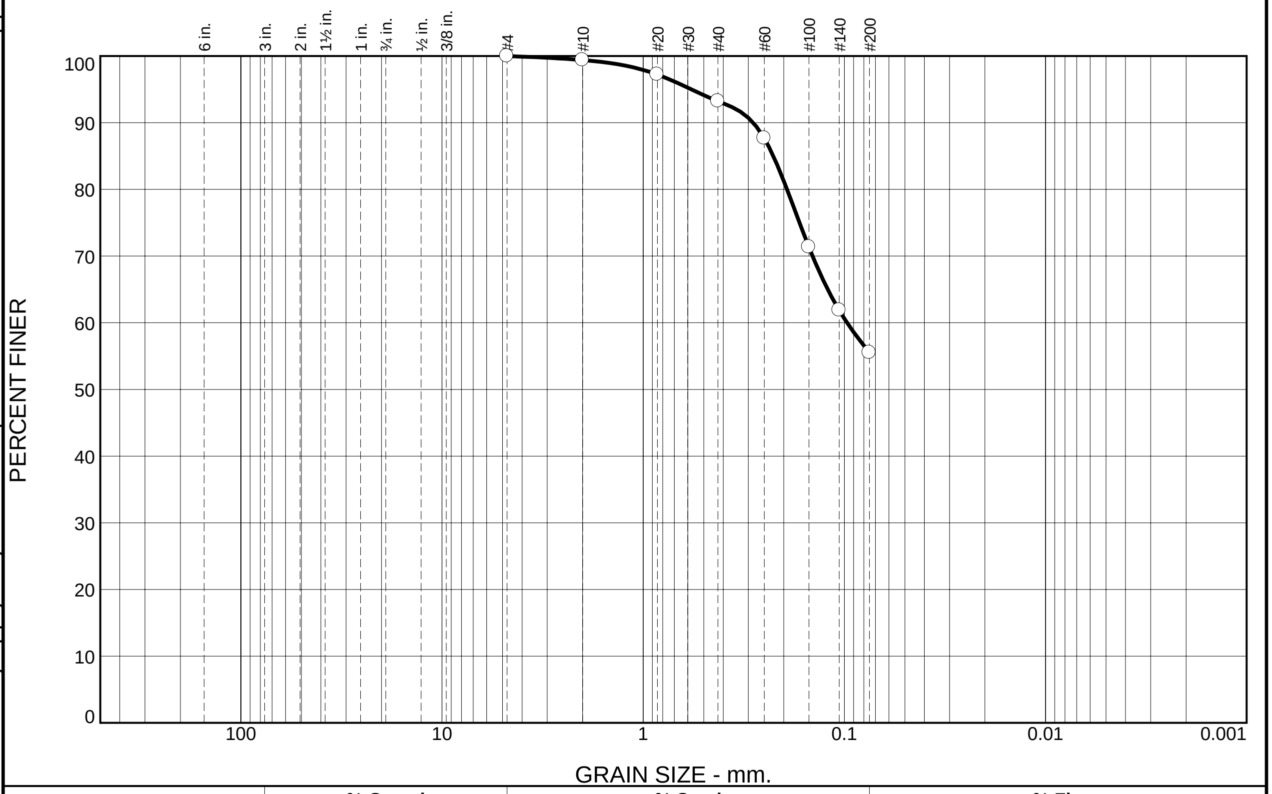
Client: HCEA SCG/RK&K

Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: ad

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.6	6.2	37.7	55.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.4		
#20	97.2		
#40	93.2		
#60	87.7		
#100	71.3		
#140	61.9		
#200	55.5		

* (no specification provided)

Material Description

sandy elastic silt

Atterberg Limits

PL= 47 LL= 97 PI= 50

Coefficients

D_{90}= 0.2839 D_{85}= 0.2255 D_{60}= 0.0969
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(27)

Remarks

Nat moisture = 74.0%

Source of Sample: LOT-A1-06 **Depth:** 33.5-35
Sample Number: S10 **Date:** 7/22

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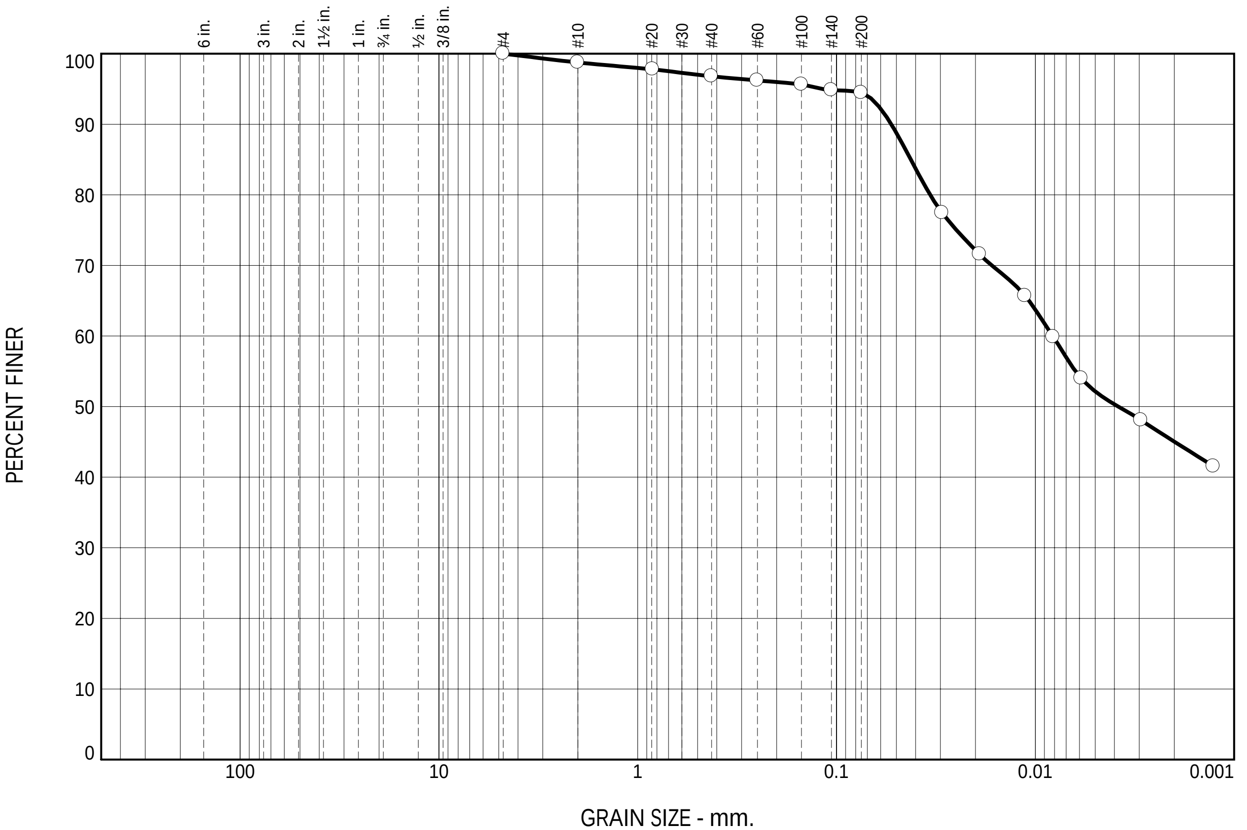
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: ad

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.3	1.9	2.4	42.2	52.2

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	98.7		
#20	97.8		
#40	96.8		
#60	96.2		
#100	95.6		
#140	94.8		
#200	94.4		
0.0294 mm.	77.4		
0.0191 mm.	71.5		
0.0113 mm.	65.7		
0.0081 mm.	59.8		
0.0059 mm.	54.0		
0.0029 mm.	48.1		
0.0013 mm.	41.5		

* (no specification provided)

Soil Description

Elastic Silt

Atterberg Limits

PL= 45
LL= 89
PI= 44

Coefficients

D_{90}= 0.0530
D_{85}= 0.0423
D_{60}= 0.0082
D_{50}= 0.0038
D_{30}=
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= MH
AASHTO= A-7-5(53)

Remarks

Source of Sample: LOT-A1-07 Depth: 13.5
Sample Number: S-6
Date: 10/20

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Project: South Market Street Lab Testing

Project No: P20051
Figure

Tested By: AD

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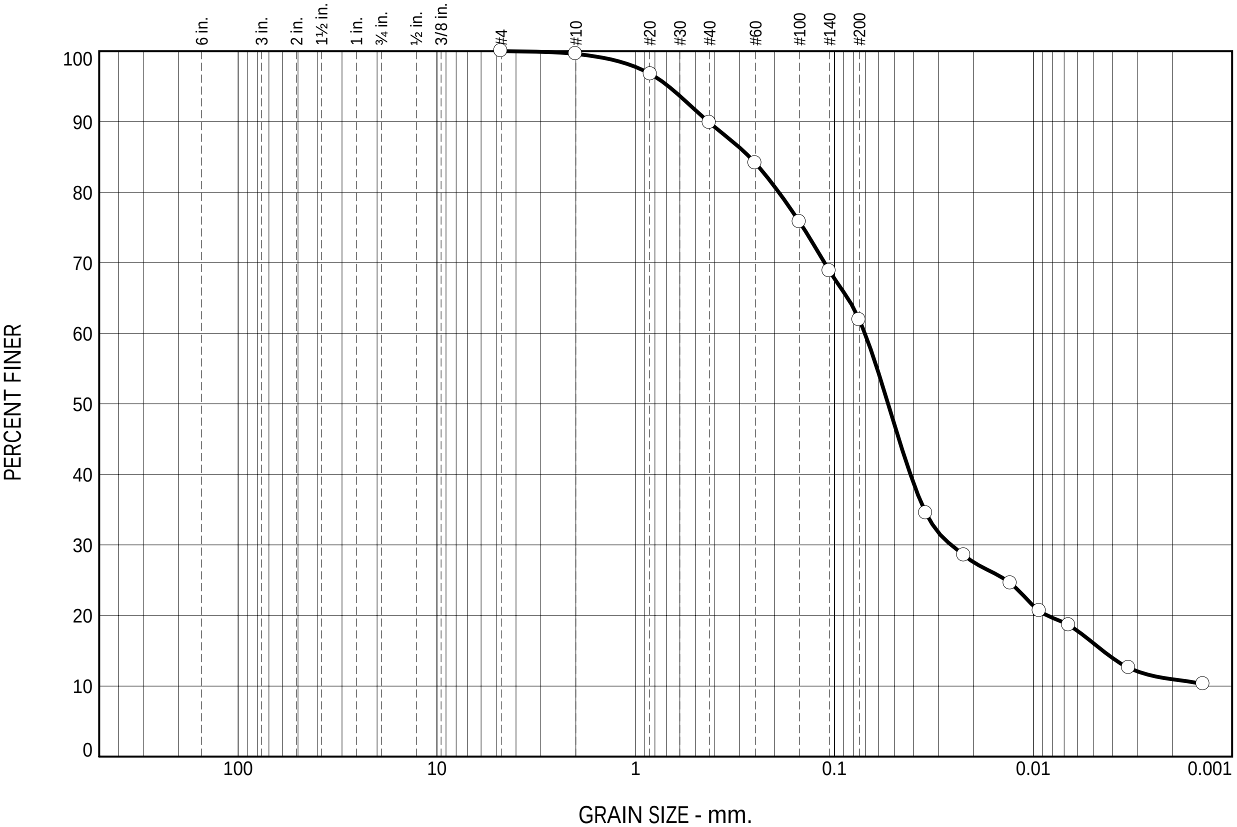
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.4	9.8	27.9	45.8	16.1

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.6		
#20	96.7		
#40	89.8		
#60	84.1		
#100	75.8		
#140	68.8		
#200	61.9		
0.0346 mm.	34.5		
0.0223 mm.	28.5		
0.0130 mm.	24.6		
0.0093 mm.	20.7		
0.0066 mm.	18.6		
0.0033 mm.	12.6		
0.0014 mm.	10.3		

* (no specification provided)

Soil Description

sandy lean clay

Atterberg Limits

PL= 25 LL= 41 PI= 16

Coefficients

D_{90}= 0.4319 D_{85}= 0.2677 D_{60}= 0.0704
D_{50}= 0.0537 D_{30}= 0.0259 D_{15}= 0.0045
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(8)

Remarks

Natural Moisture = 47.2%

Source of Sample: LOT-A1-07 Depth: 28.5
Sample Number: S-9 Date:

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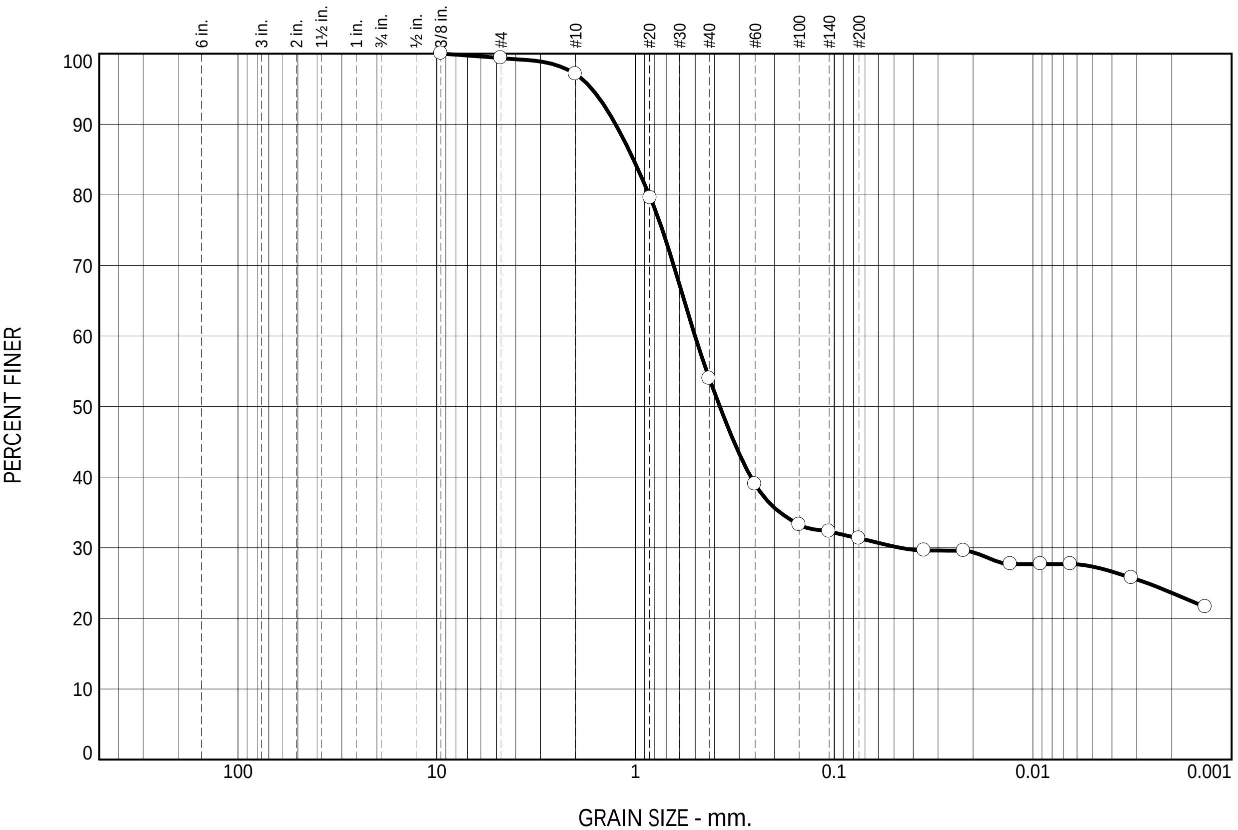
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: cs/ad

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.6	2.3	43.1	22.7	4.0	27.3

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.4		
#10	97.1		
#20	79.6		
#40	54.0		
#60	39.0		
#100	33.3		
#140	32.3		
#200	31.3		
0.0352 mm.	29.6		
0.0223 mm.	29.6		
0.0129 mm.	27.7		
0.0091 mm.	27.7		
0.0065 mm.	27.7		
0.0032 mm.	25.8		
0.0014 mm.	21.6		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= NP LL= 23 PI= NP

Coefficients

D_{90}= 1.2593 D_{85}= 1.0236 D_{60}= 0.5015
D_{50}= 0.3761 D_{30}= 0.0465 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Natural Moisture = 21.8%

Source of Sample: LOT-A1-07 Depth: 48.5
Sample Number: S-13 Date:

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Project No: P20051 Figure

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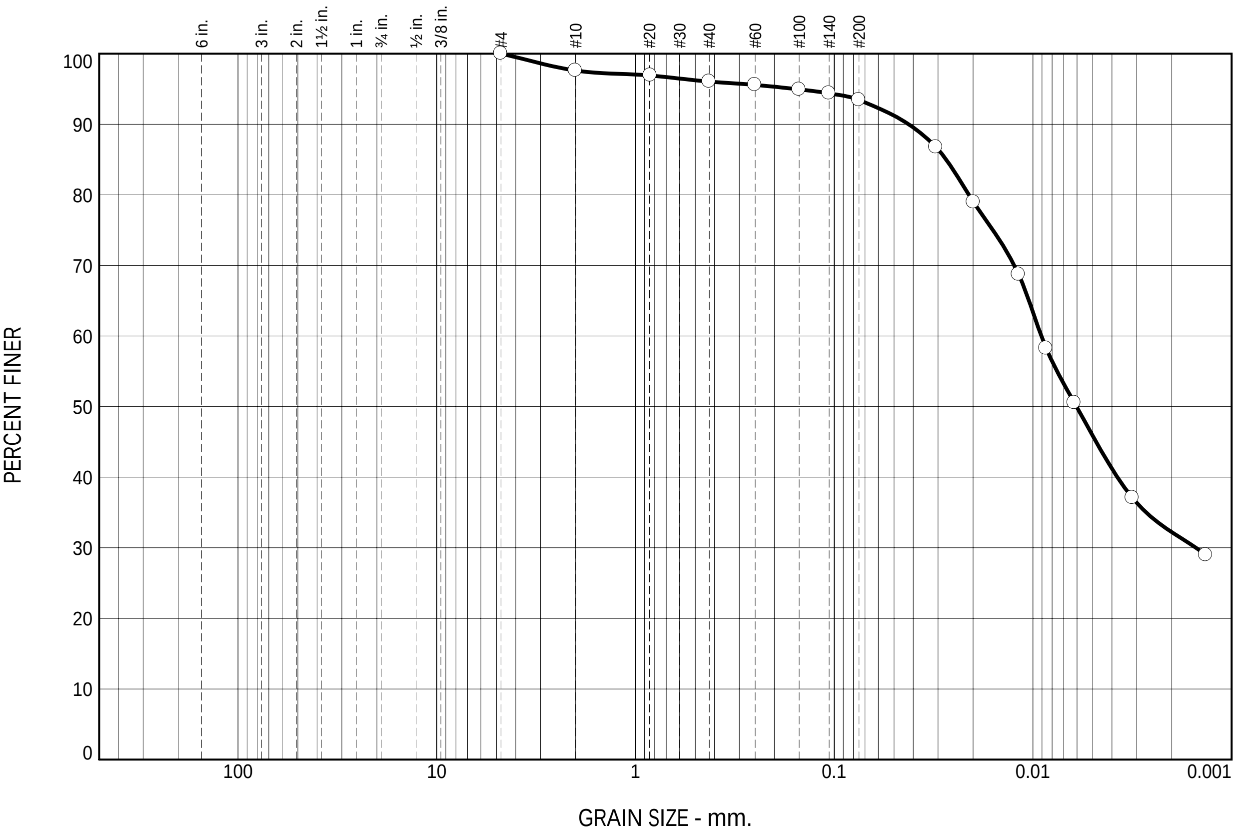
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	2.4	1.6	2.6	47.5	45.9

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	97.6		
#20	96.9		
#40	96.0		
#60	95.6		
#100	94.9		
#140	94.4		
#200	93.4		
0.0307 mm.	86.7		
0.0199 mm.	78.9		
0.0118 mm.	68.7		
0.0086 mm.	58.3		
0.0062 mm.	50.5		
0.0032 mm.	37.1		
0.0013 mm.	29.0		

* (no specification provided)

Soil Description

Fat Clay

Atterberg Limits

PL= 31   LL= 120   PI= 89

Coefficients

D_{90}= 0.0422 D_{85}= 0.0273 D_{60}= 0.0091
D_{50}= 0.0060 D_{30}= 0.0015 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH   AASHTO= A-7-5(96)

Remarks

Natural Moisture = 72.3%

Source of Sample: LOT-A1-08   Depth: 10
Sample Number: S-5   Date:

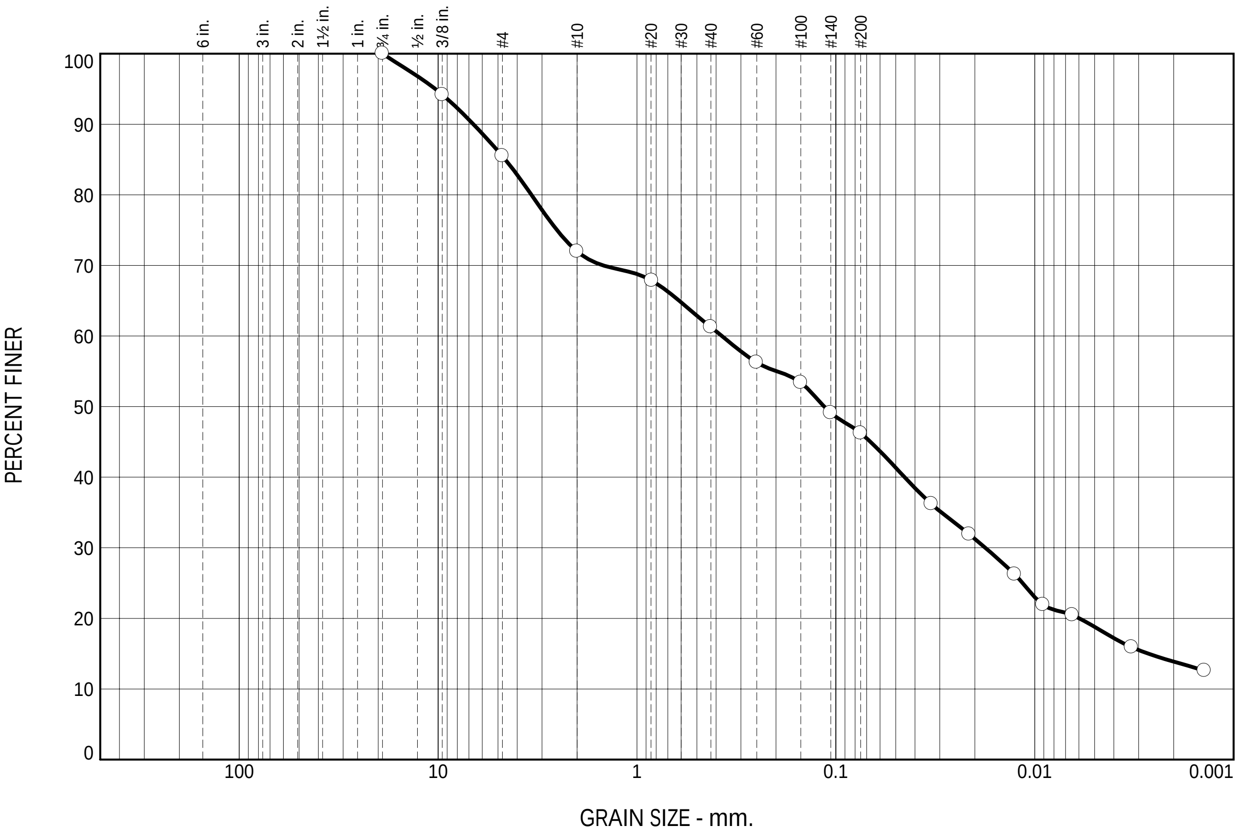
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051   Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	14.5	13.5	10.7	15.1	27.4	18.8

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	94.2		
#4	85.5		
#10	72.0		
#20	67.8		
#40	61.3		
#60	56.2		
#100	53.4		
#140	49.1		
#200	46.2		
0.0330 mm.	36.2		
0.0213 mm.	31.9		
0.0126 mm.	26.2		
0.0091 mm.	21.9		
0.0065 mm.	20.5		
0.0033 mm.	15.9		
0.0014 mm.	12.6		

* (no specification provided)

Soil Description

clayey sand

Atterberg Limits

PL= 27 LL= 52 PI= 25

Coefficients

D_{90}= 6.6451 D_{85}= 4.5927 D_{60}= 0.3742
D_{50}= 0.1145 D_{30}= 0.0177 D_{15}= 0.0027
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-7-6(8)

Remarks

Natural Moisture = 43.5%

Source of Sample: LOT-A1-08 Depth: 22
Sample Number: T-1 Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

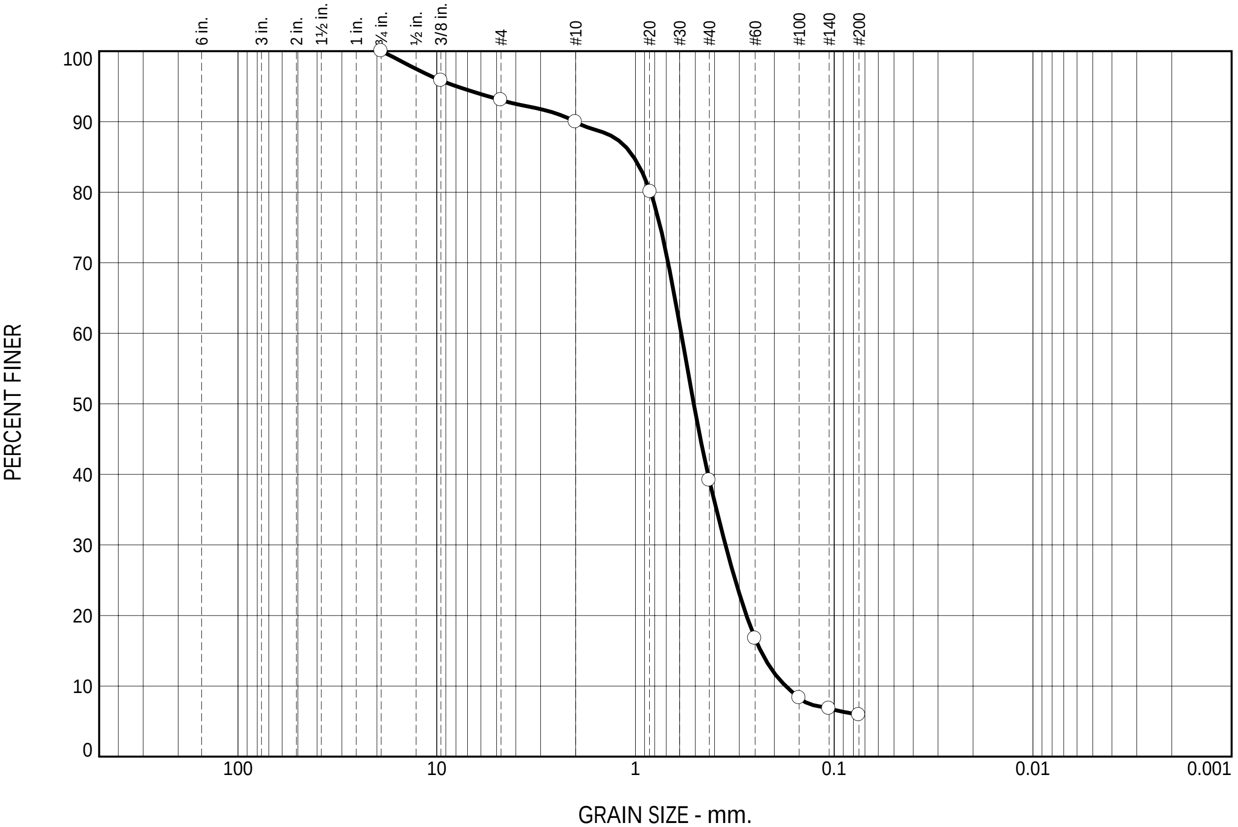
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.0	3.1	50.7	33.3	5.9	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	95.8		
#4	93.0		
#10	89.9		
#20	80.0		
#40	39.2		
#60	16.8		
#100	8.3		
#140	6.8		
#200	5.9		

* (no specification provided)

Soil Description

poorly graded sand w/silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 2.0175 D_{85}= 1.0214 D_{60}= 0.5884
D_{50}= 0.5088 D_{30}= 0.3523 D_{15}= 0.2342
D_{10}= 0.1753 C_u= 3.36 C_c= 1.20

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Natural Moisture = 23.2%

Source of Sample: LOT-A1-08 Depth: 38.5
Sample Number: S-11 Date:

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Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: cs/ad

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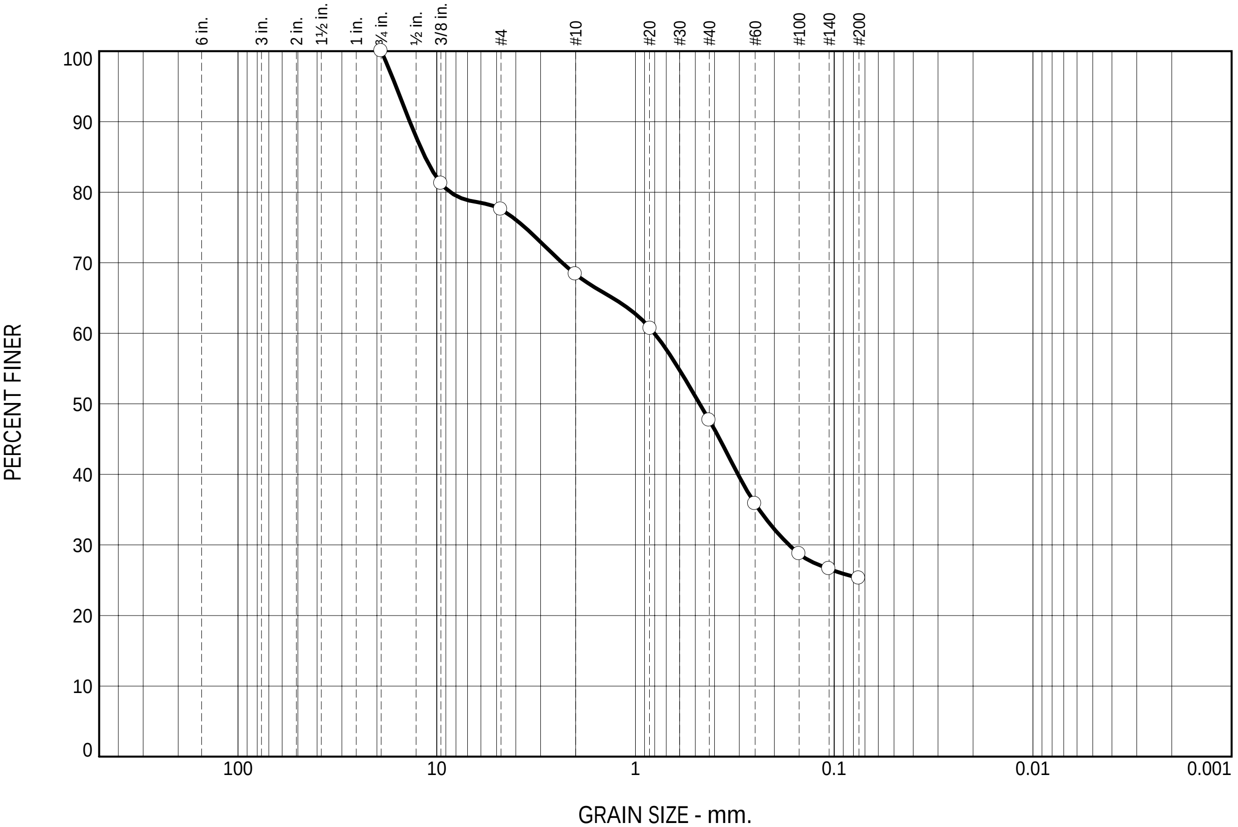
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	22.5	9.1	20.7	22.4	25.3	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	81.2		
#4	77.5		
#10	68.4		
#20	60.7		
#40	47.7		
#60	35.8		
#100	28.7		
#140	26.6		
#200	25.3		

* (no specification provided)

Soil Description

Clayey Sand w/gravel

Atterberg Limits

PL= 28
LL= 68
PI= 40

Coefficients

D_{90}= 13.6564
D_{85}= 11.4476
D_{60}= 0.8031
D_{50}= 0.4753
D_{30}= 0.1686
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= SC
AASHTO= A-2-7(3)

Remarks

Natural Moisture = 26.2%

Source of Sample: LOT-A2-11
Depth: 7.5-9.0
Sample Number: S-4
Date:

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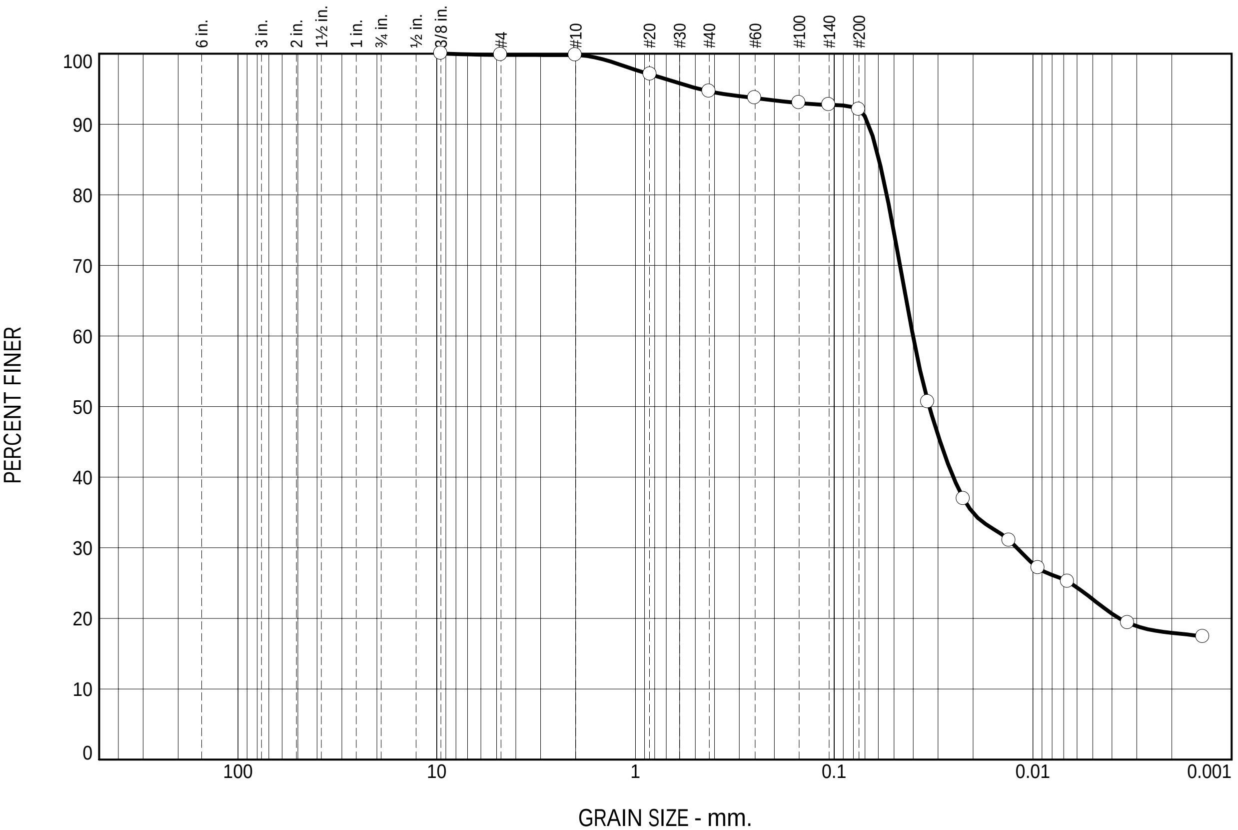
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051
Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.0	5.1	2.6	69.4	22.7

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.8		
#10	99.8		
#20	97.0		
#40	94.7		
#60	93.7		
#100	93.0		
#140	92.7		
#200	92.1		
0.0337 mm.	50.7		
0.0223 mm.	36.9		
0.0131 mm.	31.0		
0.0094 mm.	27.1		
0.0067 mm.	25.2		
0.0033 mm.	19.4		
0.0014 mm.	17.4		

* (no specification provided)

Soil Description

Fat Clay

Atterberg Limits

PL= 34 LL= 80 PI= 46

Coefficients

D_{90}= 0.0672 D_{85}= 0.0595 D_{60}= 0.0401
D_{50}= 0.0332 D_{30}= 0.0120 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(51)

Remarks

Natural Moisture = 59.4%

Source of Sample: LOT-A2-11 Depth: 18.5-20.0
Sample Number: S-7 Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

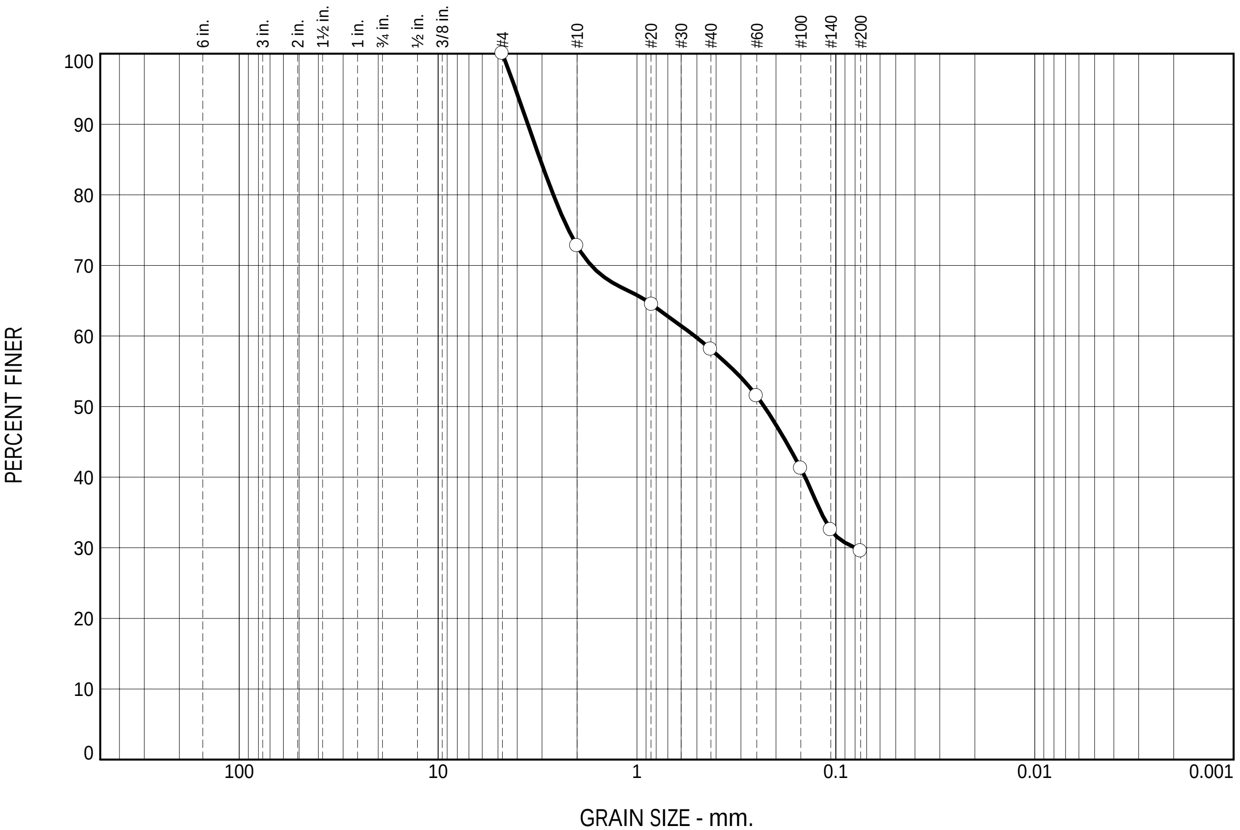
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	27.3	14.6	28.6	29.5	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	72.7		
#20	64.5		
#40	58.1		
#60	51.5		
#100	41.2		
#140	32.5		
#200	29.5		

* (no specification provided)

Soil Description

Clayey Sand

Atterberg Limits

PL= 15
LL= 38
PI= 23

Coefficients

D_{90}= 3.5386	D_{85}= 3.0652	D_{60}= 0.5128
D_{50}= 0.2291	D_{30}= 0.0800	D_{15}=
D_{10}=	C_u=	C_c=

Classification

USCS= SC
AASHTO= A-2-6(2)

Remarks

Natural Moisture = 19.0%

Source of Sample: LOT-A2-11
Depth: 48.5-50.0
Sample Number: S-13
Date:

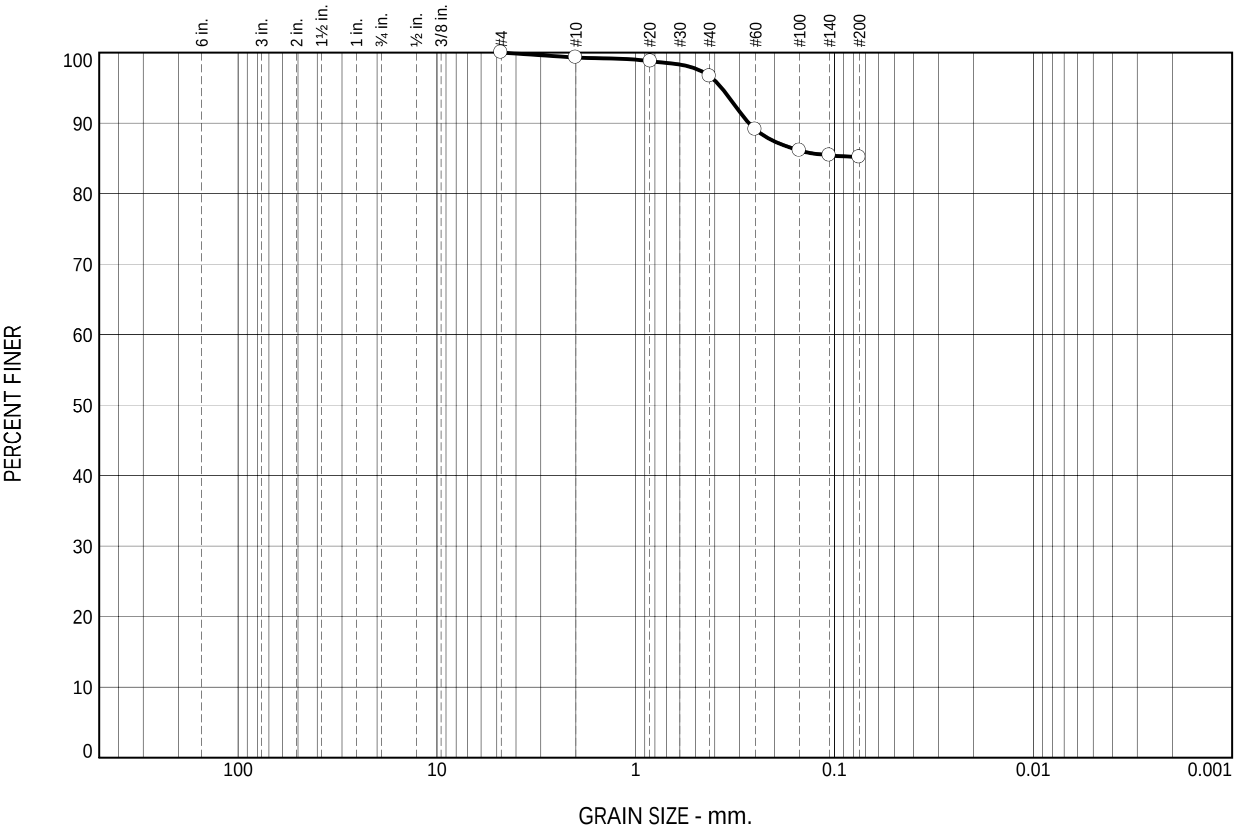
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051
Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.7	2.6	11.5	85.2	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.3		
#20	98.8		
#40	96.7		
#60	89.1		
#100	86.1		
#140	85.4		
#200	85.2		

* (no specification provided)

Soil Description

Elastic Silt w/sand

Atterberg Limits

PL= 44 LL= 103 PI= 59

Coefficients

D_{90}= 0.2698	D_{85}=	D_{60}=
D_{50}=	D_{30}=	D_{15}=
D_{10}=	C_u=	C_c=

Classification

USCS= MH AASHTO= A-7-5(60)

Remarks

Natural Moisture = 77.6%

Source of Sample: LOT-A2-12 Depth: 7.5-9.0
Sample Number: S-4

Date: 1/6

HILLIS-CARNES ENGINEERING ASSOCIATES

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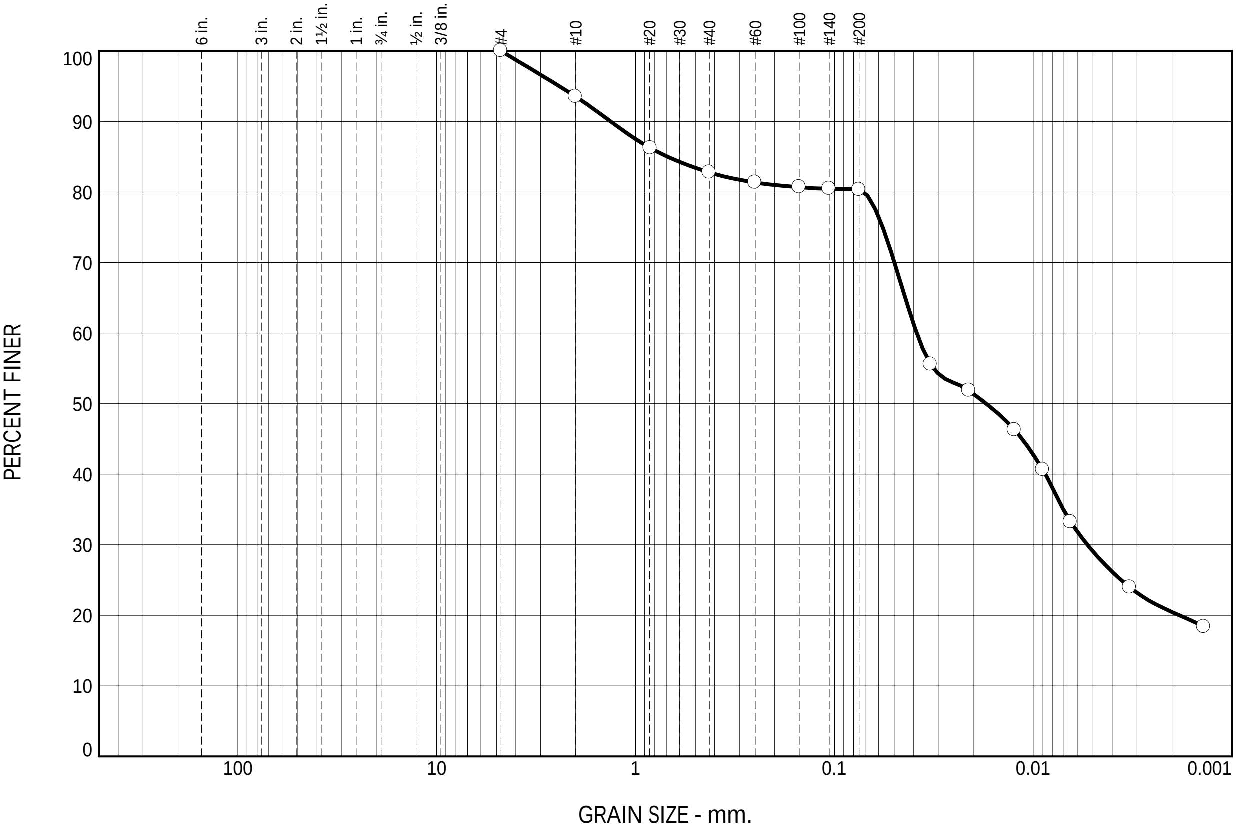
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	6.5	10.7	2.5	51.2	29.1

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	93.5		
#20	86.2		
#40	82.8		
#60	81.3		
#100	80.7		
#140	80.5		
#200	80.3		
0.0327 mm.	55.6		
0.0210 mm.	51.8		
0.0124 mm.	46.3		
0.0089 mm.	40.6		
0.0065 mm.	33.2		
0.0033 mm.	24.0		
0.0014 mm.	18.4		

* (no specification provided)

Soil Description

Fat Clay w/sand

Atterberg Limits

PL= 29	LL= 91	PI= 62

Coefficients

D_{90}= 1.3343	D_{85}= 0.6891	D_{60}= 0.0385
D_{50}= 0.0172	D_{30}= 0.0053	D_{15}=
D_{10}=	C_u=	C_c=

Classification

USCS= CH AASHTO= A-7-6(54)

Remarks

Natural Moisture = 78.2%

Source of Sample: LOT-A2-12 Depth: 15.0-16.5
Sample Number: S-6
Date: 1/15

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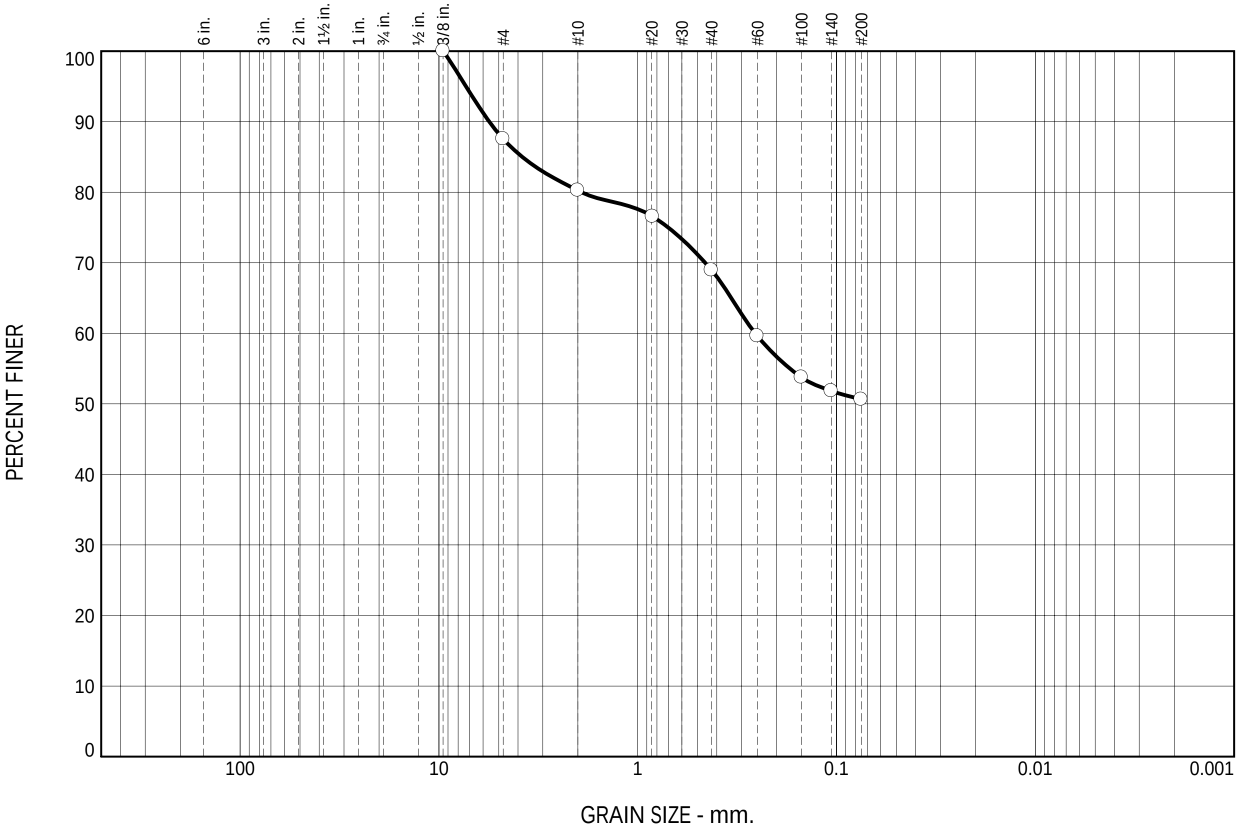
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	12.5	7.3	11.2	18.4	50.6	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	87.5		
#10	80.2		
#20	76.6		
#40	69.0		
#60	59.6		
#100	53.8		
#140	51.8		
#200	50.6		

* (no specification provided)

Soil Description

Sandy elastic Silt

Atterberg Limits

PL= 49　LL= 114　PI= 65

Coefficients

D_{90}= 5.5861　D_{85}= 3.8081　D_{60}= 0.2566
D_{50}=　D_{30}=　D_{15}=
D_{10}=　C_u=　C_c=

Classification

USCS= MH　AASHTO= A-7-5(29)

Remarks

Nat moisture = 103.2%

Source of Sample: LOT-A2-12　Depth: 17.0-19.0
Sample Number: T-2

Date: 1/25

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Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051　Figure

Tested By: AD

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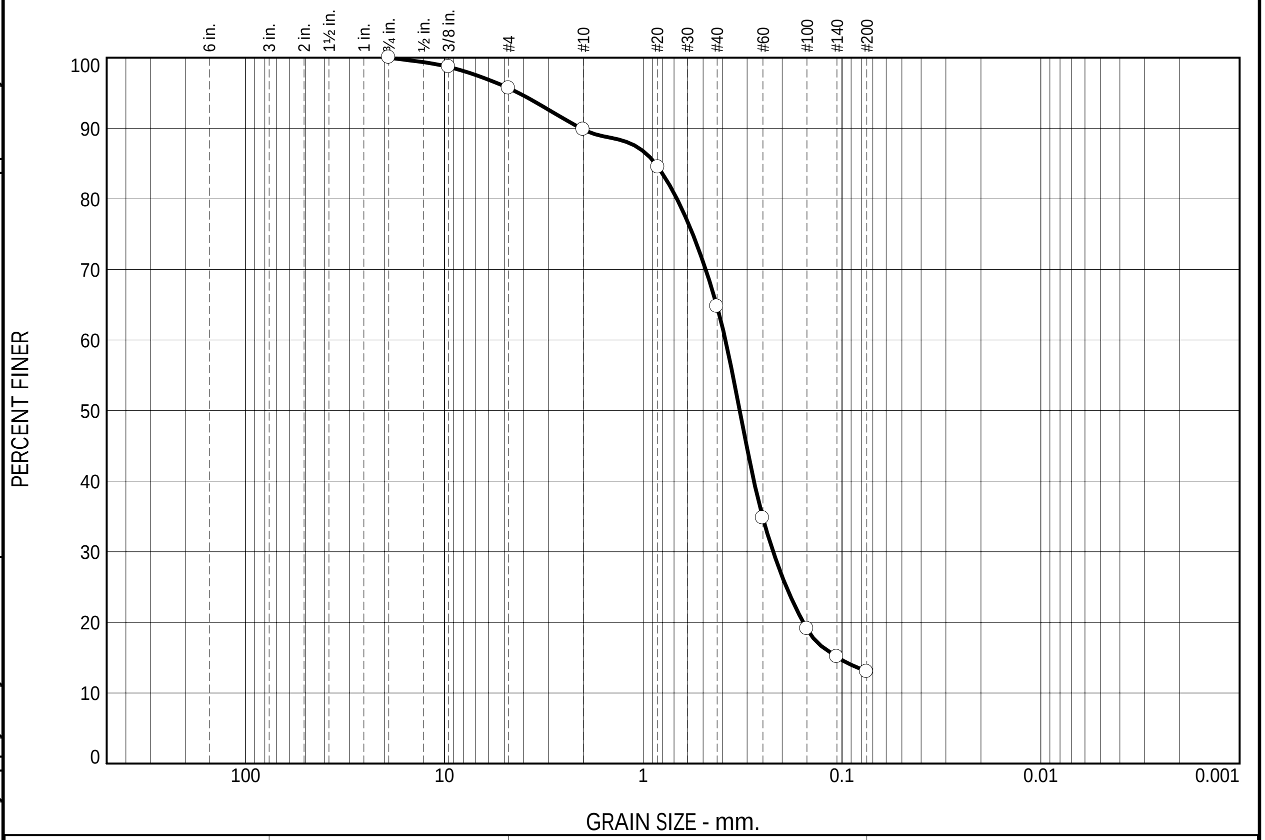
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.3	5.9	25.1	51.7	13.0	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	98.7		
#4	95.7		
#10	89.8		
#20	84.5		
#40	64.7		
#60	34.8		
#100	19.1		
#140	15.1		
#200	13.0		

* (no specification provided)

Soil Description

Silty Sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 2.0596 D_{85}= 0.8688 D_{60}= 0.3859
D_{50}= 0.3269 D_{30}= 0.2219 D_{15}= 0.1045
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Natural Moisture = 21.0%

Source of Sample: LOT-A2-12 Depth: 28.5-30.0
Sample Number: S-9 Date: 1/6

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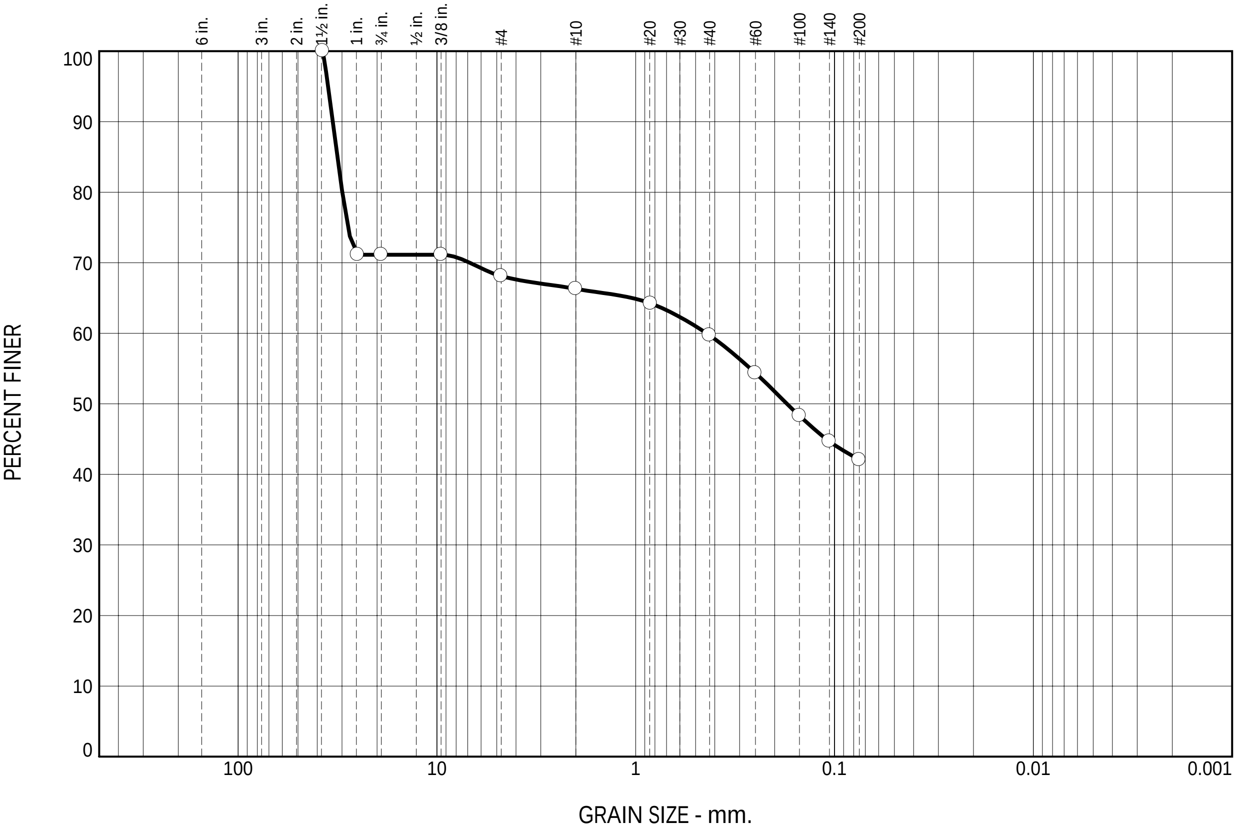
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	28.9	3.0	1.8	6.6	17.7	42.0	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	71.1		
.75	71.1		
.375	71.1		
#4	68.1		
#10	66.3		
#20	64.2		
#40	59.7		
#60	54.4		
#100	48.3		
#140	44.7		
#200	42.0		

* (no specification provided)

Soil Description

Clayey Gravel w/sand

Atterberg Limits

PL= 12　LL= 52　PI= 40

Coefficients

D_{90}= 33.3725　D_{85}= 31.6530　D_{60}= 0.4405
D_{50}= 0.1734　D_{30}=　D_{15}=
D_{10}=　C_u=　C_c=

Classification

USCS= GC　AASHTO= A-7-6(10)

Remarks

Natural Moisture = 15.2%

Source of Sample: LOT-A2-12　Depth: 58.5-60.0
Sample Number: S-15

Date: 1/6

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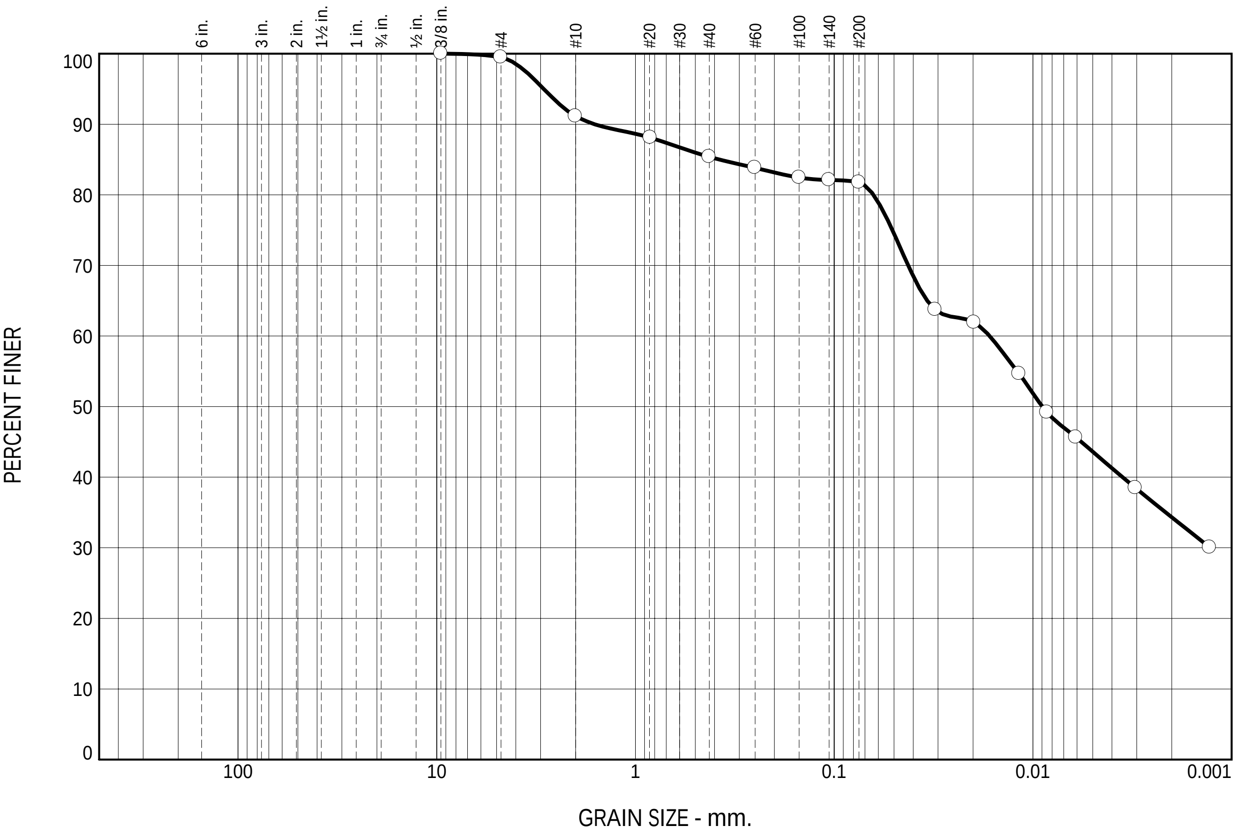
Project: South Market Street Lab Testing

Project No: P20051　Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	8.4	5.7	3.6	38.2	43.6

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.5		
#10	91.1		
#20	88.1		
#40	85.4		
#60	83.8		
#100	82.4		
#140	82.1		
#200	81.8		
0.0310 mm.	63.7		
0.0197 mm.	61.9		
0.0117 mm.	54.6		
0.0085 mm.	49.2		
0.0061 mm.	45.6		
0.0030 mm.	38.5		
0.0013 mm.	30.0		

* (no specification provided)

Soil Description

Elastic Silt w/sand

Atterberg Limits

PL= 46 LL= 109 PI= 63

Coefficients

D_{90}= 1.6047 D_{85}= 0.3785 D_{60}= 0.0165
D_{50}= 0.0090 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(61)

Remarks

Natural Moisture = 80.6%

Source of Sample: LOT-A2-13 Depth: 10
Sample Number: T-1 Date: 1/25

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Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 Figure

Tested By: AD

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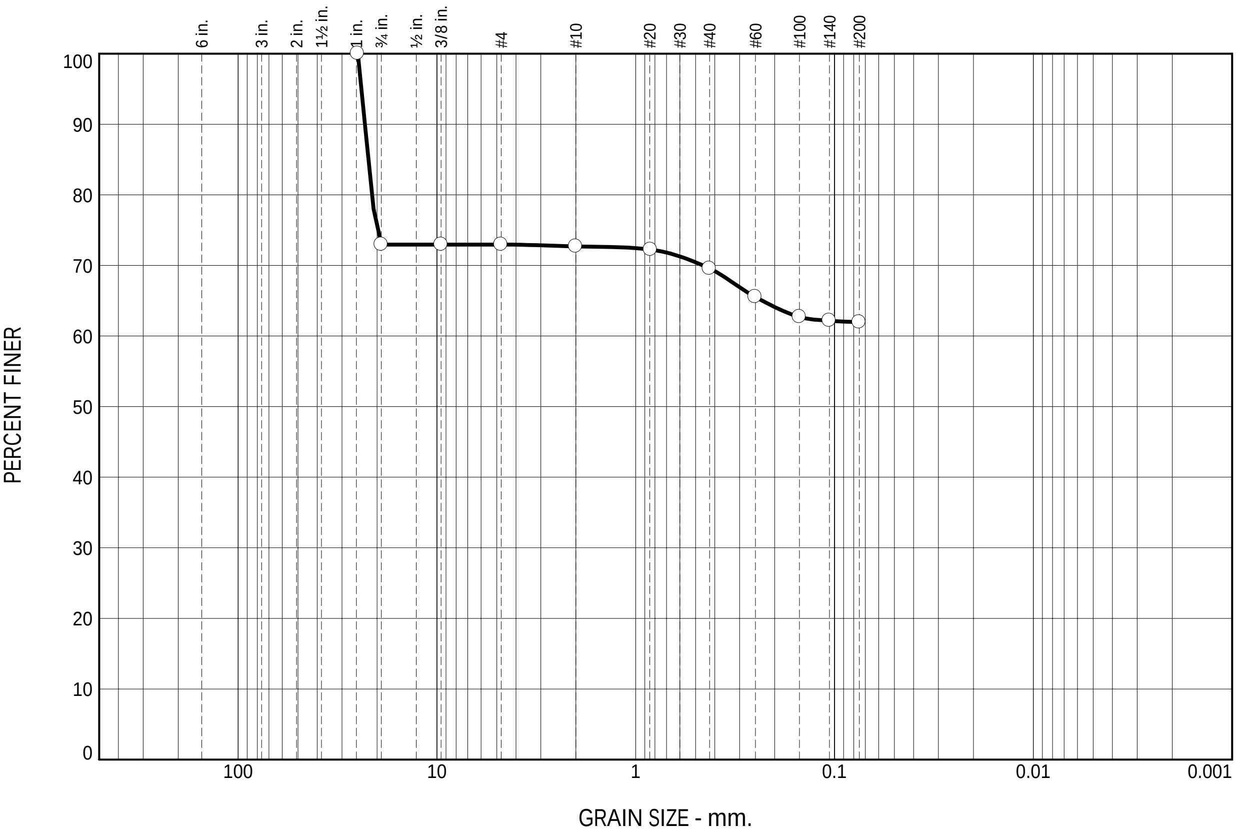
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	27.0	0.0	0.3	3.1	7.6	62.0	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	73.0		
.375	73.0		
#4	73.0		
#10	72.7		
#20	72.2		
#40	69.6		
#60	65.5		
#100	62.7		
#140	62.2		
#200	62.0		

* (no specification provided)

Soil Description

Gravelly Elastic Silt

Atterberg Limits

PL= 78
LL= 148
PI= 70

Coefficients

D_{90}= 22.9921
D_{85}= 22.1272
D_{60}=
D_{50}=
D_{30}=
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= MH
AASHTO= A-7-5(48)

Remarks

Natural Moisture = 67.5%

Source of Sample: LOT-A2-13
Depth: 13.5-15.0
Sample Number: S-6
Date: 1/6

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051
Figure

Tested By: AD

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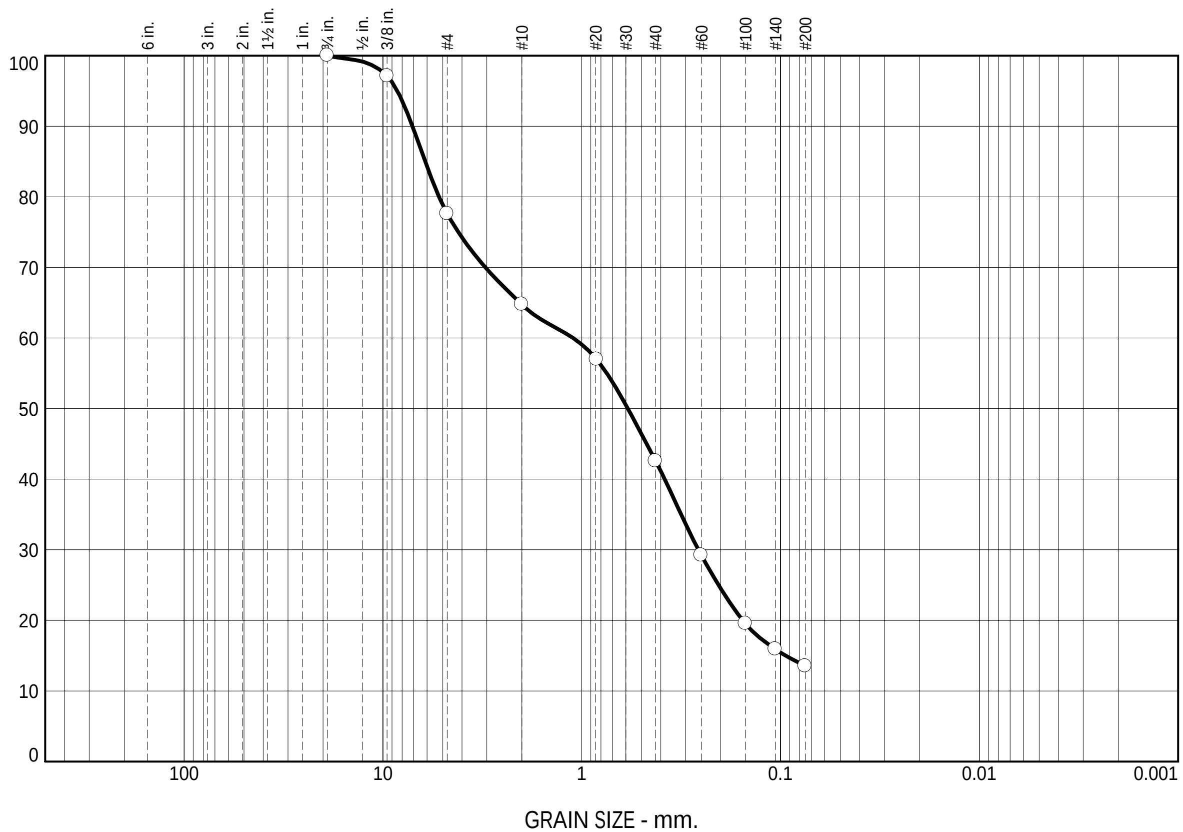
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	22.4	12.9	22.1	29.1	13.5	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	97.1		
#4	77.6		
#10	64.7		
#20	56.9		
#40	42.6		
#60	29.2		
#100	19.5		
#140	15.9		
#200	13.5		

* (no specification provided)

Soil Description

Silty Sand w/gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 7.1011 D_{85}= 6.1224 D_{60}= 1.1046
D_{50}= 0.5858 D_{30}= 0.2590 D_{15}= 0.0942
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Natural Moisture = 9.9%

Source of Sample: LOT-A2-13 Depth: 23.5-25.0
Sample Number: S-8 Date: 1/6

HILLIS-CARNES ENGINEERING ASSOCIATES

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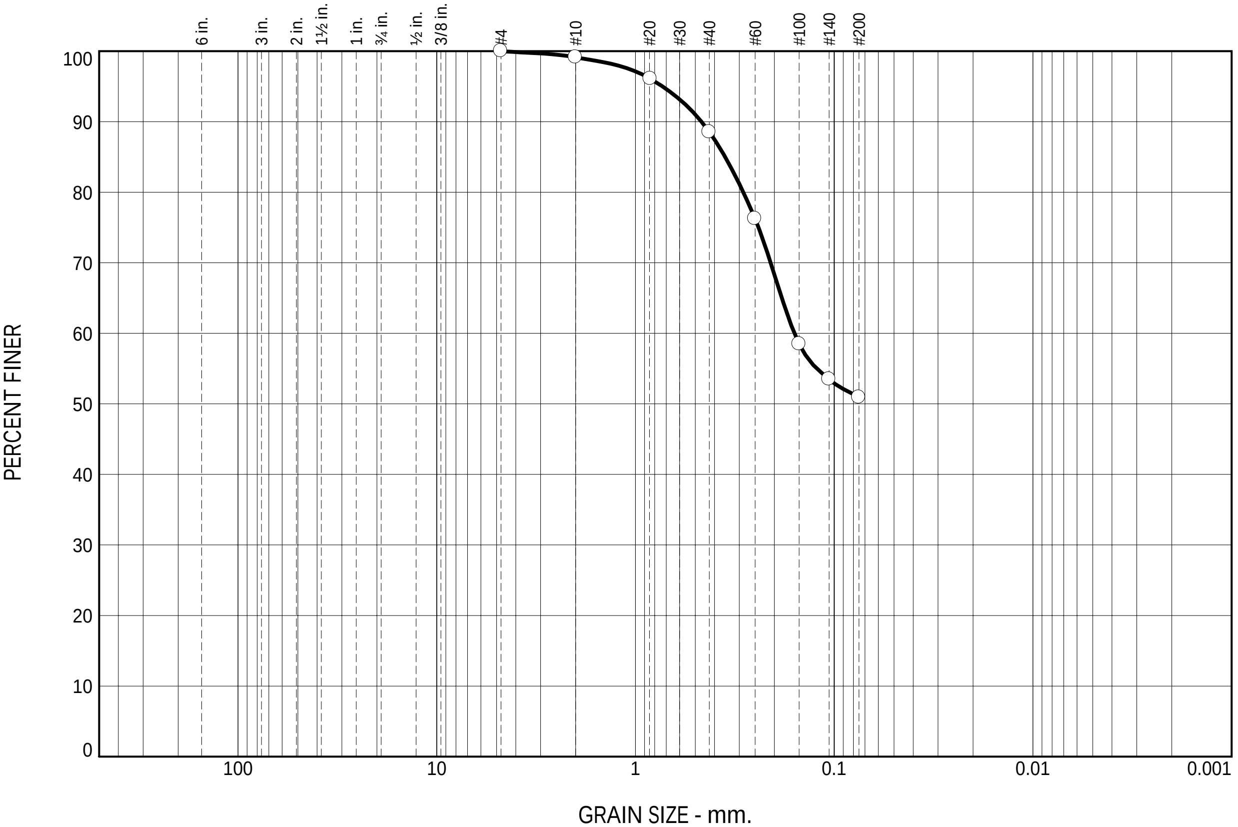
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.9	10.6	37.6	50.9	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.1		
#20	96.1		
#40	88.5		
#60	76.2		
#100	58.5		
#140	53.5		
#200	50.9		

* (no specification provided)

Soil Description

Sandy Silt

Atterberg Limits

PL= NP
LL= 22
PI= NP

Coefficients

D_{90}= 0.4657
D_{85}= 0.3538
D_{60}= 0.1586
D_{50}=
D_{30}=
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= ML
AASHTO= A-4(0)

Remarks

Natural Moisture = 14.5%

Source of Sample: LOT-A2-13 Depth: 38.5-40.0
Sample Number: S-11
Date: 1/6

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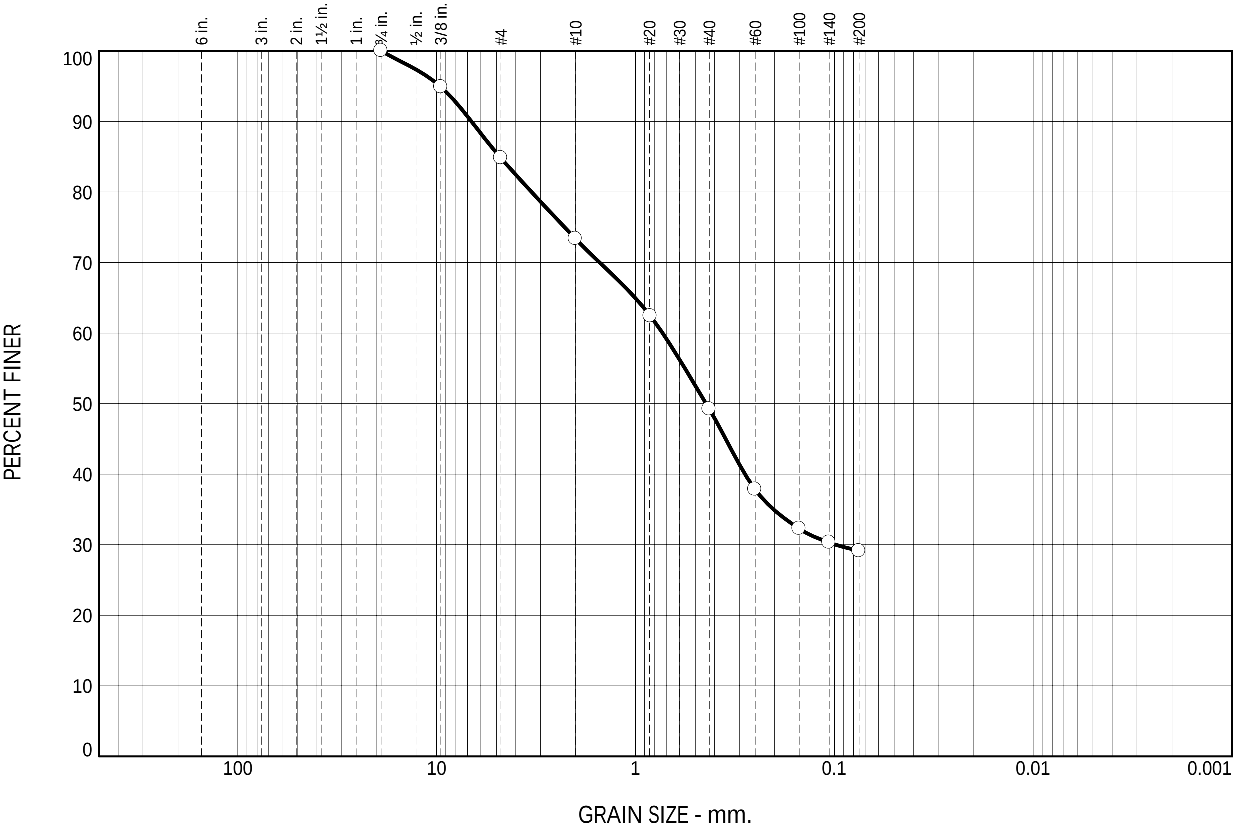
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051
Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	15.2	11.5	24.1	20.1	29.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	94.9		
#4	84.8		
#10	73.3		
#20	62.4		
#40	49.2		
#60	37.8		
#100	32.3		
#140	30.3		
#200	29.1		

* (no specification provided)

Soil Description

Clayey Sand w/gravel

Atterberg Limits

PL= 10 LL= 29 PI= 19

Coefficients

D_{90}= 6.6822 D_{85}= 4.8175 D_{60}= 0.7309
D_{50}= 0.4420 D_{30}= 0.0984 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-6(1)

Remarks

Natural Moisture = 17.5%

Source of Sample: LOT-A2-14 Depth: 5.0-6.5
Sample Number: S-3 Date:

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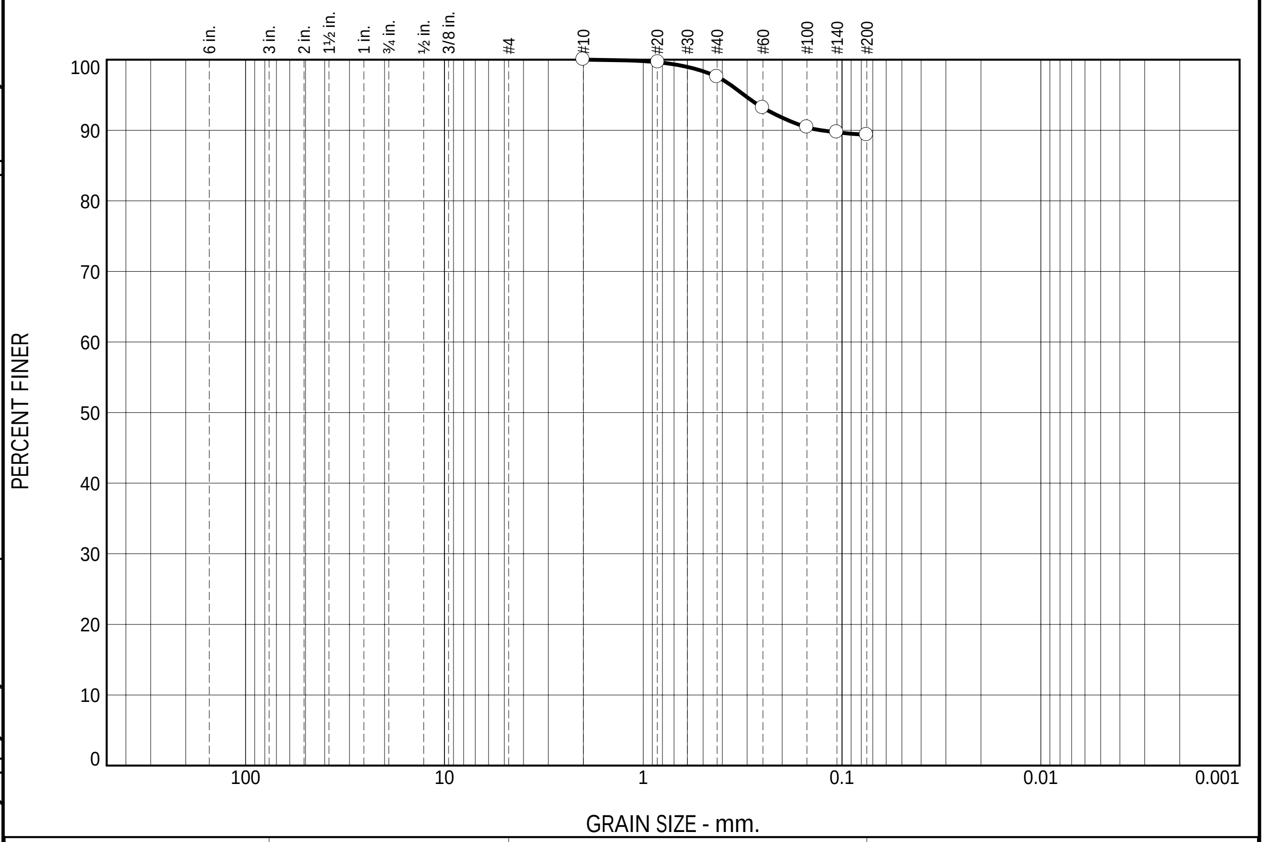
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	2.4	8.3	89.3	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.6		
#40	97.6		
#60	93.2		
#100	90.4		
#140	89.7		
#200	89.3		

* (no specification provided)

Soil Description

Clay

Atterberg Limits

PL= 54 LL= 108 PI= 54

Coefficients

D_{90}= 0.1282 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(62)

Remarks

Natural Moisture = 68.0%

Source of Sample: LOT-A2-14 Depth: 13.5-15
Sample Number: S-6 Date:

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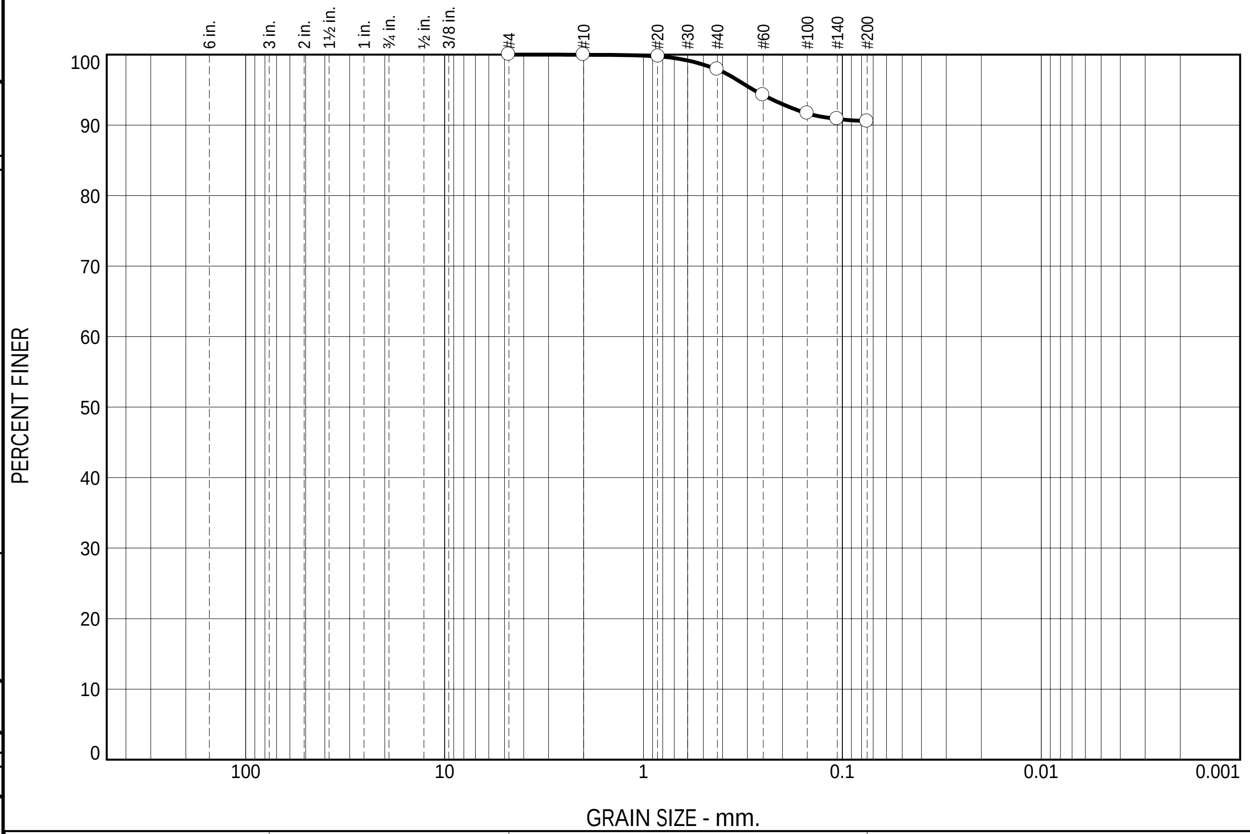
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	2.1	7.4	90.5	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.7		
#40	97.9		
#60	94.2		
#100	91.6		
#140	90.9		
#200	90.5		

* (no specification provided)

Soil Description

Fat Clay

Atterberg Limits

PL= 38 LL= 95 PI= 57

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(61)

Remarks

Natural Moisture = 71.5%

Source of Sample: LOT-A2-14 Depth: 28.5-30
Sample Number: S-9
Date:

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Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

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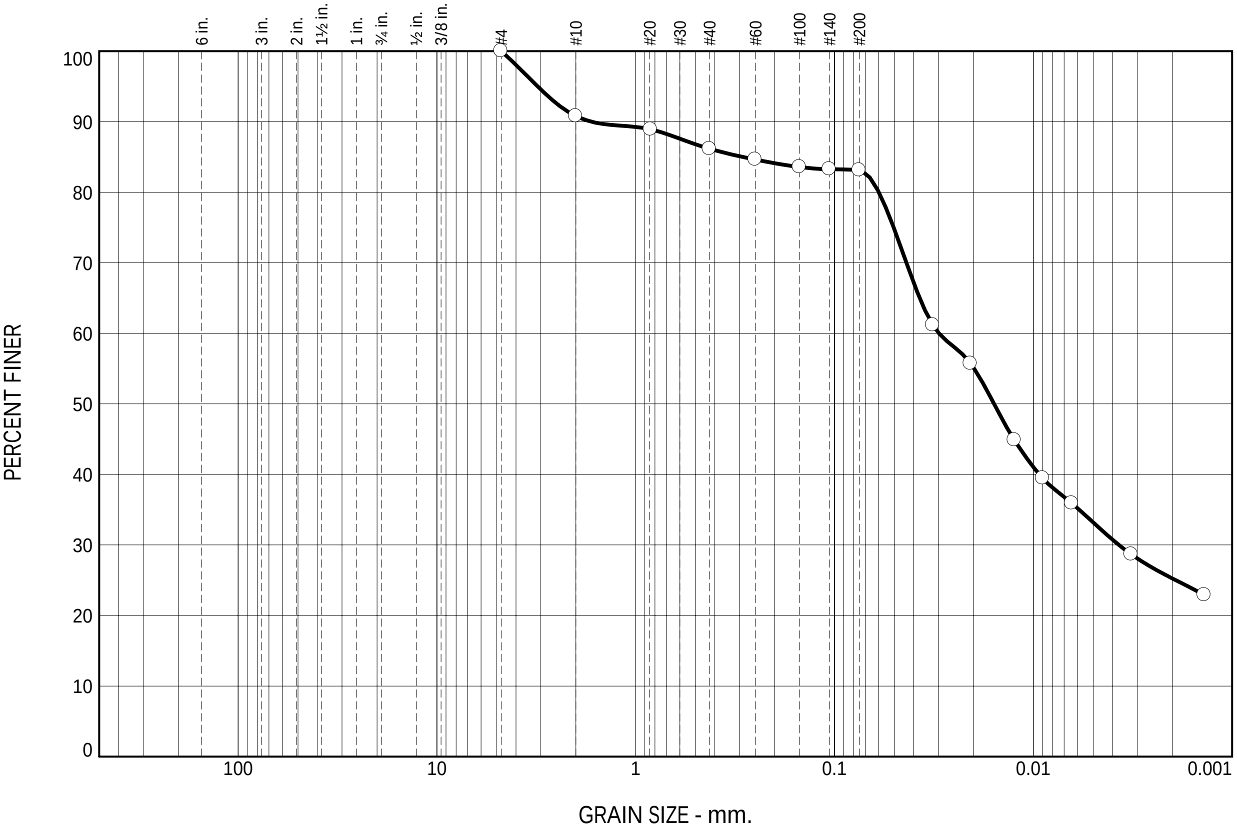
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	9.2	4.7	3.0	49.9	33.2

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	90.8		
#20	88.9		
#40	86.1		
#60	84.6		
#100	83.6		
#140	83.3		
#200	83.1		
0.0319 mm.	61.2		
0.0207 mm.	55.7		
0.0124 mm.	44.9		
0.0090 mm.	39.5		
0.0064 mm.	35.9		
0.0032 mm.	28.7		
0.0014 mm.	22.9		

* (no specification provided)

Soil Description

Fat Clay w/sand

Atterberg Limits

PL= 32 LL= 85 PI= 53

Coefficients

D_{90}= 1.6736 D_{85}= 0.2895 D_{60}= 0.0298
D_{50}= 0.0158 D_{30}= 0.0037 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(50)

Remarks

Natural Moisture = 60.0%

Source of Sample: LOT-A2-15 Depth: 5-6.5
Sample Number: S-3 Date:

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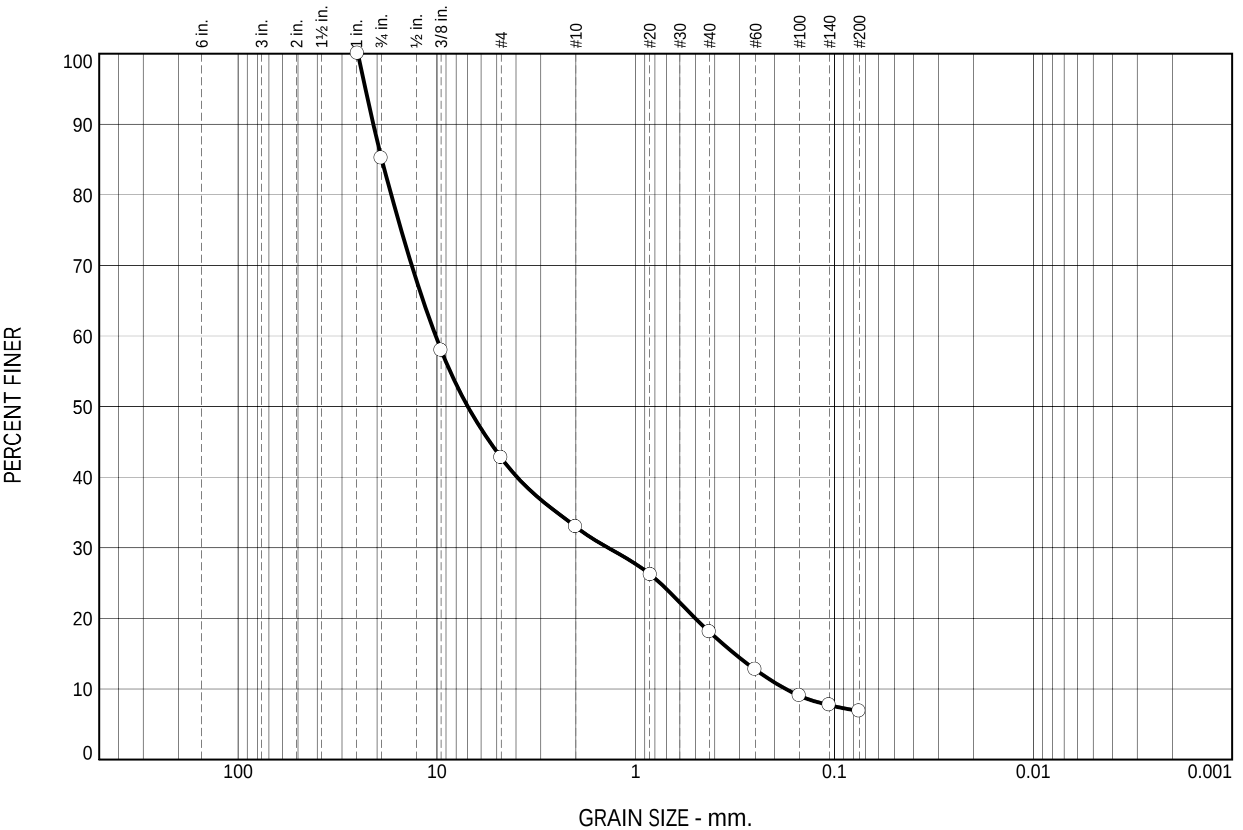
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	14.7	42.5	9.8	14.9	11.3	6.8	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	85.2		
.375	57.9		
#4	42.8		
#10	33.0		
#20	26.2		
#40	18.1		
#60	12.7		
#100	9.0		
#140	7.7		
#200	6.8		

* (no specification provided)

Soil Description

Well graded Grravel w/silt and sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 20.8909 D_{85}= 18.9294 D_{60}= 10.1415
D_{50}= 6.9941 D_{30}= 1.3758 D_{15}= 0.3185
D_{10}= 0.1760 C_u= 57.62 C_c= 1.06

Classification

USCS= GW-GM AASHTO= A-1-a

Remarks

Natural Moisture = 7.5%

Source of Sample: LOT-A2-15 Depth: 18.5-20
Sample Number: S-6 Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

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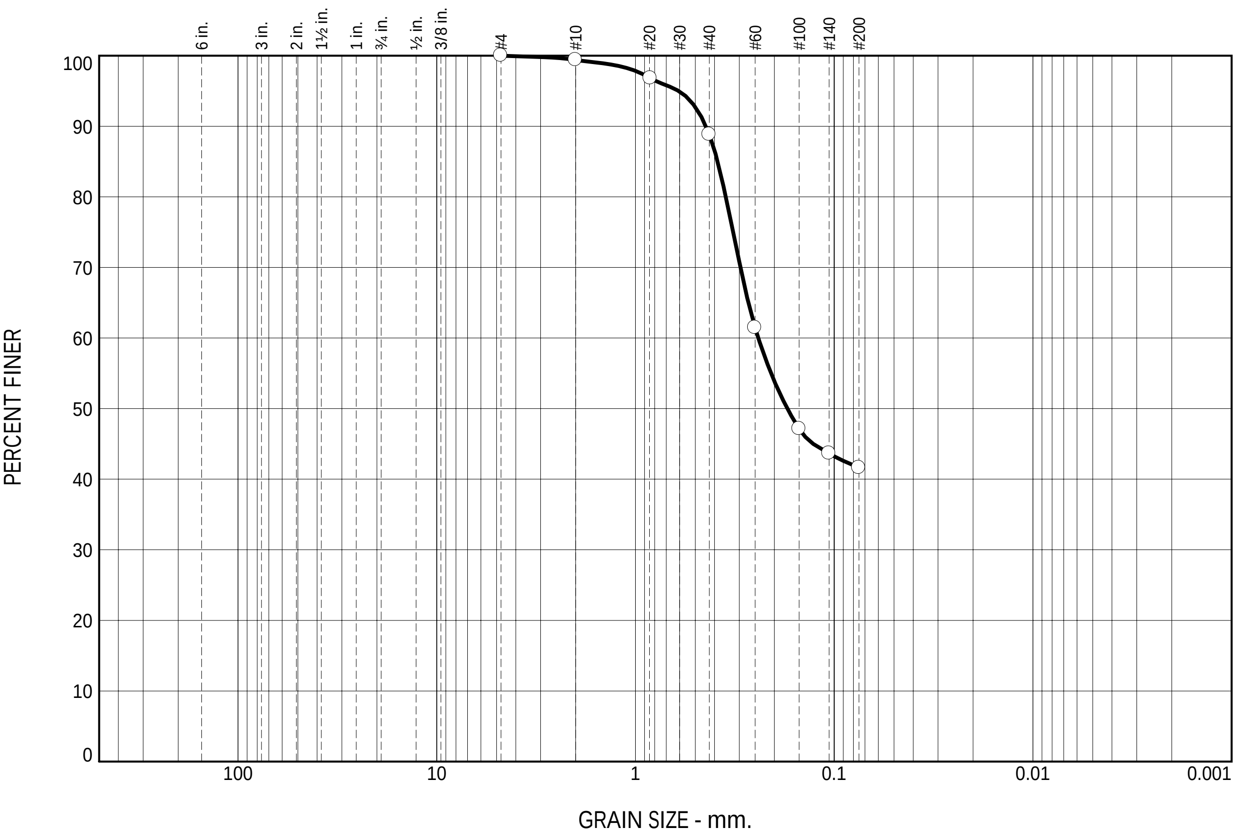
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.6	10.6	47.2	41.6	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.4		
#20	96.8		
#40	88.8		
#60	61.4		
#100	47.1		
#140	43.7		
#200	41.6		

* (no specification provided)

Soil Description

Clayey Sand

Atterberg Limits

PL= 13 LL= 32 PI= 19

Coefficients

D_{90}= 0.4423 D_{85}= 0.3862 D_{60}= 0.2408
D_{50}= 0.1721 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-6(4)

Remarks

Natural Moisture = 11.2%

Source of Sample: LOT-A2-15 Depth: 43.5-45
Sample Number: S-11 Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

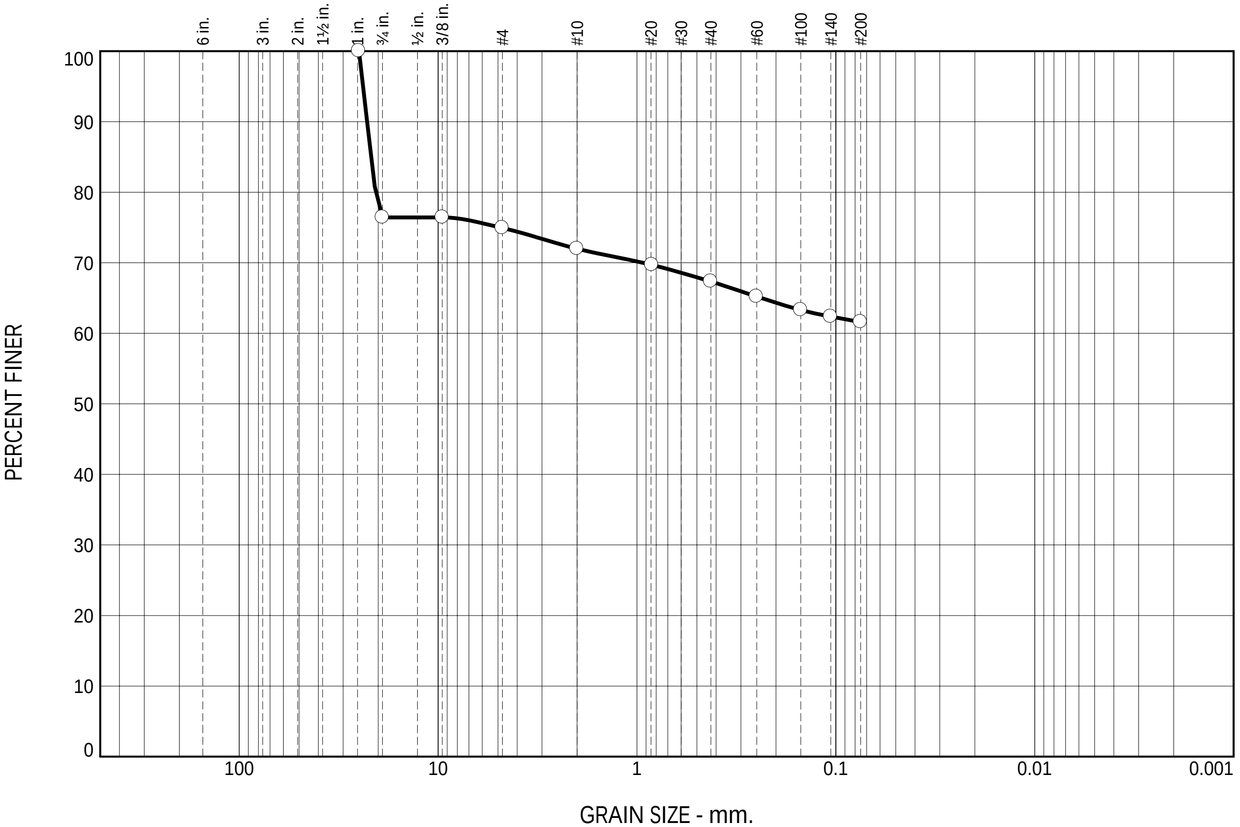
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	23.6	1.5	2.9	4.7	5.7	61.6	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	76.4		
.375	76.4		
#4	74.9		
#10	72.0		
#20	69.7		
#40	67.3		
#60	65.2		
#100	63.3		
#140	62.4		
#200	61.6		

* (no specification provided)

Soil Description

Gravelly Fat Clay

Atterberg Limits

PL= 28 LL= 51 PI= 23

Coefficients

D_{90}= 22.7352 D_{85}= 21.7393 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(13)

Remarks

Natural Moisture = 47.0%

Source of Sample: LOT-A2-16 Depth: 10
Sample Number: S-5 Redo
Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

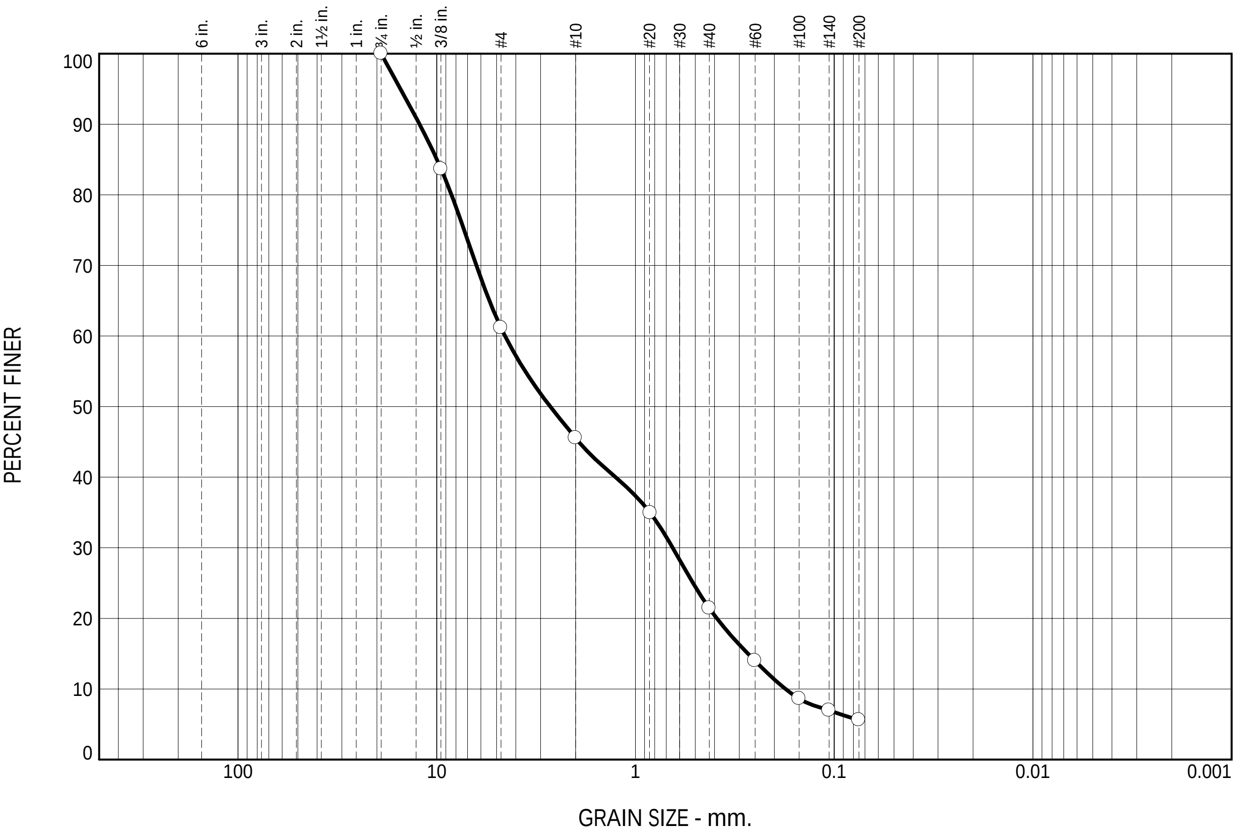
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	38.8	15.7	24.1	15.8	5.6	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	83.6		
#4	61.2		
#10	45.5		
#20	34.9		
#40	21.4		
#60	14.0		
#100	8.6		
#140	7.0		
#200	5.6		

* (no specification provided)

Soil Description

poorly graded sand w/silt and gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 12.2003 D_{85}= 9.9810 D_{60}= 4.5296
D_{50}= 2.6814 D_{30}= 0.6495 D_{15}= 0.2715
D_{10}= 0.1757 C_u= 25.77 C_c= 0.53

Classification

USCS= SP-SM AASHTO= A-1-a

Remarks

Natural Moisture = 10.3%

Source of Sample: LOT-A2-16 Depth: 23.5
Sample Number: S-8 Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: EA

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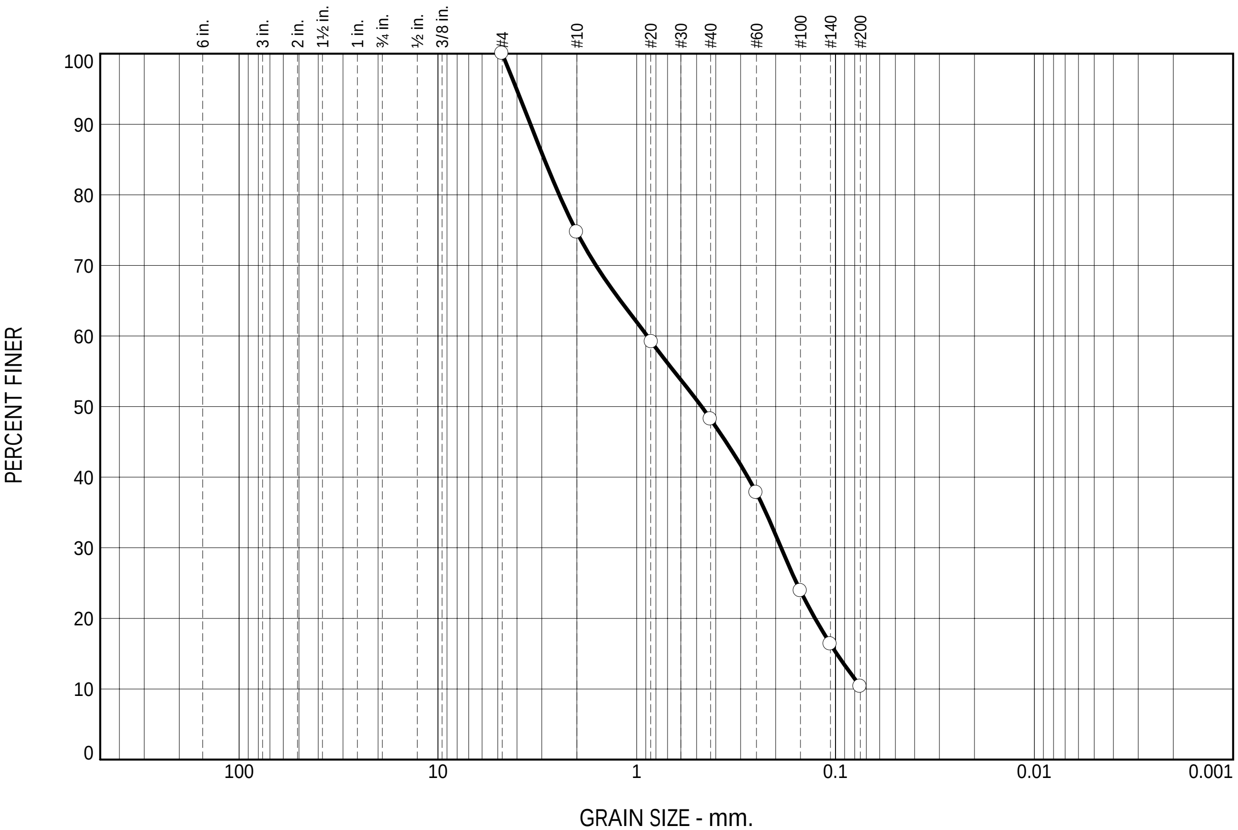
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	25.3	26.5	37.9	10.3	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	74.7		
#20	59.1		
#40	48.2		
#60	37.8		
#100	23.9		
#140	16.3		
#200	10.3		

* (no specification provided)

Soil Description

Poorly graded sand w/clay

Atterberg Limits

PL= 12 LL= 27 PI= 15

Coefficients

D_{90}= 3.4250 D_{85}= 2.9111 D_{60}= 0.8854
D_{50}= 0.4717 D_{30}= 0.1877 D_{15}= 0.0987
D_{10}= C_u= C_c=

Classification

USCS= SP-SC AASHTO= A-2-6(0)

Remarks

Natural Moisture = 16.7%

Source of Sample: LOT-A2-16 Depth: 33.5
Sample Number: S-10 Date:

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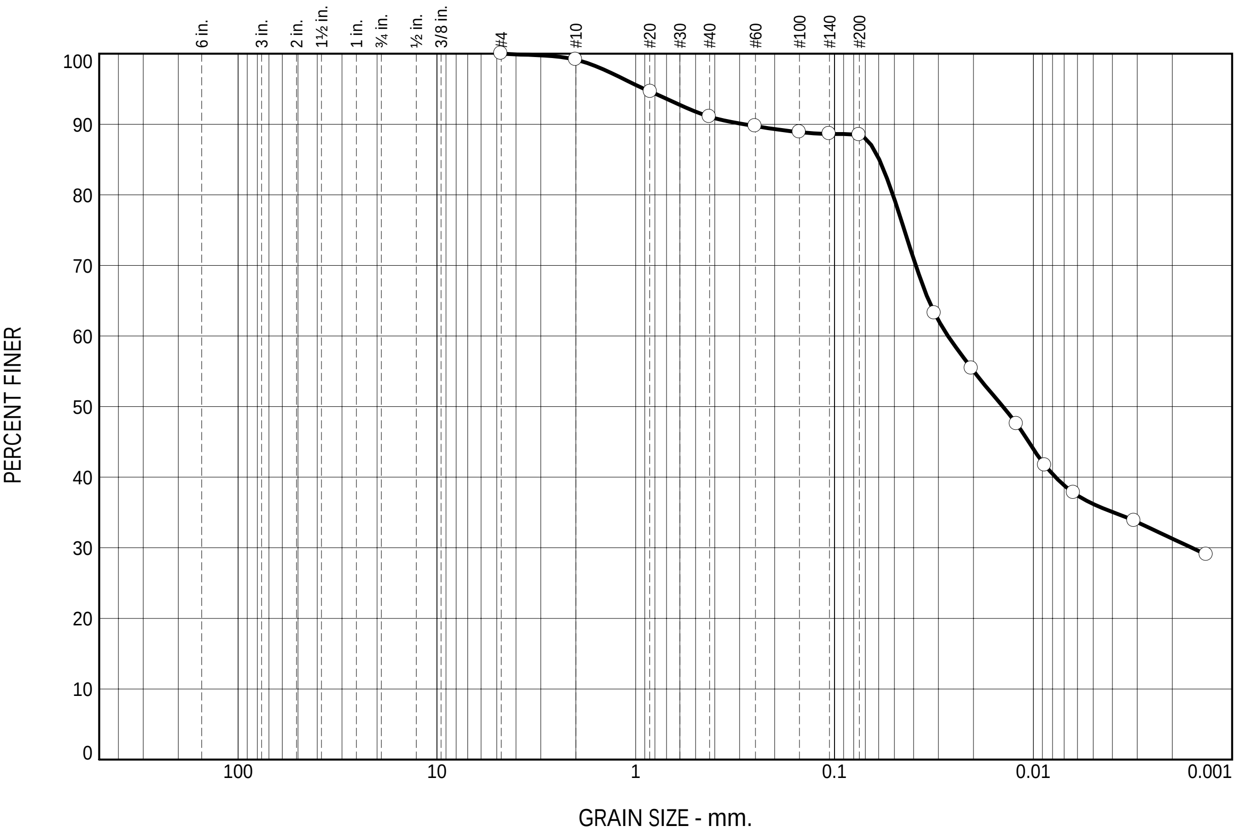
Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.9	8.0	2.6	52.3	36.2

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.1		
#20	94.6		
#40	91.1		
#60	89.7		
#100	88.9		
#140	88.6		
#200	88.5		
0.0314 mm.	63.2		
0.0204 mm.	55.4		
0.0121 mm.	47.5		
0.0087 mm.	41.7		
0.0063 mm.	37.8		
0.0031 mm.	33.8		
0.0013 mm.	29.0		

* (no specification provided)

Soil Description

Fat clay

Atterberg Limits

PL= 39 LL= 104 PI= 65

Coefficients

D_{90}= 0.2843 D_{85}= 0.0596 D_{60}= 0.0268
D_{50}= 0.0142 D_{30}= 0.0016 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(68)

Remarks

Natural Moisture = 67.3%

Source of Sample: LOT-A2-17 Depth: 28.5
Sample Number: S-9 Date: 11/11

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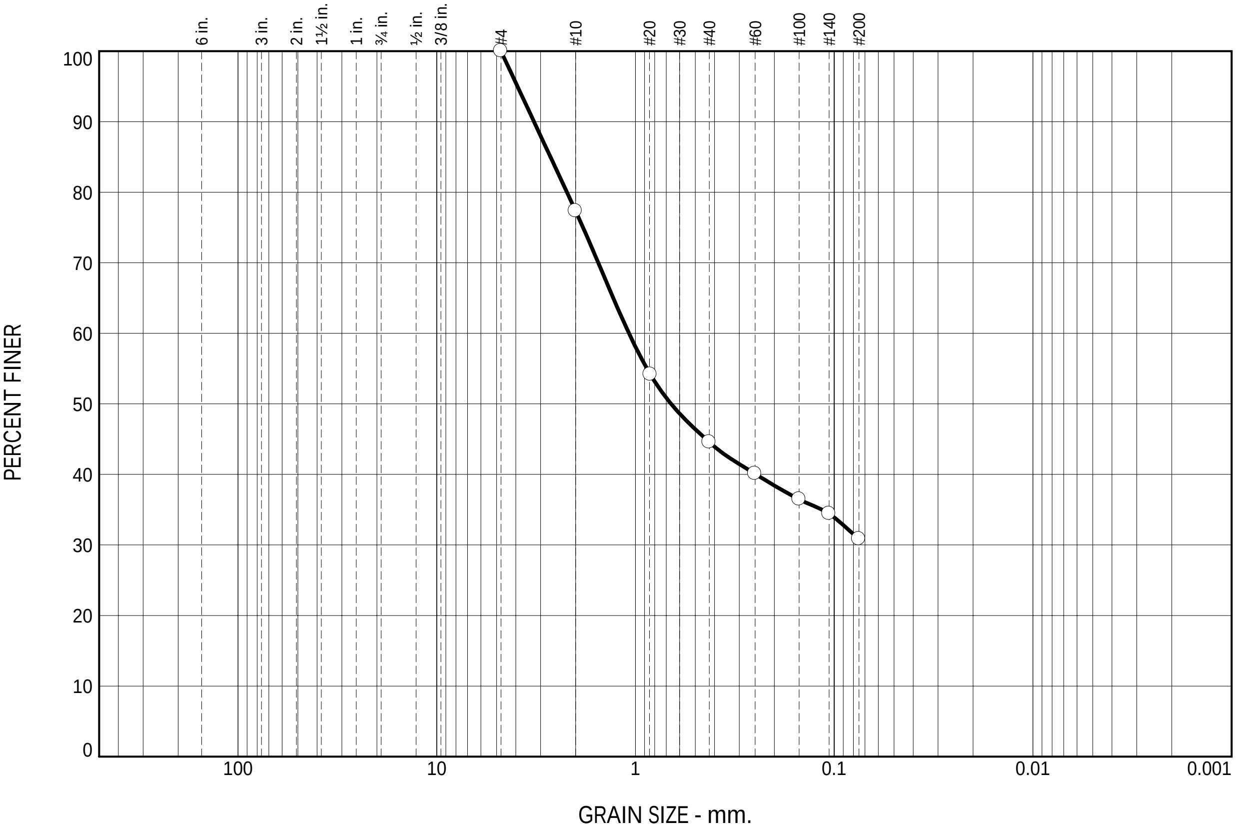
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	22.7	32.7	13.8	30.8	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	77.3		
#20	54.2		
#40	44.6		
#60	40.1		
#100	36.5		
#140	34.4		
#200	30.8		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= 37 LL= 73 PI= 36

Coefficients

D_{90}= 3.2404 D_{85}= 2.6767 D_{60}= 1.0779
D_{50}= 0.6622 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-7(4)

Remarks

Natural Moisture = 52.3%

Source of Sample: LOT-A2-17 Depth: 43.5
Sample Number: S-12

Date: 11/11

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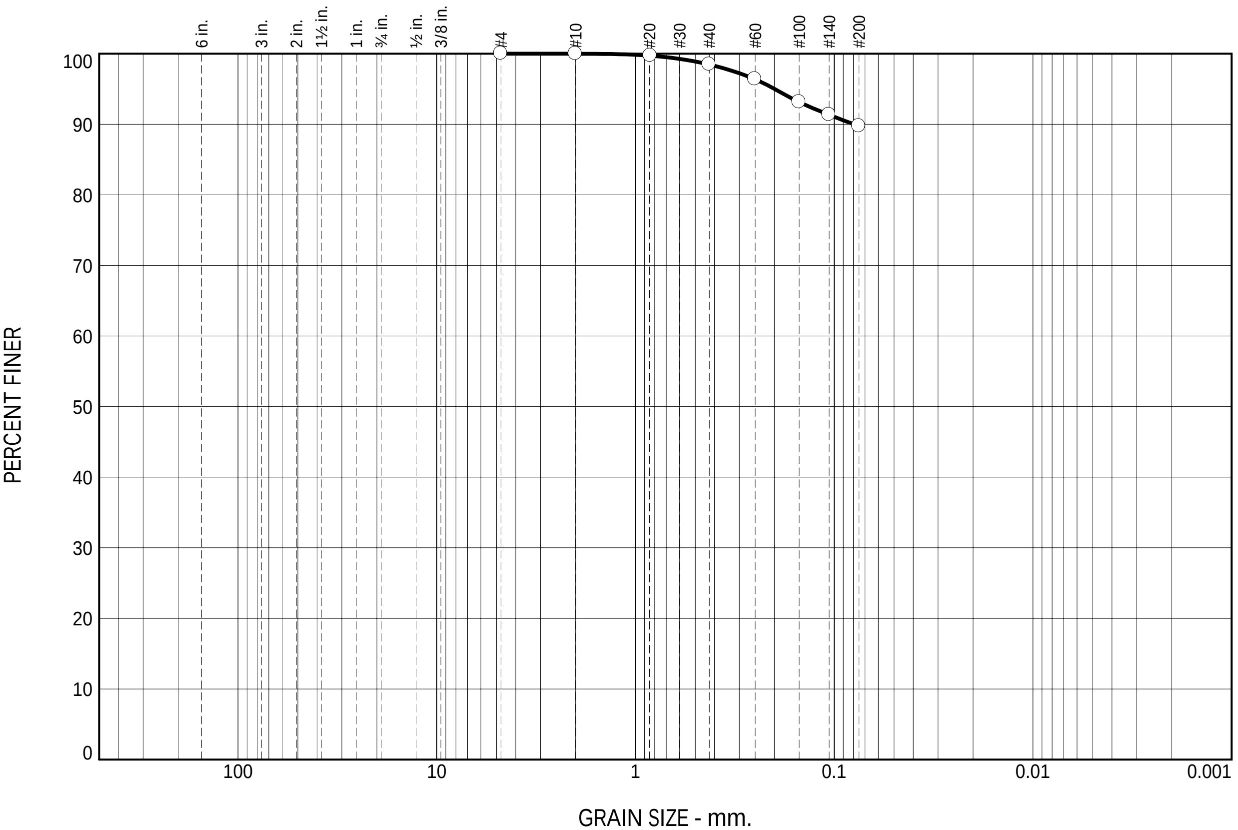
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.5	8.8	89.7	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.7		
#40	98.5		
#60	96.4		
#100	93.1		
#140	91.3		
#200	89.7		

* (no specification provided)

Soil Description

Elastic Silt

Atterberg Limits

PL= 35 LL= 65 PI= 30

Coefficients

D_{90}= 0.0796 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(33)

Remarks

Natural Moisture = 24.4%

Source of Sample: LOT-A2-17 Depth: 68.5
Sample Number: S-17 Redo Date:

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Project No: P20051 Figure

Tested By: AD

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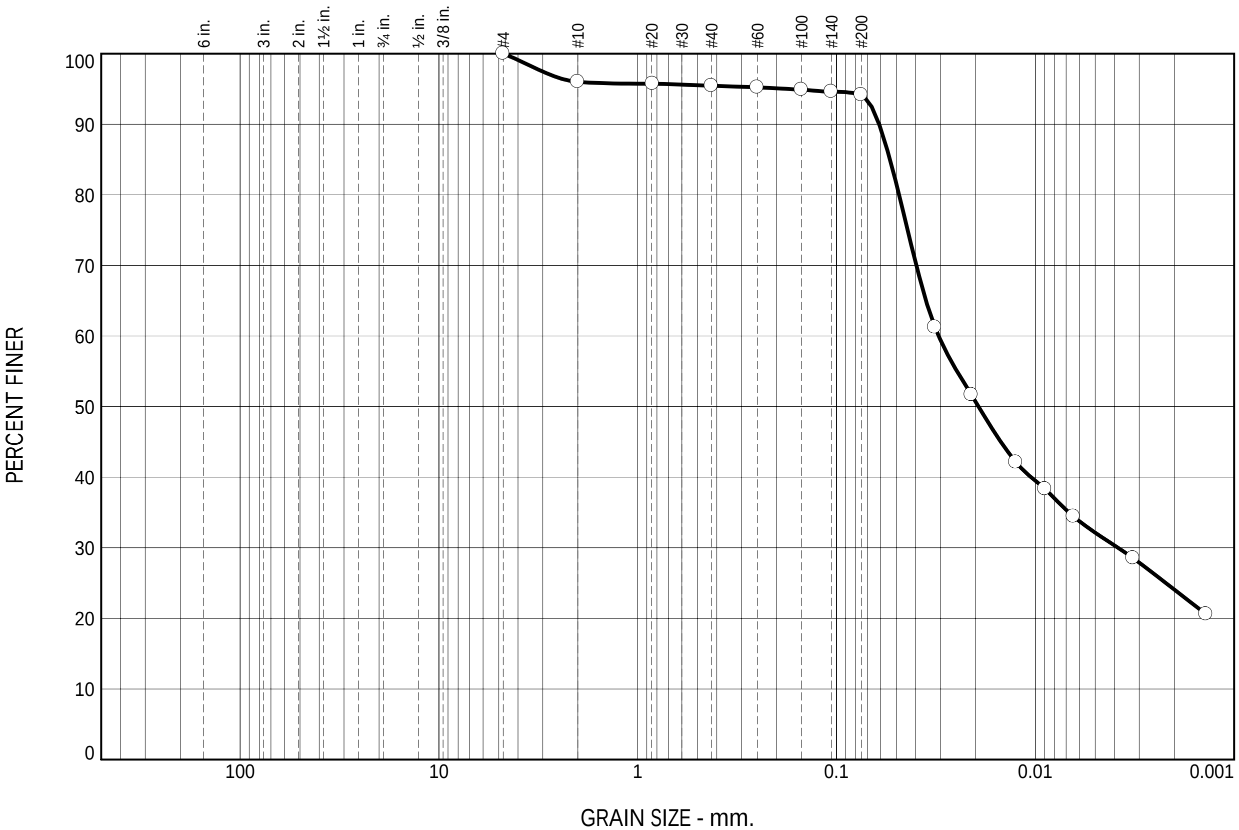
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	4.0	0.6	1.3	62.0	32.1

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	96.0		
#20	95.7		
#40	95.4		
#60	95.2		
#100	94.9		
#140	94.6		
#200	94.1		
0.0319 mm.	61.2		
0.0209 mm.	51.7		
0.0125 mm.	42.1		
0.0089 mm.	38.3		
0.0064 mm.	34.4		
0.0032 mm.	28.5		
0.0014 mm.	20.6		

* (no specification provided)

Soil Description

Fat Clay

Atterberg Limits

PL= 39 LL= 97 PI= 58

Coefficients

D_{90}= 0.0610	D_{85}= 0.0538	D_{60}= 0.0306
D_{50}= 0.0193	D_{30}= 0.0038	D_{15}=
D_{10}=	C_u=	C_c=

Classification

USCS= CH AASHTO= A-7-5(67)

Remarks

Natural Moisture = 54.9%

Source of Sample: LOT-A2-17A Depth: 32
Sample Number: T-1 Date:

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Project: South Market Street Lab Testing
Project No: P20051 Figure

Tested By: AD

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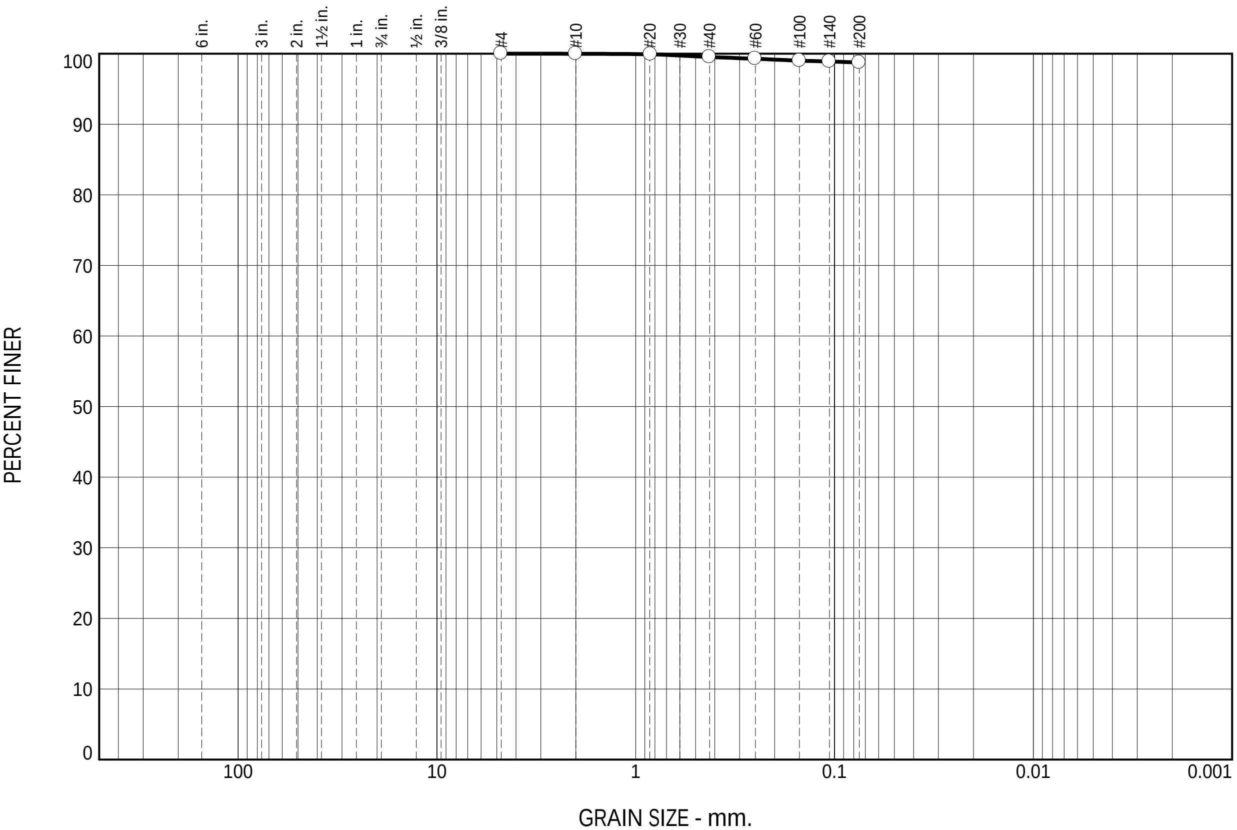
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.5	0.8	98.7	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.5		
#60	99.3		
#100	99.0		
#140	98.9		
#200	98.7		

* (no specification provided)

Soil Description

Fat Clay

Atterberg Limits

PL= 36 LL= 90 PI= 54

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(66)

Remarks

Natural Moisture = 57.4%

Source of Sample: LOT-A2-18 Depth: 18.5
Sample Number: S-7 Redo
Date:

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Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

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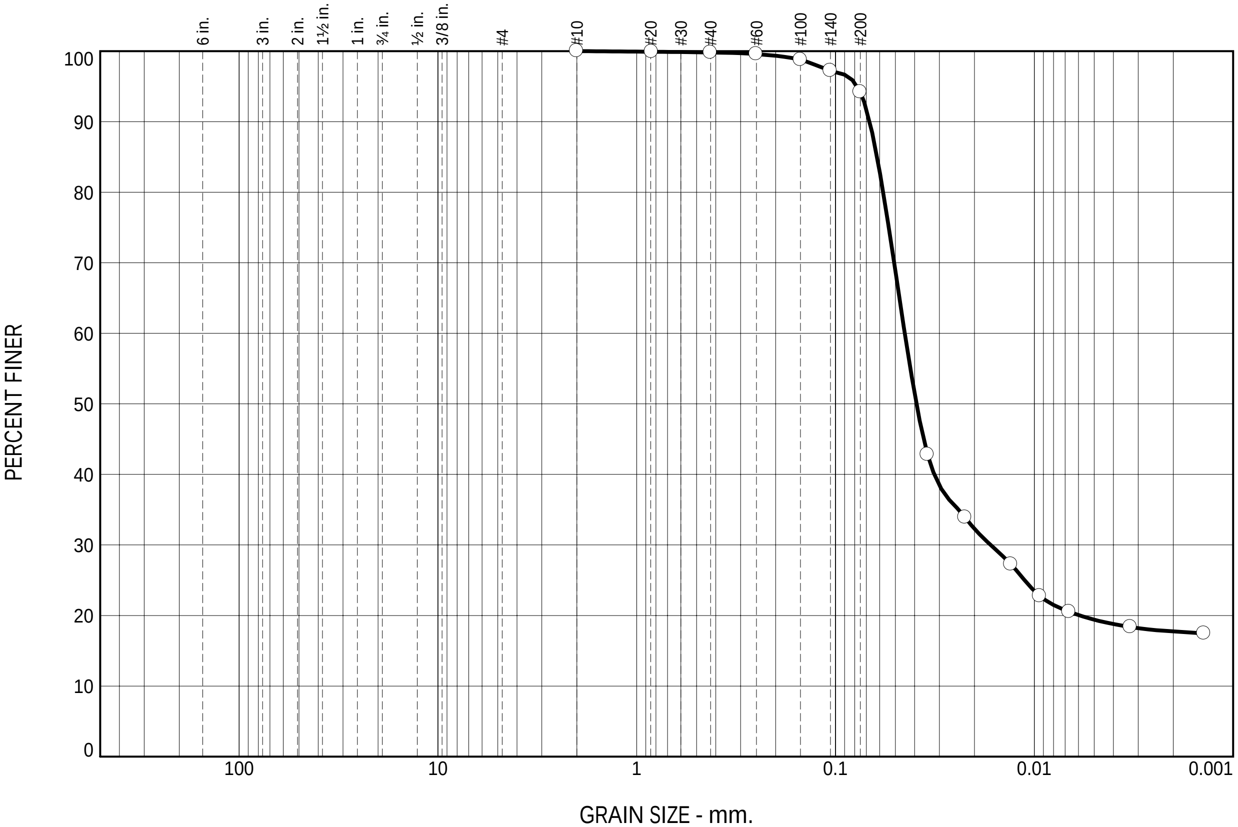
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	5.6	74.8	19.4

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.9		
#40	99.8		
#60	99.6		
#100	98.8		
#140	97.2		
#200	94.2		
0.0344 mm.	42.8		
0.0223 mm.	33.9		
0.0131 mm.	27.3		
0.0094 mm.	22.8		
0.0067 mm.	20.5		
0.0033 mm.	18.4		
0.0014 mm.	17.5		

* (no specification provided)

Soil Description

Elastic silk

Atterberg Limits

PL= 53 LL= 106 PI= 53

Coefficients

D_{90}= 0.0674 D_{85}= 0.0618 D_{60}= 0.0448
D_{50}= 0.0392 D_{30}= 0.0166 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(65)

Remarks

Natural Moisture = 66.1%

Source of Sample: LOT-A2-18 Depth: 38.5
Sample Number: S-11 Date:

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Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

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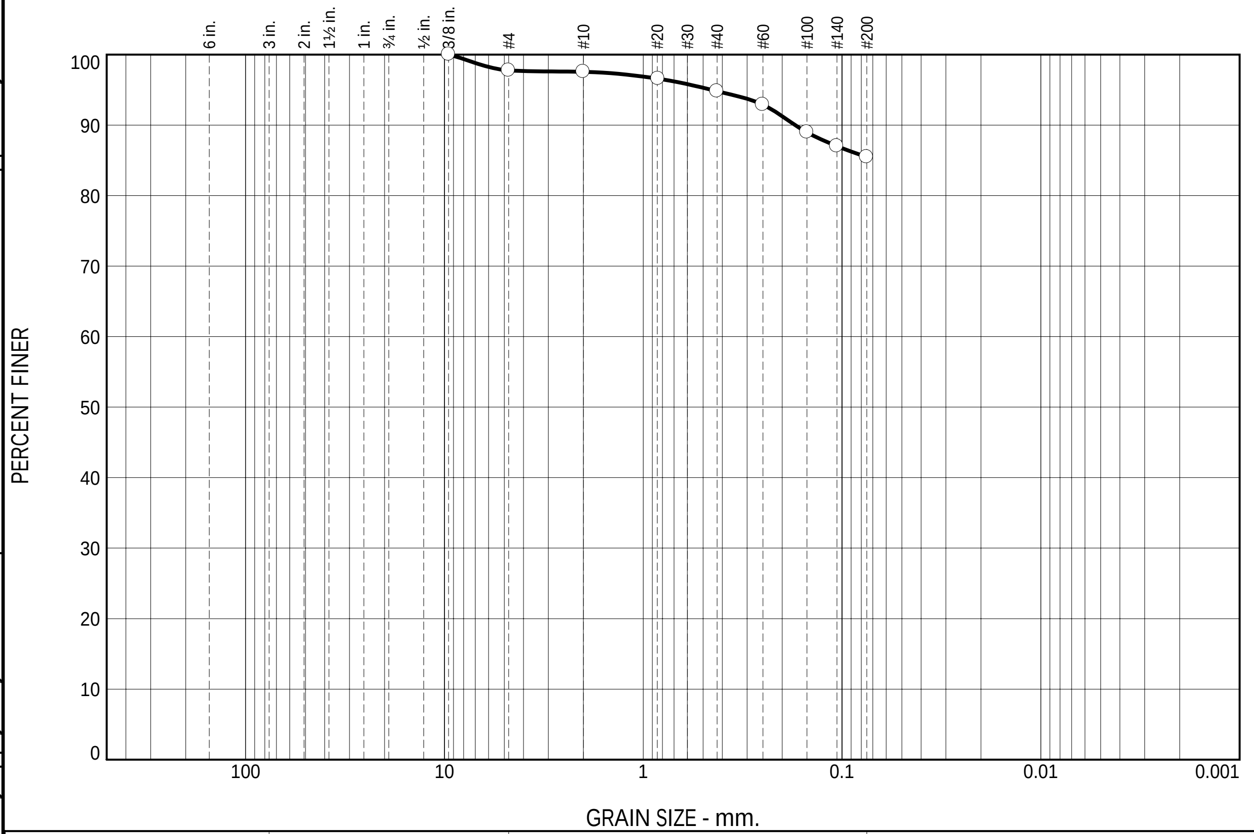
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.2	0.3	2.7	9.4	85.4	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	97.8		
#10	97.5		
#20	96.6		
#40	94.8		
#60	92.9		
#100	89.0		
#140	87.0		
#200	85.4		

* (no specification provided)

Soil Description

Elastic Silt w/sand

Atterberg Limits

PL= 33 LL= 63 PI= 30

Coefficients

D_{90}= 0.1722	D_{85}=	D_{60}=
D_{50}=	D_{30}=	D_{15}=
D_{10}=	C_u=	C_c=

Classification

USCS= MH AASHTO= A-7-5(30)

Remarks

Natural Moisture = 33.8%

Source of Sample: LOT-A2-18 Depth: 53.5
Sample Number: S-14 Redo

Date:

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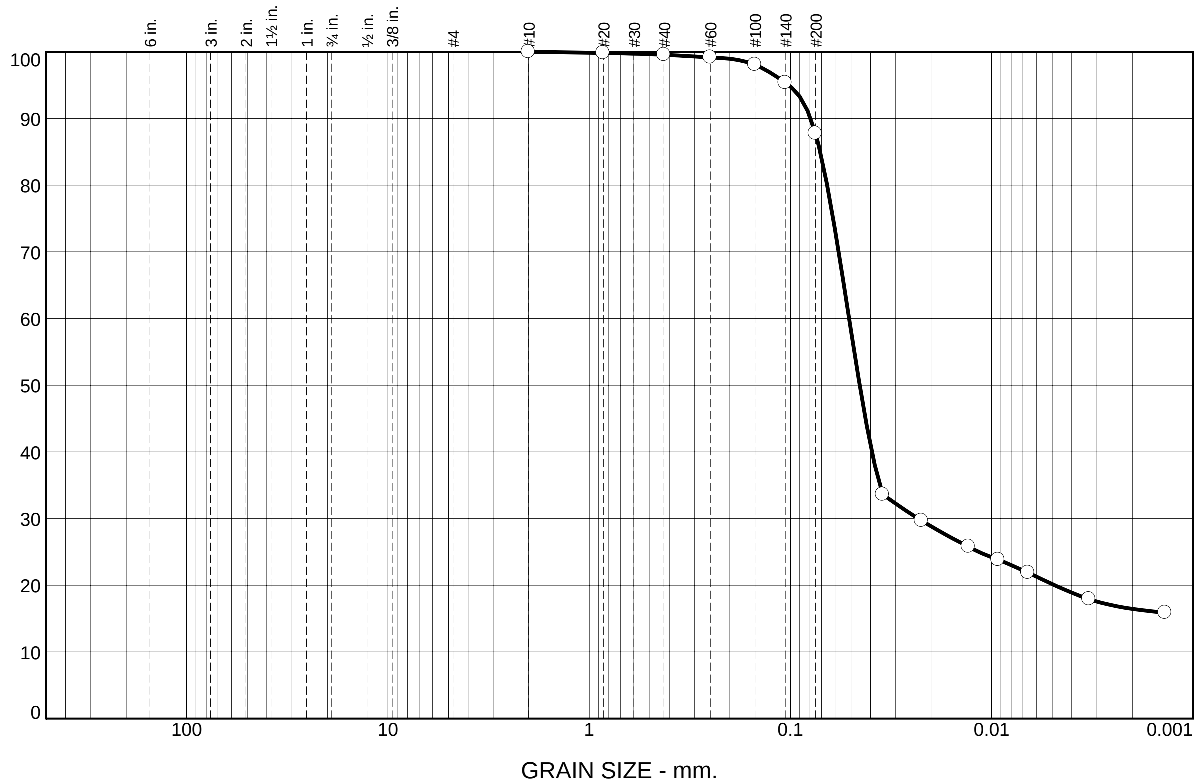
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.4	11.9	67.5	20.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.8		
#40	99.6		
#60	99.2		
#100	98.1		
#140	95.4		
#200	87.7		

* (no specification provided)

Material Description

Black fat clay

Atterberg Limits

PL= 31 LL= 64 PI= 33

Coefficients

D_{90}= 0.0793 D_{85}= 0.0711 D_{60}= 0.0511
D_{50}= 0.0453 D_{30}= 0.0232 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(34)

Remarks

Source of Sample: OL-B-01 **Depth:** 17-19
Sample Number: T-2

Date: 7/7

HILLIS-CARNES ENGINEERING ASSOCIATES

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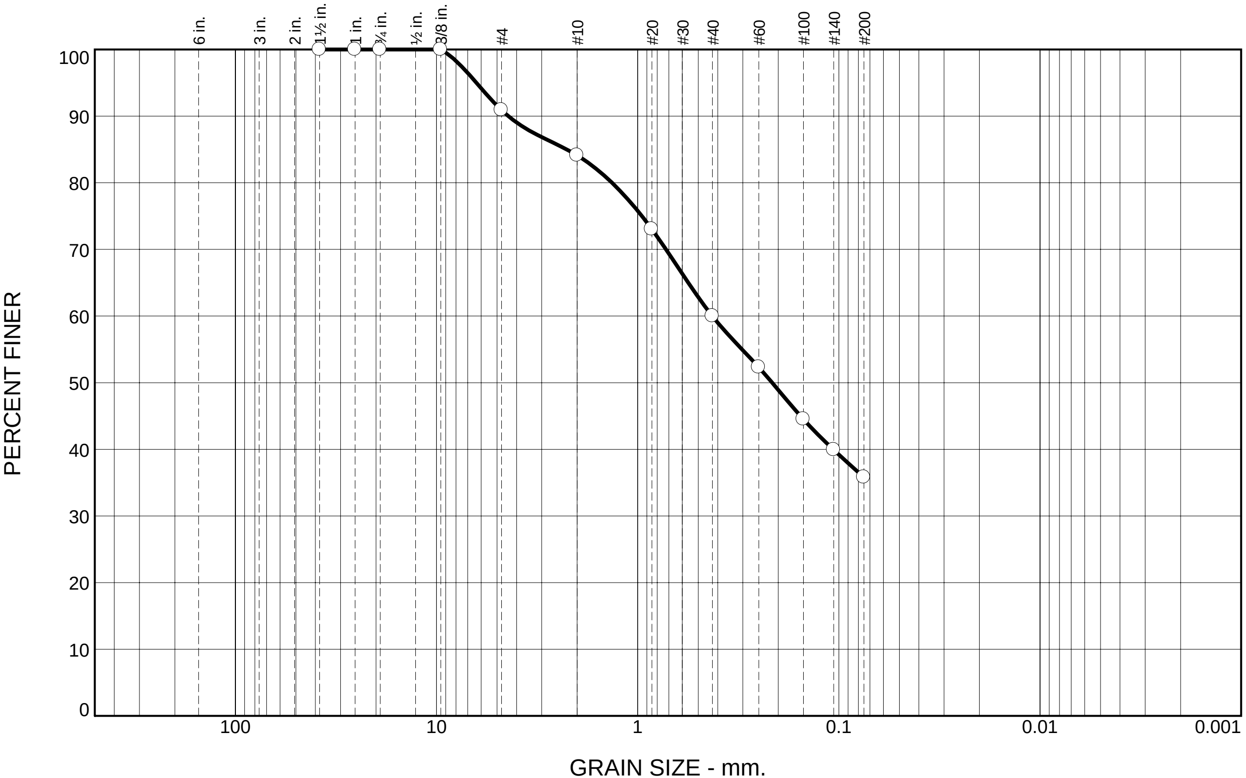
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: ACD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	9.1	6.8	24.1	24.2	35.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	100.0		
.75	100.0		
.375	100.0		
#4	90.9		
#10	84.1		
#20	73.0		
#40	60.0		
#60	52.3		
#100	44.5		
#140	39.9		
#200	35.8		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 4.4003 D_{85}= 2.2523 D_{60}= 0.4256
D_{50}= 0.2146 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

NAt moisture = 23.9%

Source of Sample: OL-B-01 **Depth:** 38.5-40
Sample Number: S-10 **Date:** 6/29

HILLIS-CARNES ENGINEERING ASSOCIATES

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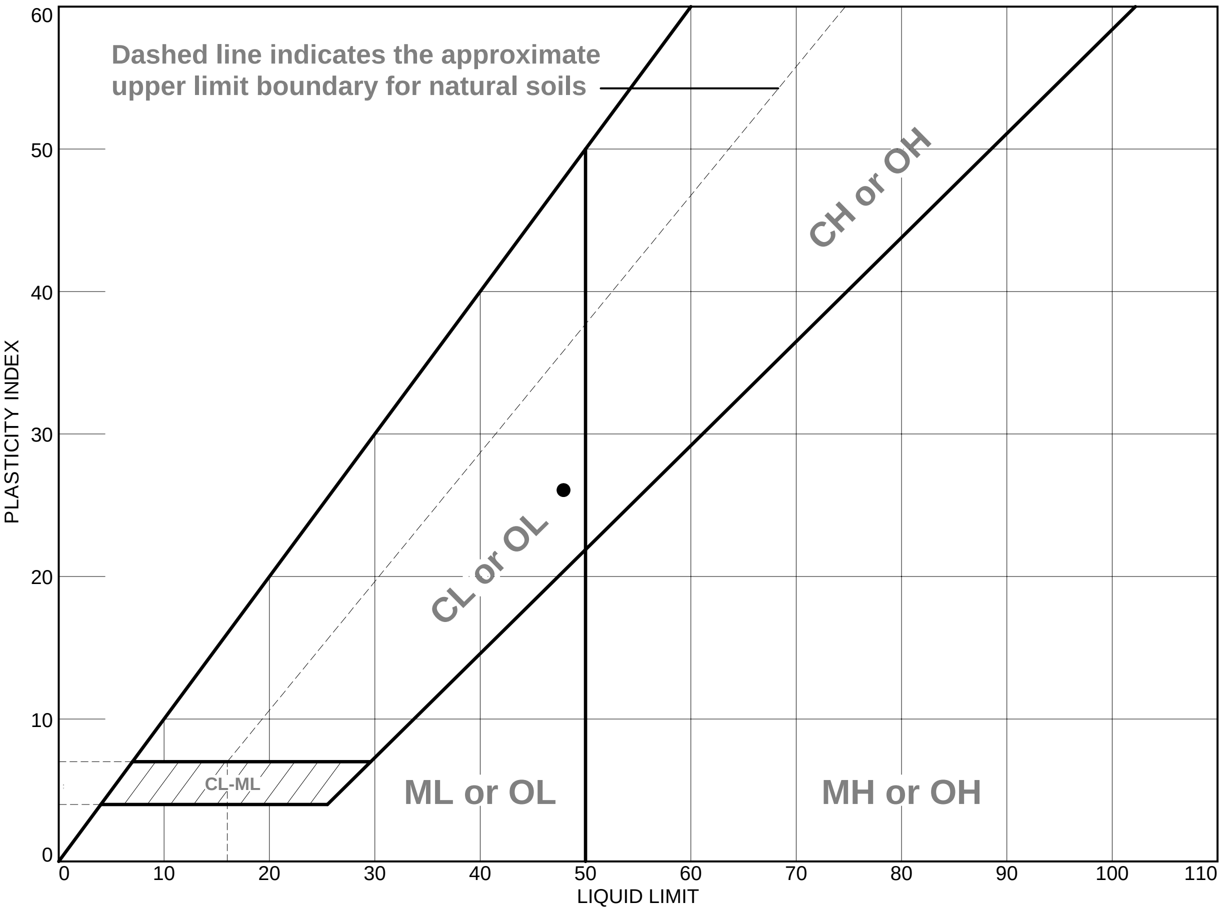
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: ACD

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey sand	48	22	26	60.0	35.8	SC

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

●**Source of Sample:** OL-B-01 **Depth:** 38.5-40 **Sample Number:** S-10

Remarks:

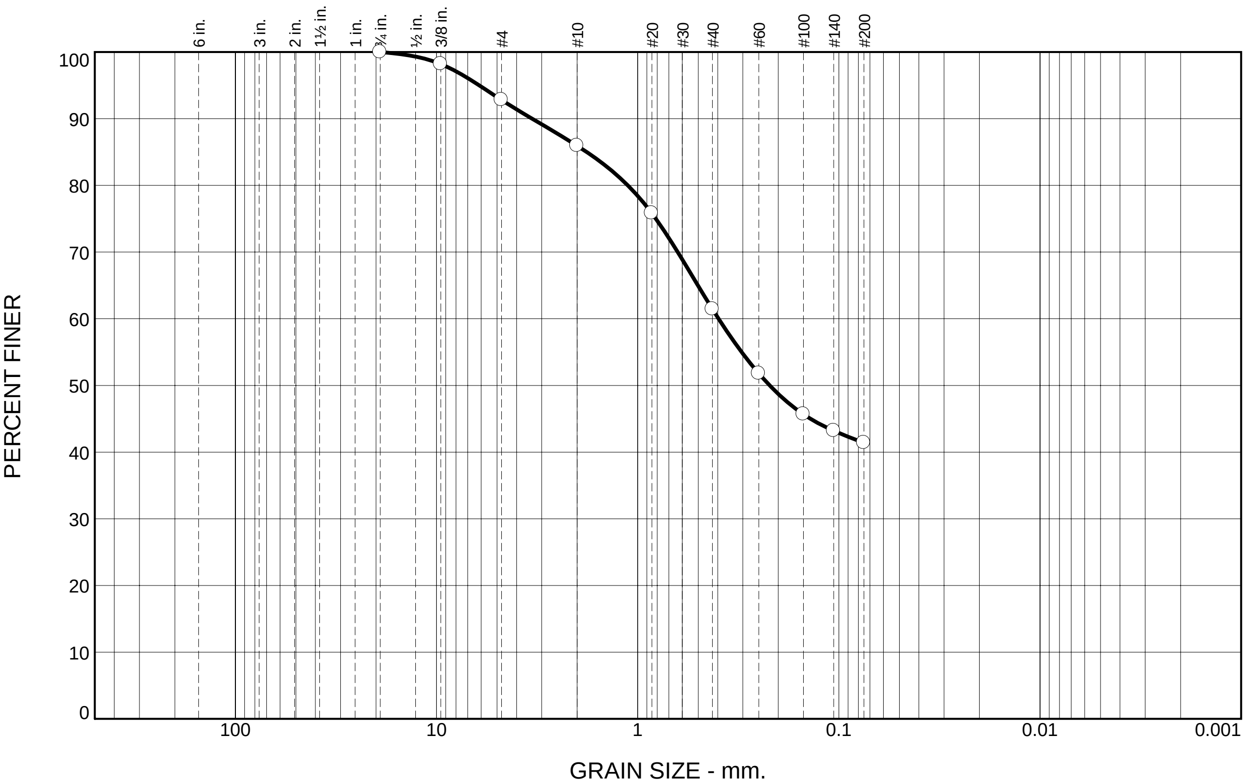
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Figure

Tested By: ad

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.2	6.9	24.5	20.0	41.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	98.2		
#4	92.8		
#10	85.9		
#20	75.8		
#40	61.4		
#60	51.8		
#100	45.7		
#140	43.2		
#200	41.4		

* (no specification provided)

Material Description

Dk gray silty sand

Atterberg Limits

PL= NP
LL= NP
PI= NP

Coefficients

D_{90}= 3.3446
D_{85}= 1.7924
D_{60}= 0.3962
D_{50}= 0.2207
D_{30}=
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= SM
AASHTO= A-4(0)

Remarks

Nat moisture = 22.6%
(separate sample)

Location: Bulk RB-B-01

Date: 6/1

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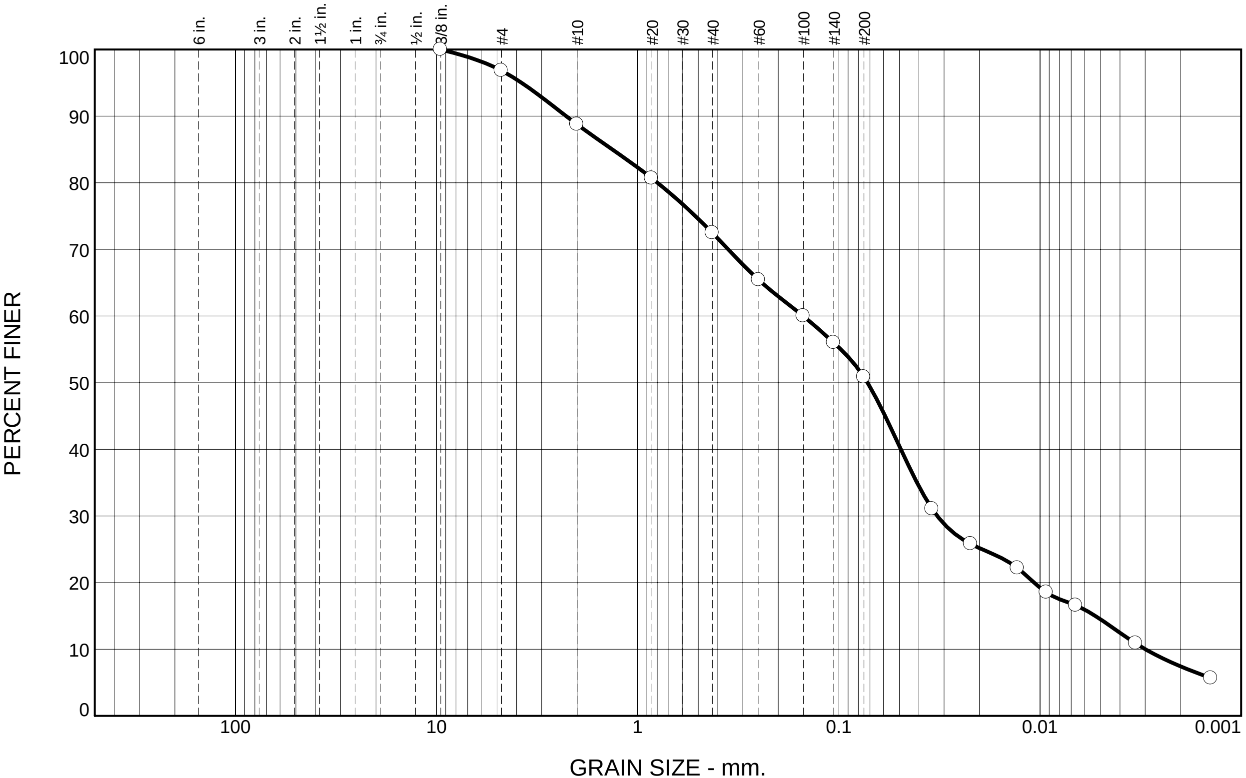
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051
Figure

Tested By: ad

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.2	8.0	16.3	21.7	36.3	14.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	96.8		
#10	88.8		
#20	80.7		
#40	72.5		
#60	65.4		
#100	60.0		
#140	56.0		
#200	50.8		

* (no specification provided)

Material Description

Sandy Fat Clay

Atterberg Limits

PL= 31	LL= 69	PI= 38

Coefficients

D_{90}= 2.2650	D_{85}= 1.3369	D_{60}= 0.1504
D_{50}= 0.0721	D_{30}= 0.0324	D_{15}= 0.0053
D_{10}= 0.0030	C_{u}= 50.21	C_{c}= 2.33

Classification

USCS= CH AASHTO= A-7-5(16)

Remarks

Nat moisture = 52.5%

Source of Sample: RB-B-01 **Depth:** 15-17
Sample Number: T-1

Date: 7/8

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Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: ACD

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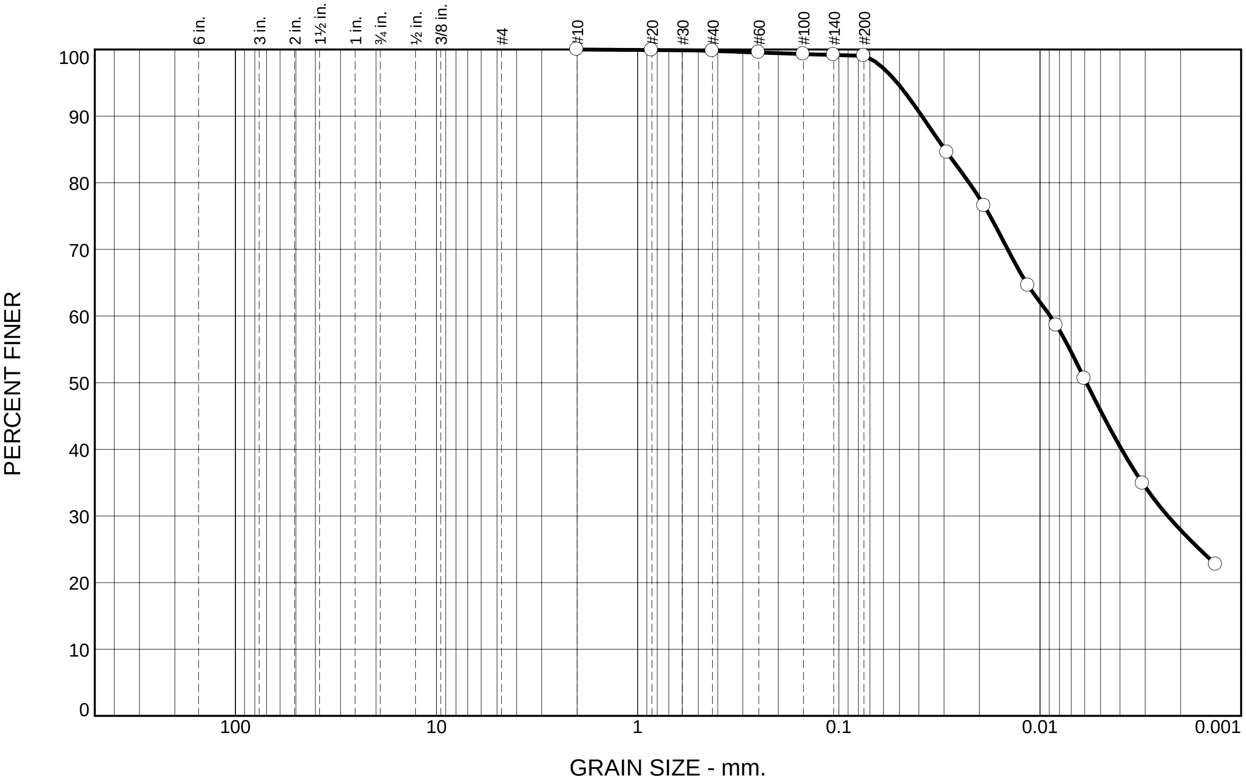
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	0.8	53.2	45.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.9		
#40	99.8		
#60	99.5		
#100	99.3		
#140	99.2		
#200	99.0		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0386	D_{85}= 0.0297	D_{60}= 0.0089
D_{50}= 0.0059	D_{30}= 0.0023	D_{15}=
D_{10}=	C_u=	C_c=

Classification

USCS= AASHTO=

Remarks

Nat moisture = 55.1%

Source of Sample: RB-B-01 **Depth:** 33.5-35
Sample Number: S-9 **Date:** 6/29

HILLIS-CARNES ENGINEERING ASSOCIATES

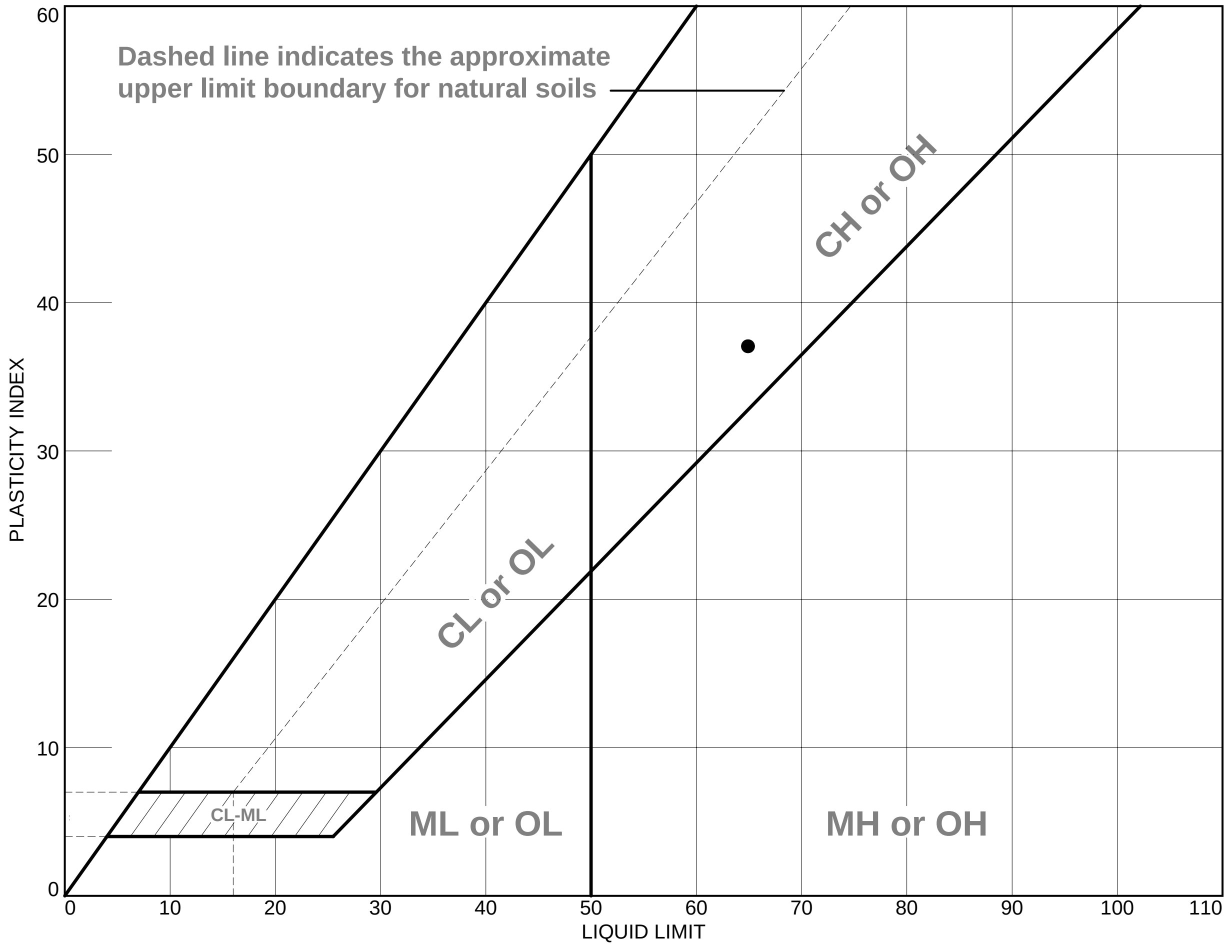
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Fat Clay	65	28	37	99.8	99.0	CH

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

● **Source of Sample:** RB-B-01 **Depth:** 33.5-35 **Sample Number:** S-9

Remarks:

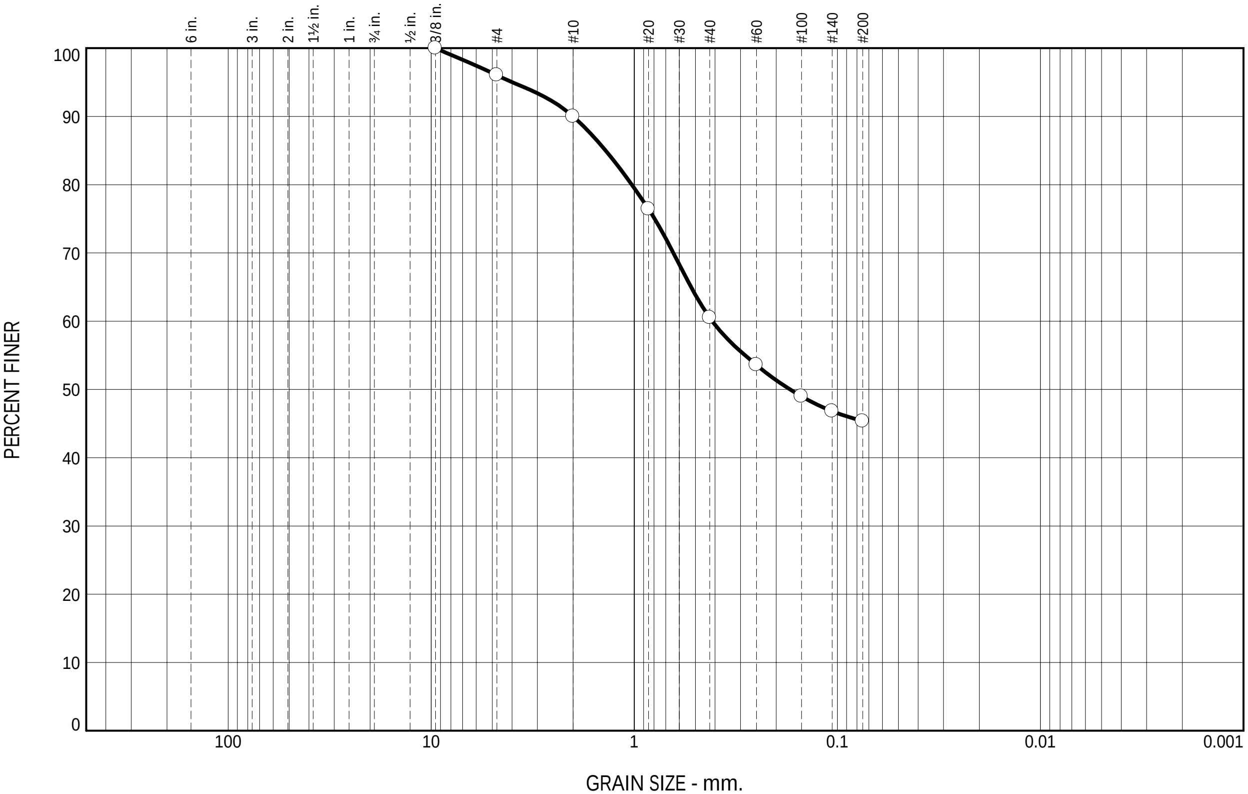
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Figure

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.0	6.0	29.5	15.2	45.3	

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
.375	100.0			
#4	96.0			
#10	90.0			
#20	76.4			
#40	60.5			
#60	53.6			
#100	49.0			
#140	46.8			
#200	45.3			

* (no specification provided)

Material Description

Clayey sand

Atterberg Limits

PL= 23 LL= 39 PI= 16

Coefficients

D_{90}= 2.0020 D_{85}= 1.3835 D_{60}= 0.4131
D_{50}= 0.1708 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-6(4)

Test Remarks

Nat moisture = 35.8%

Source of Sample: RB-B-02A Depth: 0-10.0
Sample Number: BULK Sample Date: 8/1

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: cs

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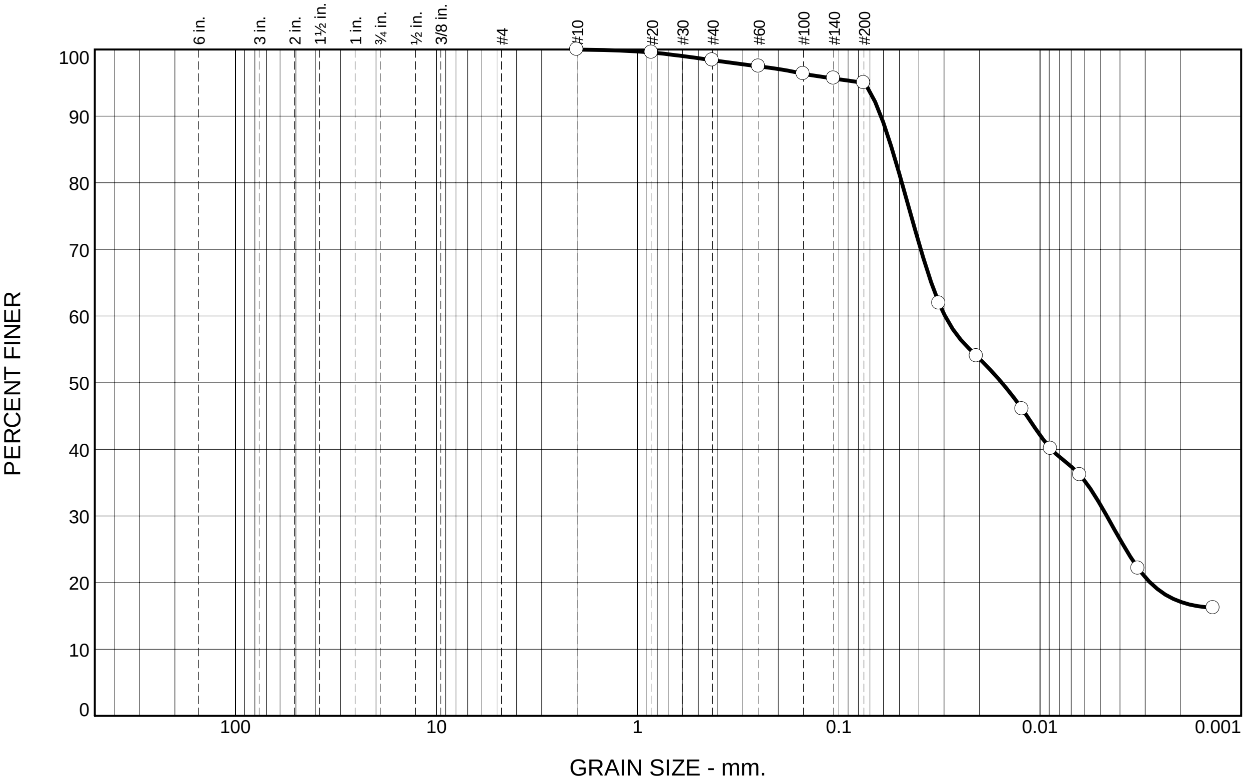
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.6	3.4	63.3	31.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.5		
#40	98.4		
#60	97.5		
#100	96.3		
#140	95.6		
#200	95.0		

* (no specification provided)

Material Description

fat clay

Atterberg Limits

PL= 35 LL= 105 PI= 70

Coefficients

D_{90}= 0.0617 D_{85}= 0.0543 D_{60}= 0.0296
D_{50}= 0.0155 D_{30}= 0.0047 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(80)

Remarks

Nat moisture = 68.4%

Source of Sample: RB-B-02A **Depth:** 20-21.5
Sample Number: S6 **Date:** 7/22

HILLIS-CARNES ENGINEERING ASSOCIATES

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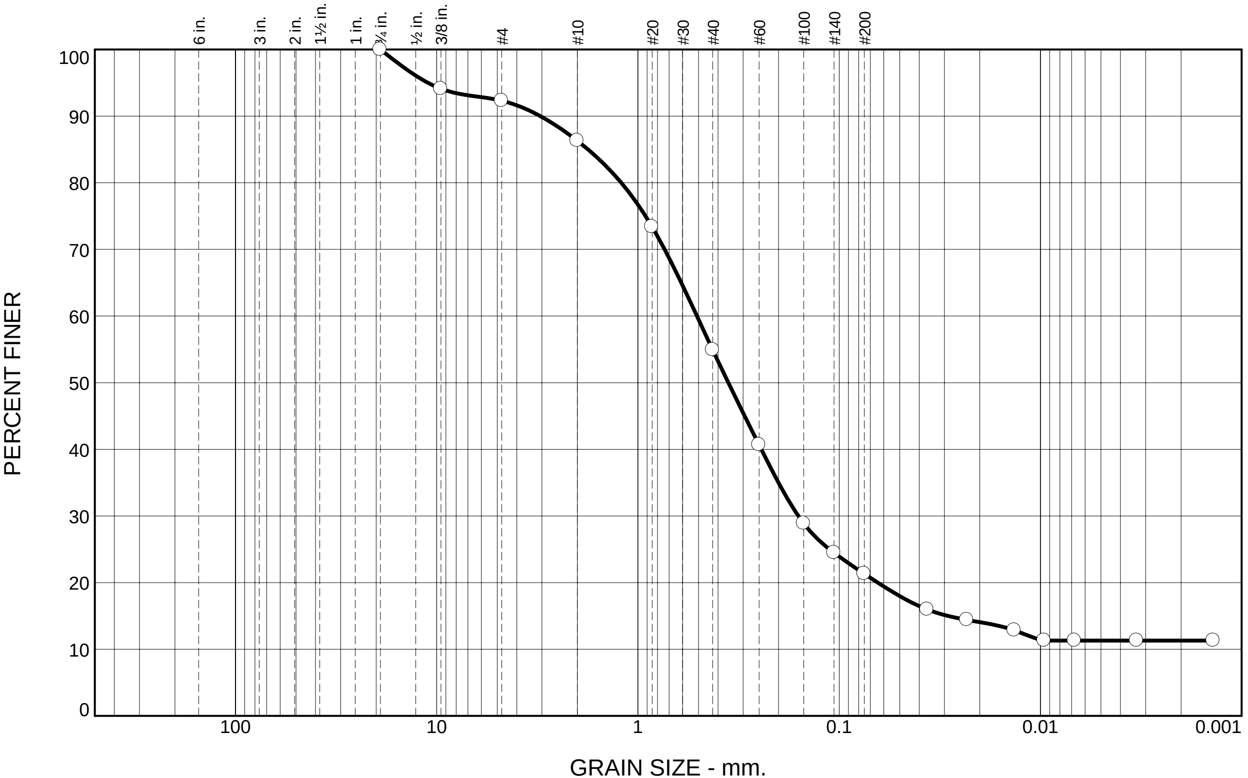
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: ad

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.7	6.0	31.4	33.6	10.0	11.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	94.1		
#4	92.3		
#10	86.3		
#20	73.4		
#40	54.9		
#60	40.7		
#100	28.9		
#140	24.5		
#200	21.3		

* (no specification provided)

Material Description

clayey sand

Atterberg Limits

PL= 25 LL= 49 PI= 24

Coefficients

D_{90}= 3.0511 D_{85}= 1.7699 D_{60}= 0.5089
D_{50}= 0.3554 D_{30}= 0.1597 D_{15}= 0.0288
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-7(1)

Remarks

Nat moisture = 24.0%

Source of Sample: RB-B-03 **Depth:** 10-11.5
Sample Number: S5 **Date:** 7/19

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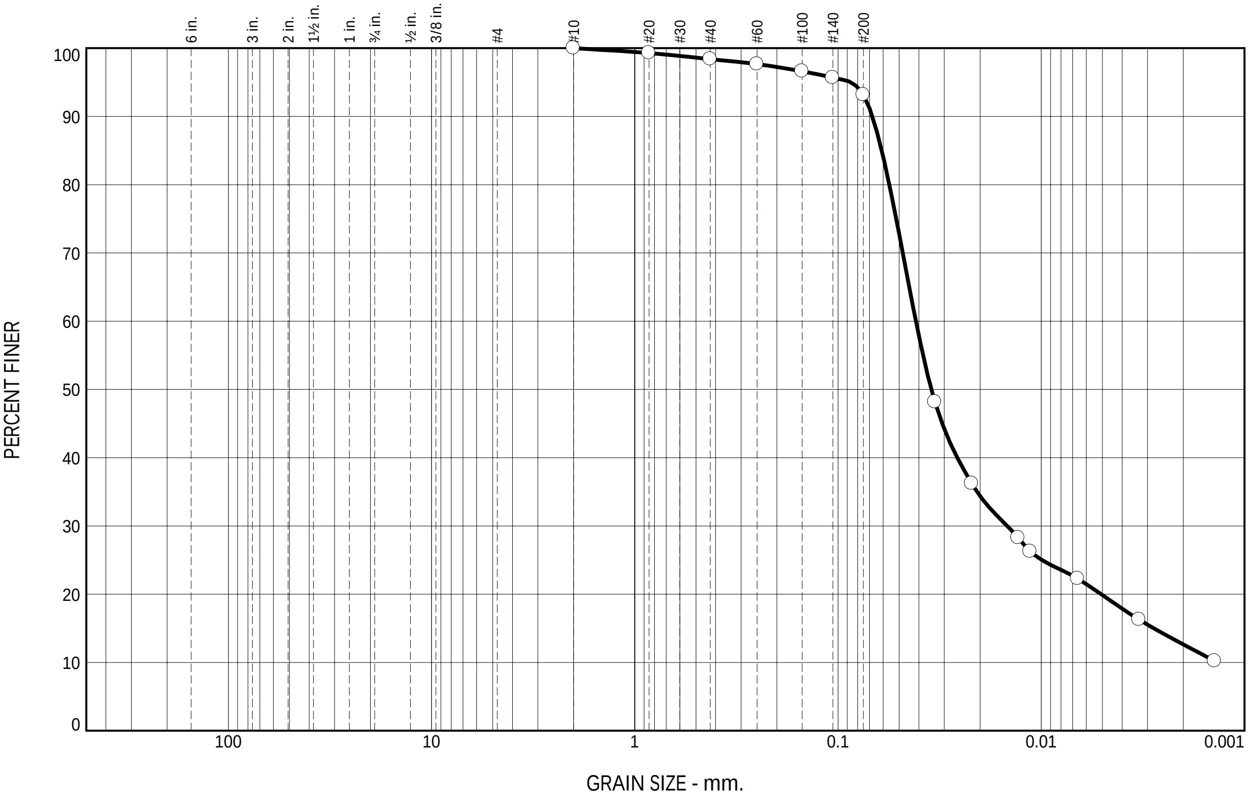
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: ad

Particle Size Distribution Report

ASTM D422 & D1140



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.6	5.2	73.3	19.9

Test Results (ASTM D422 & D1140)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
#10	100.0			
#20	99.3			99.3
#40	98.4			98.4
#60	97.7			97.7
#100	96.6			96.6
#140	95.7			95.7
#200	93.2			93.2
0.0333 mm.	48.2			
0.0219 mm.	36.2			
0.0130 mm.	28.3			
0.0113 mm.	26.2			
0.0066 mm.	22.3			
0.0033 mm.	16.3			
0.0014 mm.	10.2			

* (no specification provided)

Material Description

Fat clay

Atterberg Limits

PL= 31 LL= 71 PI= 40

Coefficients

D_{90}= 0.0677	D_{85}= 0.0609	D_{60}= 0.0414
D_{50}= 0.0347	D_{30}= 0.0147	D_{15}= 0.0028
D_{10}=	C_u=	C_c=

Classification

USCS= CH AASHTO= A-7-5(44)

Test Remarks

Nat moisture = 57.3%

Source of Sample: RB-B-03 Depth: 23-25

Sample Number: T1

Sample Date: 7/23

HILLIS-CARNES ENGINEERING ASSOCIATES

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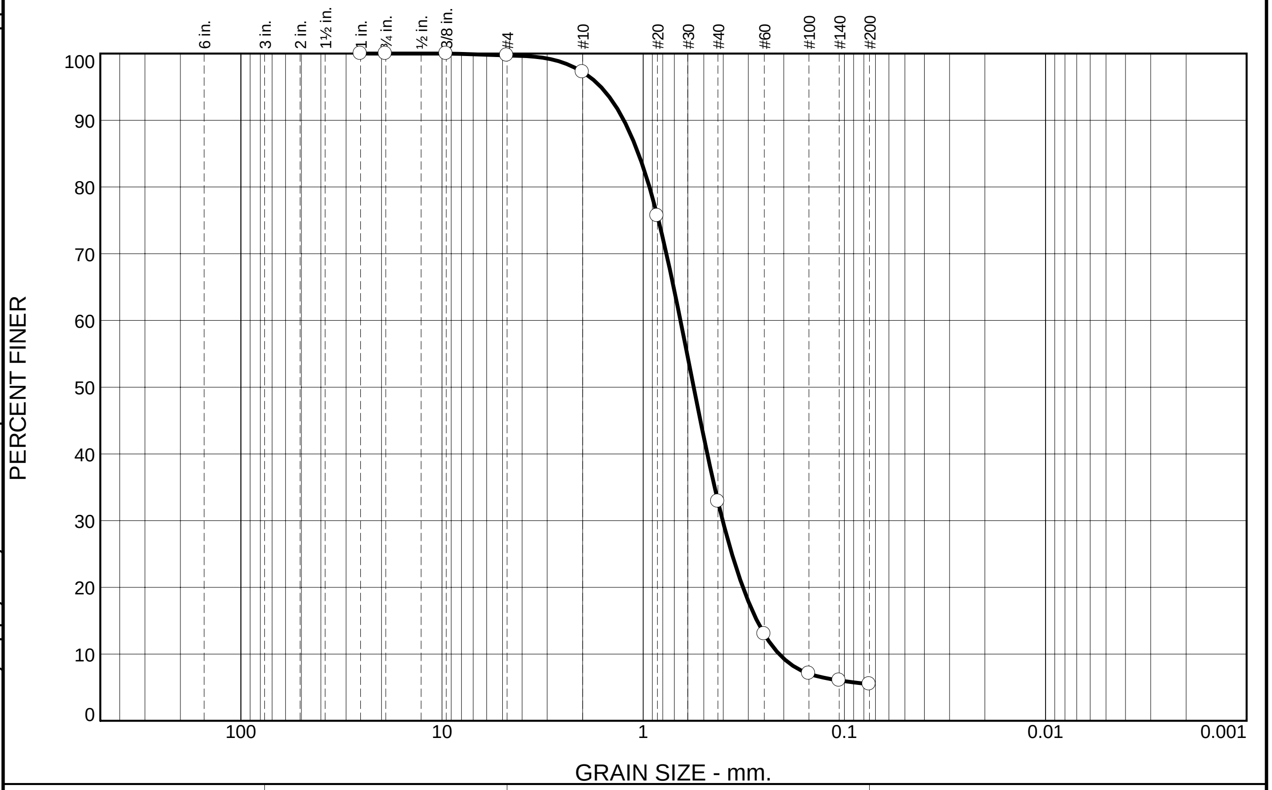
Client: HCEA SCG/RK&K

Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: ad

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	2.5	64.3	27.4	5.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	100.0		
.375	100.0		
#4	99.7		
#10	97.2		
#20	75.7		
#40	32.9		
#60	13.0		
#100	7.1		
#140	6.1		
#200	5.5		

* (no specification provided)

Material Description

poorly graded sand w/silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 1.2479 D_{85}= 1.0564 D_{60}= 0.6525
D_{50}= 0.5607 D_{30}= 0.4024 D_{15}= 0.2718
D_{10}= 0.2112 C_u= 3.09 C_c= 1.18

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Nat moisture = 19.1%

Source of Sample: RB-B-03 **Depth:** 33.5-35
Sample Number: S10 **Date:**

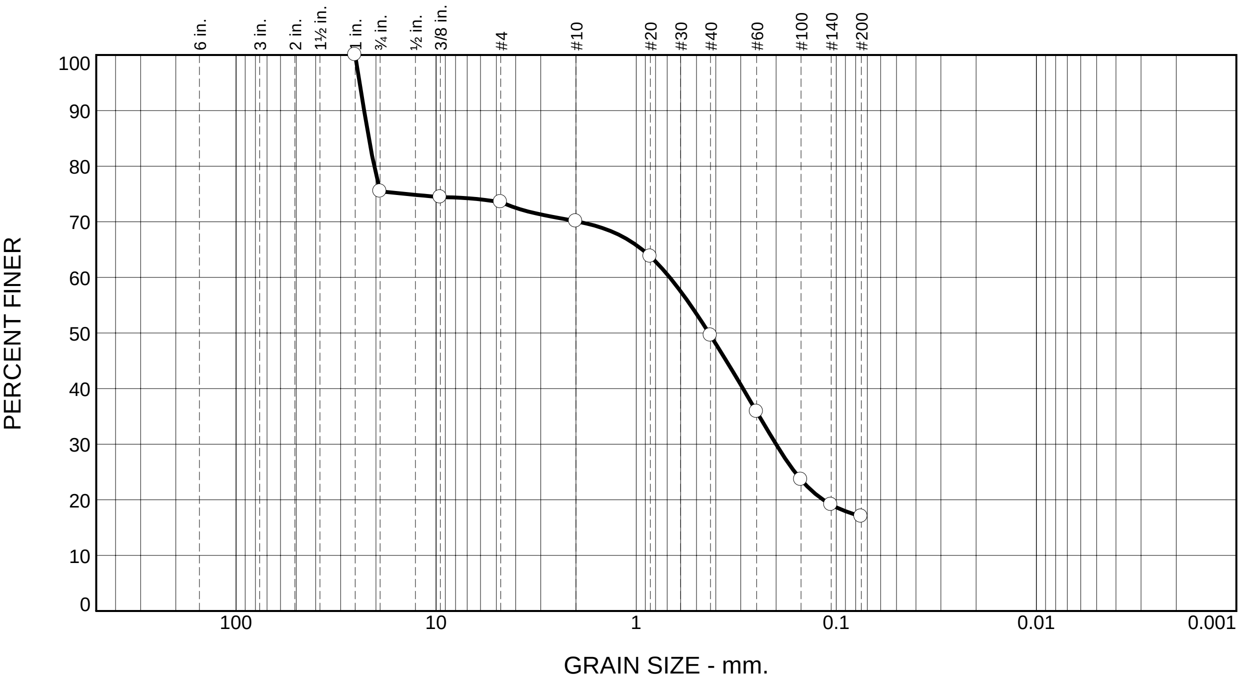
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: ACD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	24.5	2.0	3.4	20.6	32.5	17.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	75.5		
.375	74.4		
#4	73.5		
#10	70.1		
#20	63.8		
#40	49.5		
#60	35.8		
#100	23.6		
#140	19.1		
#200	17.0		

* (no specification provided)

Material Description

Red brown silty sand w/gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 22.9140 D_{85}= 21.6800 D_{60}= 0.6799

D_{50}= 0.4330 D_{30}= 0.2002 D_{15}=

D_{10}= C_u= C_c=

Remarks

Nat moisture = 6.3%

Date Received: 7/17 **Date Tested:** 7/24

Tested By: cs

Checked By:

Title:

Source of Sample: RB-B-04 **Depth:** 0 **Date Sampled:** 7/13

Sample Number: Bulk

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client:

Project: South Market Street Lab Testing

Project No: P20051 **Figure**

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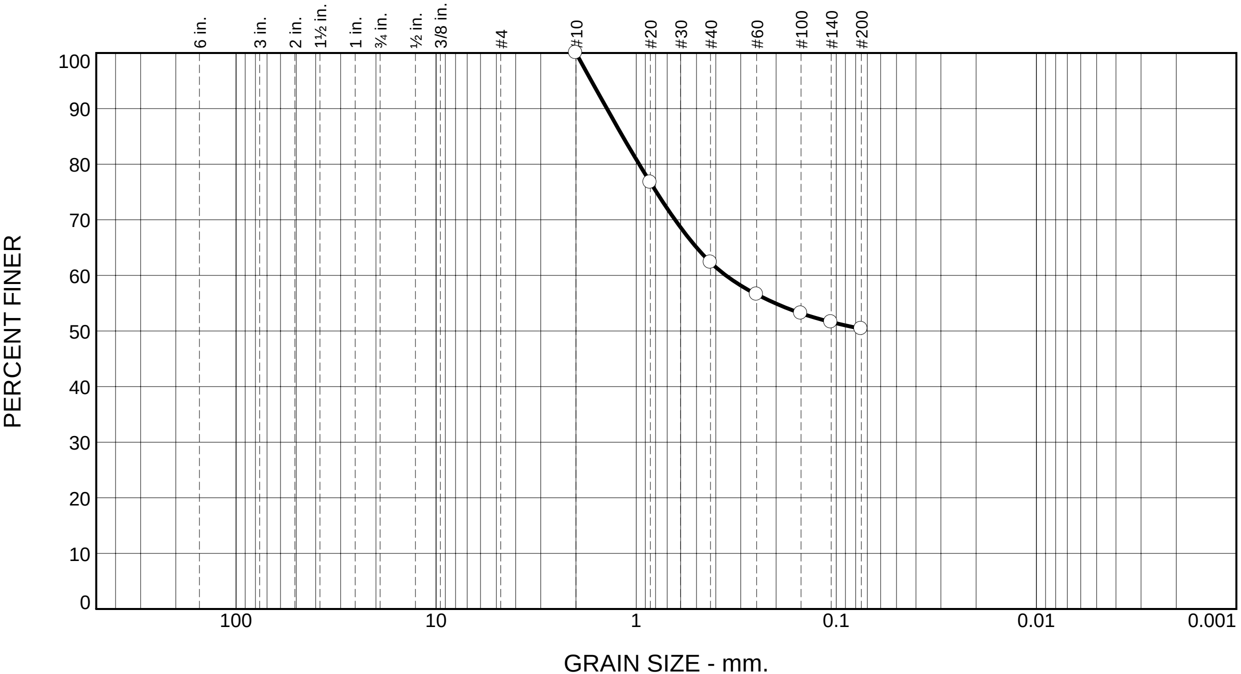
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	37.7	11.9	50.4	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	76.7		
#40	62.3		
#60	56.6		
#100	53.2		
#140	51.6		
#200	50.4		

* (no specification provided)

Material Description

Grey silt

Atterberg Limits (ASTM D 4318)

PL= 28 **LL=** 49 **PI=** 21

Classification

USCS (D 2487)= CL **AASHTO (M 145)=** A-7-6(8)

Coefficients

D_{90}=	1.4017	D_{85}=	1.1679	D_{60}=	0.3570
D_{50}=		D_{30}=		D_{15}=	
D_{10}=		C_u=		C_c=	

Remarks

Nat moisture = 65.5%

Date Received: 7/17 **Date Tested:** 7/24

Tested By: cs

Checked By:

Title:

Source of Sample: RB-B-04 **Depth:** 17.5 **Date Sampled:** 7/13

Sample Number: S-7

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Client:

Project: South Market Street Lab Testing

Project No: P20051 **Figure**

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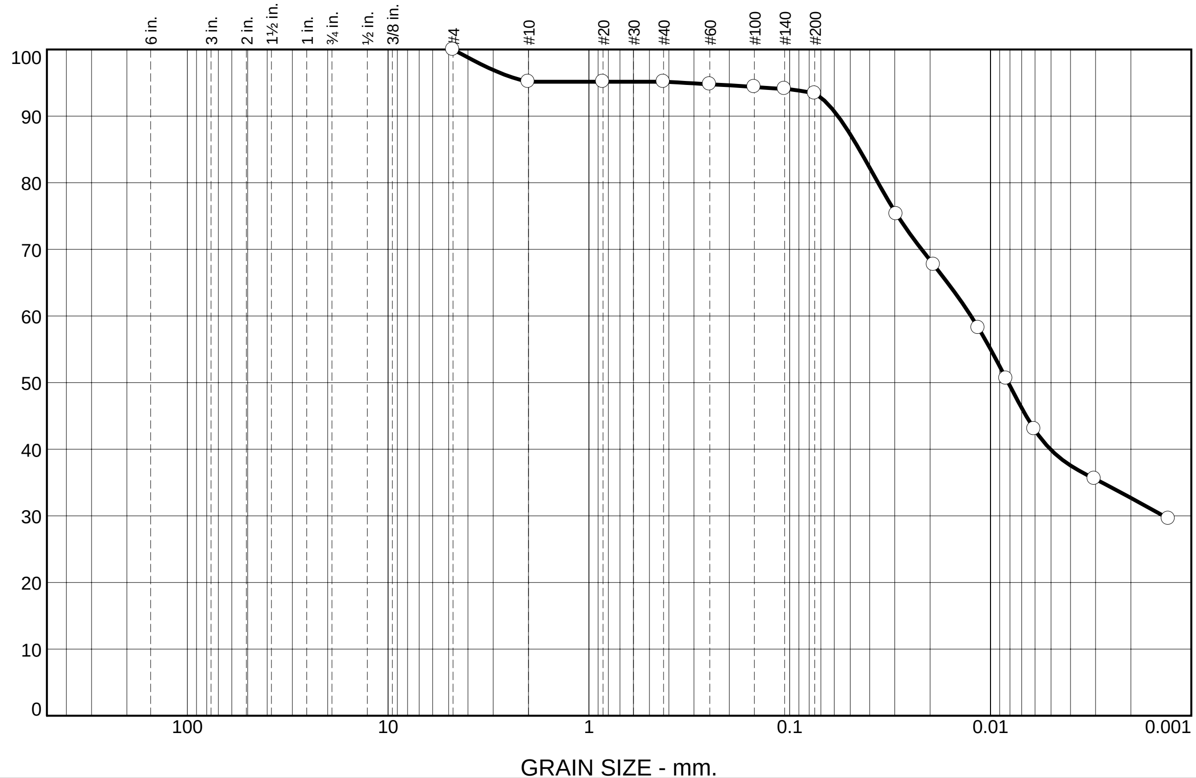
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	4.8	0.0	1.8	53.5	39.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	95.2		
#20	95.2		
#40	95.2		
#60	94.8		
#100	94.4		
#140	94.1		
#200	93.4		

* (no specification provided)

Material Description

Grey silt

Atterberg Limits

PL= 30 LL= 50 PI= 20

Classification

USCS= MH AASHTO= A-7-5(22)

Remarks

Nat moisture = 65.9%

Source of Sample: RB-B-04 **Depth:** 28.5
Sample Number: S-9 **Date:** 7/13

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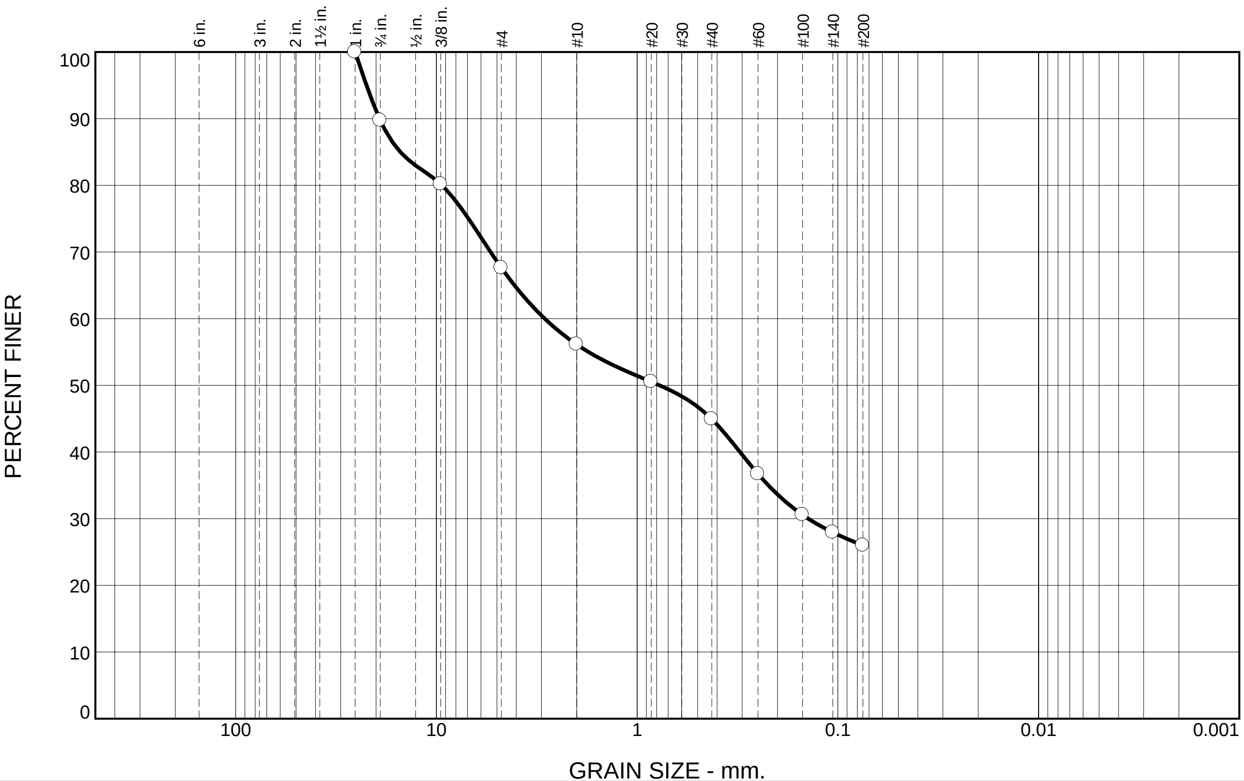
Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.3	22.1	11.5	11.2	18.9	26.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	89.7		
.375	80.2		
#4	67.6		
#10	56.1		
#20	50.5		
#40	44.9		
#60	36.7		
#100	30.6		
#140	28.0		
#200	26.0		

* (no specification provided)

Material Description

Black silty sand w/gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Nat moisture = 24.7%

Source of Sample: RB-B-05 **Depth:** 3.5
Sample Number: S-2 **Date:**

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Client:
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Project No: P20051 **Figure**

Tested By: cs

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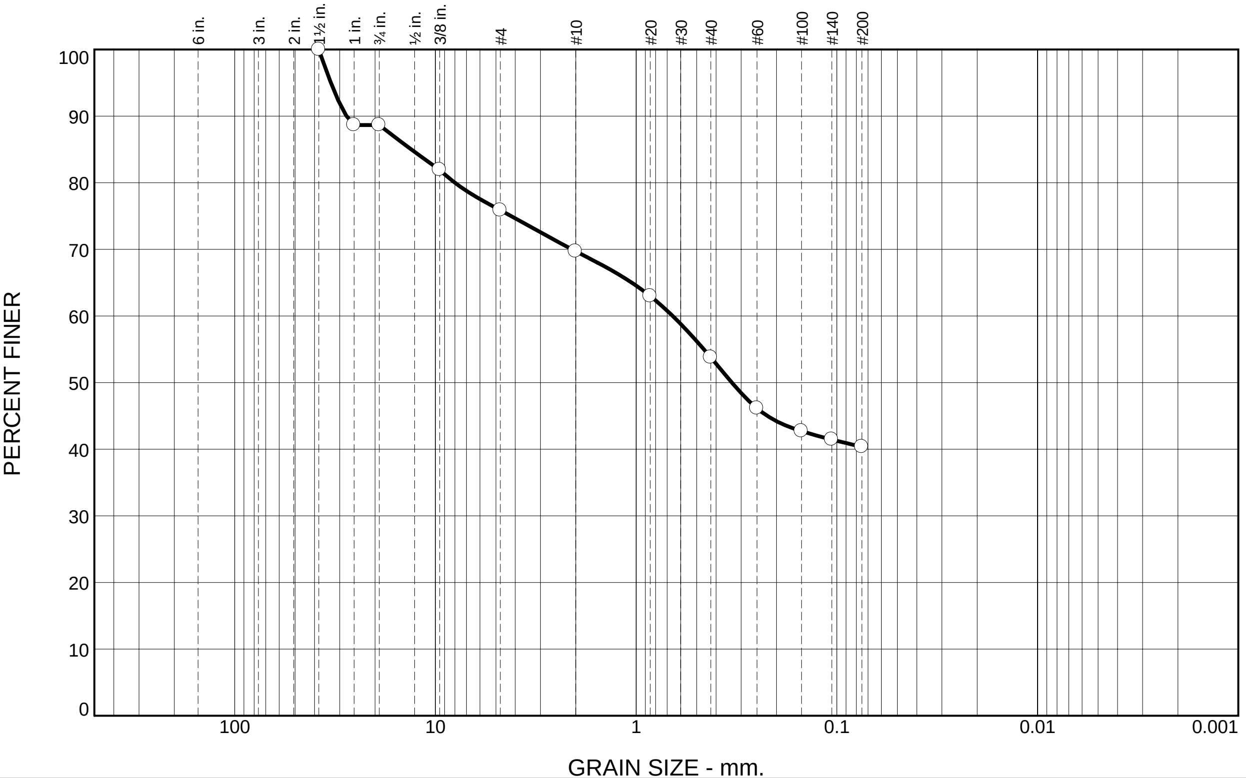
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.3	12.8	6.2	15.9	13.4	40.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	88.7		
.75	88.7		
.375	81.9		
#4	75.9		
#10	69.7		
#20	63.0		
#40	53.8		
#60	46.1		
#100	42.7		
#140	41.5		
#200	40.4		

* (no specification provided)

Material Description

Brown/black silty sand w/gravel

Atterberg Limits

PL= 28 LL= 34 PI= 6

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Nat moisture = 34.3%

Source of Sample: RB-B-05 **Depth:** 8.5
Sample Number: S-4 **Date:**

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Philadelphia, Pennsylvania

Client:
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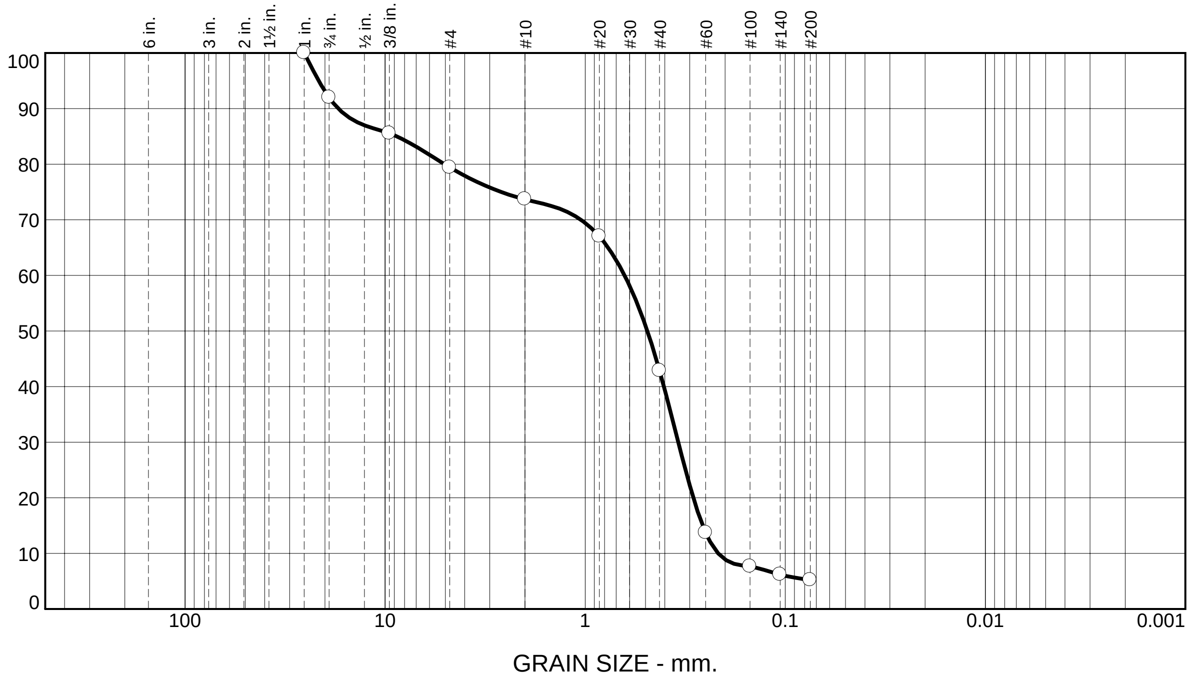
Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.0	12.6	5.7	30.8	37.7	5.2	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
.75	92.0		
.375	85.5		
#4	79.4		
#10	73.7		
#20	67.0		
#40	42.9		
#60	13.7		
#100	7.6		
#140	6.2		
#200	5.2		

* (no specification provided)

Material Description

Grey sand

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=** A-1-b

Coefficients

D_{90}= 17.1397 D_{85}= 8.7571 D_{60}= 0.6355
D_{50}= 0.4893 D_{30}= 0.3428 D_{15}= 0.2587
D_{10}= 0.2166 C_u= 2.93 C_c= 0.85

Remarks

Nat moisture = 18.3%

Date Received: 7/17 **Date Tested:** 7/24

Tested By: cs

Checked By:

Title:

Source of Sample: RB-B-06 **Depth:** 33.5 **Date Sampled:** 7/13
Sample Number: S-10

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Project: South Market Street Lab Testing

Project No: P20051 **Figure**

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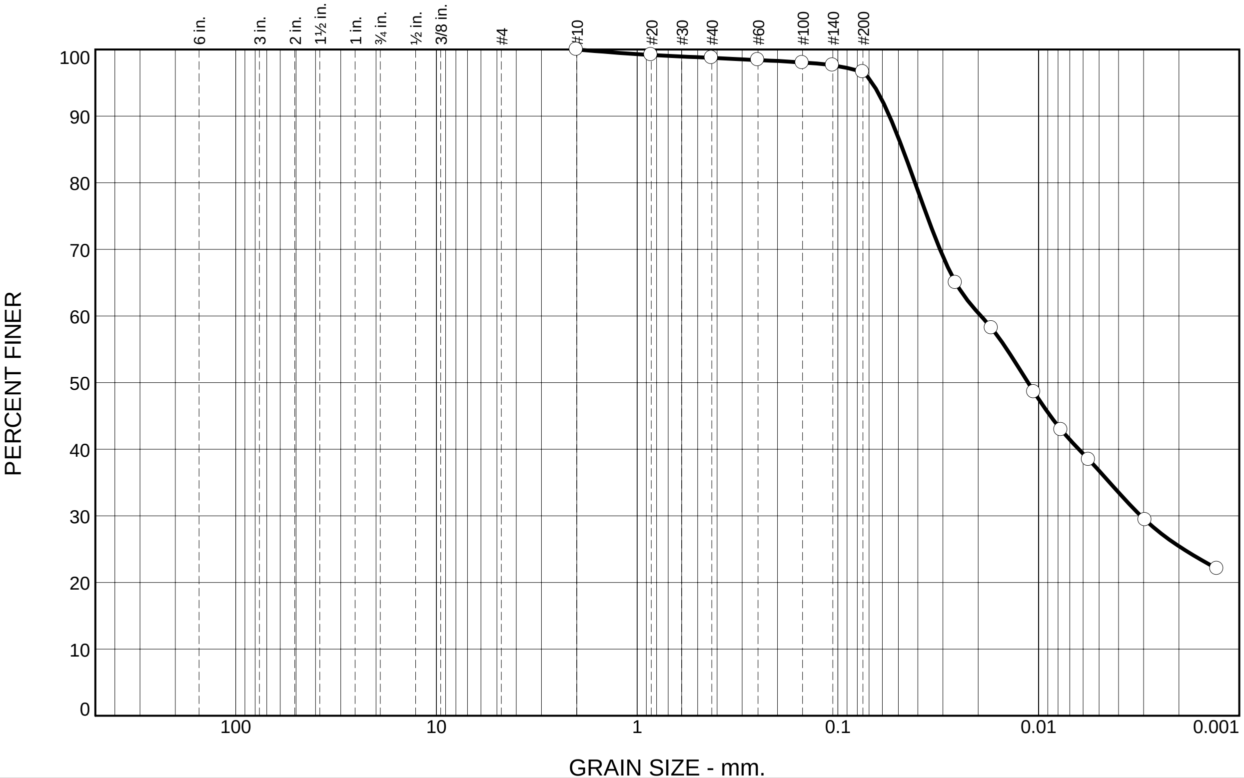
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.3	2.1	59.8	36.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.2		
#40	98.7		
#60	98.4		
#100	98.0		
#140	97.6		
#200	96.6		

* (no specification provided)

Material Description

Grey silt

Atterberg Limits

PL= 27 LL= 43 PI= 16

Classification

USCS= ML AASHTO= A-7-6(18)

Remarks

Nat moisture = 62.3%

Source of Sample: RB-B-06 **Depth:** 17.5

Sample Number: U-1

Date: 7/17

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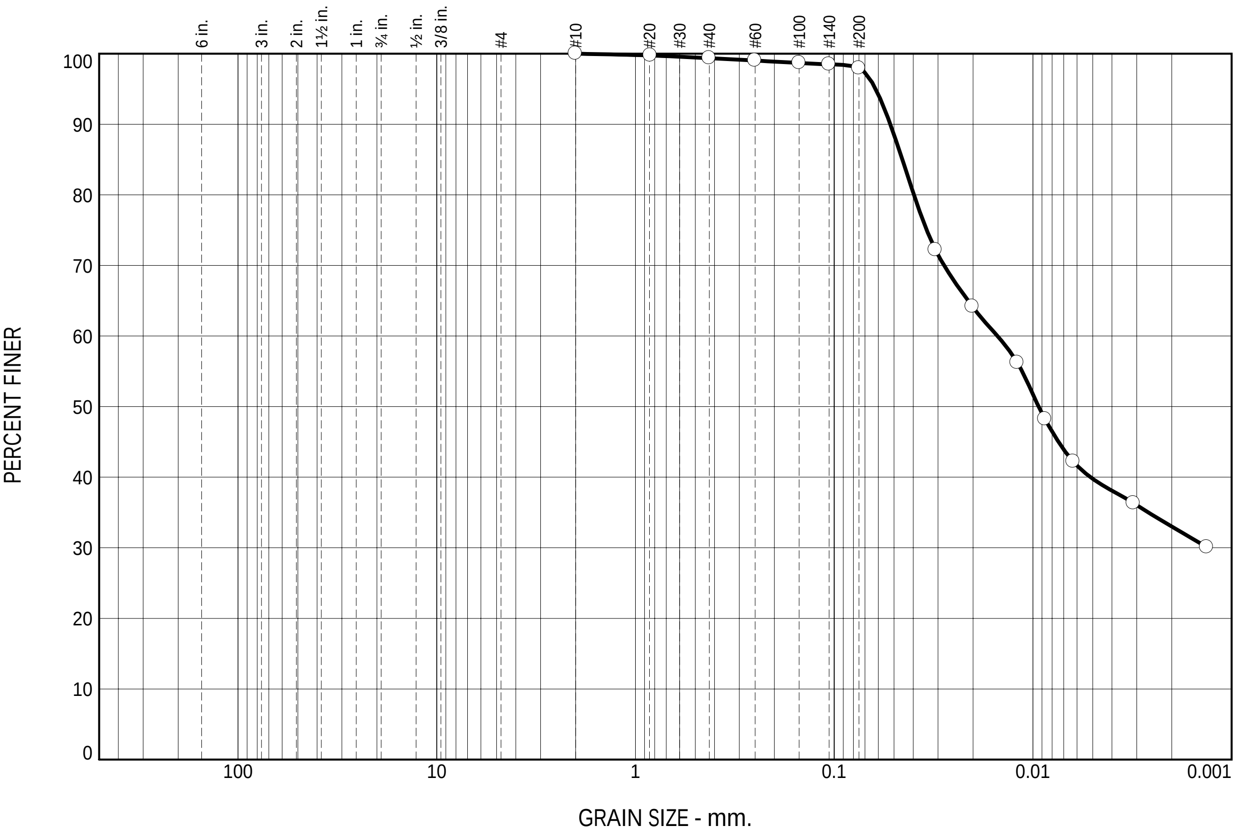
Client:

Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.6	1.5	58.1	39.8

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.7		
#40	99.4		
#60	99.0		
#100	98.7		
#140	98.5		
#200	97.9		
0.0309 mm.	72.2		
0.0202 mm.	64.2		
0.0120 mm.	56.2		
0.0087 mm.	48.2		
0.0063 mm.	42.2		
0.0031 mm.	36.3		
0.0013 mm.	30.1		

* (no specification provided)

Soil Description

Elastic Silt

Atterberg Limits

PL= 37 LL= 76 PI= 39

Coefficients

D_{90}= 0.0522 D_{85}= 0.0454 D_{60}= 0.0151
D_{50}= 0.0094 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(48)

Remarks

Natural Moisture = 63.!%

Source of Sample: RB-B-07 Depth: 7.5
Sample Number: S-4
Date:

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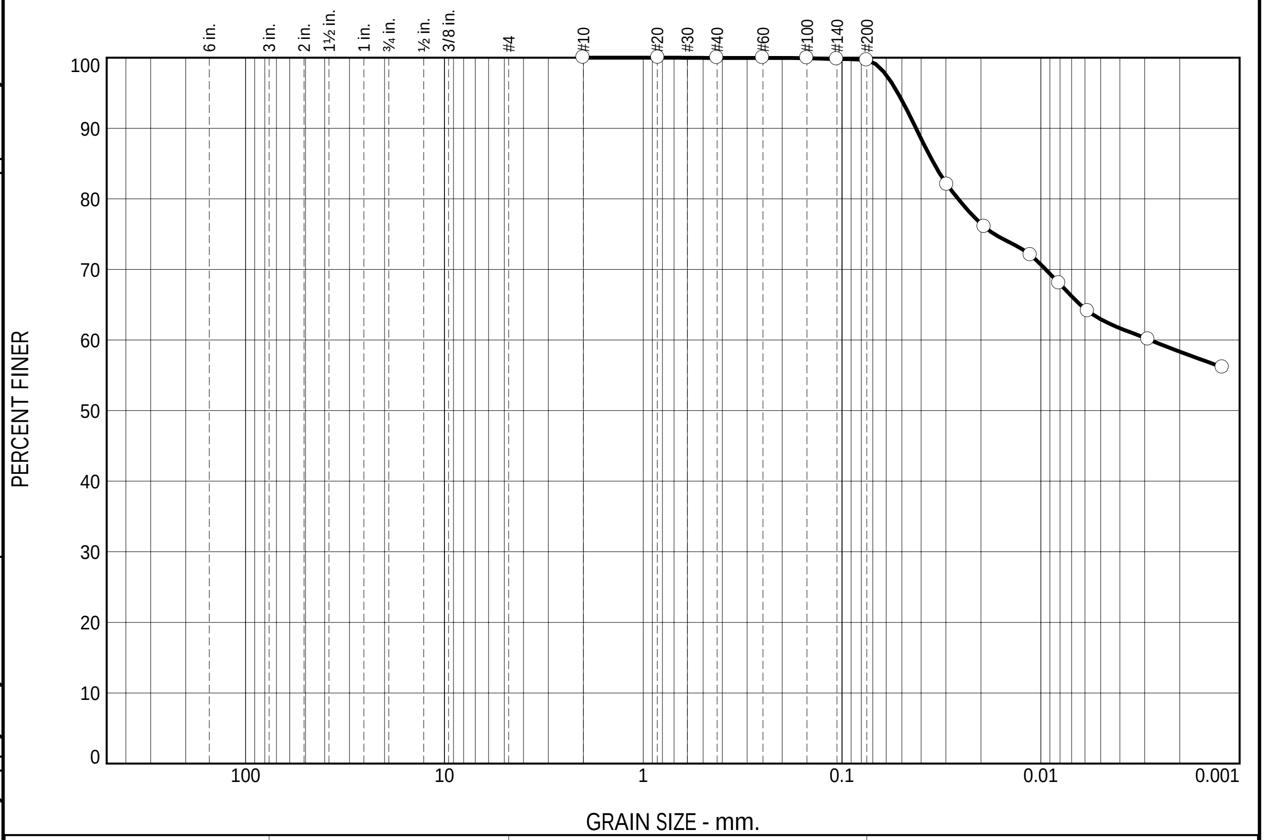
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	0.4	36.6	63.0

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	100.0		
#60	100.0		
#100	99.9		
#140	99.8		
#200	99.6		
0.0296 mm.	82.0		
0.0192 mm.	76.0		
0.0113 mm.	72.0		
0.0081 mm.	68.1		
0.0058 mm.	64.1		
0.0029 mm.	60.1		
0.0012 mm.	56.1		

* (no specification provided)

Soil Description

Black Fat Clay

Atterberg Limits

PL= 37 LL= 90 PI= 53

Coefficients

D_{90}= 0.0424 D_{85}= 0.0345 D_{60}= 0.0028
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(66)

Remarks

Nat moisture = 68.7%

Source of Sample: RB-B-07 Depth: 20
Sample Number: T-1

Date: 10/31

HILLIS-CARNES ENGINEERING ASSOCIATES

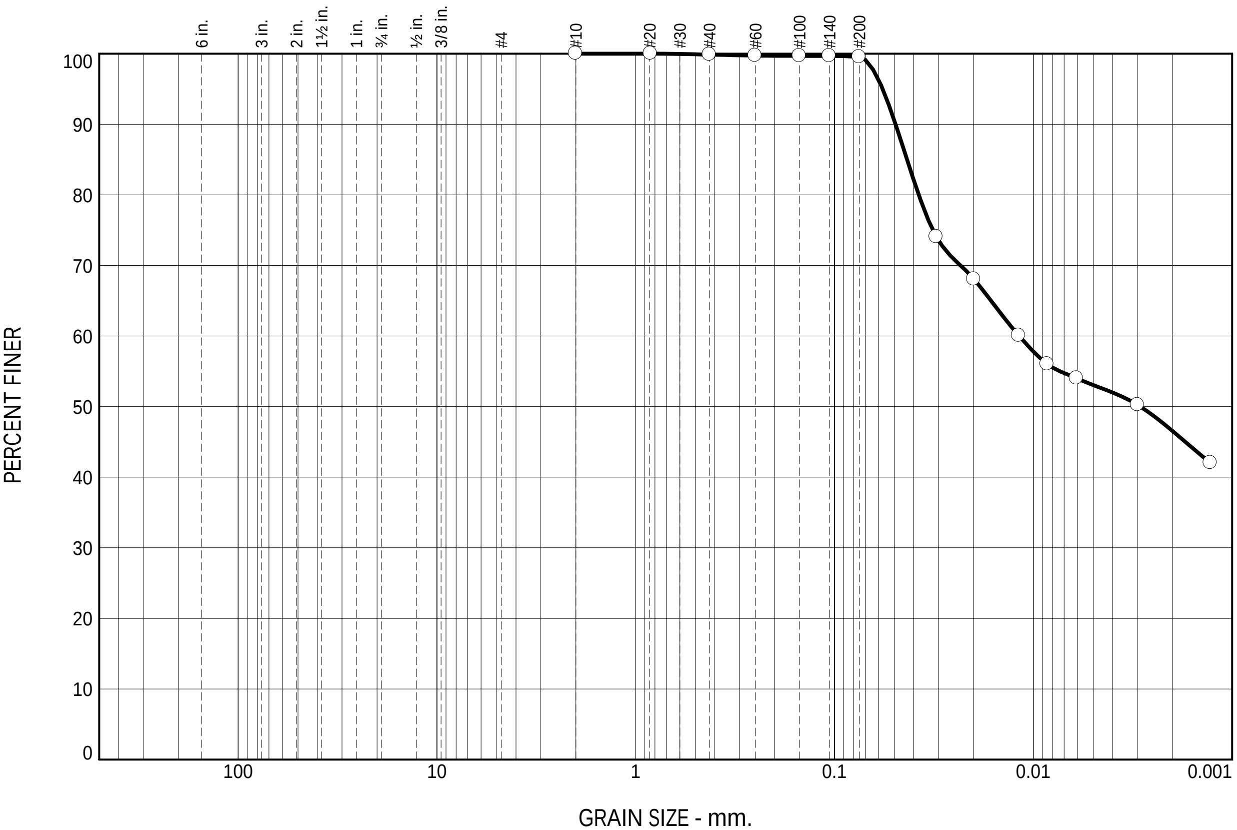
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	0.4	46.4	53.1

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.9		
#60	99.7		
#100	99.7		
#140	99.7		
#200	99.5		
0.0307 mm.	74.0		
0.0199 mm.	68.0		
0.0118 mm.	60.1		
0.0085 mm.	56.0		
0.0060 mm.	54.0		
0.0030 mm.	50.2		
0.0013 mm.	42.0		

* (no specification provided)

Soil Description

Fat Clay

Atterberg Limits

PL= 37 LL= 97 PI= 60

Coefficients

D_{90}= 0.0493 D_{85}= 0.0432 D_{60}= 0.0118
D_{50}= 0.0029 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(74)

Remarks

Natural Moisture = 75.6%

Source of Sample: RB-B-07 Depth: 33.5
Sample Number: S-12 Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

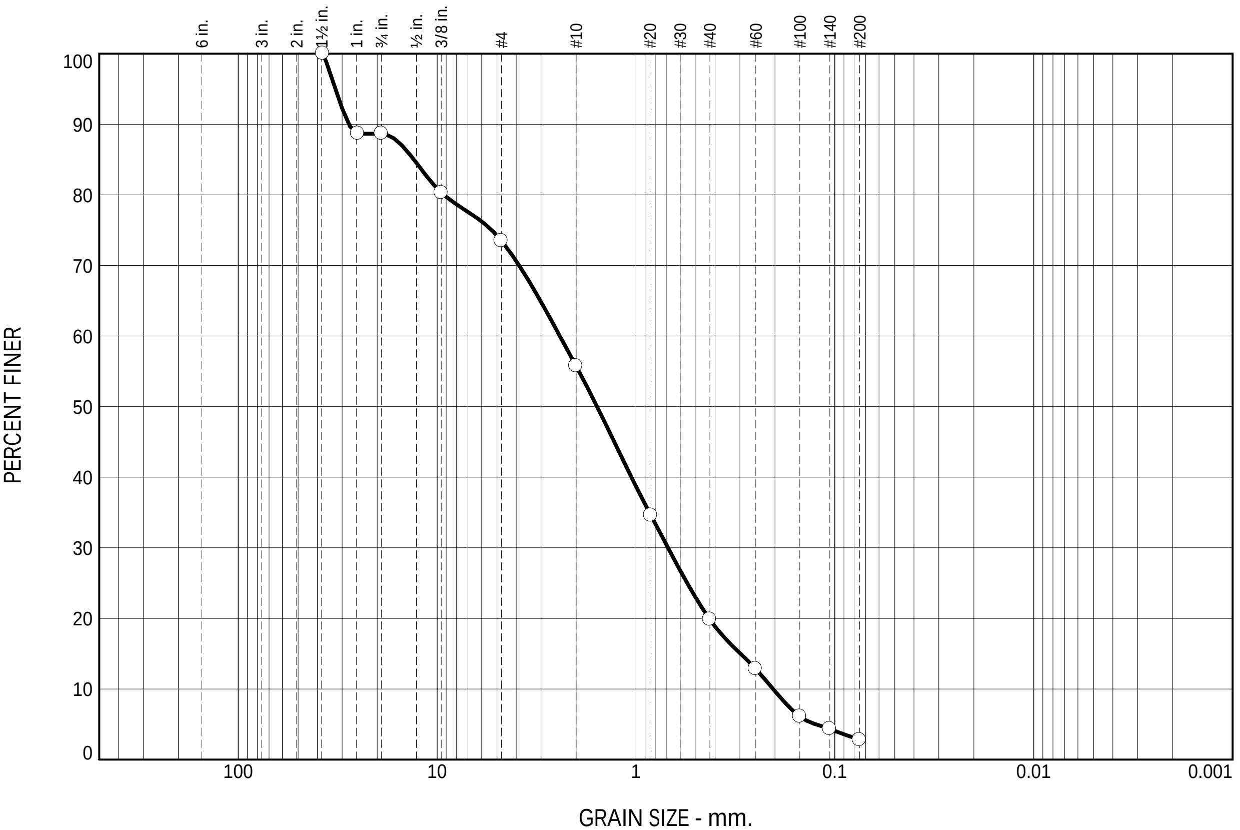
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.3	15.2	17.8	35.9	17.0	2.8	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	88.7		
.75	88.7		
.375	80.3		
#4	73.5		
#10	55.7		
#20	34.6		
#40	19.8		
#60	12.8		
#100	6.1		
#140	4.3		
#200	2.8		

* (no specification provided)

Soil Description

Poorly graded sand w/gravel

Atterberg Limits

PL= NP LL= 24 PI= NP

Coefficients

D_{90}= 27.7902 D_{85}= 13.0820 D_{60}= 2.4145
D_{50}= 1.5697 D_{30}= 0.6901 D_{15}= 0.2982
D_{10}= 0.2045 C_u= 11.81 C_c= 0.96

Classification

USCS= SP AASHTO= A-1-b

Remarks

Nat moisture = 30.1%

Source of Sample: RB-B-08 Depth: 0
Sample Number: Bulk
Date: 11/1

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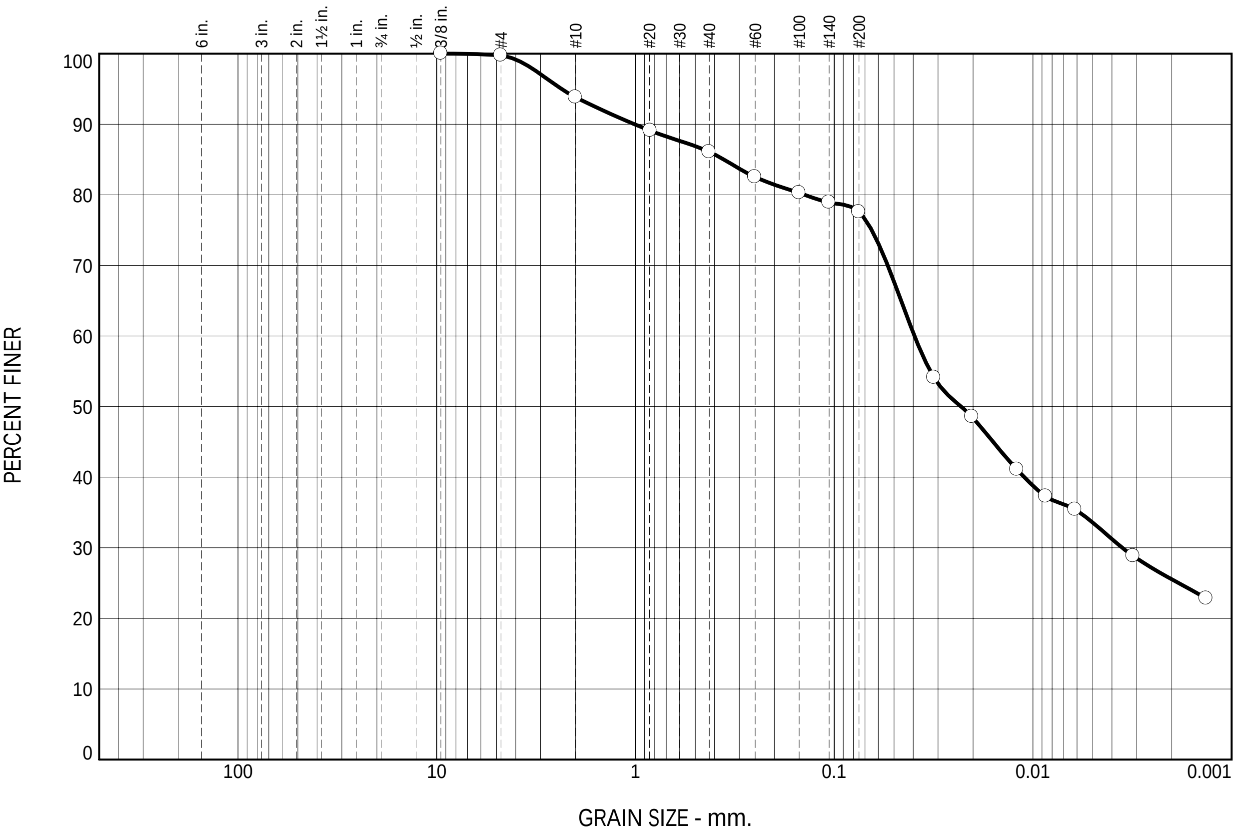
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	5.9	7.7	8.6	43.9	33.6

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.7		
#10	93.8		
#20	89.1		
#40	86.1		
#60	82.5		
#100	80.3		
#140	78.9		
#200	77.5		
0.0314 mm.	54.1		
0.0203 mm.	48.5		
0.0120 mm.	41.1		
0.0086 mm.	37.3		
0.0061 mm.	35.4		
0.0031 mm.	28.8		
0.0013 mm.	22.8		

* (no specification provided)

Soil Description

Fat Clay w/sand

Atterberg Limits

PL= 36
LL= 96
PI= 60

Coefficients

D_{90}= 1.0102
D_{85}= 0.3592
D_{60}= 0.0394
D_{50}= 0.0230
D_{30}= 0.0035
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= CH
AASHTO= A-7-5(52)

Remarks

Nat moisture = 79.3%

Source of Sample: RB-B-08
Depth: 15
Sample Number: T-1
Date: 8/20

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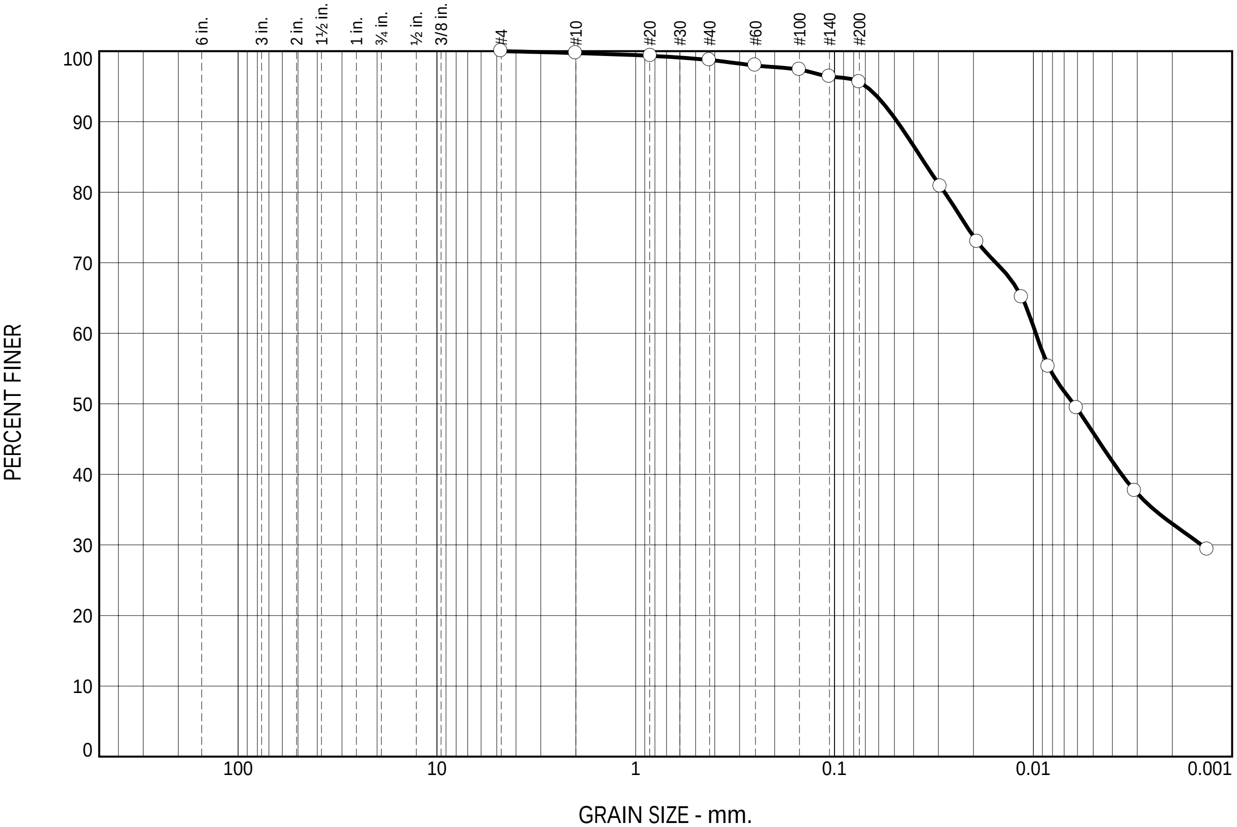
Project: South Market Street Lab Testing
Project No: P20051
Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	1.0	3.1	49.7	45.9

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	99.3		
#40	98.7		
#60	98.0		
#100	97.4		
#140	96.4		
#200	95.6		
0.0293 mm.	80.8		
0.0192 mm.	73.0		
0.0114 mm.	65.1		
0.0084 mm.	55.3		
0.0061 mm.	49.4		
0.0031 mm.	37.7		
0.0013 mm.	29.4		

* (no specification provided)

Soil Description

Elastic Silt

Atterberg Limits

PL= 47 LL= 90 PI= 43

Coefficients

D_{90}= 0.0484 D_{85}= 0.0369 D_{60}= 0.0097
D_{50}= 0.0063 D_{30}= 0.0014 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(54)

Remarks

Natural Moisture = 65.9%

Source of Sample: RB-B-08 Depth: 23.5
Sample Number: S-9 Date:

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Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: cs/ad

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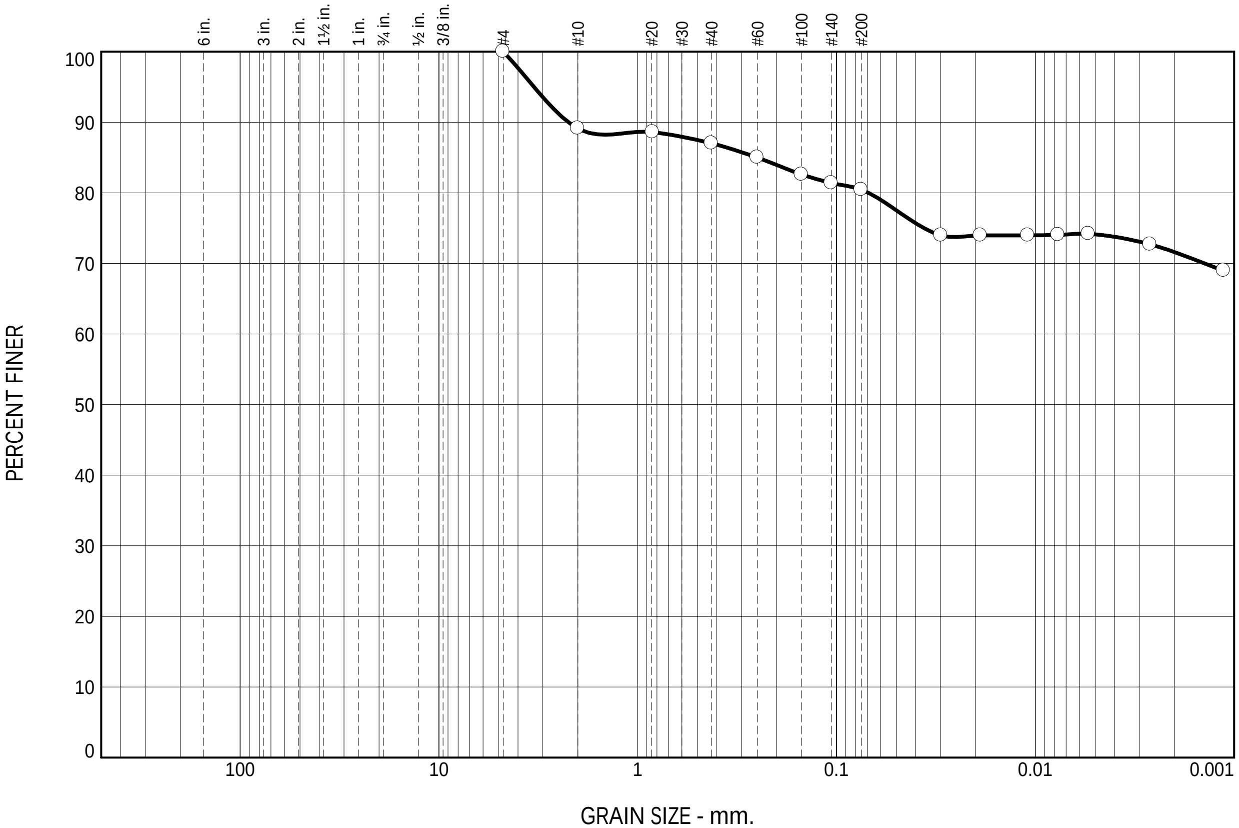
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	10.9	2.1	6.6	6.3	74.1

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	89.1		
#20	88.6		
#40	87.0		
#60	85.0		
#100	82.6		
#140	81.4		
#200	80.4		
0.0298 mm.	73.9		
0.0189 mm.	73.9		
0.0109 mm.	73.9		
0.0077 mm.	74.0		
0.0054 mm.	74.2		
0.0026 mm.	72.7		
0.0011 mm.	68.9		

* (no specification provided)

Soil Description

Elastic silt w/sand

Atterberg Limits

PL= 35 LL= 69 PI= 34

Coefficients

D_{90}= 2.2311 D_{85}= 0.2507 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(31)

Remarks

Natural Moisture = 32.3%

Source of Sample: RB-B-08 Depth: 48.5
Sample Number: S-14
Date: 10/14

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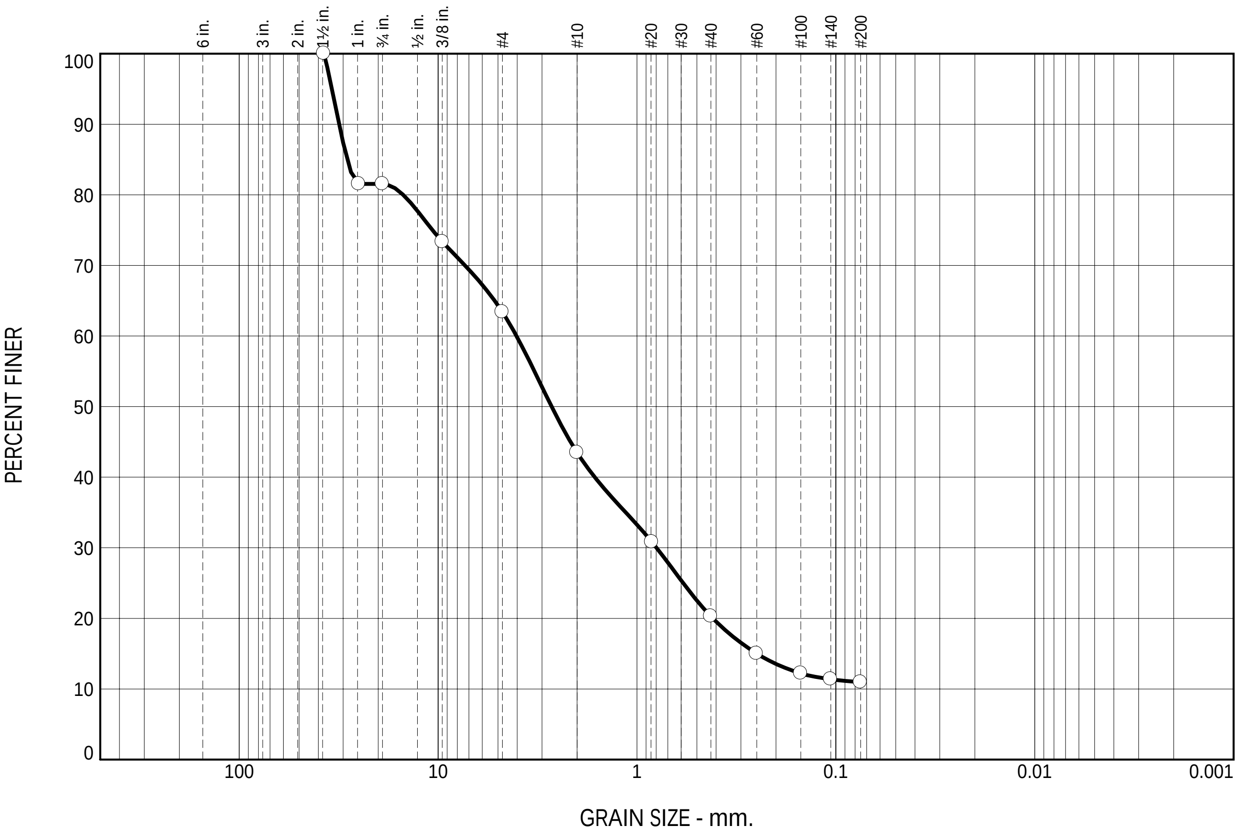
Project: South Market Street Lab Testing
Project No: P20051 Figure

Tested By: cs/ad / AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	18.5	18.1	19.9	23.2	9.4	10.9	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	81.5		
.75	81.5		
.375	73.3		
#4	63.4		
#10	43.5		
#20	30.8		
#40	20.3		
#60	15.0		
#100	12.2		
#140	11.4		
#200	10.9		

* (no specification provided)

Soil Description

Poorly graded sand w/clay and gravel

Atterberg Limits

PL= 16 LL= 28 PI= 12

Coefficients

D_{90}= 31.4388	D_{85}= 28.6448	D_{60}= 4.0340
D_{50}= 2.6836	D_{30}= 0.7976	D_{15}= 0.2495
D_{10}=	C_u=	C_c=

Classification

USCS= SP-SC AASHTO= A-2-6(0)

Remarks

Source of Sample: RB-B-09 Depth: 0.0-10.0
Sample Number: Bulk

Date: 11/5

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Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

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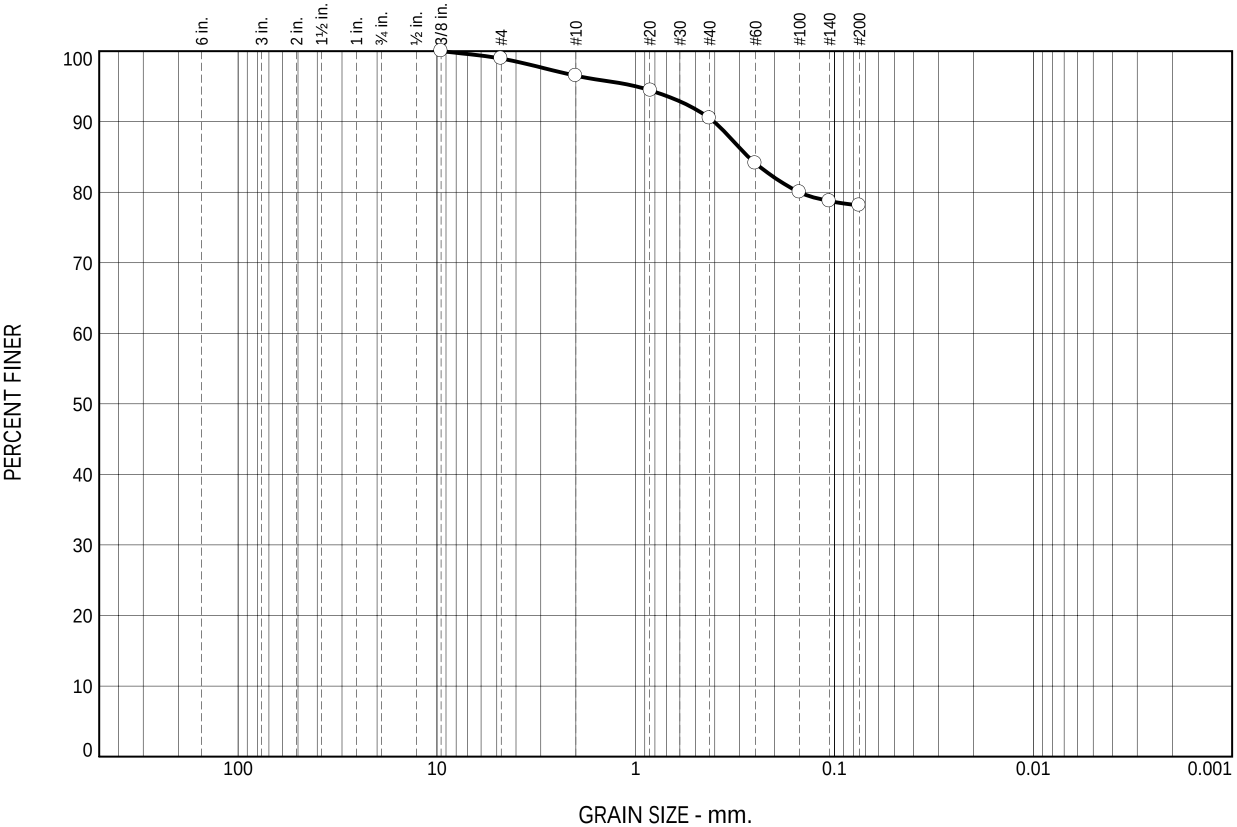
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.1	2.4	6.0	12.4	78.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	98.9		
#10	96.5		
#20	94.4		
#40	90.5		
#60	84.1		
#100	80.0		
#140	78.7		
#200	78.1		

* (no specification provided)

Soil Description

Elastic Silt w/sand

Atterberg Limits

PL= 43 LL= 103 PI= 60

Coefficients

D_{90}= 0.4040 D_{85}= 0.2713 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(54)

Remarks

Natural Moisture = 70.2%

Source of Sample: RB-B-09 Depth: 10.0-11.5
Sample Number: S-5
Date:

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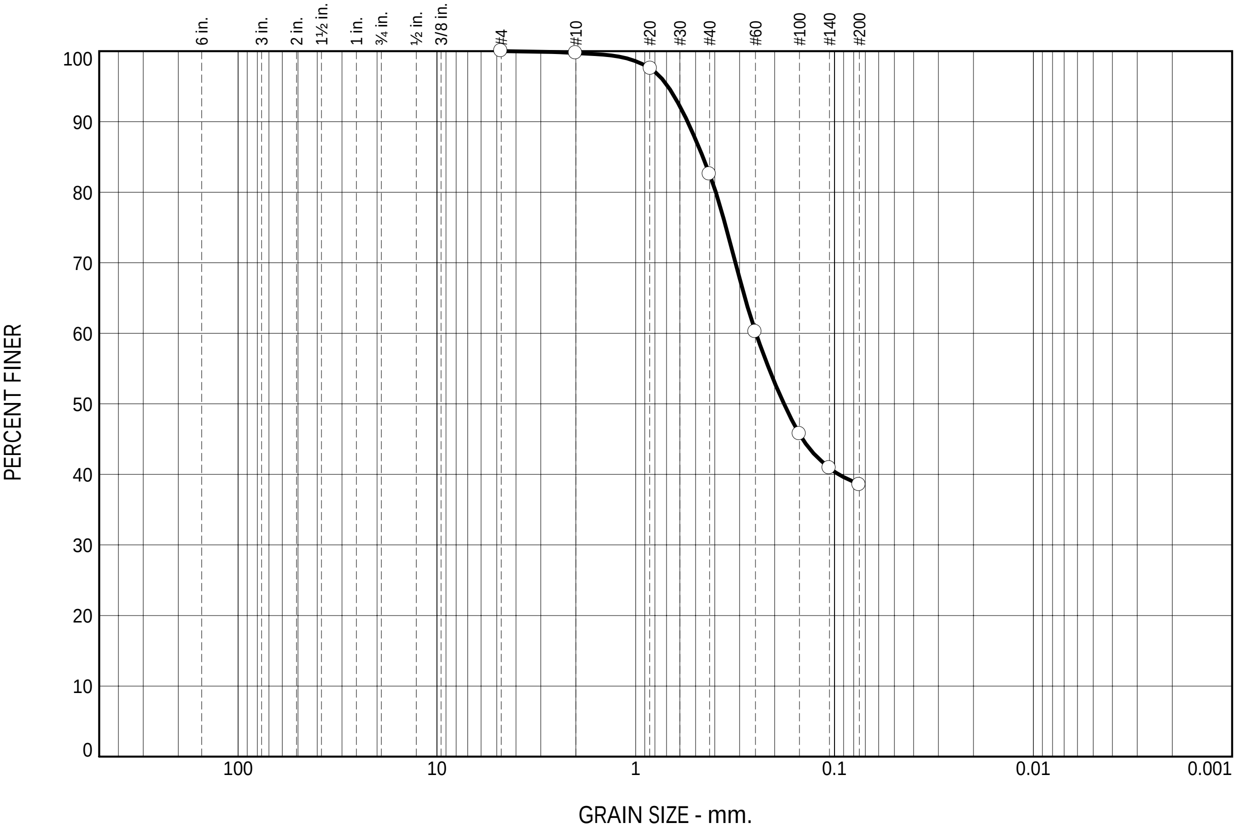
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	17.2	44.0	38.5	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	97.5		
#40	82.5		
#60	60.2		
#100	45.7		
#140	40.9		
#200	38.5		

* (no specification provided)

Soil Description

Silty clayey sand

Atterberg Limits

PL= 11 LL= 17 PI= 6

Coefficients

D_{90}= 0.5484 D_{85}= 0.4598 D_{60}= 0.2484
D_{50}= 0.1796 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-4(0)

Remarks

Natural Moisture = 19.8%

Source of Sample: RB-B-09 Depth: 17.5-19.0
Sample Number: S-8 Date:

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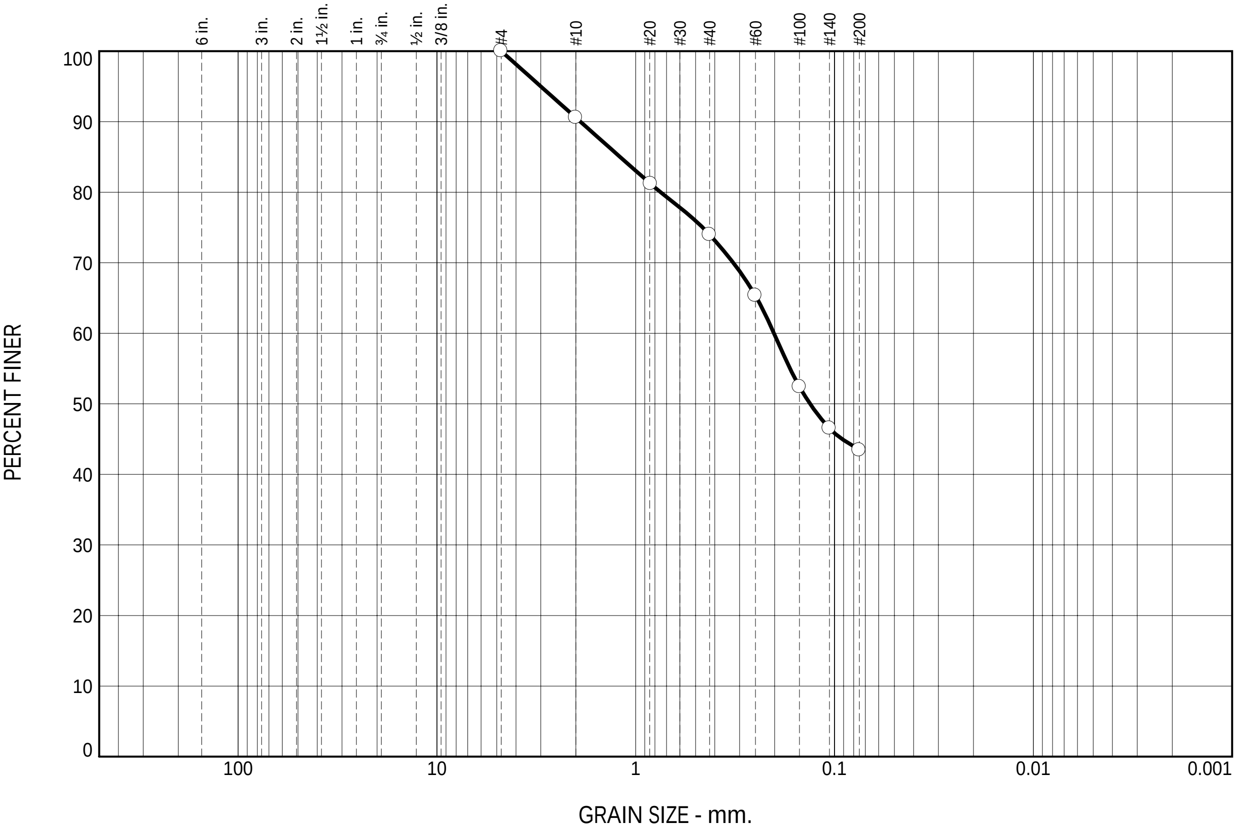
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	9.4	16.6	30.6	43.4	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	90.6		
#20	81.2		
#40	74.0		
#60	65.3		
#100	52.4		
#140	46.5		
#200	43.4		

* (no specification provided)

Soil Description

Clayey Sand

Atterberg Limits

PL= 11
LL= 30
PI= 19

Coefficients

D_{90}= 1.8980
D_{85}= 1.1986
D_{60}= 0.2016
D_{50}= 0.1327
D_{30}=
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= SC
AASHTO= A-6(4)

Remarks

Natural Moisture = 16.2%

Source of Sample: RB-B-09 Depth: 38.5-40.0
Sample Number: S-13
Date:

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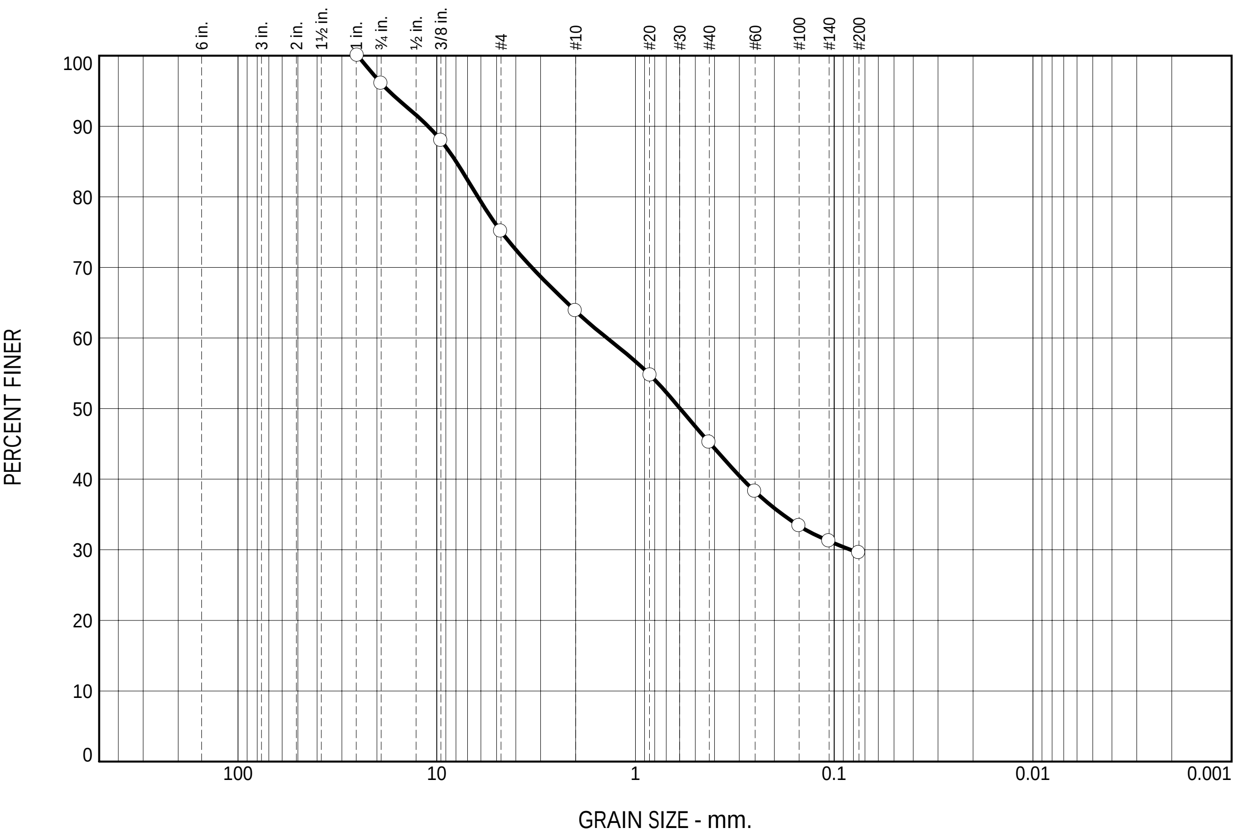
Project: South Market Street Lab Testing
Project No: P20051
Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.9	21.0	11.3	18.6	15.7	29.5	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	96.1		
.375	88.0		
#4	75.1		
#10	63.8		
#20	54.7		
#40	45.2		
#60	38.2		
#100	33.4		
#140	31.2		
#200	29.5		

* (no specification provided)

Soil Description

Clayey Sand w/gravel

Atterberg Limits

PL= 20 LL= 34 PI= 14

Coefficients

D_{90}= 11.0493 D_{85}= 7.9959 D_{60}= 1.3908
D_{50}= 0.5954 D_{30}= 0.0826 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-6(1)

Remarks

Nat moisture = 11.5%

Source of Sample: RB-B-10 Depth: 0.6-10
Sample Number: Bulk Date:

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Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

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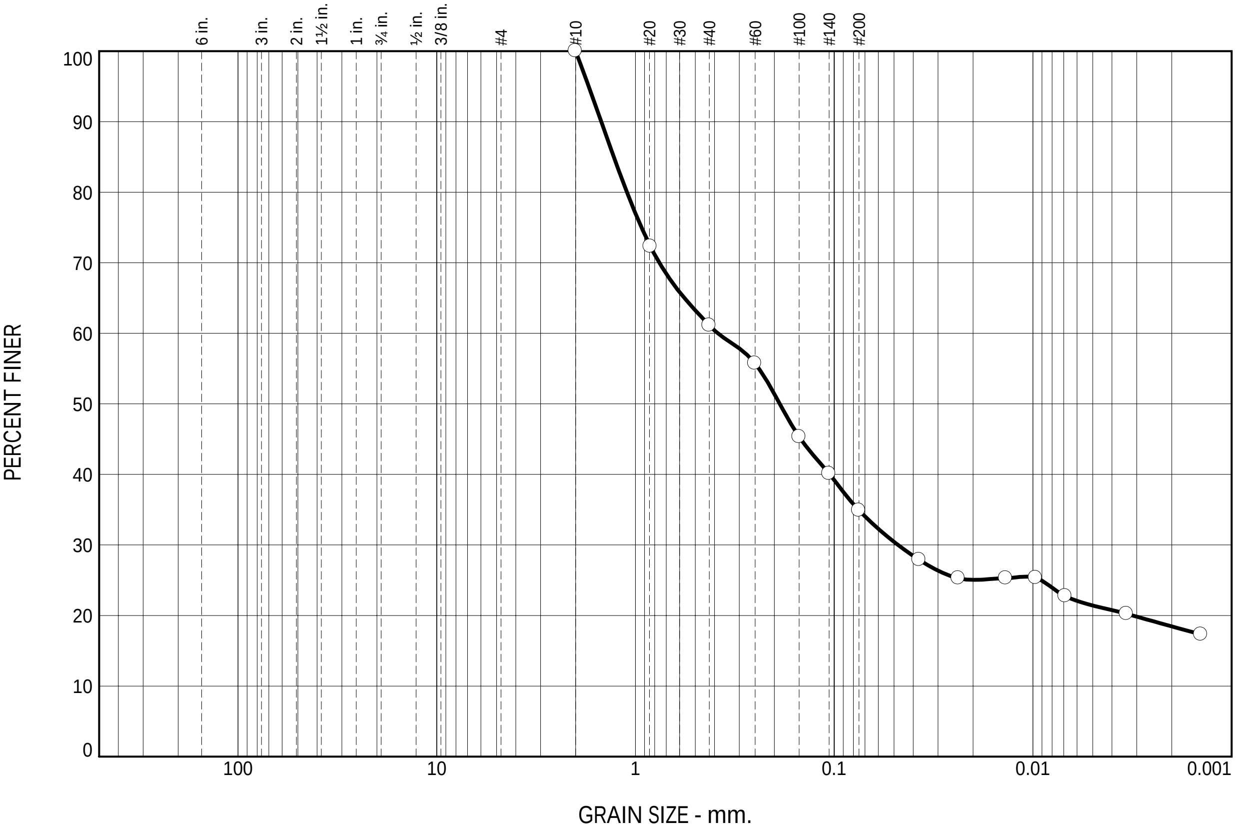
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	38.9	26.2	13.5	21.4

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	72.3		
#40	61.1		
#60	55.7		
#100	45.3		
#140	40.1		
#200	34.9		
0.0373 mm.	27.9		
0.0237 mm.	25.3		
0.0137 mm.	25.3		
0.0097 mm.	25.3		
0.0069 mm.	22.7		
0.0034 mm.	20.2		
0.0014 mm.	17.3		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= 96 LL= 194 PI= 98

Coefficients

D_{90}= 1.4865 D_{85}= 1.2848 D_{60}= 0.3855
D_{50}= 0.1879 D_{30}= 0.0477 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-7(18)

Remarks

Natural Moisture = 127.7%

Source of Sample: RB-B-10 Depth: 10.0-11.5
Sample Number: S-5 Date:

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Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

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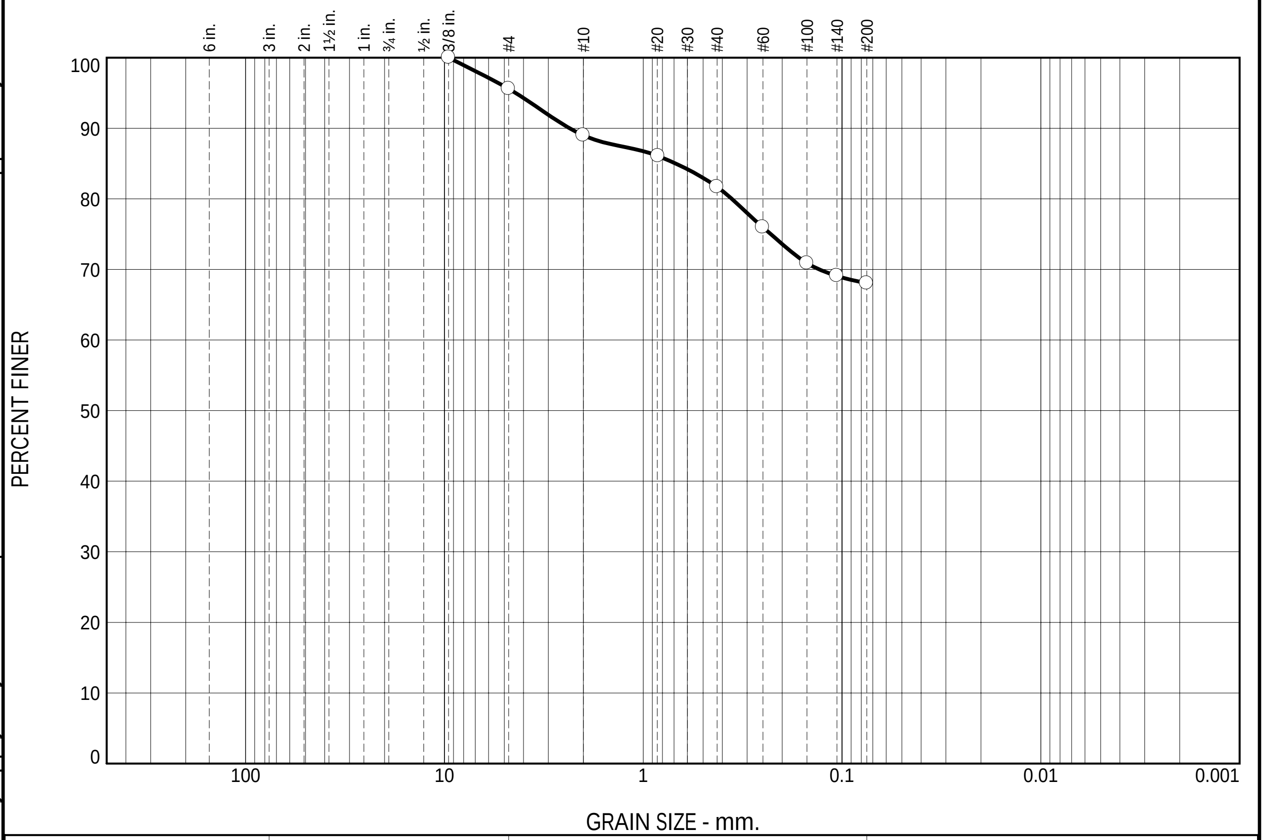
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.4	6.6	7.3	13.7	68.0	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	95.6		
#10	89.0		
#20	86.1		
#40	81.7		
#60	76.0		
#100	70.9		
#140	69.1		
#200	68.0		

* (no specification provided)

Soil Description

Sandy elastic silt

Atterberg Limits

PL= 74
LL= 157
PI= 83

Coefficients

D_{90}= 2.3463
D_{85}= 0.6872
D_{60}=
D_{50}=
D_{30}=
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= MH
AASHTO= A-7-5(65)

Remarks

Source of Sample: RB-B-10
Depth: 12.5-19.0
Sample Number: S-6
Date:

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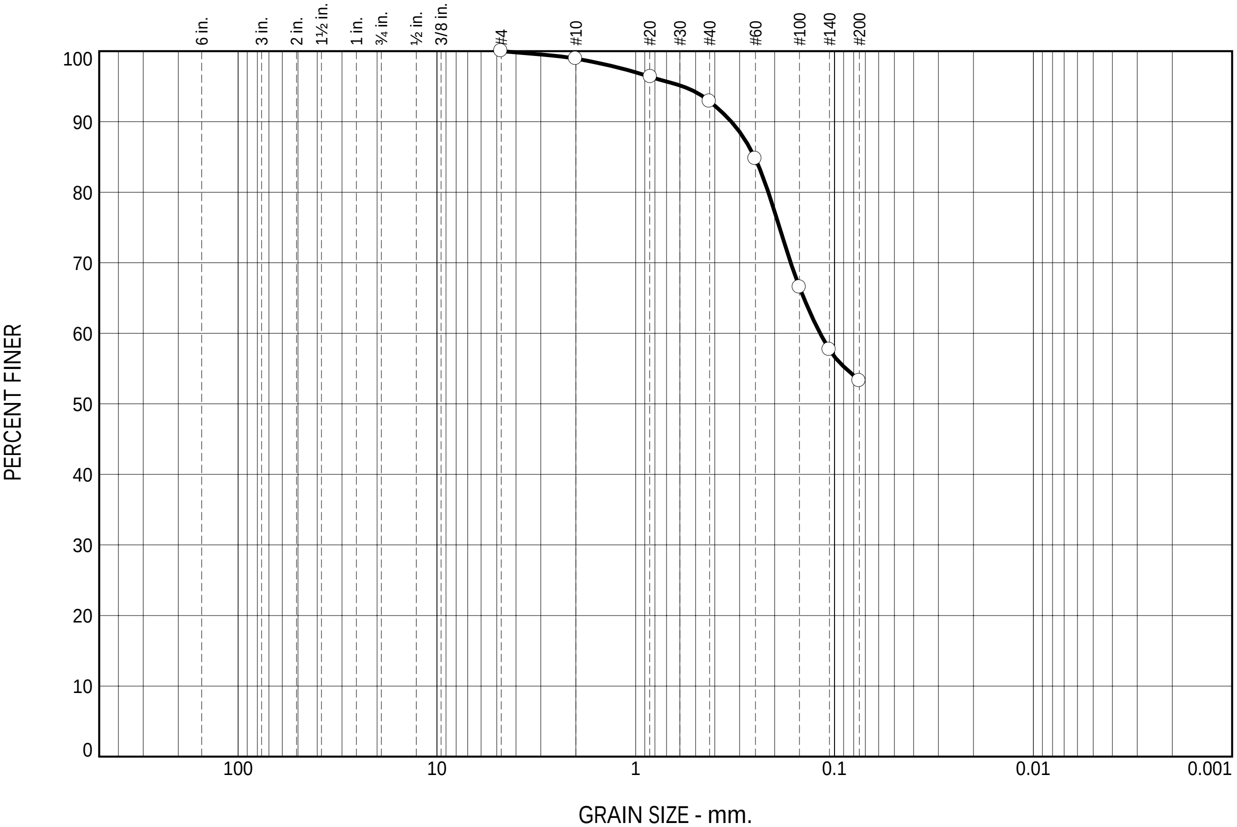
Project: South Market Street Lab Testing
Project No: P20051
Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.1	6.0	39.6	53.3	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	98.9		
#20	96.3		
#40	92.9		
#60	84.7		
#100	66.5		
#140	57.7		
#200	53.3		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 14 LL= 30 PI= 16

Coefficients

D_{90}= 0.3303 D_{85}= 0.2526 D_{60}= 0.1182
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(5)

Remarks

Natural Moisture = 13.9%

Source of Sample: RB-B-10 Depth: 38.5-40.0
Sample Number: S-13 Date:

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Project No: P20051 Figure

Tested By: AD

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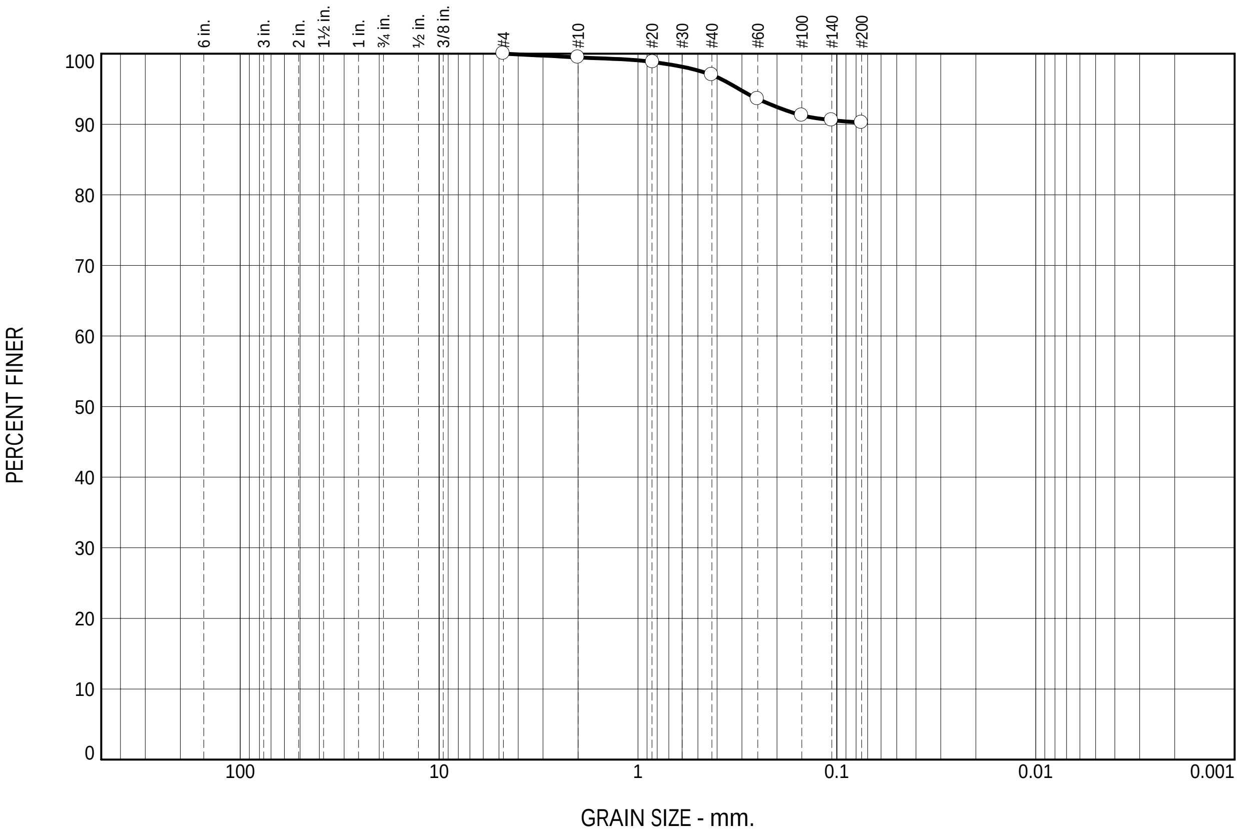
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.5	2.5	6.8	90.2	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.5		
#20	98.8		
#40	97.0		
#60	93.6		
#100	91.3		
#140	90.6		
#200	90.2		

* (no specification provided)

Soil Description

Fat Clay

Atterberg Limits

PL= 27 LL= 62 PI= 35

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(36)

Remarks

Natural Moisture = 54.2%

Source of Sample: RB-B-11 Depth: 7.5-9.0
Sample Number: S-4 Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

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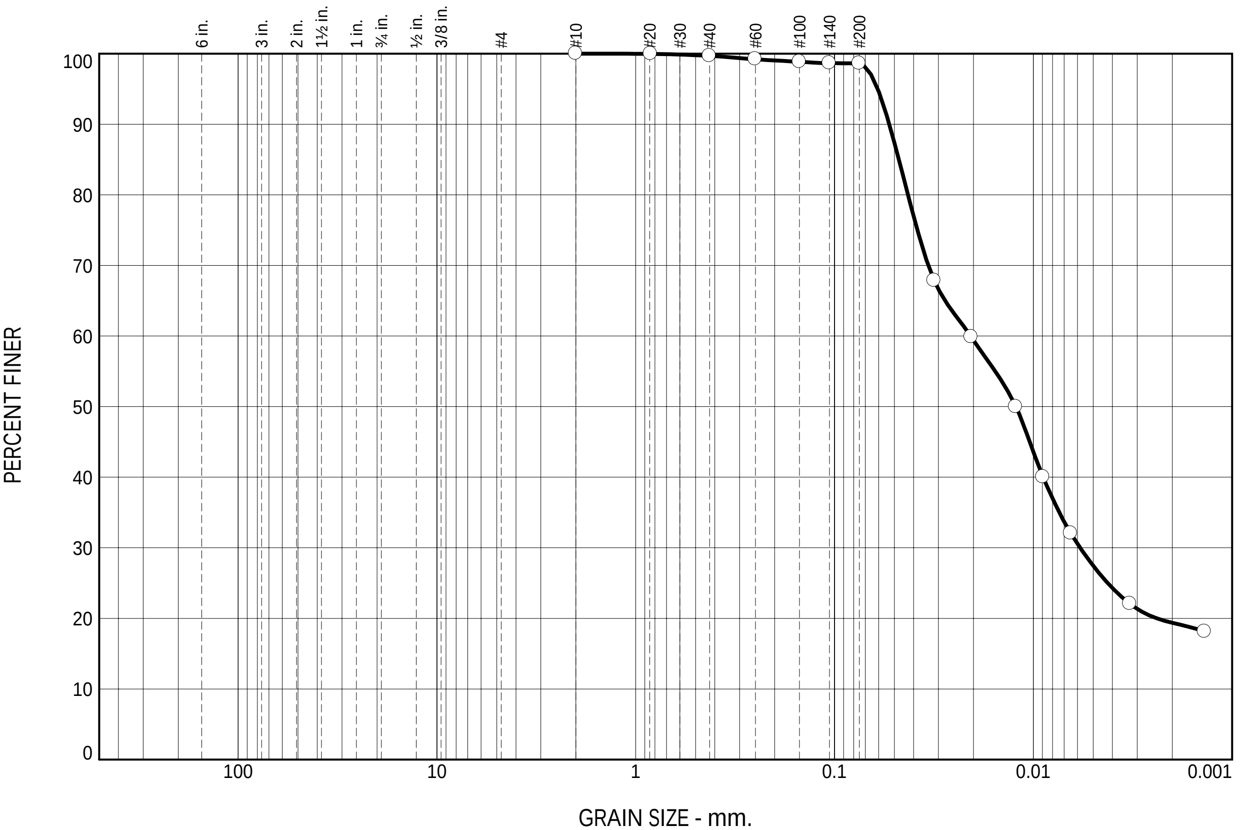
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.3	1.1	71.1	27.5

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#40	99.7		
#60	99.2		
#100	98.8		
#140	98.6		
#200	98.6		
0.0315 mm.	67.8		
0.0205 mm.	59.9		
0.0122 mm.	50.0		
0.0089 mm.	40.0		
0.0065 mm.	32.0		
0.0033 mm.	22.1		
0.0014 mm.	18.1		

* (no specification provided)

Soil Description

Fat clay

Atterberg Limits

PL= 30 LL= 68 PI= 38

Coefficients

D_{90}= 0.0530 D_{85}= 0.0474 D_{60}= 0.0207
D_{50}= 0.0122 D_{30}= 0.0058 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(45)

Remarks

Source of Sample: RB-B-11 Depth: 15.0
Sample Number: T-1 Date:

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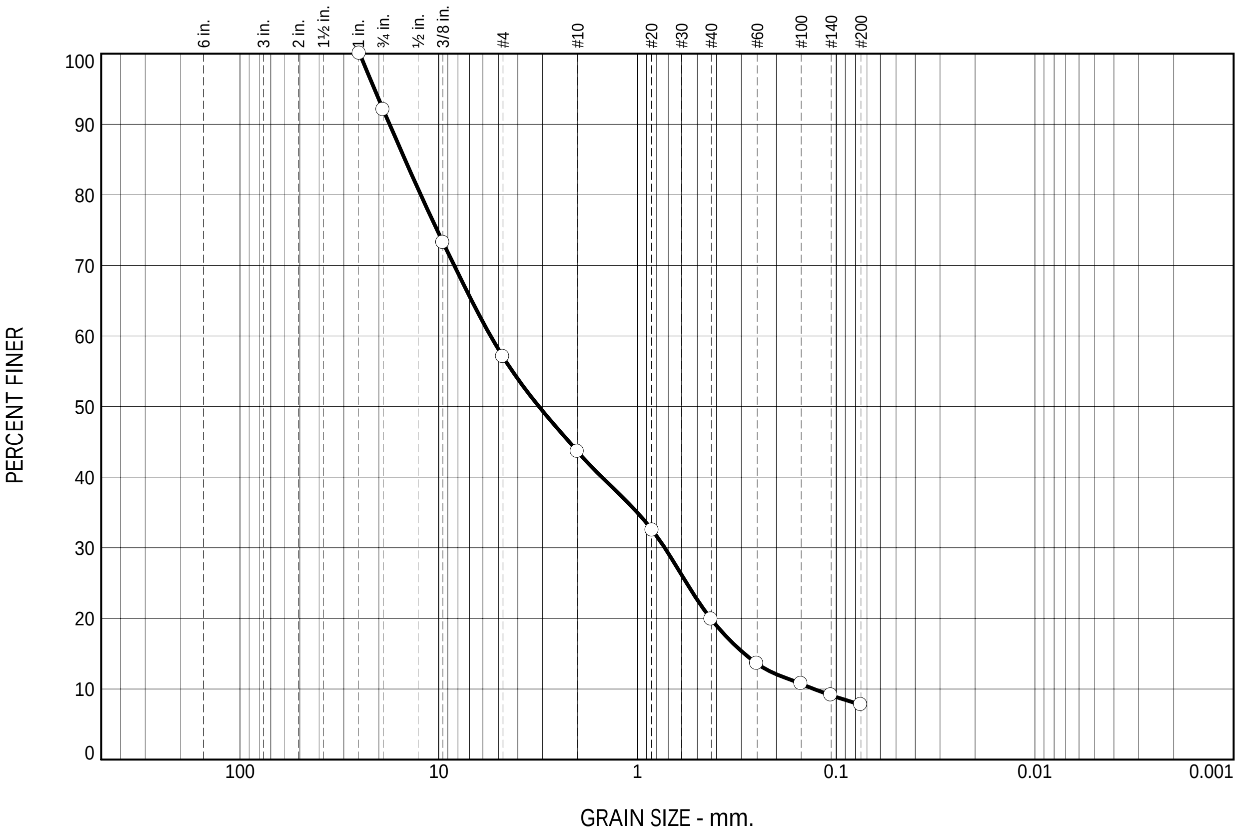
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	7.9	35.0	13.5	23.7	12.1	7.8	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	92.0		
.375	73.2		
#4	57.1		
#10	43.6		
#20	32.5		
#40	19.9		
#60	13.6		
#100	10.7		
#140	9.1		
#200	7.8		

* (no specification provided)

Soil Description

Poorly graded Sand w/silt and gravel

Atterberg Limits

PL= 15　LL= 18　PI= 3

Coefficients

D_{90}= 17.6740　D_{85}= 14.7765　D_{60}= 5.4818
D_{50}= 3.1286　D_{30}= 0.7293　D_{15}= 0.2900
D_{10}= 0.1295　C_u= 42.34　C_c= 0.75

Classification

USCS= SP-SM　AASHTO= A-1-a

Remarks

Natural Moisture = 9.0%

Source of Sample: RB-B-11　Depth: 33.5-35.0
Sample Number: S-11　Date:

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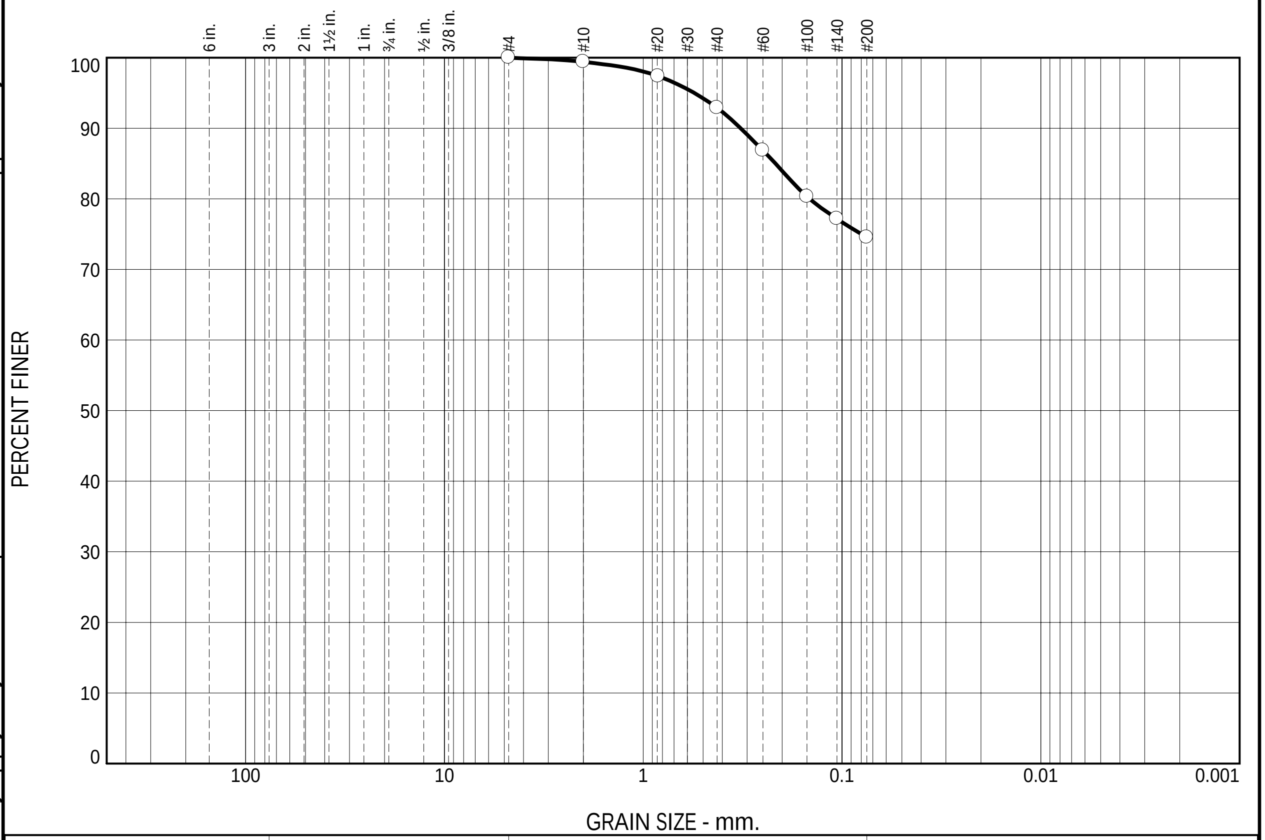
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051　Figure

Tested By: AD

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.6	6.5	18.4	74.5	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.4		
#20	97.4		
#40	92.9		
#60	86.9		
#100	80.3		
#140	77.2		
#200	74.5		

* (no specification provided)

Soil Description

Fat Clay w/sand

Atterberg Limits

PL= 22 LL= 58 PI= 36

Coefficients

D_{90}= 0.3238 D_{85}= 0.2162 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(27)

Remarks

Natural Moisture = 32.0%

Source of Sample: RB-B-11 Depth: 53.5-55.0
Sample Number: S-15 Date:

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Project: South Market Street Lab Testing

Project No: P20051 Figure

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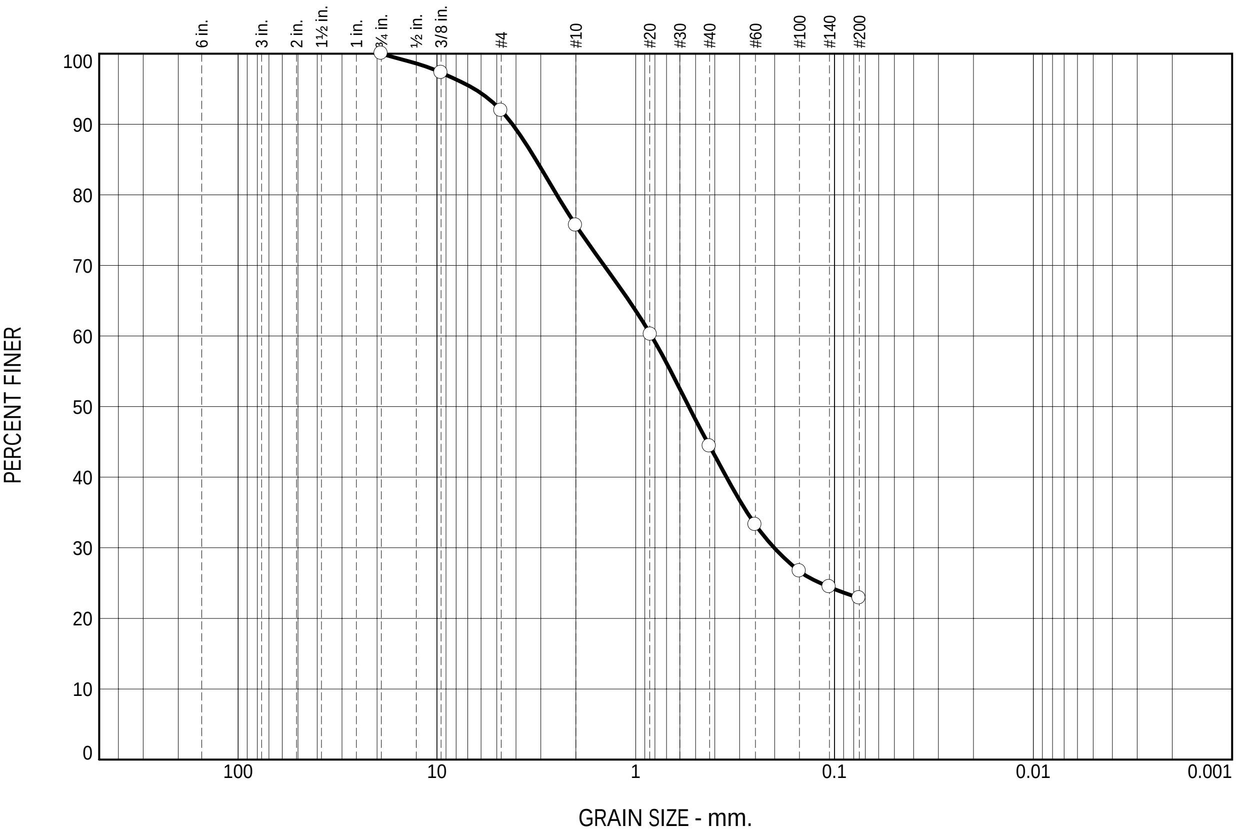
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	8.1	16.2	31.3	21.5	22.9	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	97.3		
#4	91.9		
#10	75.7		
#20	60.2		
#40	44.4		
#60	33.3		
#100	26.7		
#140	24.4		
#200	22.9		

* (no specification provided)

Soil Description

Clayey Sand

Atterberg Limits

PL= 13 LL= 23 PI= 10

Coefficients

D_{90}= 4.1716 D_{85}= 3.1828 D_{60}= 0.8325
D_{50}= 0.5405 D_{30}= 0.2011 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-4(0)

Remarks

Nat moisture = 11.1%

Source of Sample: RB-B-12 Depth: 0.3-10
Sample Number: Bulk Date:

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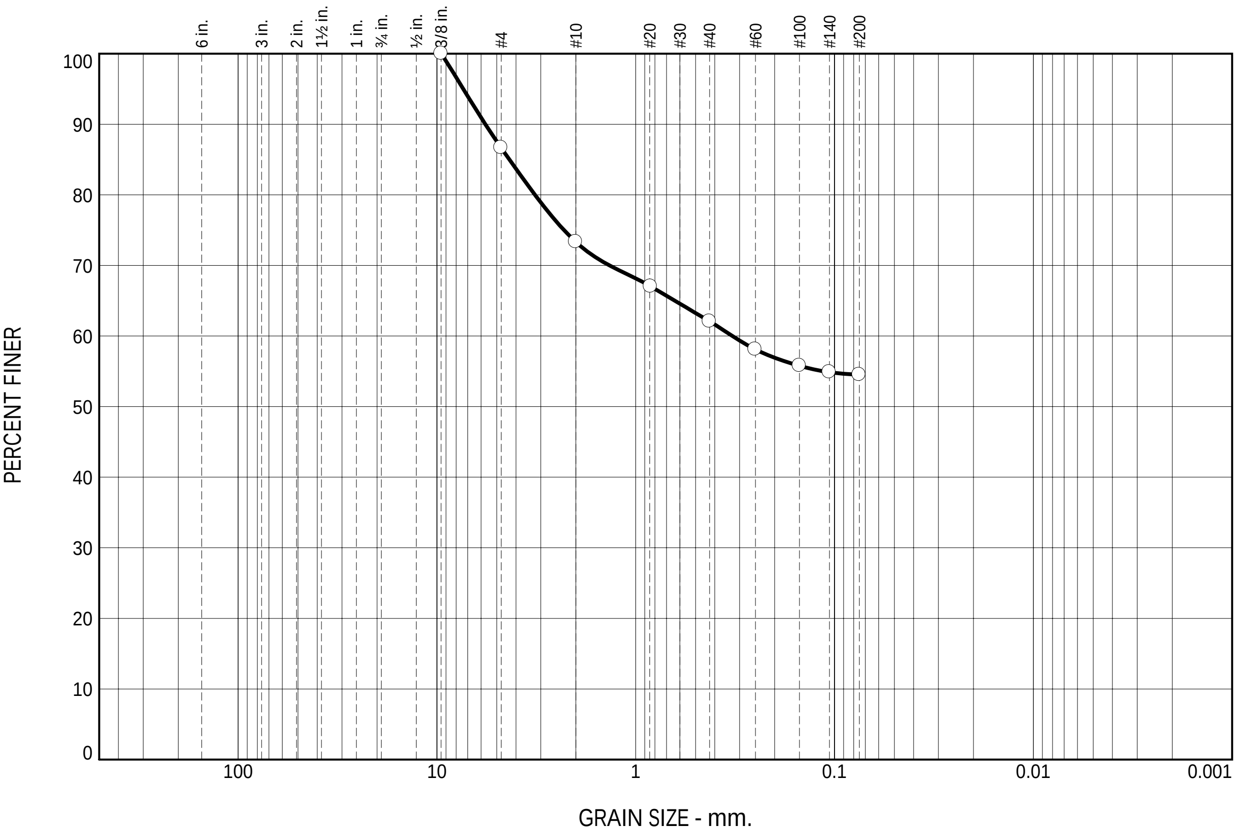
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	13.3	13.4	11.2	7.6	54.5	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	86.7		
#10	73.3		
#20	67.0		
#40	62.1		
#60	58.1		
#100	55.8		
#140	54.9		
#200	54.5		

* (no specification provided)

Soil Description

Sandy elastic Silt

Atterberg Limits

PL= 54	LL= 131	PI= 77

Coefficients

D_{90}= 5.7069	D_{85}= 4.3172	D_{60}= 0.3263
D_{50}=	D_{30}=	D_{15}=
D_{10}=	C_u=	C_c=

Classification

USCS= MH AASHTO= A-7-5(39)

Remarks

Source of Sample: RB-B-12 Depth: 12.5-14.0
Sample Number: S-6
Date:

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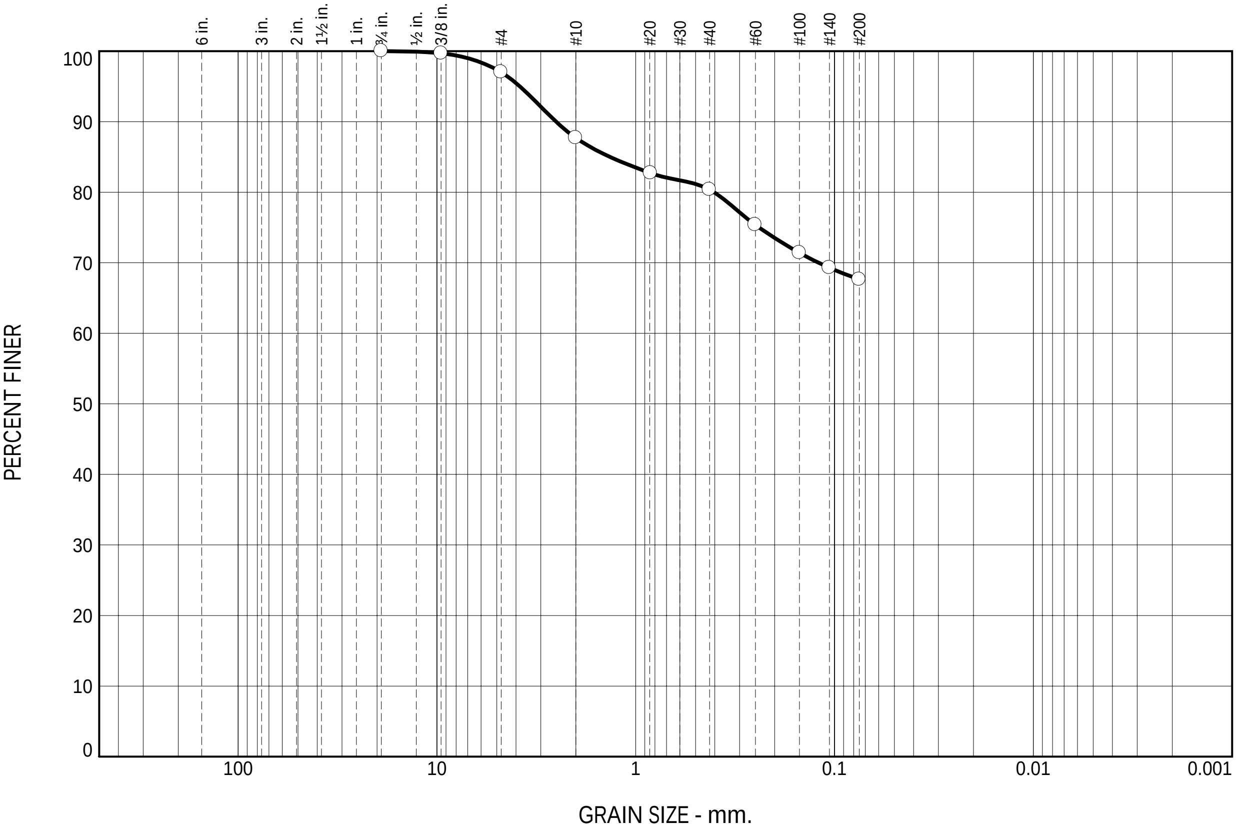
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.0	9.3	7.3	12.8	67.6	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	99.7		
#4	97.0		
#10	87.7		
#20	82.7		
#40	80.4		
#60	75.4		
#100	71.4		
#140	69.3		
#200	67.6		

* (no specification provided)

Soil Description

Sandy lean Clay

Atterberg Limits

PL= 24 LL= 47 PI= 23

Coefficients

D_{90}= 2.5156 D_{85}= 1.3470 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(15)

Remarks

Natural Moisture = 25.9%

Source of Sample: RB-B-12 Depth: 43.5-45.0
Sample Number: S-14 Date:

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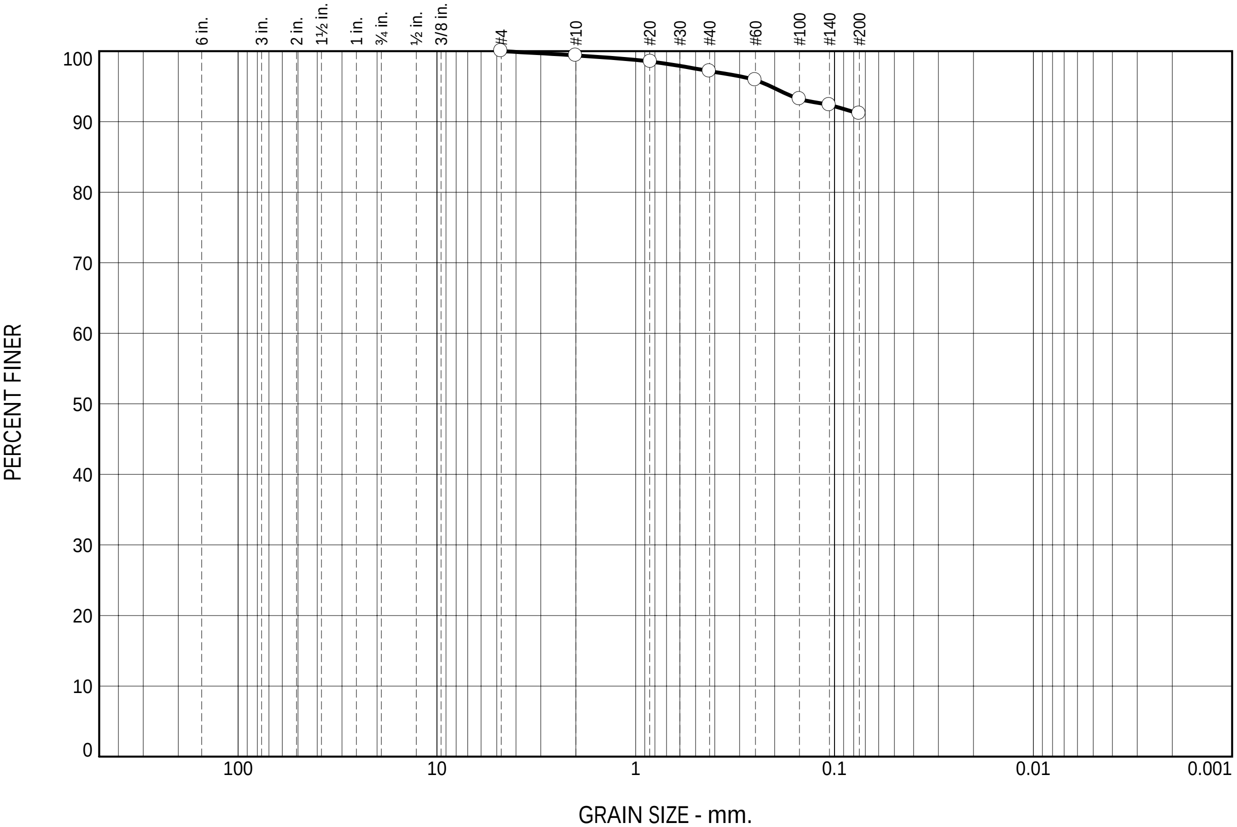
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.6	2.2	6.1	91.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.4		
#20	98.5		
#40	97.2		
#60	95.9		
#100	93.2		
#140	92.4		
#200	91.1		

* (no specification provided)

Soil Description

Fat Clay

Atterberg Limits

PL= 24
LL= 57
PI= 33

Coefficients

D_{90}=
D_{85}=
D_{60}=
D_{50}=
D_{30}=
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= CH
AASHTO= A-7-6(33)

Remarks

Natural Moisture = 35.4%

Source of Sample: RB-B-13 Depth: 5
Sample Number: S-3 Redo
Date:

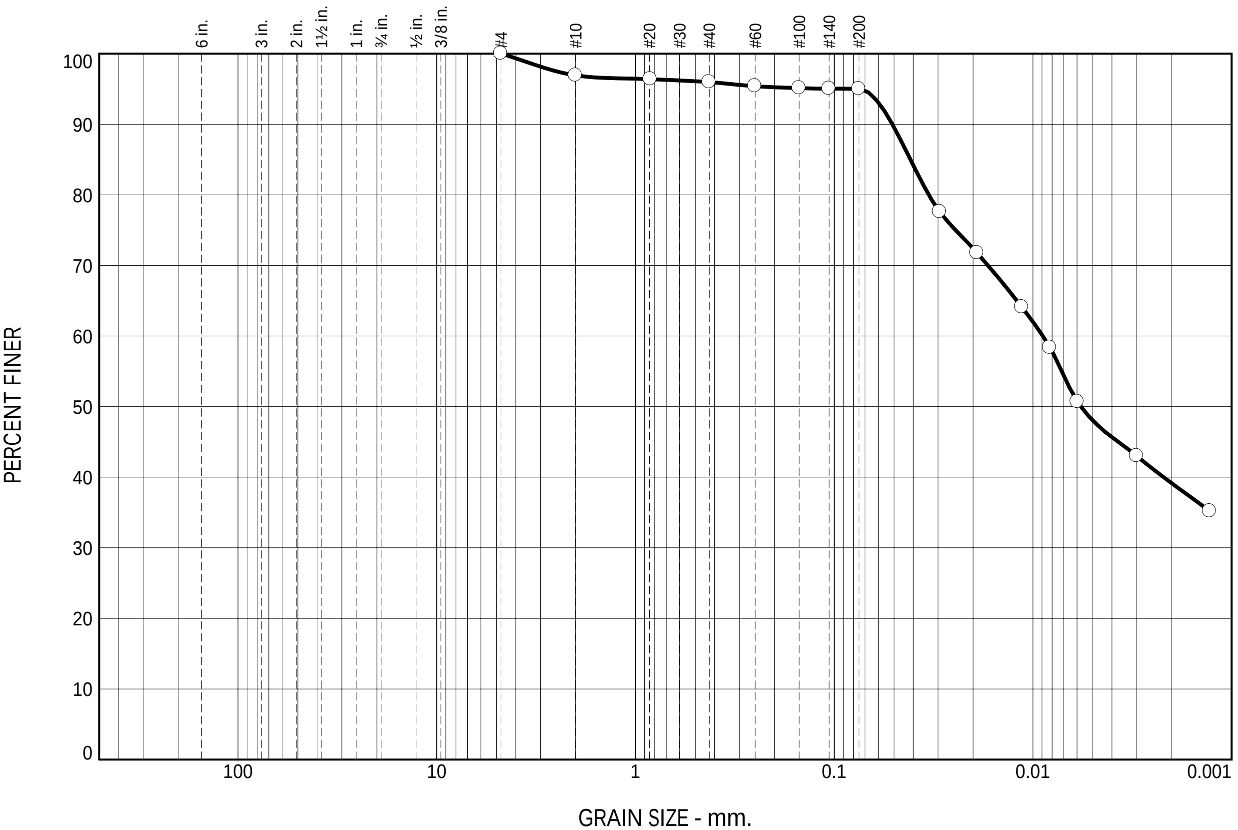
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051
Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	3.1	0.9	1.0	47.0	48.0

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	96.9		
#20	96.4		
#40	96.0		
#60	95.4		
#100	95.1		
#140	95.0		
#200	95.0		
0.0294 mm.	77.6		
0.0191 mm.	71.8		
0.0114 mm.	64.1		
0.0082 mm.	58.4		
0.0060 mm.	50.7		
0.0030 mm.	43.0		
0.0013 mm.	35.2		

* (no specification provided)

Soil Description

Elastic Silt

Atterberg Limits

PL= 44
LL= 92
PI= 48

Coefficients

D_{90}= 0.0509
D_{85}= 0.0413
D_{60}= 0.0089
D_{50}= 0.0057
D_{30}=
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= MH
AASHTO= A-7-5(58)

Remarks

Nautral Moisture = 71.0%

Source of Sample: RB-B-13 Depth: 15
Sample Number: S-7
Date:

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Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051
Figure

Tested By: AD

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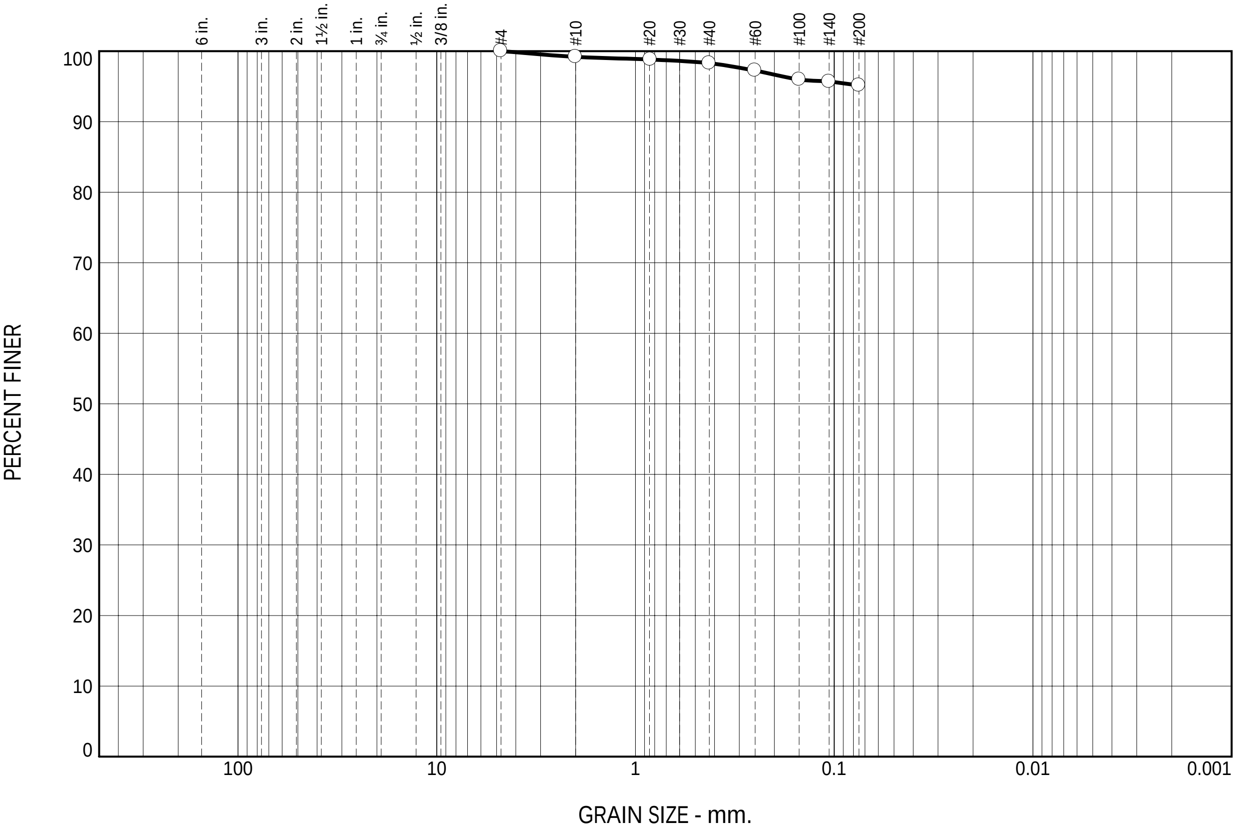
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.8	0.9	3.2	95.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.2		
#20	98.8		
#40	98.3		
#60	97.2		
#100	96.0		
#140	95.7		
#200	95.1		

* (no specification provided)

Soil Description

Fat Clay

Atterberg Limits

PL= 40 LL= 103 PI= 63

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(73)

Remarks

Nat moisture = 63.4%

Source of Sample: RB-B-13 Depth: 28.5
Sample Number: S-11 Redo

Date: 2/2

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Philadelphia, Pennsylvania

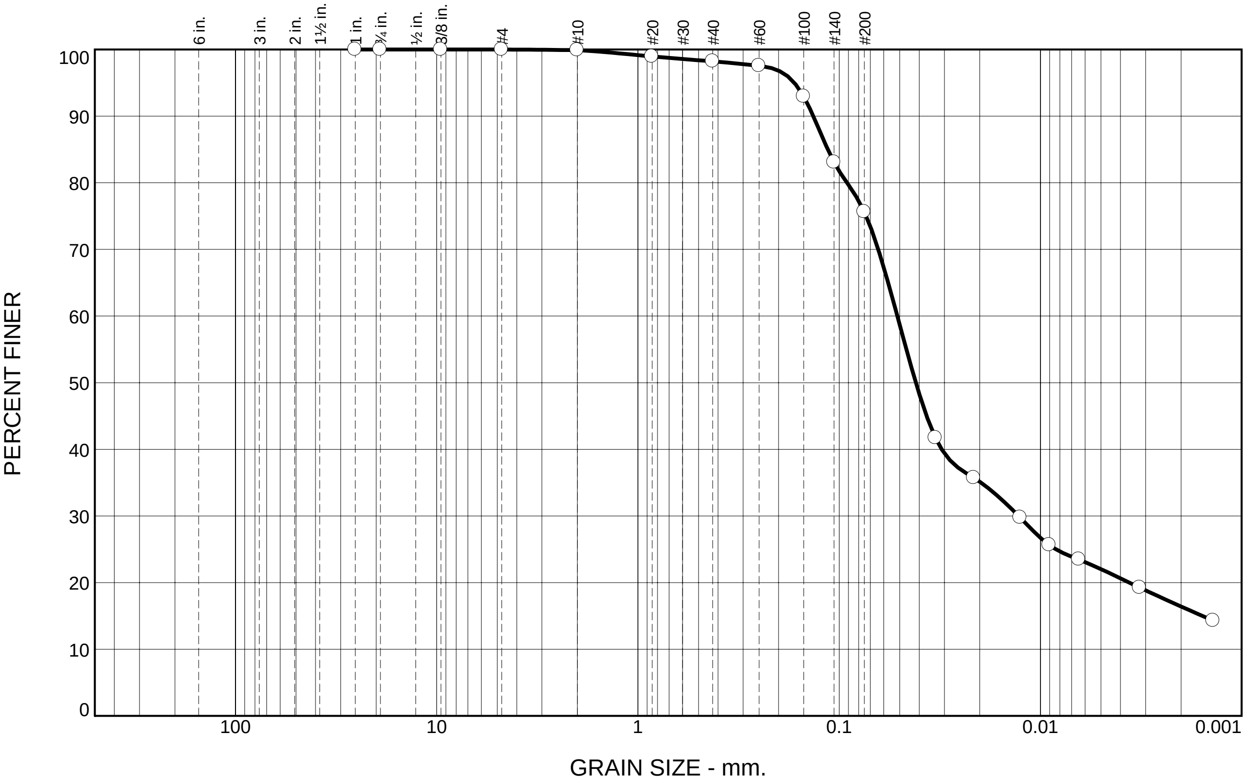
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical sample

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	1.7	22.6	53.6	22.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	100.0		
.375	100.0		
#4	100.0		
#10	99.9		
#20	99.0		
#40	98.2		
#60	97.5		
#100	92.9		
#140	83.1		
#200	75.6		

* (no specification provided)

Material Description

Black fat clay w/sand

Atterberg Limits

PL= 34 LL= 70 PI= 36

Coefficients

D_{90}= 0.1344 D_{85}= 0.1139 D_{60}= 0.0514
D_{50}= 0.0416 D_{30}= 0.0128 D_{15}= 0.0016
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(30)

Remarks

Nat mositure = 54.9%

Source of Sample: RW-B-01 **Depth:** 21.5-23.5
Sample Number: T-1 **Date:** 7/7

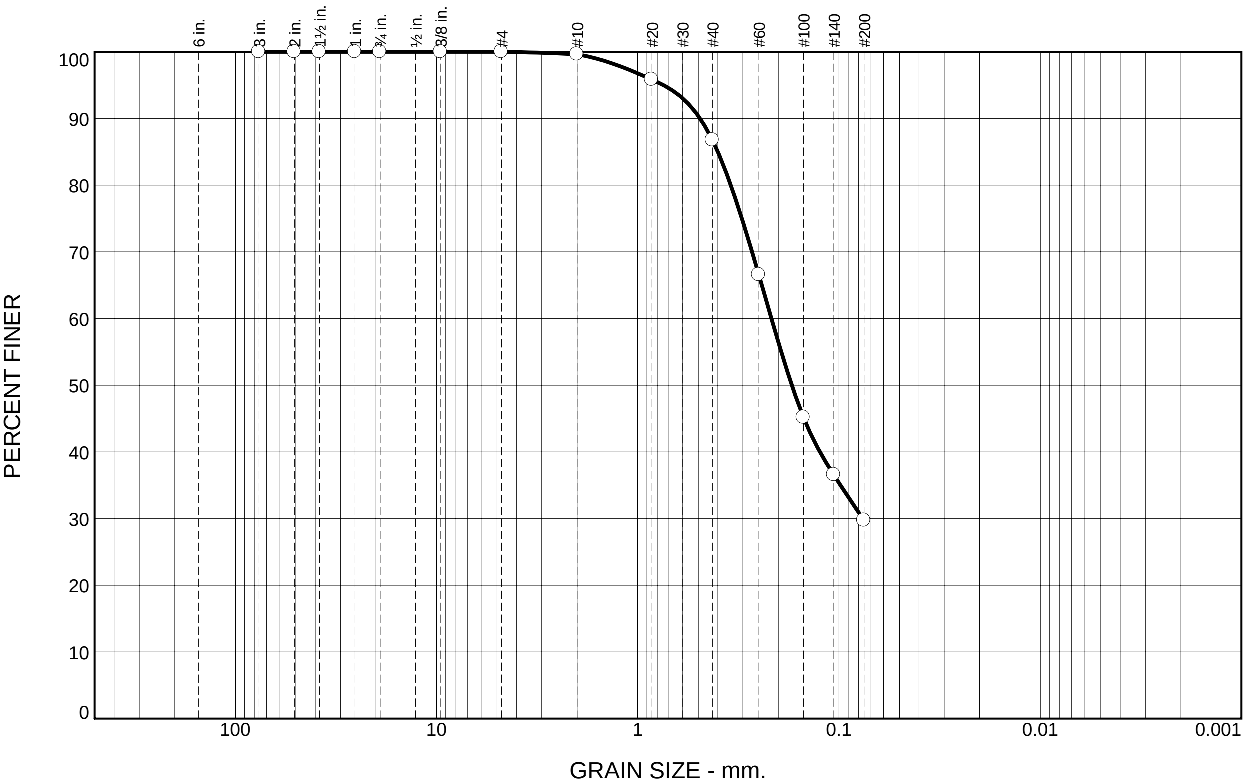
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: ACD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.4	12.8	57.1	29.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	100.0		
.375	100.0		
#4	100.0		
#10	99.6		
#20	95.8		
#40	86.8		
#60	66.5		
#100	45.2		
#140	36.5		
#200	29.7		

* (no specification provided)

Material Description

Gray clayey sand

Atterberg Limits

PL= 25 LL= 55 PI= 30

Coefficients

D_{90}= 0.4896 D_{85}= 0.3997 D_{60}= 0.2165
D_{50}= 0.1715 D_{30}= 0.0761 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-7(3)

Remarks

Nat mositure = 27.9%

Source of Sample: RW-B-01 **Depth:** 53.5-55'
Sample Number: S-15 **Date:** 6/29

HILLIS-CARNES ENGINEERING ASSOCIATES

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Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: ACD

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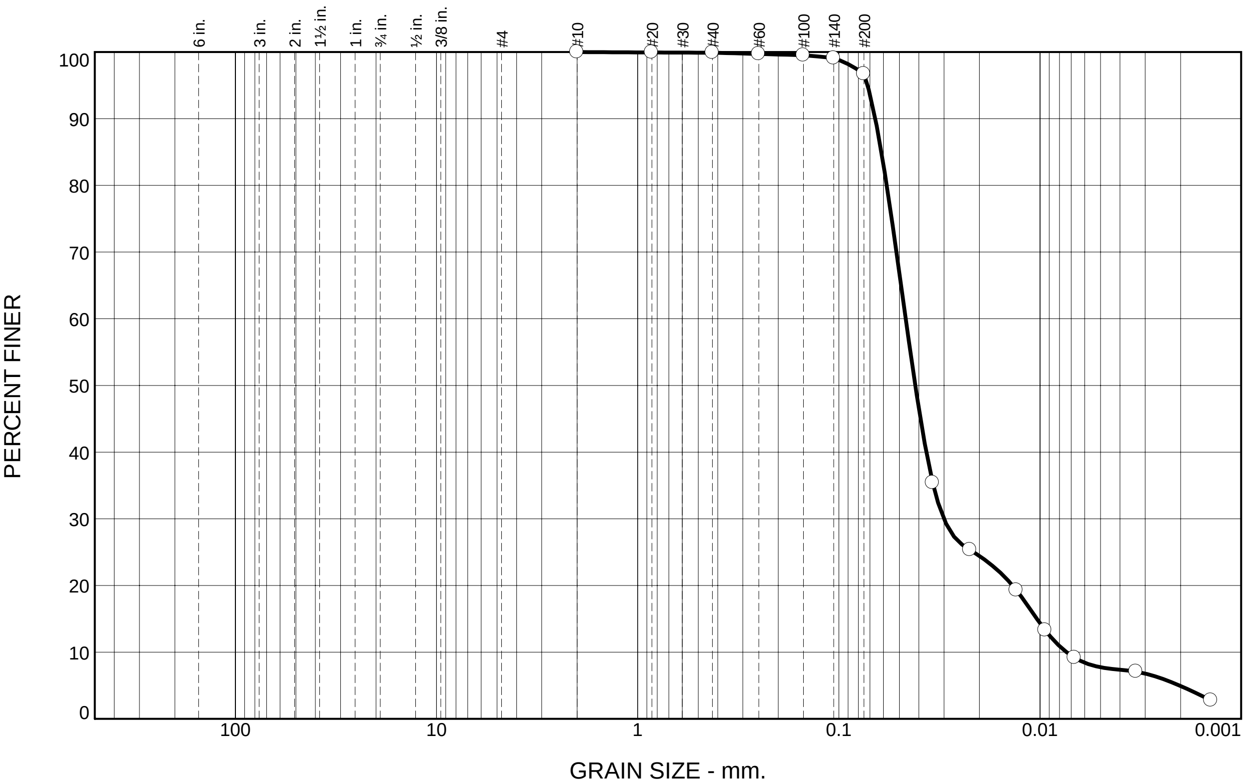
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	3.2	89.0	7.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.9		
#40	99.9		
#60	99.7		
#100	99.5		
#140	99.1		
#200	96.7		

* (no specification provided)

Material Description

Black fat clay

Atterberg Limits

PL= 33 LL= 80 PI= 47

Coefficients

D_{90}= 0.0659 D_{85}= 0.0614 D_{60}= 0.0465
D_{50}= 0.0417 D_{30}= 0.0301 D_{15}= 0.0104
D_{10}= 0.0074 C_u= 6.30 C_c= 2.63

Classification

USCS= CH AASHTO= A-7-5(55)

Remarks

Nat mositure = 52.5%

Source of Sample: RW-B-02 **Depth:** 12.5-14
Sample Number: S-6 **Date:** 6/29

HILLIS-CARNES ENGINEERING ASSOCIATES

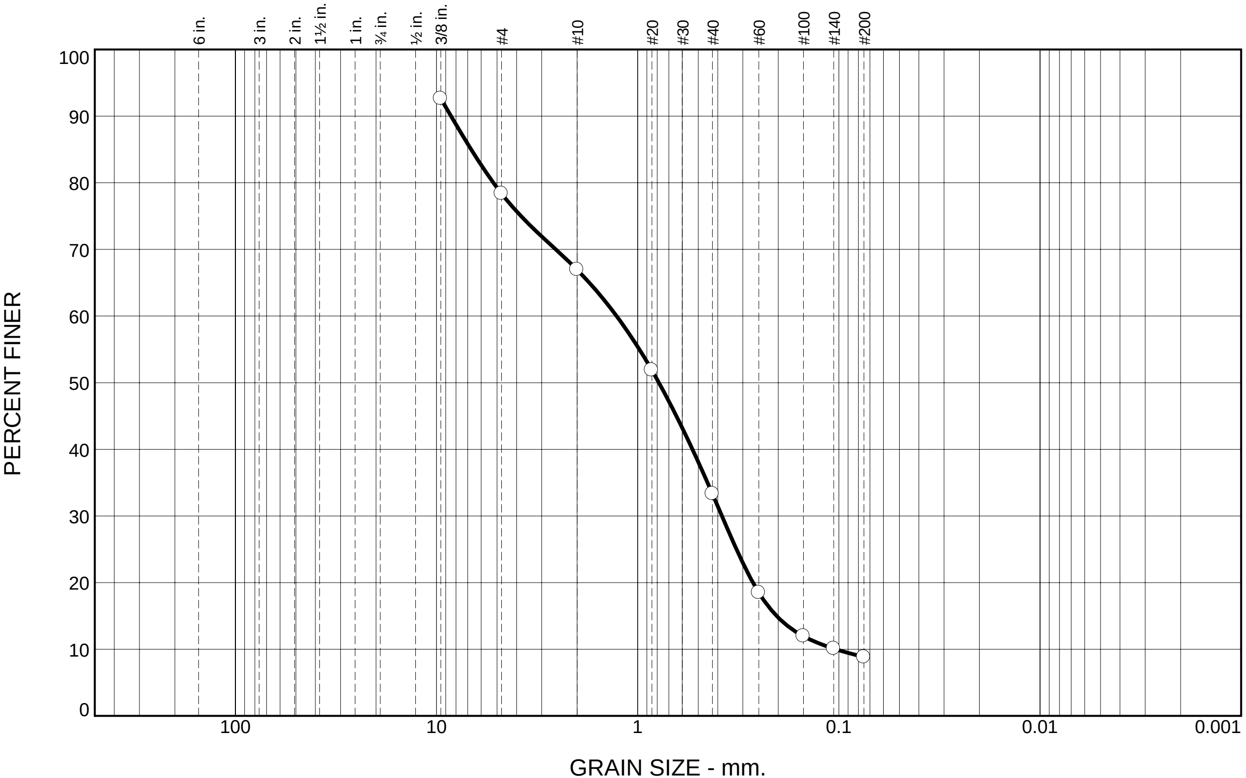
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
		21.6	11.5	33.6	24.5	8.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	92.6		
#4	78.4		
#10	66.9		
#20	51.9		
#40	33.3		
#60	18.5		
#100	12.0		
#140	10.1		
#200	8.8		

* (no specification provided)

Material Description

well graded sand w/silt and gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 8.4676 D_{85}= 6.7250 D_{60}= 1.2732
D_{50}= 0.7839 D_{30}= 0.3813 D_{15}= 0.2041
D_{10}= 0.1037 C_u= 12.28 C_c= 1.10

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

Nat moisture = 12.8%

Source of Sample: RW-B-02 **Depth:** 33.5-35
Sample Number: S-11

Date: 6/29

HILLIS-CARNES ENGINEERING ASSOCIATES

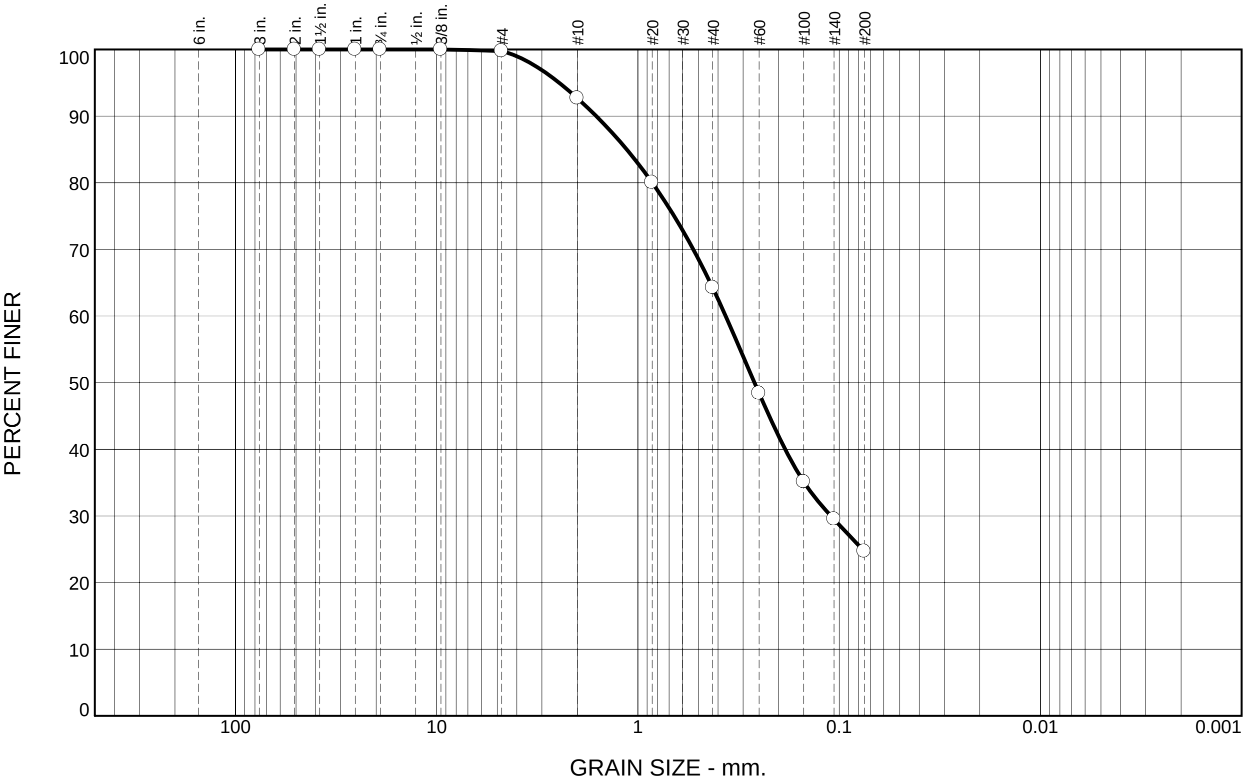
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: ACD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	7.1	28.5	39.5	24.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	100.0		
.375	100.0		
#4	99.8		
#10	92.7		
#20	80.0		
#40	64.2		
#60	48.4		
#100	35.1		
#140	29.5		
#200	24.7		

* (no specification provided)

Material Description

Brown clayey sand

Atterberg Limits

PL= 25 LL= 45 PI= 20

Coefficients

D_{90}= 1.6109 D_{85}= 1.1370 D_{60}= 0.3665

D_{50}= 0.2636 D_{30}= 0.1097 D_{15}=

D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-2-7(1)

Remarks

Nat moisture = 29.1%

Source of Sample: RW-B-02 **Depth:** 48.5-50

Sample Number: S-14

Date: 6/29

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

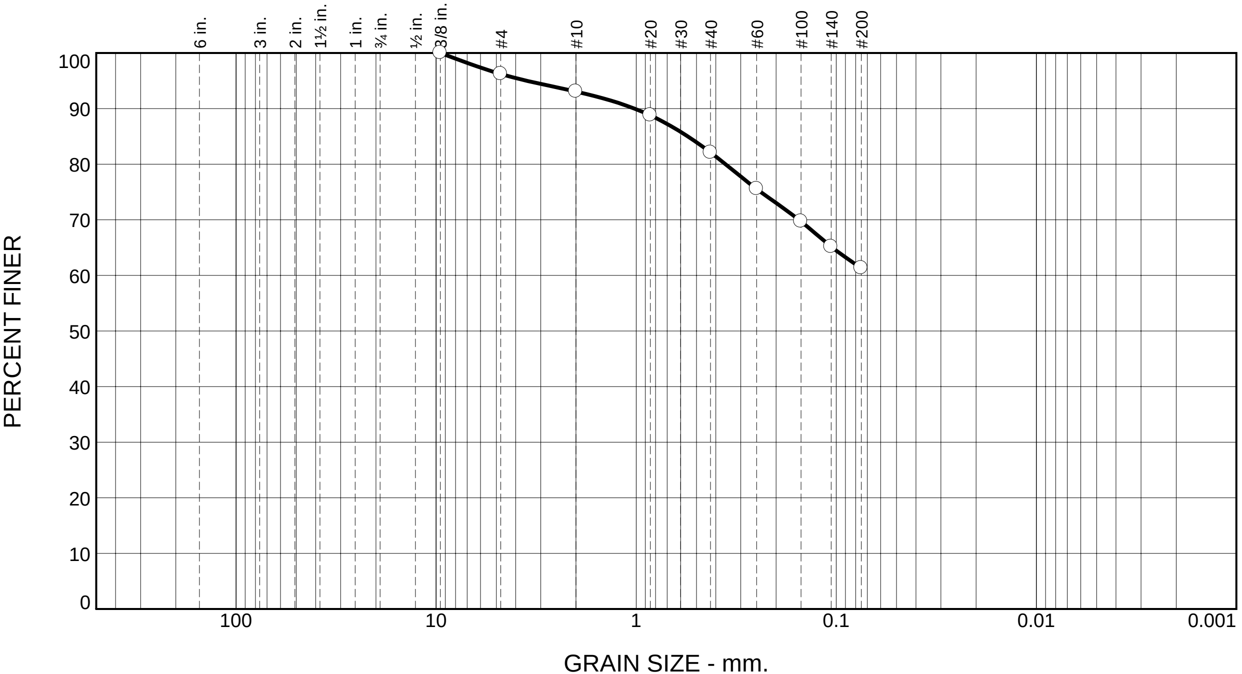
Client: HCEA SCG/RK&K

Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: ACD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.8	3.1	11.0	20.8	61.3	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.375	100.0		
#4	96.2		
#10	93.1		
#20	88.8		
#40	82.1		
#60	75.5		
#100	69.7		
#140	65.2		
#200	61.3		

* (no specification provided)

Material Description

Brown clay

Atterberg Limits (ASTM D 4318)

PL= 20 **LL=** 25 **PI=** 5

Classification

USCS (D 2487)= CL-ML **AASHTO (M 145)=** A-4(1)

Coefficients

D_{90}=	1.0213	D_{85}=	0.5527	D_{60}=	
D_{50}=		D_{30}=		D_{15}=	
D_{10}=		C_u=		C_c=	

Remarks

Nat moisture = 15.8%

Date Received: 7/17 **Date Tested:** 7/24

Tested By: cs

Checked By:

Title:

Source of Sample: RW-B-03 **Depth:** 7.5 **Date Sampled:** 7/13
Sample Number: S-4

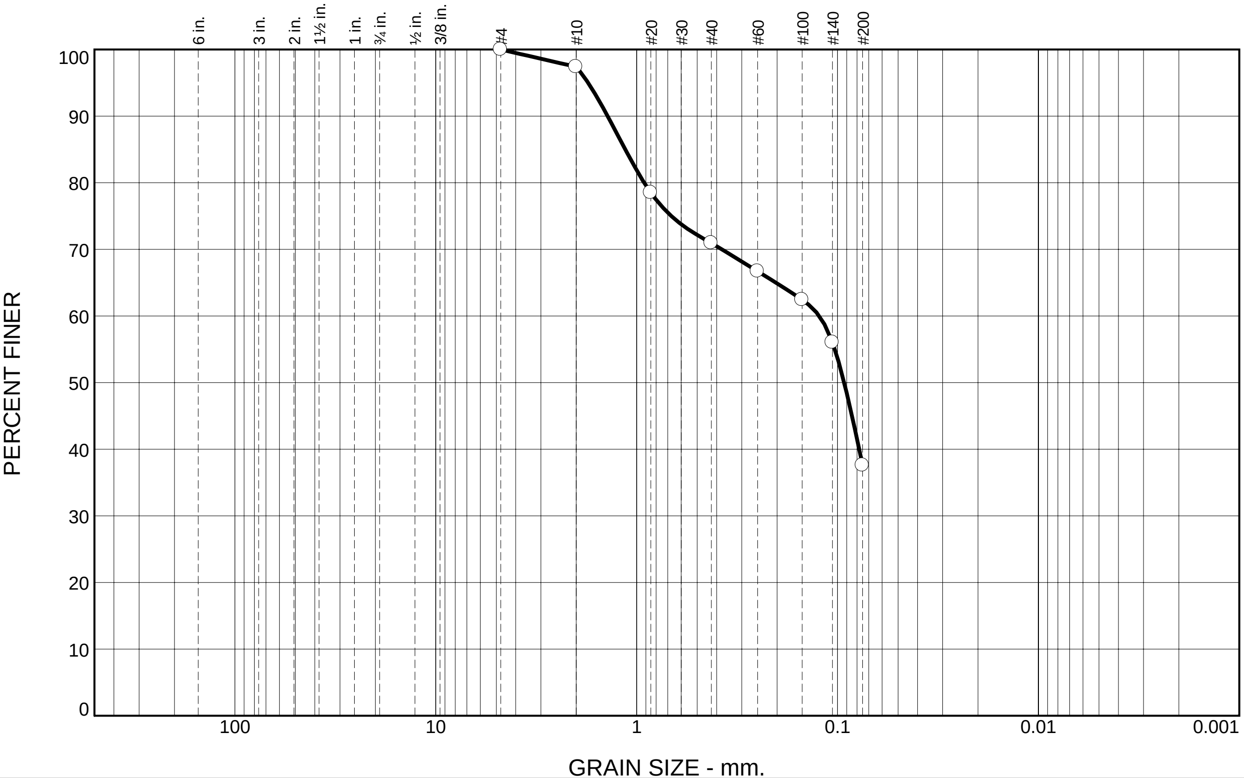
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	2.6	26.5	33.3	37.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	97.4		
#20	78.5		
#40	70.9		
#60	66.7		
#100	62.4		
#140	56.0		
#200	37.6		

* (no specification provided)

Material Description

Grey clayey sand

Atterberg Limits

PL= 24 LL= 53 PI= 29

Classification

USCS= SC AASHTO= A-7-6(5)

Remarks

Nat moisture = 42.6%

Source of Sample: RW-B-03 **Depth:** 23.5
Sample Number: T-1 **Date:** 7/17

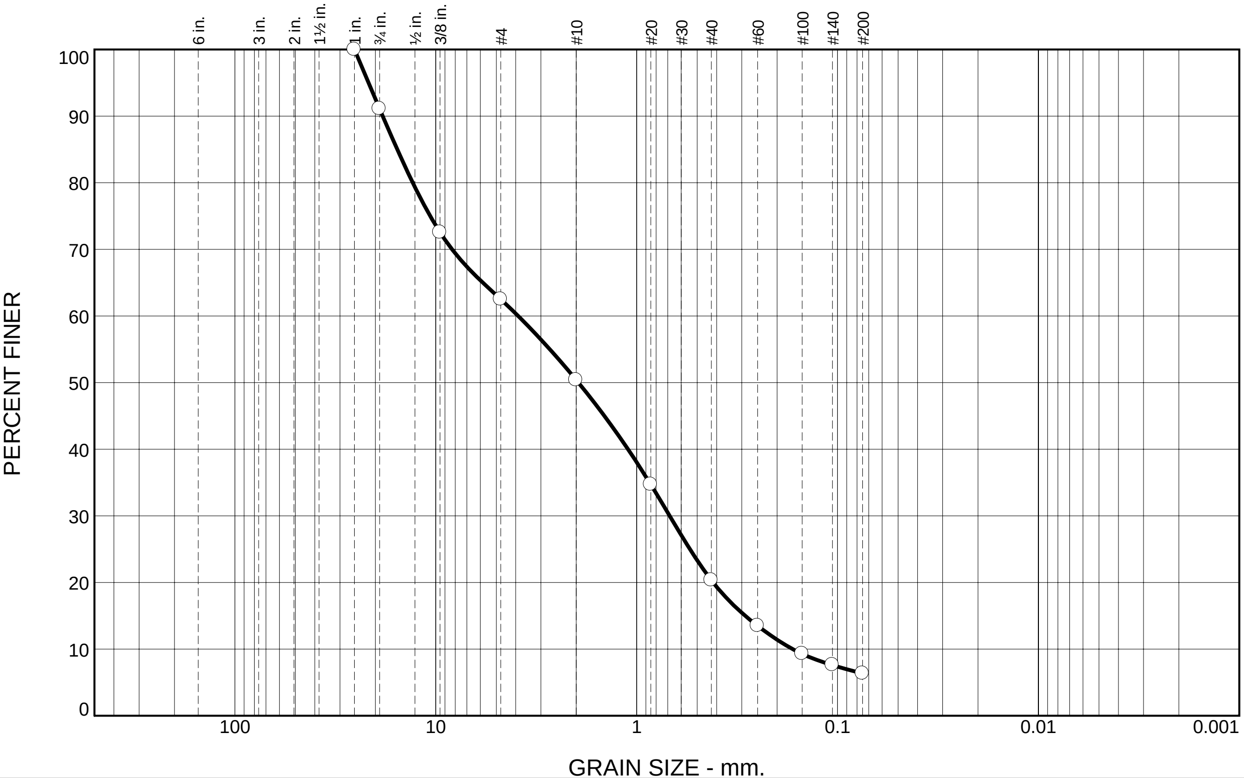
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.9	28.6	12.1	30.1	14.0	6.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	91.1		
.375	72.6		
#4	62.5		
#10	50.4		
#20	34.7		
#40	20.3		
#60	13.5		
#100	9.3		
#140	7.6		
#200	6.3		

* (no specification provided)

Material Description

grey poorly graded sand w/silt and gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Classification

USCS= SP-SM AASHTO= A-1-a

Remarks

Nat moisture = 11.3%

Source of Sample: RW-B-03 **Depth:** 38.5
Sample Number: S-12
Date: 7/17

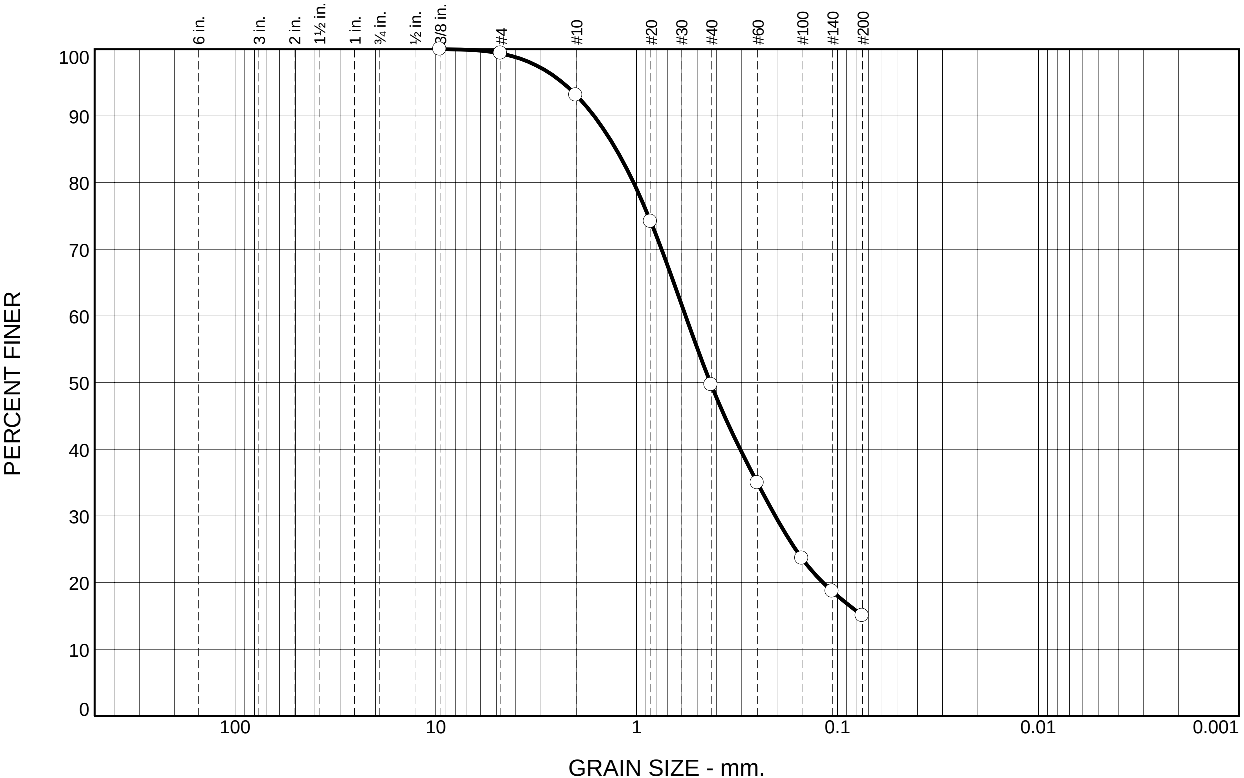
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.6	6.3	43.5	34.6	15.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.4		
#10	93.1		
#20	74.1		
#40	49.6		
#60	34.9		
#100	23.6		
#140	18.7		
#200	15.0		

* (no specification provided)

Material Description

Lt brown silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Classification

USCS= SM AASHTO= A-1-b

Remarks

Nat mositure = 27.5%

Source of Sample: RW-B-03 **Depth:** 53.5
Sample Number: S-15
Date: 7/17

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

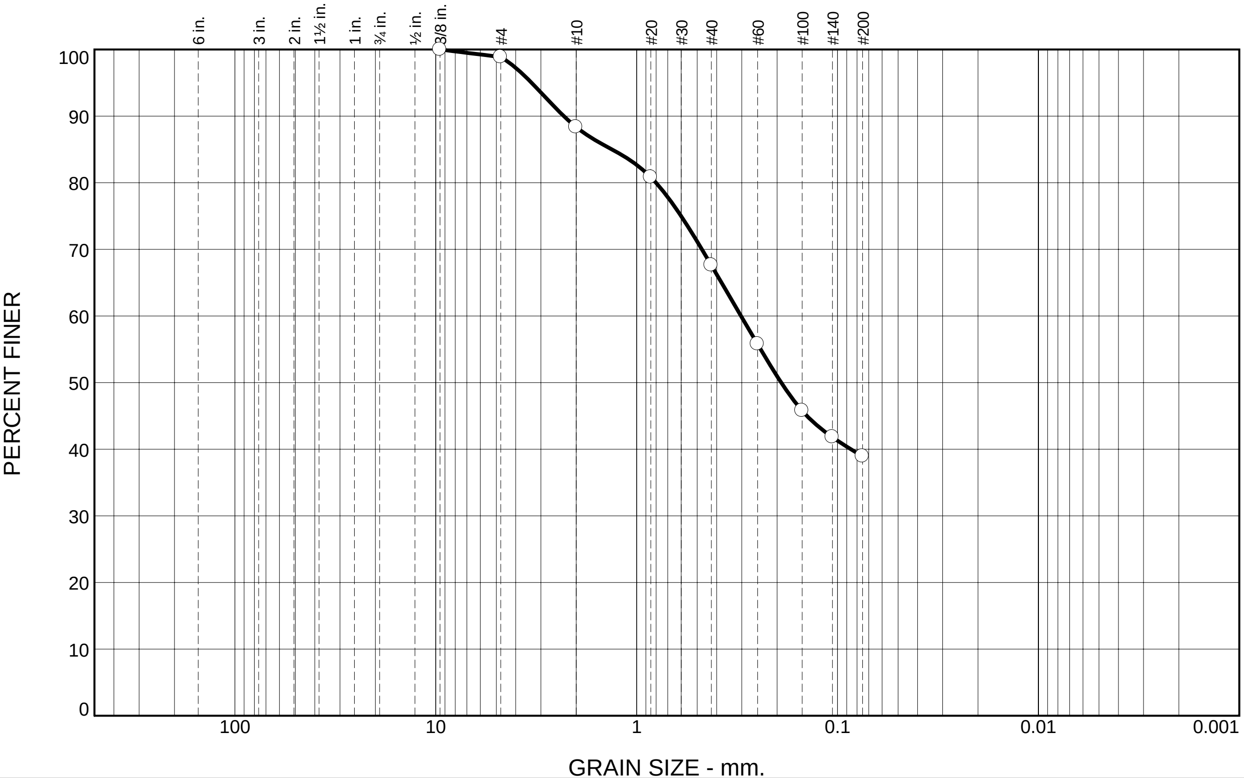
Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.1	10.6	20.7	28.7	38.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	98.9		
#10	88.3		
#20	80.8		
#40	67.6		
#60	55.8		
#100	45.8		
#140	41.8		
#200	38.9		

* (no specification provided)

Material Description

Red and grey clayey sand

Atterberg Limits

PL= 22
LL= 44
PI= 22

Classification

USCS= SC
AASHTO= A-7-6(4)

Remarks

Nat moisture = 20.4%

Source of Sample: RW-B-04 **Depth:** 17
Sample Number: T-1
Date: 7/17

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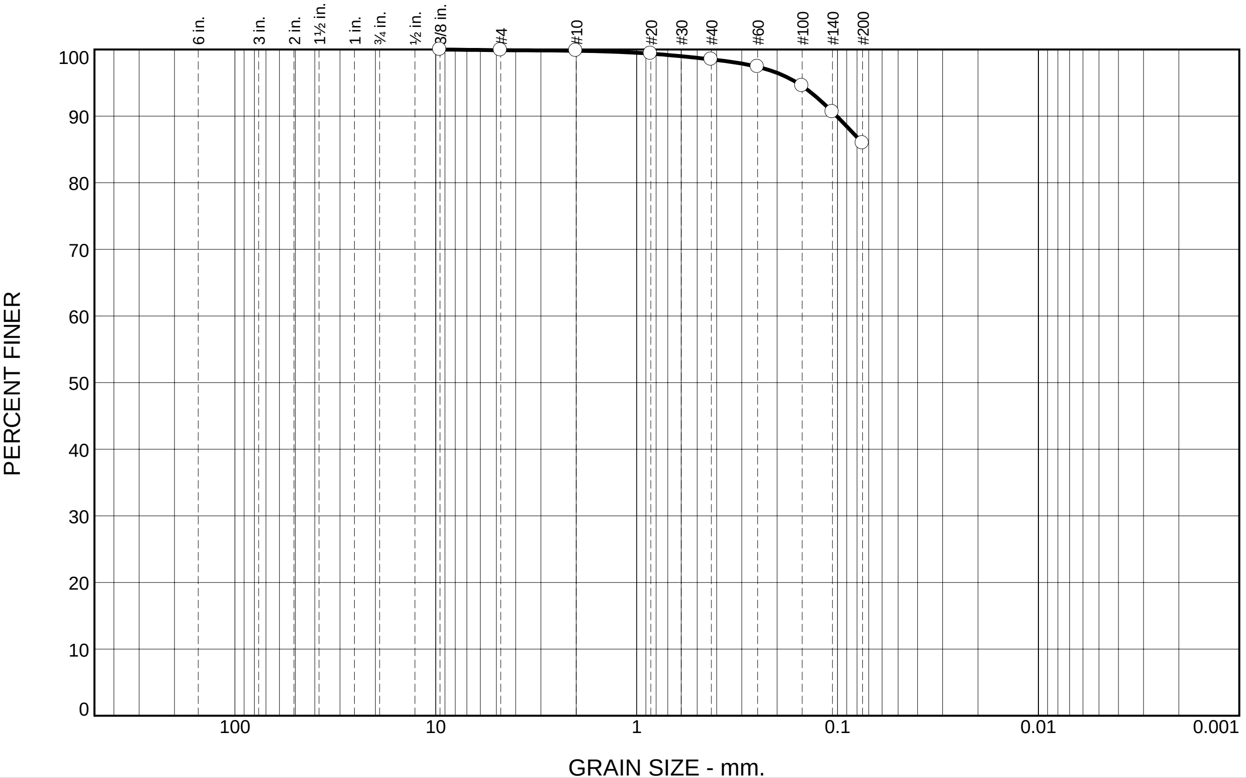
Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.1	1.3	12.5	86.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.9		
#10	99.8		
#20	99.4		
#40	98.5		
#60	97.4		
#100	94.5		
#140	90.6		
#200	86.0		

* (no specification provided)

Material Description

black silt

Atterberg Limits

PL= 28 LL= 34 PI= 6

Classification

USCS= ML AASHTO= A-4(6)

Remarks

Nat moisture = 62.1%

Source of Sample: RW-B-05 **Depth:** 7.5
Sample Number: S-4 **Date:**

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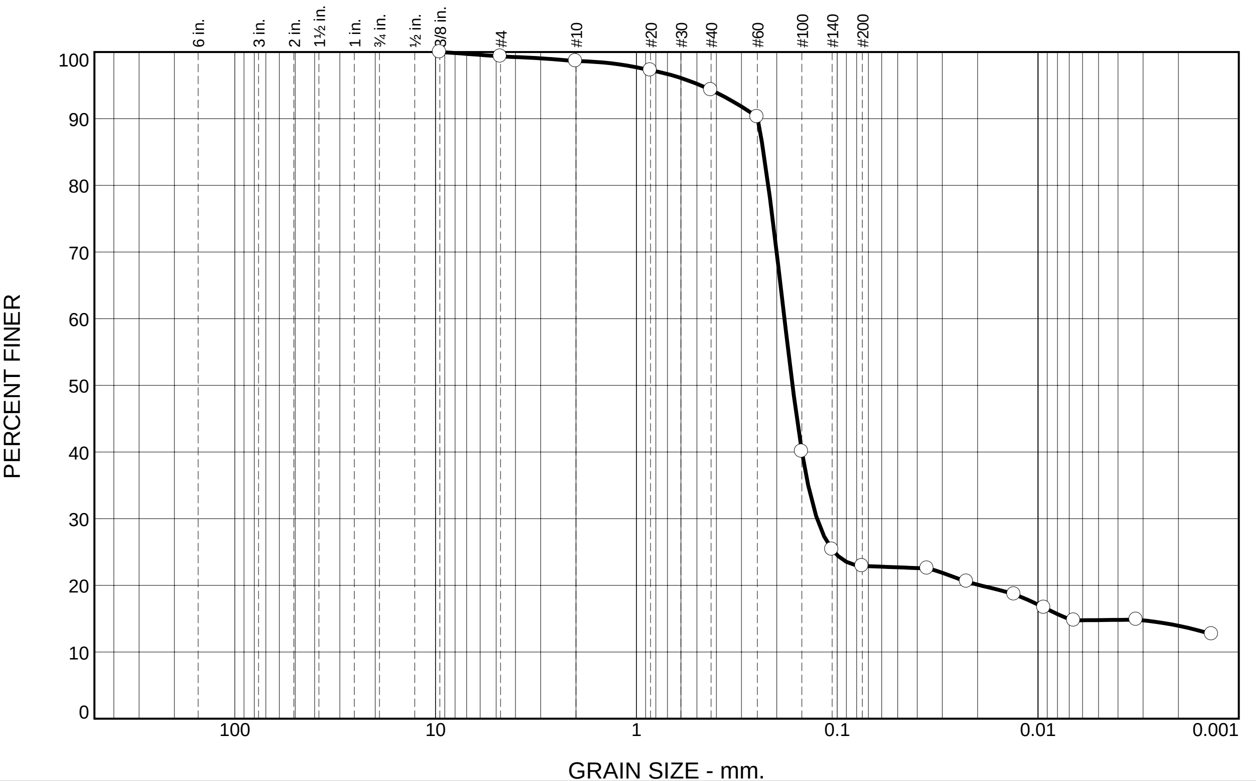
Client:
Project: South Market Street Lab Testing
Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	0.7	4.3	71.4	8.1	14.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.3		
#10	98.6		
#20	97.3		
#40	94.3		
#60	90.3		
#100	40.1		
#140	25.4		
#200	22.9		

* (no specification provided)

Material Description

Black silty sand

Atterberg Limits

PL= NP LL= 29 PI= NP

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

NAt moisture = 40.1%

Source of Sample: RW-B-05 **Depth:** 15.0
Sample Number: U-1 **Date:**

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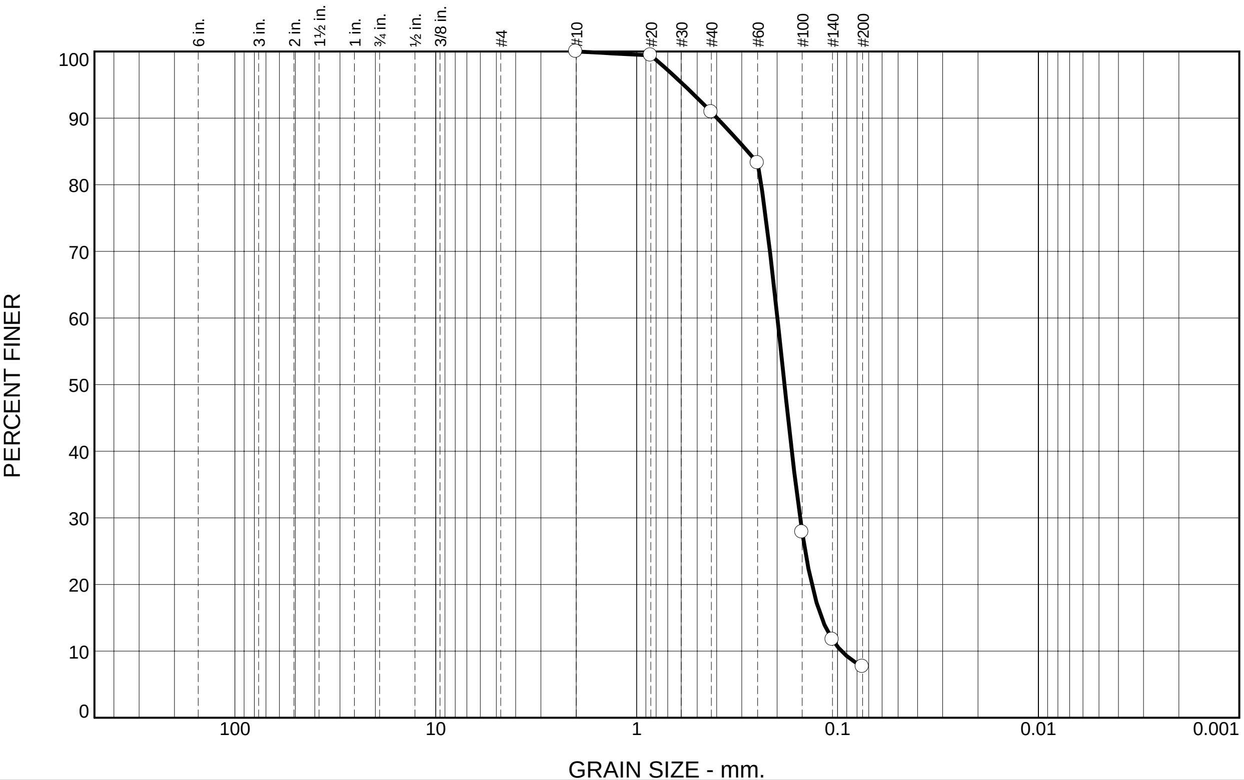
Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	9.1	83.2	7.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.4		
#40	90.9		
#60	83.3		
#100	27.8		
#140	11.7		
#200	7.7		

* (no specification provided)

Material Description

Grey/brown poorly graded sand w/silt

Atterberg Limits

PL= NP LL= NP PI= NP

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Nat moisture = 32.1%

Source of Sample: RW-B-05 **Depth:** 33.5
Sample Number: S-10 **Date:**

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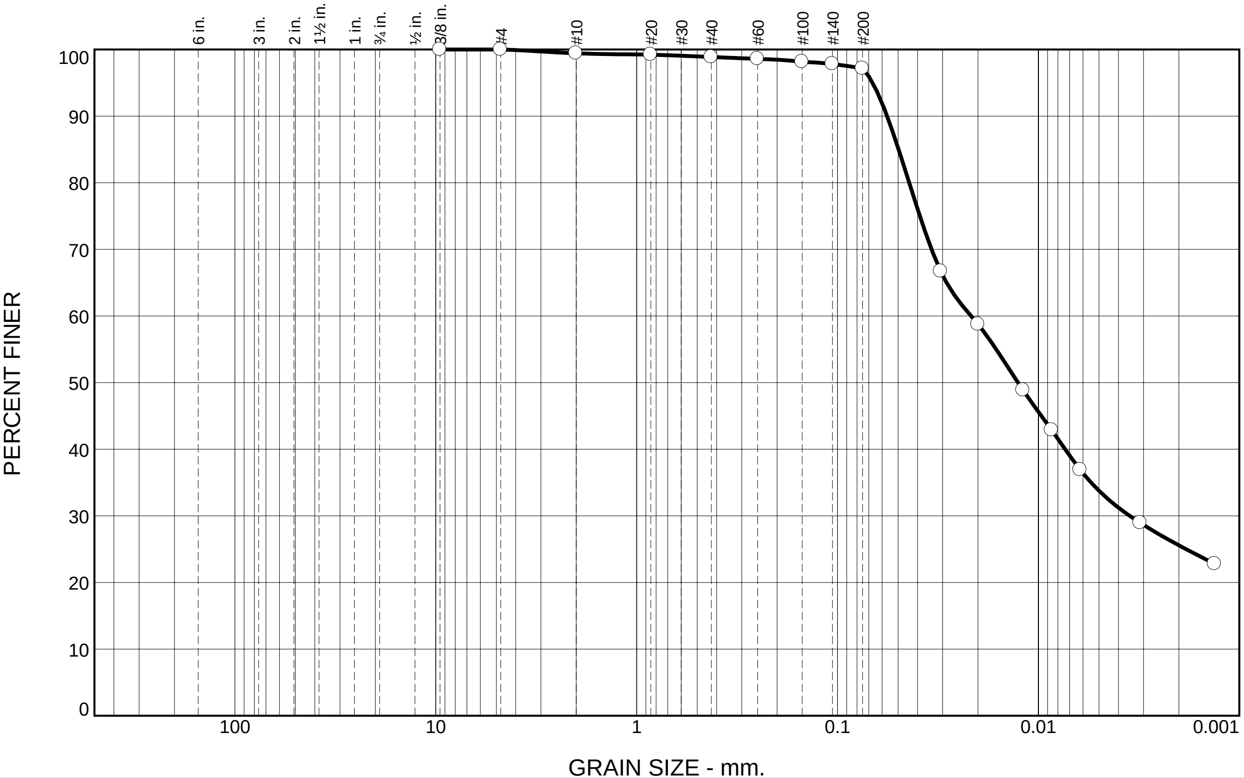
Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.6	0.5	1.8	63.3	33.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	100.0		
#10	99.4		
#20	99.2		
#40	98.9		
#60	98.6		
#100	98.1		
#140	97.8		
#200	97.1		

* (no specification provided)

Material Description

Brown silt

Atterberg Limits

PL= 32 LL= 46 PI= 14

Classification

USCS= ML AASHTO= A-7-5(18)

Remarks

NAt moistuer = 64.4%

Source of Sample: RW-B-06 **Depth:** 9.0
Sample Number: U-1 **Date:**

HILLIS-CARNES ENGINEERING ASSOCIATES

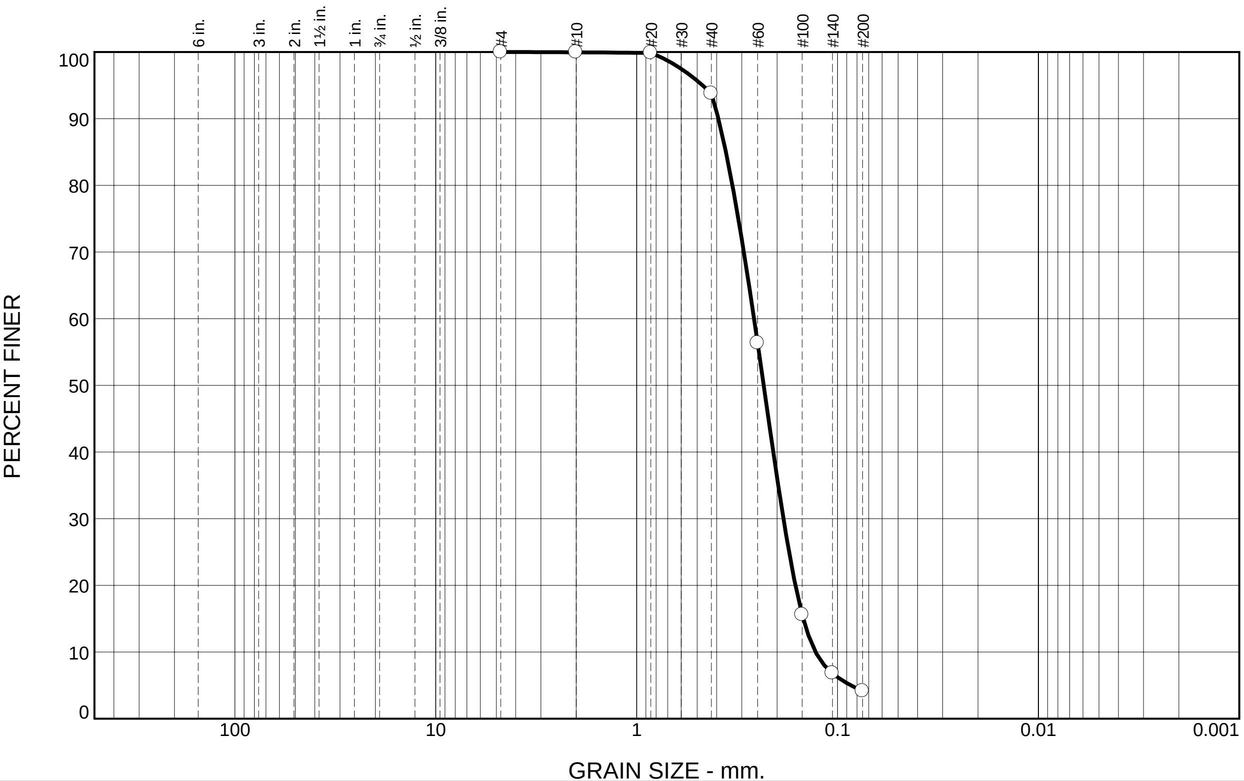
Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	6.2	89.7	4.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.9		
#40	93.8		
#60	56.4		
#100	15.6		
#140	6.8		
#200	4.1		

* (no specification provided)

Material Description

grey, brown poorly graded sand

Atterberg Limits

PL= NP LL= NP PI= NP

Classification

USCS= SP AASHTO= A-3

Remarks

Nat moisture = 22.6%

Source of Sample: RW-B-06 **Depth:** 28.5

Sample Number: S-9

Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

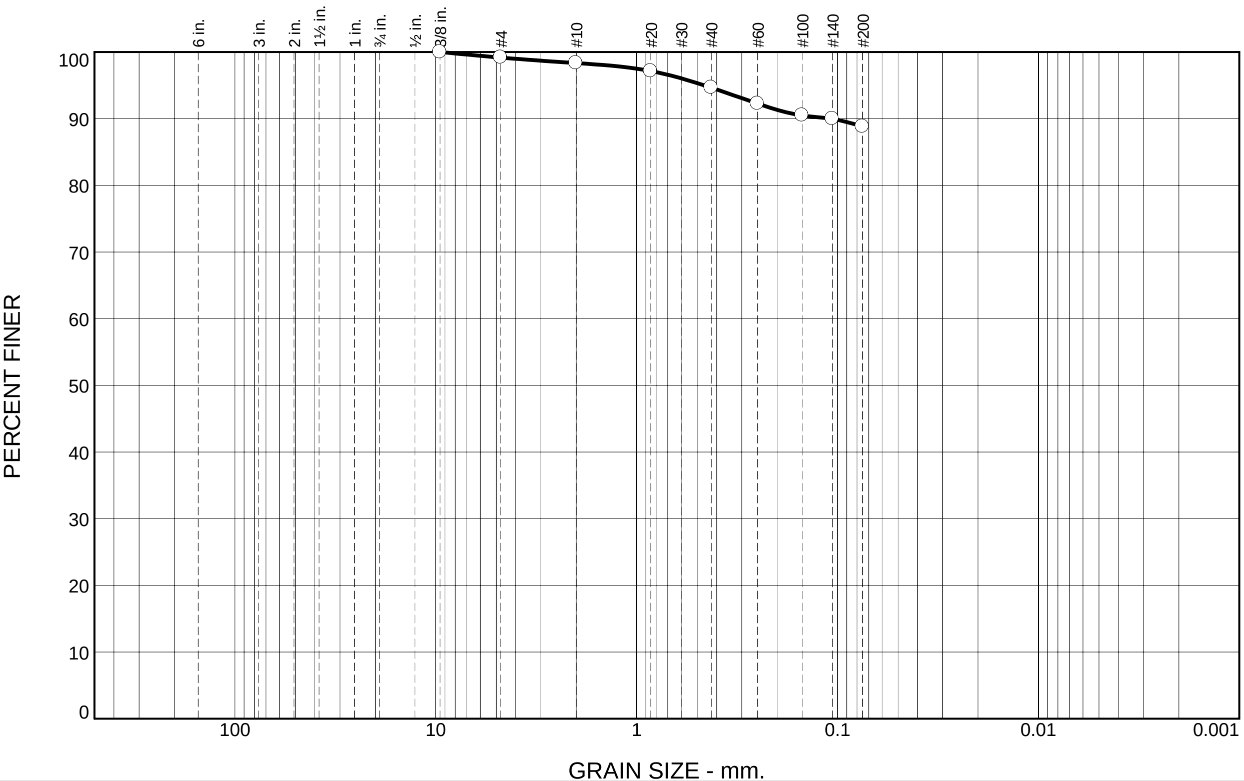
Client:

Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.8	0.9	3.6	5.9	88.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.2		
#10	98.3		
#20	97.1		
#40	94.7		
#60	92.3		
#100	90.5		
#140	90.0		
#200	88.8		

* (no specification provided)

Material Description

Black/brown silt

Atterberg Limits

PL= 29 LL= 49 PI= 20

Classification

USCS= ML AASHTO= A-7-6(21)

Remarks

NAT MOISTURE = 44.3%

Source of Sample: RW-B-07 **Depth:** 10.0
Sample Number: S-5 **Date:**

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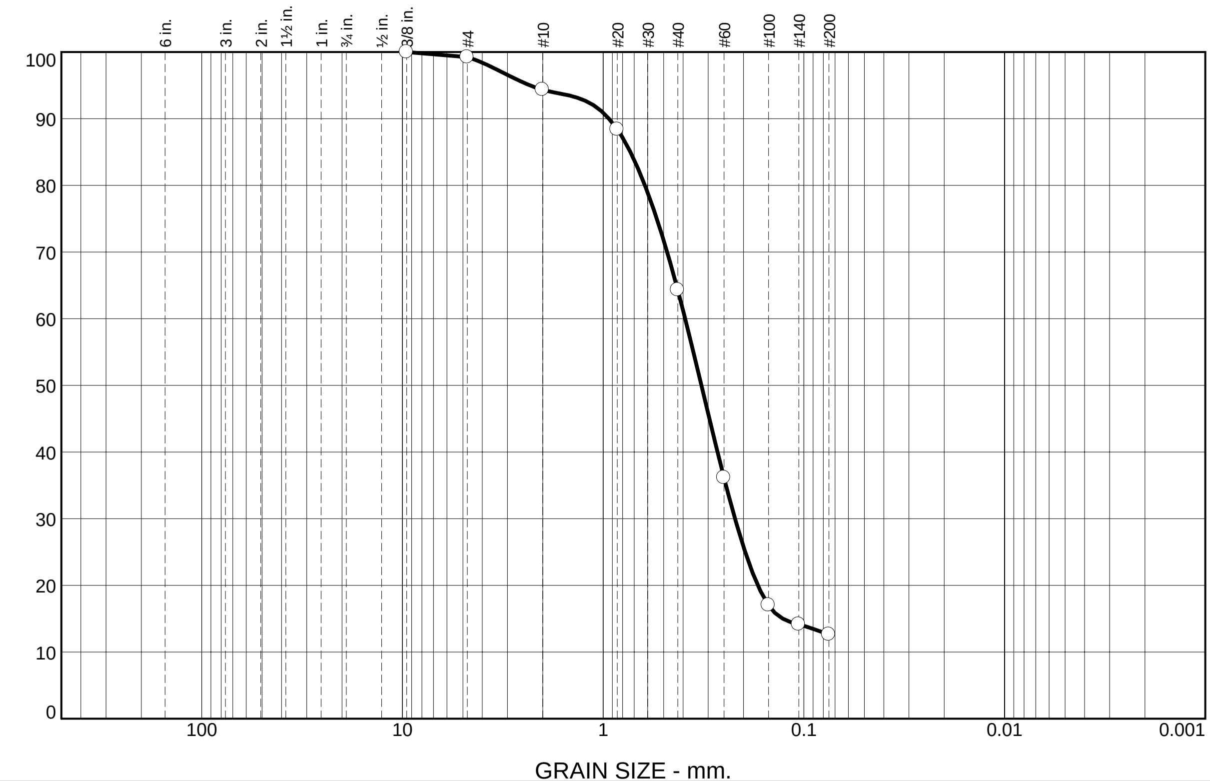
Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.8	4.9	30.0	51.7	12.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.2		
#10	94.3		
#20	88.4		
#40	64.3		
#60	36.1		
#100	17.0		
#140	14.1		
#200	12.6		

* (no specification provided)

Material Description

Grey/black silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Nat moisture = 25.7%

Source of Sample: RW-B-07 **Depth:** 28.5
Sample Number: S-10 **Date:**

HILLIS-CARNES ENGINEERING ASSOCIATES

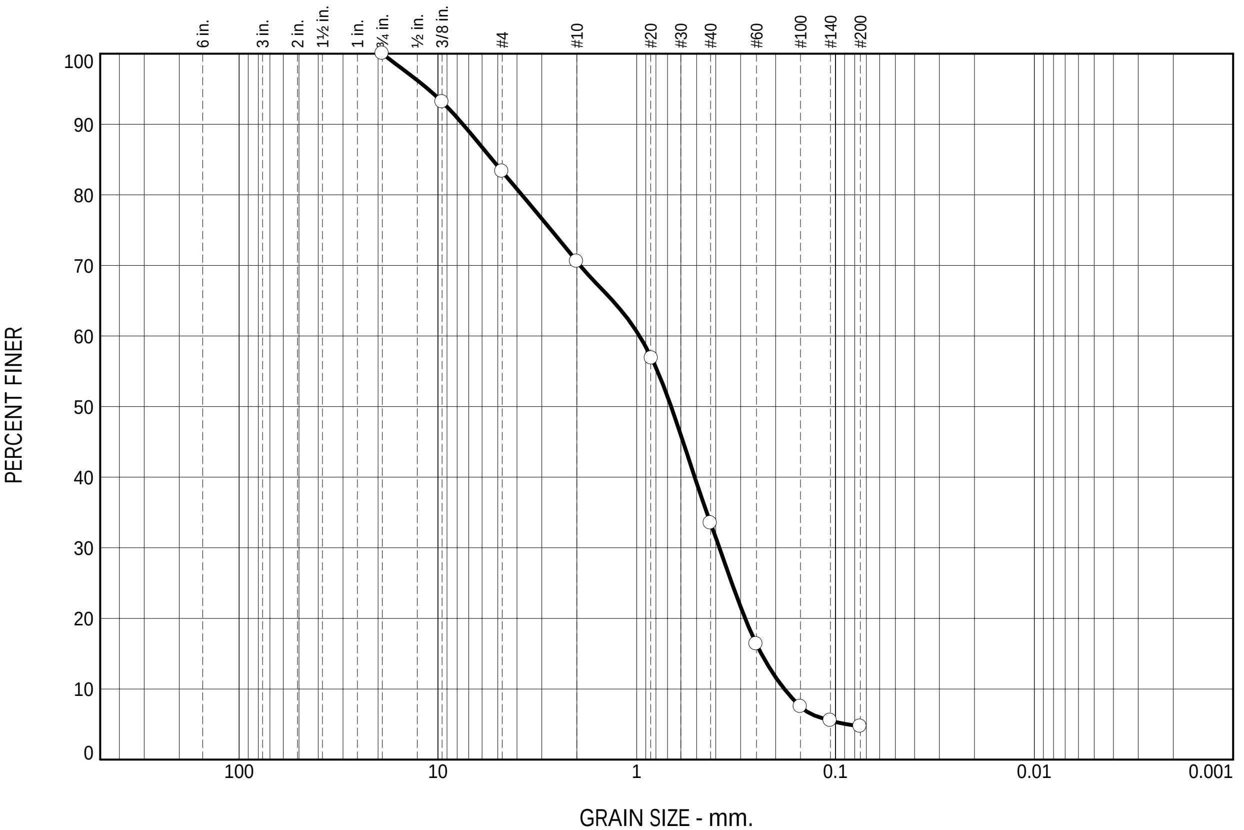
Philadelphia, Pennsylvania

Client:
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: cs

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	16.7	12.8	37.0	28.8	4.7	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	93.1		
#4	83.3		
#10	70.5		
#20	56.8		
#40	33.5		
#60	16.4		
#100	7.5		
#140	5.5		
#200	4.7		

* (no specification provided)

Soil Description

Poorly graded sand w/gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 7.4923 D_{85}= 5.3349 D_{60}= 0.9685
D_{50}= 0.6711 D_{30}= 0.3838 D_{15}= 0.2360
D_{10}= 0.1810 C_u= 5.35 C_c= 0.84

Classification

USCS= SP AASHTO= A-1-b

Remarks

Natural Moisture = 18.4%

Source of Sample: RW-B-08 Depth: 2.5
Sample Number: S-2

Date: 10/14

HILLIS-CARNES ENGINEERING ASSOCIATES

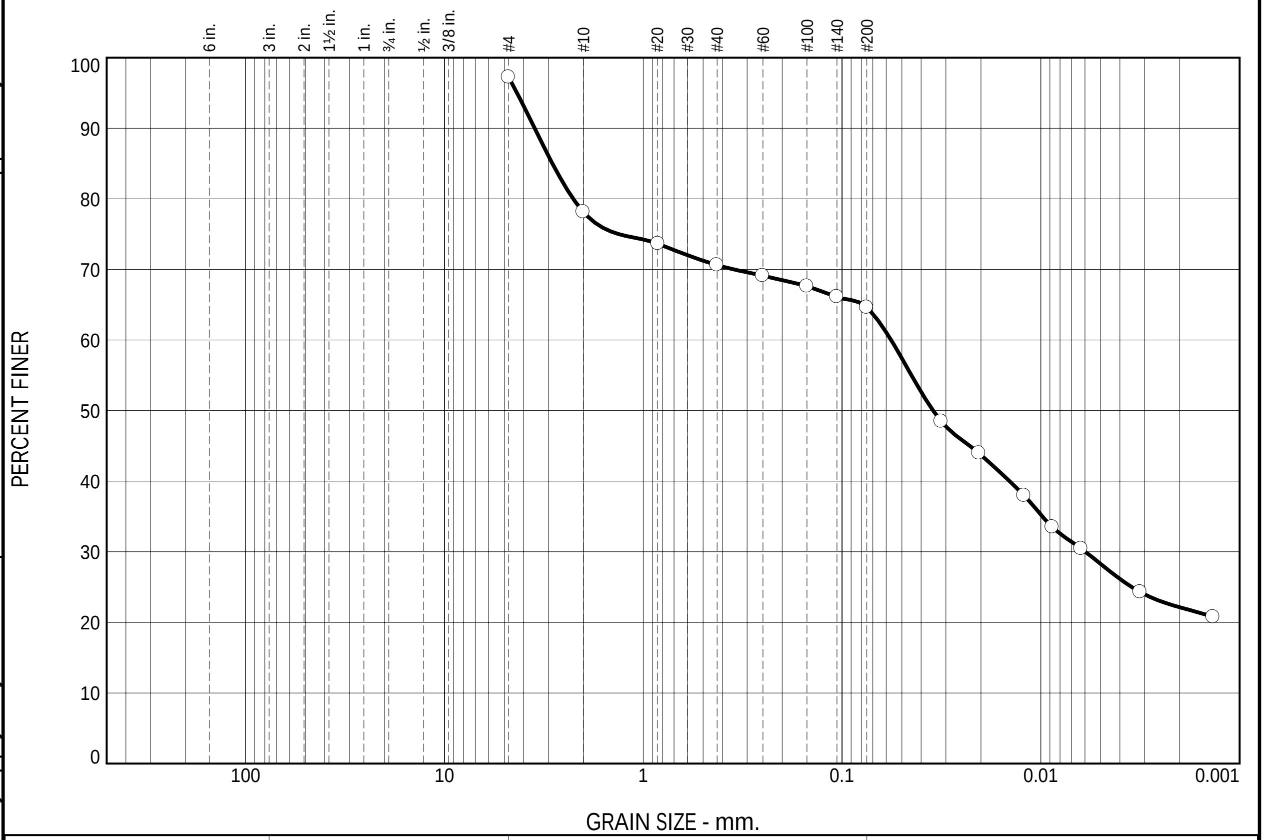
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: cs/ad

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
			19.1	7.5	6.0	36.3	28.3

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	97.2		
#10	78.1		
#20	73.6		
#40	70.6		
#60	69.1		
#100	67.6		
#140	66.1		
#200	64.6		
0.0316 mm.	48.4		
0.0204 mm.	43.9		
0.0121 mm.	37.9		
0.0087 mm.	33.5		
0.0063 mm.	30.4		
0.0032 mm.	24.3		
0.0014 mm.	20.8		

* (no specification provided)

Soil Description

Sandy fat clay

Atterberg Limits

PL= 24 LL= 58 PI= 34

Coefficients

D_{90}= 3.5152 D_{85}= 2.8614 D_{60}= 0.0566
D_{50}= 0.0348 D_{30}= 0.0060 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(21)

Remarks

nat mositure = 47.4%

Source of Sample: RW-B-08 Depth: 10
Sample Number: T-1
Date: 10/20

HILLIS-CARNES ENGINEERING ASSOCIATES

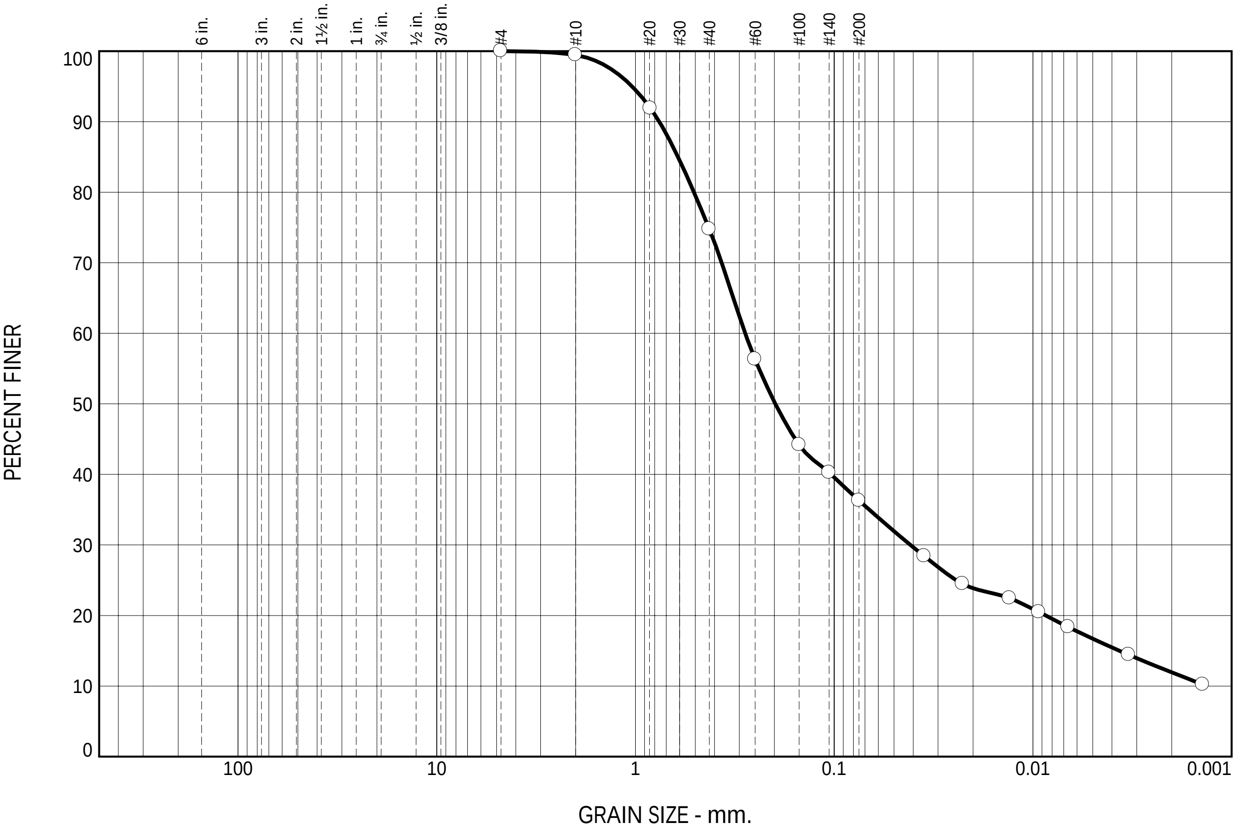
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.6	24.6	38.5	19.6	16.7

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.4		
#20	91.9		
#40	74.8		
#60	56.3		
#100	44.2		
#140	40.2		
#200	36.3		
0.0352 mm.	28.4		
0.0225 mm.	24.5		
0.0131 mm.	22.5		
0.0093 mm.	20.5		
0.0066 mm.	18.4		
0.0033 mm.	14.4		
0.0014 mm.	10.2		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 22 LL= 47 PI= 25

Coefficients

D_{90}= 0.7594 D_{85}= 0.6109 D_{60}= 0.2804
D_{50}= 0.1977 D_{30}= 0.0413 D_{15}= 0.0037
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-7-6(3)

Remarks

Natural Moisture = 36.1%

Source of Sample: RW-B-08 Depth: 28.5
Sample Number: S-10
Date: 10/20

HILLIS-CARNES ENGINEERING ASSOCIATES

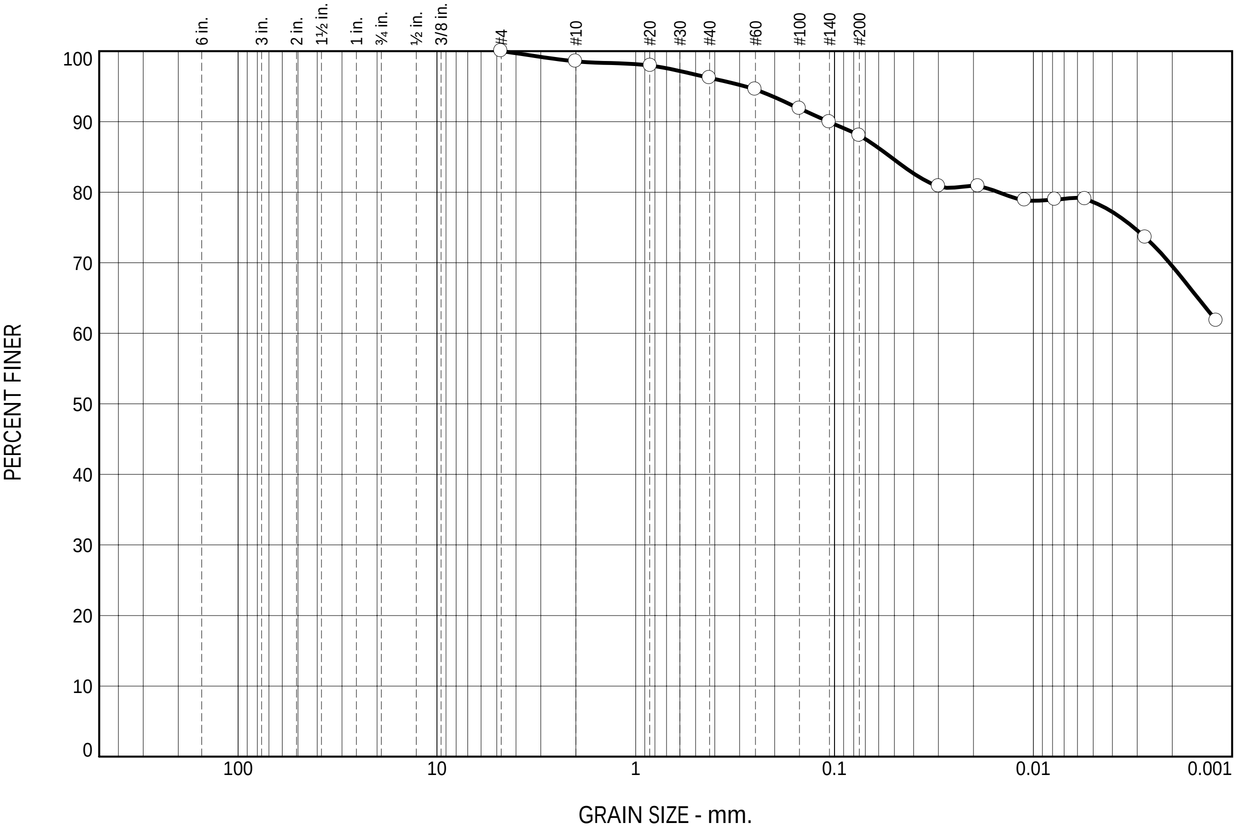
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: cs/ad / AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.4	2.4	8.2	9.4	78.6

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	98.6		
#20	97.9		
#40	96.2		
#60	94.6		
#100	91.9		
#140	89.9		
#200	88.0		
0.0299 mm.	80.9		
0.0189 mm.	80.9		
0.0110 mm.	78.9		
0.0078 mm.	79.0		
0.0055 mm.	79.1		
0.0027 mm.	73.6		
0.0012 mm.	61.8		

* (no specification provided)

Soil Description

Elastic Silt

Atterberg Limits

PL= 39 LL= 65 PI= 26

Coefficients

D_{90}= 0.1072 D_{85}= 0.0522 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(29)

Remarks

Natural Moisture = 44.0%

Source of Sample: RW-B-08 Depth: 43.5
Sample Number: S-13
Date: 10/14

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: cs/ad / AD

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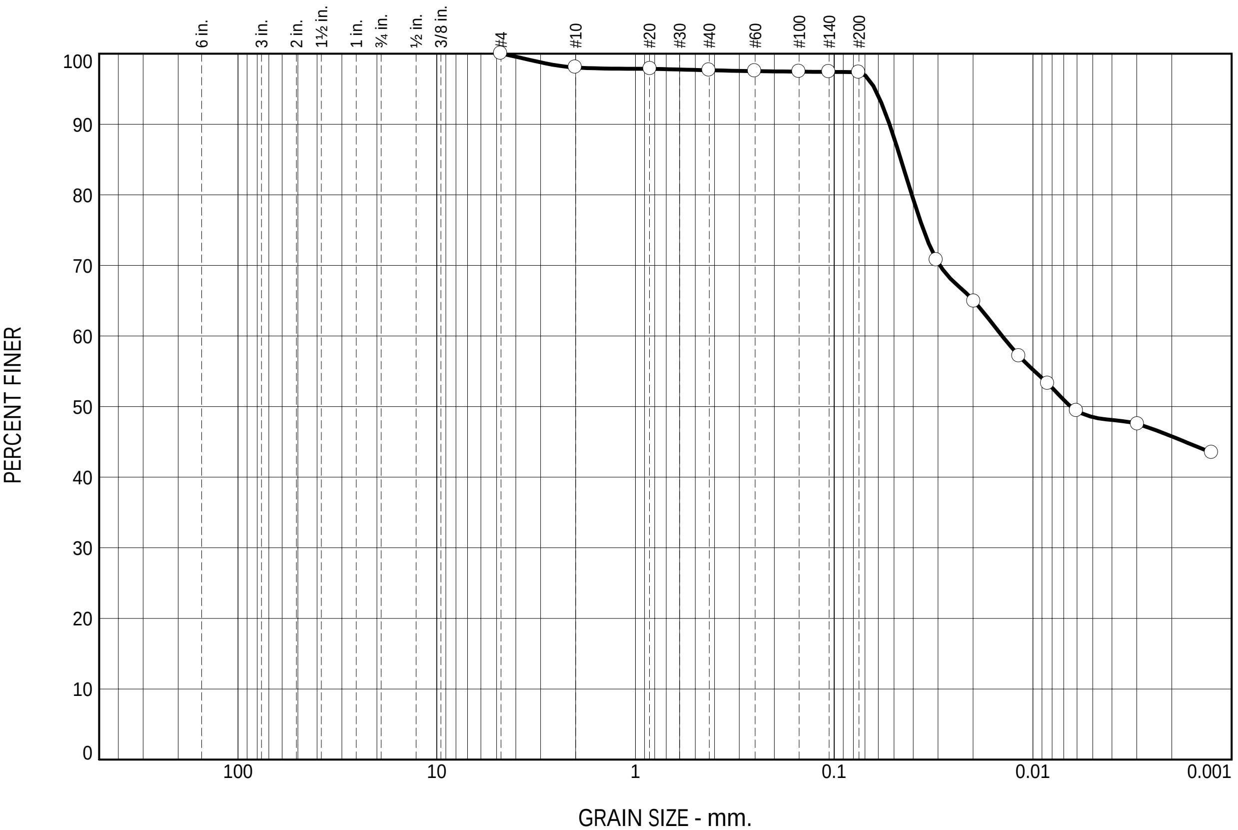
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	2.0	0.4	0.3	48.8	48.5

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	98.0		
#20	97.8		
#40	97.6		
#60	97.5		
#100	97.4		
#140	97.4		
#200	97.3		
0.0305 mm.	70.7		
0.0197 mm.	64.9		
0.0117 mm.	57.1		
0.0084 mm.	53.2		
0.0060 mm.	49.4		
0.0030 mm.	47.5		
0.0013 mm.	43.5		

* (no specification provided)

Soil Description

Elastic Silt

Atterberg Limits

PL= 36 LL= 77 PI= 41

Coefficients

D_{90}= 0.0527 D_{85}= 0.0462 D_{60}= 0.0143
D_{50}= 0.0064 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(49)

Remarks

Natural Moisture = 68%

Source of Sample: RW-B-09 Depth: 10
Sample Number: S-5
Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

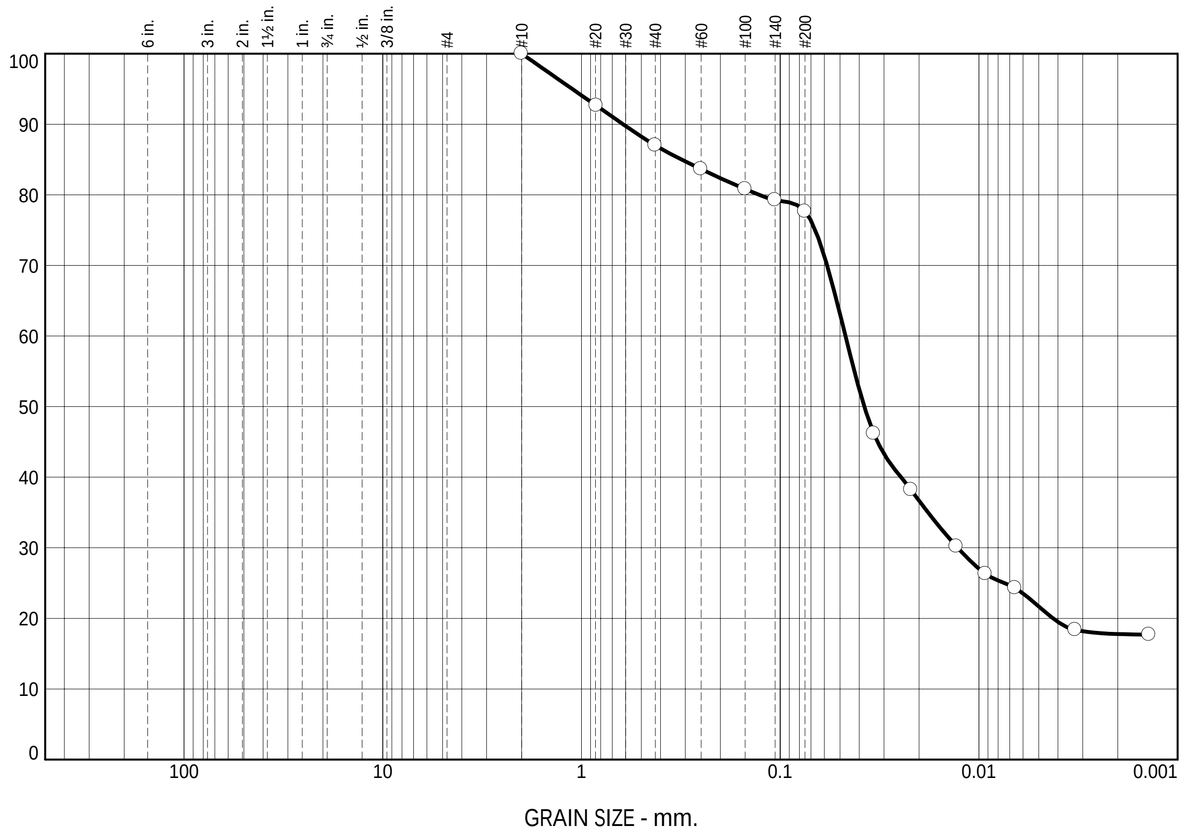
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: cs/ad / AD

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	13.0	9.4	55.9	21.7

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	92.6		
#40	87.0		
#60	83.6		
#100	80.8		
#140	79.2		
#200	77.6		
0.0338 mm.	46.2		
0.0219 mm.	38.2		
0.0130 mm.	30.2		
0.0093 mm.	26.3		
0.0066 mm.	24.3		
0.0033 mm.	18.4		
0.0014 mm.	17.7		

* (no specification provided)

Soil Description

Fat Clay w/sand

Atterberg Limits

PL= 29 LL= 72 PI= 43

Coefficients

D_{90}= 0.6174 D_{85}= 0.3136 D_{60}= 0.0469

D_{50}= 0.0377 D_{30}= 0.0128 D_{15}=

D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(36)

Remarks

Nat moisture = 68.7%

Source of Sample: RW-B-09 Depth: 17.5

Sample Number: T-1

Date: 10/31

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

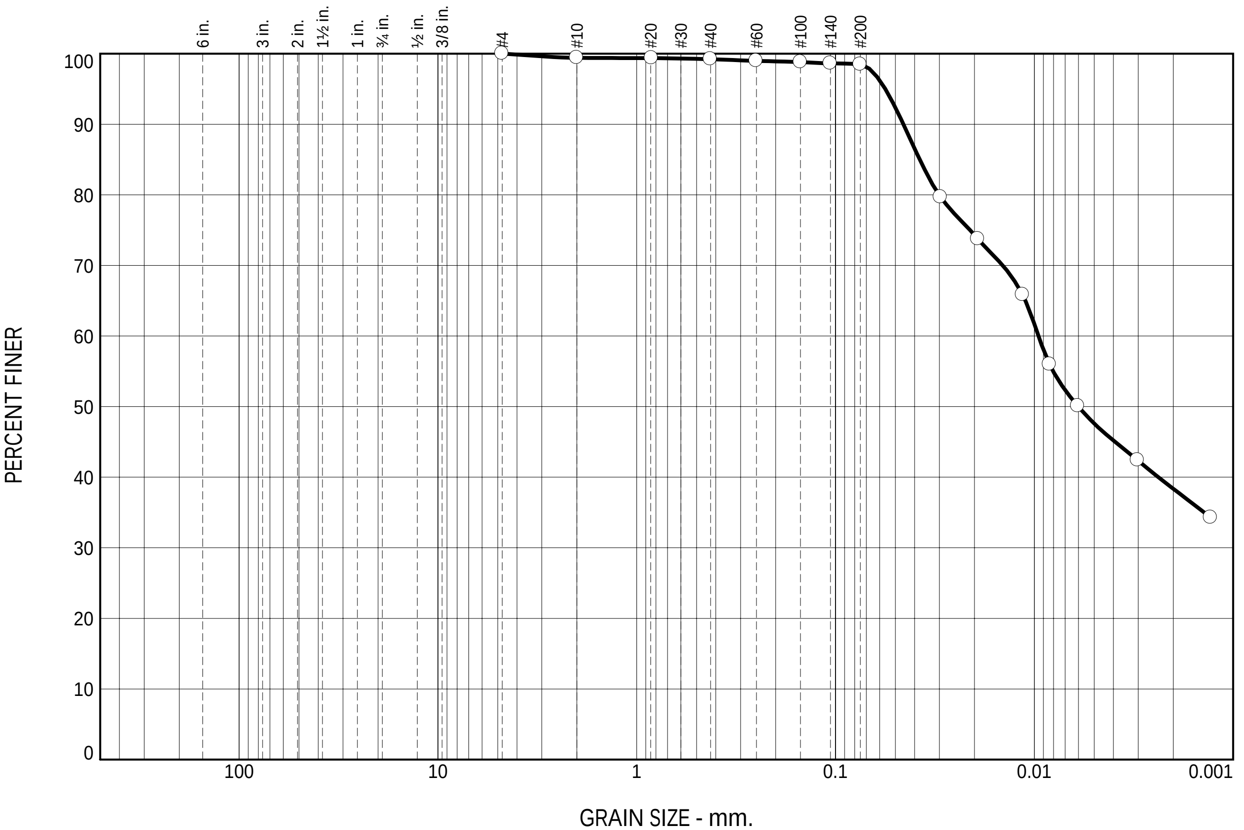
Client: HCEA SCG/RK&K

Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.6	0.2	0.7	50.9	47.6

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.4		
#20	99.4		
#40	99.2		
#60	99.0		
#100	98.8		
#140	98.6		
#200	98.5		
0.0296 mm.	79.7		
0.0192 mm.	73.7		
0.0114 mm.	65.8		
0.0084 mm.	56.0		
0.0060 mm.	50.1		
0.0030 mm.	42.4		
0.0013 mm.	34.3		

* (no specification provided)

Soil Description

Fat Clay

Atterberg Limits

PL= 32 LL= 95 PI= 63

Coefficients

D_{90}= 0.0456 D_{85}= 0.0377 D_{60}= 0.0095
D_{50}= 0.0060 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(74)

Remarks

Natural Moisture = 71%

Source of Sample: RW-B-09 Depth: 33.5
Sample Number: S-11 Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

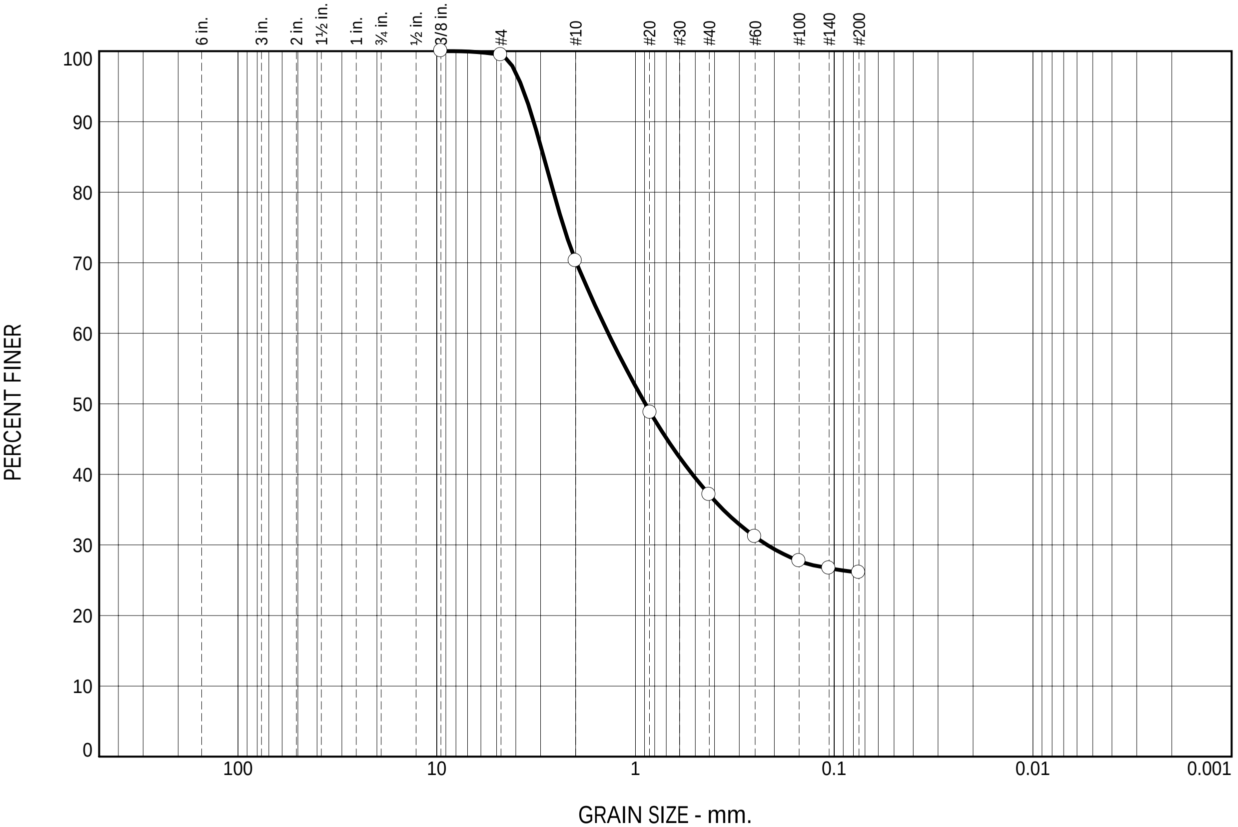
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.6	29.1	33.2	11.0	26.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.4		
#10	70.3		
#20	48.8		
#40	37.1		
#60	31.2		
#100	27.7		
#140	26.7		
#200	26.1		

* (no specification provided)

Soil Description

Silty Sand

Atterberg Limits

PL= 57 LL= 75 PI= 18

Coefficients

D_{90}= 3.2527 D_{85}= 2.8926 D_{60}= 1.3706
D_{50}= 0.8914 D_{30}= 0.2174 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-7(1)

Remarks

Natural Moisture = 87.8%

Source of Sample: RW-B-10 Depth: 10.0-11.5
Sample Number: S-5 Date: 12/12

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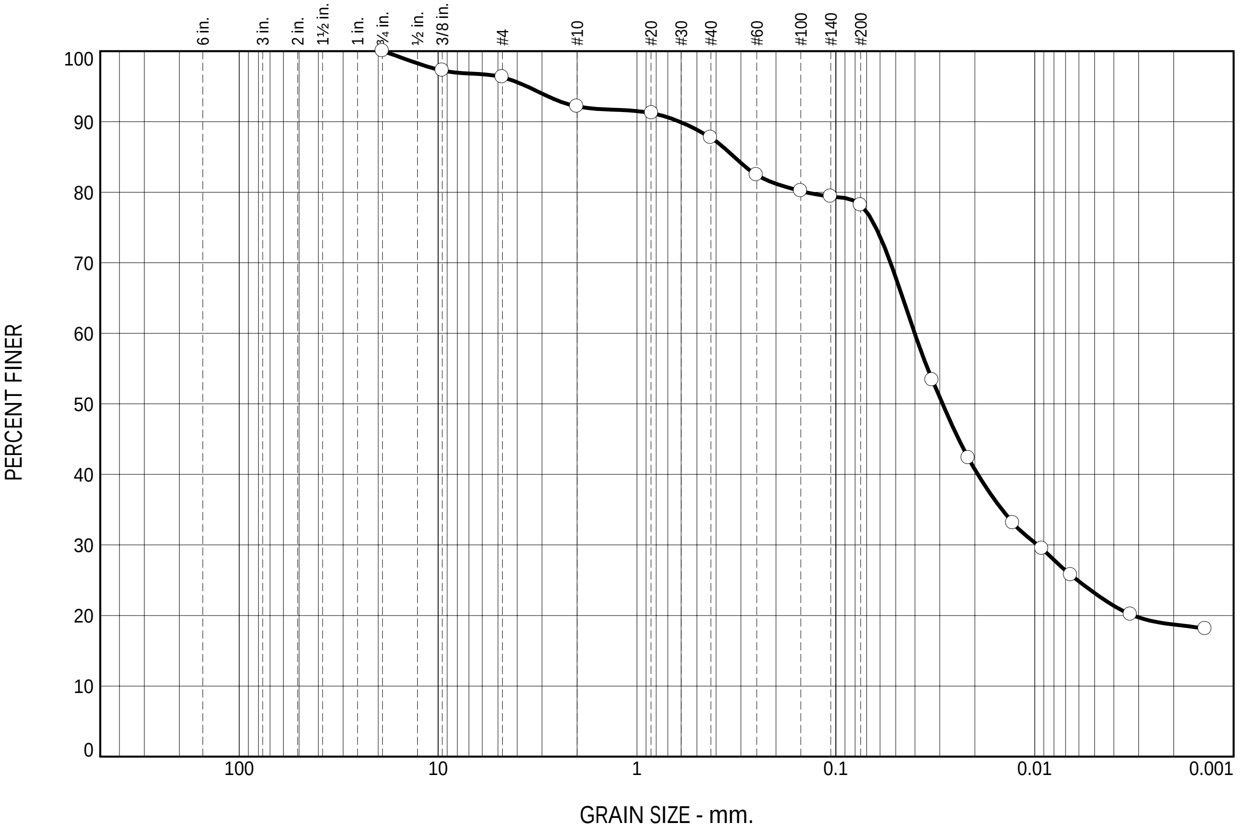
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.7	4.1	4.5	9.5	55.0	23.2

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	97.2		
#4	96.3		
#10	92.2		
#20	91.2		
#40	87.7		
#60	82.4		
#100	80.2		
#140	79.4		
#200	78.2		
0.0327 mm.	53.4		
0.0216 mm.	42.3		
0.0129 mm.	33.1		
0.0092 mm.	29.5		
0.0066 mm.	25.8		
0.0033 mm.	20.2		
0.0014 mm.	18.1		

* (no specification provided)

Soil Description

Silt w/sand

Atterberg Limits

PL= 28 LL= 47 PI= 19

Coefficients

D_{90}= 0.6109 D_{85}= 0.3242 D_{60}= 0.0401
D_{50}= 0.0291 D_{30}= 0.0097 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-7-6(16)

Remarks

Natural Moisture = 52.5%

Source of Sample: RW-B-10 Depth: 24
Sample Number: T-2

Date: 1/18

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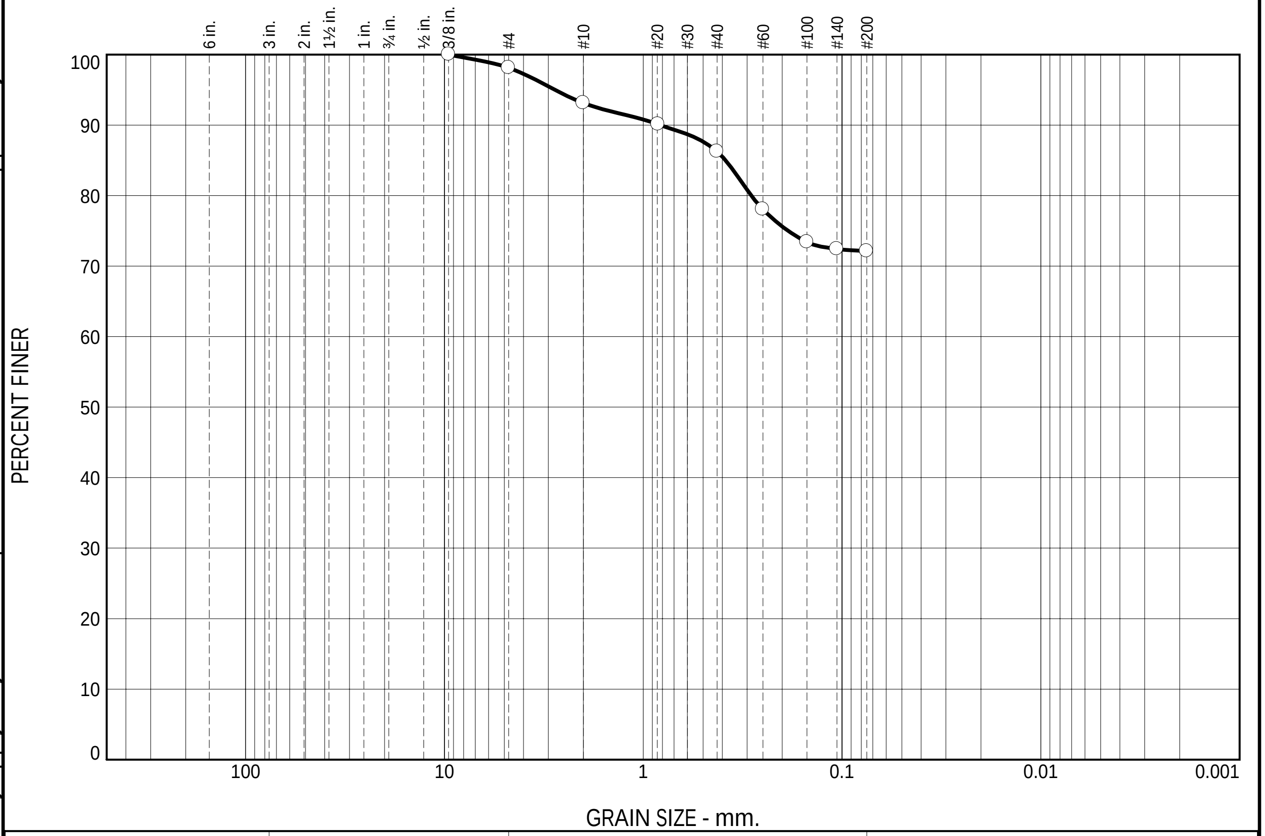
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.9	5.0	6.9	14.1	72.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	98.1		
#10	93.1		
#20	90.1		
#40	86.2		
#60	78.0		
#100	73.4		
#140	72.4		
#200	72.1		

* (no specification provided)

Soil Description

Fat Clay w/sand

Atterberg Limits

PL= 23 LL= 52 PI= 29

Coefficients

D_{90}= 0.8230 D_{85}= 0.3854 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(20)

Remarks

Natural Moisture = 59.4%

Source of Sample: RW-B-10 Depth: 38.5-40.0
Sample Number: S-13 Date:

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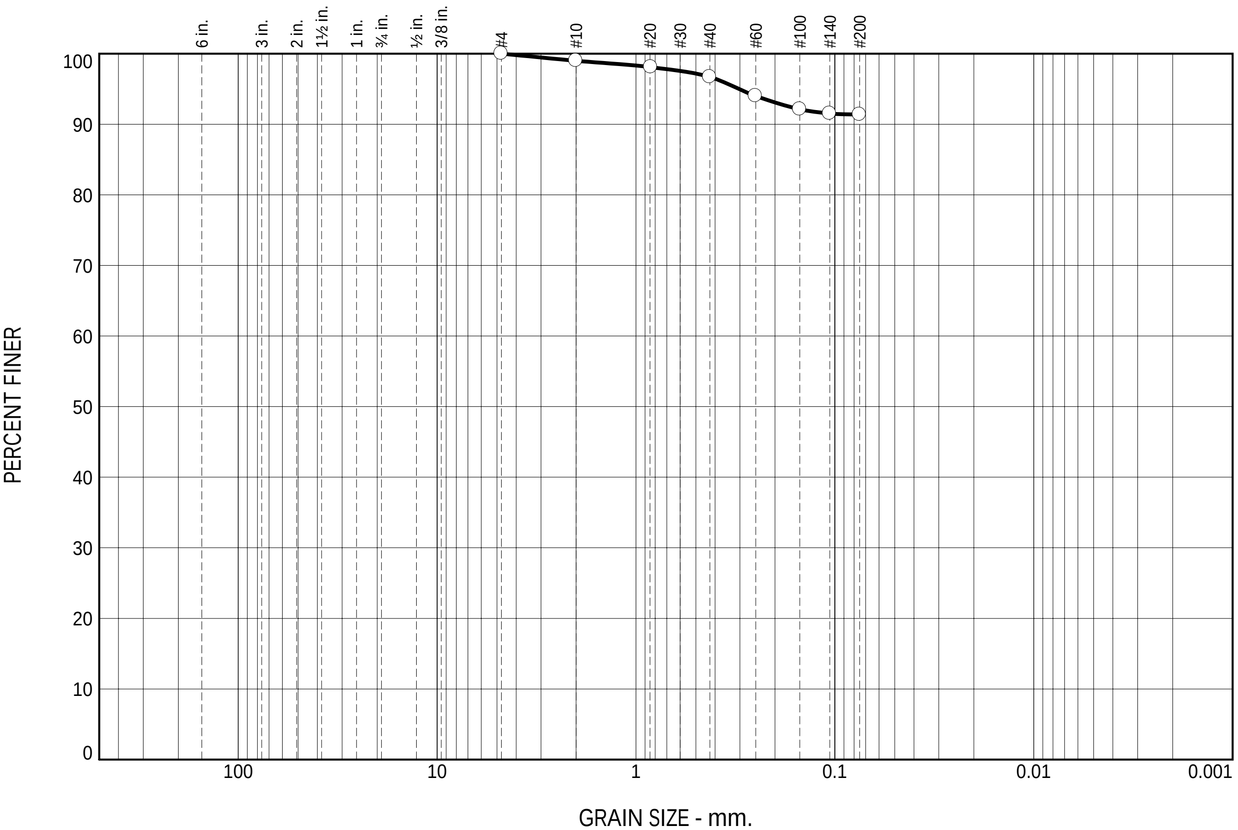
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.0	2.3	5.3	91.4	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.0		
#20	98.1		
#40	96.7		
#60	94.0		
#100	92.1		
#140	91.5		
#200	91.4		

* (no specification provided)

Soil Description

Fat clay

Atterberg Limits

PL= 31 LL= 68 PI= 37

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(40)

Remarks

Natural Moisture = 43.8%

Source of Sample: RW-B-11 Depth: 10.0-11.5
Sample Number: S-5 Date:

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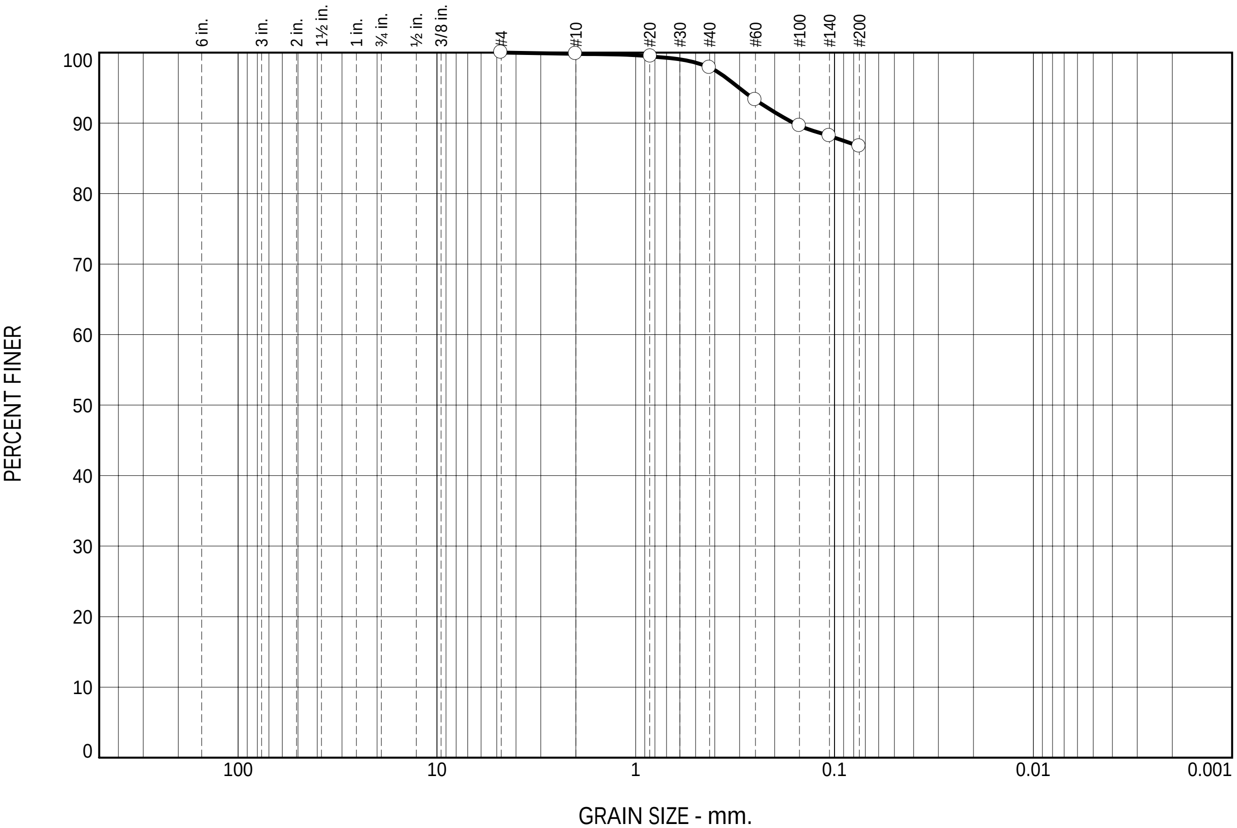
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	1.9	11.2	86.7	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	99.5		
#40	97.9		
#60	93.3		
#100	89.6		
#140	88.2		
#200	86.7		

* (no specification provided)

Soil Description

Fat Clay

Atterberg Limits

PL= 40 LL= 93 PI= 53

Coefficients

D_{90}= 0.1600 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(55)

Remarks

Natural Moisture = 54.4%

Source of Sample: RW-B-11 Depth: 23.5-25.0
Sample Number: S-10 Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

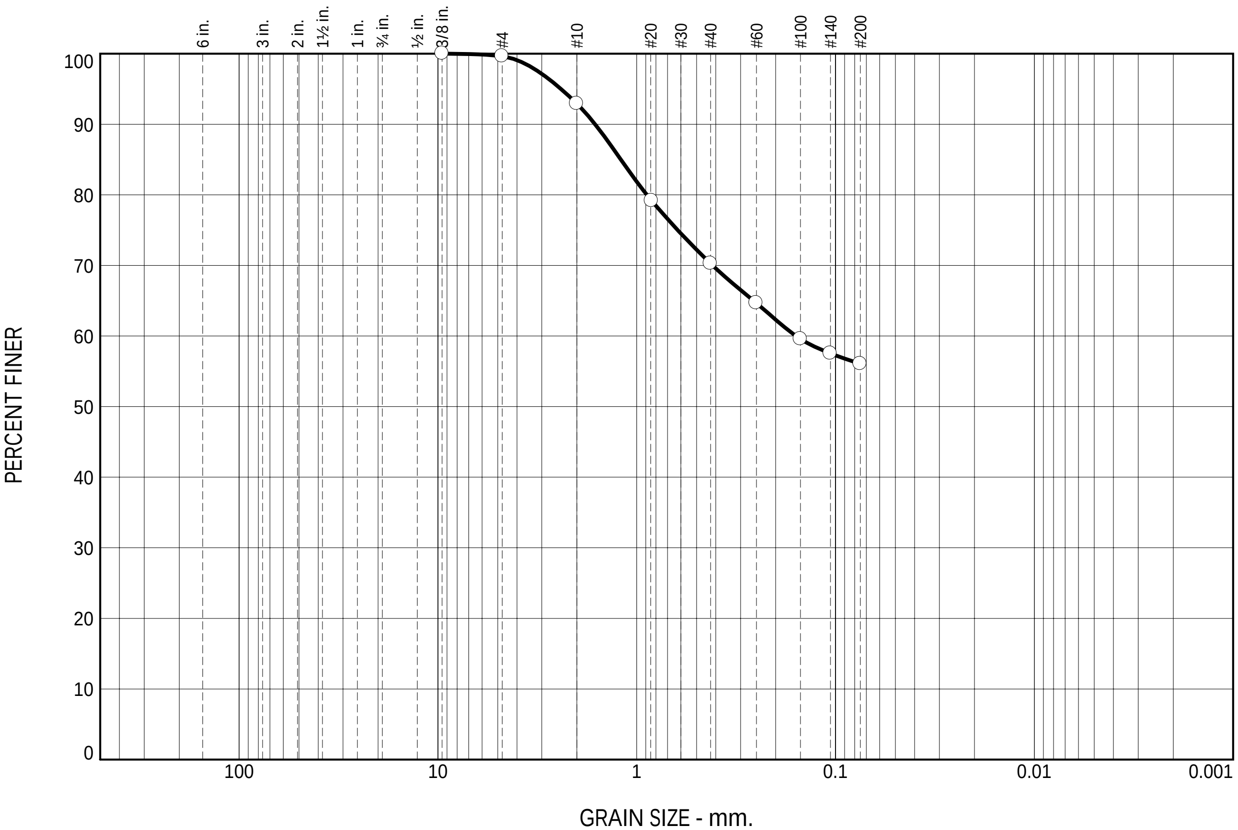
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	6.7	22.6	14.2	56.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.6		
#10	92.9		
#20	79.2		
#40	70.3		
#60	64.7		
#100	59.6		
#140	57.5		
#200	56.1		

* (no specification provided)

Soil Description

Sandy fat Clay

Atterberg Limits

PL= 34
LL= 71
PI= 37

Coefficients

D_{90}= 1.6199
D_{85}= 1.2017
D_{60}= 0.1579
D_{50}=
D_{30}=
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= CH
AASHTO= A-7-5(19)

Remarks

Natural Moisture = 30.7%

Source of Sample: RW-B-11 Depth: 53.5-55.0
Sample Number: S-16
Date:

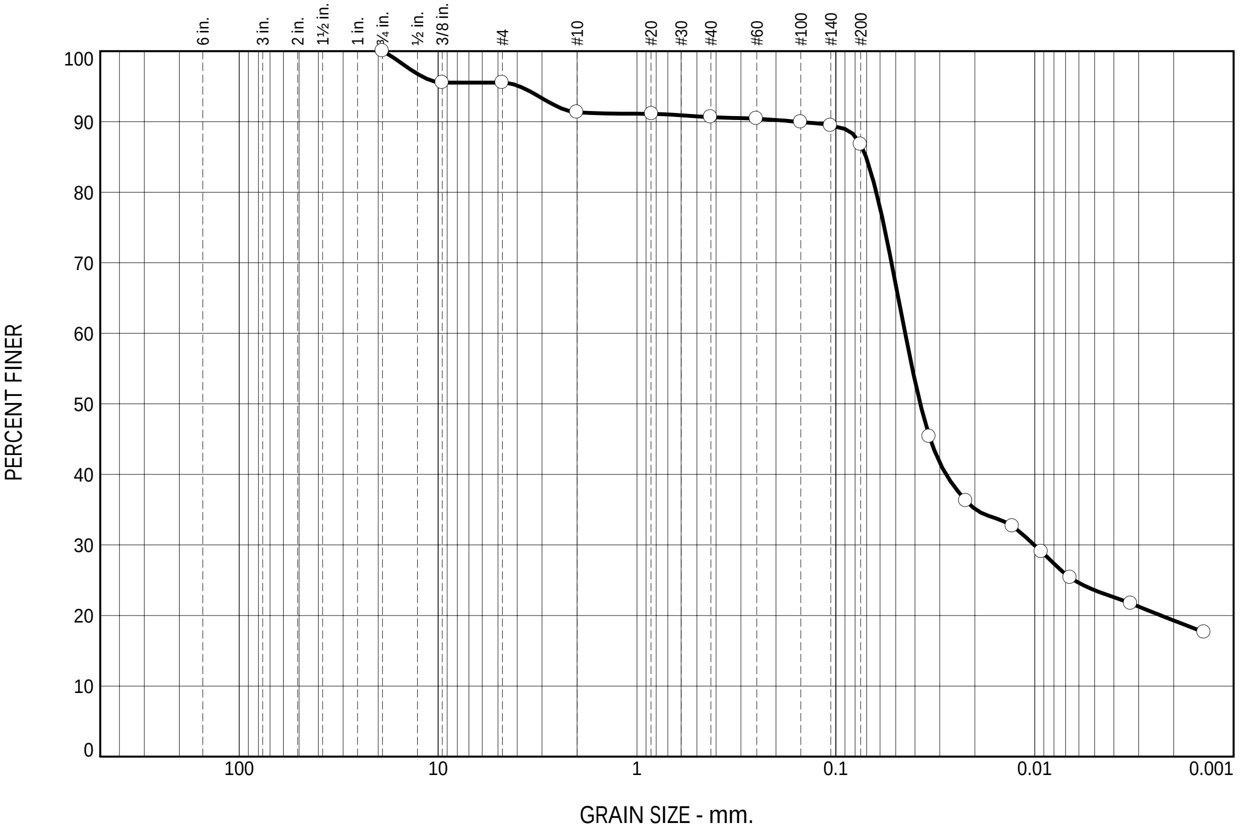
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051
Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.5	4.2	0.7	3.8	63.2	23.6

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	95.5		
#4	95.5		
#10	91.3		
#20	91.1		
#40	90.6		
#60	90.4		
#100	89.9		
#140	89.4		
#200	86.8		
0.0339 mm.	45.4		
0.0221 mm.	36.2		
0.0129 mm.	32.6		
0.0092 mm.	29.0		
0.0066 mm.	25.3		
0.0033 mm.	21.7		
0.0014 mm.	17.6		

* (no specification provided)

Soil Description

Fat Clay

Atterberg Limits

PL= 26 LL= 66 PI= 40

Coefficients

D_{90}= 0.1586 D_{85}= 0.0705 D_{60}= 0.0448
D_{50}= 0.0376 D_{30}= 0.0101 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(39)

Remarks

Natural Moisture = 54.7%

Source of Sample: RW-B-12 Depth: 17.5-19.5
Sample Number: T-2 Date:

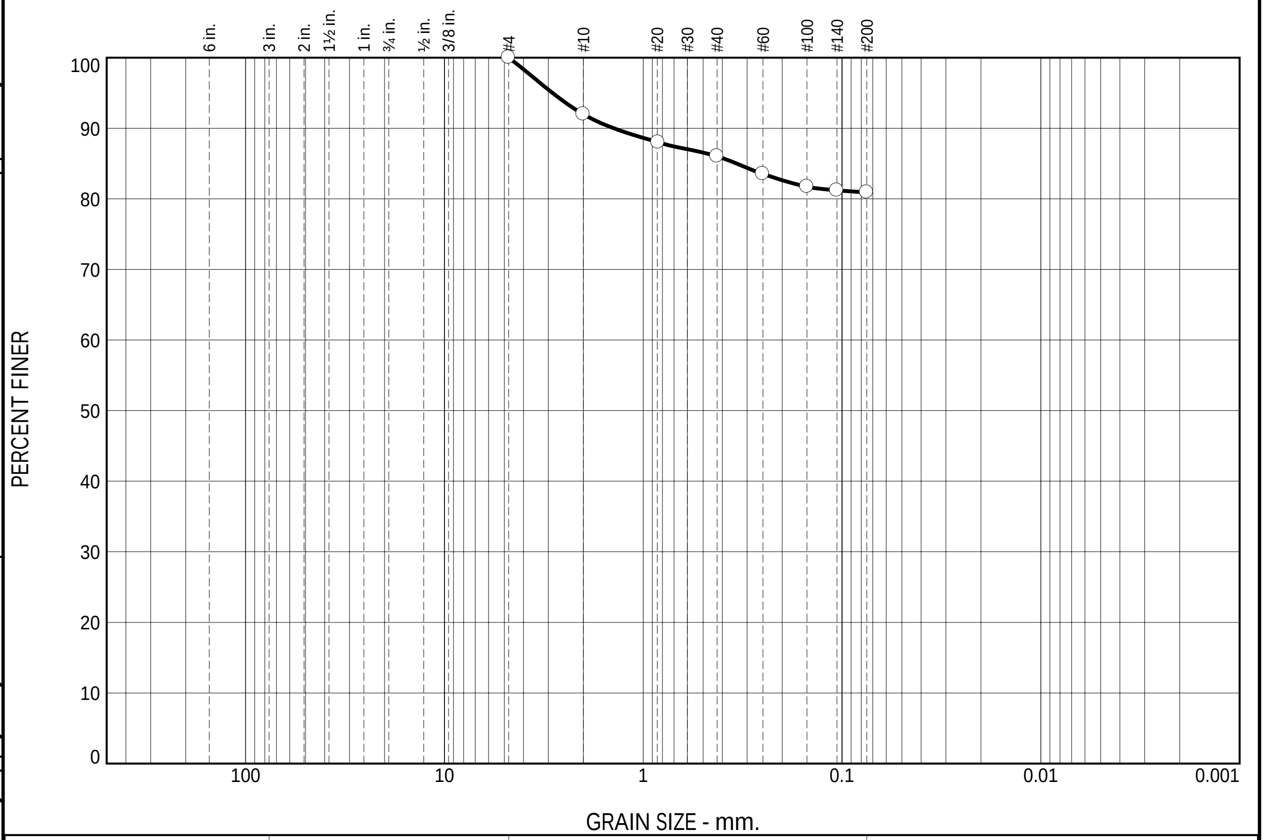
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	8.0	6.0	5.1	80.9	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	92.0		
#20	88.0		
#40	86.0		
#60	83.5		
#100	81.7		
#140	81.2		
#200	80.9		

* (no specification provided)

Soil Description

Elastic Silt w/sand

Atterberg Limits

PL= 39 LL= 86 PI= 47

Coefficients

D_{90}= 1.4061 D_{85}= 0.3395 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(44)

Remarks

Natural Moisture = 71.9%

Source of Sample: RW-B-12 Depth: 33.5-35.0
Sample Number: S-10 Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

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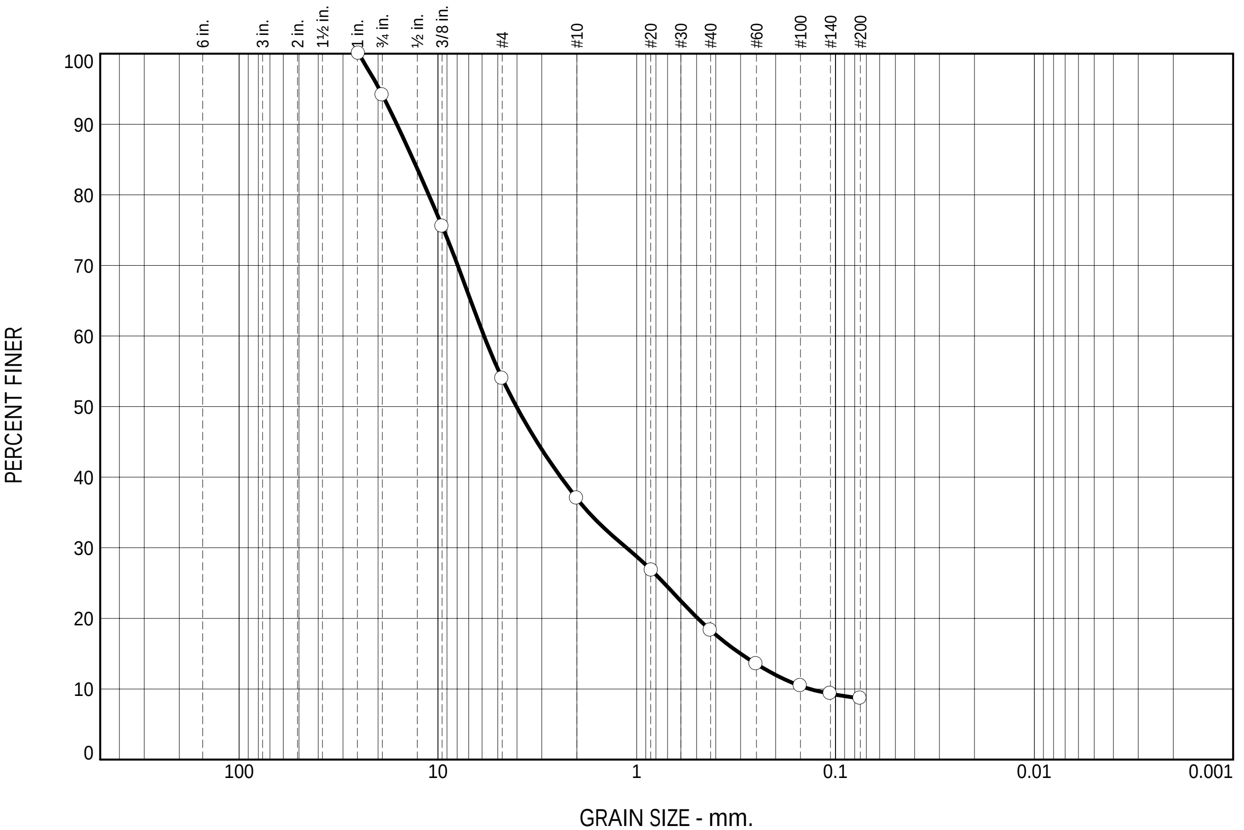
Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.8	40.2	17.0	18.7	9.6	8.7	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	94.1		
.375	75.5		
#4	54.0		
#10	37.0		
#20	26.8		
#40	18.3		
#60	13.5		
#100	10.4		
#140	9.3		
#200	8.7		

* (no specification provided)

Soil Description

Well-graded Gravel w/silt and sand

Atterberg Limits

PL= NP LL= 22 PI= NP

Coefficients

D_{90}= 16.0965 D_{85}= 13.3178 D_{60}= 5.8591
D_{50}= 4.0251 D_{30}= 1.1246 D_{15}= 0.3003
D_{10}= 0.1350 C_u= 43.39 C_c= 1.60

Classification

USCS= GW-GM AASHTO= A-1-a

Remarks

Natural Moisture = 8.9%

Source of Sample: RW-B-13 Depth: 7.5-9.0
Sample Number: S-4 Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

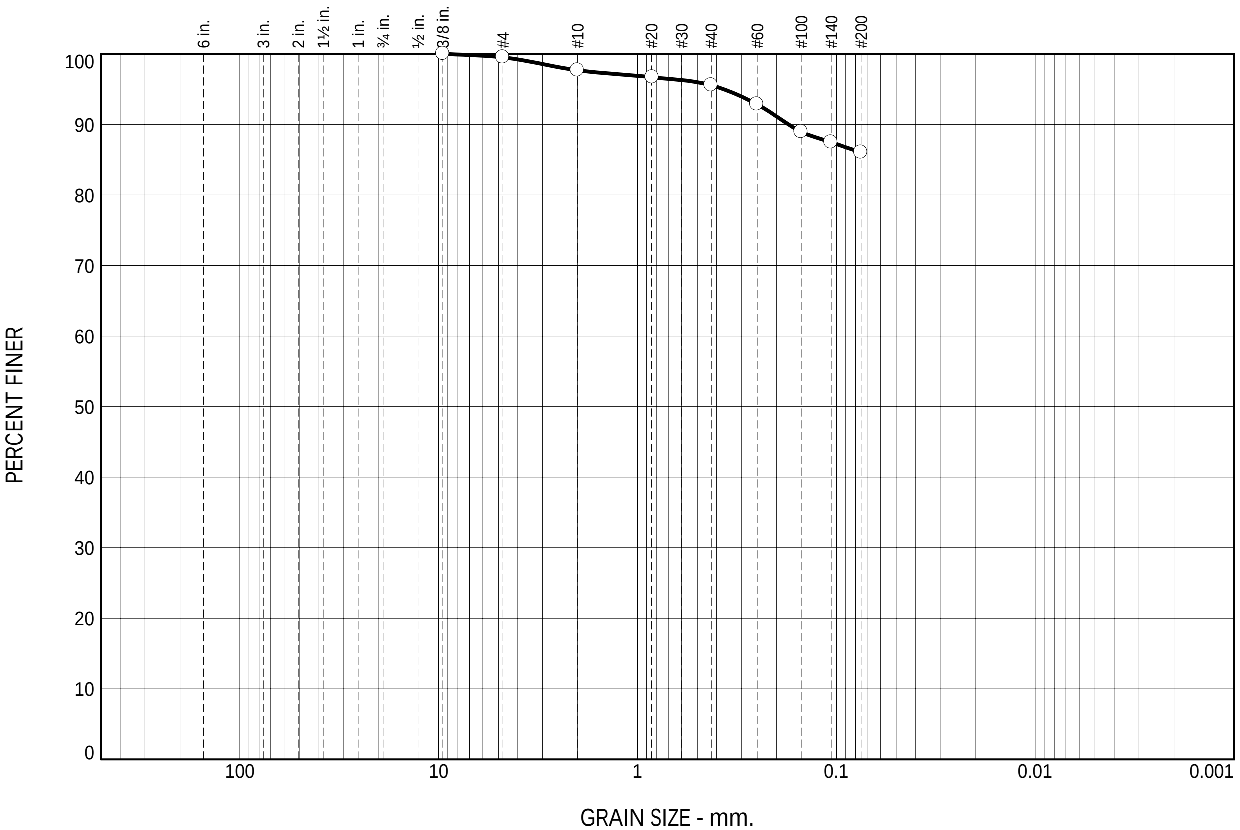
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	1.8	2.1	9.6	86.0	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.5		
#10	97.7		
#20	96.7		
#40	95.6		
#60	92.8		
#100	88.9		
#140	87.5		
#200	86.0		

* (no specification provided)

Soil Description

Elastic Silt

Atterberg Limits

PL= 53 LL= 110 PI= 57

Coefficients

D_{90}= 0.1742 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(61)

Remarks

Natural Moisture = 65.1%

Source of Sample: RW-B-13 Depth: 15.0-16.5
Sample Number: S-7

Date: 12/12

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

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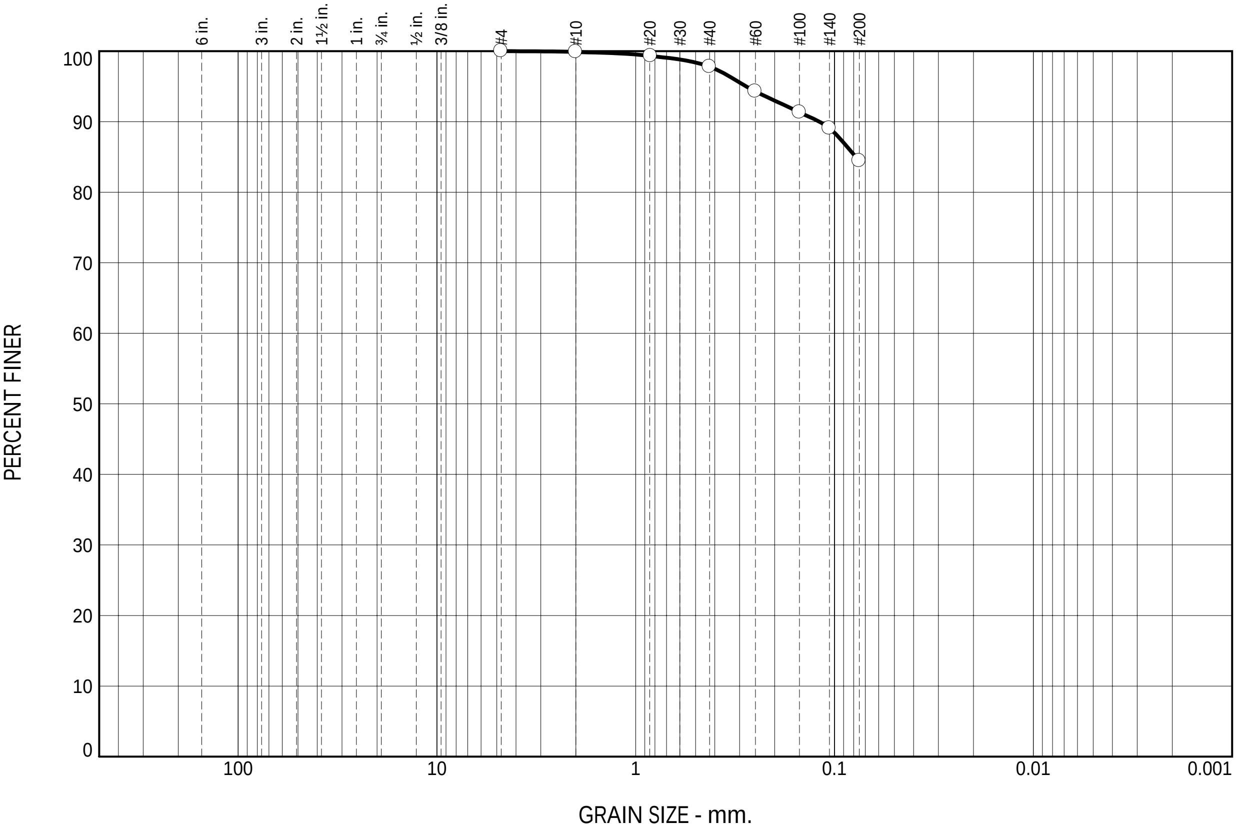
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	2.1	13.4	84.4	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.3		
#40	97.8		
#60	94.3		
#100	91.3		
#140	89.1		
#200	84.4		

* (no specification provided)

Soil Description

Fat Clay w/sand

Atterberg Limits

PL= 32 LL= 67 PI= 35

Coefficients

D_{90}= 0.1190 D_{85}= 0.0782 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(34)

Remarks

Natural Moisture = 46.5%

Source of Sample: RW-B-13 Depth: 28.5-30.0
Sample Number: S-11

Date: 12/12

HILLIS-CARNES ENGINEERING ASSOCIATES

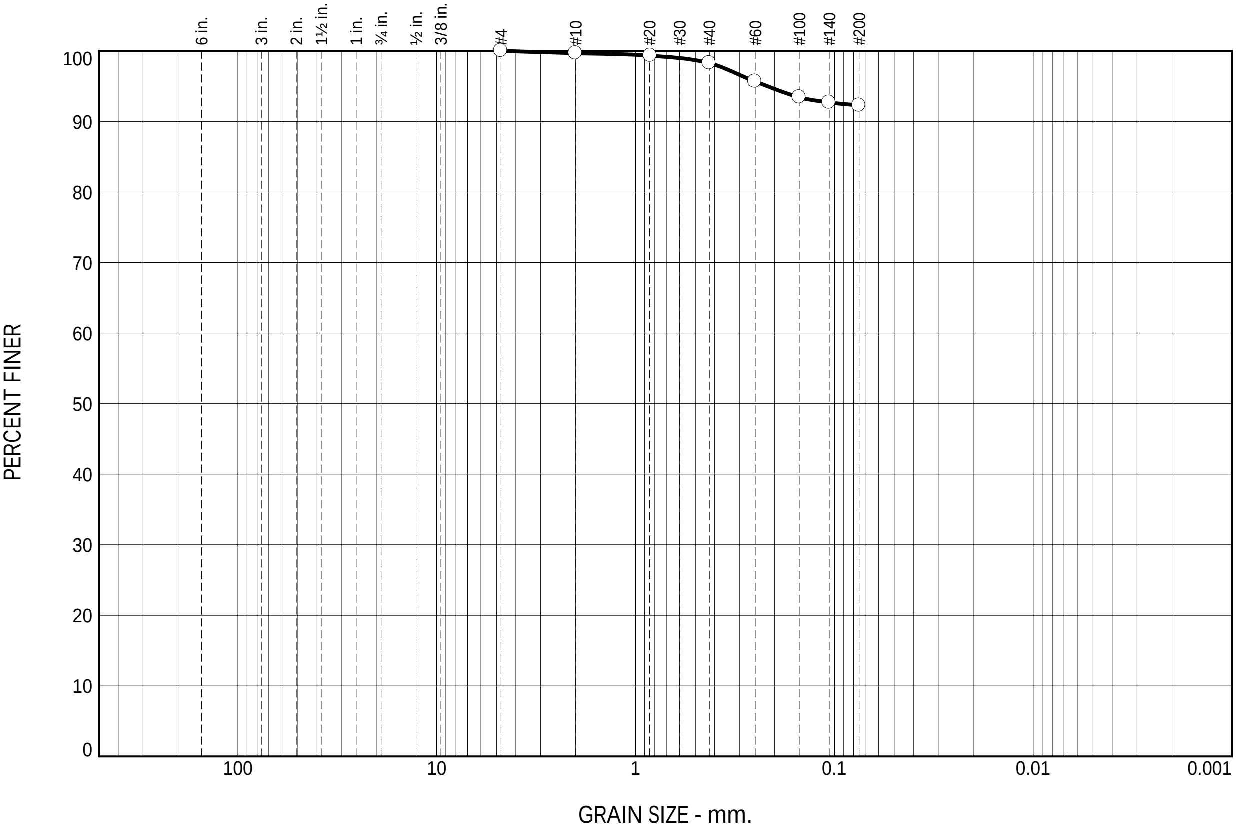
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	1.4	6.0	92.3	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	99.3		
#40	98.3		
#60	95.7		
#100	93.4		
#140	92.7		
#200	92.3		

* (no specification provided)

Soil Description

Fat Clay

Atterberg Limits

PL= 31 LL= 91 PI= 60

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-5(64)

Remarks

Natural Moisture = 57.4%

Source of Sample: RW-B-13 Depth: 38.5-40.0
Sample Number: S-13
Date:

HILLIS-CARNES ENGINEERING ASSOCIATES

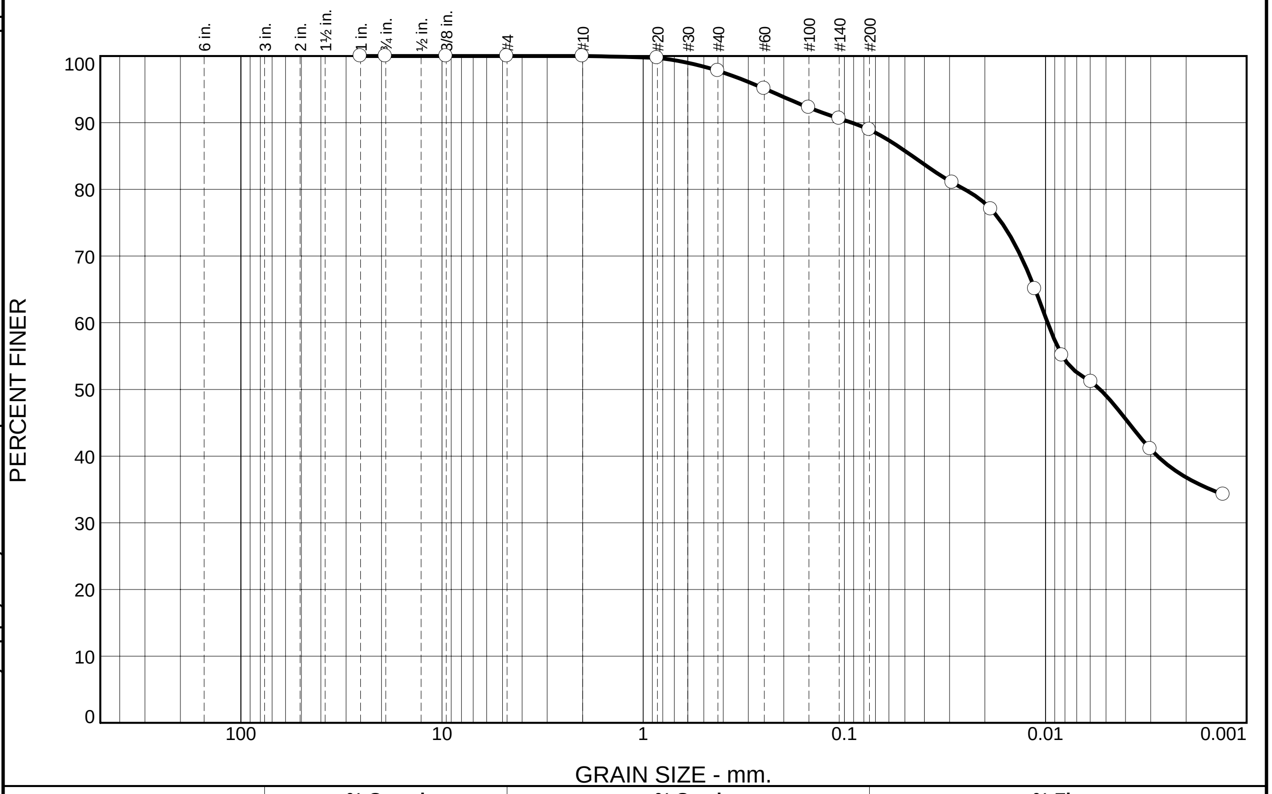
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 Figure

Tested By: AD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	2.2	8.8	39.9	49.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	100.0		
.375	100.0		
#4	100.0		
#10	100.0		
#20	99.7		
#40	97.8		
#60	95.1		
#100	92.3		
#140	90.6		
#200	89.0		

* (no specification provided)

Material Description

Fat Clay

Atterberg Limits

PL= 20 LL= 57 PI= 37

Coefficients

D_{90}= 0.0917 D_{85}= 0.0459 D_{60}= 0.0098
D_{50}= 0.0054 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(35)

Remarks

Nat moisture = 76.1%
Organic Content = 8.44%

Source of Sample: SP-B-01 **Depth:** 18.5-20
Sample Number: S-7

Date: 7/13

HILLIS-CARNES ENGINEERING ASSOCIATES

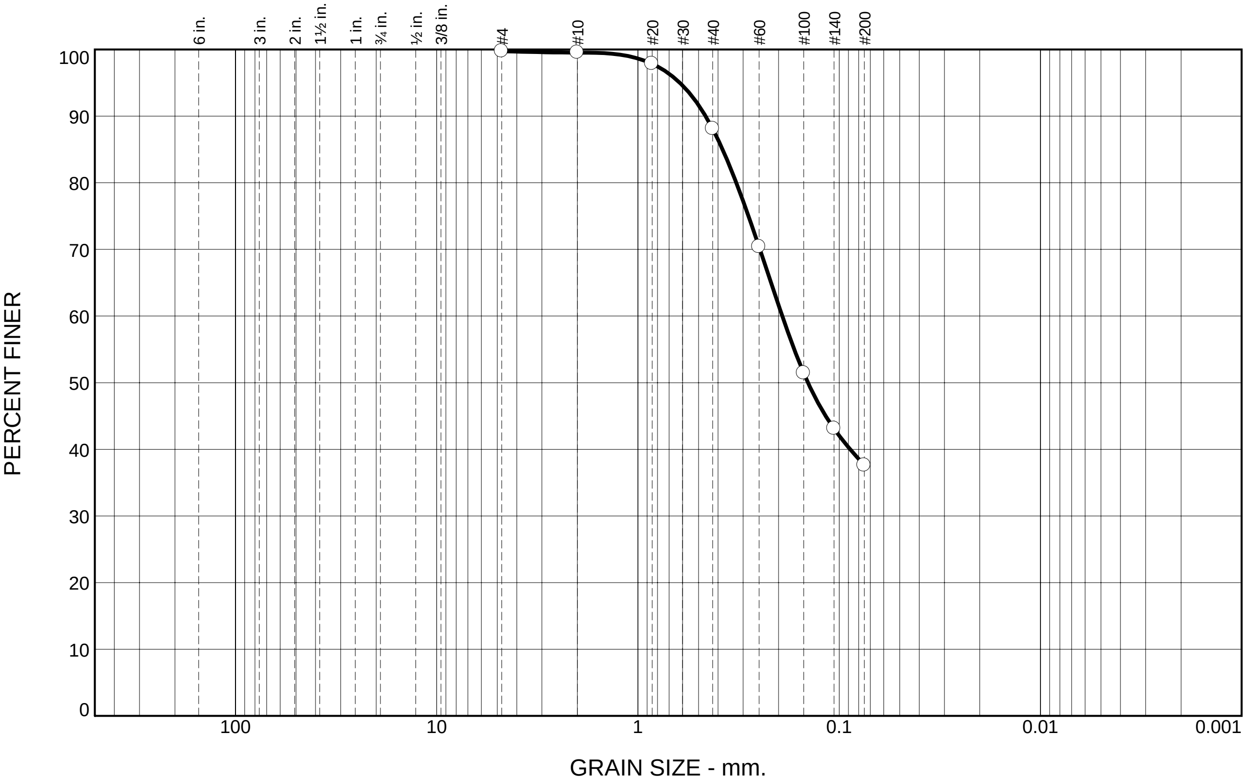
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: ACD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
			0.2	11.4	50.5	37.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	99.7		
#10	99.5		
#20	97.9		
#40	88.1		
#60	70.4		
#100	51.4		
#140	43.1		
#200	37.6		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4608 D_{85}= 0.3796 D_{60}= 0.1918
D_{50}= 0.1429 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Nat moisture = 19.8%

Source of Sample: SP-B-01 **Depth:** 40-41.5
Sample Number: S-11 **Date:** 6/29

HILLIS-CARNES ENGINEERING ASSOCIATES

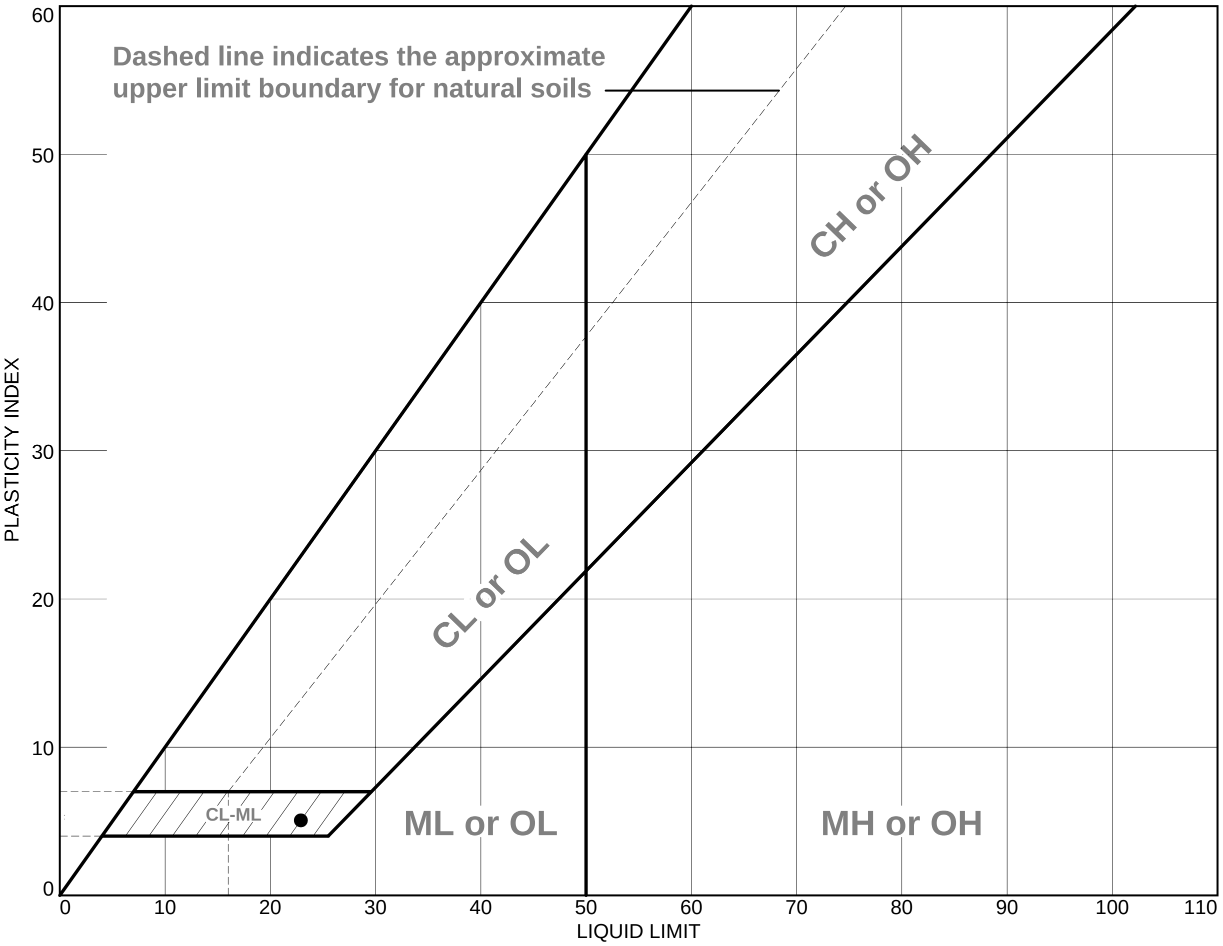
Philadelphia, Pennsylvania

Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing

Project No: P20051 **Figure**

Tested By: ACD

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty Clayey Sand	23	18	5	88.1	37.6	SC-SM

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

● **Source of Sample:** SP-B-01 **Depth:** 40-41.5 **Sample Number:** S-11

Remarks:

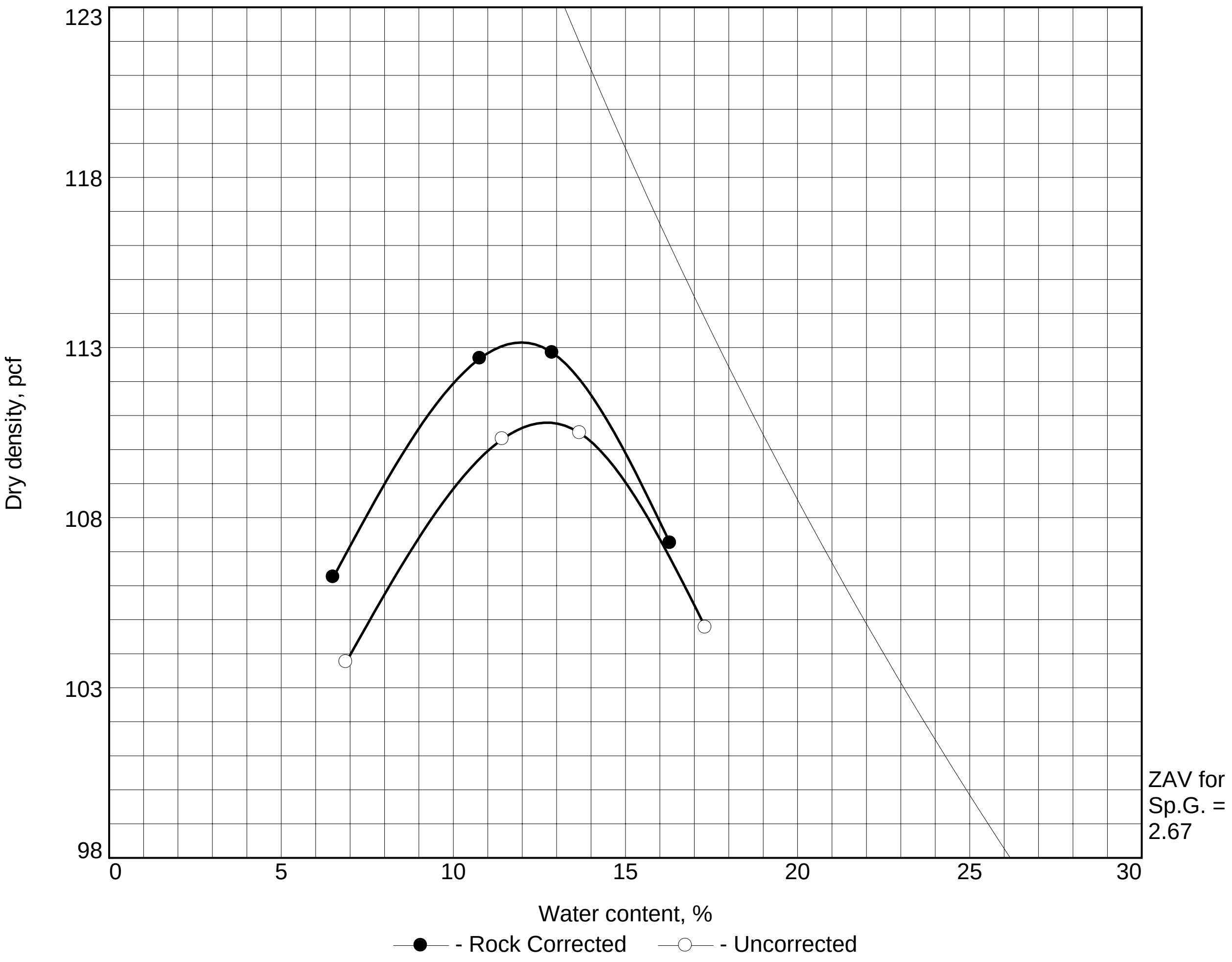
HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Figure

Moisture-Density and CBR Test Results

LABORATORY COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method B Modified
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
			22.6				6.3	41.4

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 113.1 pcf	110.8 pcf	Dk gray silty sand
Optimum moisture = 12.0 %	12.7 %	

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

Date: 6/1

○ **Location:** Bulk RB-B-01

HILLIS-CARNES ENGINEERING ASSOCIATES

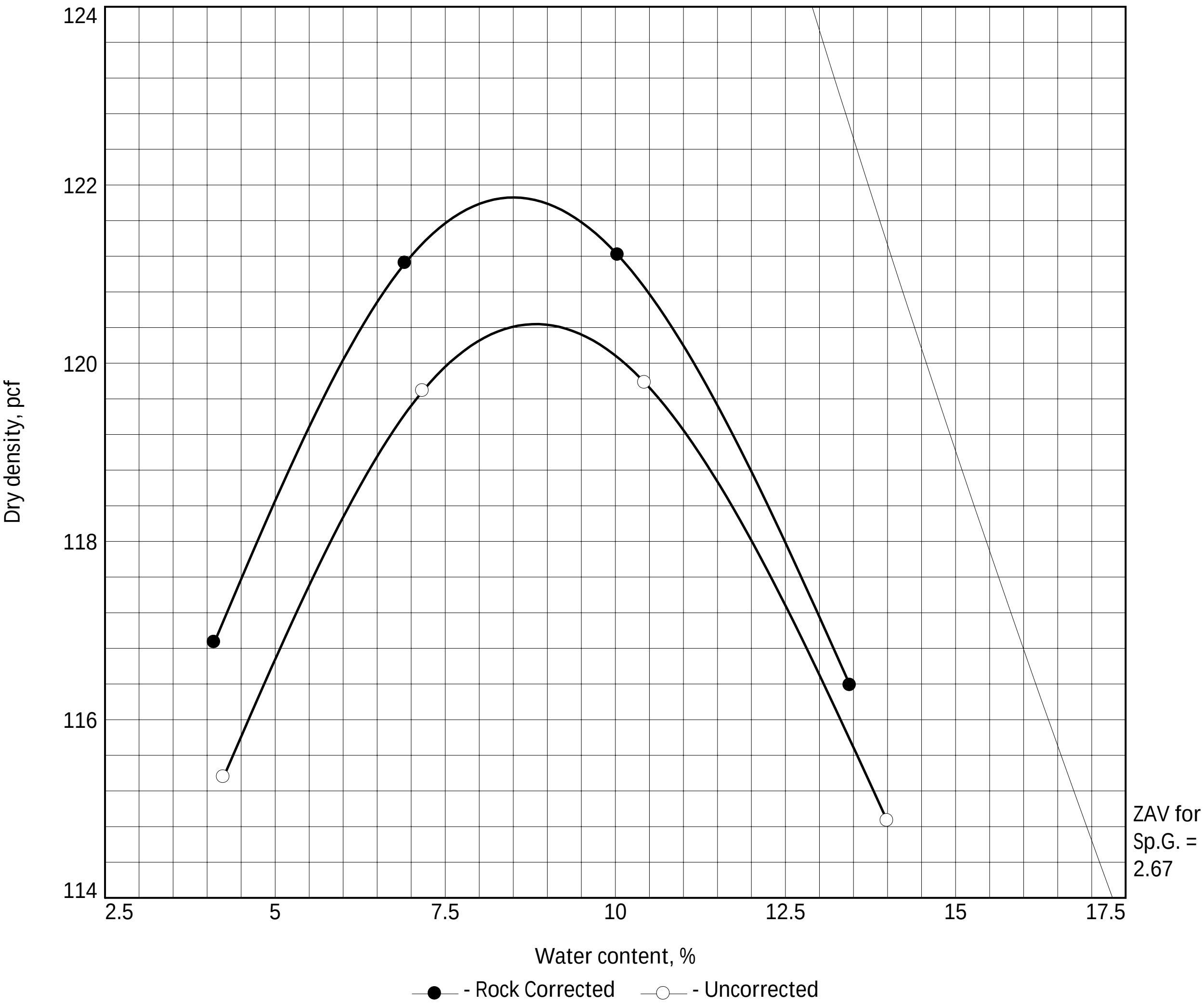
Philadelphia, Pennsylvania

Remarks:

Figure

Tested By: cs

LABORATORY COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method B Modified
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
			35.8	2.67			4.2	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 121.9 pcf	120.4 pcf	
Optimum moisture = 8.5 %	8.8 %	

Project No. P20051 Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Date: 8/2
○ Source of Sample: RB-B-02A Sample Number: BULK

HILLIS-CARNES ENGINEERING ASSOCIATES

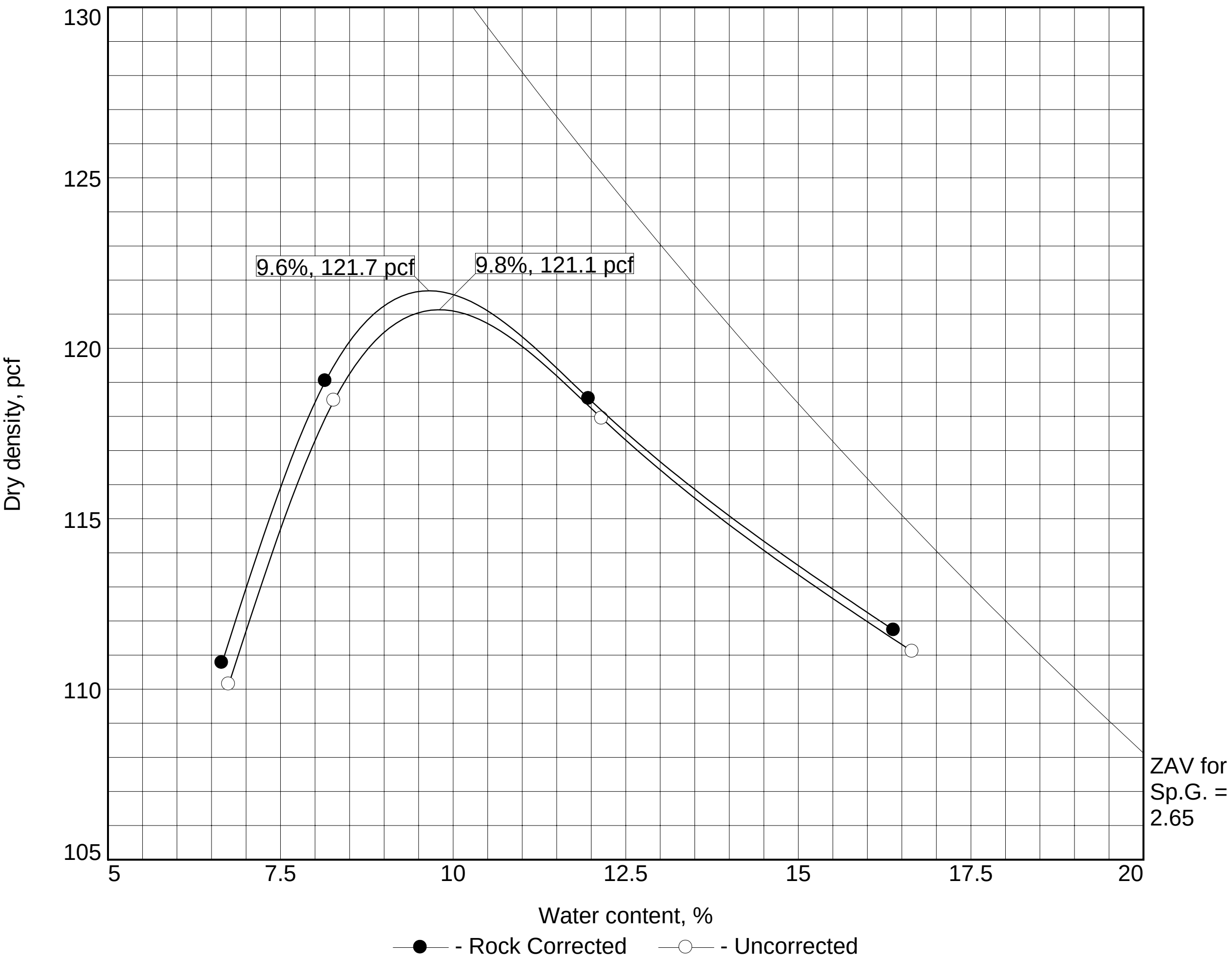
Philadelphia, Pennsylvania

Remarks:

Figure

Tested By: cs

COMPACTION TEST REPORT



Test specification: ASTM D 1557-07 Method B Modified
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
0			6.3				1.7	17.0

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 121.7 pcf	121.1 pcf	Red brown silty sand w/gravel
Optimum moisture = 9.6 %	9.8 %	

Project No. P20051 **Client:**
Project: South Market Street Lab Testing

○**Source of Sample:** RB-B-04 **Sample Number:** Bulk

HILLIS-CARNES ENGINEERING ASSOCIATES

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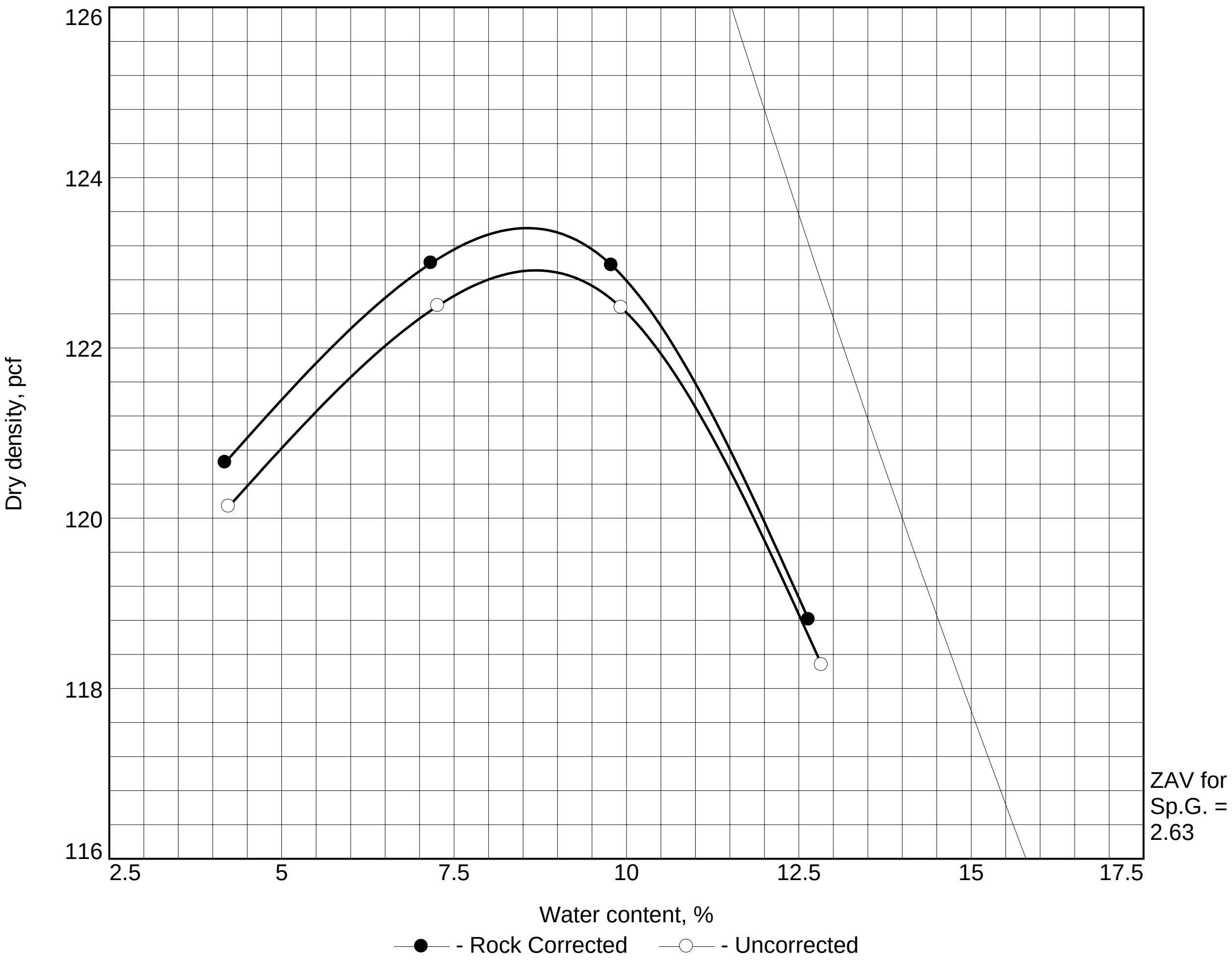
Remarks:

Figure

Tested By: cs



Test specification: ASTM D 1557-12 Method C Modified
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
0	SM	A-2-4(0)	22.9		19	NP	1.6	29.8

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 123.4 pcf	122.9 pcf	Black/Brown silty sand w/gravel
Optimum moisture = 8.6 %	8.7 %	

Project No. P20051 **Client:**

Project: South Market Street Lab Testing

Date: 9/15

○ **Source of Sample:** RB-B-05 **Sample Number:** BULK

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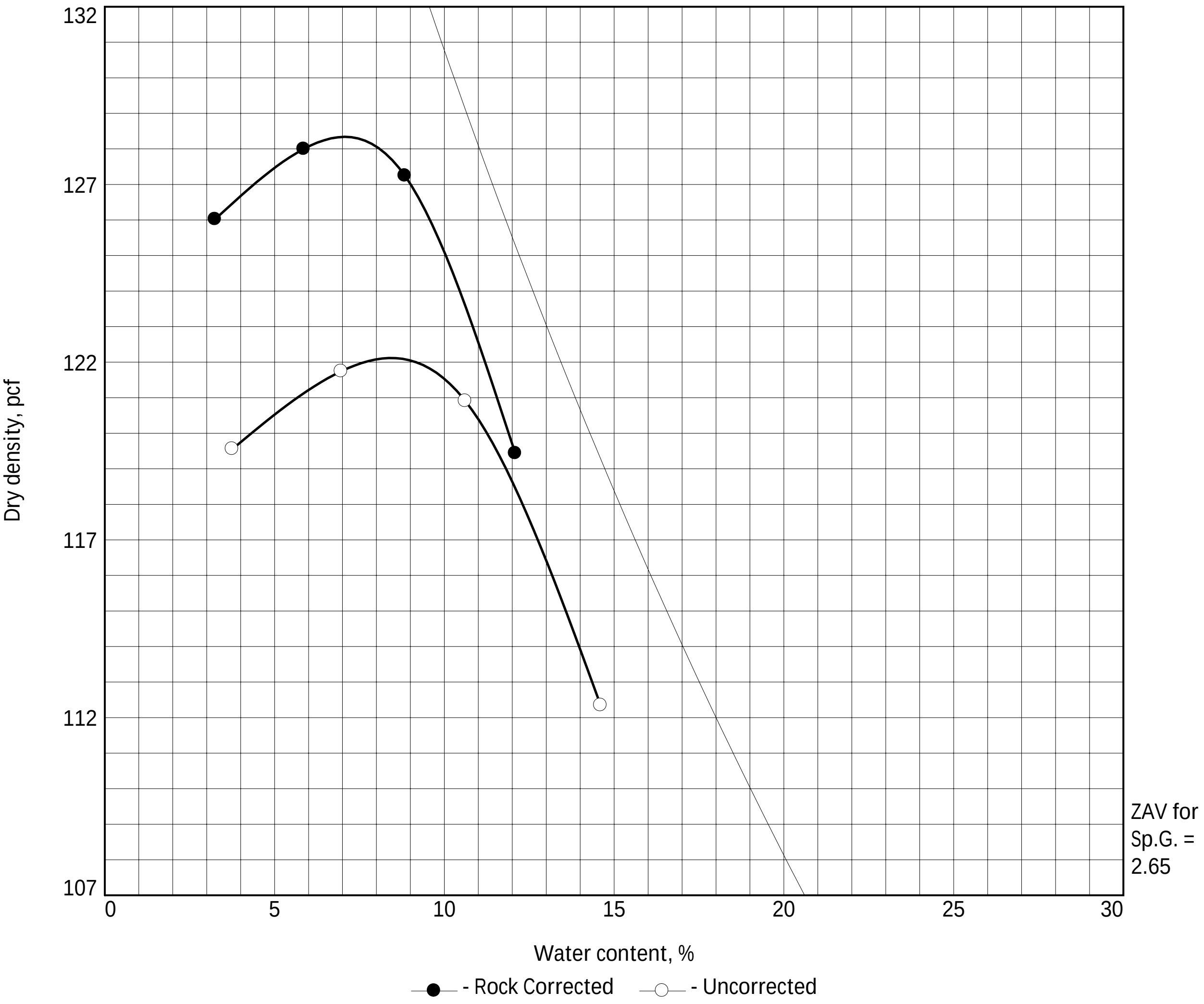
Remarks:

Figure

Tested By: cs

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

LABORATORY COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method C Modified
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
0.0-10.0	SP-SC	A-2-6(0)	10.3		28	12	18.5	10.9

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 128.3 pcf	122.1 pcf	Poorly graded sand w/clay and gravel
Optimum moisture = 7.1 %	8.4 %	

Project No. P20051 Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Date: 12/2
○ Source of Sample: RB-B-09 Sample Number: Bulk

Remarks:

HILLIS-CARNES ENGINEERING ASSOCIATES

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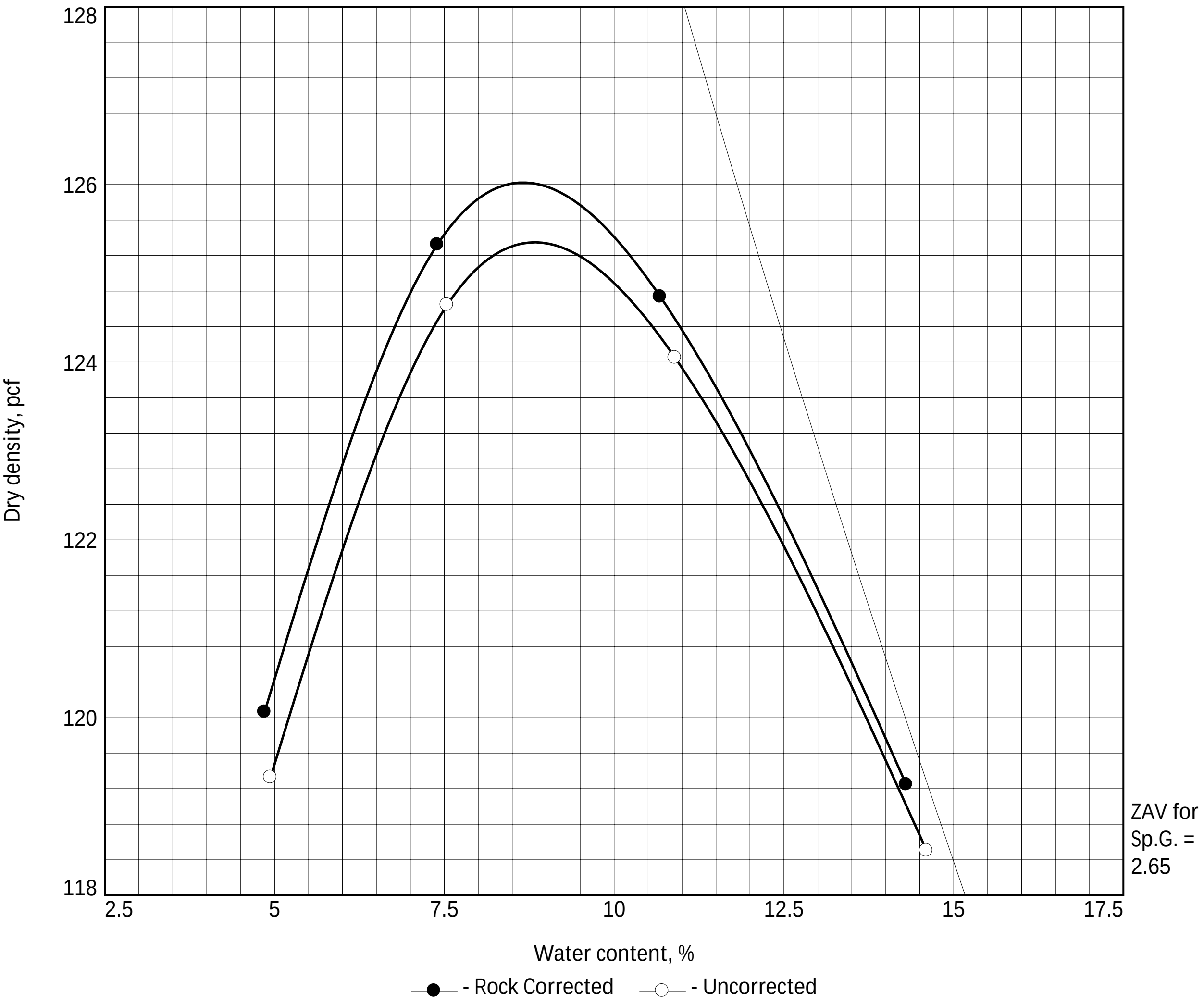
Figure

Tested By: cs/ad

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

LABORATORY COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method C Modified
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
0.6-10	SC	A-2-6(1)	11.8		34	14	2.2	29.5

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 126.0 pcf	125.3 pcf	Clayey Sand w/gravel
Optimum moisture = 8.7 %	8.8 %	

Project No. P20051 Client: HCEA SCG/RK&K
Project: South Market Street Lab Testing
Date: 1/18
○ Source of Sample: RB-B-10 Sample Number: Bulk

HILLIS-CARNES ENGINEERING ASSOCIATES

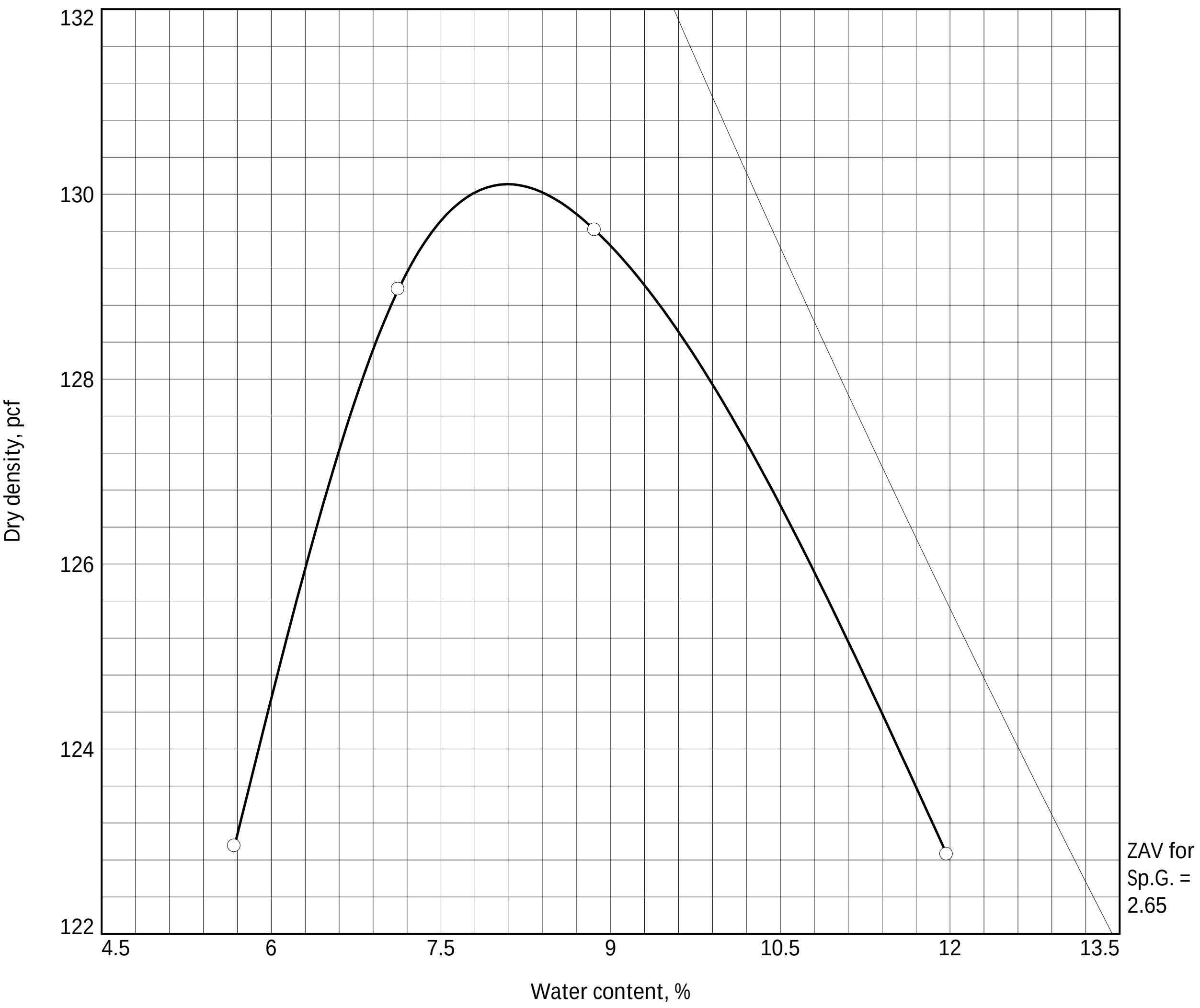
Philadelphia, Pennsylvania

Remarks:

Figure

Tested By: ad/cs/bs

LABORATORY COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method C Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
0.3-10	SC	A-2-4(0)			23	10	0.0	22.9

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 130.1 pcf Optimum moisture = 8.1 %	Clayey Sand

Project No. P20051 Client: HCEA SCG/RK&K

Project: South Market Street Lab Testing

Date: 12/7

○ Source of Sample: RB-B-12 Sample Number: Bulk

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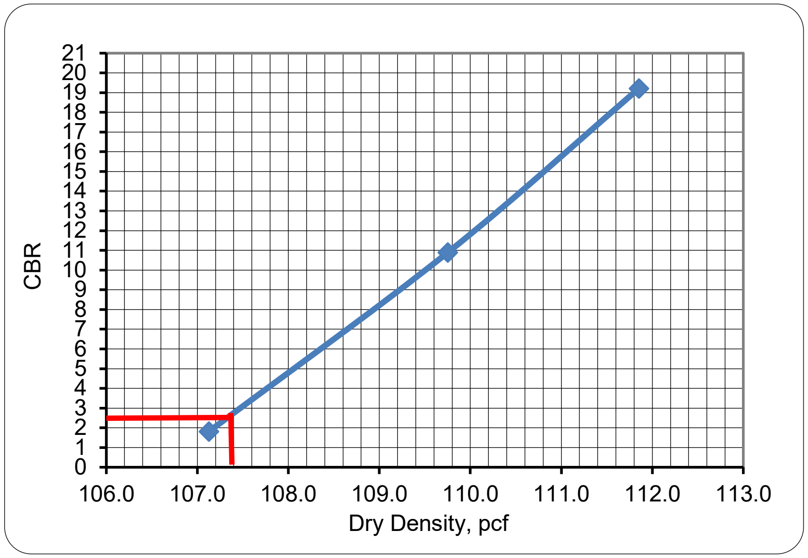
Philadelphia, Pennsylvania

Remarks:

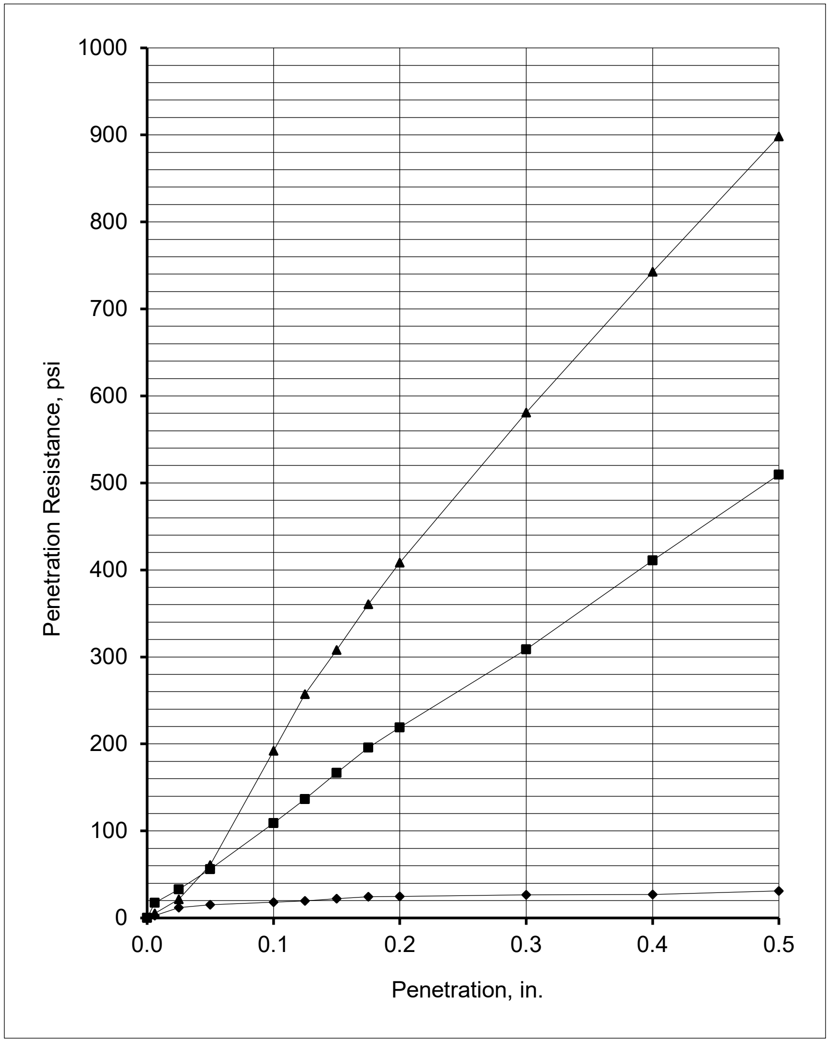
Figure

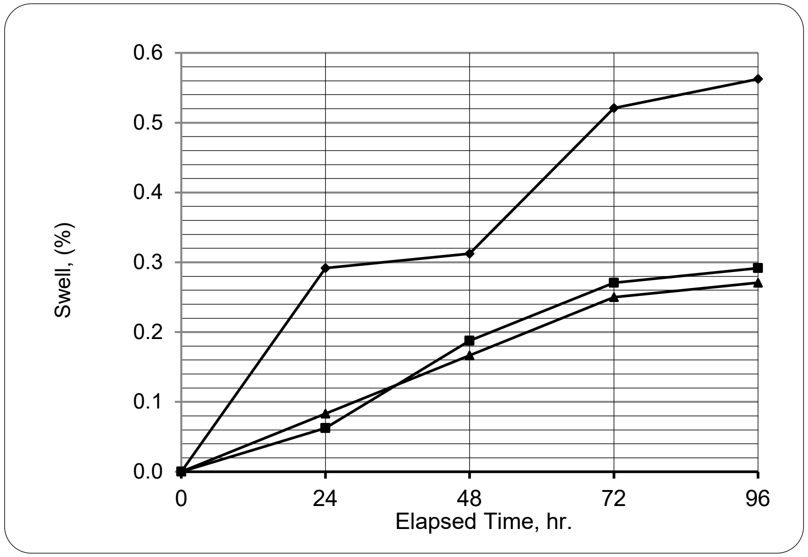
These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

California Bearing Ratio ASTM D1883



CBR @ 95% = 2.5
for 0.1 in. penetration

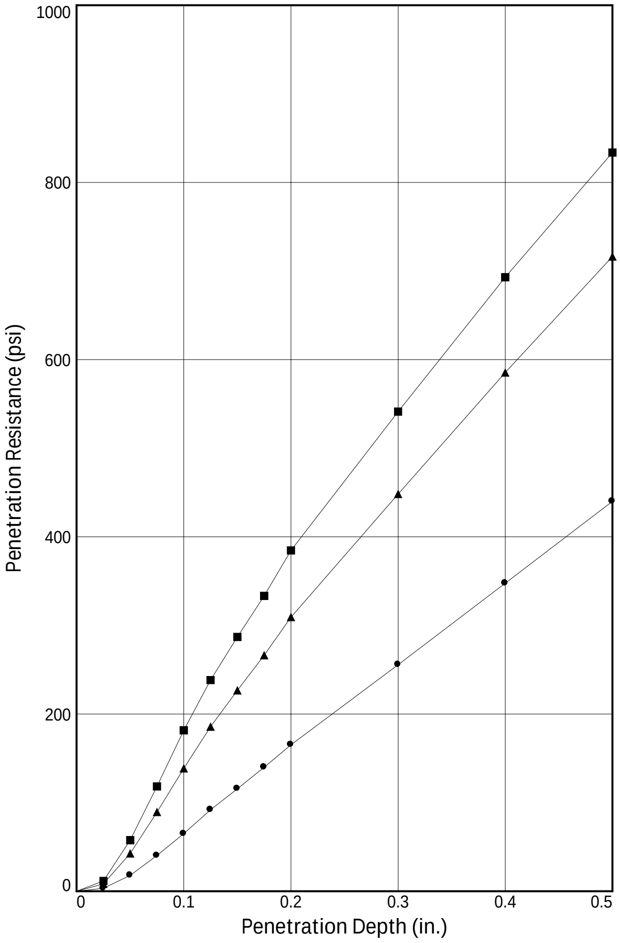


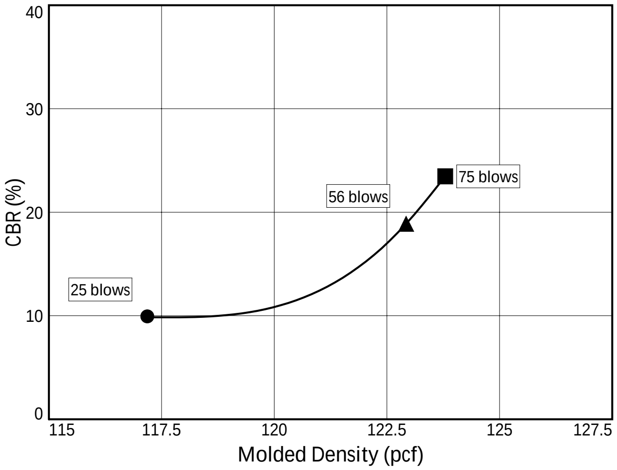


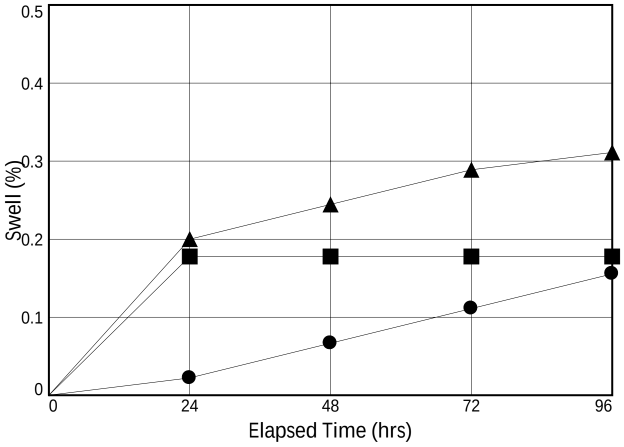
Hillis-Carnes Engineering Associates

Job No:	P20051	Liquid Limit		Molded Data			Soaked (Top 1") Data			CBR, (%)		Swell
Client	SCG	Plastic Limit		Dry Density	Moisture	Max. Density	Dry Density	Moisture	Max. Density	0.1	0.2	
Job Name	Market St	Plastic Index		pcf	%	%	pcf	%	%	in.	in.	%
Label		Specific Gravity	N/A	107.1	12.0	88.0	107.8	15.7	88.5	1.8	1.7	0.56
Sample	RB-B-01 Bulk	Nat. Moist. Content, %	12	109.8	12.0	90.2	110.1	13.7	90.5	10.9	14.6	0.29
Date	15-Jun-21	Max. Density (pcf)	107.4	111.9	12.0	91.9	109.4	13.9	89.9	19.2	27.2	0.27

BEARING RATIO TEST REPORT
ASTM D1883-14







	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ●	117.2	101.1	9.3	117.0	101	16.0	9.9	12.9	0.032	5	0.2
2 ▲	122.9	106	9.1	122.5	105.7	12.6	18.9	23.1	0.027	5	0.3
3 ■	123.8	106.8	9.3	123.6	106.6	12.2	23.5	28.1	0.023	5	0.2

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Clayey sand	SC	115.9	8.8	39	16

Project No: P20051
Project: South Market Street Lab Testing
Source of Sample: RB-B-02A Depth: 0-10.0
Sample Number: BULK
Date: 8/1

BEARING RATIO TEST REPORT

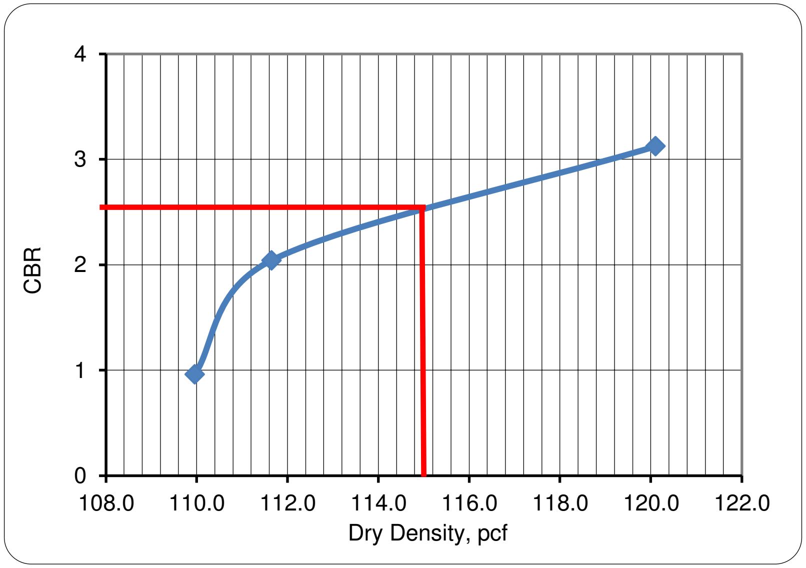
HILLIS-CARNES ENGINEERING ASSOCIATES

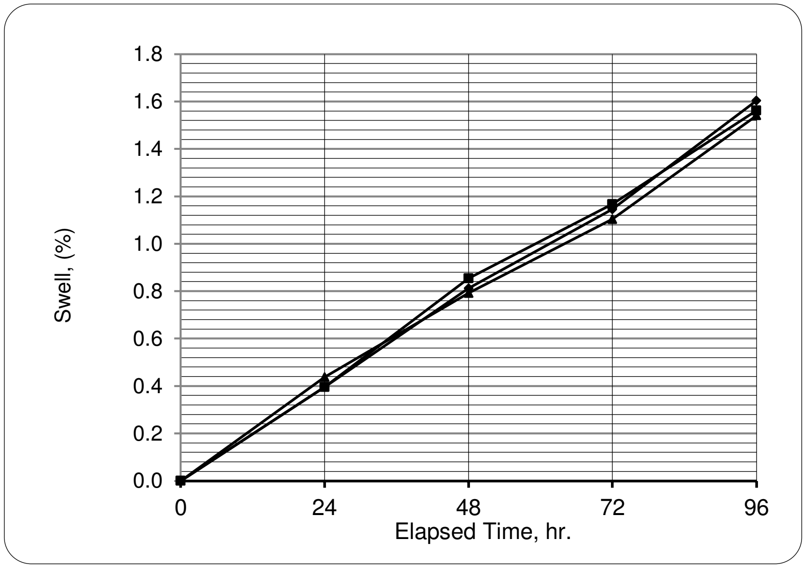
Test Remarks:

Figure ________

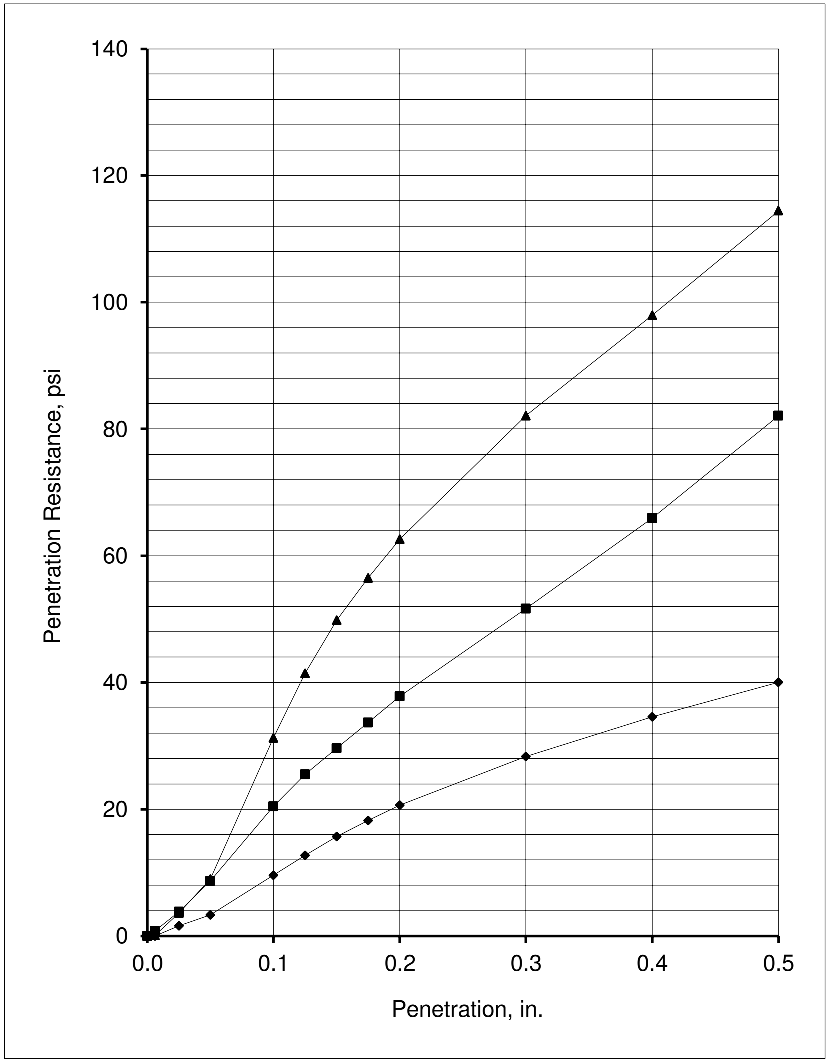
Tested By: cs

California Bearing Ratio ASTM D1883





CBR @ 95% = **2.5**
for 0.1 in. penetration



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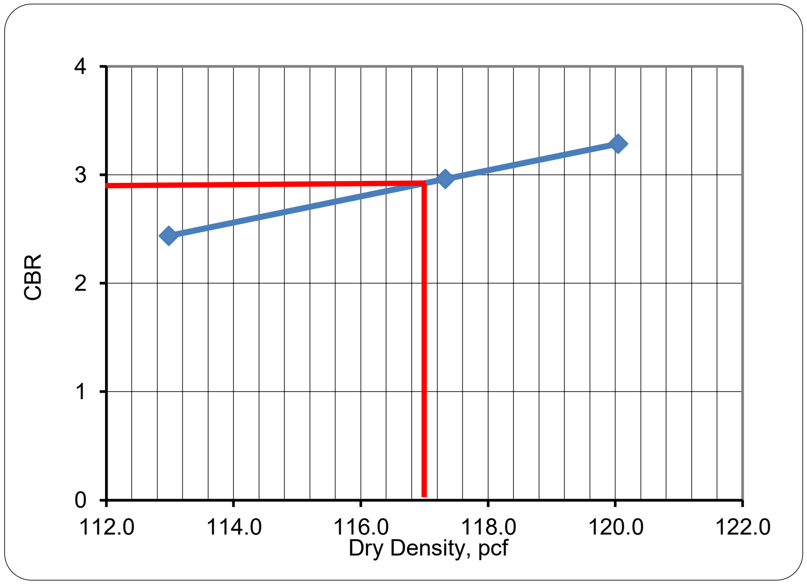
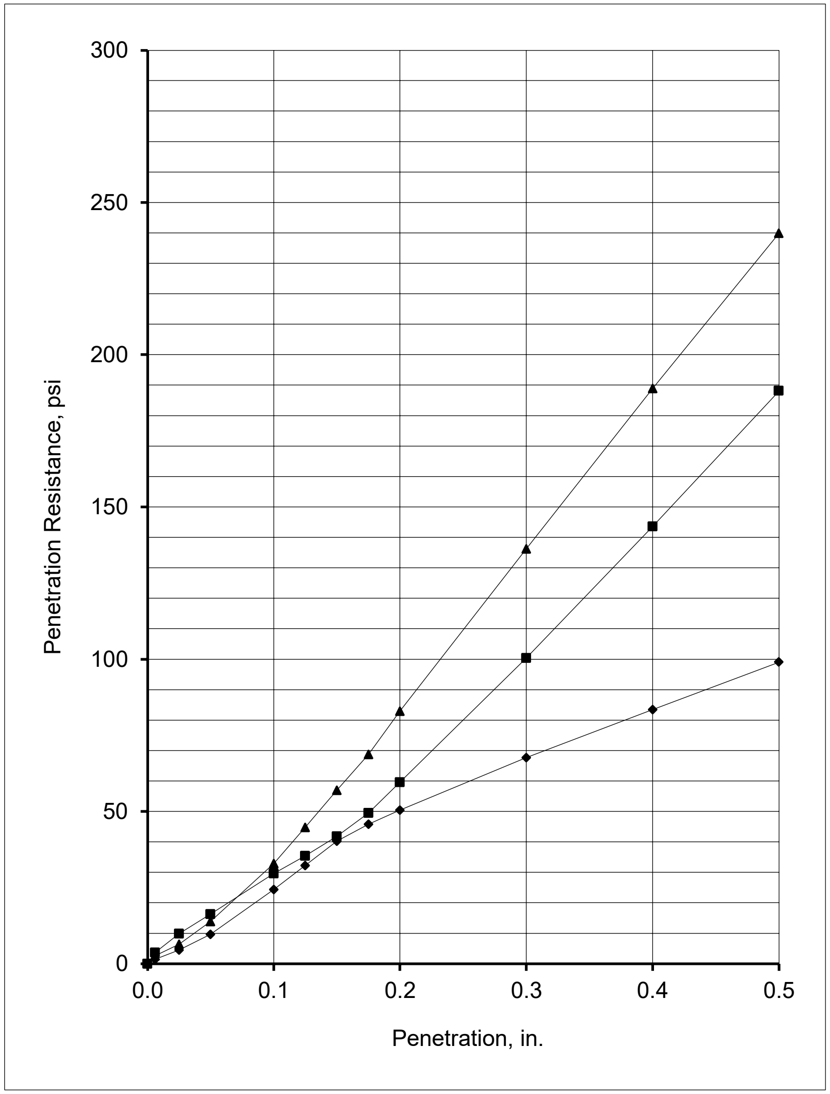
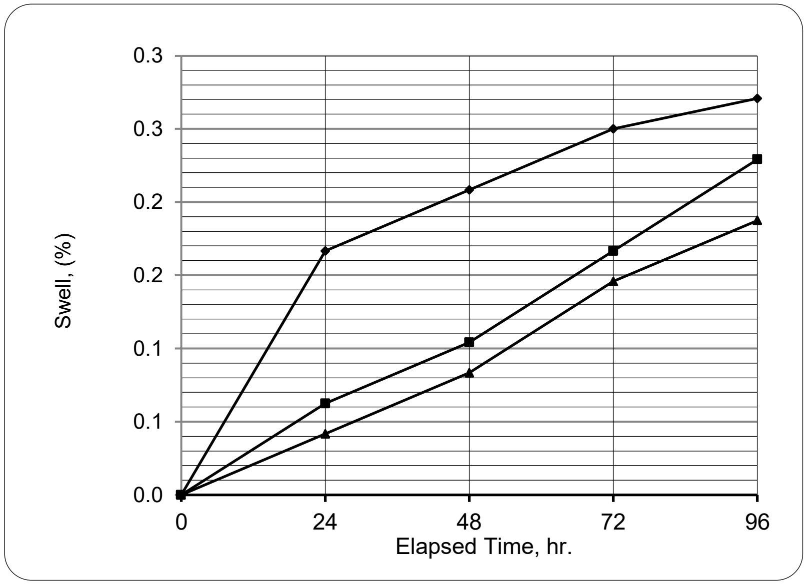
Job No:	P20051	Liquid Limit	27	Molded Data			Soaked (Top 1") Data			CBR, (%)		Swell
Client	SCG	Plastic Limit	16	Dry Density	Moisture	Max. Density	Dry Density	Moisture	Max. Density	0.1	0.2	
Job Name	Market St	Plastic Index	11	pcf	%	%	pcf	%	%	in.	in.	%
Label	**RB-B-04**	Specific Gravity	N/A	110.0	9.5	90.4	103.5	19.5	85.1	1.0	1.4	1.60
Sample	**Bulk**	Nat. Moist. Content, %	9.6	111.6	9.5	91.7	112.5	19.4	92.5	2.0	2.5	1.56
Date	10-Aug-20	Max. Density (pcf)	121.7	120.1	9.5	98.7	117.3	17.1	96.3	3.1	4.2	1.54

California Bearing Ratio ASTM D1883



CBR @ 95% = 2.9
for 0.1 in. penetration

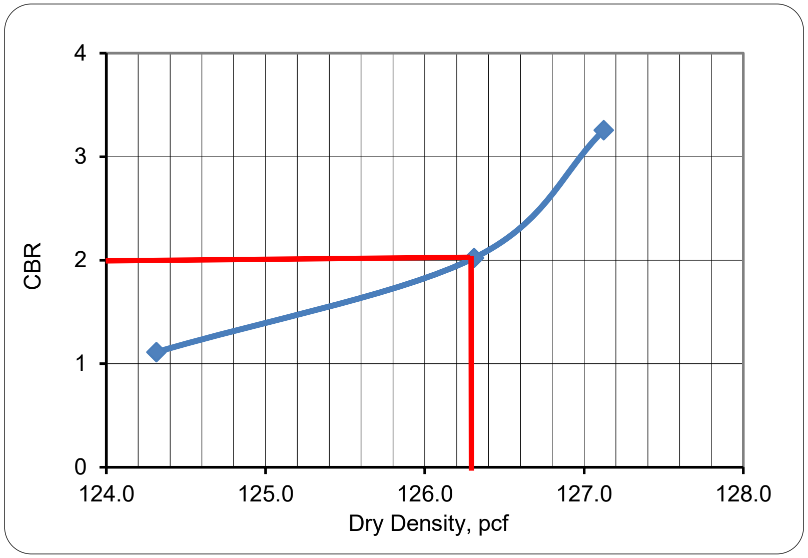




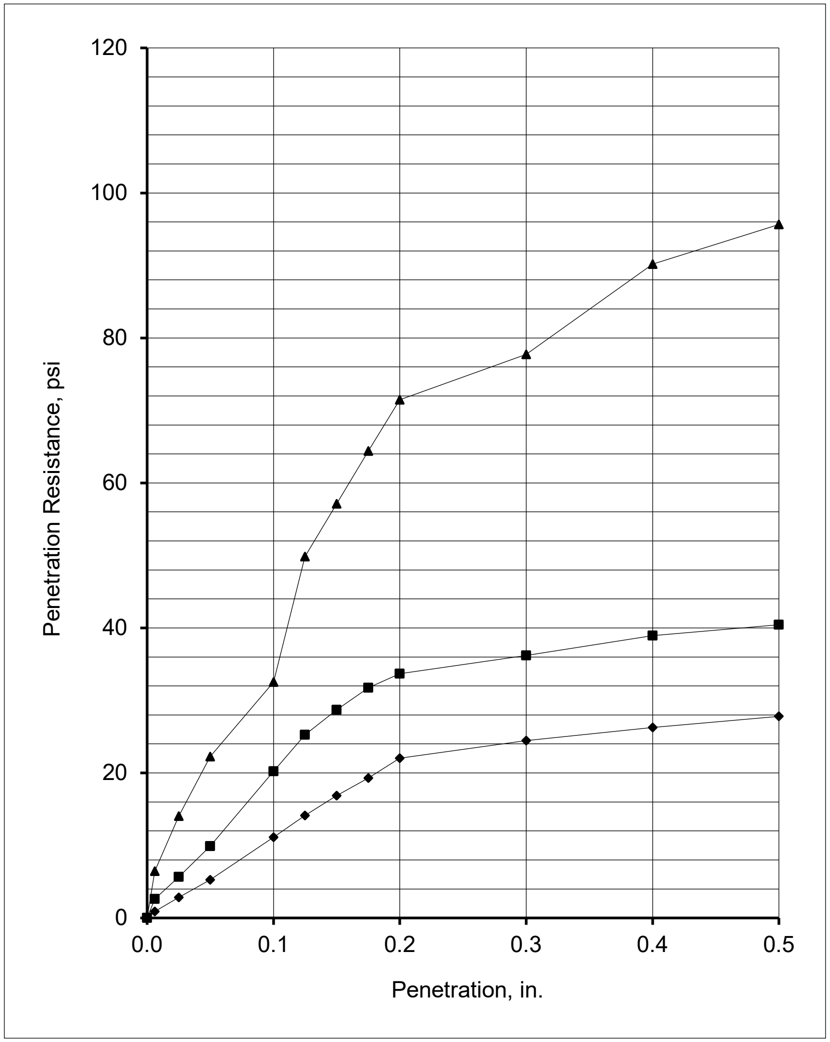
Hillis-Carnes Engineering Associates

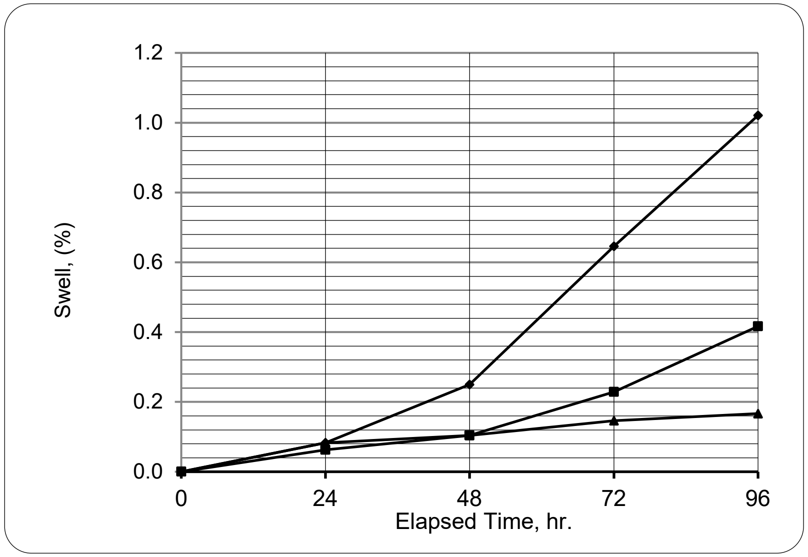
Job No:	P20051	Liquid Limit	19	Molded Data			Soaked (Top 1") Data			CBR, (%)		Swell
Client	SCG	Plastic Limit	NP	Dry Density	Moisture	Max. Density	Dry Density	Moisture	Max. Density	0.1	0.2	
Job Name	Market St	Plastic Index	NP	pcf	%	%	pcf	%	%	in.	in.	%
Label	RB-B-05	Specific Gravity	N/A	113.0	8.2	91.7	111.2	13.2	90.2	2.4	3.4	0.27
Sample	BULK	Nat. Moist. Content, %	8.0	117.3	8.2	95.2	115.7	12.3	93.9	3.0	4.0	0.23
Date	`9/24/2020	Max. Density (pcf)	123.2	120.0	8.2	97.4	118.4	12.2	96.1	3.3	5.5	0.19

California Bearing Ratio ASTM D1883



CBR @ 95% = **2.0**
for 0.1 in. penetration

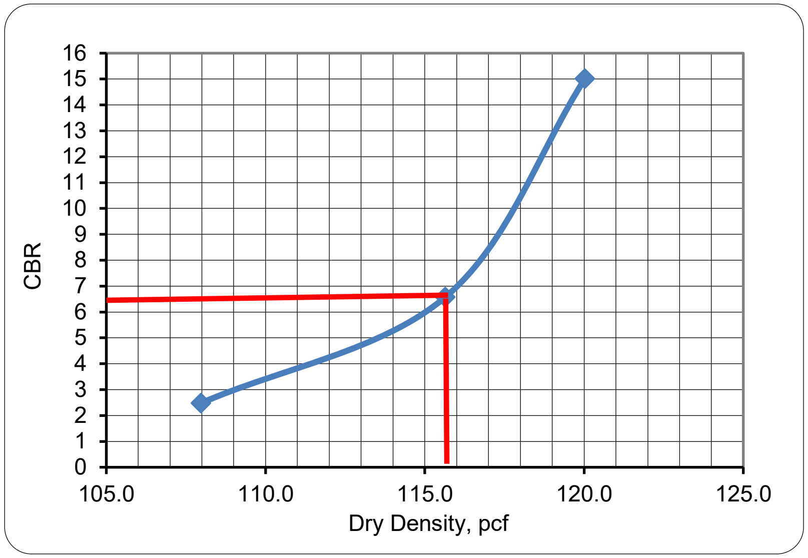




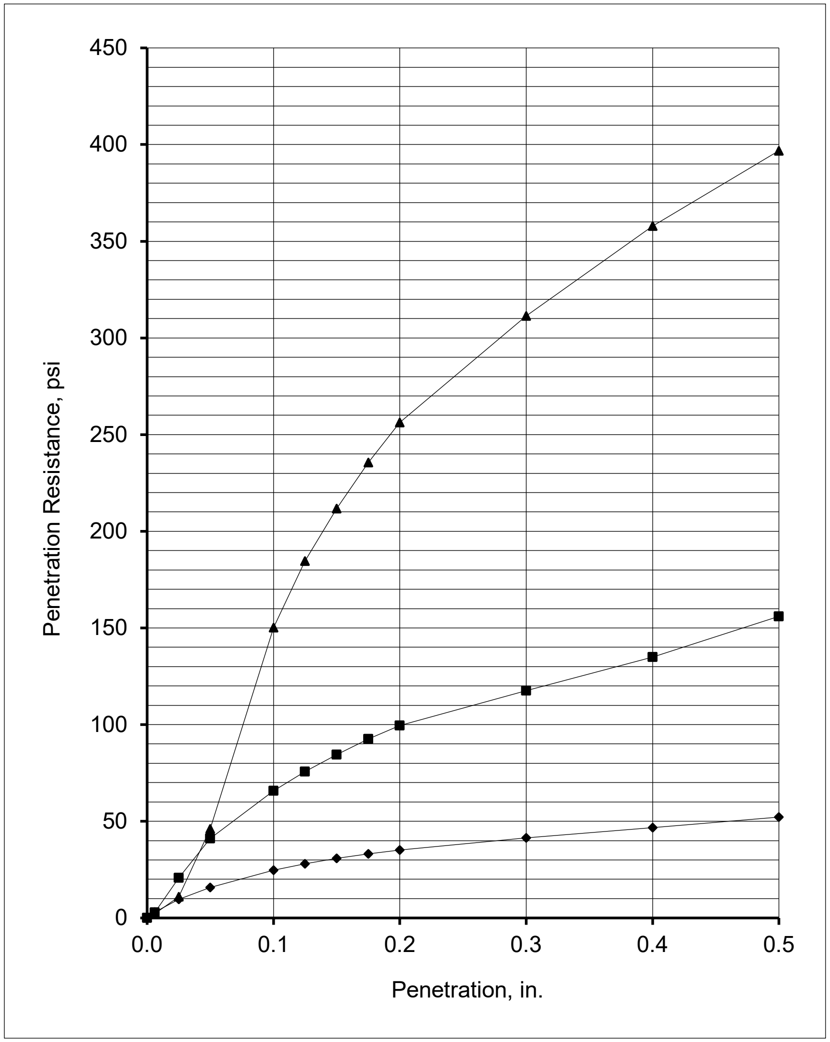
Hillis-Carnes Engineering Associates

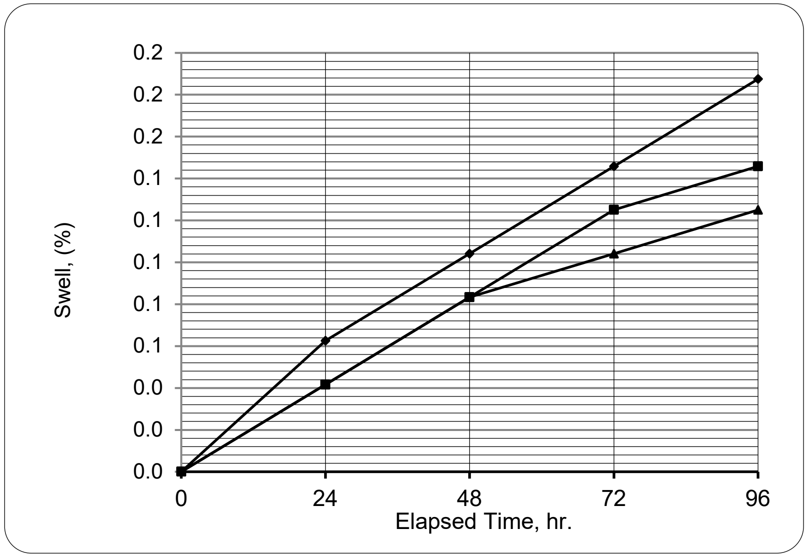
Job No:	P20051	Liquid Limit	24	Molded Data			Soaked (Top 1") Data			CBR, (%)		Swell
Client	SCG	Plastic Limit	NP	Dry Density	Moisture	Max. Density	Dry Density	Moisture	Max. Density	0.1	0.2	
Job Name	Market St	Plastic Index	NP	pcf	%	%	pcf	%	%	in.	in.	%
Label		Specific Gravity	N/A	124.3	7.3	102.1	125.3	9.5	103.0	1.1	1.5	1.02
Sample	RB-B-08 Bulk	Opt. Moist. Content, %	8.0	126.3	7.1	103.8	126.5	9.2	104.0	2.0	2.2	0.42
Date	11-Nov-22	Max. Density (pcf)	132.2	127.1	6.8	104.5	126.5	9.2	104.0	3.3	4.8	0.17

California Bearing Ratio ASTM D1883



CBR @ 95% = 6.6
for 0.1 in. penetration

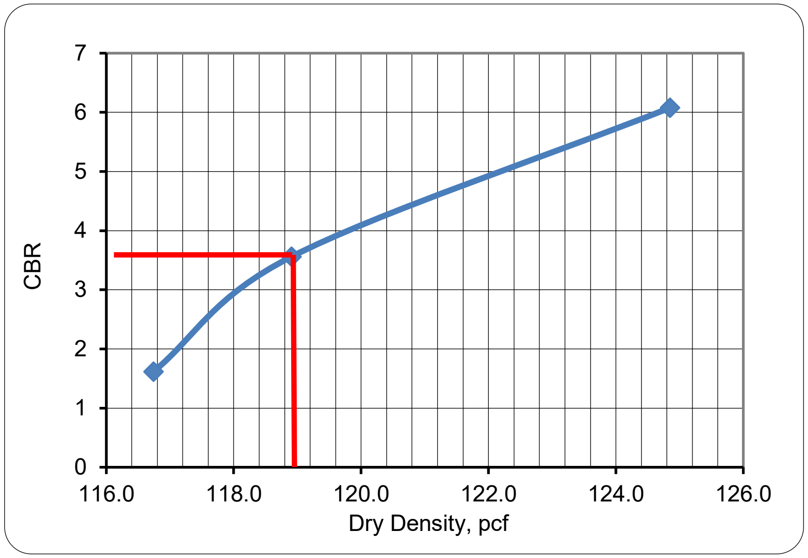




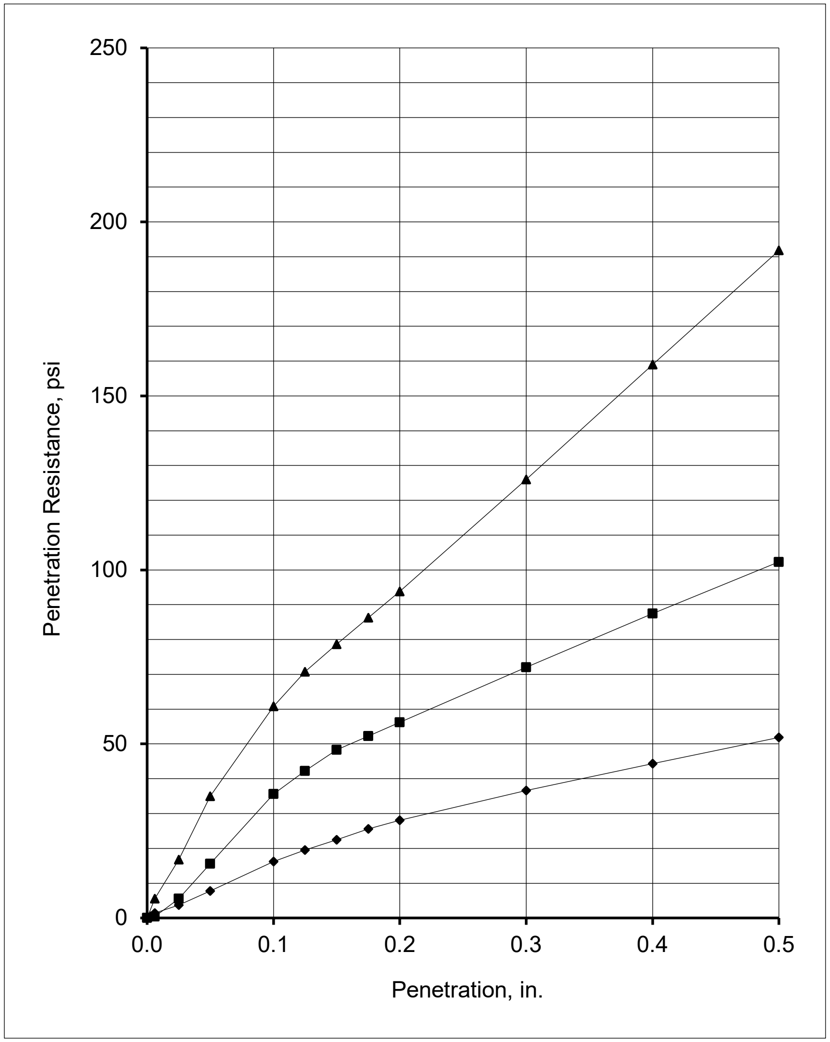
Hillis-Carnes Engineering Associates

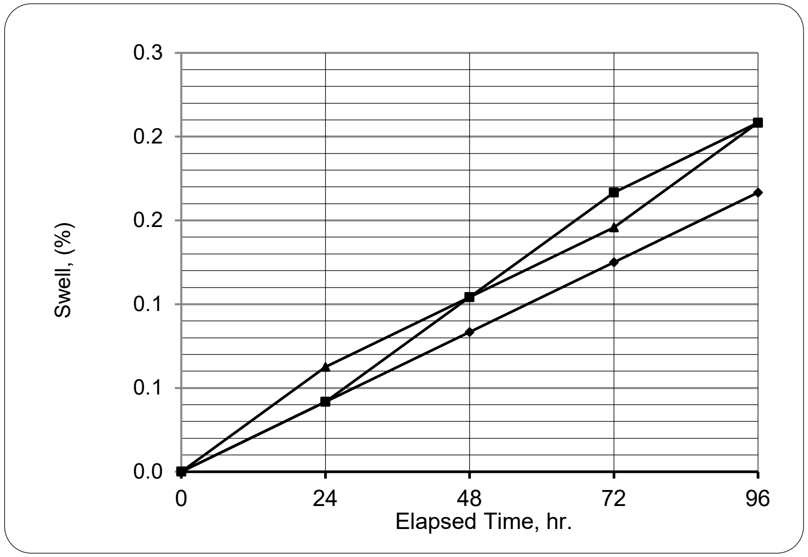
Job No:	P20051	Liquid Limit	28	Molded Data			Soaked (Top 1") Data			CBR, (%)		Swell
Client	SCG	Plastic Limit	16	Dry Density	Moisture	Max. Density	Dry Density	Moisture	Max. Density	0.1	0.2	
Job Name	Market St	Plastic Index	12	pcf	%	%	pcf	%	%	in.	in.	%
Label		Specific Gravity	2.65	108.0	7.3	88.7	114.6	14.9	94.2	2.5	2.3	0.19
Sample	RB-B-09 Bulk	Opt. Moist. Content, %	7.6	115.6	7.3	95.0	114.7	12.8	94.3	6.6	6.6	0.15
Date	11-Dec-22	Max. Density (pcf)	125.8	120.0	7.3	98.6	115.8	11.2	95.2	15.0	17.1	0.13

California Bearing Ratio ASTM D1883



CBR @ 95% = 3.6
for 0.1 in. penetration

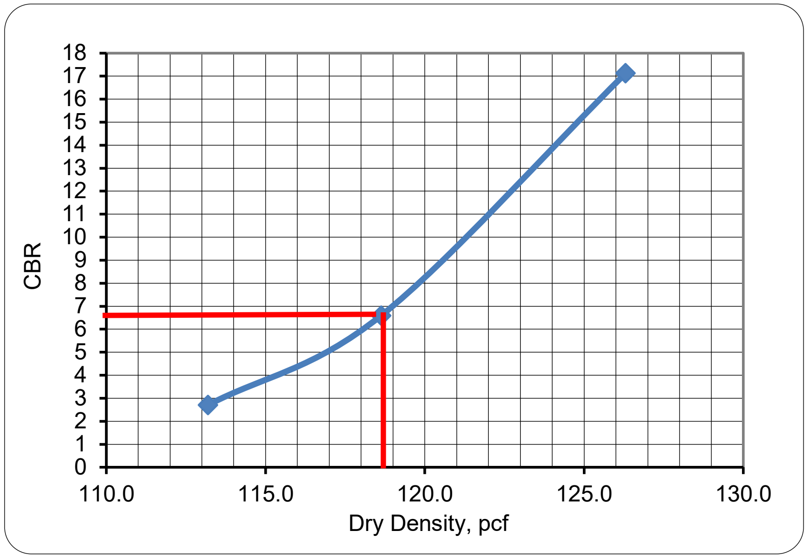




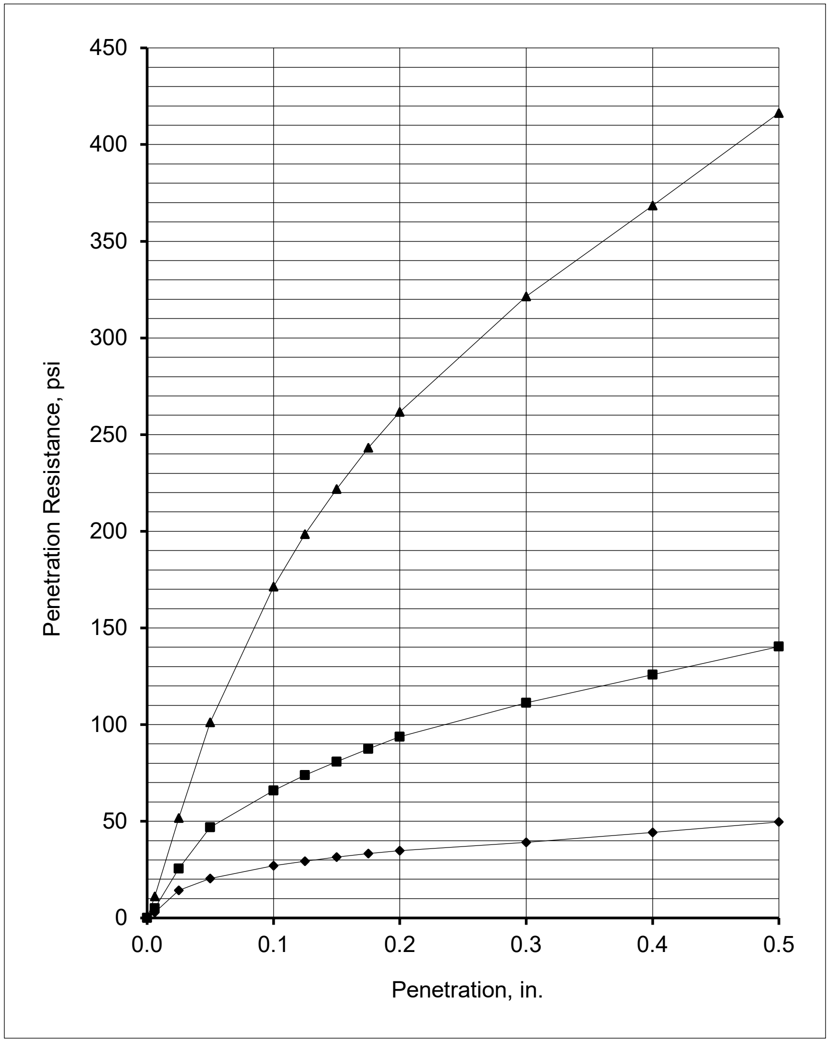
Hillis-Carnes Engineering Associates

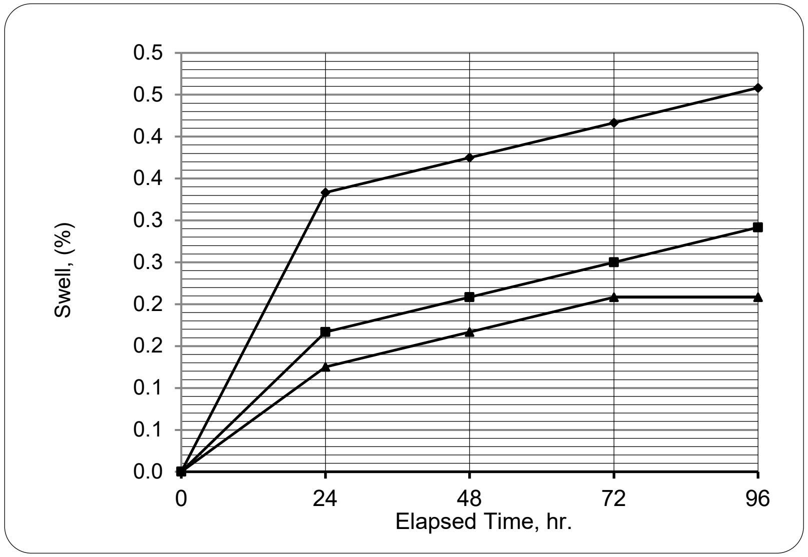
Job No:	P20051	Liquid Limit	24	Molded Data			Soaked (Top 1") Data			CBR, (%)		Swell
Client	SCG	Plastic Limit	NP	Dry Density	Moisture	Max. Density	Dry Density	Moisture	Max. Density	0.1	0.2	
Job Name	Market St	Plastic Index	NP	pcf	%	%	pcf	%	%	in.	in.	%
Label		Specific Gravity	2.65	116.7	8.8	95.9	117.9	14.4	96.9	1.6	1.9	0.17
Sample	RB-B-10 Bulk	Opt. Moist. Content, %	8.8	118.9	8.8	97.7	117.3	16.0	96.4	3.6	3.7	0.21
Date	6-Feb-22	Max. Density (pcf)	125.3	124.9	8.8	102.6	123.9	13.2	101.8	6.1	6.3	0.21

California Bearing Ratio ASTM D1883



CBR @ 95% = 6.6
for 0.1 in. penetration



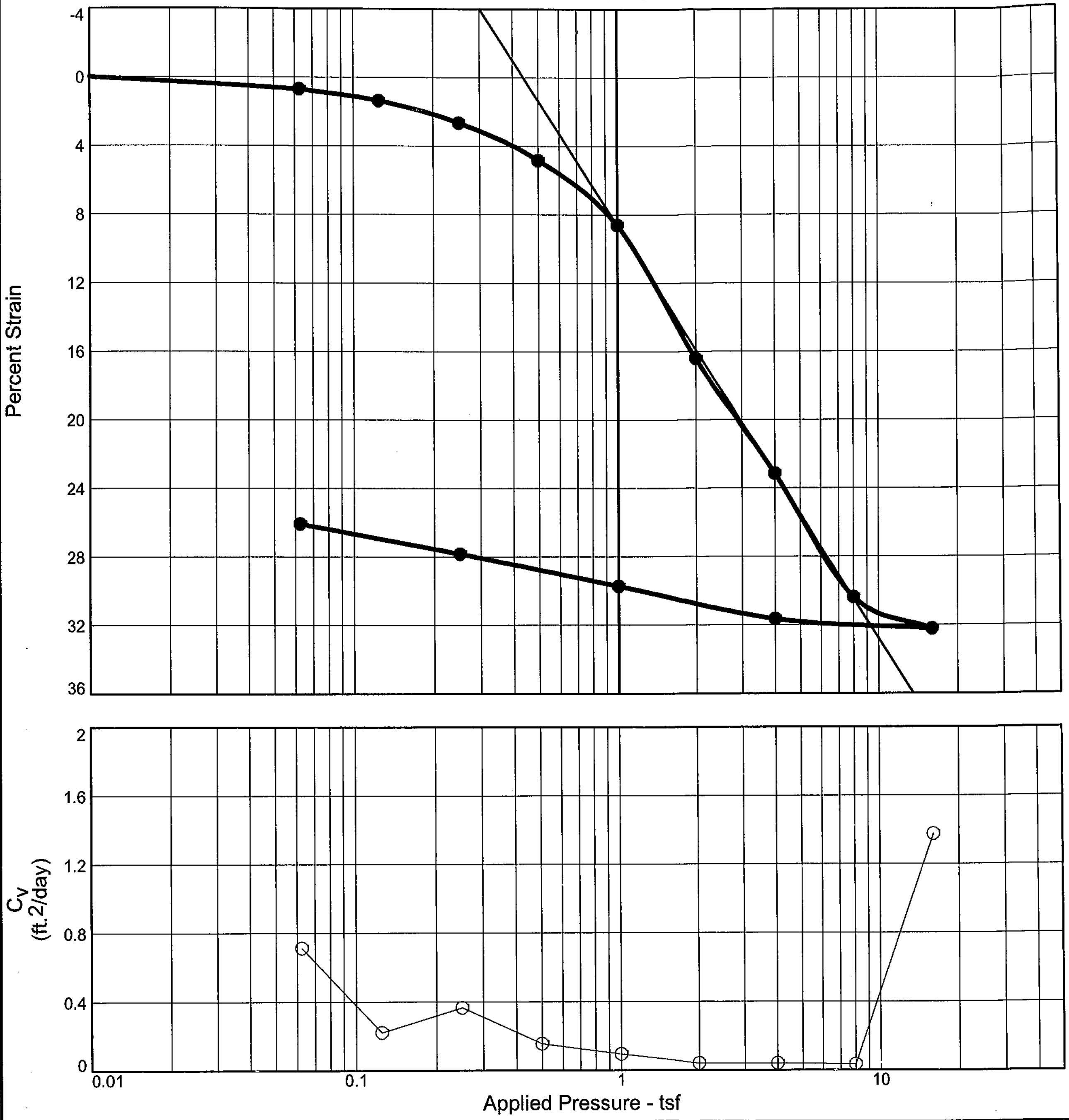


Hillis-Carnes Engineering Associates

Job No:	P20051	Liquid Limit	13	Molded Data			Soaked (Top 1") Data			CBR, (%)		Swell
Client	SCG	Plastic Limit	10	Dry Density	Moisture	Max. Density	Dry Density	Moisture	Max. Density	0.1	0.2	
Job Name	Market St	Plastic Index	3	pcf	%	%	pcf	%	%	in.	in.	%
Label		Specific Gravity	2.65	113.2	8.0	93.0	112.3	15.7	92.3	2.7	2.3	0.46
Sample	RB-B-12 Bulk	Opt. Moist. Content, %	8.0	118.6	8.0	97.5	118.4	13.2	97.3	6.6	6.2	0.29
Date	20-Dec-22	Max. Density (pcf)	130.1	126.3	8.0	103.8	124.7	11.7	102.5	17.1	17.4	0.21

Consolidation Test Results

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
75.0 %	54.1 %	57.2	91	50	2.7		1.0	0.71	0.08	1.949

MATERIAL DESCRIPTION	USCS	AASHTO
Elastic Silt w/ sand	MH	A-7-5(43)

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

Location: BH-B-01A **Depth:** 15-17' **Sample Number:** 01A

Remarks:

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.
Annapolis Junction, MD

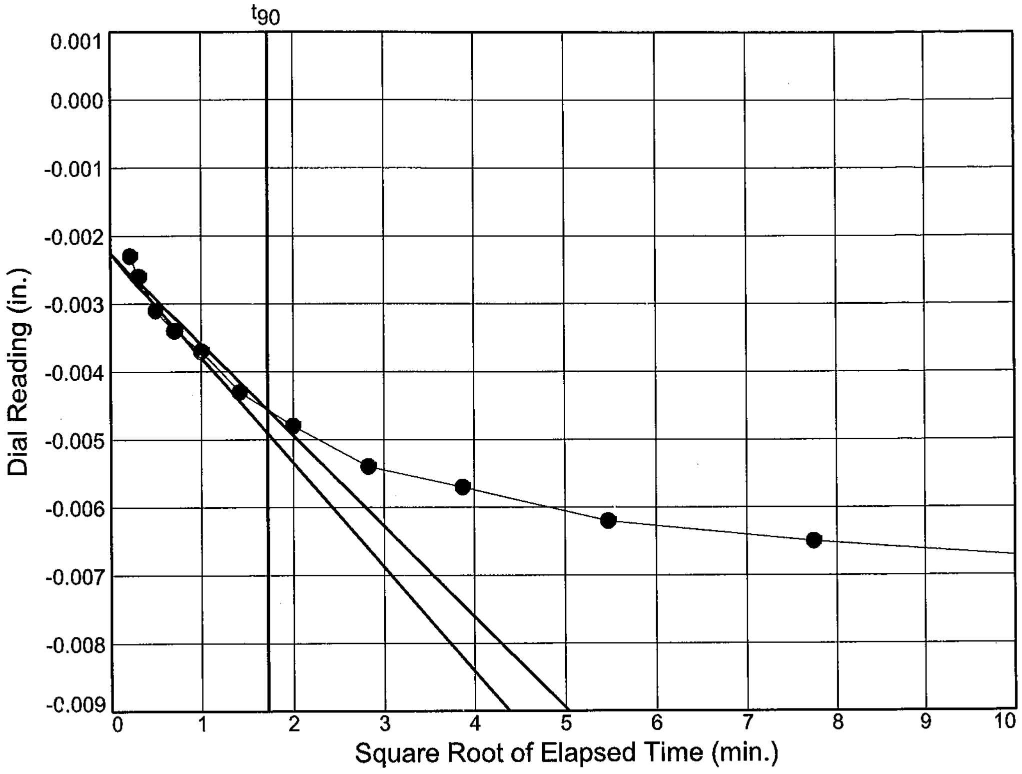
Figure

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical san

Dial Reading vs. Time

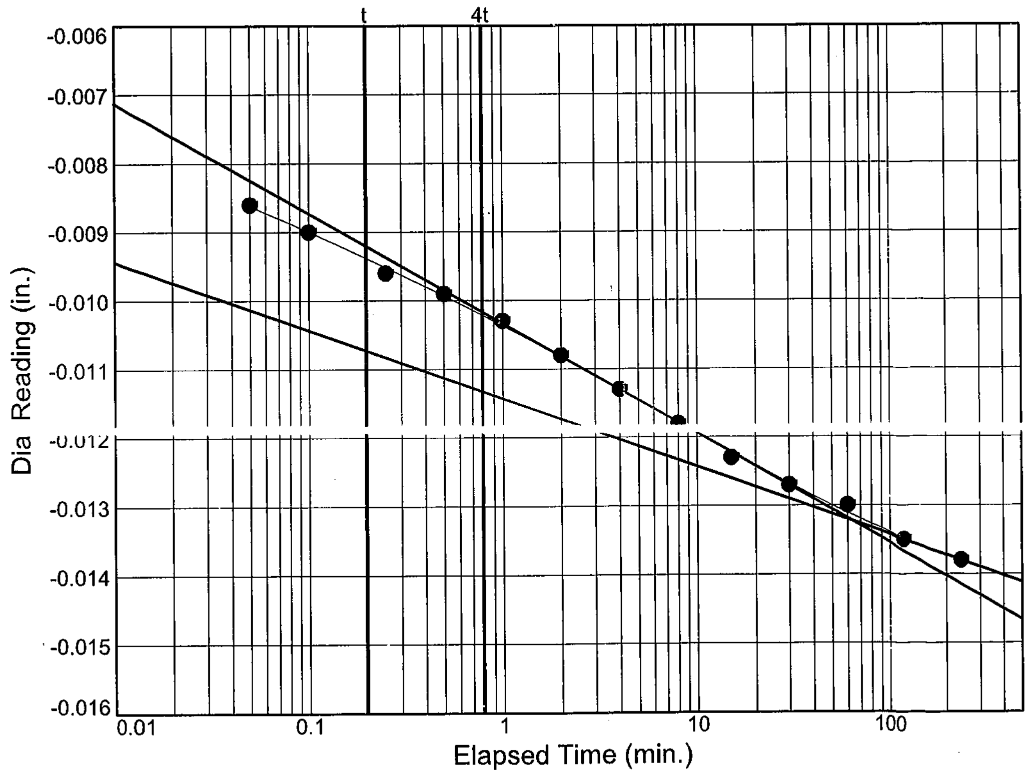
Project No.: P20051
Project: South Market Street Lab Testing

Location: BH-B-01A   Depth: 15-17'   Sample Number: 01A



Load No.= 1
Load= 0.06 tsf
D_0 = -0.0023
D_{90} = -0.0046
D_{100} = -0.0048
T_{90} = 2.95 min.

C_v @ T_{90}
0.713 ft.^{2}/day



Load No.= 2
Load= 0.13 tsf
D_0 = -0.0085
D_{50} = -0.0109
D_{100} = -0.0132
T_{50} = 2.18 min.

C_v @ T_{50}
0.221 ft.^{2}/day

C_α = 0.003

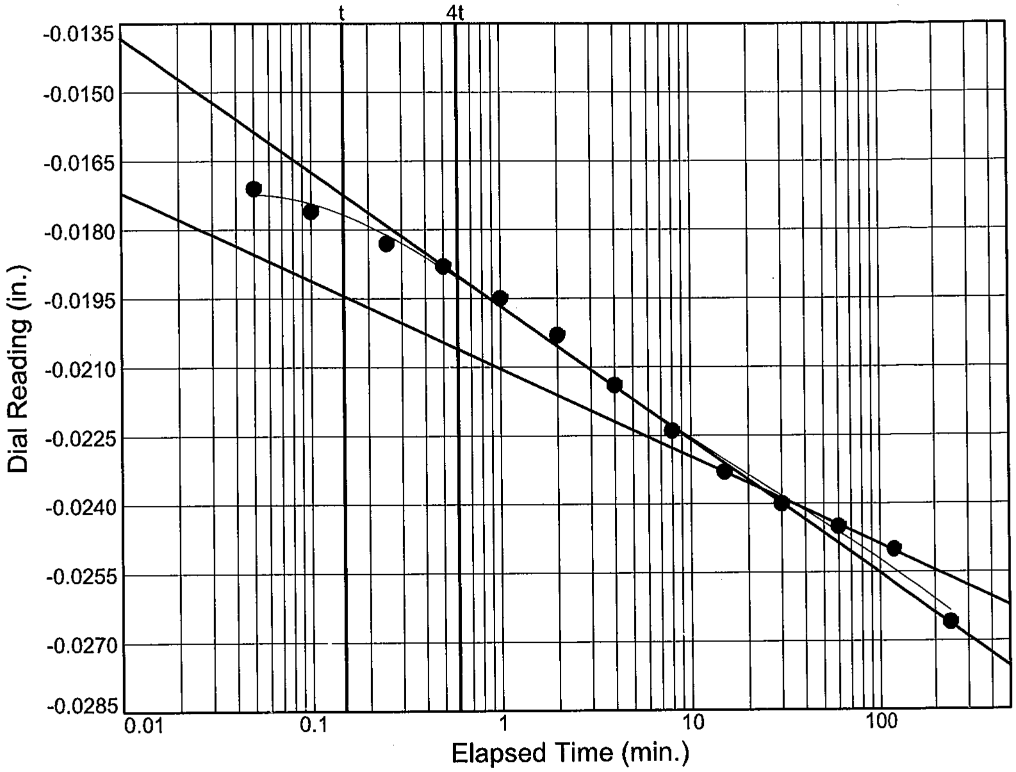
Figure

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Location: BH-B-01A Depth: 15-17' Sample Number: 01A



Load No.= 3

Load= 0.25 tsf

D_0 = -0.0163

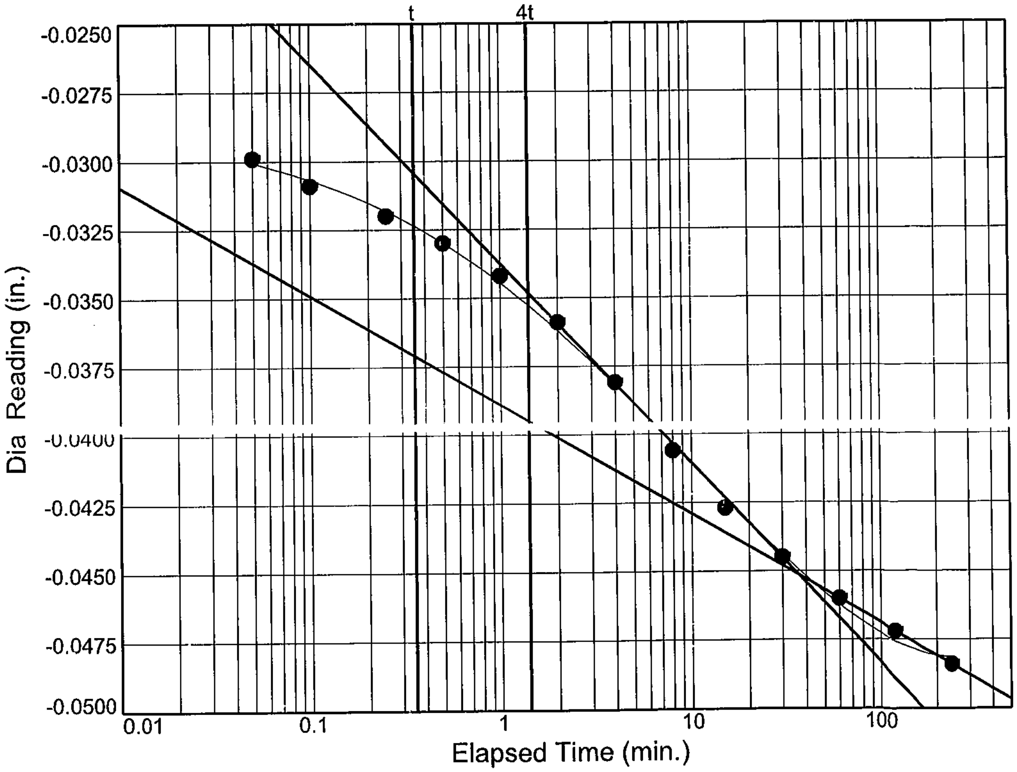
D_{50} = -0.0200

D_{100} = -0.0237

T_{50} = 1.29 min.

C_v @ T_{50}
0.366 ft.^{2}/day

C_α = 0.006



Load No.= 4

Load= 0.50 tsf

D_0 = -0.0294

D_{50} = -0.0373

D_{100} = -0.0451

T_{50} = 2.95 min.

C_v @ T_{50}
0.155 ft.^{2}/day

C_α = 0.012

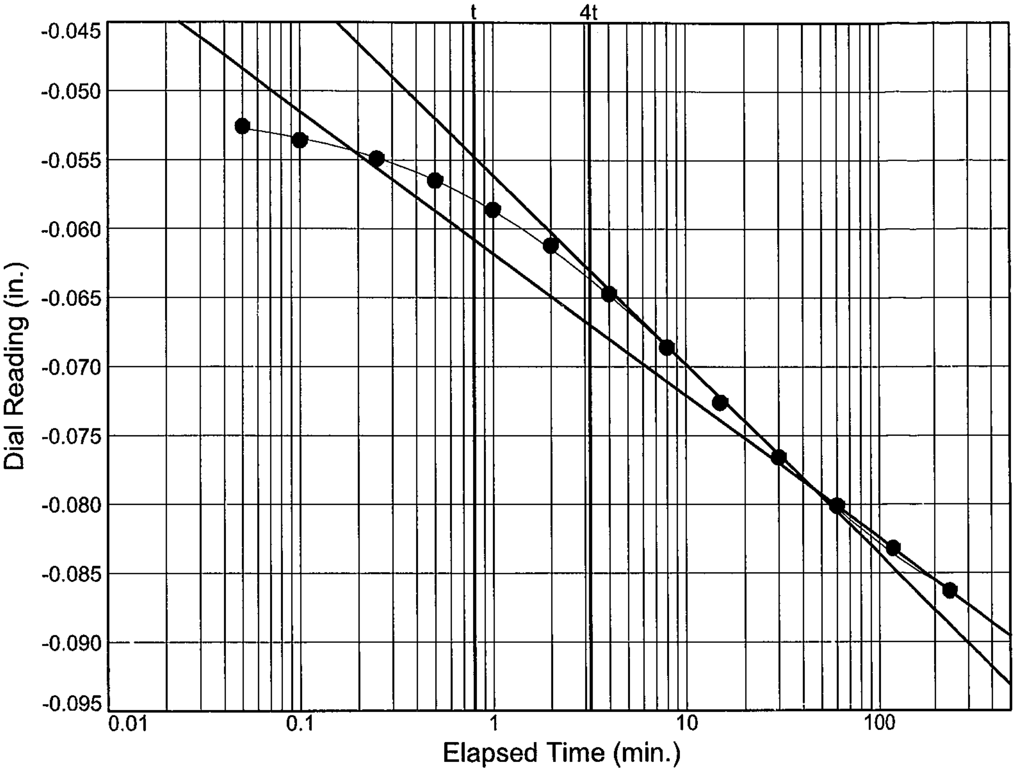
Figure

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Location: BH-B-01A Depth: 15-17' Sample Number: 01A



Load No.= 5

Load= 1.00 tsf

D_0 = -0.0521

D_{50} = -0.0655

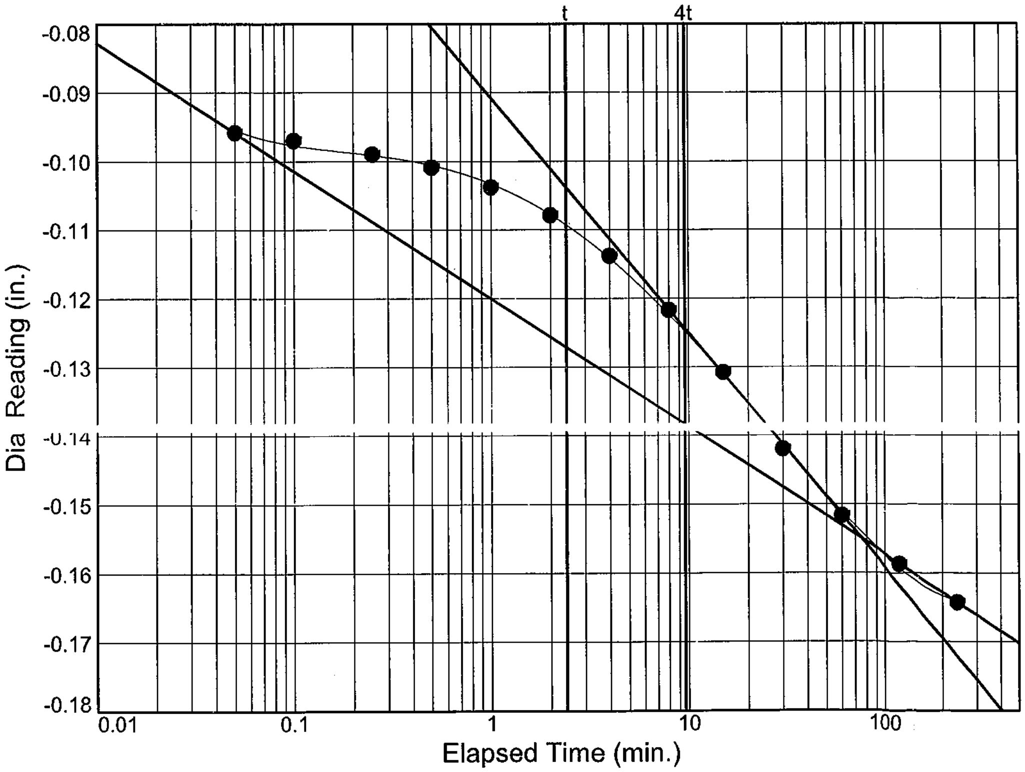
D_{100} = -0.0789

T_{50} = 4.57 min.

C_v @ T_{50}

0.094 ft.^{2}/day

C_α = 0.030



Load No.= 6

Load= 2.00 tsf

D_0 = -0.0937

D_{50} = -0.1243

D_{100} = -0.1549

T_{50} = 9.23 min.

C_v @ T_{50}

0.041 ft.^{2}/day

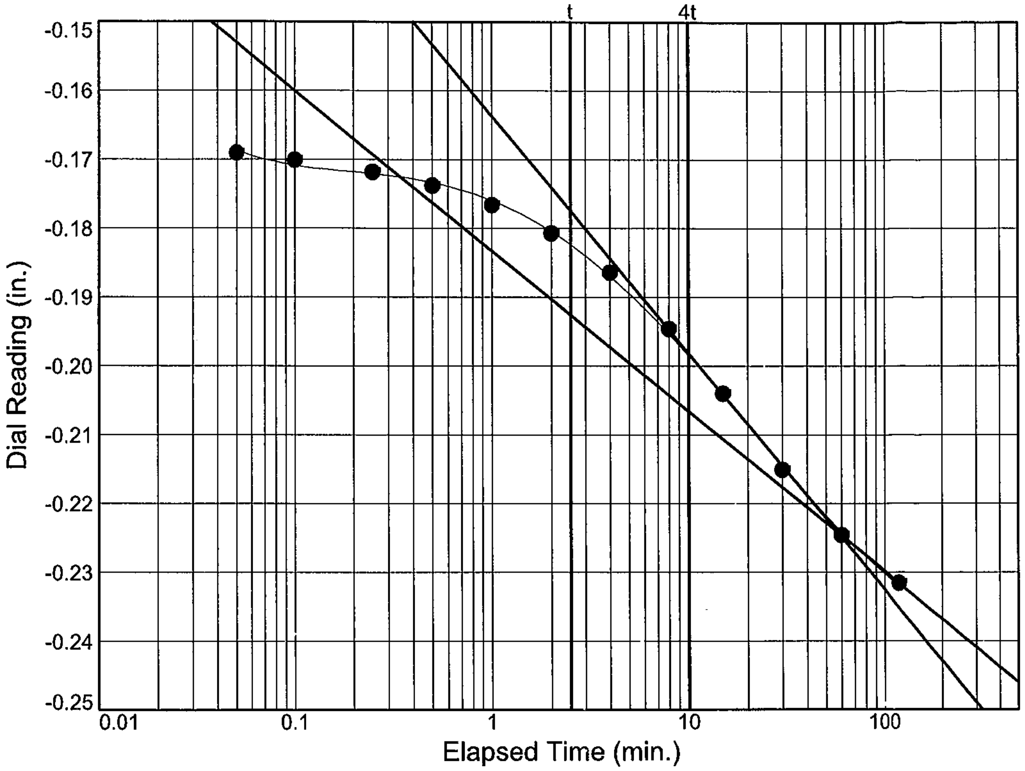
C_α = 0.055

Figure

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

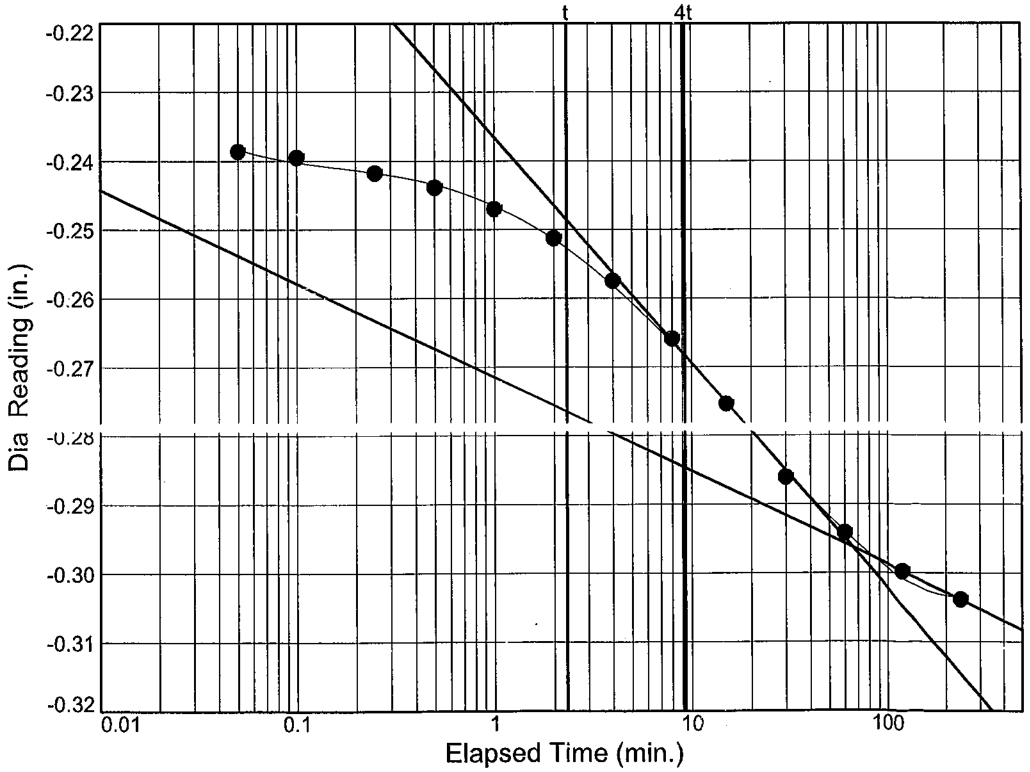
Location: BH-B-01A Depth: 15-17' Sample Number: 01A



Load No.= 7
Load=4.00 tsf
D_0 = -0.1662
D_{50} = -0.1952
D_{100} = -0.2241
T_{50} = 7.89 min.

C_v @ T_{50}
0.040 ft.^{2}/day

C_α = 0.069



Load No.= 8
Load=8.00 tsf
D_0 = -0.2368
D_{50} = -0.2665
D_{100} = -0.2962
T_{50} = 7.98 min.

C_v @ T_{50}
0.033 ft.^{2}/day

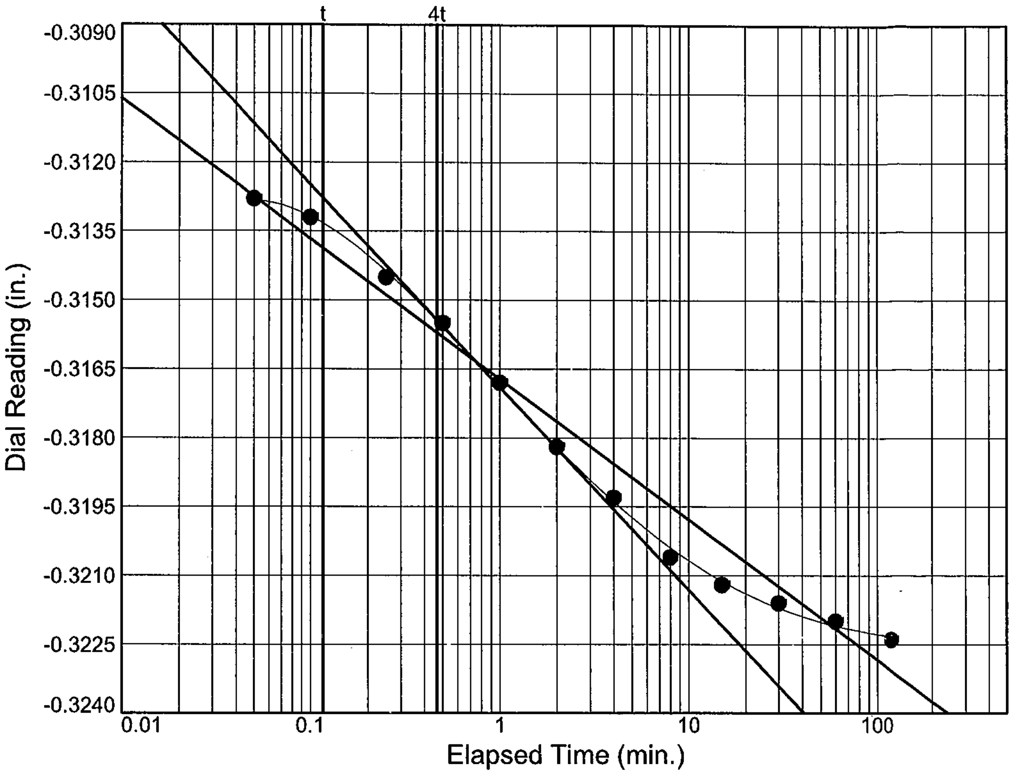
C_α = 0.040

Figure

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Location: BH-B-01A Depth: 15-17' Sample Number: 01A



Load No.= 9
Load= 16.00 tsf
D_0 = -0.3112
D_{50} = -0.3138
D_{100} = -0.3163
T_{50} = 0.17 min.

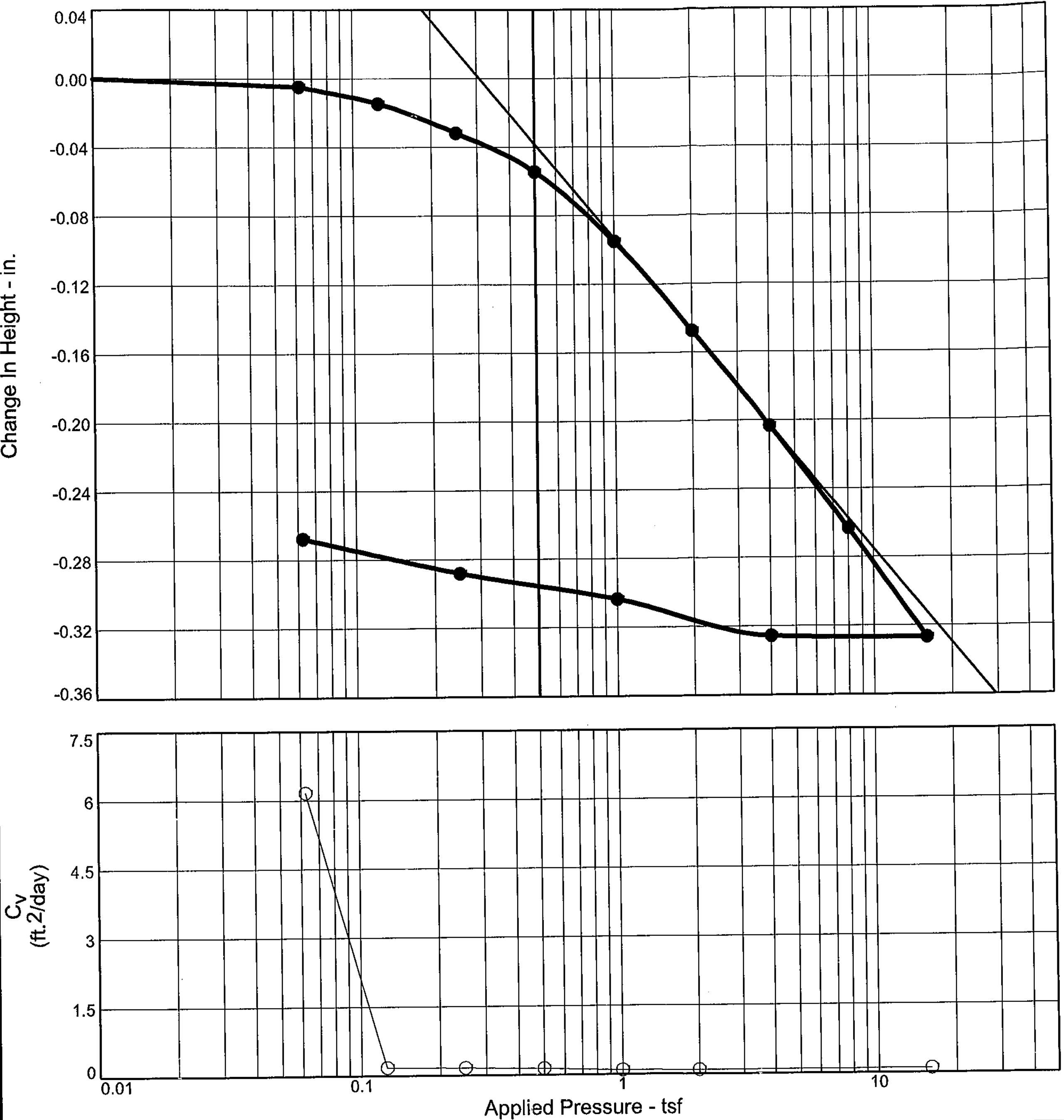
C_v @ T_{50}
1.376 ft.^{2}/day

C_α = 0.009

Figure

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
102.4 %	58.1 %	66.6	65	31	2.7		0.7	0.46	0.06	1.532

MATERIAL DESCRIPTION	USCS	AASHTO
Elastic Silt w/ sand	MH	A-7-5(30)

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

Location: BH-B-03A **Depth:** 15-17' **Sample Number:** 03A

Remarks:

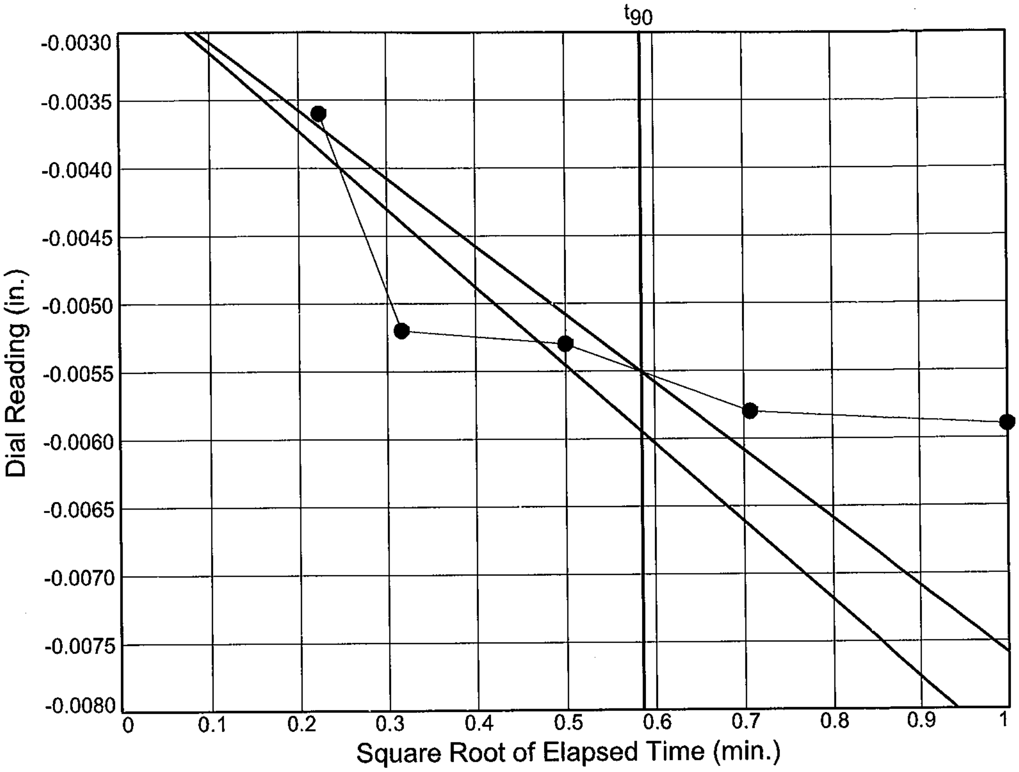
HILLIS-CARNES ENGINEERING ASSOCIATES, INC.
Annapolis Junction, MD

Figure

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Location: BH-B-03A Depth: 15-17' Sample Number: 03A



Load No.= 1

Load= 0.06 tsf

D_0 = -0.0026

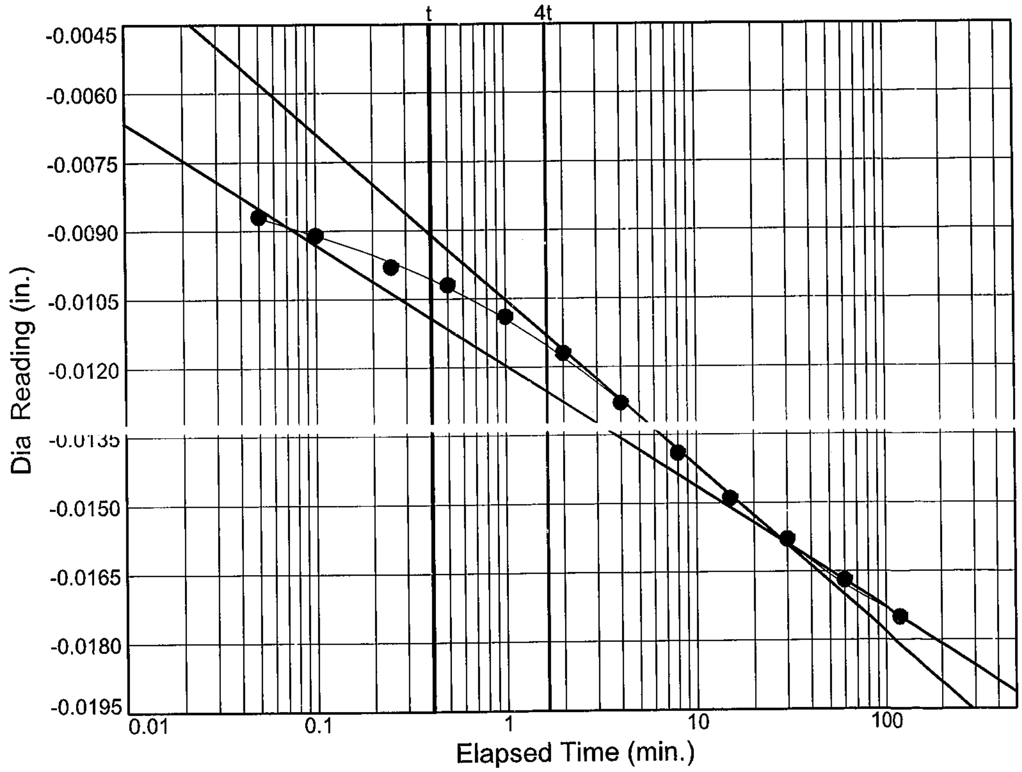
D_{90} = -0.0055

D_{100} = -0.0058

T_{90} = 0.34 min.

C_v @ T_{90}

6.164 ft.^{2}/day



Load No.= 2

Load= 0.13 tsf

D_0 = -0.0086

D_{50} = -0.0122

D_{100} = -0.0159

T_{50} = 2.79 min.

C_v @ T_{50}

0.173 ft.^{2}/day

C_α = 0.007

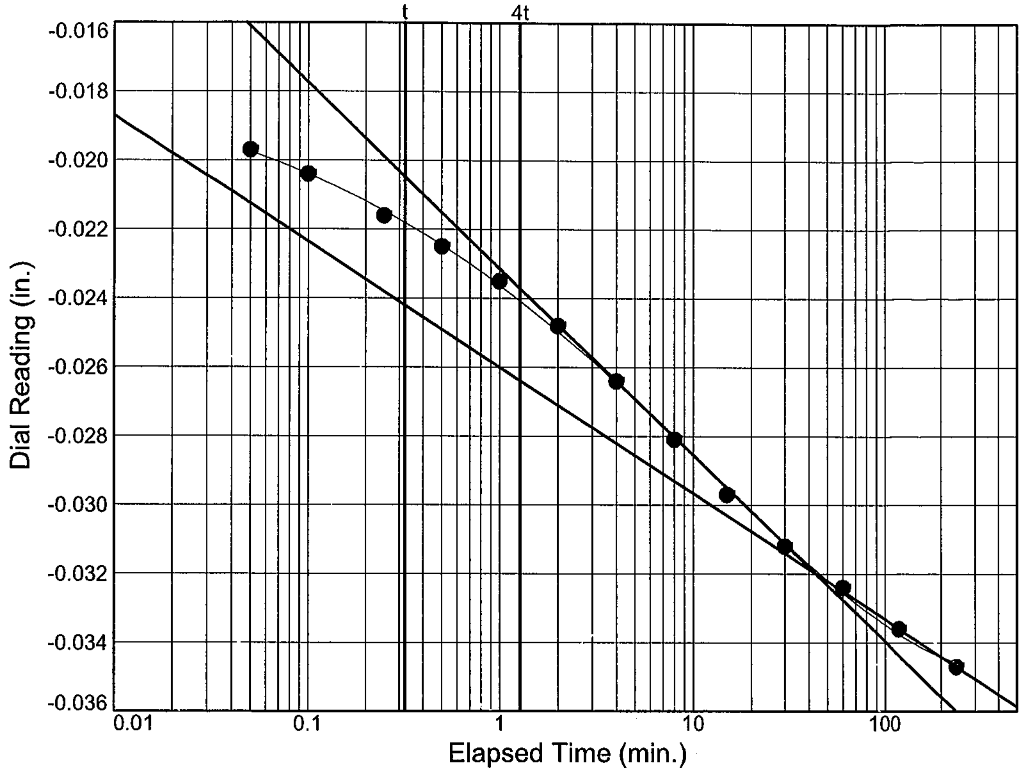
Figure

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Location: BH-B-03A Depth: 15-17' Sample Number: 03A



Load No.= 3

Load= 0.25 tsf

D_0 = -0.0195

D_{50} = -0.0257

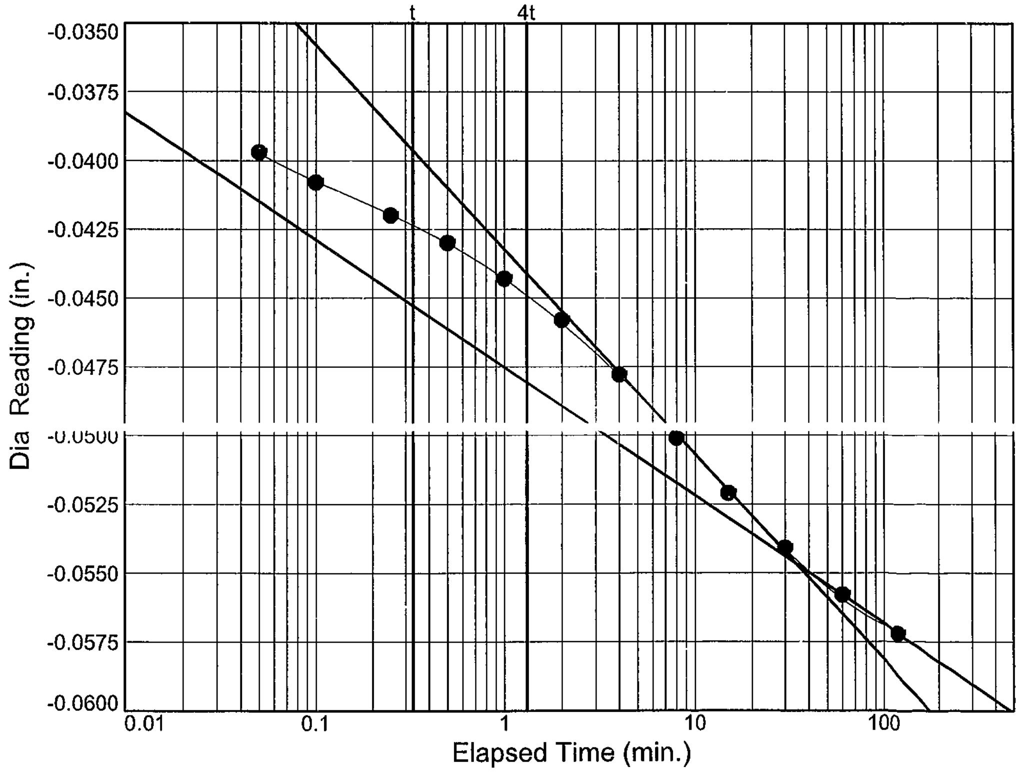
D_{100} = -0.0320

T_{50} = 2.90 min.

C_v @ T_{50}

0.162 ft.^{2}/day

C_α = 0.009



Load No.= 4

Load= 0.50 tsf

D_0 = -0.0398

D_{50} = -0.0472

D_{100} = -0.0547

T_{50} = 3.26 min.

C_v @ T_{50}

0.138 ft.^{2}/day

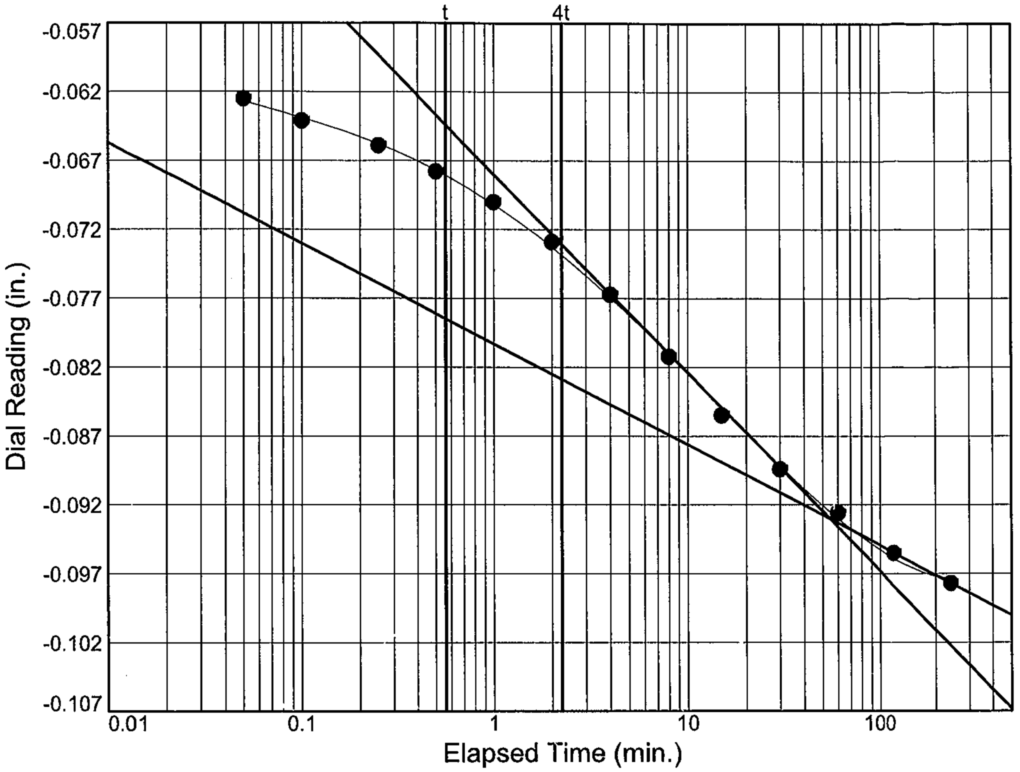
C_α = 0.012

Figure

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Location: BH-B-03A Depth: 15-17' Sample Number: 03A



Load No.= 5

Load= 1.00 tsf

D_0 = -0.0623

D_{50} = -0.0776

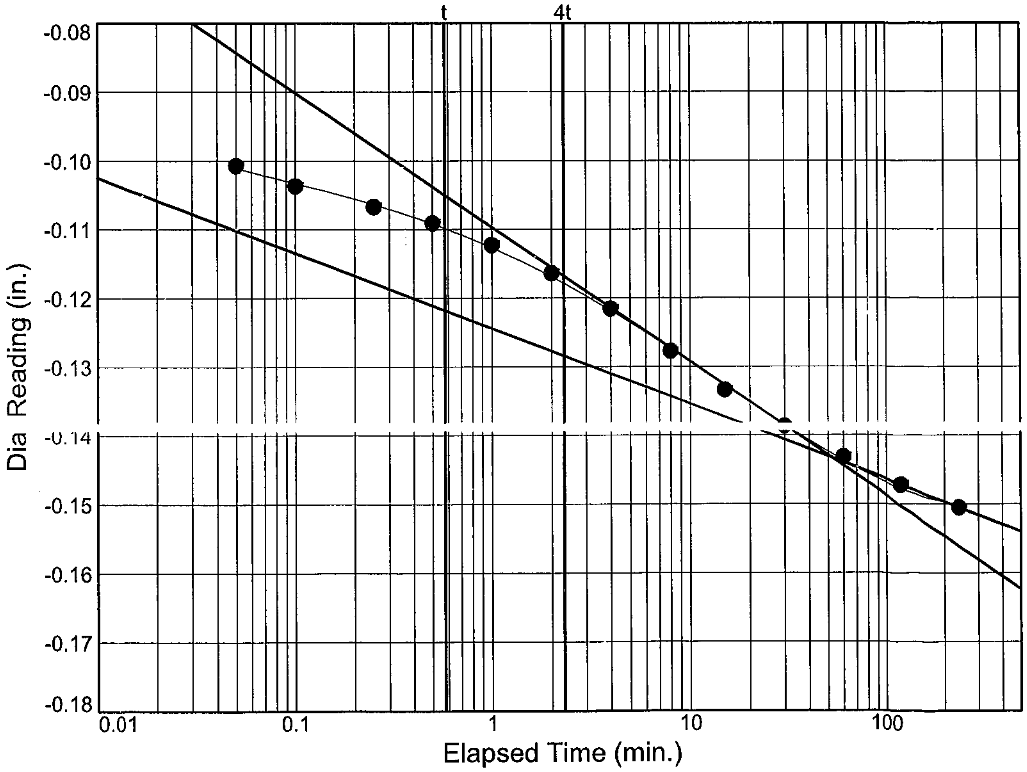
D_{100} = -0.0930

T_{50} = 4.54 min.

C_v @ T_{50}

0.093 ft.^{2}/day

C_α = 0.019



Load No.= 6

Load= 2.00 tsf

D_0 = -0.1018

D_{50} = -0.1225

D_{100} = -0.1432

T_{50} = 4.37 min.

C_v @ T_{50}

0.087 ft.^{2}/day

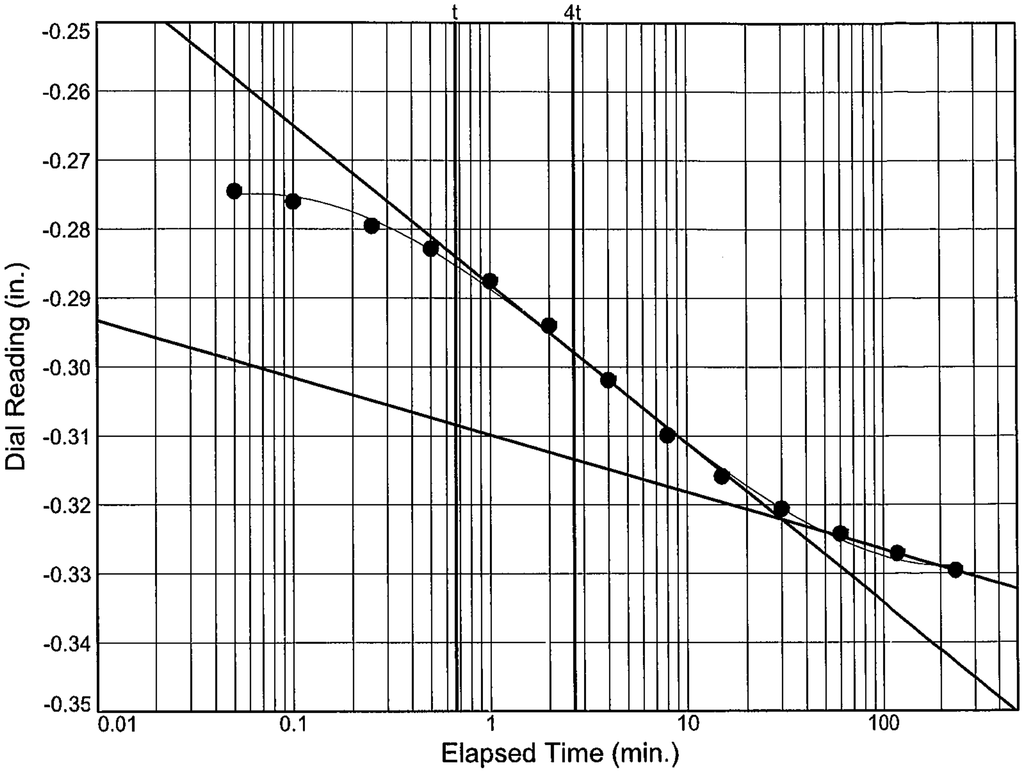
C_α = 0.028

Figure

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Location: BH-B-03A Depth: 15-17' Sample Number: 03A



Load No.= 9

Load= 16.00 tsf

D_0 = -0.2725

D_{50} = -0.2973

D_{100} = -0.3221

T_{50} = 2.53 min.

C_v @ T_{50}
0.096 ft.^{2}/day

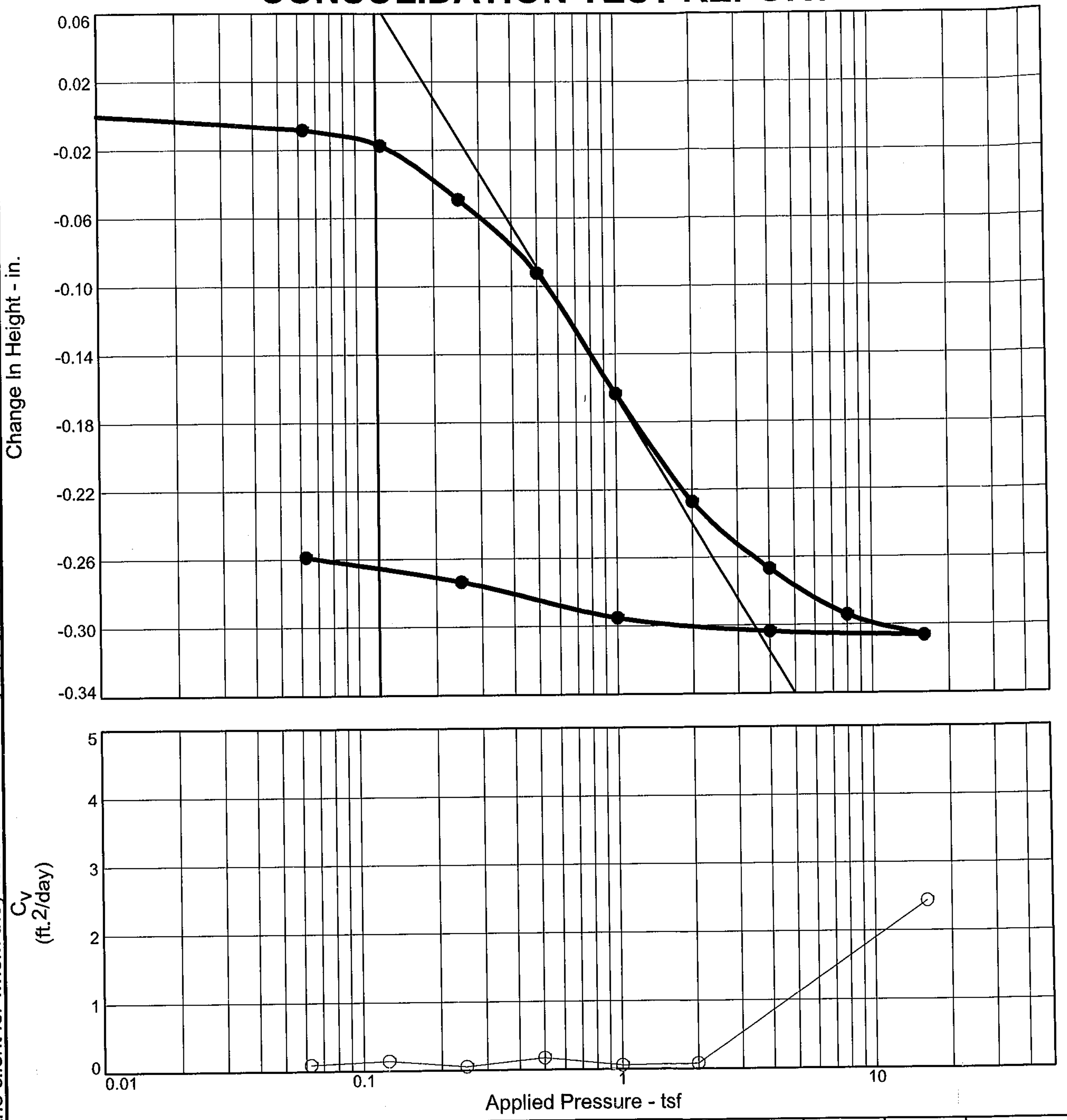
C_α = 0.021

Figure

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical sam

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
78.4 %	60.9 %	54.5	83	42	2.7		0.3	0.78	0.06	2.096

MATERIAL DESCRIPTION	USCS	AASHTO
Elastic Silt w/ sand	MH	A-7-5(42)

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

Location: BH-B-04 **Depth:** 21.5-23.5' **Sample Number:** 04

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

Annapolis Junction, MD

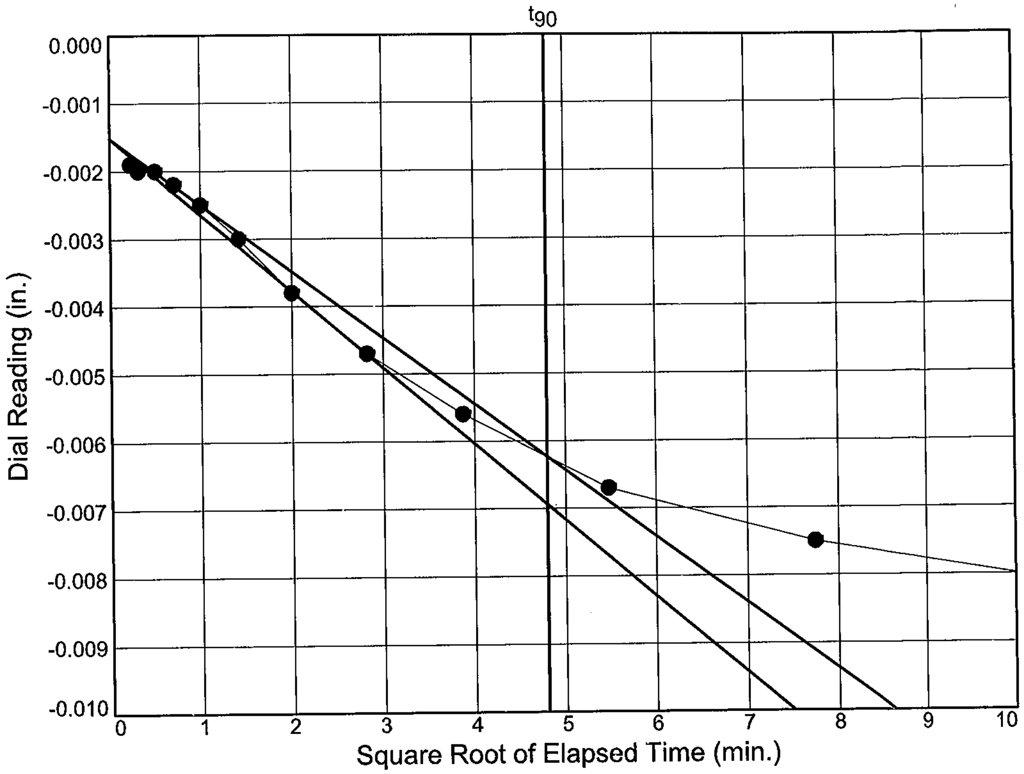
Remarks:

Figure

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Location: BH-B-04 Depth: 21.5-23.5' Sample Number: 04



Load No.= 1

Load= 0.06 tsf

D_0 = -0.0015

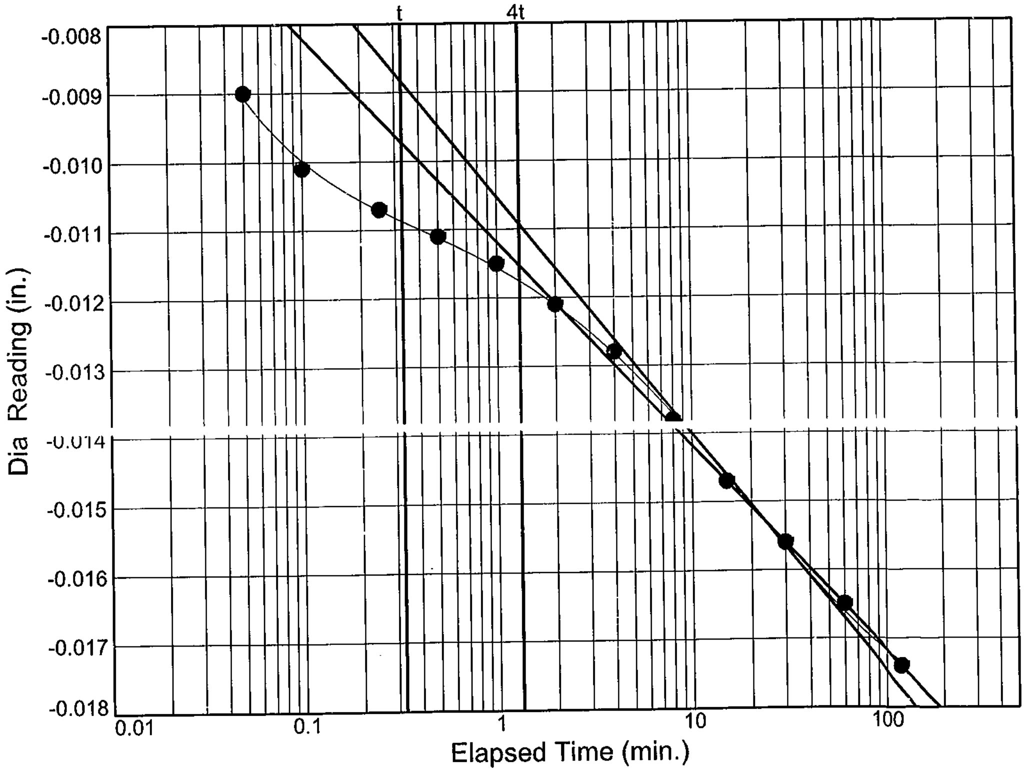
D_{90} = -0.0062

D_{100} = -0.0068

T_{90} = 23.07 min.

C_v @ T_{90}

0.091 ft.^{2}/day



Load No.= 2

Load= 0.13 tsf

D_0 = -0.0100

D_{50} = -0.0126

D_{100} = -0.0153

T_{50} = 3.34 min.

C_v @ T_{50}

0.144 ft.^{2}/day

C_α = 0.009

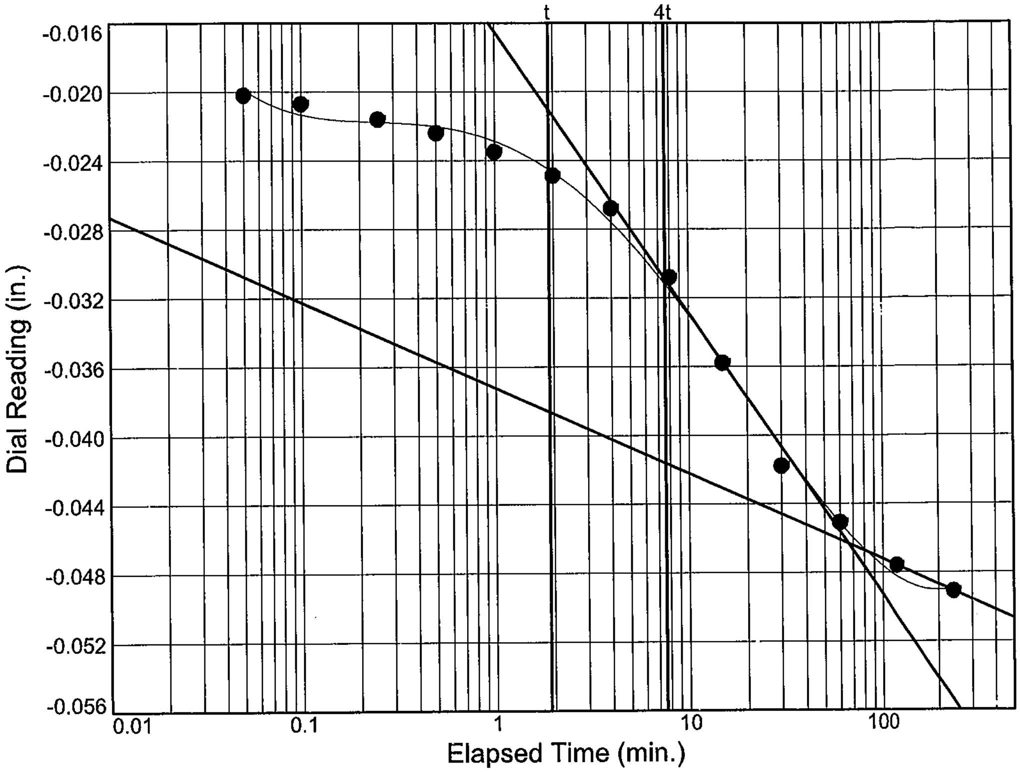
Figure

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

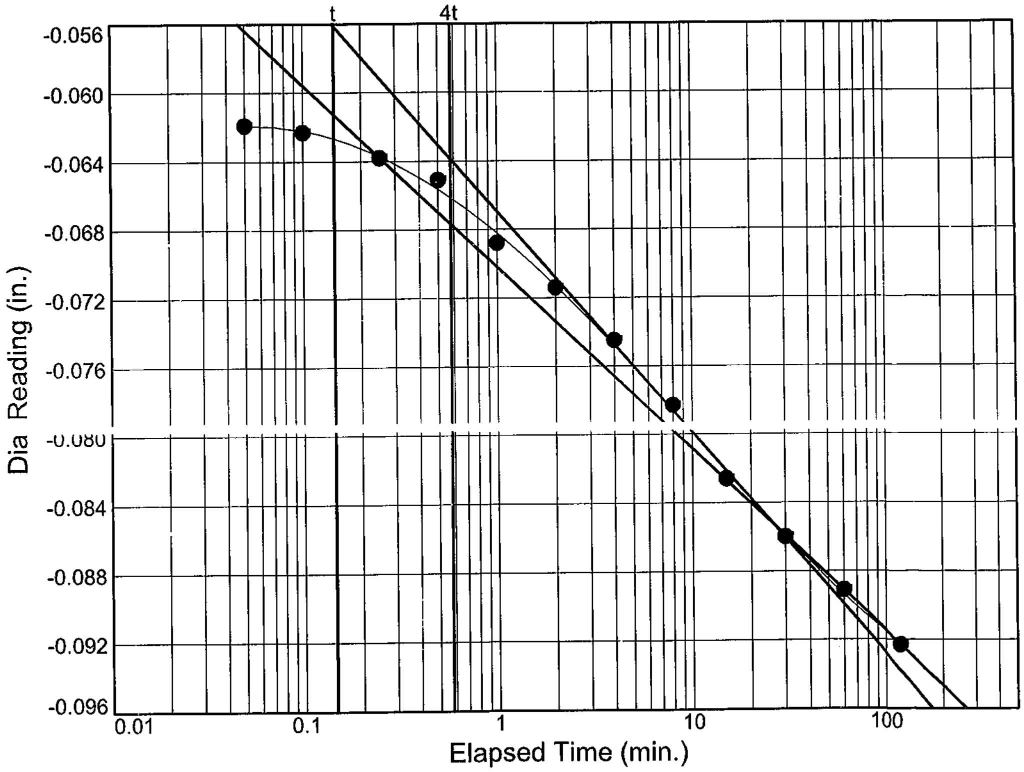
Location: BH-B-04 Depth: 21.5-23.5' Sample Number: 04



Load No.= 3
Load= 0.25 tsf
D_0 = -0.0178
D_{50} = -0.0321
D_{100} = -0.0463
T_{50} = 8.70 min.

C_v @ T_{50}
0.053 ft.^{2}/day

C_α = 0.015



Load No.= 4
Load= 0.50 tsf
D_0 = -0.0592
D_{50} = -0.0723
D_{100} = -0.0853
T_{50} = 2.43 min.

C_v @ T_{50}
0.174 ft.^{2}/day

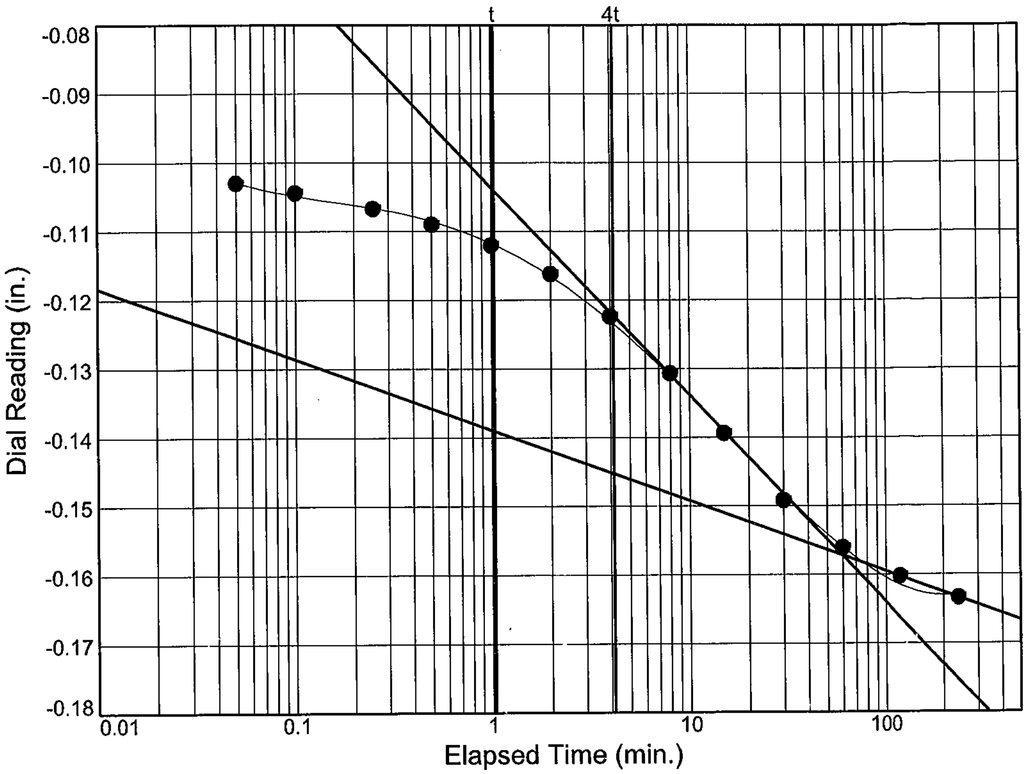
C_α = 0.033

Figure

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Location: BH-B-04 Depth: 21.5-23.5' Sample Number: 04



Load No.= 5

Load= 1.00 tsf

D_0 = -0.1004

D_{50} = -0.1288

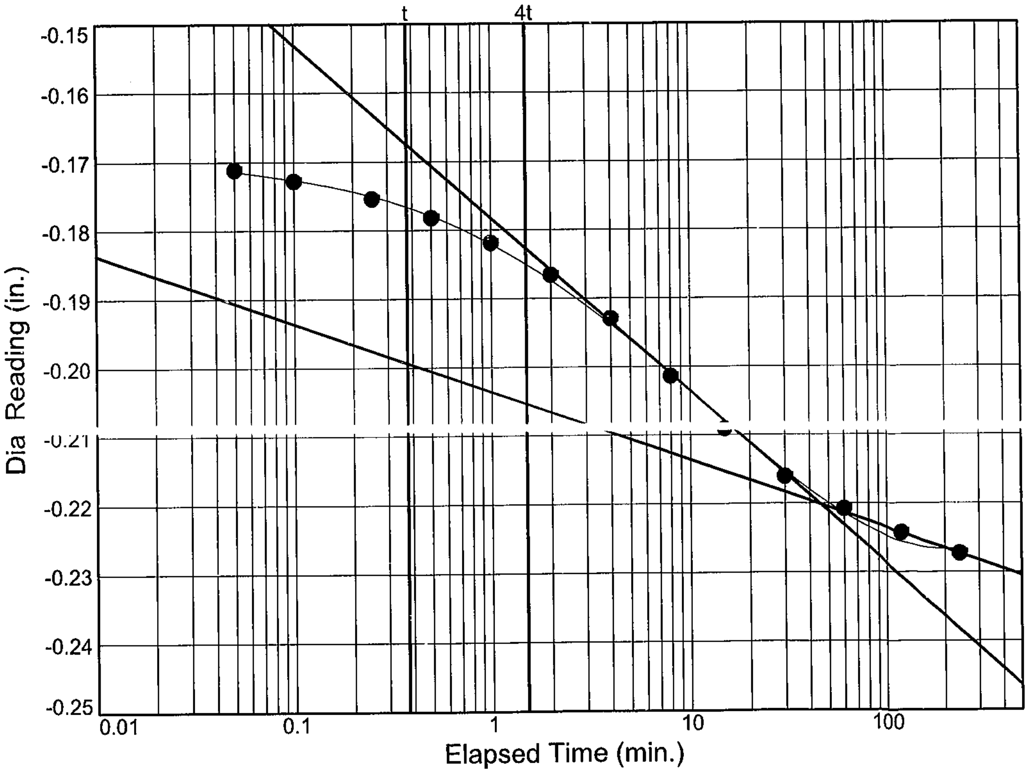
D_{100} = -0.1572

T_{50} = 6.63 min.

C_v @ T_{50}

0.056 ft.^{2}/day

C_α = 0.032



Load No.= 6

Load= 2.00 tsf

D_0 = -0.1682

D_{50} = -0.1941

D_{100} = -0.2201

T_{50} = 4.13 min.

C_v @ T_{50}

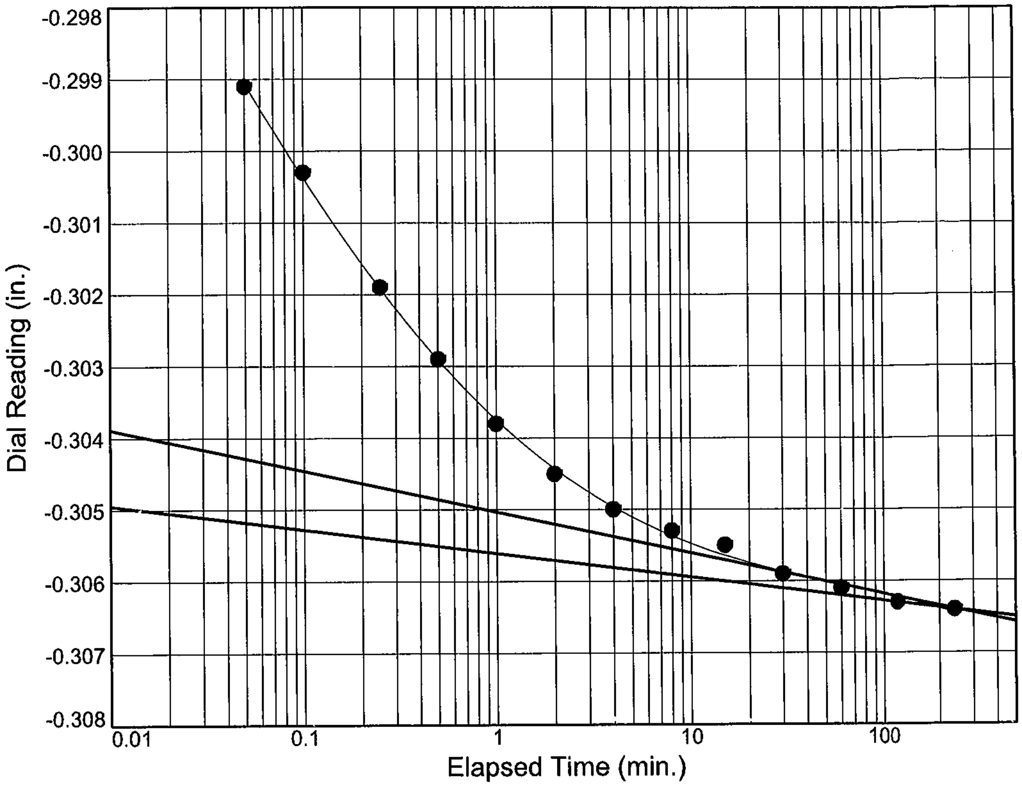
0.078 ft.^{2}/day

C_α = 0.031

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Location: BH-B-04 Depth: 21.5-23.5' Sample Number: 04



Load No.= 9

Load= 16.00 tsf

D_0 = -0.2943

D_{50} = -0.3004

D_{100} = -0.3064

T_{50} = 0.10 min.

C_v @ T_{50}

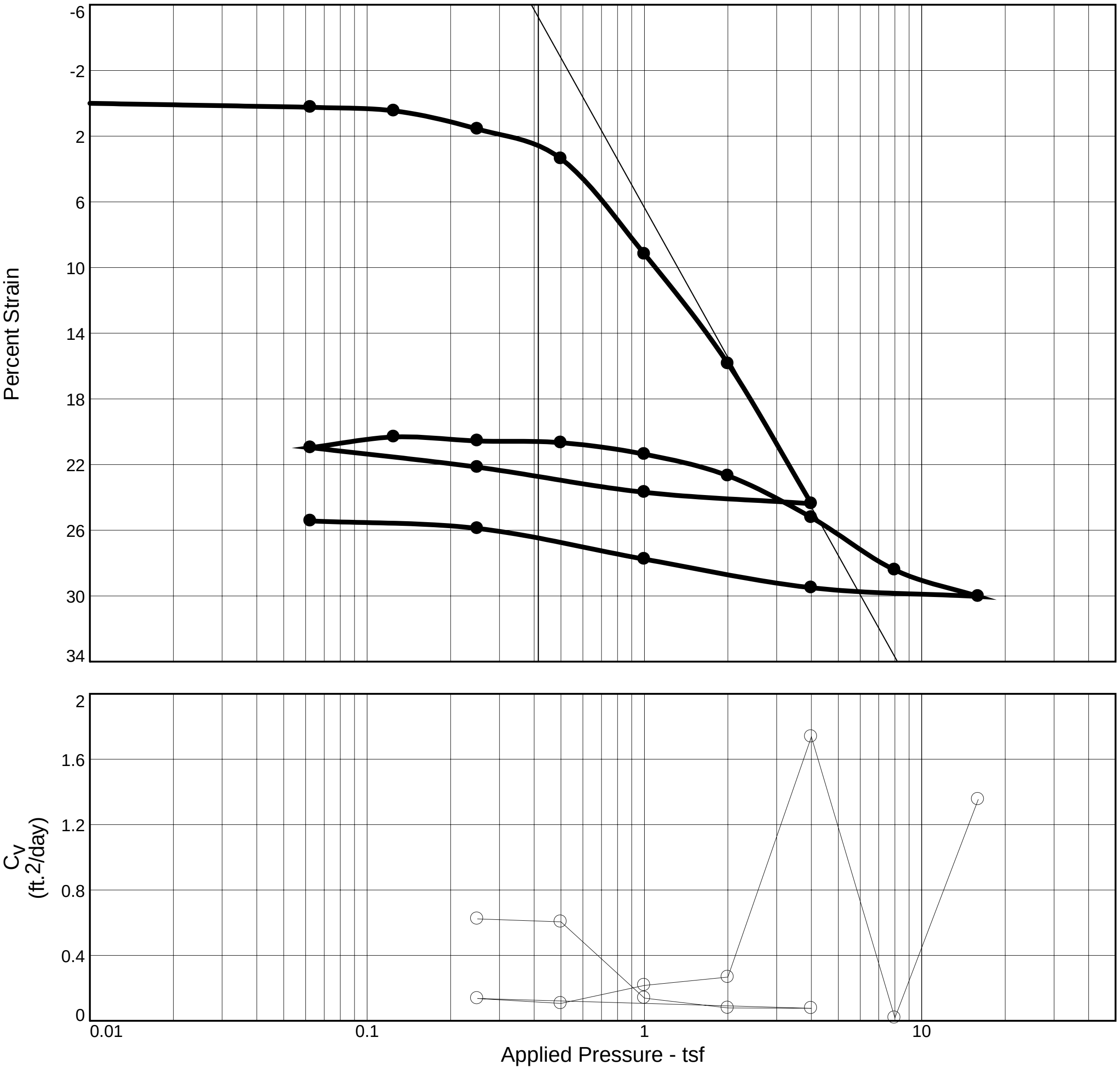
2.439 ft.^{2}/day

C_α = 0.001

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
81.3 %	43.7 %	68.3	80	47	2.65		0.8	0.73	0.06	1.424

MATERIAL DESCRIPTION	**USCS**	**AASHTO**
Black fat clay	CH	A-7-5(56)

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

Source of Sample: EMB-B-01 **Depth:** 13-15 **Sample Number:** T-1

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Remarks:

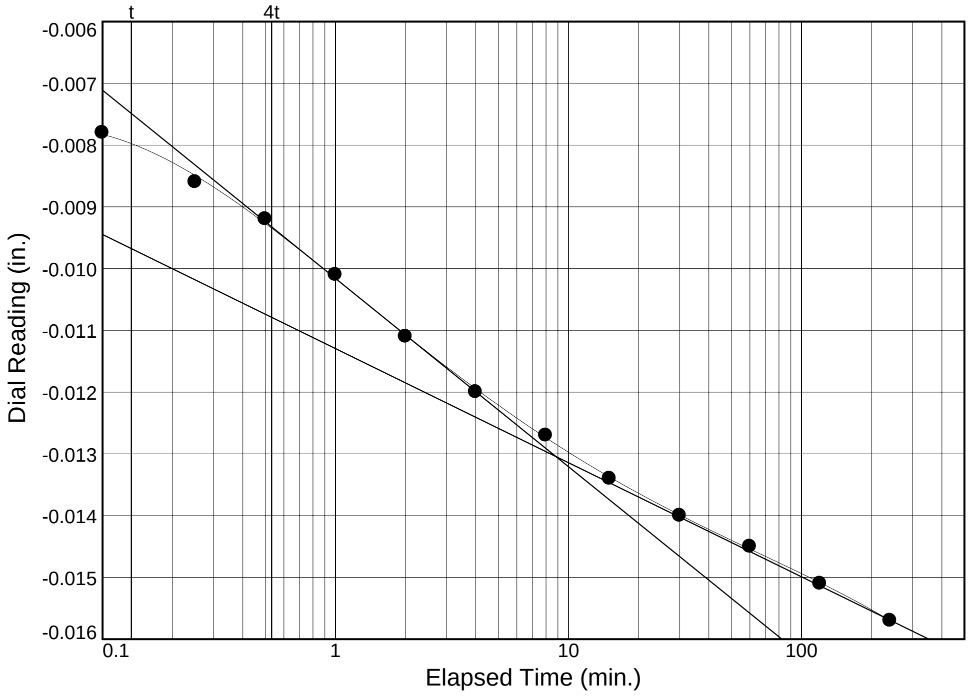
Figure

Tested By: cs

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

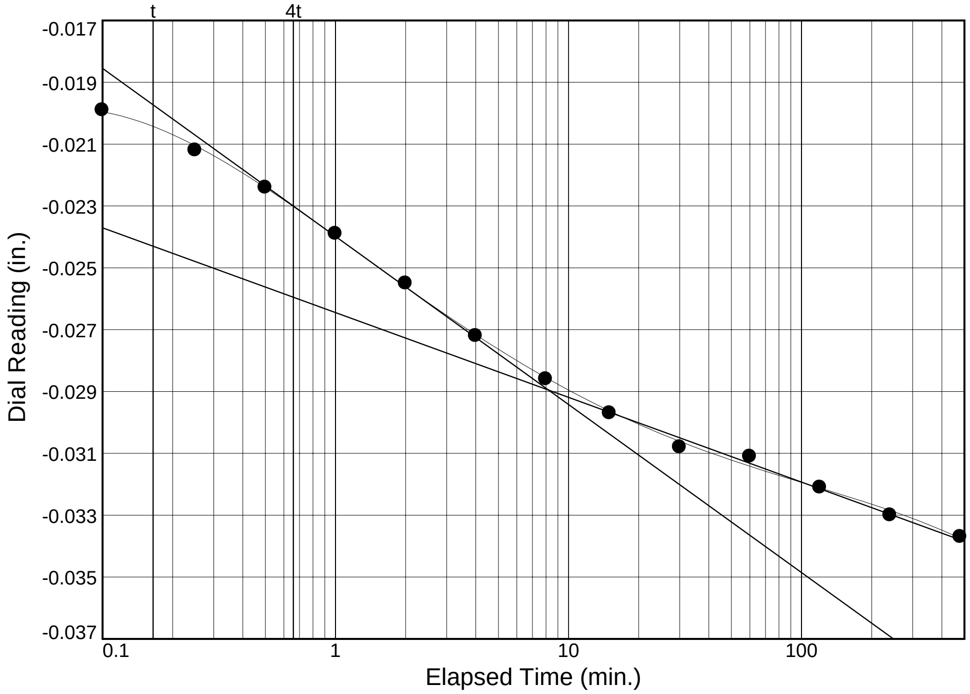
Source of Sample: EMB-B-01 Depth: 13-15 Sample Number: T-1



Load No.= 3
Load= 0.25 tsf
D_0 = -0.0066
D_{50} = -0.0098
D_{100} = -0.0130
T_{50} = 0.77 min.

C_v @ T_{50}
0.624 ft.^2/day

C_α = 0.004



Load No.= 4
Load= 0.50 tsf
D_0 = -0.0178
D_{50} = -0.0234
D_{100} = -0.0290
T_{50} = 0.77 min.

C_v @ T_{50}
0.605 ft.^2/day

C_α = 0.007

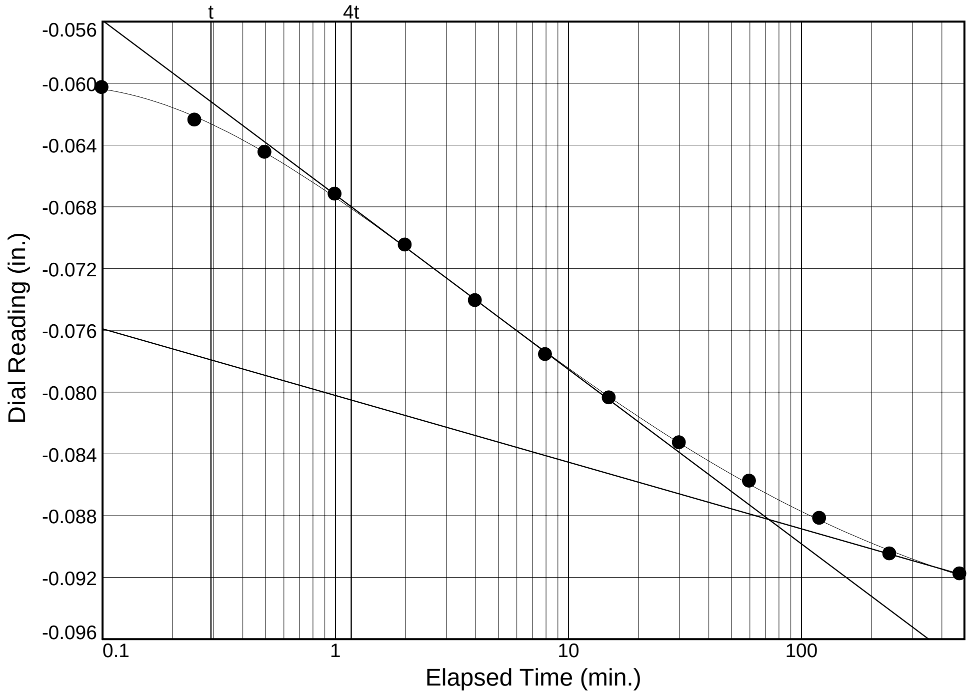
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

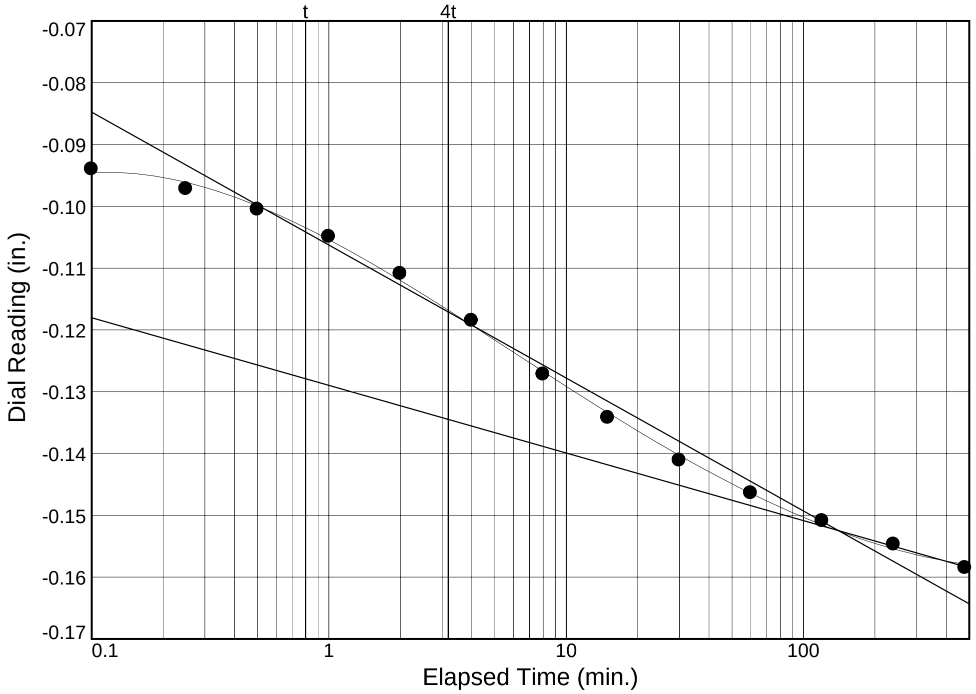
Source of Sample: EMB-B-01 Depth: 13-15 Sample Number: T-1



Load No.= 5
Load= 1.00 tsf
D_0 = -0.0571
D_{50} = -0.0727
D_{100} = -0.0883
T_{50} = 3.05 min.

C_v @ T_{50}
0.139 ft.^{2}/day

C_α = 0.010



Load No.= 6
Load= 2.00 tsf
D_0 = -0.0901
D_{50} = -0.1213
D_{100} = -0.1525
T_{50} = 4.83 min.

C_v @ T_{50}
0.079 ft.^{2}/day

C_α = 0.027

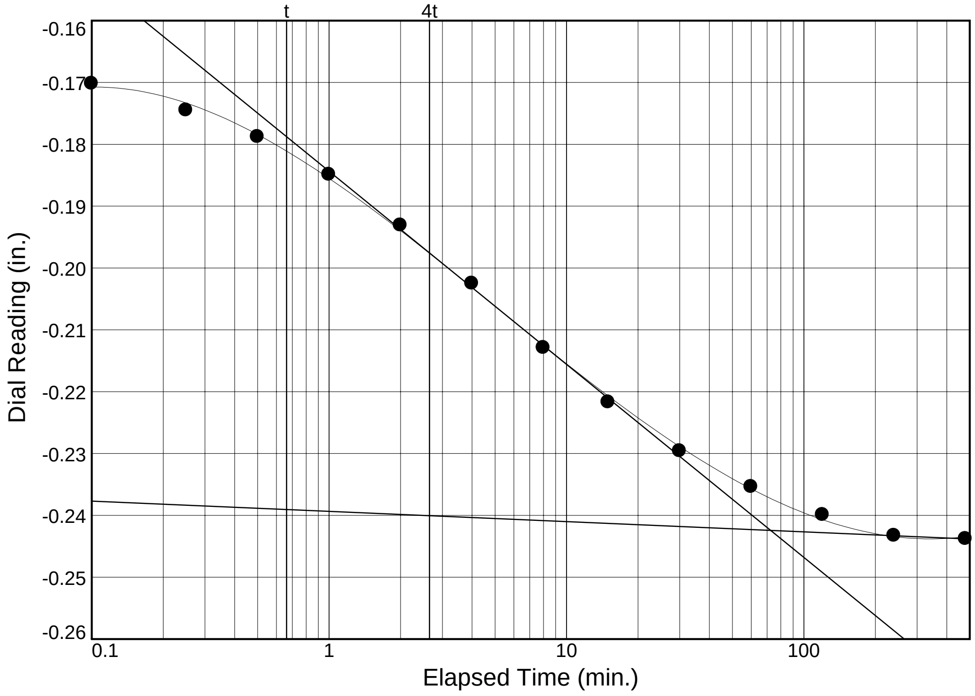
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

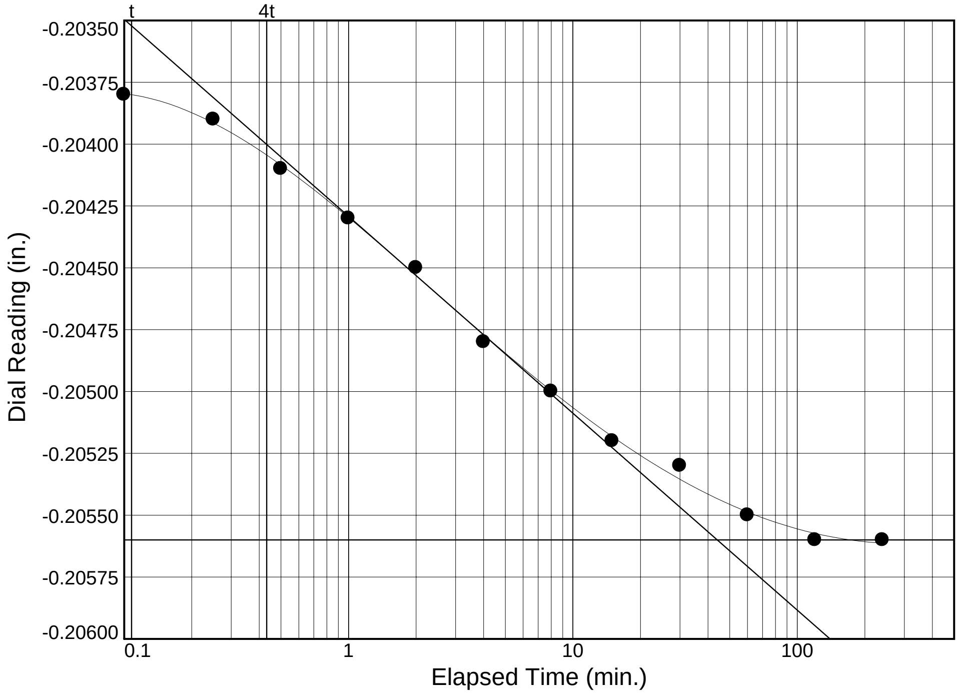
Source of Sample: EMB-B-01 Depth: 13-15 Sample Number: T-1



Load No.= 7
Load= 4.00 tsf
D_0 = -0.1646
D_{50} = -0.2035
D_{100} = -0.2424
T_{50} = 4.10 min.

C_v @ T_{50}
0.076 ft.^{2}/day

C_α = 0.004



Load No.= 12
Load= 0.25 tsf
D_0 = -0.2036
D_{50} = -0.2046
D_{100} = -0.2056
T_{50} = 2.29 min.

C_v @ T_{50}
0.136 ft.^{2}/day

C_α = 0.000

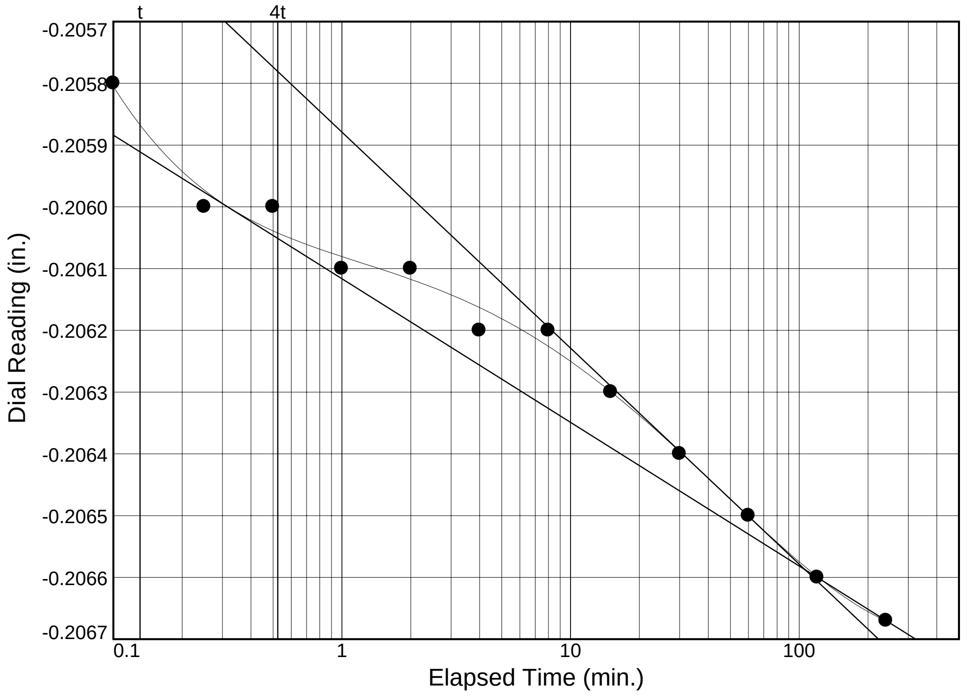
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: EMB-B-01 Depth: 13-15 Sample Number: T-1



Load No.= 13

Load= 0.50 tsf

D_0 = -0.2057

D_{50} = -0.2061

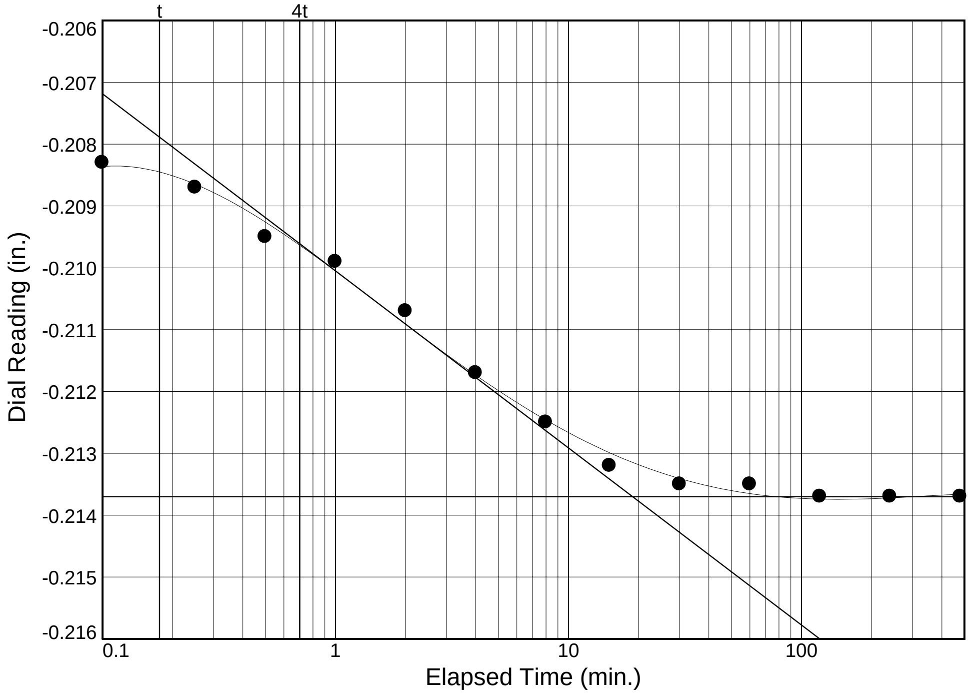
D_{100} = -0.2066

T_{50} = 2.90 min.

C_v @ T_{50}

0.107 ft.^{2}/day

C_α = 0.001



Load No.= 14

Load= 1.00 tsf

D_0 = -0.2073

D_{50} = -0.2105

D_{100} = -0.2137

T_{50} = 1.42 min.

C_v @ T_{50}

0.217 ft.^{2}/day

C_α = 0.000

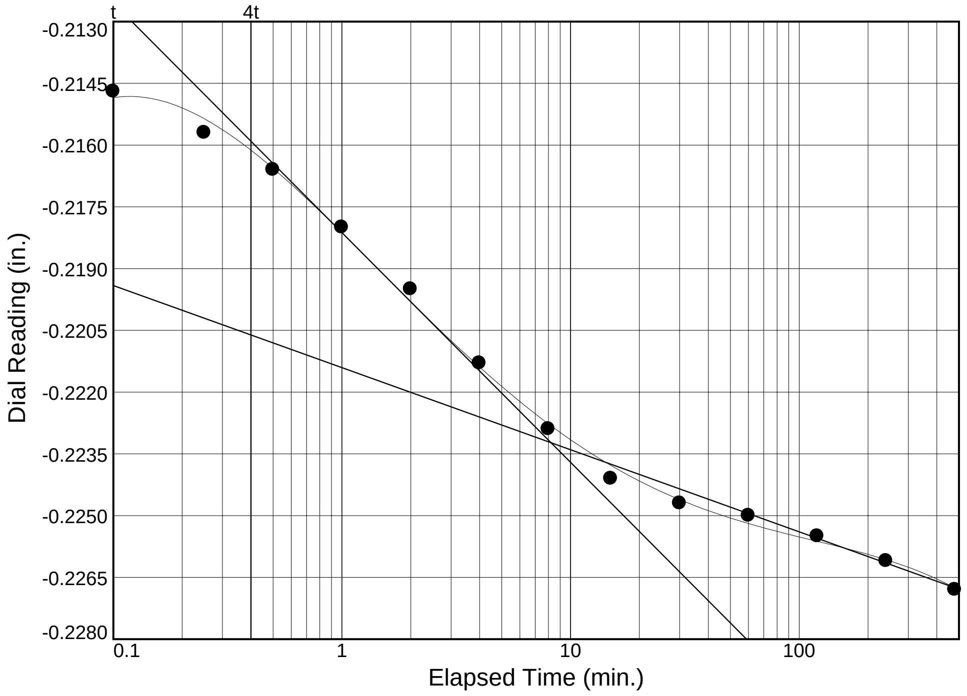
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: EMB-B-01 Depth: 13-15 Sample Number: T-1



Load No.= 15

Load= 2.00 tsf

D_0 = -0.2136

D_{50} = -0.2184

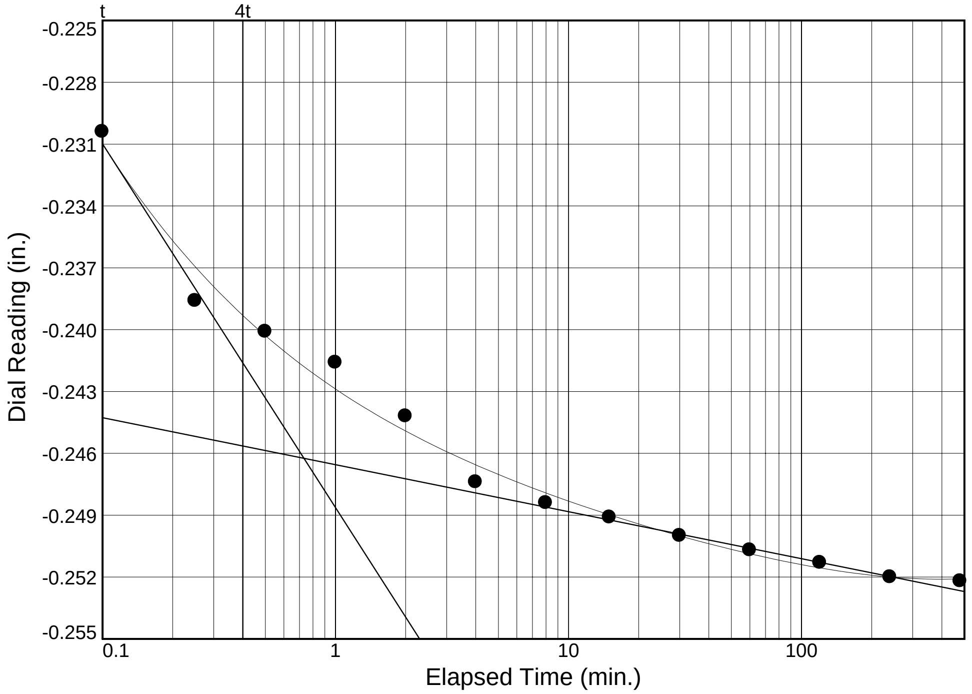
D_{100} = -0.2232

T_{50} = 1.12 min.

C_v @ T_{50}

0.267 ft.^{2}/day

C_α = 0.005



Load No.= 16

Load= 4.00 tsf

D_0 = -0.2227

D_{50} = -0.2345

D_{100} = -0.2462

T_{50} = 0.16 min.

C_v @ T_{50}

1.737 ft.^{2}/day

C_α = 0.006

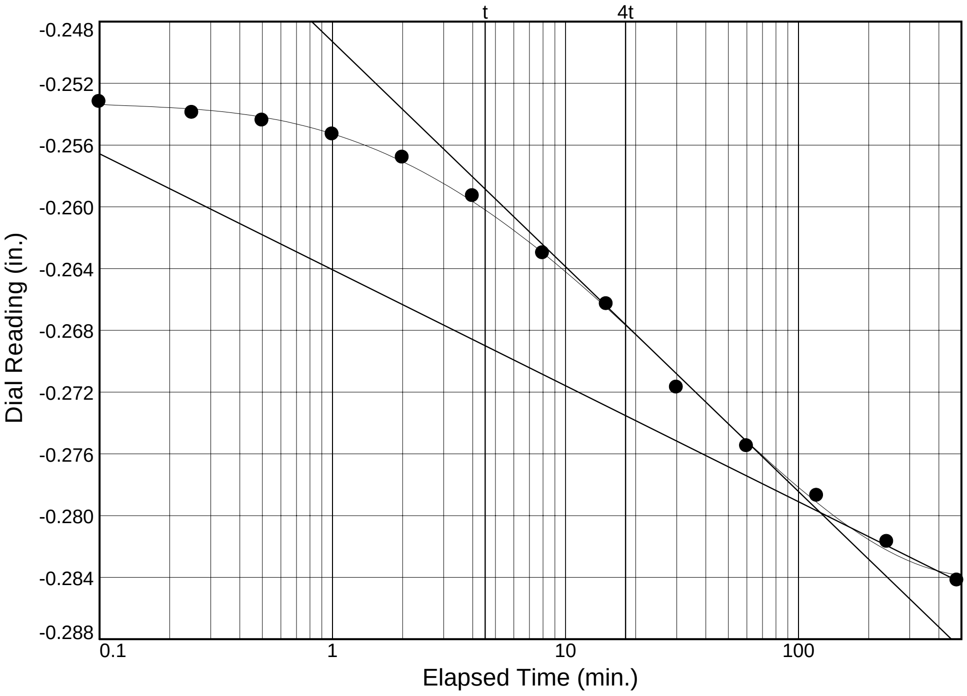
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: EMB-B-01 Depth: 13-15 Sample Number: T-1



Load No.= 17

Load= 8.00 tsf

D_0 = -0.2527

D_{50} = -0.2663

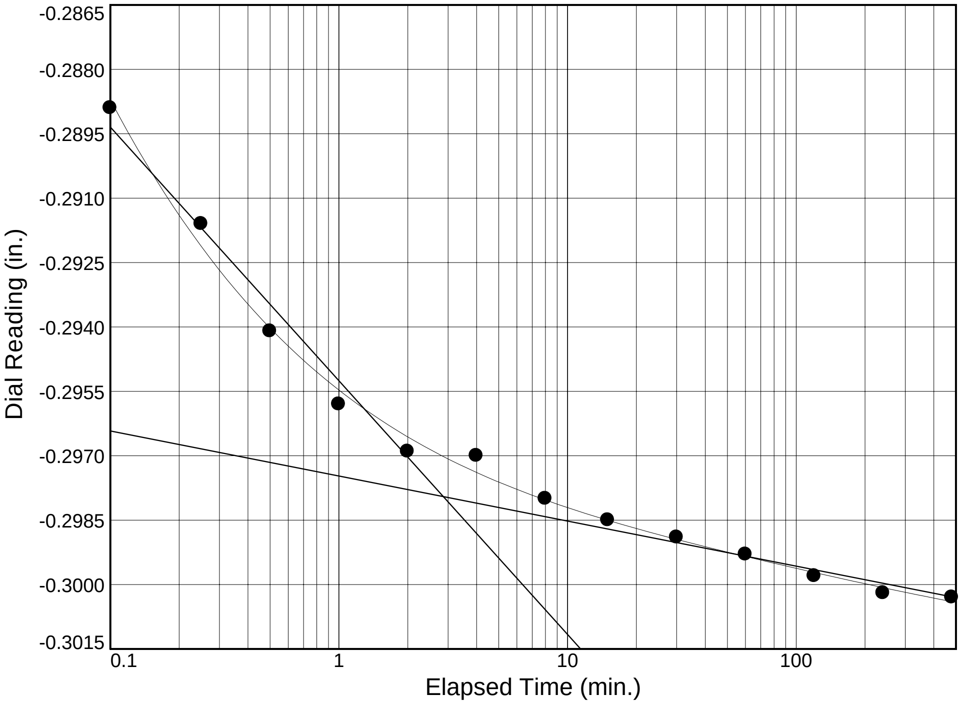
D_{100} = -0.2798

T_{50} = 14.31 min.

C_v @ T_{50}

0.018 ft.^{2}/day

C_α = 0.018



Load No.= 18

Load= 16.00 tsf

D_0 = -0.2842

D_{50} = -0.2911

D_{100} = -0.2980

T_{50} = 0.18 min.

C_v @ T_{50}

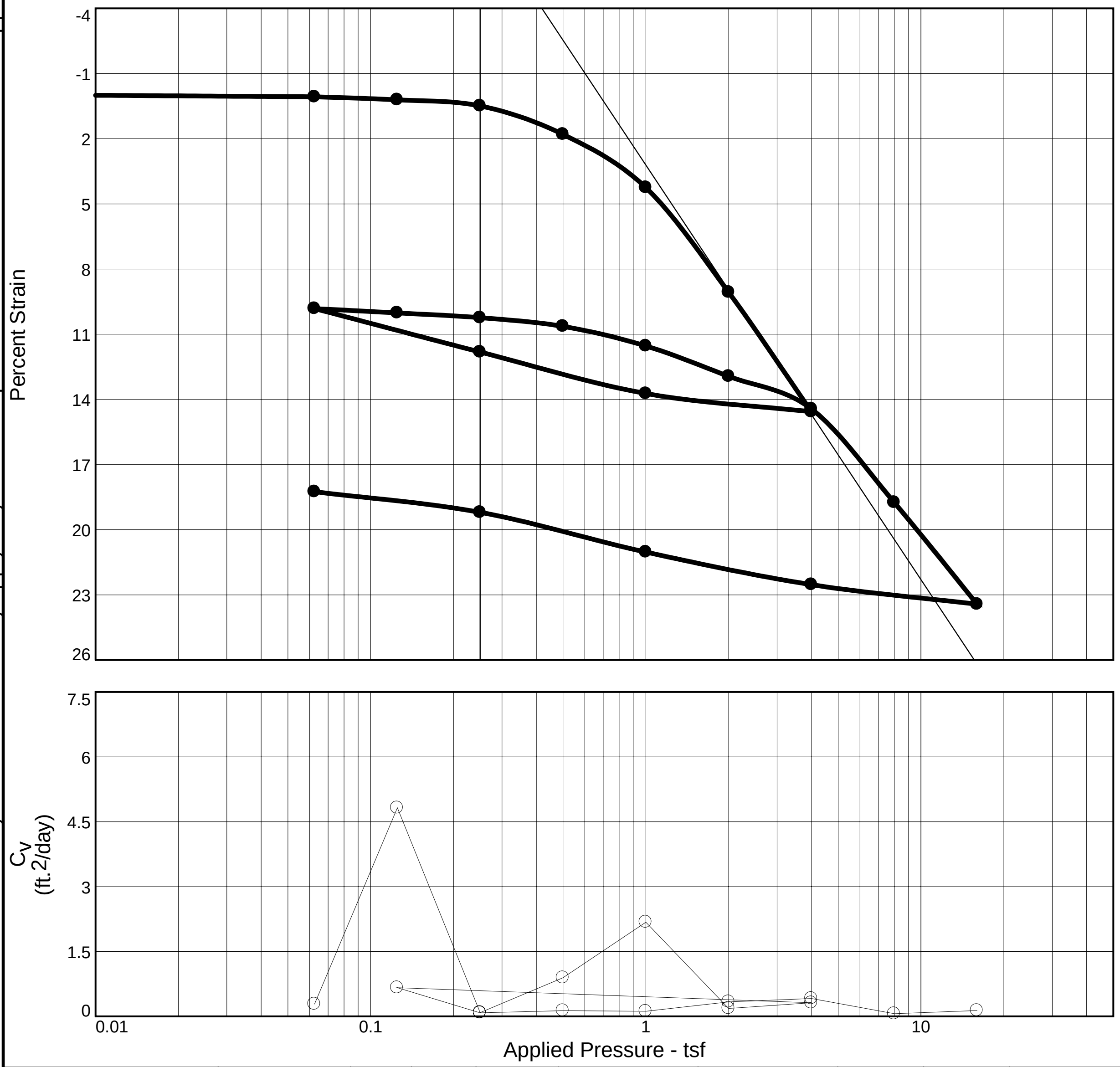
1.354 ft.^{2}/day

C_α = 0.003

Figure

Hillis-Carnes Engineering Associates

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
96.5 %	48.1 %	71.3	83	51	2.65		0.8	0.44	0.06	1.319

MATERIAL DESCRIPTION	USCS	AASHTO
Fat Clay w/sand	CH	A-7-5(49)

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

Source of Sample: EMB-B-02 **Depth:** 17.0 **Sample Number:** T-1A

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Remarks:

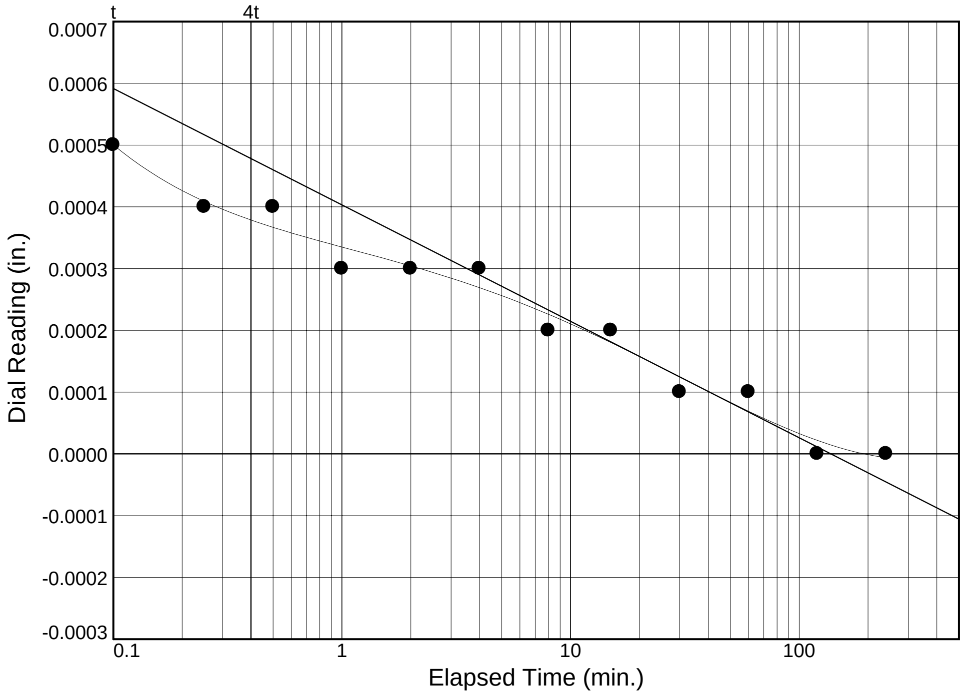
Figure

Tested By: CS

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

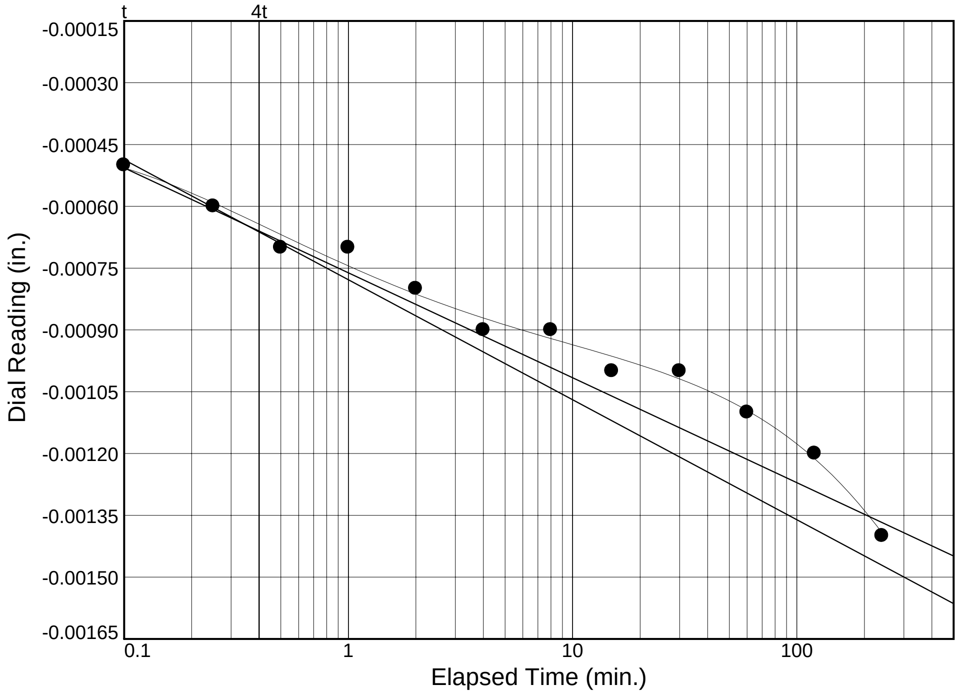
Source of Sample: EMB-B-02 Depth: 17.0 Sample Number: T-1A



Load No.= 1
Load= 0.06 tsf
D_0 = 0.0006
D_{50} = 0.0003
D_{100} = 0.0000
T_{50} = 1.73 min.

C_v @ T_{50}
0.285 ft.^{2}/day

C_α = 0.000



Load No.= 2
Load= 0.13 tsf
D_0 = -0.0004
D_{50} = -0.0005
D_{100} = -0.0006
T_{50} = 0.10 min.

C_v @ T_{50}
4.822 ft.^{2}/day

C_α = 0.001

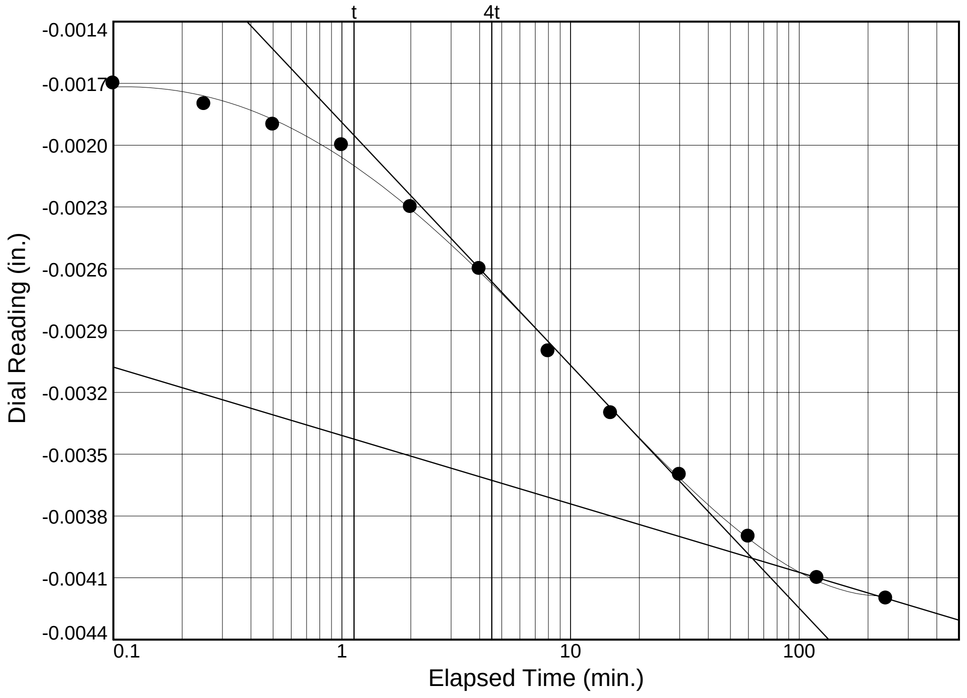
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

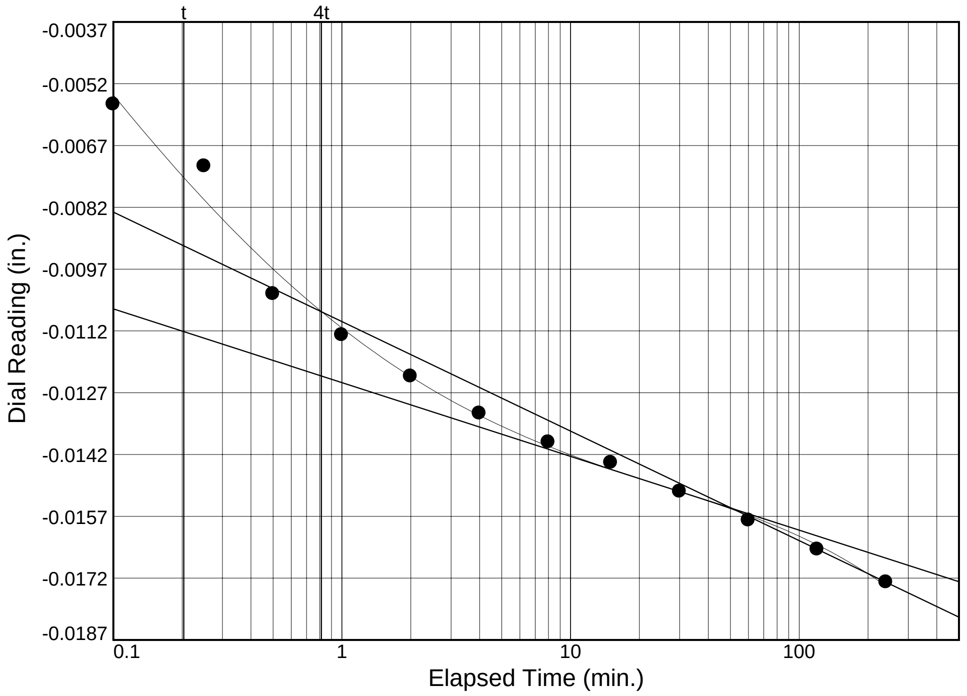
Source of Sample: EMB-B-02   Depth: 17.0   Sample Number: T-1A



Load No.= 3
Load= 0.25 tsf
D_0 = -0.0015
D_{50} = -0.0028
D_{100} = -0.0040
T_{50} = 5.49 min.

C_v @ T_{50}
0.089 ft.^{2}/day

C_α = 0.001



Load No.= 4
Load= 0.50 tsf
D_0 = -0.0042
D_{50} = -0.0099
D_{100} = -0.0155
T_{50} = 0.54 min.

C_v @ T_{50}
0.893 ft.^{2}/day

C_α = 0.006

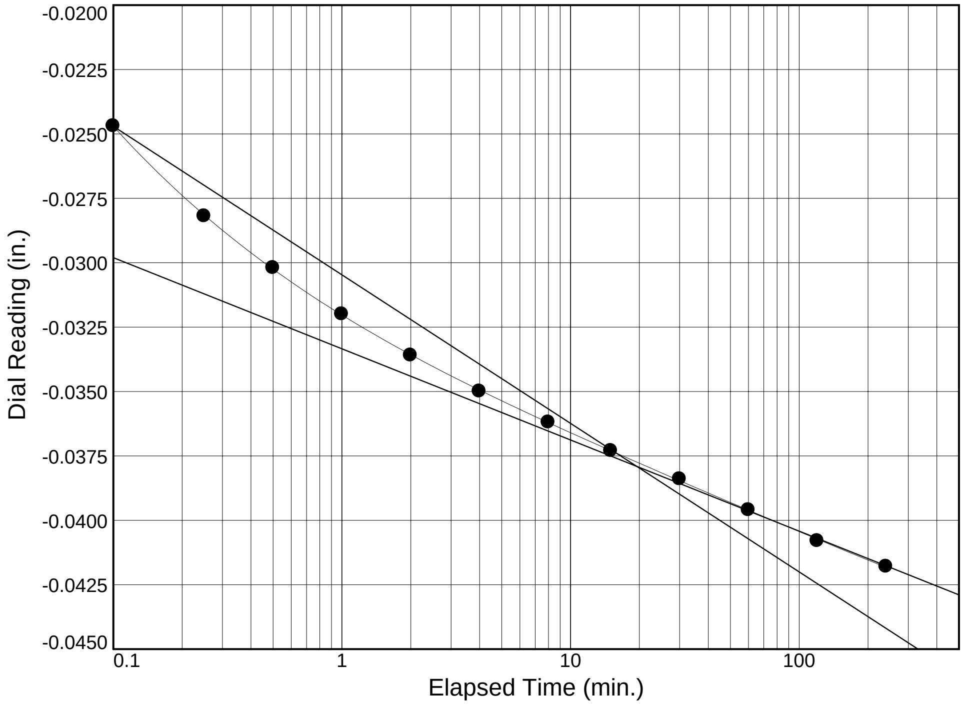
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

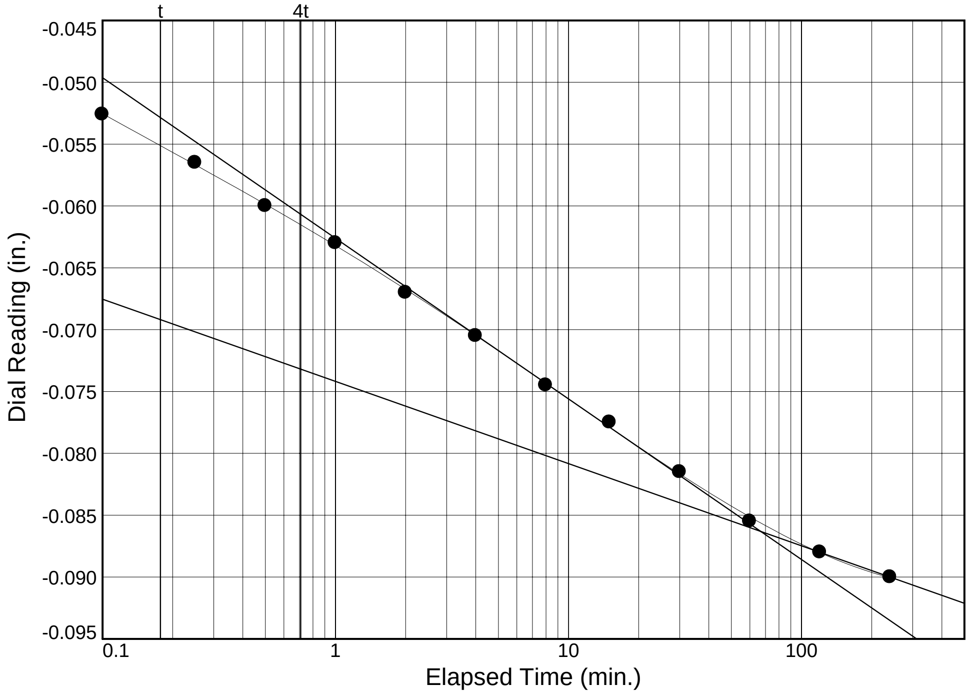
Source of Sample: EMB-B-02 Depth: 17.0 Sample Number: T-1A



Load No.= 5
Load= 1.00 tsf
D_0 = -0.0173
D_{50} = -0.0276
D_{100} = -0.0379
T_{50} = 0.21 min.

C_v @ T_{50}
2.178 ft.^{2}/day

C_α = 0.008



Load No.= 6
Load= 2.00 tsf
D_0 = -0.0487
D_{50} = -0.0675
D_{100} = -0.0863
T_{50} = 2.32 min.

C_v @ T_{50}
0.185 ft.^{2}/day

C_α = 0.015

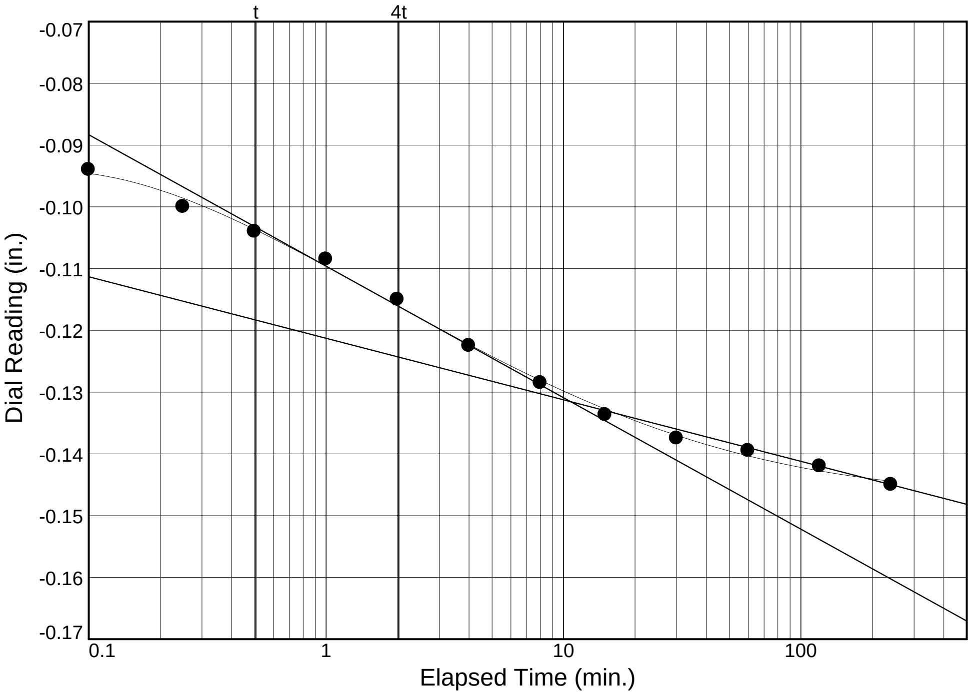
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: EMB-B-02 Depth: 17.0 Sample Number: T-1A



Load No.= 7

Load= 4.00 tsf

D_0 = -0.0914

D_{50} = -0.1115

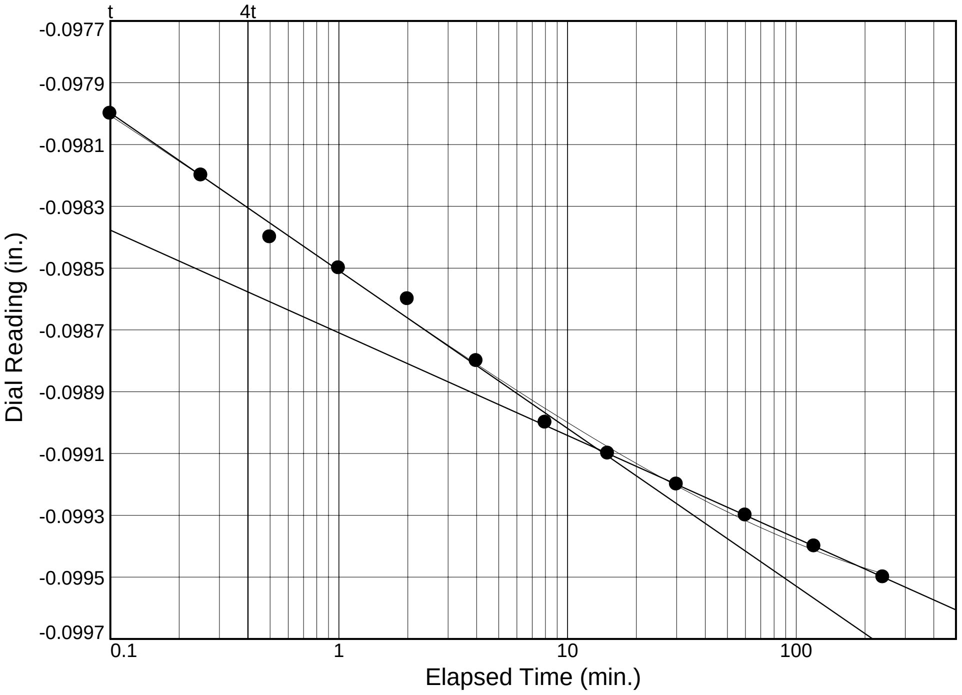
D_{100} = -0.1315

T_{50} = 1.22 min.

C_v @ T_{50}

0.314 ft.^{2}/day

C_α = 0.023



Load No.= 11

Load= 0.13 tsf

D_0 = -0.0977

D_{50} = -0.0984

D_{100} = -0.0991

T_{50} = 0.60 min.

C_v @ T_{50}

0.664 ft.^{2}/day

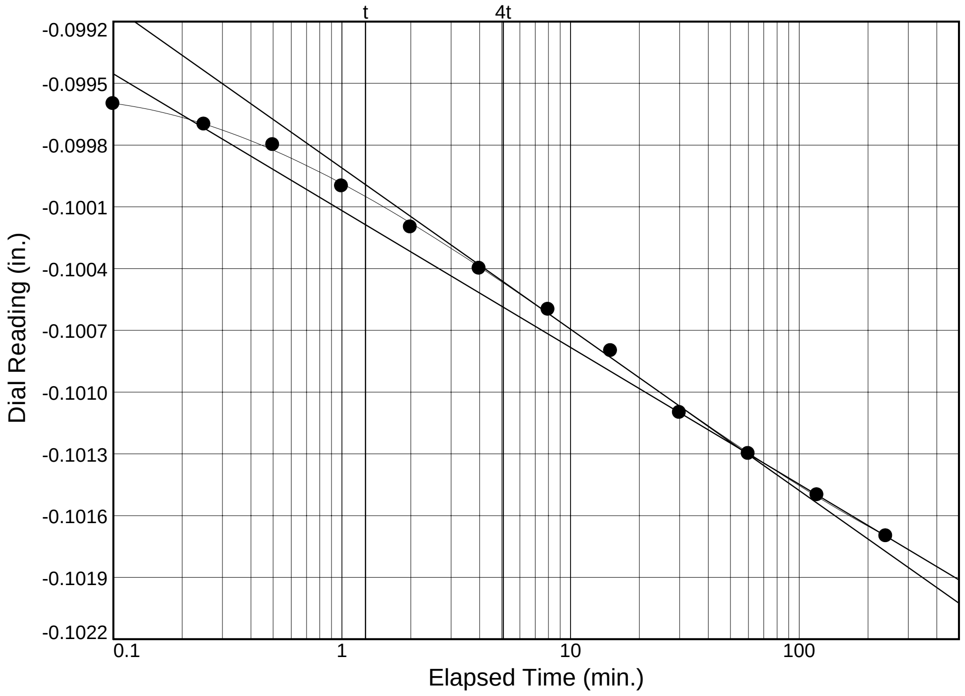
C_α = 0.001

Figure

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: EMB-B-02 Depth: 17.0 Sample Number: T-1A



Load No.= 12

Load= 0.25 tsf

D_0 = -0.0996

D_{50} = -0.1005

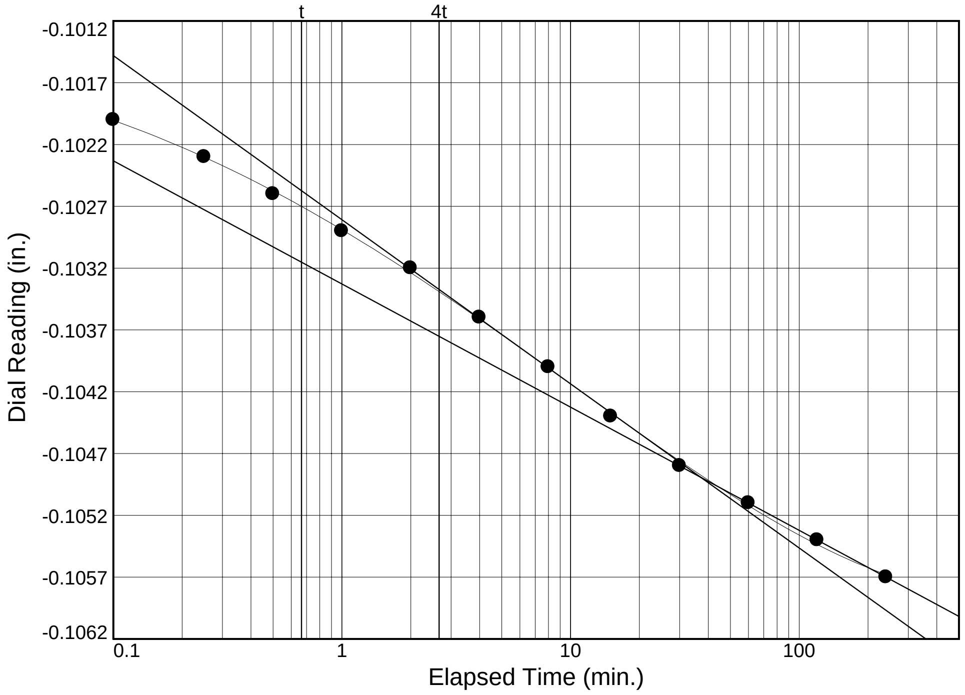
D_{100} = -0.1013

T_{50} = 4.85 min.

C_v @ T_{50}

0.082 ft.^{2}/day

C_α = 0.002



Load No.= 13

Load= 0.50 tsf

D_0 = -0.1020

D_{50} = -0.1034

D_{100} = -0.1049

T_{50} = 2.97 min.

C_v @ T_{50}

0.133 ft.^{2}/day

C_α = 0.002

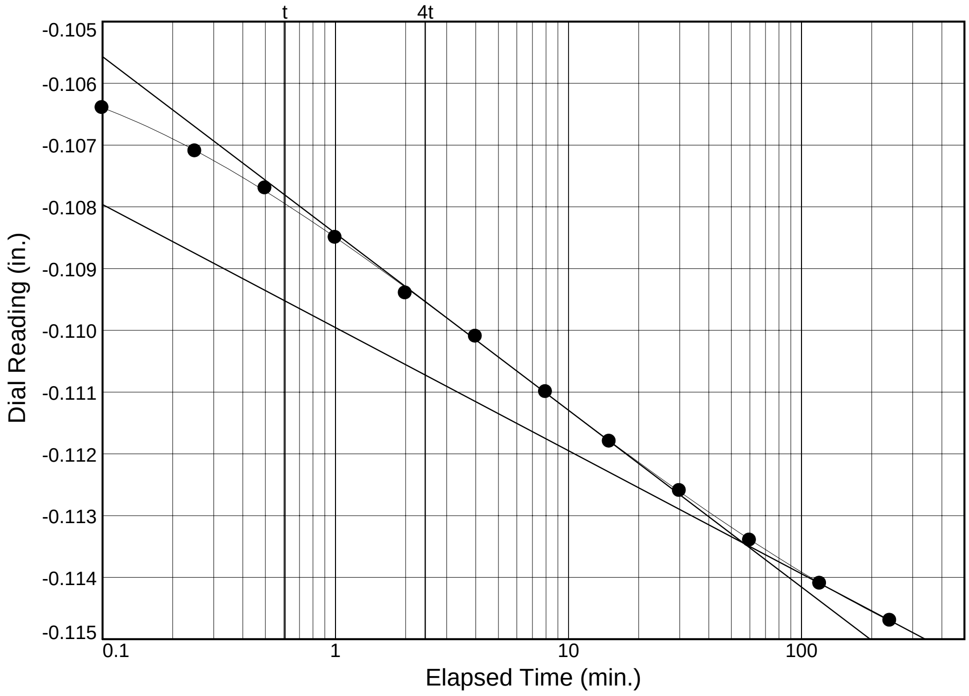
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: EMB-B-02 Depth: 17.0 Sample Number: T-1A



Load No.= 14

Load= 1.00 tsf

D_0 = -0.1064

D_{50} = -0.1099

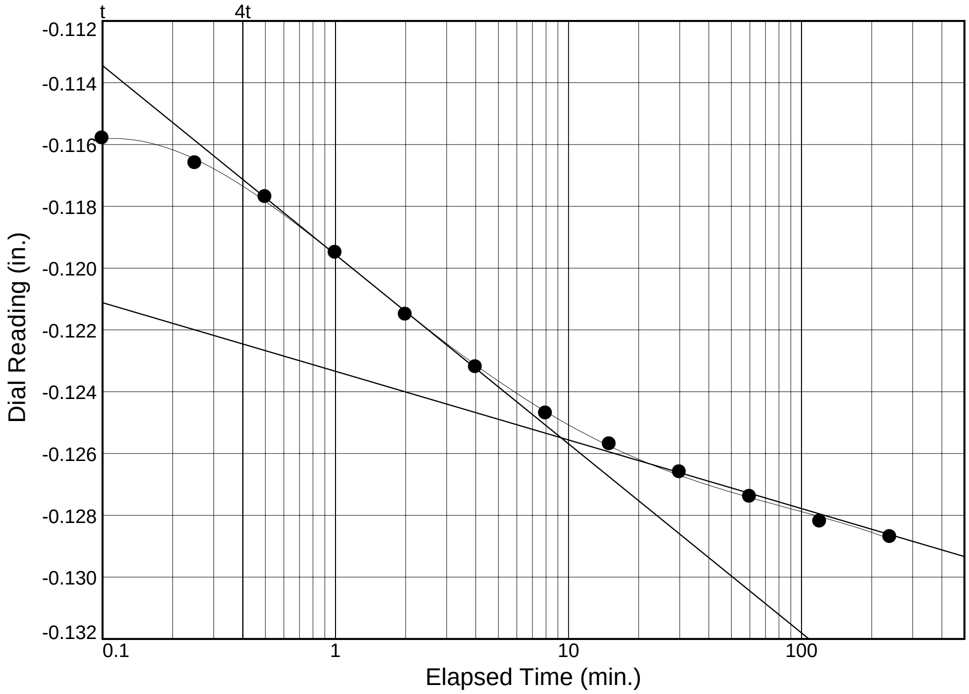
D_{100} = -0.1134

T_{50} = 3.26 min.

C_v @ T_{50}

0.119 ft.^{2}/day

C_α = 0.005



Load No.= 15

Load= 2.00 tsf

D_0 = -0.1143

D_{50} = -0.1199

D_{100} = -0.1255

T_{50} = 1.13 min.

C_v @ T_{50}

0.336 ft.^{2}/day

C_α = 0.005

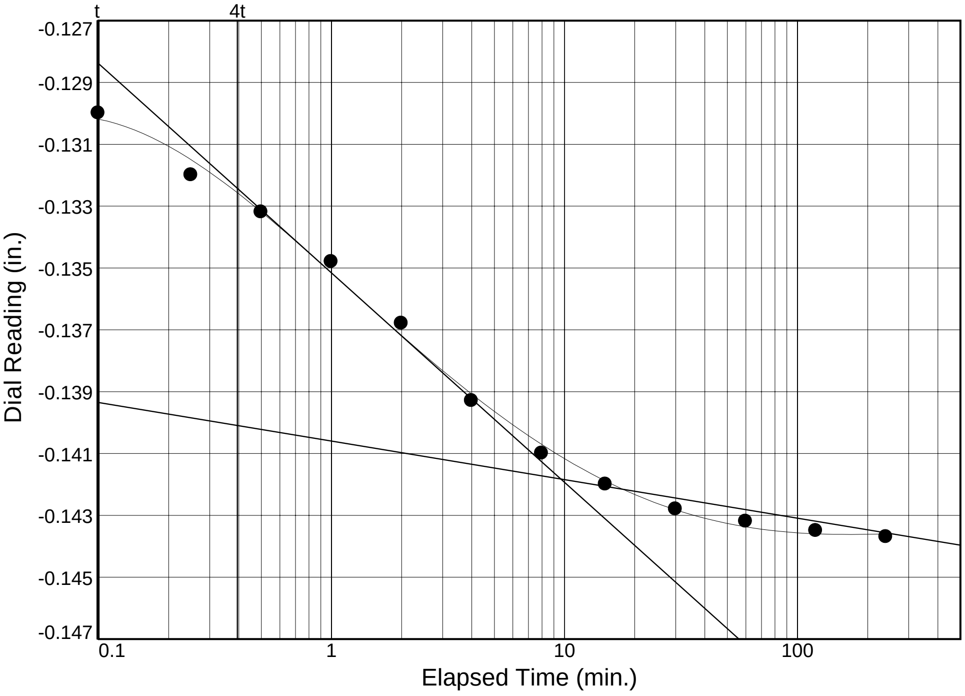
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

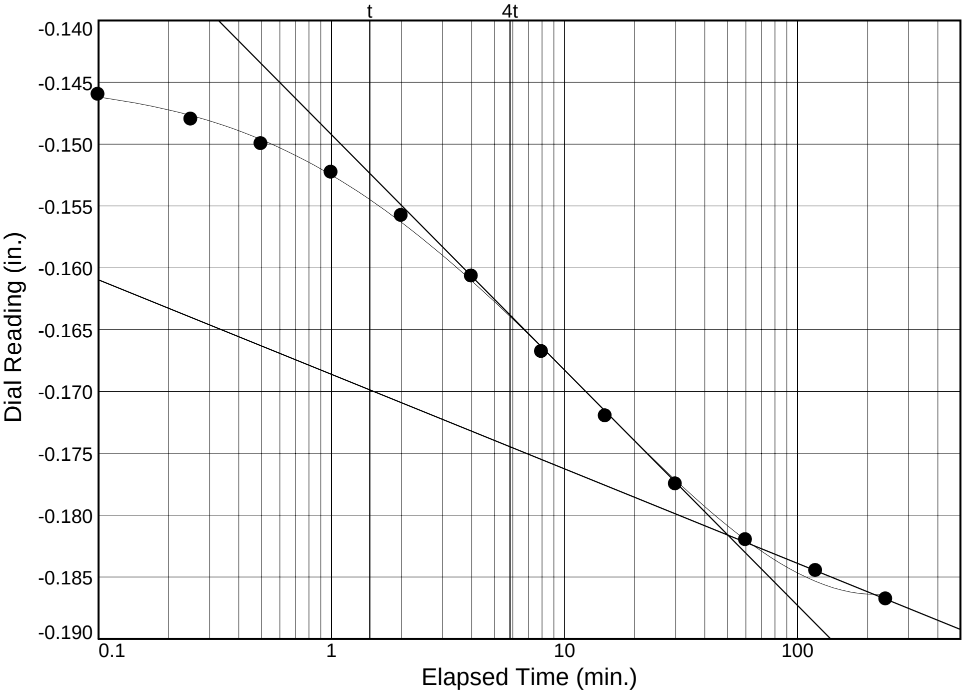
Source of Sample: EMB-B-02 Depth: 17.0 Sample Number: T-1A



Load No.= 16
Load= 4.00 tsf
D_0 = -0.1278
D_{50} = -0.1348
D_{100} = -0.1418
T_{50} = 0.89 min.

C_v @ T_{50}
0.414 ft.^{2}/day

C_α = 0.003



Load No.= 17
Load= 8.00 tsf
D_0 = -0.1450
D_{50} = -0.1633
D_{100} = -0.1816
T_{50} = 5.39 min.

C_v @ T_{50}
0.064 ft.^{2}/day

C_α = 0.018

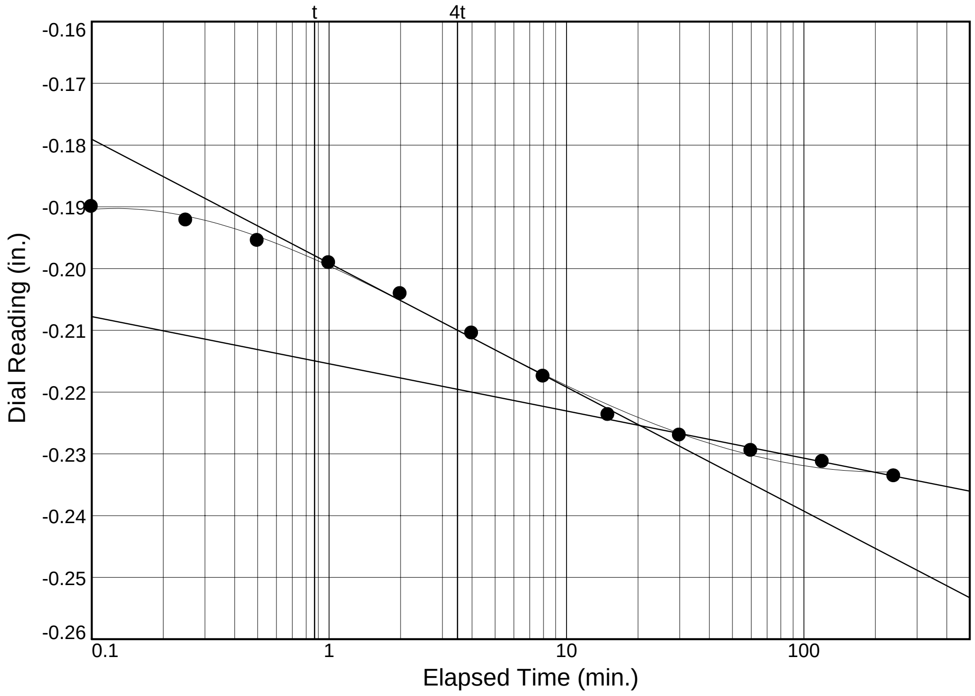
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: EMB-B-02 Depth: 17.0 Sample Number: T-1A



Load No.= 18
Load= 16.00 tsf
D_0 = -0.1870
D_{50} = -0.2062
D_{100} = -0.2254
T_{50} = 2.25 min.

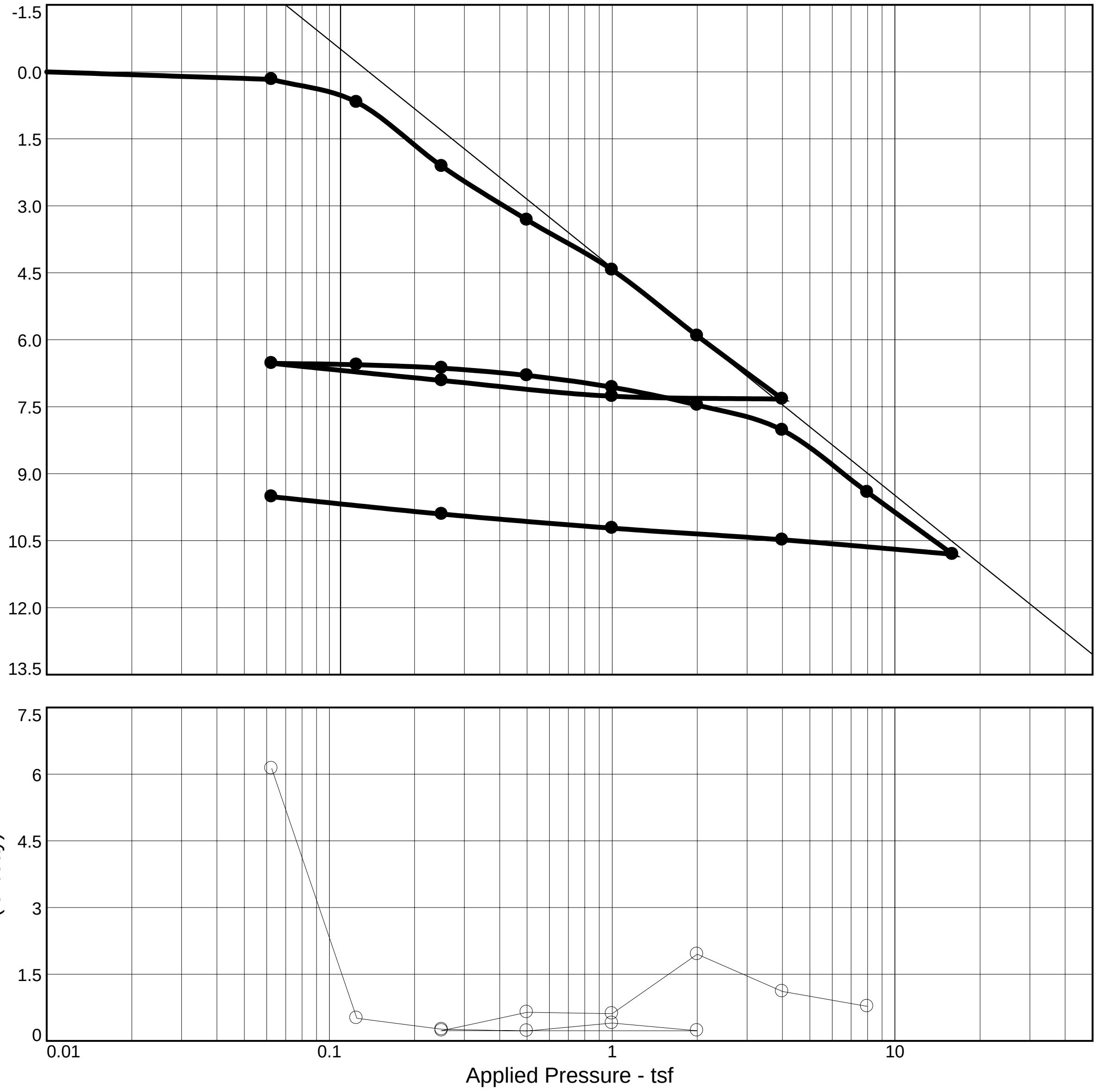
C_v @ T_{50}
0.136 ft.^{2}/day

C_α = 0.018

Figure

Hillis-Carnes Engineering Associates

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
98.3 %	43.5 %	76.2	52	25	2.65		0.2	0.11	0.01	1.171

MATERIAL DESCRIPTION	USCS	AASHTO
clayey sand	SC	A-7-6(8)

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

Source of Sample: LOT-A1-08 **Depth:** 22 **Sample Number:** T-1

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Remarks:

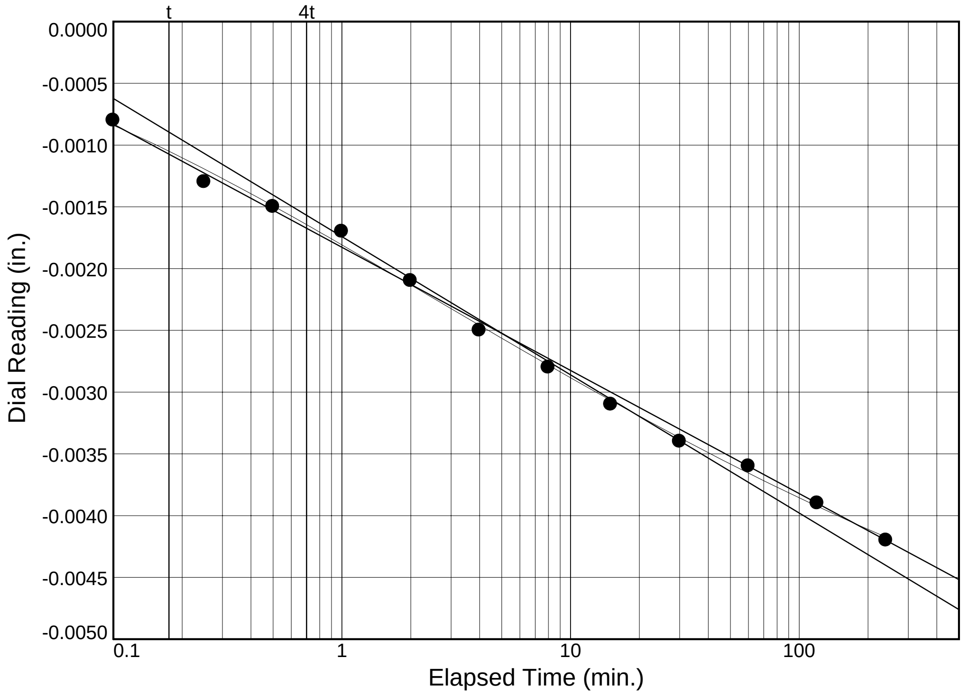
Figure

Tested By: cs

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: LOT-A1-08 Depth: 22 Sample Number: T-1



Load No.= 1

Load= 0.06 tsf

D_0 = -0.0005

D_{50} = -0.0015

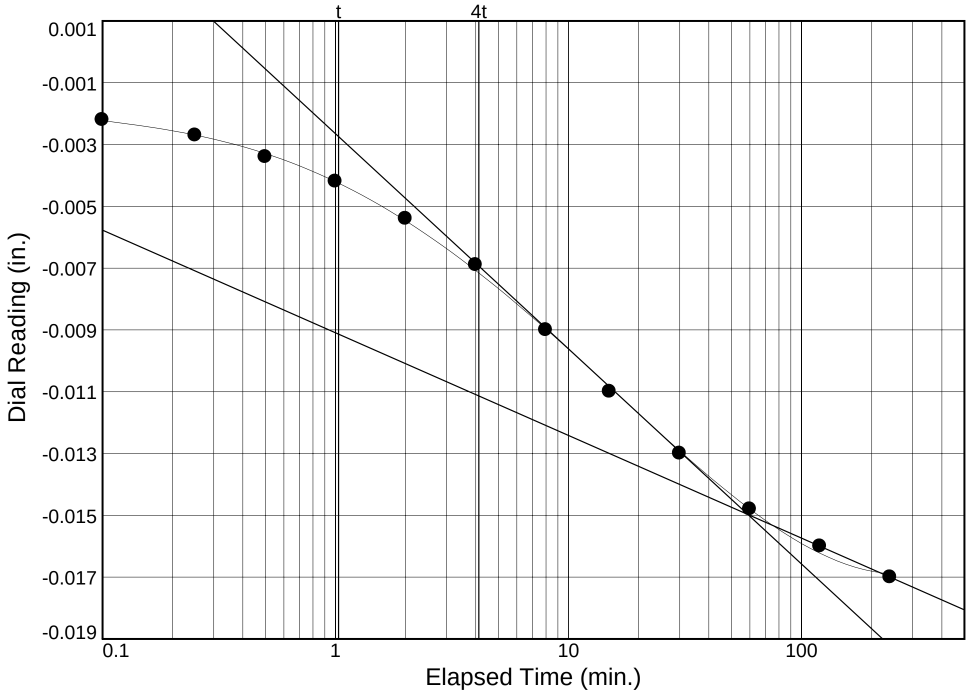
D_{100} = -0.0025

T_{50} = 0.50 min.

C_v @ T_{50}

6.127 ft.^{2}/day

C_α = 0.001



Load No.= 2

Load= 0.13 tsf

D_0 = -0.0013

D_{50} = -0.0082

D_{100} = -0.0150

T_{50} = 6.00 min.

C_v @ T_{50}

0.510 ft.^{2}/day

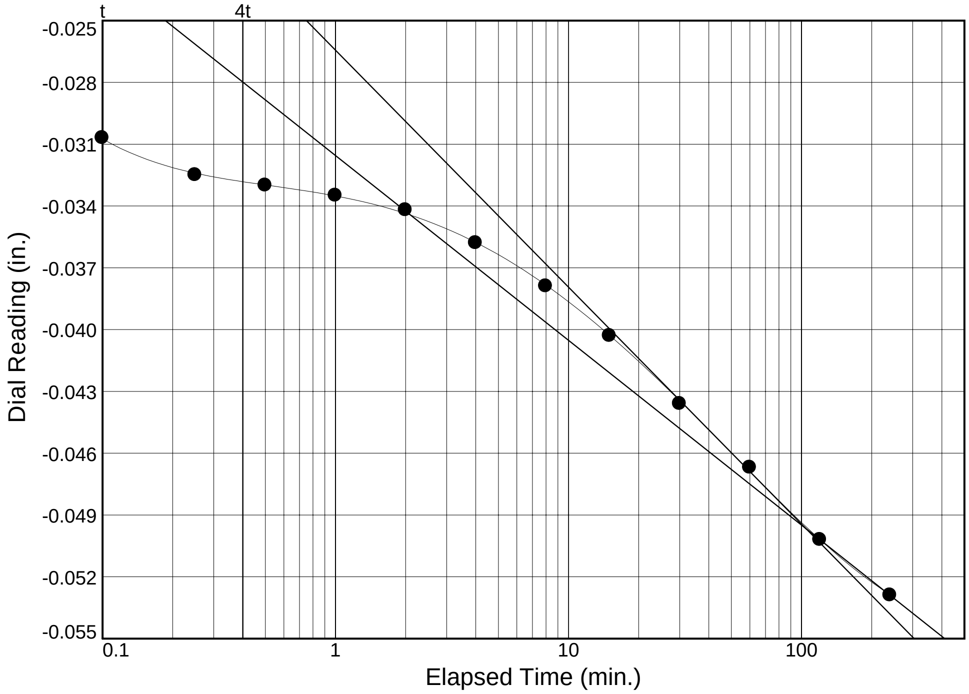
C_α = 0.003

Figure

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

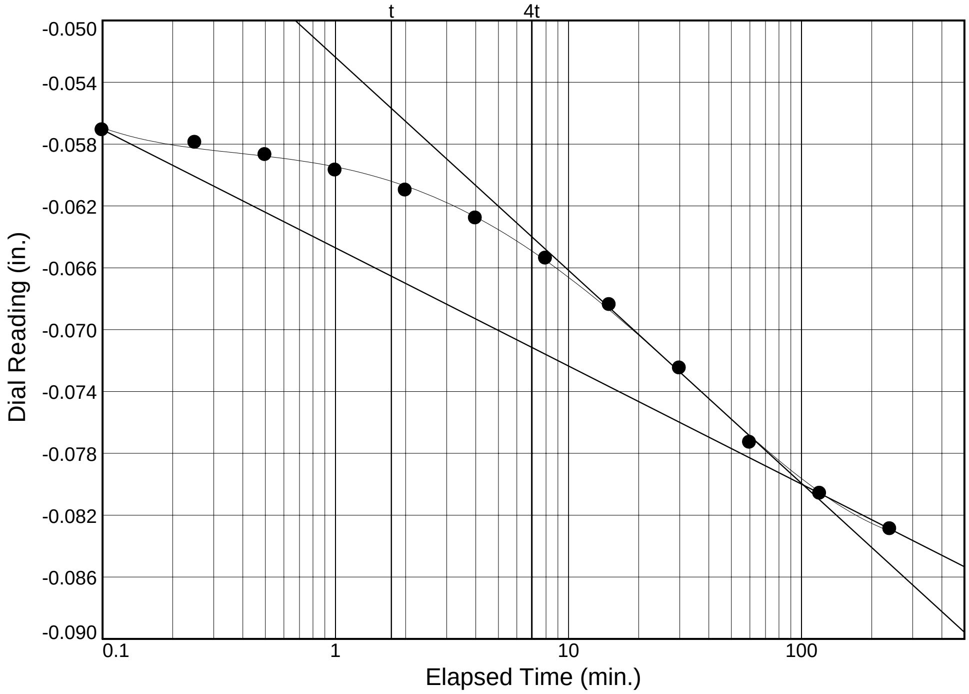
Source of Sample: LOT-A1-08 Depth: 22 Sample Number: T-1



Load No.= 3
Load= 0.25 tsf
D_0 = -0.0287
D_{50} = -0.0392
D_{100} = -0.0497
T_{50} = 11.44 min.

C_v @ T_{50}
0.261 ft.^{2}/day

C_α = 0.008



Load No.= 4
Load= 0.50 tsf
D_0 = -0.0559
D_{50} = -0.0680
D_{100} = -0.0801
T_{50} = 13.03 min.

C_v @ T_{50}
0.224 ft.^{2}/day

C_α = 0.007

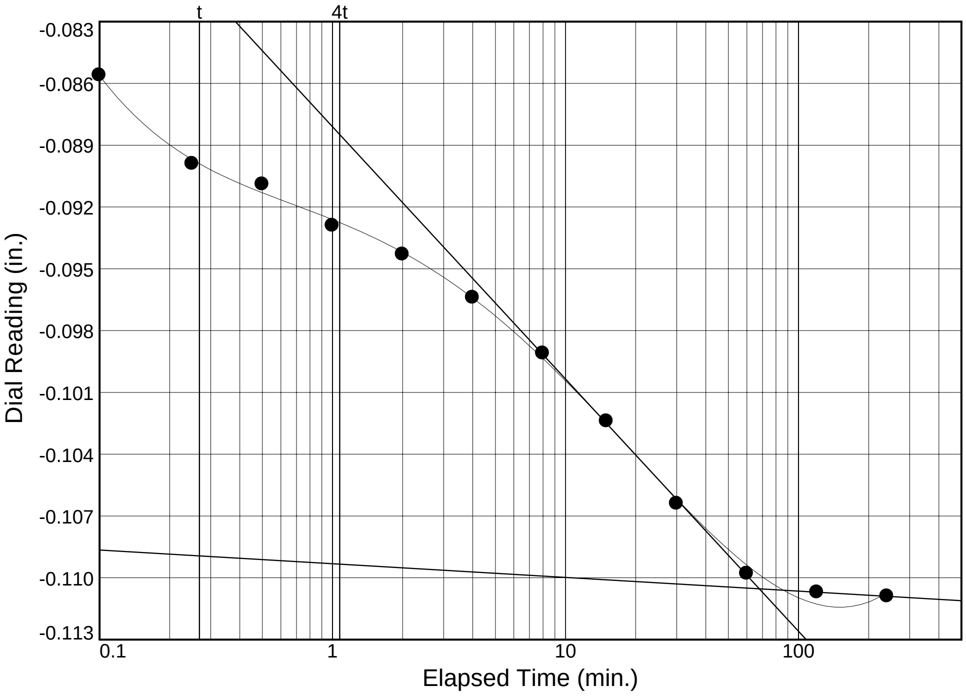
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: LOT-A1-08 Depth: 22 Sample Number: T-1



Load No.= 5

Load= 1.00 tsf

D_0 = -0.0870

D_{50} = -0.0988

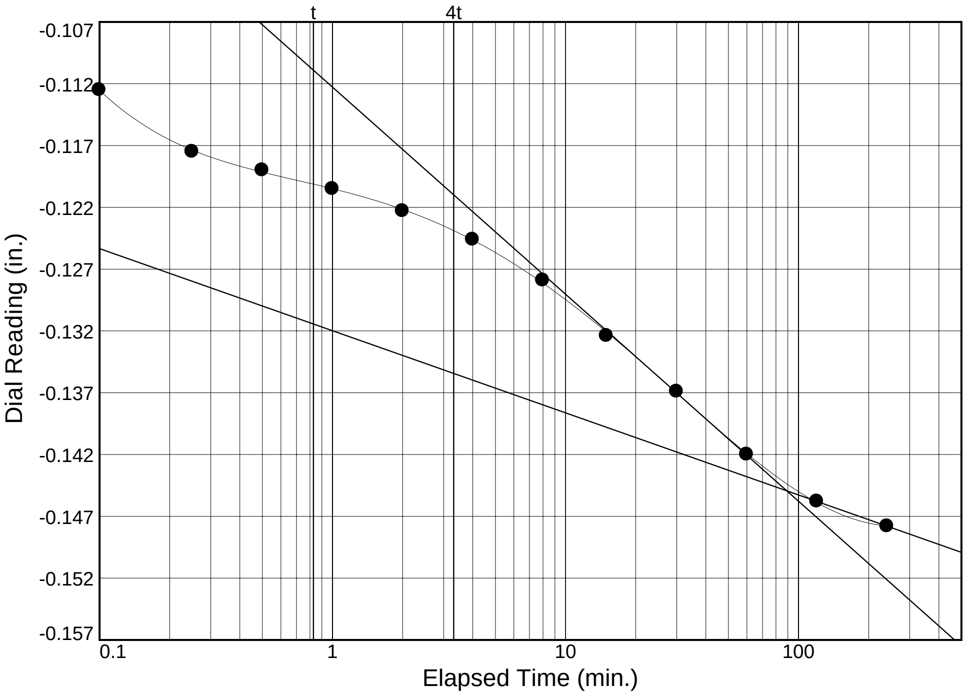
D_{100} = -0.1105

T_{50} = 7.08 min.

C_v @ T_{50}

0.402 ft.^{2}/day

C_α = 0.001



Load No.= 6

Load= 2.00 tsf

D_0 = -0.1164

D_{50} = -0.1307

D_{100} = -0.1449

T_{50} = 12.08 min.

C_v @ T_{50}

0.229 ft.^{2}/day

C_α = 0.006

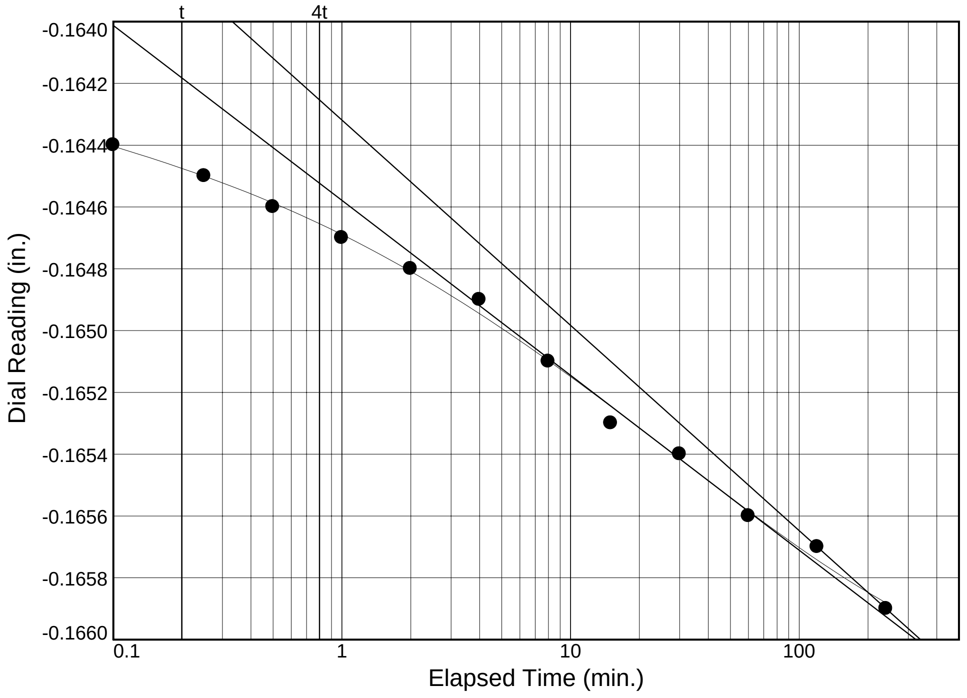
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

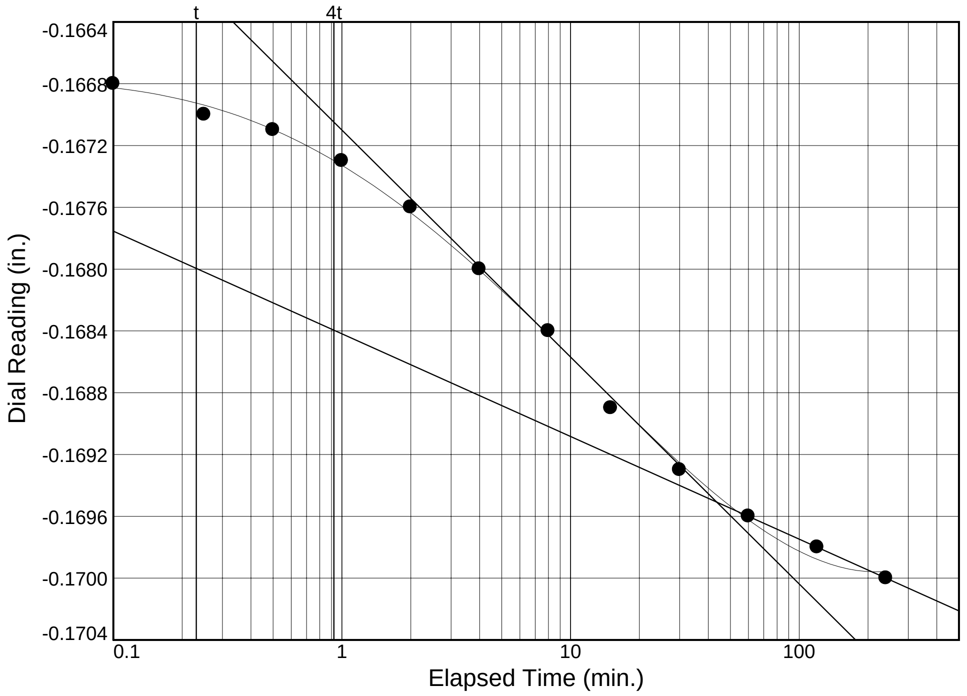
Source of Sample: LOT-A1-08 Depth: 22 Sample Number: T-1



Load No.= 12
Load= 0.25 tsf
D_0 = -0.1643
D_{50} = -0.1652
D_{100} = -0.1661
T_{50} = 11.68 min.

C_v @ T_{50}
0.230 ft.^{2}/day

C_α = 0.001



Load No.= 13
Load= 0.50 tsf
D_0 = -0.1666
D_{50} = -0.1680
D_{100} = -0.1695
T_{50} = 4.16 min.

C_v @ T_{50}
0.644 ft.^{2}/day

C_α = 0.001

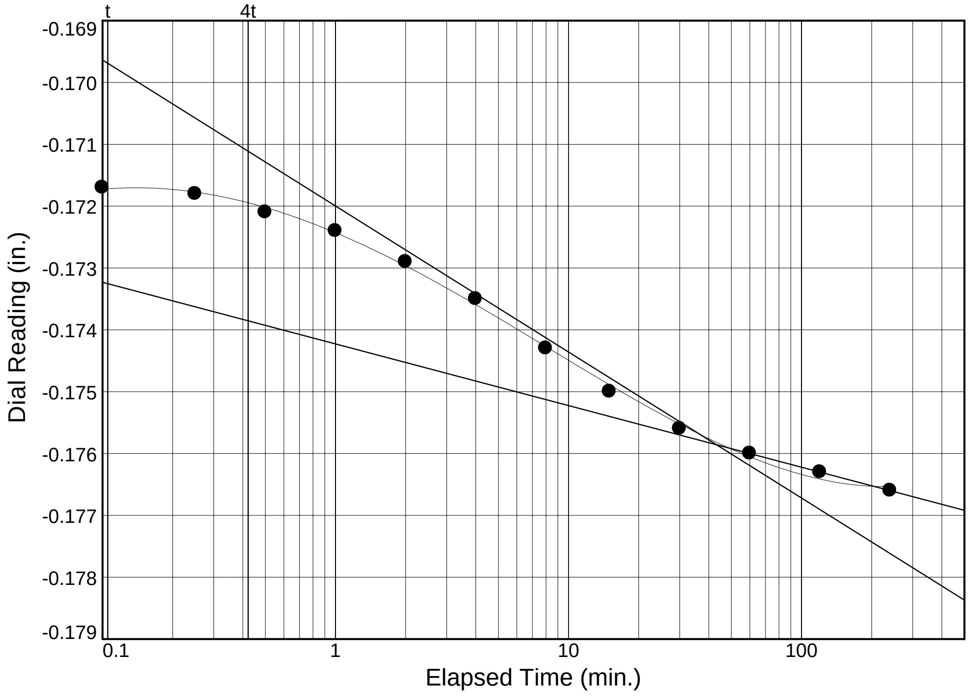
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

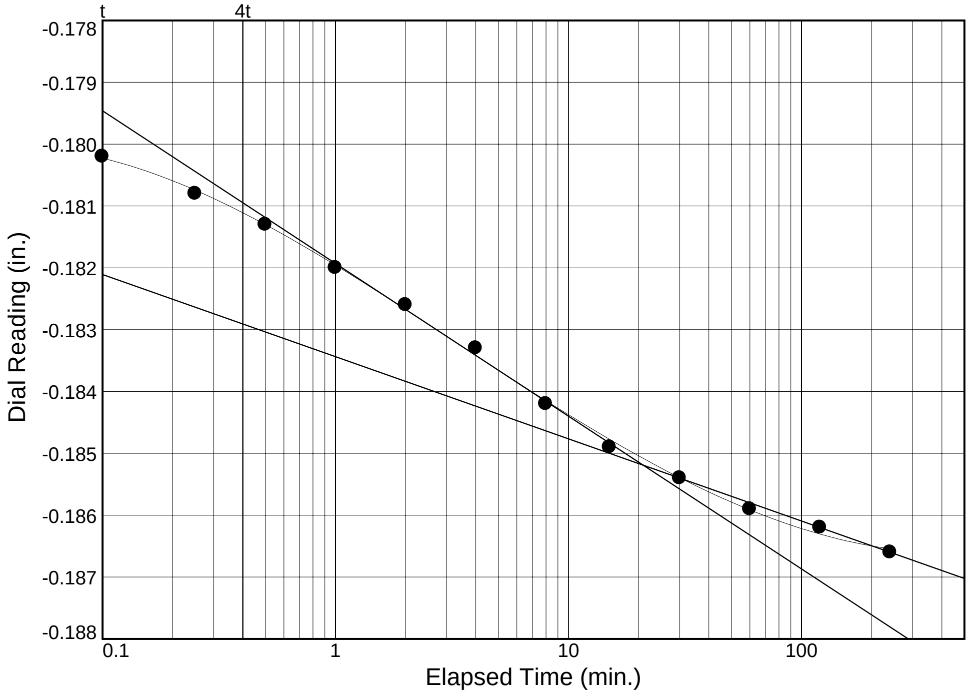
Source of Sample: LOT-A1-08 Depth: 22 Sample Number: T-1



Load No.= 14
Load= 1.00 tsf
D_0 = -0.1715
D_{50} = -0.1737
D_{100} = -0.1759
T_{50} = 4.36 min.

C_v @ T_{50}
0.612 ft.^{2}/day

C_α = 0.001



Load No.= 15
Load= 2.00 tsf
D_0 = -0.1793
D_{50} = -0.1823
D_{100} = -0.1852
T_{50} = 1.36 min.

C_v @ T_{50}
1.949 ft.^{2}/day

C_α = 0.001

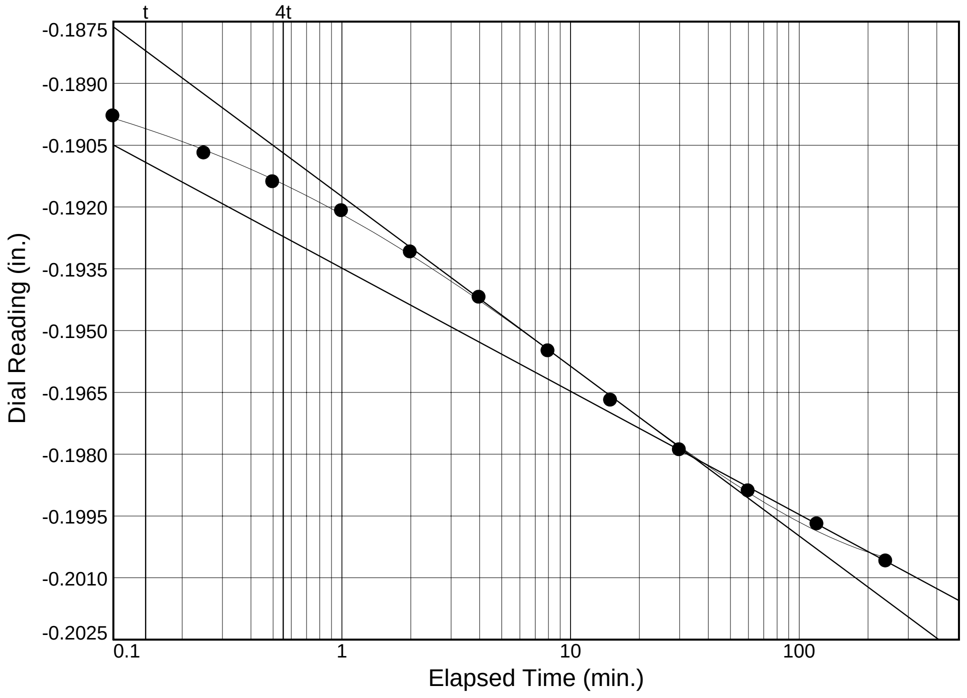
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

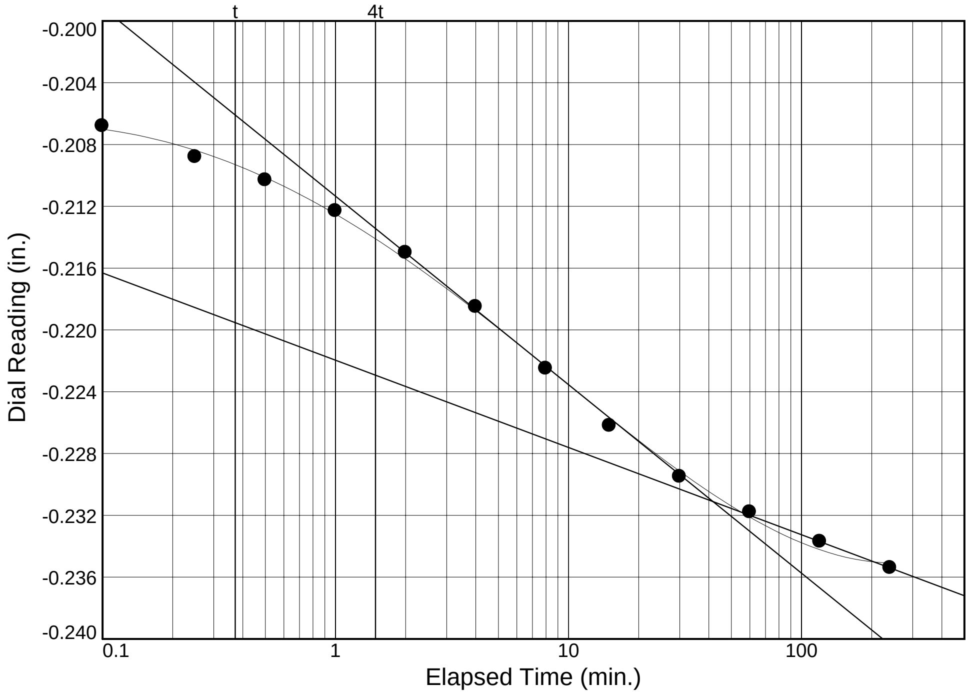
Source of Sample: LOT-A1-08 Depth: 22 Sample Number: T-1



Load No.= 16
Load= 4.00 tsf
D_0 = -0.1888
D_{50} = -0.1934
D_{100} = -0.1981
T_{50} = 2.35 min.

C_v @ T_{50}
1.113 ft.^{2}/day

C_α = 0.003

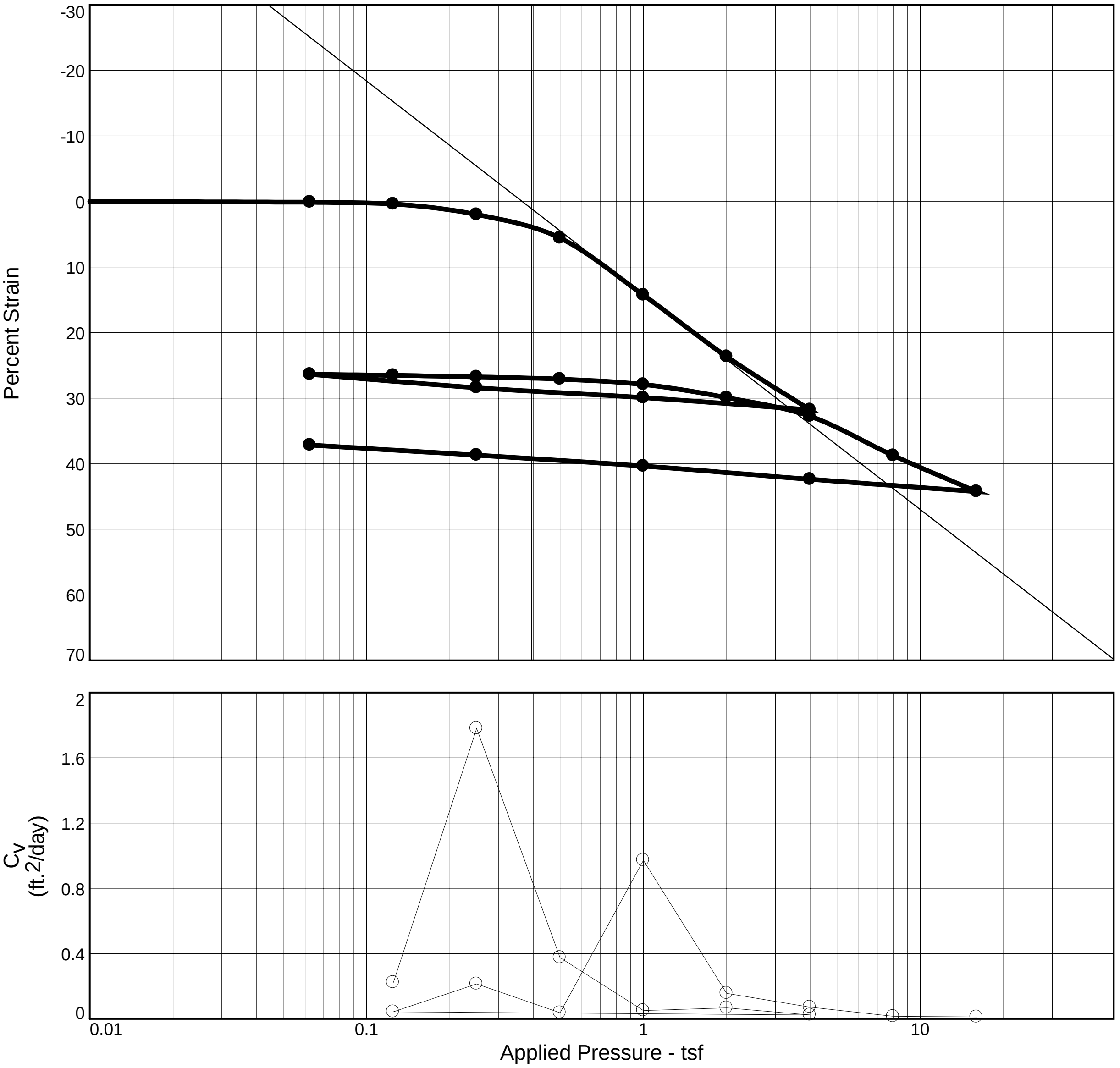


Load No.= 17
Load= 8.00 tsf
D_0 = -0.2045
D_{50} = -0.2178
D_{100} = -0.2311
T_{50} = 3.30 min.

C_v @ T_{50}
0.776 ft.^{2}/day

C_α = 0.005

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
88.6 %	103.2 %	40.5	114	65	2.65		0.5	1.34	0.13	3.088

MATERIAL DESCRIPTION	USCS	AASHTO
Sandy elastic Silt		

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

Source of Sample: LOT-A2-12 **Depth:** 17.0-19.0 **Sample Number:** T-2

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Remarks:

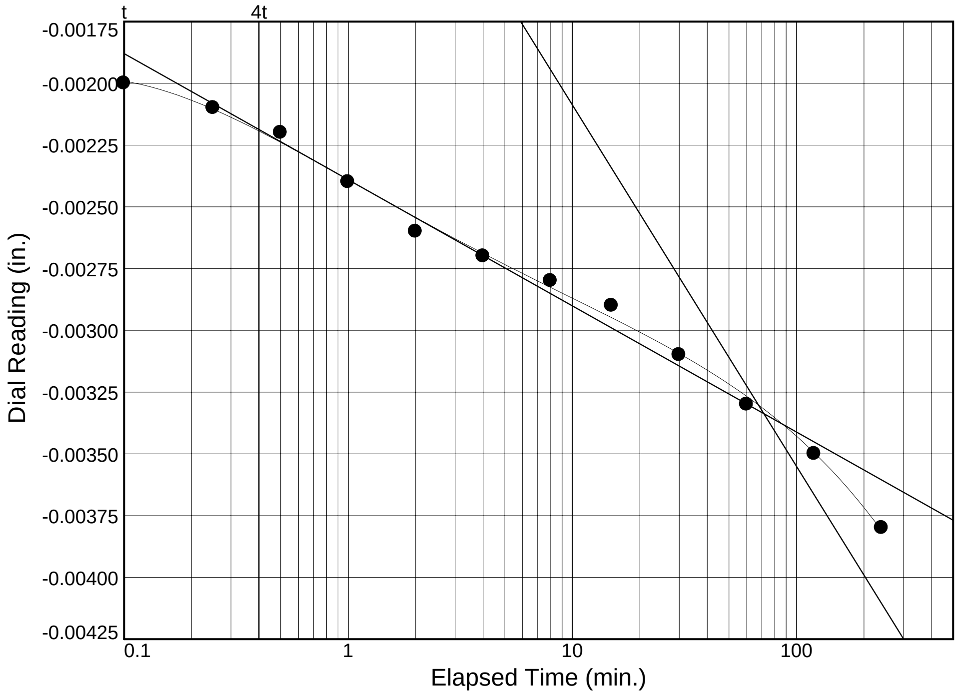
Figure

Tested By: cs

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: LOT-A2-12 Depth: 17.0-19.0 Sample Number: T-2



Load No.= 2

Load= 0.13 tsf

D_0 = -0.0018

D_{50} = -0.0026

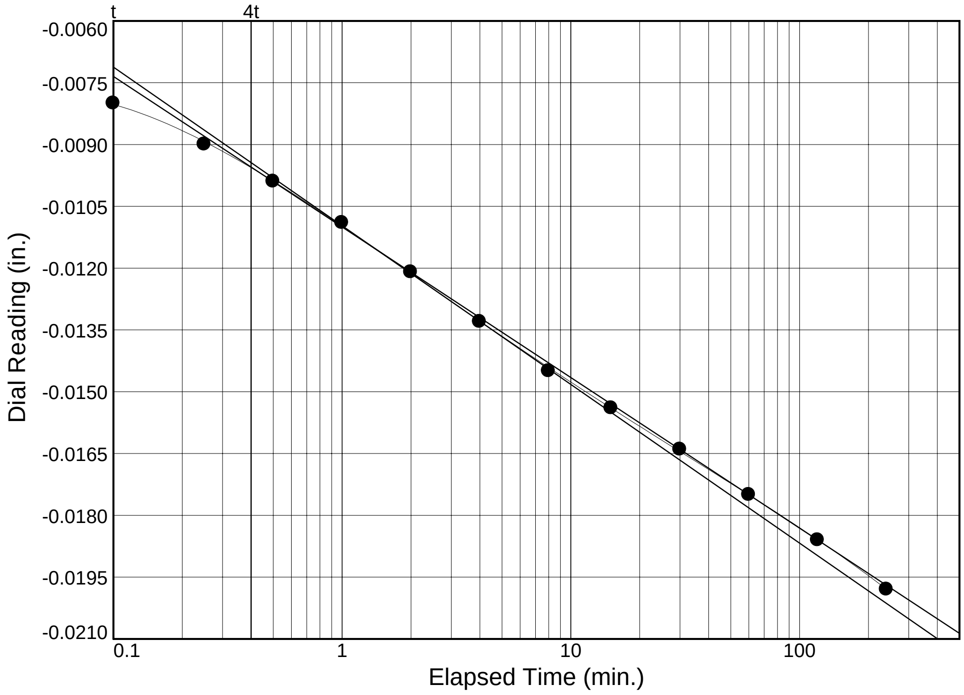
D_{100} = -0.0033

T_{50} = 2.20 min.

C_v @ T_{50}

0.223 ft.^{2}/day

C_α = 0.006



Load No.= 3

Load= 0.25 tsf

D_0 = -0.0065

D_{50} = -0.0090

D_{100} = -0.0116

T_{50} = 0.27 min.

C_v @ T_{50}

1.779 ft.^{2}/day

C_α = 0.015

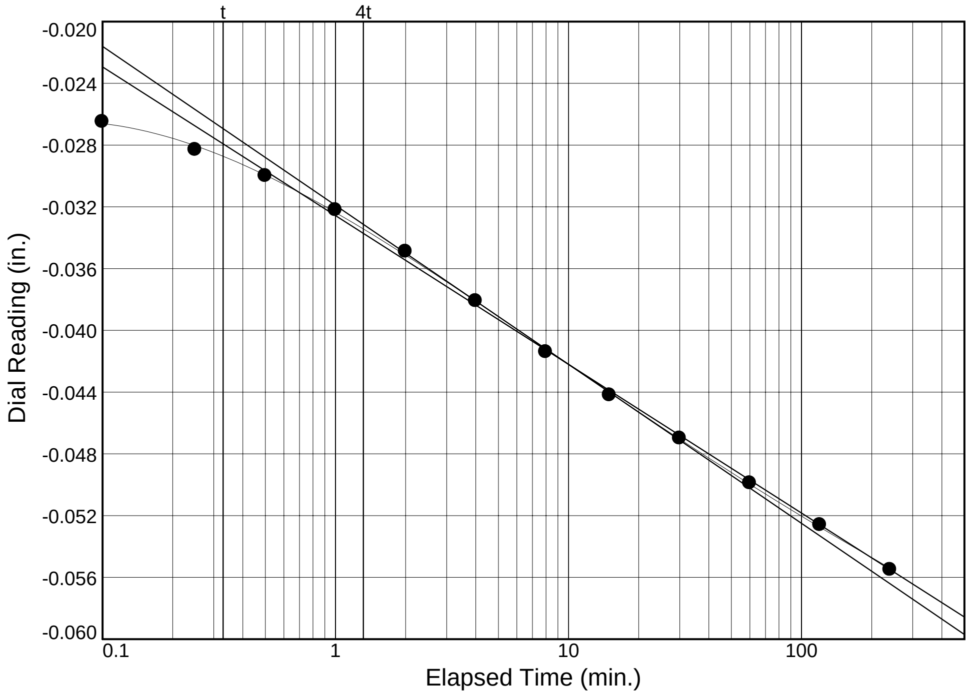
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

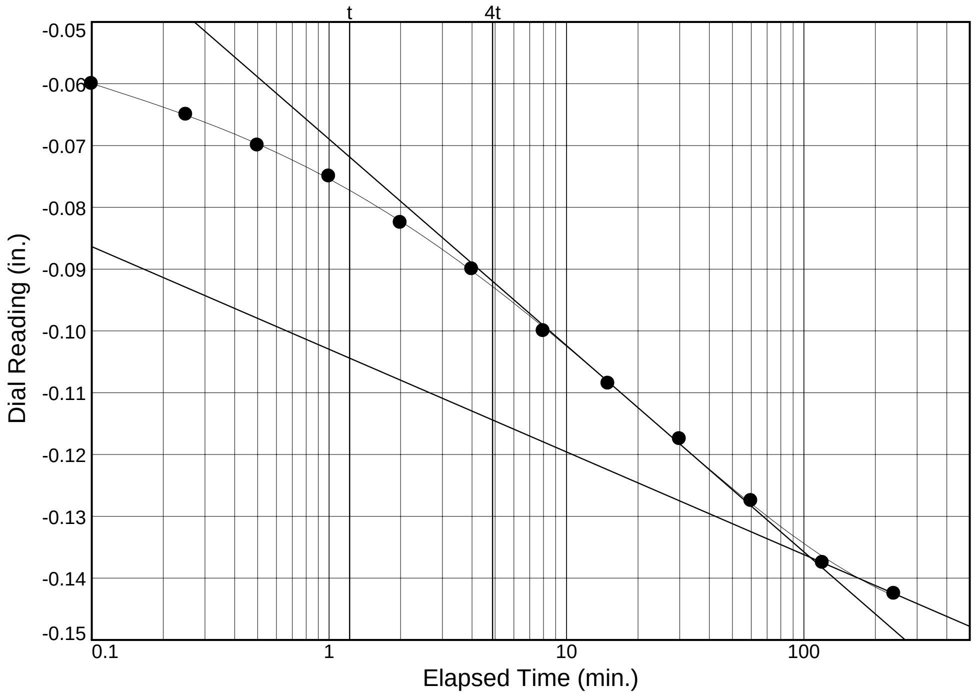
Source of Sample: LOT-A2-12 Depth: 17.0-19.0 Sample Number: T-2



Load No.= 4
Load= 0.50 tsf
D_0 = -0.0240
D_{50} = -0.0331
D_{100} = -0.0422
T_{50} = 1.21 min.

C_v @ T_{50}
0.376 ft.^{2}/day

C_α = 0.039



Load No.= 5
Load= 1.00 tsf
D_0 = -0.0617
D_{50} = -0.0991
D_{100} = -0.1366
T_{50} = 7.86 min.

C_v @ T_{50}
0.051 ft.^{2}/day

C_α = 0.068

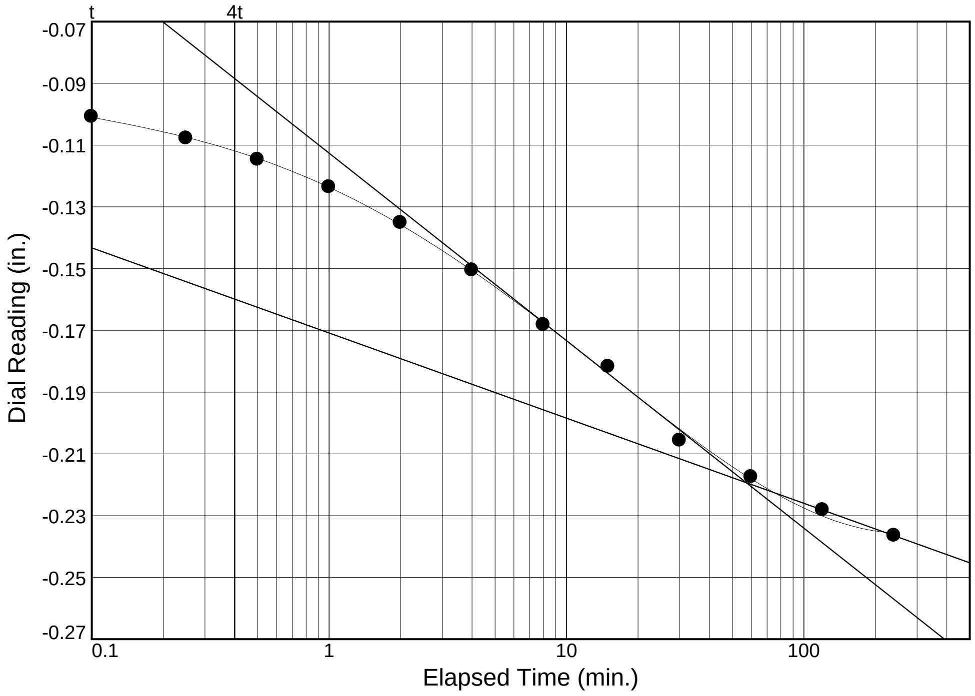
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: LOT-A2-12 Depth: 17.0-19.0 Sample Number: T-2



Load No.= 6

Load= 2.00 tsf

D_0 = -0.0902

D_{50} = -0.1547

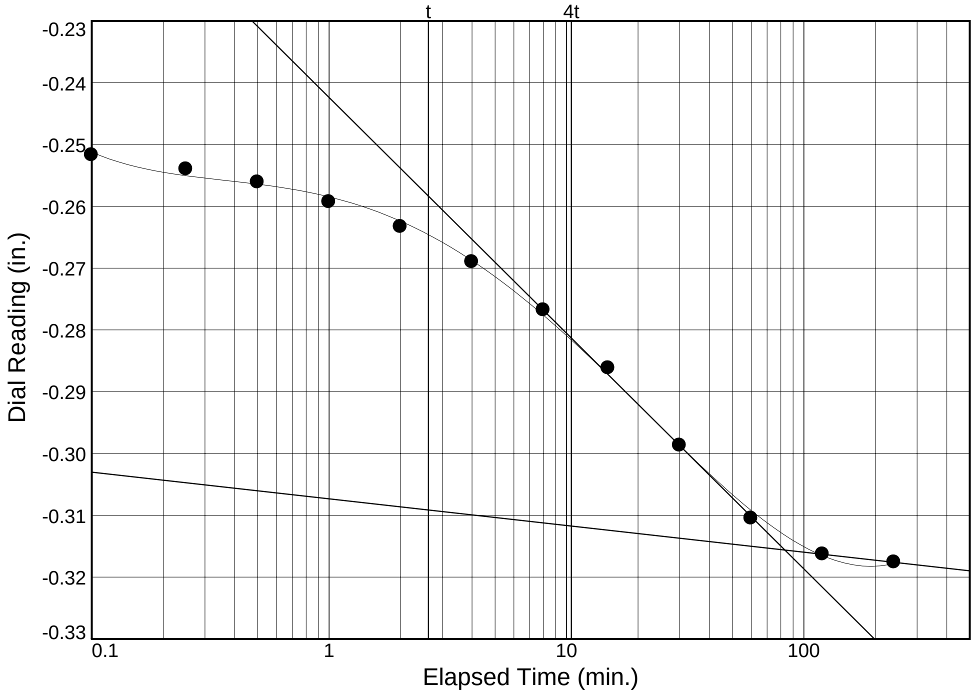
D_{100} = -0.2193

T_{50} = 4.76 min.

C_v @ T_{50}

0.068 ft.^{2}/day

C_α = 0.113



Load No.= 7

Load= 4.00 tsf

D_0 = -0.2475

D_{50} = -0.2816

D_{100} = -0.3156

T_{50} = 10.44 min.

C_v @ T_{50}

0.024 ft.^{2}/day

C_α = 0.018

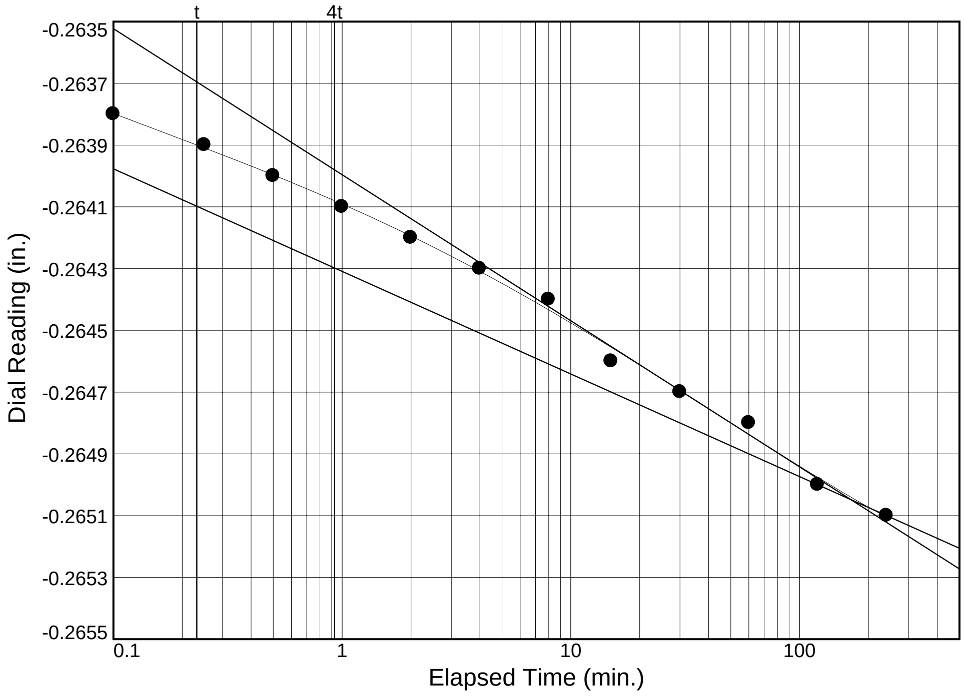
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

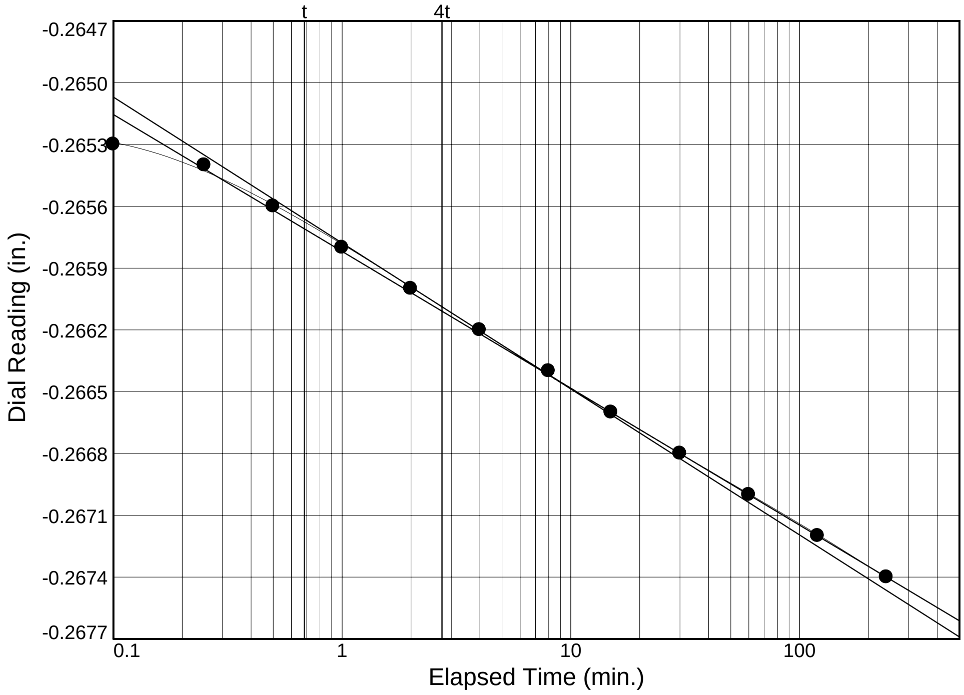
Source of Sample: LOT-A2-12 Depth: 17.0-19.0 Sample Number: T-2



Load No.= 11
Load= 0.13 tsf
D_0 = -0.2637
D_{50} = -0.2644
D_{100} = -0.2650
T_{50} = 6.11 min.

C_v @ T_{50}
0.044 ft.^{2}/day

C_α = 0.001



Load No.= 12
Load= 0.25 tsf
D_0 = -0.2653
D_{50} = -0.2658
D_{100} = -0.2664
T_{50} = 1.23 min.

C_v @ T_{50}
0.215 ft.^{2}/day

C_α = 0.003

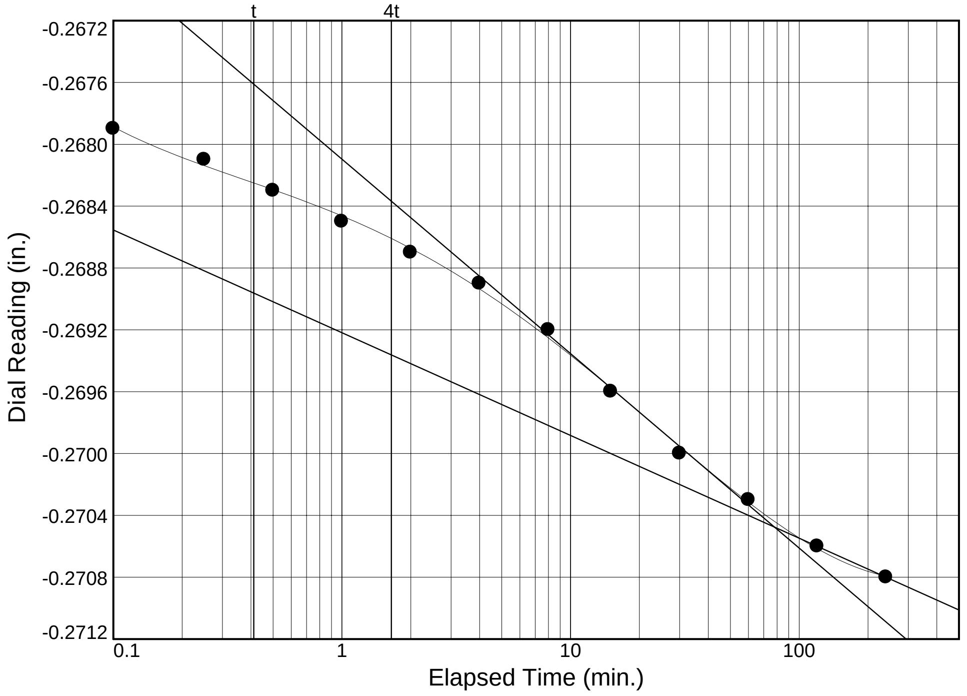
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: LOT-A2-12 Depth: 17.0-19.0 Sample Number: T-2



Load No.= 13

Load= 0.50 tsf

D_0 = -0.2679

D_{50} = -0.2692

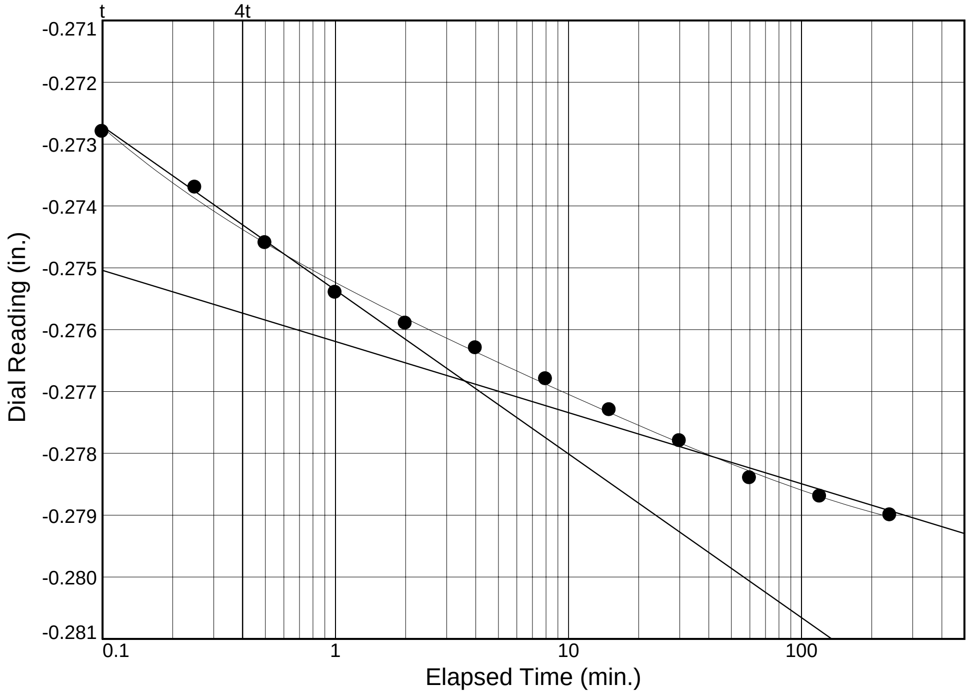
D_{100} = -0.2705

T_{50} = 6.94 min.

C_v @ T_{50}

0.038 ft.^{2}/day

C_α = 0.003



Load No.= 14

Load= 1.00 tsf

D_0 = -0.2711

D_{50} = -0.2740

D_{100} = -0.2768

T_{50} = 0.27 min.

C_v @ T_{50}

0.972 ft.^{2}/day

C_α = 0.005

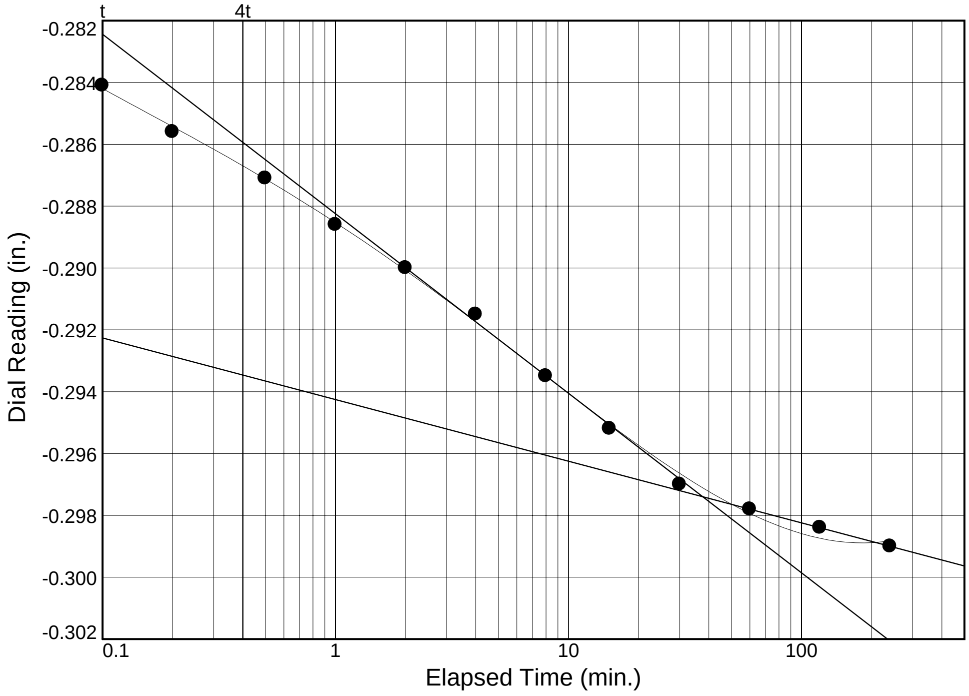
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

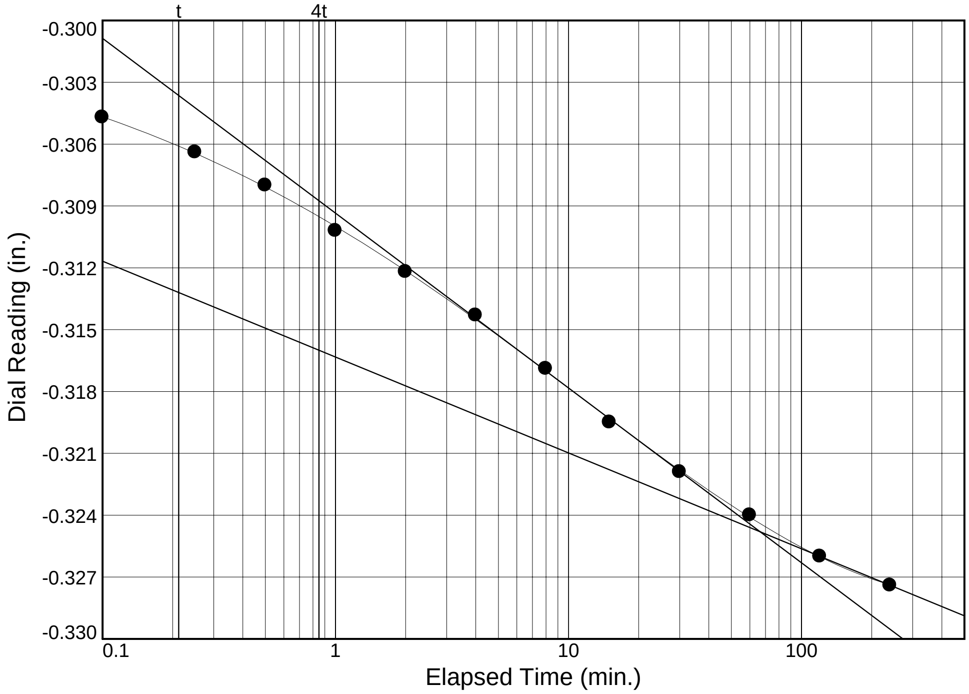
Source of Sample: LOT-A2-12 Depth: 17.0-19.0 Sample Number: T-2



Load No.= 15
Load= 2.00 tsf
D_0 = -0.2817
D_{50} = -0.2895
D_{100} = -0.2974
T_{50} = 1.58 min.

C_v @ T_{50}
0.157 ft.^{2}/day

C_α = 0.008



Load No.= 16
Load= 4.00 tsf
D_0 = -0.3027
D_{50} = -0.3137
D_{100} = -0.3248
T_{50} = 3.21 min.

C_v @ T_{50}
0.072 ft.^{2}/day

C_α = 0.019

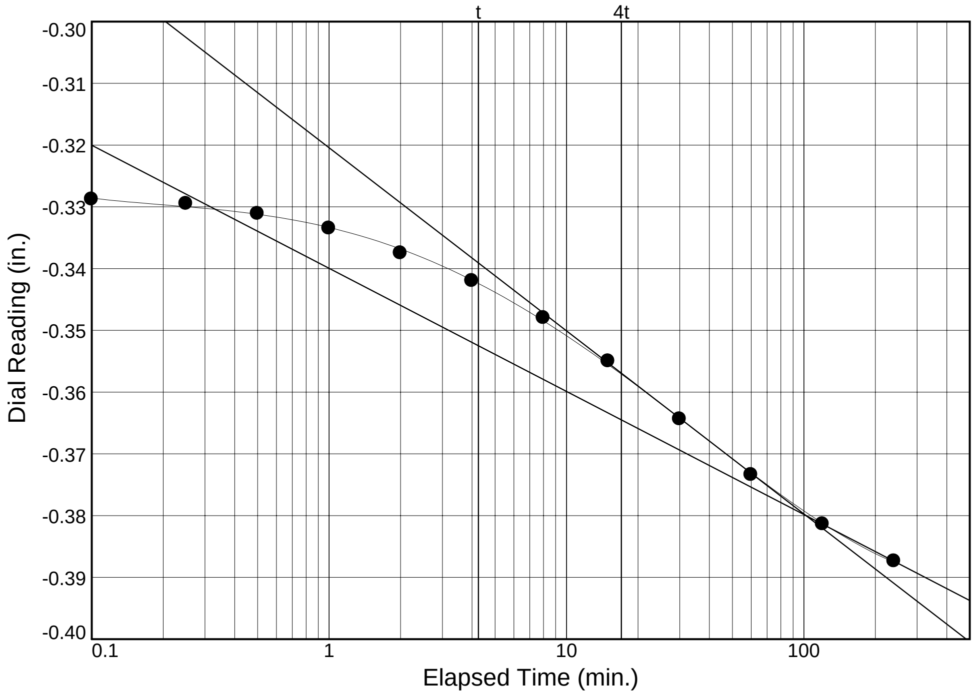
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

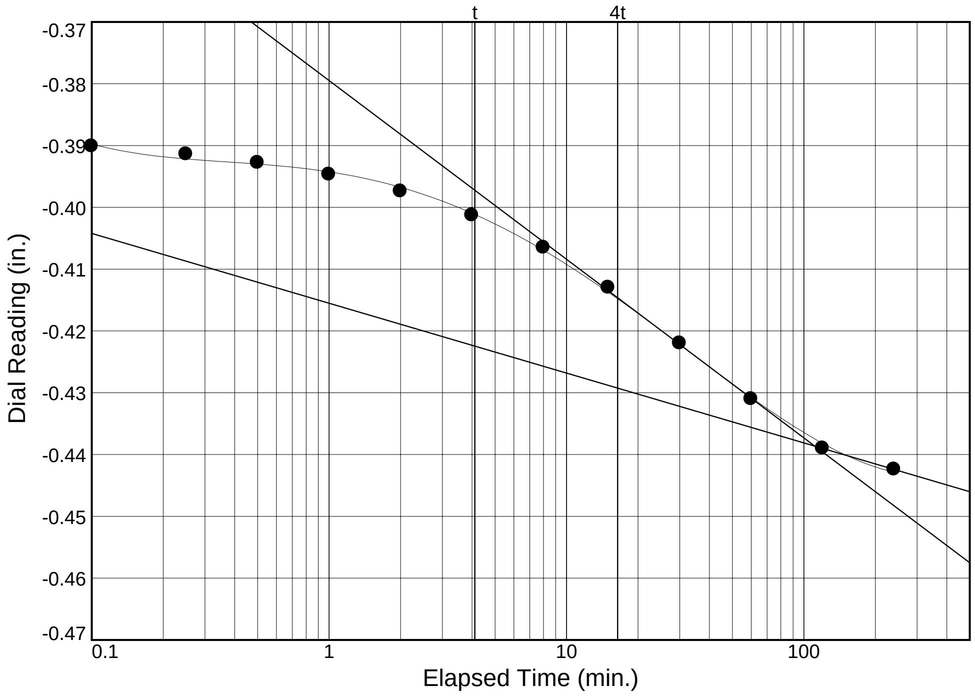
Source of Sample: LOT-A2-12 Depth: 17.0-19.0 Sample Number: T-2



Load No.= 17
Load= 8.00 tsf
D_0 = -0.3277
D_{50} = -0.3539
D_{100} = -0.3800
T_{50} = 12.99 min.

C_v @ T_{50}
0.016 ft.^{2}/day

C_α = 0.081



Load No.= 18
Load= 16.00 tsf
D_0 = -0.3875
D_{50} = -0.4131
D_{100} = -0.4386
T_{50} = 14.14 min.

C_v @ T_{50}
0.012 ft.^{2}/day

C_α = 0.046

Figure

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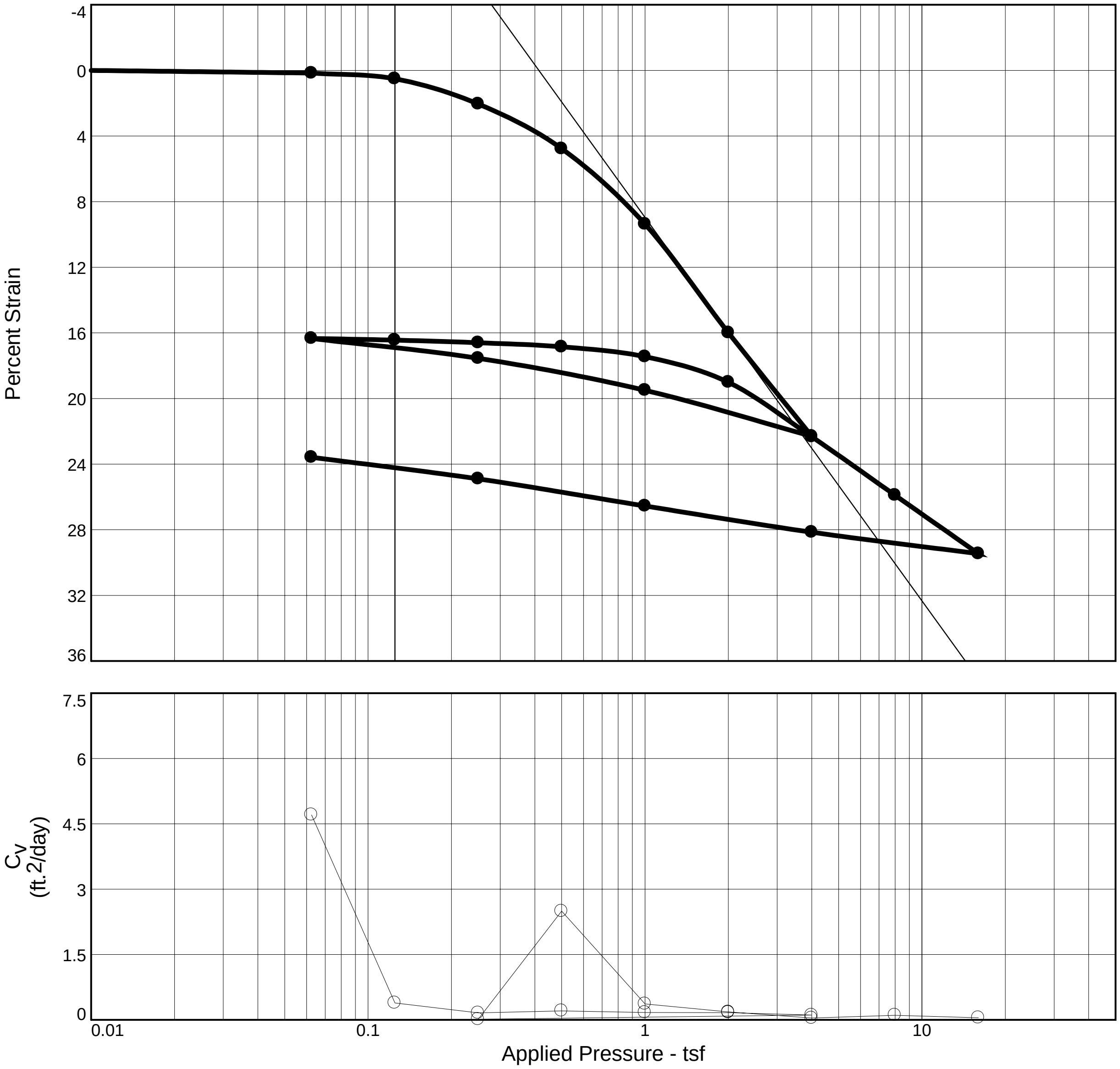
CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
85.0 %	80.6 %	47.1	109	63	2.65		0.5	0.82	0.11	2.512

MATERIAL DESCRIPTION	USCS	AASHTO
Elastic Silt w/sand		

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

Source of Sample: LOT-A2-13 **Depth:** 10 **Sample Number:** T-1 Redo

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Remarks:

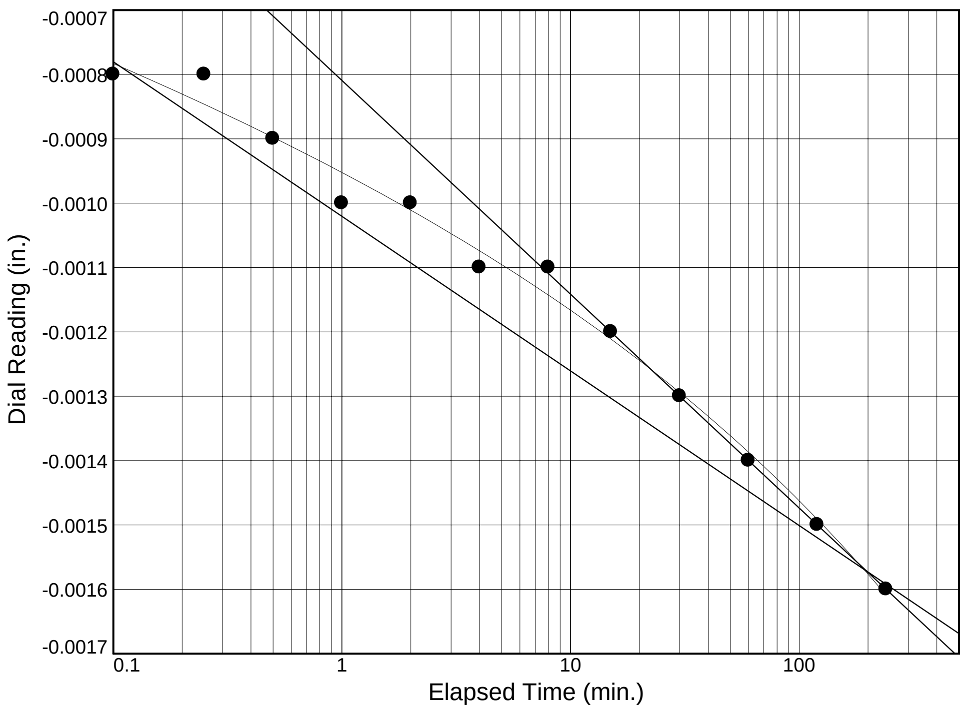
Figure

Tested By: cs

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: LOT-A2-13 Depth: 10 Sample Number: T-1 Redo



Load No.= 1

Load= 0.06 tsf

D_0 = 0.0000

D_{50} = -0.0008

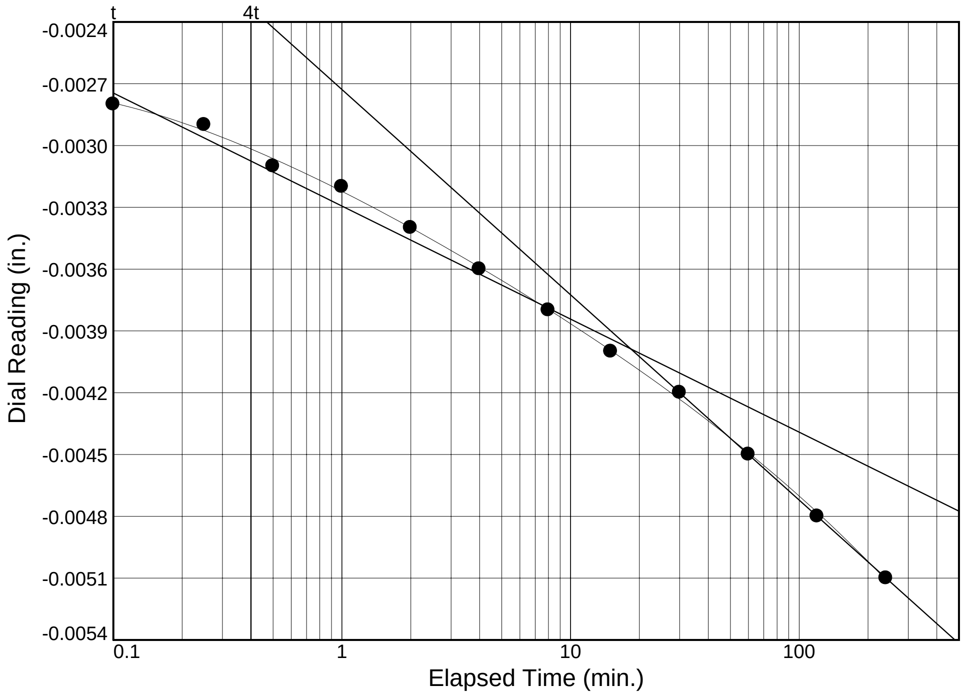
D_{100} = -0.0016

T_{50} = 0.10 min.

C_v @ T_{50}

4.705 ft.^{2}/day

C_α = 0.001



Load No.= 2

Load= 0.13 tsf

D_0 = -0.0026

D_{50} = -0.0033

D_{100} = -0.0040

T_{50} = 1.26 min.

C_v @ T_{50}

0.389 ft.^{2}/day

C_α = 0.004

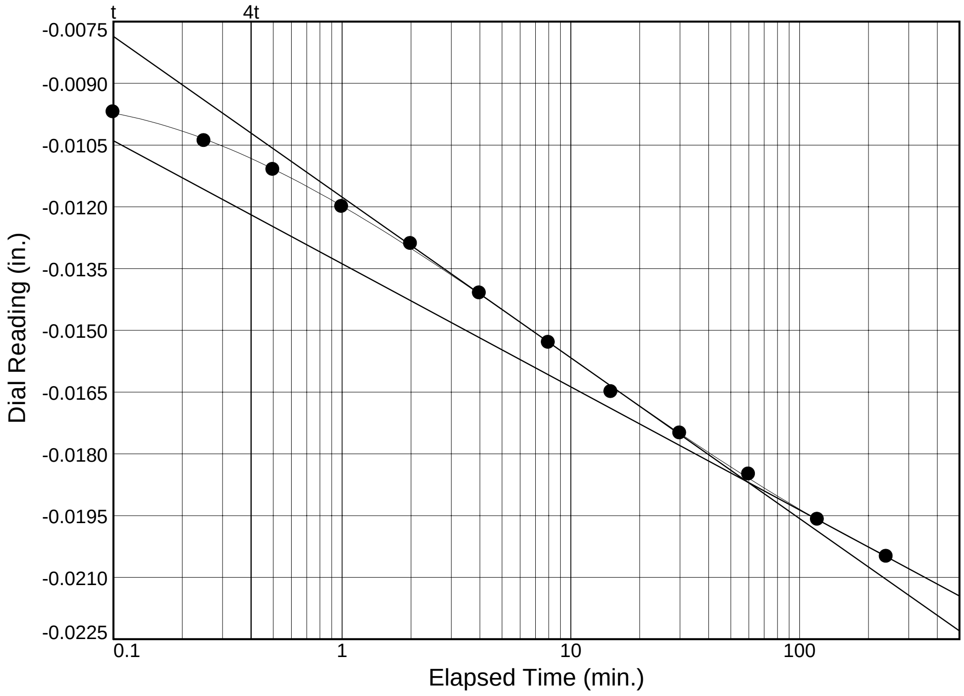
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: LOT-A2-13 Depth: 10 Sample Number: T-1 Redo



Load No.= 3

Load= 0.25 tsf

D_0 = -0.0086

D_{50} = -0.0137

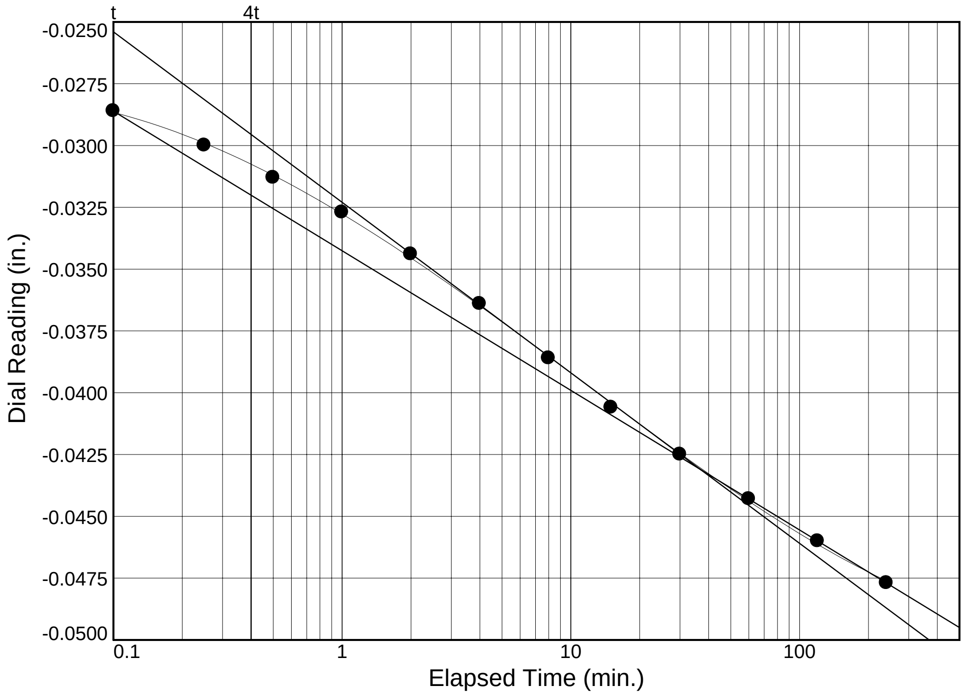
D_{100} = -0.0187

T_{50} = 2.99 min.

C_v @ T_{50}

0.160 ft.^{2}/day

C_α = 0.011



Load No.= 4

Load= 0.50 tsf

D_0 = -0.0266

D_{50} = -0.0348

D_{100} = -0.0431

T_{50} = 2.22 min.

C_v @ T_{50}

0.206 ft.^{2}/day

C_α = 0.020

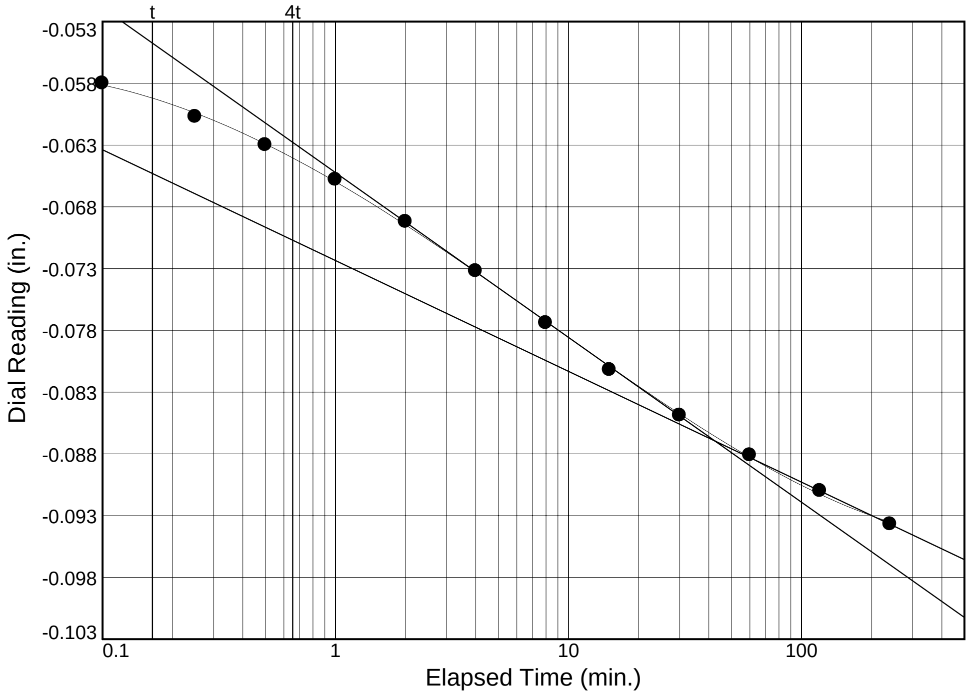
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: LOT-A2-13 Depth: 10 Sample Number: T-1 Redo



Load No.= 5

Load= 1.00 tsf

D_0 = -0.0544

D_{50} = -0.0707

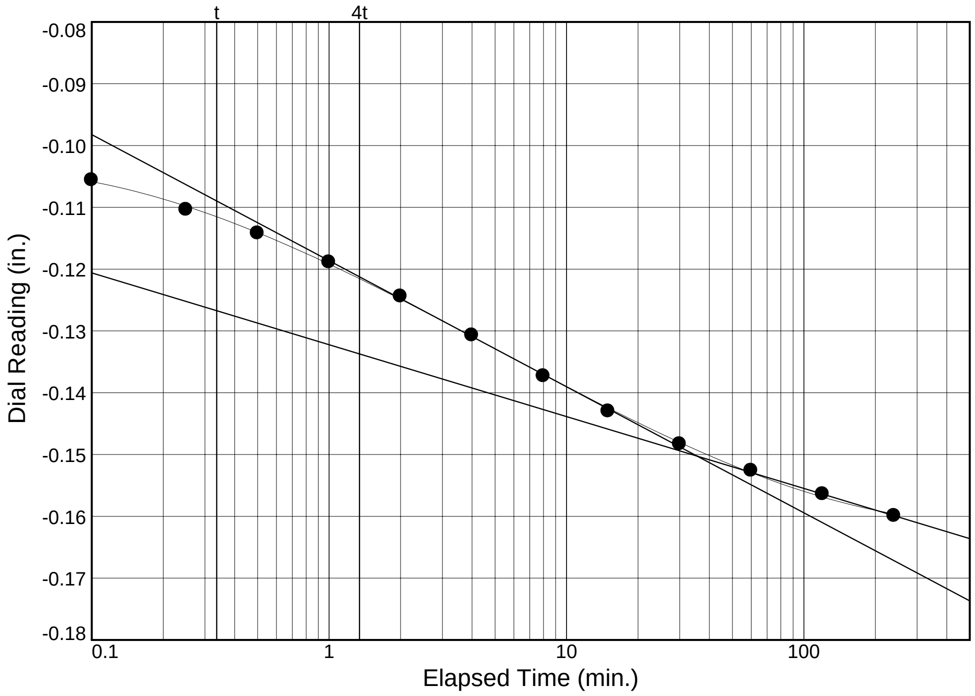
D_{100} = -0.0870

T_{50} = 2.49 min.

C_v @ T_{50}

0.171 ft.^{2}/day

C_α = 0.032



Load No.= 6

Load= 2.00 tsf

D_0 = -0.1015

D_{50} = -0.1259

D_{100} = -0.1502

T_{50} = 2.25 min.

C_v @ T_{50}

0.167 ft.^{2}/day

C_α = 0.041

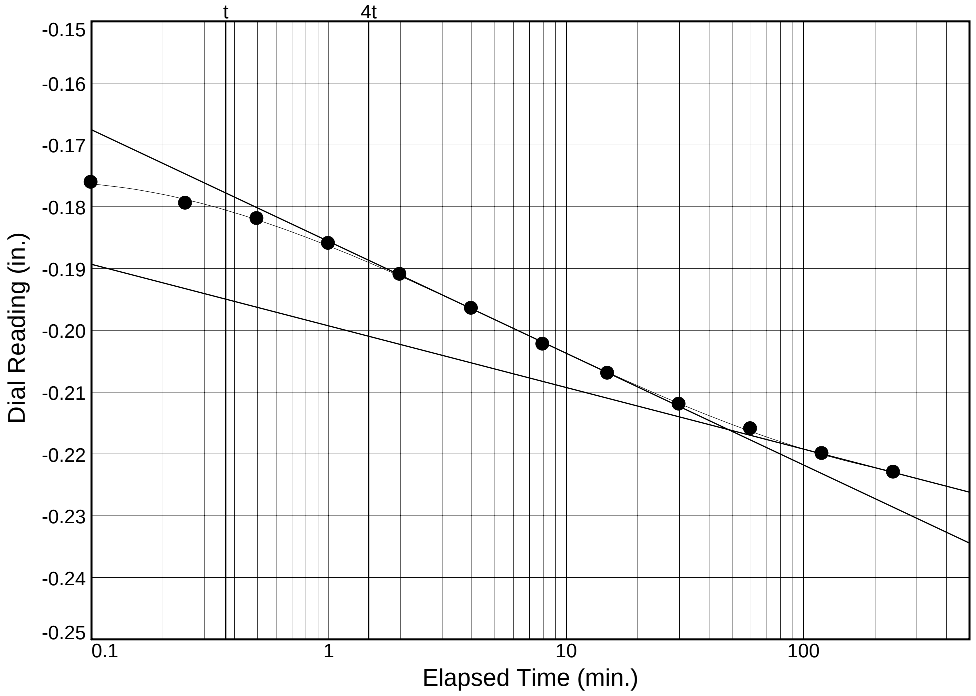
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

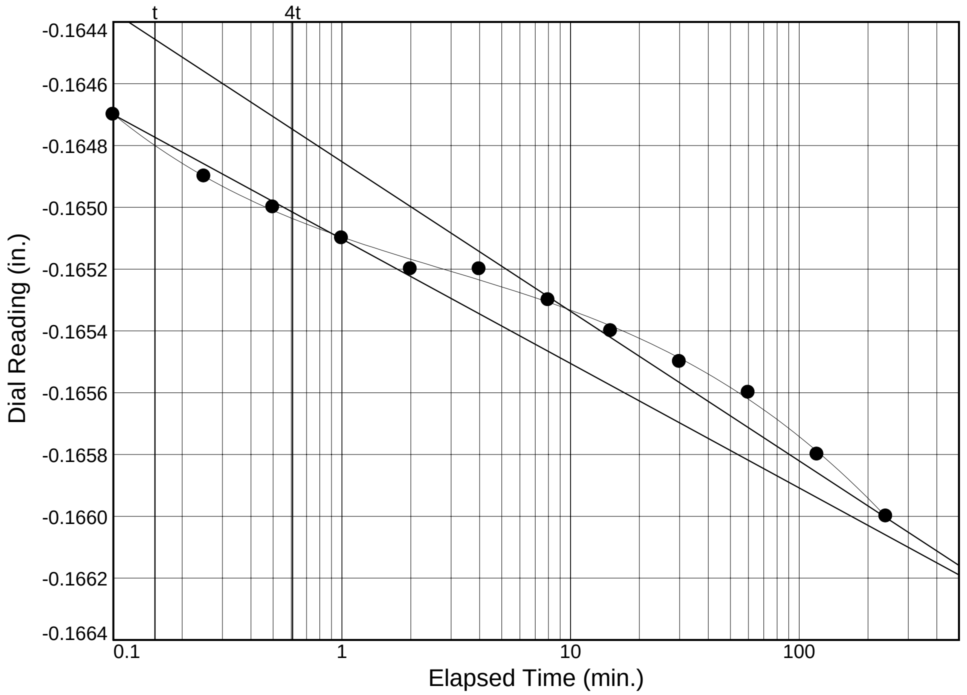
Source of Sample: LOT-A2-13 Depth: 10 Sample Number: T-1 Redo



Load No.= 7
Load= 4.00 tsf
D_0 = -0.1721
D_{50} = -0.1941
D_{100} = -0.2160
T_{50} = 2.91 min.

C_v @ T_{50}
0.110 ft.^{2}/day

C_α = 0.035



Load No.= 12
Load= 0.25 tsf
D_0 = -0.1646
D_{50} = -0.1655
D_{100} = -0.1663
T_{50} = 24.06 min.

C_v @ T_{50}
0.014 ft.^{2}/day

C_α = 0.002

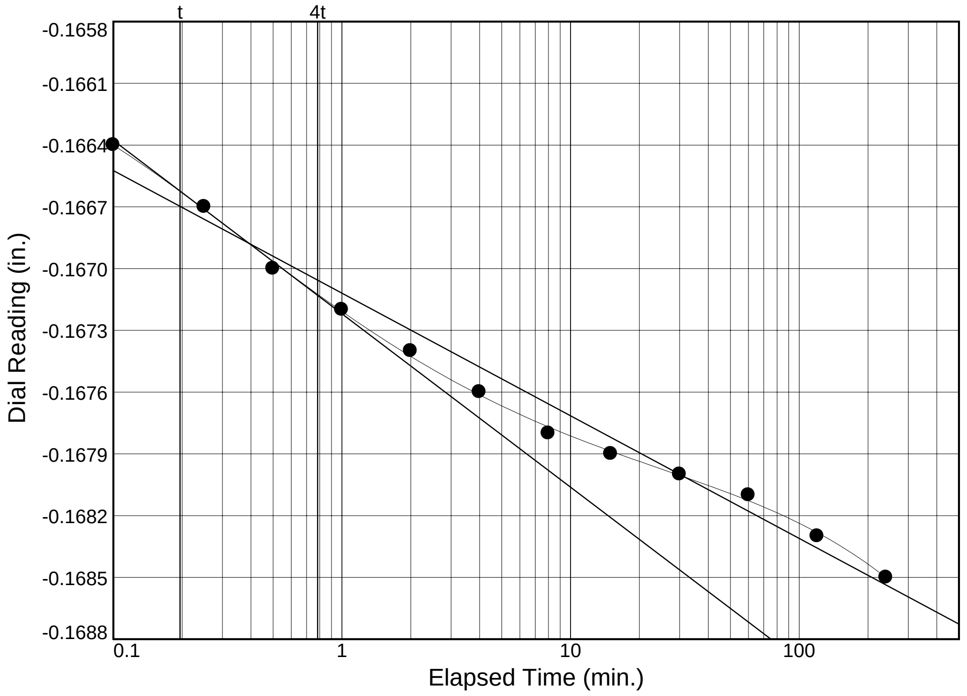
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: LOT-A2-13 Depth: 10 Sample Number: T-1 Redo



Load No.= 13

Load= 0.50 tsf

D_0 = -0.1661

D_{50} = -0.1665

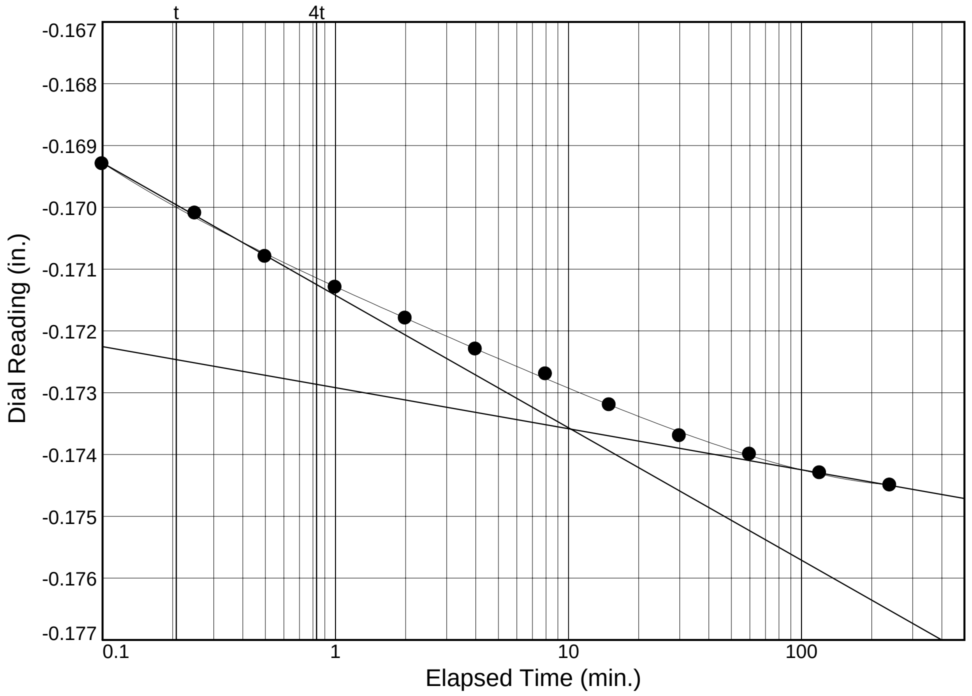
D_{100} = -0.1669

T_{50} = 0.14 min.

C_v @ T_{50}

2.497 ft.^{2}/day

C_α = 0.002



Load No.= 14

Load= 1.00 tsf

D_0 = -0.1689

D_{50} = -0.1712

D_{100} = -0.1736

T_{50} = 0.92 min.

C_v @ T_{50}

0.367 ft.^{2}/day

C_α = 0.002

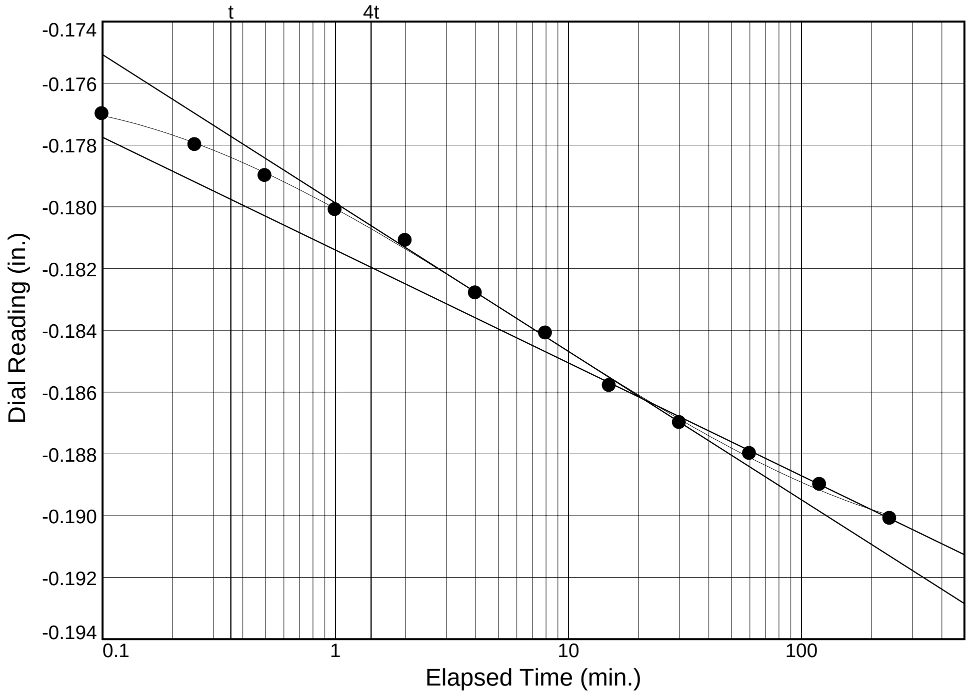
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: LOT-A2-13 Depth: 10 Sample Number: T-1 Redo



Load No.= 15

Load= 2.00 tsf

D_0 = -0.1761

D_{50} = -0.1812

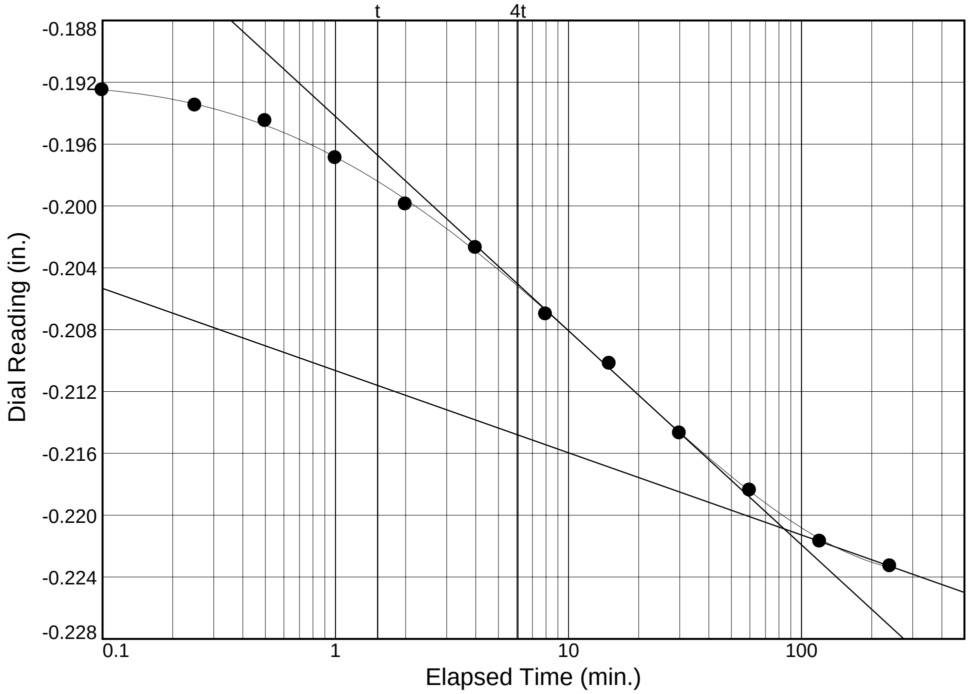
D_{100} = -0.1862

T_{50} = 1.80 min.

C_v @ T_{50}

0.183 ft.^{2}/day

C_α = 0.013



Load No.= 16

Load= 4.00 tsf

D_0 = -0.1916

D_{50} = -0.2062

D_{100} = -0.2209

T_{50} = 7.30 min.

C_v @ T_{50}

0.042 ft.^{2}/day

C_α = 0.019

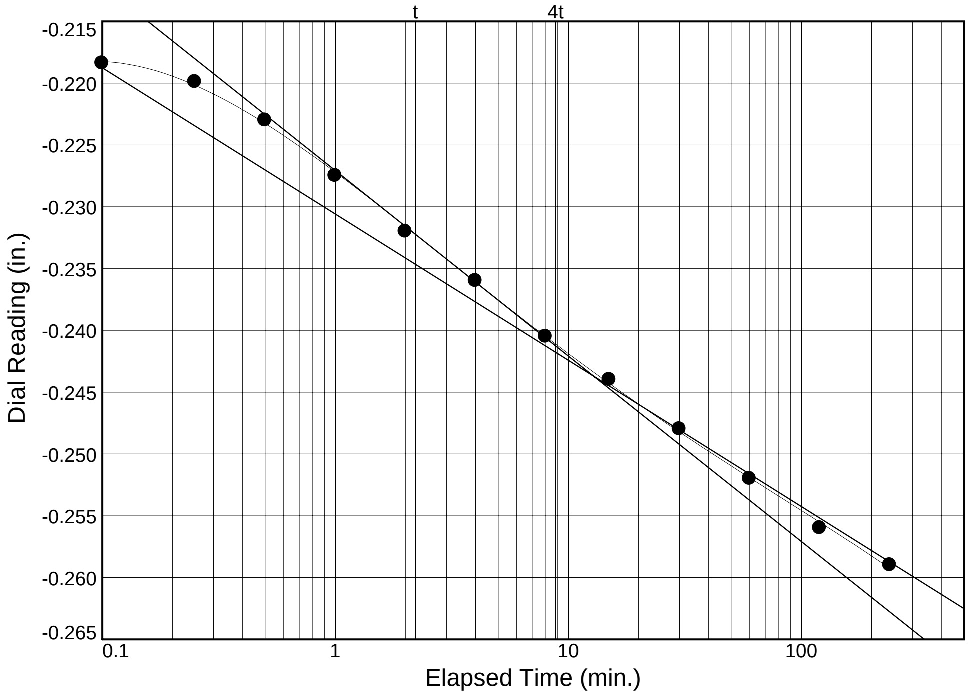
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

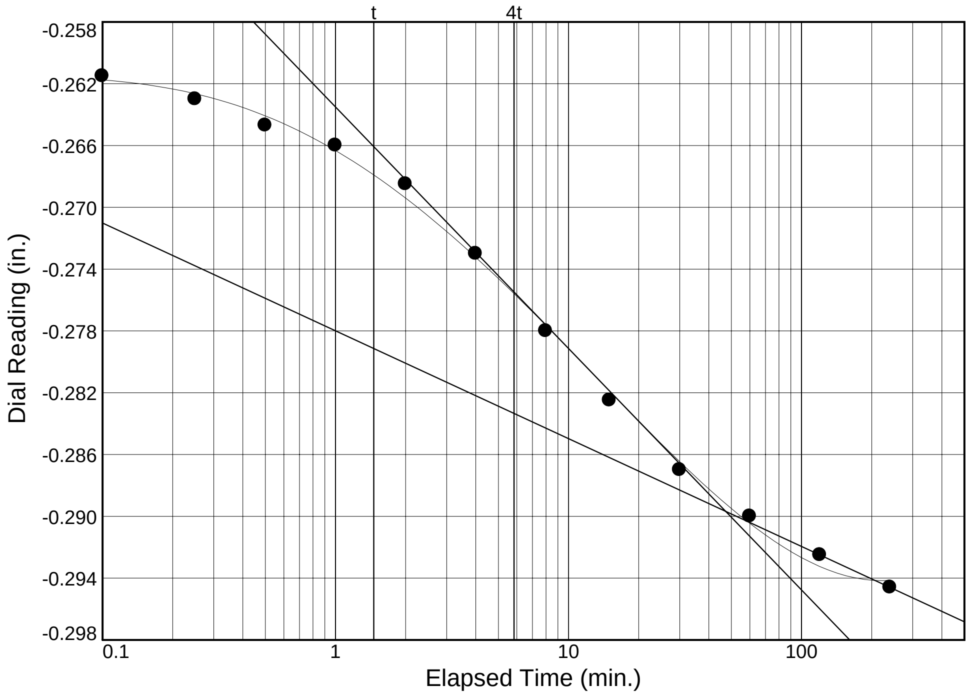
Source of Sample: LOT-A2-13 Depth: 10 Sample Number: T-1 Redo



Load No.= 17
Load= 8.00 tsf
D_0 = -0.2233
D_{50} = -0.2335
D_{100} = -0.2437
T_{50} = 2.70 min.

C_v @ T_{50}
0.105 ft.^{2}/day

C_α = 0.042



Load No.= 18
Load= 16.00 tsf
D_0 = -0.2602
D_{50} = -0.2749
D_{100} = -0.2897
T_{50} = 5.28 min.

C_v @ T_{50}
0.049 ft.^{2}/day

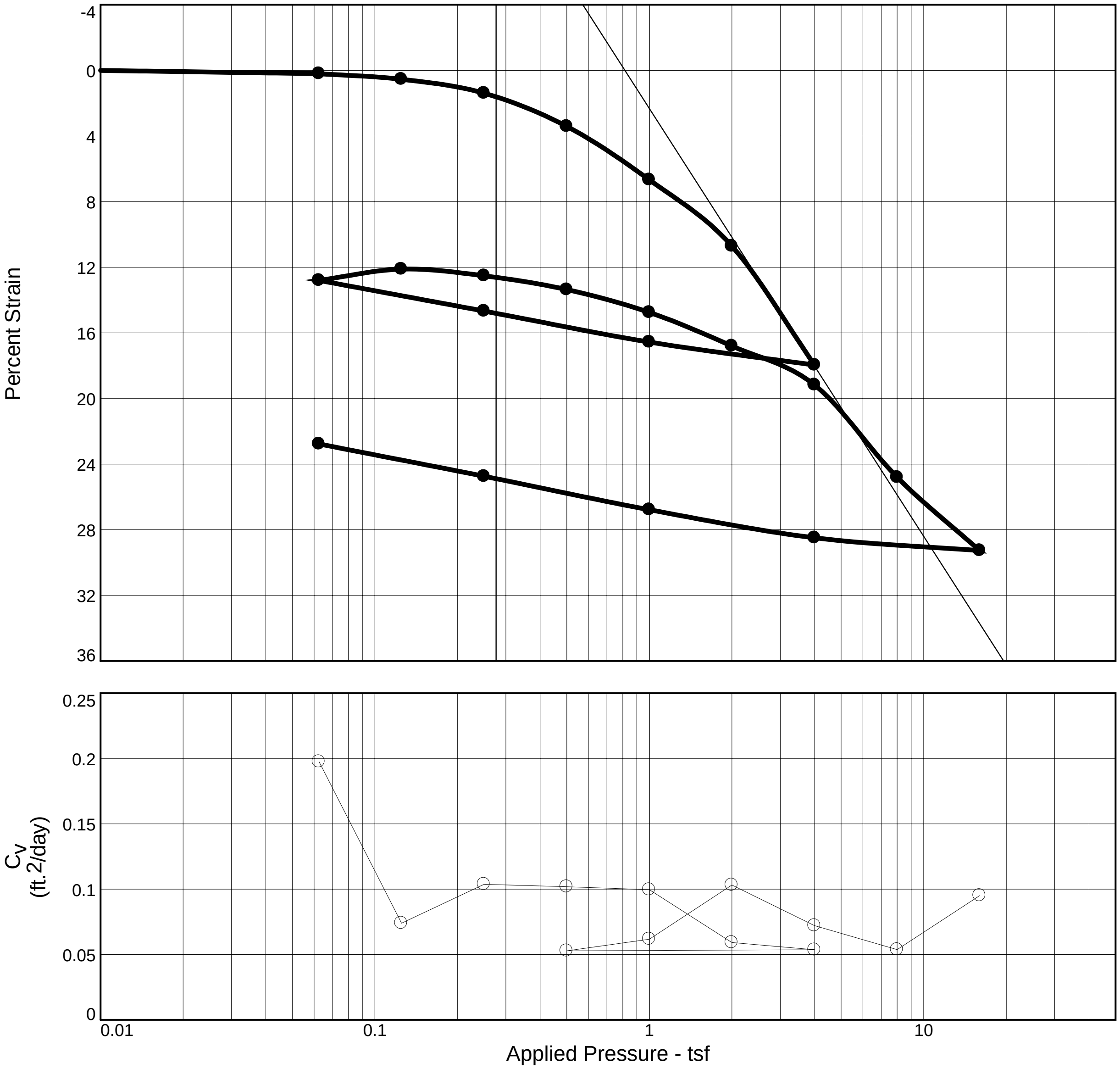
C_α = 0.025

Figure

Hillis-Carnes Engineering Associates

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
98.4 %	54.9 %	66.8	97	58	2.65		1.1	0.65	0.09	1.478

MATERIAL DESCRIPTION	USCS	AASHTO
LOT-A2-17A T-1 Fat Clay		

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

Source of Sample: LOT-A2-17

Remarks:

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

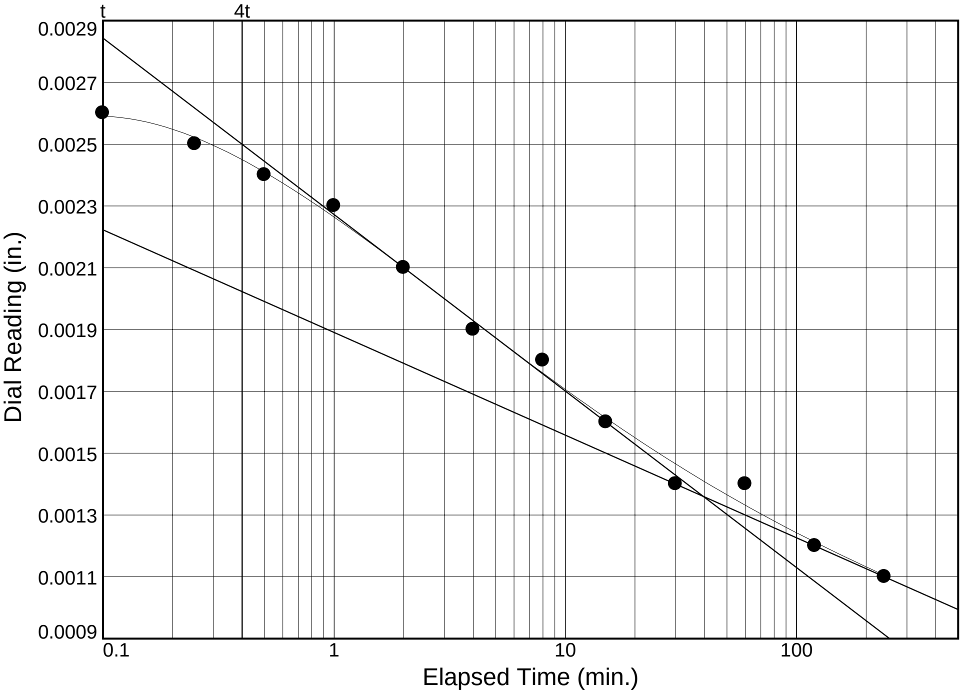
Figure

Tested By: CS

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: LOT-A2-17



Load No.= 1

Load= 0.06 tsf

D_0 = 0.0027

D_{50} = 0.0020

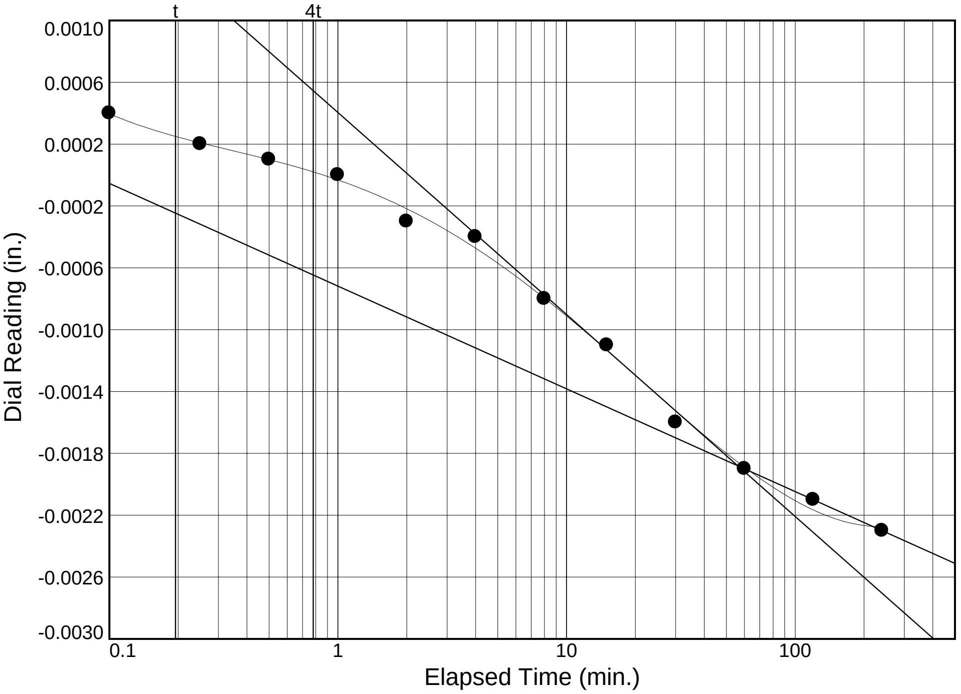
D_{100} = 0.0014

T_{50} = 2.49 min.

C_v @ T_{50}

0.198 ft.^{2}/day

C_α = 0.001



Load No.= 2

Load= 0.13 tsf

D_0 = 0.0005

D_{50} = -0.0007

D_{100} = -0.0019

T_{50} = 6.61 min.

C_v @ T_{50}

0.074 ft.^{2}/day

C_α = 0.002

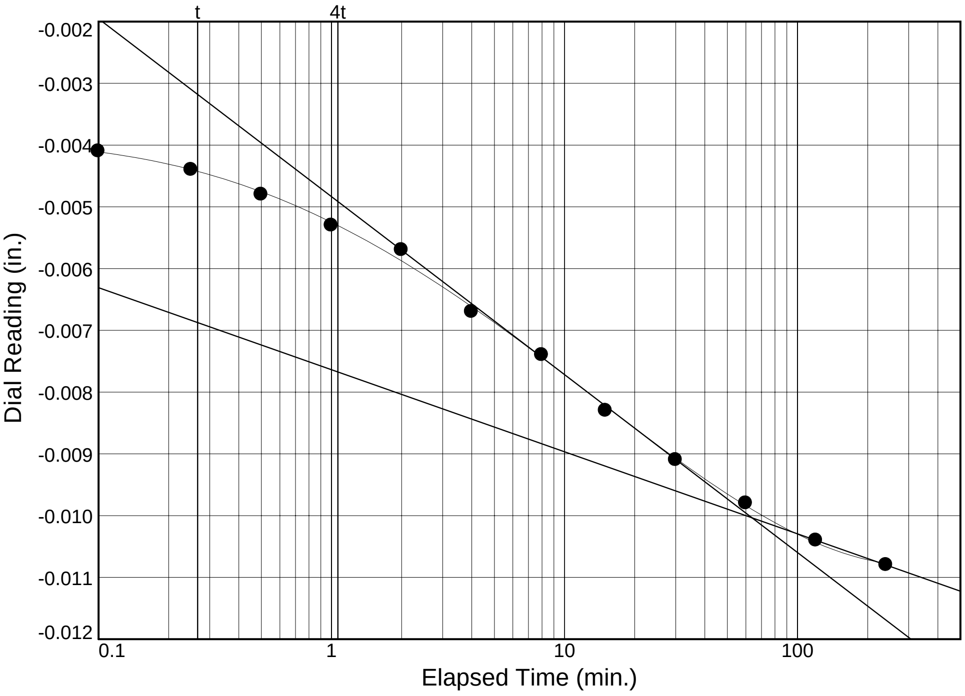
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

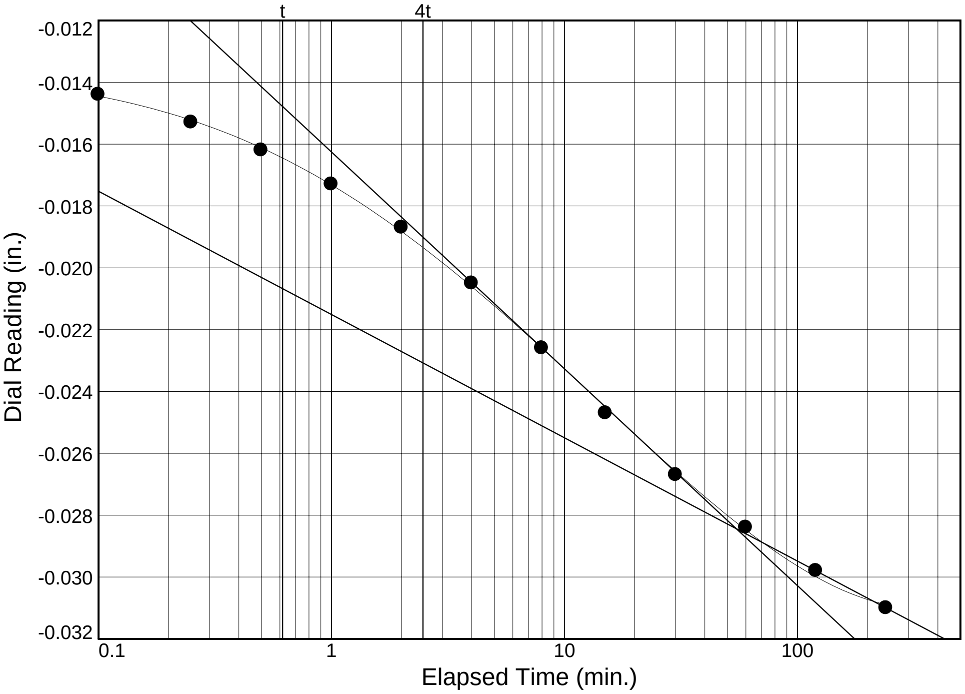
Source of Sample: LOT-A2-17



Load No.= 3
Load= 0.25 tsf
D_0 = -0.0035
D_{50} = -0.0068
D_{100} = -0.0100
T_{50} = 4.66 min.

C_v @ T_{50}
0.104 ft.^{2}/day

C_α = 0.003



Load No.= 4
Load= 0.50 tsf
D_0 = -0.0136
D_{50} = -0.0210
D_{100} = -0.0284
T_{50} = 4.60 min.

C_v @ T_{50}
0.102 ft.^{2}/day

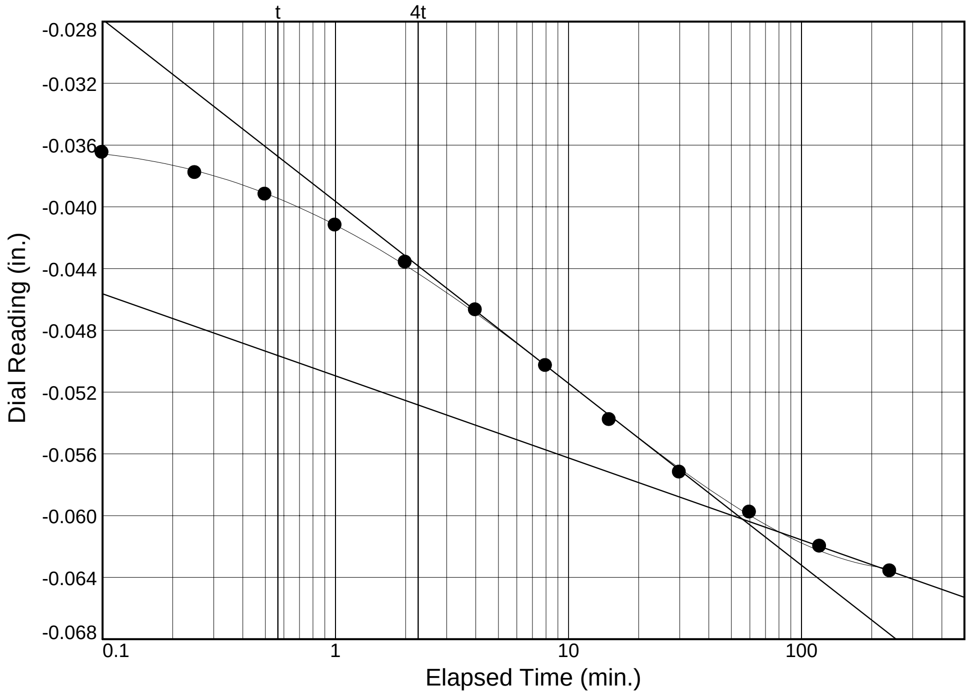
C_α = 0.010

Figure

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: LOT-A2-17



Load No.= 5

Load= 1.00 tsf

D_0 = -0.0346

D_{50} = -0.0474

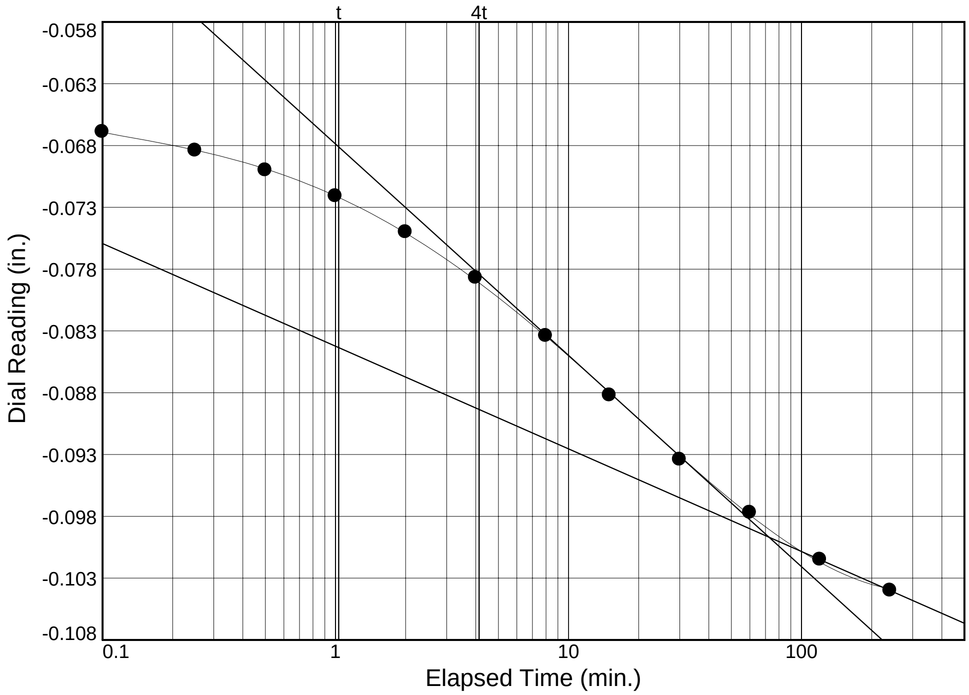
D_{100} = -0.0602

T_{50} = 4.46 min.

C_v @ T_{50}

0.100 ft.^{2}/day

C_α = 0.013



Load No.= 6

Load= 2.00 tsf

D_0 = -0.0653

D_{50} = -0.0825

D_{100} = -0.0997

T_{50} = 6.95 min.

C_v @ T_{50}

0.059 ft.^{2}/day

C_α = 0.021

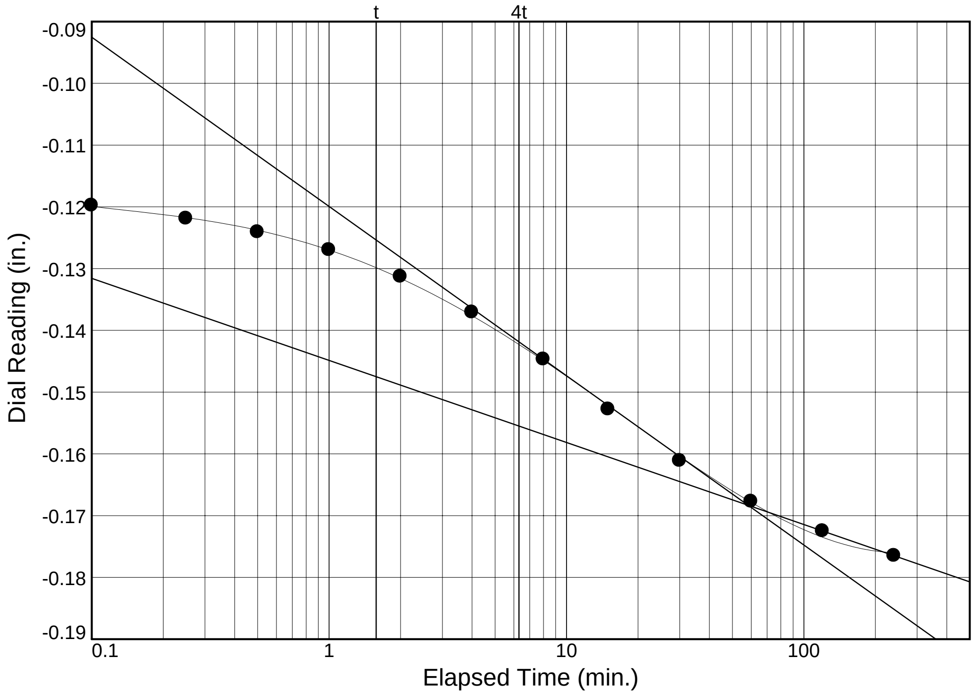
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: LOT-A2-17



Load No.= 7

Load= 4.00 tsf

D_0 = -0.1174

D_{50} = -0.1429

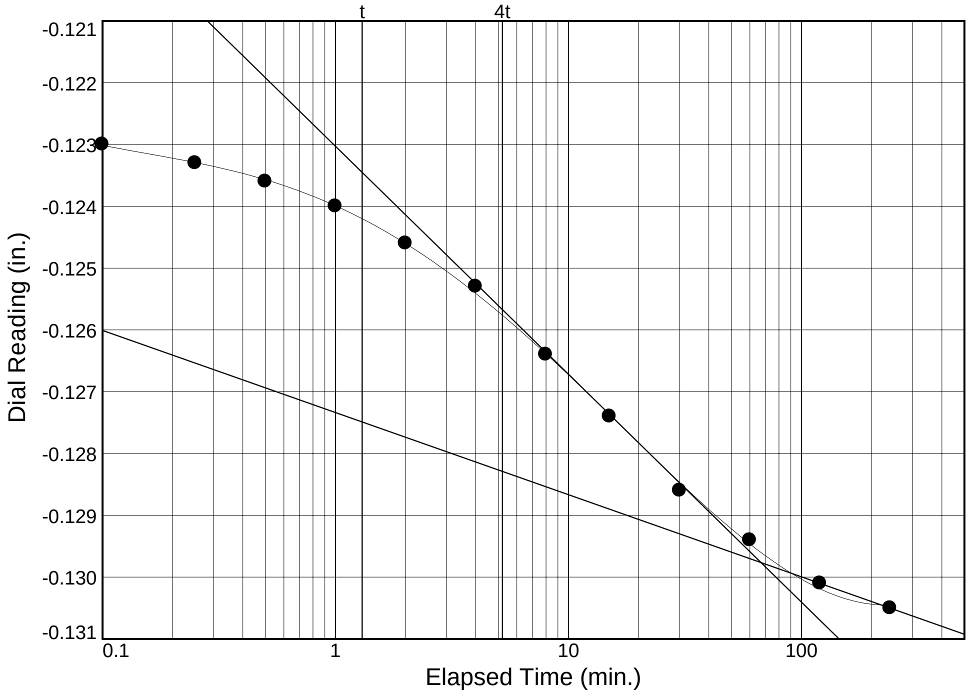
D_{100} = -0.1683

T_{50} = 6.66 min.

C_v @ T_{50}

0.054 ft.^{2}/day

C_α = 0.033



Load No.= 13

Load= 0.50 tsf

D_0 = -0.1226

D_{50} = -0.1262

D_{100} = -0.1298

T_{50} = 7.06 min.

C_v @ T_{50}

0.053 ft.^{2}/day

C_α = 0.003

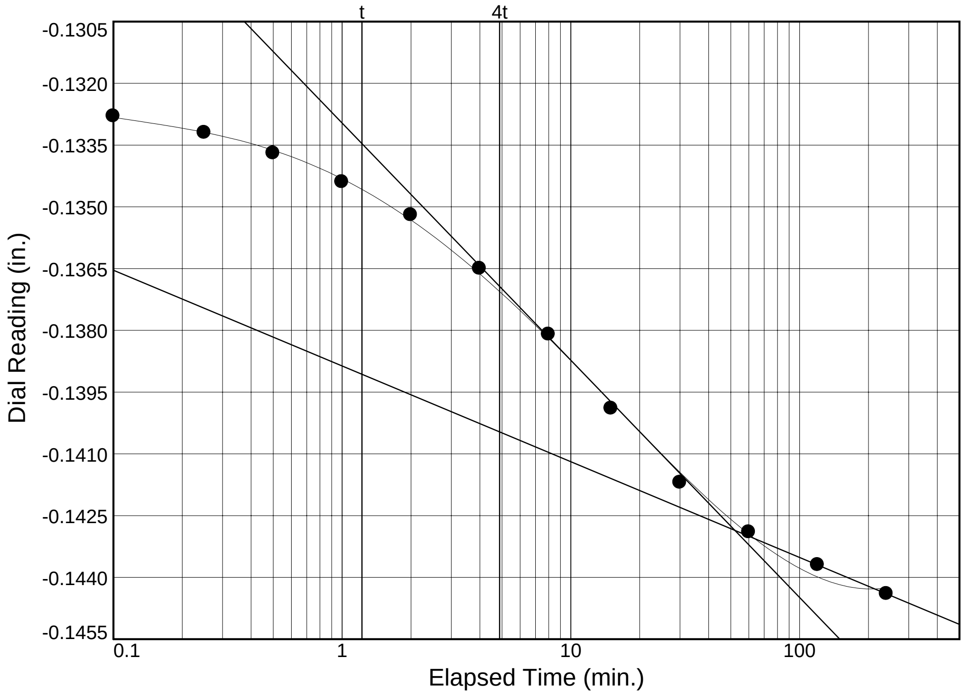
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

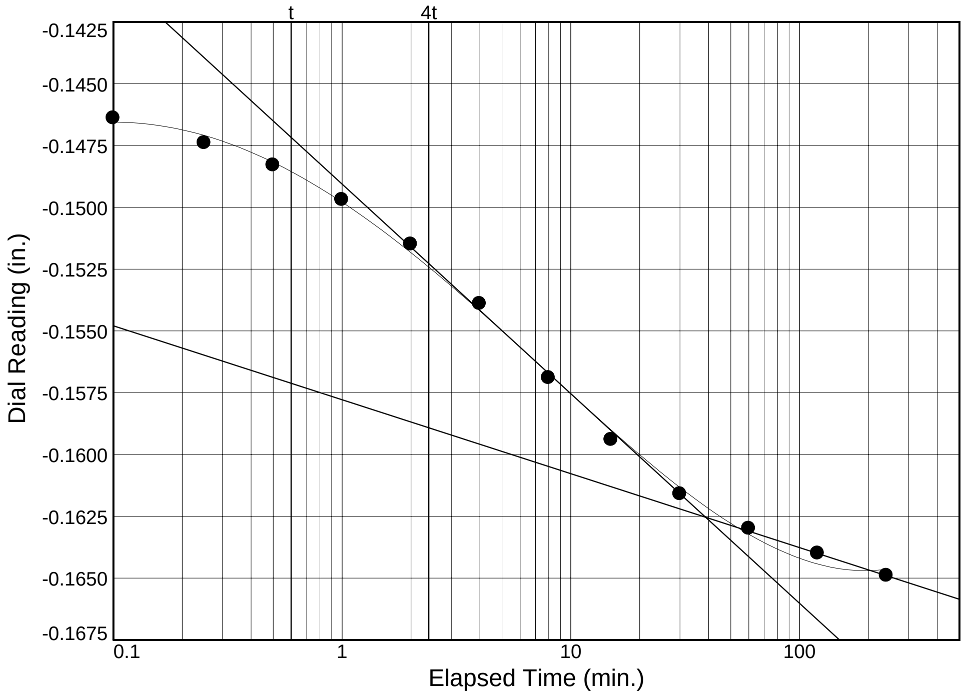
Source of Sample: LOT-A2-17



Load No.= 14
Load= 1.00 tsf
D_0 = -0.1321
D_{50} = -0.1375
D_{100} = -0.1429
T_{50} = 5.88 min.

C_v @ T_{50}
0.062 ft.^{2}/day

C_α = 0.006



Load No.= 15
Load= 2.00 tsf
D_0 = -0.1447
D_{50} = -0.1536
D_{100} = -0.1625
T_{50} = 3.39 min.

C_v @ T_{50}
0.103 ft.^{2}/day

C_α = 0.007

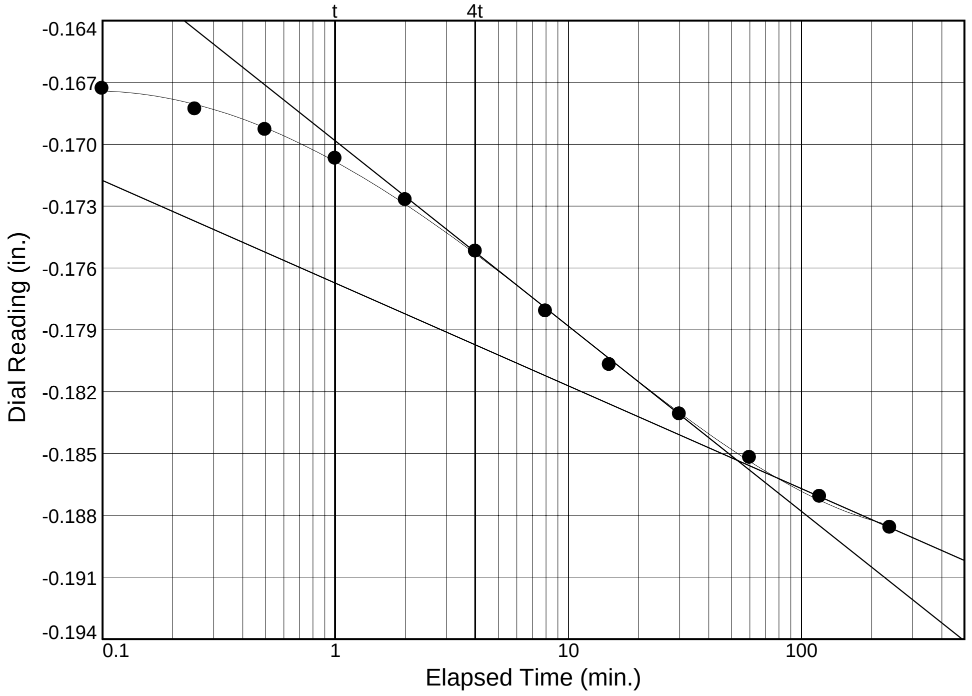
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: LOT-A2-17



Load No.= 16

Load= 4.00 tsf

D_0 = -0.1663

D_{50} = -0.1758

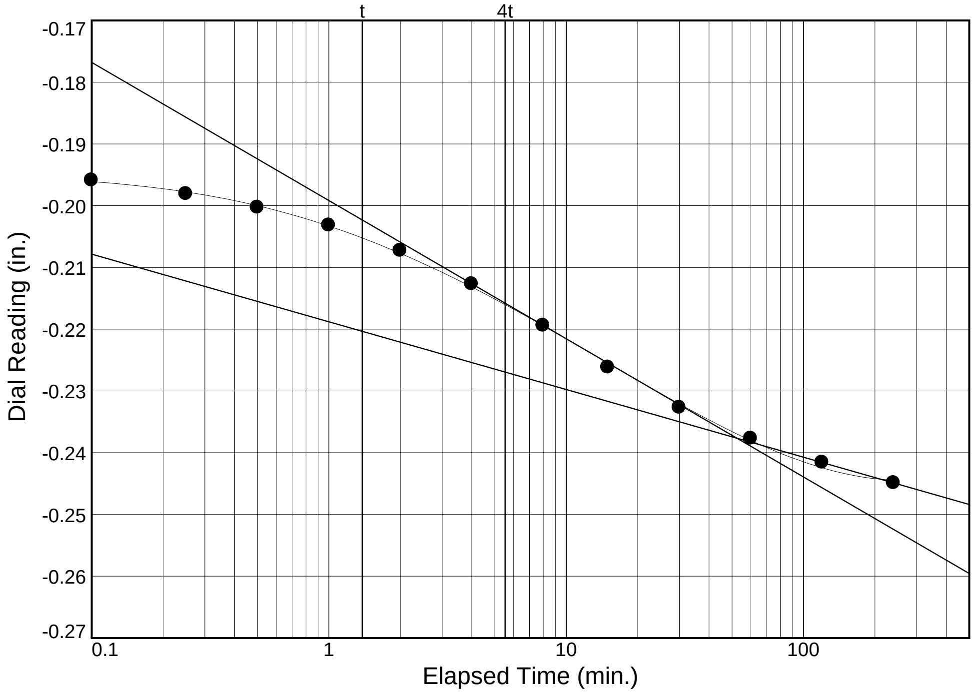
D_{100} = -0.1853

T_{50} = 4.59 min.

C_v @ T_{50}

0.072 ft.^{2}/day

C_α = 0.012



Load No.= 17

Load= 8.00 tsf

D_0 = -0.1944

D_{50} = -0.2161

D_{100} = -0.2377

T_{50} = 5.55 min.

C_v @ T_{50}

0.054 ft.^{2}/day

C_α = 0.027

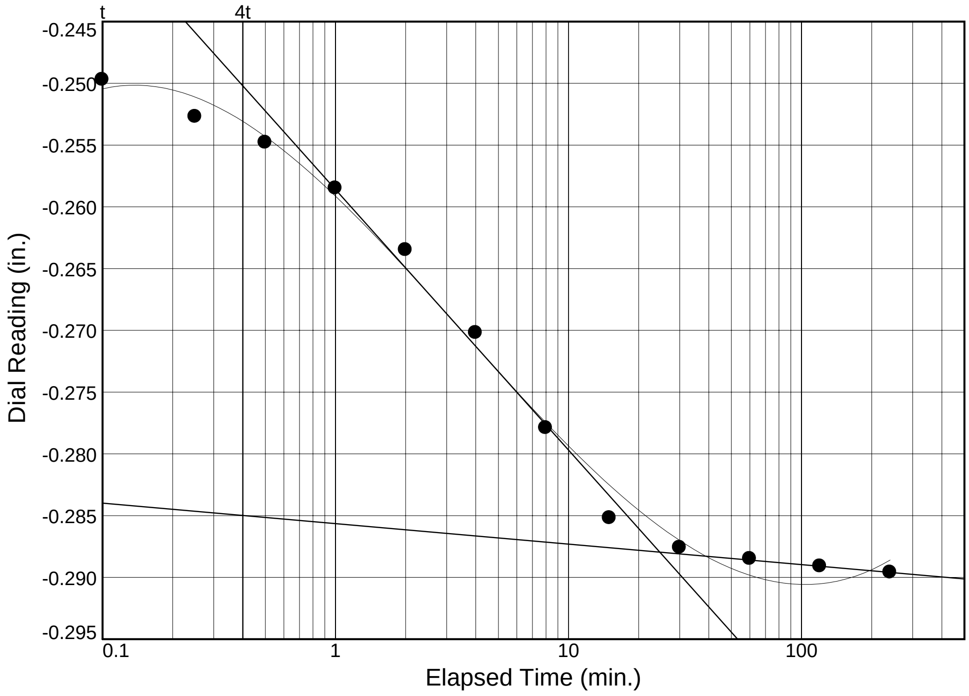
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: LOT-A2-17



Load No.= 18

Load= 16.00 tsf

D_0 = -0.2478

D_{50} = -0.2679

D_{100} = -0.2880

T_{50} = 2.76 min.

C_v @ T_{50}

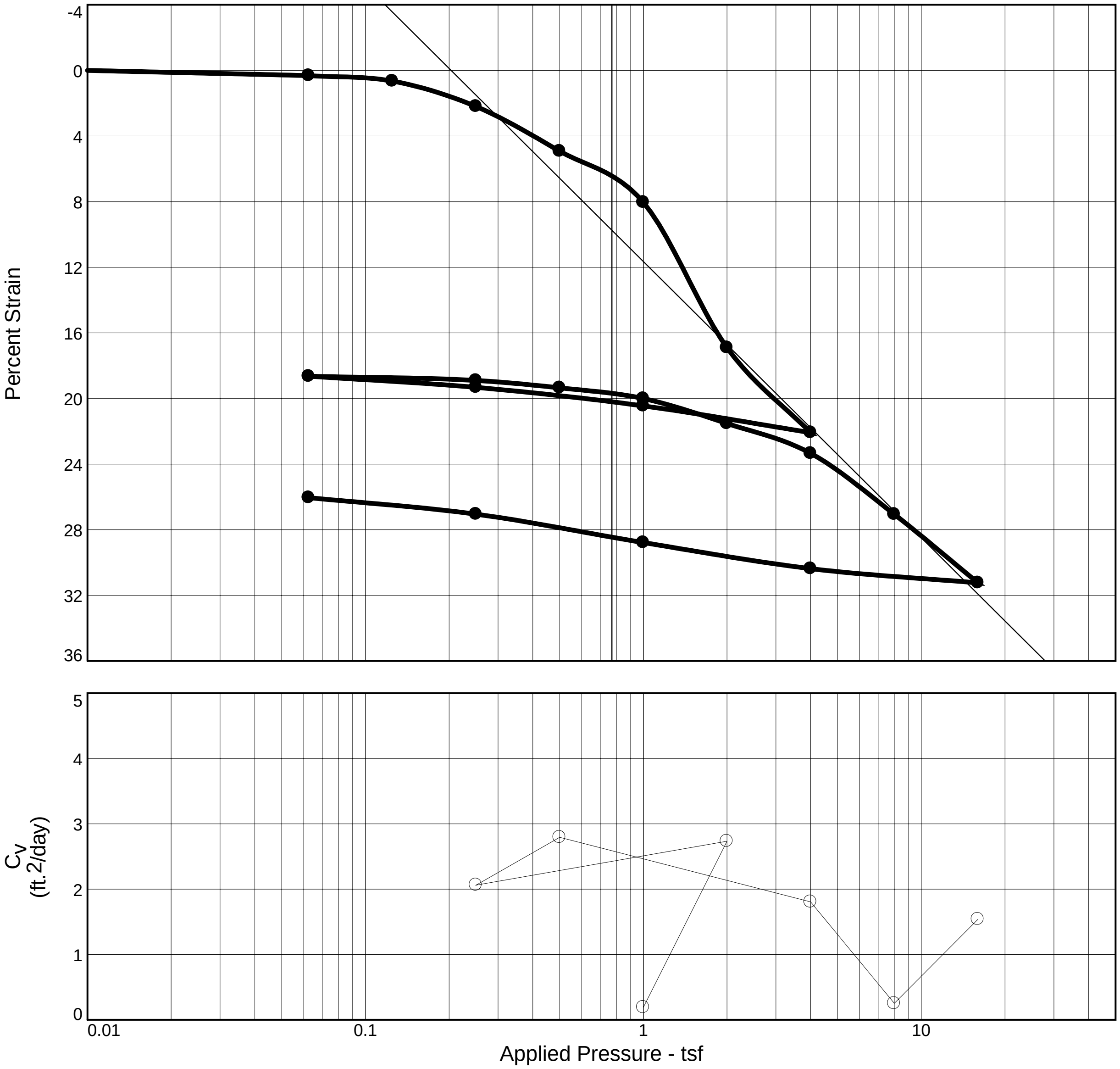
0.095 ft.^{2}/day

C_α = 0.004

Figure

Hillis-Carnes Engineering Associates

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
89.3 %	51.7 %	65.2	64	33	2.65		0.4	0.43	0.06	1.536

MATERIAL DESCRIPTION	USCS	AASHTO
Black fat clay	CH	A-7-5(34)

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

Source of Sample: OL-B-01 **Depth:** 17-19 **Sample Number:** T-2

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.
Annapolis Junction, MD

Remarks:

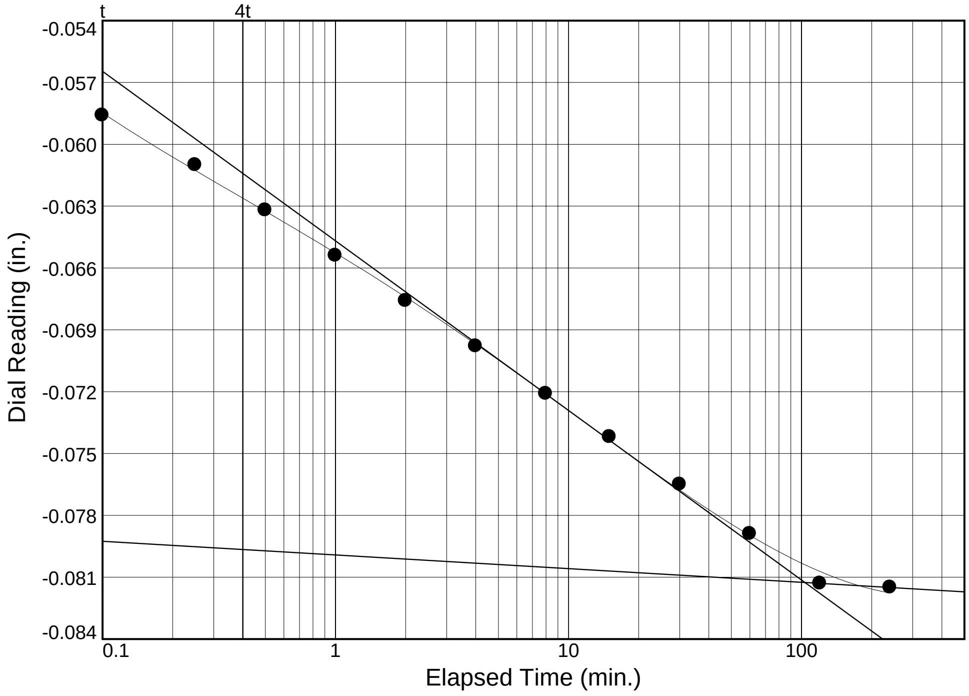
Figure

Tested By: cs

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

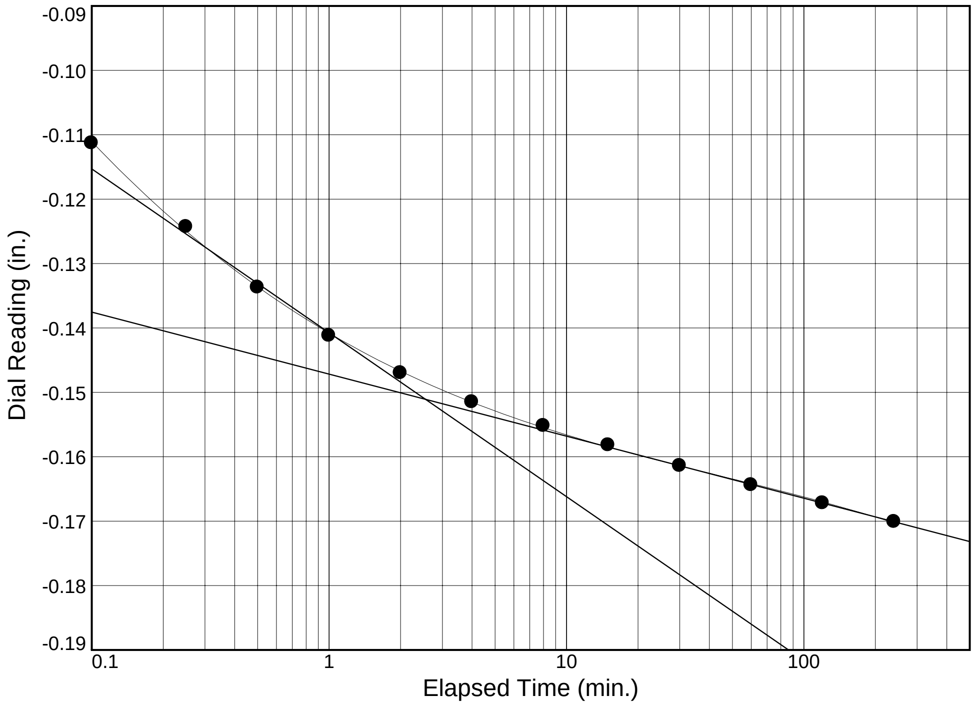
Source of Sample: OL-B-01 Depth: 17-19 Sample Number: T-2



Load No.= 5
Load= 1.00 tsf
D_0 = -0.0543
D_{50} = -0.0678
D_{100} = -0.0813
T_{50} = 2.25 min.

C_v @ T_{50}
0.191 ft.^{2}/day

C_α = 0.002



Load No.= 6
Load= 2.00 tsf
D_0 = -0.0815
D_{50} = -0.1163
D_{100} = -0.1511
T_{50} = 0.14 min.

C_v @ T_{50}
2.733 ft.^{2}/day

C_α = 0.024

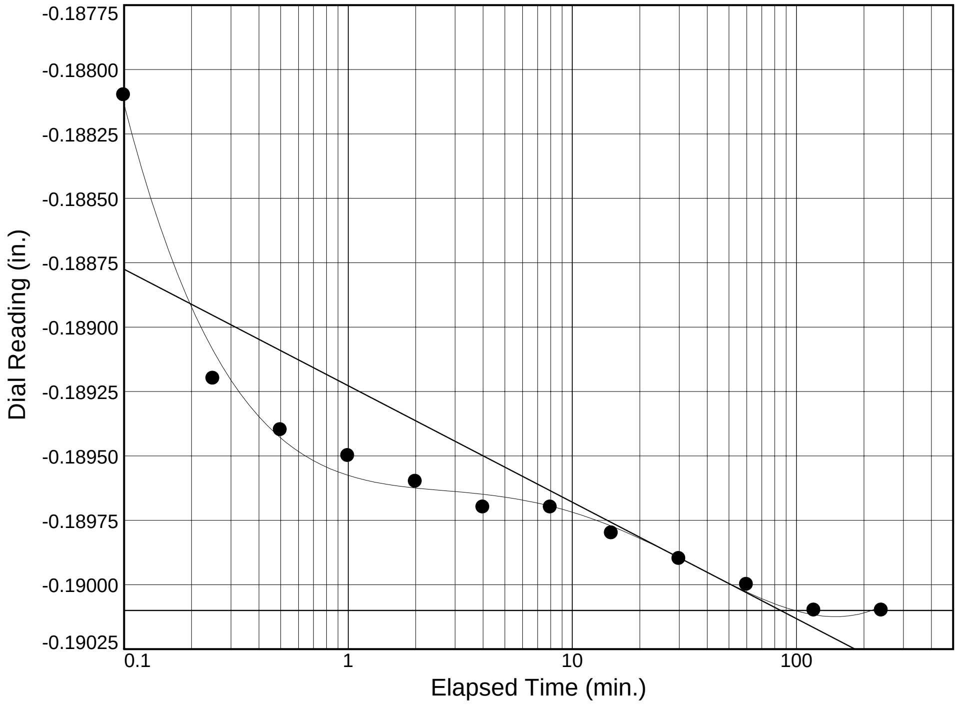
Figure

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

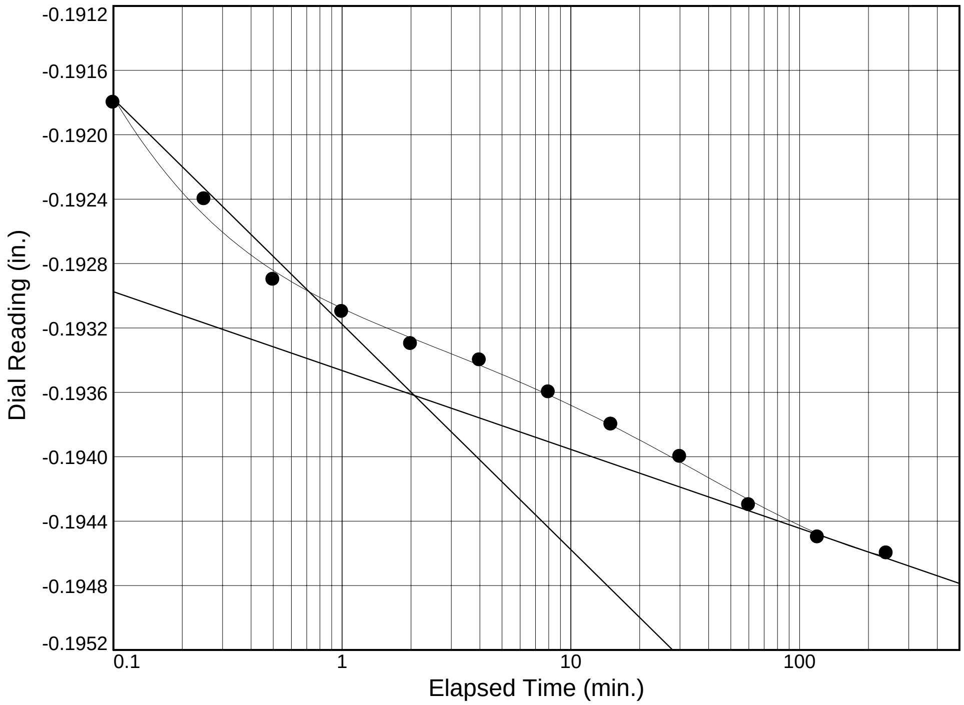
Source of Sample: OL-B-01 Depth: 17-19 Sample Number: T-2



Load No.= 11
Load= 0.25 tsf
D_0 = -0.1873
D_{50} = -0.1887
D_{100} = -0.1901
T_{50} = 0.16 min.

C_v @ T_{50}
2.063 ft.^{2}/day

C_α = 0.000



Load No.= 12
Load= 0.50 tsf
D_0 = -0.1902
D_{50} = -0.1919
D_{100} = -0.1936
T_{50} = 0.12 min.

C_v @ T_{50}
2.794 ft.^{2}/day

C_α = 0.001

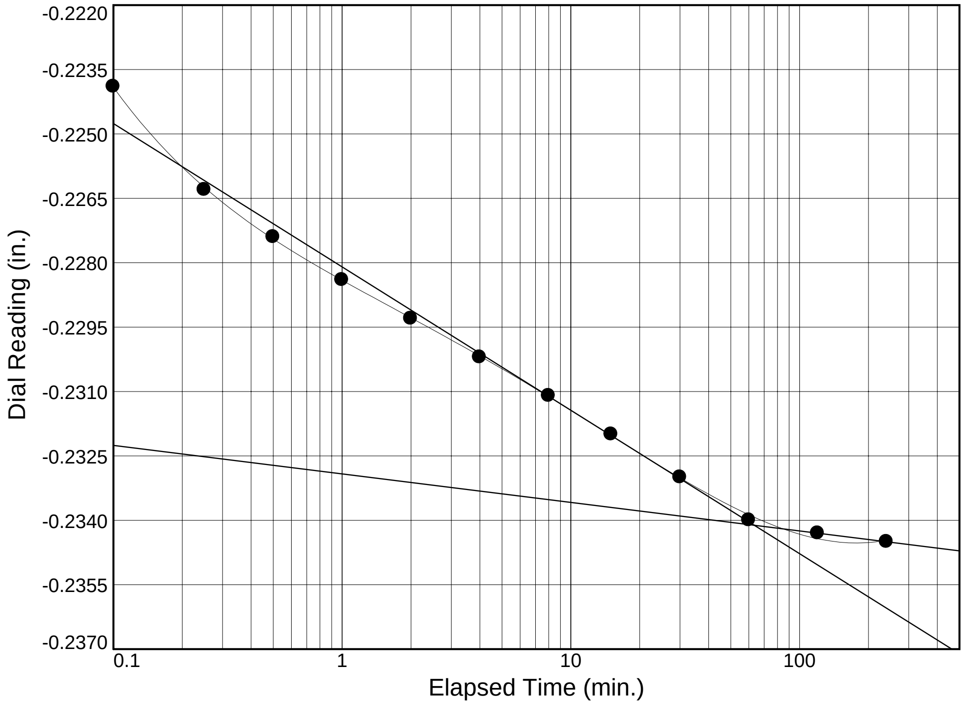
Figure

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

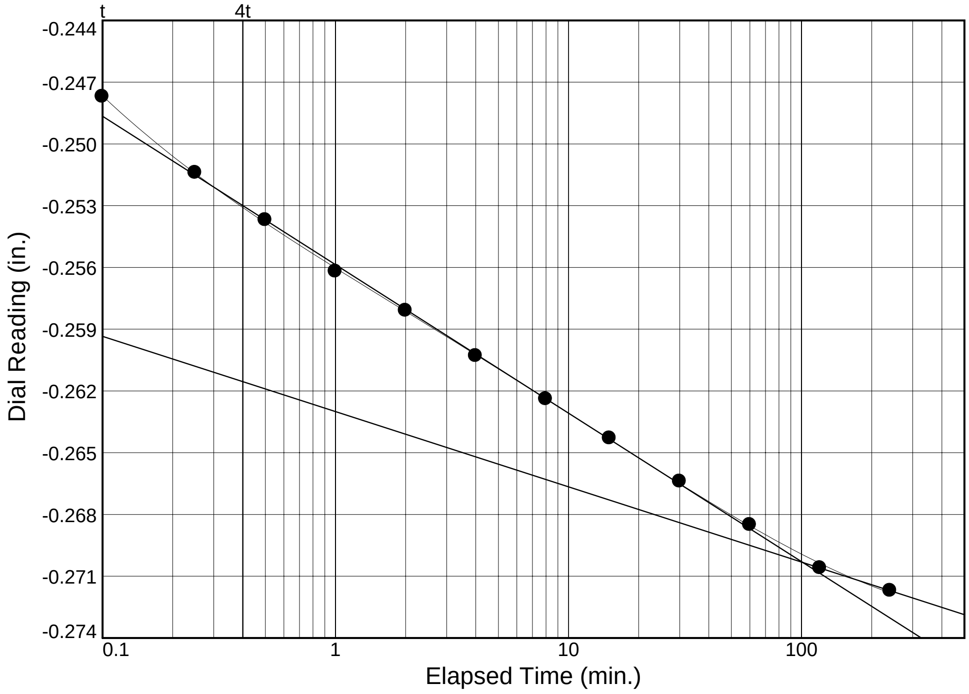
Source of Sample: OL-B-01 Depth: 17-19 Sample Number: T-2



Load No.= 15
Load= 4.00 tsf
D_0 = -0.2165
D_{50} = -0.2253
D_{100} = -0.2341
T_{50} = 0.16 min.

C_v @ T_{50}
1.806 ft.^{2}/day

C_α = 0.002



Load No.= 16
Load= 8.00 tsf
D_0 = -0.2422
D_{50} = -0.2563
D_{100} = -0.2703
T_{50} = 1.09 min.

C_v @ T_{50}
0.253 ft.^{2}/day

C_α = 0.009

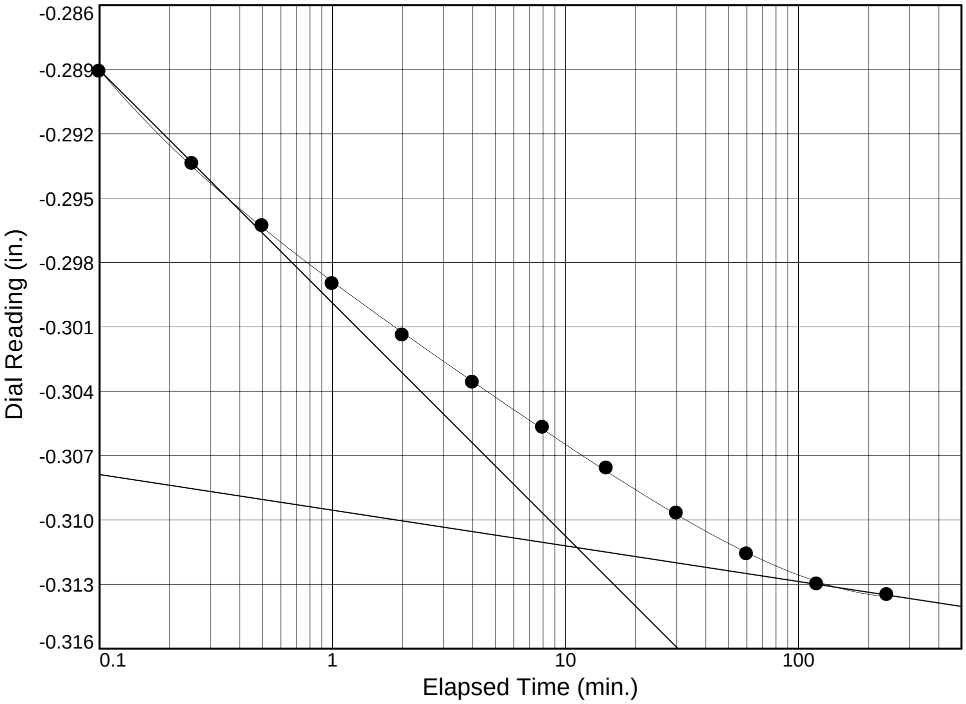
Figure

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: OL-B-01 Depth: 17-19 Sample Number: T-2



Load No.= 17

Load= 16.00 tsf

D_0 = -0.2717

D_{50} = -0.2915

D_{100} = -0.3113

T_{50} = 0.16 min.

C_v @ T_{50}

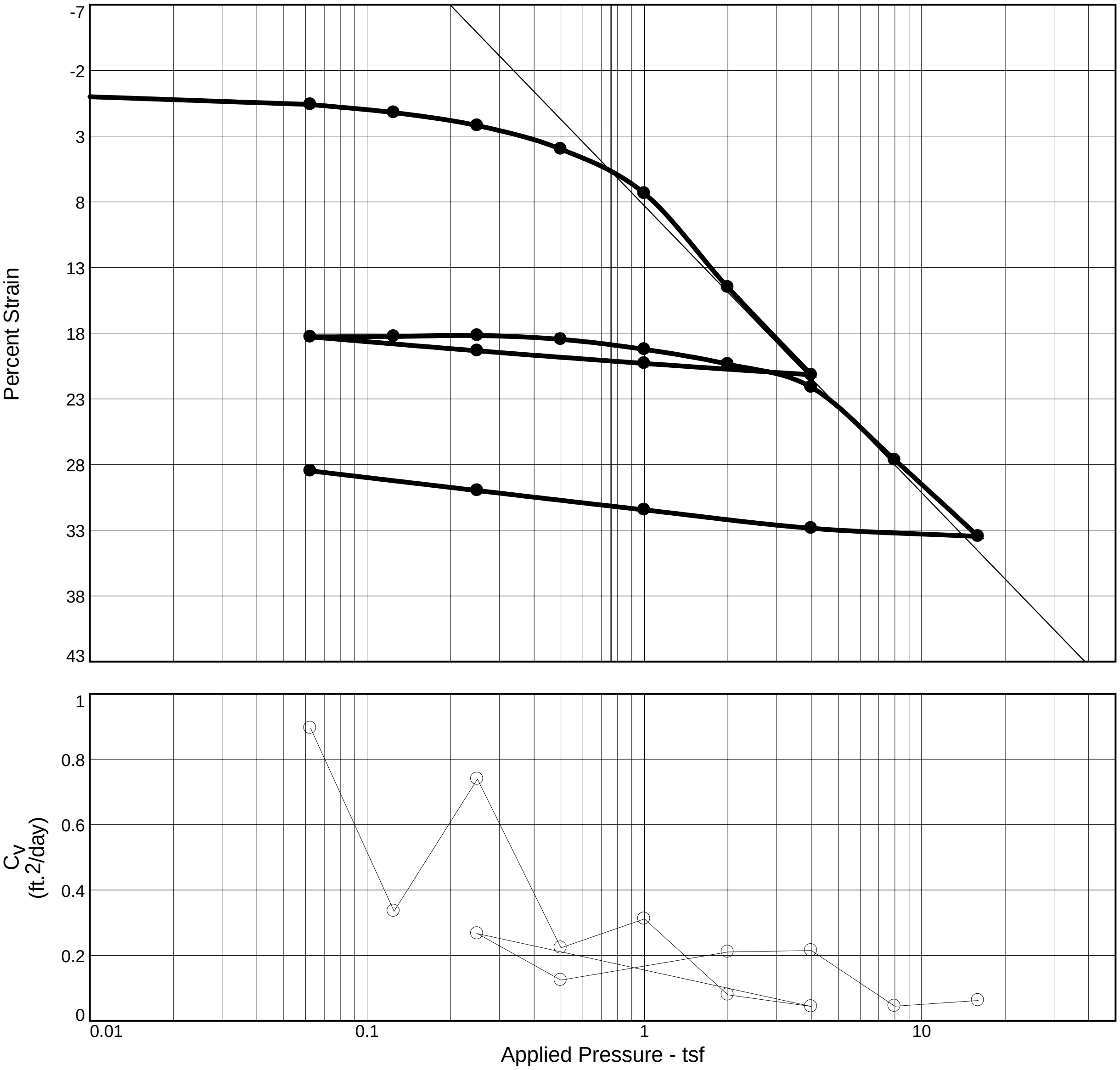
1.540 ft.^{2}/day

C_α = 0.004

Figure

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
113.5 %	57.2 %	69.2	71	40	2.65		0.7	0.51	0.05	1.336

MATERIAL DESCRIPTION	USCS	AASHTO
Fat clay	CH	A-7-5(44)

Project No. P20051 **Client:** HCEA SCG/RK&K
Project: South Market Street Lab Testing

Source of Sample: RB-B-03 **Depth:** 23-25 **Sample Number:** T1

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Remarks:

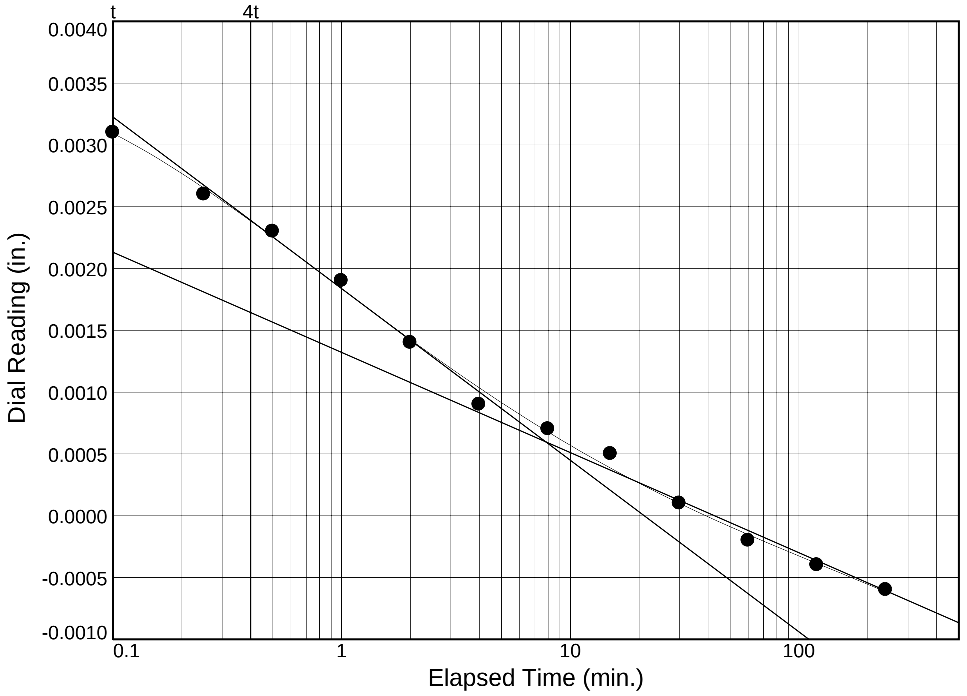
Figure

Tested By: cs

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

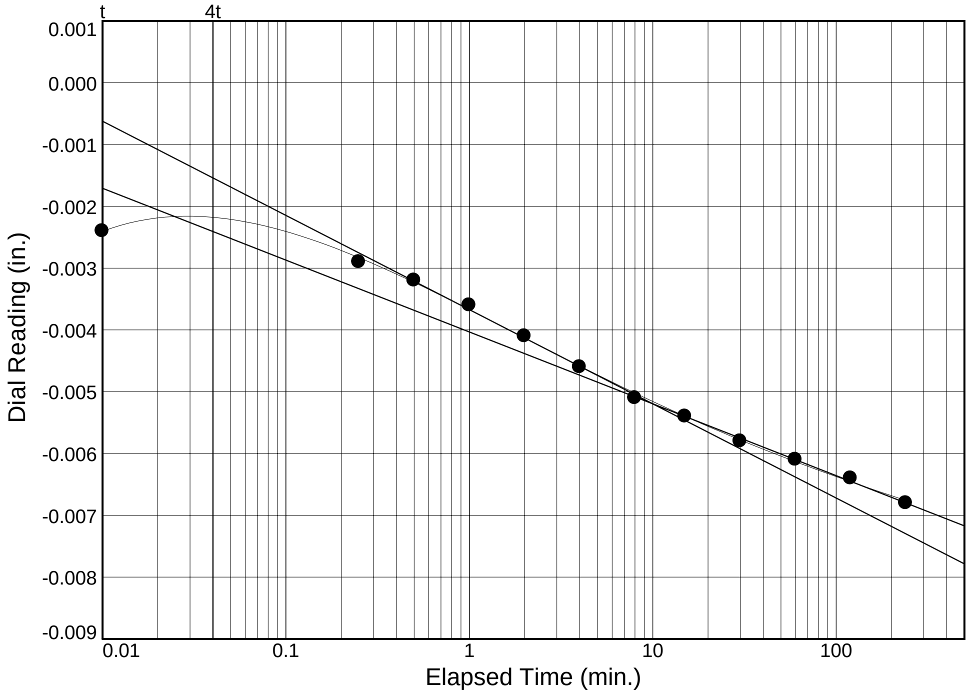
Source of Sample: RB-B-03 Depth: 23-25 Sample Number: T1



Load No.= 1
Load= 0.06 tsf
D_0 = 0.0038
D_{50} = 0.0022
D_{100} = 0.0006
T_{50} = 0.55 min.

C_v @ T_{50}
0.895 ft.^{2}/day

C_α = 0.002



Load No.= 2
Load= 0.13 tsf
D_0 = -0.0026
D_{50} = -0.0039
D_{100} = -0.0052
T_{50} = 1.44 min.

C_v @ T_{50}
0.335 ft.^{2}/day

C_α = 0.003

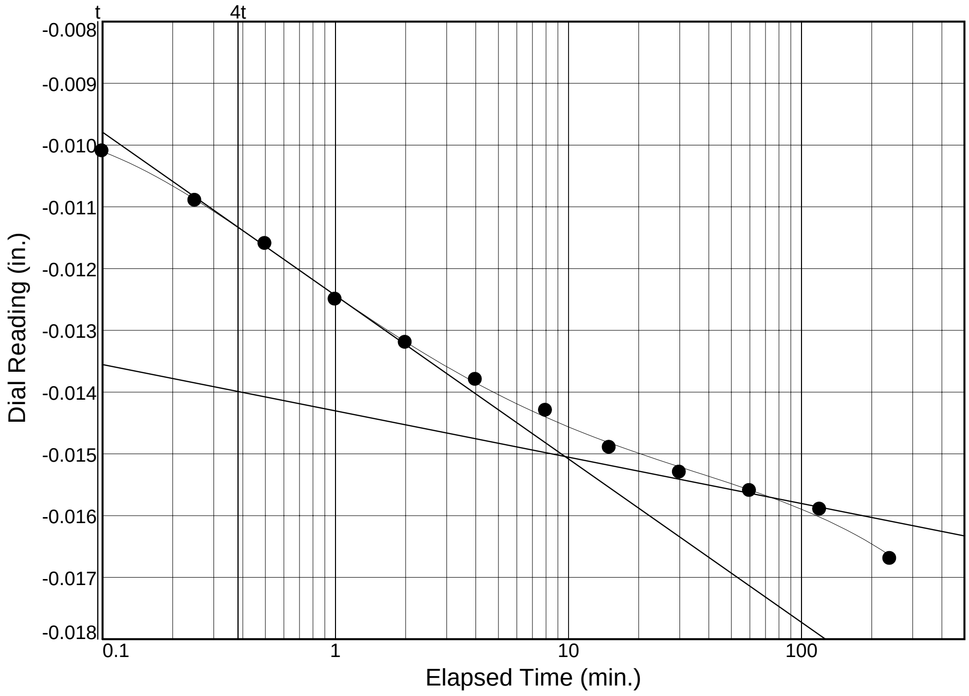
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

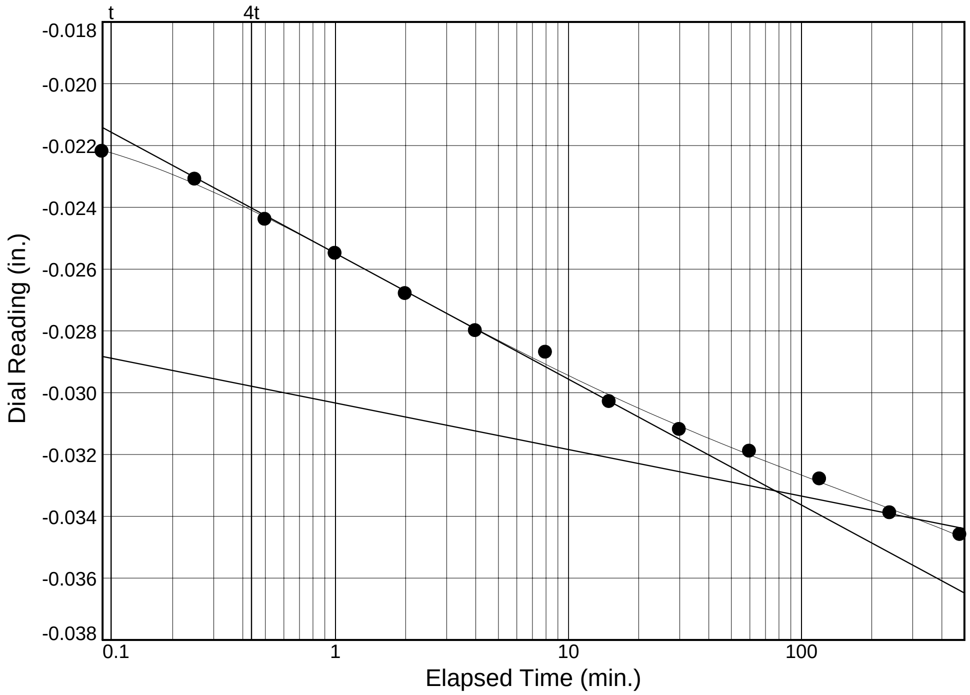
Source of Sample: RB-B-03 Depth: 23-25 Sample Number: T1



Load No.= 3
Load= 0.25 tsf
D_0 = -0.0088
D_{50} = -0.0119
D_{100} = -0.0150
T_{50} = 0.64 min.

C_v @ T_{50}
0.739 ft.^{2}/day

C_α = 0.002



Load No.= 4
Load= 0.50 tsf
D_0 = -0.0204
D_{50} = -0.0268
D_{100} = -0.0332
T_{50} = 2.07 min.

C_v @ T_{50}
0.223 ft.^{2}/day

C_α = 0.004

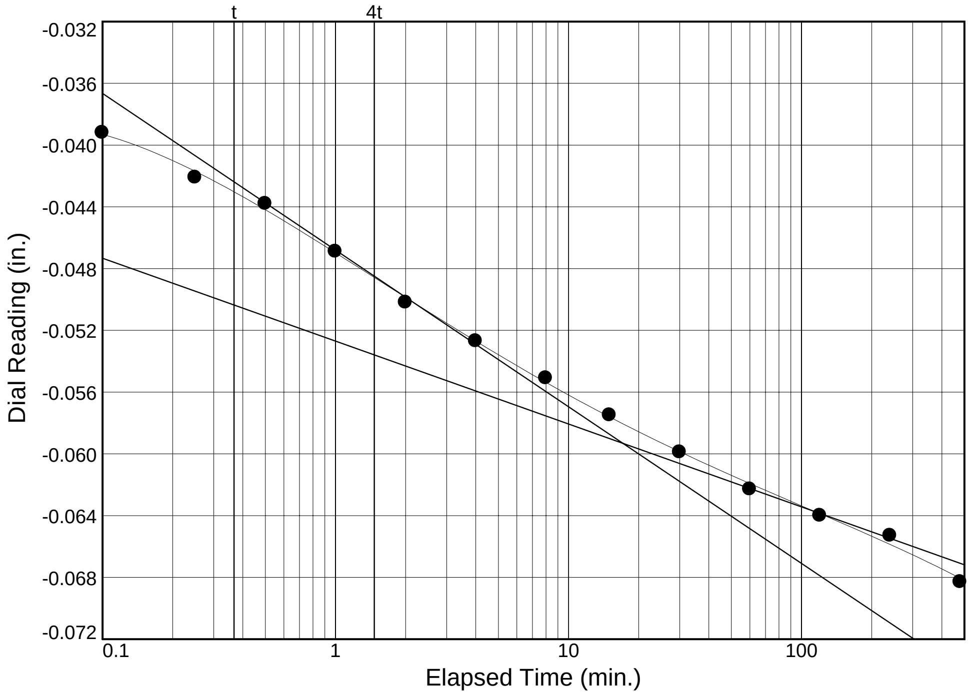
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

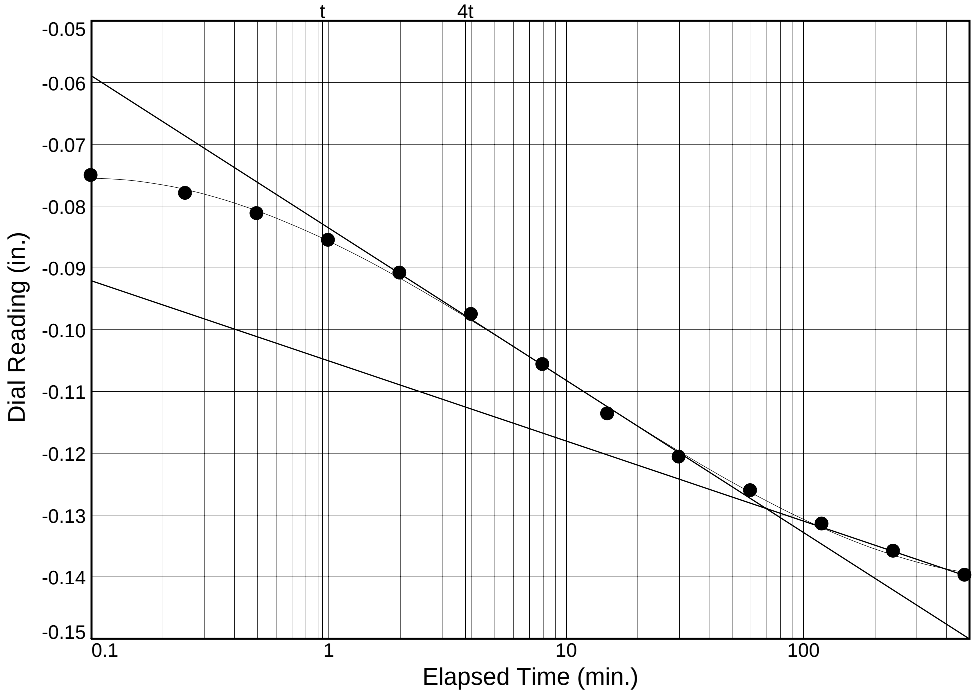
Source of Sample: RB-B-03 Depth: 23-25 Sample Number: T1



Load No.= 5
Load= 1.00 tsf
D_0 = -0.0375
D_{50} = -0.0484
D_{100} = -0.0593
T_{50} = 1.41 min.

C_v @ T_{50}
0.312 ft.^{2}/day

C_α = 0.013



Load No.= 6
Load= 2.00 tsf
D_0 = -0.0725
D_{50} = -0.1007
D_{100} = -0.1289
T_{50} = 4.93 min.

C_v @ T_{50}
0.079 ft.^{2}/day

C_α = 0.030

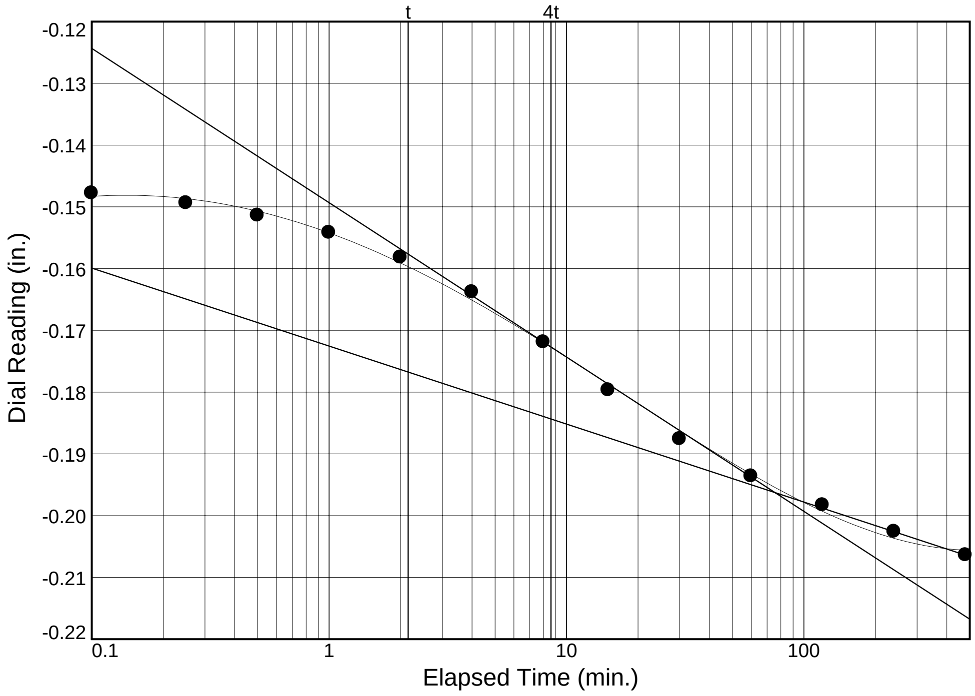
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

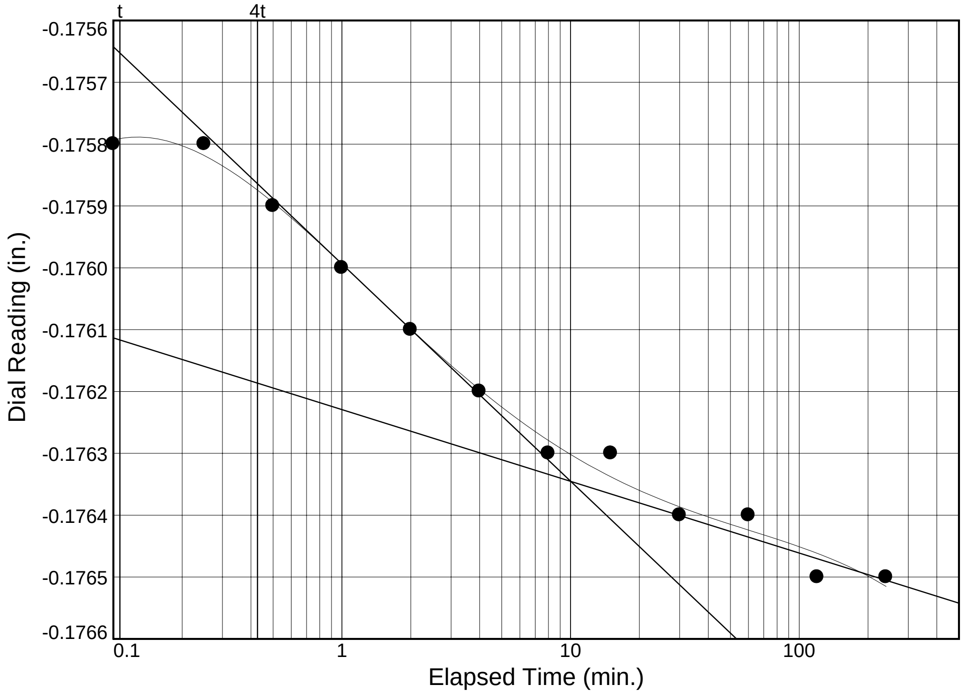
Source of Sample: RB-B-03 Depth: 23-25 Sample Number: T1



Load No.= 7
Load= 4.00 tsf
D_0 = -0.1466
D_{50} = -0.1714
D_{100} = -0.1963
T_{50} = 7.55 min.

C_v @ T_{50}
0.044 ft.^{2}/day

C_α = 0.029



Load No.= 12
Load= 0.25 tsf
D_0 = -0.1757
D_{50} = -0.1760
D_{100} = -0.1763
T_{50} = 1.24 min.

C_v @ T_{50}
0.267 ft.^{2}/day

C_α = 0.000

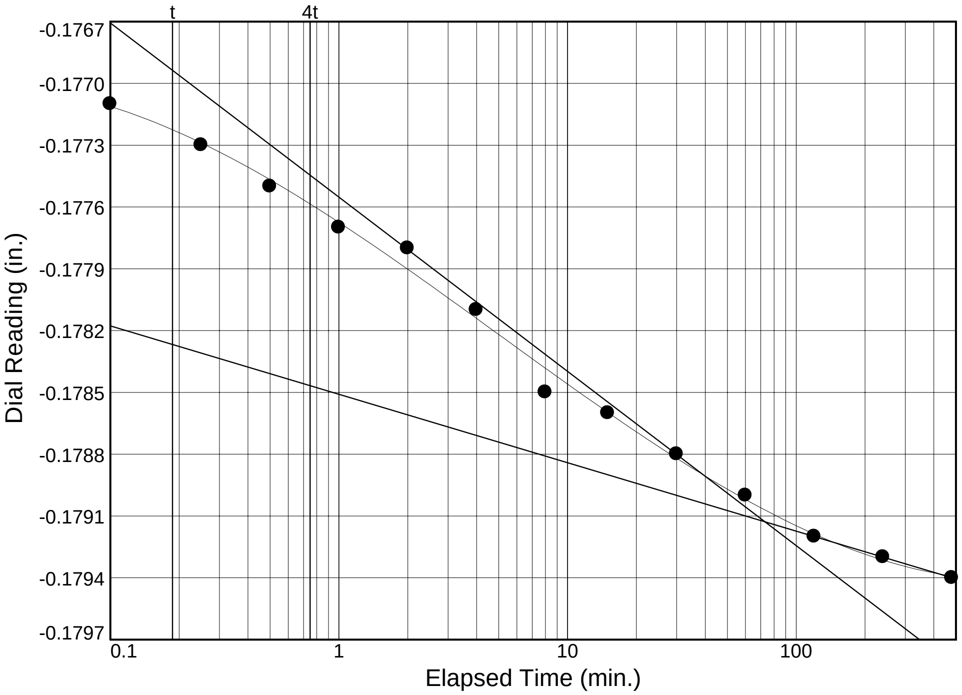
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RB-B-03 Depth: 23-25 Sample Number: T1



Load No.= 13

Load= 0.50 tsf

D_0 = -0.1769

D_{50} = -0.1780

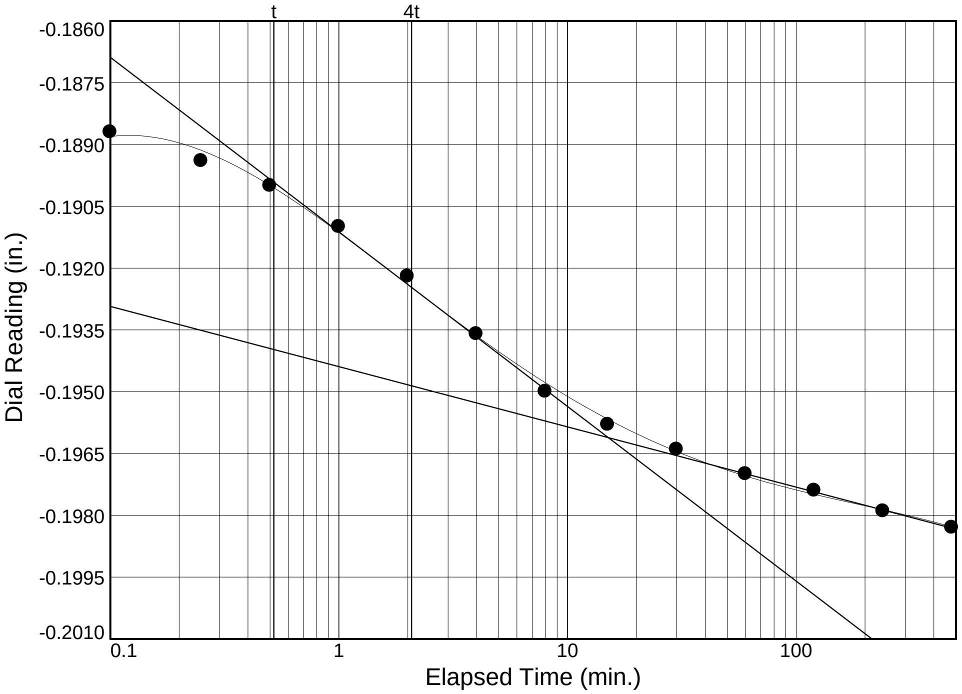
D_{100} = -0.1791

T_{50} = 2.64 min.

C_v @ T_{50}

0.125 ft.^2/day

C_α = 0.001



Load No.= 15

Load= 2.00 tsf

D_0 = -0.1876

D_{50} = -0.1919

D_{100} = -0.1961

T_{50} = 1.50 min.

C_v @ T_{50}

0.211 ft.^2/day

C_α = 0.003

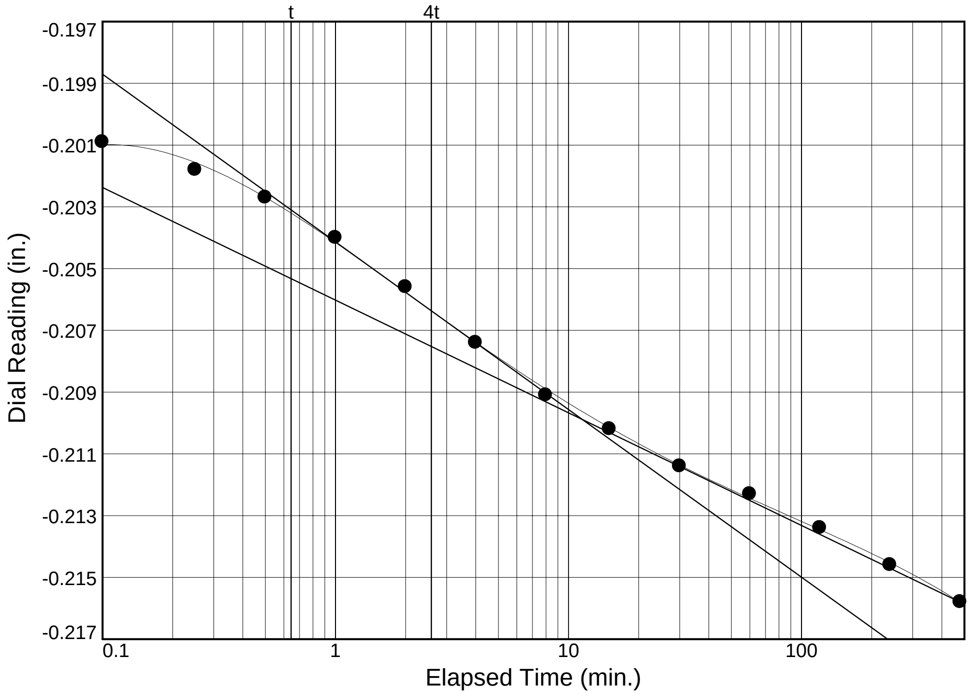
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

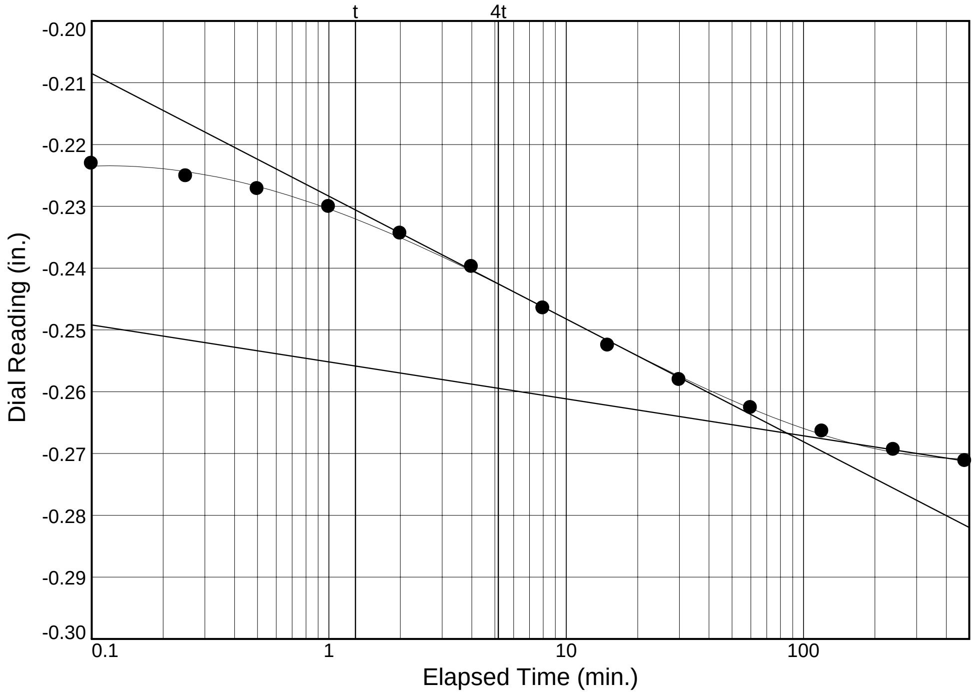
Source of Sample: RB-B-03 Depth: 23-25 Sample Number: T1



Load No.= 16
Load= 4.00 tsf
D_0 = -0.2000
D_{50} = -0.2050
D_{100} = -0.2099
T_{50} = 1.42 min.

C_v @ T_{50}
0.215 ft.^{2}/day

C_α = 0.009



Load No.= 17
Load= 8.00 tsf
D_0 = -0.2215
D_{50} = -0.2441
D_{100} = -0.2667
T_{50} = 6.19 min.

C_v @ T_{50}
0.045 ft.^{2}/day

C_α = 0.014

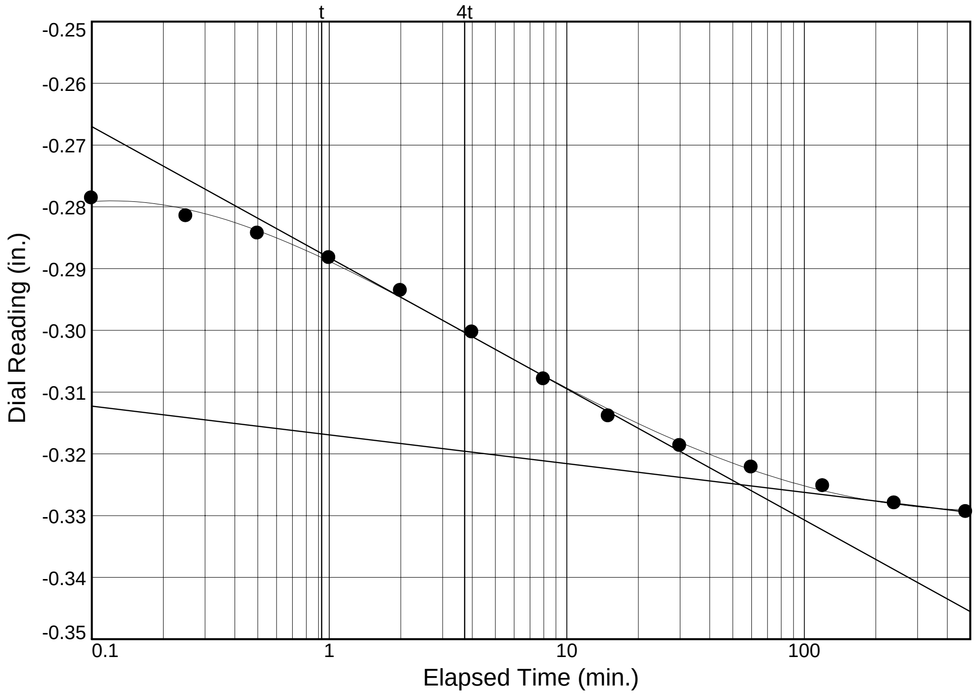
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RB-B-03 Depth: 23-25 Sample Number: T1



Load No.= 18
Load= 16.00 tsf
D_0 = -0.2761
D_{50} = -0.3005
D_{100} = -0.3250
T_{50} = 3.80 min.

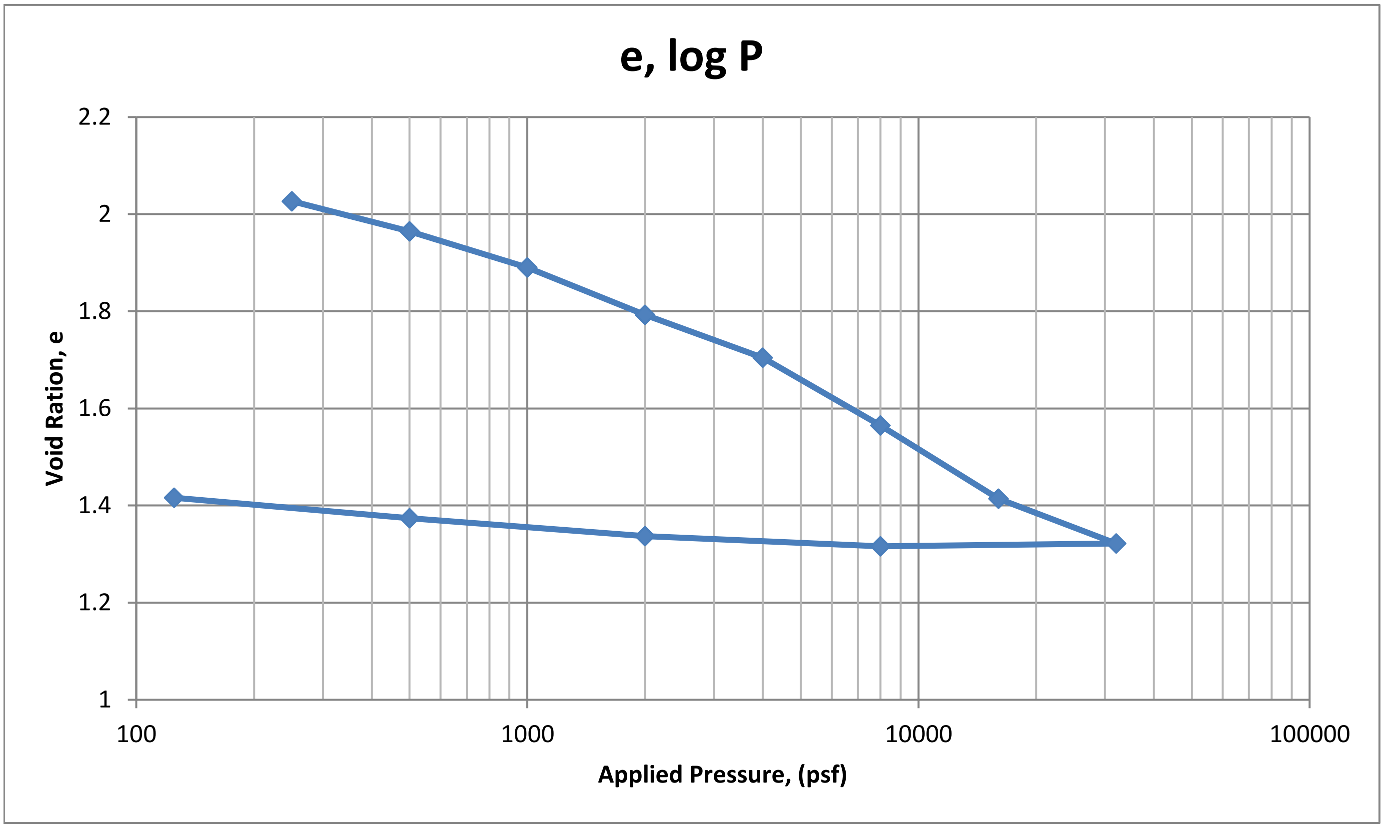
C_v @ T_{50}
0.062 ft.^{2}/day

C_α = 0.011

Figure

Hillis-Carnes Engineering Associates

Consolidation Test Report



Material Description	USCS	AASHTO
Lean clay, some fine to medium sand, some silt	CL	0

LL	26
PI	8
Sg	3.37

	Init	Final
Dry Density (pcf)	92.9	87.2
Moisture	0.288	0.420
Saturation	0.767	1.000
Void Ratio	2.039	1.416

Pc (psf)	Cc
4000	0.50

Preparation:

Shelby tube extraction

Notes:

Proj. No. P20051 Client: HCEA

Project: Market St Project

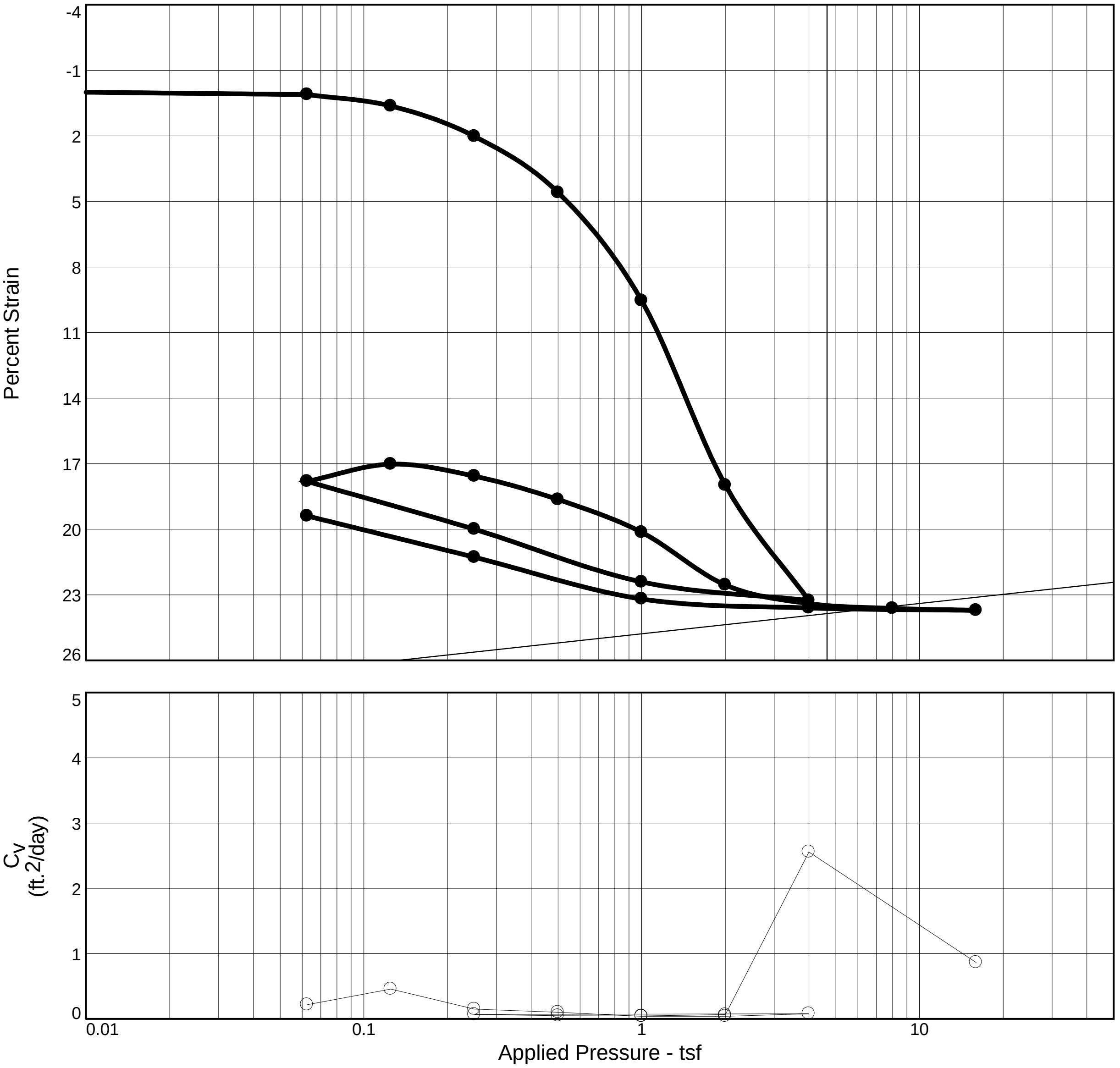
Sample: RB-B-06-U-1

Depth: 17.5-19.5

Hillis-Carnes Engineering Associates

Media, Pennsylvania

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
102.1 %	68.7 %	59.5	90	53	2.65		5.5	0.04	0.09	1.782

MATERIAL DESCRIPTION	USCS	AASHTO
Black Fat Clay	CH	A-7-5(66)

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

Source of Sample: RB-B-07 **Depth:** 20 **Sample Number:** T-1

Remarks:

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Figure

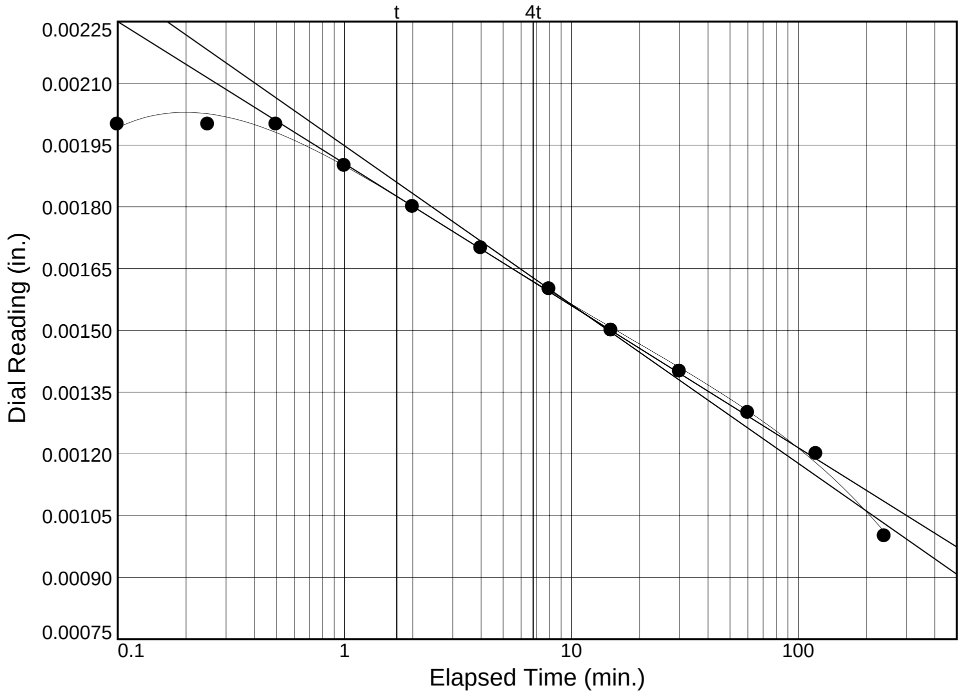
Tested By: cs

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical sample

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RB-B-07 Depth: 20 Sample Number: T-1



Load No.= 1

Load= 0.06 tsf

D_0 = 0.0020

D_{50} = 0.0018

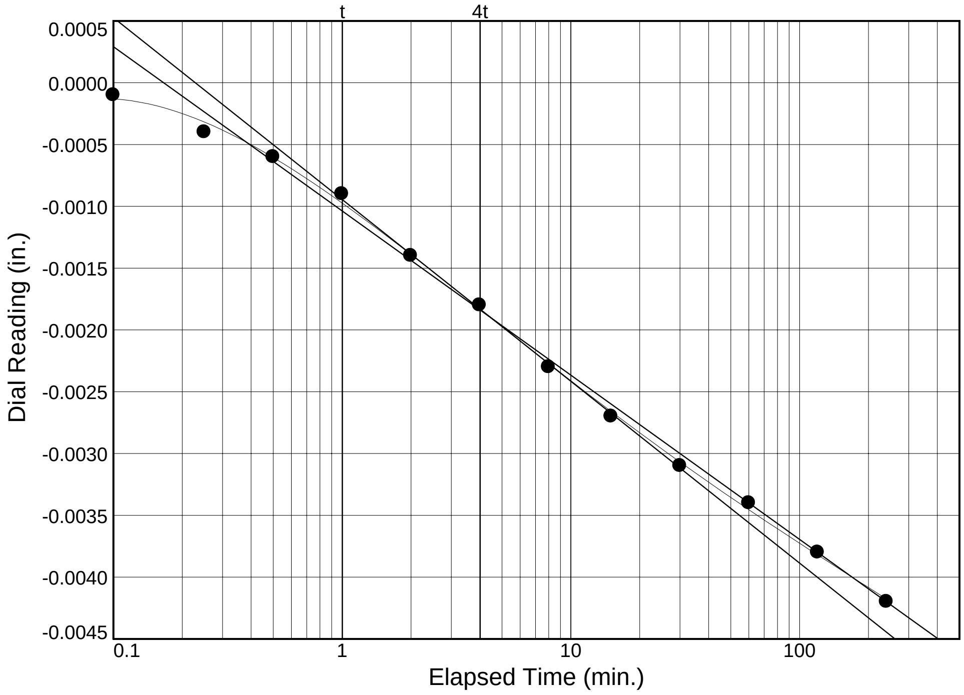
D_{100} = 0.0015

T_{50} = 2.26 min.

C_v @ T_{50}

0.218 ft.^{2}/day

C_α = 0.001



Load No.= 2

Load= 0.13 tsf

D_0 = -0.0001

D_{50} = -0.0010

D_{100} = -0.0019

T_{50} = 1.07 min.

C_v @ T_{50}

0.457 ft.^{2}/day

C_α = 0.004

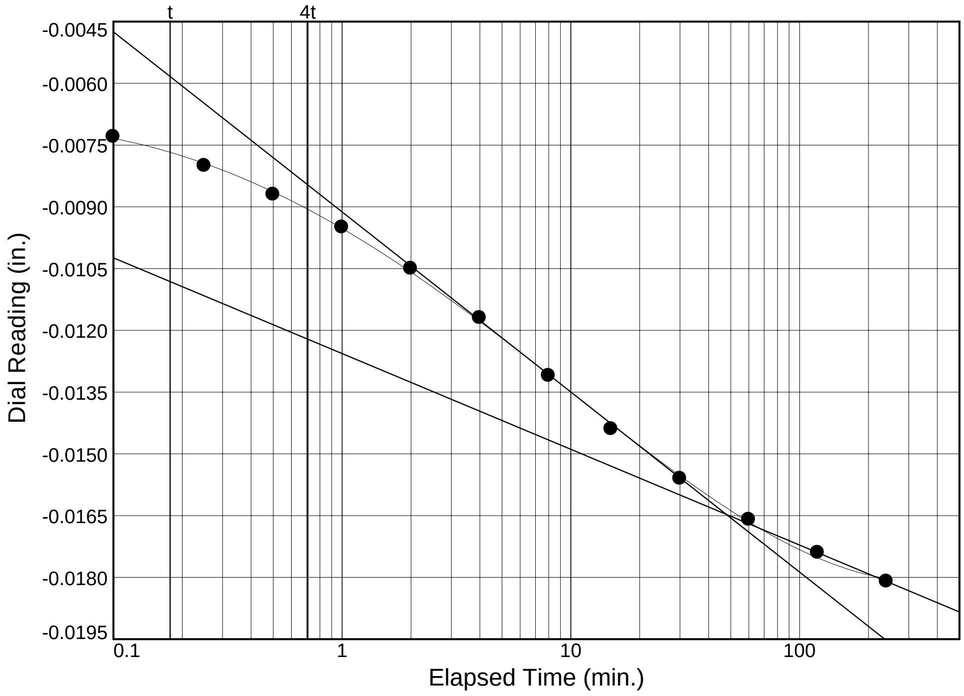
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RB-B-07 Depth: 20 Sample Number: T-1



Load No.= 3

Load= 0.25 tsf

D_0 = -0.0063

D_{50} = -0.0114

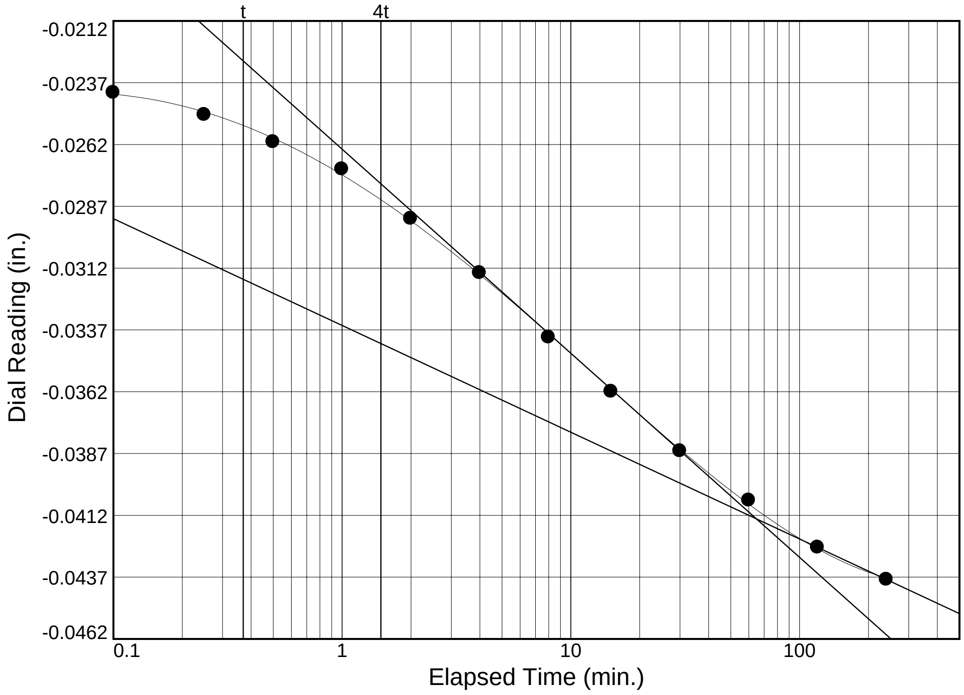
D_{100} = -0.0165

T_{50} = 3.19 min.

C_v @ T_{50}

0.151 ft.^{2}/day

C_α = 0.006



Load No.= 4

Load= 0.50 tsf

D_0 = -0.0224

D_{50} = -0.0319

D_{100} = -0.0413

T_{50} = 4.53 min.

C_v @ T_{50}

0.102 ft.^{2}/day

C_α = 0.012

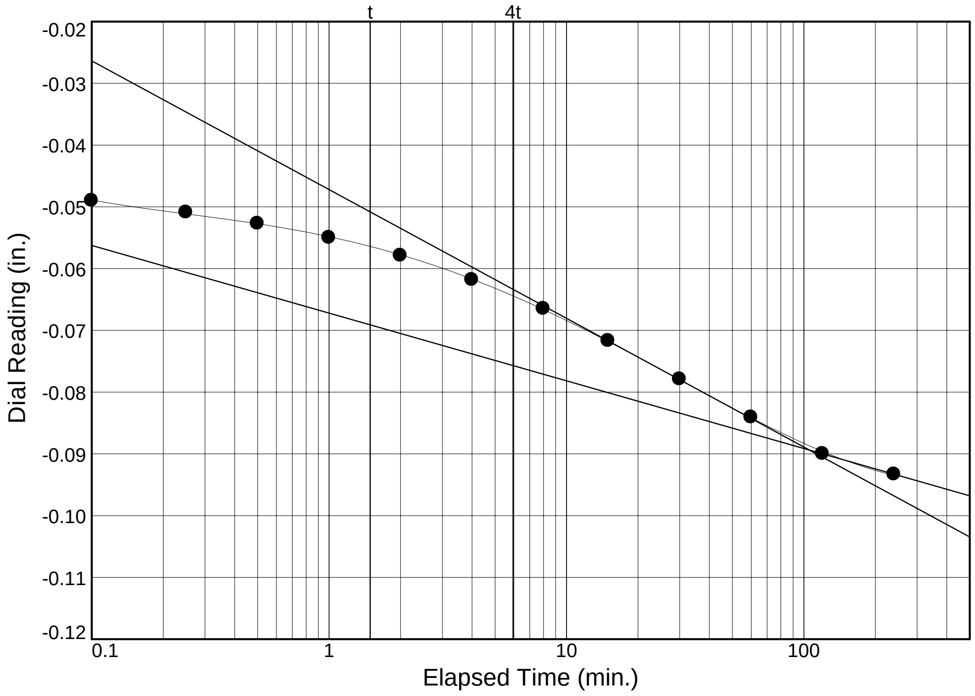
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

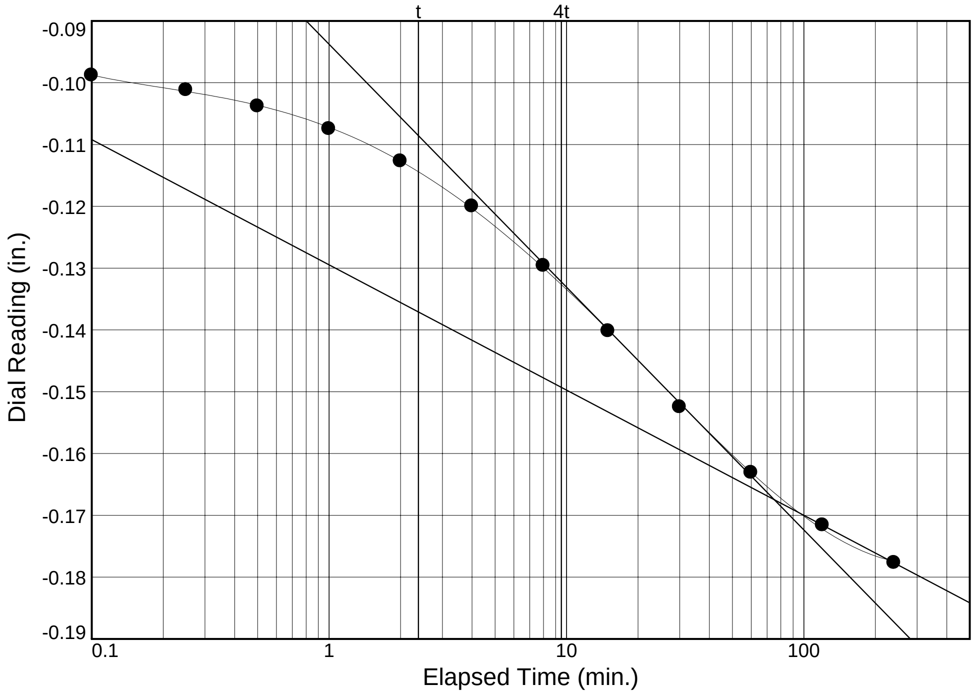
Source of Sample: RB-B-07 Depth: 20 Sample Number: T-1



Load No.= 5
Load= 1.00 tsf
D_0 = -0.0484
D_{50} = -0.0689
D_{100} = -0.0894
T_{50} = 10.60 min.

C_v @ T_{50}
0.040 ft.^{2}/day

C_α = 0.030



Load No.= 6
Load= 2.00 tsf
D_0 = -0.0962
D_{50} = -0.1318
D_{100} = -0.1675
T_{50} = 9.01 min.

C_v @ T_{50}
0.041 ft.^{2}/day

C_α = 0.056

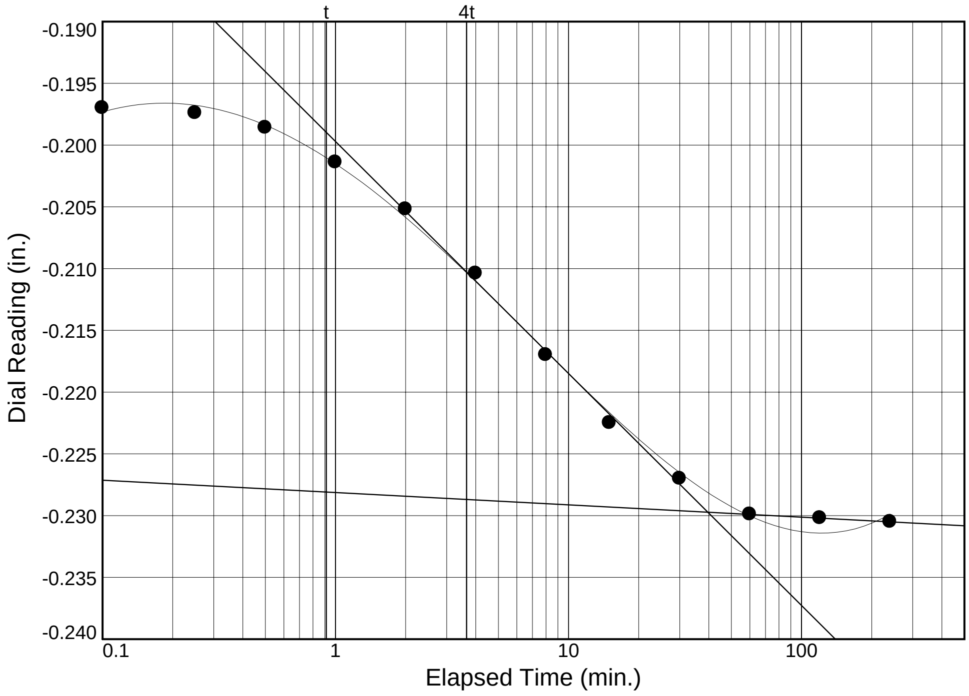
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

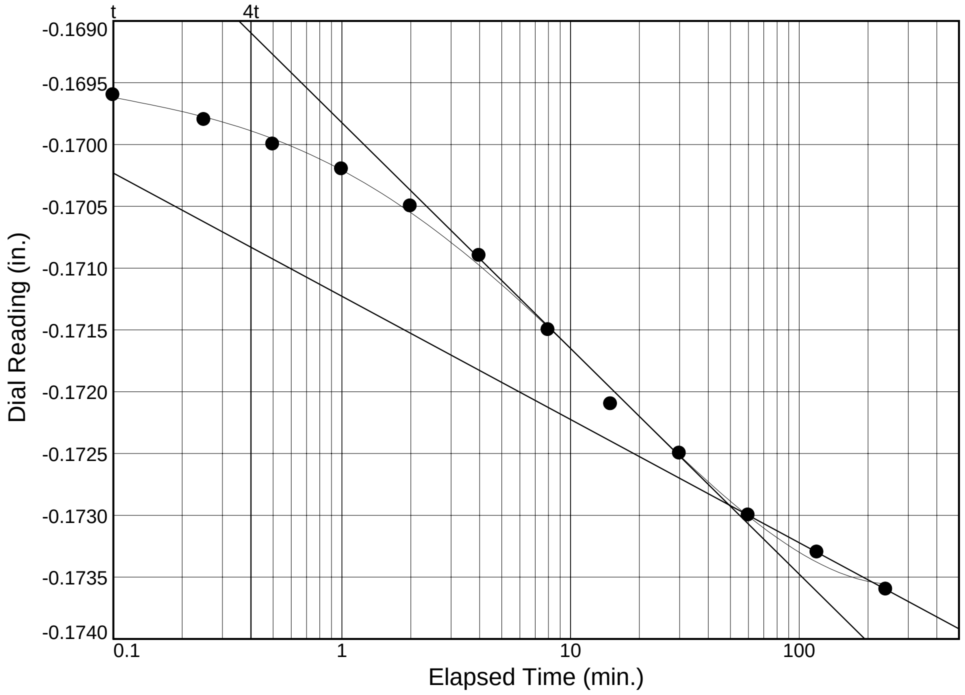
Source of Sample: RB-B-07 Depth: 20 Sample Number: T-1



Load No.= 7
Load= 4.00 tsf
D_0 = -0.1917
D_{50} = -0.2107
D_{100} = -0.2297
T_{50} = 3.82 min.

C_v @ T_{50}
0.080 ft.^{2}/day

C_α = 0.003



Load No.= 12
Load= 0.25 tsf
D_0 = -0.1693
D_{50} = -0.1711
D_{100} = -0.1729
T_{50} = 4.98 min.

C_v @ T_{50}
0.068 ft.^{2}/day

C_α = 0.003

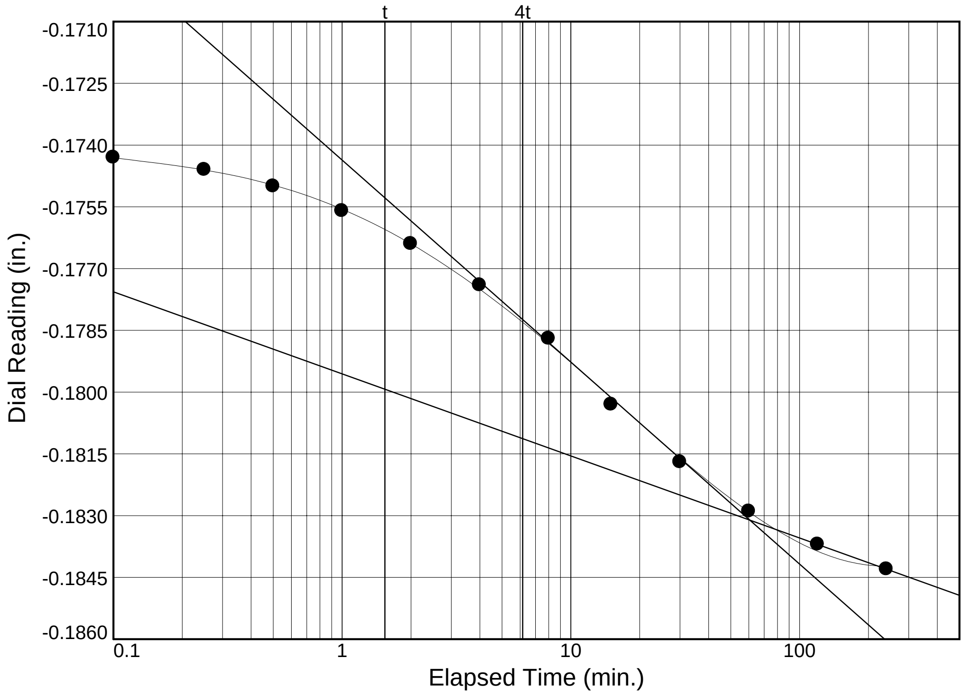
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

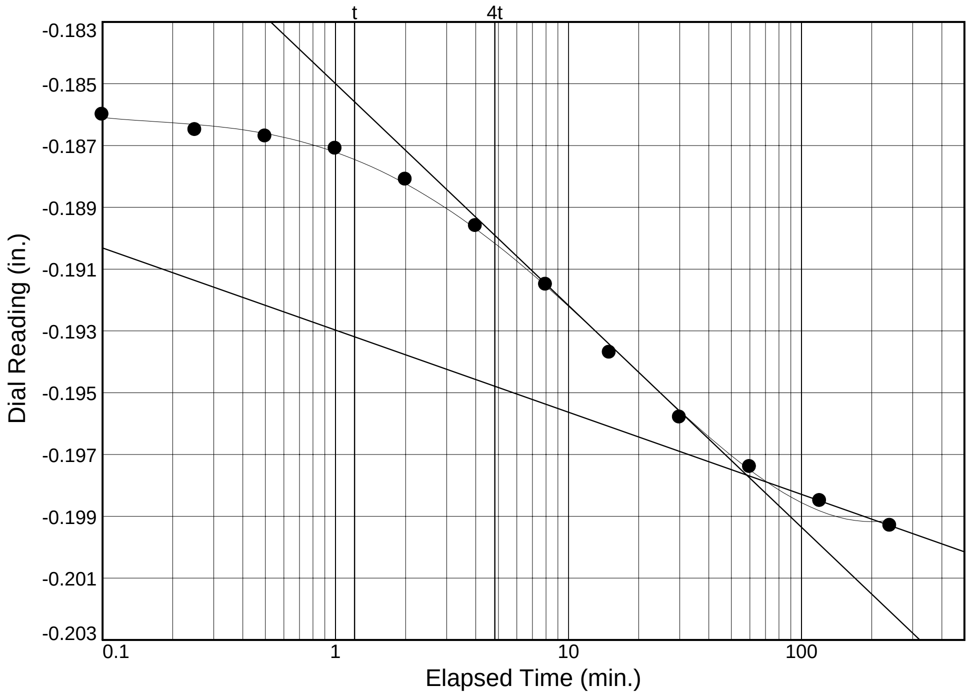
Source of Sample: RB-B-07 Depth: 20 Sample Number: T-1



Load No.= 13
Load= 0.50 tsf
D_0 = -0.1738
D_{50} = -0.1785
D_{100} = -0.1831
T_{50} = 6.64 min.

C_v @ T_{50}
0.050 ft.^{2}/day

C_α = 0.006



Load No.= 14
Load= 1.00 tsf
D_0 = -0.1847
D_{50} = -0.1912
D_{100} = -0.1977
T_{50} = 7.08 min.

C_v @ T_{50}
0.045 ft.^{2}/day

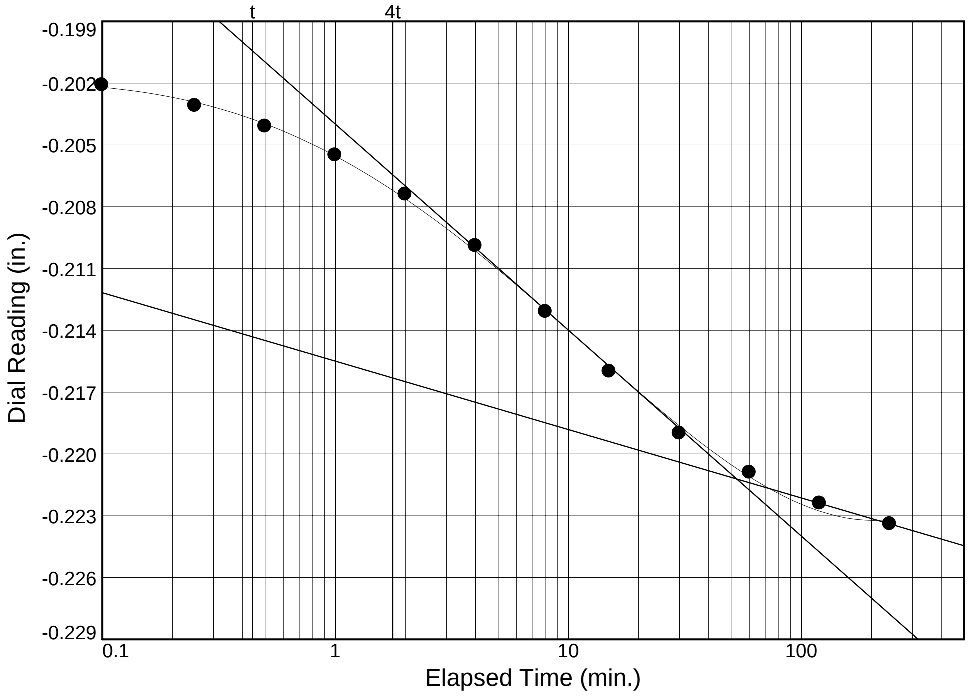
C_α = 0.007

Figure

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RB-B-07 Depth: 20 Sample Number: T-1



Load No.= 15

Load= 2.00 tsf

D_0 = -0.2003

D_{50} = -0.2108

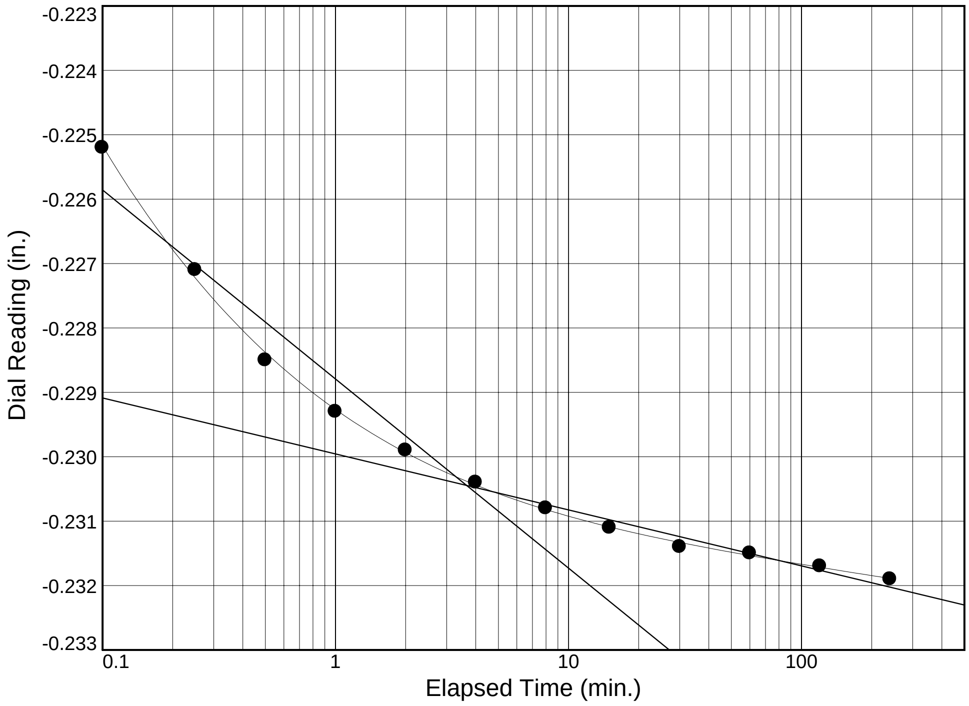
D_{100} = -0.2212

T_{50} = 4.65 min.

C_v @ T_{50}

0.066 ft.^{2}/day

C_α = 0.009



Load No.= 16

Load= 4.00 tsf

D_0 = -0.2206

D_{50} = -0.2255

D_{100} = -0.2304

T_{50} = 0.11 min.

C_v @ T_{50}

2.557 ft.^{2}/day

C_α = 0.002

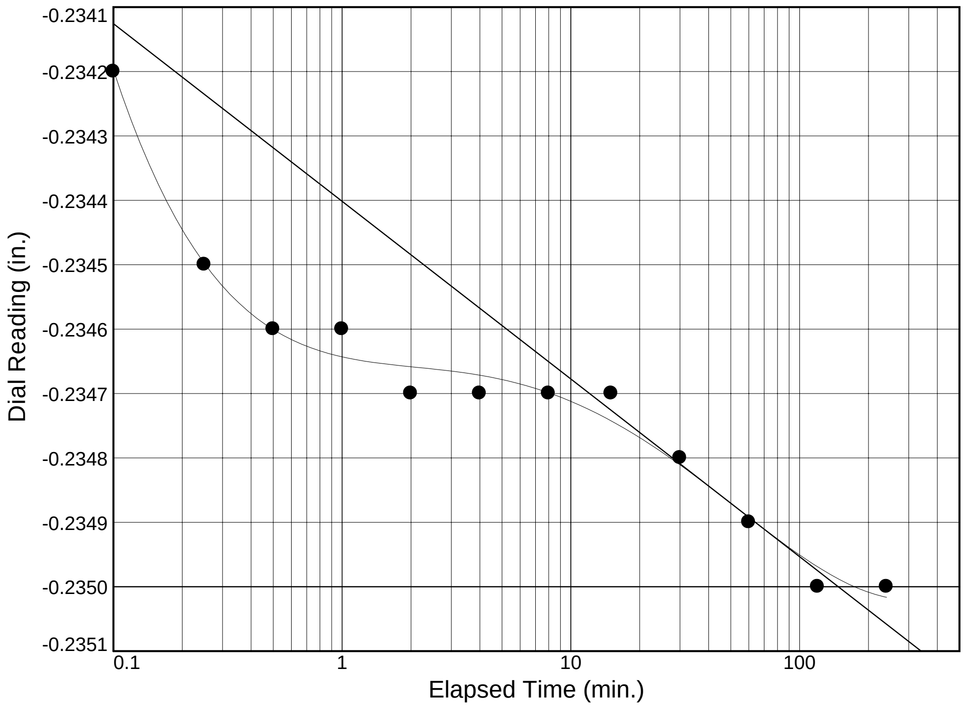
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RB-B-07 Depth: 20 Sample Number: T-1



Load No.= 18

Load= 16.00 tsf

D_0 = -0.2341

D_{50} = -0.2345

D_{100} = -0.2350

T_{50} = 0.33 min.

C_v @ T_{50}

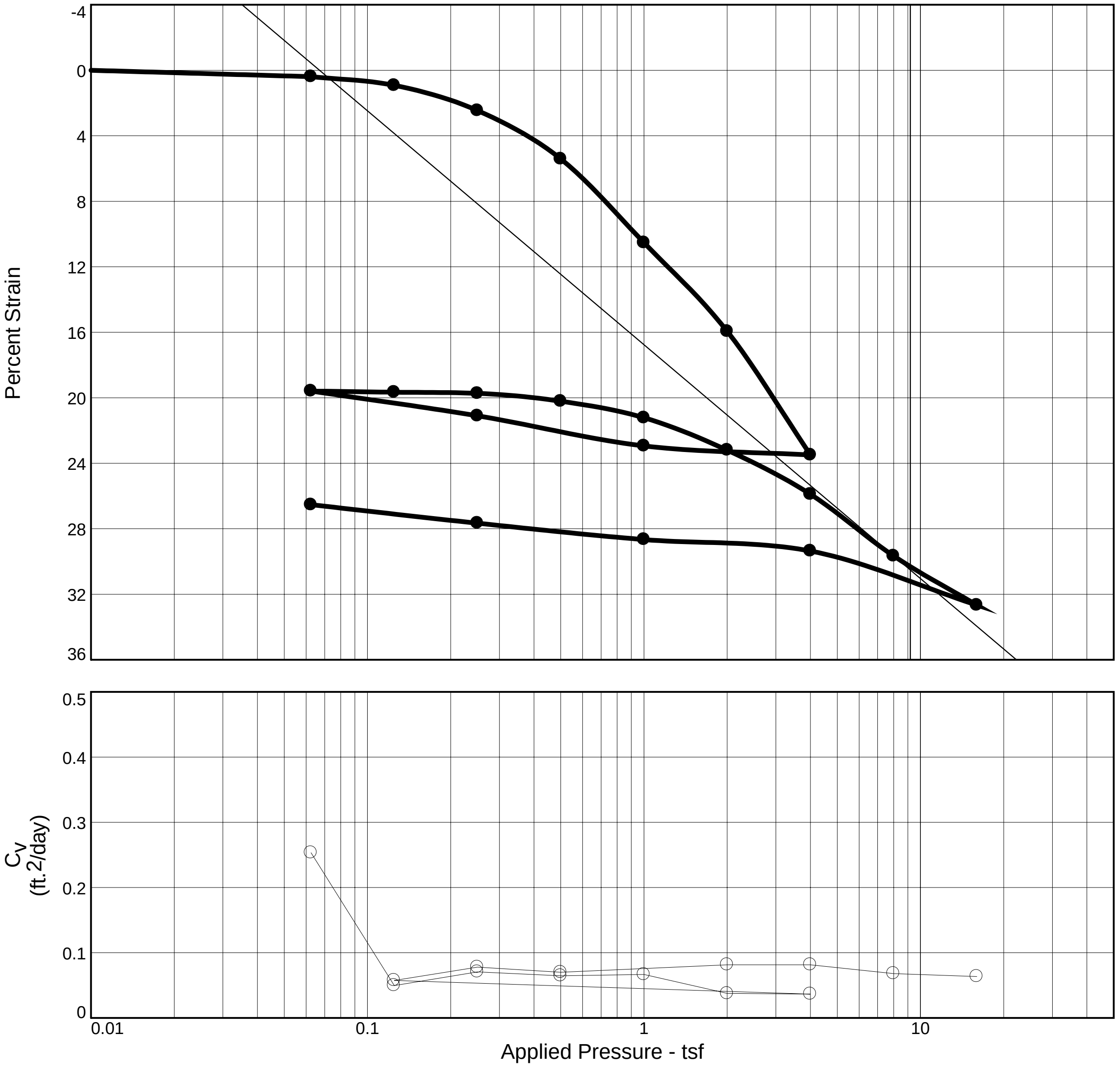
0.864 ft.^{2}/day

C_α = 0.000

Figure

Hillis-Carnes Engineering Associates

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
91.8 %	79.3 %	50.3	96	60	2.65		9.0	0.47	0.10	2.289

MATERIAL DESCRIPTION	USCS	AASHTO
Clay	CH	A-7-5(55)

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

Source of Sample: RB-B-08 **Depth:** 15 **Sample Number:** T-1

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Remarks:

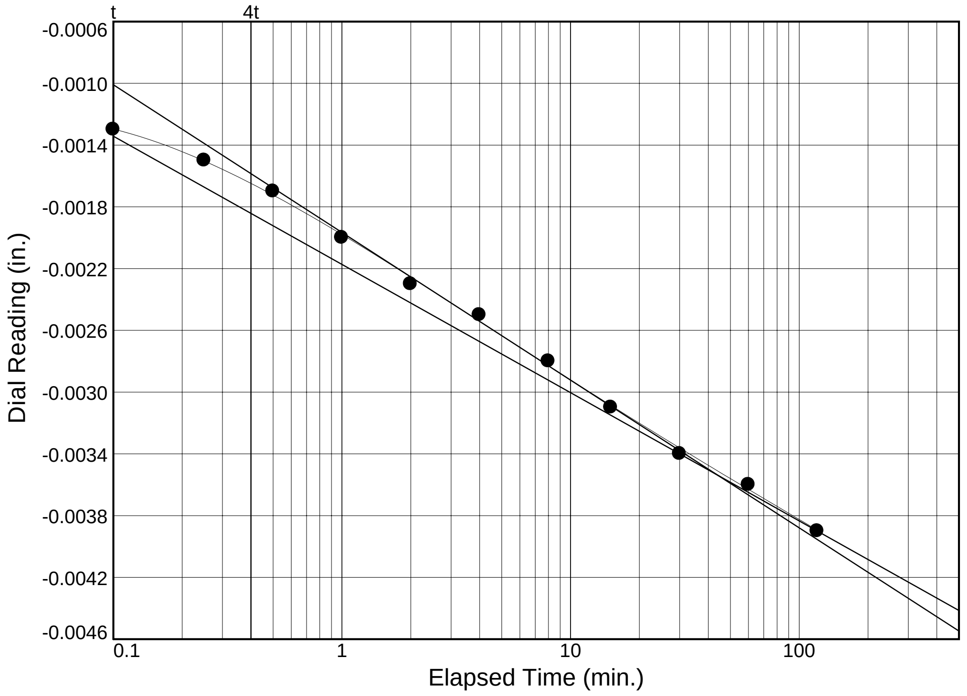
Figure

Tested By: cs

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

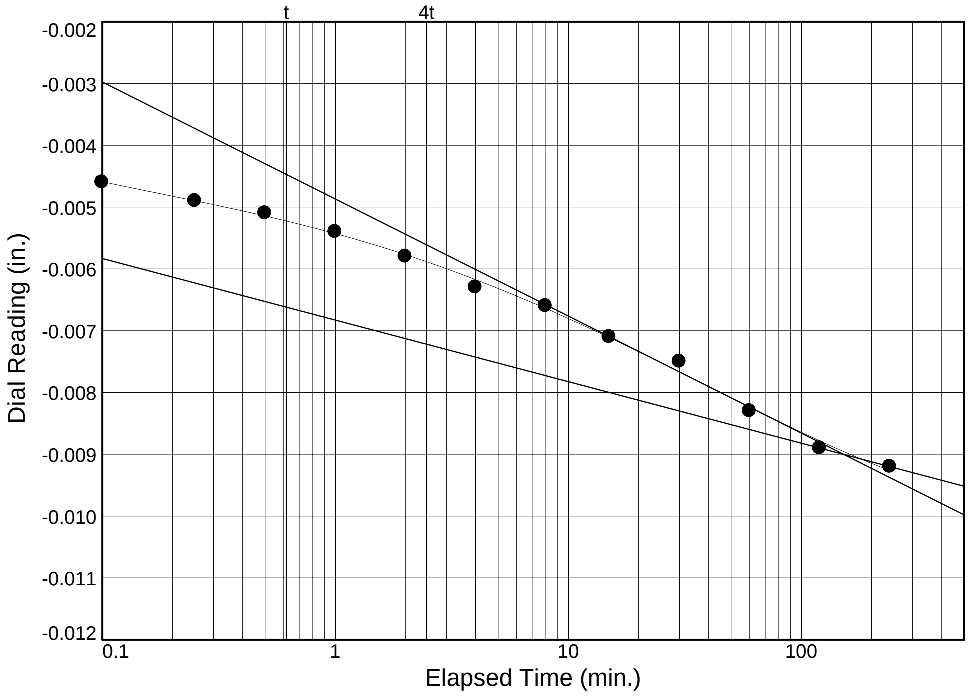
Source of Sample: RB-B-08 Depth: 15 Sample Number: T-1



Load No.= 1
Load= 0.06 tsf
D_0 = -0.0009
D_{50} = -0.0022
D_{100} = -0.0035
T_{50} = 1.94 min.

C_v @ T_{50}
0.253 ft.^{2}/day

C_α = 0.003



Load No.= 2
Load= 0.13 tsf
D_0 = -0.0046
D_{50} = -0.0068
D_{100} = -0.0090
T_{50} = 9.77 min.

C_v @ T_{50}
0.050 ft.^{2}/day

C_α = 0.003

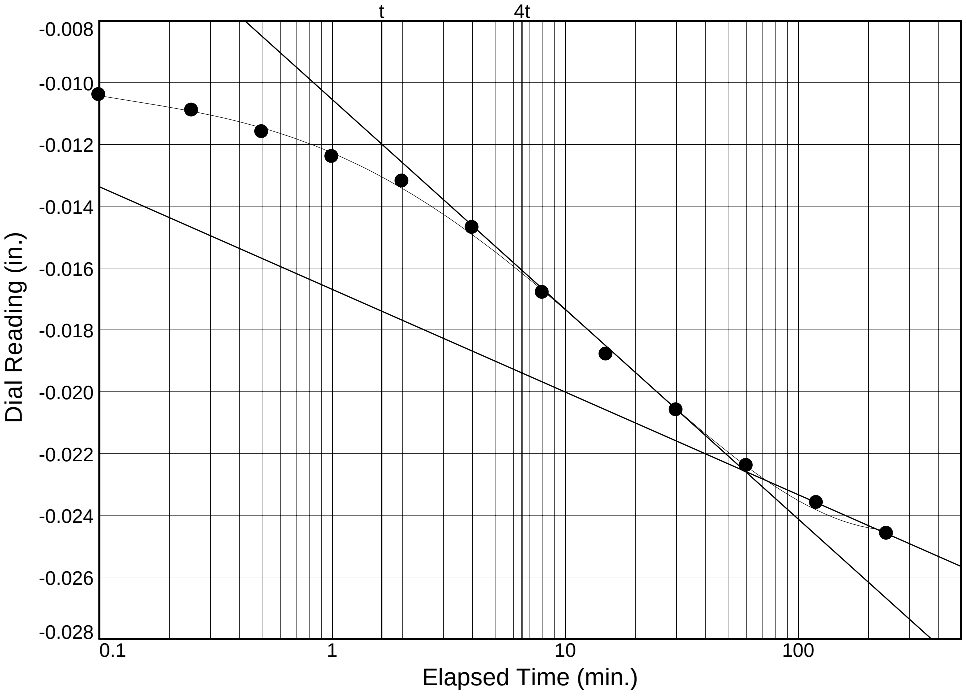
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RB-B-08 Depth: 15 Sample Number: T-1



Load No.= 3

Load= 0.25 tsf

D_0 = -0.0099

D_{50} = -0.0163

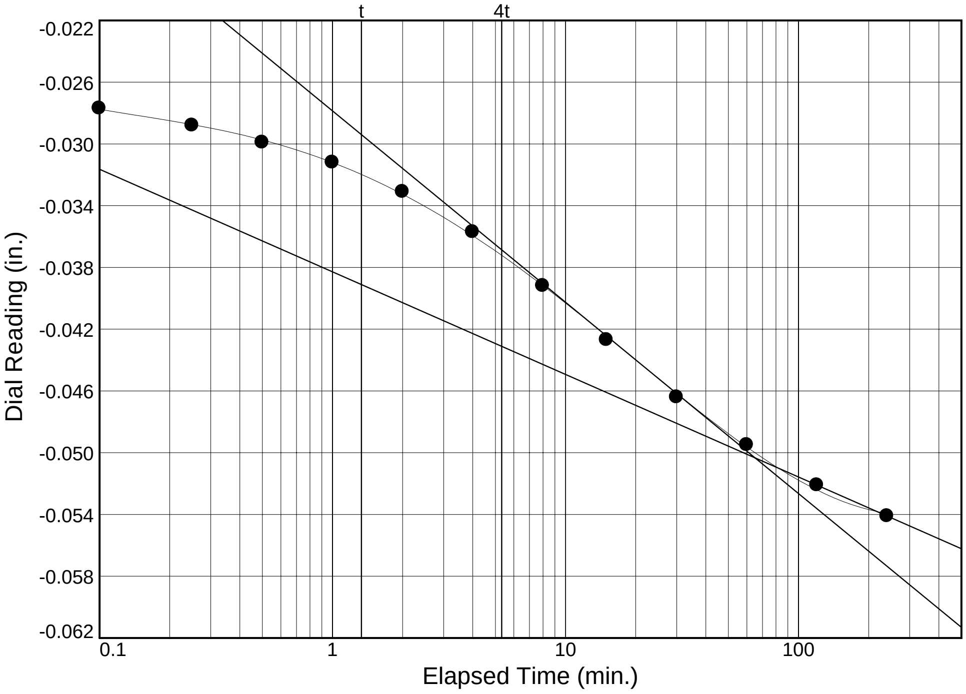
D_{100} = -0.0226

T_{50} = 6.73 min.

C_v @ T_{50}

0.071 ft.^{2}/day

C_α = 0.011



Load No.= 4

Load= 0.50 tsf

D_0 = -0.0267

D_{50} = -0.0385

D_{100} = -0.0503

T_{50} = 7.02 min.

C_v @ T_{50}

0.065 ft.^{2}/day

C_α = 0.022

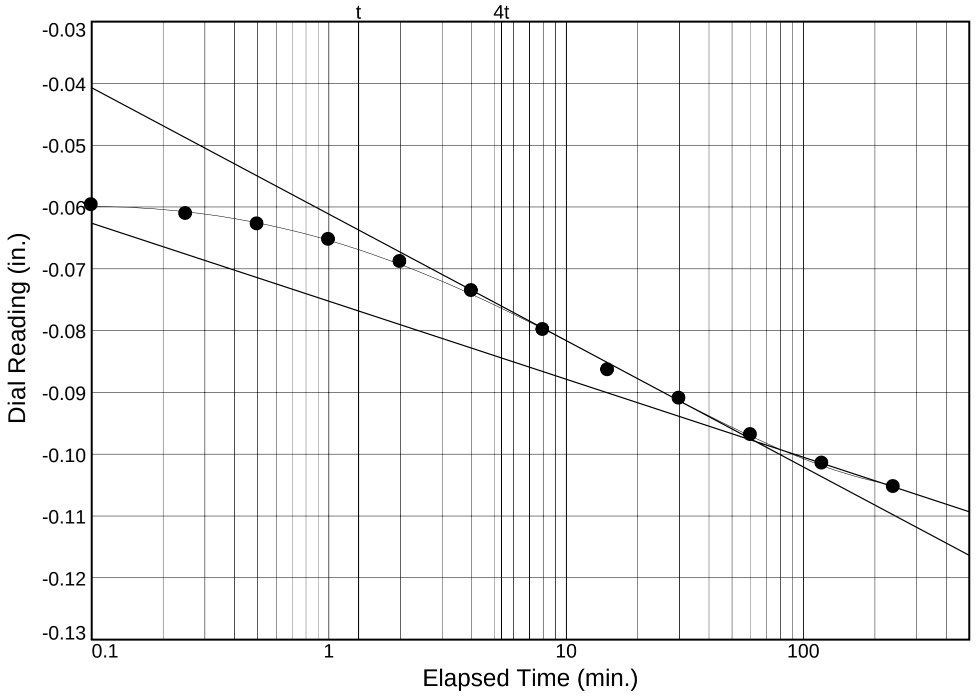
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RB-B-08 Depth: 15 Sample Number: T-1



Load No.= 5

Load= 1.00 tsf

D_0 = -0.0574

D_{50} = -0.0777

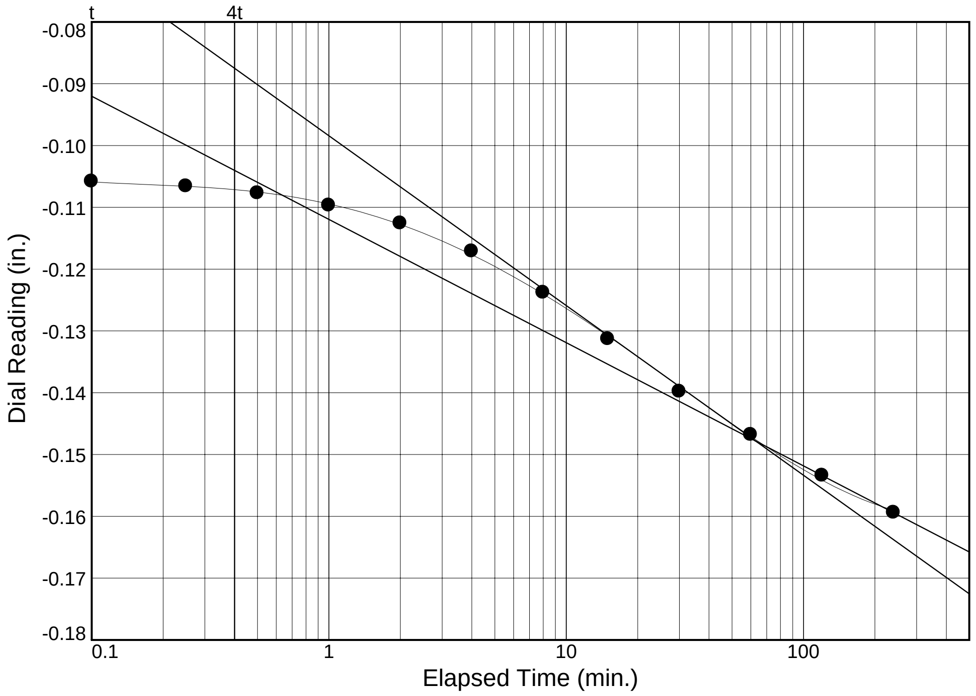
D_{100} = -0.0980

T_{50} = 6.26 min.

C_v @ T_{50}

0.067 ft.^{2}/day

C_α = 0.042



Load No.= 6

Load= 2.00 tsf

D_0 = -0.1046

D_{50} = -0.1262

D_{100} = -0.1478

T_{50} = 9.85 min.

C_v @ T_{50}

0.038 ft.^{2}/day

C_α = 0.066

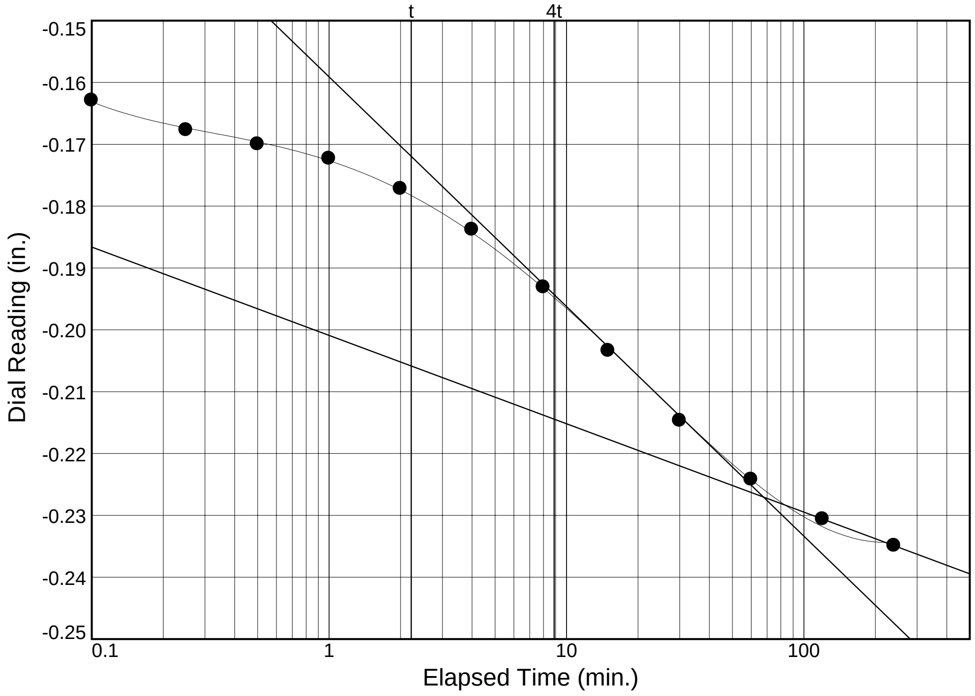
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

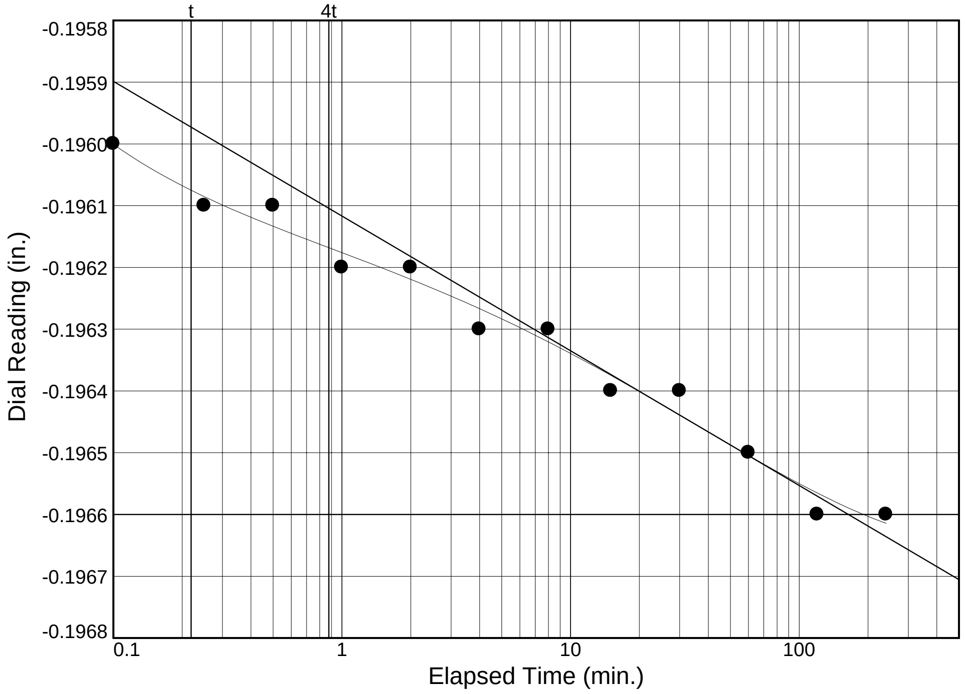
Source of Sample: RB-B-08 Depth: 15 Sample Number: T-1



Load No.= 7
Load= 4.00 tsf
D_0 = -0.1618
D_{50} = -0.1944
D_{100} = -0.2270
T_{50} = 8.66 min.

C_v @ T_{50}
0.037 ft.^{2}/day

C_α = 0.047



Load No.= 11
Load= 0.13 tsf
D_0 = -0.1960
D_{50} = -0.1963
D_{100} = -0.1966
T_{50} = 5.52 min.

C_v @ T_{50}
0.058 ft.^{2}/day

C_α = 0.000

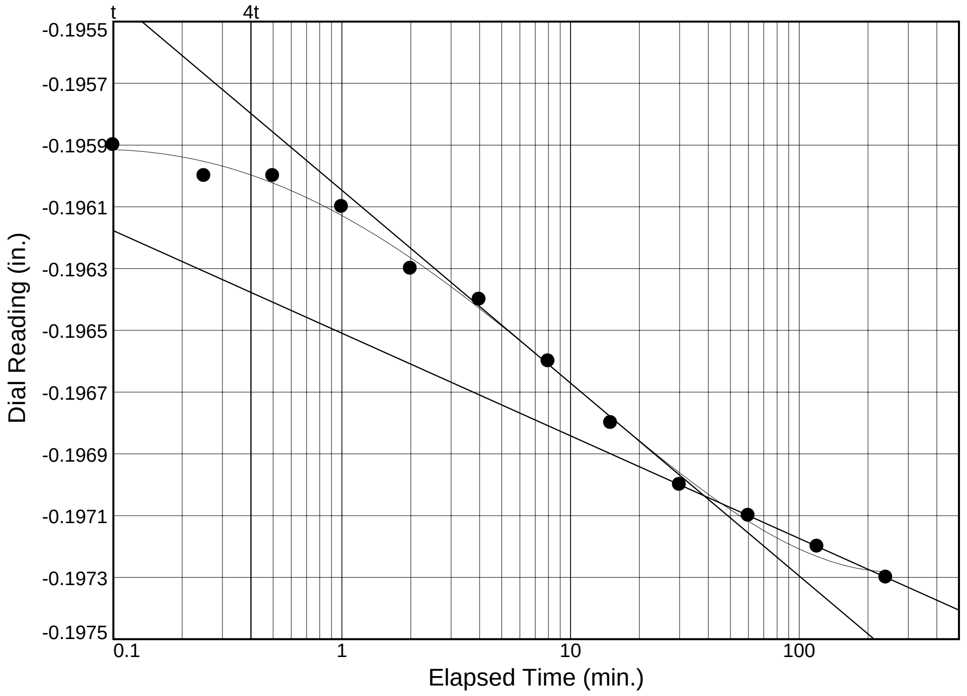
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

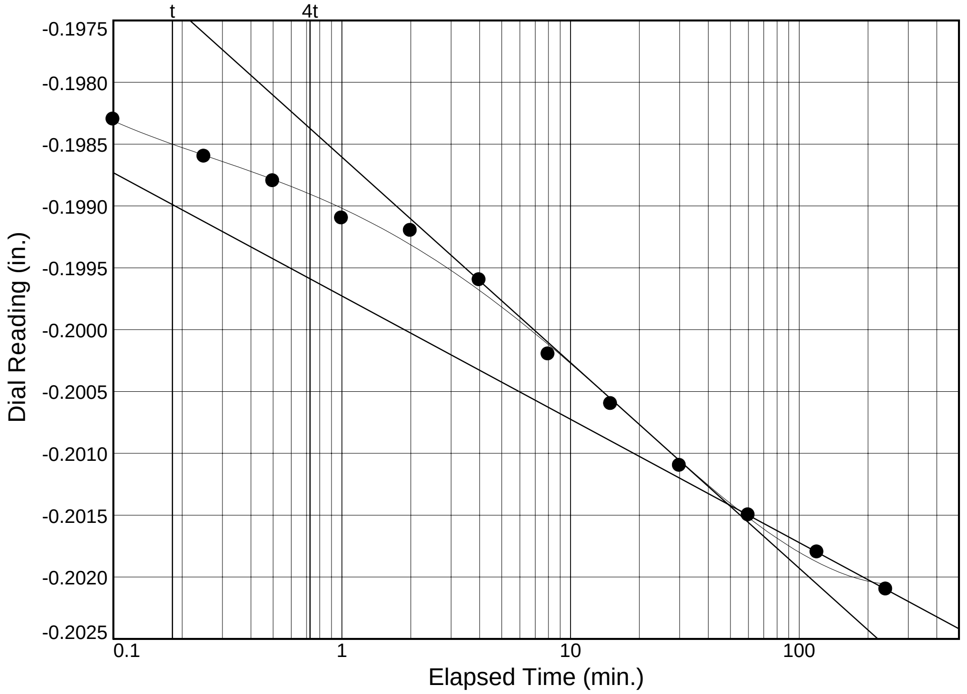
Source of Sample: RB-B-08 Depth: 15 Sample Number: T-1



Load No.= 12
Load= 0.25 tsf
D_0 = -0.1958
D_{50} = -0.1964
D_{100} = -0.1970
T_{50} = 4.08 min.

C_v @ T_{50}
0.078 ft.^{2}/day

C_α = 0.001



Load No.= 13
Load= 0.50 tsf
D_0 = -0.1981
D_{50} = -0.1998
D_{100} = -0.2014
T_{50} = 4.50 min.

C_v @ T_{50}
0.070 ft.^{2}/day

C_α = 0.003

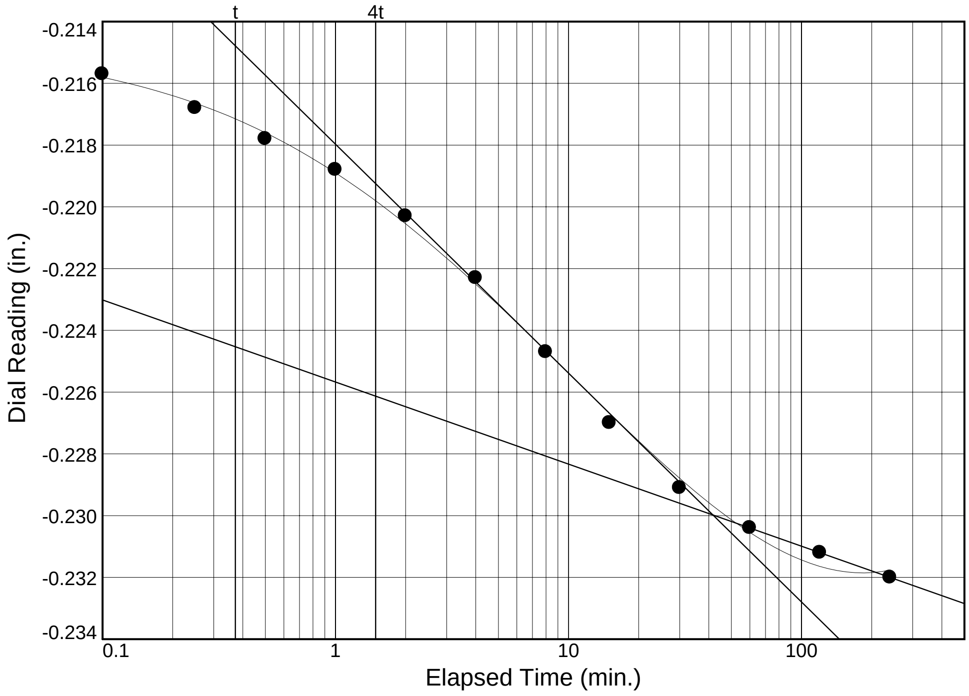
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

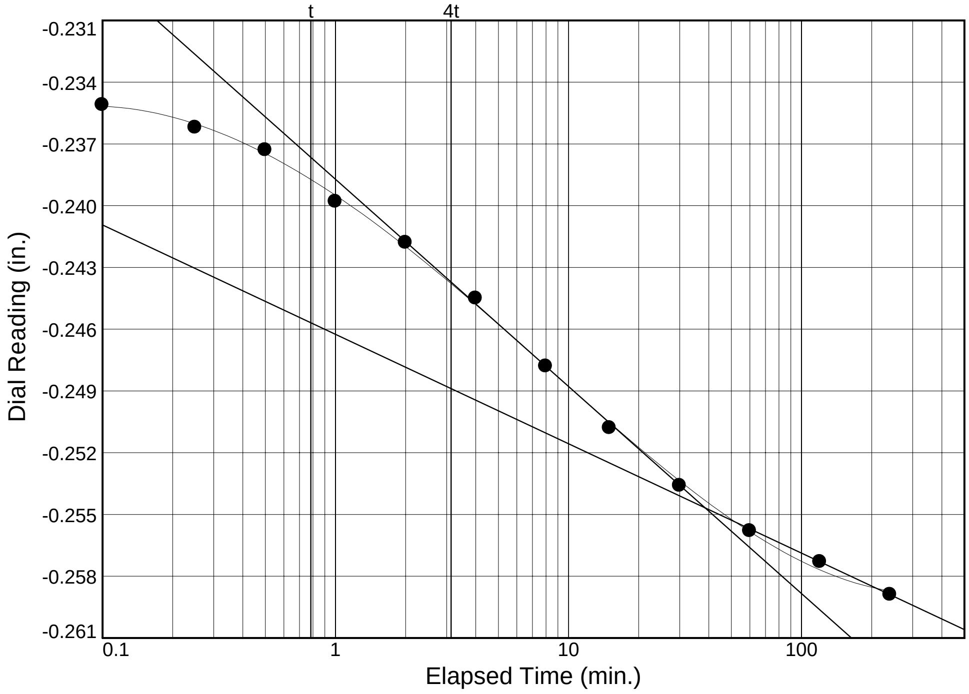
Source of Sample: RB-B-08 Depth: 15 Sample Number: T-1



Load No.= 15
Load= 2.00 tsf
D_0 = -0.2145
D_{50} = -0.2222
D_{100} = -0.2300
T_{50} = 3.65 min.

C_v @ T_{50}
0.082 ft.^{2}/day

C_α = 0.009



Load No.= 16
Load= 4.00 tsf
D_0 = -0.2337
D_{50} = -0.2442
D_{100} = -0.2547
T_{50} = 3.44 min.

C_v @ T_{50}
0.082 ft.^{2}/day

C_α = 0.017

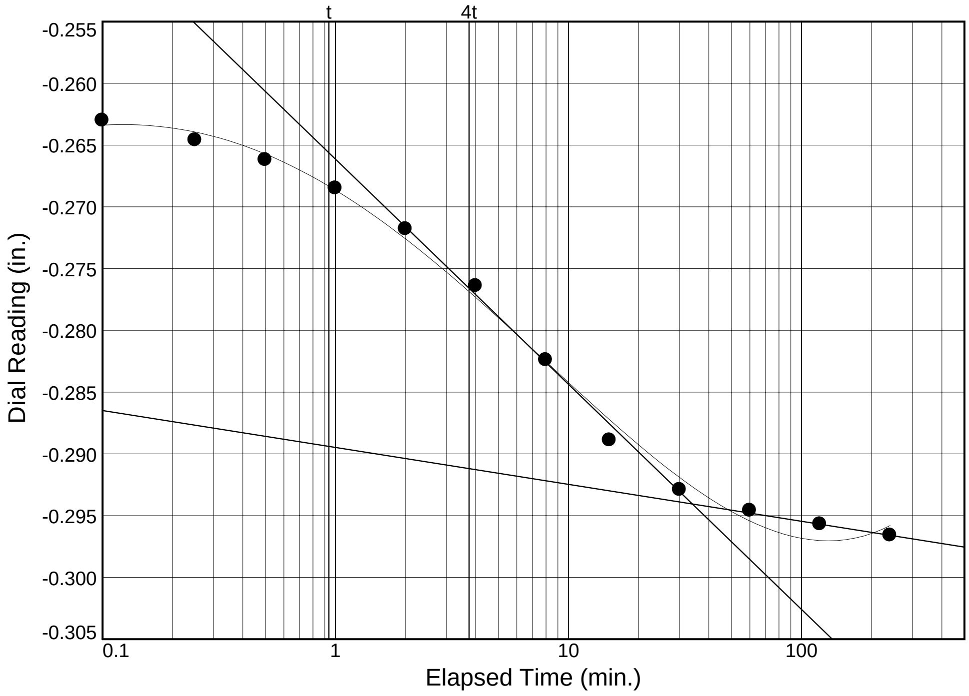
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

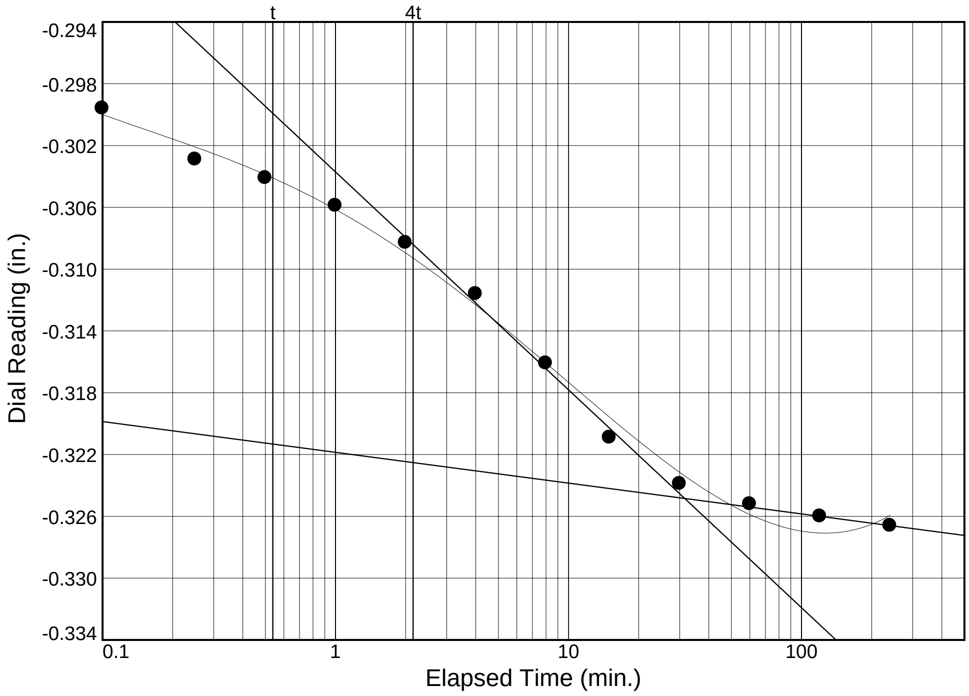
Source of Sample: RB-B-08 Depth: 15 Sample Number: T-1



Load No.= 17
Load= 8.00 tsf
D_0 = -0.2598
D_{50} = -0.2769
D_{100} = -0.2941
T_{50} = 3.77 min.

C_v @ T_{50}
0.068 ft.^{2}/day

C_α = 0.010



Load No.= 18
Load= 16.00 tsf
D_0 = -0.2989
D_{50} = -0.3119
D_{100} = -0.3248
T_{50} = 3.67 min.

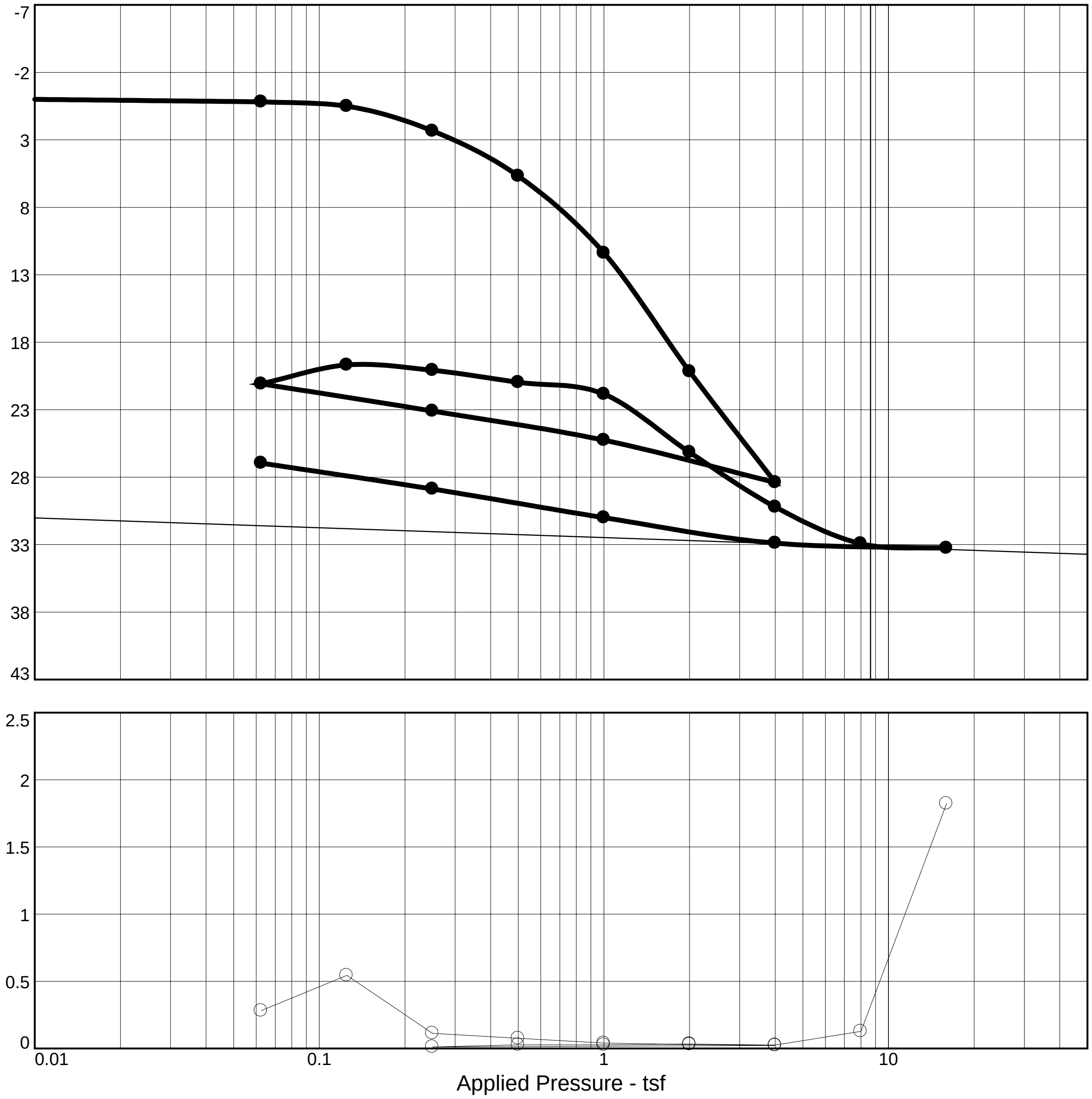
C_v @ T_{50}
0.064 ft.^{2}/day

C_α = 0.007

Figure

Hillis-Carnes Engineering Associates

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
99.4 %	87.5 %	49.6			2.65		9.0	0.02	0.16	2.332

MATERIAL DESCRIPTION	USCS	AASHTO

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

Source of Sample: RB-B-11 **Depth:** 15.0 **Sample Number:** T-1

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Remarks:

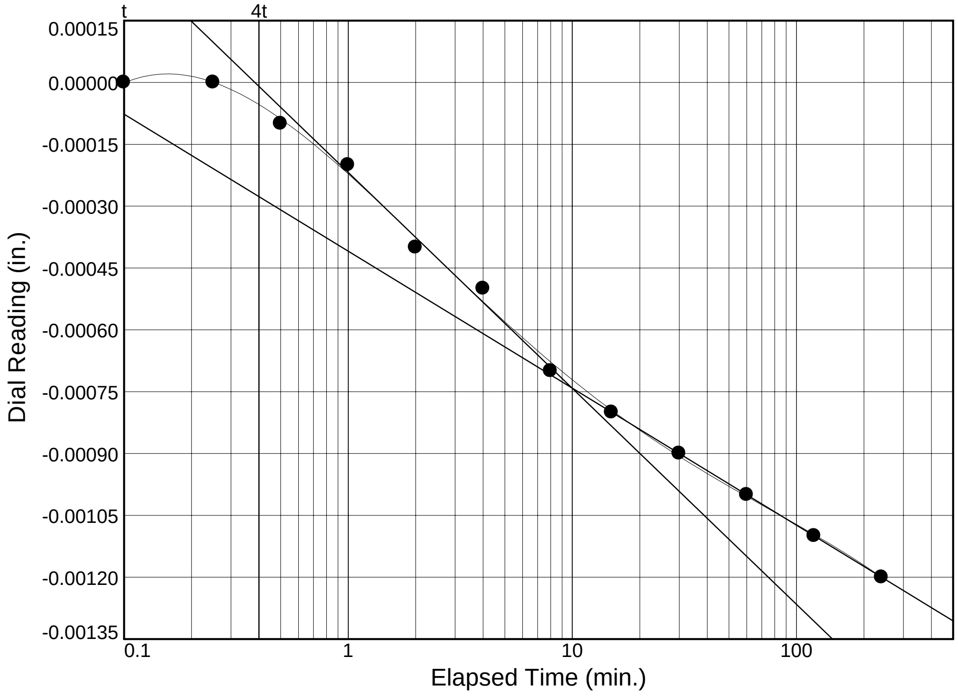
Figure

Tested By: cs

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

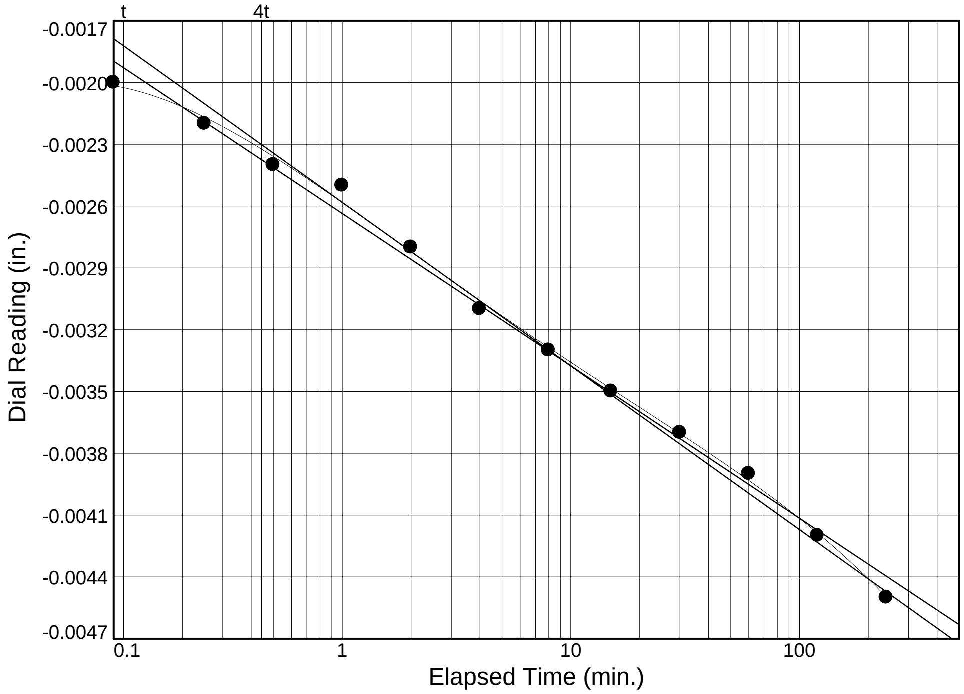
Source of Sample: RB-B-11 Depth: 15.0 Sample Number: T-1



Load No.= 1
Load= 0.06 tsf
D_0 = 0.0001
D_{50} = -0.0003
D_{100} = -0.0007
T_{50} = 1.74 min.

C_v @ T_{50}
0.282 ft.^{2}/day

C_α = 0.001



Load No.= 2
Load= 0.13 tsf
D_0 = -0.0017
D_{50} = -0.0025
D_{100} = -0.0034
T_{50} = 0.90 min.

C_v @ T_{50}
0.544 ft.^{2}/day

C_α = 0.002

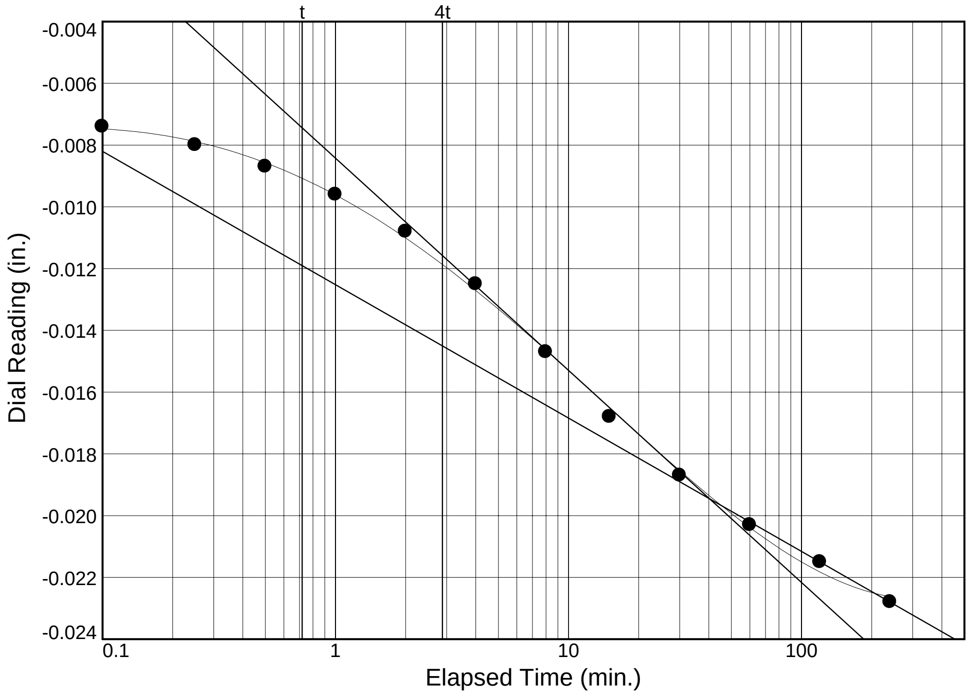
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

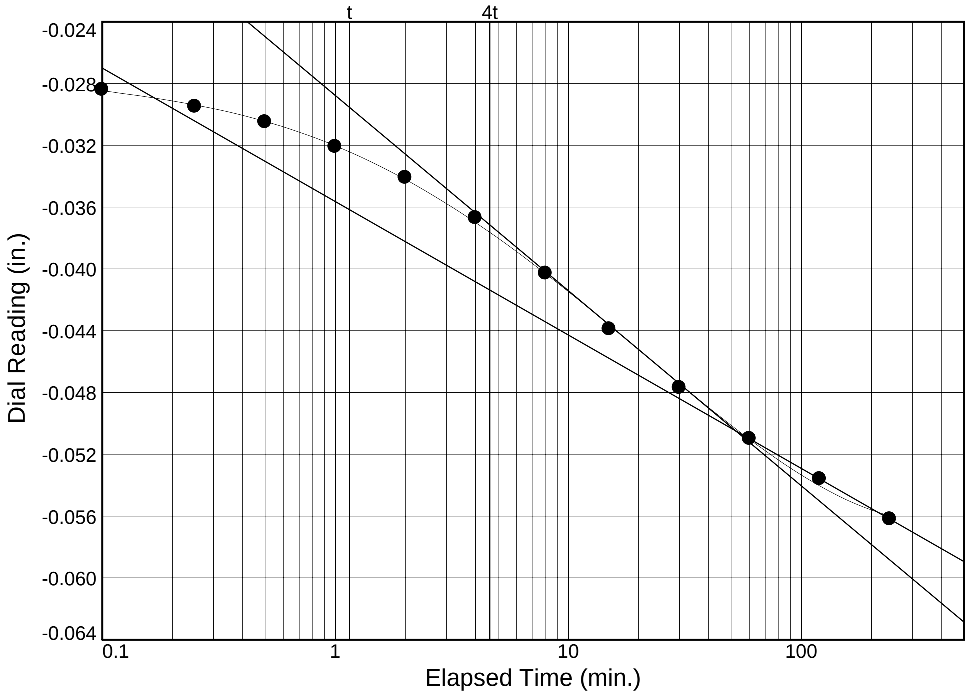
Source of Sample: RB-B-11 Depth: 15.0 Sample Number: T-1



Load No.= 3
Load= 0.25 tsf
D_0 = -0.0063
D_{50} = -0.0129
D_{100} = -0.0195
T_{50} = 4.24 min.

C_v @ T_{50}
0.113 ft.^{2}/day

C_α = 0.014



Load No.= 4
Load= 0.50 tsf
D_0 = -0.0272
D_{50} = -0.0389
D_{100} = -0.0505
T_{50} = 5.96 min.

C_v @ T_{50}
0.076 ft.^{2}/day

C_α = 0.029

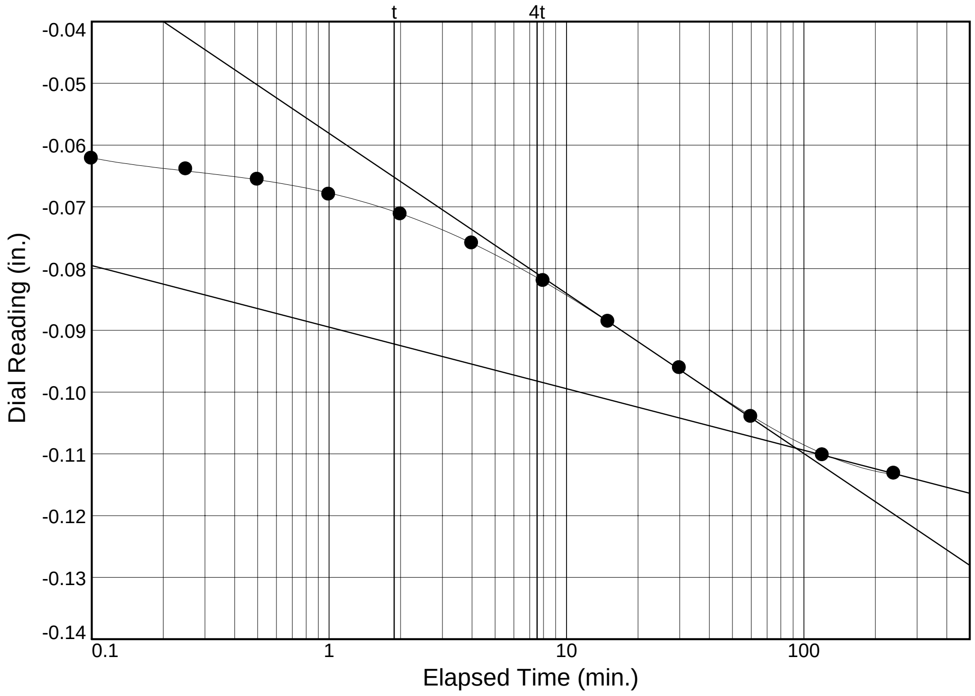
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

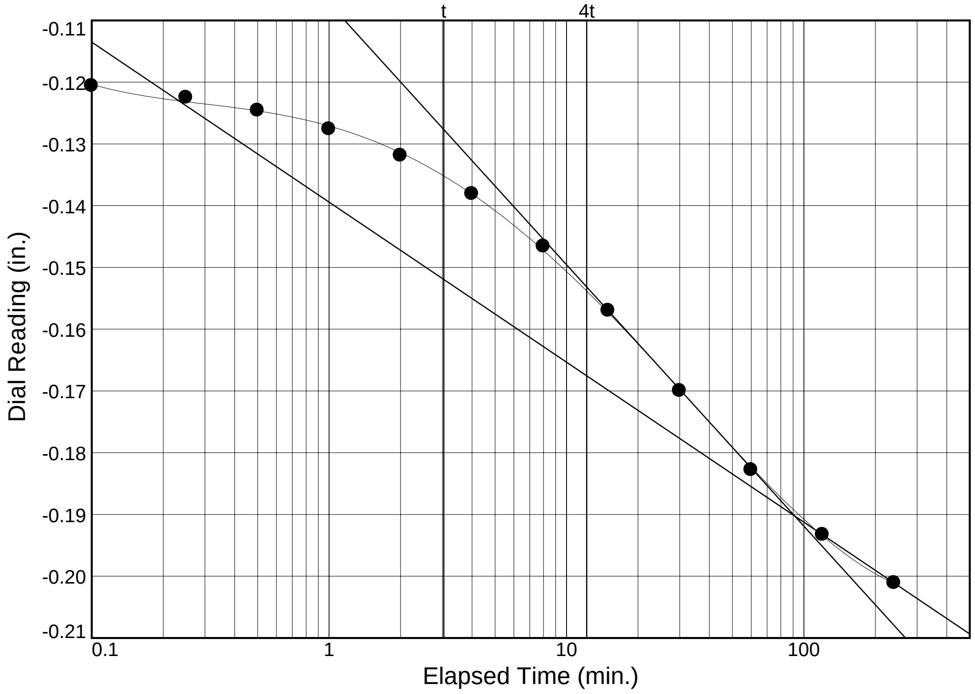
Source of Sample: RB-B-11 Depth: 15.0 Sample Number: T-1



Load No.= 5
Load= 1.00 tsf
D_0 = -0.0600
D_{50} = -0.0846
D_{100} = -0.1091
T_{50} = 10.23 min.

C_v @ T_{50}
0.040 ft.^{2}/day

C_α = 0.033



Load No.= 6
Load= 2.00 tsf
D_0 = -0.1165
D_{50} = -0.1534
D_{100} = -0.1902
T_{50} = 11.84 min.

C_v @ T_{50}
0.030 ft.^{2}/day

C_α = 0.086

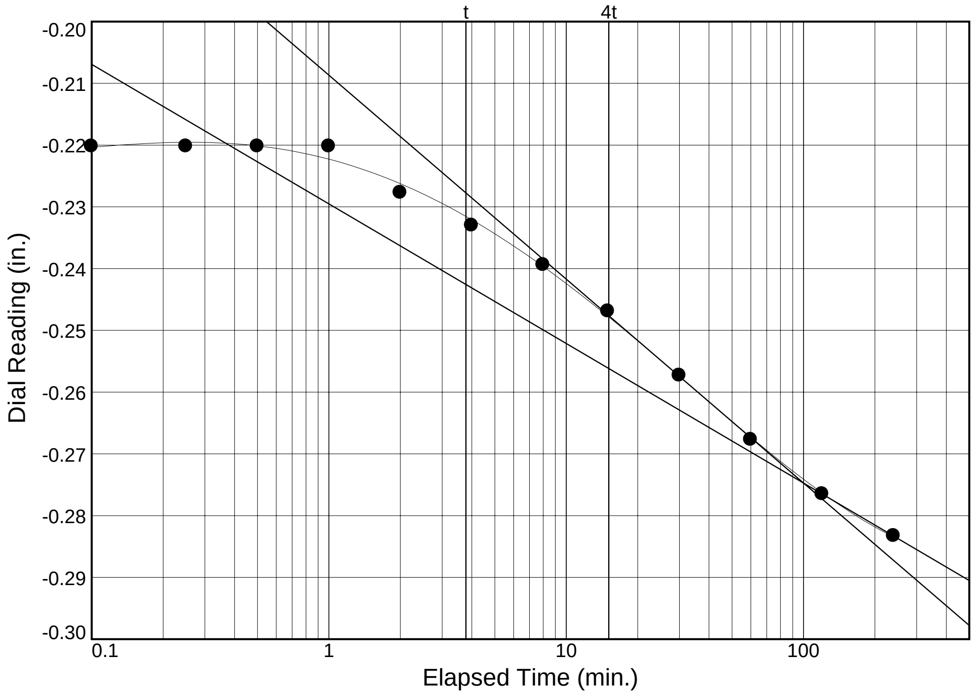
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RB-B-11 Depth: 15.0 Sample Number: T-1



Load No.= 7

Load= 4.00 tsf

D_0 = -0.2153

D_{50} = -0.2450

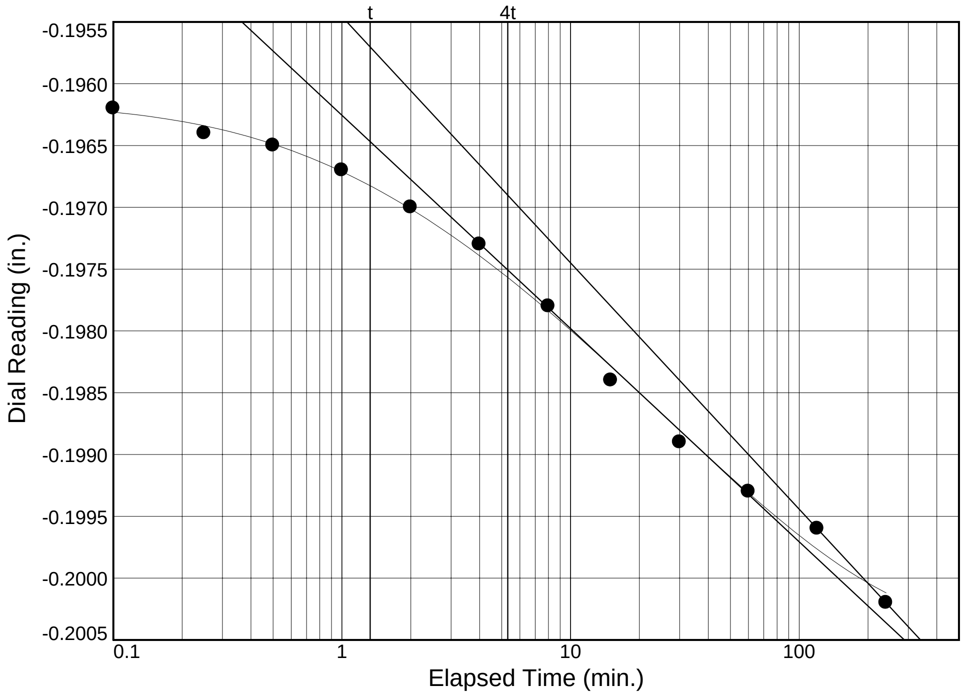
D_{100} = -0.2747

T_{50} = 12.22 min.

C_v @ T_{50}

0.023 ft.^{2}/day

C_α = 0.075



Load No.= 12

Load= 0.25 tsf

D_0 = -0.1961

D_{50} = -0.1987

D_{100} = -0.2014

T_{50} = 27.68 min.

C_v @ T_{50}

0.011 ft.^{2}/day

C_α = 0.007

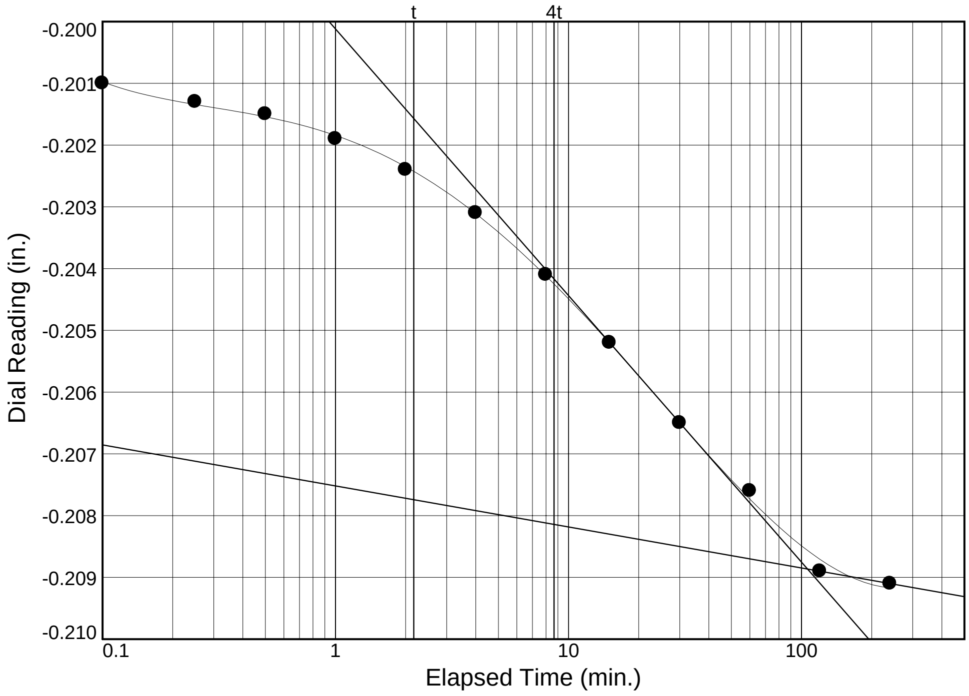
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RB-B-11 Depth: 15.0 Sample Number: T-1



Load No.= 13

Load= 0.50 tsf

D_0 = -0.2006

D_{50} = -0.2047

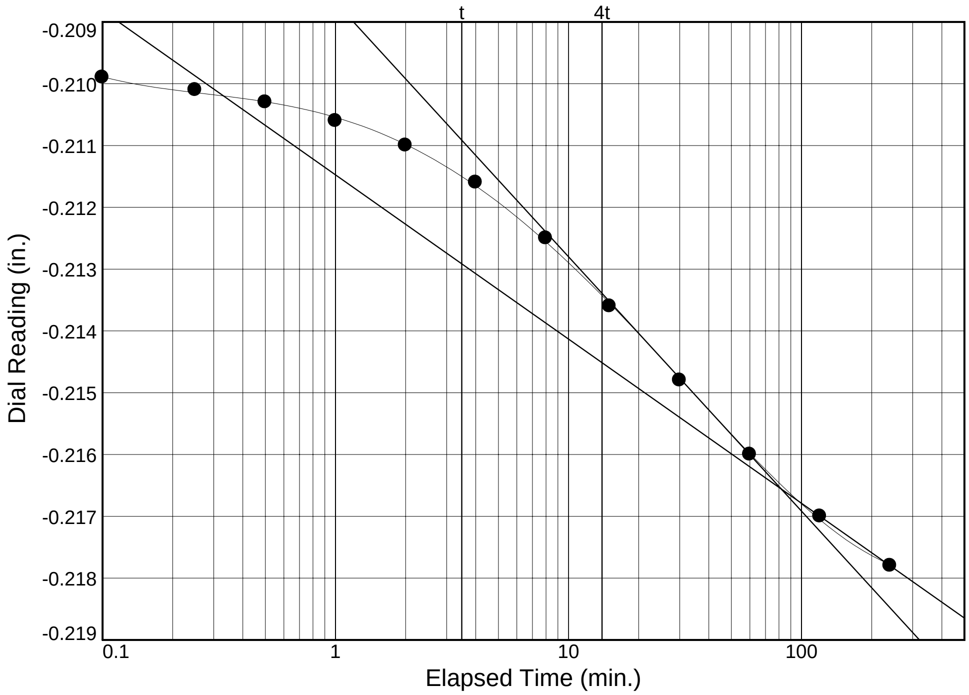
D_{100} = -0.2089

T_{50} = 11.51 min.

C_v @ T_{50}

0.027 ft.^{2}/day

C_α = 0.002



Load No.= 14

Load= 1.00 tsf

D_0 = -0.2096

D_{50} = -0.2131

D_{100} = -0.2166

T_{50} = 11.14 min.

C_v @ T_{50}

0.027 ft.^{2}/day

C_α = 0.009

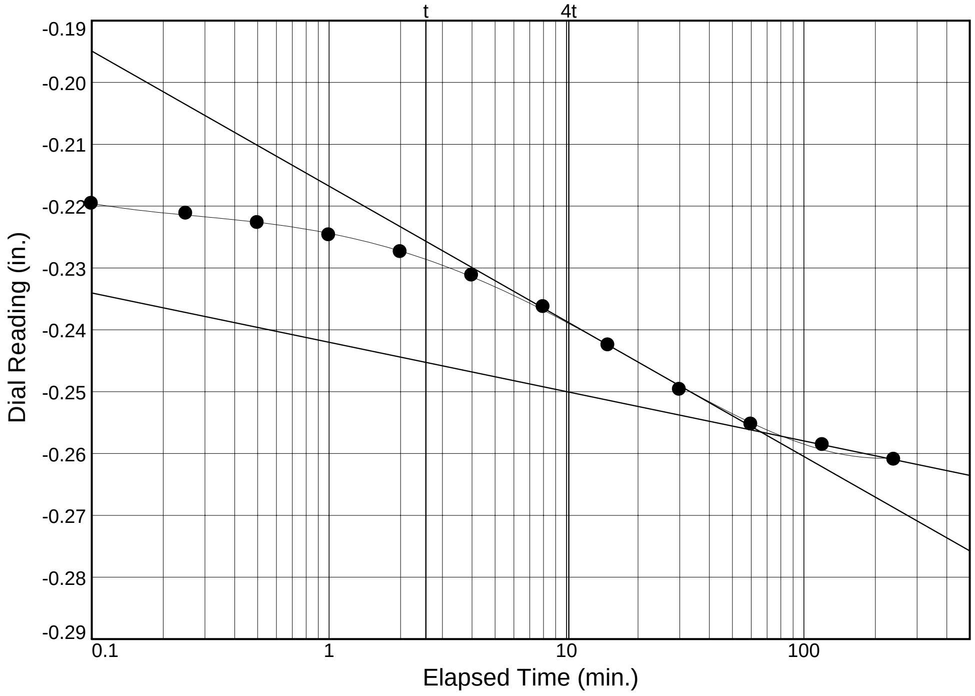
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

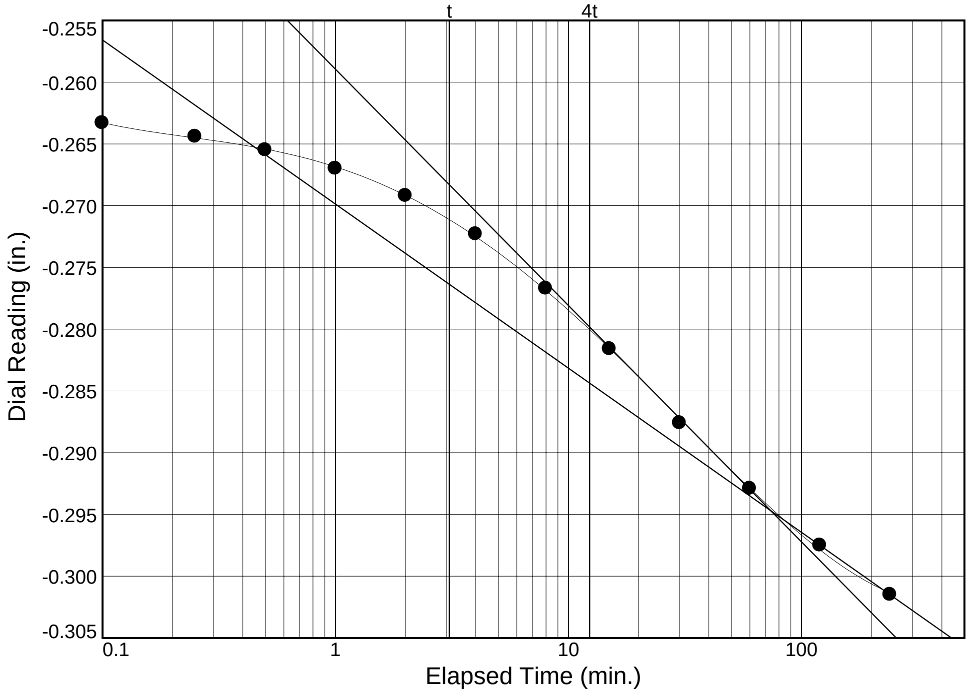
Source of Sample: RB-B-11 Depth: 15.0 Sample Number: T-1



Load No.= 15
Load= 2.00 tsf
D_0 = -0.2182
D_{50} = -0.2374
D_{100} = -0.2565
T_{50} = 8.54 min.

C_v @ T_{50}
0.033 ft.^{2}/day

C_α = 0.027



Load No.= 16
Load= 4.00 tsf
D_0 = -0.2622
D_{50} = -0.2785
D_{100} = -0.2947
T_{50} = 9.99 min.

C_v @ T_{50}
0.025 ft.^{2}/day

C_α = 0.044

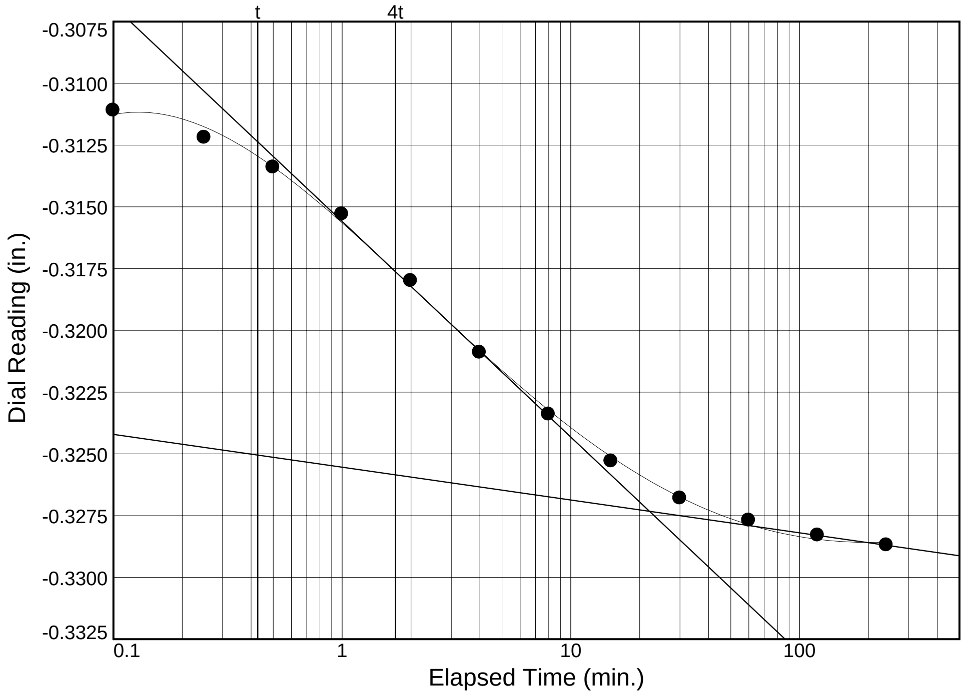
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

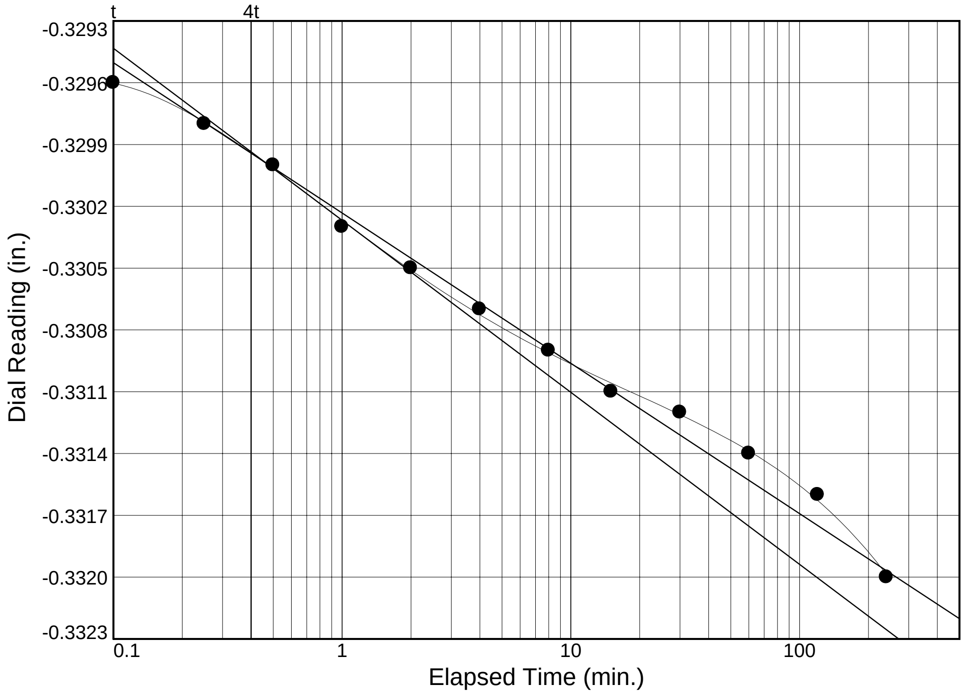
Source of Sample: RB-B-11 Depth: 15.0 Sample Number: T-1



Load No.= 17
Load= 8.00 tsf
D_0 = -0.3083
D_{50} = -0.3178
D_{100} = -0.3273
T_{50} = 1.79 min.

C_v @ T_{50}
0.128 ft.^{2}/day

C_α = 0.004



Load No.= 18
Load= 16.00 tsf
D_0 = -0.3293
D_{50} = -0.3296
D_{100} = -0.3300
T_{50} = 0.12 min.

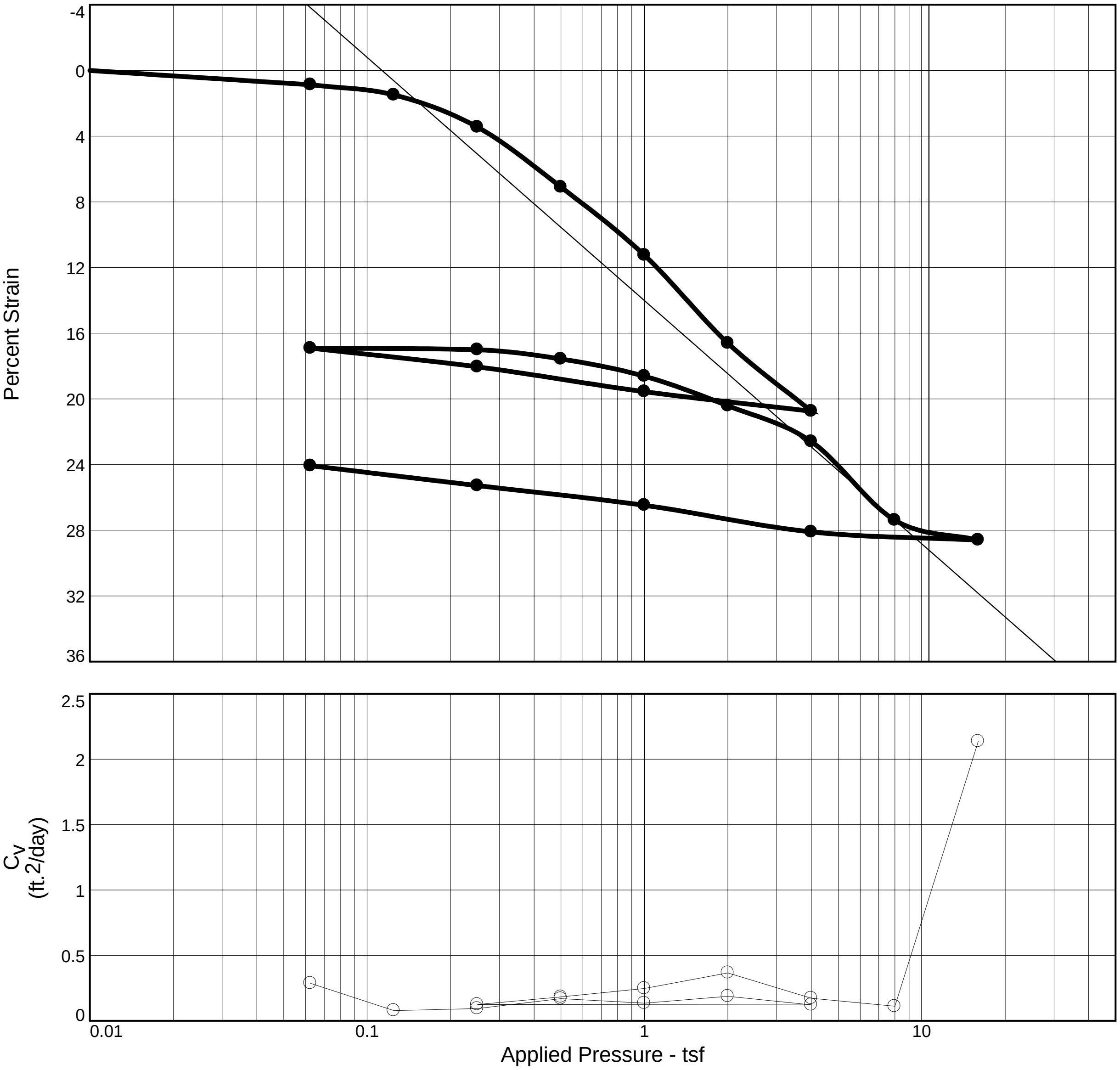
C_v @ T_{50}
1.822 ft.^{2}/day

C_α = 0.002

Figure

Hillis-Carnes Engineering Associates

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
99.7 %	54.9 %	67.3	70	36	2.65		9.4	0.36	0.07	1.459

MATERIAL DESCRIPTION	USCS	AASHTO
Black fat clay w/sand	CH	A-7-5(30)

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

Source of Sample: RW-B-01 **Depth:** 21.5-23.5 **Sample Number:** T-1

Remarks:

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.
Annapolis Junction, MD

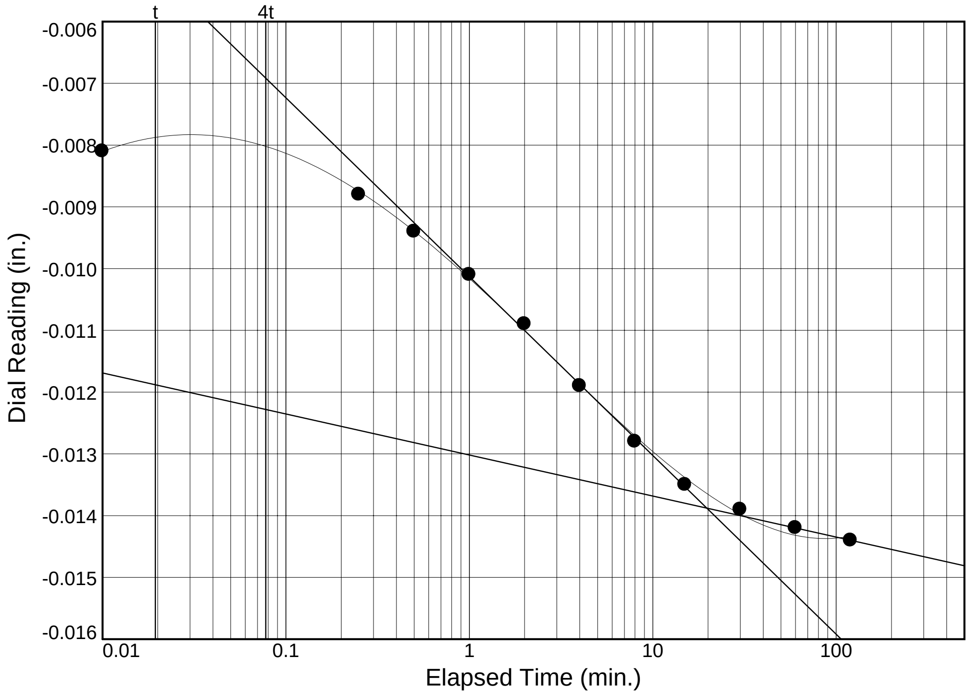
Figure

Tested By: cs

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RW-B-01 Depth: 21.5-23.5 Sample Number: T-1



Load No.= 1

Load= 0.06 tsf

D_0 = -0.0077

D_{50} = -0.0108

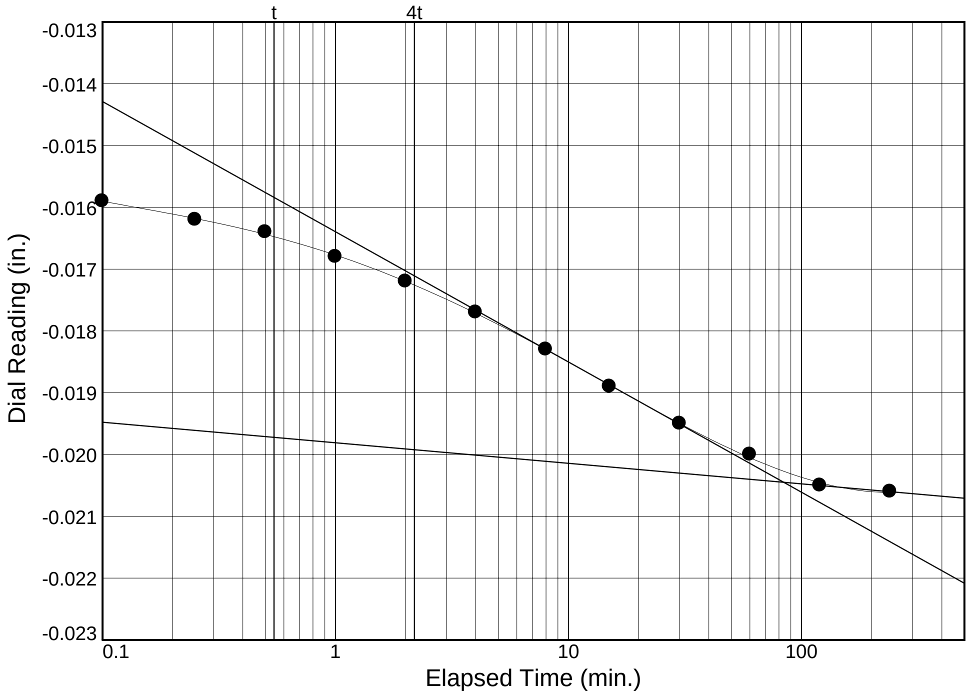
D_{100} = -0.0139

T_{50} = 1.71 min.

C_v @ T_{50}

0.286 ft.^{2}/day

C_α = 0.002



Load No.= 2

Load= 0.13 tsf

D_0 = -0.0157

D_{50} = -0.0181

D_{100} = -0.0204

T_{50} = 6.13 min.

C_v @ T_{50}

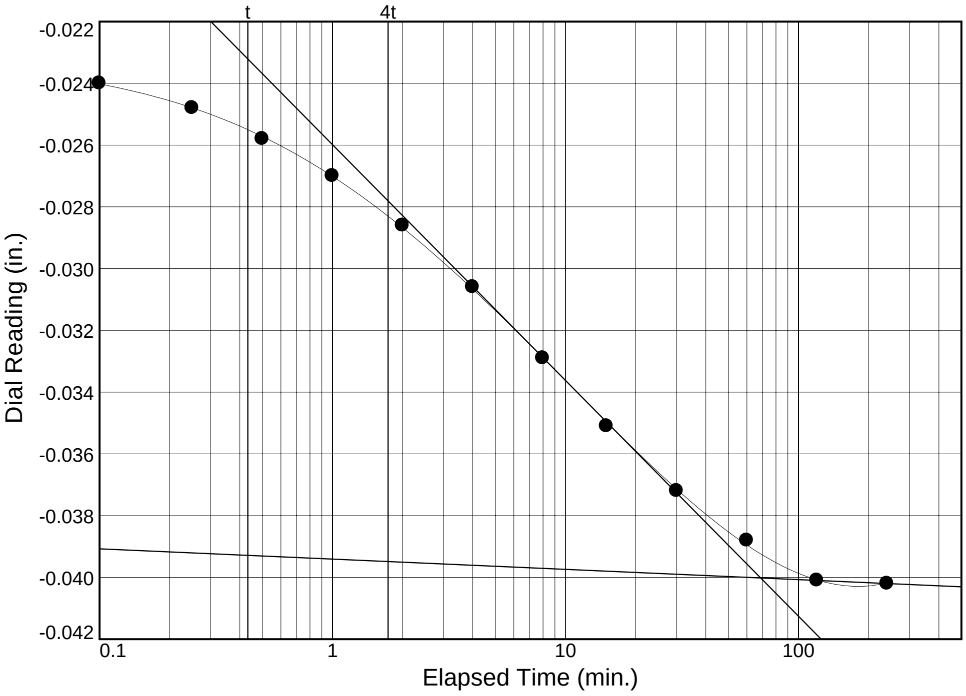
0.078 ft.^{2}/day

C_α = 0.001

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RW-B-01 Depth: 21.5-23.5 Sample Number: T-1



Load No.= 3

Load= 0.25 tsf

D_0 = -0.0227

D_{50} = -0.0314

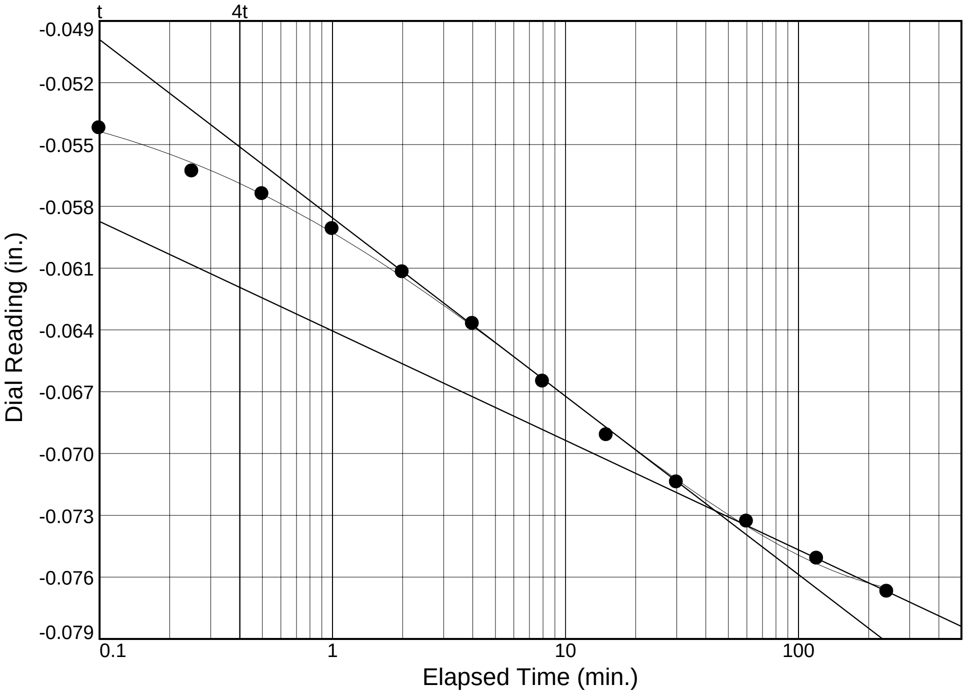
D_{100} = -0.0400

T_{50} = 4.99 min.

C_v @ T_{50}

0.094 ft.^{2}/day

C_α = 0.001



Load No.= 4

Load= 0.50 tsf

D_0 = -0.0518

D_{50} = -0.0623

D_{100} = -0.0728

T_{50} = 2.59 min.

C_v @ T_{50}

0.169 ft.^{2}/day

C_α = 0.013

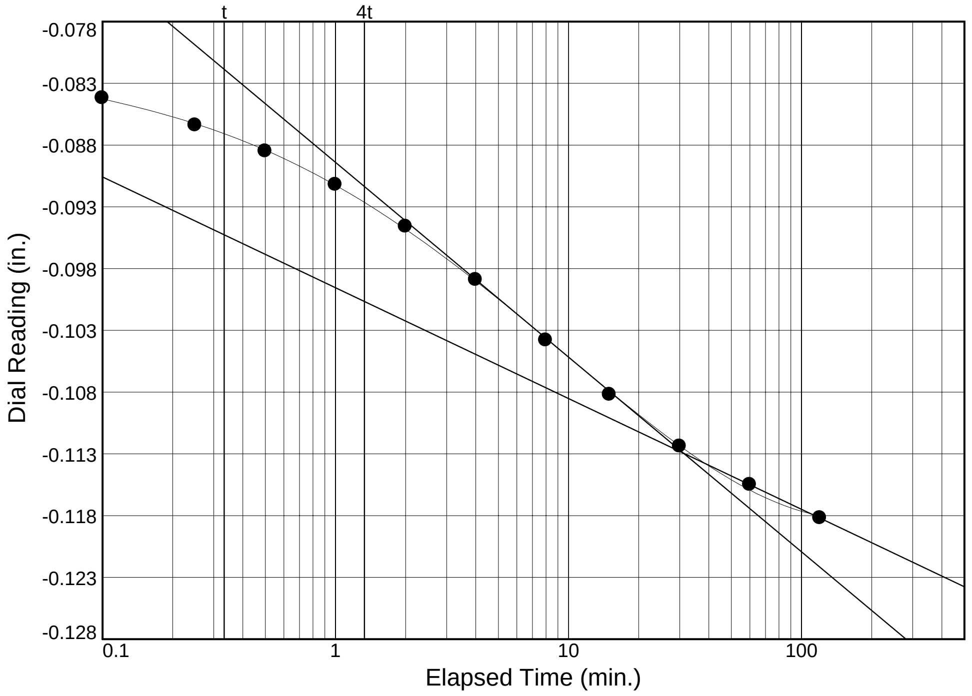
Figure

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RW-B-01 Depth: 21.5-23.5 Sample Number: T-1



Load No.= 5

Load= 1.00 tsf

D_0 = -0.0815

D_{50} = -0.0972

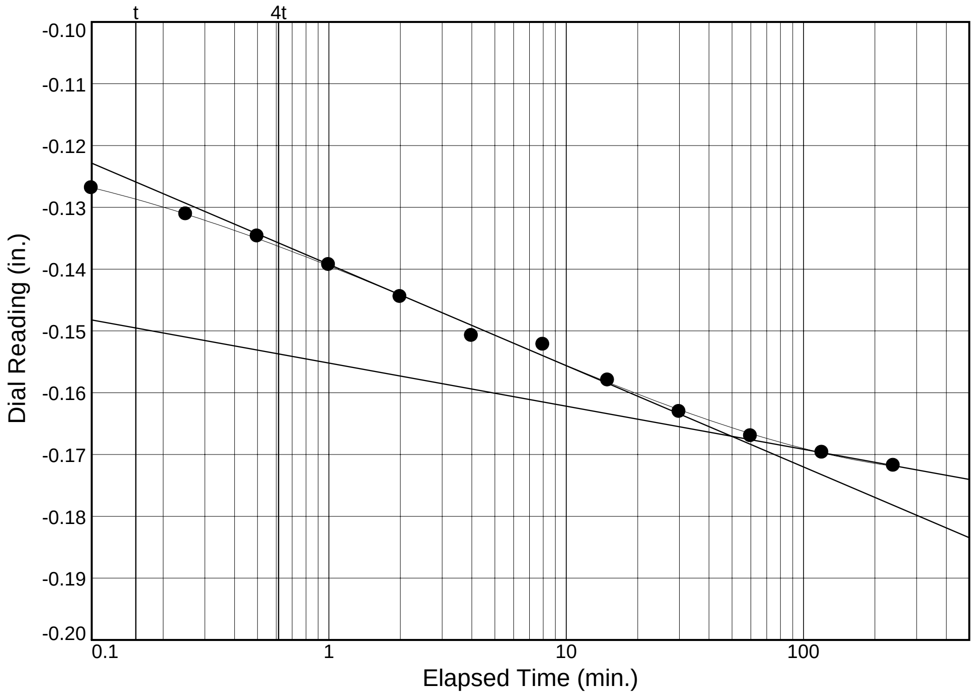
D_{100} = -0.1130

T_{50} = 3.01 min.

C_v @ T_{50}

0.135 ft.^{2}/day

C_α = 0.022



Load No.= 6

Load= 2.00 tsf

D_0 = -0.1210

D_{50} = -0.1440

D_{100} = -0.1670

T_{50} = 1.95 min.

C_v @ T_{50}

0.188 ft.^{2}/day

C_α = 0.017

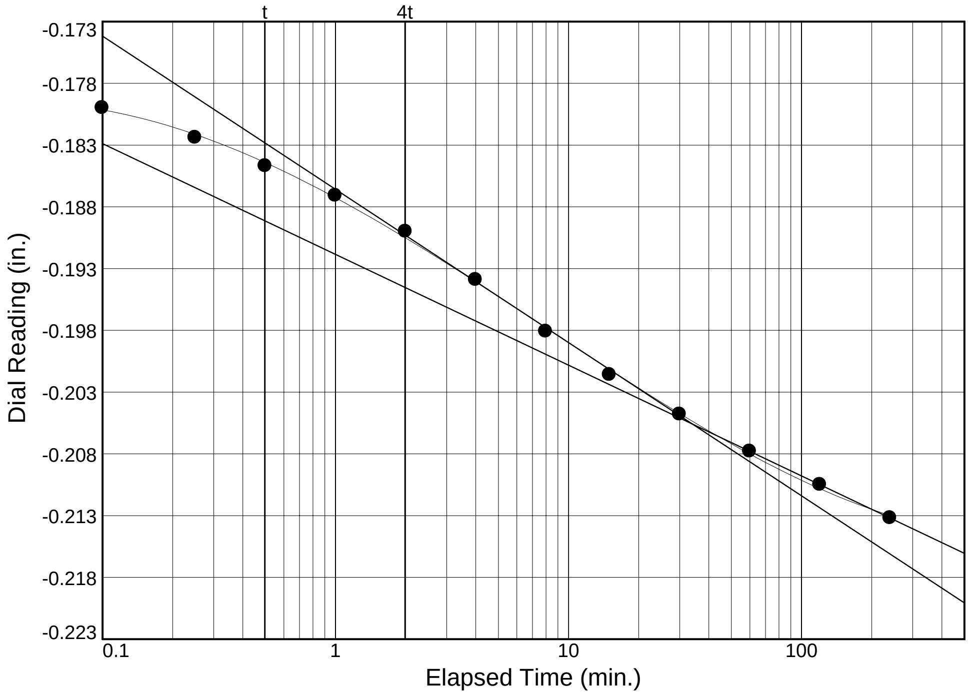
Figure

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

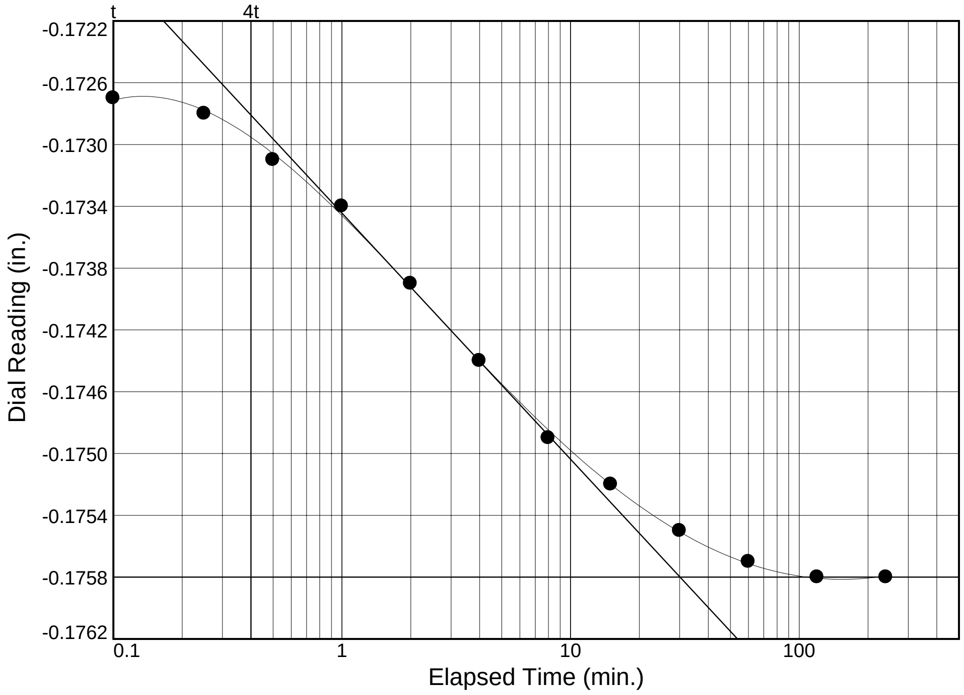
Source of Sample: RW-B-01 Depth: 21.5-23.5 Sample Number: T-1



Load No.= 7
Load= 4.00 tsf
D_0 = -0.1783
D_{50} = -0.1920
D_{100} = -0.2056
T_{50} = 2.66 min.

C_v @ T_{50}
0.122 ft.^{2}/day

C_α = 0.022



Load No.= 11
Load= 0.25 tsf
D_0 = -0.1725
D_{50} = -0.1741
D_{100} = -0.1758
T_{50} = 2.72 min.

C_v @ T_{50}
0.125 ft.^{2}/day

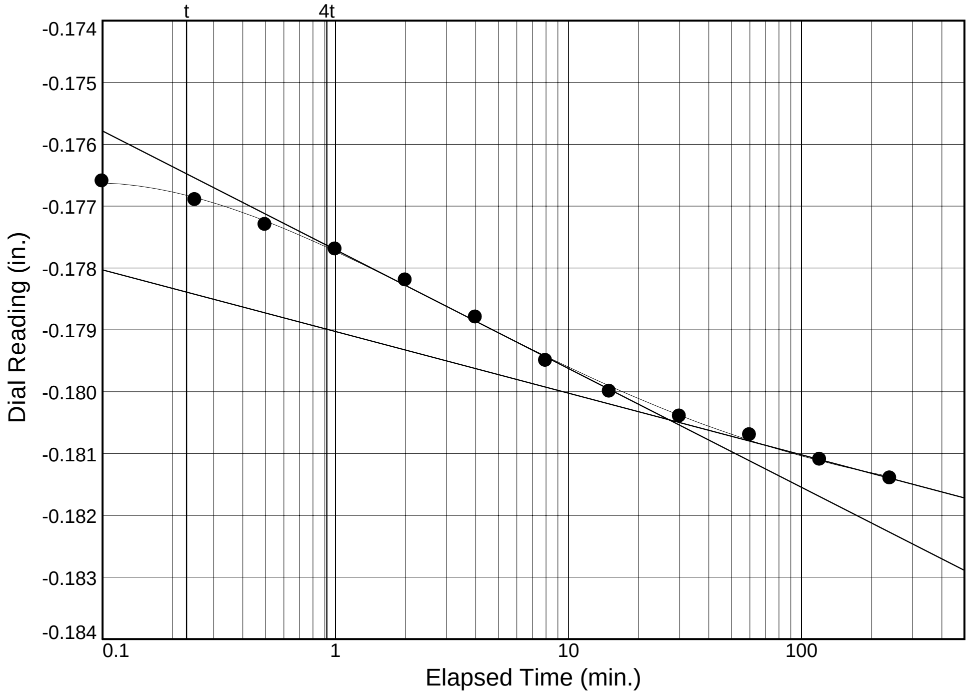
C_α = 0.000

Figure

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

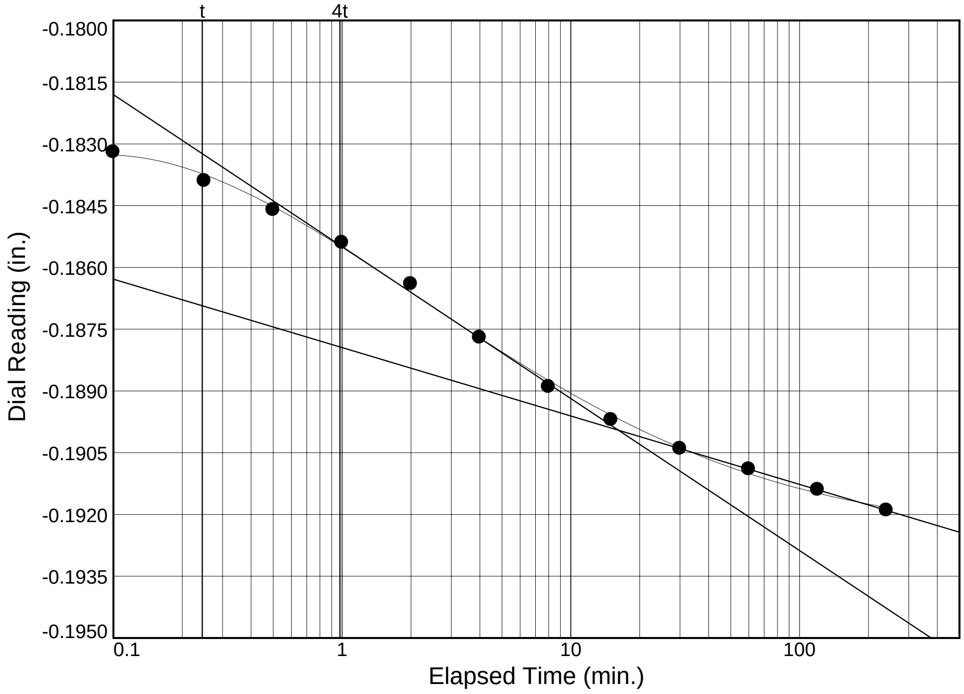
Source of Sample: RW-B-01 Depth: 21.5-23.5 Sample Number: T-1



Load No.= 12
Load= 0.50 tsf
D_0 = -0.1760
D_{50} = -0.1782
D_{100} = -0.1805
T_{50} = 1.84 min.

C_v @ T_{50}
0.183 ft.^{2}/day

C_α = 0.002



Load No.= 13
Load= 1.00 tsf
D_0 = -0.1820
D_{50} = -0.1860
D_{100} = -0.1900
T_{50} = 1.33 min.

C_v @ T_{50}
0.248 ft.^{2}/day

C_α = 0.004

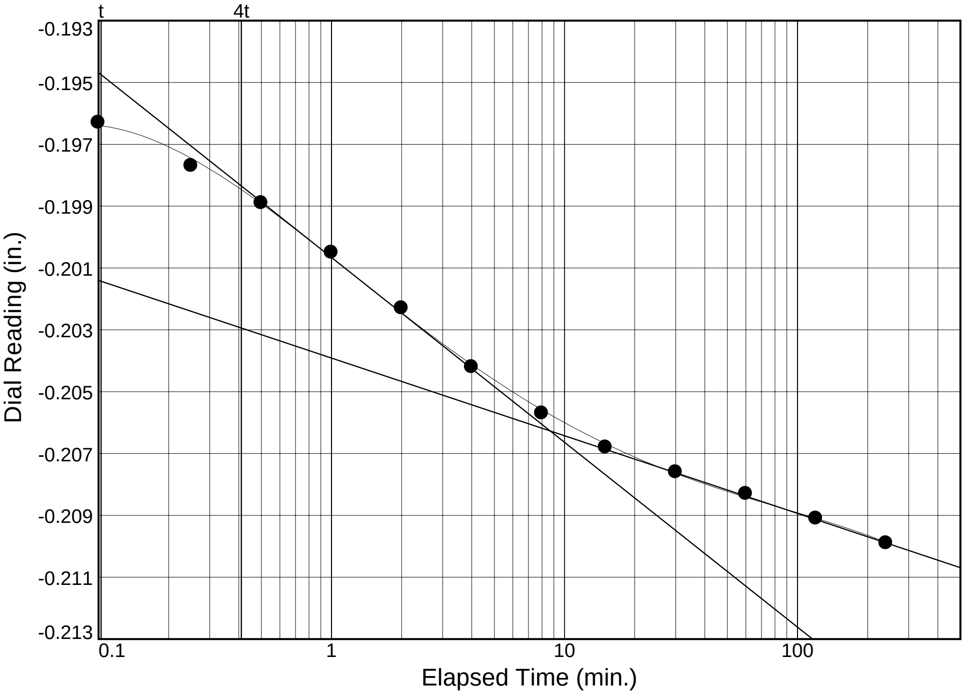
Figure

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

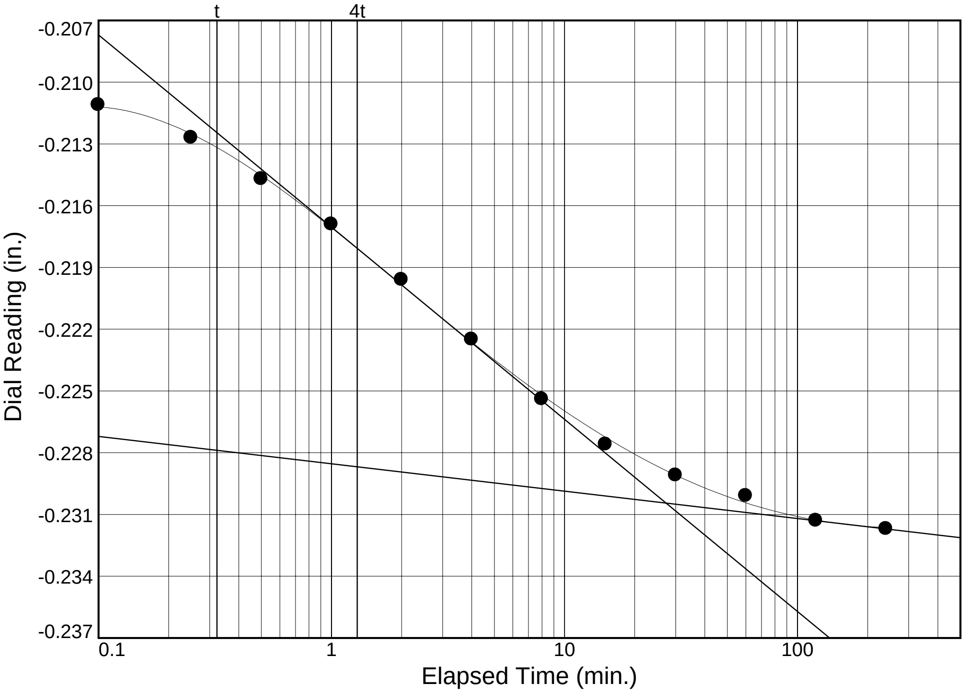
Source of Sample: RW-B-01 Depth: 21.5-23.5 Sample Number: T-1



Load No.= 14
Load= 2.00 tsf
D_0 = -0.1943
D_{50} = -0.2003
D_{100} = -0.2063
T_{50} = 0.87 min.

C_v @ T_{50}
0.367 ft.^{2}/day

C_α = 0.006



Load No.= 15
Load= 4.00 tsf
D_0 = -0.2083
D_{50} = -0.2194
D_{100} = -0.2304
T_{50} = 1.77 min.

C_v @ T_{50}
0.172 ft.^{2}/day

C_α = 0.003

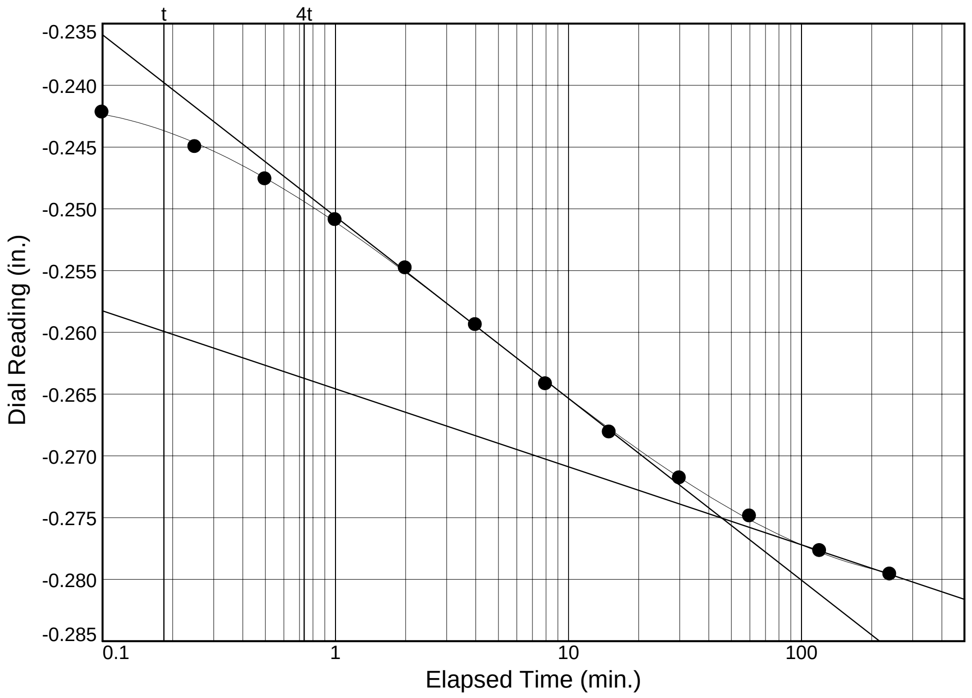
Figure

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

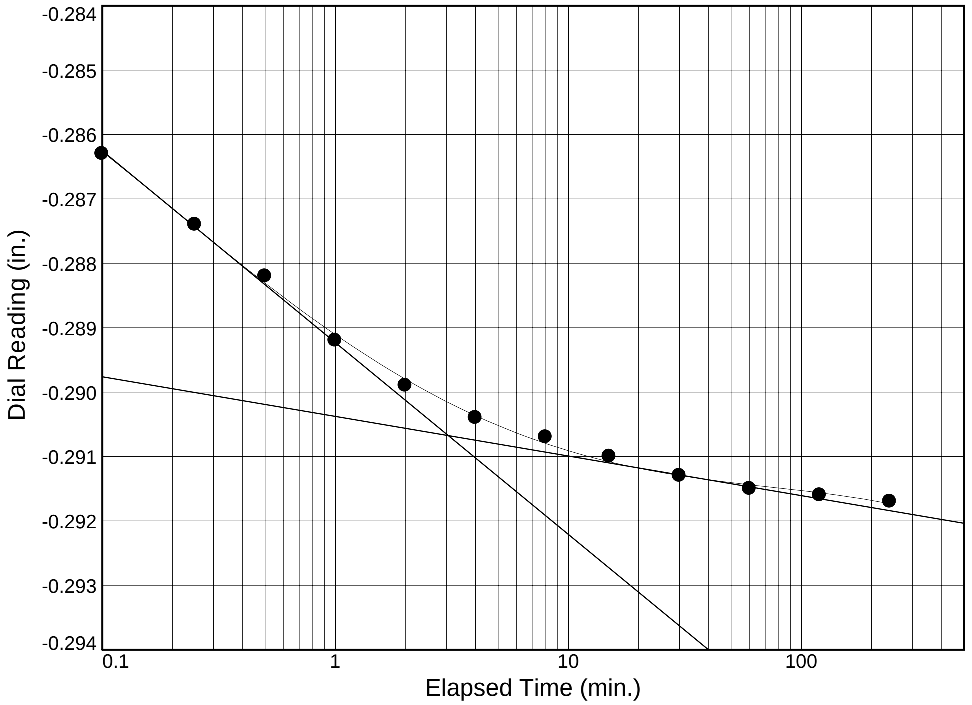
Source of Sample: RW-B-01 Depth: 21.5-23.5 Sample Number: T-1



Load No.= 16
Load= 8.00 tsf
D_0 = -0.2379
D_{50} = -0.2565
D_{100} = -0.2750
T_{50} = 2.48 min.

C_v @ T_{50}
0.112 ft.^{2}/day

C_α = 0.016



Load No.= 17
Load= 16.00 tsf
D_0 = -0.2823
D_{50} = -0.2865
D_{100} = -0.2907
T_{50} = 0.12 min.

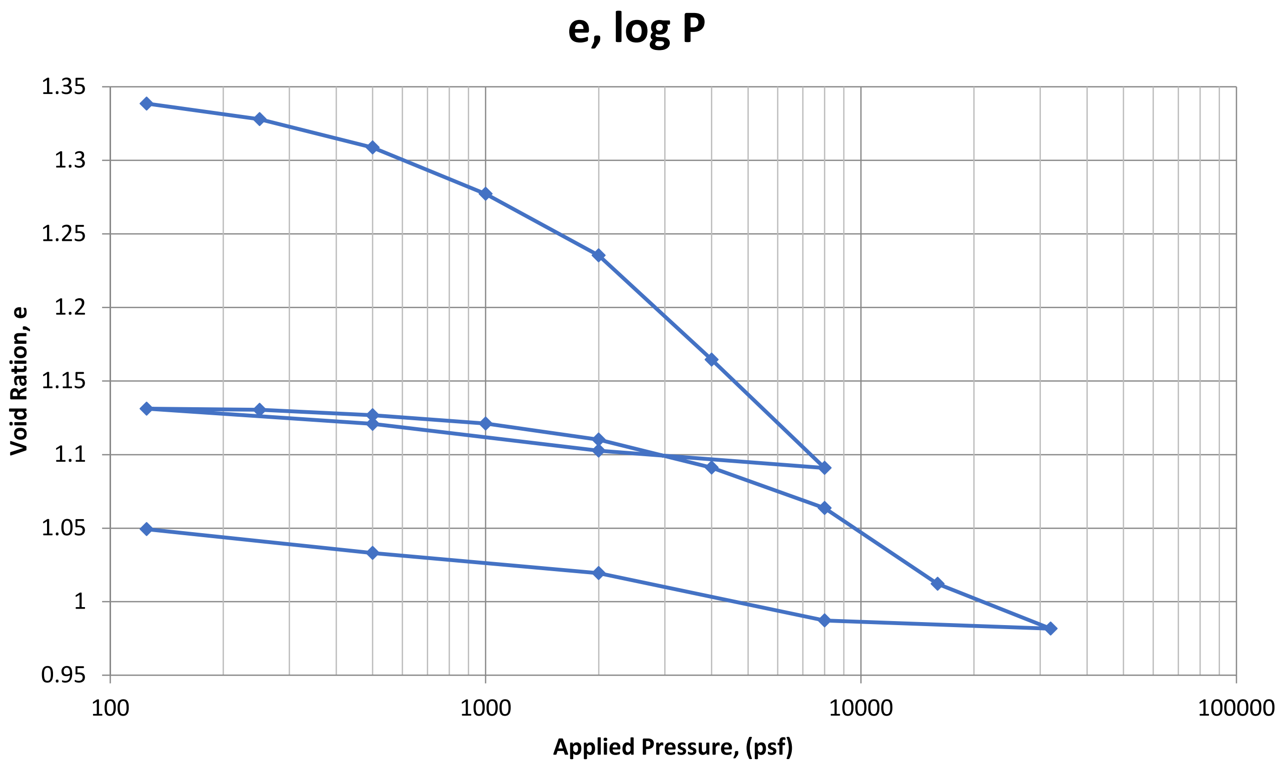
C_v @ T_{50}
2.136 ft.^{2}/day

C_α = 0.002

Figure

HILLIS-CARNES ENGINEERING ASSOCIATES, INC.

Consolidation Test Report



Material Description	USCS	AASHTO
Silty SAND	SM	0

LL	29
PI	NP
Sg	2.83

	Init	Final
Dry Density (pcf)	77.1	86.1
Moisture	0.401	0.371
Saturation	0.879	1.00
Void Ratio	1.289	1.049

Pc (psf)	Cc
1525	0.26

Preparation:

Shelby tube extraction

Proj. No. P20051
Project: Market Street
Sample: RWB05
Depth: 15-17'

Client: HCEA

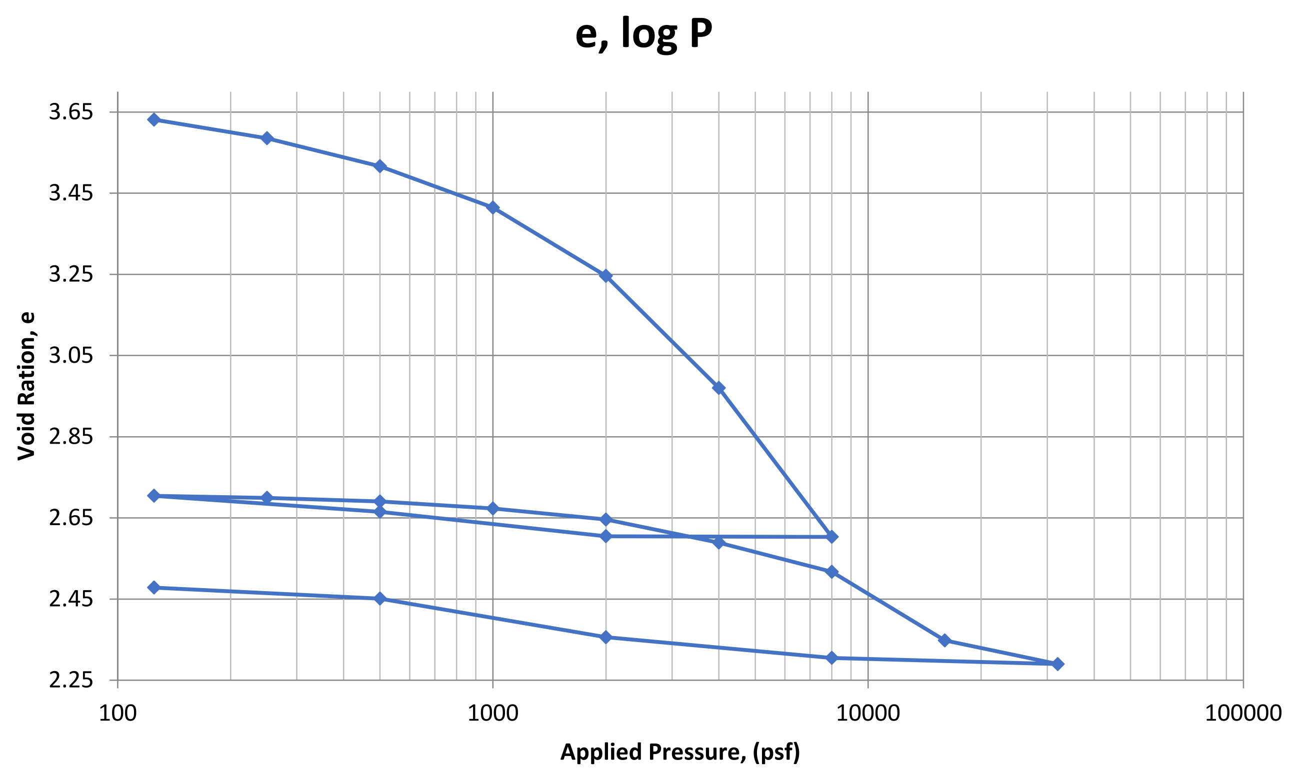
Hillis-Carnes Engineering Associates

Media, Pennsylvania

Coefficient of Consolidation per Load increment

	Load (tsf)	Load (psf)	Cv (in^2/min)	Cv (ft^2/day)
Initial Load	0.0625	125	0.1226	1.226
	0.125	250	0.0387	0.3874
	0.25	500	0.0871	0.8713
	0.5	1000	0.0746	0.7462
	1	2000	0.0702	0.7016
	2	4000	0.0582	0.5816
	4	8000	0.0423	0.4226
Reload	0.125	250	0.0551	0.5515
	0.25	500	0.0404	0.4040
	0.5	1000	0.0510	0.5096
	1	2000	0.0693	0.6928
	2	4000	0.0713	0.7127
	4	8000	0.0402	0.4017
	8	16000	0.0613	0.6131
	16	32000	0.0679	0.6795

Consolidation Test Report



Material Description	USCS	AASHTO
SILT	ML	0

LL	46
PI	14
Sg	3.89

	Init	Final
Dry Density (pcf)	52.4	69.7
Moisture	0.644	0.638
Saturation	0.691	1.00
Void Ratio	3.626	2.479

Pc (psf)	Cc
1800	1.22

Preparation:

Shelby tube extraction

Proj. No. P20051
Project: Market Street
Sample: RWB06
Depth: 9-11'

Client: HCEA

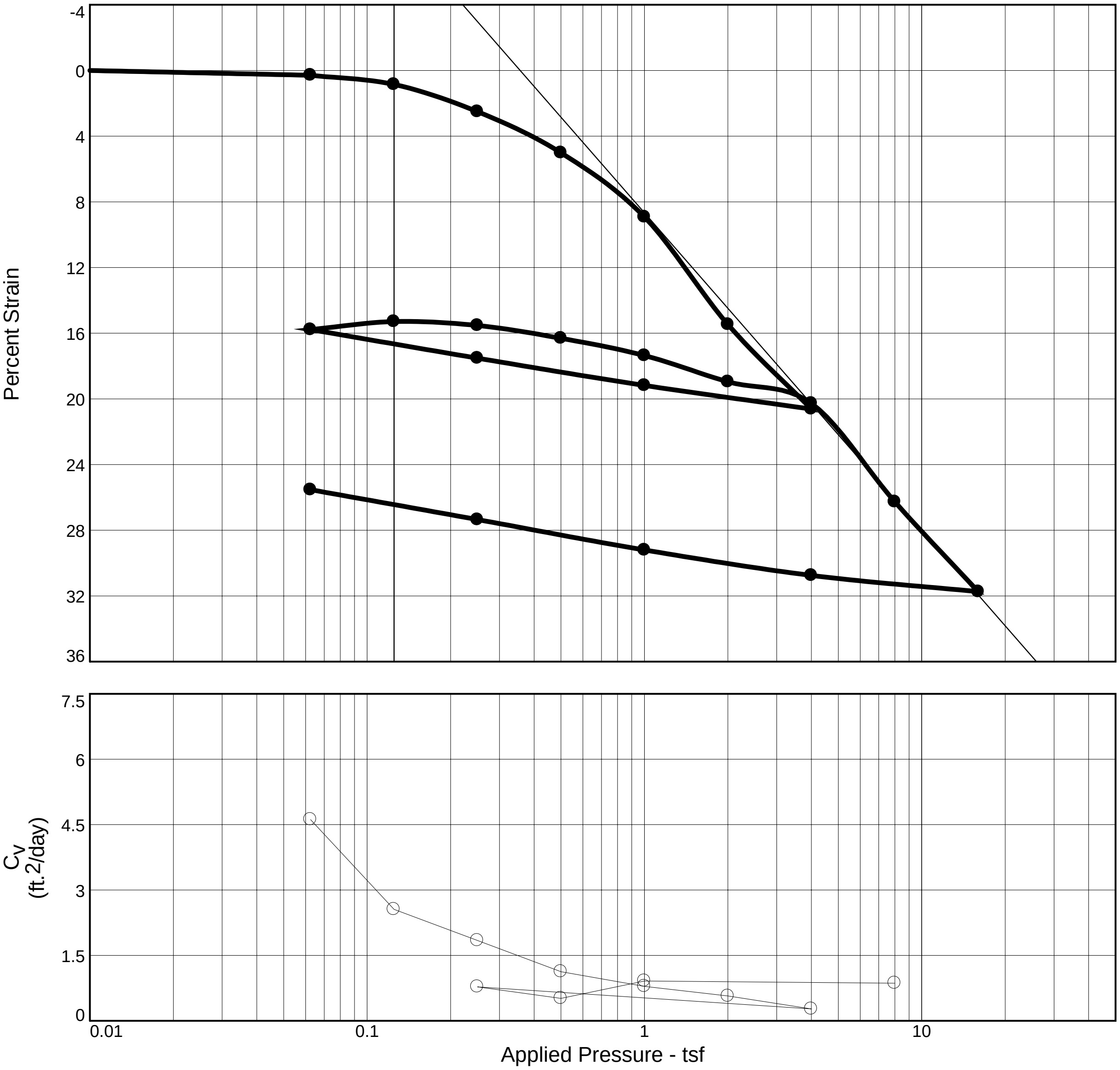
Hillis-Carnes Engineering Associates

Media, Pennsylvania

Coefficient of Consolidation per Load increment

	Load (tsf)	Load (psf)	Cv (in^2/min)	Cv (ft^2/day)
Initial Load	0.0625	125	0.0163	0.163
	0.125	250	0.0099	0.0989
	0.25	500	0.0121	0.1212
	0.5	1000	0.0116	0.1164
	1	2000	0.0102	0.1017
	2	4000	0.0073	0.0731
	4	8000	0.0054	0.0545
Reload	0.125	250	0.0160	0.1596
	0.25	500	0.0114	0.1145
	0.5	1000	0.0108	0.1078
	1	2000	0.0109	0.1092
	2	4000	0.0113	0.1133
	4	8000	0.0075	0.0750
	8	16000	0.0100	0.1001
	16	32000	0.0169	0.1688

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
89.4 %	52.5 %	64.8	47	19	2.65		0.4	0.49	0.07	1.555

MATERIAL DESCRIPTION	USCS	AASHTO
Silt w/sand	ML	A-7-6(16)

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

Source of Sample: RW-B-10 **Depth:** 24 **Sample Number:** T-2

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

Remarks:

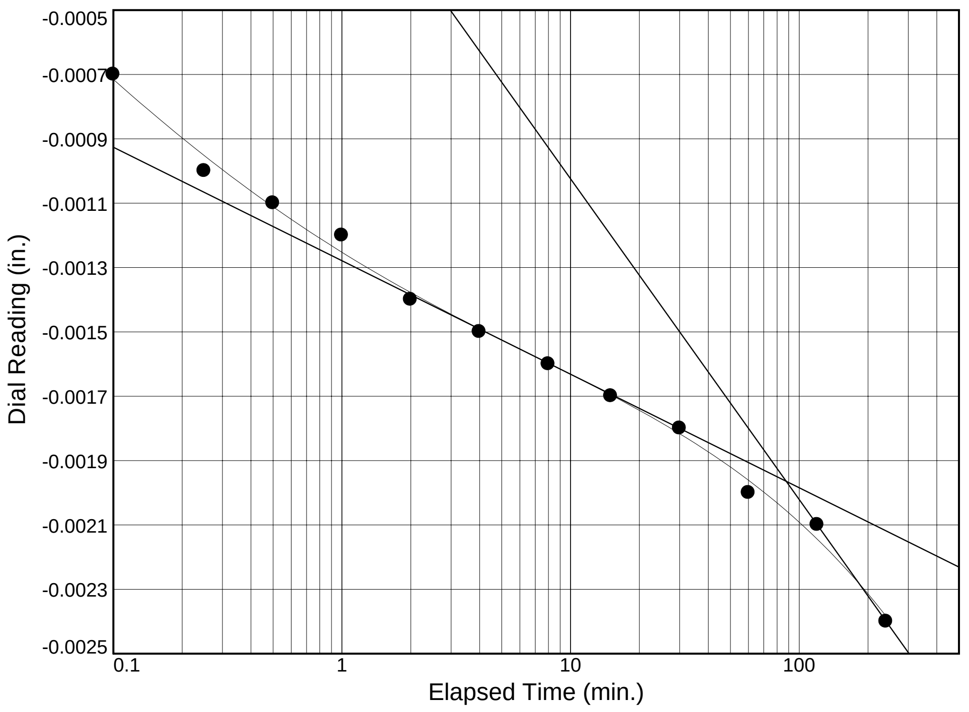
Figure

Tested By: cs

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RW-B-10 Depth: 24 Sample Number: T-2



Load No.= 1

Load= 0.06 tsf

D_0 = 0.0005

D_{50} = -0.0007

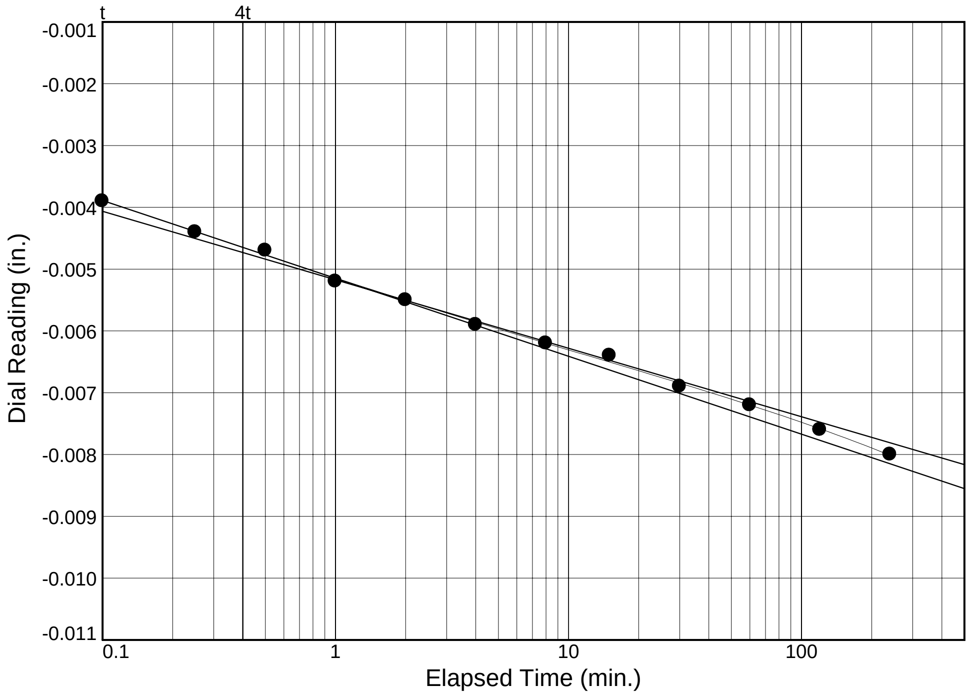
D_{100} = -0.0020

T_{50} = 0.11 min.

C_v @ T_{50}

4.616 ft.^{2}/day

C_α = 0.003



Load No.= 2

Load= 0.13 tsf

D_0 = -0.0031

D_{50} = -0.0042

D_{100} = -0.0053

T_{50} = 0.19 min.

C_v @ T_{50}

2.558 ft.^{2}/day

C_α = 0.003

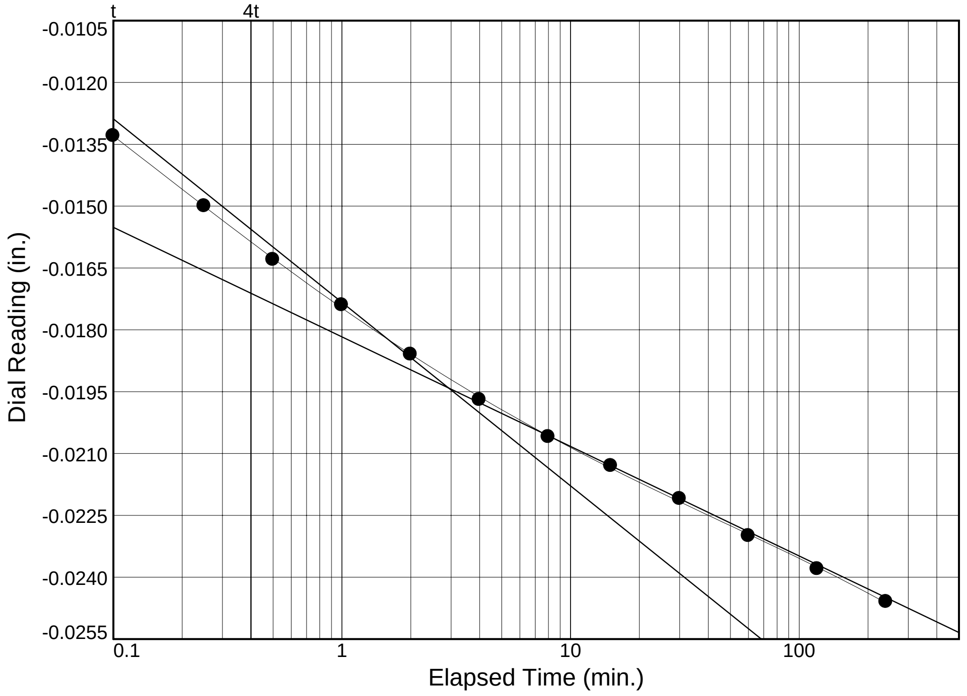
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

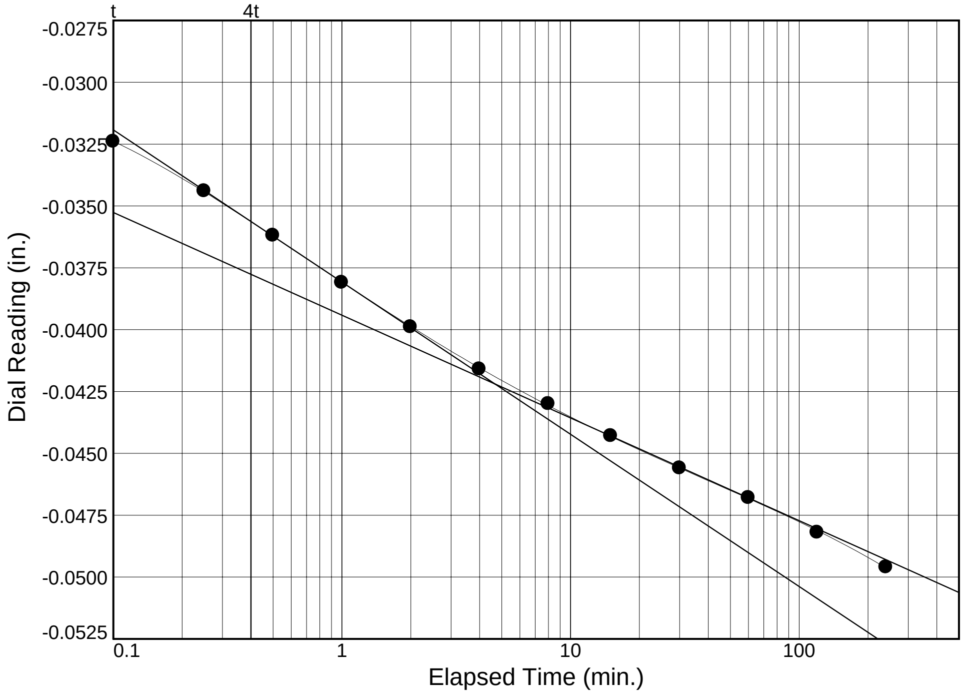
Source of Sample: RW-B-10 Depth: 24 Sample Number: T-2



Load No.= 3
Load= 0.25 tsf
D_0 = -0.0107
D_{50} = -0.0151
D_{100} = -0.0194
T_{50} = 0.26 min.

C_v @ T_{50}
1.842 ft.^{2}/day

C_α = 0.007



Load No.= 4
Load= 0.50 tsf
D_0 = -0.0291
D_{50} = -0.0357
D_{100} = -0.0422
T_{50} = 0.40 min.

C_v @ T_{50}
1.128 ft.^{2}/day

C_α = 0.011

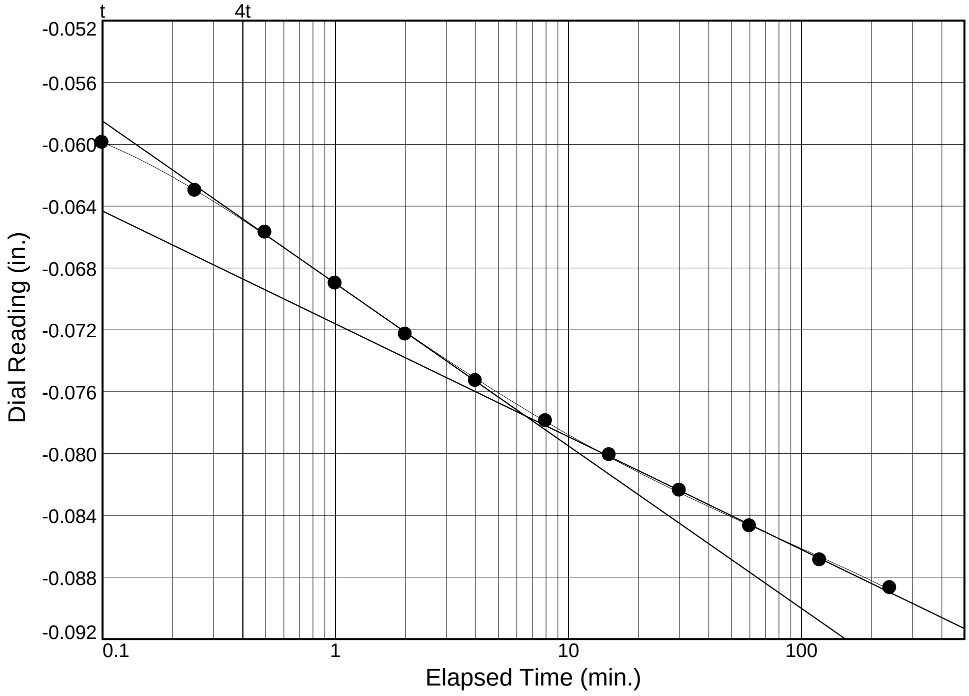
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

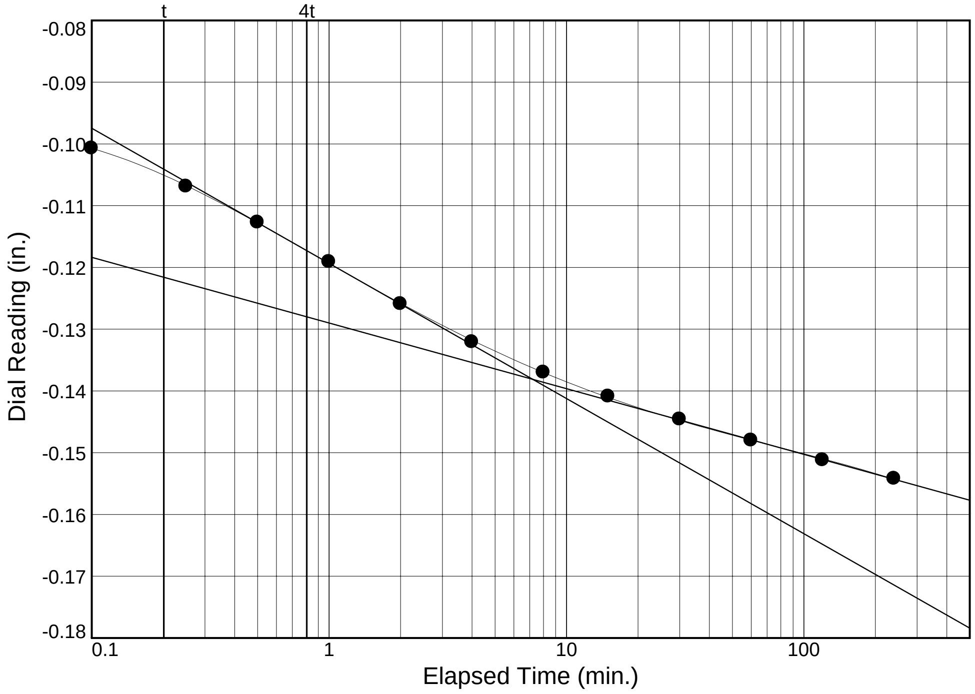
Source of Sample: RW-B-10 Depth: 24 Sample Number: T-2



Load No.= 5
Load= 1.00 tsf
D_0 = -0.0549
D_{50} = -0.0662
D_{100} = -0.0776
T_{50} = 0.54 min.

C_v @ T_{50}
0.791 ft.^{2}/day

C_α = 0.019



Load No.= 6
Load= 2.00 tsf
D_0 = -0.0928
D_{50} = -0.1155
D_{100} = -0.1381
T_{50} = 0.67 min.

C_v @ T_{50}
0.570 ft.^{2}/day

C_α = 0.027

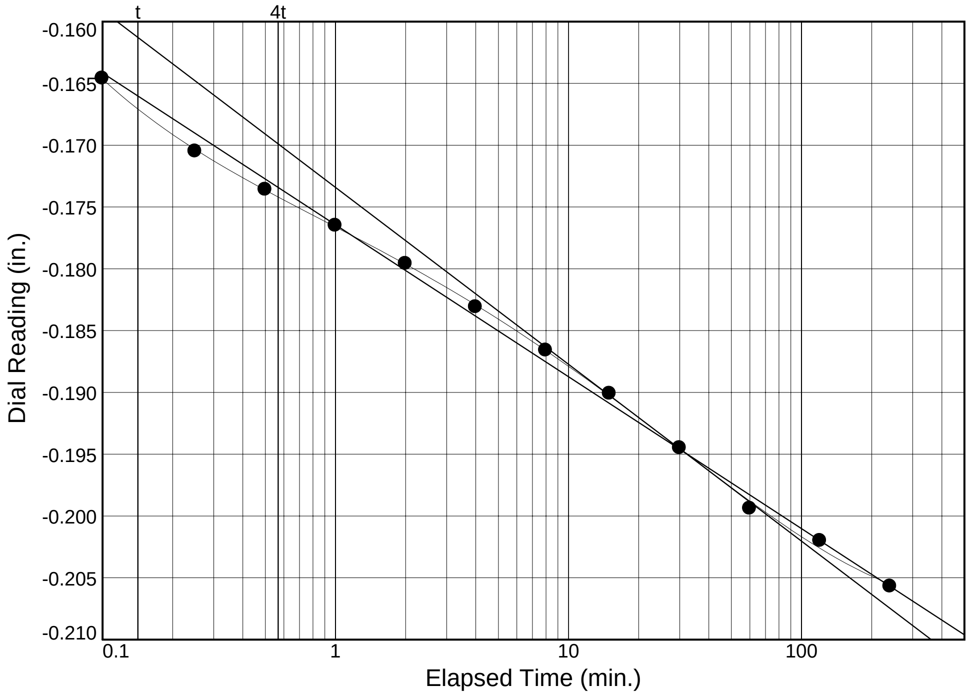
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RW-B-10 Depth: 24 Sample Number: T-2



Load No.= 7

Load= 4.00 tsf

D_0 = -0.1600

D_{50} = -0.1774

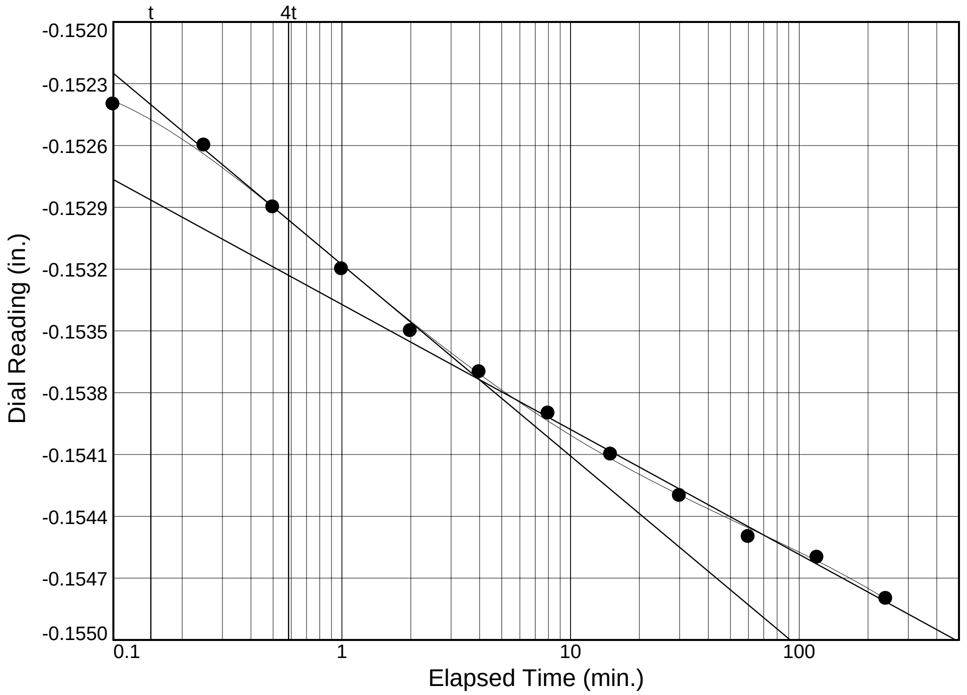
D_{100} = -0.1949

T_{50} = 1.21 min.

C_v @ T_{50}

0.273 ft.^{2}/day

C_α = 0.031



Load No.= 12

Load= 0.25 tsf

D_0 = -0.1520

D_{50} = -0.1529

D_{100} = -0.1537

T_{50} = 0.45 min.

C_v @ T_{50}

0.779 ft.^{2}/day

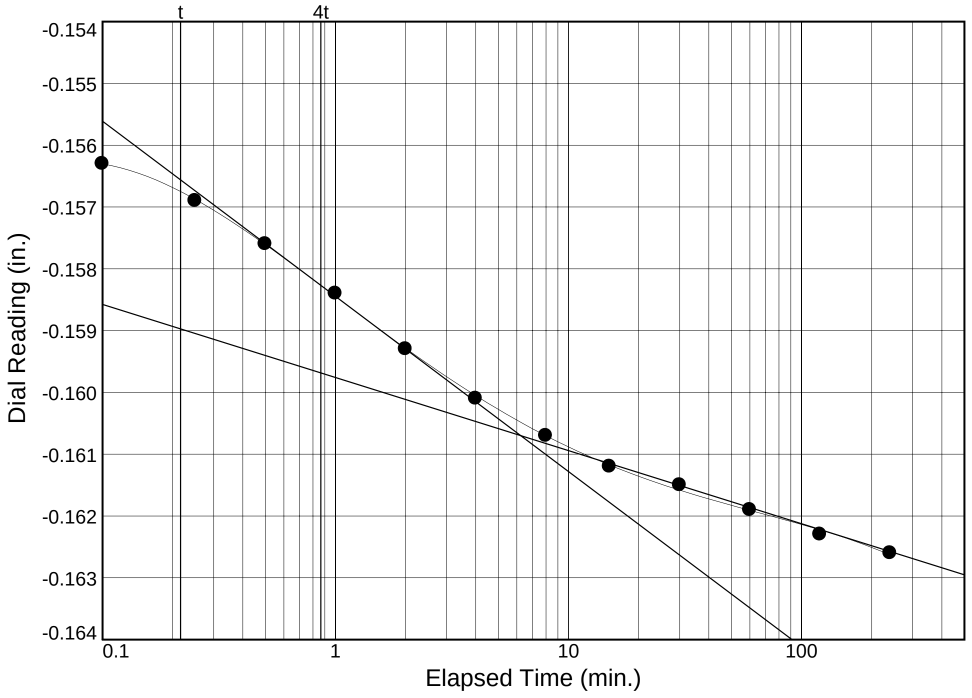
C_α = 0.002

Figure

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RW-B-10 Depth: 24 Sample Number: T-2



Load No.= 13

Load= 0.50 tsf

D_0 = -0.1552

D_{50} = -0.1580

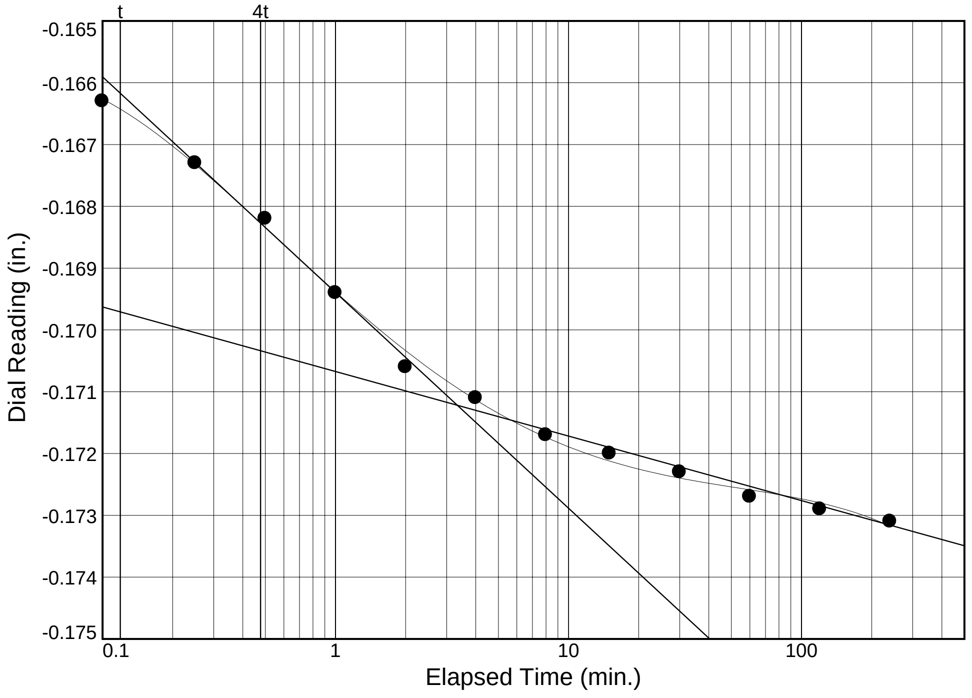
D_{100} = -0.1607

T_{50} = 0.67 min.

C_v @ T_{50}

0.516 ft.^{2}/day

C_α = 0.003



Load No.= 14

Load= 1.00 tsf

D_0 = -0.1646

D_{50} = -0.1679

D_{100} = -0.1712

T_{50} = 0.37 min.

C_v @ T_{50}

0.915 ft.^{2}/day

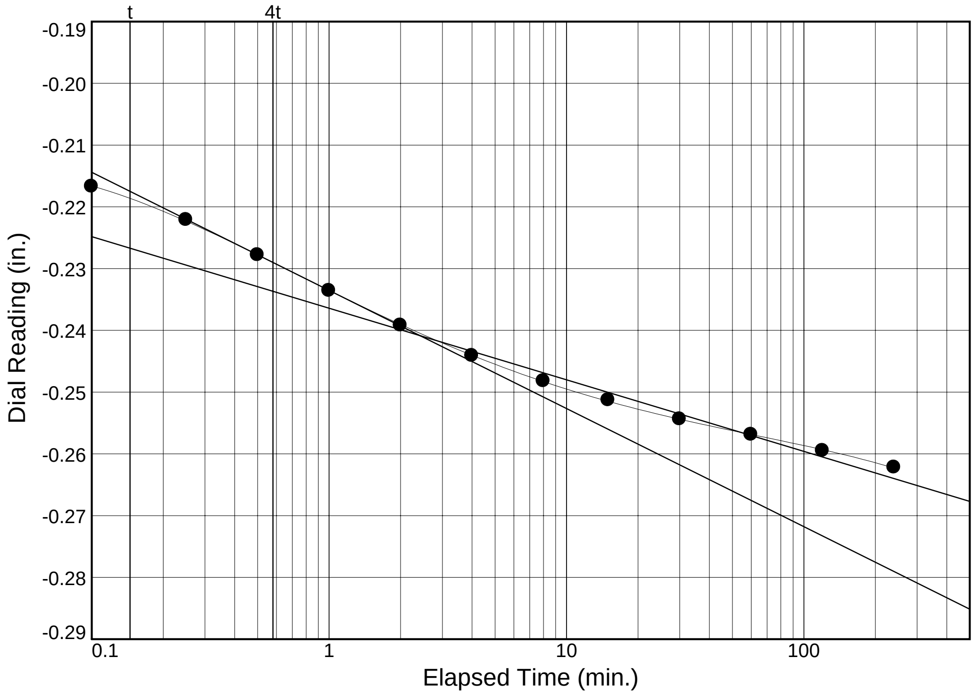
C_α = 0.003

Figure

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RW-B-10 Depth: 24 Sample Number: T-2



Load No.= 17

Load= 8.00 tsf

D_0 = -0.2082

D_{50} = -0.2246

D_{100} = -0.2409

T_{50} = 0.33 min.

C_v @ T_{50}

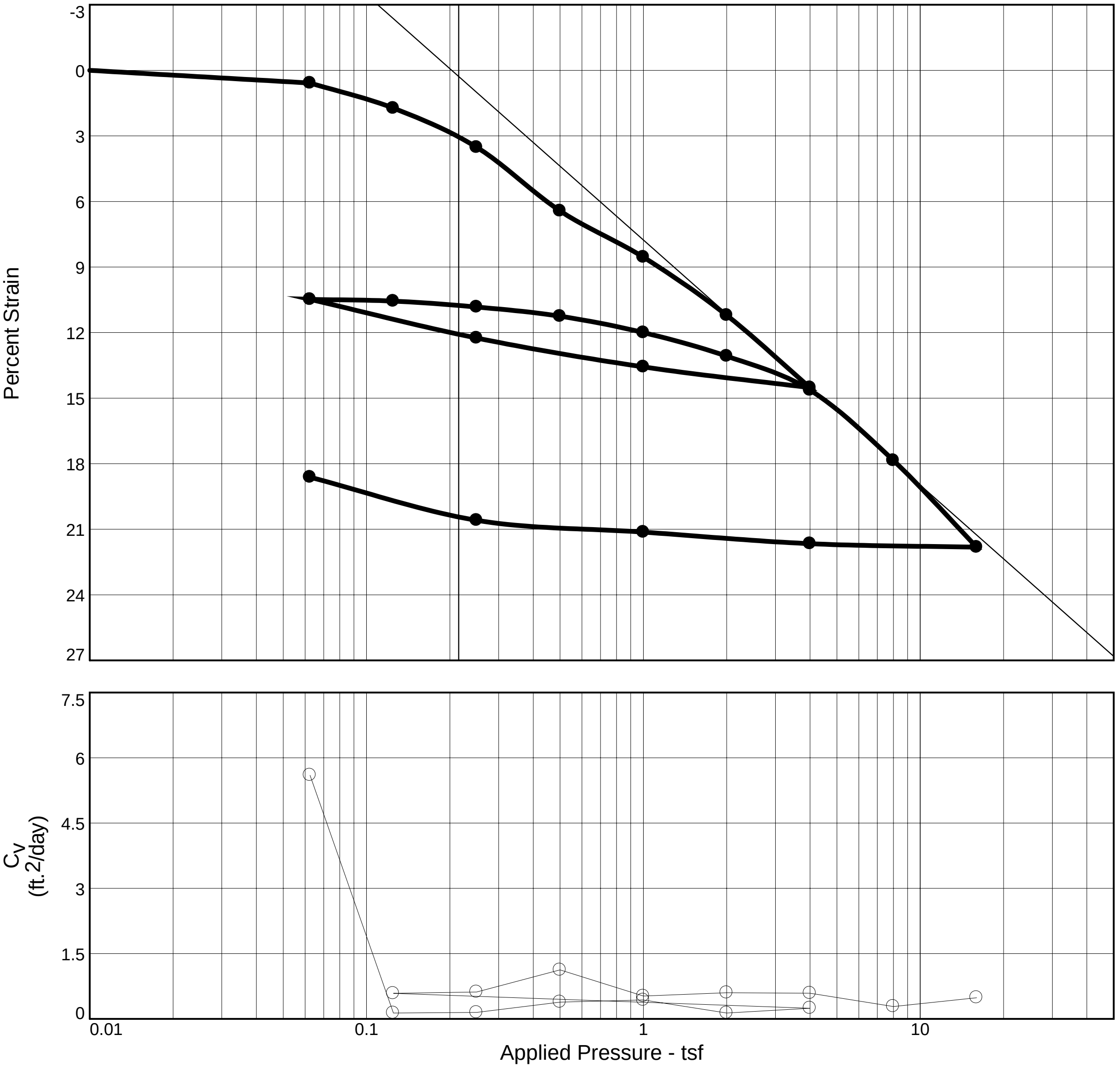
0.864 ft.^{2}/day

C_α = 0.030

Figure

Hillis-Carnes Engineering Associates

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
249.9 %	54.7 %	104.7	66	40	2.65		0.5	0.18	0.03	0.580

MATERIAL DESCRIPTION	USCS	AASHTO
Fat Clay	CH	A-7-6(39)

Project No. P20051 **Client:** HCEA SCG/RK&K

Project: South Market Street Lab Testing

Source of Sample: RW-B-12 **Depth:** 17.5-19.5 **Sample Number:** T-2

Remarks:

HILLIS-CARNES ENGINEERING ASSOCIATES

Philadelphia, Pennsylvania

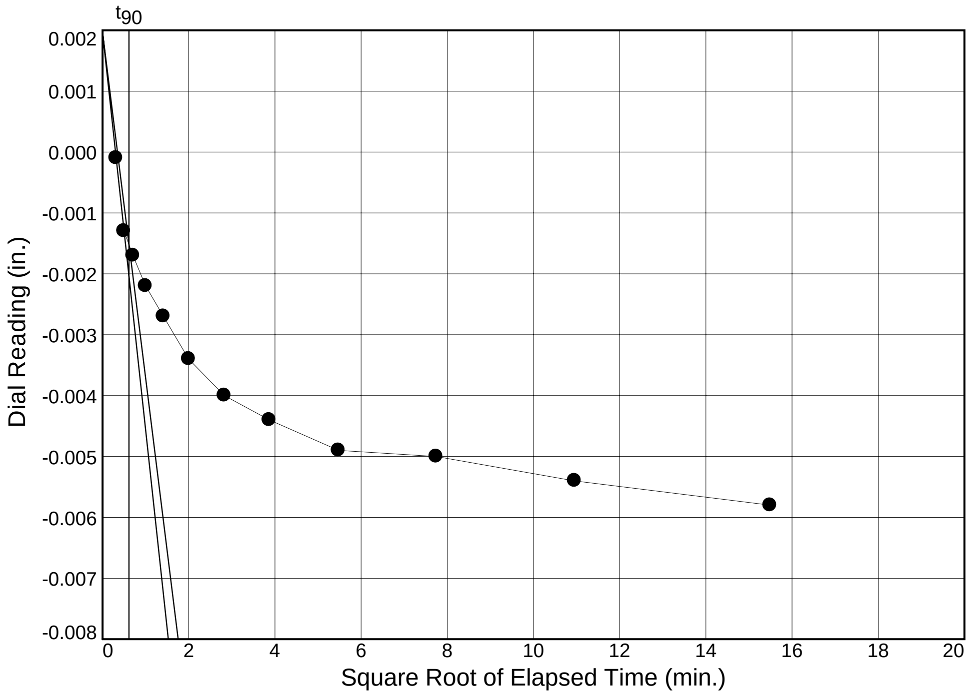
Figure

Tested By: cs11

Dial Reading vs. Time

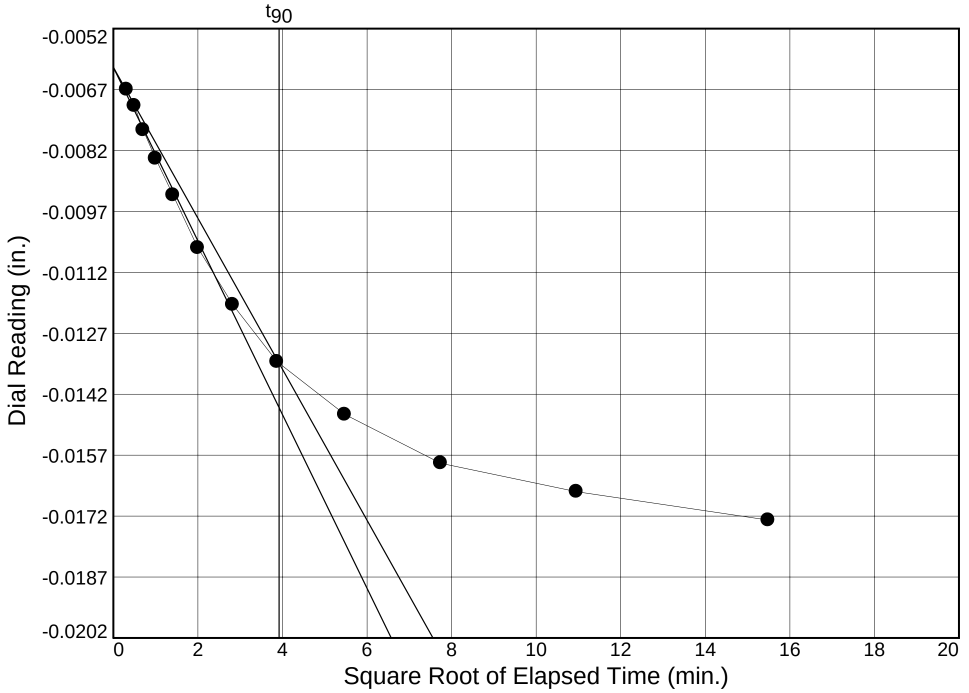
Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RW-B-12 Depth: 17.5-19.5 Sample Number: T-2



Load No.= 1
Load= 0.06 tsf
D_0 = 0.0020
D_{90} = -0.0015
D_{100} = -0.0019
T_{90} = 0.38 min.

C_v @ T_{90}
5.599 $ft.^2$/day



Load No.= 2
Load= 0.13 tsf
D_0 = -0.0062
D_{90} = -0.0134
D_{100} = -0.0142
T_{90} = 15.37 min.

C_v @ T_{90}
0.135 $ft.^2$/day

Figure

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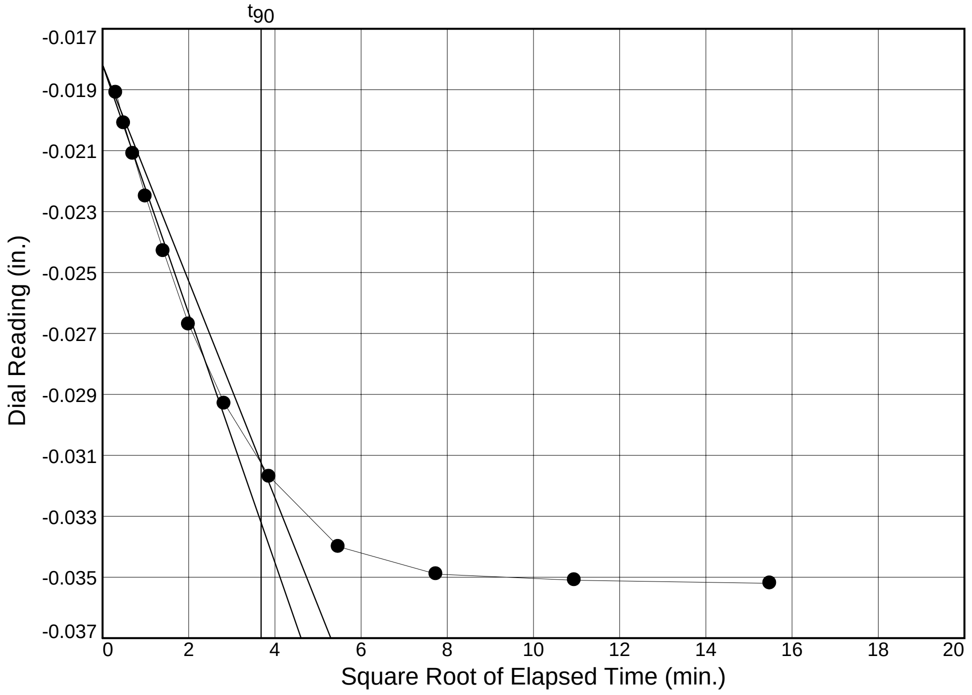
Dial Reading vs. Time

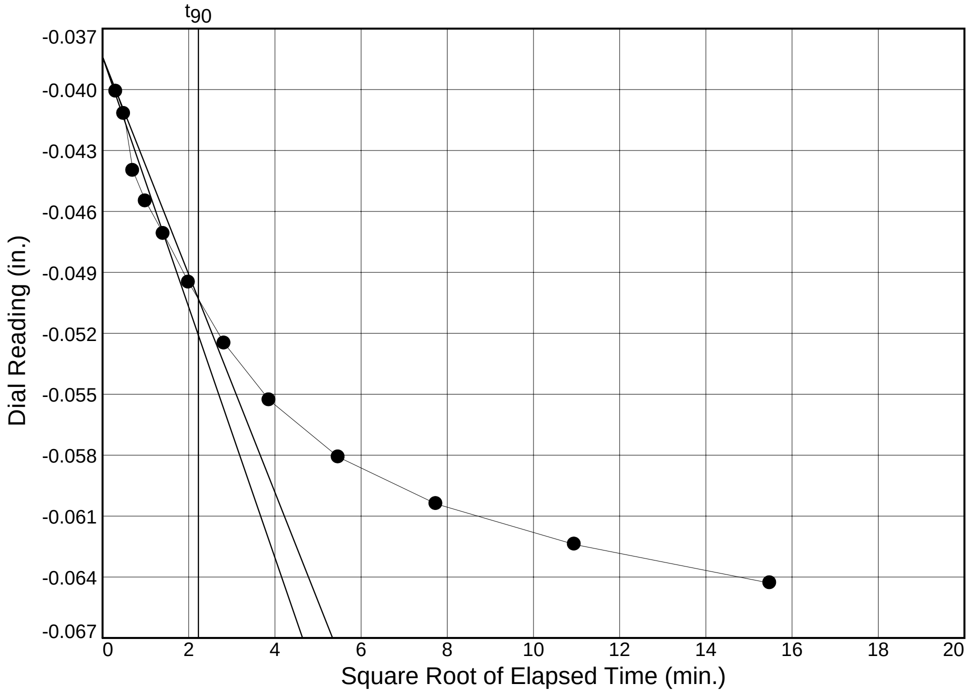
Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RW-B-12 Depth: 17.5-19.5 Sample Number: T-2



Load No.= 3
Load= 0.25 tsf
D_0 = -0.0182
D_{90} = -0.0313
D_{100} = -0.0327
T_{90} = 13.55 min.

C_v @ T_{90}
0.148 ft.^{2}/day



Load No.= 4
Load= 0.50 tsf
D_0 = -0.0384
D_{90} = -0.0503
D_{100} = -0.0516
T_{90} = 4.95 min.

C_v @ T_{90}
0.387 ft.^{2}/day

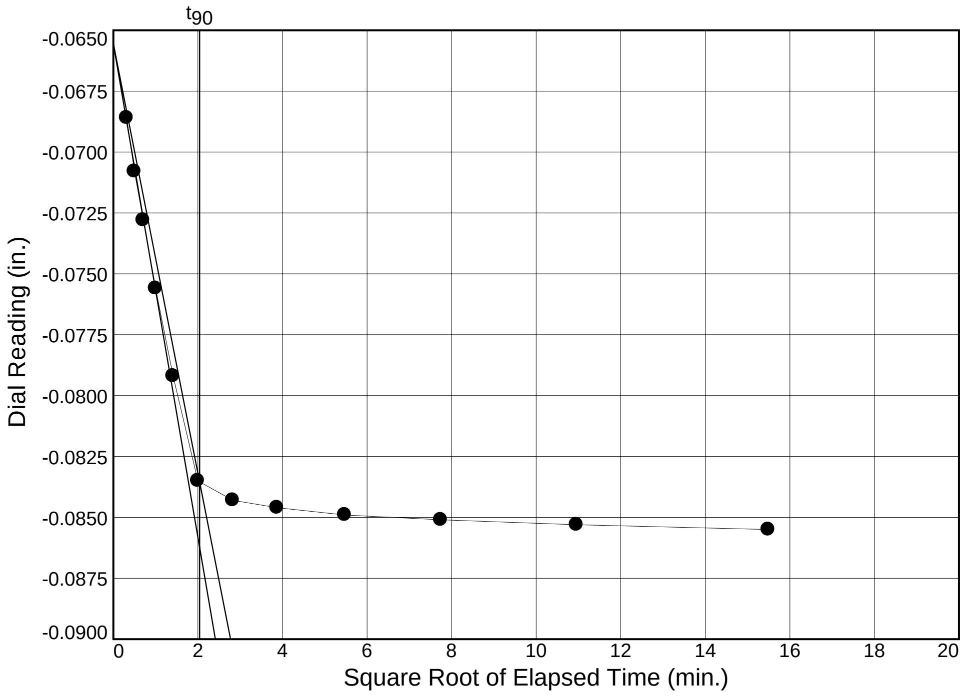
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RW-B-12 Depth: 17.5-19.5 Sample Number: T-2



Load No.= 5

Load= 1.00 tsf

D_0 = -0.0656

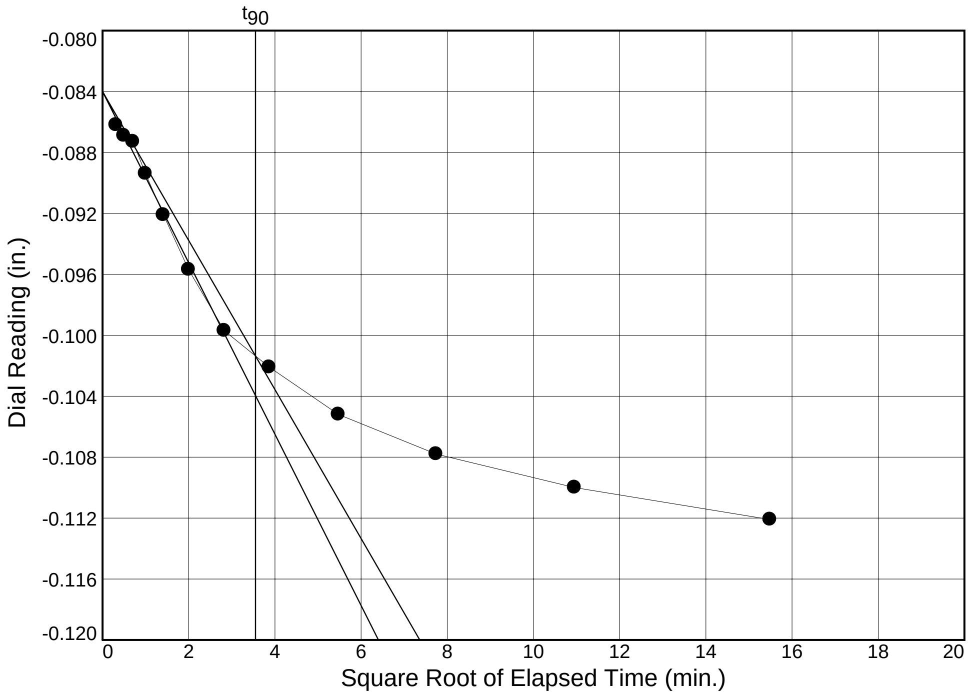
D_{90} = -0.0835

D_{100} = -0.0855

T_{90} = 4.16 min.

C_v @ T_{90}

0.436 ft.^{2}/day



Load No.= 6

Load= 2.00 tsf

D_0 = -0.0840

D_{90} = -0.1014

D_{100} = -0.1033

T_{90} = 12.59 min.

C_v @ T_{90}

0.137 ft.^{2}/day

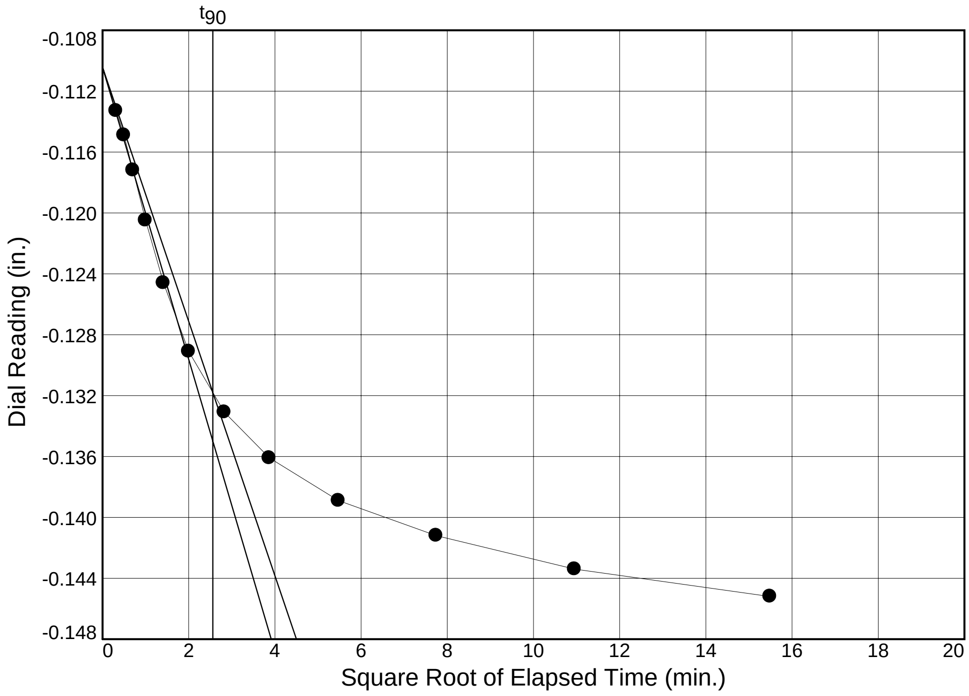
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

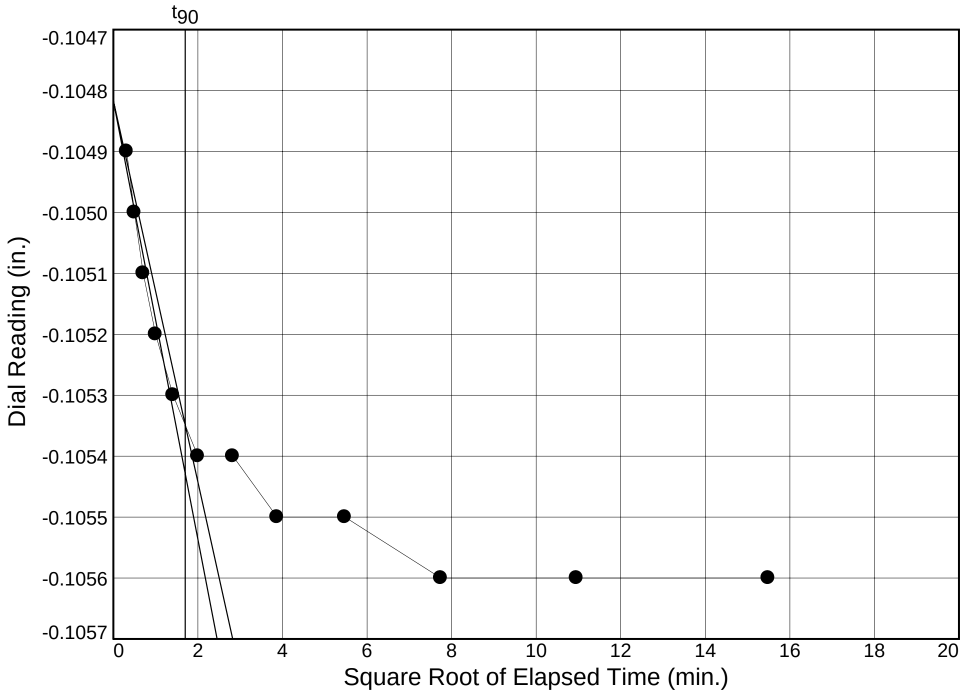
Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RW-B-12 Depth: 17.5-19.5 Sample Number: T-2



Load No.= 7
Load= 4.00 tsf
D_0 = -0.1104
D_{90} = -0.1318
D_{100} = -0.1342
T_{90} = 6.55 min.

C_v @ T_{90}
0.246 ft.^{2}/day



Load No.= 11
Load= 0.13 tsf
D_0 = -0.1048
D_{90} = -0.1053
D_{100} = -0.1054
T_{90} = 2.89 min.

C_v @ T_{90}
0.587 ft.^{2}/day

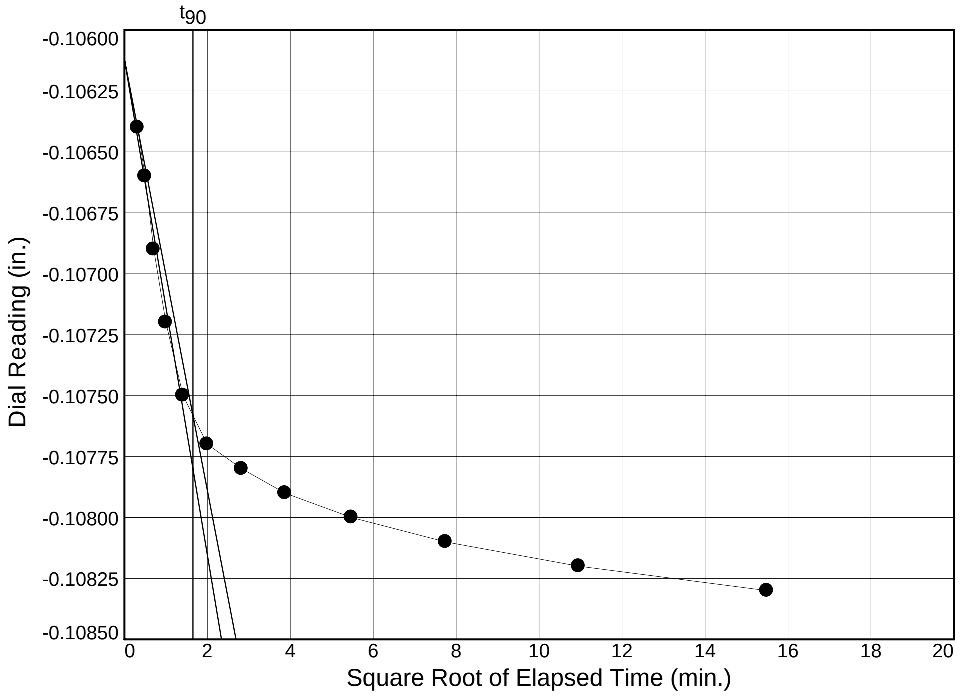
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

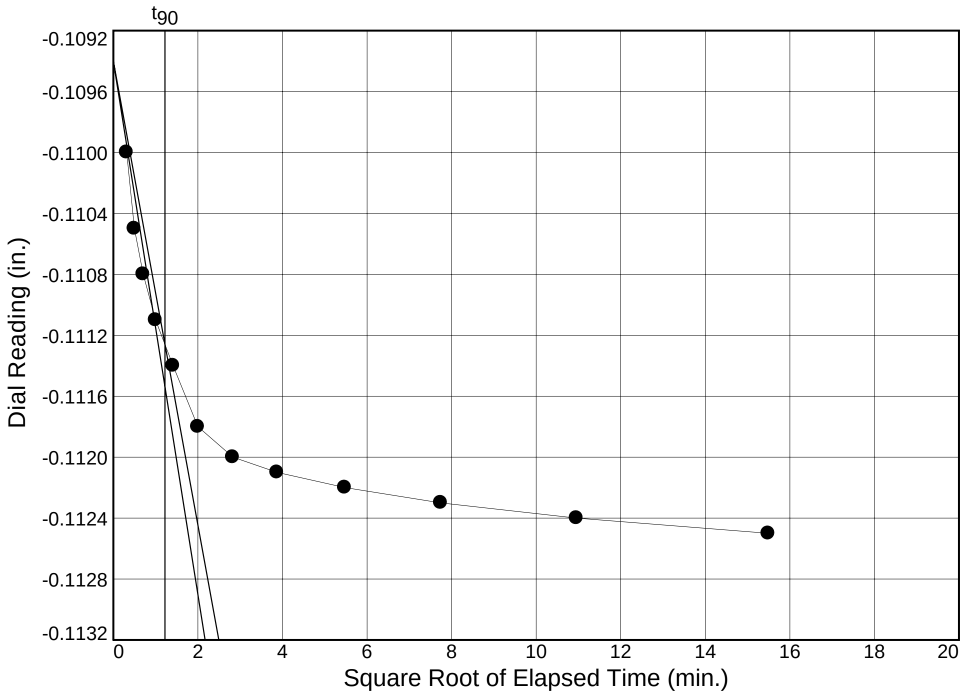
Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RW-B-12 Depth: 17.5-19.5 Sample Number: T-2



Load No.= 12
Load= 0.25 tsf
D_0 = -0.1061
D_{90} = -0.1076
D_{100} = -0.1077
T_{90} = 2.73 min.

C_v @ T_{90}
0.618 ft.^{2}/day



Load No.= 13
Load= 0.50 tsf
D_0 = -0.1094
D_{90} = -0.1113
D_{100} = -0.1115
T_{90} = 1.49 min.

C_v @ T_{90}
1.127 ft.^{2}/day

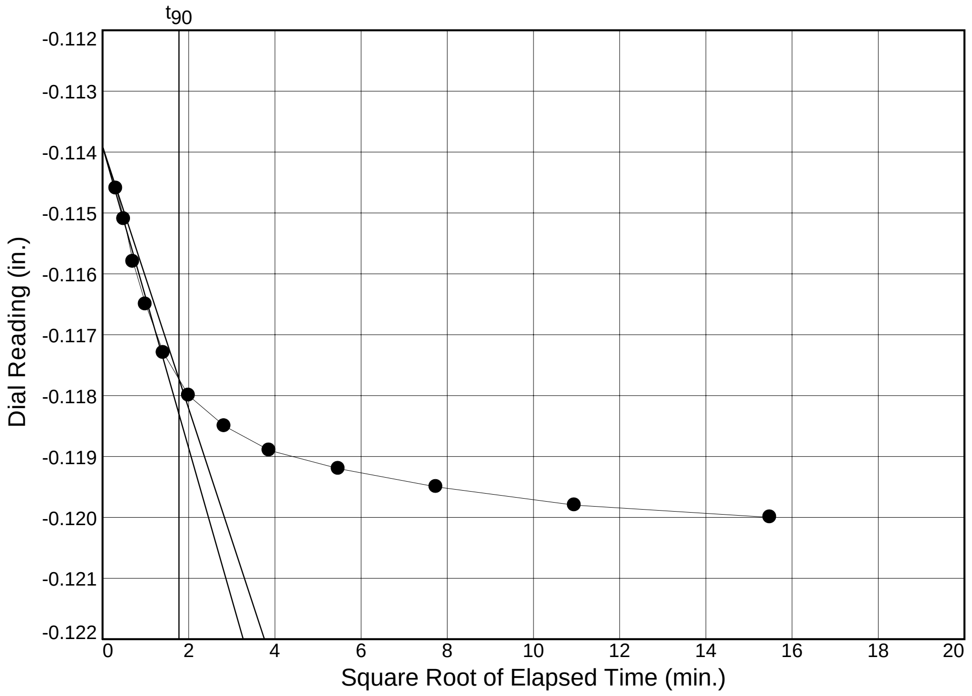
Figure

Hillis-Carnes Engineering Associates

Dial Reading vs. Time

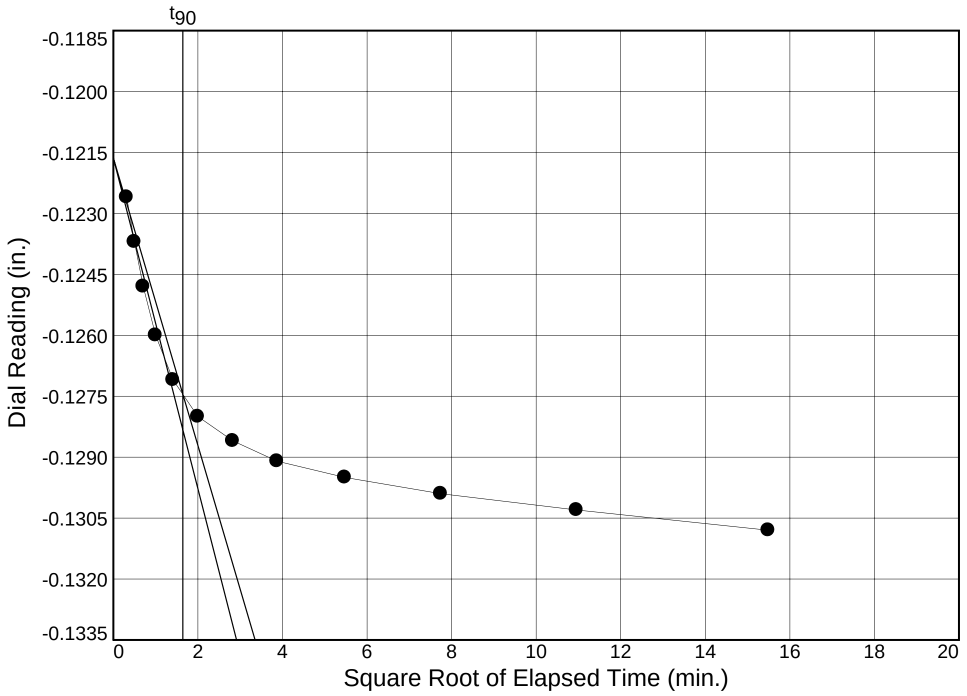
Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RW-B-12 Depth: 17.5-19.5 Sample Number: T-2



Load No.= 14
Load= 1.00 tsf
D_0 = -0.1139
D_{90} = -0.1177
D_{100} = -0.1182
T_{90} = 3.15 min.

C_v @ T_{90}
0.526 ft.^{2}/day



Load No.= 15
Load= 2.00 tsf
D_0 = -0.1216
D_{90} = -0.1275
D_{100} = -0.1281
T_{90} = 2.70 min.

C_v @ T_{90}
0.601 ft.^{2}/day

Figure

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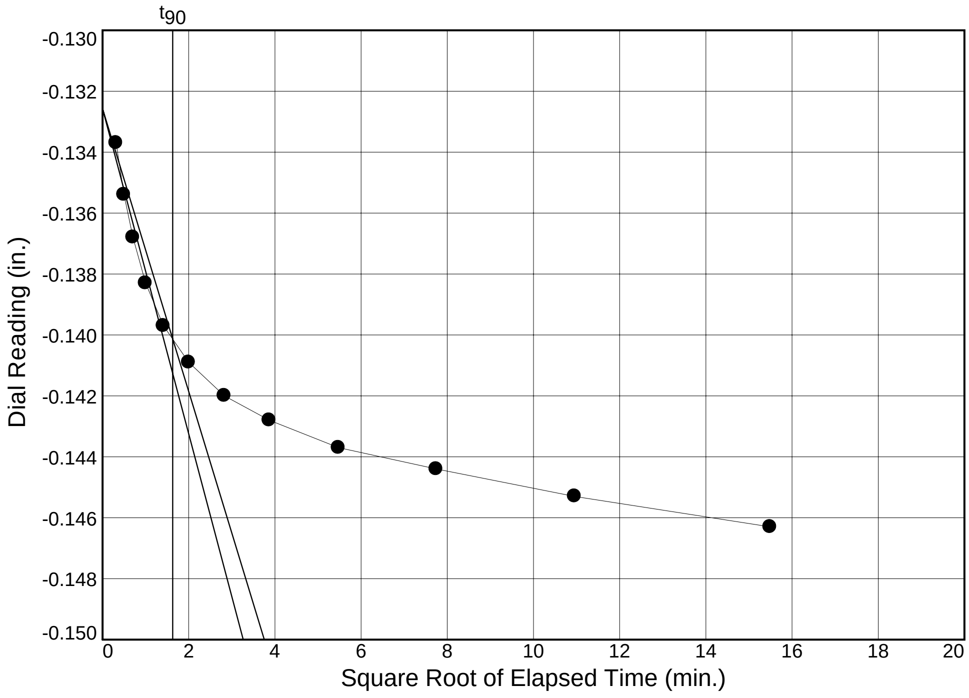
Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RW-B-12 Depth: 17.5-19.5 Sample Number: T-2



Load No.= 16

Load= 4.00 tsf

D_0 = -0.1326

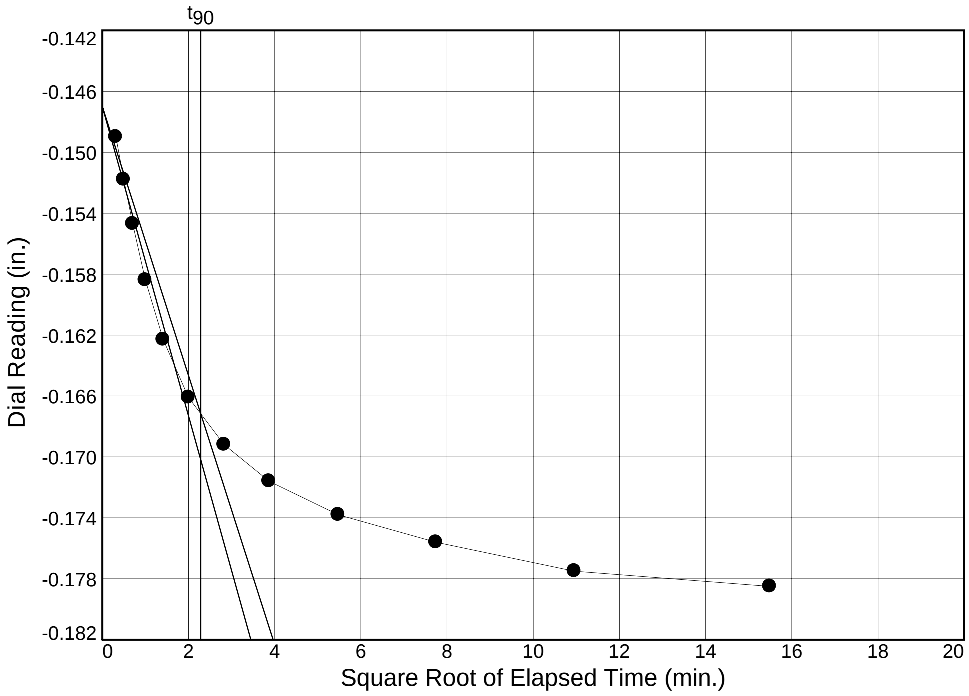
D_{90} = -0.1401

D_{100} = -0.1410

T_{90} = 2.66 min.

C_v @ T_{90}

0.591 ft.^{2}/day



Load No.= 17

Load= 8.00 tsf

D_0 = -0.1470

D_{90} = -0.1672

D_{100} = -0.1694

T_{90} = 5.21 min.

C_v @ T_{90}

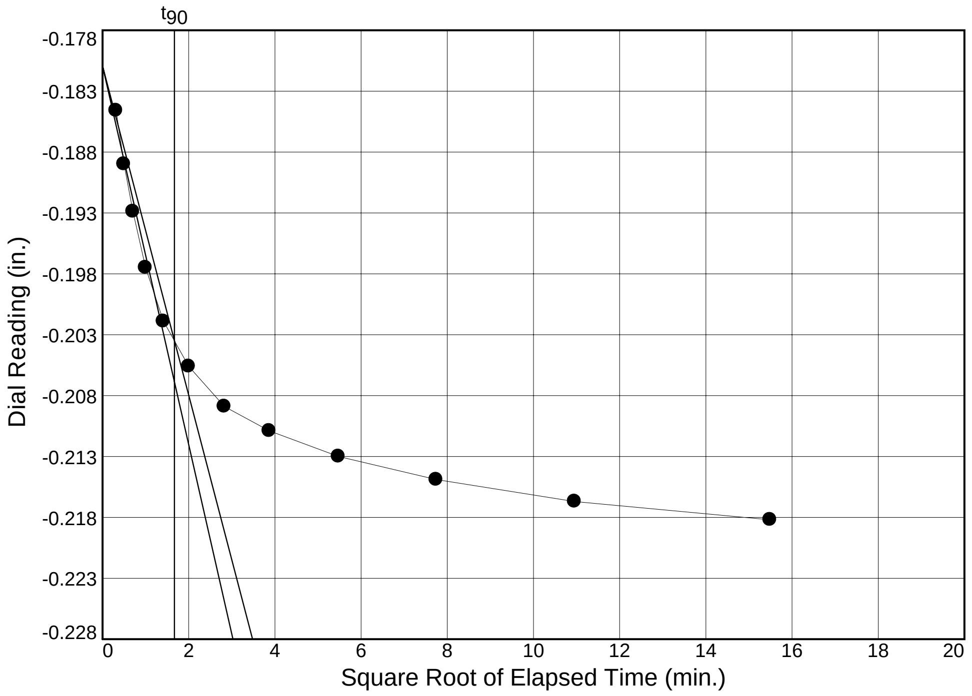
0.285 ft.^{2}/day

Figure

Dial Reading vs. Time

Project No.: P20051
Project: South Market Street Lab Testing

Source of Sample: RW-B-12 Depth: 17.5-19.5 Sample Number: T-2



Load No.= 18

Load= 16.00 tsf

D_0 = -0.1809

D_{90} = -0.2035

D_{100} = -0.2060

T_{90} = 2.79 min.

C_v @ T_{90}

0.488 ft.^{2}/day

Figure

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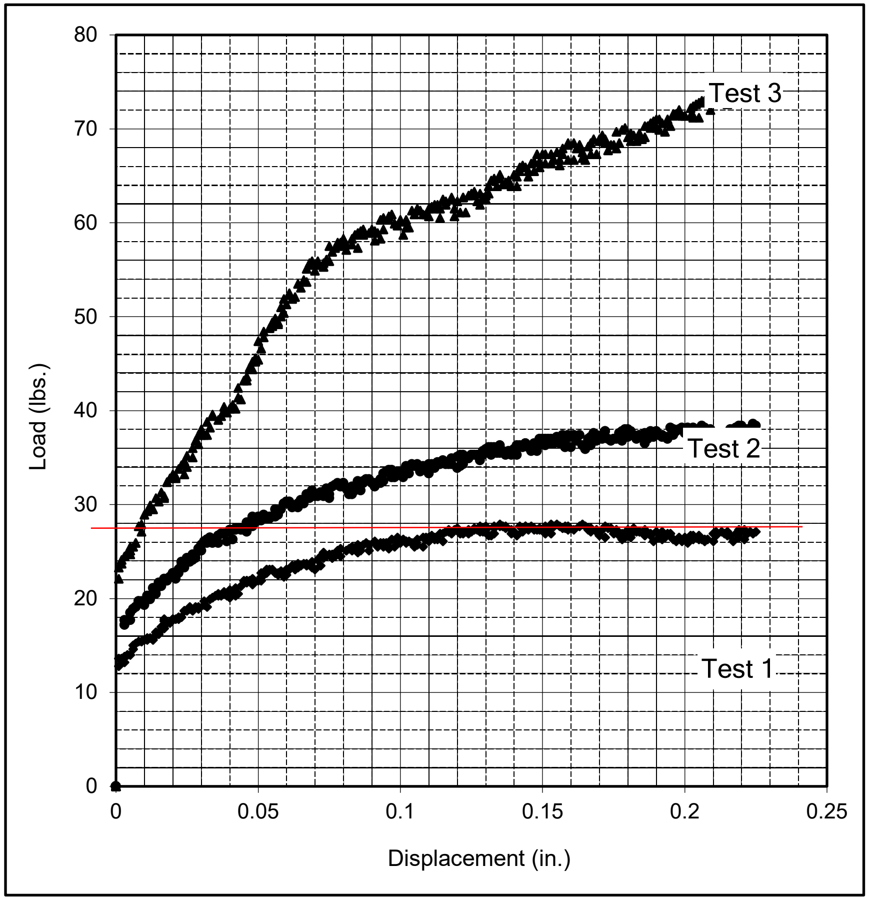
Direct Shear Test Results

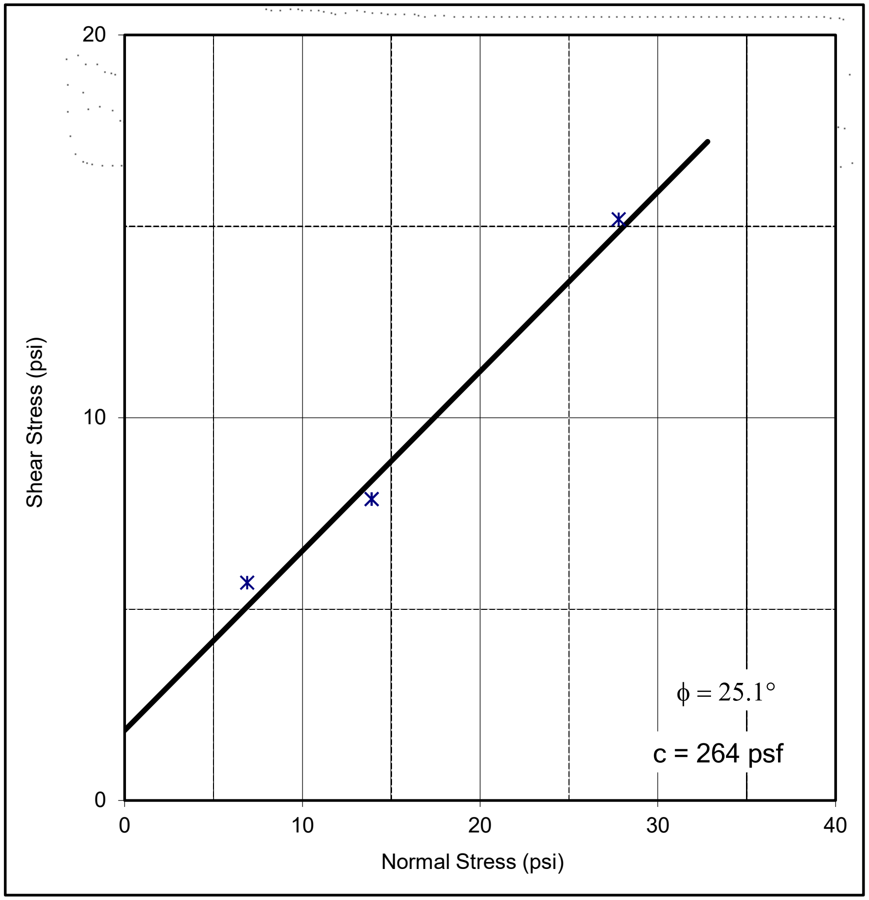
Hillis-Carnes Engineering Asssociates

Media, Pennsylvania

ASTM 3080 2.5"d x 1" DIRECT SHEAR TEST RESULTS

Project No.: P20051		**Project Name:** Market St			
Date: 2/1/2023		**Sample:** LOTA217AT1			
Sample Description: Fat Clay					
Test No.	**Normal Stress (psi)**	**Shear Strength (psi)**	**Friction**	**Symbol**	**Test Condition**
1	6.90	5.69	Peak	◆	As received
2	13.90	7.88	Peak	●	As received
3	27.80	15.18	Peak	▲	As received





Hillis-Carnes Engineering Asssociates

Media, Pennsylvania

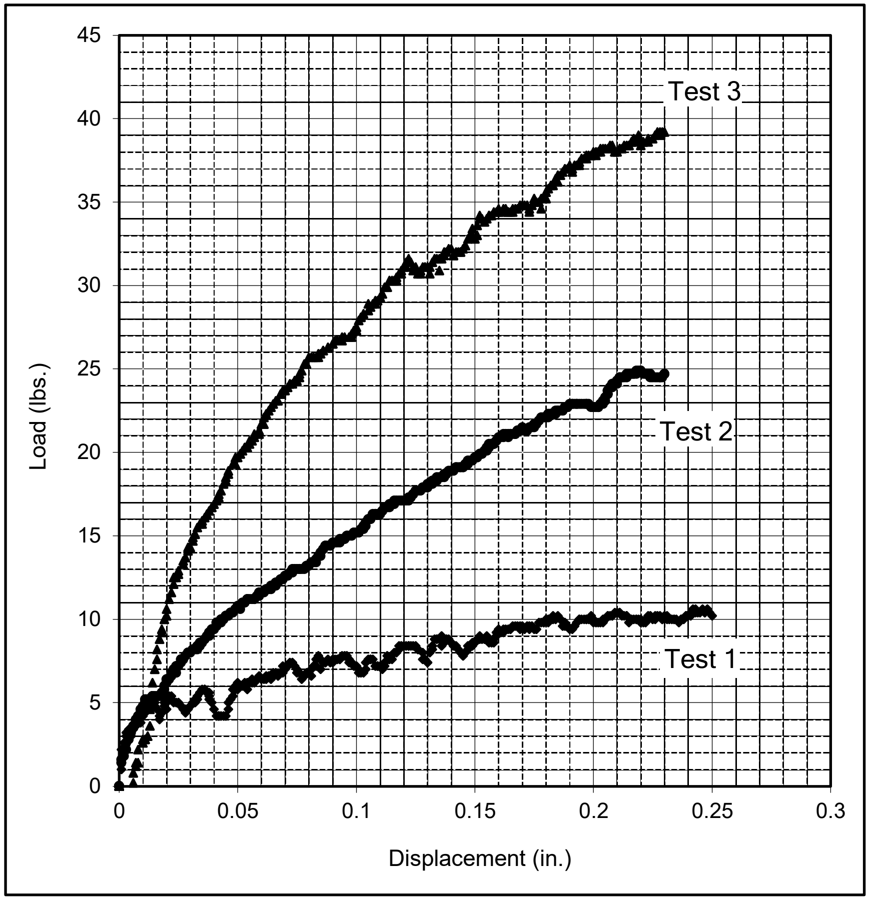
ASTM 3080 2.5"d x 1" DIRECT SHEAR TEST RESULTS

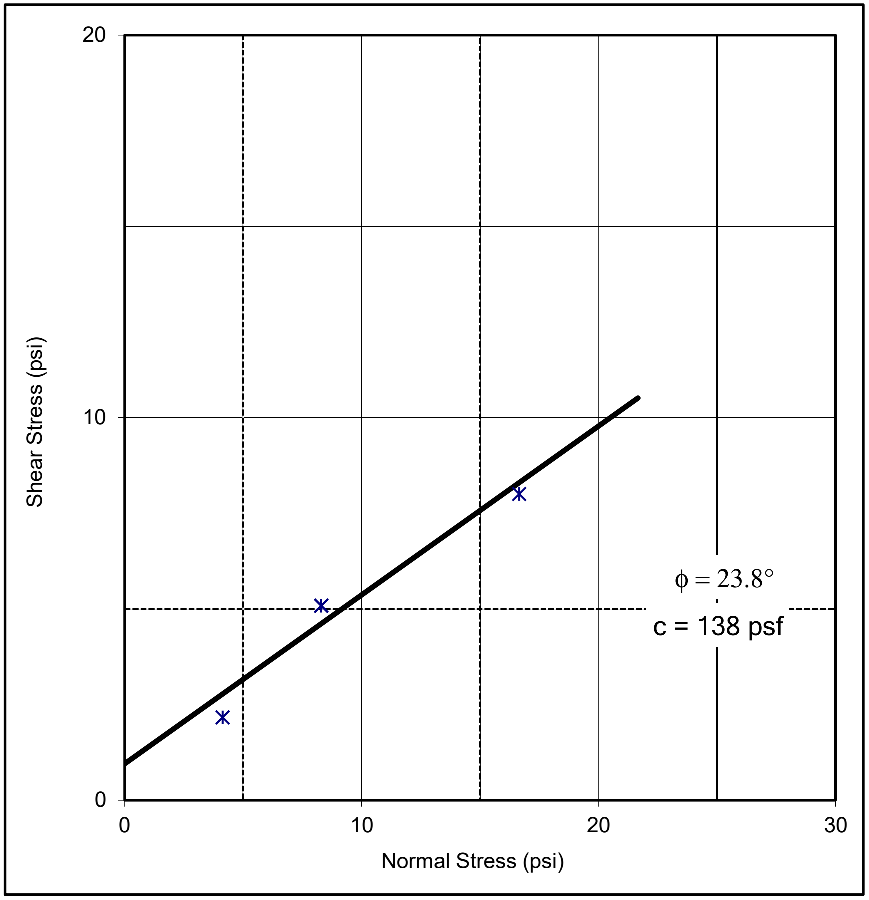
Project No.: P20051 **Project Name:** Market St

Date: 7/8/2021 **Sample:** RB-B-01-T-1

Sample Description: Black clay

Test No.	Normal Stress (psi)	Shear Strength (psi)	Friction	Symbol	Test Condition
1	4.14	2.16	Peak	◆	As received
2	8.30	5.08	Peak	●	As received
3	16.66	8.00	Peak	▲	As received





Hillis-Carnes Engineering Asssociates

Media, Pennsylvania

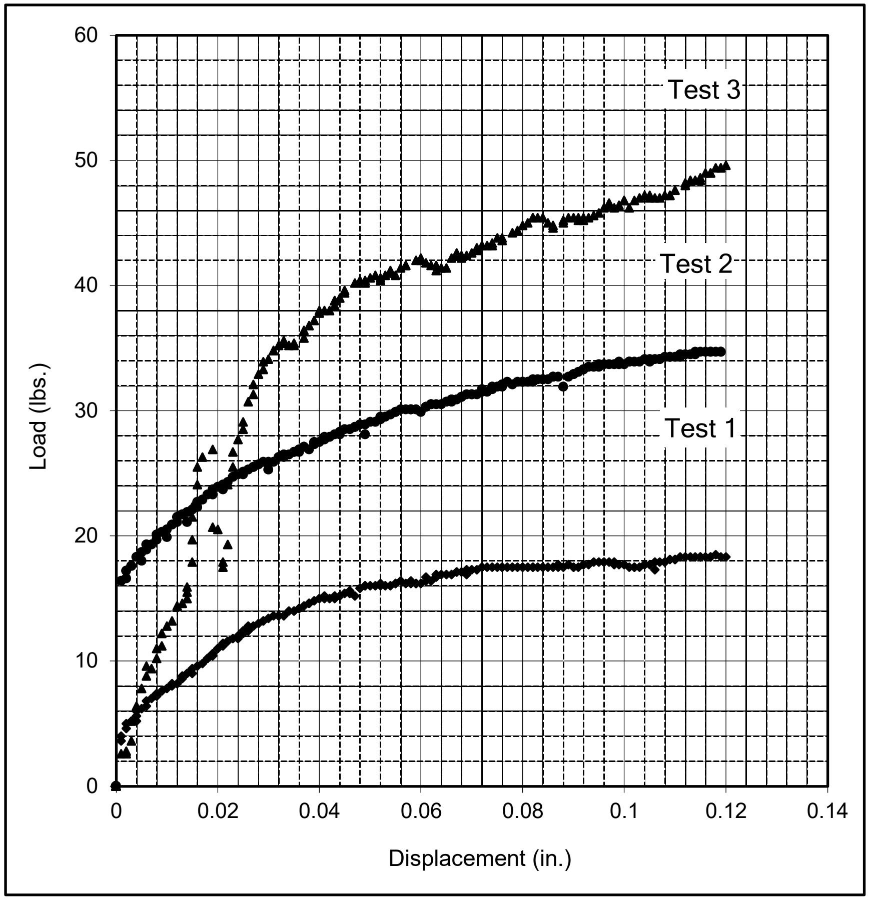
ASTM 3080 2.5"d x 1" DIRECT SHEAR TEST RESULTS

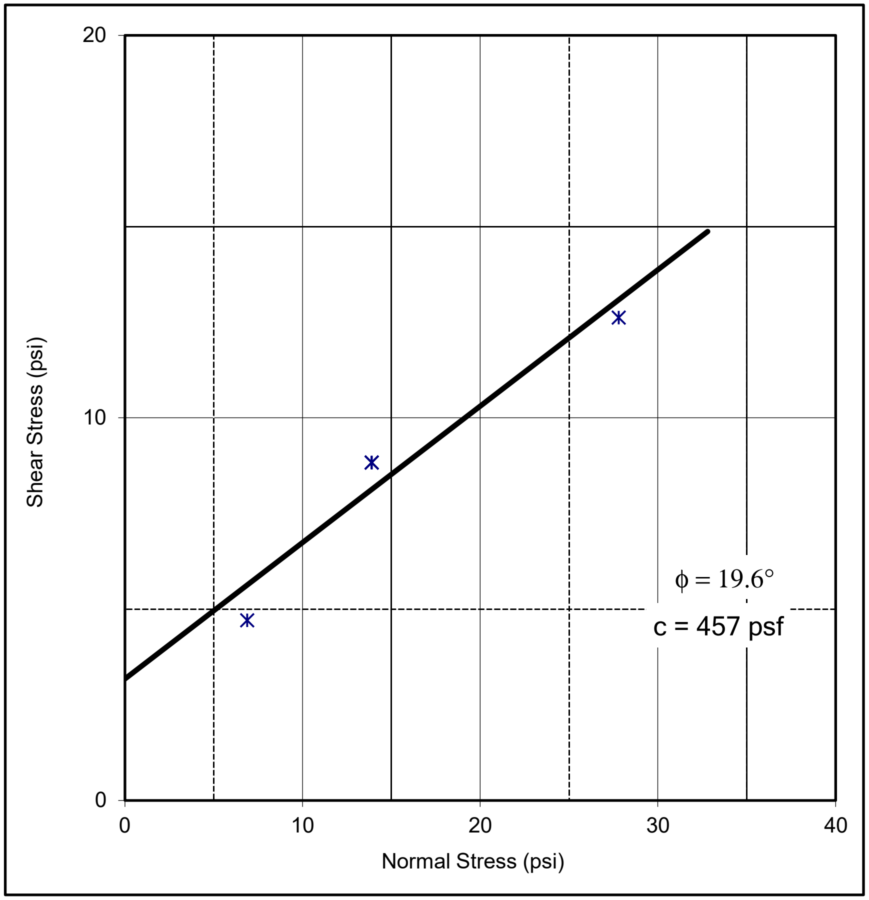
Project No.: P20051 **Project Name:** Market St

Date: 7/30/2020 **Sample:** RW-B-04-T-1

Sample Description: Grey clay

Test No.	Normal Stress (psi)	Shear Strength (psi)	Friction	Symbol	Test Condition
1	6.90	4.71	Peak	◆	As received
2	13.90	8.83	Peak	●	As received
3	27.80	12.62	Peak	▲	As received





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Hillis-Carnes Engineering Asssociates

Media, Pennsylvania

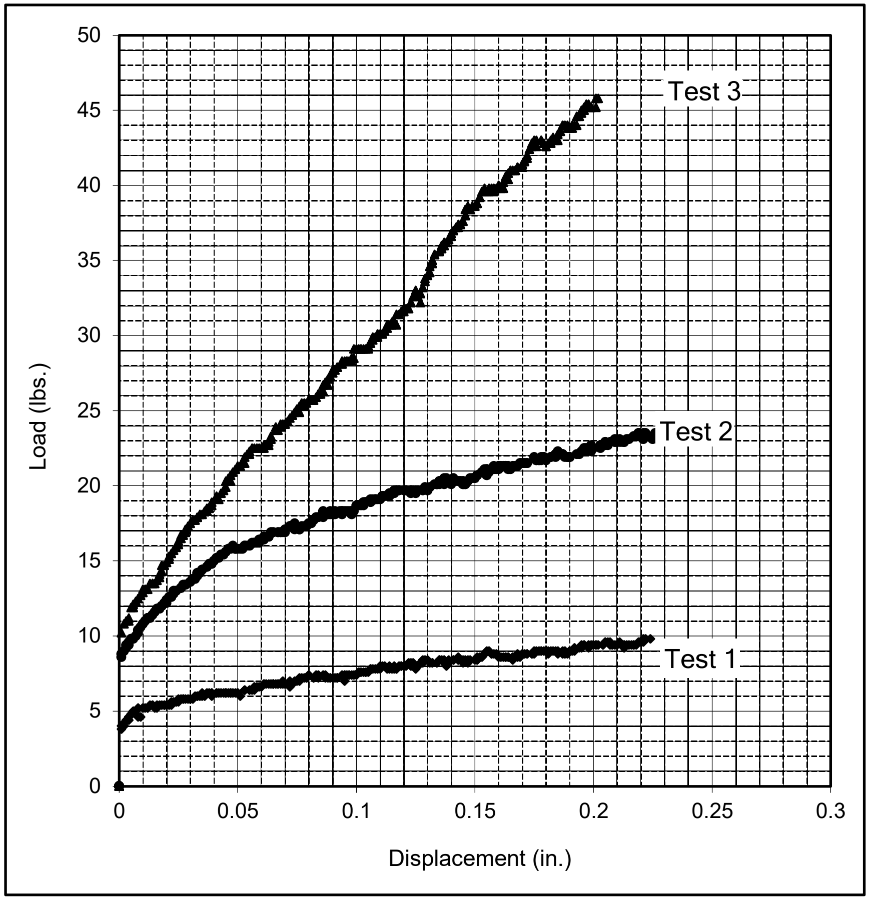
ASTM 3080 2.5"d x 1" DIRECT SHEAR TEST RESULTS

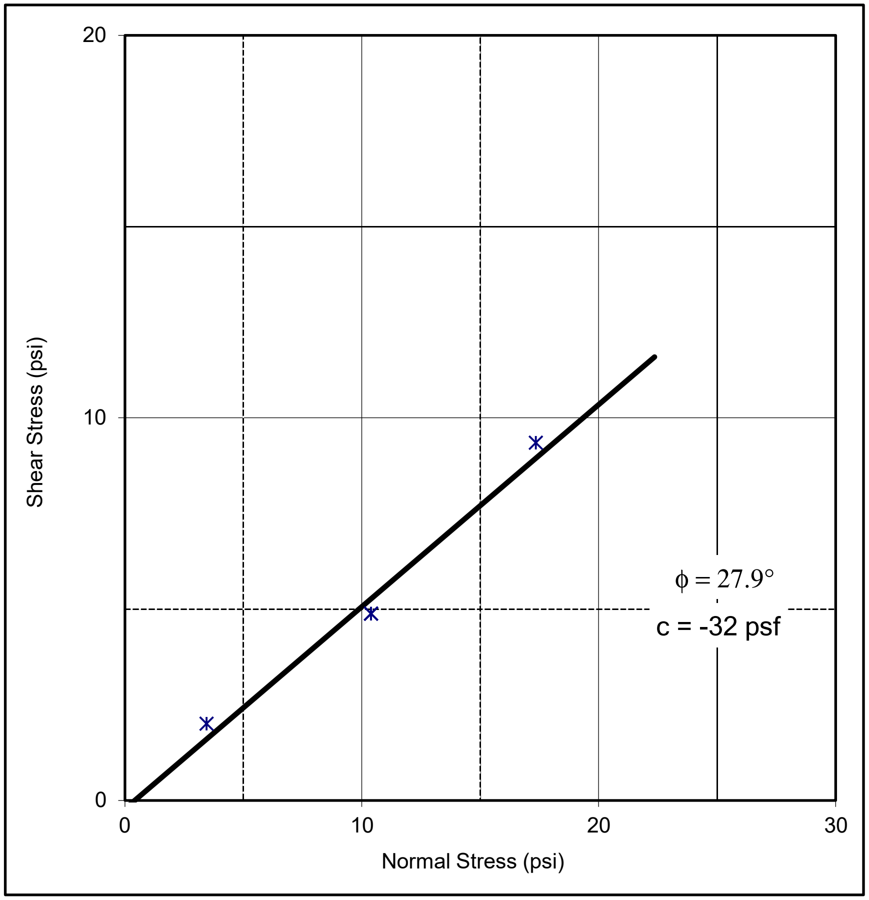
Project No.: P20051 **Project Name:** Market St

Date: 9/28/2020 **Sample:** RW-B-06-U-1

Sample Description: Brown silt

Test No.	Normal Stress (psi)	Shear Strength (psi)	Friction	Symbol	Test Condition
1	3.45	2.00	Peak	◆	As received
2	10.40	4.88	Peak	●	As received
3	17.35	9.35	Peak	▲	As received





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2:45 PM10/15/2020

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Media, Pennsylvania

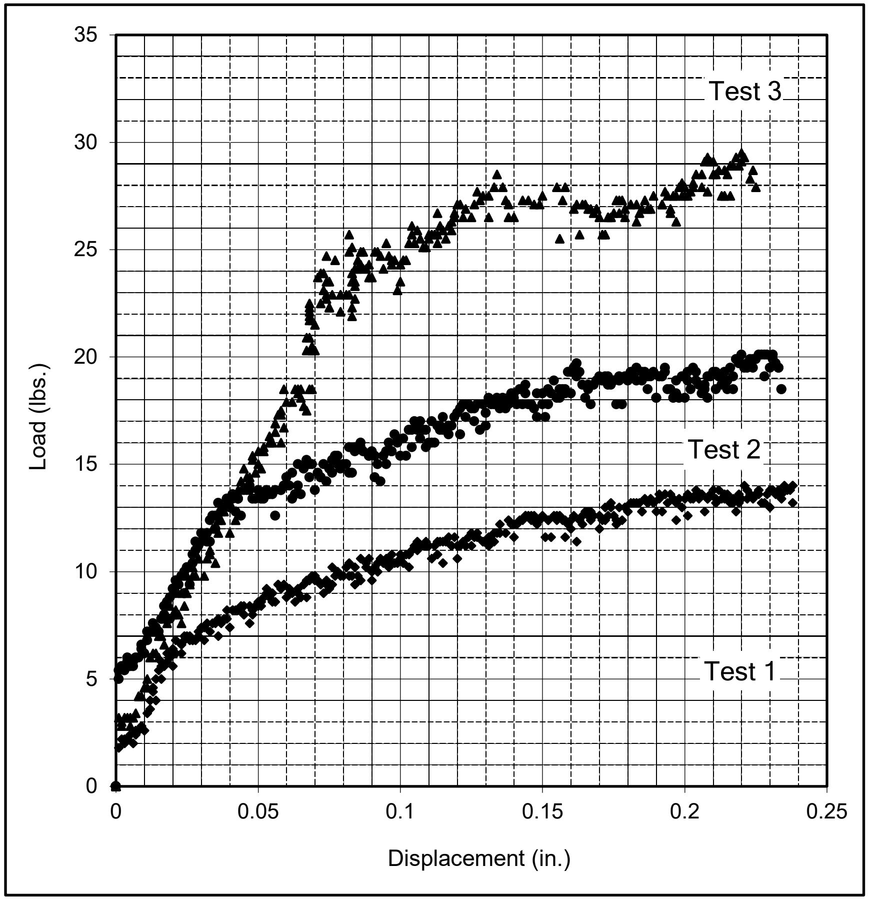
ASTM 3080 2.5"d x 1" DIRECT SHEAR TEST RESULTS

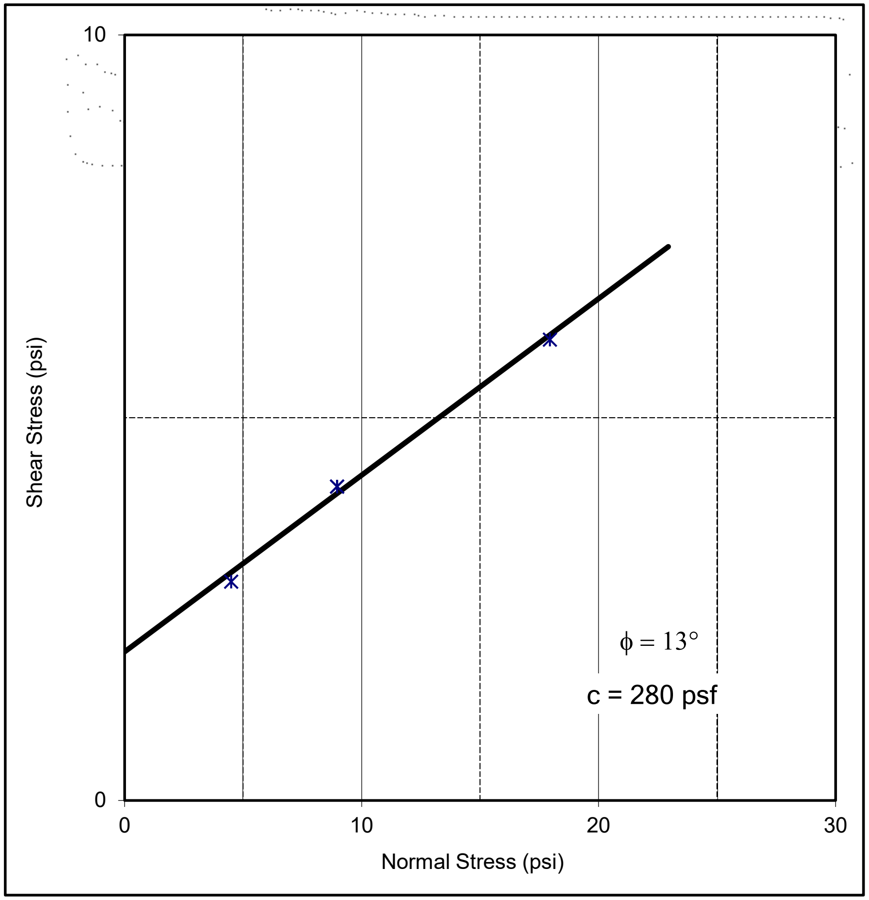
Project No.: P20051 **Project Name:** S. Mkt St

Date: 12/2/2022 **Sample:** RWB12 T2

Sample Description: 0

Test No.	Normal Stress (psi)	Shear Strength (psi)	Friction	Symbol	Test Condition
1	4.49	2.86	Peak	◆	Intact/Saturated
2	8.97	4.10	Peak	●	Intact/Saturated
3	17.94	6.02	Peak	▲	Intact/Saturated





CU Test Results

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ENGINEERING ASSOCIATES

300 South Pennell Road, Suite 410
Media, Pennsylvania 19063
484-434-1000

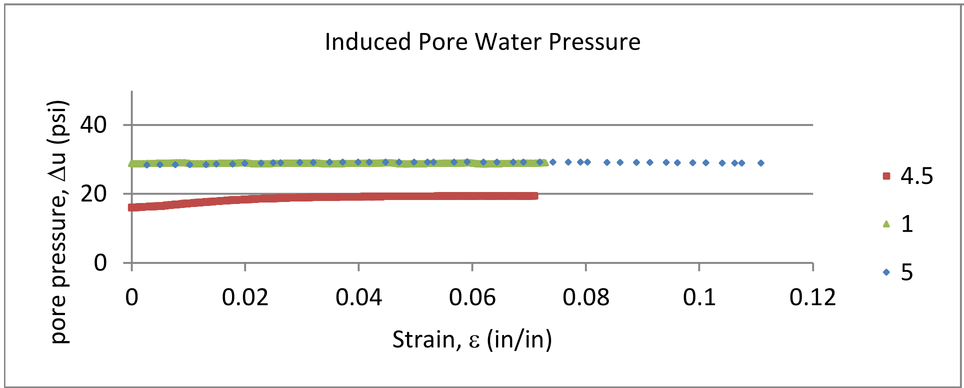
Client: SCG
Project: S. Market Street - RDC
Project No.: P20051

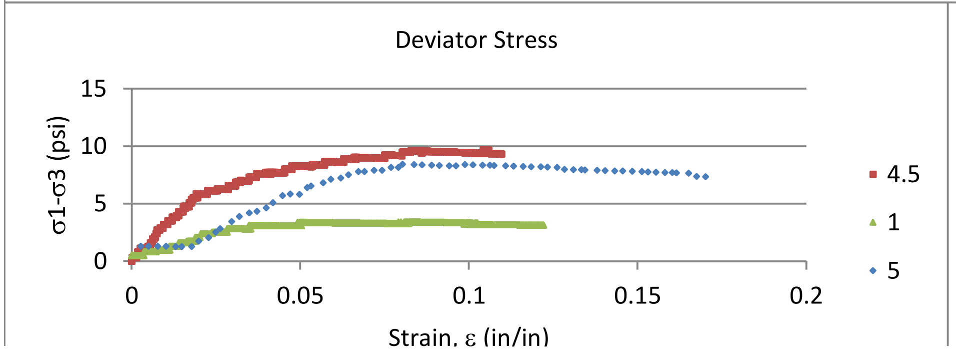
ASMT D 4767 - Consolidated Undrained Triaxial Compression

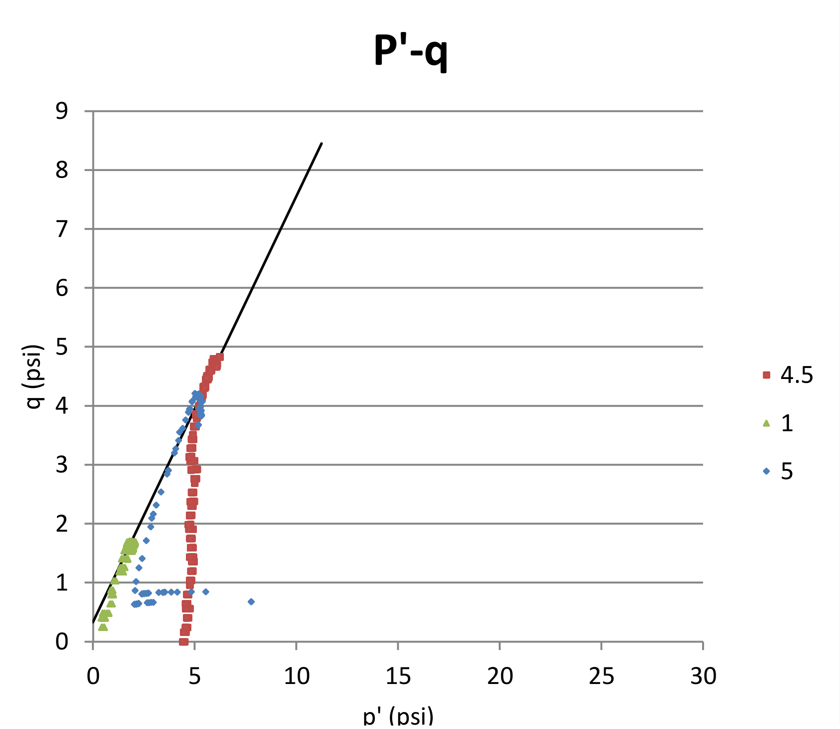
Sample: BHB-01A, T-1 (15.0'-17.0')
Sample Preparation: Test 1, Test 2, and Test 3 extracted

Test No.	Water Content	Dry Density (pcf)	Wet Density (pcf)	Consolidation Pressure (psi)	Max.Deviator Stress (psi)	Strain at Failure
1	60.7%	70.2	112.8	4.5	9.0	6.6%
2	62.6%	20.1	32.7	1	3.4	4.9%
3	69.2%	13.4	22.6	5	8.4	8.0%

ϕ = 46.3°
c = 69 psf
α = 35.9°
a = 47 psf







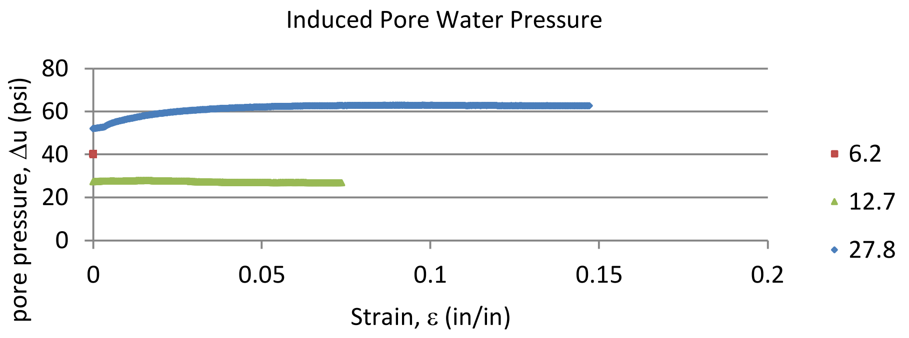
Client: SCG
Project: S. Market Street - RDC
Project No.: P20051

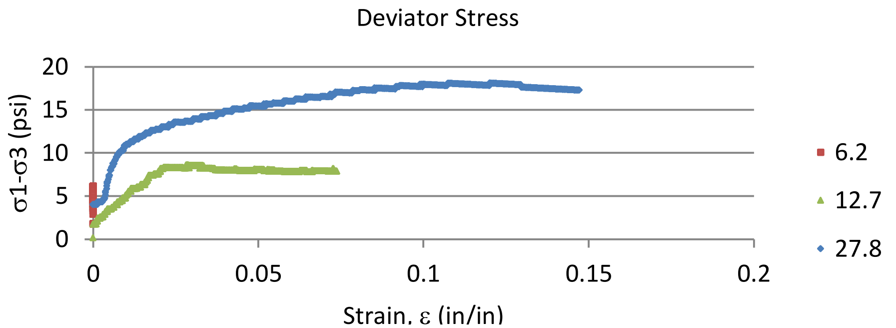
ASMT D 4767 - Consolidated Undrained Triaxial Compression

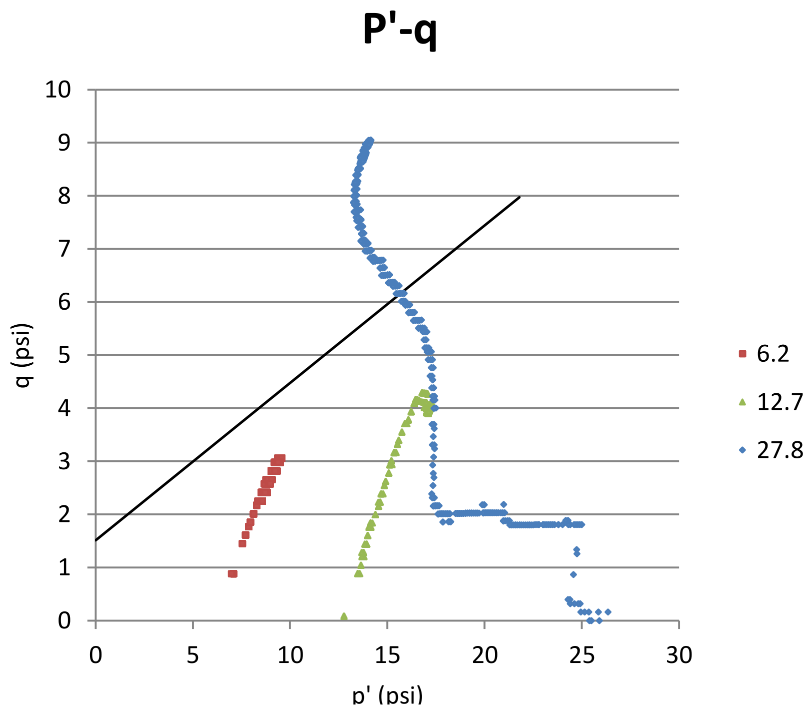
Sample: BHB04, **T-1 (21.5'-23.5')**
Sample Preparation: Test 1, Test 2, and Test 3 extracted

Test No.	Water Content	Dry Density (pcf)	Wet Density (pcf)	Consolidation Pressure (psi)	Max.Deviator Stress (psi)	Strain at Failure
1	25.9%	34.5	43.4	6.2	6.1	0.0%
2	11.6%	46.3	51.6	12.7	8.6	2.8%
3	29.2%	77.4	100.1	27.8	18.1	12.0%

ϕ = 17.3°
c = 228 psf
α = 16.5°
a = 218 psf







HILLIS-CARNES
ENGINEERING ASSOCIATES

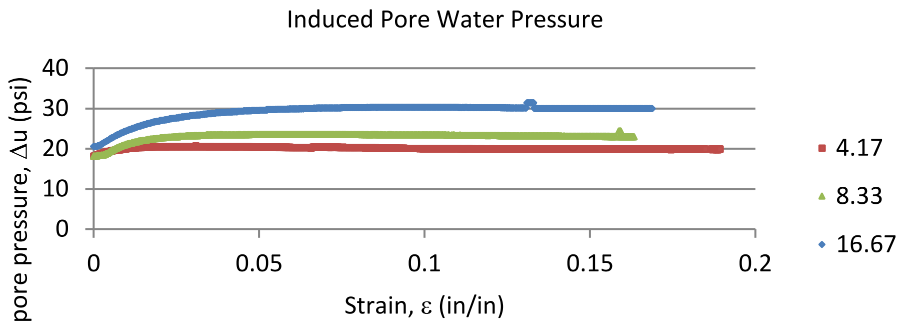
300 South Pennell Road, Suite 410
Media, Pennsylvania 19063
484-434-1000

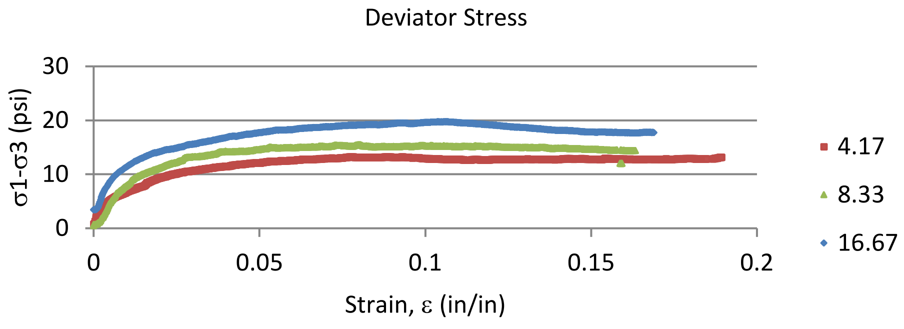
Client: HCEA SCG
Project: S Market St
Project No.: P20051

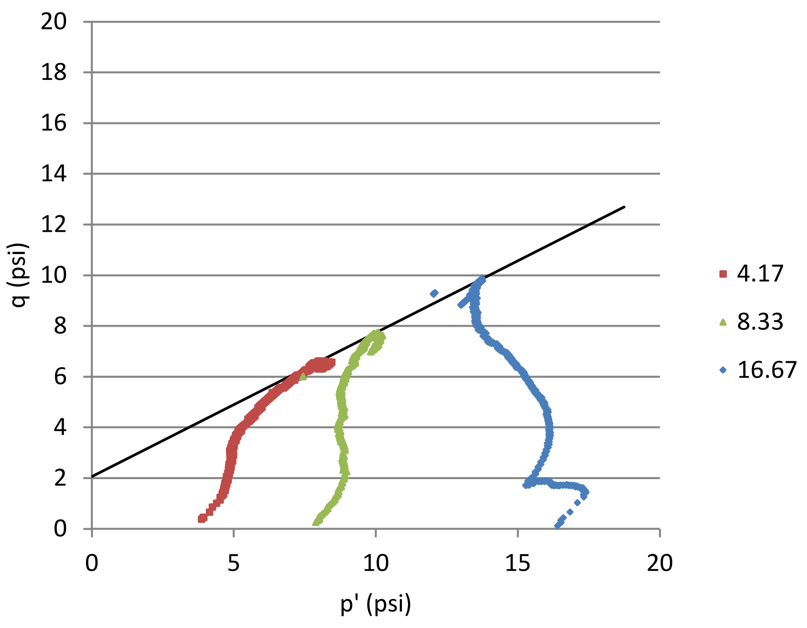
ASMT D 4767 - Consolidated Undrained Triaxial Compression

Sample : EMBB02T1
Sample Preparation: Intact

Test No.	Water Content	Dry Density (pcf)	Wet Density (pcf)	Consolidation Pressure (psi)	Max.Deviator Stress (psi)	Strain at Failure		
							ϕ =	34.6°
1	55.5%	75.5	117.4	4.17	13.2	7.8%	c =	361 psf
2	57.4%	74.6	117.4	8.33	15.5	8.0%	α =	29.6°
3	53.1%	76.7	117.4	16.67	19.7	10.6%	a =	297 psf


Induced Pore Water Pressure


Deviator Stress


p'-q

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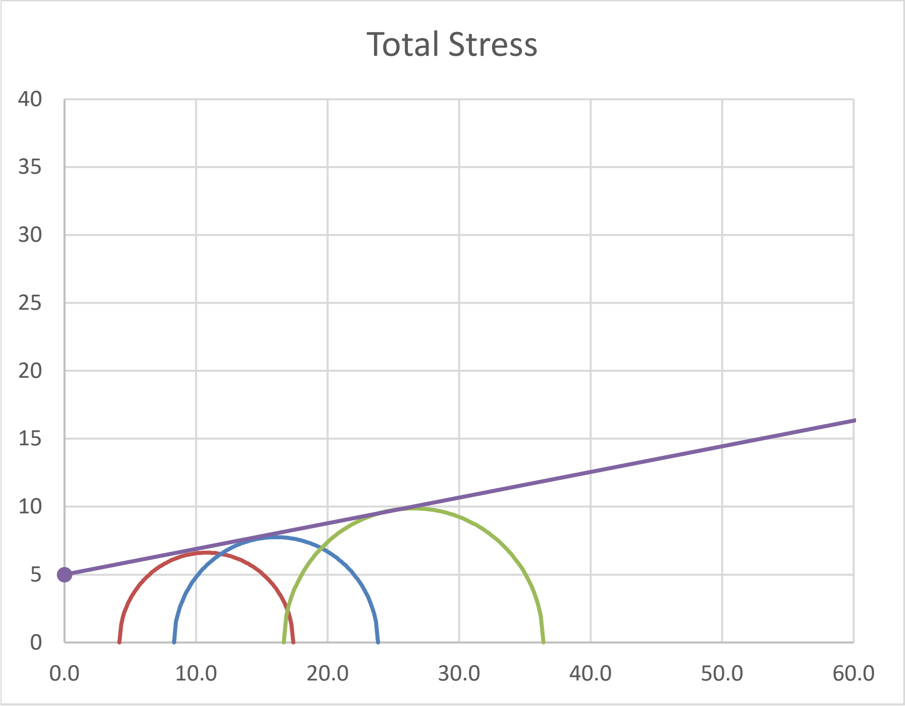
Media, Pennsylvania 19063
484-434-1000

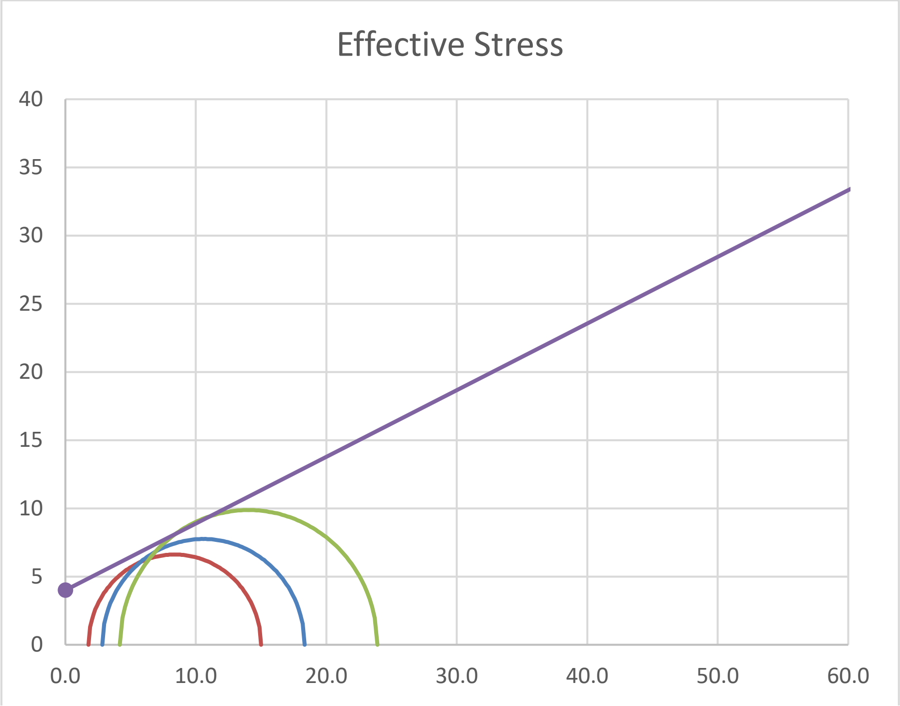
Client: HCEA SCG
Project: S Market St
Project No.: P20051

ASMT D 4767 - Consolidated Undrained Triaxial Compression

Sample : EMBB02T1
Sample Preparation: Intact

Test No.	Consolidation Cell Pressure (psi)	Max. Dev Stress (psi)	Strain at Failure	Pore Pressure Δu (psi)	σ_1 (psi)	σ_3 (psi)	σ_1' (psi)	σ_3' (psi)
1	4.17	13.2	7.8%	2.4	17.4	4.2	15.0	1.8
2	8.33	15.5	8.0%	5.5	23.8	8.3	18.3	2.8
3	16.67	19.7	10.6%	12.5	36.4	16.7	23.9	4.2


Total Stress


Effective Stress

c = 5 psi	phi = 10.7		c = 4 psi	phi = 26.1
720 psf			576 psf	

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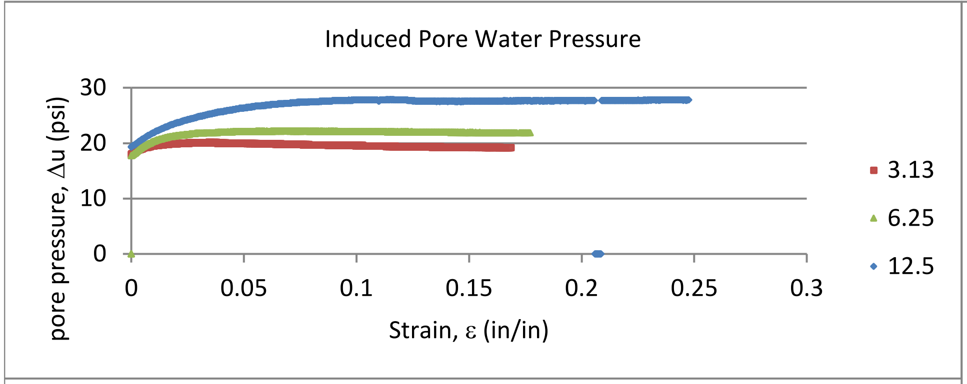
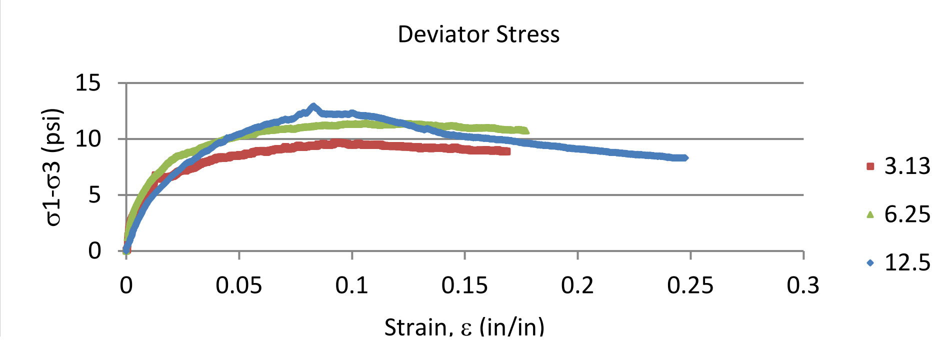
Client: HCEA SCG
Project: S Market St
Project No.: P20051

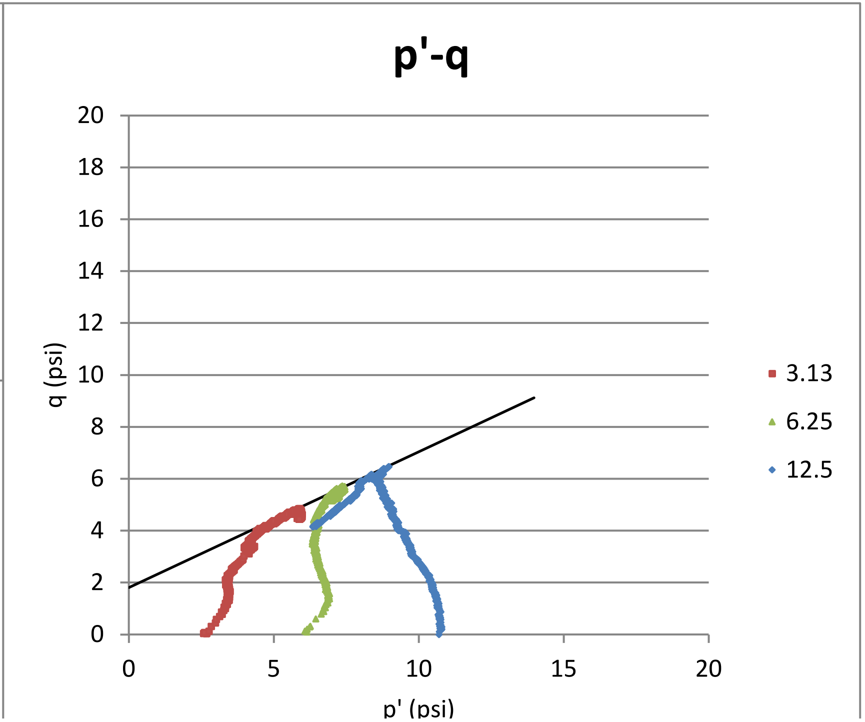
ASMT D 4767 - Consolidated Undrained Triaxial Compression

Sample : LOTA213T1
Sample Preparation: Intact

Test No.	Water Content	Dry Density (pcf)	Wet Density (pcf)	Consolidation Pressure (psi)	Max.Deviator Stress (psi)	Strain at Failure		
							φ =	31.6°
1	59.7%	68.1	108.7	3.13	9.7	9.2%	c =	305 psf
2	57.2%	73.6	115.6	6.25	11.4	10.6%	α =	27.6°
3	82.8%	60.0	109.6	12.5	12.9	8.3%	a =	260 psf


Induced Pore Water Pressure


Deviator Stress


p'-q

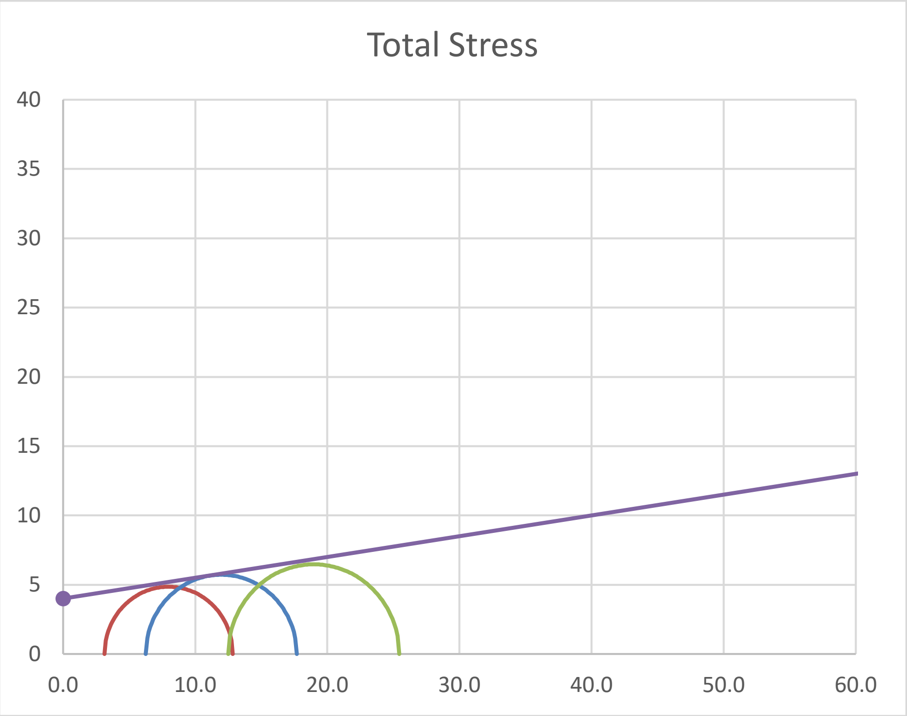
NOTE: 3rd section was different in composition than 1st two sections. 1st two were denser, gray silt/clay, 3rd was more of an organic silt/

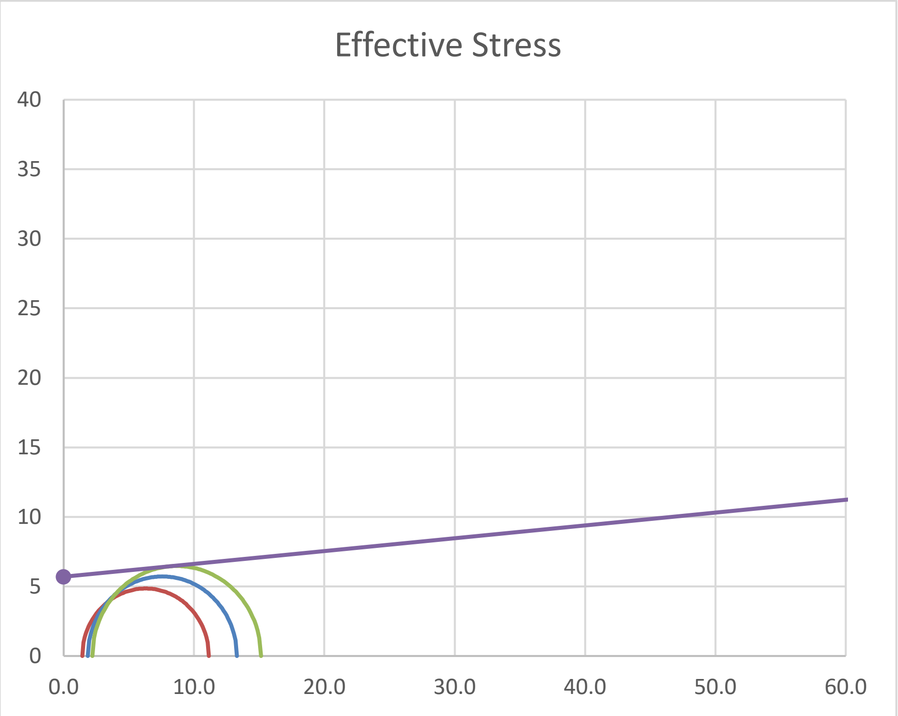
Client: HCEA SCG
Project: S Market St
Project No.: P20051

ASMT D 4767 - Consolidated Undrained Triaxial Compression

Sample : LOTA213T1
Sample Preparation: Intact

Test No.	Consolidation Cell Pressure (psi)	Max. Dev Stress (psi)	Strain at Failure	Pore Pressure Δu (psi)	σ_1 (psi)	σ_3 (psi)	σ_1' (psi)	σ_3' (psi)
1	3.13	9.7	9.2%	1.7	12.8	3.1	11.1	1.4
2	6.25	11.4	10.6%	4.4	17.7	6.3	13.3	1.9
3	12.5	12.9	8.3%	10.3	25.4	12.5	15.1	2.2


Total Stress


Effective Stress

c = 4 psi phi = 8.5
576 psf

c = 5.7 psi phi = 5.3
820.8 psf

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484-434-1000

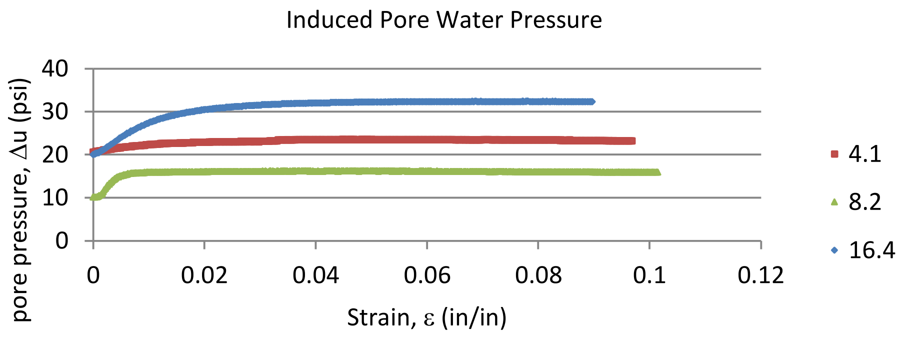
Client: SCG
Project: S. Market Street - RDC
Project No.: P20051

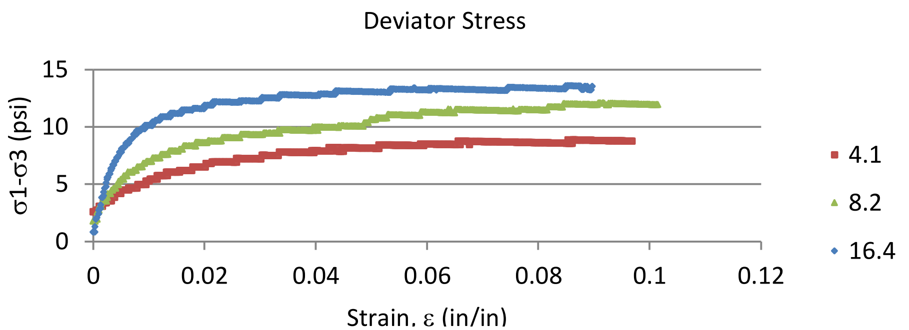
ASMT D 4767 - Consolidated Undrained Triaxial Compression

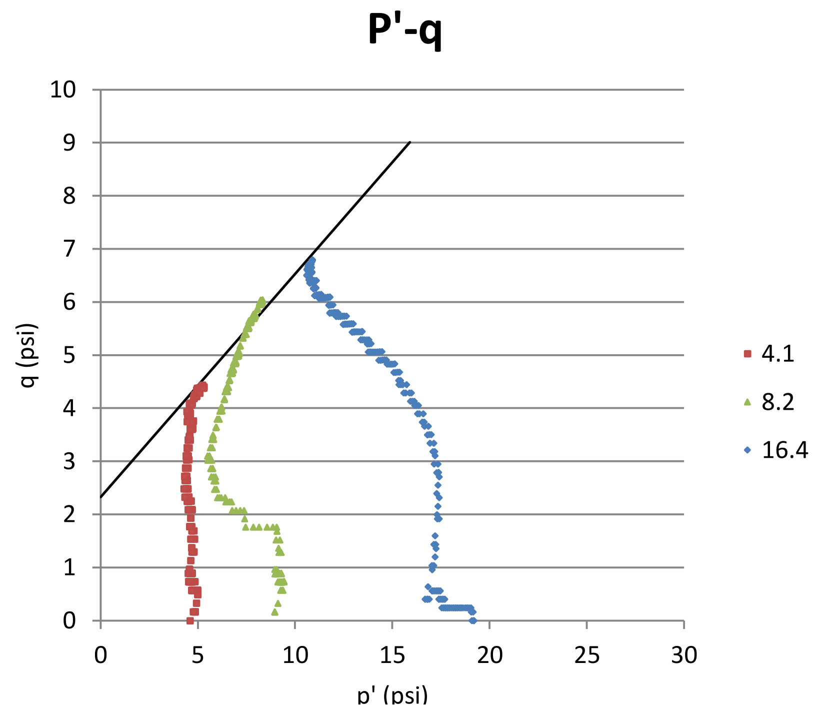
Sample: OLB-01, `T-2 (17.0'-19.0')`
Sample Preparation: Test 1, Test 2, and Test 3 extracted

Test No.	Water Content	Dry Density (pcf)	Wet Density (pcf)	Consolidation Pressure (psi)	Max.Deviator Stress (psi)	Strain at Failure
1	56.9%	65.5	102.8	4.1	8.9	8.5%
2	49.1%	77.4	115.4	8.2	12.1	9.1%
3	46.2%	74.0	108.2	16.4	13.6	8.5%

ϕ = 24.9°
c = 369 psf
α = 22.8°
a = 335 psf







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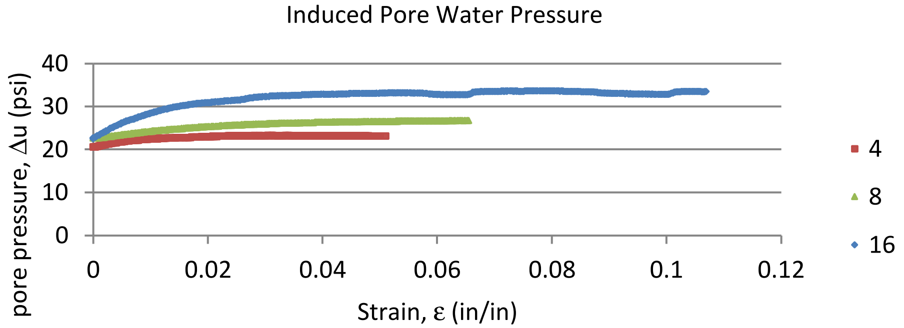
Client: SCG
Project: S. Market Street - RDC
Project No.: P20051

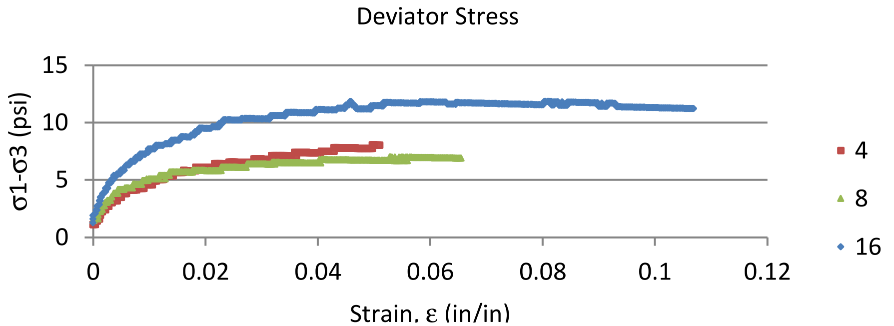
ASMT D 4767 - Consolidated Undrained Triaxial Compression

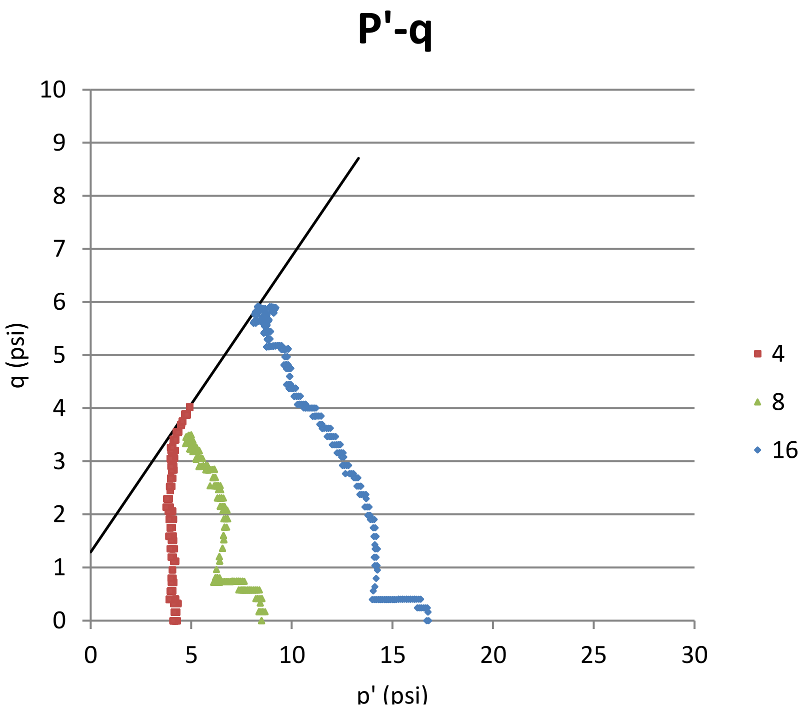
Sample: RWB-01, `T-1 (21.5'-23.5')`
Sample Preparation: Test 1, Test 2, and Test 3 extracted

Test No.	Water Content	Dry Density (pcf)	Wet Density (pcf)	Consolidation Pressure (psi)	Max.Deviator Stress (psi)	Strain at Failure
1	35.1%	85.3	115.3	4	8.0	5.0%
2	36.9%	77.2	105.6	8	7.0	5.3%
3	58.9%	66.8	106.1	16	11.8	8.0%

ϕ = 33.9°
c = 224 psf
α = 29.1°
a = 186 psf


Induced Pore Water Pressure


Deviator Stress


P'-q

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Project: S. Market Street - RDC
Project No.: P20051

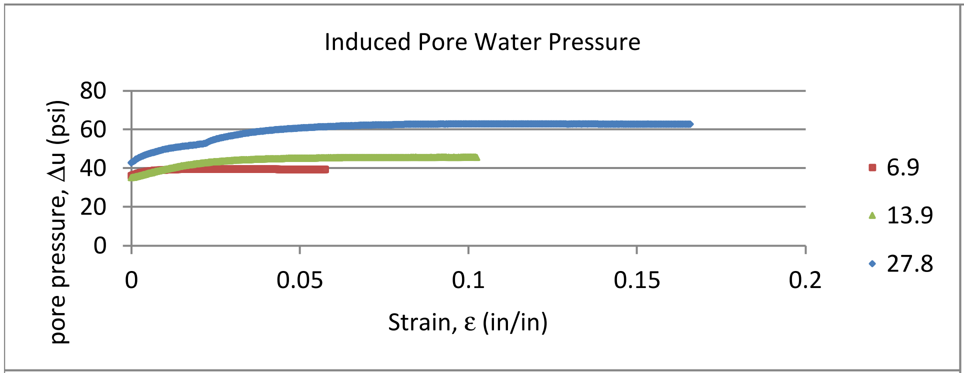
ASMT D 4767 - Consolidated Undrained Triaxial Compression

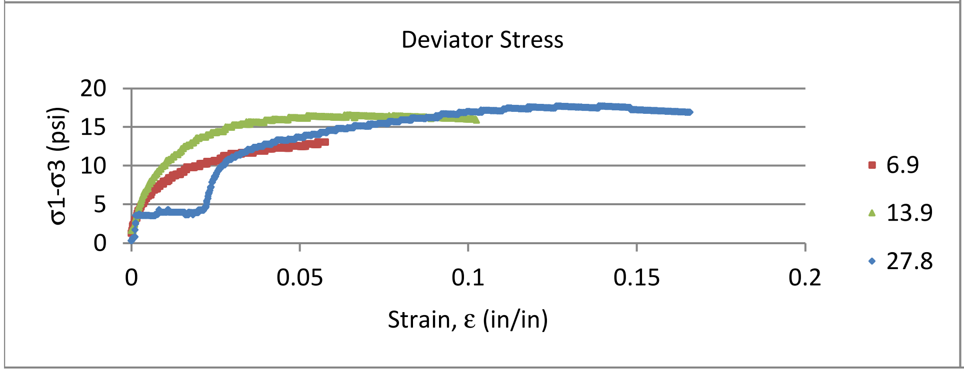
Sample: **`Boring: RW-B-3, T-1 (23.5'-25.5')`**

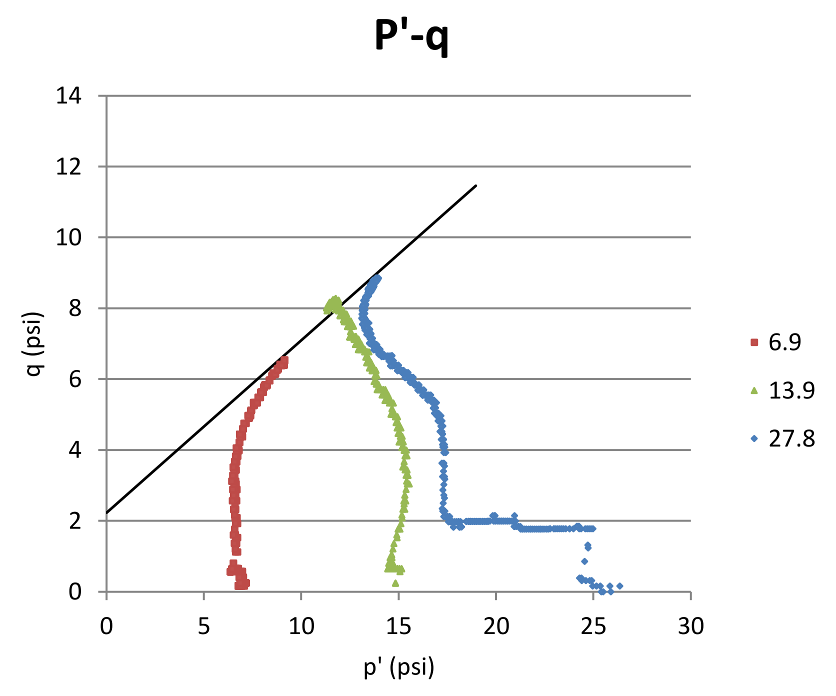
Sample Preparation: Test 1, Test 2, and Test 3 extracted

Test No.	Water Content	Dry Density (pcf)	Wet Density (pcf)	Consolidation Pressure (psi)	Max.Deviator Stress (psi)	Strain at Failure
1	45.2%	77.6	112.8	6.9	13.1	5.5%
2	58.8%	67.2	106.7	13.9	16.6	6.3%
3	29.2%	76.6	99.0	27.8	17.7	13.9%

ϕ = 29.1°
c = 368 psf
α = 26°
a = 321 psf


Induced Pore Water Pressure


Deviator Stress


P'-q

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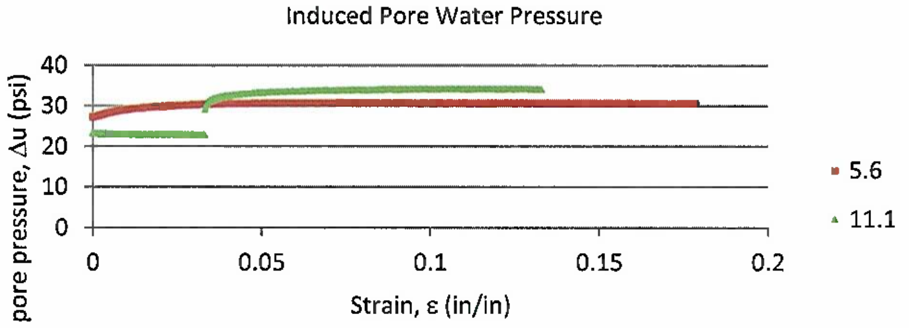
Client: HCEA SCG
Project: S Market St
Project No.: P20051

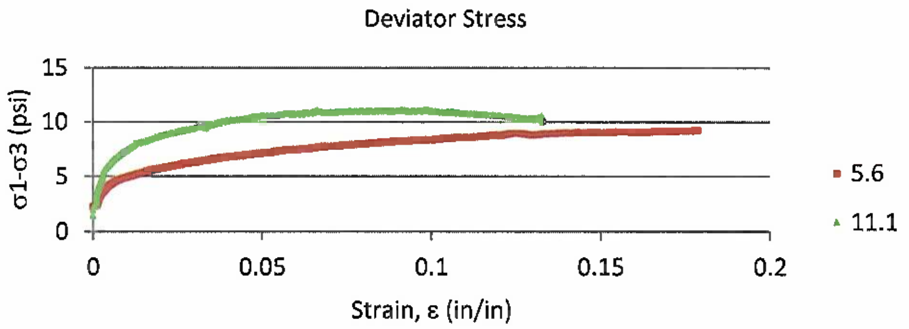
ASMT D 4767 - Consolidated Undrained Triaxial Compression

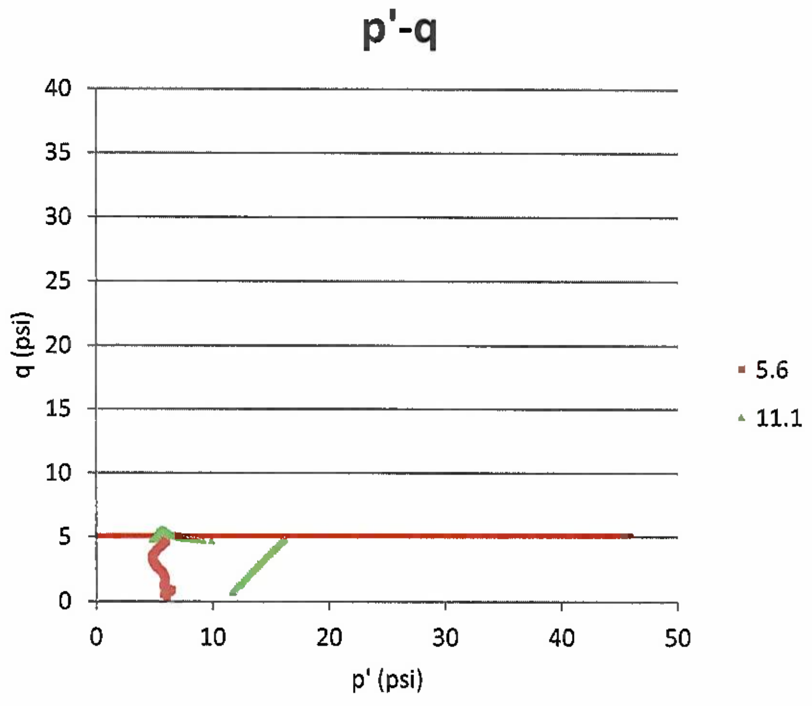
Sample : RWB08T1
Sample Preparation: Intact

Test No.	Water Content	Dry Density (pcf)	Wet Density (pcf)	Consolidation Pressure (psi)	Max.Deviator Stress (psi)	Strain at Failure
1	51.6%	82.0	124.3	5.6	9.3	17.8%
2	65.1%	69.1	114.1	11.1	11.1	9.9%
3						

ϕ = 0°
c = 735 psf
α = 0°
a = 735 psf







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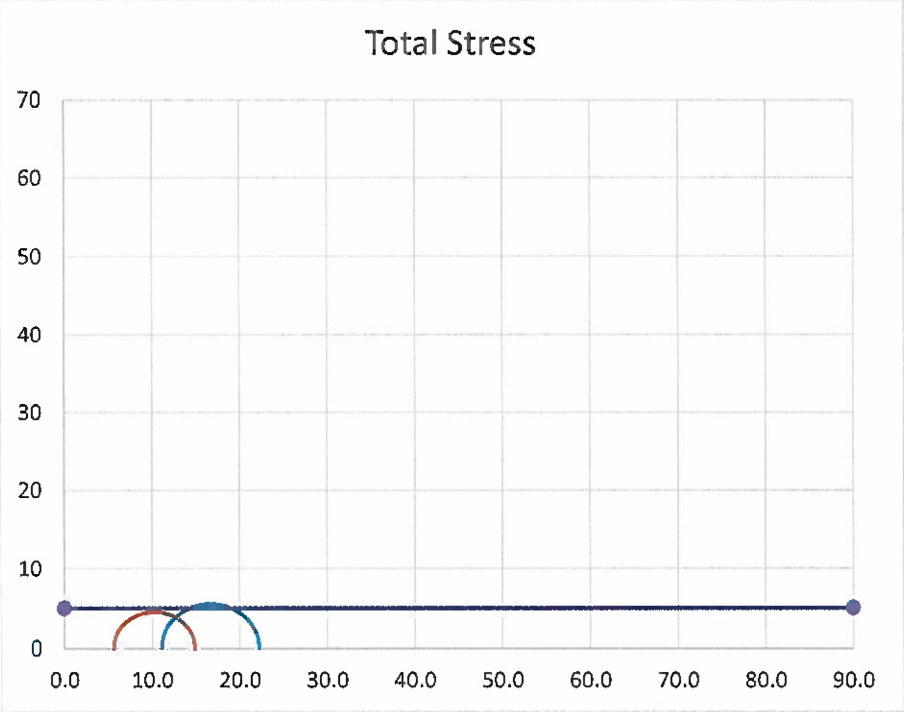
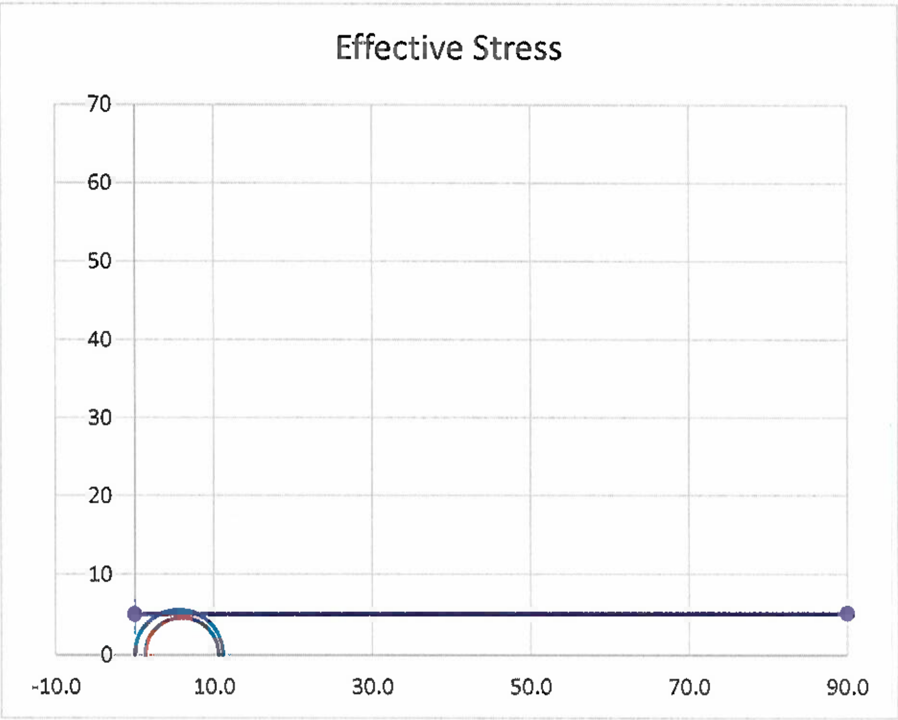
Project: S Market St
Project No.: P20051

ASMT D 4767 - Consolidated Undrained Triaxial Compression

Sample : RWB08T1
Sample Preparation: Intact

Test No.	Consolidation Cell Pressure (psi)	Max. Dev Stress (psi)	Strain at Failure	Pore Pressure Δu (psi)	σ_1 (psi)	σ_3 (psi)	σ_1' (psi)	σ_3' (psi)
1	5.6	9.3	17.8%	4.3	14.9	5.6	10.6	1.3
2	11.1	11.1	9.9%	11.1	22.2	11.1	11.1	0.0
3	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!	#REF!


Total Stress


Effective Stress

c = 5.1 phi = 0

c = 5.1 phi = 0

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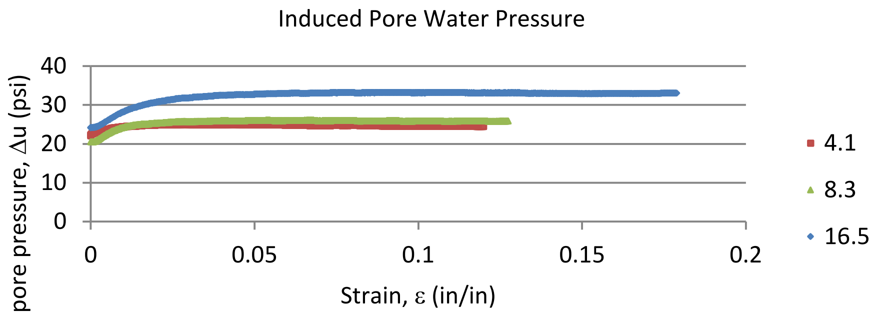
Client: HCEA SCG
Project: S Market St
Project No.: P20051

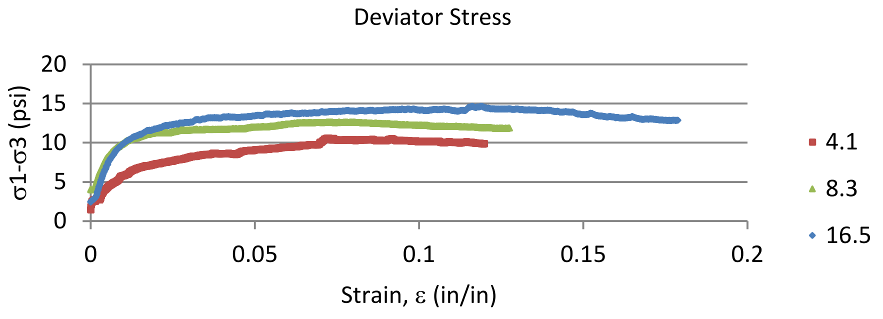
ASMT D 4767 - Consolidated Undrained Triaxial Compression

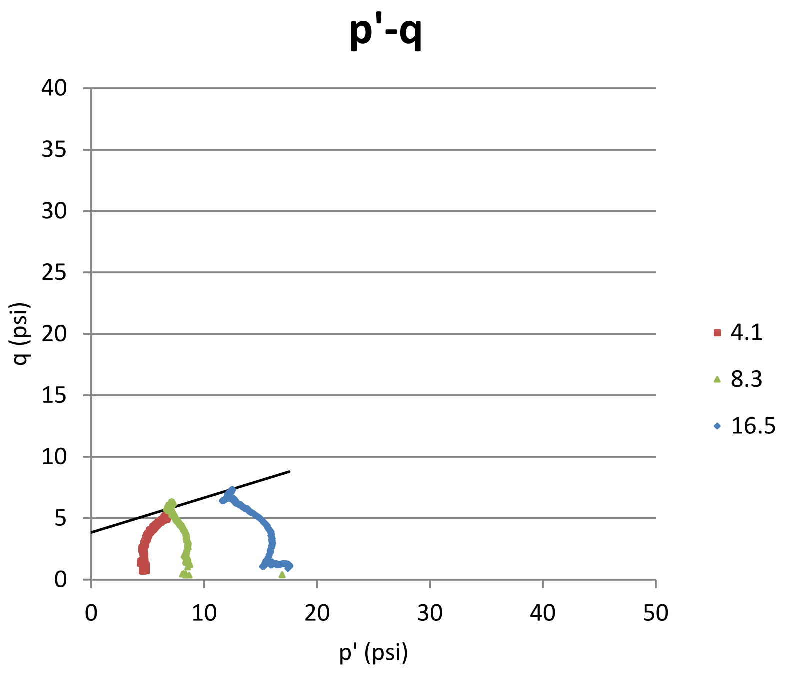
Sample : RWB09T1
Sample Preparation: Intact

Test No.	Water Content	Dry Density (pcf)	Wet Density (pcf)	Consolidation Pressure (psi)	Max.Deviator Stress (psi)	Strain at Failure
1	51.9%	80.5	122.3	4.1	10.6	7.2%
2	50.8%	78.5	118.4	8.3	12.6	7.3%
3	46.5%	80.9	118.5	16.5	14.7	11.9%

ϕ = 16.4°
c = 575 psf
α = 15.8°
a = 552 psf







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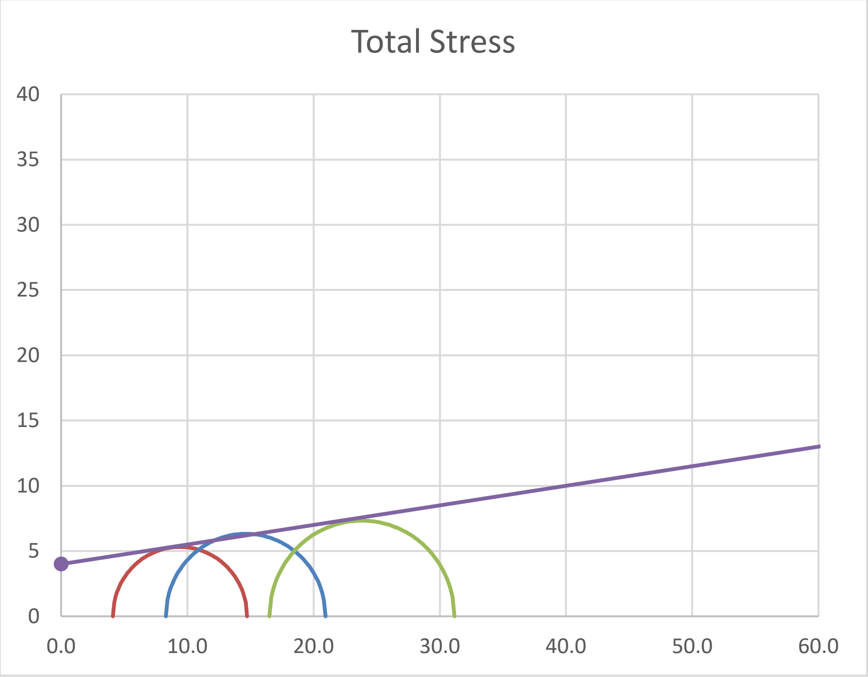
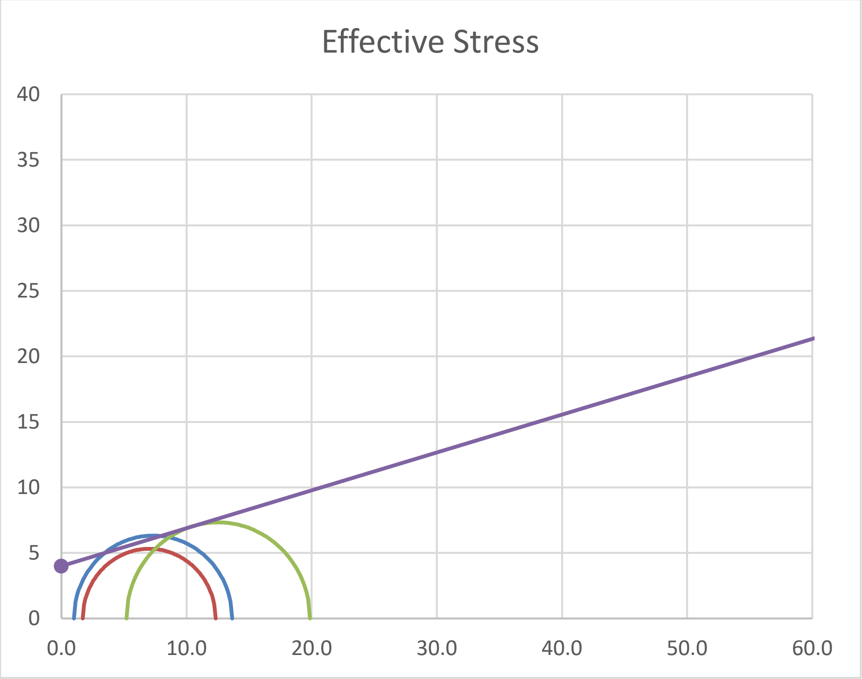
Client: HCEA SCG
Project: S Market St
Project No.: P20051

ASMT D 4767 - Consolidated Undrained Triaxial Compression

Sample : RWB09T1
Sample Preparation: Intact

Test No.	Consolidation Cell Pressure (psi)	Max. Dev Stress (psi)	Strain at Failure	Pore Pressure Δu (psi)	σ_1 (psi)	σ_3 (psi)	σ_1' (psi)	σ_3' (psi)
1	4.1	10.6	7.2%	2.4	14.7	4.1	12.3	1.7
2	8.3	12.6	7.3%	7.3	20.9	8.3	13.6	1.0
3	16.5	14.7	11.9%	11.3	31.2	16.5	19.9	5.2





c = 4 psi phi = 8.5
576 psf

c = 4 psi phi = 16.1
576 psf

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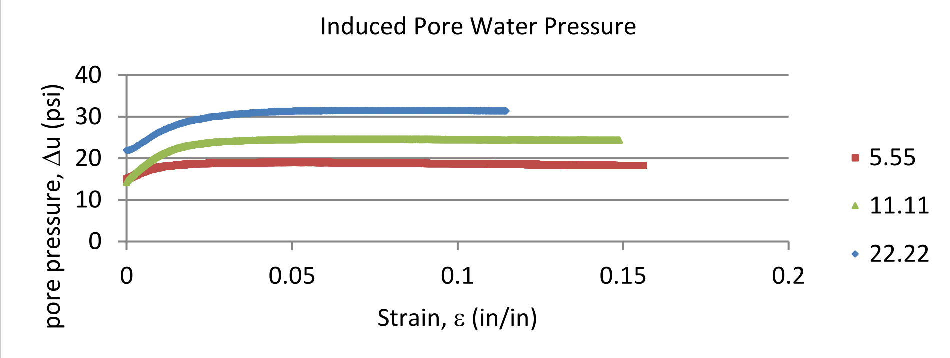
Project: S Market St
Project No.: P20051

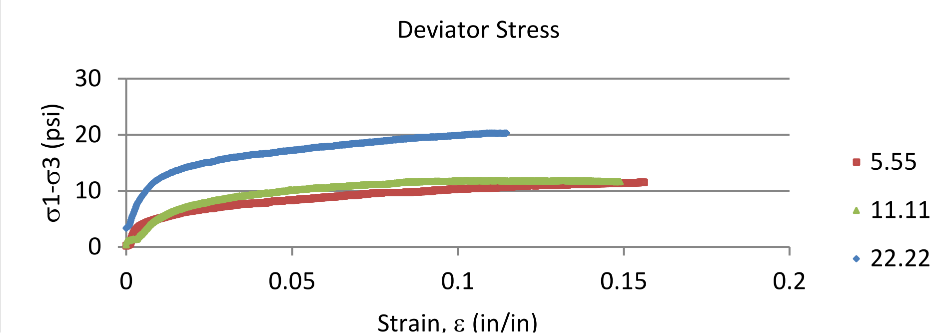
ASMT D 4767 - Consolidated Undrained Triaxial Compression

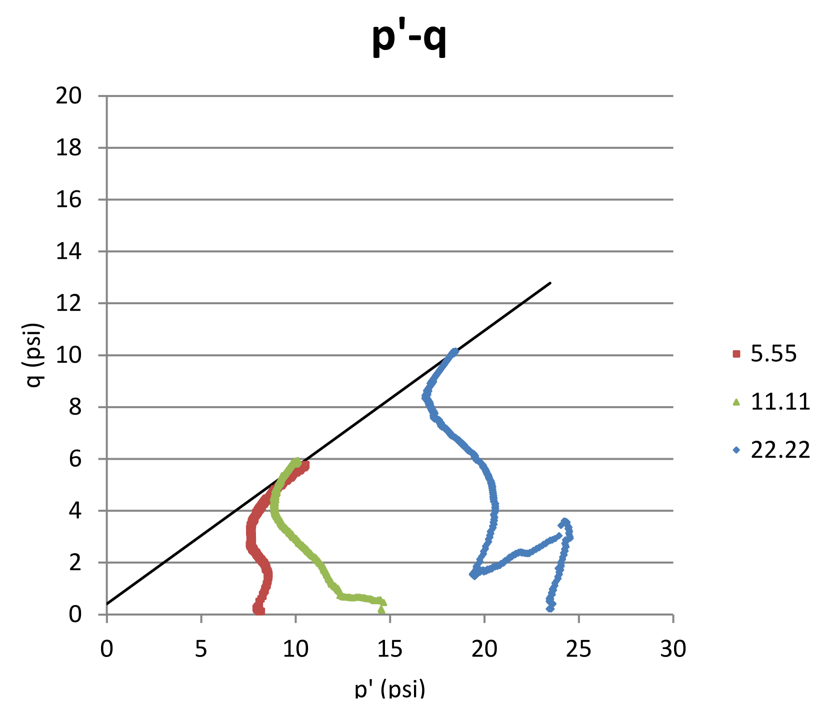
Sample : RWB10T2
Sample Preparation: Intact

Test No.	Water Content	Dry Density (pcf)	Wet Density (pcf)	Consolidation Pressure (psi)	Max.Deviator Stress (psi)	Strain at Failure
1	44.8%	85.0	123.0	5.55	11.6	15.6%
2	56.0%	68.4	106.6	11.11	11.9	13.1%
3	42.7%	79.2	113.1	22.22	20.3	11.5%

ϕ = 31.8°
c = 70 psf
α = 27.8°
a = 60 psf







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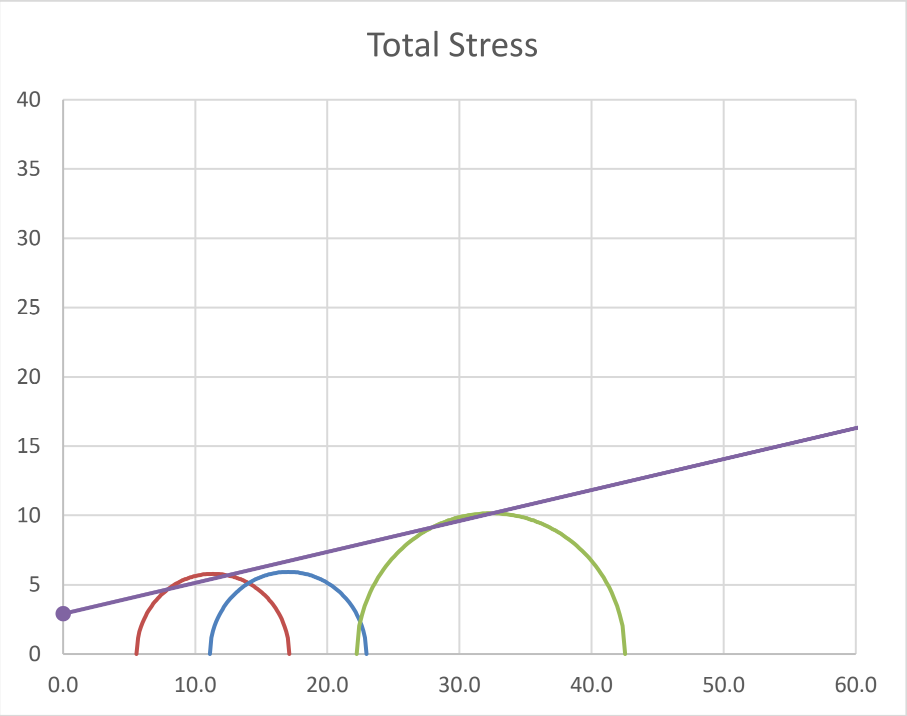
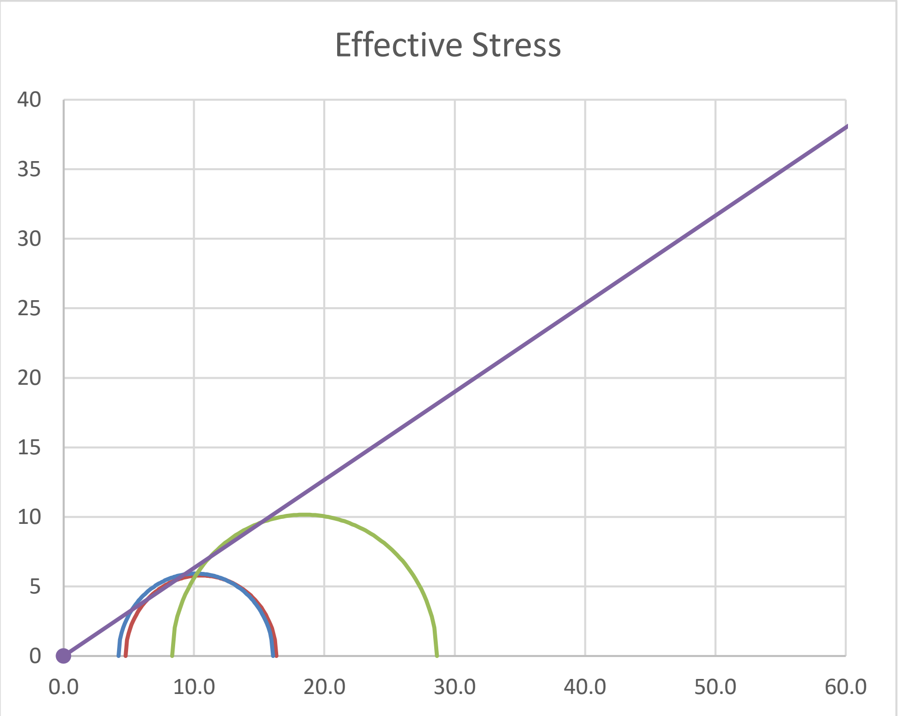
Client: HCEA SCG
Project: S Market St
Project No.: P20051

ASMT D 4767 - Consolidated Undrained Triaxial Compression

Sample : RWB10T2
Sample Preparation: Intact

Test No.	Consolidation Cell Pressure (psi)	Max. Dev Stress (psi)	Strain at Failure	Pore Pressure Δu (psi)	σ_1 (psi)	σ_3 (psi)	σ_1' (psi)	σ_3' (psi)
1	5.55	11.6	15.6%	0.8	17.1	5.6	16.3	4.8
2	11.11	11.9	13.1%	6.9	23.0	11.1	16.1	4.2
3	22.22	20.3	11.5%	13.9	42.5	22.2	28.6	8.3





c = 2.9 psi phi = 12.6
417.6 psf

c = 0 psi phi = 32.3
0 psf

Corrosion Test Results

ESSENTIAL
CORROSION
PROTECTION

6/17/2021

Hillis-Carnes Consulting Group Laboratory Soil Sample Analysis Results

Project	Sample ID	As-Is Resistivity (ohm-cm)	"Wetted" Resistivity	Redox (mV)	pH	Chloride (ppm)	Sulfate (ppm)	Sulfides
Market St	RW-B-01 C1-4	670	650	276	7.3	<20	<5	Not Present
	RW-B-02 C5-8	1,300	1,300	260	6.6	<20	<5	Not Present
	BH-B-01/BH-B-02	2,900	1,800	270	7.0	<20	<5	Not Present
	BH-B-01A/BH-B-02	1,300	1,300	265	6.8	<20	<5	Not Present

ESSENTIAL
CORROSION
PROTECTION

5/18/2021

Hillis-Carnes Consulting Group Laboratory Soil Sample Analysis Results

Project	Sample ID	As-Is Resistivity (ohm-cm)	"Wetted" Resistivity	Redox (mV)	pH	Chloride (ppm)	Sulfate (ppm)	Sulfides
Mkt St	BH-B-03A	2,700	2,500	186	8.2	<20	20	Not Present

ESSENTIAL
CORROSION
PROTECTION

8/11/2020

Hillis-Carnes Consulting Group Laboratory Soil Sample Analysis Results

Project	Sample ID	As-Is Resistivity (ohm-cm)	"Wetted" Resistivity	Redox (mV)	pH	Chloride (ppm)	Sulfate (ppm)	Moisture	Sulfides
Market St P20051	RBB06	7,200	1,600	470	7.6	45	25	39%	Not Present
	RWB03	1100	1000	274	7.4	200	215	13%	Not Present

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ESSENTIAL
CORROSION
PROTECTION

9/24/2020

Hillis-Carnes Consulting Group Laboratory Soil Sample Analysis Results

Project	Sample ID	As-Is Resistivity (ohm-cm)	"Wetted" Resistivity	Redox (mV)	pH	Chloride (ppm)	Sulfate (ppm)	Sulfides
Market St	A1-01-Bulk	1,500	1,100	238	7.9	45	570	Not Present
	RW-B-05-Grab1	13,000	13,000	178	8.1	45	<5	Not Present
	RW-B-05-Grab2	1,700	1,700	-24	7.7	45	310	Not Present

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ESSENTIAL
CORROSION
PROTECTION

11/19/2022

Hillis-Carnes Consulting Group Laboratory Soil Sample Analysis Results

Project SUBm	Sample ID	As-Is Resistivity (ohm-cm)	"Wetted" Resistivity	Redox (mV)	pH	Chloride (ppm)	Sulfate (ppm)	Sulfides
Mkt St 5	RW-B-12, G2	26,000	26,000	-52	6.9	45	<5	Not Present
5	RW-B-13, G1	28,000	4,300	87	8.6	45	185	Not Present
5	Lot-A2-12, G1	42,000	2,800	124	8.6	45	270	Not Present
4	RW-B-12, Grab	2,100	1,800	27	8.2	45	240	Not Present
4	RW-B-11,GRab	1,900	1,900	92	8.0	65	70	Not Present
3	Lot-A2-18, Grab	39,000	2,100	68	10.0	20	750	Not Present
5	RW-B-10, Grab	5,300	3,100	116	9.3	20	80	Not Present

Appendix D

ADVANCED GeoServices
Engineering for the Environment. Planning for People.™

1055 Andrew Drive, Suite A
West Chester, PA 19380-4293
tel 610.840.9100 fax 610.840.9199
www.advancedgeoservices.com

March 12, 2014

2013-3065-04

The Buccini Pollin Group
322 A Street
Wilmington, DE 19806

Attention: Mr. John Groth

GEOTECHNICAL INVESTIGATION
201-211 SOUTH MARKET STREET
WILMINGTON, DELAWARE

Gentlemen:

Advanced GeoServices is pleased to present this report of the geotechnical investigation conducted to assist with the design and construction of the proposed development at 201-211 South Market Street in Wilmington, Delaware. This investigation was conducted in general accordance with our proposal 2013-P-0301-G last revised on December 4, 2013 and your verbal authorization.

Soil samples obtained during this investigation will be retained for a period of six months, after which they will be returned to you.

We appreciate this opportunity to be of service to you during the initial phase of this development. We are available to provide additional assistance during subsequent design/construction phases. Please call us when we may be of further service.

Very truly yours,

ADVANCED GEOSERVICES

Paul F. Marano, P.E.
Project Consultant

PAUL F. MARANO
No. 8919

Todd D. Trotman, P.E.
Project Consultant

PFM:TDT:kk

Attachments

F:\Projects\2013\20133065 - 201-211 South Market Street\Sec Files\Reports\Geotechnical Report (3-12-14).docx

INTRODUCTION

The Buccini Pollin Group engaged Advanced GeoServices Corp. to conduct this geotechnical investigation for the proposed development at 201-211 South Market Street. The development site is located on the west side of Market Street, just south of its intersection with A Street in Wilmington, Delaware.

The investigation for this parcel consisted of a site reconnaissance by Advanced GeoServices personnel, the drilling and logging of eleven test borings, laboratory testing of representative soil samples, appropriate engineering analyses, and the preparation of this report. This report addresses the observed subsurface conditions in conjunction with the information provided to us and presents conclusions and recommendations with regard to geotechnical issues related to the design and construction of the proposed development.

SITE CONDITIONS

The site consists of two parcels: 201 and 211 South Market Street, as shown on Figure 1. Parcel 201 is a 0.6 acre lot located in the northeast corner of the site, adjacent to Market Street. Parcel 211 takes up the remaining 5.2 acres of the site. The site is fairly level; ground surface elevations range from 5 to 6 on the 201 parcel and from 5.5 to 7 on the 211 parcel.

Both parcels are presently open. Several buildings had been situated on site; the former floor slab areas are still present. The western edge of parcel 211 (adjacent to the Christina River) is wooded. The majority of the remaining site areas are covered with concrete that does not seem to be structural; the concrete appears to have been dumped on site and spread out.

PROJECT DESCRIPTION

The proposed development will consist of 45 townhomes, located in nine clusters on parcel 201 and the north and southeast sections of parcel 211, and an apartment building in the southwest corner of parcel 211, as shown on Figure 1. The height of the apartment building has not been finalized; it may be as low as 4 stories or as high as 16 stories. Wall/column loadings for these structures have not been developed yet, but we expect that the townhome loadings will be relatively light.

The townhomes will be on-grade and the apartment building will be erected over on-grade parking. The finished site grades will likely be at or about elevation 10; this grading will require about 3 to 5 feet of additional fill throughout the majority of the site.

GENERAL SUBSURFACE CONDITIONS

The site is located within the estuary zone of the Christina River. This region is characterized by a surface layer of fill underlain by fine-grained alluvium and granular alluvium. The weathering profile of the underlying bedrock (decomposed and intact granite) is present beneath the alluvial strata.

Subsurface conditions were defined by drilling eleven test borings. The boring locations are shown on Figure 1, and logs of the borings are included in Appendix A. Laboratory testing was conducted on representative samples of the collected subsurface materials. The results of this testing is included in Appendix B. Inferred subsurface profiles in the apartment building and townhome areas are shown on Figures 2 and 3, respectively, and the encountered subsurface conditions are summarized below.

Concrete

The borings in the southern and western portions of the site (B-1 through B-7) contain a surface cover of concrete. The concrete ranges from 8 to 12 inches thick and is distressed; we were able to penetrate it with the augers during drilling.

Existing Fill

Existing fill was encountered in all borings either at the ground surface or beneath the concrete. The fill predominantly consists of silty clay or silty sand and gravel and ranges from 3 to 9 feet thick. The Standard Penetration Test results (ASTM D 1586 'N' values) of the silty clay fill range from 2 to 7 blows per foot, indicating a soft to firm consistency. The 'N' values within the silty sand and gravel fill range from 7 to 46 blows per foot, indicating a dense to very dense condition.

Moisture content testing was conducted on two of the samples of silty clay fill. The moisture contents were 25.8 and 24.0 percent.

Fine Grained Alluvium

The river estuary material was encountered beneath the fill in all borings. This material consists of very moist gray silty clay with fine sand lenses. The thickness of the fine grained alluvium ranges from 15 to 23 feet throughout most of the site, but increases to 34 feet in boring B-11 (parcel 201). The 'N' values within this material generally range from weight of hammer (WOH) to 8 blows per foot and can typically be classified as very soft to soft.

Representative samples of this alluvium were tested for moisture content and Atterberg (plasticity) limits. The moisture contents range from 44.2 to 65.4 percent. The liquid limits range from 68 to 88 percent and the plastic limits range from 32 to 36 percent.

Engineering property testing (unconsolidated undrained triaxial (strength) tests and consolidation (settlement) testing) was conducted on two undisturbed tube samples collected from this stratum. The results show compressive strengths of 970 and 1,120 pounds per square foot. The settlement characteristics are shown on the appropriate graphs in Appendix B.

Granular Alluvium

Two interbedded strata of granular alluvium (a medium to fine sand and a coarse to fine sand and gravel) are present beneath the fine-grained alluvium in all of the test borings. The medium to fine sand stratum is present in six of the borings and is 5 to 12 feet thick. The 'N' values within the medium to fine sand range from 6 to 26 blows per foot, indicating a generally medium dense condition.

The sand and gravel is present in ten of the borings at elevations of -17.5 to -25 and ranges from 5 to more than 16 feet thick. The 'N' values within the sand and gravel range from 6 to 81 blows per foot, indicating a generally dense to very dense condition.

Decomposed Rock

Decomposed rock was encountered beneath the granular alluvium at depths of 33 to 43 feet (elevations of -37.5 to -38.5) in eight of the borings. This horizon results from the physical and chemical weathering of the underlying granitic bedrock and consists of multicolored fine sandy silty clay. The decomposed rock is saprolitic (soil-like), but still retains a relic rock structure. The 'N' values range from 32 to 80 blows per foot in the Apartment Building area and 16 to 40 blows per foot in the Townhome areas, classifying this material as hard and very stiff, respectively. The thickness of the decomposed rock, where fully penetrated, ranges from 10 to 39 feet.

Intact Rock

Auger refusal, an indication of intact (unweathered) rock, was encountered in borings B-1 through B-4 at depths of 51 to 80 feet, corresponding to an elevation range of -44.5 to -74.5.

Groundwater

Groundwater was encountered at depths of 3 to 6 feet in the borings during drilling. These depths correspond to an elevation range of -0.5 to 3.0. It should be noted that the site is adjacent to the Christina River and groundwater levels are influenced by tidal action.

CONCLUSIONS

Based upon our evaluation of the collected information and our understanding of regional subsurface conditions, we offer the following comments and conclusions.

Earthworks

Imported fill will be required to bring the site up to the proposed grades. The anticipated new fill thickness ranges from 3 to 5 feet. Recommendations for the fill are included in this report.

The majority of the site excavations will likely be within the new fill or the existing fill. The new fill, if excavated at a suitable moisture content, can be re-used as fill/backfill. The predominantly granular (sand and gravel) portions of the existing fill are also suitable for re-use as fill in their present state. The fine grained silty clay fill appears to be too wet to achieve proper compaction and if excavated is not suitable for re-use as fill.

The site contains building remnants and the majority of the site contains an 8 to 12 inch thick concrete cover. Although some portions of this concrete cover were distressed and can be easily penetrated, the presence of these obstructions and associated delays in excavations should be considered during the planning and scheduling of the work.

Groundwater was encountered at elevations of -0.5 to +3.0 within the borings. The groundwater level is influenced by the tidal action of the adjacent Christina River. For planning purposes, it would be prudent to assume that excavations of 6 feet or more below the final grades will require groundwater control measures.

Settlements

The additional load of the new fill will induce settlement of the underlying soft fine grained alluvium. From the conditions encountered in the borings and the soil parameters derived from the consolidation tests, these settlements were calculated to be 6 to 8 inches in the 211 parcel and as much as 14 inches in the 201 parcel (where the soft stratum is thicker). The estimated times for the majority of these settlements to occur were calculated to be 2 to 4 months in parcel 211 and 4 to 8 months in parcel 201.

Settlement calculations are not precise. It has been our experience that calculated settlement estimates are typically very conservative and the actual settlements that occur are usually significantly less than the calculated amounts. However, the resulting settlements are likely to be in excess of what would be tolerable for building or floor slab support.

If the project schedule allows, it would be beneficial to place this fill in advance and allow the settlements to occur prior to site/building construction. The settlements could also be induced (and the time for settlement decreased) by the application of an additional surcharge on top of the grading fill. This process would allow for the use of on-grade slabs and eliminate the need for structurally supported slabs. A surcharge procedure and associated settlement monitoring program can be developed once the final grading plan, floor loads, and project schedule are finalized.

Foundations

The underlying soft fine grained alluvium will settle excessively under the proposed building loads; a deep foundation system will be required for support of the structures. Several deep foundation types are feasible for this site including timber piles, augered cast-in-place concrete piles, and concrete filled steel pipe piles. The selection of a cost-effective pile type will depend upon the expected column/wall loads. Considering their relatively light loads, the townhomes can be economically supported on timber piles.

Floor Slab Support

Ground floor slabs will require pile support because of the expected settlement of the underlying soft materials. However, the slabs can be supported on grade if the new grading fills are surcharged and/or allowed to settle prior to construction. If a surcharge/settlement monitoring program is implemented it may still be necessary to perform corrective measures such as additional compaction and/or limited undercutting to provide adequate support in some localized areas.

RECOMMENDATIONS

Recommendations pertaining to the design and construction of the proposed 201-211 South Market Street development are presented in the following sections. These recommendations should be reviewed and modified if necessary when the site grades and building loads are finalized.

Site Preparation

All debris, topsoil, vegetation, and former building remnants that will interfere with the proposed development should be removed from the construction areas. The existing concrete cover should either be removed or broken up into small (< 12 inch) pieces and left in place. Existing utilities that will be disturbed by the construction should be relocated or abandoned.

Stripped areas that do not contain a concrete rubble cover should be proof-rolled with a smooth drum vibratory roller to delineate any soft/unstable areas and to compact soils disturbed during the previous stripping/removal operations. Areas which exhibit instability should be undercut and replaced with compacted load-bearing fill.

Load-Bearing Fill

Materials used as load-bearing fill and backfill should consist of predominantly granular soils that are free of organics, degradable inclusions, excess moisture, frozen materials, or particles larger than 8 inches. The granular portions of the existing fill can be re-used as load-bearing fill, provided that the unsuitable materials noted above are removed from the fill prior to its re-use.

Load-bearing fill should be placed on a stable subgrade in horizontal lifts with a maximum loose thickness of 12 inches. Each lift should be compacted to at least 92 percent of the maximum dry density as determined by ASTM D 1557. In addition, each lift must be stable, i.e., no appreciable movement should be noted beneath the traffic of the construction equipment.

Foundations

The townhomes should be supported on 8-inch (tip diameter) timber piles bearing 4 to 5 feet into the underlying very dense granular alluvium. The calculated allowable pile capacities and bearing levels are shown below:

201 parcel: 9 tons/pile - bearing at elev. -40 (~ 50 ft. beneath final grade)
211 parcel: 14 tons/pile - bearing at elev. -24 (~ 34 ft. beneath final grade)

Several pile types and bearing levels can be used for support of the apartment building. The pile types and diameters, calculated allowable capacities, and bearing elevations are shown below:

Pile Type	Diameter	Capacity	Bearing	Depth (1)
Timber	8 inch (tip)	14 tons	elev. -24	~ 34 ft.
ACIP (2)	12 inch	21.5 tons	elev. -31	~ 37 ft.
	14 inch	31 tons	elev. -31	~ 37 ft.
	18 inch	65 tons	elev. -31	~ 37 ft.
ACIP (3)	12 inch	60 tons	rock	50-80 ft.
	14 inch	80 tons	rock	50-80 ft.
	18 inch	132 tons	rock	50-80 ft.
Pipe Pile (4)	12 inch	35 tons	elev. -24	~ 34 ft.
	14 inch	52 tons	elev. -24	~ 34 ft.
	18 inch	112 tons	elev. -24	~ 34 ft.
Pipe Pile (5)	12 inch	38.5 tons	elev. -33	~ 43 ft.
	14 inch	57 tons	elev. -33	~ 43 ft.
	18 inch	120 tons	elev. -33	~ 43 ft.

(1) beneath final grade (assumed elev. +10)
(2) augered, cast-in-place concrete pile bearing on decomposed rock
(3) augered, cast-in-place concrete pile bearing on intact rock
(4) concrete filled steel pipe pile bearing 5 ft. into very dense granular alluvium
(5) concrete filled steel pipe pile bearing on decomposed rock

The listed bearing levels should be used for bidding and estimating purposes; the actual bearing elevation at any given location must be determined in the field during installation.

We recommend the performance of a pile load test for any pile type with a capacity of 60 tons or greater. The test should be monitored by the geotechnical engineer.

Note that these foundations should also be used to support ground floor slabs unless a surcharge/settlement monitoring program is implemented prior to construction.

Timber Piles

Timber piles should consist of pressure treated Douglas fir or southern pine timber piles that meet the requirements of ASTM D 25, Standard Specification for Round Timber Piles. All piles should have a minimum tip diameter of 8 inches and a minimum butt diameter of 10 inches. The estimated allowable pile capacities and bearing levels are noted above.

Capacities should be determined during the driving operation by means of the modified Engineering News formula stated below:

$$P = \frac{1.25\, e_h E_h}{S + 0.1} \frac{W_r + n^2 W_p}{W_r + W_p}$$

where:

P = allowable pile capacity, in pounds
e_h = hammer efficiency (usually between 0.75 and 1.0)
E_h = hammer energy rating, in foot-pounds
s = amount of point penetration per blow, in inches
W_r = weight of ram, in pounds
n = coefficient of restitution (0.25 for timber piles)
W_p = weight of pile, including weight of pile cap, driving shoe, and cap block, in pounds

Center to center spacing of individual piles within a group should be at least 2.5 times the butt diameter. A reduction factor for pile groups will not be required.

Piles should be installed within three inches of the design location and should be no more than two percent out of plumb. Piles should be checked for heaving after the surrounding piles are driven, and any piles which are found to have heaved more than 2 inches should be re-driven.

Augered Cast-in-Place Concrete Piles

The apartment building can be supported on augered cast-in-place concrete piles designed for the allowable capacities and estimated bearing levels shown above. No reduction factor will be required for pile groups. The minimum center-to-center spacing between piles in a group should be 2.5 times the pile diameter.

The foundations should be installed by an experienced pile contractor and crew with a minimum of three years of auger-cast pile installation experience. The contractor should have successfully completed at least three projects of similar size under similar site and subsurface conditions.

The piles should be installed with a continuous flight auger with a diameter of ± 3% of the planned pile diameter. The contractor should make every attempt to install the piles so that the actual pile center is within 3 inches of the planned center.

The grout port on the auger should be at the bottom and should be plugged during augering. The auger should be advanced in a continuous manner until the design bearing level is achieved. The rate of grout injection must be coordinated with the rate of auger removal so that a minimum of five feet of grout head is maintained in the augers. The total grout volume of each pile should be at least 115% of its theoretical volume. This injection rate should be determined for the on-site equipment prior to pile installation. If the injected grout volume falls below 115% for a five feet increment of the pile, the pile should be re-drilled ten feet and re-grouted.

Cans or short casing should be installed at the surface of each pile to prevent debris/soil intrusion into the top of the completed pile.

Concrete Filled Steel Pipe Piles

The apartment building can be supported on concrete filled steel pipe piles designed for the allowable capacities and estimated bearing levels shown above. No reduction factor will be required for pile groups.

Center to center spacing of individual piles within a group should be at least 2.5 times the pile diameter. The contractor should make every attempt to install the piles so that the actual pile center is within 3 inches of the planned center. The use of a driving shoe is recommended.

Capacities should be determined during the driving operation by means of pile driving analyzers. Alternatively, the modified Engineering News formula stated below can be used.

$$P = \frac{1.25\, e_h E_h}{S + 0.1} \, \frac{W_r + n^2 W_p}{W_r + W_p}$$

where:

P = allowable pile capacity, in pounds
e_h = hammer efficiency (usually between 0.75 and 1.0)
E_h = hammer energy rating, in foot-pounds
s = amount of point penetration per blow, in inches
W_r = weight of ram, in pounds
n = coefficient of restitution (0.50 for steel pile on steel anvil)
W_p = weight of pile, including weight of pile cap, driving shoe, and cap block, in pounds

Floor Slabs

Ground floor slabs should be structurally supported unless a surcharge/settlement monitoring program is implemented. If so, the slabs can be supported on grade on load-bearing fill. Prior to on-grade slab construction, the subgrade should be proof-rolled with a smooth drum vibratory roller to delineate any soft/unstable areas and to compact soils disturbed during the previous construction operations. Areas which exhibit instability should be undercut and replaced with compacted load-bearing fill.

To preclude uneven curing and to provide a capillary break, a four-inch thick well compacted granular base course should be placed beneath the slabs. The base course should consist of a free-draining coarse aggregate such as DelDOT No. 57.

Seismic Design Criteria

We recommend that seismic site class D be used for design of structures on this site. This classification was developed using the subsurface conditions defined by the test borings in accordance with IBC procedures for determining seismic site classification.

Further Studies/Evaluation

We recommend that further analyses and/or evaluations be performed when the site grading and structural loads have been finalized. These studies should include the requirements for a surcharge and/or settlement monitoring program (if the project schedule allows it) and further refinement of the pile types and capacities.

Construction Monitoring

We also recommend monitoring of the geotechnical aspects of the construction by a geotechnical engineering firm that is familiar with the site conditions and the proposed construction. This monitoring should include earthworks construction, pile installations, and subgrade preparation procedures.

LIMITATIONS

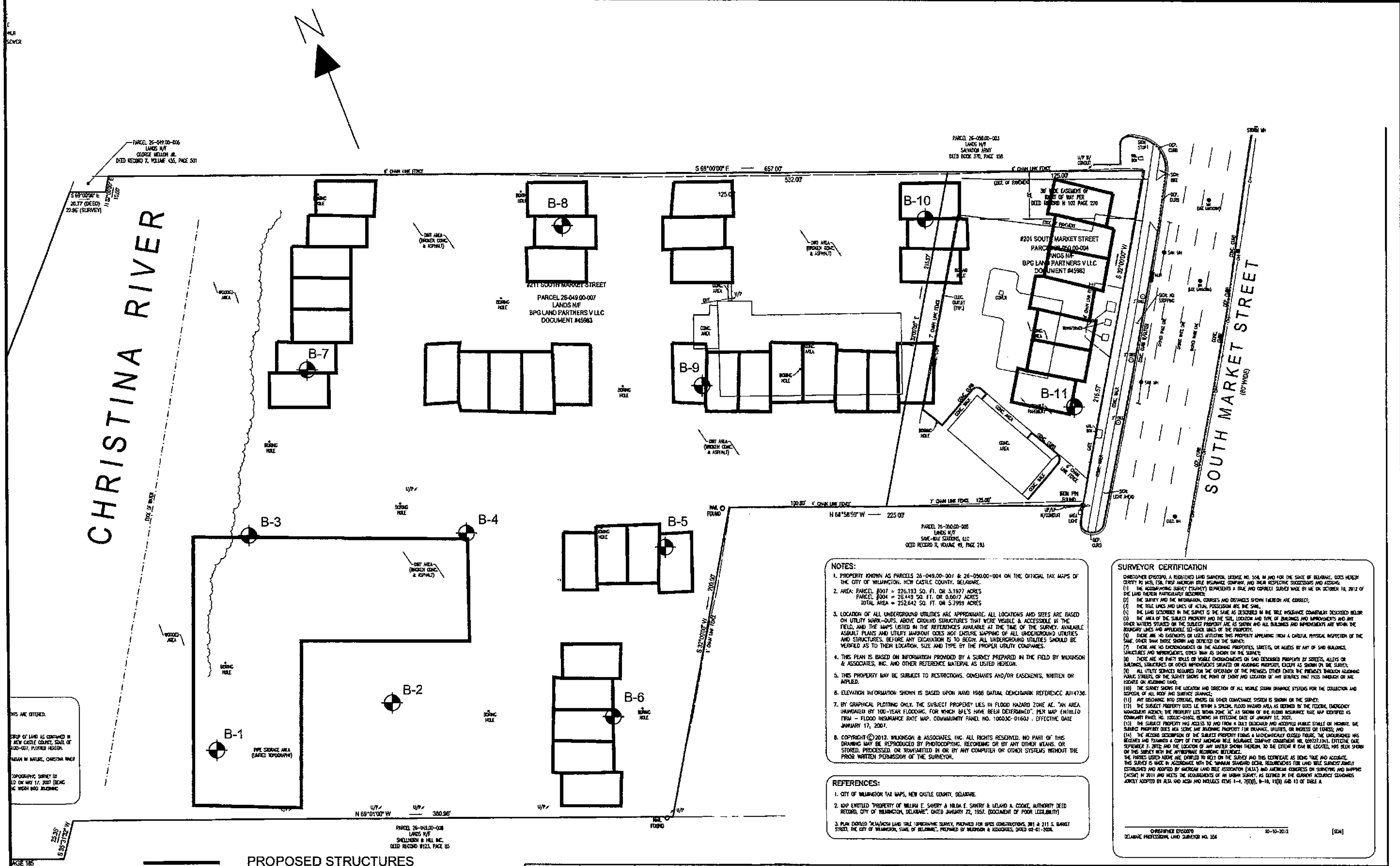
All conclusions and recommendations presented in this report are predicated on the assumptions that the information provided to us by others is accurate and that the subsurface conditions do not deviate appreciably from those disclosed by the test borings. Our conclusions and recommendations are subject to confirmation or revision upon our review of the final plans and specifications for the proposed construction, and are based on the premise that competent geotechnical field decisions will be provided during construction.

The scope of this geotechnical investigation report is limited to an evaluation of the load-carrying capabilities and stability of the subsurface materials. Oil, hazardous waste, radioactivity, irritants, pollutants, radon, and other dangerous substances and conditions were not the subject of this report.

Their presence and/or absence is not implied, inferred, or suggested by this report or the results of this study.

Statements and conclusions regarding the impact of geotechnical conditions on the design and construction of this development, as stated in this report, are unique to the proposed project. Findings, conclusions, and recommendations are not transferable to other development schemes, site arrangements, or structural systems.

FIGURES



NOTES:

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   PARCEL #004 = 26,449 SQ. FT. OR 0.6072 ACRES
   TOTAL AREA = 252,642 SQ. FT. OR 5.7999 ACRES
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REFERENCES:

1. CITY OF WILMINGTON TAX MAPS, NEW CASTLE COUNTY, DELAWARE.
2. MAP ENTITLED "PROPERTY OF WILLIAM E. SAVERY & HILDA E. SAVERY & LELAND A. COOKE, AUTHORITY DEED RECORD, CITY OF WILMINGTON, DELAWARE", DATED JANUARY 22, 1957. (DOCUMENT OF POOR LEGIBILITY)
3. PLAN ENTITLED "ALTA/ACSM LAND TITLE TOPOGRAPHIC SURVEY, PREPARED FOR SPES CONSTRUCTIONS, 201 & 211 S. MARKET STREET, THE CITY OF WILMINGTON, STATE OF DELAWARE", PREPARED BY WILKINSON & ASSOCIATES, DATED 02-01-2008.

SURVEYOR CERTIFICATION

CHRISTOPHER EPISCOPO, A REGISTERED LAND SURVEYOR, LICENSE NO. 556 IN AND FOR THE STATE OF DELAWARE, DOES HEREBY CERTIFY TO BPG, FSB, FIRST AMERICAN TITLE INSURANCE COMPANY, AND THEIR RESPECTIVE SUCCESSORS AND ASSIGNS:
(1) THE ACCOMPANYING SURVEY ("SURVEY") REPRESENTS A TRUE AND CORRECT SURVEY MADE BY ME ON OCTOBER 10, 2012 OF THE LAND THEREIN PARTICULARLY DESCRIBED;
(2) THE SURVEY AND THE INFORMATION, COURSES AND DISTANCES SHOWN THEREON ARE CORRECT;
(3) THE TITLE LINES AND LINES OF ACTUAL POSSESSION ARE THE SAME;
(4) THE LAND DESCRIBED IN THE SURVEY IS THE SAME AS DESCRIBED IN THE TITLE INSURANCE COMMITMENT DESCRIBED BELOW;
(5) THE AREA OF THE SUBJECT PROPERTY AND THE SIZE, LOCATION AND TYPE OF BUILDINGS AND IMPROVEMENTS AND ANY OTHER MATTERS SITUATED ON THE SUBJECT PROPERTY ARE AS SHOWN AND ALL BUILDINGS AND IMPROVEMENTS ARE WITHIN THE BOUNDARY LINES AND APPLICABLE SET-BACK LINES OF THE PROPERTY;
(6) THERE ARE NO EASEMENTS OR USES AFFECTING THIS PROPERTY APPEARING FROM A CAREFUL PHYSICAL INSPECTION OF THE SAME, OTHER THAN THOSE SHOWN AND DEPICTED ON THE SURVEY;
(7) THERE ARE NO ENCROACHMENTS ON THE ADJOINING PROPERTIES, STREETS, OR ALLEYS BY ANY OF SAID BUILDINGS, STRUCTURES AND IMPROVEMENTS, OTHER THAN AS SHOWN ON THE SURVEY;
(8) THERE ARE NO PARTY WALLS OR VISIBLE ENCROACHMENTS ON SAID DESCRIBED PROPERTY BY STREETS, ALLEYS OR BUILDINGS, STRUCTURES OR OTHER IMPROVEMENTS SITUATED ON ADJOINING PROPERTY, EXCEPT AS SHOWN ON THE SURVEY;
(9) ALL UTILITY SERVICES REQUIRED FOR THE OPERATION OF THE PREMISES EITHER ENTER THE PREMISES THROUGH ADJOINING PUBLIC STREETS, OR THE SURVEY SHOWS THE POINT OF ENTRY AND LOCATION OF ANY UTILITIES THAT PASS THROUGH OR ARE LOCATED ON ADJOINING LAND;
(10) THE SURVEY SHOWS THE LOCATION AND DIRECTION OF ALL VISIBLE STORM DRAINAGE SYSTEMS FOR THE COLLECTION AND DISPOSAL OF ALL ROOF AND SURFACE DRAINAGE;
(11) ANY DISCHARGE INTO STREAMS, RIVERS OR OTHER CONVEYANCE SYSTEM IS SHOWN ON THE SURVEY;
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(13) THE SUBJECT PROPERTY HAS ACCESS TO AND FROM A DULY DEDICATED AND ACCEPTED PUBLIC STREET OR HIGHWAY. THE SUBJECT PROPERTY DOES NOT SERVE ANY ADJOINING PROPERTY FOR DRAINAGE, UTILITIES, OR INGRESS OR EGRESS; AND
(14) THE RECORD DESCRIPTION OF THE SUBJECT PROPERTY FORMS A MATHEMATICALLY CLOSED FIGURE. THE UNDERSIGNED HAS RECEIVED AND EXAMINED A COPY OF FIRST AMERICAN TITLE INSURANCE COMPANY COMMITMENT NO. 659727.1041, EFFECTIVE DATE SEPTEMBER 7, 2012; AND THE LOCATION OF ANY MATTER SHOWN THEREON, TO THE EXTENT IT CAN BE LOCATED, HAS BEEN SHOWN ON THIS SURVEY WITH THE APPROPRIATE RECORDING REFERENCE.
THE PARTIES LISTED ABOVE ARE ENTITLED TO RELY ON THE SURVEY AND THIS CERTIFICATE AS BEING TRUE AND ACCURATE.
THIS SURVEY IS MADE IN ACCORDANCE WITH THE "MINIMUM STANDARD DETAIL REQUIREMENTS FOR LAND TITLE SURVEYS" JOINTLY ESTABLISHED AND ADOPTED BY AMERICAN LAND TITLE ASSOCIATION ("ALTA") AND AMERICAN CONGRESS ON SURVEYING AND MAPPING ("ACSM") IN 2011 AND MEETS THE REQUIREMENTS OF AN URBAN SURVEY, AS DEFINED IN THE CURRENT ACCURACY STANDARDS JOINTLY ADOPTED BY ALTA AND ACSM AND INCLUDES ITEMS 1-4, 7(B)(1), 8-10, 11(B) AND 13 OF TABLE A.

CHRISTOPHER EPISCOPO 10-10-2012 [SEAL]
DELAWARE PROFESSIONAL LAND SURVEYOR NO. 556

SURVEY BY: MS	FIELD DATE: 10/5/12
DRAFTED BY: CRS	HORIZ. SCALE: 1" = 30'
DATE: 10/10/2012	VERT. SCALE: N/A
PROJECT NO.: 2012-128	CHECKED BY: TBJ
DRAWING NO.: 2012128ALTA	REVISION NO.: 0

REV NO.	DESCRIPTION	DATE
NO.	DESC.	DATE
NO.	DESC.	DATE
NO.	DESC.	DATE
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NO.	DESC.	DATE
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NO.	DESC.	DATE
NO.	DESC.	DATE

PREPARED BY:

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PHONE (610) 395-7940
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PREPARED FOR:

BPG LAND PARTNERS V, LLC
322 A STREET
WILMINGTON, DE 19801
PHONE NO.

PLAN TITLE:

ALTA/ACSM LAND TITLE SURVEY
OF
201 & 211 S. MARKET STREET
THE CITY OF WILMINGTON
STATE OF DELAWARE

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SHEET NO.: 1 OF 1

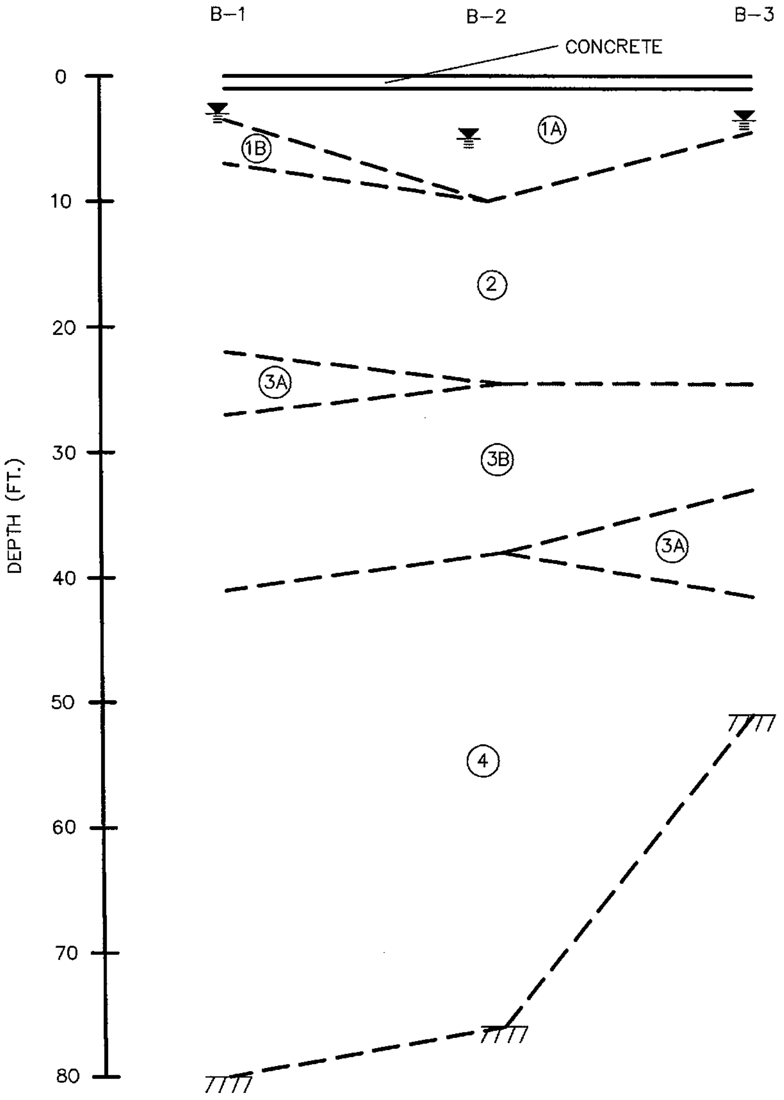
BORING LOCATION PLAN

PROJECT MANAGER:	PFM	SCALE:	1" = 60'
CHECKED BY:	PFM	PROJECT NUMBER:	20133065
DRAWN BY:	JRP	DATE:	2/7/2014

ADVANCED GeoServices
Engineering for the Environment. Planning for People.™
1055 ANDREW DRIVE, SUITE A, WEST CHESTER, PA 19380
tel 610.840.9100 fax 610.840.9199 www.advancedgeoservices.com

201-211 S. MARKET STREET
WILMINGTON, DE

FIG. 1



(1A): FILL: SOFT TO FIRM SILTY CLAY

(1B): FILL: VERY DENSE SILTY SAND AND GRAVEL

(2): FINE GRAINED ALLUVIUM: VERY SOFT TO SOFT SILTY CLAY WITH FINE SAND LENSES

(3A): GRANULAR ALLUVIUM: MEDIUM DENSE MEDIUM TO FINE SAND

(3B): GRANULAR ALLUVIUM: DENSE TO VERY DENSE COARSE TO FINE SAND AND GRAVEL

(4): DECOMPOSED ROCK: HARD SANDY SILTY CLAY WITH RELIC ROCK STRUCTURE

7777 AUGER/SPOON REFUSAL (INDICATIVE OF INTACT ROCK)

▼ GROUNDWATER LEVEL

HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 10'

INFERRED SUBSURFACE PROFILE
APARTMENT BUILDING AREA

PROJECT MANAGER: PFM
SCALE:
CHECKED BY: PFM
PROJECT NUMBER: 20133065
DRAWN BY: JRP
DATE: 2/17/2014

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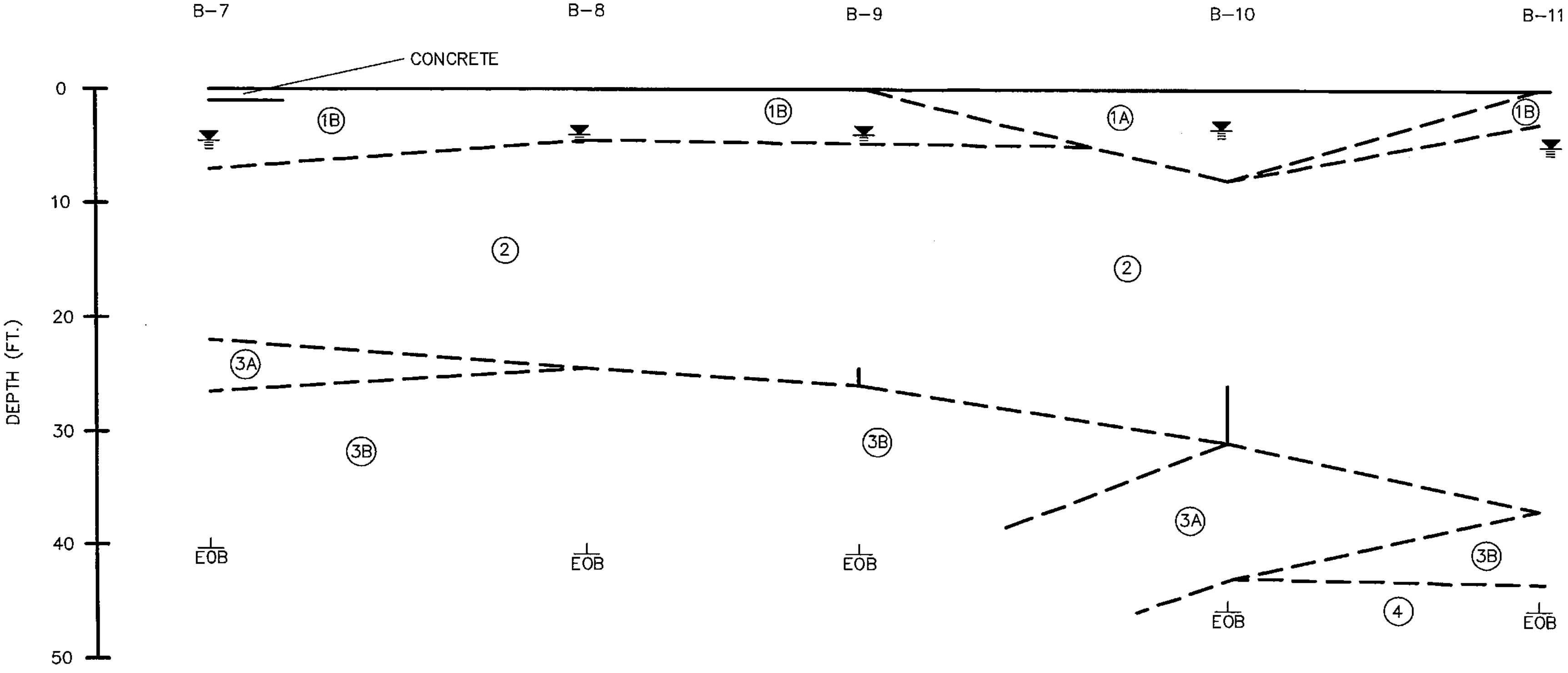
201-211 S. MARKET STREET
WILMINGTON, DE

FIG. 2



(1A): FILL: SOFT TO FIRM SILTY CLAY

(1B): FILL: MEDIUM DENSE TO VERY DENSE SILTY SAND AND GRAVEL

(2): FINE GRAINED ALLUVIUM: VERY SOFT TO SOFT SILTY CLAY WITH FINE SAND LENSES

(3A): GRANULAR ALLUVIUM: LOOSE TO MEDIUM DENSE MEDIUM TO FINE SAND

(3B): GRANULAR ALLUVIUM: DENSE TO VERY DENSE COARSE TO FINE SAND AND GRAVEL

(4): DECOMPOSED ROCK: VERY STIFF TO HARD SANDY SILTY CLAY WITH RELIC ROCK STRUCTURE

EOB END OF BORING

▼ GROUNDWATER LEVEL

HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 10'

INFERRED SUBSURFACE PROFILE
RESIDENTIAL AREA

PROJECT MANAGER: PFM
CHECKED BY: PFM
DRAWN BY: JRP
SCALE:
PROJECT NUMBER: 20133065
DATE: 2/17/2014

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201-211 S. MARKET STREET
WILMINGTON, DE

FIG. 3

APPENDIX A

APPENDIX A

TEST BORINGS

Subsurface conditions within the 201-211 South Market Street site were explored by drilling eleven test borings, located as shown on Figure 1. The borings were drilled by Earthcore Services under the technical supervision of Advanced GeoServices personnel. The field locations of the borings were determined by Advanced GeoServices personnel, and the ground surface elevations at the boring locations were estimated from topographic information presented on the February 27, 2013 Existing Conditions Plan developed by RK&K. Logs of the borings are included in this appendix.

Soil samples were obtained for identification and classification purposes by means of the Standard Penetration Test (ASTM D 1586). The sampling resistance of the subsurface materials is recorded on the boring log adjacent to the sample locations; this resistance is given in hammer blows per six inches (or fraction of six-inch increment) of sampler penetration. The Standard Penetration Resistance, or 'N' values, are also shown on the logs. These values are determined by totaling the blow counts required for the last 12 inches (or fraction of twelve-inch increment) of sampler penetration.

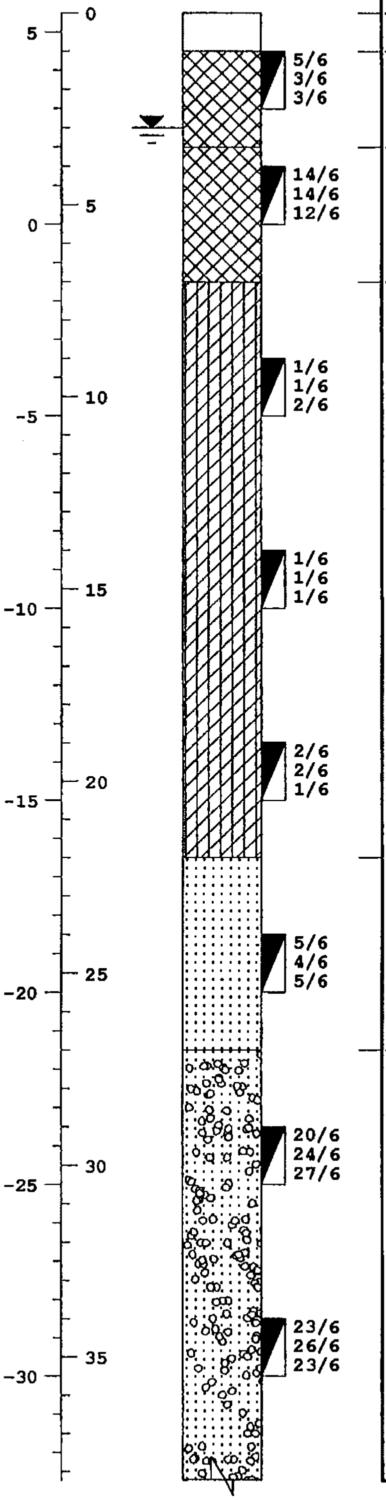
Undisturbed tube samples (ASTM D 1587) of the fine-grained alluvium were collected from borings B-3 and B-9. These samples are also shown on the logs.

Upon completion the boreholes were filled with a cement grout and the drilling spoils were placed in drums. The drums were left on site.

LOG OF TEST BORING
TEST BORING B-1

DATE: 2/5/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 3 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 5.5 ft.
CHECKED BY: PFM
DRILLER: T. Wilson
INSPECTOR: M. Simonds



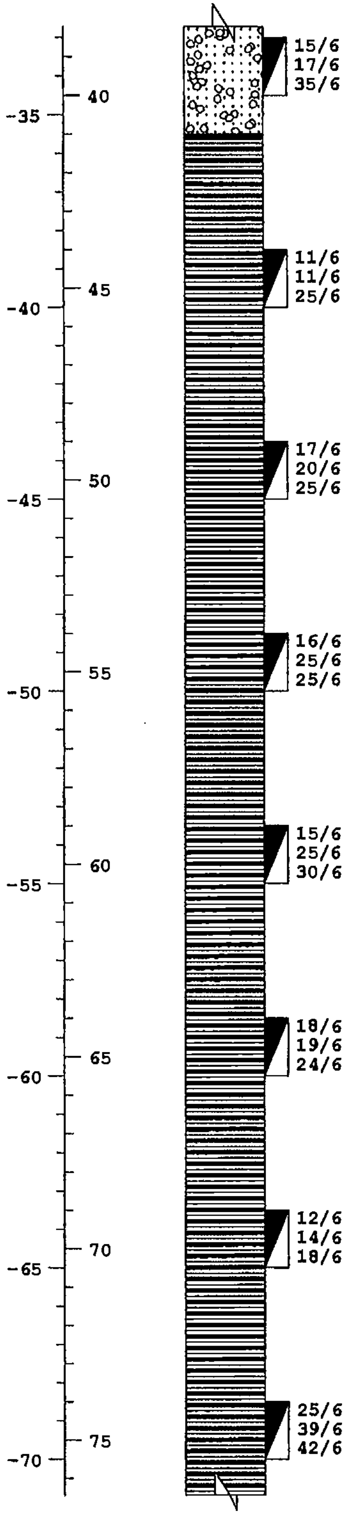
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
5.5		Concrete.			
1.0 4.5	5/6 3/6 3/6	Firm moist brown silty CLAY. (FILL)	6		
3.5 2	14/6 14/6 12/6	Very dense moist brown and gray silty coarse to fine SAND and GRAVEL. (FILL)	26		
7.0 -1.5	1/6 1/6 2/6	Soft moist light to dark gray silty CLAY, trace fine sand lenses. (FINE GRAINED ALLUVIUM)	3		
	1/6 1/6 1/6		2		
	2/6 2/6 1/6		3		
22.0 -16.5	5/6 4/6 5/6	Medium dense moist gray medium to fine SAND. (GRANULAR ALLUVIUM)	9		
27.0 -21.5	20/6 24/6 27/6	Very dense wet light brown and gray coarse to fine SAND and rounded GRAVEL. (GRANULAR ALLUVIUM)	51		
	23/6 26/6 23/6		49		

LOG OF TEST BORING

TEST BORING B-1

DATE: 2/5/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 3 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 5.5 ft.
CHECKED BY: PFM
DRILLER: T. Wilson
INSPECTOR: M. Simonds

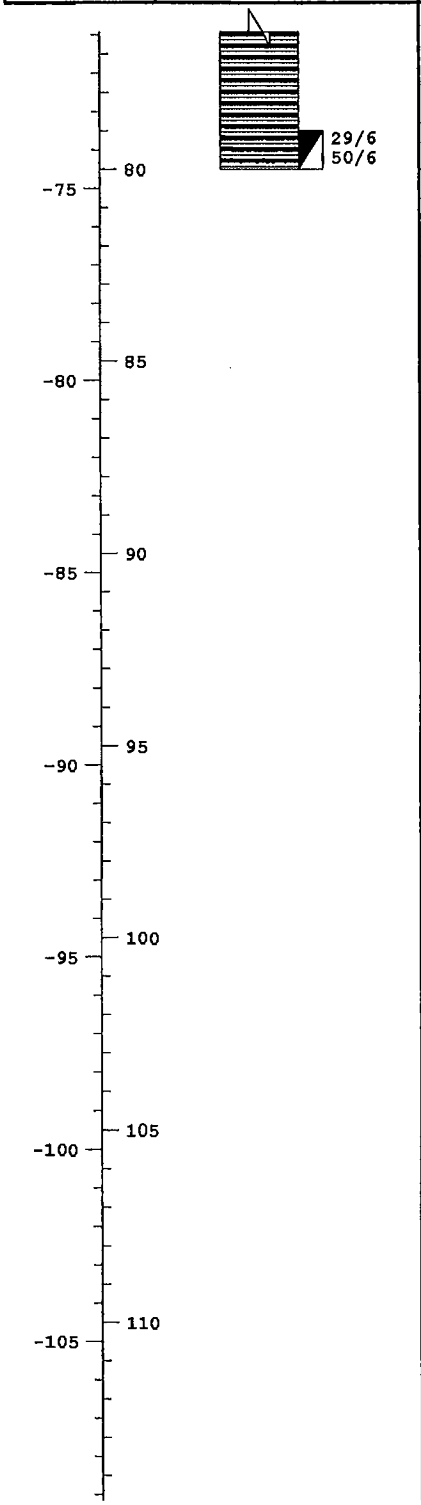


ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
	15/6 17/6 35/6	Very dense wet light brown and gray coarse to fine SAND and rounded GRAVEL. (GRANULAR ALLUVIUM)	52		
		41.0 -35.5			
		Hard, moist brown, black, white and green medium to fine sandy silty CLAY. Relic rock structure is evident. (DECOMPOSED ROCK)			
	11/6 11/6 25/6		36		
	17/6 20/6 25/6		45		
	16/6 25/6 25/6		50		
	15/6 25/6 30/6		55		
	18/6 19/6 24/6		43		
	12/6 14/6 18/6		32		
	25/6 39/6 42/6		81		

LOG OF TEST BORING
TEST BORING B-1

DATE: 2/5/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 3 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 5.5 ft.
CHECKED BY: PFM
DRILLER: T. Wilson
INSPECTOR: M. Simonds



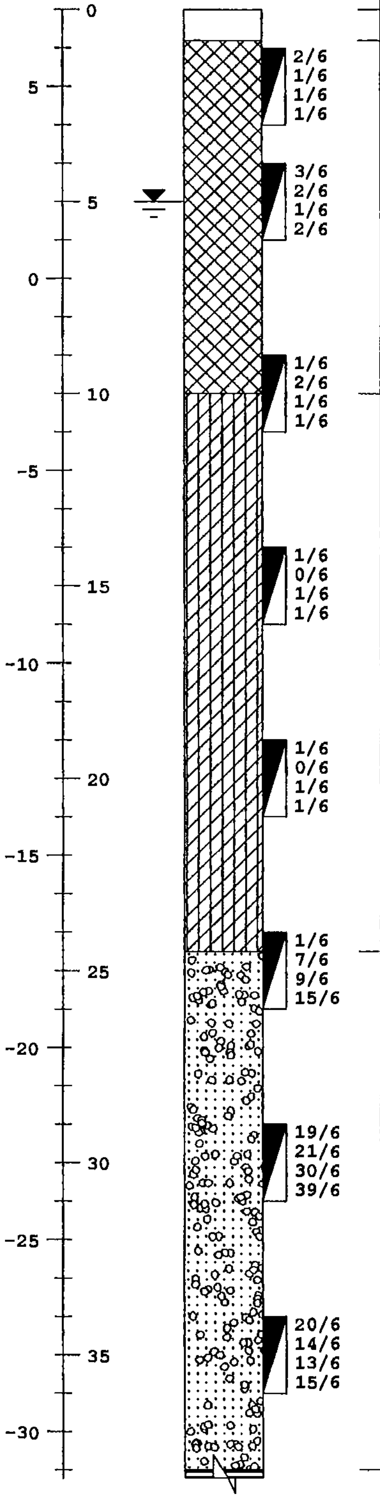
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
	29/6 50/6	Hard, moist brown, black, white and green medium to find sandy silty CLAY. Relic rock structure is evident. (DECOMPOSED ROCK) 80.0	50/6"		
		-74.5 Completion Depth = 80 feet END OF TEST BORING @ 80.0 FT.			

LOG OF TEST BORING
TEST BORING B-2

DATE: 1/30/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 5.0 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 7.0 ft.
CHECKED BY: PFM
DRILLER: T. Wilson
INSPECTOR: M. Simonds

ELEVATION / DEPTH — SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES

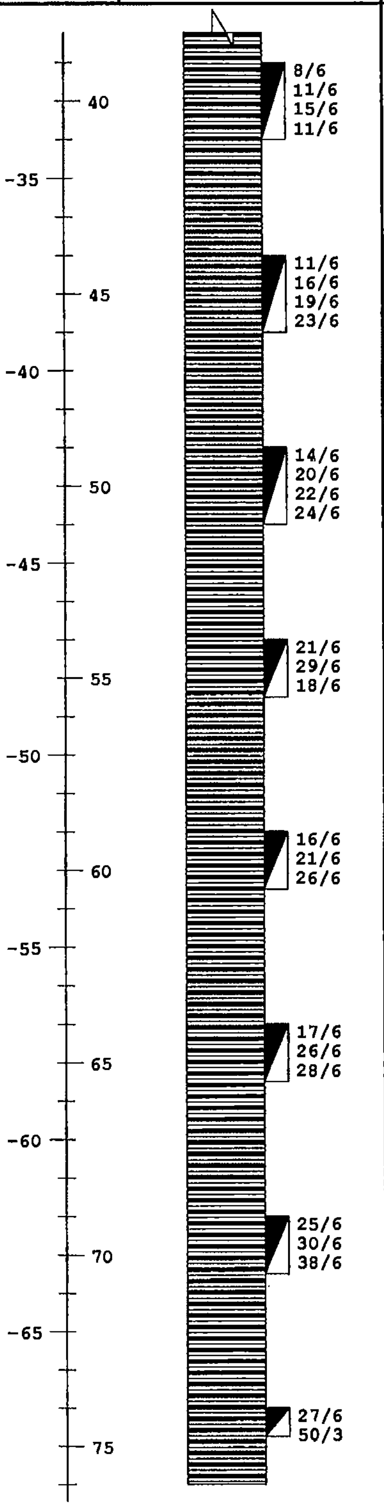


Soil Description		SPT (N)	Moisture (%)	Other Tests
Concrete.	7 0.8 6.2	2		
Soft moist dark brown and gray silty CLAY. (FILL)		3		
	10.0 -3	3		
Very soft to soft moist gray silty CLAY, trace fine sand lenses. (FINE GRAINED ALLUVIUM)		1	50.6	LL=68 PL=32
		1		
	24.5 -17.5	16		
Medium dense to very dense wet brown and gray coarse to fine SAND and rounded GRAVEL. (GRANULAR ALLUVIUM)		51		
		27		
	38.0			

LOG OF TEST BORING
TEST BORING B-2

DATE: 1/30/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 5.0 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 7.0 ft.
CHECKED BY: PFM
DRILLER: T. Wilson
INSPECTOR: M. Simonds



ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
	8/6 11/6 15/6 11/6	-31 Very stiff to hard moist brown, gray, white and black sandy silty CLAY. Relic rock structure is evident. (DECOMPOSED ROCK)	26		
	11/6 16/6 19/6 23/6		35		
	14/6 20/6 22/6 24/6		42		
	21/6 29/6 18/6		47		
	16/6 21/6 26/6		47		
	17/6 26/6 28/6		54		
	25/6 30/6 38/6		68		
	27/6 50/3		50/3"		
		76.0			

LOG OF TEST BORING

TEST BORING B-2

DATE: 1/30/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 5.0 ft.

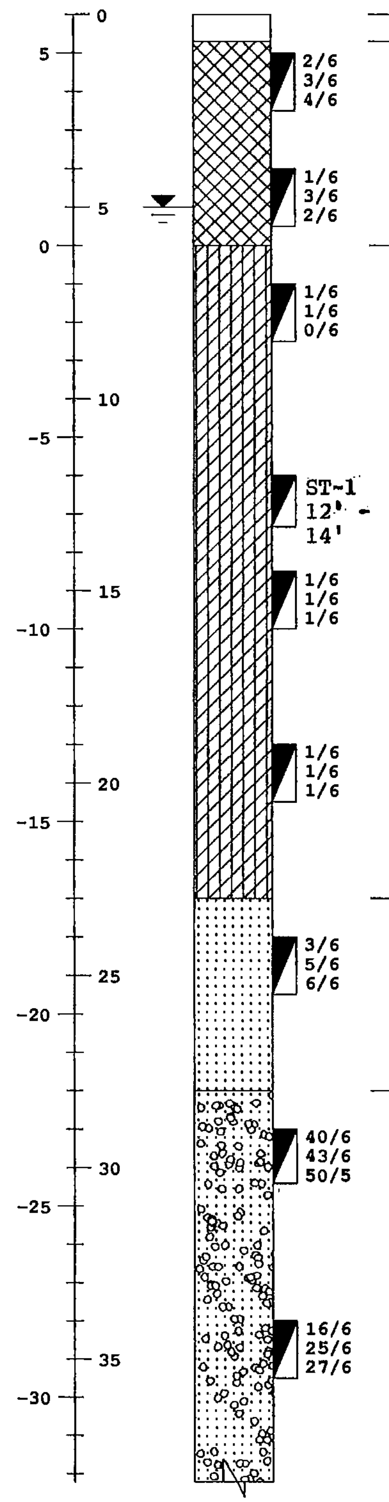
PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 7.0 ft.
CHECKED BY: PFM
DRILLER: T. Wilson
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
-70 80 -75 85 -80 90 -85 95 -90 100 -95 105 -100 110 -105		Completion Depth = 76 feet -69 AUGER REFUSAL @ 76.0 FT.			

LOG OF TEST BORING
TEST BORING B-3

DATE: 2/4/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 5.0 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 6.0 ft.
CHECKED BY: PFM
DRILLER: T. Wilson
INSPECTOR: M. Simonds

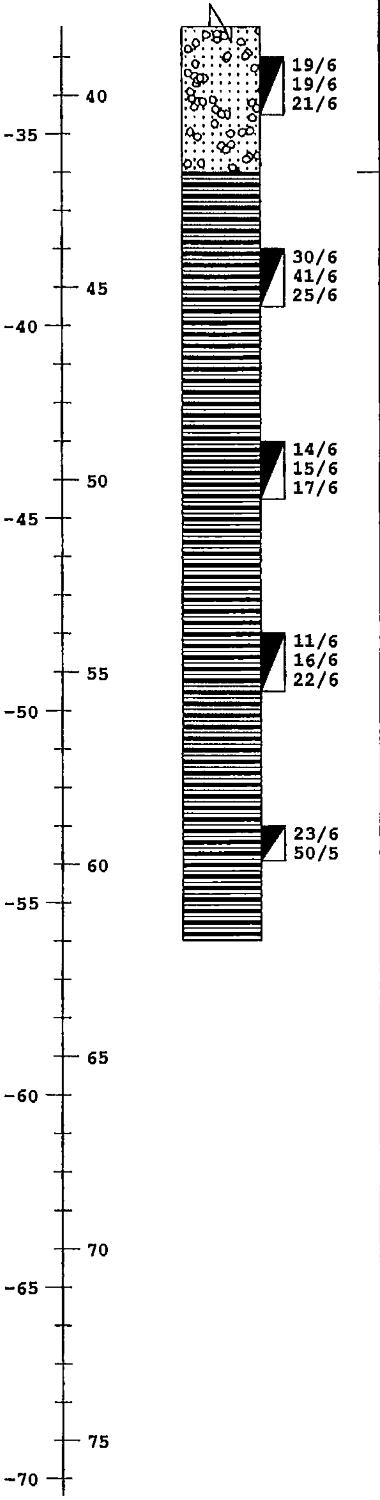


ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
6 0.7 5.3	2/6 3/6 4/6	Concrete. Firm moist red-brown silty CLAY with layers of sand. (FILL)	7	25.8	
	1/6 3/6 2/6		5	24.0	
6.0 0	1/6 1/6 0/6	Very soft to soft moist gray silty CLAY, trace fine sand lenses. (FINE GRAINED ALLUVIUM)	1	49.6	
	ST-1 12' 14'			59.5	*LL=73* *PL=36* *UU Consol.*
	1/6 1/6 1/6		2	44.2	
	1/6 1/6 1/6		2	56.1	
23.0 -17	3/6 5/6 6/6	Medium dense moist to wet gray medium to fine SAND. (GRANULAR ALLUVIUM)	11	31.0	
28.0 -22	40/6 43/6 50/5	Dense to very dense wet, brown and gray coarse to fine SAND and rounded GRAVEL. (GRANULAR ALLUVIUM)	93		
	16/6 25/6 27/6		52		

LOG OF TEST BORING
TEST BORING B-3

DATE: 2/4/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 5.0 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 6.0 ft.
CHECKED BY: PFM
DRILLER: T. Wilson
INSPECTOR: M. Simonds



Soil Description	SPT (N)	Moisture (%)	Other Tests
Dense to very dense wet, brown and gray coarse to fine SAND and rounded GRAVEL. (GRANULAR ALLUVIUM)	40		
42.0 -36 Hard moist red-brown gray and green sandy silty CLAY. Relic rock structure is apparent. (DECOMPOSED ROCK)	66		
	32		
	38		
	50/5"		
62.0 -56 Completion Depth = 62 feet AUGER REFUSAL @ 62.0 FT.			

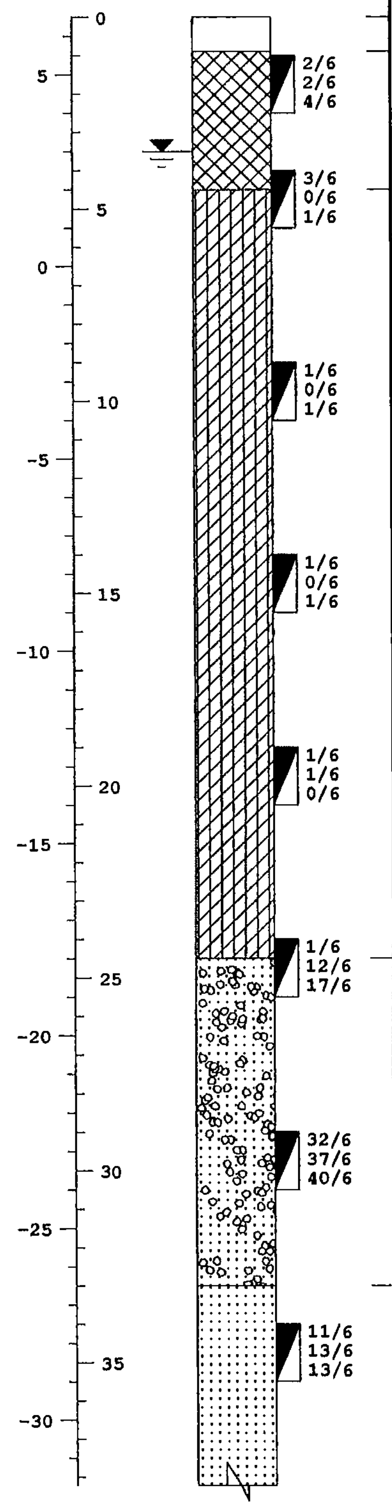
LOG OF TEST BORING
TEST BORING B-4

DATE: 1/31/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 3.5 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 6.5 ft.
CHECKED BY: PFM
DRILLER: T. Wilson
INSPECTOR: M. Simonds

ELEVATION / DEPTH

SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES

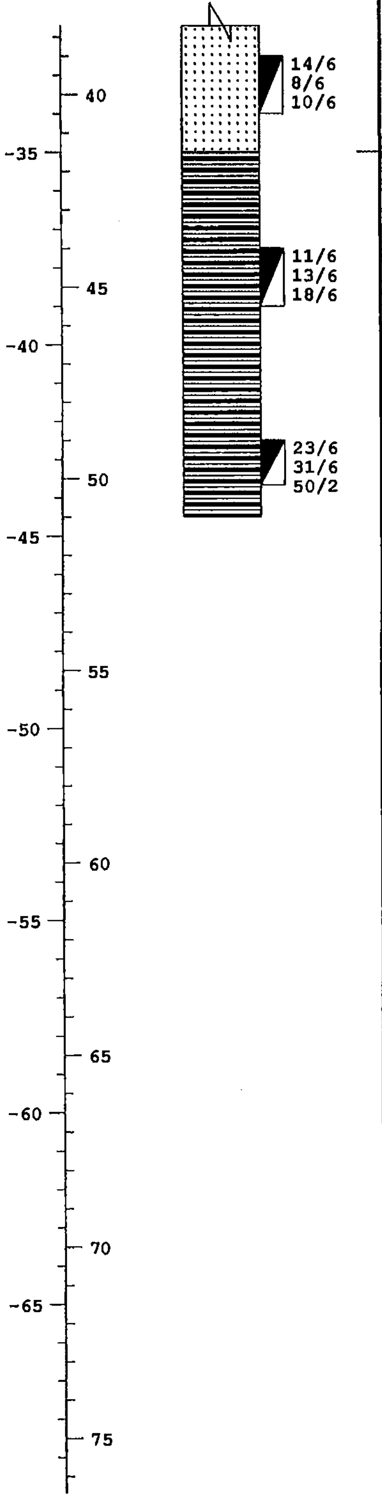


Soil Description	SPT (N)	Moisture (%)	Other Tests
6.5 Concrete.			
0.9 5.6 Firm moist brown sandy clayey SILT, trace gravel. (FILL)	6		
4.5 2 Very soft moist gray silty CLAY, trace fine sand lenses. (FINE GRAINED ALLUVIUM)	1		
	1		
	1		
	1		
24.5 -18 Dense to very dense wet brown and gray coarse to fine SAND and rounded GRAVEL. (GRANULAR ALLUVIUM)	29		
	77		
33.0 -26.5 Medium dense wet gray coarse to fine SAND, trace rounded gravel. (GRANULAR ALLUVIUM)	26		

LOG OF TEST BORING
TEST BORING B-4

DATE: 1/31/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 3.5 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 6.5 ft.
CHECKED BY: PFM
DRILLER: T. Wilson
INSPECTOR: M. Simonds



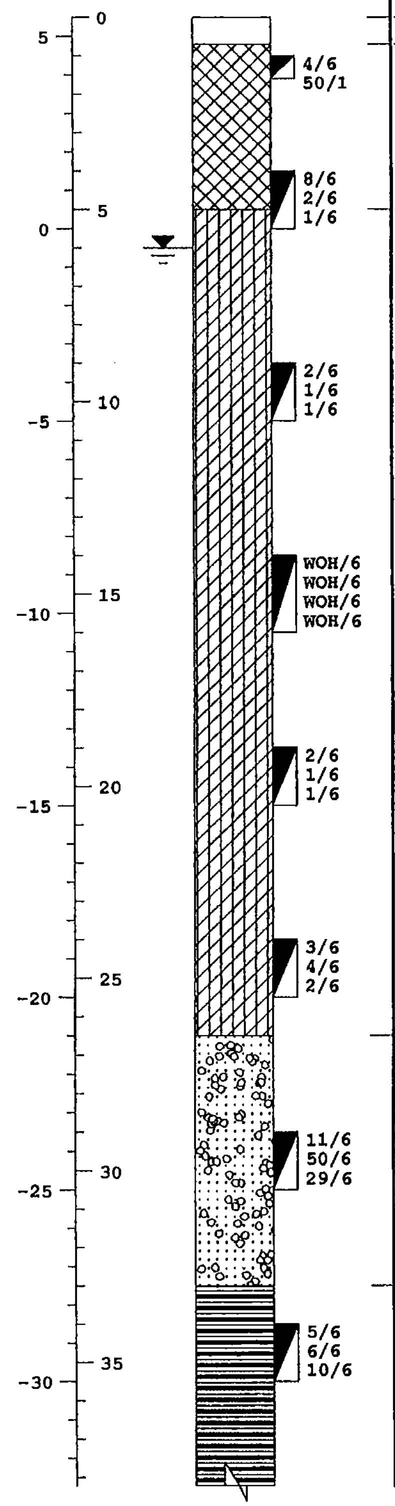
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
	14/6 8/6 10/6	Medium dense wet gray coarse to fine SAND, trace rounded gravel. (GRANULAR ALLUVIUM)	18		
		41.5 -35			
	11/6 13/6 18/6	Hard moist brown, gray, white and green silty CLAY with medium to fine sand. Relic rock structure is evident. (DECOMPOSED ROCK)	31		
	23/6 31/6 50/2		81/8"		
		51.0 -44.5			
		Completion Depth = 51 feet AUGER REFUSAL @ 51.0 FT.			

LOG OF TEST BORING
TEST BORING B-5

DATE: 1/31/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 6.0 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 5.5 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

ELEVATION / DEPTH — SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES



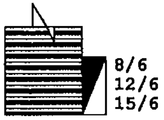
Soil Description	SPT (N)	Moisture (%)	Other Tests
5.5			
Concrete.			
0.7 4.8			
Dense wet brown and gray SAND and GRAVEL. (FILL)	50/1"		
	3		
5.0 0.5			
Very soft to soft moist gray silty CLAY, trace fine sand lenses. (FINE GRAINED ALLUIUM)			
	2		
	WOH		
	2		
	6		
26.5 -21			
Very dense wet brown and gray coarse to fine SAND and rounded GRAVEL. (GRANULAR ALLUVIUM)	79		
33.0 -27.5			
Very stiff moist brown and yellow-brown silty CLAY with medium to fine sand. Relic rock structure is evident. (DECOMPOSED ROCK)	16		

LOG OF TEST BORING

TEST BORING B-5

DATE: 1/31/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 6.0 ft.

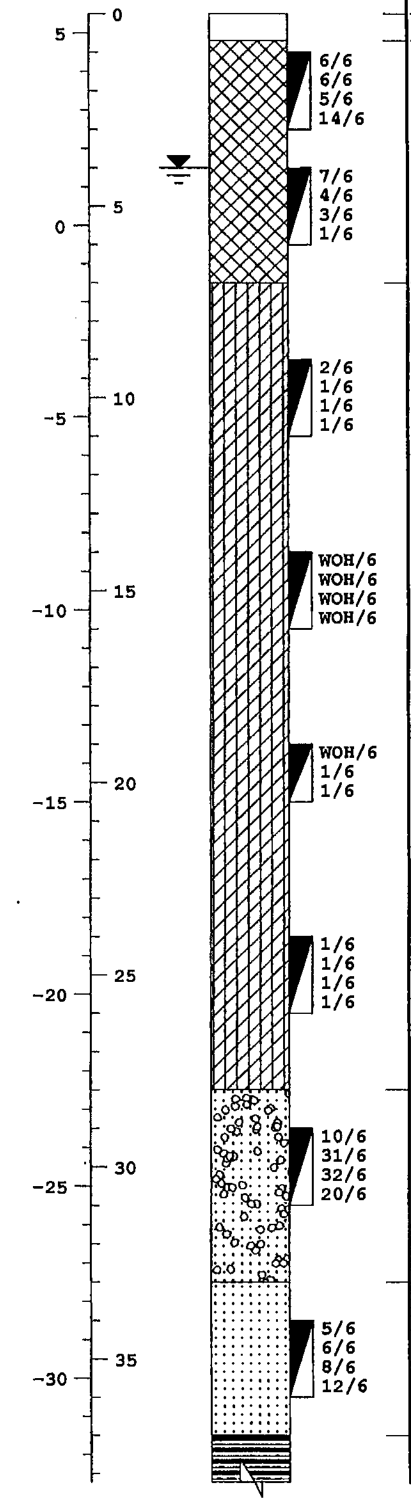
PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 5.5 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
-35 / 40	 8/6 12/6 15/6	Very stiff moist brown and yellow-brown silty CLAY with medium to fine sand. Relic rock structure is evident. (DECOMPOSED ROCK) 40.5	27		
		-35 Completion Depth = 40.5 feet END OF TEST BORING @ 40.5 FT.			
-40 / 45					
-45 / 50					
-50 / 55					
-55 / 60					
-60 / 65					
-65 / 70					
-70 / 75					

LOG OF TEST BORING
TEST BORING B-6

DATE: 1/30/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 4.0 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 5.5 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

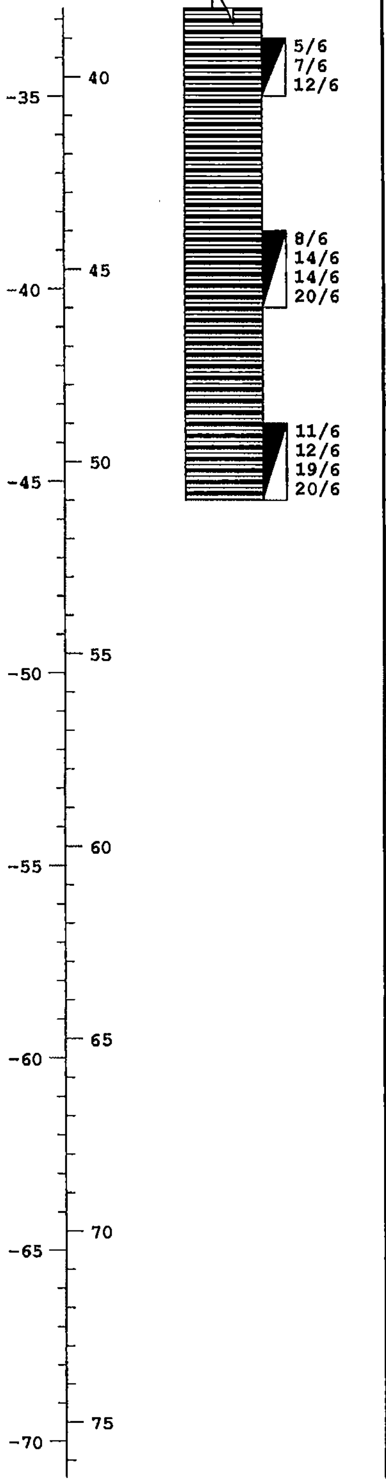


ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
5.5 0.7 4.8		Concrete slab.			
	6/6 6/6 5/6 14/6	Medium dense to dense red-brown to black silty coarse to fine SAND and GRAVEL. (FILL)	11		
	7/6 4/6 3/6 1/6		7		
7.0 -1.5	2/6 1/6 1/6 1/6	Very soft to soft moist gray silty CLAY, trace fine sand lenses. (FINE GRAINED ALLUVIUM)	2		
	WOH/6 WOH/6 WOH/6 WOH/6		WOH		
	WOH/6 1/6 1/6		2		
	1/6 1/6 1/6 1/6		2		
28.0 -22.5	10/6 31/6 32/6 20/6	Very dense wet brown and gray coarse to fine SAND and rounded GRAVEL. (GRANULAR ALLUVIUM)	63		
33.0 -27.5	5/6 6/6 8/6 12/6	Medium dense wet brown and gray medium to fine SAND. (GRANULAR ALLUVIUM)	14		
37.0 -31.5		Very stiff moist brown, gray and yellow-brown sandy			

LOG OF TEST BORING
TEST BORING B-6

DATE: 1/30/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 4.0 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 5.5 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

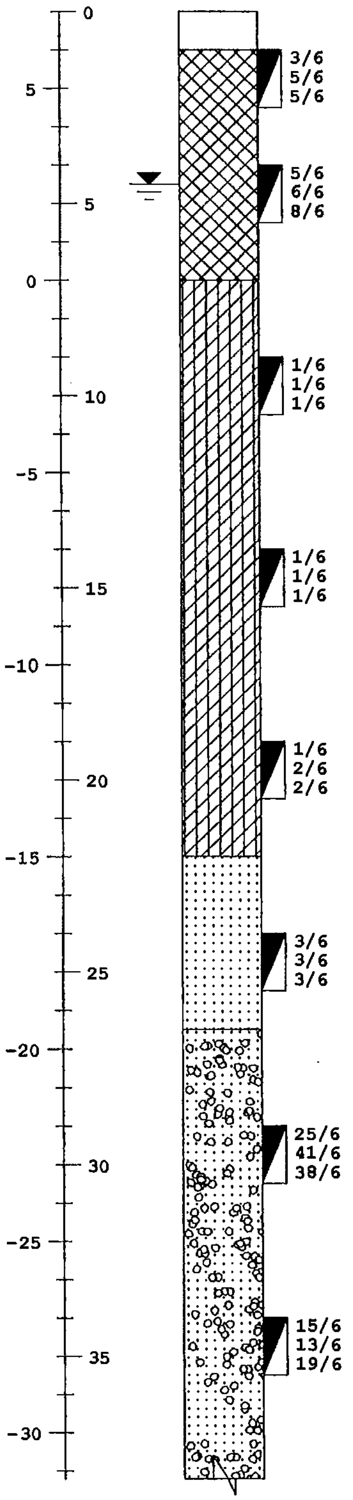


Soil Description	SPT (N)	Moisture (%)	Other Tests
silty CLAY. Relic rock structure is evident. (DECOMPOSED ROCK)	19 28 31		
51.0 -45.5			
Completion Depth = 51 feet END OF TEST BORING @ 51.0 FT.			

LOG OF TEST BORING
TEST BORING B-7

DATE: 2/3/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 4.5 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 7.0 ft.
CHECKED BY: PFM
DRILLER: T. Wilson
INSPECTOR: M. Simonds



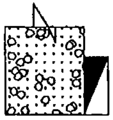
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
7		Concrete.			
1.0 6	3/6 5/6 5/6	Dense moist brown silty coarse to fine SAND and GRAVEL. (FILL)	10		
	5/6 6/6 8/6		14		
7.0 0		Soft moist gray silty CLAY, trace fine sand lenses. (FINE GRAINED ALLUVIUM)			
	1/6 1/6 1/6		2		
	1/6 1/6 1/6		2		
	1/6 2/6 2/6		4		
22.0 -15		Loose gray silty medium to fine SAND. (GRANULAR ALLUVIUM)			
	3/6 3/6 3/6		6		
26.5 -19.5		Dense to very dense wet brown coarse to fine SAND and rounded GRAVEL, trace cobbles. (GRANULAR ALLUVIUM)			
	25/6 41/6 38/6		79		
	15/6 13/6 19/6		32		

LOG OF TEST BORING

TEST BORING B-7

DATE: 2/3/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 4.5 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 7.0 ft.
CHECKED BY: PFM
DRILLER: T. Wilson
INSPECTOR: M. Simonds

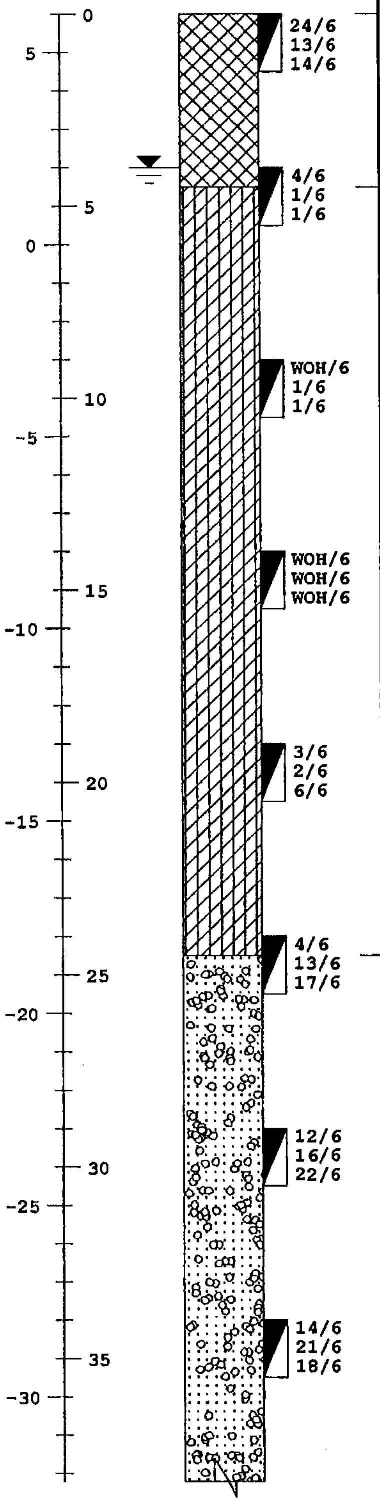
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
40	 12/6 27/6 22/6	Dense to very dense wet brown coarse to fine SAND and rounded GRAVEL, trace cobbles. (GRANULAR ALLUVIUM) 40.5	49		
-35 45 -40 50 -45 55 -50 60 -55 65 -60 70 -65 75		-33.5 Completion Depth = 40.5 feet END OF TEST BORING @ 40.5 FT.			

LOG OF TEST BORING

TEST BORING B-8

DATE: 2/4/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 4.0 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 6.0 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

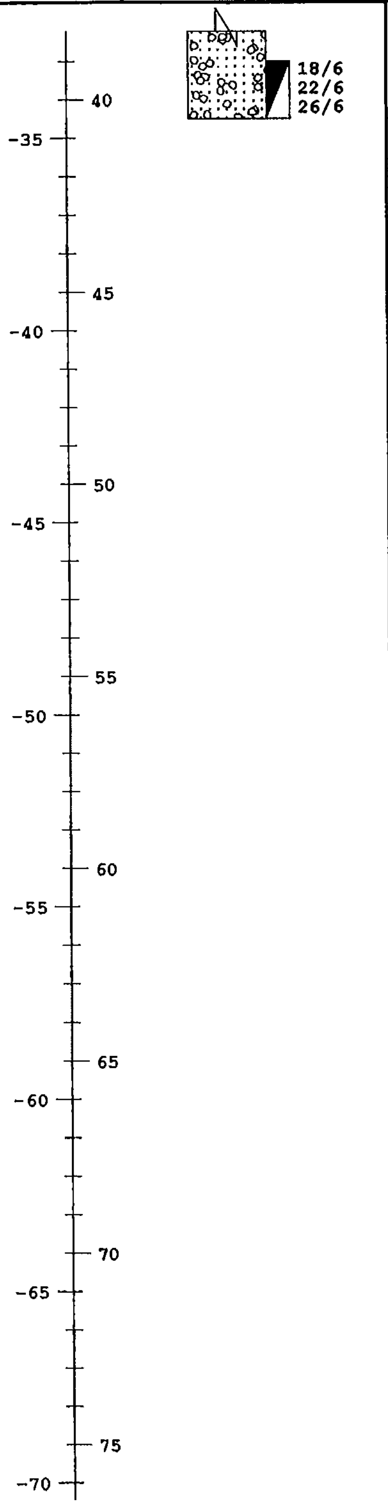


ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
6	24/6 13/6 14/6	Very dense moist to wet brown and black silty coarse to fine SAND and GRAVEL. (FILL)	27		
4.5 1.5	4/6 1/6 1/6	Very soft to firm moist gray silty CLAY, trace sand lenses. (FINE GRAINED ALLUVIUM)	2		
	WOH/6 1/6 1/6		2		
	WOH/6 WOH/6 WOH/6		WOH		
	3/6 2/6 6/6		8		
24.5 -18.5	4/6 13/6 17/6	Dense wet brown and gray coarse to fine SAND with rounded gravel. (GRANULAR ALLUVIUM)	30		
	12/6 16/6 22/6		38		
	14/6 21/6 18/6		39		

LOG OF TEST BORING
TEST BORING B-8

DATE: 2/4/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 4.0 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 6.0 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

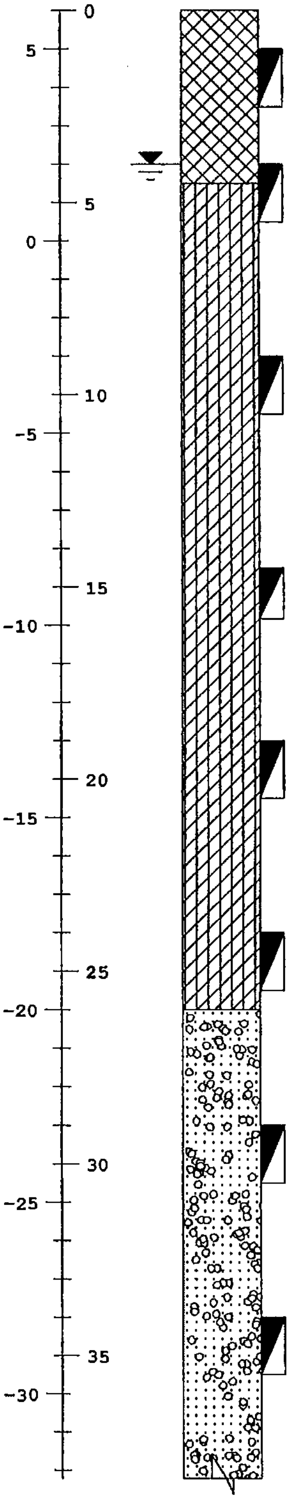


ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
	18/6 22/6 26/6	Dense wet brown and gray coarse to fine SAND with rounded gravel. (GRANULAR ALLUVIUM) 40.5	48		
		-34.5 Completion Depth = 40.5 feet END OF TEST BORING @ 40.5 FT.			

LOG OF TEST BORING
TEST BORING B-9

DATE: 2/3/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 4.0 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 6.0 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

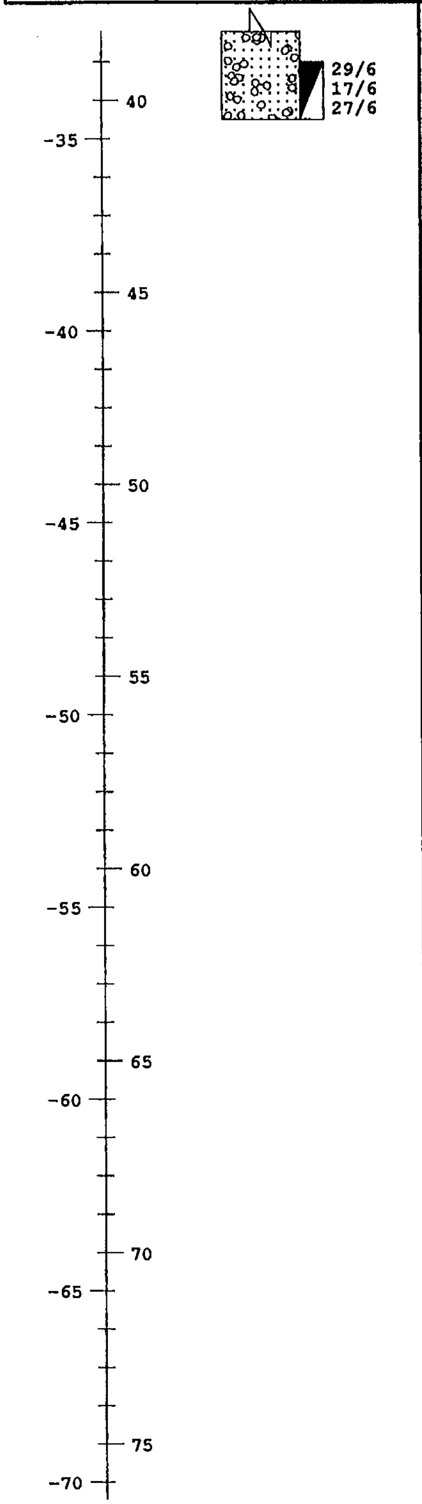


ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
6		Medium dense moist to wet brown and gray silty SAND and GRAVEL with clay. (FILL)			
	3/6 3/6 6/6		9		
	5/6 1/6 1/6		2		
4.5 1.5		Very soft to soft moist gray silty CLAY, trace fine sand lenses and vegetation. (FINE GRAINED ALLUVIUM)			
	1/6 0/6 1/6		1		
	ST-1 14.5'- 16.5'			65.4	LL=88 PL=33 UU
	WOH/6 WOH/6 2/6		2		
	2/6 1/6 1/6		2		
26.0 -20		Dense to very dense wet brown and gray coarse to fine SAND and rounded GRAVEL. (GRANULAR ALLUVIUM)			
	18/6 40/6 41/6		81	7.2	GS
	12/6 20/6 27/6		47		

LOG OF TEST BORING
TEST BORING B-9

DATE: 2/3/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 4.0 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 6.0 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds



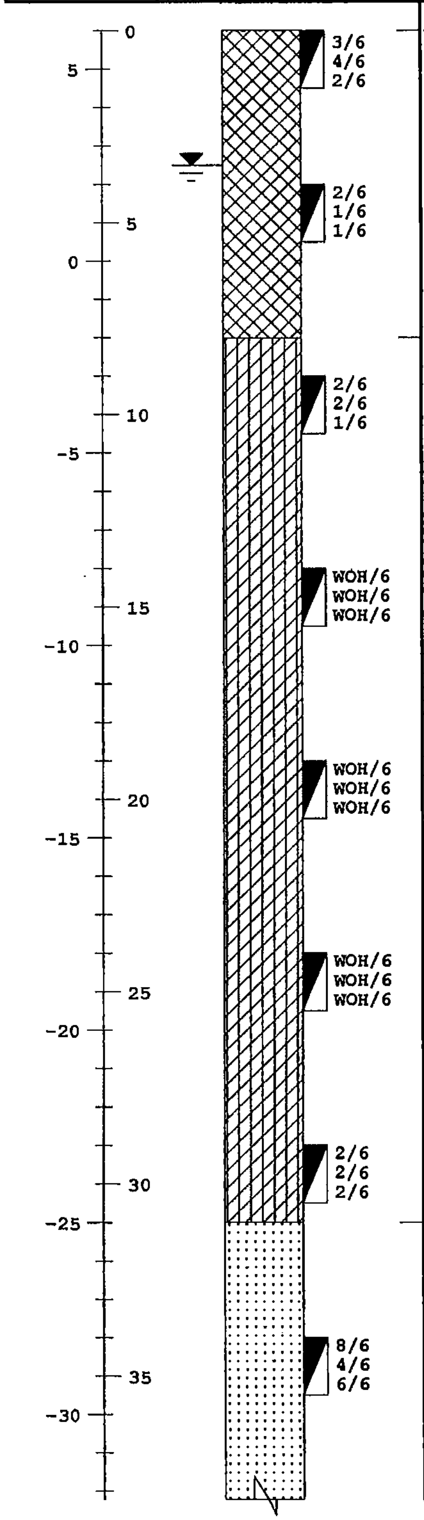
ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
	29/6 17/6 27/6	Dense to very dense wet brown and gray coarse to fine SAND and rounded GRAVEL. (GRANULAR ALLUVIUM) 40.5	44		
		-34.5 Completion Depth = 40.5 feet END OF TEST BORING @ 40.5 FT.			

LOG OF TEST BORING
TEST BORING B-10

DATE: 2/5/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 3.5 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 6.0 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

ELEVATION / DEPTH | SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES

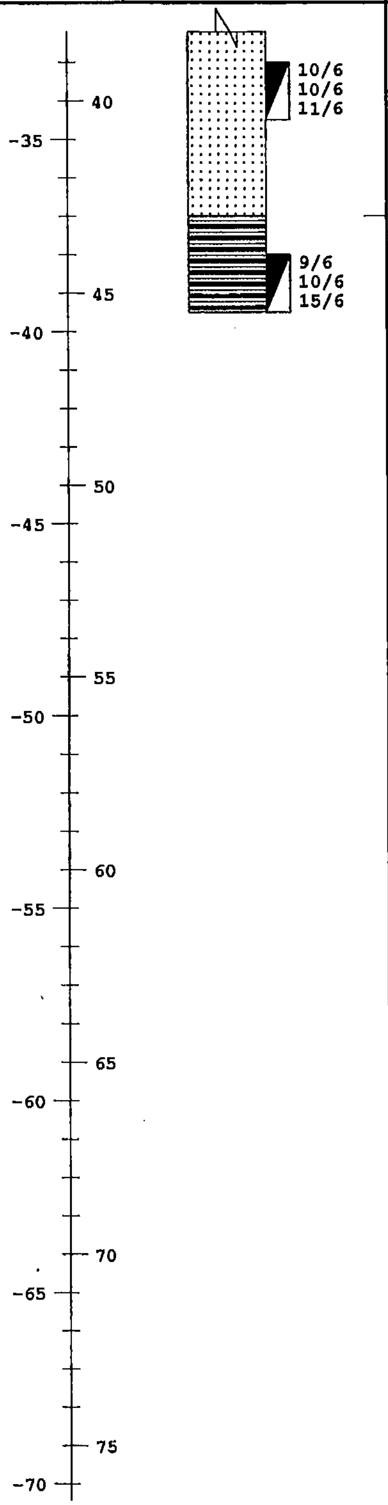


Soil Description	SPT (N)	Moisture (%)	Other Tests
6 Soft to firm moist to wet brown silty CLAY, trace coarse to fine sand, occasional boulder. (FILL)	6		
	2		
8.0 -2 Very soft to soft gray silty CLAY, trace fine sand lenses. (FINE GRAINED ALLUVIUM)	3		
	WOH		
	WOH		
	WOH		
	4		
31.0 -25 Medium dense wet brown and gray coarse to fine SAND, trace rounded gravel. (GRANULAR ALLUVIUM)	10		

LOG OF TEST BORING
TEST BORING B-10

DATE: 2/5/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 3.5 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 6.0 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

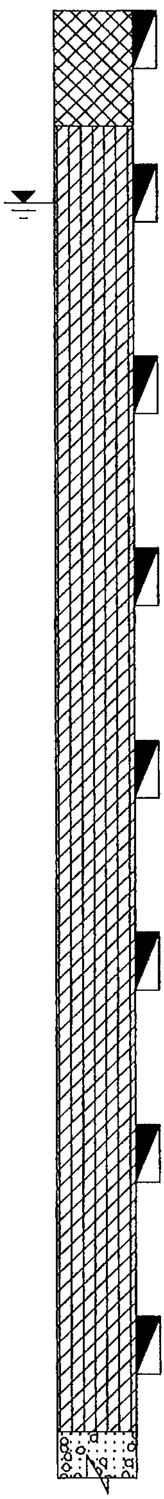


ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
	10/6 10/6 11/6	Medium dense wet brown and gray coarse to fine SAND, trace rounded gravel. (GRANULAR ALLUVIUM)	21		
43.0 -37	9/6 10/6 15/6	Very stiff moist brown to yellow-brown silty CLAY, trace medium to fine sand. (DECOMPOSED ROCK)	25		
45.5 -39.5		Completion Depth = 45.5 feet END OF TEST BORING @ 45.5 FT.			

LOG OF TEST BORING
TEST BORING B-11

DATE: 2/5/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 5.0 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 5.0 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds



ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
5 — 0	14/6 26/6 20/6	5 Very dense wet brown coarse to find SAND with gravel. (FILL)	46		
		3.0 2 Very soft to firm moist gray silty CLAY, trace sand lenses. (FINE GRAINED ALLUVIUM)			
0 — 5	2/6 3/6 2/6		5		
-5 — 10	WOH/6 WOH/6 WOH/6		WOH		
-10 — 15	WOH/6 WOH/6 WOH/6		WOH		
-15 — 20	WOH/6 WOH/6 WOH/6		WOH		
-20 — 25	WOH/6 WOH/6 WOH/6		WOH		
-25 — 30	1/6 0/6 1/6		1		
-30 — 35	WOH/6 1/6 1/6		2		
		37.0 -32 Very dense wet brown and gray coarse to fine SAND			

ADVANCED GEOSERVICES

LOG OF TEST BORING

TEST BORING B-11

DATE: 2/5/14
PROJECT: 211 South Market Street
BORING LOCATION: See Figure 1
DRILLING METHOD: Hollow Stem Auger
DRILLING COMPANY: Earthcore Services
WATER ENCOUNTERED AT: 5.0 ft.

PROJECT NO.: 2013-3065-01
SURFACE ELEVATION: 5.0 ft.
CHECKED BY: PFM
DRILLER: J. Swope
INSPECTOR: M. Simonds

ELEVATION / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS BLOWS PER 6 INCHES	Soil Description	SPT (N)	Moisture (%)	Other Tests
-35 40	25/6 32/6 24/6	and rounded GRAVEL. (GRANULAR ALLUVIUM)	56		
43.5 -38.5 -40 45	10/6 15/6 25/6	Hard moist brown-gray and green sandy silty CLAY. Relic rock structure is apparent. (DECOMPOSED ROCK)	40		
45.5 -40.5		Completion Depth = 45.5 feet END OF TEST BORING @ 45.5 FT.			
-45 50					
-50 55					
-55 60					
-60 65					
-65 70					
-70 75					

APPENDIX B

APPENDIX B

LABORATORY TESTING

A limited laboratory testing program was conducted on representative soil samples collected from the borings to investigate the physical properties of the subsurface materials. The testing consisted of determinations of natural moisture content (ASTM D 2216), Atterberg (liquid and plastic) limits (ASTM D 4318), and particle size distribution (ASTM D 422). The test results are included in this Appendix and the results of the moisture content and Atterberg limit testing are also shown on the boring logs in Appendix A, adjacent to the tested samples.

Unconsolidated undrained triaxial tests (ASTM D 2850) were conducted on portions of the undisturbed tube samples collected from B-3 and B-9 to determine the compressive strength of the fine grained alluvium. A consolidation test (ASTM D 2435) was also conducted on a portion of the same tube sample from B-3 to determine the settlement characteristics of the fine grained alluvium. The results of this testing are included in this Appendix.

LAB_SUMMARY_TABLE_BLUEBELL 19994621_NO.2014_02-03_201_211_S_MARKET_ST.GPJ URS_BLUE.GDT 2/27/14

Project: 201-211 S. Market St.
Project No.: 19994621

SUMMARY OF LABORATORY TEST RESULTS

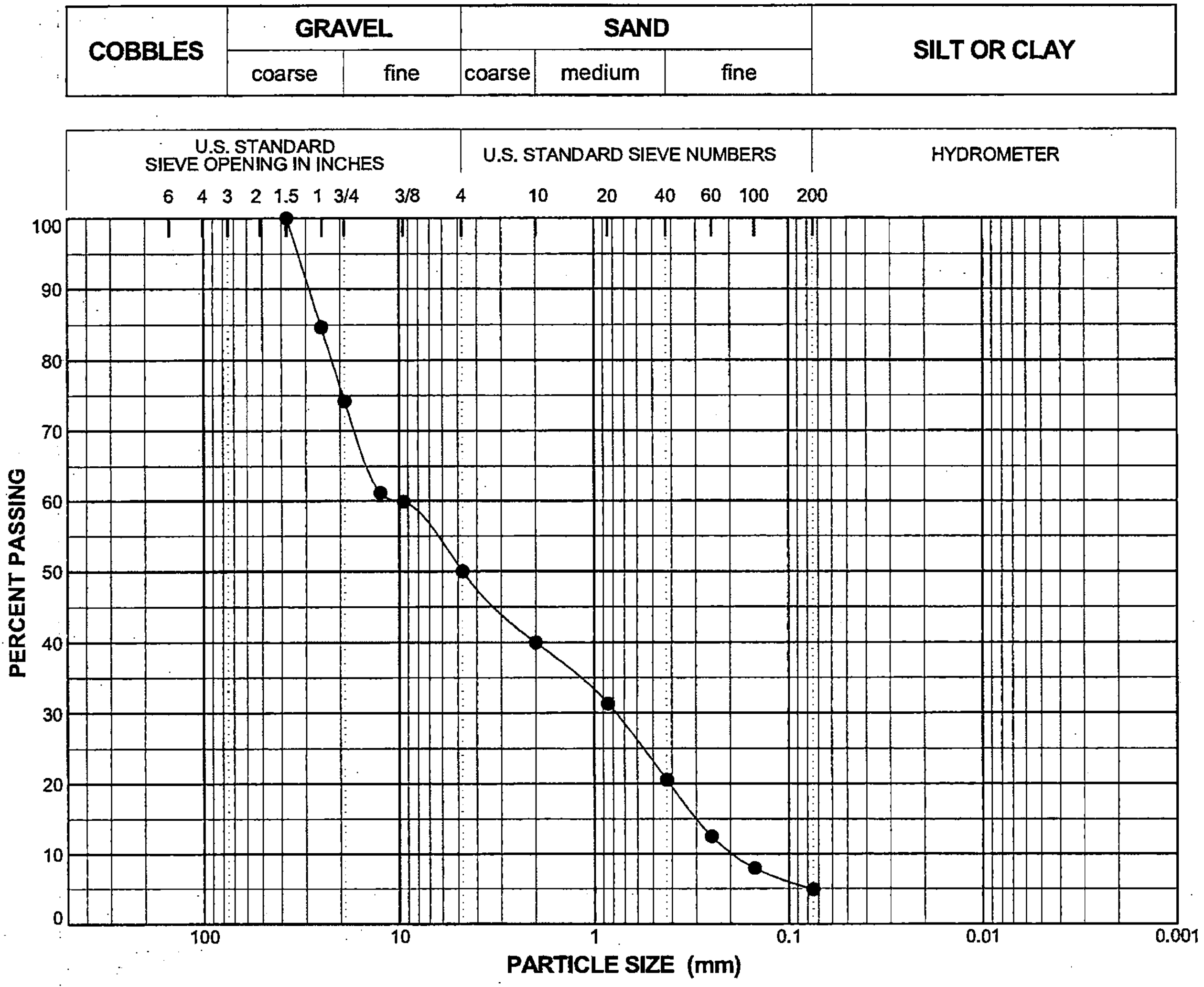
Boring and Sample Number	Depth (feet)	Classification	USCS Symbol	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits		Specific Gravity	Organic Content (%)	Grain Size		Compaction	Consolidation	Unconfined Compression		Triaxial Compression		Permeability (cm/sec)	Special Tests
						Liquid Limit	Plastic Limit			<#200 (%)	<2μ (%)			Stress (psi)	Strain (%)	UU	CIU		
B-2 S-4	14.0-16.0			50.6		68	32												
B-3 S-1	1.0-2.5			25.8															
B-3 S-2	4.0-5.5			24.0															
B-3 S-3	7.0-8.5			49.6															
B-3 ST-1	12.0-14.0					73	36												
B-3	–	UU Test		59.5	63.6											*			
B-3	–	Consolidation Test		54.4	70.6								*						
B-3 S-4	14.5-16.0			44.2															
B-3 S-5	19.0-20.5			56.1															
B-3 S-6	24.0-25.5			31.0															
B-9 ST-1	14.5-16.5					88	33												
B-9	–	UU Test		65.4	60.3											*			
B-9 S-6	29.0-30.5	Brown POORLY GRADED GRAVEL with SAND	GP	7.2						5									

Note: The soil classification is based partially on visual classification unless both grain size and Atterberg limits are performed.

* Refer to Laboratory Test Curves

Sheet 1 of 1

Project File Path:



SYMBOL	●		
Boring	B-9		
Sample	S-6		
Spec			
Depth (ft)	29.0-30.5		
% +3"	0.0		
% Gravel	50.0		
% Sand	45.1		
% Fines	4.9		
% -2μ			
Cc	0.33		
Cu	51.58		
LL			
PL			
PI			
USCS	GP		
w (%)	7.2		

Particle Size (Sieve #)	PERCENT FINER		
	●		
4"			
3"			
1-1/2"	100.0		
3/4"	74.2		
3/8"	59.9		
4	50.0		
10	40.0		
20	31.3		
40	20.5		
60	12.5		
100	7.9		
200	4.9		

SYMBOL	DESCRIPTION AND REMARKS
●	Brown POORLY GRADED GRAVEL with SAND (GP)

PARTICLE SIZE DISTRIBUTION

201-211 S. Market St.

Project Number 19994621	February 2014	Figure 1

URS

LAB_SUMMARY_TABLE_BLUEBELL 19994621_NO.2014_02-03_201_211_S_MARKET_ST.GPJ URS_BLUE.GDT 2/27/14

Project: 201-211 S. Market St.
Project No.: 19994621

URS

SUMMARY OF LABORATORY TEST RESULTS

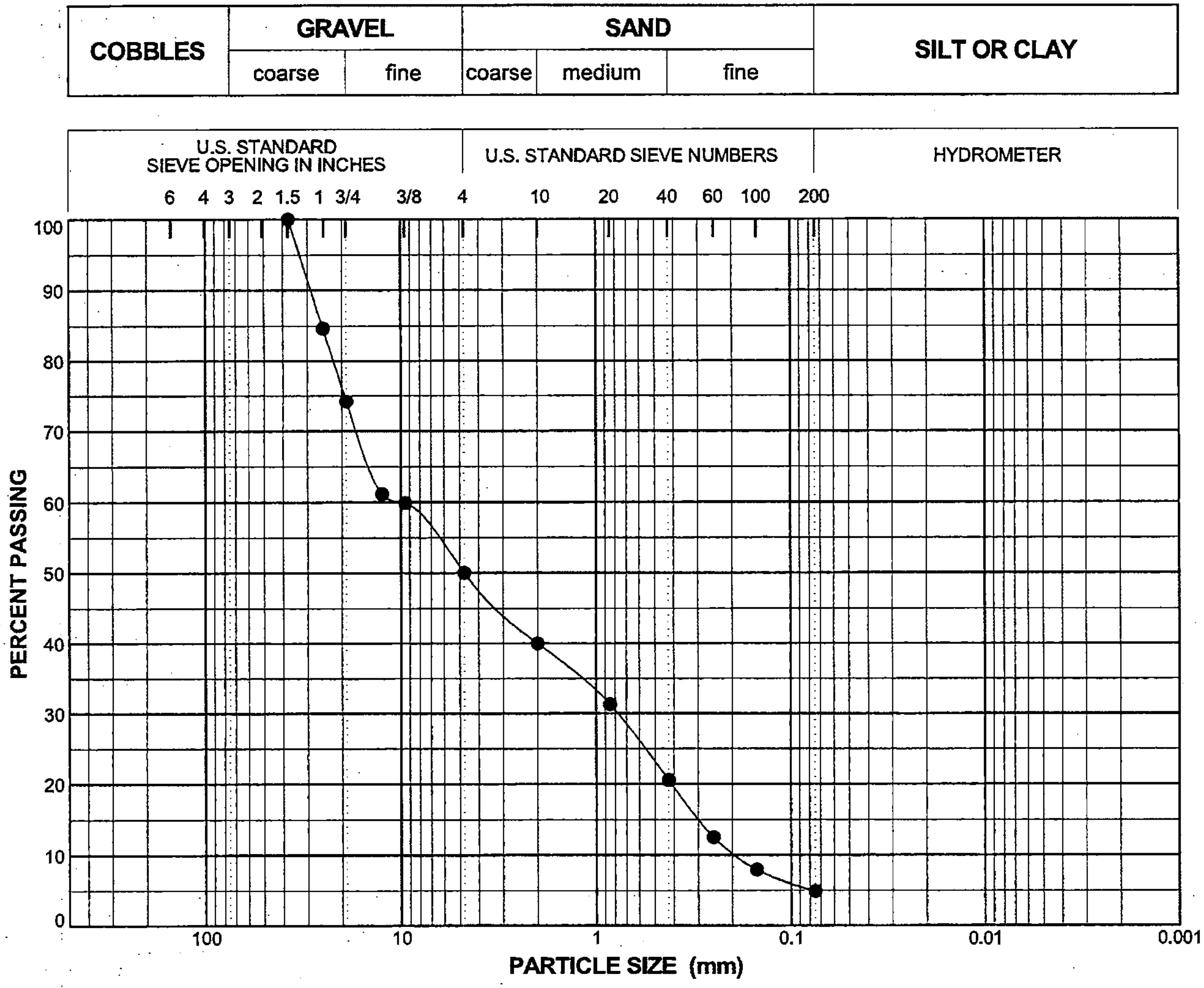
Boring and Sample Number	Depth (feet)	Classification	USCS Symbol	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits		Specific Gravity	Organic Content (%)	Grain Size		Compaction	Consolidation	Unconfined Compression		Triaxial Compression		Permeability (cm/sec)	Special Tests
						Liquid Limit	Plastic Limit			<#200 (%)	<2μ (%)			Stress (psi)	Strain (%)	UU	CIU		
B-2 S-4	14.0-16.0			50.6		68	32												
B-3 S-1	1.0-2.5			25.8															
B-3 S-2	4.0-5.5			24.0															
B-3 S-3	7.0-8.5			49.6															
B-3 ST-1	12.0-14.0					73	36												
B-3	–	UU Test		59.5	63.6											*			
B-3	–	Consolidation Test		54.4	70.6								*						
B-3 S-4	14.5-16.0			44.2															
B-3 S-5	19.0-20.5			56.1															
B-3 S-6	24.0-25.5			31.0															
B-9 ST-1	14.5-16.5					88	33												
B-9	–	UU Test		65.4	60.3											*			
B-9 S-6	29.0-30.5	Brown POORLY GRADED GRAVEL with SAND	GP	7.2						5									

Note: The soil classification is based partially on visual classification unless both grain size and Atterberg limits are performed.

* Refer to Laboratory Test Curves

Sheet 1 of 1

Project File Path:



SYMBOL	●		
Boring	B-9		
Sample	S-6		
Spec			
Depth (ft)	29.0-30.5		
% +3"	0.0		
% Gravel	50.0		
% Sand	45.1		
% Fines	4.9		
% -2µ			
Cc	0.33		
Cu	51.58		
LL			
PL			
PI			
USCS	GP		
w (%)	7.2		

Particle Size (Sieve #)	PERCENT FINER ●		
4"			
3"			
1-1/2"	100.0		
3/4"	74.2		
3/8"	59.9		
4	50.0		
10	40.0		
20	31.3		
40	20.5		
60	12.5		
100	7.9		
200	4.9		

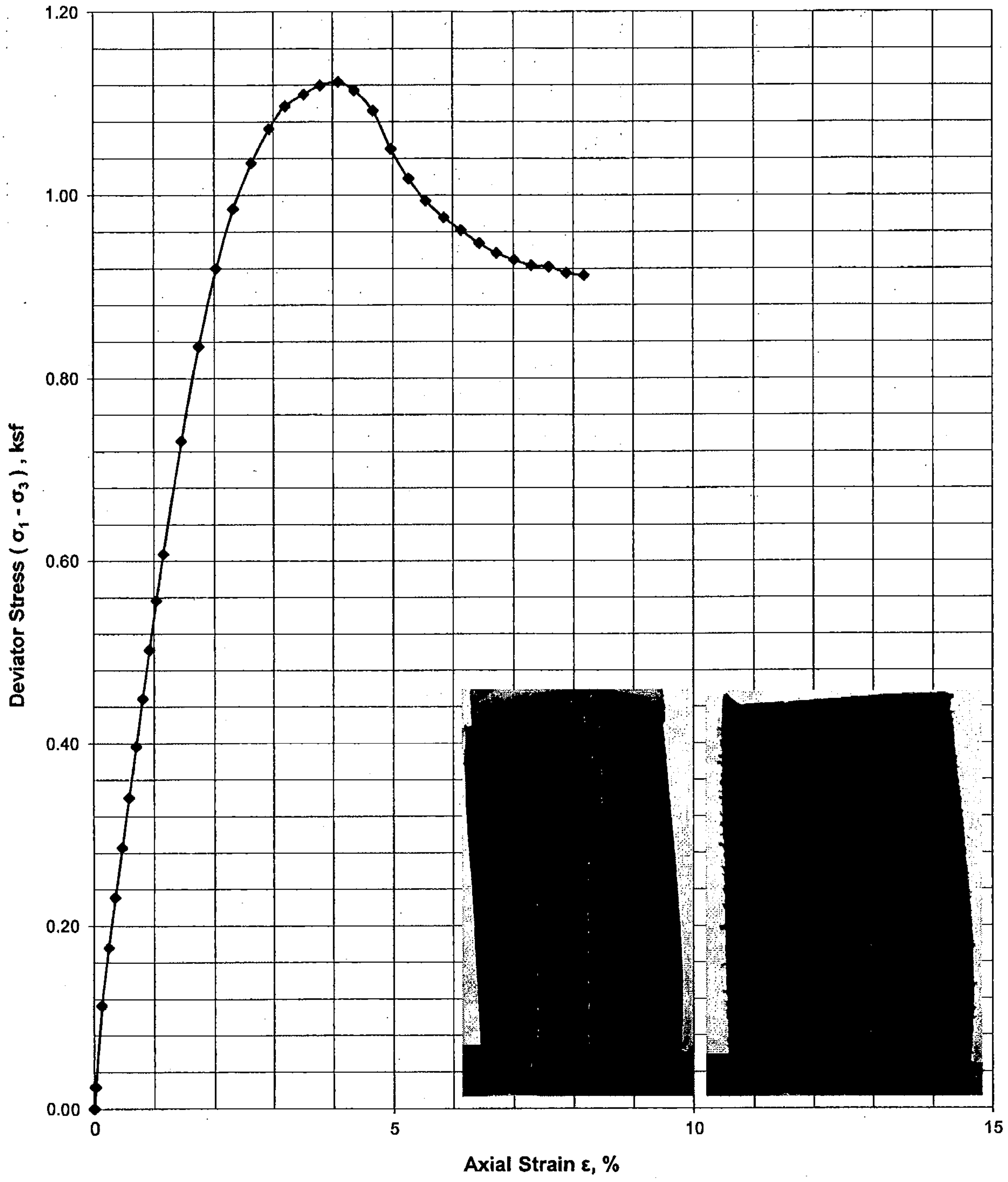
SYMBOL	DESCRIPTION AND REMARKS
●	Brown POORLY GRADED GRAVEL with SAND (GP)

PARTICLE SIZE DISTRIBUTION

201-211 S. Market St.

Project Number 19994621	February 2014	Figure 1

URS



Specimen Information							Test Summary			
Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Atterberg Limits		Initial Length (in)	Initial Dia. (in)	σ_3 (ksf)	$(\sigma_1 - \sigma_3)_{max}$ (ksf)	ε_f %	Strain Rate (%/min)
			LL	PL						
59.5	101.4	63.6	73	36	5.59	2.87	1.152	1.12	4.1	1.0
Description:							Tested by: RM		Reviewed by: YM	

Project No.: 19994621	Project Name: 201-211 S. Market St.	Unconsolidated-Undrained Triaxial Compression (UU) Test ASTM D 2850

Boring No.: B-3	Sample No.: ST-1	Sample Depth (ft): 13.4-14.0	Date: 2/7/2014

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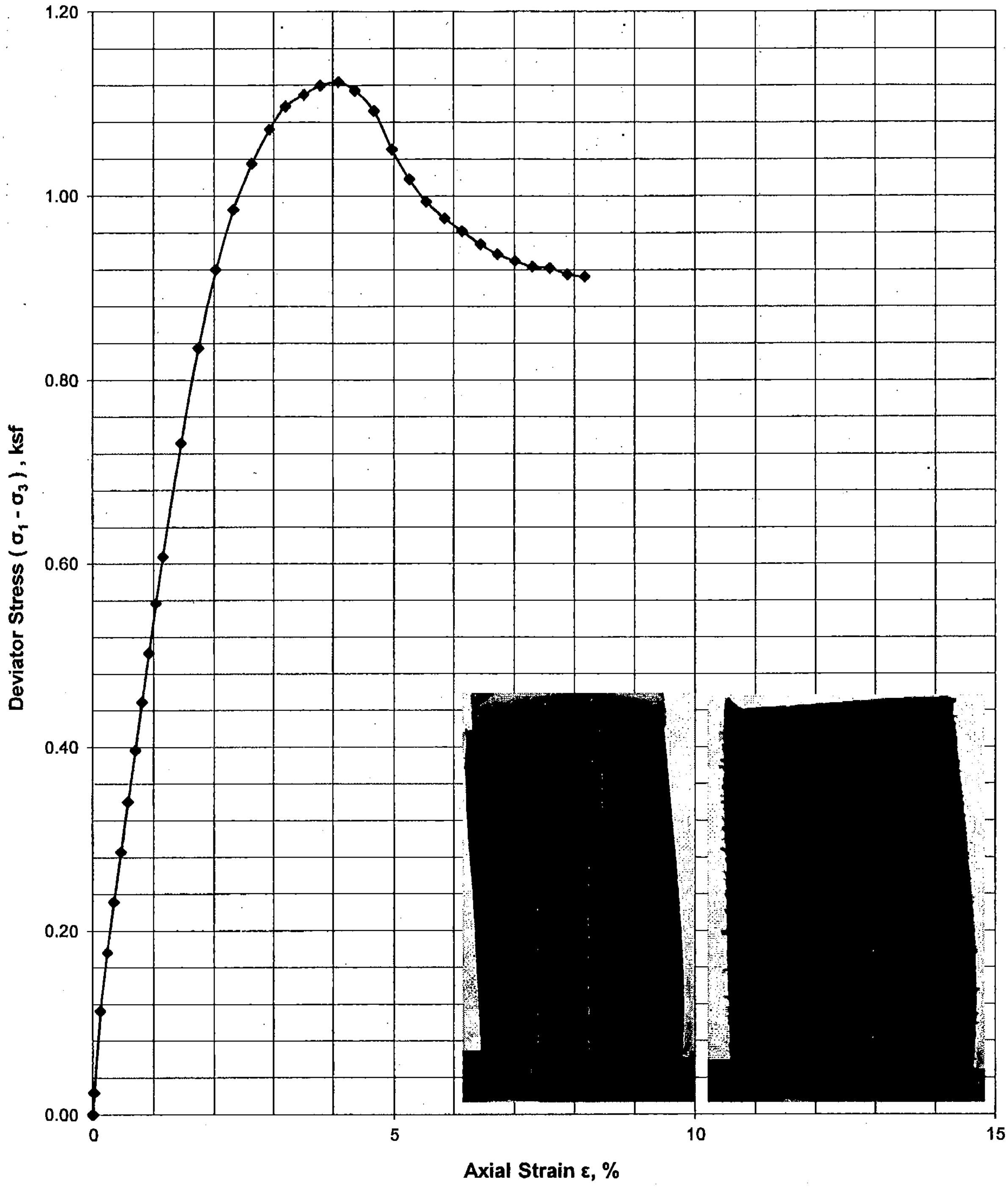
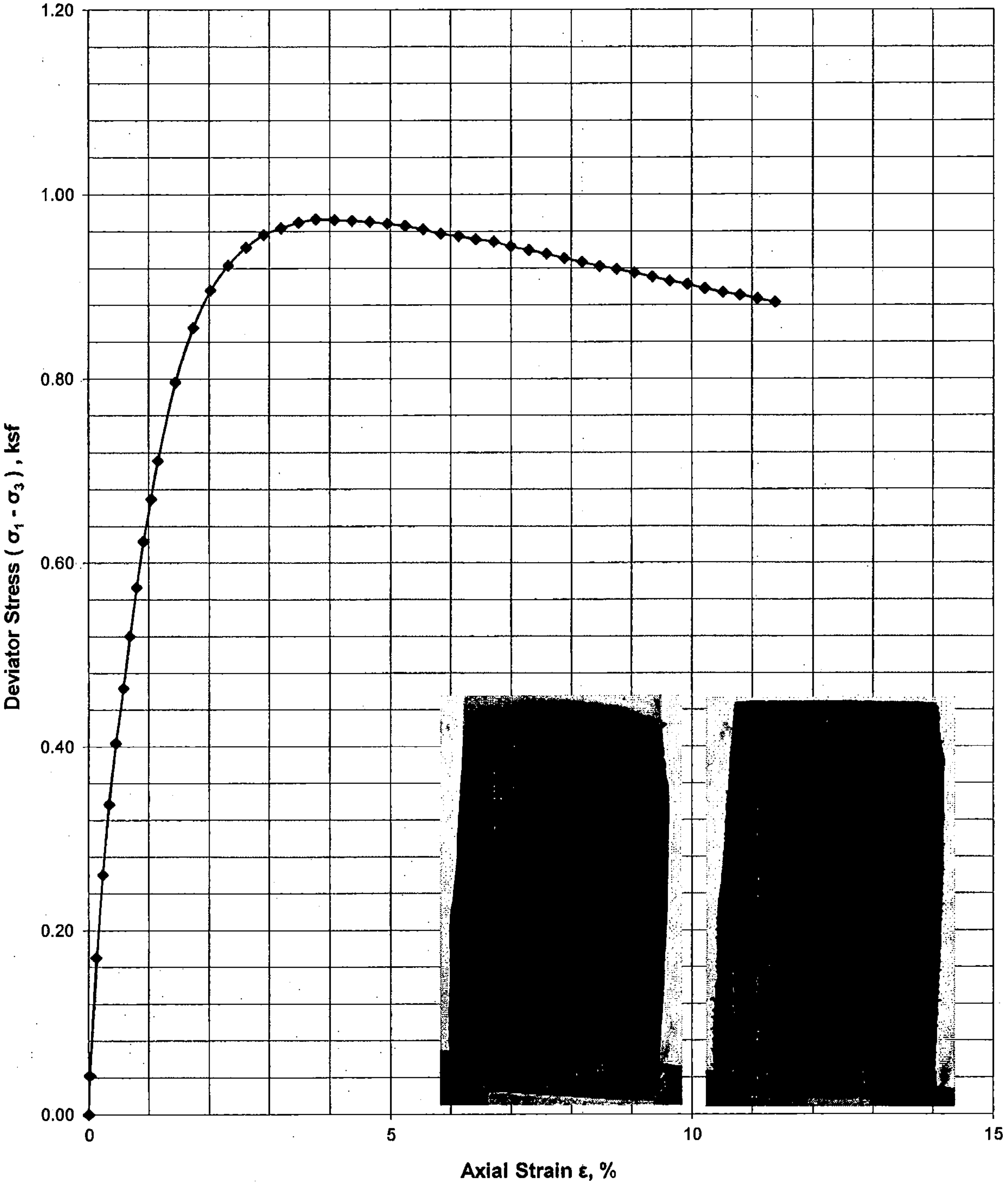


Specimen Information							Test Summary			
Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Atterberg Limits		Initial Length (in)	Initial Dia. (in)	σ_3 (ksf)	$(\sigma_1 - \sigma_3)_{max}$ (ksf)	ε_f %	Strain Rate (%/min)
			LL	PL						
59.5	101.4	63.6	73	36	5.59	2.87	1.152	1.12	4.1	1.0
Description:							Tested by: RM		Reviewed by: YM	

Project No.: 19994621	Project Name: **201-211 S. Market St.**	**Unconsolidated-Undrained Triaxial Compression (UU) Test** **ASTM D 2850**	
Boring No.: B-3	Sample No.: ST-1	Sample Depth (ft): 13.4-14.0	Date: 2/7/2014

URS



Specimen Information							Test Summary			
Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Atterberg Limits LL	Atterberg Limits PL	Initial Length (in)	Initial Dia. (in)	σ_3 (ksf)	$(\sigma_1 - \sigma_3)_{max}$ (ksf)	ε_f %	Strain Rate (%/min)
65.4	99.7	60.3	88	33	5.59	2.86	1.152	0.97	3.77	1.0
Description:							Tested by: BS		Reviewed by: YM	

Project No.: 19994621	Project Name: **201-211 S. Market St.**	**Unconsolidated-Undrained Triaxial Compression (UU) Test** **ASTM D 2850**

Boring No.: B-9	Sample No.: ST-1	Sample Depth (ft): 15.9-16.4	Date: 2/7/2014

URS

CONSOLIDATION TEST REPORT

Coefficients of Consolidation and Secondary Consolidation

No.	Load (tsf)	C_V (ft.^{2}/day)	C_α	No.	Load (tsf)	C_V (ft.^{2}/day)	C_α	No.	Load (tsf)	C_V (ft.^{2}/day)	C_α
3	0.25	0.15									
4	0.50	2.10									
5	1.00	1.18									
6	2.00	0.41	0.010								
7	4.00	0.45	0.010								
13	4.00	0.96									
14	8.00	0.65	0.009								
15	16.00	1.08	0.008								
16	32.00	1.75	0.008								

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	P_c (tsf)	C_c	Initial Void Ratio
Saturation	Moisture							
105.0 %	52.4 %	70.6	73	36	2.60	1.01	0.43	1.297

MATERIAL DESCRIPTION	USCS	AASHTO

Project No. 19994621 **Client:** Advanced Geoservices

Project: 201 - 211 S Market St.

Source: B-3 **Sample No.:** ST-1 **Elev./Depth:** 12.0-14.0

URS CORPORATION

Fort Washington, PA

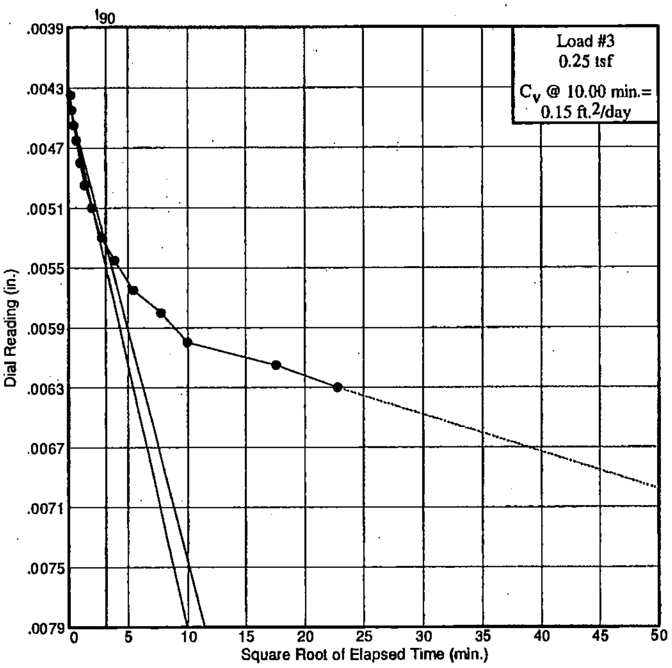
Remarks:

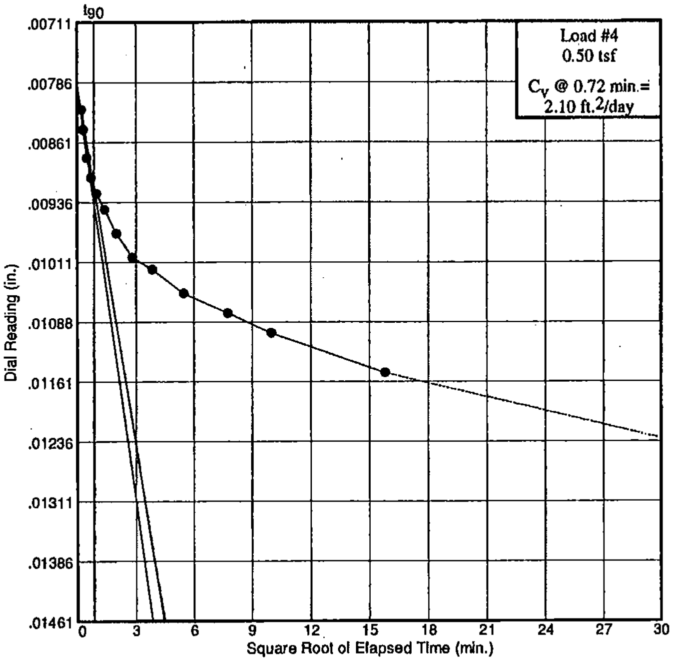
Figure

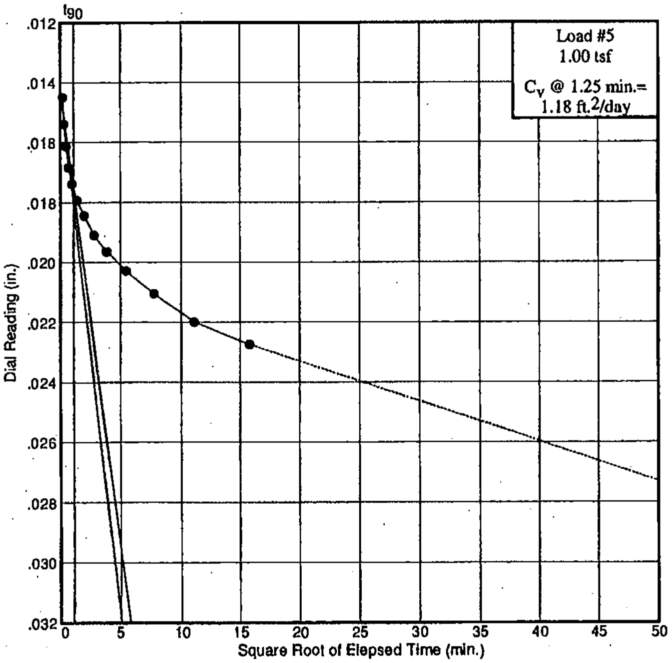
Dial Reading vs. Time

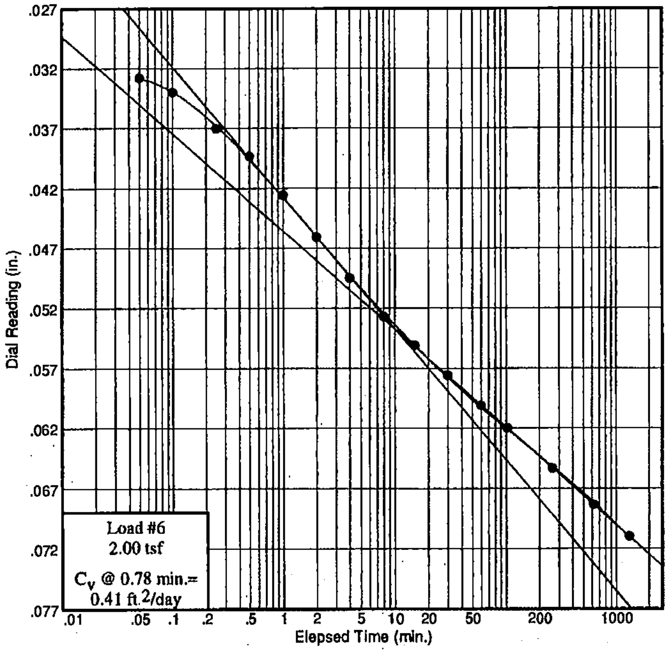
Project No.: 19994621
Project: 201 - 211 S Market St.

Source: B-3
Sample No.: ST-1
Elev./Depth: 12.0-14.0









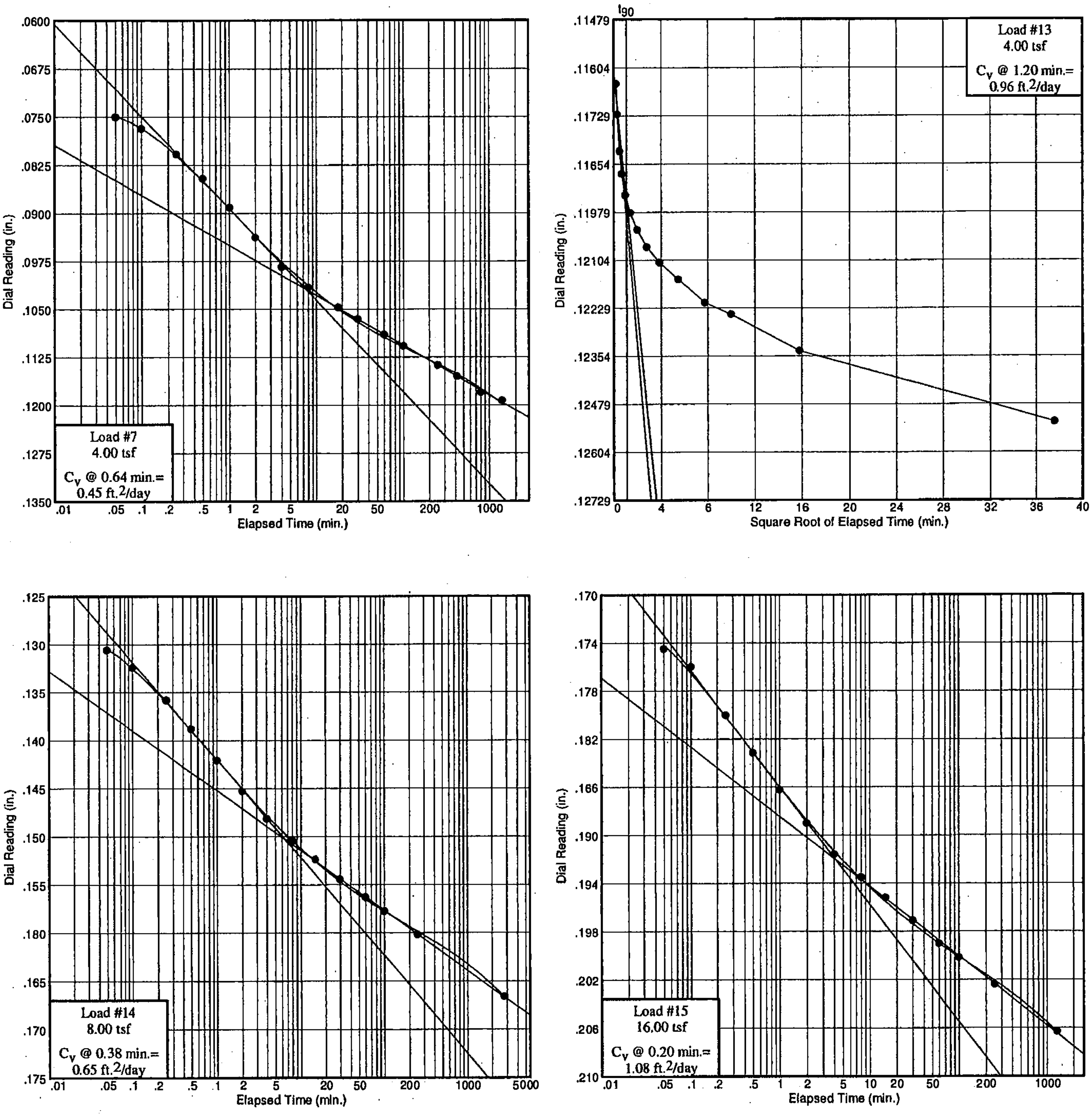
URS CORPORATION
Fort Washington, PA

Figure

Dial Reading vs. Time

Project No.: 19994621
Project: 201 - 211 S Market St.

Source: B-3 Sample No.: ST-1 Elev./Depth: 12.0-14.0



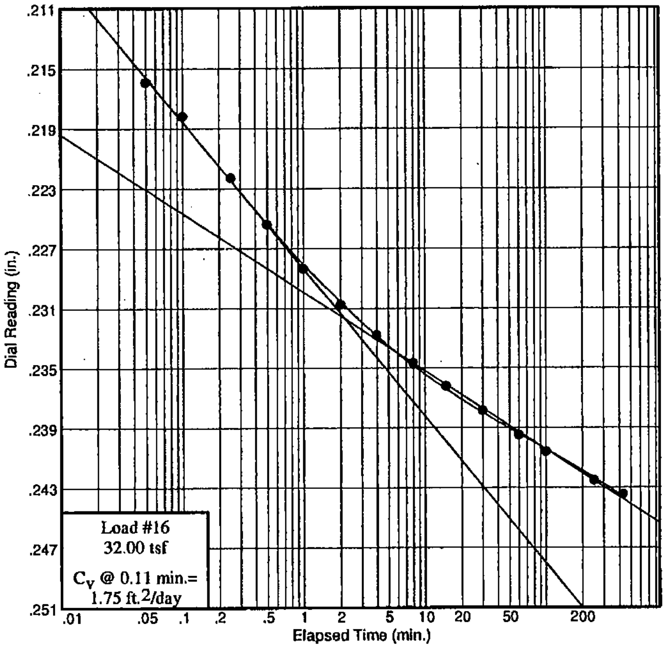
URS CORPORATION
Fort Washington, PA

Figure

Dial Reading vs. Time

Project No.: 19994621
Project: 201 - 211 S Market St.

Source: B-3 Sample No.: ST-1 Elev./Depth: 12.0-14.0



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Fort Washington, PA

Figure

ADVANCED GeoServices
Engineering for the Environment. Planning for People.℠
1055 Andrew Drive, Suite A
West Chester, PA 19380-4293
tel 610.840.9100 fax 610.840.9199
www.advancedgeoservices.com

March 18, 2014

2013-3065-05

The Buccini Pollin Group
322 A Street
Wilmington, DE 19806

Attention: Mr. John Groth

Reference: Surcharge Fill and Settlement Monitoring
201-211 S. Market Street
Wilmington, Delaware

Gentlemen:

At your request, Advanced GeoServices has conducted further evaluation of the estimated settlements for the townhome portions of the proposed 201-211 S. Market Street development. These settlements will result from the placement of the required grading fill on site. The intent of this evaluation was to determine the amount of additional surcharge fill required to reduce the time of settlement to two months (60 days) or less.

Background

The proposed grading for this development will require the addition of 3 to 5 feet of fill. The load that this fill imparts on the underlying very soft to soft fine grained alluvium will result in estimated settlements of about 14 inches in the 201 Parcel and 6 to 8 inches in the 211 parcel. The time required for this settlement to occur has been estimated as 4 to 8 months in the 201 parcel and 2 to 4 months in the 211 parcel. Details of this settlement were included in our March 12, 2014 geotechnical investigation report.

Evaluation

In order to reduce the time required for the settlement to occur it will be necessary to surcharge the townhome portions of the site (i.e., apply additional fill to induce the expected settlement over a shorter period of time). The results of our evaluation are summarized below:

Parcel 201	6 ft. of surcharge fill (1)	Est. duration: 35 to 60 days
Parcel 211(2)	2 ft. of surcharge fill (1)	Est. duration: 30 to 50 days

(1) The amount of additional fill required above the fills needed to achieve final grades
(2) The townhome portion of the parcel (north and southeast sections of the parcel)

Please note that settlement calculations are not precise. These estimates are based upon the available data (the boring logs and consolidation testing) noted in our geotechnical report. The actual amount and duration of the settlements must be monitored to assure that the required settlements are complete.

Estimated Volumes

The estimated area and quantities for the surcharge are shown below:

Parcel	Area (ft.^{2})	Surcharge (ft.)	Volume (yd.^{3})
201	26,450	6	5,900
211	117,300 (2)	2	8,700
		Total:	14,600 yd.^{3}

(2) The townhome portion of the parcel (north and southeast sections of the parcel)

The amount of grading fill required for the apartment area of Parcel 211 is estimated to be about 16,200 cubic yards. Thus, if the proposed construction schedule permits, the surcharge fill can be used to bring the apartment area up to grade once the surcharge is no longer needed in the townhome areas.

Recommendations

Surcharge: To allow for later use as site fill, surcharge fill should meet the criteria presented in the "Load-Bearing Fill" section of our March 12 geotechnical investigation report. The bottom foot of the surcharge fill should be compacted to at least 92 percent of the maximum dry density determined by ASTM D 1557. The remainder of the surcharge can be placed in 18-inch lifts and "tracked-in" with the construction equipment. The top and sides of the surcharge should be sloped to provide positive drainage.

Settlement Monitoring: Prior to the placement of the site grading fill, at least 14 settlement monitoring plates should be established on the existing ground surface within surcharge areas. Proposed monitoring locations are shown on the attached sketch plan. The plates should consist of a 2 ft. x 2 ft. x ¾ in. plywood base plate with a vertical riser pipe. (See the attached schematic). The pipe should be capable of being extended by adding couplings and additional pipe lengths.

The settlement plates should be surveyed on a regular schedule to monitor the amount of settlement and to determine when the settlement is essentially complete. We recommend twice per week during placement of the grading and surcharge fills and for the first month thereafter, and once a week for the second month. The evaluation of the survey results must be performed by the geotechnical engineer to determine when the surcharge can be removed.

We appreciate this opportunity to be of service to you during the initial phase of this development. We are available to provide additional assistance during subsequent design/construction phases. Please call us when we may be of further service.

Very truly yours,

ADVANCED GEOSERVICES CORP.

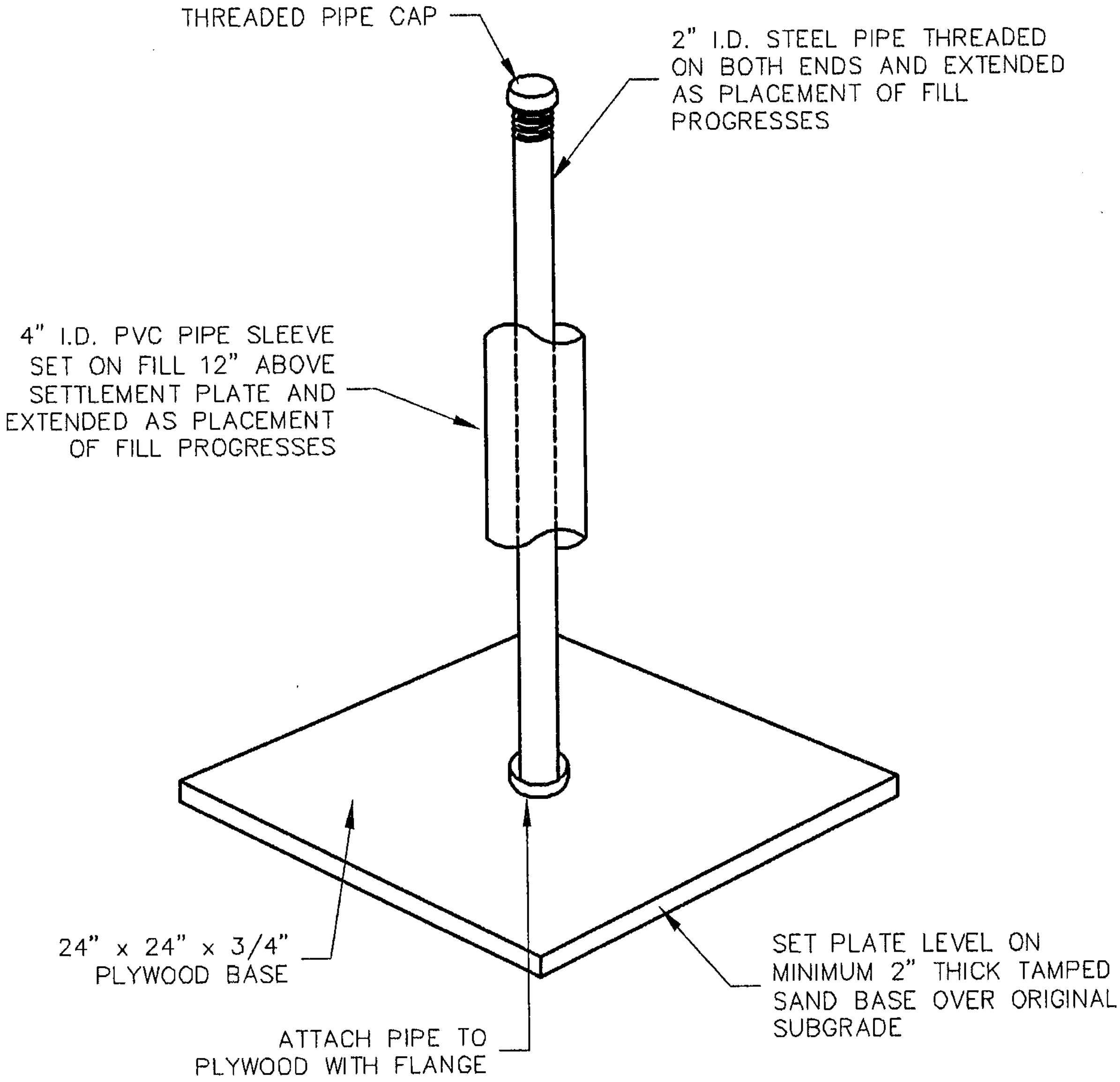
Paul F. Marano, P.E.
Project Consultant

PAUL F. MARANO
REGISTERED
No. 8919
DELAWARE
PROFESSIONAL ENGINEER

Todd D. Trotman, P.E.
Project Consultant

PFM:TDT:kk

Attachments

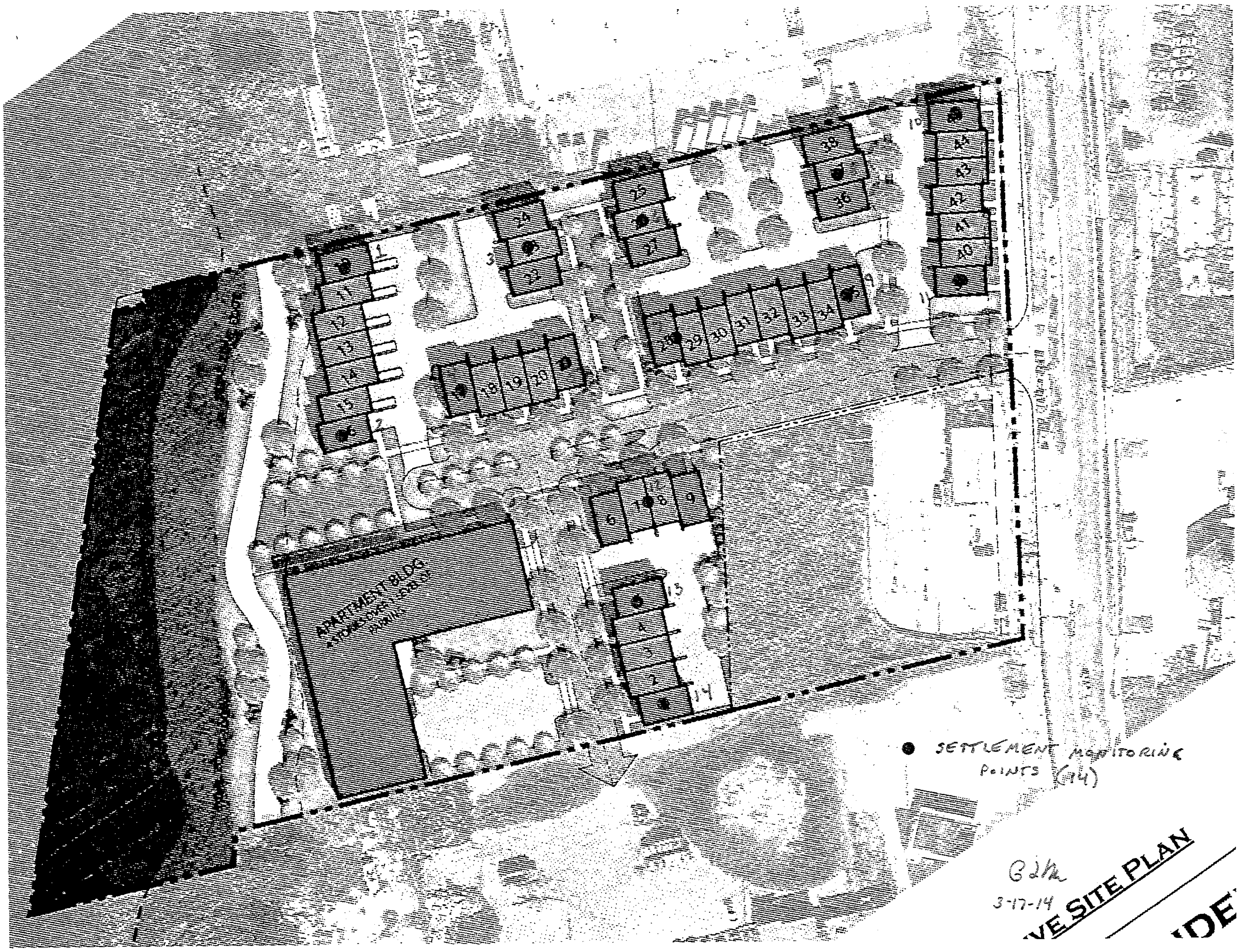


Scale:
N.T.S.
Originated By:
P.F.M.
Drawn By:
V.E.N.
Checked By:
Project Mgr:
P.F.M.
Dwg No.
99584-01
Issued:

SETTLEMENT PLATE SCHEMATIC

Advanced GeoServices Corp.
Chadds Ford Business Campus, Rts. 202 & 1
Brandywine One, Suite 202
Chadds Ford, Pennsylvania 19317

Project No.
2013-3085-05



● SETTLEMENT MONITORING POINTS (14)

GJK
3-17-14

VE SITE PLAN

DE

Wilmington Riverfront Transportation Infrastructure Project
Draft Environmental Assessment
Appendix G, Phase IA Archaeological Assessment

Appendix B: Geoarchaeological Assessment

DANIEL R. HAYES, GEOARCHAEOLOGIST
125 BENNINGTON RD. • CHARLOTTESVILLE VA 22901• (434) 906-1584
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Letter Report

Supplemental geoarchaeological desktop assessments of the South Market Street Redevelopment Project, Wilmington, New Castle County, Delaware, regarding pre- and post-Contact landscape evolution, subsurface stratigraphy, potential for the waterfront area to host archaeological resources in varied contexts and pertinent investigative techniques.

For: RKK
700 East Pratt St, Suite 500
Baltimore, MD 21202

December 04, 2023

Introduction

Landforms bordering river systems are generally prime and dynamic environments for human settlement and archaeological site formation. Context and preservation of any associated archaeological resources are often contingent upon the formation processes and relative ages of host landforms. Geoarchaeological investigations within alluvial settings focus on identification of principal landform formation processes and resulting components within a chronological framework.

This geoarchaeological desktop study comprises a review of data assembled from project cultural resource management and geotechnical and studies completed to date regarding interpretations of the source, extent, distribution, chronology and potential significance of project area landform components to better understand the natural and cultural history of the waterfront area (RK&K Draft Technical Report or Phase IA Archaeological Assessment of the South Market Street Redevelopment Project, July 2023).

Geologic background and potential for archaeological site formation

The project area includes an urbanized section of waterfront in South Wilmington, Delaware, bordered by the tidal Christina River, a tributary of the Delaware River. The study area has been subjected to a continuous and sometimes dynamic range of landscape change throughout the ~15.5-14.0 ka period of human habitation in North America---the late Pleistocene through Holocene epochs---including the post-settlement period (post AD 1600) through modern times.

Over the long term these landform changes include the effects of post-glacial sea level rise that led to initial (late glacial/early Holocene) formation of Delaware Bay, followed by the eventual upstream extension of tidal conditions to the Fall Zone near the contact between the Coastal Plain and Piedmont Physiographic Provinces. Progressively rising sea levels within the tidal reach of the Delaware River and tributary estuaries have reduced tributary stream gradients and supported expanded accumulation of fine-grained alluvial estuary and marsh sediments that in reduced-energy environments (such as backwaters or drowned valleys) may have buried older, previously extant (terrestrial) landscapes. Rising water levels that expanded marsh conditions and increased flood susceptibility have also compromised human settlement potential (including prehistoric) along low-altitude landforms such as the study area (a relatively low Coastal Plain landform bordered flanked by the Delaware River and tributary Christina River).

Geologic background sources reviewed in the 2023 RK&K South Market Street draft report (including geotechnical components) as well as the 2011 Louis Berger Group report regarding a proposed Christina River bridge all detail the source and relative antiquity of the host landform (the Scotts Corners Formation), the initial formation of which predates human habitation and settlement in North America. The Scotts Corners Formation was deposited along the ancestral Delaware Bay during the last interglacial high stand of the sea ~100 kyBP (the Sangamon interglacial period which ranged from ~125-75 ky BP prior to onset of the Wisconsin glaciation period of low sea levels). The landform itself is a alluvial construct of fluvial marine sediments, fining upward from basal gravels to stratified and sands and silts, (possibly capped with eolian elements) that with a deeply weathered surface soil (Othello silt loam) that is classified as an Ultisol. This soil type includes relatively deep B-horizons with strong pedogenic structure that are indicative of long-term, top-down weathering in good drainage conditions that predated the current Holocene trend regarding rising sea-level (and groundwater conditions). Its classification attests to its long term and relatively deep pedogenic weathering; present conditions of relatively poorly drainage represent the post-weathering effects of rising groundwater conditions (such as gleyed subsoil horizons). This soil is typically capped with fines (sand and silt dominated) that may include eolian (wind-derived) additions and/or surface reworking. In regards to prehistory of the area there is reason to anticipate the project setting as having potential for settlement and archaeological site formation dating back millennia. It may be assumed that any pre-Contact surface may have some potential for inclusion of pre-Contact archaeological resources, with potential inclusions of post-Contact as well.

Prior to the eventual late Holocene establishment of tidal conditions within this upper reach of Delaware Bay the Christina River—despite its relatively small drainage basin that reaches into interior Piedmont uplands likely was deeply incised within the axis of its present channel flanking the project area at a much greater elevation differential than modern; at some point during prehistory (Archaic?) it may have been easily crossed by foot. The project area undoubtedly was far better drained than at present and river channel and banks likely exposed basal strata components of Coastal Plain sediments including gravels etc rather than muds noted presently. The 'river' likely retained sufficient gradient to remain free flowing in contrast to the late pre-Contact/early post-Contact periods when tidal conditions likely began backfilling the river with alluvial fines (including muds) derived from the Delaware drainage; historic-era land use practices (eg deforestation, agricultural practices) in source drainage basins also contributed more alluvial sediment to the drainage system.

Conditions noted during early mid 17th c historic settlement and later bear the imprint of rising tidal conditions with marsh conditions along the riverfront areas. Most early historic settlement including commercial development was concentrated along the left descending bank of the Christina River, likely due in part to higher, better drained landforms as well as ready access to the interior regions. These factors regarding settlement practices and site selection would not necessarily carry similar weight with prehistoric populations.

Post Contact landform modifications and fill deposition.

Site-specific landform changes that followed the post-Contact establishment of the Wilmington settlement though the modern era included 'reclamation/improvement' of low-lying landform components through grade improvement by deposition of fill sediments, particularly in regards to improvement to transportation features (roads) and commercial developments. The potential exists for deposits of fill sediments to both bury and/or include archaeological evidence (of varied contexts and relative significance). Fills may include materials quarried from extant landforms (both piedmont uplands and coastal landforms) as well as dredge spoil extracted from the Christina River. Several gravel/sand borrow pits and infilled ponds (likely remnant borrows) are evident south and southeast of the project area on topographic maps.

The project area has undergone at least two recent episodes of geotechnical investigations regarding subsurface stratigraphy assessed by standard penetration test (SPT) borings included within Appx D of the RK&K Draft Technical Report: a 2014 report by Advance Geoservices that consisted of 11 SPT tests, and 2023 report by Klein and Roy that included an additional 52 SPT borings (53 including one duplicate bore: Lot-A2-17A).

In brief, SPT bore methods employed here involved use of a hollow stem auger that penetrated deep into substrate, sometimes to basal rock. Substrate extracted by the auger (auger spoil) was of course mixed, but relatively 'intact' samples were recovered from the core of the auger (in 18" sample tubes) at variable intervals that ranged in depth from 1.0--3.5' below surface (as noted in bore logs). The amount of sediment actually recovered from sample tubes could vary from full to none at all (which may occur if the bit of the sample tube is blocked by gravel, brick etc). The amount of measured hammer blows required to insert the sample tube into substrate is one measure of the relative cohesiveness of the substrate.

As stated in the Advance Geoservices report: "The scope of this geotechnical investigation report is limited to an evaluation of the load carrying capabilities and stability of the subsurface materials (RK&K 2023:802). The primary focus of this type of investigation is to evaluate the physical characteristics of landform sediments for engineering purposes; while frameworks of overall subsurface stratigraphy may be organized from bore results the methods employed to achieve viable geotechnical results are not necessarily adequate for evaluation of the source and condition of major strata, particularly near-surface strata of primary interest for cultural resource management evaluations. In regards to descriptions in SPT logs, Fills often include a *mixed* assemblage of apparent alluvial sediment (sand and silt dominated, with some gravel) with occasional mentions of inclusions (macro-organics such as wood, and oftentimes 'brick'). This may be interpreted to possibly include any indigenous surface sediments and soils that existed in surface and near-surface contexts prior to any reclamation efforts.

Advance Geoservices defines "Existing Fill" without any specific attribution to source, as: 'encountered in all borings either at the ground surface or beneath concrete. The fill predominately consists of silty clay or silty sand and gravel that ranges from 3 to 9 feet thick."

Strata that underlie Existing Fills are normally better defined and may include source attribution, such as “Fine Grained Alluvium” which Advance Geosciences defined as: “The river estuary material…encountered beneath the fill in all borings. This material consists of very moist gray silty clay with fine sand lenses. The thickness of the fine grained alluvium ranges from 15-23 feet throughout most of the site.”

Table 4.3 (RK&K Appx D, p 98) summarizes the depth of Fill material encountered in the latest set of borings reported by Klein and Roy, (n=53 including one duplicate boring: Lot-A2-17A); data includes ground surface elevations, thickness of fill and the bottom elevation of fill. Discounting the duplicate boring, and two clearly atypical borings not particularly representative of the overall sample (Borings Lot-A2-16 and -17, located in the south and southwestern part of the study area), and including similar information gleaned from the 2014 Advance Geoservices report (n=11 tests) altogether includes a total of 61 borings that can be summarized as such:

Ground surface elevations ranged from 5.0-11.0 feet above sea level, thickness of Fill ranged from 2.0-14.0 feet below surface, and in consideration of the bottom elevations of Fill materials 62% of borings (38 of 61) reported fills to extend to at or below sea level. Such a high percentage of Fill measurements to or below sea level does not seem plausible.

While it is possible for some of these locations to include Fill materials at or below sea level, on a low-lying landform such as the project area there would expectedly have been more incentives for fill deposition than extraction. And, archival records indicate apparent use and settlement of tracts of the original landscape (sans fills) likely continued (at least in part) as late as the 1930’s (as evident in RK&K Figure 21: an aerial photograph that depicts residences and probable row-cropped ag fields). It appears apparent that regarding Fills, the geotechnical reports consider Fills as including remnant landform surface sediments and soils that would be considered of particular relevance to the archaeological record.

Assessment of project landforms for Archaeological content

Descriptions of Fill sediments in the boring logs are not adequate for clear identification of any pre-Contact surface and associated relic, near-surface soil development (such as A-E-B soil horizons). Nor do these descriptions clearly allow for the clear differentiation of these ‘fills’ regarding their contexual integrity (native sediments or imports, weathered in place or relatively intact, reworked by farm or construction equipment, truncated, etc.). The only practical way to assess these conditions and the presence/absence of archaeological content will involve subsurface testing with the intentions and methods (shovel test, test excavation unit, solid earth core, open trench, etc) to address these particular unknowns.

How far below surface to extend any initial tests is an open question. In some boring locations it appears possible that the pre-contact ground surface elevation may be close to modern--and in other locations clearly capped with non-local fills. However, *assuming* that at least the upper ~2-3+ft (60-90+cm) of the relic landform may have been most viable for inclusion of archaeological site evidence (a target range), and assuming a minimal elevation of the original project landform of ~5 ft (1.5m), it may be estimated that any initial subsurface testing may not be critical below 2.0’ amsl.

Prior to initiating any subsurface testing it would be useful to check any available data regarding any archaeological sites recorded on similar landforms of similar age in the project area; age, depths below surface, spatial distribution, etc.

A staged approach may prove useful regarding initial subsurface evaluations, beginning with shovel test evaluations in areas considered most likely to represent the pre-Contact landform surface of least disturbance. Results may advise the need and/or means of additional and possibly deeper testing.