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Geology and Geotechnical Considerations of the SSC Site in Texas:

Subsurface Investigation and Log of Boring for Two Main Place Dallas, Texas

Material Presented at the meeting of the Underground Tunnelling Advisory Panel
April 30, 1989 at the
SSC Laboratory at Lawrence Berkeley Laboratory

SUBSURFACE INVESTIGATION

TWO MAIN PLACE

DALLAS, TEXAS

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SUBSURFACE INVESTIGATION

TWO MAIN PLACE

DALLAS, TEXAS

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SUBSURFACE INVESTIGATION

TWO MAIN PLACE

DALLAS, TEXAS

FOR

DALLAS TEXAS CORPORATION

ONE MAIN PLACE

DALLAS, TEXAS

GENERAL:

In accordance with the terms of an agreement dated 26 March 1969, a subsurface investigation has been conducted at the site of the proposed Two Main Place Complex in Dallas, Texas. Recommendations concerning the method and extent of testing for the subsurface structure of the Two Main Place Complex, as related to vertical core borings, horizontal core borings, the application of the NX bore-hole camera, inclined core borings, and other exploratory methods deemed necessary by this office have been made to the architects and engineers, in writing. Upon approval by the architect and structural engineers, the necessary investigative and exploratory procedures required to conduct the subsurface investigation have been accomplished and are discussed herein in subsequent paragraphs.

Specifically, the site is located in downtown Dallas, Texas

and is bounded by Elm Street, Lamar Street, Griffin Street, and the western-most portion of One Main Place, along the east curb line of Griffin Street, between Main Street and Elm Street.

The purpose of the investigation was to determine the type of subsurface strata present at the site and to evaluate foundation conditions by means of laboratory tests, engineering analysis, and geologic evaluations. The results of the investigation, as reported herein, contain certain conclusions regarding excavation procedures, retaining walls, rock bolting, foundations and improvements to be erected within the confines of the proposed complex as well as information considered pertinent regarding foundation types, loading intensities, anticipated heave conditions, anticipated consolidation, lateral pressures, vertical wall stability, and recommended additional studies considered essential to the design and construction of the proposed complex.

As the investigation progressed, data in preliminary form was submitted to the owner from time to time and all such submittals are included or modified in appropriate sections of this report.

Two separate reports have been issued to the owner during

the investigation and are not included herein; one presented the results of borings drilled to locate an existing sewer tunnel under Commerce Street and the other presented observed data obtained during an Earth Anchor Pull Out Test.

Insofar as the proposed complex is relatively complicated in scope and specialized drilling and subsurface exploration techniques, as well as specialized techniques regarding geologic and engineering evaluations, were utilized throughout the investigation, each of these procedures is discussed in detail in subsequent paragraphs.

In view of the complexity of the project and the large number of data sheets required, the Logs of Borings, Location of Borings, and Benchmark Drawings have been submitted as a separate volume.

SUBSURFACE EXPLORATION:

Phase A of the exploratory program provided for the drilling of inclined, NX-size core borings at selected, strategic locations around the perimeter of the proposed excavation. These inclined core borings, identified as ACB-1 through ACB-21 were drilled on an angle of approximately 45°, measured with respect to the vertical, and were located so as to provide a maximum of subsurface information

around the perimeter of the project in order to evaluate in detail the subsurface primary sediments present at the boring locations.

The purpose of the inclined core borings drilled around the perimeter of the project has been to explore and sample the foundation rock materials encountered, or expected to be encountered, outside the proposed excavation limits. These data were obtained in areas where vertical excavation is anticipated and both soil and rock retainage systems are anticipated for the protection of adjacent streets, structures, and other real estate intended for use other than the Two Main Place Complex.

Each of the inclined core borings was pressure tested by the insertion of an expandable packer within the boring, below the base of temporary steel surface casing. Water was then injected into the boring, under pressure, and any zone of leakage within the primary sediments was delineated by altering the elevation of the expandable packer. These pressure test data are shown where appropriate on the attached "Logs of Borings".

Immediately upon the completion of pressure testing operations, each boring was throughly washed and cleaned in

preparation for NX bore-hole photography. Each of the borings was photographed continuously from the base of the temporary surface casing to the bottom of the hole, utilizing Republic Engineering and Manufacturing Company, NX Bore Hole Camera, Model 500. Continuous color photographs were obtained at minimum depth intervals of three-quarters of an inch, thus providing a continuous photographic record of the primary rock strata penetrated. Geologic and engineering evaluations of primary materials photographed by the bore hole camera have been compiled into a photographic log of the bore hole. Both photographic data and visual observations from physical inspection of the core extracted during core drilling operations are presented in the Logs of Borings volume of this report.

All core borings were located in the field by means of a field survey as to location, elevation, magnetic bearing as to the direction of the boring, as well as the angle of inclination of the boring. These data are shown where appropriate on the attached "Logs of Borings" and "Location of Borings".

Phase B of the exploratory porgram provided for the drilling of a series of NX-size vertical core borings in areas considered representative of both Tower and Low-Rise portions

of the project.

Three benchmark complex units were installed in areas considered critical for monitoring the rebound or heave of the primary shale formation during load removal expected to be experienced during excavation stages, as well as to monitor settlement and/or consolidation of the primary shale formation during the application of structural loads anticipated during construction stages of the project. These benchmark complex locations are shown on the attached sheet entitled "Location of Borings". In addition, a typical detail of the benchmark complex installation is shown on an attached data sheet.

Vertical Core Borings Nos. L-1 through L-8 are located within the confines of the proposed low-rise Plaza area while Core Borings Nos. T-1 through T-11 are located so as to be representative of the proposed high-rise Tower section of the proposed complex.

Borings Numbered 1 through 9, which are shown on the Location of Borings Sheet, were made under a prior agreement. The logs of these borings are not presented in this report but are shown, where applicable, on the Geologic Profile Sheets presented herein.

All vertical core borings assigned to the "T Series" and to the "L Series" were pressure tested in accordance with criteria discussed in connection with the angle hole series of borings. These pressure test data are reported where appropriate on the attached "Logs of Borings".

The benchmark complex borings provided for the extraction of 4-inch diameter core throughout the section of primary sediments penetrated to the depth of 120 feet, with one such boring being drilled at each benchmark location. The remaining three borings at each benchmark location were drilled by the wash-boring technique and each 300-foot deep boring (one at each benchmark location) was subjected to electrical resistivity logging and these electrical resistivity curves for these borings are shown, where appropriate, on the boring logs.

Each core boring was drilled by the rotary process and was terminated in the firm, unweathered Eagle Ford Shale formation of Cretaceous Age. At each boring location, the entire section of the Austin Chalk Limestone formation present was penetrated. All borings were drilled in areas considered significant to the design and construction of the proposed complex. In the vertical core borings, undisturbed, typical, representative samples of the cohesive overburden soils were

obtained by means of a thin-walled, seamless, Shelby-tube sampler forced into the soil by means of a rapid thrust from two balanced hydraulic rams. Representative disturbed samples of the non-cohesive and granular materials penetrated were obtained by use of a standard split-spoon sampler in connection with the Standard Penetration Test procedures. The penetration test procedure utilizes the standard split-spoon sampler driven into the non-cohesive soil by means of a 140 pound weight falling freely for a distance of 30-inches and the number of blows required for one-foot of penetration is recorded, where appropriate, on the attached "Boring Logs". No overburden sampling was attempted on the inclined or angle core borings. Continuous cores of the primary sediments encountered were obtained, in both vertical and angle core borings, through the use of a double-tube, bottom discharge, NX-size coring tool fitted with an appropriate cutting bit.

All soil samples and selected core samples of the primary materials encountered were field extracted, identified as to boring number and depth, preserved in moisture-proof plastic, and packaged for transport to the laboratory for further tests and evaluations. All core drilling and sample preservation was under the direct supervision of an engineering geologist.

LABORATORY TESTS:

All soil samples and cores of the primary sediments extracted from the exploratory core borings conducted at the site were carefully classified and identified in the field by qualified engineering geologists. In addition, these samples have been evaluated and have been identified and classified in more detail in the laboratory. All soil samples have been classified in accordance with the Unified System of Soils Classification (Casagrande) as shown on the attached sheet entitled "Key to Classification As Used On Logs". Primary sediments encountered have been identified and described in accordance with standard geologic nomenclature.

In order to aid in the evaluations of soil materials present at the site, a series of Mechanical Analyses and -200 mesh Sieve Analyses have been conducted on selected, representative, granular materials encountered by the subsurface exploration procedures. In addition, a series of Unit Dry Weight and Moisture Content determinations have been conducted on cohesive soils penetrated by the core borings located near the anticipated perimeter of the proposed excavation.

The shearing resistance of primary sediments encountered at an elevation believed to be compatible with the base of the

proposed excavation has been investigated by a long term, Direct Shear, test procedure. The results of this strength determination may be seen on an attached data sheet.

In addition, the long term consolidation characteristics of the primary Eagle Ford Shale formation have been investigated by a series of Time-Consolidation tests. These test data are graphically reported herein as Time Rate of Consolidation and Pressure vs Void Ratio curves.

Strength properties of the primary sediments encountered at the site have been investigated by a series of Unconfined Compression tests wherein an axial load is applied to a laterally unsupported, cylindrical, sample until failure occurs within the sample. These test data are reported on appropriate summary sheets attached hereto. In addition, a series of Confined Compression tests have been conducted in order to determine the Modulus of Elasticity of anticipated founding material throughout the proposed project. These determinations were conducted as Confined Compression tests, utilizing representative core samples and a confining pressure approximately equivalent to overburden pressures.

A series of Double-Ring Shear tests were performed on representative samples extracted from core borings in areas which

will be stressed during the excavation of the vertical wall section of the proposed complex and near the approximate base of the anticipated excavation. The results of these Double-Ring Shear tests are shown, in summary form, and provide data concerning shearing strength of the primary sediments in a horizontal direction, essentially parallel to the bedding planes.

A series of Brazil Tension tests, were conducted in order to provide data concerning the tension strength of primary sediments in directions both parallel to and at an inclination to the normal bedding planes of the primary sediments encountered at the site. These tests involve compressional loading in a direction parallel to the diameter of selected core samples from both vertical and angle core borings.

Long term deformation and shear tests have been conducted on selected samples extracted from the Eagle Ford Shale materials penetrated below the base of the anticipated excavation. These tests provide data relative to shearing resistance parallel to the bedding planes, subsequent to long term loading normal to the bedding planes.

All laboratory test data have been summarized and are attached hereto on appropriate sheets.

SUBSURFACE CONDITIONS:

Based on data available from the exploratory core borings conducted at the site, the overburden materials present range in thickness from approximately 22-feet, to as much as approximately 28-feet, throughout the project area. These materials are largely alluvial in nature, having been deposited by the Trinity River and its tributaries during some previous geologic era. There was encountered, however, considerable quantities of man-made fill, particularly in the upper 8 to 12 feet of materials penetrated. This man-made fill is believed to be a residue of building demolition and subsequent basement filling, accomplished during recent years. For the most part, the natural soil materials penetrated range from clay, to sandy clay, to clayey sand, to sand and gravel, to gravel.

Immediately underlying the alluvial overburden materials, each of the core borings encountered the chalky limestone identified herein as the Austin Chalk Limestone formation of Cretaceous Age. Typically, and in its unweathered state, the Austin Chalk Limestone formation is a dense, well indurated, fossiliferous, chalky limestone which is considered an ideal founding medium for structural loads. Throughout the project area, the uppermost layers of the Austin Chalk Limestone, ranging in thickness from a few inches to as much as 2 or 3 feet are tan in color, having experienced

differential weathering in the form of leaching. Commonly associated with this weathered layer of the Austin Chalk, numerous thin clay seams and numerous iron stained fractures are present. As may be noted on the attached boring logs, (both physical description logs and photographic logs) there is associated with the Austin Chalk Limestone, a considerable number of fractures, some of which are open and some of which have been healed by secondary mineralization in the form of calcite deposition.

Near the base of the Austin Chalk Limestone formation, the exploratory core borings penetrated the dark gray, slightly arenaceous, shaly, transition zone of the Austin Chalk Formation. The thickness of this transition zone, at the project area, is in the range of 5 to 10 feet.

Immediately underlying the transition zone of the Austin Chalk Limestone, each of the core borings encountered the gray, thinly laminated, firm, fossiliferous, compact, clayey shale of the Eagle Ford Shale foramtion of Cretaceous Age. For the most part, the Eagle Ford Shale strata are a relatively uniform marine deposit. However, it should be noted that in each of the "T Series" borings the drill penetrated a relatively uniform shaly sandstone of approximately 5-feet in thickness (see attached "Logs of Borings").

The attached "Geologic Profile Sections" have been prepared by interpolation between borings so as to represent the typical stratigraphic relationship of materials encountered by the vertical core borings. The uppermost layers of the Austin Chalk Formation were encountered at relatively uniform elevations while the uppermost portion of the Austin Chalk transition zone is somewhat undulatory in nature as a result of depositional characteristics. The base of the Austin Chalk transition zone and the uppermost layers of the underlying Eagle Ford Shale formation represent a regional unconformity due to erosional precesses of the geologic past. However, based on data accumulated throughout this exploratory program, the uppermost contact of the Eagle Ford Shale was encountered at relatively uniform elevations with only minor erosional unconformity features being noted. As may be seen from the attached "Geologic Profile Sections", the primary sediments of Cretaceous Age encountered at the project site are dipping gently to the east and to the south, toward the Gulf of Mexico.

Inasmuch as the clayey shale of the Eagle Ford Formation of Cretaceous Age was encountered at elevations ranging from approximately 360 MSL to 370 MSL, it is anticipated that the required excavation for the project will terminate at, or very near, the contact of the Austin Chalk transition

zone and the uppermost layers of the Eagle Ford Shale formation. Since a major erosional unconformity is known to exist between the basal units of the Austin Chalk Limestone and the uppermost units of the Eagle Ford Shale, within the Dallas area, minor changes in the elevation of the top of shale may be expected. The erosional unconformity, in connection with vertical displacement from minor faulting which is known to have occurred within the geologic past and is present within the immediate area within the proposed complex, is responsible for the regional irregularity of the uppermost surface of the Eagle Ford Shale.

It is anticipated that the excavation for the proposed complex will expose a considerable number of minor faults and/or joints within the Austin Chalk Limestone formation, and perhaps within the Eagle Ford Shale formation.

As previously mentioned, small gravity or normal faults, as well as some reverse faults are known to exist within the project area and are quite common within the Austin Chalk Limestone section. While these faults are often zones of weakness they are, for the most part, minor and their full extent and location can not be totally and completely analyzed from subsurface exploration in advance of actual exposure or additional access for exploration. Thus, additional data

regarding the extent and location of minor faulting or jointing must be obtained during the excavation operations utilizing adequate geologic mapping and a more extensive use of the NX bore hole camera technique during future subsurface exploration operations as the excavation progresses downward. Thus, a combination of both subsurface mapping techniques and additional subsurface exploration must be utilized in delineating potential structural defects within the Austin Chalk Limestone section.

FOUNDATION STUDIES:

Inasmuch as required excavation is anticipated to encounter the lowermost layers of the Austin Chalk transition zone or the uppermost layers of Eagle Ford Shale, throughout the project area, it is anticipated that all structural foundations (exclusive of sheeting and shoring systems) will be founded on or within the Eagle Ford Shale formation of Cretaceous Age.

Data obtained from this subsurface exploration program indicate that the Eagle Ford Shale formation is present throughout the project area in a thickness in excess of 250-feet. In addition, laboratory test data in the nature of Modulus of Elasticity determinations indicate that the Eagle Ford Shale will react elastically within the range of anticipated

structural loading. Thus, equations based on the Theory of Elasticity have been utilized in studies to determine the allowable bearing capacity for anticipated foundations. The shearing resistance of the Eagle Ford Shale has been taken as one-half of the unconfined compressive strength as determined in the laboratory, a safety factor of three or more, considerations of differential movement, and assuming no overburden pressure as a result of basement excavation, the allowable unit bearing capacities for end bearing stress transfer within or on the Eagle Ford Shale formation have been determined for both mat and spread footing configurations. The adopted unit load intensity for mat foundations is 95.0 psi (6.84 tons per square foot) and 128.5 psi (9.25 tons per square foot) for spread footing foundations.

It is anticipated that a combination foundation system consisting of both mat foundations and spread footing foundations will be utilized to support the proposed structure. Accordingly, detailed theoretical evaluations of both heave and settlement have been made.

Studies were made of the probable vertical movements of a combination mat and spread footing foundation system as proposed by the Architects and Engineers in December of 1969 and continuing in the early portion of 1970. In essence,

this foundation system would be constructed at a generalized depth of 65-feet below the existing ground surface and all foundation members would be supported by the Eagle Ford Shale formation.

For the settlement study using the Elastic Theory, it was assumed that a uniform depth excavation was in place and that all loads would be applied at two unit pressures; all large mat type foundations would be uniformly loaded at a unit pressure of 95 pounds per square inch and all spread footings would be uniformly loaded at a uniform pressure of 128.5 pounds per square inch. It was further assumed that the Eagle Ford Shale was elastic, homogeneous, bounded by a plane surface, and semi-infinite in depth. Pressure profiles under selected points were determined by means of the Boussinesq Equation. Deflection resulting from these pressures and from pressures of adjacent and influencing footings would be proportional to stress in terms of the Modulus of Elasticity.

The results of this study are shown in plan view on the attached Sheet No. 1 and in an East-West section through the South Tower area by Sheet No. 2. These studies assumed that the foundation mat, and all spread footings, were rigid elements and that the Modulus of Elasticity of the

Eagle Ford Shale could be taken as 38,700 pounds per square inch.

Estimates of vertical movement of the base of the excavation resulting from the removal of some 65-feet of material were made by means of a finite element analysis with elements of the mesh extending some 750-feet in a lateral direction from the center line of the excavation (approximately Main Street) and some 450-feet below the surface of the existing ground. For the finite element analysis, a membrane type of soil retaining wall (zero strength) was imposed along the line of all vertical cuts above the primary formation. Thus, the indicated deflections in the overburden material are those for no lateral support of the soil. For the finite element analysis, material properties were taken as are summarized on the attached Sheet FE-3 dated February 1970 and consist of overburden soils with a Modulus of 2,700 psi, the Austin Chalk with a Modulus of Elasticity of 250,000 psi and the Eagle Ford Shale with a Modulus of Elasticity of 38,700 psi.

The coefficient K, "Coefficient of Lateral Earth Pressure" was taken as 1.0 for the Austin Chalk formation for an initial study and then taken as 0.0 for a second study, thus providing a bracket of the probable value.

The resulting lateral and vertical movements of the ground, as determined by the finite element analysis, are graphically presented on Sheet FE-3 for each condition studied. The maximum vertical heave in the center of the excavation amounts to 0.27 feet and this numerical value is considered verified by previous physical measurements of rebound at the site of the existing One Main Place Building.

An identical study was made for an excavation depth of 60-feet rather than 65-feet and the results of the heave or rebound resulting from the excavation are graphically shown on Sheet FE-1 dated February 1970.

Building loads were applied at the base of the excavation in accordance with a footing plan as shown on Sheet 1. The net deflections resulting from the combined heave and settlement are shown by the dashed line labeled "Net Deflection From Excavation Rebound and Building Loads As Shown" on Sheet FE-1 dated February 1970. This net deflection curve has been determined under the assumption that all applied loads, both on the mat and on the spread footings, were applied to rigid footings.

A similar study was made wherein the applied loads to the

footings were assumed to be applied to footings that were first truly flexible and secondly truly rigid; the results of the net deflection studies are shown graphically on the attached Sheet FE-5 dated February 1970.

Again using the finite element method of analysis, shear stresses in all formations were determined for an excavation 65-feet in depth with vertical perimeter walls and contours of maximum shear stress are presented on Sheet FE-4 dated February 1970.

Shear stresses were determined after application of building loads for an excavation 60-feet in depth as shown on Sheet FE-6 dated 27 March 1970 where all loads were applied to flexible footings. A similar study was then made where all loads were applied to a rigid footing. Contours of maximum shear stresses for the later case are shown in detail on Sheet FE-7 dated 27 March 1970.

The study of maximum shear stresses indicates an increase in shear stress in the Eagle Ford Formation near the corner of the excavation for the 65-foot depth case in the magnitude of 4 tons per square foot resulting from the excavation. The increase in shear stress results in a total stress, in the shale, of the approximate magnitude of the ultimate shearing

resistance of the formation when tested parallel to the bedding planes. After application of building loads, the magnitude of the shear decreases to a lower value and indicates the desirability, or necessity, of loading the near-perimeter footing area as soon as practical.

PROTECTION OF EXPOSED CUTS:

The Eagle Ford Shale formation and Austin Chalk transition zone (which contains numerous shale bands and overlies the compact clayey shale formation) are both subject to rapid weathering upon exposure to atmospheric conditions. As a result, it is recommended that all open cuts, either vertical or horizontal, which expose the Eagle Ford Shale and/or the Austin Chalk transition zone, be covered with a protective coating within a period of not more than two or three hours after the cut has been made. If the exposure of these strata is allowed to continue for longer periods of time, the exposed surface of the shaly units will dry, crack, and separate along bedding planes, crumble and disintergrate rapidly. It is therefore imperative that protection of the shale and/or transition zone be accomplished, at all times, in order to prevent undue exposure to the elements. The strata may be protected either by the application of lean concrete in the nature of a thin seal slab or by the application of asphaltic coating.

DRAINAGE:

The subsurface exploration indicates the presence of free ground water at the site. This water is present, for the most part, in the overburden system and is undoubtedly present in, or along, certain structural defects within the primary sediments. It is therefore imperative that an under-floor drainage system be constructed under all basement floors and that this drainage system be connected to a positive sump-pump in order to prevent an excessive build up of hydrostatic pressures. In addition, it is recommended that the basement walls be protected from hydrostatic pressures by horizontal drains (drilled into the unexcavated perimeter walls), lateral drains (between the basement walls and the excavation face), as well as vertical drains (between the basement walls and the excavation face), all inter-connected to a positive sump-pump.

The above mentioned lateral and vertical drains may be constructed in the nature of laterally connected chimneys and constructed of material such as crushed limestone which will not deteriorate with age and will provide free and rapid drainage for ground water. Backfill between the basement walls and the cut face of the excavation should consist of free draining granular material and should be placed in horizontal layers and compacted so as to prevent arching

and future settlement. It is recommended that nominal 3-inch diameter drain holes be drilled at levels more fully described in the Excavation Section of this report, around the perimeter of the entire complex in order that vertical and near-vertical joint systems which are capable of transmitting water may be drained, thereby reducing lateral pressures of the excavation faces.

EXCAVATION:

Information currently available to this office indicates that the project area will be excavated to a depth of approximately 60-feet below the existing ground surface. It is further anticipated that the excavation will extend approximately to property lines, and that vertical cuts will be required. Materials that will be penetrated by the excavation consist largely of the overburden soils ranging from approximately 23-feet to approximately 28-feet in thickness, and the primary Austin Chalk Limestone formation which will extend to depths of approximately 58 to 65 feet below the existing ground surface. It is probable that the excavation will expose primary sediments of the Eagle Ford Shale formation in certain areas.

A wall retainage system will be required in order to secure

overburden materials and adjacent streets. Several wall retainage systems may be entirely suitable; however, it is anticipated that the more or less conventional system, previously used in the Dallas area, will be considered. This system may consist of drilled-in, concrete shafts acting as an anchored bulkhead, or as a full cantilever wall. Lateral pressures that will be developed by the overburden soils may be taken as an equivalent fluid pressure of 45 pounds per cubic foot. To this value should be added the surcharge loads from streets, adjacent structures, construction equipment or supplies, and so forth, as may be applicable. This equivalent fluid pressure includes a requirement that a free drainage system, as discussed previously, will be provided in order that no hydrostatic pressure will be present within the soils, on the soil side of the retaining wall system.

Should consideration be given to the use of a tension tie-back system, anchored within the limestone section, a cross-bed shear force will be developed within the limestone. The average strength of the limestone in cross-bed shear has been determined in the laboratory, and was found to be 17.5 tons per square foot. Utilzing a safety factor of five, the allowable shear becomes 3.5 tons per square foot. Tension tie-back systems grouted into the rock should not exceed this unit value in anchorage length.

For the most part, vertical cuts into and slightly through the limestone section itself, to depths anticipated for this project, will be stable with an adaquate safety factor, provided no defects are present within the limestone. However, such defects are known to be present in the form of joints, shear planes, and minor fault planes. Ground water is also present at the site. Thus, the adopted retainage system must be investigated for stability by the use of a free body force diagram, assuming the presence of a water filled, near-vertical defect at various locations behind the rock-cut face, including the end point of any tension tie-back or rock bolt system. The presence of these known and potential defects has been established by the use of the inclined core borings and subsequent NX Bore Hole photography, as delineated on the attached "Logs of Borings", "Geological Analysis of Bore Hole Photography", and as shown on the attached sheet entitled "Plan View of Geologic Features from Borehole Photography".

Careful analysis of the "Logs of Borings" and the results of the bore hole photography as shown on Sheet BP-1, indicate that several of the observed geologic defects within the areas explored may affect the stability of the anticipated vertical excavation face. These areas and features are indicated in red on Sheet BP-1. Areas of particular concern

include the entire north (Elm Street) face of the proposed excavation; the west (Lamar Street) face near the intersection of Lamar and Elm Streets; the west (Lamar Street) face from Main Street to Commerce Street; and entire section of the excavation along Commerce Street.

A rock wall stability analysis has been conducted utilizing a free-body diagram and data obtained during this investigation. The free body diagram attached illustrates the effect that the presence of an open defect in the primary formation may have on wall stability. The horizontal distance "L" represents the distance from the cut face to the location of a defect that is open. The analysis was made assuming that the defect was water filled, having gained access to water at the top of the primary formation or at a depth below the existing ground surface, d_1, by rainfall or other sources.

The numerical values for the quantities "L", "e", "p' ", "p" " were determined by means of a computer analysis. The attached tabulation indicates that the critical value of "L" is 40.8 feet. This is the minimum value of "L" required to prevent uplift, or conversly, to provide a compressive force "p" ". Thus, for conditions illustrated by the free body diagram, no vertical cut can be made until

the rock mass behind the cut face can be adequately tied so as to perform as a true block of a minimum width of 41-feet for this depth of excavation.

Since the results of the bore hole photography program give an insight into the defects of the formation, and reveal insitu conditions at the point sampled, it is recommended that rock-bolts or tie-backs be proportioned to resist the applied stresses illustrated by the free body diagram and that the spacing of such anchorage be planned initially on a horizontal spacing not greater than 10-feet on center and on a vertical spacing not greater than 20-feet on center.

In view of the necessity to provide positive drainage from the unexcavated rock mass around the perimeter of the vertical excavation, it is recommended that a series of horizontal core borings, on approximately 100-foot centers, be drilled in the vertical, exposed excavation face of the primary sediments as the excavation progresses downward. These borings should be in stages; that is, stage one should be drilled when the excavation reaches a depth, into rock, of approximately 12-feet and each subsequent stage should be drilled at excavation depth increments not to exceed 15-feet. These borings should extend horizontally a minimum distance of 50-feet, should be pressure

tested and subjected to bore hole photography. Each boring can thus serve as a multiple purpose boring by providing for the extraction of rock core, pressure test data, bore hole photographic data, and the installation of permanent horizontal drains.

Such additional data may serve to augment criteria set forth herein or provide data necessary to permit field modifications of the projected rock wall anchorage.

Based on data currently available, all rock wall anchorage should penetrate and be anchored at a distance greater than 41-feet from the cut face with the anchorage distance being determined by the recommended allowable pullout crossbed shear resistance provided herein.

INSPECTION OF ROCK CUT DURING EXCAVATION:

Local faulting is known to have occurred throughout the Austin Chalk Limestone section and indeed within the Dallas, Texas area. It is therefore considered essential that the services of a qualified engineering geologist or foundation engineer be acquired during the period of excavation and foundation installation in order to verify the soundness of exposed excavation faces and conduct additional exploration including bore hole photography as previously described. In addition,

provisions should be made for monitoring the performance of adjacent structures and/or streets as well as wall faces during excavation and construction. Such monitoring should commence prior to any excavation within the project. The entire excavated area which exposes the primary sediments should be mapped in detail, insofar as geologic mapping is concerned, during the excavation and foundation installation operations.

In addition, detailed monitoring should be accomplished on all benchmark installations currently installed at the project area.

Mason-Johnston & Assoc., Inc.
12 June 1970

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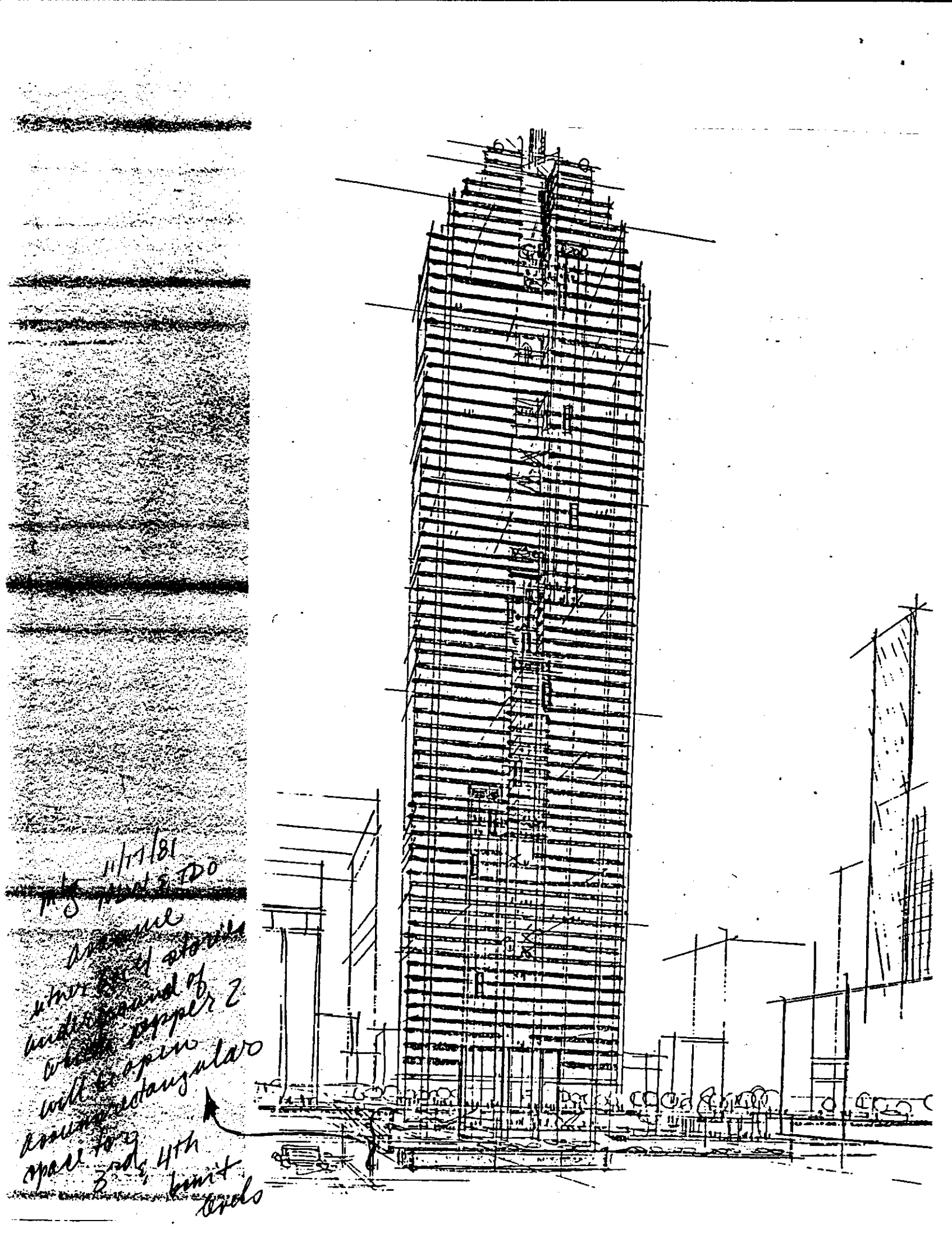
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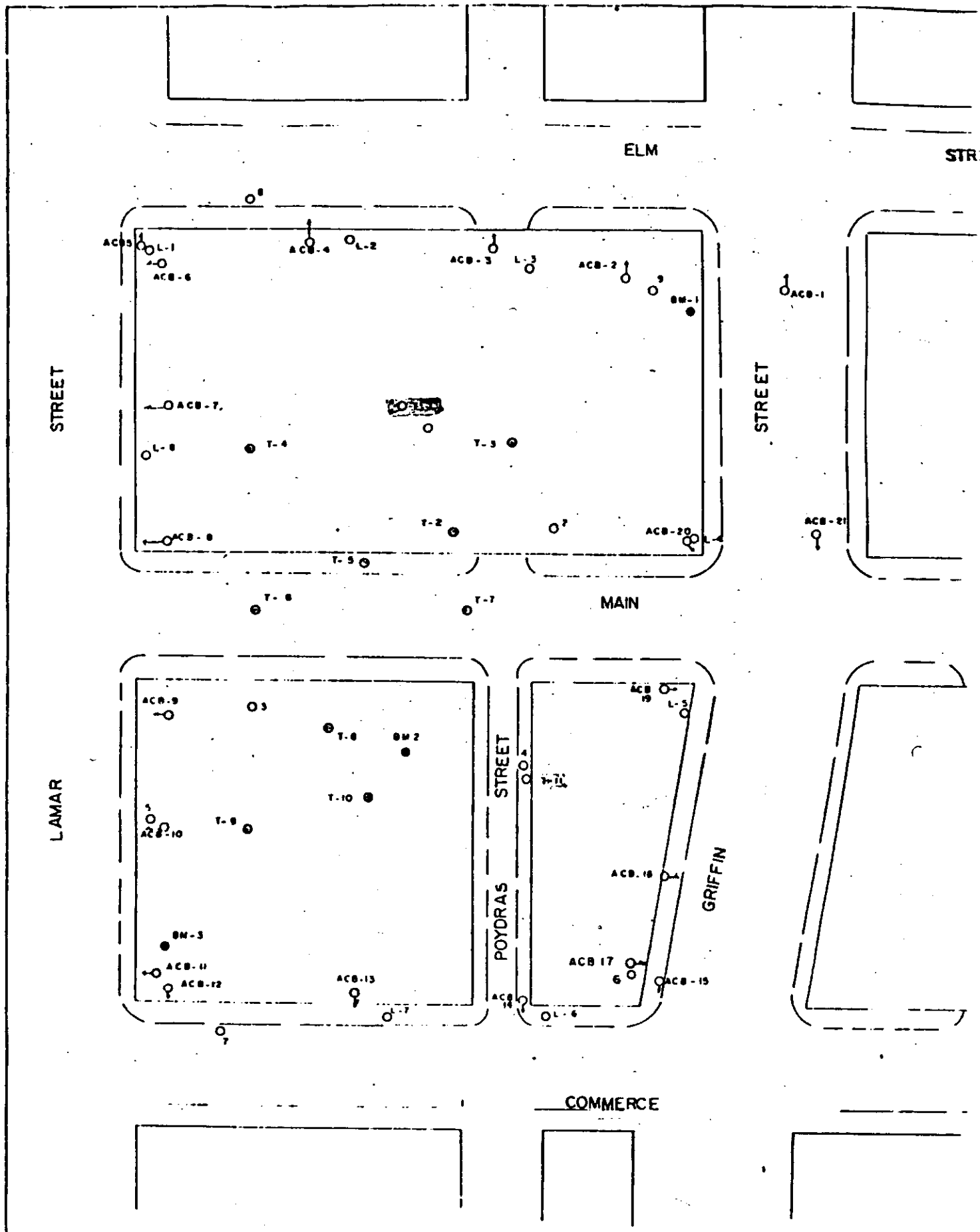
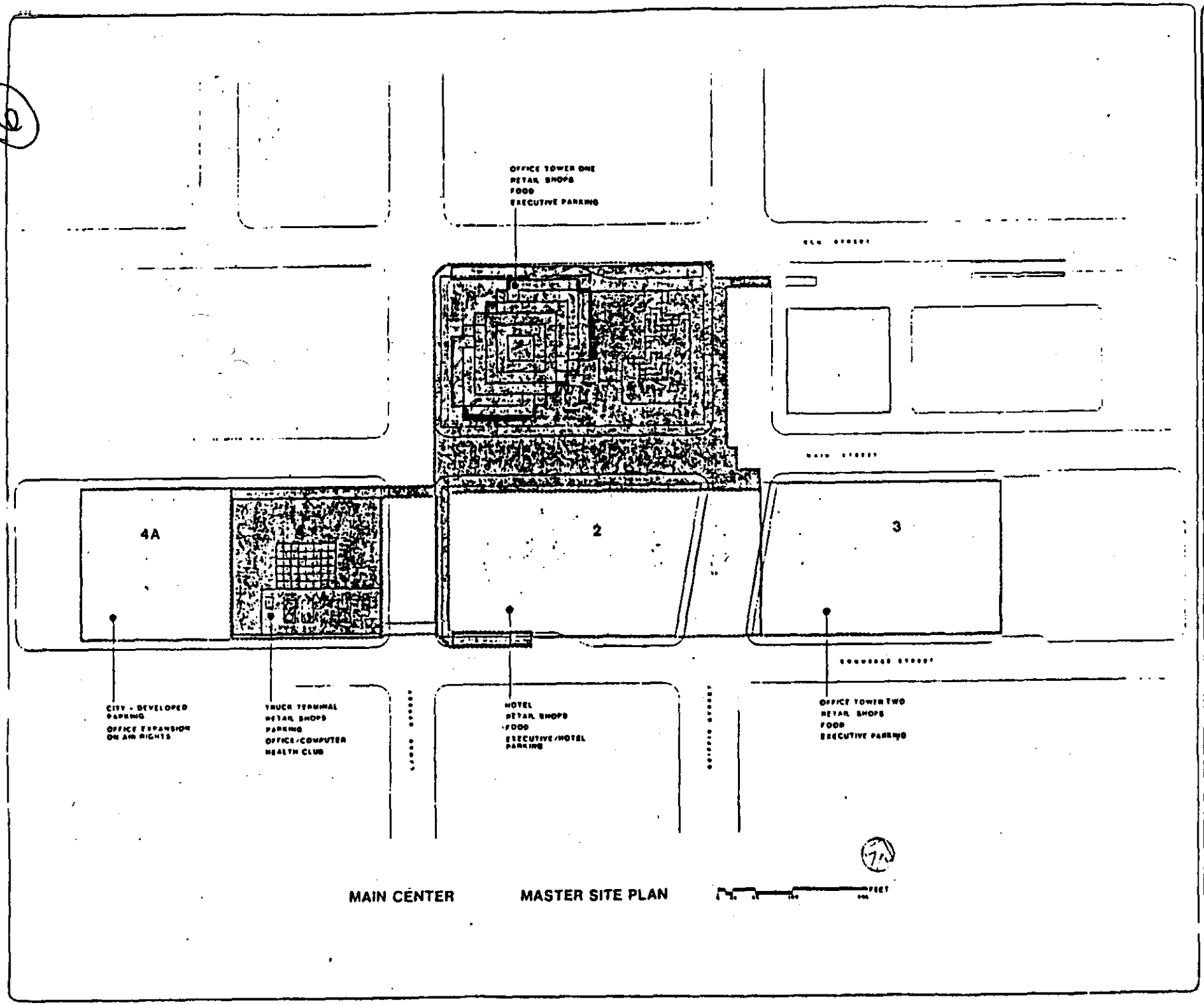

ELM
STR
STREET
STREET
MAIN
LAMAR
STREET
POYDRAS
GRIFFIN
COMMERCE
ACB-1
ACB-2
ACB-3
ACB-4
ACB-5
ACB-6
ACB-7
ACB-8
ACB-9
ACB-10
ACB-11
ACB-12
ACB-13
ACB-15
ACB-16
ACB-17
ACB-18
ACB-19
ACB-20
ACB-21
L-1
L-2
L-3
L-4
L-5
L-6
L-7
L-8
BM-1
BM-2
BM-3
T-2
T-3
T-4
T-5
T-6
T-7
T-8
T-9
T-10
T-11



MAIN CENTER MASTER SITE PLAN

MAIN CENTER
DALLAS TEXAS

JRJ

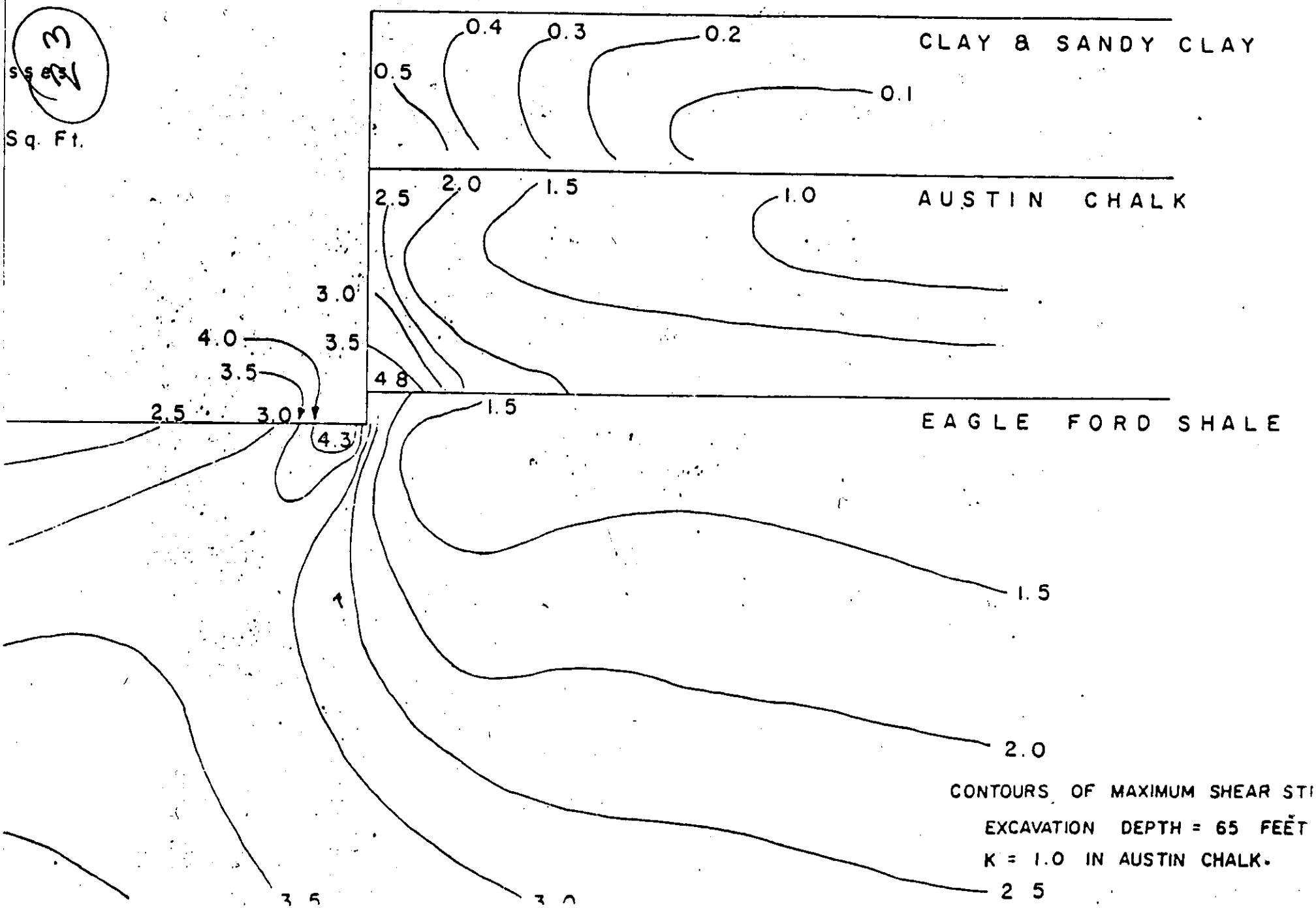
1

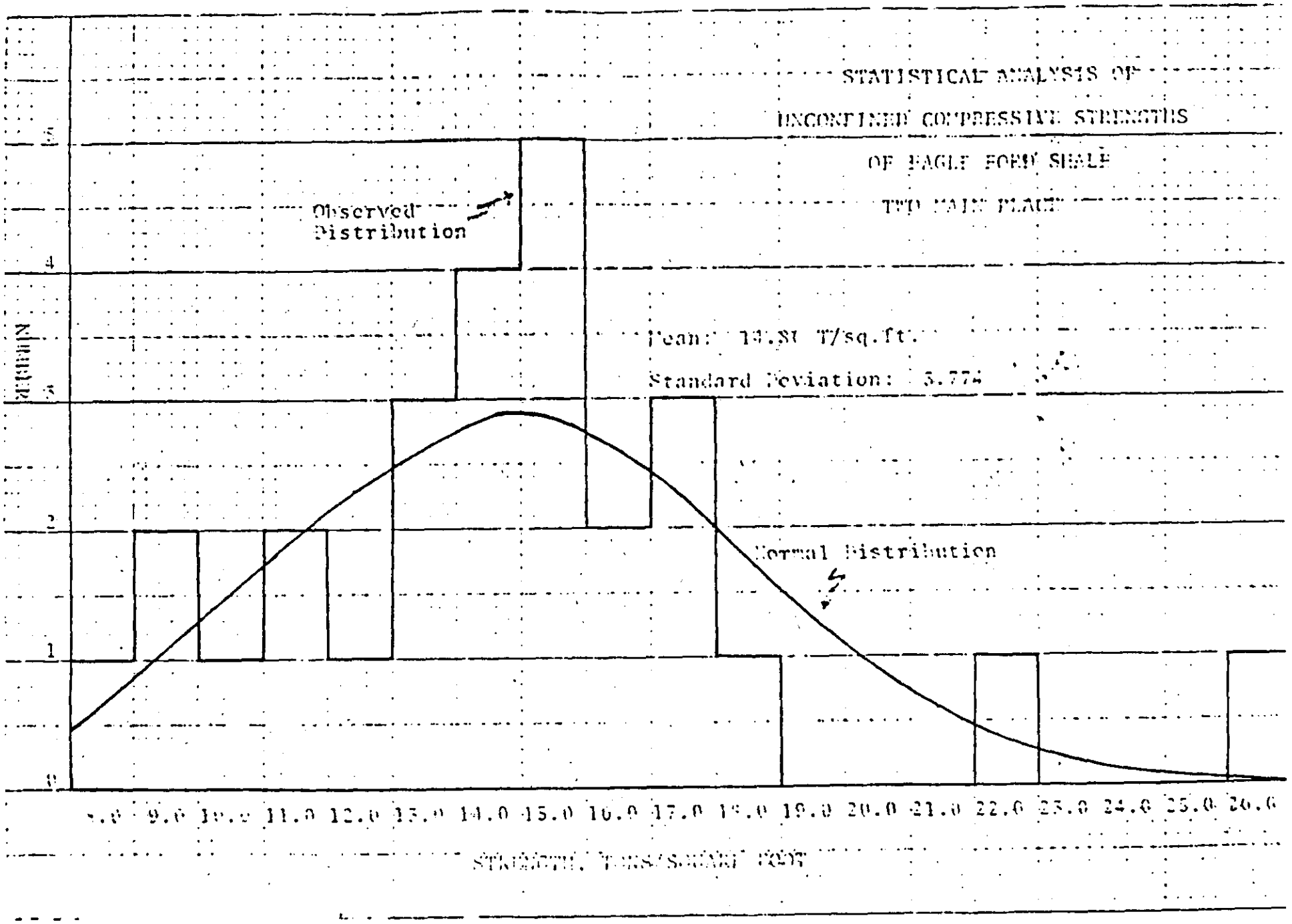
7

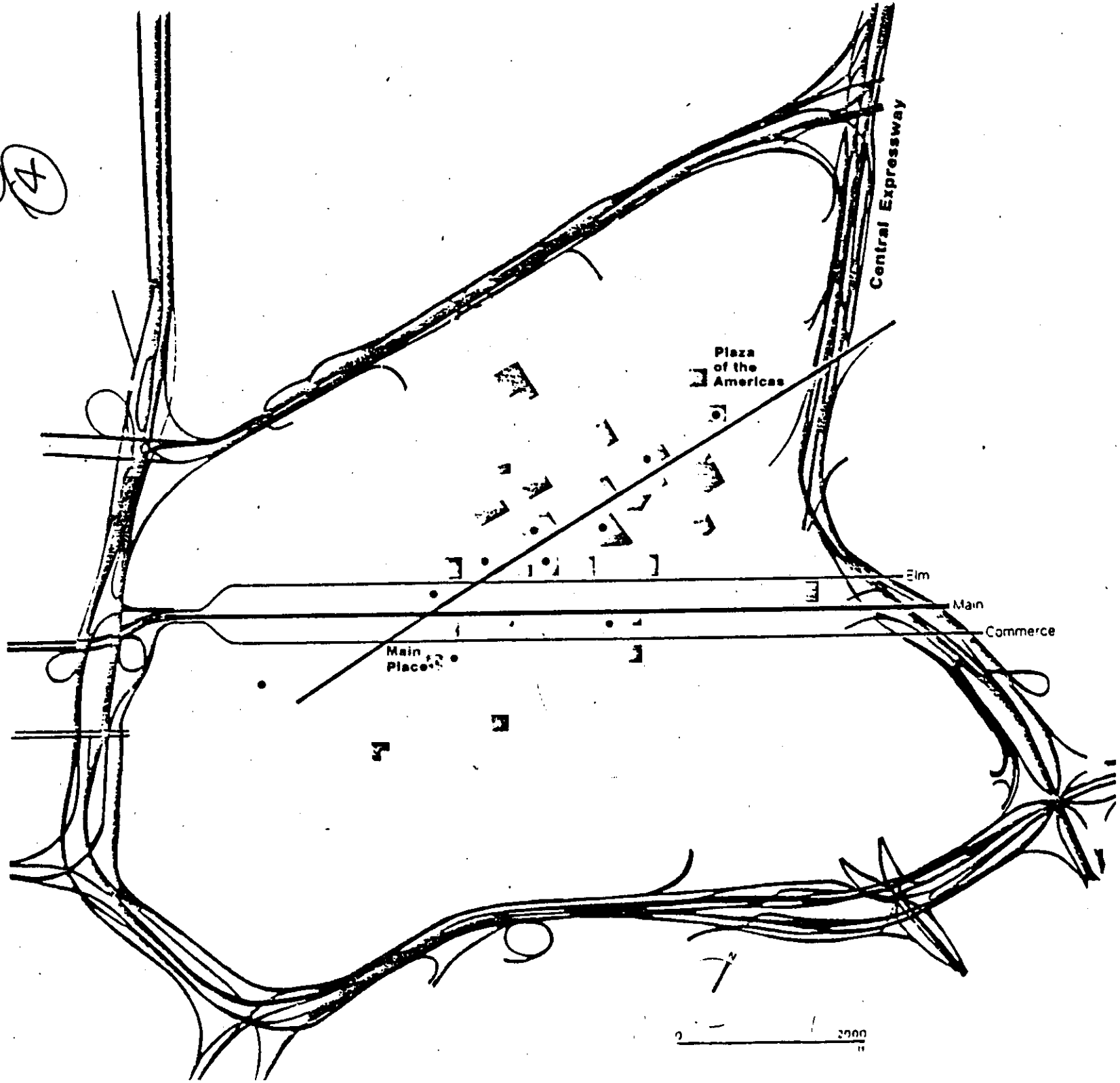
LOWER LOBBY/CONCOURSE PLAN

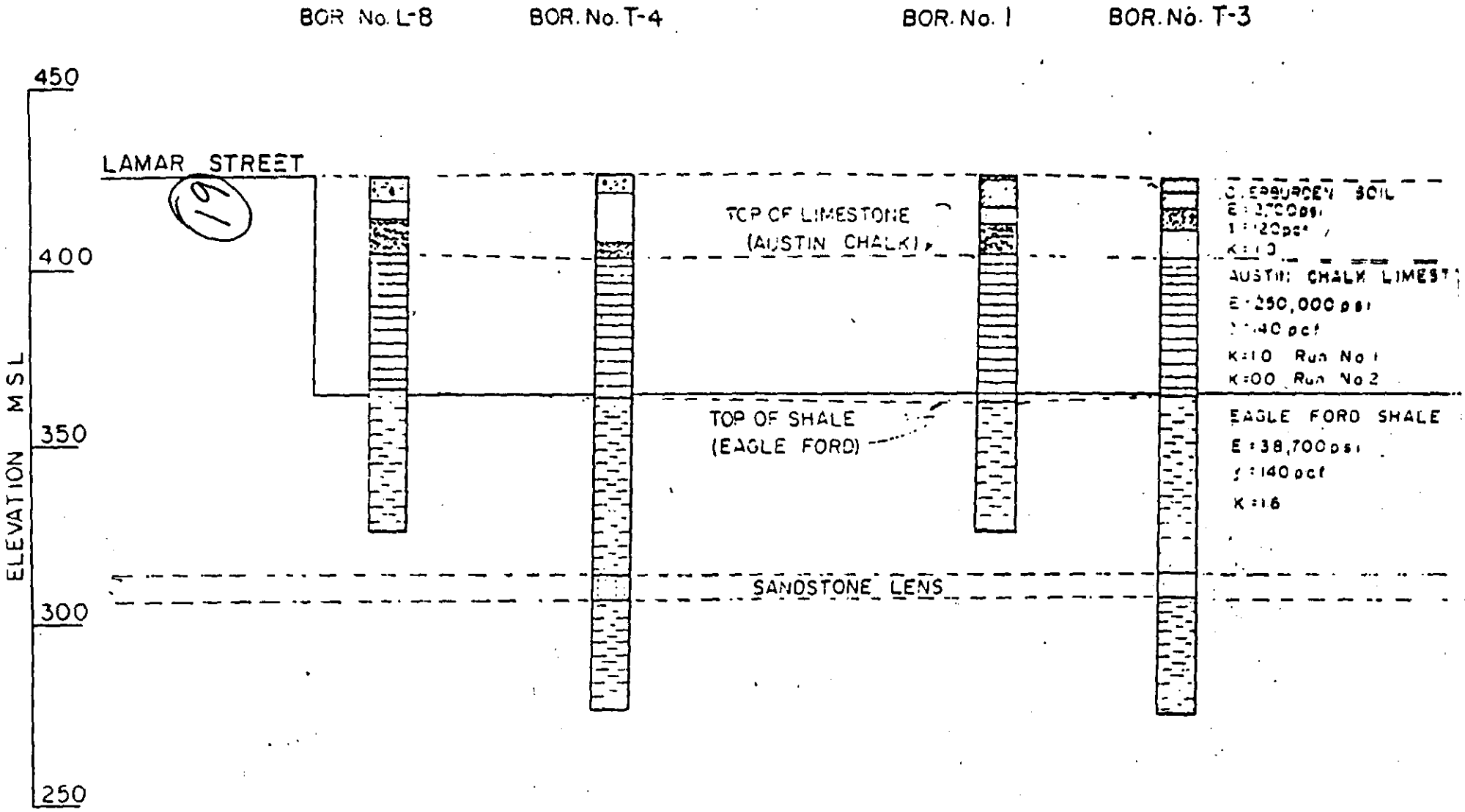
MAIN CENTER
DALLAS TEXAS

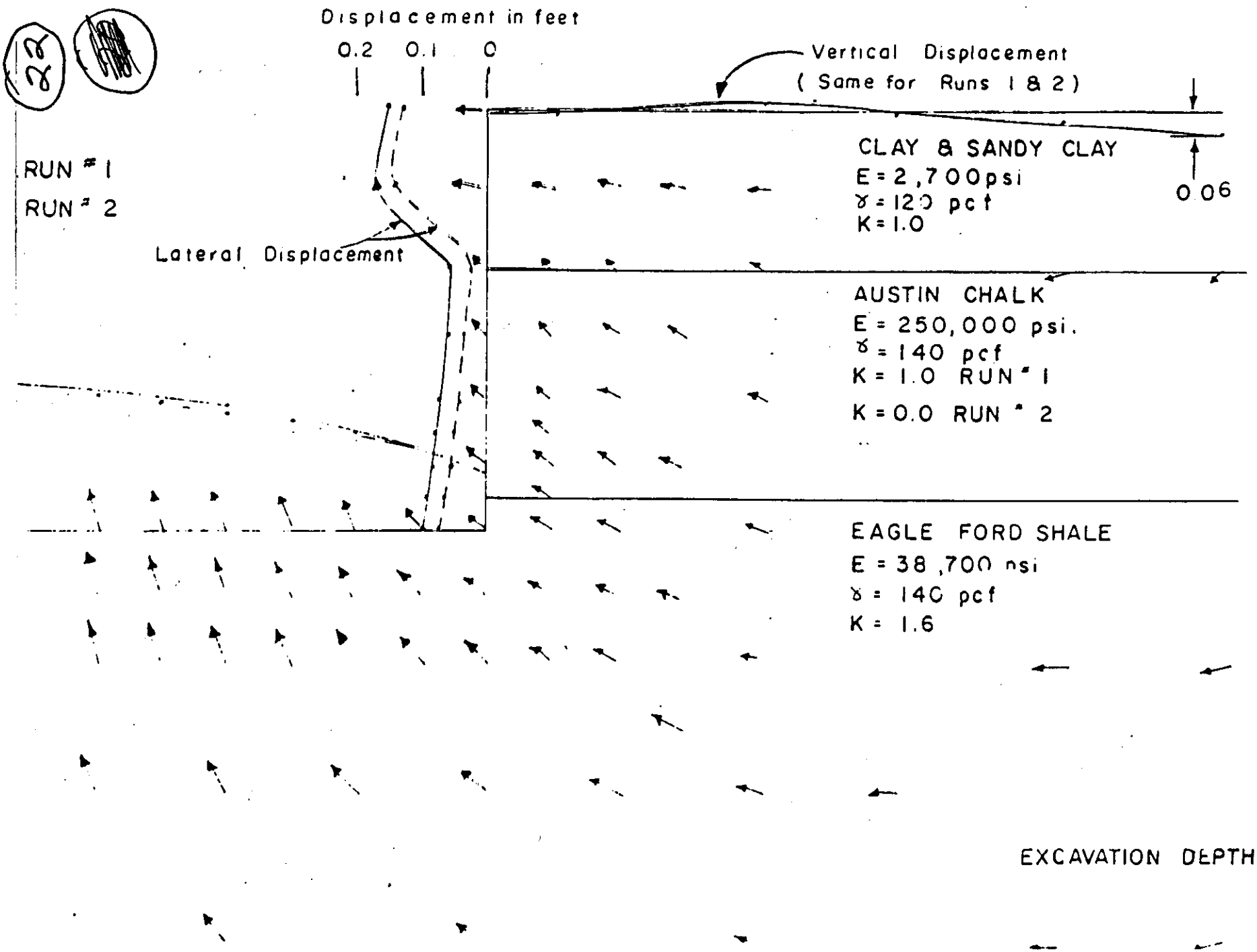
JRJ ARCHITECTS


Sq. Ft.
CLAY & SANDY CLAY
AUSTIN CHALK
EAGLE FORD SHALE
0.5
0.4
0.3
0.2
0.1
2.5
2.0
1.5
1.0
3.0
4.0
3.5
3.5
4.8
2.5
3.0
4.3
1.5
1.5
2.0
2.5
3.5
3.0
CONTOURS OF MAXIMUM SHEAR STI
EXCAVATION DEPTH = 65 FEET
K = 1.0 IN AUSTIN CHALK.

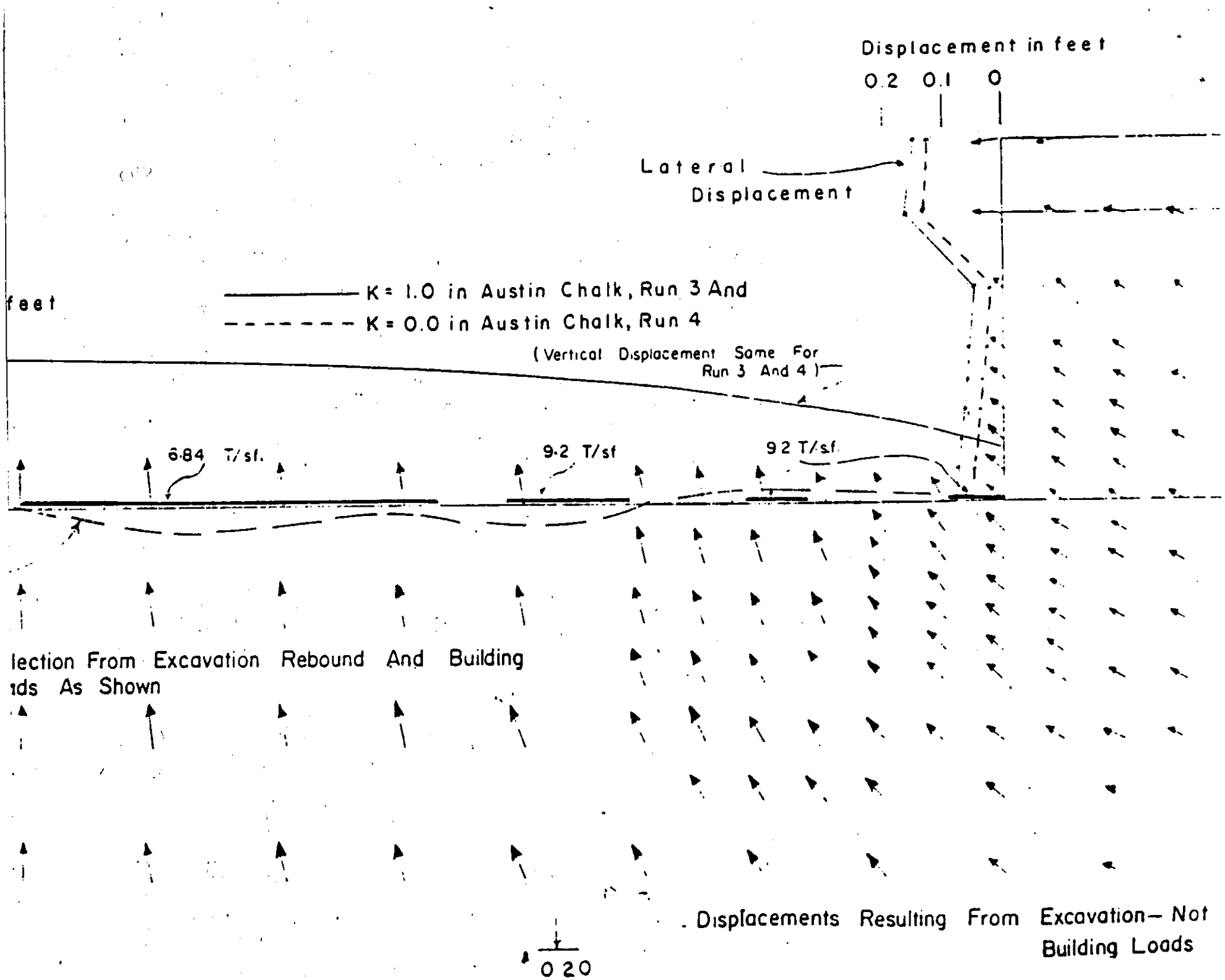

STATISTICAL ANALYSIS OF
UNCONFINED COMPRESSIVE STRENGTHS
OF EAGLE FORD SHALE
TTP MAIN PLANT
Observed Distribution
Mean: 18.50 T/sq.ft.
Standard Deviation: 3.774
Normal Distribution
NUMBER
0
1
2
3
4
5
9.0
10.0
11.0
12.0
13.0
14.0
15.0
16.0
17.0
18.0
19.0
20.0
21.0
22.0
23.0
24.0
25.0
26.0
STRENGTH, TONS/SQUARE FOOT

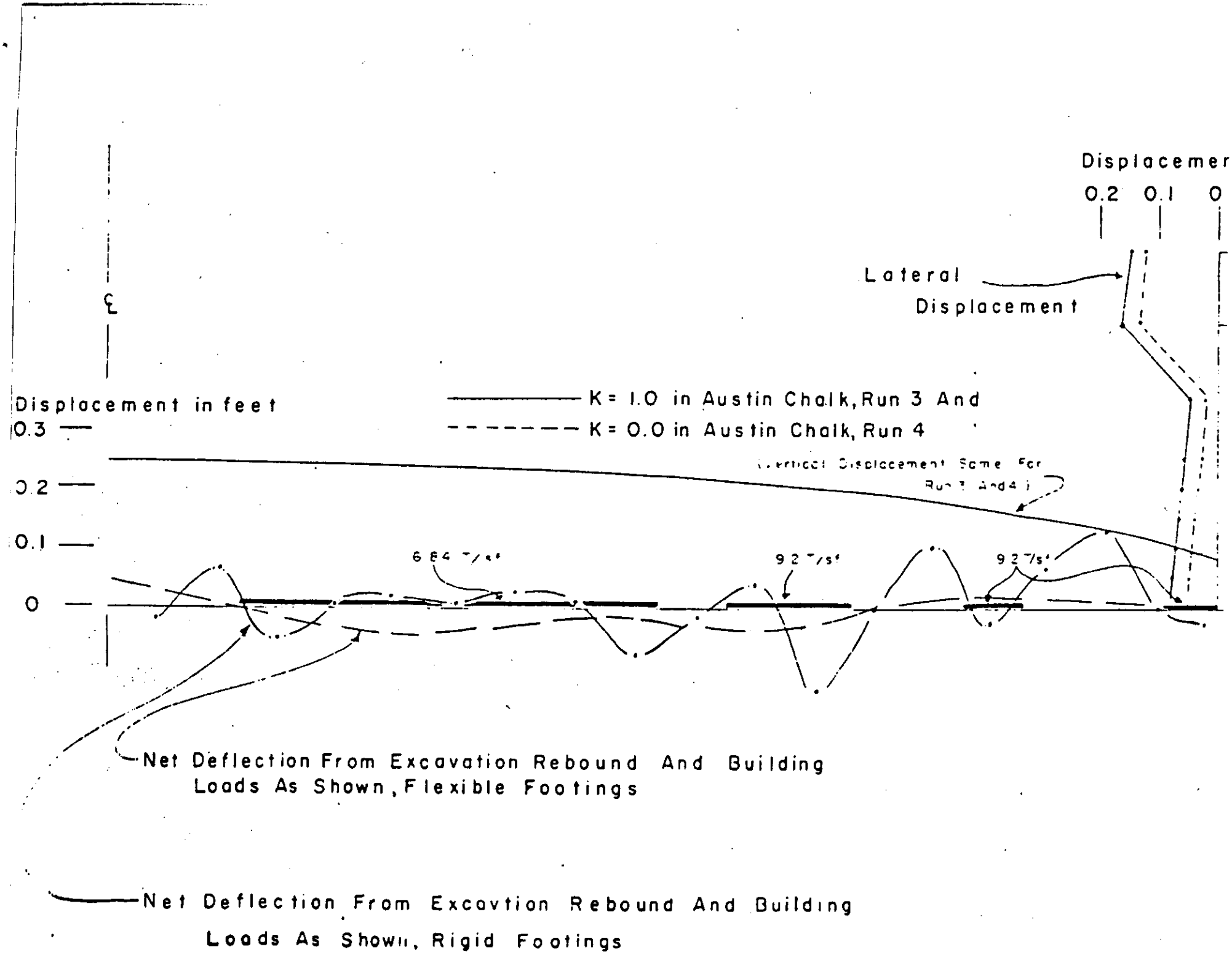

Central Expressway
Plaza of the Americas
Elm
Main
Commerce
Main Place


BOR No. L-8
BOR. No. T-4
BOR. No. 1
BOR. No. T-3
450
400
350
300
250
ELEVATION MSL
LAMAR STREET
19
TOP OF LIMESTONE
(AUSTIN CHALK)
TOP OF SHALE
(EAGLE FORD)
SANDSTONE LENS
AUSTIN CHALK LIMEST
E = 250,000 psi
K = 1.0 Run No 1
K = 0.0 Run No 2
EAGLE FORD SHALE
E = 38,700 psi
γ = 140 pcf
K = 1.6

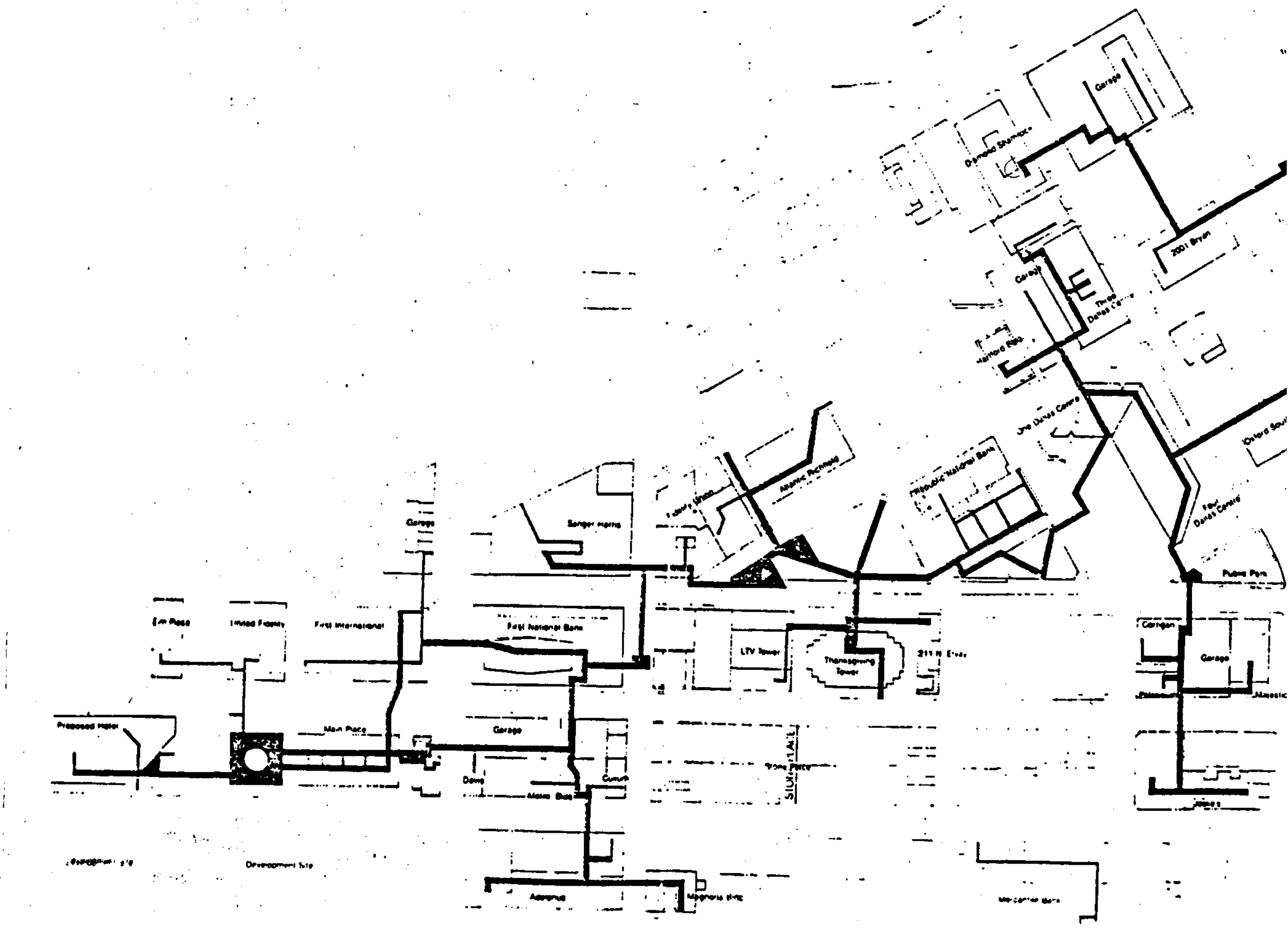


EXCAVATION DEPTH = 65 FE

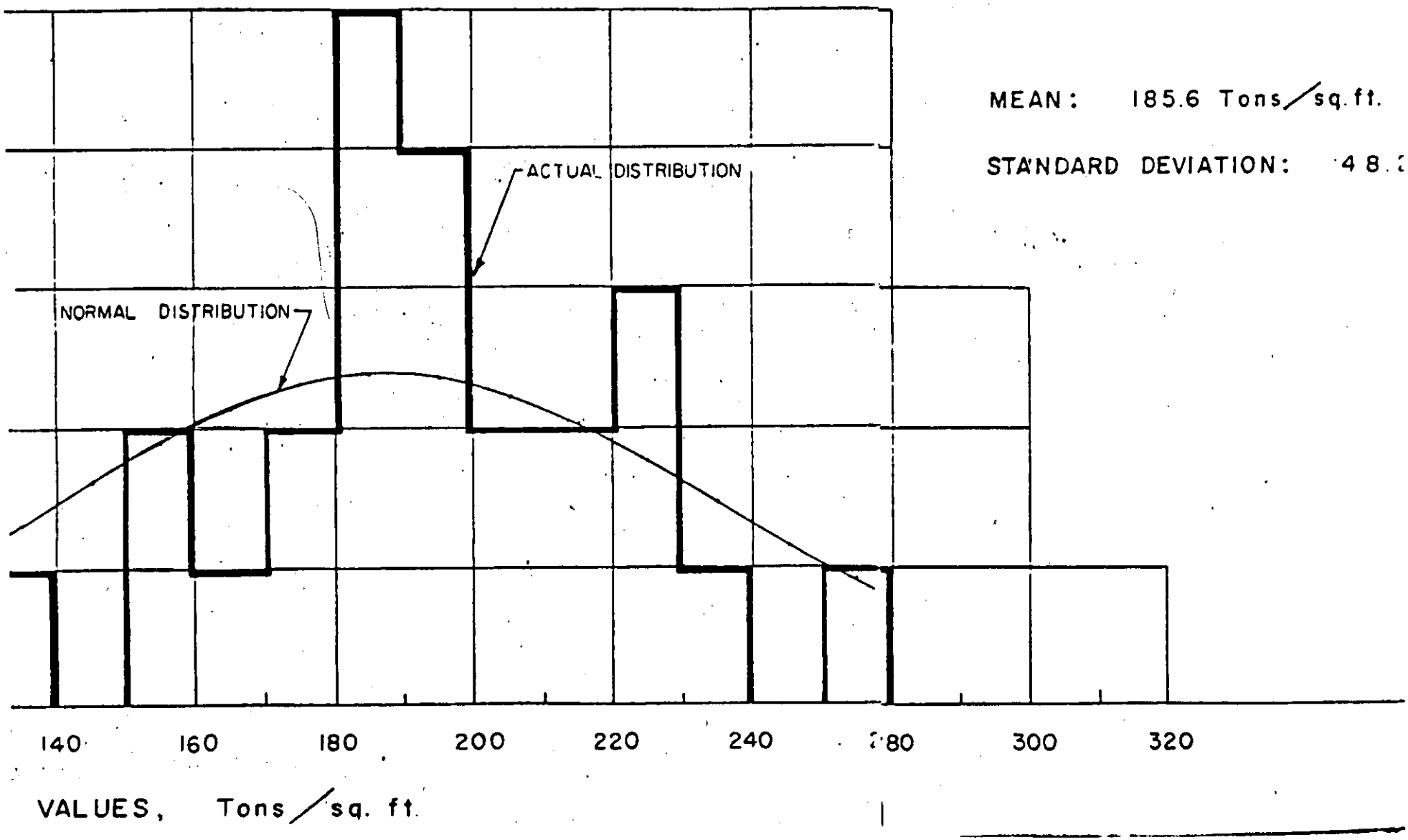

Displacement in feet
0.2 0.1 0
Lateral Displacement
feet
K = 1.0 in Austin Chalk, Run 3 And
K = 0.0 in Austin Chalk, Run 4
(Vertical Displacement Same For Run 3 And 4)
6.84 T/sf.
9.2 T/sf
9.2 T/sf
lection From Excavation Rebound And Building
ıds As Shown
Displacements Resulting From Excavation— Not Building Loads
0 20

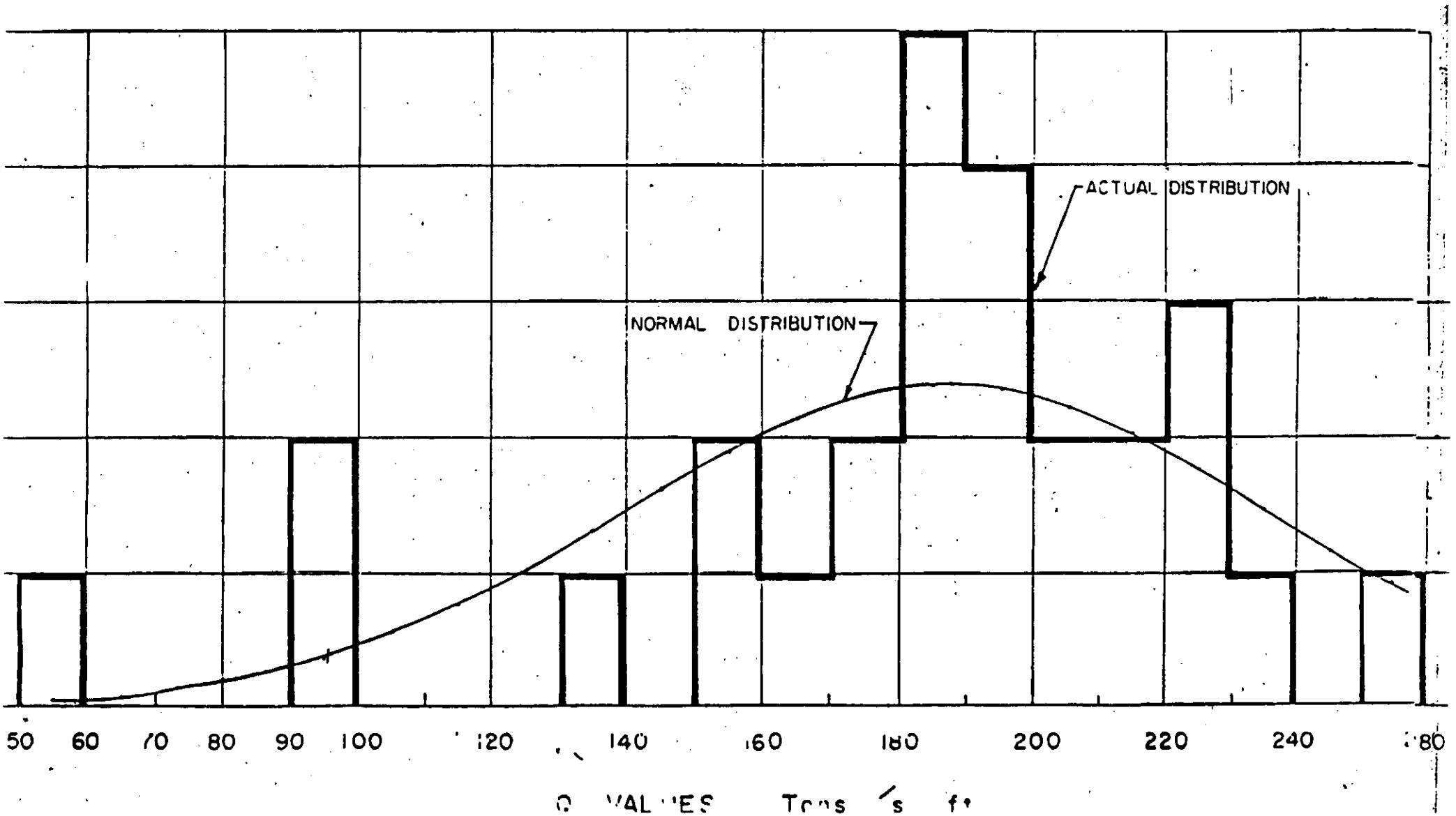

Displacemer
0.2 0.1 0
Lateral
Displacement
Displacement in feet
0.3
0.2
0.1
0
K = 1.0 in Austin Chalk, Run 3 And
K = 0.0 in Austin Chalk, Run 4
Vertical Displacement Same For
Run 3 And 4
6.84 T/sf
9.2 T/sf
9.2 T/sf
Net Deflection From Excavation Rebound And Building
Loads As Shown, Flexible Footings
Net Deflection From Excavtion Rebound And Building
Loads As Shown, Rigid Footings

5


Garage
Diamond Shamrock
2001 Bryan
Garage
Three Dallas Centre
Hartford Bldg.
One Dallas Centre
Atlantic Richfield
Fidelity Union
Sanger Harris
Republic National Bank
Four Dallas Centre
Public Park
Garage
Elm Place
United Fidelity
First International
First National Bank
LTV Tower
Thanksgiving Tower
211 N. Ervay
Corrigan
Garage
Majestic
Proposed Hotel
Main Place
Garage
Davis
Stone Place
Development Site
Adolphus
Magnolia Bldg.
Mercantile Bank

20


MEAN: 185.6 Tons/sq.ft.
STANDARD DEVIATION: 48.2
ACTUAL DISTRIBUTION
NORMAL DISTRIBUTION
140
160
180
200
220
240
280
300
320
VALUES, Tons/sq. ft.


ACTUAL DISTRIBUTION
NORMAL DISTRIBUTION
50
60
70
80
90
100
120
140
160
180
200
220
240
280

GEOLOGISTS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

Sheet 1 of 3

(8)

DATE 7-15-69
PROJECT 2933/69
TYPE Core Boring
BORING NO BM 1-2
LOCATION Site Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot —— ⊗ LABORATORY DATA PL + ---- ● - - + MC,% UDW, pcf △ UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 —— O 20 40 60 80 100 —— ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
							428.5
			Asphalt, tan sandy clay and bricks				425.7
5			Sand				
10							
15							
							10[illegible].6
20			Tan sand and gravel				
25			Tan weathered limestone				
			Limestone, gray hard		1.0	1.0	
30			50° slickenside fracture shaly				
35					5.0	5.0	
					5.0	5.0	
40							
					5.0	5.0	
45							
					5.0	5.0	
50							

ENGINEERS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

DATE 7-15-69
PROJECT 2953-60
TYPE Core Boring
BORING NO BM 1-2
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ⊗ / LABORATORY DATA PL + MC,% ● LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 — O, 20 40 60 80 100 — ●	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
55					5.0	3.8	
					5.0	5.0	369.0
60			Limestone, darker gray, hard, fossiliferous slightly shaly		5.0	5.0	
65			(Transition Zone)				362.0
			Shale, dark gray, firm to moderately hard, fossiliferous		5.0	5.0	
70							
					5.0	5.0	
75							
			45° fracture		5.0	5.0	
80							
					5.0	5.0	
85							
			numerous 30° to 45° fractures		5.0	5.0	
90							
					5.0	5.0	
95							
			40° fracture		5.0	5.0	
100							

ENGINEERS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

10

DATE 7-15-69
PROJECT 2953-69
TYPE Core boring
BORING NO BM 1-2
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ——⊗ / LABORATORY DATA PL + ----●---- + LL / UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 —— ○ / 20 40 60 80 100 —— ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
105			Very hard limestone band		5.0	4.[illegible]	
110			Shale, dark gray, firm to moderately hard, fossiliferous		5.0	5.0	
115					5.0	5.0	312.2
120			Sandstone, greyshaly firm to moderately hard		4.5	4.[illegible]	307.5
			Total Depth = 121.0 feet				

ENGINEERS

GEOLOGIC ANALYSIS

BORE-HOLE PHOTOGRAPHY

11

FOR

TWO MAIN PLACE
DALLAS, TEXAS

Project: 2952/69
Date: 8 July 1969
Elevation: 428.4'

Location: See Plan
Orientation: 45°00' off Vertical
Azimuth: 344°00' (Magnetic)

Boring No.: ACB-3
Type: Angle Core
Total Depth: 88.0'

Photographed Section: 30.0'-86.5'

Depth, ft.	Elev., ft.	Description of Feature
30.0	407.2	Start Photography
32.5	405.4	Bottom of Surface Casing: Limestone, tan and gray slightly weathered (Austin Chalk)
32.6	405.3	Fracture: Open to 1/2" Strike: 62°; dip 67° NW
32.8	405.2	Fracture: Hairline, tight, iron stained Strike: 64°; dip 35° NW
32.9	405.1	Fracture: Hairline to open 1/8", some calcite filling, iron-stained Strike: 71°; dip 17° SE
33.0	405.0	Limestone, gray, unweathered (Austin Chalk)
33.3	404.9	Fracture: Hairline to 1/4", calcite filled, tight Strike: 72°; dip 12° SE
33.4	404.8	Fracture: Hairline, calcite healed, tight Strike: 96°; dip 11° SW
36.0	402.4	Fracture: Hairline to 1/8", calcite filled, tight, multiple, complex Strike: 103°; dip 58° NE
52.8	391.1	Fracture: Hairline to 1/8", calcite filled, tight Strike: 109°; dip 22° SW
53.4	390.6	Fracture Zone: Hairline to open 1/16", multiple, complex, some calcite filling Strike: 73°; dip 26° SE
57.5	387.7	Fracture: Hairline to 1/8", calcite filled, tight Strike: 141°; dip 77° NE
58.1	387.3	Fracture: Hairline, tight, calcite healed Strike: 4°; dip 35° NW
62.5	384.2	Fracture: Hairline, to 1/8", calcite filled, multiple, complex, tight Strike: 134°; dip 89° NE
63.7	383.4	Fracture: Hairline to 3/4" calcite filled, multiple, complex, tight Strike: 108°, dip 52° NE

Photographic Analysis By: Aubrey D. Henley

GEOLOGIC ANALYSIS

BORE-HOLE PHOTOGRAPHY

(12)

FOR

TWO MAIN PLACE
DALLAS, TEXAS

Project: 2952/69
Date: 8 July 1969
Elevation: 428.4'

Location: See Plan
Orientation: 45°00' off Vertical
Azimuth: 344°00' (Magnetic)

Boring No.: ACB-3
Type: Angle Core
Total Depth: 88.0'

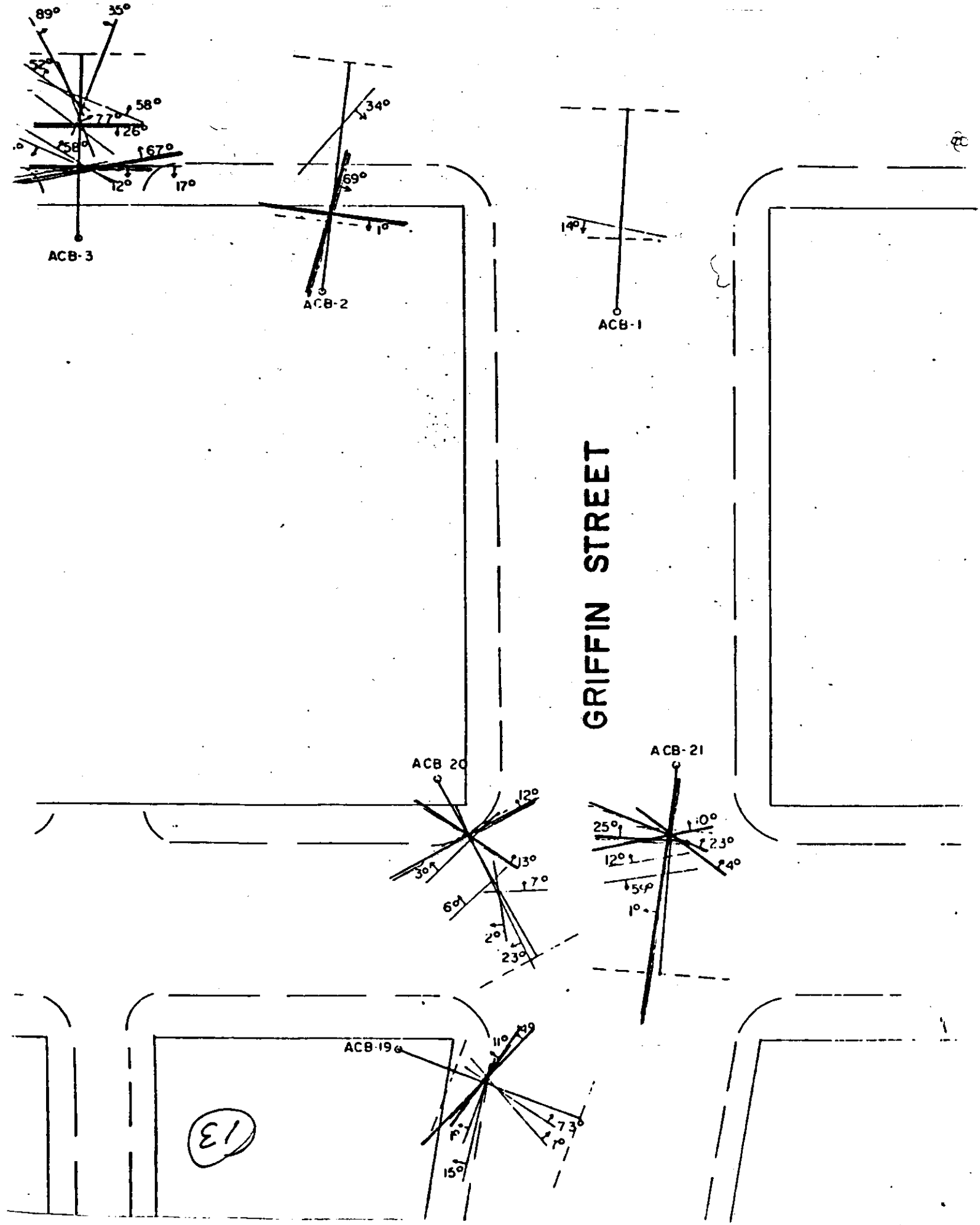
Photographed Section: 30.0-86.5'

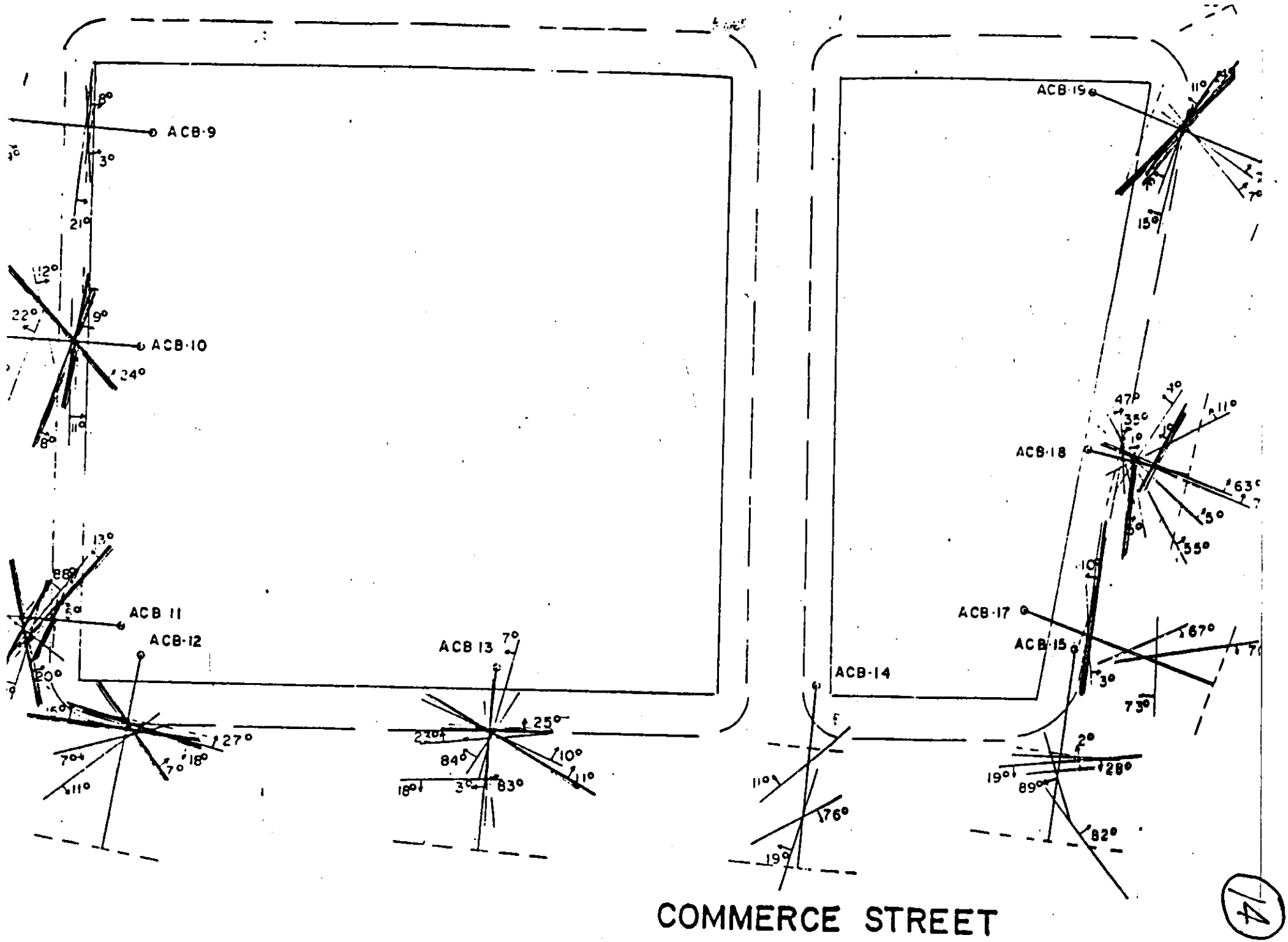
Depth, ft.	Elev., ft.	Description of Feature
66.7	381.2	Fracture: Hairline to 1", calcite filled, tight Strike: 94°; dip 58° NE
72.8	376.9	Limestone: dark gray, shaly, fossiliferous (Austin Chalk Transition Zone)
86.2	367.4	Shale: dark gray, thinly laminated (Eagle Ford)
86.5	367.2	End Photography

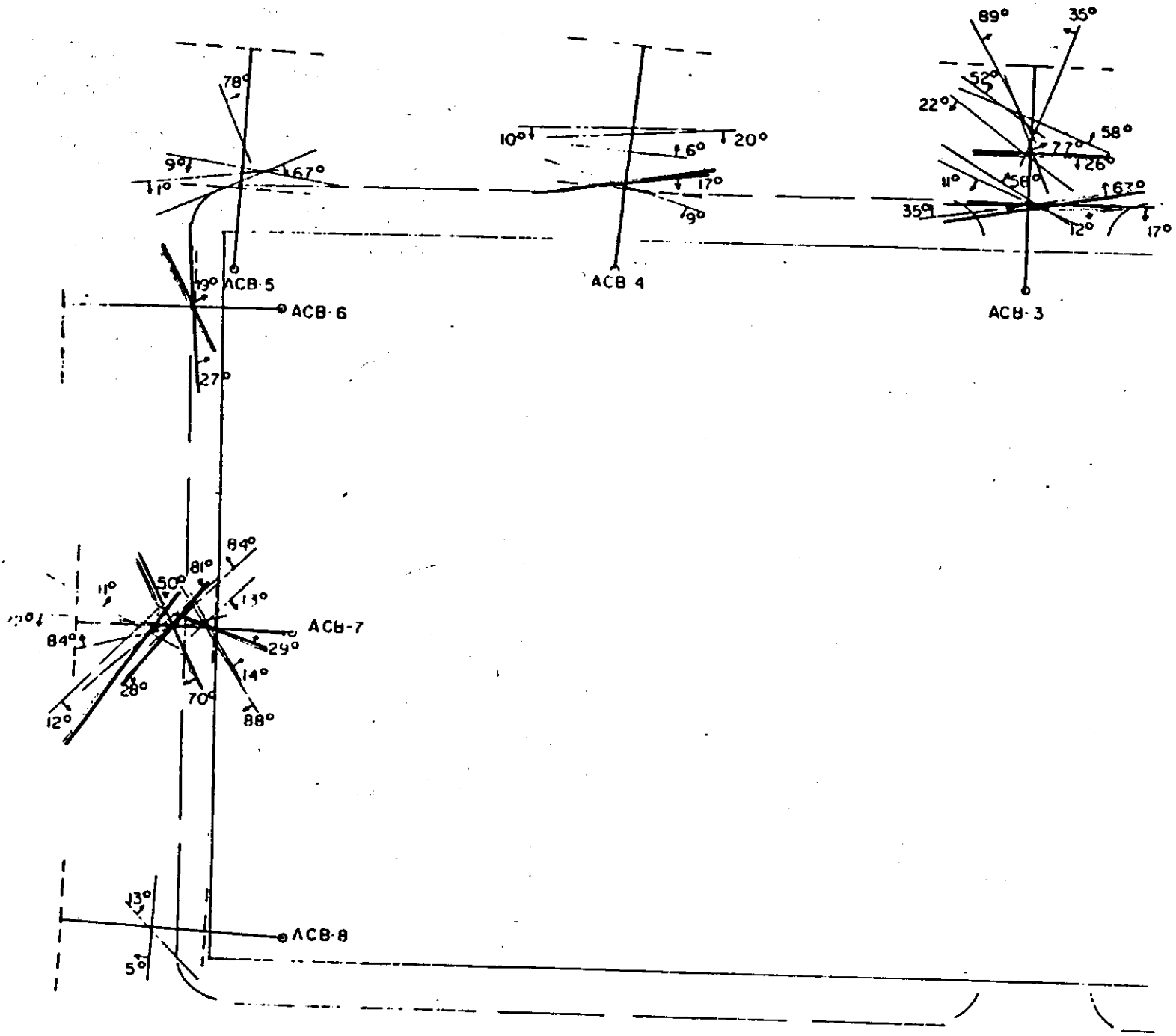
Note: All strike angles are magnetic bearings (0°-360°)

Photographic Analysis By: Aubrey D. Henley

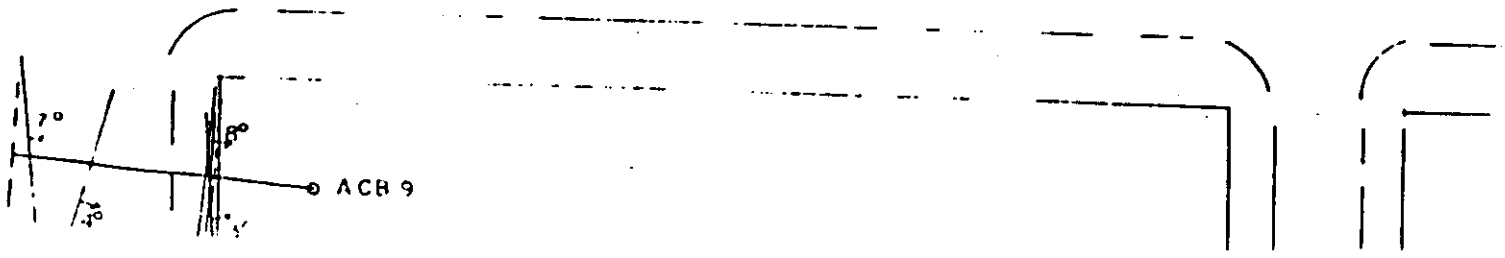
Sheet 2 of 2


89°
35°
52°
58°
77°
26°
58°
67°
12°
17°
ACB-3
34°
69°
1°
ACB-2
14°
ACB-1
GRIFFIN STREET
ACB 20
12°
3°
13°
7°
6°
2°
23°
ACB-21
25°
10°
23°
12°
4°
5°
1°
ACB-19
11°
9
7
3
1°
15°
13

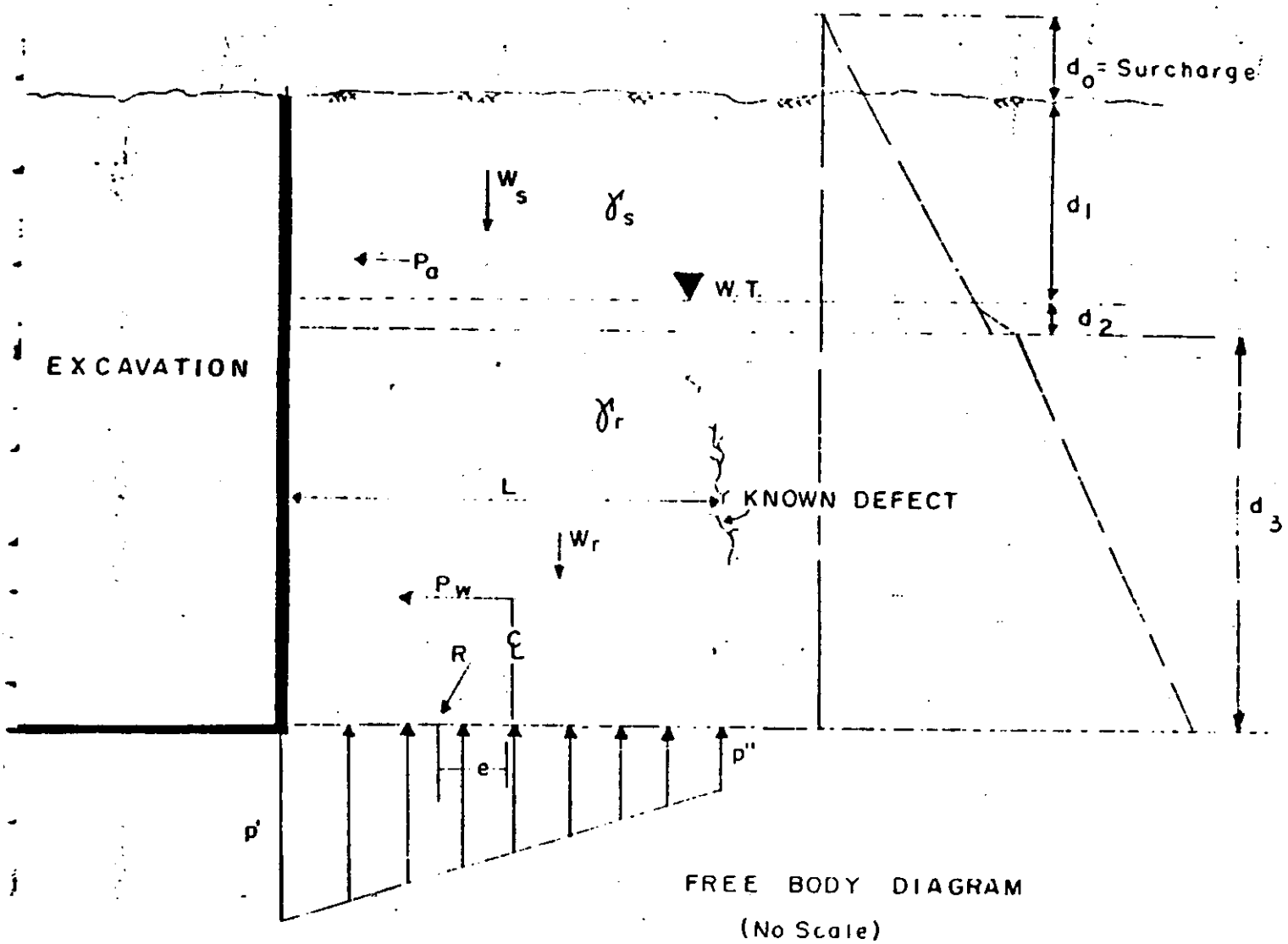

ACB-9
ACB-10
ACB 11
ACB-12
ACB 13
ACB-14
ACB-15
ACB-17
ACB-18
ACB-19
COMMERCE STREET


78°
9°
67°
11°
ACB-5
ACB-6
27°
10°
20°
6°
17°
9°
ACB 4
89°
35°
52°
22°
58°
77°
26°
11°
56°
67°
359
12°
17°
ACB-3
84°
81°
50°
11°
13°
84°
ACB-7
29°
14°
28°
70°
88°
12°
13°
ACB-8
5°

MAIN STREET


7°
8°
ACB 9

16



FREE BODY DIAGRAM
(No Scale)

LOG OF BORING

Sheet 5 of 6

FOR

TWO MAIN PLACE

DALLAS, TEXAS

DATE 6-16-69

PROJECT 2069(69)

BORING NO. T-1

TYPE Core Boring

LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ——⊘	LABORATORY DATA: PL. + ---- ● ---- + LL. WC,% ; UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 — — O; 20 40 60 80 100 — — ◎; DN, pcf △	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
205			1/2" hard limestone band			10.0	10.0	
210			Shale, dark gray, firm to moderately hard					
215						10.0	10.0	210.3
220			Shale, dark gray, firm to moderately hard, fossiliferous					
225			Low angle fracture 3" Very hard limestone band Low angle fracture			10.0	10.0	
230								
235			2" hard limestone band 2" hard limestone band			10.0	9.2	
240								
245						10.0	10.0	

GEOLOGISTS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

DATE 6-16-69
PROJECT 2069.00
TYPE Core Boring
BORING NO. T-1
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ——⊗ / LABORATORY DATA PL + ---- MC,% ●---- LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 —— O 20 40 60 80 100 -- ◐	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
255			Low angle fractures		10.0	10.0	
260							
265					10.0	10.0	
270			Shale, dark gray, firmito moderately hard, fossiliferous				
275					10.0	10.0	
280				PRESSURE TEST Bottom of Hole = 301.5' Depth of Packer = 2[illegible]' Pressure = 30 psi Time = 10 min. Quantity = 0			
285					9.5	9.5	
290							
295					10.0	10.0	
300							
			Total Depth = 301.5 feet				126.3

ENGINEERS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

Sheet 1 of 6

DATE 6-18-69
PROJECT 2909/69
TYPE Core Boring
BORING NO. T-2
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ——⊗ / LABORATORY DATA: PL + ---- ● ---- + LL, MC,%, UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 —— O, 20 40 60 80 100 —— ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
							427.2
			Sand, gravel, concrete brick, asphalt, fill				425.2
5			Tan sandy clay				418.4
10			Light tan fine sand				
15							
20							404.4
			Limestone, tan, weathered	PT-50 Blows = 3"			403.8
25			Limestone, gray, hard				
30			shaly band		10.0	10.0	
35							
40				X — Pocket Penetrometer Reading	10.0	10.0	
45			shaly band				
50					10.0	10.0	

LOG OF BORING

Sheet 2 of 6

FOR

TWO MAIN PLACE

DALLAS, TEXAS

DATE 6-18-69 | BORING NO. T-2

PROJECT 2906/69 | TYPE Core Boring | LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
			Limestone, gray, hard			373.8
55			Limestone, darker gray, hard, slightly fossiliferous	10.0	10.0	
60			(Transition Zone)			363.2
65			Shale, dark gray, firm to moderately hard, fossiliferous			357.2
70			Shale, dark gray, firm to moderately hard.	10.0	10.0	
75			Low to high angle fracture; Low angle fracture			
80				10.0	10.0	
85			Low angle fracture			
90				10.0	10.0	
			Low angle fracture			
95			Low angle fracture; Low angle fracture			
			Shaly limestone band	10.0	10.0	
100						

FIELD PT blows/foot —— ⊗

LABORATORY DATA: PL + ----- ● ----- + LL; MC,% ; UDW, pcf △

UNCONFINED COMPRESSION, TSF: 2.0 4.0 6.0 8.0 10.0 —— C; 20 40 60 80 100 —— ⊂

LOG OF BORING
FOR

TWO MAIN PLACE
DALLAS, TEXAS

DATE 6-18-69
PROJECT 2907/69
TYPE Core Boring
BORING NO. T-2
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT. blows/foot ——⊗ / LABORATORY DATA PL + ----●---- + LL, MC,% UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 — — O 20 40 60 80 100 — — ⊗	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
			Shaly limestone band				
105			shaly limestone band low angle fracture				
			numerous low angle fractures		10.0	10.0	
110			Shale, dark gray, firm to moderately hard				314.2
115			Sandstone, gray, firm to moderately hard, shaly				309.2
120			Shale, dark gray, firm to moderately hard		10.0	10.0	
125							
130					10.0	10.0	
135							
140					10.0	10.0	
			low angle fracture				
145							
					10.0	10.0	
150							

LOG OF BORING
FOR

TWO MAIN PLACE
DALLAS, TEXAS

DATE 6-18-69
PROJECT 2909/69
TYPE Core Boring
BORING NO. T-2
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot —— ⊗	LABORATORY DATA: PL + ----- MC,% ● ----- LL +	UDW, pcf △	UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 —— C; 20 40 60 80 100 —— ⊗	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
			Limestone Band							
155										
160								10.0	10.0	
165										
170			Shale, dark gray, firm to moderately hard					10.0	10.0	
175										
180								10.0	10.0	
185										
190			4" hard limestone band					10.0	10.0	
			High angle fracture							
195			Low to high angle fracture							
			Low angle fracture							
			Low angle fracture							
200								10.0	10.0	

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

DATE 6-19-69
PROJECT 2969/69
TYPE Core Boring
BORING NO. T-2
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD FT blows/foot ——⊗ LABORATORY DATA PL + ····· MC,% ●····· LL + UDW, pcf △ UNCONFINED COMPRESSION, TSF 2.0 40 60 8.0 10.0 —— C 20 40 60 80 100 —— ◎	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
			Vertical fracture				
			1" hard limestone band				
205			Low angle fracture				
210			Shale, dark gray, firm to moderately hard		10.0	10.0	
215							
			numerous low angle fracture				
220					10.0	10.0	
225			High angle fracture				
230					10.0	10.0	
			High angle fracture				
235			High angle fracture				
			2" hard limestone band				
240					10.0	10.0	
			Low angle fracture				
245							
250					10.0	10.0	

GEOLOGISTS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

DATE 6-19-69 BORING NO. T-2
PROJECT 2909/69 TYPE Core Boring LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ——⊗ / LABORATORY DATA: PL. + ---- ● ---- + LL. / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 —— O / 20 40 60 80 100 —— ⊗ / JDW, pcf △	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
255			low angle slickensided fractures				
260					10.0	10.0	
			low angle fracture				
			numerous low to high angle slickensided fractures				
265							
270					10.0	10.0	
			not as hard as above, soft to medium firm				
275							
			Shale, dark gray, firm to moderately hard	PRESSURE TEST	10.0	10.0	
280				Bottom of Hole = 300 feet			
				Depth of Packer = 25.8 feet			
285			low angle fracture	Pressure = 30 psi			
			low angle fracture	Time = 5 min.	8.5	8.5	
290			low angle fracture	Quantity = 0			
			1" hard mudstone band				
295					9.0	9.0	
300							127.2
			Total Depth = 300.0 feet				

ENGINEERS

GEOLOGISTS — MAYON-JOHNSTON & ASSOCIATES, INC. DALLAS, TEXAS

LOG OF BORING
FOR

TWO MAIN PLACE
DALLAS, TEXAS

DATE 7-8-69
PROJECT 2555/69
TYPE Core Boring
BORING NO. T-3
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD FT blows/foot ——⊗ / LABORATORY DATA Pl. + ---- MC,% ● ---- LL + / UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 —— C / 20 40 60 80 100 —— ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
							426.9
			Asphalt				425.9
			Light brown sandy clay				423.7
5			Light gray sandy clay				
							418.7
10			Light gray & tan clayey sand				
							412.8
15			Light tan fine sand				
20				◉ 50 Blows = 6"			
							404.5
25			Limestone, gray hard				
			Shaly band				
30					10.0	5.5	
35							
40				X = Pocket Penetrometer Reading	10.0	10.0	
45					10.0	11.0	
50							

ENGINEERS

GEOLOGISTS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

Sheet 2 of 3

DATE 7-8-69
PROJECT 2453/69
TYPE Core Boring
BORING NO. T-3
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
						375.4
55			Limestone, darker gray, hard, fossiliferous, slightly shaly			
60			(Transition Zone)	10.0	10.0	
						364.9
65			Shale, dark gray firm to moderately hard, fossiliferous			
70			Thin sandstone band Thin sandstone band	10.0	10.0	
75						
80				10.0	10.0	
85						
90				10.0	10.0	
95			low angle fracture low angle fracture			
100			1" Sandstone band	10.0	10.0	

FIELD PT blows/foot —— ⊗
LABORATORY DATA
PL + ----- ● ----- + MC,% LL UDW, pcf △
UNCONFINED COMPRESSION, TSF
2.0 4.0 6.0 8.0 10.0 —— O
20 40 60 80 100 —— ◉

ENGINEERS

GEOLOGISTS — MASON-JOHNSTON & ASSOCIATES, INC. DALLAS, TEXAS

LOG OF BORING

FOR

TWO MAIN PLACE

DALLAS, TEXAS

Sheet 3 of 3

DATE 7-8-69

PROJECT 3063765

TYPE Core Boring

BORING NO. T-3

LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot — — — ⊗ / LABORATORY DATA PL + ····· ● ····· + LL, MC,% UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 ——— O 20 40 60 80 100 — — ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
			numerous low angle fracture				
105			Shale, dark gray, firm to moderately hard, fossiliferous				
110					10.0	10.0	315.7
			Sandstone, light gray, firm to moderately hard, slightly shaly				
115							309.6
			Shale, dark gray, firm to moderately hard, foss.				
120					10.0	10.0	
125			low angle fracture				
130					10.0	10.0	
				PRESSURE TEST			
135				Depth of Hole = 150 feet			
				Depth of Packer = 25 feet			
140				Pressure = 25 psi	10.0	10.0	
				Time = 5 min			
145				Quantity = 0			
					8.0	8.0	
150							276.9
			Total Depth = 150.0 feet				

ENGINEERS

GEOLOGISTS

LOG OF BORING
FOR

TWO MAIN PLACE
DALLAS, TEXAS

DATE 8-22-69
PROJECT 2953-69
TYPE Core Boring
BORING NO. T-4
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ——⊗ / LABORATORY DATA PL + ----- MC,% ● ----- LL + / UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 —— O / 20 40 60 80 100 —— ◎	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
							428.4
			Bricks, wood, steel, etc.				
5							423.3
			Tan fine sand				
10				◎ 37 BPF			
15							
							409.4
20			Light tan & light gray clayey sand				
							404.9
25			Limestone, tan, weathered				404.3
			Limestone, gray, hard				
30					9.5	9.5	
35			55° fracture 40° fracture 40° fracture 40° fracture 55° fracture				
40					10.0	10.0	
45							
50					10.0	10.0	

ENGINEERS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

DATE 8-22-69
PROJECT 2963/69
TYPE Core Boring
BORING NO. T-4
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT. blows/foot ——⊗ / LABORATORY DATA PL + ----●---- + LL MC,% UDW, pcf / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 —— O 20 40 60 80 100 —— ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
							375.4
55			Limestone, darker gray, hard, fossiliferous, slightly shaly				
60			(Transition Zone)		10.0	10.0	
							365.9
65			Shale, dark gray, firm to moderately hard, fossiliferous				
70					10.0	10.0	
75							
80					10.0	10.0	
85							
90			very hard limestone band, calcite healed		9.0	9.0	
			40° fracture				
95			45° fracture				
			1/2" limestone band		9.0	8.5	
100							

GEOLOGISTS

LOG OF BORING

FOR

TWO MAIN PLACE

DALLAS, TEXAS

DATE 8-22-69 BORING NO. T-4

PROJECT [illegible]/69 TYPE Core Boring LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD P.T. blows/foot ——⊗ LABORATORY DATA PL + ---- MC,% ●---- LL +- UDW, pcf △ UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 —— O 20 40 60 80 100 - - ◐	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
			Shale, dark gray firm to moderately hard, fossiliferous		2.0	2.0	
					1.5	1.5	
105							
110			45° fracture		10.0	10.0	
			Sandstone, light gray firm to moderately hard, slightly shaly				
115							
120			Shale, [illegible] gray firm to moderately hard		10.0	10.0	
125							
[illegible]			[illegible]		10.0	10.0	
[illegible]				PRESSURE TEST [illegible] 150.0 feet [illegible] 4.0 feet [illegible]	10.0	10.0	
[illegible]					1.5	1.5	
[illegible]			[illegible]				27[illegible].4
			[illegible]				

GEOLOGISTS

MASON-JOHNSTON & ASSOCIATES, INC. DALLAS, TEXAS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

Sheet 1 of 3

DATE 8-22-69
PROJECT 2953/69
TYPE Core Boring
BORING NO. T-5
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT. blows/foot ⊗ / LABORATORY DATA PL + MC,% ● LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 ○ 20 40 60 80 100 ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
							427.3
			Bricks & concrete				423.8
5			Tan fine sand				
10							
15							
20							406.1
			Limestone, weathered				405.3
25			Limestone, gray hard				
30					10.0	9.3	
35							
40					10.0	10.0	
45							
50					10.0	10.0	

ENGINEERS

GEOLOGISTS

LOG OF BORING

Sheet 2 of 3

FOR

TWO MAIN PLACE

DALLAS, TEXAS

DATE 8-23-69 BORING NO. T-5

PROJECT 2053/19 TYPE Core Boring LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ⊗ / LABORATORY DATA PL + MC,% ● LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 ○ / 20 40 60 80 100 ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
							373.6
55			Limestone, darker gray, hard, fossiliferous, slightly shaly		10.0	10.0	
60			(Transition Zone)				364.8
65			Shale, dark gray, firm to moderately hard, fossiliferous		10.0	10.0	
70							
75							
80					10.0	10.0	
85			50° fracture 60° fracture				
90					10.0	10.0	
95			numerous low angle fractures				
100			1/2" Limestone band		10.0	10.0	

ENGINEERS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

DATE 8-23-69
PROJECT 2953/69
TYPE Core Boring
BORING NO T-5
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ⊗ / LABORATORY DATA PL + MC,% ● LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 ○ 20 40 60 80 100 ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
			40° fracture				
			50° fracture				
105			Shale, dark gray, firm to moderately hard, fossiliferous				
110							315.6
			Sandstone, light gray, shaly, firm				
115							309.6
120			Shale, dark gray, firm to moderately hard		10.0	10.0	
125				PRESSURE TEST	10.0	10.0	
130				Bottom of Hole = 150.0 feet Depth of Packer = 81 feet			
135				Pressure = 20 psi Time = 5 min	10.0	10.0	
140				Quantity = 0			
145					8.5	8.5	
150							277.3
			Total Depth = 150.0 feet				

MASON-JOHNSTON & ASSOCIATES, INC. DALLAS, TEXAS

GEOLOGISTS

LOG OF BORING

FOR

TWO MAIN PLACE

DALLAS, TEXAS

Sheet 1 of 3

DATE 7-26-69 BORING NO. T-6

PROJECT 2053/69 TYPE Core Boring LOCATION See Plan

FIELD PT blows/foot ——⊗

LABORATORY DATA: PL + ····· MC,% ● ····· LL + UDW, pcf △

UNCONFINED COMPRESSION, TSF: 2.0 4.0 6.0 8.0 10.0 —— O; 20 40 60 80 100 - - - ◎

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
						426.3
			Asphalt			425.8
			Tan sandy clay			422.8
5			Tan clayey sand			421.3
			Tan medium fine sand			
10						
15						417.3
20			Tan sandy gravel			404.6
			45° fracture			
			60° fracture			
25			Shaly band			
			Limestone, gray, hard	10.0	10.0	
30			Shaly band			
			Shaly Band			
			65° Slickensided fracture			
35				10.0	10.0	
40			45° fracture			
45			40° fracture, shaly			
				10.0	10.0	
50						

ENGINEERS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

DATE 7-26-69
PROJECT 2953/69
TYPE Core Boring
BORING NO. T-6
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD P.T. blows/foot ⊗ / LABORATORY DATA PL + MC,% ● LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 ○ / 20 40 60 80 100 ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
			70° fracture				374.3
55			Limestone, dark gray, hard, fossiliferous slightly shaly (Transition Zone)		9.5	9.5	366.3
60			Shale, dark gray, firm to moderately hard, foss.				
65					10.0	10.0	
70							
75					10.0	10.0	
80							
85			55° fracture		7.5	7.4	
90			40° fracture		7.5	7.5	
95							
100			40° to 70° fracture				

LOG OF BORING

Sheet 3 of 3

FOR

TWO MAIN PLACE

DALLAS, TEXAS

DATE 7-26-69 BORING NO. T-6

PROJECT 2953/69 TYPE Core Boring LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ⊗ / LABORATORY DATA PL + MC,% ● LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 ○ / 20 40 60 80 100 ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
105			Shale, dark gray, firm to medium hard, fossiliferous		10.0	10.0	
110							316.5
			Sandstone, gray, hard slightly shaly		10.0	10.0	311.4
115			Shale, dark gray, firm to moderately hard, fossiliferous				
120					10.0	10.0	
125							
					3.0	3.0	
130				PRESSURE TEST			
135				Bottom of Hole = 149.5 feet Depth of Packer = 2[illegible] feet	10.0	10.0	
140				Pressure = 20 psi Time = 3 min			
145				Quantity = 0	10.0	10.0	
							276.8
150			Total Depth = 149.5 feet				

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

Sheet 1 of 3

DATE 7-26
PROJECT 2953/69
TYPE Core Boring
BORING NO T-7
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
			Asphalt			423.2
			Gravel			
5			Light gray sandy clay			416.2
10			Light gray clayey sand			411.2
15			Tan medium fine sand			406.2
20			Tan medium coarse sand with some gravel			404.2 / 403.5
25			Limestone, weathered medium firm	10.0	10.0	
30			Limestone, gray hard 45° fracture			
35				10.0	10.0	
40						
45			Shaly band	10.0	10.0	
50						

FIELD PT blows/foot ⊗
LABORATORY DATA
PL + MC,% ● LL + UDW, pcf △
UNCONFINED COMPRESSION, TSF
2.0 4.0 6.0 8.0 10.0 — O
20 40 60 80 100 — ◉

X — Pocket Penetrometer Reading

GEOLOGISTS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

DATE 7-26-69 BORING NO. T-7

PROJECT 2053/6 TYPE Core Barrel LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ⊗ / LABORATORY DATA PL + MC,% ● LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 — O; 20 40 60 80 100 ---- ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
							372.2
55			Limestone, darker gray, hard, slightly shaly, fossiliferous		10.0	10.0	
60			(Transition Zone)				362.8
65			Shale, dark gray firm to moderately hard, fossiliferous		10.0	10.0	
70			1" hard limestone band; 35° fracture				
75			1" hard limestone band		10.0	10.0	
80			45° fracture				
85					10.0	10.0	
90			45° fracture; 40° fracture				
95					10.0	10.0	
100			sandstone, shaly				

ENGINEERS

GEOLOGISTS — MASON JOHNSTON & ASSOCIATES, INC. DALLAS, TEXAS

LOG OF BORING

Sheet 3 of 3

FOR

TWO MAIN PLACE

DALLAS, TEXAS

DATE 7-26-69

PROJECT 2953.60

TYPE Core Boring

BORING NO T-7

LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ⊗ / LABORATORY DATA PL + MC,% ● LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 ○ / 20 40 60 80 100 ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
			Shale, dark gray, firm to moderately hard, fossiliferous				
105			50° fracture				
			55° fracture		10.0	10.0	
110			65° fracture				313.3
			Sandstone, gray, hard shaly				
115							304.2
			Shale, dark gray firm to moderately hard, fossiliferous		10.0	10.0	
120							
125							
			3" hard limestone band		10.0	10.0	
130							
				Field Set Tests			
				Bottom of Hole = 150 feet			
135				Depth of Water = 25 feet	10.0	10.0	
				Flows at 4 gpm			
140				Time Taken			
				Quantity 10 gallons			
145					9.0	9.0	
150							275.2
			Total Depth = 150.0 feet				

ENGINEERS

GEOLOGISTS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

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DATE 7-19-69
PROJECT 2953/69
TYPE Core Boring
BORING NO. T-8
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ⊗ / LABORATORY DATA PL + MC,% ● LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 — O; 20 40 60 80 100 — ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
							427.6
			Concrete				427.1
			Tan sandy clay with gravel				424.4
5			Tan & light gray sandy clay				
							418.6
10			Light gray & light tan medium fine sand				
							414.4
15			Tan clayey sand				
20				● 50 blows = 10"			
							404.8
							404.5
			Gravel				404.1
25			Tan weathered limestone				
30			Limestone, gray, hard		9.5	9.5	
35				X = Pocket Penetrometer Reading			
40					10.0	10.0	
45							
50					10.0	10.0	

ENGINEERS

LOG OF BORING

FOR
TWO MAIN PLACE
DALLAS, TEXAS

DATE 7-19-69 BORING NO. T-8
PROJECT 2063-69 TYPE Core Boring LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ⊗ / LABORATORY DATA PL + MC,% ● LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 — O, 20 40 60 80 100 — ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
							375.6
55			Limestone, darker gray, hard, slightly shaly, fossiliferous				
60			(Transition Zone)		10.0	10.0	
							365.2
65			Shale, dark gray, firm to moderately hard, fossiliferous				
70			1/2" Limestone Band		10.0	10.0	
75							
80					10.0	10.0	
85							
			40° fracture				
90					10.0	10.0	
			30° fracture				
95			50° fracture				
			55° fracture				
							329.2
100			Limestone, gray, shaly, firm to moderately hard		10.0	10.0	327.6

LOG OF BORING
FOR

TWO MAIN PLACE
DALLAS, TEXAS

DATE 7-19-69
PROJECT 2953/69
TYPE Core Boring
BORING NO. T-8
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
			50° fracture			
105			Shale, dark gray, firm to moderately hard, fossiliferous			
			40° fracture			
110			50° fracture	10.0	10.0	
						315.1
115			Sandstone, gray, firm to moderately hard, shaly			
						310.3
120			Shale, dark gray firm to moderately hard, fossiliferous	10.0	10.0	
125						
130				10.0	10.0	
			55° fracture			
135						
140			5" hard limestone bard	10.0	10.0	
			40° fracture			
145				7.0	7.0	
150						277.6
			Total Depth - 150.0 feet			

FIELD PT blows/foot ——— ⊗
LABORATORY DATA
PL + ····· ● ····· + MC,% LL
UDW, pcf △
UNCONFINED COMPRESSION, TSF
2.0 4.0 6.0 8.0 10.0 ——— O
20 40 60 80 100 ——— ◉

PRESSURE TEST
Bottom of Hole - 150 feet
Depth of Packer - 27 feet
Pressure - 25 psi
Time - 5 minutes
Quantity - 0

GEOLOGISTS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

DATE 7-2-69 BORING NO. T-9

PROJECT 2653760 TYPE Core Boring LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ——⊗ / LABORATORY DATA PL. MC,% L.L. UDW, pcf / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 — O; 20 40 60 80 100 — ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
							428.2
			Asphalt				427.2
			Tan with layers sand with small gravel				425.0
5				X			
			Tan sandy clay				420.0
10			Light tan clayey sand				
15							411.5
			Light gray clayey sand				
20							405.8
			Gravel				405.0
							404.7
25			Limestone, tan, weathered, medium firm				
30			Limestone, gray, hard		9.5	9.5	
35							
40					10.0	10.0	
45							
50					10.0	10.0	

ENGINEERS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

DATE 7-2, 69 BORING NO T-9
PROJECT 20[illegible] TYPE Core Boring LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ⊗ / LABORATORY DATA PL + MC,% ● LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 — O; 20 40 60 80 100 — ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
							375.2
55			Limestone, darker, gray, hard, slightly shaly, fossiliferous				
					10.0	10.0	
60			(Transition Zone)				
							364.5
65			Shale, dark gray, firm to moderately hard, fossiliferous				
70					10.0	10.0	
			9/4" Limestone hard				
			55° fracture				
75			30° fracture				
			55° fracture				
80					10.0	10.0	
85							
90					10.0	10.0	
			40° fracture				
			60° fracture				
95			55° fracture				
			65° fracture				
100			[illegible] hard limestone band		10.0	10.0	
			30° fracture				

LOG OF BORING

FOR
TWO MAIN PLAZE
DALLAS, TEXAS

DATE 7-21-66 BORING NO. T-9
PROJECT [illegible] TYPE [illegible] LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ⊗ / LABORATORY DATA PL + MC,% ● LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 — O (20 40 60 80 100 — ◉)	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
			Shale, dark gray, firm to moderately hard, fossiliferous				
105							
			45° fracture				
			65° fracture				
110					10.0	10.0	
							315.6
			1" hard limestone band				
115							
			Sandstone, gray, shaly, firm to moderately hard				310.7
			45° fracture				
120					10.0	10.0	
			Shale, dark gray firm to moderately hard, fossiliferous				
125							
			2" hard limestone band				
130					10.0	10.0	
				PRESSURE TEST			
135				Bottom of Hole - 150.0 feet			
				Depth of Water - 21.5 feet			
			3" hard limestone band	Pressure - 30 psi			
140					10.0	10.0	
				Time - 5 min.			
145				Quantity - 0			
					7.0	7.0	
150							278.2
			Total Depth - 150.0 feet				

LOG OF BORING

FOR

TWO MAIN PLACE
DALLAS, TEXAS

Sheet 1 of 3

DATE 8-25-69
PROJECT 295[illegible]69
TYPE Core Boring
BORING NO. T-10
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ⊗ / LABORATORY DATA PL + MC,% ● LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 — O, 20 40 60 80 100 — ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
							426.3
			Bricks, fill				424.3
5			Gray sandy clay				
							417.3
10			Light gray sandy clay				
				40 BPF			412.3
15			Light gray fine sand				
				47 BPF			407.3
20			Light gray sandy clay				405.8
							404.8
							404.3
			Tan sand with small gravel				
25							
			Limestone, tan, wea., med. firm to firm		9.5	9.5	
30							
			Limestone, gray hard				
35							
				Pocket Penetrometer Reading	9.3	9.3	
40			55° fracture				
45							
					10.0	10.0	
50							

GEOLOGISTS

LOG OF BORING
FOR

TWO MAIN PLACE
DALLAS, TEXAS

DATE 8-25-69
PROJECT 20[illegible]
TYPE Core boring
BORING NO. T-10
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ——⊗ / LABORATORY DATA PL + ·····● MC,% ····· LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 —— O (20 40 60 80 100 —— ◉)	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
							372.3
55			Limestone, darker gray, hard, fossiliferous, slightly shaly		10.0	10.0	
60			(Transition Zone)				362.3
65			Shale, dark gray, firm to moderately hard, fossiliferous		10.0	10.0	
70			55° slickensided fracture 60° slickensided fracture				
75			55° fracture		10.0	10.0	
80			40° fracture				
85			55° fracture		10.0	10.0	
90			45° fracture				
95			55° fracture 40° fracture		10.0	10.0	
100							

ENGINEERS

GEOLOGISTS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

DATE 8-27-69 BORING NO. T-10

PROJECT 2063-69 TYPE Core Boring LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ⊗ / LABORATORY DATA PL + MC,% ● LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 ○ / 20 40 60 80 100 ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
			Very hard limestone band				
			numerous low angle fractures				
105							
			Shale, dark gray, firm to moderately hard, fossiliferous		10.0	10.0	
110							
			Hard limestone band				312.0
115			Sandstone, gray, shaly, medium firm to firm		10.0	10.0	307.7
120			Shale, dark gray, firm				
125					9.0	9.0	
130				PRESSURE TEST Bottom of Hole = 150.0 feet Depth of Packer = 29.0 feet Pressure = 30 psi Time = 4 minutes Quantity = 0	10.0	10.0	
135							
140							
145					9.6	9.6	
150							276.3
			Total Depth = 150.0 feet				

ENGINEERS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

DATE 7-28-69
PROJECT 2953/69
TYPE Core Boring
BORING NO T-11
LOCATION See Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ⊗ / LABORATORY DATA PL + MC,% ● LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 ○ / 20 40 60 80 100 ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
							425.4
			Concrete				~~425.0~~
5			Basement				
10							414.8
							~~414.1~~
			Concrete				
15			Tan sandy clay, fill				
20							404.0
							~~403.1~~
			Limestone, tan, weathered				
25							
			Limestone, gray hard		10.0	10.0	
30							
			shaly				
35							
			shaly		9.0	9.0	
40			40° fracture				
45							
					10.0	10.0	
50							

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

Sheet 2 of [illegible]

DATE 26-[illegible]
PROJECT 26[illegible]
TYPE [illegible]
BORING NO. [illegible]
LOCATION [illegible]

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ——⊗ LABORATORY DATA PL + ----- MC,% ● ----- LL + UDW, pcf △ UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 —— O 20 40 60 80 100 —— ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
							370.4
55			Limestone, darker gray, hard slightly shaly, fossiliferous		10.0	10.0	
60							
			(Transition Zone)				
65							360.0
			Shale, dark gray, firm to moderately hard, fossiliferous		10.0	10.0	
70							
75					10.0	10.0	
80							
85					10.0	10.0	
90			70° fracture				
[illegible]			45° fracture		10.0	10.0	
100			45° fracture				

GEOLOGISTS

LOG OF BORING
FOR
TWO MAIN PLACE
DALLAS, TEXAS

DATE 7-28-69
PROJECT 2055/69
TYPE Core Boring
BORING NO. T-11
LOCATION Site Plan

DEPTH, FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	FIELD PT blows/foot ⊗ / LABORATORY DATA PL + MC,% ● LL + UDW, pcf △ / UNCONFINED COMPRESSION, TSF 2.0 4.0 6.0 8.0 10.0 ○ (20 40 60 80 100) ◉	CORE DRILLED	CORE RECOVERED	ELEVATION, FEET
							324.1
			Sandstone, gray, hard, shaly				322.4
105							
			Shale, dark gray firm to moderately hard, fossiliferous		10.0	10.0	
110							
							312.2
			Sandstone, gray, hard shaly				
115					10.0	10.0	
							307.4
120			Shale, gray, firm to moderately hard, fossiliferous				
125					10.0	10.0	
130							
135					10.0	10.0	
140							
145					9.0	1.1	
150							275.4
			Total Depth = 150.0 feet				

ENGINEERS