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LEGACY PARKWAY

STRUCTURE F-668

GLOVER'S LANE OVER LP

STRUCTURE C-948

GLOVER'S PED OVER I-15 & UPRR

Salt Lake & Davis Counties, Utah

Utah Department of Transportation
SP-0067(5)0

September 2006

Geotechnical Investigation Report for Structures

200601-119

RB&G
ENGINEERING
INC.

September 22, 2006

Mr. Sohail Khan
Carter & Burgess
420 East South Temple Suite 342
Salt Lake City, Utah 84111-1321

Reference: Legacy Parkway Project No. SP-0067(5)0

Gentlemen:

A Geotechnical Investigation Report for Structures has been completed for Structure F-668, Glover's Lane over Legacy Parkway and Structure C-948, Glover's Ped over I-15 & UPRR in Salt Lake and Davis Counties, Utah. The investigation has been conducted in accordance with a proposal submitted to your organization for the work, and the results of the study are summarized in the report transmitted herewith.

We appreciate the opportunity of providing this service for you. If there are any questions relating to the information contained herein, please call.

Sincerely,

RB&G ENGINEERING, INC.

REGISTERED PROFESSIONAL ENGINEER
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Geotechnical Investigation Report for Structures

Legacy Parkway

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RB&G ENGINEERING, INC.

Professional Engineers

LEGACY PARKWAY

UTAH DEPARTMENT OF TRANSPORTATION
SP-0067(5)0

GEOTECHNICAL INVESTIGATION REPORT FOR STRUCTURES

Structure F-668 – Glover's Lane over LP
Structure C-948 – Glover's Ped over I-15 & UPRR

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LEGACY PARKWAY

UTAH DEPARTMENT OF TRANSPORTATION
SP-0067(5)0

GEOTECHNICAL INVESTIGATION REPORT FOR STRUCTURES

Structure F-668 – Glover's Lane over LP
Structure C-948 – Glover's Ped over I-15 & UPRR

1.0 GENERAL

This report presents the results of geotechnical investigations and provides foundation recommendations for the following bridge structures located within the Legacy Parkway project:

- Structure F-668 – Glover's Lane over Legacy Parkway
- Structure C-948 – Glover's Lane Pedestrian Bridge over I-15 & UPRR

The primary purpose of this investigation is to determine the characteristics of the subsurface material throughout the project area, and to make appropriate foundation design recommendations for the proposed structures. The report is intended to aid designers in evaluating the site and subsurface conditions for foundation design and potential construction problems.

1.1 PROJECT DESCRIPTION

The Legacy Parkway will be a four-lane, limited-access, divided highway extending approximately 14 miles from Interstate 215 at 2100 North in North Salt Lake, northward to the junction of Interstate 15 and U.S. Highway 89 near Farmington (see Figure 1) . A multiple-use pedestrian, bicycle, and horse trail will parallel the Parkway.

1.1.1 General

The Legacy Parkway project is divided into three Segments. Segment 3 begins at LP NB Station 2610+00 (LP SB Sta. 3610+00) and continues north to the northerly terminus of the project. Glover's Lane will cross over the Parkway via Structure F-668, located at about LP NB Station 2628+00. Structure C-448, a three-span steel structure, presently carries Glover's Lane over the UPRR line, the

new UTA Commuter Rail line, and I-15. Structure C-948 will be a pedestrian bridge located on the north side of Structure C-448.

1.1.2 Proposed Improvements

The bridge over Glover's Lane (F-668) is expected to be a pre-stressed concrete girder structure approximately 77 feet wide and with two spans ranging from 100 to 115 feet in length. The roadway on the bridge will be about 56 feet wide, and sidewalks will be located on both sides of the structure. The pedestrian bridge (C-948) over UPRR, UTA Commuter Rail, and I-15, will be a steel structure approximately 10 feet wide with three spans ranging from 130 to 140 feet in length. The structure will be located immediately north of the existing Glover's Lane over UPRR and I-15 bridge (C-448), with about 5 feet of open space separating the two structures. Preliminary drawings of the proposed structures are included for reference in Appendix A.

1.1.3 Climatic Conditions

The climate in the project area is characterized by relatively warm summers and cold winters. The frost depth ranges between 20 to 30 inches. Winter snow often requires plowing, and de-icing salt is regularly deposited on major roadways during the winter months.

2.0 PREVIOUS REPORTS AND INVESTIGATIONS

The following geotechnical reports and investigations have been completed previously by others for this project.

2.1 PB/FAK GEOTECHNICAL INVESTIGATION REPORT

UDOT provided copies of the Geotechnical Reports prepared by Parsons Brinckerhoff Quade & Douglas (PB) for Fluor Ames Kraemer (FAK), LLC as a part of the Design-Build Legacy Parkway Project. The report includes the results of subsurface investigations performed by Kleinfelder, Inc. and provides geotechnical recommendations for the structures contemplated in the original project. It should be noted that the project was divided into five segments for the Design-Build project. The Glover's Lane bridge sites were located in Segment 4 of the Design-Build project. At the time of the Design-Build project, the proposed structure at Glover's lane was a six-span bridge crossing over Legacy Parkway, UPRR, and I-15.

2.2 KLEINFELDER GEOTECHNICAL INVESTIGATION

It is our understanding the Kleinfelder, Inc. conducted an investigation of the preferred Legacy Parkway alignment for UDOT and the results were submitted in a report dated June 2, 2000. Some of its findings were reproduced in the PB/FAK Design Build reports referenced in Section 2.1 above.

2.3 DAMES & MOORE PRELIMINARY GEOTECHNICAL STUDY

It is our understanding that Dames & Moore completed a geotechnical study for the proposed preliminary Legacy Parkway corridor and presented the results in a 1998 report.

3.0 EXISTING FACILITIES

The proposed Glover's Lane over LP bridge site is presently occupied by embankment fill on the west approach to Structure C-448 over the UPRR and I-15. Structure C-448 will be left in place. The west approach fill will be removed where the Legacy Parkway is to cross through the area. The existing fill will be raised and widened at some locations to accommodate structure F-668, which will be about twice as wide as C-448.

Abutment 3 of structure F-668 will be located about 170 feet west of the existing UPRR tracks. Construction of the UTA Commuter Rail line was underway at the time of the field investigations described in this report.

The nearest buildings to the bridge sites are homes and industrial/agricultural buildings located between 400 and 500 feet west of the F-668 west abutment, and another group of homes located about 450 to 500 feet east of the C-948 east abutment. Various utility lines exist throughout the project area, including buried utilities such as gas, oil, power, and communications lines. Overhead power lines currently run from east to west along the north side of the Glover's Lane embankment, and a separate set of power lines runs in a north-south direction between Legacy Parkway and the UPRR tracks.

4.0 FINDINGS

4.1 EXISTING SITE CONDITIONS

The topography is relatively flat throughout Segment 3, and generally slopes down to the west towards the Great Salt Lake. The proposed Legacy Parkway corridor begins just west of the existing I-215 / Redwood Road interchange on the south and continues northward. The southerly portion of the corridor travels along the westerly limits of North Salt Lake, Woods Cross, West Bountiful, and Centerville, about 0.5 to 2 miles west of I-15. North of Parrish Lane in Centerville, the Parkway corridor will be located less than about 0.25 miles west of I-15, with the two corridors essentially parallel continuing north to the I-15 / US-89 interchange in Farmington. The south and north interchanges are already partially constructed. Some industrial and commercial facilities are located along the alignment.

The Glover's lane bridge sites are relatively flat, except for the raised roadway and railroad embankments. East of I-15, the ground surface begins to slope more steeply up to the east towards the Wasatch Mountains. Vegetation at the site consists primarily of weeds and wild grasses. Some trees were observed along the base of the Glover's Lane roadway embankment.

4.2 SURFACE DRAINAGE

Surface drainage in the project area generally follows the topography to the west towards the Great Salt Lake. In addition to the Jordan River and Oil Drain at the south interchange, some creeks, streams, and canals (including City Canal, Rick's Creek, and Steed/Davis Creek) cross the alignment at various locations, creating the potential for flooding. Flooding and ponding on the soft surface soils, particularly in low-lying areas at the toes of roadway embankments, can make access to bridge sites difficult.

4.3 GEOLOGY

The project is located within the Wasatch Front section of the Basin and Range physiographic region. The Wasatch Front consists of a series of down dropped valleys bounded primarily by the Wasatch Mountains on the east and the Great Salt Lake, Utah Lake and the Oquirrh Mountains on the west. The area extends from Juab County in the south up through Salt Lake, Davis, Weber and Box Elder counties to the north.

The general topography of the Wasatch Front is due, in large part, to Basin and Range extensional faulting. The Wasatch Fault is an extensional normal fault which trends northerly along the base of the Wasatch Mountains from Levan in the south, and up into Idaho to the north. Prior to extensional faulting, the region was subjected to compressional forces from the west resulting in extensive thrust faulting and mountain building. Extensional forces are still active today with various segments of the Wasatch Fault capable of generating large earthquakes with magnitudes near 7.4.

The Wasatch Mountains to the east of I-15 and the Wasatch Front communities consist predominately of Precambrian to Mesozoic, metamorphic and sedimentary bedrock. The valleys along the Wasatch Front are predominately covered with Pleistocene Lake Bonneville deposits, and younger alluvial fan and stream deposits. The Bonneville Lake Cycle began about 30,000 years ago when the climate was much cooler and wetter. The lake reached its highest elevation of about 5,100 feet, known as the Bonneville shoreline, between 16,000 to 14,500 years ago. From this shoreline, the lake eventually overtopped and breached through unconsolidated sediments near Red Rock Pass sending a catastrophic flood into the Snake River drainage system in southeastern Idaho, about 14,500 years before present. Within about a year, the lake had dropped to an elevation of about 4,740 feet, forming the Provo shoreline. Due to changing climatic conditions, the lake level gradually dropped to the historic levels of its modern day remnant, the Great Salt Lake. The last major high water shoreline of the lake was the Gilbert shoreline which reached an elevation of about 4,250 feet between 11,000 to 10,000 years ago. Historically, the Great Salt Lake has fluctuated between 4,211.9 and about 4,191 feet above sea level.

During Bonneville times, thousands of feet of sediment were deposited in the valley. Deposits consist of deep-water silts and clays, shoreline sand and gravels and gravelly barrier beach and deltaic deposits. The unconsolidated to semi-consolidated valley fill deposits are thought to range from 2,000 to 5,000 feet thick (Black, and others, 2003; Currey, and others, 1984; Hintze, 1988; Stokes, 1986).

A geologic map of the Central Wasatch Front by Davis (1983) shows the surficial deposits in the proposed Parkway alignment to consist of floodplain and delta deposits (chiefly fine-grained and poorly drained sediments) in the vicinity of the south interchange, Provo Formation and younger lake bottom sediments (clays, silts, sands, and localized offshore bars) through the majority of the project, and landslide deposits near the north interchange. Newer maps of the area (Personius and Scott, 1992; Nelson and Personius, 1993), characterize the predominant surficial geologic deposits throughout the

study area as Lake Bonneville lacustrine clay and silt, with Holocene to upper Pleistocene lateral spread deposits at some locations. Post-Bonneville lacustrine and marsh deposits are encountered along the easterly shores of the Great Salt Lake and encroach on the Parkway alignment from the west at some bridge sites. Localized upper Holocene stream alluvium associated with the Jordan River can be found along the shores of the river near the southerly terminus of the project. Bonneville lacustrine sand and gravel may be encountered near the northerly terminus, along with upper Holocene fan alluvium consisting of cobbles and gravel in a sandy matrix.

Davis (1983) shows the surficial geology of the Glover's Lane bridge sites to consist of landslide deposits, with Provo Formation and younger lake bottom sediments located east and south of the site. (see Figure 2a). The landslide deposits are mapped over a relatively large area extending from the vicinity of Glover's Lane on the south to near the intersection of Highway 89 and Farmington Main Street on the north. The slide deposits mapped by Davis also extend as far west as the shores of the Great Salt Lake in this area.

Figure 2b shows the Glover's Lane sites to lie within surficial Holocene to upper Pleistocene lateral spread deposits mapped by Nelson and Personius (1993). These deposits extend to the north and west of the sites, while lacustrine silt and clay deposits are shown to the south and east of the sites. Some fan alluvium and debris flow units are mapped on the east side of I-15 on the south side of Glover's Lane.

Figure 2c shows portions of the Farmington Siding Landslide Complex mapped by Harty and Lowe (1992). The liquefaction-induced landslide deposits on this map are scattered throughout the area west of Farmington, and it will be noted that liquefaction-induced landslide deposits from the Lake Bonneville regressive phase to early Great Salt Lake period are mapped on the westerly portion of the Glover's Lane sites. This unit is characterized by masses of soil forming complex landslides that probably moved as both flow failures and lateral spreads during earthquakes. The surficial soils on the easterly portion of the site are shown as fine-grained lacustrine soils from the same time period.

4.4 GEOLOGIC HAZARDS

Geologic hazards identified within the Legacy Parkway project area include ground shaking, liquefaction-induced lateral spreading and landslides, and subsidence during a moderate to large seismic event on the Salt Lake or Weber segments of the WFZ. Large seismic events on one of the other surrounding less studied faults such as the Great Salt Lake fault may also trigger these hazards.

Due to the close proximity of the Parkway to the Great Salt Lake, tilting of the lake during tectonic subsidence will shift the lake toward the east. This subsidence will cause a rise in already high ground-water tables and cause the lake to inundate toward the east. Subsidence and tilting will be greatest nearest the fault and will taper off away from the fault toward the west. Studies by Keaton (1987), and Chang and Smith (1998) have compared the 7.5 magnitude earthquake at Hebgen Lake, Montana in 1959 to a maximum credible earthquake along the Wasatch Front. Keaton's study shows the area near the most eastern extent of Farmington Bay to have the greatest potential for flooding. It should be noted that the magnitude of this hazard is directly related to the level of the lake and the location and magnitude of the earthquake. Ground shaking from surrounding faults or rupture of the Great Salt Lake fault beneath the lake also has the potential to generate wave hazards in the form of seiche (water oscillation waves) or a lake tsunami. The actual hazard potential to the Parkway from these waves is not known. Based on a study by Lin and Wang (1978) the hazard from seiche on the lake is likely low.

Other hazards include shallow ground water and potential flooding. A more detailed discussion of seismic hazards at the Glover's Lane bridge sites is provided in Section 5.0.

4.5 SOIL MATERIALS

Borings at the Glover's Lane bridge sites encountered primarily lean clay with silt and sand layers in the upper 60 to 90 feet, followed by medium-dense to very dense sand with occasional clay layers. Soil conditions at each site are described in further detail in Section 7.1.2.

4.6 HYDROGEOLOGIC CONDITIONS

Groundwater in the Salt Lake Valley occurs in late Tertiary and Quaternary alluvial and lacustrine basin-fill deposits that range from coarse gravel to clay. Four hydraulically connected aquifers have been identified in the basin sediments: 1) a deep, unconfined aquifer in gravelly deposits along the fronts of the Wasatch Range and Oquirrh Mountains; 2) a deep, confined aquifer in the center of the valley in gravel deposits beneath clay confined beds; 3) a shallow, unconfined aquifer in the center of the valley overlying the confined aquifer; and 4) local perched aquifers located primarily adjacent to mountain fronts.

The hydraulic gradient in the Parkway area generally slopes down in a westerly direction toward the Great Salt Lake. The depth to groundwater was measured at each boring location as indicated on the boring logs and was within about 2 to 5 feet of the ground surface at the Glover's Lane bridge sites at the time of drilling (March-May 2006). Fluctuations of a few feet can be expected due to typical seasonal variations. Wet and soft conditions were encountered at the toes of existing embankments and other low-lying areas, creating difficult access conditions. Artesian conditions were encountered in the lower confined aquifers at some locations.

4.7 POTENTIALLY HAZARDOUS MATERIALS

Potentially hazardous materials were not noted during the field investigation. All soil samples were re-examined in the laboratory and no odors indicative of contamination were noted. Potential sources of contamination include the oil drain at the southerly end of the project along with various past and present industrial sites located in the vicinity of the Parkway alignment. The apparent lack of contamination observed by field and lab personnel does not preclude the possible presence of potentially hazardous materials in the project area.

5.0 EARTHQUAKE CONSIDERATIONS

The study area is located within the seismically active Intermountain Seismic Belt which extends from Arizona to Canada. The nearest potentially active faults are the Salt Lake City Segment and the Weber Segment of the Wasatch Fault Zone (WFZ). The Salt Lake City segment is capable of generating a magnitude 7.2 earthquake. The Weber Segment of the WFZ is capable of generating a magnitude 7.4 earthquake.

5.1 DESIGN CRITERIA

5.1.1 MCEER Site Class

The subsurface profile encountered by borings at the site generally consists of firm to stiff clay deposits with average undrained shear strength in the 900 to 1100 psf range in the upper 60 to 90 feet. The clayey soils are underlain by medium-dense to dense layers of sand, silt, and gravel. Based upon available subsurface information, it is recommended that MCEER Site Class D be used for seismic design.

5.1.2 Ground Acceleration Values

The Glover's Lane bridge sites are located at about latitude 40.965° North and longitude 111.893° West, which is approximately 0.6 miles west of the Weber Segment, and about 7.5 miles north of the Salt Lake City Segment of the WFZ. USGS-NEHRP probabilistic peak ground acceleration (PGA) values are tabulated below:

Probabilistic ground motion values in %g.

	10%PE in 50 yr	2%PE in 50 yr
PGA	22.36	60.43
0.2 sec SA	53.77	141.18
1.0 sec SA	18.65	58.55

It should be noted that the USGS-NEHRP mapped values are calculated for "firm rock" sites having a shear wave velocity of 1500 feet per second in the upper 100 feet (MCEER Site Class B/C boundary), and that bedrock ground motions may amplify or attenuate as they propagate through the softer overburden soils existing in the Legacy Parkway area.

As part of the current Legacy Parkway project, Kleinfelder, Inc. developed site specific horizontal and vertical acceleration response spectra for the 1250 West bridge site and the State Street bridge site. It is our understanding that Kleinfelder will provide a report with conclusions and recommendations for applying the site-specific spectra at other sites on the project.

5.2 LIQUEFACTION AND LATERAL SPREAD

Liquefaction analyses were performed using the "Simplified Procedure" developed by Seed and Idriss (1971). This procedure involves determining the seismic shear stress ratio induced by an earthquake and comparing it with the seismic shear stress ratio required to cause liquefaction. Recommended refinements for the "Simplified Procedure" for SPT data presented at the 1996 NCEER workshop (Youd et al., 1997) were also applied in the analyses.

Evaluation of data from the test holes indicates that several soil layers may liquefy during the seismic event having a 2 percent probability of exceedance in 50 years. Layer thicknesses and potential liquefaction-induced settlement corresponding to volumetric strain are summarized on the table below.

Boring No.	Thickness of Liquefiable Layers (ft)		Calculated Liquefaction Settlement (in)	
	Within Depth Investigated	Within Upper 50 Feet	Within Depth Investigated	Within Upper 50 Feet
RSB-19-611	11.5	3	2.1	0.3
RSB-19-613	17.5	3.5	3.4	0.4
RSB-19-614	41.5	11.5	8.1	1.7

It has been noted that surficial soils in the vicinity of the Glover's Lane bridge sites have been mapped as lateral spread and landslide deposits. Lateral spread occurs when a continuous soil layer liquefies due to earthquake ground shaking, and the overlying soils move laterally down a gentle slope (usually less than about 6 percent) or toward a free face. Continuous liquefiable soil layers having $(N_1)_{60}$ values less than 15 are considered susceptible to lateral spread, particularly when encountered within about 30 feet of the ground surface. Soil deposits exhibiting lateral spread potential as determined from the borings are summarized on the following table.

Boring No.	Approx. Station	Approx. Offset	Layer Elevation (ft)	Soil Type	$(N_1)_{60}$	Notes
RSB-19-611	61+60	52' L	4230.5 – 4227.5	Sandy Silt	10	
SB-19-274	62+22	7' R	4226.5 – 4218.5	Silty Sand	---	piston sampler
LSB-19-470	62+97	7' R	---	---	---	zone not sampled
LSB-19-471	64+10	8' R	---	---	---	zone not sampled
SB-19-276	64+21	7' R	4234 – 4227.5	Sand	6	
			4223 – 4217.5	Sand	12	
RSB-19-613	66+36	22' L	4233 – 4228.5	Sandy Silt	8 to 11	
SB-19-279	66+50	27' R	4225.5 – 4220.5	Sand	12	
LSB-19-473	67+77	7' R	4226 – 4221	Sand	8	
SB-19-281	68+65	32' R	4225.5 – 4217	Silt	14	silt may be plastic
			4217 – 4215	Silty Sand	---	piston sampler
RSB-19-614	68+72	26' L	4237 – 4229.5	Sand & Silt	10 to 11	

It will be noted from the table that each boring in which sampling was performed between elevations 4233 and 4215 feet encountered some evidence of lateral spread potential within this zone. A continuous layer through this zone may be susceptible to lateral spread. Based on the borings performed in 2006 alone ("RSB" borings), this layer ranges from about 3 to 8 feet in thickness, consists primarily of non-plastic sandy silt with 52 to 58 percent passing the No. 200 sieve, and has average SPT $(N_1)_{60}$ values of about 10.

The average ground slope across the site appears to vary from about 0.5 to 1.5 percent. Based on these parameters, along with grain size characteristics of the susceptible samples, the computed lateral spread displacement for the design seismic event ranges from 2.2 to 5.5 feet, depending on the ground slope and the thickness of the susceptible soil layer. It is our opinion that the continuous thickness of the layer susceptible to lateral spread is 3 feet or less, and that the most likely magnitude of horizontal displacement is between 2 and 3 feet.

When the magnitude of lateral displacement is significant (greater than about 4 inches), it is anticipated that the displacement of the ground surface will cause displacement of adjacent structures. Displacement of the spreading soil layer can impose significant lateral loads on pile foundations. Soils in the upper 10 to 20 feet are expected to experience horizontal displacement of up to 3 feet due to the seismic event having a 2 percent probability of exceedance in 50 years. For the event having a 10 percent probability of exceedance in 50 years, the anticipated displacement is in the 1.5 to 2.0-foot range. If structures cannot satisfactorily accommodate the estimated magnitudes of horizontal displacement, it is recommended that subsurface mitigation be performed at this site to help protect bridge foundations from liquefaction-induced lateral spreading. Recommended mitigations methods are discussed in Section 7.2.1.6.

6.0 FIELD AND LABORATORY TEST DATA

6.1 SUBSURFACE EXPLORATION

Subsurface investigations performed at the bridge sites include borings performed by Kleinfelder in conjunction with the Design-Build project, along with supplemental borings performed by RB&G Engineering and UDOT in 2006 for the current project.

Boring logs for bridge subsurface investigations performed in 2006 are included in Appendix B of this report. Test holes performed by RB&G Engineering in 2006 are labeled with the prefix "RSB" (or "RSC" for CPT holes, where applicable), followed by a number identifying the bridge site, then by a hole number in the 600 series. It will be noted that sites at Glover's lane were designated with the number 19, based on the number used for the Glover's Lane bridge in the Design-Build project.

Kleinfelder, Inc. performed several borings at the Glover's Lane bridge sites, and copies of applicable boring logs are also included in Appendix B. These borings are labeled "SB", for "Structure Boring", followed by the site number (19), followed by a boring number in the 200 series. It is our understanding that the borings labeled "LSB" and numbered in the 400 series were supplemental borings performed subsequent to the initial "SB" borings.

For all structure borings drilled in 2006, the subsurface investigation was performed using CME rotary drill rigs, with a tri-cone rock bits and NW casing to advance the boring, and water as the drilling fluid. Sampling was generally performed at 5-foot intervals. At some locations, sampling was performed at closer intervals to evaluate liquefaction hazard for loose cohesionless soils in the upper 30 to 40 feet. Disturbed samples were obtained by driving a 2-inch split spoon sampling tube through a distance of 18 inches using a 140-pound weight dropped from a distance of 30 inches. The drill rig used for each boring is noted on the boring log. The automatic trip hammer on the CME-55 No. 1 rig was evaluated by UDOT using Pile Driving Analyzer equipment in March 2006 and the energy ratio was determined to be about 72%. The CME-55 No. 2 rig was likewise evaluated, and the rope-and-cathead system had an average energy ratio of 55%. It is our understanding that UDOT's CME-850 rig had an average energy ratio of 80%.

The number of hammer blows required to drive the sampling spoon through each 6 inches of penetration is shown on the boring logs. The sum of the last two blow counts, which represents the number of blows to drive the sampling spoon through 12 inches, is defined as the standard penetration value. The standard penetration value, corrected for

overburden and hammer energy, provides a good indication of the in-place density of sandy material; however, it only provides an indication of the relative stiffness of cohesive material, since the penetration resistance of materials of this type is a function of the moisture content. Considerable care must be exercised in interpreting the standard penetration value in gravelly-type soils, particularly where the size of granular particles exceeds the inside diameter of the sampling spoon. If the spoon can be driven through the full 18 inches with a reasonable core recovery, the standard penetration value provides a good indication of the in-place density of gravelly-type material. For materials containing more than 35% gravel size particles, the density descriptions shown on the boring logs were developed based on correlations between relative density and standard penetration value for gravelly soils.

At some locations within the project it was not possible to drive the sampling spoon through the full 18 inches at some sampling depths. Where the sampling tube could not be driven through the full 18 inches, the number of blows to drive the spoon through a given depth of penetration is shown on the boring logs.

Undisturbed samples were obtained by pushing a 2.62-inch (inside diameter) thin-walled sampling tube into the subsurface material using the hydraulic pressure on the drill rig. The locations at which the undisturbed samples were obtained are shown on the boring logs.

Miniature vane shear (torvane) tests, which provide an indication of the undrained shearing strength of cohesive materials, were performed on samples of cohesive soils during the field investigations. The results of these tests are shown on the boring logs as the torvane value in tsf.

Each sample obtained in the field was classified in the laboratory according to the Unified Soil Classification System. The symbols designating soil types according to this system are presented on the boring logs. A description of the Unified Soil Classification System is included with the logs (see Appendix B), and the meaning of the various symbols shown on the logs can be obtained from this figure. Laboratory-tested samples were also classified according to the AASHTO Classification System, and the symbols designating the soil types according to this system are also presented on the boring logs.

6.2 LABORATORY TESTING

Laboratory tests performed during this investigation to define the characteristics of the subsurface material included:

1) Mechanical Analysis
2) Density
3) Natural Moisture Content
4) Atterberg Limits
5) Unconfined Compressive Strength
6) Consolidation
7) Triaxial Shear
8) pH, Resistivity, Sulfates, and Chlorides

Laboratory testing was performed in accordance with applicable standards published by the American Society for Testing and Materials (ASTM) and/or the American Association of State Highway and Transportation Officials (AASHTO).

The results of laboratory tests performed during this investigation are presented on the boring logs and summarized on tables located in Appendix C of this report. Plots of applicable test data are also included in Appendix C.

7.0 STRUCTURES

7.1 DESCRIPTION

7.1.1 General

It is our understanding that the Glover's Lane over LP bridge (F-668) will be a two-span pre-stressed concrete girder structure about 77 feet wide, with span lengths ranging from 100 to 115 feet. The pedestrian bridge over the rail lines and I-15 will be a three-span steel plate girder structure approximately 10 feet wide, with span lengths between 130 and 140 feet. Anticipated foundation loads and structure dimensions are summarized on the table below:

Structure Number	F-668	C-946
Location	Glover's Lane over LP	Glover's Ped over I-15 & UPRR
Number of Spans	2	3
Approx. Span Length(s) (ft)	100 to 115	130 to 140
Approx. Width (ft)	77	10
Strength I Abutment Load (kip)	3807 to 4041	325
Service I Abutment Dead Load (kip)	2292 to 2475	182
Service I Abutment Live Load (kip)	530	55
Strength I Bent Load (kip)	6414	917 to 930
Service I Bent Dead Load (kip)	4568	527 to 538
Service I Bent Live Load (kip)	366	141

7.1.2 Subsurface Conditions

Boring and CPT logs submitted by the Design-Build team show predominantly soft to medium-stiff clay with silt and loose to medium-dense sand layers above an average elevation 4157 feet (about 90 feet below I-15 in this area). Soil deposits encountered below elevation 4157 feet were predominantly medium-dense to very dense sands and gravels with some silt and clay layers. Some of the Design-Build borings were drilled through the existing Glover's Lane embankment fill, which was generally described as medium-dense to very dense sand and gravel.

As shown on Figure 3a, Boring RSB-19-611 was drilled on the north side of Abutment 1 of the Glover's Lane over LP (F-668) bridge location. This boring encountered primarily stiff lean clay in the upper 12 feet, followed by 3 feet of loose non-plastic silt, then about 7 feet of soft lean clay to a depth of about 22

feet. From 22 feet to 89 feet, the boring encountered lean clay with occasional silt and sand layers less than about 4 feet thick. The lean clay was firm from 22 to 41 feet, and generally stiffer between 41 and 89 feet. Medium-dense silty sand was the predominant soil type from 89 feet (elev. 4153 feet) to the bottom of the boring at 125 feet (elev. 4117 feet), with some gravel inclusions and occasional clay layers up to about 2.5 feet thick. The lean clay and plastic silt samples in the boring had liquid limits between 28 and 47, with plasticity indices between 8 and 24.

CPT Hole RSC-19-612, located near the south side of F-668 Abutment 3, characterized the materials in the upper 81 feet as predominantly silt with some sand and clay layers. Some evidence of sensitive fines was noted in the upper 26 feet. The CPT log shows interbedded sand and silt layers between 81 and 96 feet (elev. 4159 to 4144 feet) followed by sand to the bottom of the sounding at about 106 feet (elev. 4134 feet). It has been our experience that soils identified as silts according to CPT soil behavior type correlations often classify as lean clay when samples from adjacent borings are tested in the laboratory.

As shown on Figure 3b, Boring RSB-19-613 was drilled at Bent 2 of the proposed pedestrian bridge (C-948), between the commuter rail line and the existing I-15 southbound roadway. This boring encountered primarily lean clay in the upper 12 feet, followed by about 4 feet of loose non-plastic sandy silt, then very soft clay with sand lenses to about 24 feet. A 3-foot layer of medium dense silty sand was identified between 24 and 27 feet, followed by lean clay of varying consistency (soft to stiff) with some sand and silt layers to a depth of 59 feet. A zone of medium-dense silty sand was encountered between 59 and 71 feet, and was underlain by soft to stiff lean clay to about 89 feet (elev. 4156 feet). Medium-dense to dense silty sand with some clayey sand layers was then encountered to a depth of about 123 feet (elev. 4122 feet), followed by very dense silty sand with gravel to the bottom of the boring at 132 feet (elev. 4113 feet). Lean clay samples tested in the laboratory had liquid limits ranging from 30 to 44. The plasticity index of the lean clay samples was between 12 and 22.

Boring RSB-19-614 was drilled approximately 35 feet west of Abutment 4 of the proposed pedestrian structure (C-948), and encountered loose to medium-dense silty sand and non-plastic silt with some soft to firm clay layers in the upper 18 feet. Soft clay was encountered between 18 and about 28 feet, followed by

generally firm to stiff clay to about 58 feet (elev. 4189 feet). Loose to medium-dense silty sand with some clay and silt layers were the predominant materials encountered between 58 and 89 feet (elev. 4158 feet), followed by medium-dense to very dense sand with some gravel and occasional clay layers to the bottom of the boring at 110.5 (about elev. 4137 feet). Four samples of the lean clay were tested in the laboratory, with liquid limits between 39 and 43 and plasticity indices ranging from 18 to 23.

7.1.3 Groundwater Conditions

The reported groundwater levels at each boring location are summarized on the table below:

Boring	Depth to Groundwater	Groundwater Elevation	Month of Reading
RSB-19-611	5.0'	4237.2'	April 2006
RSB-19-613	2.8'	~4242.6'	May 2006
RSB-19-614	3.0'	4244.2'	March 2006

It should be noted that artesian flow was observed in Boring RSB-19-611 at a depth of about 60 feet, with 6.5 feet of head above the ground surface. Slight artesian flow was also encountered at a depth of about 80 feet in the same boring. Artesian flow of about 4 to 5 gallons per minute was noted in Boring RSB-19-613 when the boring was between depths of about 80 to 90 feet. Artesian flow was also observed below a depth of about 80 feet in Boring RSB-19-614.

It is anticipated that the shallow static groundwater level may rise by about 2 feet at each site due to typical seasonal changes, and possibly more if environmental conditions vary significantly.

7.2 RECOMMENDATIONS

7.2.1 Bridge Structures

Deep foundations are preferred for the bridges at the Glover's Lane sites, due to the magnitudes of structural loads (including seismic design requirements) and the relatively poor strength characteristics of soils encountered near the existing ground surface. The depth to competent bearing layers, along with foundation settlement considerations, favors the use of driven piles rather than drilled shafts.

Given the anticipated subsurface soil and groundwater conditions, driven piles can be more readily installed to greater depths than drilled shaft foundations at the Glover's Lane bridge sites.

It is anticipated that the abutments of Structure F-668 will be supported by a single line of piles spaced over a total distance of 68 feet. The bent pile group will occupy a plan area measuring approximately 85 feet long by 11 feet wide.

Preliminary drawings indicate that the pedestrian bridge (C-948) abutments will be supported by a single line of pipe piles spaced over a distance of about 7.5 feet, and the bent pile groups will occupy an area about 13 feet square.

7.2.1.1 Driven Piles

Axial compression resistance values have been estimated for concrete-filled steel pipe piles. The analyses were performed using the FHWA program SPILE. Geotechnical resistance factors were selected from the 2006 Interim AASHTO LRFD Bridge Design Specifications. Resistance values were initially calculated for 16-inch OD pipe piles for both structures. Resistance values for 12.75-inch OD pipe piles at the pedestrian structure were then computed at the request of the structural engineer. Estimated resistance values and tip elevations are listed on the table below.

Pile Data Parameters	**Glover's over LP (F-668)**	**Glover's Ped over I-15 & UPRR (C-948)**
Pipe Pile Outside Diameter (in)	16	12.75
Estimated Pile Tip Elevation (ft)	Abut 1 – 4134 Abut 2 – 4142 Abut 3 – 4135	Abut 1 – 4134 Abut 2 – 4134 Abut 3 – 4139 Abut 4 – 4142
Elev. of Min. Acceptable Pile Penetration (ft)	Abut 1 – 4142 Abut 2 – 4142 Abut 3 – 4141	Abut 1 – 4139 Abut 2 – 4139 Abut 3 – 4141 Abut 4 – 4142
Strength I Axial Compression Resistance (kip)	321	Abutments – 252 Bents – 226
Extreme Event I Compression Resistance (kip)	404	Abutments – 311 Bents – 293
Required Driving Resistance (kip)	494	348 *

* Required Driving Resistance = 390 kips at abutments if piles are driven through abutment fill.

The elevation of minimum acceptable pile penetration is generally a few feet above the estimated tip elevation to allow some flexibility in actual pile driving depths. All piles should be driven to at least the minimum penetration elevation unless the geotechnical engineer approves shorter piles based on a review of tested pile driving resistance and other foundation considerations, including foundation uplift resistance and settlement.

The estimates listed above assume that new embankments will be constructed with lightweight material and/or surcharged where necessary, such that any significant embankment settlement will be completed or otherwise mitigated prior to placement of structural loads on the piles.

We recommend that piles be spaced at least 3 diameters apart (center-to-center) to reduce group effects. Potential for pile group failure under axial compression loads was checked for the following proposed pile group layouts.

- F-668 (16-inch OD pipe piles): Abutments with a single line of 17 piles spaced over 68 feet, and bents with 54 piles in a plan area measuring about 86 feet long by 11 feet wide.
- C-948 (12.75-inch OD pipe piles): Abutments with a single row of 3 piles spaced over about 7.5 feet, and bents with 13 piles in an area approximately 13-feet square

In each case, the potential for group (block) failure was found to be less critical than the axial compressive resistance of individual piles. Group resistance can therefore be determined by multiplying the single-pile resistance by the number of piles in the group, for both the Strength I and Extreme Event limit states.

A preliminary pile drivability analysis has been performed using the program GRLWEAP 2005. The analysis was performed for closed-end 16-inch OD steel pipe piles having wall thicknesses of 3/8 and 1/2 inch. The analyzed driving systems were a Delmag D 25-32 diesel hammer with the manufacturer's recommended hammer cushion, and an IHC S-90 Hydrohammer, without cushioning. The results of the analyses are summarized below.

F-668 - 16-inch OD closed-end pipe										
Hammer	3/8" Pipe Thickness					1/2" Pipe Thickness				
	Ultimate Capacity (kips)	Maximum Compress. Stress (ksi)	Blow Count (per foot)	Stroke (ft)	Energy (kip-ft)	Ultimate Capacity (kips)	Maximum Compress. Stress (ksi)	Blow Count (per foot)	Stroke (ft)	Energy (kip-ft)
D 25-32	350	26.9	47	7.5	31.9	350	25.5	39	7.5	29.7
	400	27.6	74	7.7	32.5	400	26.1	55	7.7	30.3
	425	27.8	97	7.8	32.6	450	26.6	81	7.9	30.7
	445	28.1	119	7.8	32.9	500	27.1	123	8.0	31.1
IHC S-90*	400	46.2	31	6.6	58.9	400	43.0	25	6.6	59.2
	475	46.3	55	6.6	58.8	475	43.1	37	6.6	59.1
	500	46.4	70	6.6	58.7	550	43.3	60	6.6	59.0
	555	46.5	121	6.6	58.6	635	43.4	119	6.6	58.9

* IHC S-90 assumed to operate at 95% efficiency.

C-948 –12.75-inch OD closed-end pipe										
Hammer	3/8" Pipe Thickness					1/2" Pipe Thickness				
	Ultimate Capacity (kips)	Maximum Compress. Stress (ksi)	Blow Count (per foot)	Stroke (ft)	Energy (kip-ft)	Ultimate Capacity (kips)	Maximum Compress. Stress (ksi)	Blow Count (per foot)	Stroke (ft)	Energy (kip-ft)
D 25-32	350	28.4	57	7.5	33.9	350	26.9	43	7.6	31.6
	375	28.8	78	7.6	34.3	375	27.2	53	7.7	32.0
	400	29.2	110	7.7	34.5	400	27.6	66	7.8	32.3
	405	29.3	119	7.8	34.5	455	28.2	123	8.0	32.7
IHC S-90*	350	38.8	60	6.6	37.0	350	36.3	39	6.6	37.2
	360	38.8	70	6.6	37.0	375	36.4	49	6.6	37.1
	375	38.9	88	6.6	36.9	400	36.4	63	6.6	37.1
	395	38.9	124	6.6	36.8	450	36.5	118	6.6	37.0

* IHC S-90 assumed to operate at 60% efficiency.

It will be observed from the tables that the IHC S-90 hammer appears capable of driving the piles at the Glover's Lane sites to resistance values in excess of the required driving resistance. The Delmag D 25-32 may not be capable of driving the 16-inch OD piles for Structure F-668, particularly for pipe piles with 3/8-inch wall thickness, where pile driving blow counts are expected to exceed 120 blows per foot during restrike conditions. The calculated driving stresses are significantly greater for the IHC S-90 hammer than for the diesel hammer, due to the lack of cushioning and greater energy transfer to the pile.

Based upon the results of the WEAP analysis, pipe piles with 3/8" wall thickness can be successfully driven to the required driving resistance with at least one pile driving hammer known to be locally available. A refined wave

equation analysis should be performed for the proposed pile driving system prior to mobilizing the pile driving rig(s) to the sites.

Pile driving should be monitored to ensure that driving stresses do not exceed 90 percent of the yield strength of the steel piles. The 16-inch OD pipe piles at Structure F-668 may require the larger driving hammer and may be subject to driving stresses in the order of 45 to 50 ksi. These piles should therefore have a minimum yield strength of about 56 ksi or greater. The 12.75-inch OD pipe piles for Structure C-948 should have a minimum yield strength of 35 ksi. The pile driving hammer should have an operating energy of at least 60 kip-ft for F-668, and at least 50 kip-ft from C-948.

Special care should be taken to align the hammer properly with the pile head to limit the possibility of eccentric driving stresses, which can result in over-stressing of one side of the pile. Driving should be performed only with smooth, square ends of the piles (preferable the factory-cut ends) rather than rough field-cut pile ends.

It should be noted that piles are not expected to demonstrate the required driving resistance during initial driving. Significant set-up is likely to occur as pore pressures dissipate in the hours and days following driving, thus increasing the geotechnical resistance of the pile.

7.2.1.2 Foundation Settlement

Pile resistance analyses were performed based on the neutral plane method. In this method, downdrag loads are not considered detrimental to the geotechnical pile resistance, and the resistance values above need not be reduced to account for downdrag. The effects of downdrag should, however, be accounted for in evaluations of the structural resistance of the pile section. For driven piles at each of the foundation locations listed above, the axial structural resistance of the concrete-filled pipe pile section should be checked to verify that the pile section can resist the Service I Load plus a factored downdrag load of 300 kips per pile at Structure F-668, and 250 kips per pile at Structure C-948. To account for potential corrosion, we recommend that the structural capacity evaluation be performed assuming 1/16 inch of corrosion will occur on the exterior of the steel pipe.

The Extreme Event I Resistance shown above assumes that liquefiable layers will not provide resistance during seismic loading. If this value is not exceeded, it is anticipated that the principle consequences of liquefaction will be pile group settlement resulting from downdrag loads transferred from settling soil above the liquefiable layers. The pile groups could potentially settle as much as the surrounding ground surface during liquefaction before the temporary downdrag loads are neutralized and the piles regain the full Extreme Event I Resistance; however, actual pile group settlement during liquefaction is expected to be somewhat less than the settlement of the surrounding ground surface. The maximum estimated ground settlement due to liquefaction at this site is discussed in Section 5.0.

Consolidation settlement of pile groups at Structures F-668 and C-948 was estimated based on pile group layouts provided by the structural engineers. The assumed pile group layouts are described in Section 7.2.1.1 above. In order to limit post-construction foundation settlement to less than one inch, we recommend that non-transient service loads not exceed the maximum values shown on the following table.

Structure Number	Foundation	Maximum Non-Transient Service Load (kips per pile)
F-668	Abutments	146
	Bents	90
C-948	Abutments	93
	Bents	93

Transient loads are not expected to contribute significantly to pile group settlement at these structures. The Service I Resistance values shown on the plans may exceed the values shown above if necessary to support transient service loads, under the condition that the non-transient service loads do not exceed the values on the table above.

7.2.1.3 Uplift

Uplift capacities for individual piles computed using LRFD Procedures are summarized on the table below. A resistance factor of 0.35 was used for sandy soils, and a factor of 0.25 was used for clayey soils at the Strength I limit state.

Pile Data Parameters	Glover's Lane over LP (F-668)	Glover's Ped over I-15 & UPRR (C-948)
Pipe Pile Outside Diameter (in)	16	12.75
Strength I Axial Uplift Resistance (kip)	122	85
Extreme Event I Uplift Resistance (kip)	335	250

For the anticipated pile layouts described in Section 7.2.1.3 above, the pile group uplift resistance can be taken as the single-pile uplift resistance multiplied by the number of piles in the group.

7.2.1.4 Lateral Loading

Soil parameters and other recommendations for evaluation of lateral load response using the computer programs LPILE and GROUP are included on a summary sheet in Appendix D.

7.2.1.5 Load Tests

The Strength I Pile Resistance estimates provided above are based on an LRFD resistance factor of 0.65. Table 10.5.5.2.3-3 of the 2006 AASHTO LRFD Interim Specifications shows the number of dynamic pile load tests with signal matching required at each site for use of this resistance factor. Based on the table, PDA testing and CAPWAP analyses would be required for 4 piles at each site. We recommend that at least one PDA test be performed at each abutment and bent for the Glover's Lane structures.

Skin resistance will increase in the hours and days following pile driving. PDA testing should be performed at least 24 hours after initial driving, and more time (up to a few days) may be required for the piles to achieve their required driving resistance.

7.2.1.6 Lateral Spread Mitigation

If the structures cannot be designed to satisfactorily accommodate the estimated lateral spread displacements discussed in Section 5.2, it is recommended that subgrade improvements be performed to protect the pile foundations against excessive displacement. It is anticipated that lateral spread mitigation will be considered necessary for Structure F-668 (Glover's Lane

over Legacy Parkway), due to the importance of the structure. Lateral spread mitigation might not be considered necessary for the pedestrian structure (C-948), depending on the importance of the structure and the anticipated consequences of the estimated displacements. Several methods exist for subgrade mitigation of the lateral spread hazard at bridge sites. The intent of each method is to modify the liquefiable zone to create a block of soil around each bridge foundation that will resist lateral displacement.

It is our opinion that excavation and replacement of soils to the bottom of the susceptible zone is the most positive method of lateral spread mitigation. Depending on the depth of the zone to be improved, excavation and replacement may also be the most cost efficient mitigation method. This option requires dewatering and may require shoring of the excavation and existing embankment fill. The replacement fill should meet UDOT criteria for "Embankment for Bridge".

Other potential lateral spread mitigation methods include ground improvement techniques such as vibro-replacement stone columns and compaction grouting. It is our opinion that vibro-replacement is significantly more effective than compaction grouting, due to the densifying effects of the vibrations involved in stone column construction. It has been noted that the soil layers requiring improvement at this site often classify as silt, with greater than 50 percent of the sample passing the No. 200 Sieve. Soils with high fines contents (greater than about 25 percent passing the No. 200 Sieve) can limit the densification effects of vibration, because the fine material resists dissipation of pore pressures induced by vibrations. Wick drains installed midway between columns have been shown to improve dissipation of pore pressures in soils with high fines contents, thus improving the densifying effects of vibro-replacement. We recommend that the use of wick drains be considered if stone columns are selected as the preferred mitigation method.

Based on experience with past projects, it is recommended that a replacement ratio of at least 25 percent be used if the stone column option is selected. This has been achieved on past UDOT projects using 3.5-foot diameter stone columns in an equilateral triangular pattern, with center-to-center spacing of 6.5 feet between columns. UDOT has a Special Provision for Soil Improvement by Vibro-Replacement. The actual size and spacing of stone

columns required to successfully meet the acceptance criteria should be determined by the experienced specialty contractor responsible for installing the columns.

Based on the "RSB" borings performed in 2006, it is anticipated that the mitigation zone will extend to about elevation 4227 feet. If the excavation and replacement option is selected, the depth of the excavation should be increased where necessary to remove any loose non-plastic soils encountered at this elevation. If the vibro-replacement option is used, the required depth of the stone columns at each foundation location should be determined based on pre-mitigation borings as outlined in the Special Provision. The pre-mitigation borings should extend to at least elevation 4215 feet.

In order to provide a factor of safety of greater than 1.1 against the estimated lateral spreading force, it is recommended that the mitigation area at each foundation location be at least 50 feet wide (east-west direction), with a 30-foot wide mitigation area located up-gradient (east) of the foundation centerline, and the remaining 20-foot width located down-gradient of the foundation centerline. Perpendicular to the structure, the mitigation zone should extend at least 15 feet beyond each end of the pile groups (north-south direction). Mitigation around bent foundations should be centered around the pile group if possible. The mitigation at each abutment foundation should include the abutment pile group and the footprint area of the MSE wall reinforced soil zone, so that stability of MSE walls may benefit from the subgrade improvements.

7.2.1.7 Construction Considerations

Dewatering will likely be necessary for foundation excavations and other work. It is recommended that the groundwater be lowered to a depth of 2 feet below the bottom of the excavations. It is anticipated that dewatering can best be achieved using sumps and drain trenches where clay exists at the bottom of the excavation.

Soils at the bottom of excavations may be too soft to provide an adequate working surface. Stabilization methods will depend upon conditions encountered. Moderately soft areas can be stabilized by over excavating the

foundation footprint to a depth of about 1 foot, placing a geotextile fabric such as Mirafi 500X or equal and backfilling with compacted sandy gravel. Very soft areas may be stabilized by tamping cobble rock (preferable angular to subangular) into the subgrade as needed. As a minimum, it is recommended that an 8 inch layer of granular borrow be placed below the pile cap to provide a working platform.

Excavation and shoring of existing abutment fill may be required for construction of new abutments. Maximum excavation slopes in embankment fill material of 1H:1V can be used for temporary cuts less than 20 feet deep. For temporary cuts between 20 and 30 feet deep, 1.5H:1V cut slopes or flatter should be used for the entire depth of the cut. Cut slopes in natural soils or uncompacted fill should be analyzed by the Geotechnical Engineer on a case-by-case basis.

We recommend that preconstruction surveys and vibration monitoring be performed for any critical structures or utilities located within 500 feet of the construction area.

7.2.2 Embankments

Analyses and recommendations for embankments are provided in a separate report by Kleinfelder.

7.2.3 Retaining Walls

Analyses and recommendations for retaining walls are provided in a separate report by Kleinfelder.

7.2.4 Lateral Earth Pressures

Lateral earth pressures can generally be calculated using the equation

$$P = \frac{1}{2} \gamma K H^2$$

Where P = total lateral force on the wall, plf
K = earth pressure coefficient
γ = unit weight of the soil (depends on fill material)
H =height of the wall

The earth pressure coefficient used in designing the walls will depend upon whether the wall is free to move during backfilling operations, or whether the wall is restrained during backfilling. If the wall is free to move away from the soil during backfilling operations, we recommend that an active earth pressure coefficient be used in the above equation to calculate the lateral earth pressures. If the walls are restrained or braced from movement during backfilling (as is generally the case with box culverts and similar structures), we recommend that an at-rest earth pressure coefficient be used to calculate the lateral earth pressures. A passive earth pressure coefficient should be used to calculate the lateral soil resistance where the wall is being pushed toward the soil. It should be recognized that the pressures, calculated by the above equation, are earth pressures only and do not include hydrostatic pressures. Where hydrostatic pressures may exist behind a retaining structure, we recommend either the wall be designed to resist hydrostatic pressure, or that a drainage system be placed behind the wall to prevent the development of hydrostatic pressures.

Lateral earth pressure coefficients and other recommendations for computing lateral earth pressures are included in Appendix D. A general earth pressure coefficient has been provided for calculation of earth pressures where mechanical compaction equipment is expected to be operated near non-yielding walls less than about 8 feet high. This scenario is anticipated during placement of fill around culverts. The residual pressure from compaction equipment can be reduced by limiting the proximity and weight of compacting equipment near culvert walls.

Recommendations based on the Mononobe-Okabe approach for active and passive seismic lateral earth forces are included in Appendix D. For non-yielding walls, recommended equations for calculating the dynamic thrust and dynamic overturning moment are also provided.

8.0 CORROSION INVESTIGATIONS

In order to obtain an indication of the corrosive nature of the subsurface material at the Glover's Lane Bridge sites, resistivity, pH, sulfate, and chloride tests were performed on soil samples obtained in the Test Holes. The results of these tests are tabulated below:

Test Hole	Depth (ft)	Soil Type	Resistivity ohm-cm	pH	Sulfate (ppm)	Chloride (ppm)
RSB-19-611	3-4.5	Sandy Lean Clay	15,573	8.9	78	510
	6-7.5	Lean Clay	16,871	8.8	67	578
	48.5-50	Lean Clay	16,871	7.3	533	114

The 2006 Interim LRFD specifications state that resistivity less than 2,000 ohm-cm, sulfate concentration greater than 1,000 ppm, and pH less than 5.5 (8.5 in highly organic soils) are all indicative of potential pile corrosion or deterioration. Due to the high resistivity and pH of tested samples, unusual potential for corrosion/deterioration of steel piles is not anticipated at these two sites. Type I or Type II cement may be used for concrete; however Type II cement is preferred for its superior resistance to deterioration. For design of driven piles, it is recommended that 1/16 inch of corrosion be assumed for all surfaces in contact with soil or groundwater. This reduction has been accounted for in the pile analyses described in Section 7.2.1.1.

9.0 LIMITATIONS

The conclusions and recommendations presented in this report are based upon the results of the field and laboratory tests. It should be recognized that soil materials are inherently heterogeneous and that conditions may exist throughout this site which were not defined during this investigation. If during construction, conditions are encountered which appear to be different than those presented in this report, it is requested that we be advised in order that appropriate action may be taken.

The information contained in this report is provided for the specific location and purpose of the client named herein and is not intended or suitable for reuse by any other person or entity whether for the specified use, or for any other use. Any such unauthorized reuse, by any other party is at that party's sole risk and RB&G Engineering, Inc. does not accept any liability or responsibility for its use.

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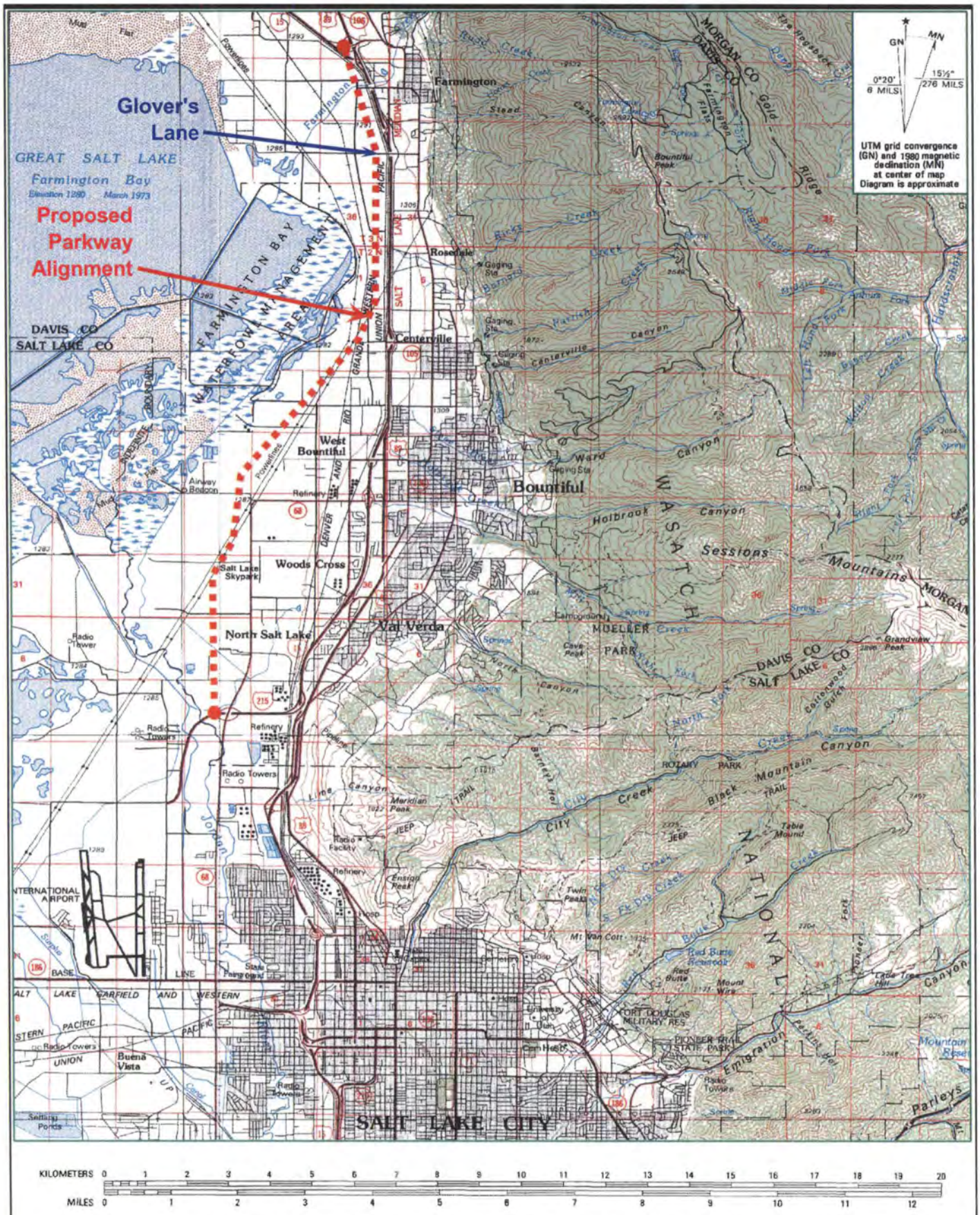
FIGURES



Portion of 1980 USGS 30 X 60 minute Salt Lake City (Utah-Wyoming) Quadrangle

RB&G ENGINEERING INC.
Provo, Utah

Figure 1 Vicinity Map
Proposed Legacy Parkway Alignment
Legacy Parkway
Salt Lake / Davis Counties, Utah

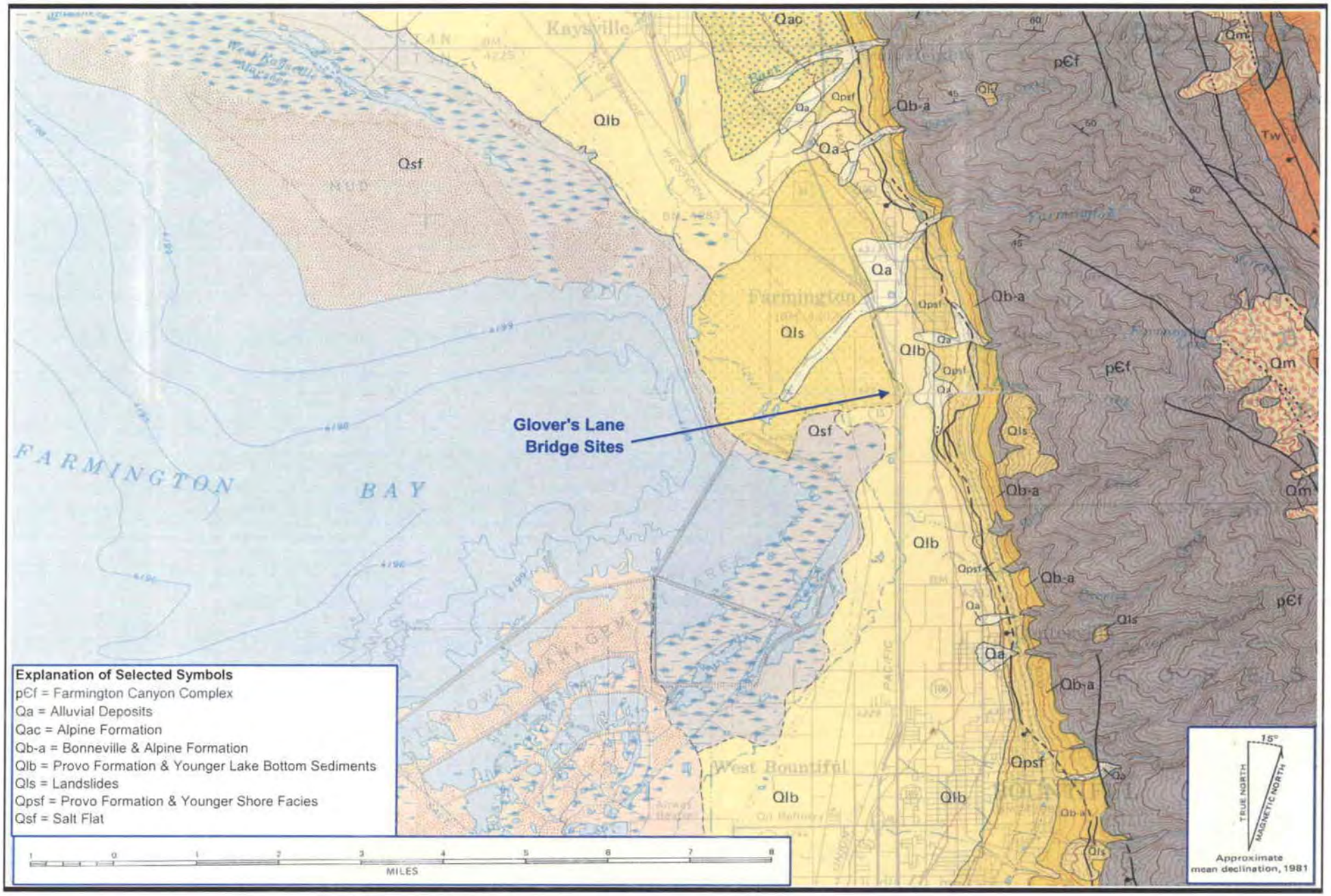


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Figure 2a Geologic Map A
Glover's Lane Bridge Sites
Legacy Parkway
Salt Lake / Davis Counties, Utah

Map modified from:
Davis, 1983
Utah Geological and Mineral Survey

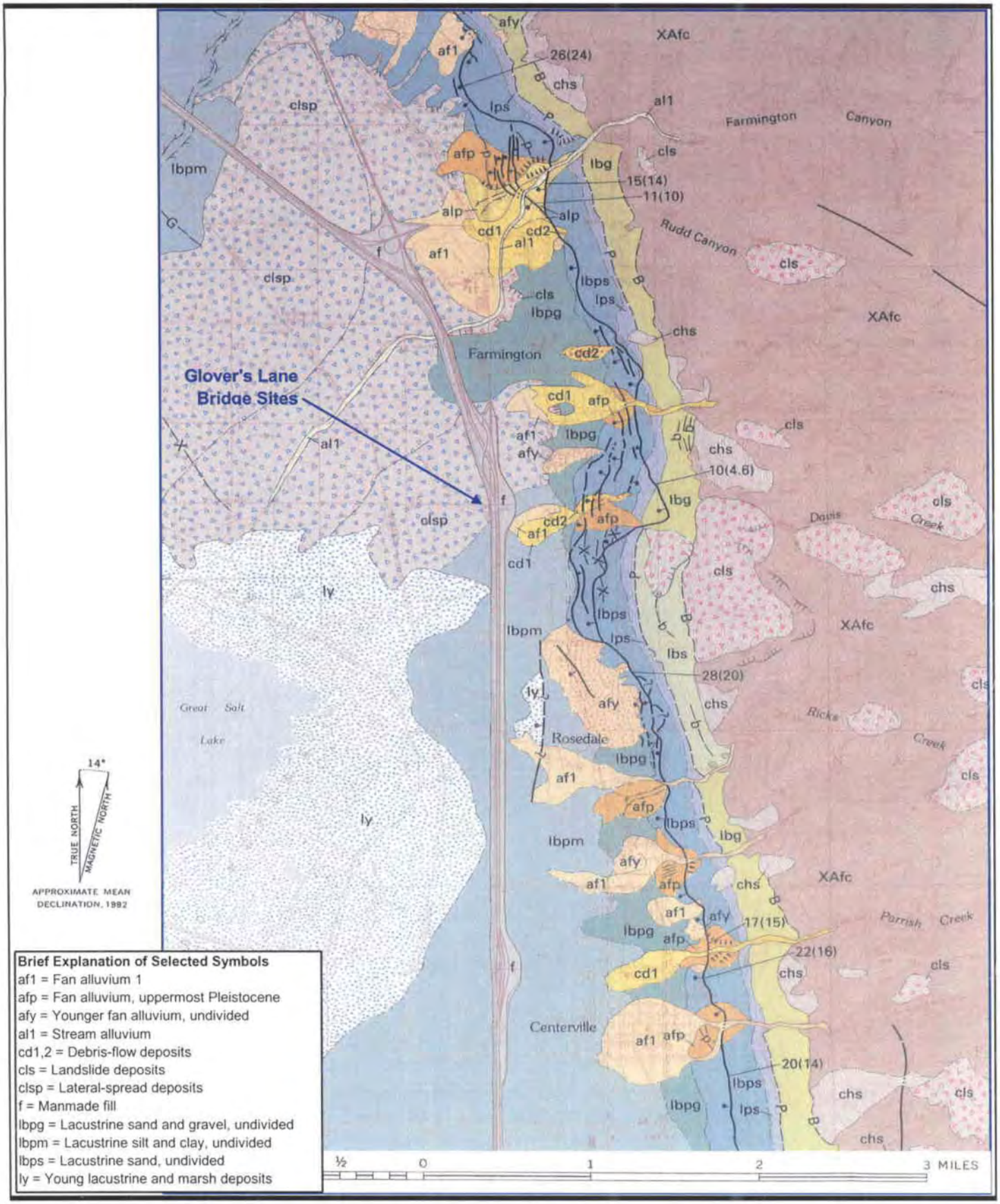

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Figure 2b Geologic Map B
Glover's Lane Bridge Sites
Legacy Parkway
Salt Lake / Davis Counties, Utah

Map modified from:
Nelson & Personius, 1993
Utah Geological Survey

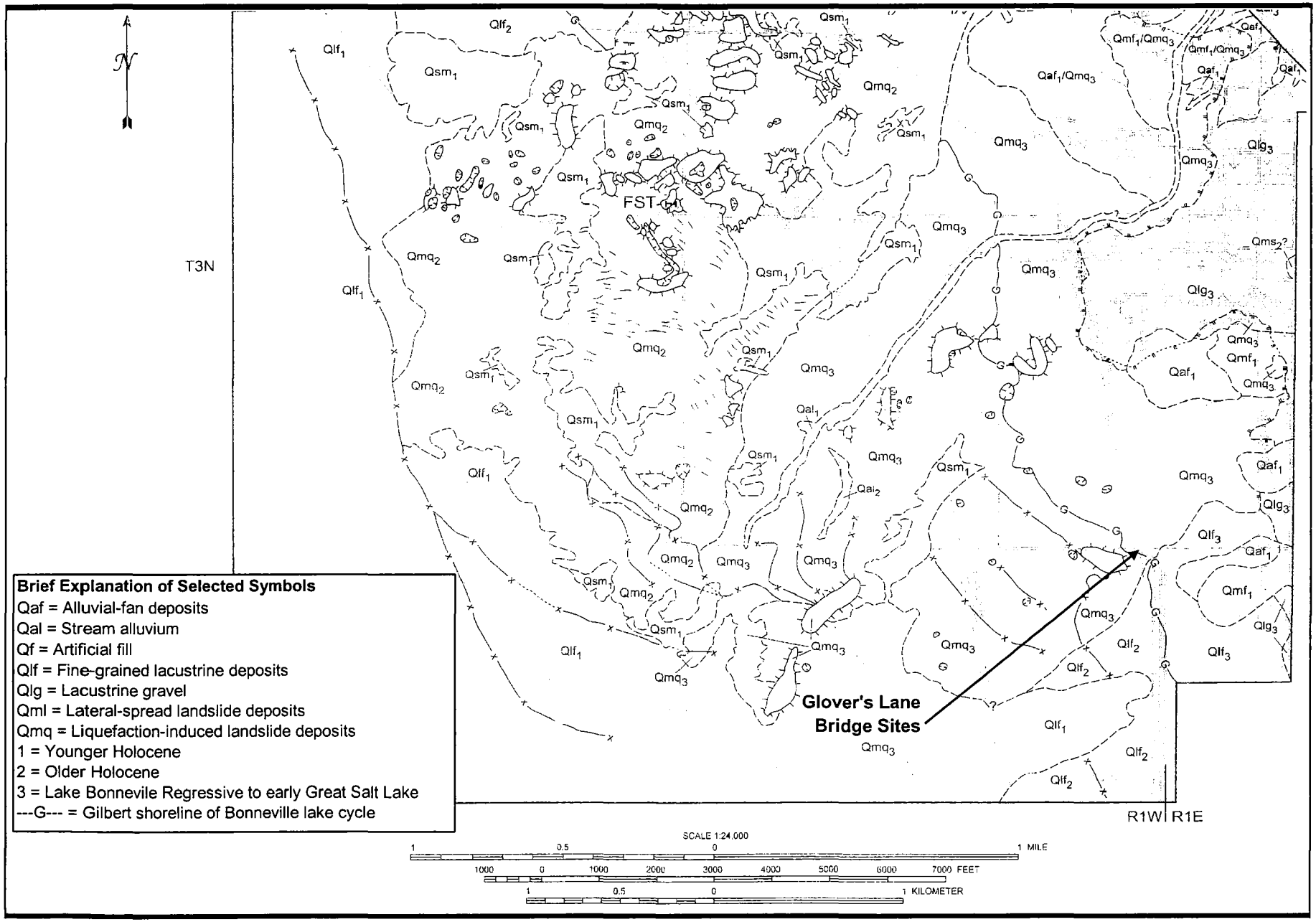

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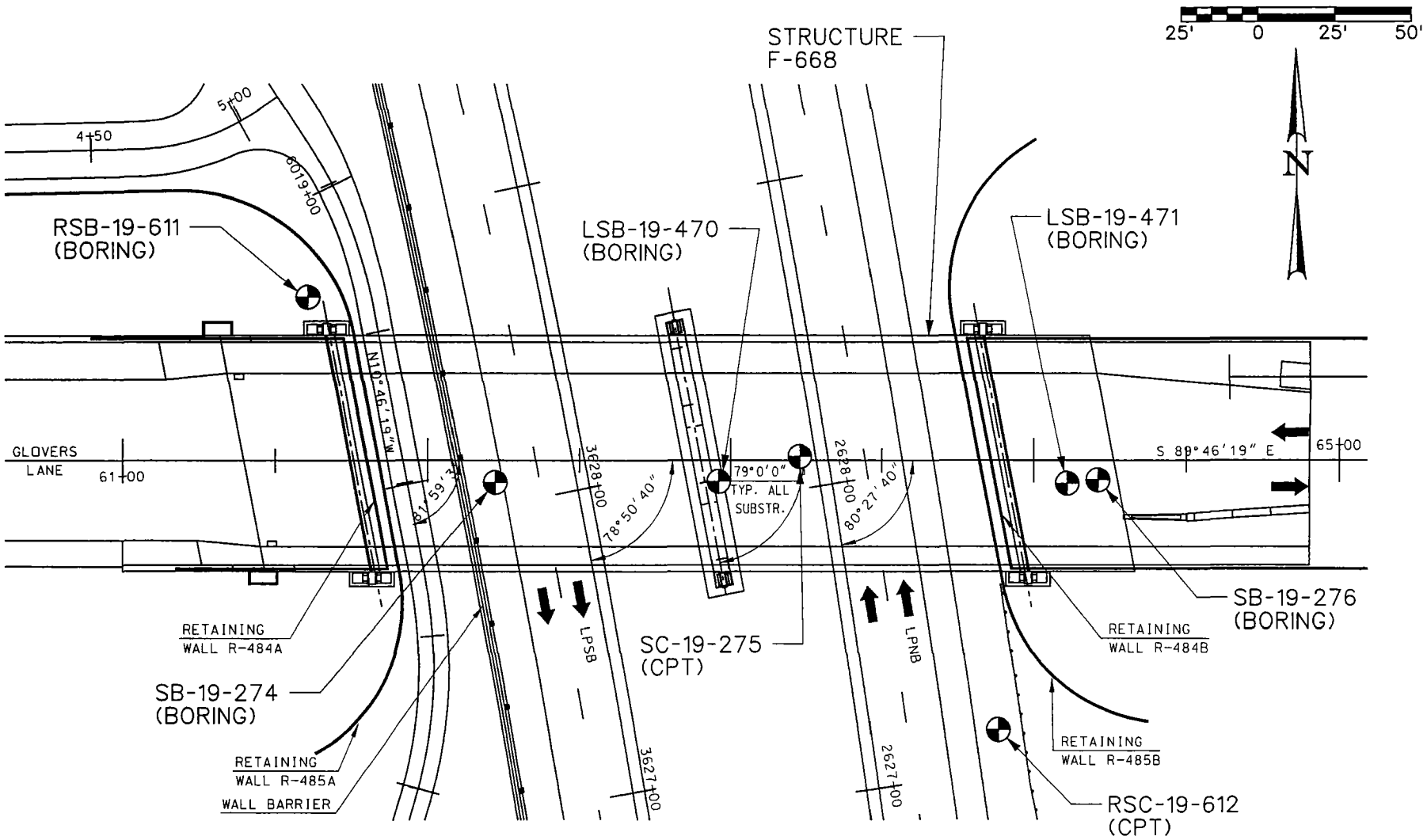
Figure 2c Geologic Map C
Farmington Siding Landslide Complex
Legacy Parkway
Salt Lake / Davis Counties, Utah

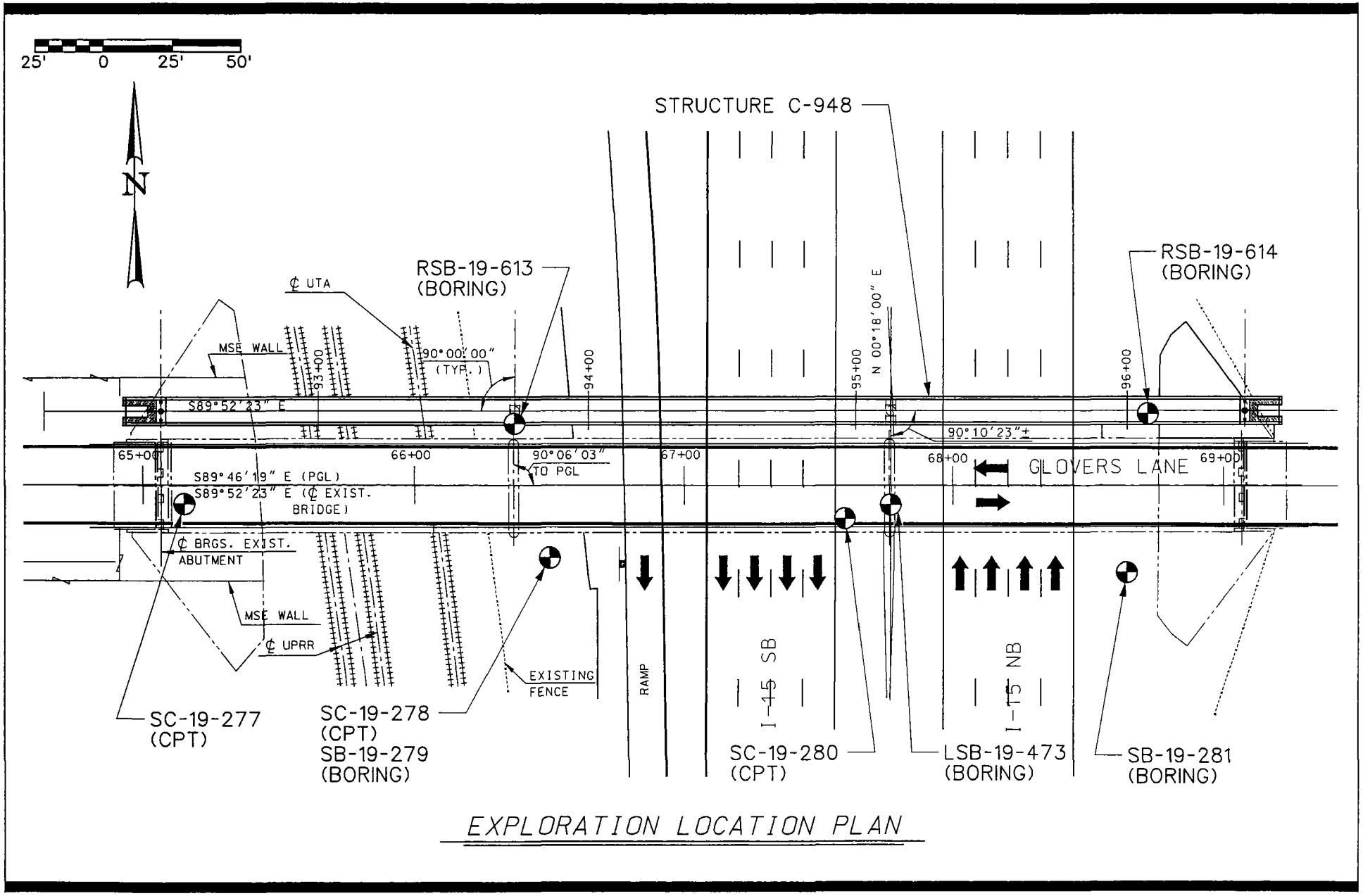
Map modified from:
Harty & Lowe, 1992



EXPLORATION LOCATION PLAN

RB&G ENGINEERING INC.
Provo, Utah

Figure 3a. SITE PLAN & TEST HOLE LOCATIONS
Legacy Parkway - Structure F-668
(Glover's Lane Over Legacy Parkway)
Salt Lake/Davis County, Utah

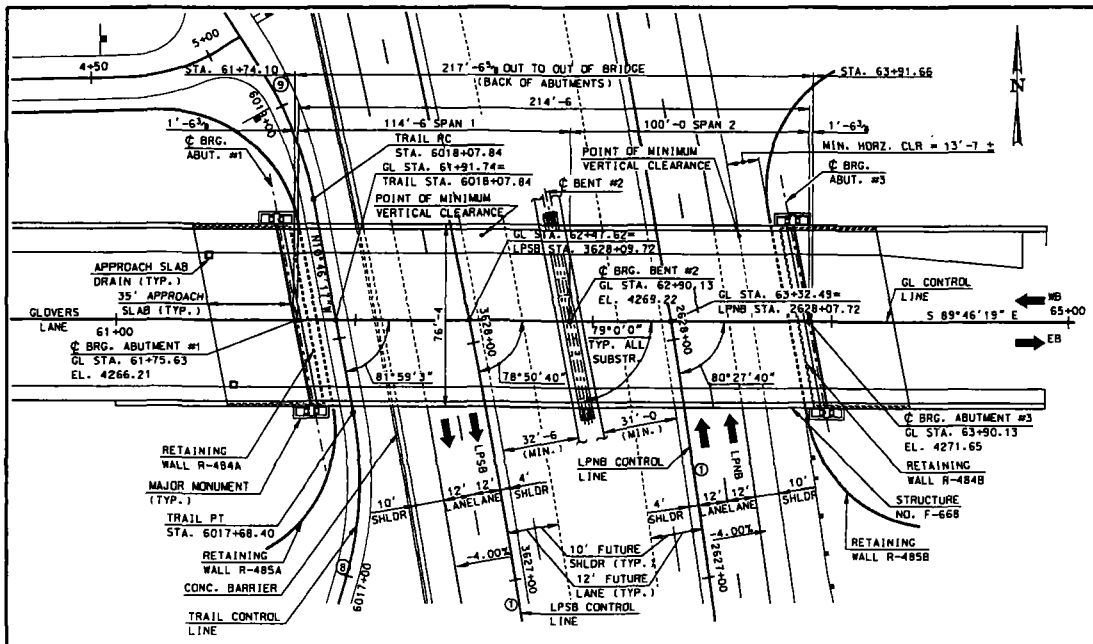


EXPLORATION LOCATION PLAN

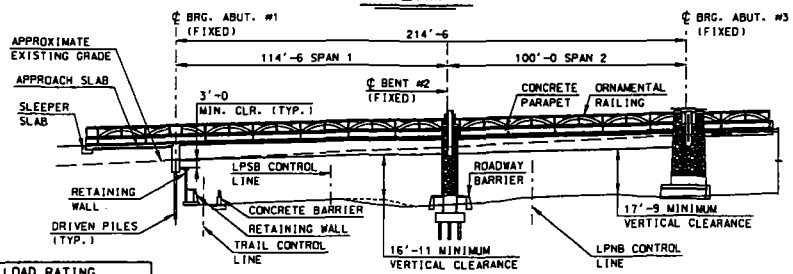
RB&G ENGINEERING INC.
Provo, Utah

Figure 3b. SITE PLAN & TEST HOLE LOCATIONS
Legacy Parkway - Structure C-948
(Glover's Ped. Over I-15 & UPPR)
Salt Lake/Davis County, Utah

APPENDIX A
Structure Drawings



PLAN



ELEVATION

BRIDGE LOAD RATING		
	HL-93	
	RATING	LOCATION
INV.	1.50	0.00' F STR 1
OPER.	1.94	0.00' F STR 1

F DENOTES RATING CONTROLLED BY FLEXURE
S DENOTES RATING CONTROLLED BY SHEAR
My AT 0.0' = 4273.8 K-FT
Vy AT 0.0' = 395 KIPS

QUANTITIES

ITEM	ESTIMATED	UNIT	AS CONST.
GRANULAR BACKFILL BORROW (PLAN QUANTITY)	400	CU YD	
PILE DRIVING EQUIPMENT	1	LUMP	
DRIVEN PILES 16 INCH	10000	FT	
ORNAMENTAL RAILING	560	FT	
REINFORCING STEEL-COATED	XXX	LB	
STRUCTURAL CONCRETE (EST. LUMP QTY 2177 CU YD)	1	LUMP	
PRESTRESSED CONCRETE MEMBERS 114'-7⅜ AASHTO TYPE VI	8	EACH	
PRESTRESSED CONCRETE MEMBERS 100'-1⅜ AASHTO TYPE VI	8	EACH	
STRUCTURAL STEEL (EST. LUMP QTY: 525 LB.)	1	LUMP	
EXPANSION JOINT	155	FT	
STONE VENEER	4200	SQ FT	
ELECTRICAL WORK BRIDGES	1	LUMP	

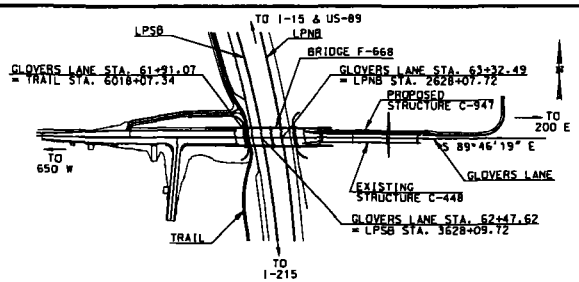
HORIZONTAL CURVE DATA

(1) 3-LPSB-1
CURVE DATA
Δ= 21°07'37"
R= 4800.00
L= 1769.93
T= 895.13
PC STA. 3616+82.88
PI STA. 3625+78.01
PT STA. 3634+52.81

(1) 3-LPNB-1
CURVE DATA
Δ= 16°18'05"
R= 5100.00
L= 1451.02
T= 730.44
PC STA. 2619+27.18
PI STA. 2626+57.62
PT STA. 2633+78.20

(8) 3-TR-8
CURVE DATA
Δ= 27°19'02"
R= 150.00
L= 71.52
T= 36.45
PC STA. 6016+96.89
PI STA. 6017+33.34
PT STA. 6017+68.40

(9) 3-TR-9
CURVE DATA
Δ= 22°17'46"
R= 150.00
L= 58.37
T= 29.56
PC STA. 6018+58.99
PI STA. 6018+88.55
PT STA. 6019+17.36



LOCATION PLAN

INDEX OF SHEETS

1. SITUATION & LAYOUT 1
2. SITUATION & LAYOUT 2
3. SOIL DATA SHEET
4. FOUNDATION PLAN
5. PILING PLAN 1
6. PILING PLAN 2
7. DRIVEN PILE DETAILS
8. ABUTMENT NO. 1
9. ABUTMENT NO. 3
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12. BENT NO. 2
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17. FRAMING PLAN
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22. DECK SECTION
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25. BENT DIAPHRAGM
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29. APPROACH SLAB PLAN
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31. SLEEPER SLAB DETAILS
32. APPROACH SLAB DRAIN DETAILS
33. EXPANSION JOINT DETAILS
34. ORNAMENTAL RAILING LAYOUT
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41. MAJOR MONUMENT DETAILS 1
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45. MAJOR MONUMENT DETAILS 5
46. PIER MONUMENT DETAILS 1
47. PIER MONUMENT DETAILS 2
48. REINFORCING STEEL SCHEDULE 1
49. REINFORCING STEEL SCHEDULE 2
50. REINFORCING STEEL SCHEDULE 3
51. REINFORCING STEEL SCHEDULE 4
52. REINFORCING STEEL SCHEDULE 5

GENERAL NOTES

1. USE COATED DEFORMED BILLET-STEEL BARS CONFORMING TO AASHTO M 284 OR M 111 AND M 31 GRADE 60 FOR ALL REINFORCING STEEL, EXCEPT USE ASTM A706 IN COLUMNS AND BENT CAPS.
2. USE STRUCTURAL STEEL CONFORMING TO AASHTO M 270 GRADE 36 EXCEPT WHERE NOTED OTHERWISE.
3. CHAMFER ALL EXPOSED CONCRETE CORNERS ¾" EXCEPT WHERE NOTED OTHERWISE.
4. PROVIDE 2" CONCRETE COVER TO REINFORCING STEEL EXCEPT WHERE NOTED OTHERWISE.
5. USE CLASS AA (AE) CAST-IN-PLACE CONCRETE EXCEPT WHERE NOTED OTHERWISE.
6. HORIZONTAL DIMENSIONS ARE PLAN. VERTICAL DIMENSIONS ARE PLUMB.

DESIGN DATA

HL-93 IN ACCORDANCE WITH 3rd EDITION AASHTO LRFD BRIDGE DESIGN AND INTERIM SPECIFICATIONS THROUGH 2006.
CAST-IN-PLACE CONCRETE: f'c= 4000 PSI fy (REINF.)= 60,000 PSI: n=8
PRESTRESSED CONCRETE: f'c= 8500 PSI: fy (NONPRESTRESSED)= 60,000 PSI: n=6
fs (PRESTRESSED)= 270,000 PSI

STRUCTURAL STEEL: Fy = 36,000 PSI
WEARING SURFACE: ½" CONCRETE: 35 PSF (FUTURE)
DESIGN SPEED: 70 MPH LEGACY PARKWAY: 35 MPH GLOVERS LANE
SEISMIC: SEISMIC DESIGN PER MCEER/ATC 49
(2475 YR RETURN PERIOD. 3% PE IN 75 YRS.)
Ss = MAX CONSIDERATION EQ GROUND MOTION AT 0.2s = 1.41g
S1 = MAX CONSIDERATION EQ GROUND MOTION AT 1.0s = 0.58g
SITE CLASS D
PEAK HOR GROUND ACCEL (PHGA)= 0.60g
(2% IN 50 YEARS)
TRAFFIC: 2030 ADT = 4500 GLOVERS LANE
2020 ADT = 37300 LEGACY PARKWAY NORTHBOUND
2020 ADT = 35500 LEGACY PARKWAY SOUTHBOUND
PARAPET TEST LEVEL: TL-3

NO.	DATE	BY	REVISIONS	REMARKS

UTAH DEPARTMENT OF TRANSPORTATION
SALT LAKE CITY, UTAH
STRUCTURES DIVISION

DESIGN KJH 07/06 CHECK WB 07/06
DRAWN RA 07/06 CHECK WB 07/06
SUBMIT CHECK

APPROVAL RECOMM. DATE CONSULTANT DESIGN ENGR.
APPROVED DATE CONSULTANT PROJ. MANAGER

LEGACY PARKWAY
GLOVERS LANE OVER LP
SITUATION & LAYOUT 1

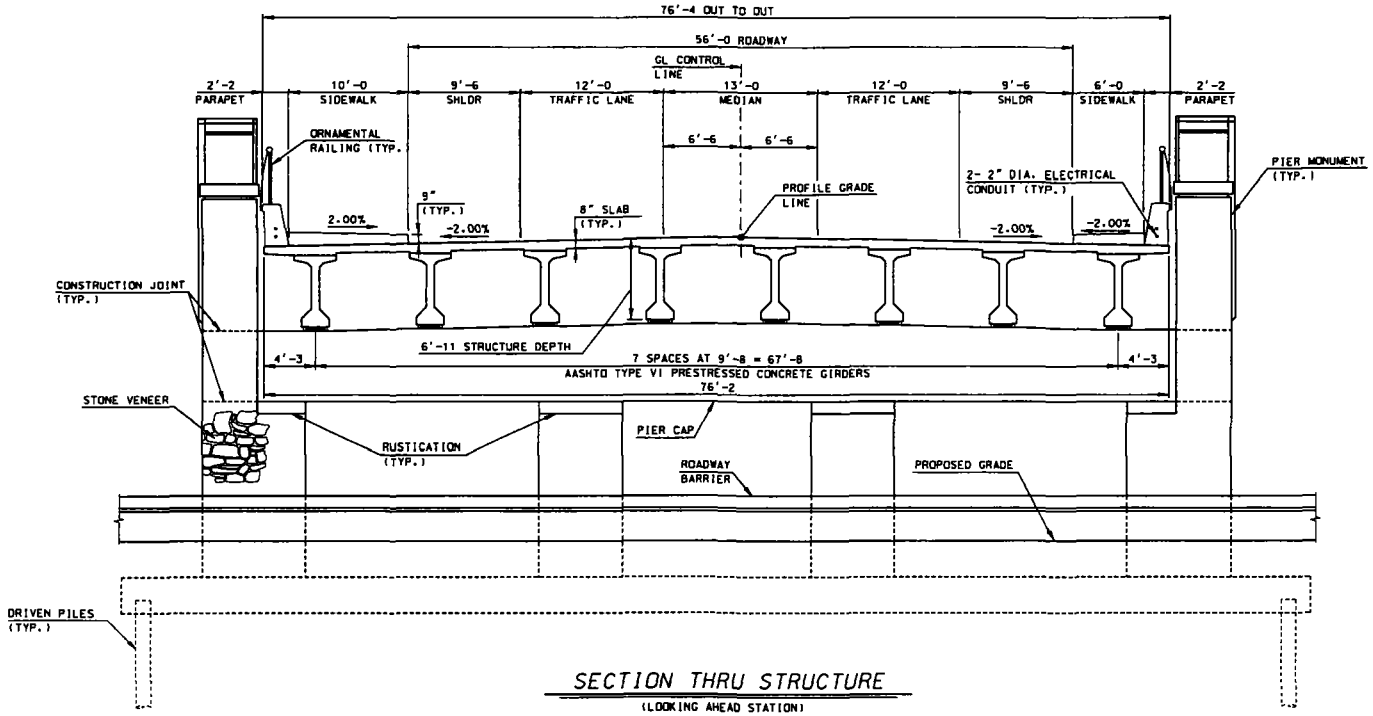
PROJECT NUMBER SP-0067 (8) 10

SL / DAVIS
COUNTY

F-668
DWG. NO.

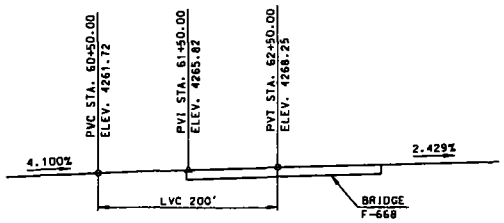
SHT. 1 OF 52

9/27/06

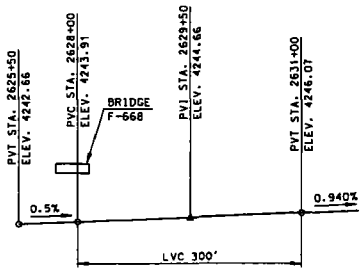


SECTION THRU STRUCTURE

(LOOKING AHEAD STATION)



GLOVERS LANE PROFILE



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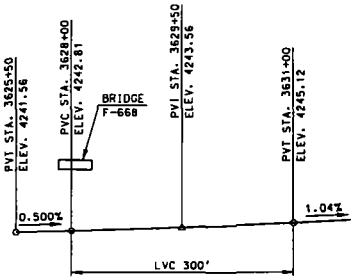

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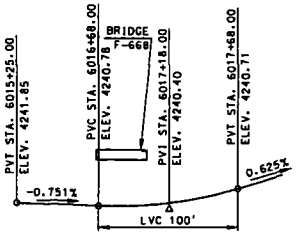

TRAIL PROFILE

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LEGACY PARKWAY
GLOVERS LANE OVER LP
SITUATION & LAYOUT 2

PROJECT NUMBER SP-0067 (8) 10

SL / DAVIS
COUNTY

F-668
DWG. NO.

SHT. 2 OF 52

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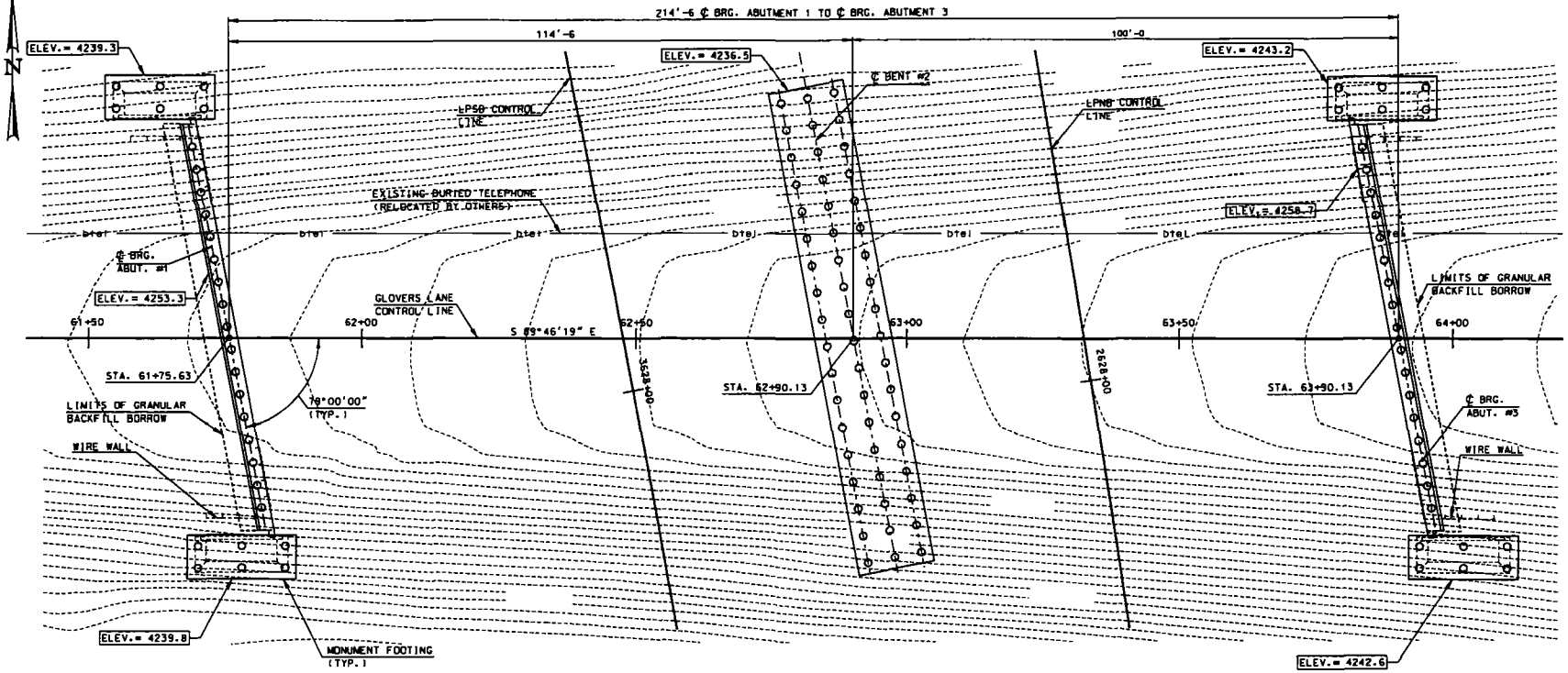
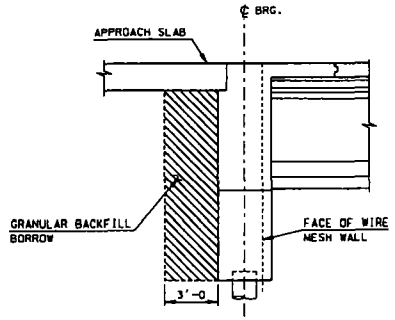
8/2/2006





NOTE:
GRANULAR BACKFILL BORROW LIMITS EXTEND FROM BOTTOM OF ABUTMENT TO BOTTOM OF APPROACH SLAB.

GRANULAR BACKFILL BORROW PAY LIMITS

NOTES

1. ELEVATIONS AT BOTTOM OF ABUTMENTS AND BENT PILE CAPS ARE SHOW THUS: ELEV.= XXXX.X
2. ALL PILES ARE 16 INCH DIAMETER. DRIVE IN ORIENTATION SHOWN.
3. ALL ABUTMENTS AND BENTS ARE PARALLEL TO BRG. S 10°46'19" E.

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LEGACY PARKWAY
GLOVERS LANE OVER LP
FOUNDATION PLAN

PROJECT NUMBER SP-0067 (8) 10

SL / DAVIS
COUNTY

F-668
DWG. NO.

SHT. 4 OF 52

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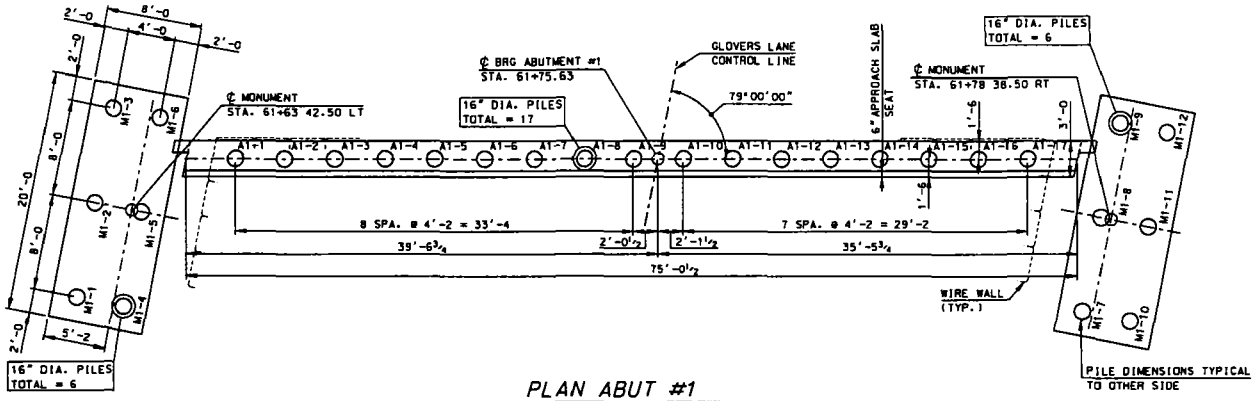
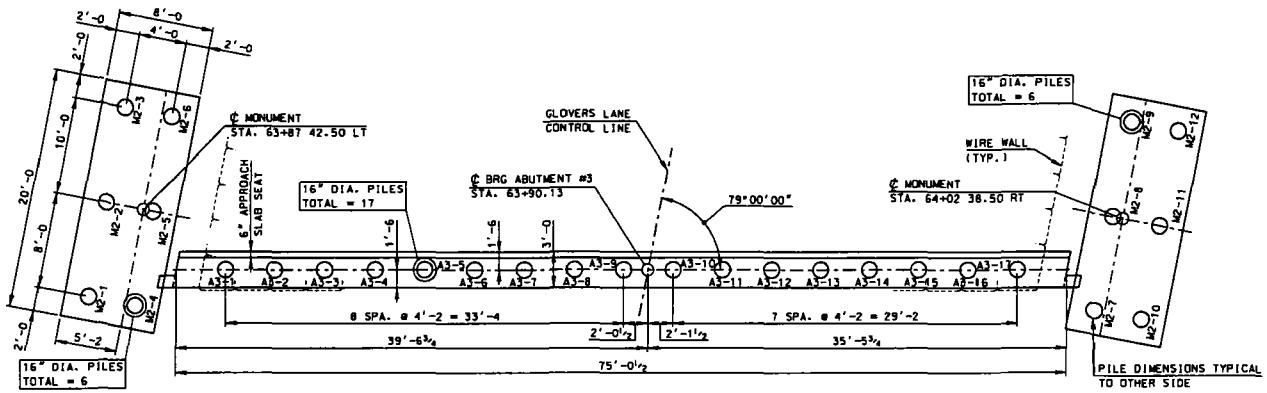


PLAN ABUT #1



PLAN ABUT #3

ABUTMENT #1 AS CONSTRUCTED PILE TIP ELEV.	
A1-1	
A1-2	
A1-3	
A1-4	
A1-5	
A1-6	
A1-7	
A1-8	
A1-9	
A1-10	
A1-11	
A1-12	
A1-13	
A1-14	
A1-15	
A1-16	
A1-17	

ABUTMENT #1 MAJOR MONUMENT AS CONSTRUCTED PILE TIP ELEV.	
M1-1	
M1-2	
M1-3	
M1-4	
M1-5	
M1-6	

ABUTMENT #1 MAJOR MONUMENT AS CONSTRUCTED PILE TIP ELEV.	
M1-7	
M1-8	
M1-9	
M1-10	
M1-11	
M1-12	

ABUTMENT #3 AS CONSTRUCTED PILE TIP ELEV.	
A3-1	
A3-2	
A3-3	
A3-4	
A3-5	
A3-6	
A3-7	
A3-8	
A3-9	
A3-10	
A3-11	
A3-12	
A3-13	
A3-14	
A3-15	
A3-16	
A3-17	

ABUTMENT #3 MAJOR MONUMENT AS CONSTRUCTED PILE TIP ELEV.	
M2-1	
M2-2	
M2-3	
M2-4	
M2-5	
M2-6	

ABUTMENT #3 MAJOR MONUMENT AS CONSTRUCTED PILE TIP ELEV.	
M2-7	
M2-8	
M2-9	
M2-10	
M2-11	
M2-12	

REVISIONS

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UTAH DEPARTMENT OF TRANSPORTATION
SALT LAKE CITY, UTAH
STRUCTURES DIVISION

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CONSULTANT PROJ. MANAGER DATE APPROVED

LEGACY PARKWAY
GLOVERS LANE OVER LP
PILING PLAN 1

PROJECT NUMBER SP-0067 (8) 10

SL / DAVIS
COUNTY

F-668
DWG. NO.

SHT. 5 OF 52

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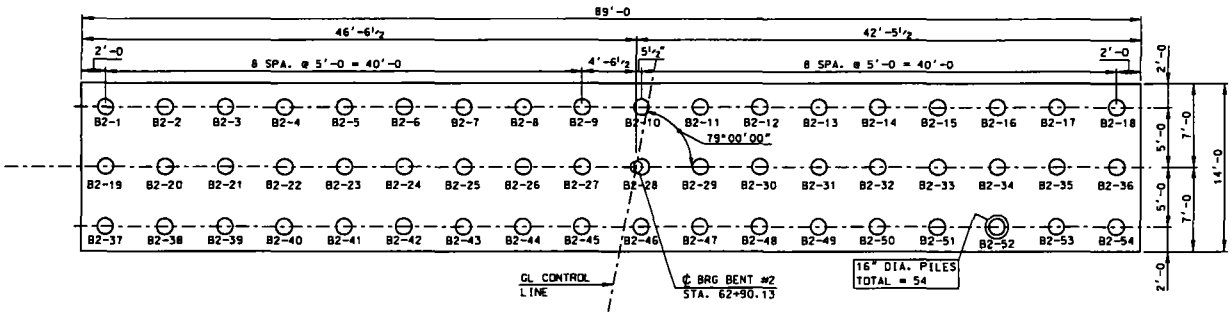

PLAN BENT #2

BENT #2 AS CONSTRUCTED PILE TIP ELEV.	
B2-1	
B2-2	
B2-3	
B2-4	
B2-5	
B2-6	
B2-7	
B2-8	
B2-9	
B2-10	
B2-11	
B2-12	
B2-13	
B2-14	
B2-15	
B2-16	
B2-17	
B2-18	

BENT #2 AS CONSTRUCTED PILE TIP ELEV.	
B2-19	
B2-20	
B2-21	
B2-22	
B2-23	
B2-24	
B2-25	
B2-26	
B2-27	
B2-28	
B2-29	
B2-30	
B2-31	
B2-32	
B2-33	
B2-34	
B2-35	
B2-36	

BENT #2 AS CONSTRUCTED PILE TIP ELEV.	
B2-37	
B2-38	
B2-39	
B2-40	
B2-41	
B2-42	
B2-43	
B2-44	
B2-45	
B2-46	
B2-47	
B2-48	
B2-49	
B2-50	
B2-51	
B2-52	
B2-53	
B2-54	

REVISIONS

NO.	DATE	BY	REMARKS

UTAH DEPARTMENT OF TRANSPORTATION
SALT LAKE CITY, UTAH
STRUCTURES DIVISION

DESIGN KJH 07/06 CHECK MB 07/06
DRAWN RA 07/06 CHECK MB 07/06
CHECK

LEGACY PARKWAY
GLOVERS LANE OVER LP
PILING PLAN 2

PROJECT NUMBER SP-0067 (8) 10

SL / DAVIS
COUNTY

F-668
DWG. NO.

SHT. 6 OF 52

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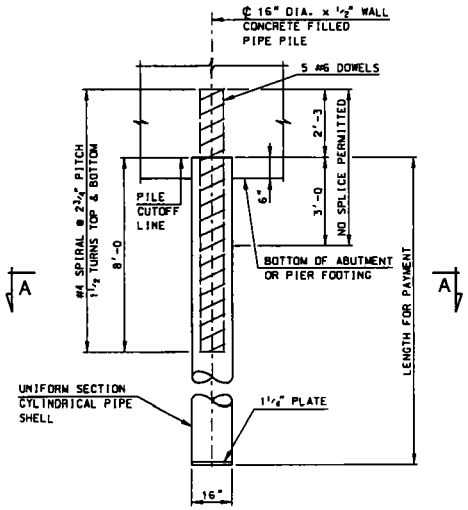
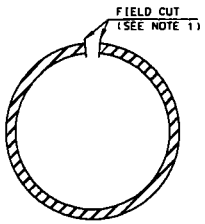
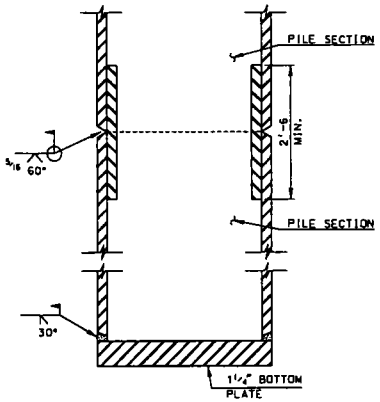


PIPE PILE DETAIL

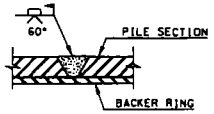




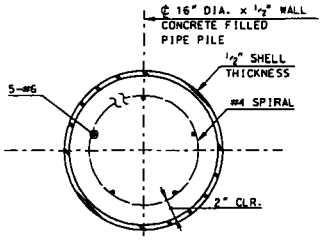
PILE SECTION

PILE SPLICE AND BOTTOM PLATE NOTES

1. FIELD CUT PIECE OF PIPE SO WHEN COMPRESSED IT WILL SLIDE INSIDE PIPE SECTIONS.
2. CONFORM TO THE AASHTO/AWS BRIDGE WELDING CODE.
3. USE FULL STRENGTH WELD SPLICES.
4. USE THE FOLLOWING WELD FOR FLAT WELD POSITION:



PILE SPLICE AND BOTTOM PLATE DETAILS



SECTION A-A

NOTES

1. FILL PILE SHELLS WITH CLASS "AA(AE)" CONCRETE. f'c = 4000 psi.
2. HOLD THE REINFORCING STEEL ADEQUATELY IN FINAL POSITION DURING PLACEMENT OF CONCRETE AROUND BARS.
3. PROVIDE PIPE MATERIAL CONFORMING TO ASTM A252 GRADE 3 (MOD). Fy = 65 ksi.
4. PROVIDE UNCOATED REINFORCEMENT FOR PLACEMENT INTO PILES.
5. FOR AS CONSTRUCTED PILE TIP ELEVATIONS, SEE SHEETS 5 AND 6.

PILE DATA

LOCATION	PILE DIAMETER (IN)	PILE SHELL THICKNESS (IN)	ESTIMATED PILE TIP ELEVATION (FT)	ELEVATION OF MIN. ACCEPTABLE PILE PENETRATION (FT)	STRENGTH I PILE LOAD (KIPS)	SERVICE I PILE RESISTANCE (KIPS)	STRENGTH I PILE RESISTANCE (KIPS)	ULTIMATE PILE RESISTANCE (KIPS)	REQ'D DRIVING RESISTANCE (KIPS)	MAXIMUM DRIVING LOAD (KIPS)
ABUT. NO. 1	16	1/2	4134	XXXX	XXX	XXX	321	404	494	1424
BENT NO. 2	16	1/2	4134	XXXX	XXX	XXX	321	404	494	1424
ABUT. NO. 3	16	1/2	4134	XXXX	XXX	XXX	321	404	494	1424

UTAH DEPARTMENT OF TRANSPORTATION
SALT LAKE CITY, UTAH
STRUCTURES DIVISION

DESIGN KJH 01/06 CHECK WB 07/06
DRAWN RA 01/06 CHECK WB 07/06

REVISIONS

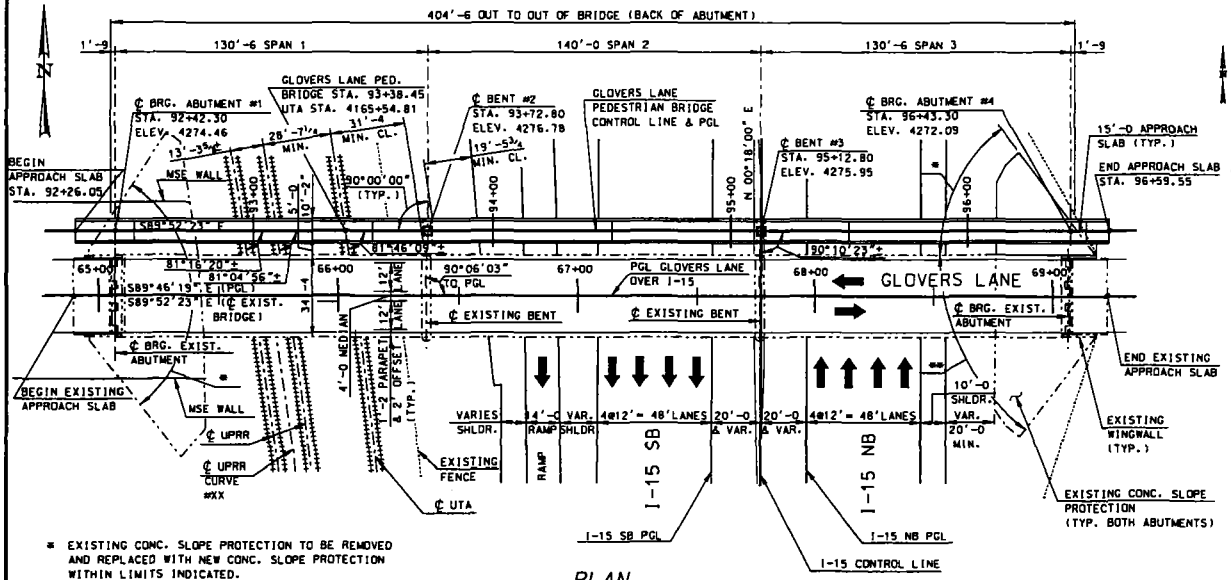
LEGACY PARKWAY
GLOVERS LANE OVER LP
DRIVEN PILE DETAILS

PROJECT NUMBER SP-0067 (8) 10

SL / DAVIS
COUNTY

F-668
DWG. NO.

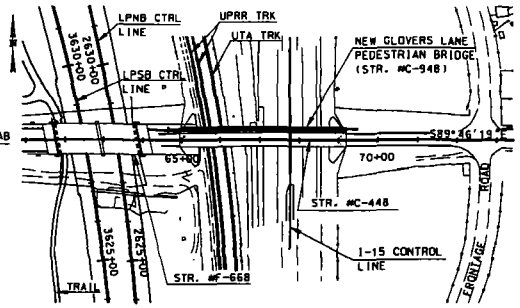
SHT. 7 OF 52



* EXISTING CONC. SLOPE PROTECTION TO BE REMOVED AND REPLACED WITH NEW CONC. SLOPE PROTECTION WITHIN LIMITS INDICATED.

** EXISTING CONC. SLOPE PROTECTION TO REMAIN WITHIN LIMITS INDICATED.

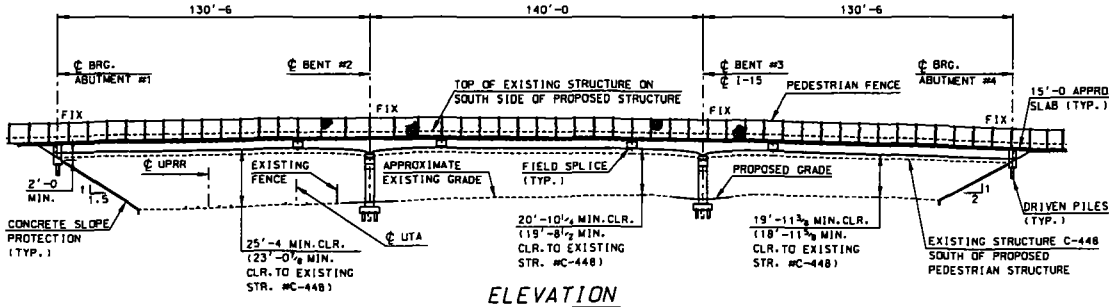
PLAN



LOCATION PLAN

INDEX OF SHEETS

1 SITUATION & LAYOUT 1
2 SITUATION & LAYOUT 2
3 SOIL DATA SHEETS
4 FOUNDATION PLAN
5 DRIVEN PILE DETAILS
6 ABUTMENTS #1 & #4
7 ABUTMENT DETAILS
8 WINGWALL DETAILS
9 BENT DETAILS 1
10 BENT DETAILS 2
11 FRAMING PLAN
12 GIRDER DETAILS 1
13 GIRDER DETAILS 2
14 GIRDER DETAILS 3
15 BEARING DETAILS
16 DECK PLAN AND SECTION
17 SCREED ELEVATIONS
18 FENCE DETAILS
19 CONCRETE SLOPE PROTECTION
20 APPROACH SLAB PLAN
21 APPROACH SLAB DETAILS
22 REINFORCING SCHEDULE 1
23 REINFORCING SCHEDULE 2
24 REINFORCING SCHEDULE 3



ELEVATION

GENERAL NOTES

1. USE COATED, DEFORMED BILLET-STEEL BARS CONFORMING TO AASHTO M284 OR M111 AND M31 GRADE 60 FOR ALL REINFORCING STEEL. PROVIDE COATED REINFORCING STEEL MADE FROM DEFORMED BILLET STEEL BARS CONFORMING ASTM A706 GRADE 60 FOR ALL REINFORCEMENT IN THE COLUMNS AND CAP.
2. USE STRUCTURAL STEEL CONFORMING TO AASHTO M270 GRADE 36 EXCEPT WHERE NOTED OTHERWISE.
3. CHAMFER ALL EXPOSED CONCRETE CORNERS 3/4" EXCEPT WHERE NOTED OTHERWISE.
4. PROVIDE 2" CONCRETE COVER TO REINFORCING STEEL EXCEPT WHERE NOTED OTHERWISE.
5. USE CLASS AA (AE) CAST-IN-PLACE CONCRETE EXCEPT WHERE NOTED OTHERWISE.
6. HORIZONTAL DIMENSIONS ARE PLAN. VERTICAL DIMENSIONS ARE PLUMB.

DESIGN DATA

PEDESTRIAN & BICYCLE LOADINGS IN ACCORDANCE WITH 3RD EDITION AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND INTERIM SPECIFICATIONS THROUGH 2006 AND IN ACCORDANCE WITH AASHTO GUIDE SPECIFICATION FOR DESIGN OF PEDESTRIAN BRIDGES (1ST EDITION, 1997).

CAST-IN-PLACE CONCRETE: f'c= 4000 psi; fy (REINF.) = 60,000 psi; n=8

STRUCTURAL STEEL: fy = 36,000 psi

SEISMIC: SEISMIC DESIGN PER MCEER/ATC 49:
2% PE IN 50 YEARS
(2475 YR RETURN PERIOD. 3% PE IN 75 YEARS)
PEAK HORIZ. GROUND ACCELERATION (PHGA) = 0.60 g
Ss = MAX CONSIDERATION EQ GROUND MOTION AT 0.2s = 1.41 g
S1 = MAX CONSIDERATION EQ GROUND MOTION AT 1.0s = 0.58 g
SITE CLASS D

TRAFFIC DATA: 2020 ADT = 37300 LEGACY PARKWAY NORTHBOUND
2020 ADT = 37300 LEGACY PARKWAY SOUTHBOUND

QUANTITIES

ITEM	ESTIMATED	UNIT	AS CONSTRUCTED
GRANULAR BACKFILL BORROW (PLAN QUANTITY)	36.4	CU YD	
PILE DRIVING EQUIPMENT	4	LUMP	
DRIVEN PILES 12 3/4 INCH	2733	FEET	
CHAIN LINK FENCE, TYPE I	864	FEET	
REINFORCING STEEL - COATED	59770	LB	
STRUCTURAL CONCRETE (EST. QTY. 269.0 YD^3)	1	LUMP	
CONCRETE SLOPE PROTECTION	663	SQ YD	
STRUCTURAL STEEL (EST. QTY. 189000 LB.) (LUMP)	1	LUMP	
EXPANSION JOINT	18.4	FEET	

REVISIONS

NO.	DATE	BY	REMARKS

UTAH DEPARTMENT OF TRANSPORTATION
SALT LAKE CITY, UTAH
STRUCTURES DIVISION

DESIGN RH 06/06 CHECK CMM 06/06
DRAWN GB 06/06 CHECK CMM 06/06
QUANT. CHECK

APPROVAL RECOMM. DATE CONSULTANT DESIGN ENGR.
APPROVED DATE CONSULTANT PROJ. MANAGER

LEGACY PARKWAY
GLOVERS PED OVER I-15 & UPRR
SITUATION & LAYOUT 1

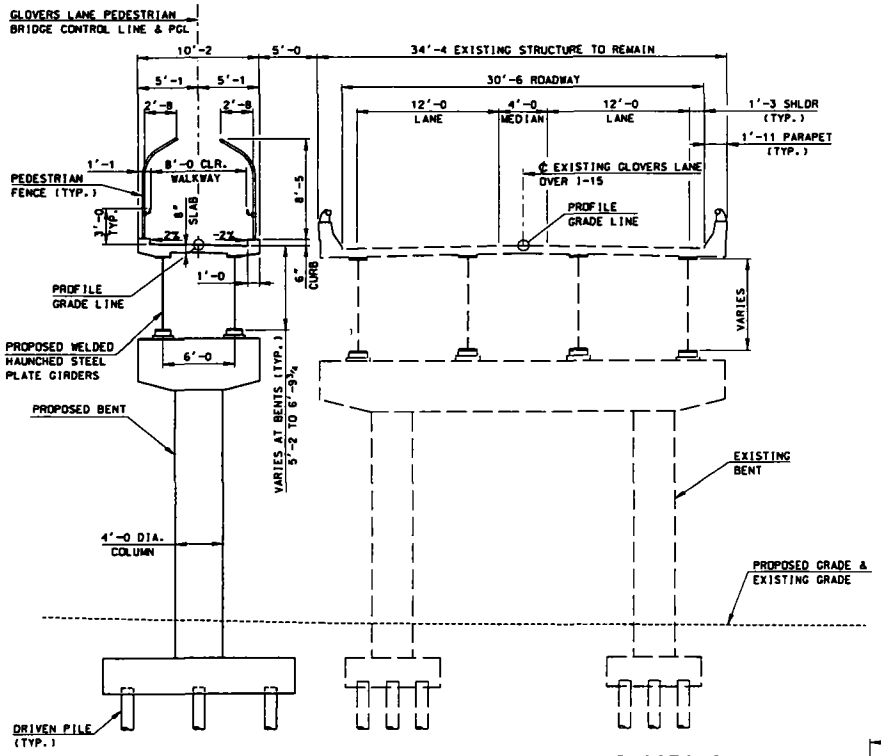
PROJECT NUMBER SP-0067 (8) 4

SL / DAVIS
COUNTY

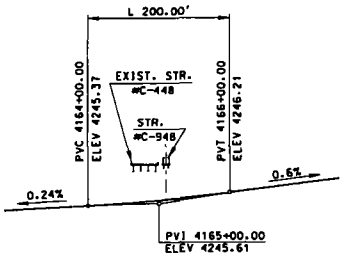
C-948
DWG. NO.

SHT. 1 OF 24

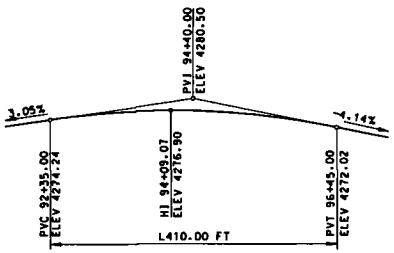
8/4/2006



SECTION THRU STRUCTURES



UTA TRACK PROFILE



GLOVERS LANE
PEDESTRIAN BRIDGE
PROFILE

NO.	DATE	BY	REVISIONS

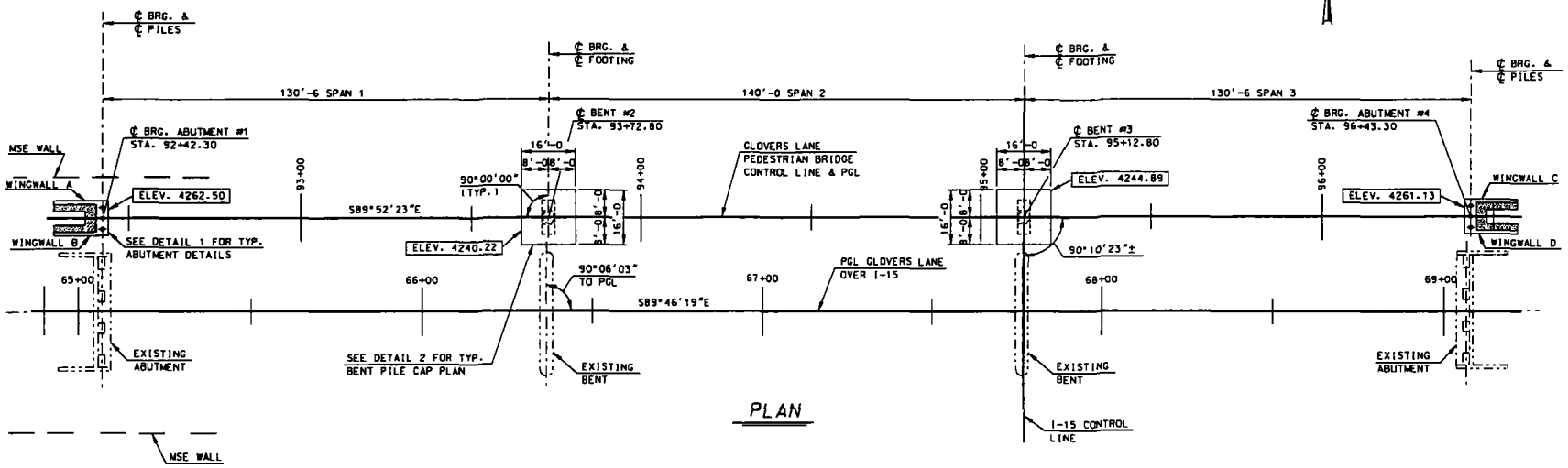
UTAH DEPARTMENT OF TRANSPORTATION
SALT LAKE CITY, UTAH
STRUCTURES DIVISION

DESIGN RH 03/06 CHECK CMM 03/06
DRAWN EF 03/06 CHECK RH 03/06
QUANT. CHECK

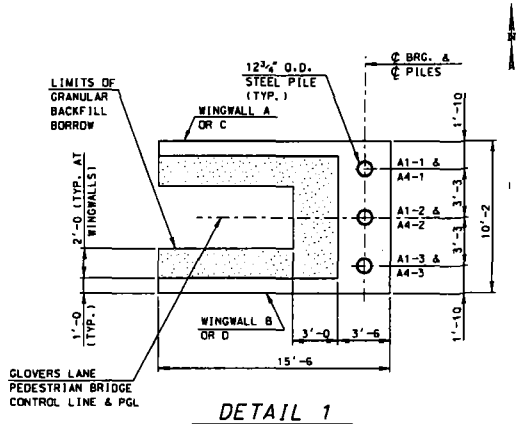
APPROVAL RECOMM. DATE CONSULTANT DESIGN ENGR.
APPROVED DATE CONSULTANT PROJ. MANAGER

LEGACY PARKWAY
GLOVERS PED OVER I-15 & UPPR
SITUATION & LAYOUT 2
PROJECT NUMBER SP-0067 (8) 4

SL / DAVIS
COUNTY
C-948
DWG. NO.
SHT. 2 OF 24

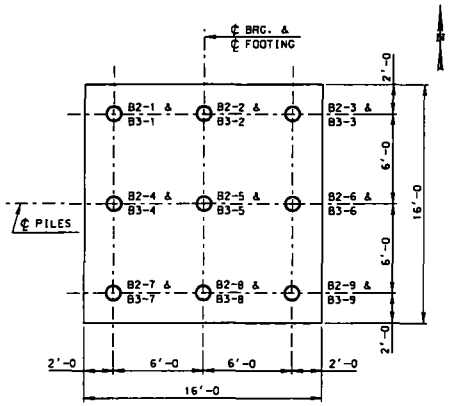


PLAN



DETAIL 1

ABUTMENT #1 SHOWN
ABUTMENT #4 SIMILAR OPPOSITE



DETAIL 2

BENT #2 SHOWN
BENT #3 SIMILAR

ABUTMENT #1 AS CONSTRUCTED PILE TIP ELEV.	
A1-1	
A1-2	
A1-3	

ABUTMENT #4 AS CONSTRUCTED PILE TIP ELEV.	
A4-1	
A4-2	
A4-3	

BENT #2 AS CONSTRUCTED PILE TIP ELEV.	
B2-1	
B2-2	
B2-3	
B2-4	
B2-5	
B2-6	
B2-7	
B2-8	
B2-9	

BENT #3 AS CONSTRUCTED PILE TIP ELEV.	
B3-1	
B3-2	
B3-3	
B3-4	
B3-5	
B3-6	
B3-7	
B3-8	
B3-9	

NOTES

1. ELEVATIONS AT BOTTOM OF ABUTMENT AND BENT PILE CAP ARE SHOWN IN RECTANGLES. ELEV. XXXX.XX
2. SEE SHEET 5 FOR PIPE PILE DETAILS.
3. REFER TO GEOTECHNICAL REPORT MEMO DATED MAY 10, 2006 BY RB&G FOR RESULTS OF SUBSURFACE INVESTIGATIONS AND ANALYSIS.
4. BRIDGE FOUNDATION DESIGN IS BASED ON THE SOIL PROPERTIES INDICATED IN THE SOIL BORINGS AND GEOTECHNICAL ANALYSES PRESENTED IN ASSOCIATED REPORTS OR MEMORANDA.

REVISIONS

NO.	DATE	BY	REMARKS

UTAH DEPARTMENT OF TRANSPORTATION
SALT LAKE CITY, UTAH
STRUCTURES DIVISION

DESIGN RM 06/06 CHECK CMM 06/06
DRAWN CRL 06/06 CHECK RM 06/06
QUANT. CHECK

CONSULTANT DESIGN ENGR. DATE
APPROVAL RECOMM. DATE
CONSULTANT PROJ. MANAGER
APPROVED

LEGACY PARKWAY
GLOVERS PED OVER I-15 & UPPR
FOUNDATION PLAN
PROJECT NUMBER SP-0067 (8) 4

SL / DAVIS
COUNTY
C-948
DWG. NO.
SHT. 4 OF 24

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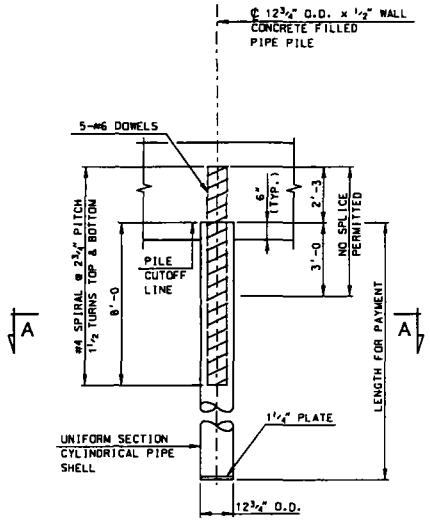
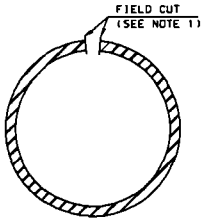
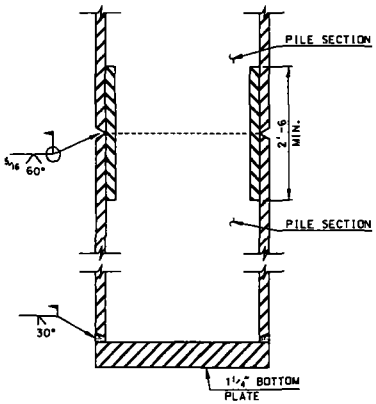
8/14/2006



PIPE PILE DETAIL

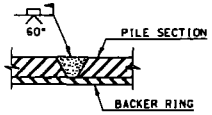




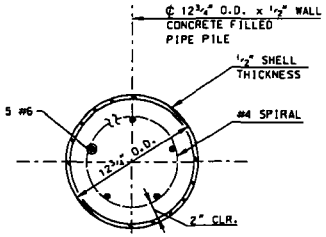
PILE SECTION

PILE SPLICE AND BOTTOM PLATE NOTES

1. FIELD CUT PIECE OF PIPE SO WHEN COMPRESSED IT WILL SLIDE INSIDE PIPE SECTIONS.
2. CONFORM TO THE AASHTO/AWS BRIDGE WELDING CODE.
3. USE FULL STRENGTH WELD SPLICES.
4. USE THE FOLLOWING WELD FOR FLAT WELD POSITION:



PILE SPLICE AND BOTTOM PLATE DETAILS



SECTION A-A

NOTES

1. FILL PILE SHELLS WITH CLASS "AA(AE)" CONCRETE. f'c = 4000 psi.
2. HOLD THE REINFORCING STEEL ADEQUATELY IN FINAL POSITION DURING PLACEMENT OF CONCRETE AROUND BARS.
3. PROVIDE PIPE MATERIAL CONFORMING TO ASTM A252 GRADE 3 (MOD). Fy = 65 ksi.
4. PROVIDE UNCOATED REINFORCEMENT FOR PLACEMENT INTO PILES.
5. FOR AS CONSTRUCTED PILE TIP ELEVATIONS, SEE SHEET 4.

PILE DATA

LOCATION	PILE DIAMETER (IN)	PILE SHELL THICKNESS (IN)	ESTIMATED PILE TIP ELEVATION (FT)	ELEVATION OF MIN. ACCEPTABLE PILE PENETRATION (FT)	STRENGTH I PILE LOAD (KIPS)	SERVICE I PILE RESISTANCE (KIPS)	STRENGTH I PILE RESISTANCE (KIPS)	ULTIMATE PILE RESISTANCE (KIPS)	REQ'D DRIVING RESISTANCE (KIPS)	MAXIMUM DRIVING LOAD (KIPS)
ABUTMENT #1	12¾	½	4134	XXXX	145	XXX	226	293	348	779
BENT #2	12¾	½	4134	XXXX	195	XXX	226	293	348	779
BENT #3	12¾	½	4134	XXXX	195	XXX	226	293	348	779
ABUTMENT #4	12¾	½	4134	XXXX	145	XXX	226	293	348	779

REVISIONS

NO.	DATE	BY	REMARKS

UTAH DEPARTMENT OF TRANSPORTATION
SALT LAKE CITY, UTAH
STRUCTURES DIVISION

DESIGN RH 06/06 CHECK CMM 07/06
DRAWN CB 07/06 CHECK CMM 07/06
QUANT. CHECK

APPROVAL RECOMM. DATE CONSULTANT DESIGN ENGR.
APPROVED DATE CONSULTANT PROJ. MANAGER

LEGACY PARKWAY
GLOVERS PED OVER I-15 & UPPR
DRIVEN PILE DETAILS
PROJECT NUMBER SP-0067 (8) 4

SL / DAVIS
COUNTY
C-948
DWG. NO.
SHT. 5 OF 24

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6/6/2006

APPENDIX B
Test Hole Logs

DRILL HOLE LOG

BORING NO. RSB-19-611

PROJECT: LEGACY PARKWAY - STRUCTURE F-668 (GLOVER'S LANE OVER L.P.)
CLIENT: UTAH DEPARTMENT OF TRANSPORTATION
LOCATION: WEST ABUTMENT, NORTH SIDE; N 399,433, E 65051
DRILLING METHOD: CME-55 NO. 2 / N.W. CASING
DRILLER: D. SAMPSON
DEPTH TO WATER - INITIAL: ▽ 5.0' **AFTER 24 HOURS:** ▼ N.M.

PROJECT NUMBER: 200601.119
DATE STARTED: 4/7/06
DATE COMPLETED: 4/12/06
GROUND ELEVATION: 4242.2'
LOGGED BY: G. PEASLEE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS (AASHTO)	Material Description		Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
				-	3,4,5,(14)	GM	brown, moist, loose	SILTY GRAVEL W/SAND								
4240																
	5			18	8,9,9,(28)	CL (A-6(1))	brown, moist, very stiff	SANDY LEAN CLAY		22.3	28	16	0	49	51	
4235				13	Pushed 0.78	CL (A-6(14))	brown, moist, stiff	LEAN CLAY		24	31	11	0	7	93	
	10			11	3,7,4,(17)	CL	brown, moist, stiff	LEAN CLAY W/SAND LAYERS TO 3" THICK								
4230				13	3,4,3,(10)	ML (A-4(0))	brown, moist, loose 3" sand layer	SANDY SILT		30		NP	0	48	52	
	15			14	1,4,5,(11) 0.22	CL	brown, moist, soft									
4225								LEAN CLAY W/SAND LENSES & LAYERS								
	20			15	1,1,8,(11) 0.15	CL	brown, moist, soft									
4220																
	25			18	Pushed 0.35	CL (A-6(12))	brown, moist, firm	LEAN CLAY	88.8	33.4	37	15	0	3	97	CT UC
4215																
	30			14	3,3,3,(6) 0.40	ML	gray, moist, firm	SANDY SILT								
4210																
	35			19	Pushed 0.33	CL	brown, moist, firm	LEAN CLAY								
4205																
	40			18	0,2,4,(5) 0.22 0.40	CL	brown, moist, firm	LEAN CLAY W/SAND LAYERS								
4200																
	45			18	Pushed 0.57	CL (A-6(15))	brown, moist, stiff	LEAN CLAY	90.8	31.7	36	15	0	4	96	CT UC
4195																
				20	2,5,6,(8) 0.65	CL	brown, moist, stiff									

LEGEND:

DISTURBED SAMPLE: 2,3,2,(6) ← Blow Count per 6"; ← $(N_1)_{60}$ Value; 0.45 ← Torvane (tsf)

UNDISTURBED SAMPLE: PUSHED; 0.45 ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
TS = Triaxial Shear
CBR = California Bearing Ratio
= Potential Liquefaction
= Potential Liquefaction & Lateral Spread

RB&G ENGINEERING INC.
PROVO, UTAH

JGV1_COLOR 119F_LOGS_COLOR.GPJ US EVAL.GDT 8/22/06

DRILL HOLE LOG

BORING NO. RSB-19-611

PROJECT: LEGACY PARKWAY - STRUCTURE F-668 (GLOVER'S LANE OVER L.P.)
CLIENT: UTAH DEPARTMENT OF TRANSPORTATION
LOCATION: WEST ABUTMENT, NORTH SIDE; N 399,433, E 65051
DRILLING METHOD: CME-55 NO. 2 / N.W. CASING
DRILLER: D. SAMPSON
DEPTH TO WATER - INITIAL: ▽ 5.0' **AFTER 24 HOURS:** ▼ N.M.

PROJECT NUMBER: 200601.119
DATE STARTED: 4/7/06
DATE COMPLETED: 4/12/06
GROUND ELEVATION: 4242.2'
LOGGED BY: G. PEASLEE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS (AASHTO)	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
4190							LEAN CLAY								
	55		☒	21	Pushed 0.66	ML (A-4(9))	brown, moist, stiff SILT		35.7	37	8	0	8	92	UC
4185															
	60						SANDY LEAN CLAY W/SAND LAYERS								
4180			■	21	9,8,9,(12) 0.37	CL	brown, moist, firm								
	65		☒	18	Pushed 0.66	CL (A-7-5(17))	brown, moist, stiff SANDY LEAN CLAY	77.2	43	47	24	0	26	74	CT UC
4175															
	70		■	17	4,7,7,(9) 0.25	SM	brown, moist, med. dense SILTY SAND W/CLAY LAYERS								
4170															
	75		☒	17	Pushed 0.33	CL (A-7-5(24))	LEAN CLAY brown, moist, firm		36	41	19	0	4	96	UC
4165															
	80		■	21	3,4,10,(9) 0.54	CL	brown, moist, stiff								
4160							LEAN CLAY W/SAND LAYERS								
	85		☒	18	Pushed 0.58	CL (A-7-5(22))	brown, moist, stiff		27	45	23	0	2	98	UC
4155															
	90		■	13	10,10,21,(18) 0.51	SP-SM CL SM	gray SAND W/SILT gray LEAN CLAY gray								
4150							SILTY SAND								
	95		☒	17	Pushed	CL SM	LEAN CLAY brown, moist, stiff brown, moist, med. dense								
4145							SILTY SAND W/FEW CLAY LENSES								
			■	13	15,14,31,(25)	SM	brown, moist, dense								

...LOGV1_COLOR 119F_LOGS_COLOR.GPJ US EVAL.GDT 8/22/06

RB&G ENGINEERING INC.
PROVO, UTAH

LEGEND:

DISTURBED SAMPLE ■ 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; 0.45 ← Torvane (tsf)

UNDISTURBED SAMPLE ☒ PUSHED 0.45 ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
TS = Triaxial Shear
CBR = California Bearing Ratio
= Potential Liquefaction
= Potential Liquefaction & Lateral Spread

DRILL HOLE LOG

BORING NO. RSB-19-611

PROJECT: LEGACY PARKWAY - STRUCTURE F-668 (GLOVER'S LANE OVER L.P.)
CLIENT: UTAH DEPARTMENT OF TRANSPORTATION
LOCATION: WEST ABUTMENT, NORTH SIDE; N 399,433, E 65051
DRILLING METHOD: CME-55 NO. 2 / N.W. CASING
DRILLER: D. SAMPSON
DEPTH TO WATER - INITIAL: ▽ 5.0' **AFTER 24 HOURS:** ▼ N.M.

PROJECT NUMBER: 200601.119
DATE STARTED: 4/7/06
DATE COMPLETED: 4/12/06
GROUND ELEVATION: 4242.2'
LOGGED BY: G. PEASLEE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS (AASHTO)	Material Description		Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
4140																
	105			14	14,16,11,(15)	SM (A-2-4(0))	brown, moist, med. dense	SILTY SAND W/GRAVEL		13.9		NP	15	56	29	
4135																
	110			11	9,14,34,(25)	SM	brown, moist, dense	SILTY SAND W/FEW CLAY LENSES								
4130																
	115			14	15,14,10,(12) *0.70*	CL	brown, moist, stiff	LEAN CLAY W/CLAYEY SAND LAYER								
4125																
	120			12	27,38,23,(31)	SM	brown, moist, dense	SILTY SAND W/FEW SAND LENSES								
4120																
	125			12	8,6,25,(15)	CH	black, moist, stiff	FAT CLAY								
						SM	dk. brown, moist, dense	SILTY SAND								
4115																
	130															
4110																
	135															
4105																
	140															
4100																
	145															
4095																

LEGEND:

DISTURBED SAMPLE: 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; 0.45 ← Torvane (tsf)

UNDISTURBED SAMPLE: PUSHED; 0.45 ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
TS = Triaxial Shear
CBR = California Bearing Ratio
= Potential Liquefaction
= Potential Liquefaction & Lateral Spread

RB&G ENGINEERING INC.
PROVO, UTAH

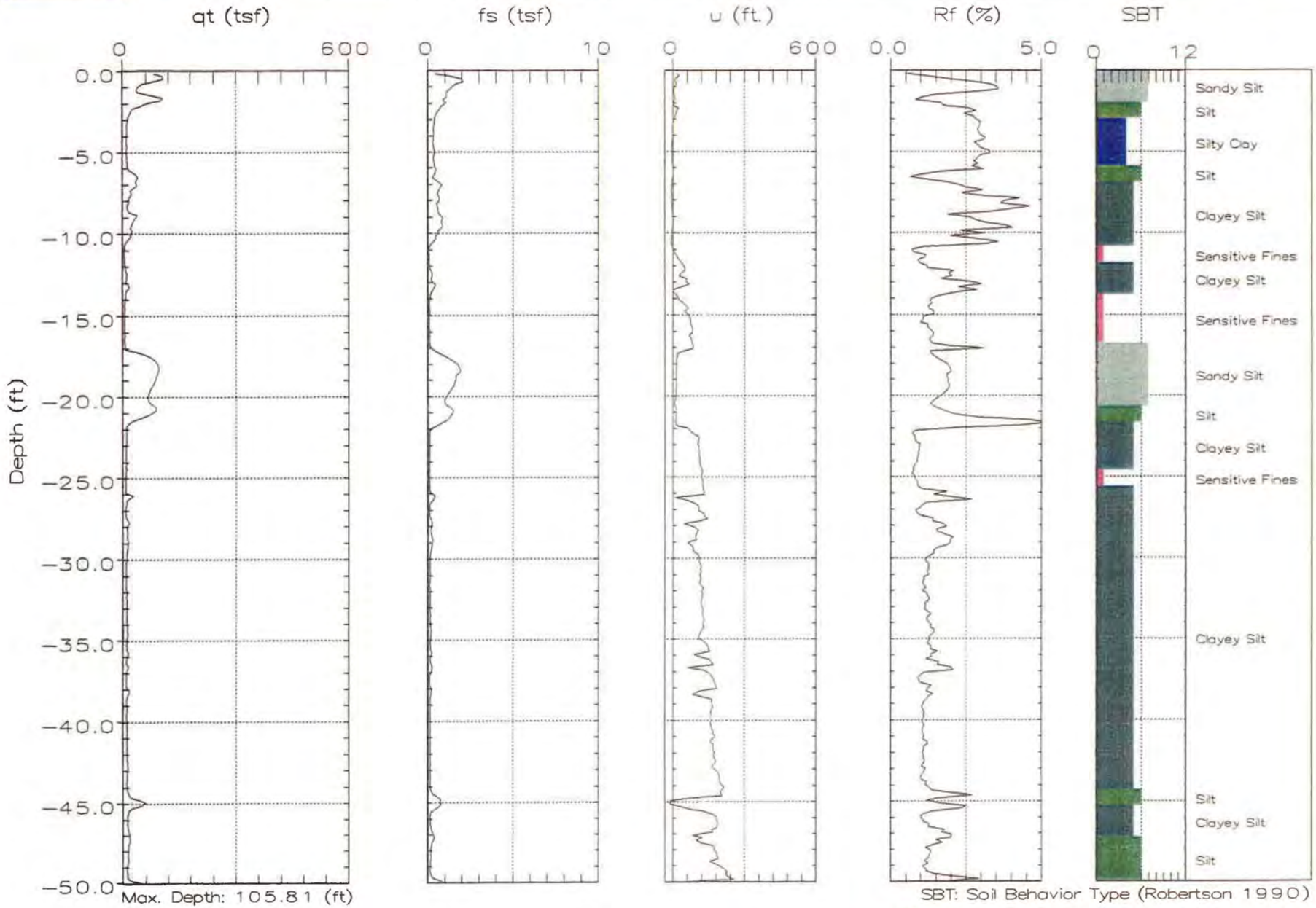
.OGV1_COLOR_119F_LOGS_COLOR.GPJ US EVAL.GDT 8/22/06

CONETEC

RB&G Engineering

HOLE NO.: RSC-19-612
LOCATION: N 399,292' E 65,278'
ELEVATION: 4240.0'

Cone: 20 Ton St 146
Date:04:28:06 11:12



Max. Depth: 105.81 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

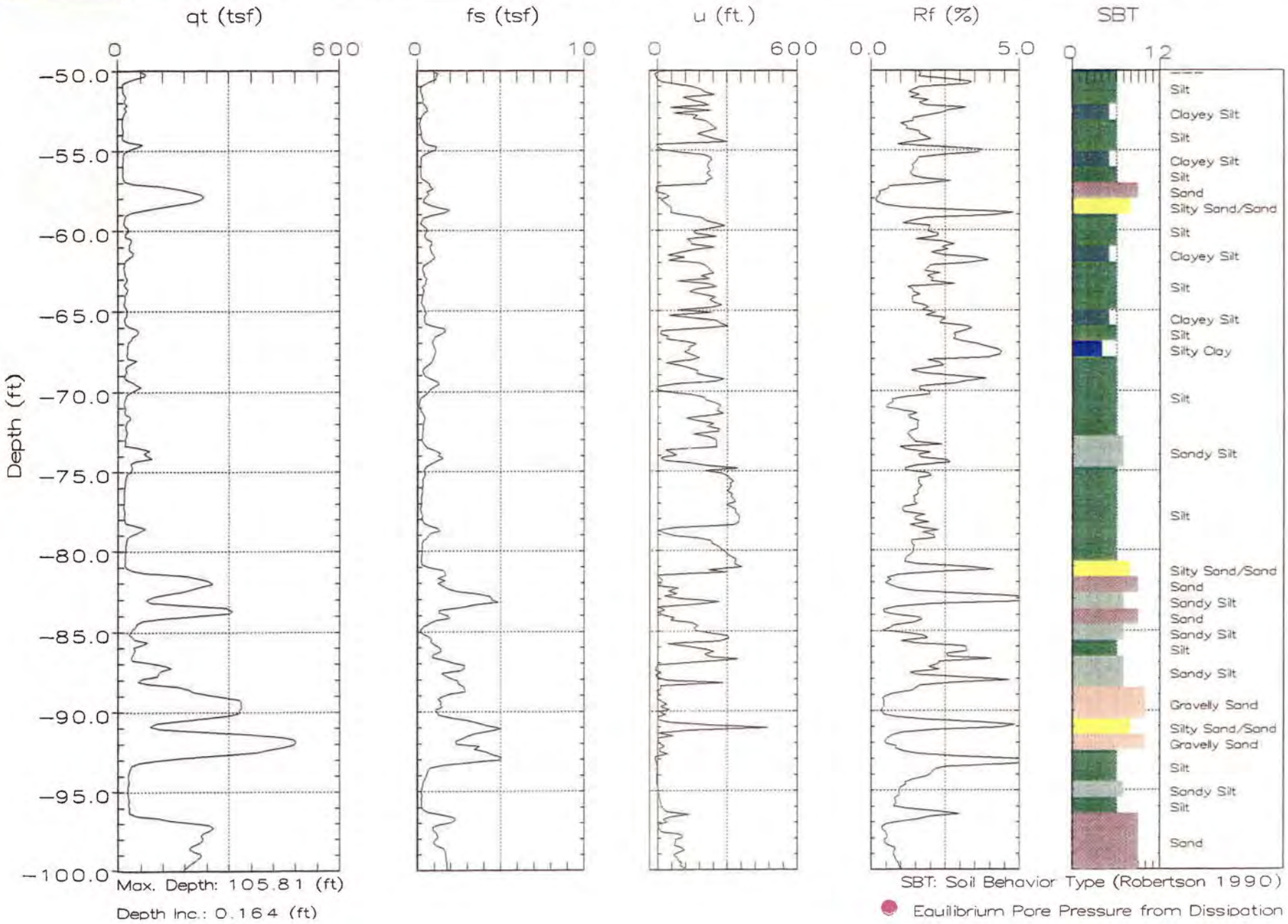
● Equilibrium Pore Pressure from Dissipation

CONETEC

RB&G Engineering

HOLE NO.: RSC-19-612
LOCATION: N 399,292' E 65,278'
ELEVATION: 4240.0'

Cone: 20 Ton St 146
Date:04:28:06 11:12



Max. Depth: 105.81 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

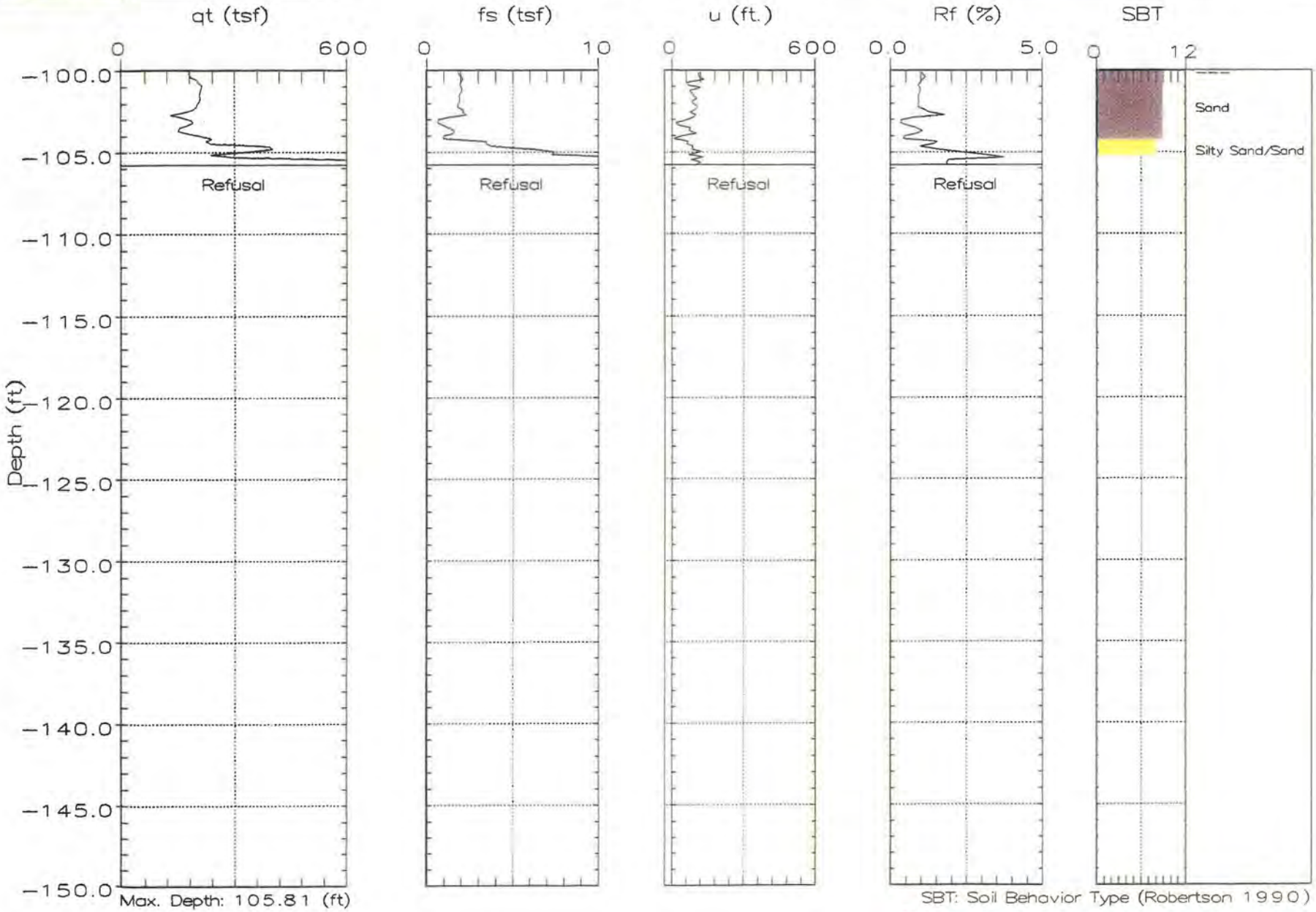
● Equilibrium Pore Pressure from Dissipation

CONETEC

RB&G Engineering

HOLE NO.: RSC-19-612
LOCATION: N 399,292' E 65,278'
ELEVATION: 4240.0'

Cone: 20 Ton St 146
Date:04:28:06 11:12



Max. Depth: 105.81 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

● Equilibrium Pore Pressure from Dissipation

Boring: SB-19-274
Sheet 1 of 3

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Graphic Log	Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	Test Results * S_u, kPa (tonnes/m²)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
	FILL: SAND and Sandy GRAVEL - very dense, moist, brown															
		5	1		SPT	0			50/100mm							
		10	2		MC	610			18 24 45 50							
1295		15	3		SPT	0			50/75mm							
		20	4		SPT	559			24 30 36 36							
		25	5		MC	25			50/125mm							
1290	Lean CLAY - stiff, moist, brown, with gray and wet silt	30	6		MC	152	CL	A-6	6 7 10 10							
	Silty SAND - loose to medium dense, wet, black, frequent clay and silt seams and layers	35	7		SPT	508	SM	A-2-5	4 4 4 2							
		40	8		P	406				43						
1285	Lean CLAY - soft, wet, brown to gray, occasional silt and silty SAND seams - SAND layer, medium grained	45	9		SPT	533	CL	A-6	0 2 4 5							
		50	10		P	610				45 48	14.9	29	36	12	94	C SG
	- very soft, some fine-grained sand seams	55	11		SPT	610			0 0 3 3							
1280		60	12		P	508										
		65	13													

Legend: ● SPT $(N_1)_{60}$; ○ SPT $(N_1)_{60}$ (Greater than 50 Blows)

Legacy Parkway - Preferred Alternative
I-215 to I-15/US 89 Interchange

KLEINFELDER

Project No. 35-8163-05

FIELD TEST BORING LOG

Boring: SB-19-274

Sheet 1 of 3

Logged by:	M. Ivers
Date Start:	2/3/00
Date Finish:	2/7/00
Station:	50+645.384 0.04 RT
Line:	GLOVERS LANE
Coordinates (m):	N 121,728.818 E 19,846.262
Elevation (m):	1299.158
Total Depth Drilled (m)	40.2
Drill Contractor:	Layne Christensen
Driller:	S. Church
Rig Type:	CME-750
Drilling Method:	Mud Rotary
Hammer Type:	Automatic
Rod Type:	AW
Boring Diameter:	133 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

* = See Key to Soil Logs for list of abbreviations and descriptions of tests

SAMPLE TYPE

SPT = Standard Penetration Test, 34.9mm ID and 50.8mm OD split spoon sampler

MC = Modified California Sampler, 50.8mm ID and 63.5mm OD split spoon sampler

P = Piston Sampler, 76.2 mm OD

SH = Shelby Tube, 76.2mm OD, pushed

BAG = Bulk Sample

UTDOT Z0038828.GPJ 4/31/00

Legacy Parkway - Preferred Alternative
I-215 to I-15/US 89 Interchange

KLEINFELDER

Project No. 35-8163-05

FIELD TEST BORING LOG

Boring: SB-19-274

Sheet 2 of 3

Logged by:	M. Ivers
Date Start:	2/3/00
Date Finish:	2/7/00
Station:	50+645.384 0.04 RT
Line:	GLOVERS LANE
Coordinates (m):	N 121,728.818 E 19,846.262
Elevation (m):	1299.158
Total Depth Drilled (m)	40.2
Drill Contractor:	Layne Christensen
Driller:	S. Church
Rig Type:	CME-750
Drilling Method:	Mud Rotary
Hammer Type:	Automatic
Rod Type:	AW
Boring Diameter:	133 mm

Boring: SB-19-274
Sheet 2 of 3

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Graphic Log	Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	Test Results * S_u, kPa (Italics in Italics)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
	- Lean CLAY, continued; soft, olive gray, mottled brown - interbedded with SILT and SAND layers 10 to 20 mm thick				SPT	559			1 2 4 8							
		70	21		P					43						
			22													
		75	23		SPT	610			0 1 1 1							
	- very soft, olive gray		24													
1275		80	25													
		85	26		P	457				47	17.1	19	68	38	49	C
	Clayey SAND - loose to medium dense, wet, black						SC	A-2-7		53						SG
			27													
		90	28													
		95	29		SPT	610			1 1 3 4							
1270	Lean CLAY - very soft, black mottled gray						CL	A-6								
			30													
		100	31													
		105	32		P	279										TV
	Poorly Graded SAND - medium dense, wet, gray, medium to coarse-grained sand, frequent GRAVEL layers						SP	A-3		38						
			33													
		110	34				GP	A-2-4								
1265	Poorly Graded GRAVEL with sand - medium dense, wet, gray, clasts up to 20 mm															
		115	35		SPT	356			10 23 33 44							
	Poorly Graded SAND - loose, wet, gray to black, medium-grained						SP	A-3								
			36													
		120	37		SPT	406			11 20 20 31							
	- medium dense, frequent lean CLAY layers 10 to 75 mm thick															
		125	38		SPT	559			8 10 12 17							
	- loose, interbedded gravel layers, olive to dark gray															
1260			39													
		130			SPT											

● SPT $(N_1)_{60}$
○ SPT $(N_1)_{60}$ (Greater than 50 Blows)

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

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SAMPLE TYPE

SPT = Standard Penetration Test, 34.9mm ID and 50.8mm OD split spoon sampler

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P = Piston Sampler, 76.2 mm OD

SH = Shelby Tube, 76.2mm OD, pushed

BAG = Bulk Sample

UTDOT 20038858 GPJ 4/1/00

Boring: SB-19-274
Sheet 3 of 3

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Graphic Log	Sample Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	● SPT $(N_1)_{60}$ ○ SPT $(N_1)_{60}$ (Greater than 50 Blows) 0 25 50	Test Results * S_u kPa (curves in italics)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
	- GRAVEL layer, very dense, clasts up to 20 mm thick					330			39 44 50/100mm								
		135	41														
			42														
		140	43														
1255		145	44														
			45														
		150	46														
		155	47														
			48														
1250		160	49														
		165	50														
			51														
		170	52														
		175	53														
1245			54														
		180	55														
		185	56														
			57														
		190	58														
1240		195	59														

Legacy Parkway - Preferred Alternative
I-215 to I-15/US 89 Interchange

KLEINFELDER

Project No. 35-8163-05

FIELD TEST BORING LOG

Boring: **SB-19-274**

Sheet 3 of 3

Logged by:	M. Ivers
Date Start:	2/3/00
Date Finish:	2/7/00
Station:	50+645.384 0.04 RT
Line:	GLOVERS LANE
Coordinates (m):	N 121,728.818 E 19,846.262
Elevation (m):	1299.158
Total Depth Drilled (m):	40.2
Drill Contractor:	Layne Christensen
Driller:	S. Church
Rig Type:	CME-750
Drilling Method:	Mud Rotary
Hammer Type:	Automatic
Rod Type:	AW
Boring Diameter:	133 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

* = See Key to Soil Logs for list of abbreviations and descriptions of tests

SAMPLE TYPE

SPT = Standard Penetration Test, 34.9mm ID and 50.8mm OD split spoon sampler

MC = Modified California Sampler, 50.8mm ID and 63.5mm OD split spoon sampler

P = Piston Sampler, 76.2 mm OD

SH = Shelby Tube, 76.2mm OD, pushed

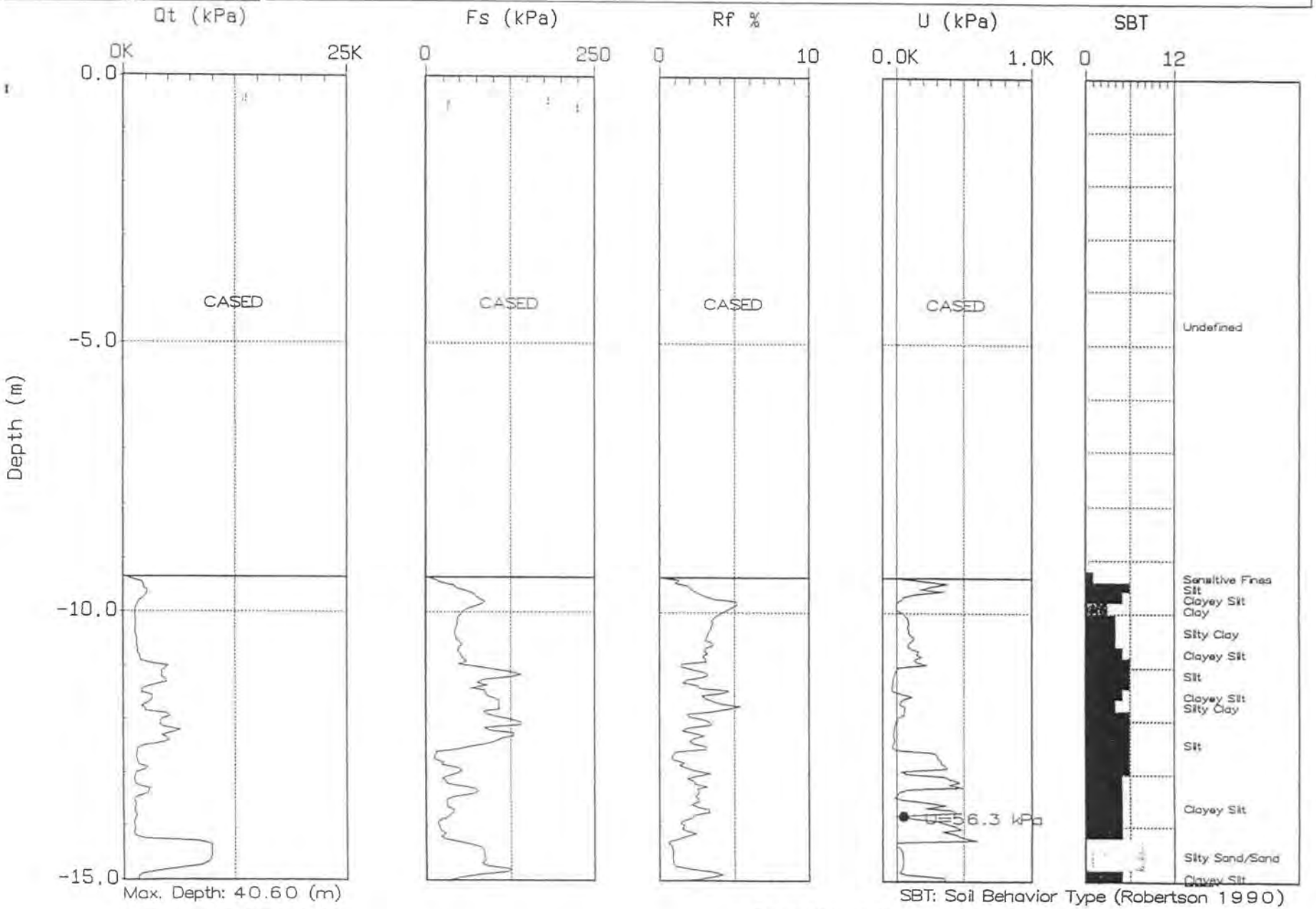
BAG = Bulk Sample

UTDOT Z0038828.GPJ 4/21/00

Legacy Parkway

Sit SC-19-275
Station: 50+676.025 2.45 LT
Elevation: 1300.597

Cone: 20 TON A 0
Date: 02:02:00 08:38



Max. Depth: 40.60 (m)
Depth inc.: 0.050 (m)

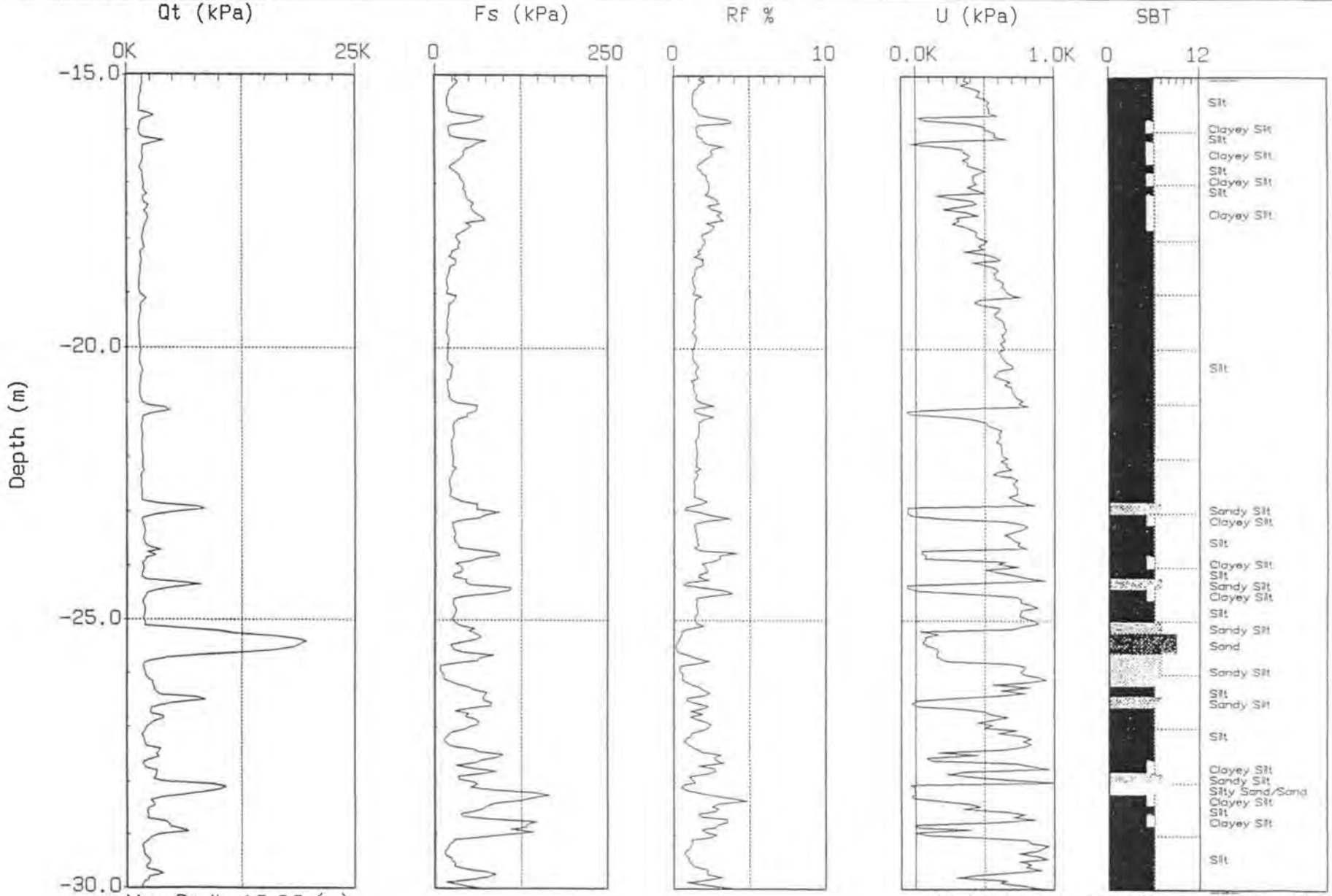
SBT: Soil Behavior Type (Robertson 1990)

● Equilibrium (or near) Pore Pressure from Dissipation

Legacy Parkway

Site: SC-19-275
Station: 50+676.025 2.45 LT
Elevation: 1300.597

Cone: 20 TON A 070
Date: 02:02:00 08:38



Max. Depth: 40.60 (m)
Depth Inc.: 0.050 (m)

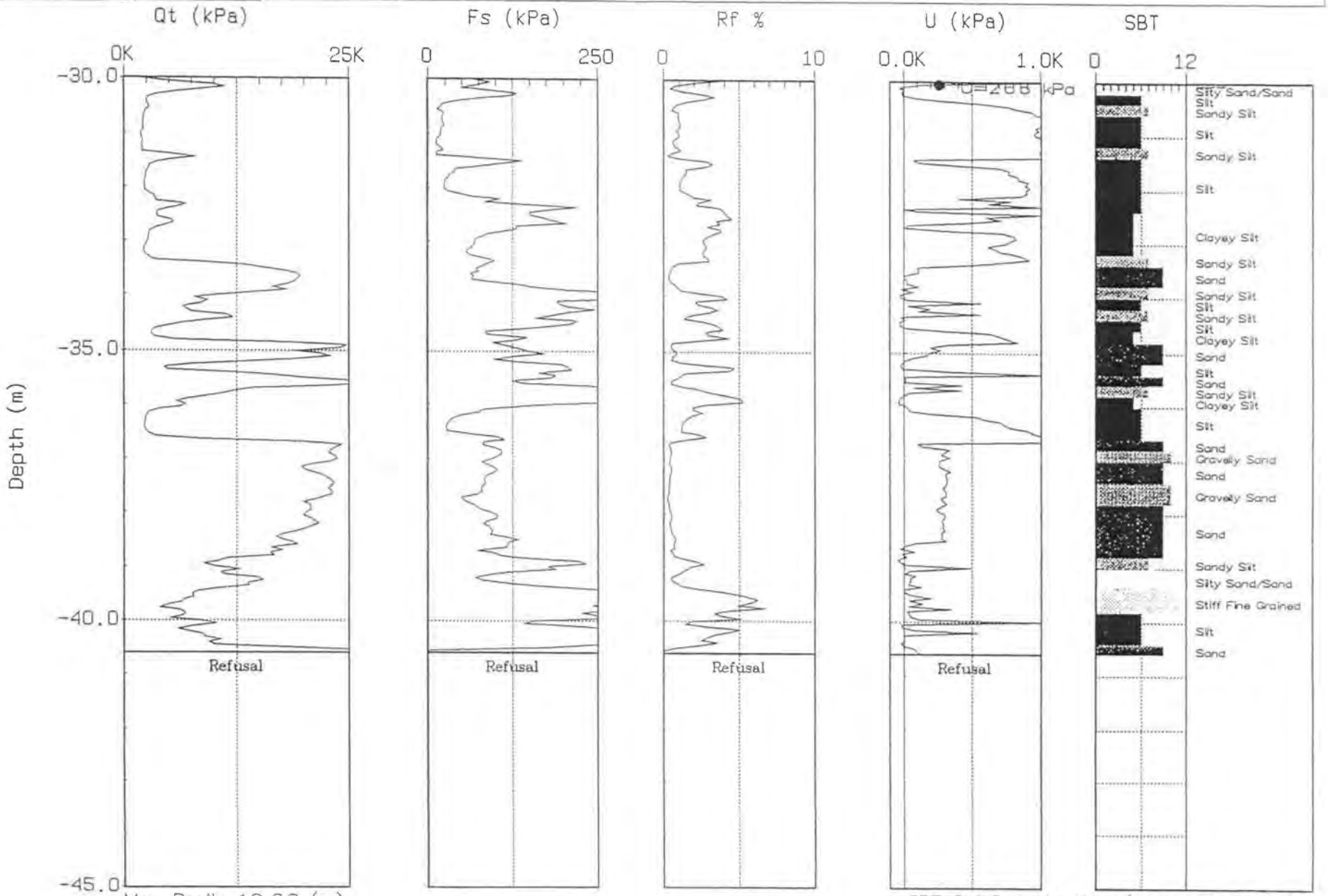
SBT: Soil Behavior Type (Robertson 1990)

● Equilibrium (or near) Pore Pressure from Dissipation

Legacy Parkway

S SC-19-275
Station: 50+676.025 2.45 LT
Elevation: 1300.597

Cone: 20 TON 70
Date: 02:02:00 08:38



Max. Depth: 40.60 (m)
Depth Inc.: 0.050 (m)

SBT: Soil Behavior Type (Robertson 1990)
● Equilibrium (or near) Pore Pressure from Dissipation

PLATE B-214

Legacy Parkway - Preferred Alternative
I-215 to I-15/US 89 Interchange

KLEINFELDER

Project No. 35-8163-05

FIELD TEST BORING LOG

Boring: **SC-19-275**

Sheet 1 of 1

Boring: SC-19-275
Sheet 1 of 1

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Graphic Log	Sample Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	SPT (N1)60 ● / SPT (N1)60 ○ (Greater than 50 Blows)	Su, kPa (torvane in italics)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
	FILL: Well-Graded SAND with silt and gravel - moist, brown																
1300			1														
	- very dense	5	2		SPT	305			15 16 19								
		10	3		SPT	356			15 18 21								
			4														
	- medium dense, gravel decreasing to approximately less than 10%	15	5		SPT	254			10 10 10	26							
1295			6														
	- dense	20			SPT	305			10 14 16	35							SV
			7														
	- poorly graded gravel, black	25	8		SPT	279			12 11 15	28							
		30	9		SPT	381	CL	A-6	12 6 5	11							
	Lean CLAY - stiff, moist, black																
			10														
1290		35	11														
			12														
		40	13														
		45	14														
			15														
		50	16														
1285		55	17														
			18														
		60	19														
		65															

Test Results *

Logged by: M. Ivers
Date Start: 1/31/00
Date Finish: 1/31/00
Station: 50+676.025 2.45 LT
Line: GLOVERS LANE
Coordinates (m): N 121,731.185 E 19,876.913
Elevation (m): 1300.661
Total Depth Drilled (m): 9.6
Drill Contractor: Haz-tech
Driller: R. Knott
Rig Type: CME-850
Drilling Method: Mud Rotary
Hammer Type: Automatic
Rod Type: NW
Boring Diameter: 133 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

* = See Key to Soil Logs for list of abbreviations and descriptions of tests

SAMPLE TYPE

SPT = Standard Penetration Test, 34.9mm ID and 50.8mm OD split spoon sampler

MC = Modified California Sampler, 50.8mm ID and 63.5mm OD split spoon sampler

P = Piston Sampler, 76.2 mm OD

SH = Shelby Tube, 76.2mm OD, pushed

BAG = Bulk Sample

UTDOT 2003B2A.GPJ 5/1/00

Boring: SB-19-276
Sheet 1 of 2

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Graphic Log	Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	Test Results * S_u, kPa (*torvane in italics*)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
	ASPHALT - 6" 1301.8															
	FILL: Poorly Graded SAND and GRAVEL - very dense, moist, brown occasional clay layers 50 mm thick		1													
		5	2		MC	305			14 22 27							pH R WSS pH WSS R
1300		10	3		SPT	406			4 20 35 32							
			4													
	- cobbles	15	5		MC	0			50/100mm							
		20	6		SPT	229			20 27 18 16							
1295			7													
		25	8		MC	152			8 42 50/75 mm							
		30	9		MC	127			6 10 10 6							
			10													
		35	11		MC	152			5 6 8 10							
	1290.5															
1290	Poorly Graded SAND - interbedded with frequent clay layers 3 to 50 mm thick	40	12		SPT	508	SP	A-1-b	2 5 5 7							
	1288.5		13													
	Lean CLAY - medium stiff, wet, gray	45	14		SH	610	CL	A-6		48						
	1287.1															
	Poorly Graded SAND - medium dense, wet, dark gray	50	15		SPT	610	SP	A-3	8 9 10 6							
	1285.5		16													
1285	Lean CLAY - soft, wet, gray-brown, with fine-grained sand seams	55	17		SPT	610	CL	A-6	3 3 3 4							
		60	18		SH	610				75 48	17.1	25	35	11	91	C C SG
		65	19		SPT	610			2 3 4 5							
		70	21													
1280			22		SH	610				53						
		75	23		SPT	610			0 0 2 6							

Graphic Log scale: 0 25 50

● SPT (N_{1})$_{60}$
○ SPT (N_{1})$_{60}$ (Greater than 50 Blows)

Legacy Parkway - Preferred Alternative
I-215 to I-15/US 89 Interchange

KLEINFELDER

Project No. 35-8163-05

FIELD TEST BORING LOG

Boring: **SB-19-276**

Sheet 1 of 2

Logged by:	M. Ivers
Date Start:	2/1/00
Date Finish:	2/2/00
Station:	50+705.923 0.19 LT
Line:	GLOVERS LN
Coordinates (m):	N 121,728.8 E 19,906.8
Elevation (m):	1302.1
Total Depth Drilled (m):	40.2
Drill Contractor:	Layne Christensen
Driller:	S. Church
Rig Type:	CME-750
Rig Serial Number:	
Drilling Method:	Mud Rotary
Hammer Type:	Safety
Rod Type:	AW
Boring Diameter:	133 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

* = See Key to Soil Logs for list of abbreviations and descriptions of tests

SAMPLE TYPE

- SPT = Standard Penetration Test, 34.9mm ID and 50.8mm OD split spoon sampler
- MC = Modified California Sampler, 50.8mm ID and 63.5mm OD split spoon sampler
- P = Piston Sampler, 76.2 mm OD
- SH = Shelby Tube, 76.2mm OD, pushed
- BAG = Bulk Sample

UTAH DEPARTMENT OF TRANSPORTATION
KLEINFELDER, INC.
SALT LAKE CITY, UTAH

LEGACY PARKWAY
GLOVERS LN OVER LP, I-15 & UPRR
SOIL DATA SHEET

PROJECT NUMBER SP-0067 (1)0

DESIGN ___ CHECK ___ DRAWN CMH 03/04 CHECK WGT 03/04 QUANT. ___ CHECK ___

APPROVAL RECOMM. ___ DATE ___ PROJECT DESIGN ENGINEER
APPROVED ___ DATE ___ ROADWAY DESIGN ENGINEER

REVIEW BY CC DATE 03/04

NO. DATE REVISIONS
DESIGN REV. BY LOCAL BY AFFECTED PARCELS REQUEST BY
ORIGINAL SUBMISSION FOR AUTHORIZATION
REVISIONS DATE

DAVIS COUNTY

F-712 BRIDGE NO.

UDOT LP 2003SB28.GPJ 3/31/04

Boring: SB-19-276
Sheet 2 of 2

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	S_u, kPa (serves in italics)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
	- Lean CLAY, continued; few sand seams	80	24	SH	610				63	14.6	30	36	15		C
	-medium stiff		25						62						C
		85	26												TR
			27												SG
1275	- GRAVEL Layer 300 mm thick, with sand 1274.3	90	28	SPT	381	CL	A-6	14 14 2 3							
	Lean CLAY with sand - soft, wet, gray-black	95	29												
			30												
	1271.1	100	31	SH	356				29						
	GRAVEL - dense, wet, gray, fine-grained, with coarse-grained sand 1270.1					GP	A-2-4								
1270	Lean CLAY - medium stiff, wet, dark olive gray, with trace of coarse-grained sand	105	32			CL	A-6								
	1268.2	110	33												
	Silty SAND with gravel - medium dense, moist, dark olive gray		34	SPT		SM	A-2-5	5 4 9 7							
		115	35												
			36												
1265	- Lean CLAY layer 25 mm thick, with interbedded gravel clasts - 40% gravel with clast up to 20 mm Lean CLAY layer 75 mm thick - Poorly Graded SAND layer, fine to medium-grained, very homogeneous	120	37	SPT	356			3 22 29 10							
		125	38	SPT				18 22 26 29							
			39												
	1261.8	130	40	SPT	356			17 19 14 22							
	End of Boring, Approximate Depth 40.2 m														
		135	41												
1260			42												
		140	43												
		145	44												
			45												
		150	46												
1255		155	47												

Graphic Log

● SPT $(N_1)_{60}$
○ SPT $(N_1)_{60}$ (Greater than 50 Blows)
0 25 50

Legacy Parkway - Preferred Alternative
I-215 to I-15/US 89 Interchange

KLEINFELDER

Project No. 35-8163-05

FIELD TEST BORING LOG

Boring: **SB-19-276**

Sheet 2 of 2

Logged by:	M. Ivers
Date Start:	2/1/00
Date Finish:	2/2/00
Station:	50+705.923 0.19 LT
Line:	GLOVERS LN
Coordinates (m):	N 121,728.8 E 19,906.8
Elevation (m):	1302.1
Total Depth Drilled (m):	40.2
Drill Contractor:	Layne Christensen
Driller:	S. Church
Rig Type:	CME-750
Rig Serial Number:	
Drilling Method:	Mud Rotary
Hammer Type:	Safety
Rod Type:	AW
Boring Diameter:	133 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

* = See Key to Soil Logs for list of abbreviations and descriptions of tests

SAMPLE TYPE

SPT = Standard Penetration Test, 34.9mm ID and 50.8mm OD split spoon sampler

MC = Modified California Sampler, 50.8mm ID and 63.5mm OD split spoon sampler

P = Piston Sampler, 76.2 mm OD

SH = Shelby Tube, 76.2mm OD, pushed

BAG = Bulk Sample

UTAH DEPARTMENT OF TRANSPORTATION
KLEINFELDER, INC.
SALT LAKE CITY, UTAH

LEGACY PARKWAY
GLOVERS LN OVER LP, I-15 & UPRR
SOIL DATA SHEET

PROJECT NUMBER SP-0067 (1)0

DAVIS COUNTY

F-712 BRIDGE NO.

REVIEW

UDOT LP Z0035828.GPJ 3/31/04

Boring: LSB-19-470
Sheet 1 of 3

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Graphic Log	Sample Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	SPT $(N_1)_{60}$ / SPT $(N_1)_{60}$ (Greater than 50 Blows)	Test Results * S_u, kPa (torvane in italics)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
	Refer to SB-19-274 for additional lithology above 30.2 meters. Samples above this depth were taken intermittently and soil descriptions do not necessarily characterize the lithology between samples																
1295		5	1														
		10	2														
		15	3														
		20	4														
		25	5														
		30	6														
		35	7														
		40	8														
		45	9														
1290	Lean CLAY - medium stiff, moist, brown to grey	50	10		SPT	559			3 4 9 7	13							
	Silty SAND - stiff, moist, grey, micaceous, fine-grained	55	11														
		60	12														
		65	13														
1285			14														
			15														
			16														
			17														
			18														
			19														

Legacy Parkway Design/Build
I-215 to I-15/US 89 Interchange
KLEINFELDER
Project No. 35-8440-08

FIELD TEST BORING LOG

Boring: LSB-19-470

Sheet 1 of 3

Logged by	M. Ivers
Date Start	7/10/01
Date Finish	7/11/02
Station	50+667.77 0.0 RT
Line	GLOVERS LANE
Coordinates (m)	N 121,728.766 E 19,868.648
Elevation (m)	1300.033
Total Depth Drilled (m)	45.1
Drill Contractor	RC Exploration
Driller	M. Labenski
Rig Type	Diedrich D-120 ATV
Rig Serial Number	D-120009
Drilling Method	Hollow-Stem Auger
Hammer Type	Automatic
Rod Type	AW
Boring Diameter	133 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

* = See Key to Soil Logs for list of abbreviations and descriptions of tests

SAMPLE TYPE

SPT = Standard Penetration Test, 34.9mm ID and 50.8mm OD split spoon sampler

MC = Modified California Sampler, 50.8mm ID and 63.5mm OD split spoon sampler

P = Piston Sampler, 76.2 mm OD

SH = Shelby Tube, 76.2mm OD, pushed

BAG = Bulk Sample

PLATE A-1
STRUCTURE 19

UTDOT 35112LN1 GPJ 12/20/02

Boring: LSB-19-470
Sheet 2 of 3

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Graphic Log	Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)				Test Results * S_{u}, kPa (tonnes/sq.ft/ksf)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
	Refer to SB-19-274 for additional lithology above 30.2 meters Samples above this depth were taken intermittently and soil descriptions do not necessarily characterize the lithology between samples	70	21																
			22																
		75	23																
			24																
		80	25																
1275		85	26																
			27																
		90	28																
		95	29																
			30																
1270	Lean CLAY - stiff to very stiff, wet, grey	100	31		SPT	381	CL	A-6	2	8	6	3							
		105	32		SPT	508			0	11	19	24							
	Poorly Graded SAND - dense, wet, grey, fine-grained sand, trace silt	110	33		SPT		SP	A-3	13	12	27	30							
			34																
1265	Silty CLAY with sand - hard, wet, olive grey	115	35		SPT	610	CL-ML	A-6	6	36	50	49							
	SILT with gravel - hard, moist, olive grey, fine-grained gravel	120	36		SPT	483	ML	A-4	50	28	32	46							
			37																
		125	38		SPT	406			19	26	33	40							
			39																
		130			SPT	457			26	25	17	20							

● SPT $(N_1)_{60}$
○ SPT $(N_1)_{60}$ (Greater than 50 Blows)

Legacy Parkway Design/Build
I-215 to I-15/US 89 Interchange
KLEINFELDER
Project No. 35-8440-08

FIELD TEST BORING LOG

Boring LSB-19-470

Sheet 2 of 3

Logged by	M. Ivers
Date Start	7/10/01
Date Finish	7/11/02
Station	50+667.77 0.0 RT
Line	GLOVERS LANE
Coordinates (m)	N 121,728.766 E 19,868.648
Elevation (m)	1300.033
Total Depth Drilled (m):	45.1
Drill Contractor	RC Exploration
Driller	M. Labenski
Rig Type:	Diedrich D-120 ATV
Rig Serial Number:	D-120009
Drilling Method:	Hollow-Stem Auger
Hammer Type	Automatic
Rod Type	AW
Boring Diameter	133 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

* = See Key to Soil Logs for list of abbreviations and descriptions of tests

SAMPLE TYPE

SPT = Standard Penetration Test, 34 9mm ID and 50 8mm OD split spoon sampler

MC = Modified California Sampler, 50 8mm ID and 63 5mm OD split spoon sampler

P = Piston Sampler, 76 2 mm OD

SH = Shelby Tube, 76 2mm OD, pushed

BAG = Bulk Sample

PLATE A-2
STRUCTURE 19

UTDOT 35112LNI GPJ 12/30/02

Boring: LSB-19-470
Sheet 3 of 3

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Graphic Log	Sample Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	SPT (N1)60 / SPT (N1)60 (Greater than 50 Blows)	Su, kPa (torvane in italics)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No 200	Other Tests
	SILT with gravel (continued) - hard, moist, olive grey, fine-grained gravel																
		135	41		SPT				48 50/ 140mm								
			42														
	Silty SAND with gravel - dense to very dense, wet, olive grey, fine-grained gravel	140	43		SPT	610	SM	A-2-4	18 14 22 15	21							
		145	44		MC				70/ 100mm								
1255			45		SPT	127			61/ 150mm								
		150	46														
		155	47														
			48														
		160	49														
1250		165	50														
			51														
		170	52														
		175	53														
			54														
1245		180	55														
			56														
		185	57														
		190	58														
			59														
		195															

Legacy Parkway Design/Build
I-215 to I-15/US 89 Interchange
KLEINFELDER
Project No. 35-8440-08

FIELD TEST BORING LOG

Boring: **LSB-19-470**

Sheet 3 of 3

Logged by	M. Ivers
Date Start	7/10/01
Date Finish.	7/11/02
Station	50+667.77 0.0 RT
Line	GLOVERS LANE
Coordinates (m)	N 121,728.766 E 19,858.648
Elevation (m)	1300.033
Total Depth Drilled (m)	45.1
Drill Contractor	RC Exploration
Driller:	M. Labenski
Rig Type	Diedrich D-120 ATV
Rig Serial Number	D-120009
Drilling Method	Hollow-Stem Auger
Hammer Type	Automatic
Rod Type	AW
Boring Diameter:	133 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

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SAMPLE TYPE

SPT = Standard Penetration Test, 34 9mm ID and 50 8mm OD split spoon sampler

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P = Piston Sampler, 76 2 mm OD

SH = Shelby Tube, 76 2mm OD, pushed

BAG = Bulk Sample

PLATE A-3
STRUCTURE 19

UTDOT 35412LNLGPJ 12/20/02

Boring: LSB-19-471
Sheet 1 of 3

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Graphic Log	Sample Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	● SPT $(N_1)_{60}$ ○ SPT $(N_1)_{60}$ (Greater than 50 Blows)	S_u kPa (torvane in italics)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
	Refer to SB-19-276 for additional lithology above 30.5 meters. Samples above this depth were taken intermittently and soil descriptions do not necessarily characterize the lithology between samples.																
1300		5	1														
		10	2														
		15	3														
		20	4														
1295		25	5														
▽		30	6														
		35	7														
1290	Lean CLAY with sand - medium stiff, wet, grey and tan	40	8		SPT	432			2 3 3 3	●5				42	20	83	
	Poorly Graded SAND - loose, wet, grey	45	9														
		50	10														
1285		55	11														
		60	12														
		65	13														
			14														
			15														
			16														
			17														
			18														
			19														

Legacy Parkway Design/Build
I-215 to I-15/US 89 Interchange
KLEINFELDER
Project No. 35-8440-08

FIELD TEST BORING LOG

Boring: **LSB-19-471**

Sheet 1 of 3

Logged by:	M. Ivers
Date Start:	7/12/01
Date Finish:	7/17/01
Station	50+702.77 0.0 RT
Line:	GLOVERS LANE
Coordinates (m)	N 121,728.617 E 19,903.647
Elevation (m)	1301.740
Total Depth Drilled (m)	46.3
Drill Contractor	RC Exploration
Driller:	M. Labenski
Rig Type	Diedrich D-120 ATV
Rig Serial Number	D-120009
Drilling Method:	Hollow-Stem Auger
Hammer Type	Automatic
Rod Type.	AW
Boring Diameter:	133 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

* = See Key to Soil Logs for list of abbreviations and descriptions of tests

SAMPLE TYPE

SPT = Standard Penetration Test, 34 9mm ID and 50 8mm OD split spoon sampler

MC = Modified California Sampler, 50.8mm ID and 63 5mm OD split spoon sampler

P = Piston Sampler, 76 2 mm OD

SH = Shelby Tube, 76.2mm OD, pushed

BAG = Bulk Sample

UTDOT 35112LMLGPJ 12/20/02

PLATE A-4
STRUCTURE 19

Boring: LSB-19-471
Sheet 2 of 3

SAMPLE DESCRIPTION
(ASTM D 2488/D 2487)

Refer to SB-19-276 for additional lithology above 30.5 meters. Samples above this depth were taken intermittently and soil descriptions do not necessarily characterize the lithology between samples.

Poorly Graded SAND - dense, wet, grey, trace fine-grained gravel, occasional clay seams

Lean CLAY - very stiff to hard, wet, grey

- occasional medium grained sand layers

- color change to olive

Silty SAND - very dense, wet, grey, some fine-grained gravel

Poorly Graded SAND - medium dense to very dense, wet, grey, medium grained sand

- occasional lean clay layers

Elevation (m)	Depth ft	Depth m	Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	SPT $(N_1)_{60}$	Test Results * S_u kPa (blows in italics)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
1280	70	21													
		22													
	75	23													
		24													
	80	25													
	85	26													
1275		27													
	90	28													
	95	29													
		30													
	100	31	SPT	457	SP	A-3	8 16 16 14	21							
1270	105	32	SPT	483	CL	A-6	8 10 6 4	10				35	11		
		33													
	110	34	SPT	533			20 16 14 13	19							
	115	35	SPT	610	SM	A-2-4	6 16 38 33	34						30	
		36													
1265	120	37	SPT	356	SP	A-3	3 12 16 22	17							
	125	38	SPT	559			4 6 8 32	8							
		39													
	130		SPT					29							

Legacy Parkway Design/Build
I-215 to I-15/US 89 Interchange
KLEINFELDER
Project No. 35-8440-08

FIELD TEST BORING LOG
Boring: LSB-19-471
Sheet 2 of 3

Logged by:	M. Ivers
Date Start:	7/12/01
Date Finish:	7/17/01
Station:	50+702.77 0.0 RT
Line:	GLOVERS LANE
Coordinates (m):	N 121,728.617 E 19,903.647
Elevation (m):	1301.740
Total Depth Drilled (m):	46.3
Drill Contractor:	RC Exploration
Driller:	M. Labenski
Rig Type:	Diedrich D-120 ATV
Rig Serial Number:	D-120009
Drilling Method:	Hollow-Stem Auger
Hammer Type:	Automatic
Rod Type:	AW
Boring Diameter:	133 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

* = See Key to Soil Logs for list of abbreviations and descriptions of tests

SAMPLE TYPE

SPT = Standard Penetration Test, 34.9mm ID and 50.8mm OD split spoon sampler

MC = Modified California Sampler, 50.8mm ID and 63.5mm OD split spoon sampler

P = Piston Sampler, 76.2 mm OD

SH = Shelby Tube, 76.2mm OD, pushed

BAG = Bulk Sample

PLATE A-5
STRUCTURE 19

UTDOT 3811ZLN.GPJ 12/20/02

Boring: LSB-19-471
Sheet 3 of 3

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Graphic Log	Sample Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	SPT $(N_1)_{60}$ / SPT $(N_1)_{60}$ (Greater than 50 Blows)	Test Results * S_u, kPa (torvane in italics)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
	Poorly Graded SAND (continued) - medium dense to very dense, wet, grey, medium grained sand					483			5 18 30 33								
	- with fine-grained gravel	135	41		SPT				34 40 29 15	40							
1260			42														
	- occasional poorly graded sand layers	140	43		SPT	533			6 8 15 25	13							
			44														
	- occasional brown clay seams	145			SPT	254			20 17 12 11	16							
			45														
		150	46		SPT												
1255			47														
		155	48														
		160	49														
			50														
		165	51														
1250		170	52														
			53														
		175	54														
		180	55														
			56														
		185	57														
1245		190	58														
			59														
		195															

Legacy Parkway Design/Build
I-215 to I-15/US 89 Interchange
KLEINFELDER
Project No. 35-8440-08

FIELD TEST BORING LOG

Boring: **LSB-19-471**

Sheet 3 of 3

Logged by:	M. Ivers
Date Start:	7/12/01
Date Finish:	7/17/01
Station:	50+702.77 0.0 RT
Line:	GLOVERS LANE
Coordinates (m):	N 121,728.617 E 19,903.647
Elevation (m):	1301.740
Total Depth Drilled (m):	46.3
Drill Contractor:	RC Exploration
Driller:	M. Labenski
Rig Type:	Diedrich D-120 ATV
Rig Serial Number:	D-120009
Drilling Method:	Hollow-Stem Auger
Hammer Type:	Automatic
Rod Type:	AW
Boring Diameter:	133 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

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SAMPLE TYPE

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MC = Modified California Sampler, 50.8mm ID and 63.5mm OD split spoon sampler

P = Piston Sampler, 76.2 mm OD

SH = Shelby Tube, 76.2mm OD, pushed

BAG = Bulk Sample

PLATE A-6
STRUCTURE 19

UTDOT 35112LNI.GPJ 12/30/02

DRILL HOLE LOG

BORING NO. RSB-19-613

PROJECT: LEGACY PARKWAY - STR. C-948 (GLOVER'S PED. OVER I-15 & UPPR)
CLIENT: UTAH DEPARTMENT OF TRANSPORTATION
LOCATION: N ~399,401, E ~65,527
DRILLING METHOD: CME-850
DRILLER: UDOT: SIZEMORE, WORWOOD, MALONE
DEPTH TO WATER - INITIAL: ▽ 2.8' **AFTER 24 HOURS:** ▼ 0.0' ARTESIAN

PROJECT NUMBER: 200601.119
DATE STARTED: 4/27/06
DATE COMPLETED: 5/5/06
GROUND ELEVATION: ~4245.4'
LOGGED BY: SIZEMORE, J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Rec. (in)	See Legend	USCS (AASHTO)	Material Description		Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
4245				15	3,8,13,9,(48)	ML	dk. brown, dense	SANDY TO CLAYEY SILT W/GRAVEL								
				4	3,3,3,4,(14)	ML	dk. brown, med. dense									
								GRAVELS								
4240	5			15	1/12",1,3,(5)	CL (A-6(8))	dk. brown, moist, soft			34	36	18	7	35	58	
				24	Pushed	CL (A-6(6))	dk. brown, moist	SANDY LEAN CLAY W/SILT & SAND LENSES	99	28	30	12	1	33	66	CT TS
4235	10			30	Pushed	CL	dk. brown, moist									
				15	4,2,2,4,(8)	ML (A-4(0))	gray, wet, very loose	SANDY SILT W/CLAY LENSES		36		NP	0	45	55	
4230	15			20	2,2,4,5,(11)	ML (A-4(0))	gray, wet, loose			35		NP	1	43	56	
				24	0/24",(0)	CL (A-6(12))	gray-brown, very moist, very soft			38	33	13	0	5	95	
4225	20			0	Pushed			LEAN CLAY W/SAND LENSES								
				24	0/12",5,10,(8)	CL	gray-brown, very moist, very soft									
						SM	gray, wet, med. dense	SILTY SAND								
4220	25			20	2,9,9,8,(27)	SM (A-2-4(0))	gray, wet, med. dense			29		NP	0	88	12	
				24	0/18",3,(0)	ML,CL-ML, SM	gray-brown, moist to wet, soft/very loose	INTERBEDDED LENSES & LAYERS OF CLAYEY SILT, SILTY CLAY, SANDY SILT & SILTY SAND trace organics								
4215	30			30	Pushed	CL (A-6(13))	gray-brown, moist, firm		89	32	34	14	0	6	94	CT UC
4210	35			24	0/18",4,(0)	CL	gray-brown, moist, soft	LEAN CLAY W/SILT LENSES trace organics								
4205	40			30	Pushed	CL (A-6(14))	gray-brown, moist		100	32	34	14	0	4	96	CT TS
4200	45			30	Pushed	CL	gray-brown, moist	LEAN CLAY W/SILT LENSES								

.OGV1_COLOR 119C_LOGS_COLOR.GPJ US EVAL.GDT 8/28/06

RB&G ENGINEERING INC.
PROVO, UTAH

LEGEND:

DISTURBED SAMPLE — 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; 0.45 ← Torvane (tsf)

UNDISTURBED SAMPLE — PUSHED; 0.45 ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
TS = Triaxial Shear
CBR = California Bearing Ratio
= Potential Liquefaction
= Potential Liquefaction & Lateral Spread

DRILL HOLE LOG

BORING NO. RSB-19-613

PROJECT: LEGACY PARKWAY - STR. C-948 (GLOVER'S PED. OVER I-15 & UPPR)
CLIENT: UTAH DEPARTMENT OF TRANSPORTATION
LOCATION: N ~399,401, E ~65,527
DRILLING METHOD: CME-850
DRILLER: UDOT: SIZEMORE, WORWOOD, MALONE
DEPTH TO WATER - INITIAL: ▽ 2.8' **AFTER 24 HOURS:** ▼ 0.0' ARTESIAN

PROJECT NUMBER: 200601.119
DATE STARTED: 4/27/06
DATE COMPLETED: 5/5/06
GROUND ELEVATION: ~4245.4'
LOGGED BY: SIZEMORE, J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS (AASHTO)	Material Description		Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
4195				24	0/20",4/4",(0)	CL	gray, moist, soft									
4190	55			30	Pushed	CL (A-6(11))	gray, moist, stiff	LEAN CLAY W/SILT LENSES	93	30	32	12	0	10	90	CT UC
4185	60			0	Pushed	-										
				24	3,10,10,8,(20)	SM	gray, wet, med. dense									
4180	65			24	3,8,3,4,(11)	SM (A-2-4(0))	gray, wet, med. dense	SILTY SAND W/SILT LENSES		27		NP	0	69	31	
4175	70			22	2,6,5,7,(11)	SM	gray, wet, med. dense									
						CL	gray, very moist, firm to stiff									
4170	75			24	1,3,4,6,(6)	CL (A-6(5))	gray, very moist, firm to stiff	LEAN CLAY W/NUMEROUS SILT & SILTY SAND LENSES & LAYERS		28	37	14	0	46	54	
4165	80			24	0/12",3,5,(3)	CL	gray, moist, soft									
4160	85			24	4,6,6,7,(10)	CL (A-7-6(23))	gray, moist, stiff	LEAN CLAY W/SILT LENSES		32	44	22	0	5	95	
4155	90			24	2,6,6,8,(10)	SC-SM (A-4(0))	gray, wet, med. dense	SILTY CLAYEY SAND		33	26	6	2	55	43	
4150	95			20	0,2,6,11,(7)	SP (A-1-b(0))	gray, wet, loose, 1" clay layer	SAND W/SILT		32		NP	0	96	4	

LOGV1_COLOR 119C_LOGS_COLOR.GPJ US EVAL.GDT 8/28/06

RB&G ENGINEERING INC.
PROVO, UTAH

LEGEND:

DISTURBED SAMPLE — 2,3,2,(6) ← Blow Count per 6" / ← $(N_1)_{60}$ Value; 0.45 ← Torvane (tsf)

UNDISTURBED SAMPLE — PUSHED; 0.45 ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
TS = Triaxial Shear
CBR = California Bearing Ratio
= Potential Liquefaction
= Potential Liquefaction & Lateral Spread

DRILL HOLE LOG

BORING NO. RSB-19-613

PROJECT: LEGACY PARKWAY - STR. C-948 (GLOVER'S PED. OVER I-15 & UPPR)
CLIENT: UTAH DEPARTMENT OF TRANSPORTATION
LOCATION: N ~399,401, E ~65,527
DRILLING METHOD: CME-850
DRILLER: UDOT: SIZEMORE, WORWOOD, MALONE
DEPTH TO WATER - INITIAL: ▽ 2.8' **AFTER 24 HOURS:** ▼ 0.0' ARTESIAN

PROJECT NUMBER: 200601.119
DATE STARTED: 4/27/06
DATE COMPLETED: 5/5/06
GROUND ELEVATION: ~4245.4'
LOGGED BY: SIZEMORE, J. BOONE

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	Sample USCS (AASHTO)	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
4145				21	3,12,27,50/4", (31)	SM	gray, wet, dense								
4140	105			24	6,11,16,17, (21)	SM (A-4(0))	gray, wet, med. dense — SILTY SAND		21		NP	1	61	38	
4135	110			16	8,16,27,40, (33)	SM	gray, wet, dense								
4130	115			11	3,8,19,36,(20)	SC-SM	gray, loose — CLAYEY SAND								
						SM (A-2-4(0))	gray, wet, dense — SILTY SAND		13		NP	5	66	29	
4125	120			12	8,14,17,18, (23)	SM	gray, wet, med. dense								
4120	125			12	19,39,39, 50/4",(56)	SM (A-1-b(0))	gray, wet, very dense — SILTY SAND W/GRAVEL				NP	12	71	17	
4115	130			18	8,24,35,28, (42)	SM	gray, wet, very dense								
4110	135														
4105	140														
4100	145														

_OGV1_COLOR 119C_LOGS_COLOR.GPJ US EVAL.GDT 8/28/06

RB&G ENGINEERING INC.
PROVO, UTAH

LEGEND:

DISTURBED SAMPLE — 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; 0.45 ← Torvane (tsf)

UNDISTURBED SAMPLE — PUSHED; 0.45 ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
TS = Triaxial Shear
CBR = California Bearing Ratio
= Potential Liquefaction
= Potential Liquefaction & Lateral Spread

DRILL HOLE LOG

BORING NO. RSB-19-614

PROJECT: LEGACY PARKWAY - STR. C-948 (GLOVER'S PED. OVER I-15 & UPPR)
CLIENT: UTAH DEPARTMENT OF TRANSPORTATION
LOCATION: EAST ABUTMENT; N 399,404, E 65,762
DRILLING METHOD: BEDKE CME-75 / N.W. CASING
DRILLER: M. WAYMENT
DEPTH TO WATER - INITIAL: ▽ 2.0' **AFTER 24 HOURS:** ▼ 3.0'

PROJECT NUMBER: 200601.119
DATE STARTED: 3/23/06
DATE COMPLETED: 3/29/06
GROUND ELEVATION: 4247.2'
LOGGED BY: M.H., G.P., N.B., J.B.

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	USCS (AASHTO)	Material Description		Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
4245				13	1,2,12,(29)	CL	brown, moist, firm	SANDY CLAY W/CONCRETE PIECES (fill)								
	5			3	1,3,5,(16)	SM	gray-brown, wet, med. dense	SILTY SAND								
4240				12	2,2,3,(10) 0.24	SP-SM CL (A-7-6(10))	gray-brown, wet, loose; gray-brown, moist, soft to firm	SAND W/SILT; SANDY LEAN CLAY		24.5	42	23	9	34	57	
	10															
4235				3	Pushed*	SM	dk. gray, wet *tried shelby, no recovery, pushed SPT sampler, 3" recovery	SILTY SAND								
	15			13	1,2,4,(11)	ML	dk. gray, wet, med. dense									
4230				15	1,2,4,(10)	ML (A-4(0))	dk. gray, wet, med. dense	SANDY SILT		34		NP	0	42	58	
	20			20	0/18",(0) 0.21	CL	brown, moist, soft									
4225																
	25			14	Pushed 0.23	CL (A-6(18))	red-brown, moist, soft	LEAN CLAY W/SAND & SILT LENSES 0.13" TO 2" APART	85.5	36.1	40	18	0	6	94	CT UC
4220																
	30			21	0/18",(0) 0.52	CL	brown, moist, stiff									
4215																
	35			19	Pushed 0.34	CL (A-6(18))	gray & brown, moist, firm			32.8	39	18	0	5	95	
4210																
	40			21	0/18",(0) 0.30	CL	gray & brown, moist, firm	LEAN CLAY W/SILTY SAND LAYERS TO 2" THICK								
4205																
	45			16	0.17 Pushed	CL SM	gray, very moist, soft; gray, wet	SILTY SAND								
4200								LEAN CLAY W/SILT & SAND LENSES 0.13" TO 1.5" APART								

RB&G ENGINEERING INC.
PROVO, UTAH

LEGEND:
DISTURBED SAMPLE: 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; 0.45 ← Torvane (tsf)
UNDISTURBED SAMPLE: PUSHED; 0.45 ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
TS = Triaxial Shear
CBR = California Bearing Ratio
= Potential Liquefaction
= Potential Liquefaction & Lateral Spread

LOGV1 COLOR 119C LOGS COLOR.GPJ US EVAL.GDT 8/28/06

DRILL HOLE LOG

BORING NO. RSB-19-614

PROJECT: LEGACY PARKWAY - STR. C-948 (GLOVER'S PED. OVER I-15 & UPPR)
CLIENT: UTAH DEPARTMENT OF TRANSPORTATION
LOCATION: EAST ABUTMENT; N 399,404, E 65,762
DRILLING METHOD: BEDKE CME-75 / N.W. CASING
DRILLER: M. WAYMENT
DEPTH TO WATER - INITIAL: ▽ 2.0' **AFTER 24 HOURS:** ▼ 3.0'

PROJECT NUMBER: 200601.119
DATE STARTED: 3/23/06
DATE COMPLETED: 3/29/06
GROUND ELEVATION: 4247.2'
LOGGED BY: M.H., G.P., N.B., J.B.

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Rec. (in)	See Legend	USCS (AASHTO)	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
				21	3,1,1,(2) 0.32,0.42	CL	gray, moist, firm								
4195							LEAN CLAY W/SILT & SAND LENSES 0.13" TO 1.5" APART								
	55			18	Pushed 0.53	CL (A-7-6(20))	dk. gray, moist, stiff	87.2	34.3	43	20	0	8	92	CT UC
4190															
	60			10	4,8,10,(17)	SM (A-2-4(0))	dk. gray, wet, med. dense		22.6		NP	0	79	21	
4185							SILTY SAND W/OCCASIONAL CLAY LAYER TO 1" THICK								
	65			14	12,12,10,(20)	SM	dk. gray, wet, med. dense								
4180						SM (A-2-4(0))	greenish-gray, wet, med. dense		25.2		NP	0	73	27	
	70			16	8,6,7,(11) 0.52	CL	green-gray, moist, stiff LEAN CLAY								
						SM	dk. gray, wet, med. dense								
4175							SILTY SAND W/OCCASIONAL CLAY LAYER TO 1.5" THICK								
	75			0	Pushed	-									
				18	4,7,12,(16)	SM (A-1-b(0))	dk. gray to black, wet, med. dense		10.6		NP	1	85	14	
4170															
	80			13	Pushed	SP-SM	greenish-gray, wet								
4165				6.5	0/3",2,5,5,(8)	SP-SM	greenish-gray, wet, loose								
							SAND W/SILT layers of sand w/gravel to 3" thick								
	85														
4160				18	0/1",1,2,3,(4)	SP-SM (A-1-b(0))	dk. gray, wet, loose		25.9		NP	0	92	8	
	90			0	Pushed	-									
				11	27,31,30,(46)	SM	greenish-gray, wet, very dense								
4155							SILTY SAND W/OCCASIONAL CLAY LAYER TO 1" THICK								
	95			11	30,19,16,(26)	SM (A-4(0))	greenish-gray, wet, med. dense		25.7		NP	5	50	45	
4150															
				1*	32,15,7,(16)	-	*rock stuck in shoe								

LEGEND:

DISTURBED SAMPLE: 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; 0.45 ← Torvane (tsf)

UNDISTURBED SAMPLE: PUSHED; 0.45 ← Torvane (tsf)

OTHER TESTS
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CBR = California Bearing Ratio
= Potential Liquefaction
= Potential Liquefaction & Lateral Spread

RB&G ENGINEERING INC.
PROVO, UTAH

.OGV1_COLOR 119C_LOGS_COLOR.GPJ US EVAL.GDT 8/28/06

DRILL HOLE LOG

BORING NO. RSB-19-614

PROJECT: LEGACY PARKWAY - STR. C-948 (GLOVER'S PED. OVER I-15 & UPPR)
CLIENT: UTAH DEPARTMENT OF TRANSPORTATION
LOCATION: EAST ABUTMENT; N 399,404, E 65,762
DRILLING METHOD: BEDKE CME-75 / N.W. CASING
DRILLER: M. WAYMENT
DEPTH TO WATER - INITIAL: ▽ 2.0' **AFTER 24 HOURS:** ▼ 3.0'

PROJECT NUMBER: 200601.119
DATE STARTED: 3/23/06
DATE COMPLETED: 3/29/06
GROUND ELEVATION: 4247.2'
LOGGED BY: M.H., G.P., N.B., J.B.

Elev. (ft)	Depth (ft)	Lithology	Sample Type	Sample Rec. (in)	Sample See Legend	Sample USCS (AASHTO)	Material Description	Dry Density (pcf)	Moisture Content (%)	Atter. Liquid Limit	Atter. Plast. Index	Gradation Gravel (%)	Gradation Sand (%)	Gradation Silt/Clay (%)	Other Tests
4145				15	8,7,15,(16)	SM (A-4(0))	greenish-gray, wet, med. dense — SILTY SAND W/OCCASIONAL CLAY LAYER TO 1" THICK		22.3		NP	7	56	37	
	105			9	13,16,21,(26)	SM	greenish-gray, wet, med. dense — SILTY SAND W/GRAVEL								
4140															
	110			12	12,11,18,(20)	SM (A-1-b(0))	greenish-gray, wet, med. dense		19.2		NP	24	52	24	
4135															
	115														
4130															
	120														
4125															
	125														
4120															
	130														
4115															
	135														
4110															
	140														
4105															
	145														
4100															

_OGV1_COLOR 119C_LOGS_COLOR.GPJ US EVAL.GDT 8/28/06

RB&G ENGINEERING INC.
PROVO, UTAH

LEGEND:

DISTURBED SAMPLE — 2,3,2,(6) ← Blow Count per 6" / $(N_1)_{60}$ Value; 0.45 ← Torvane (tsf)

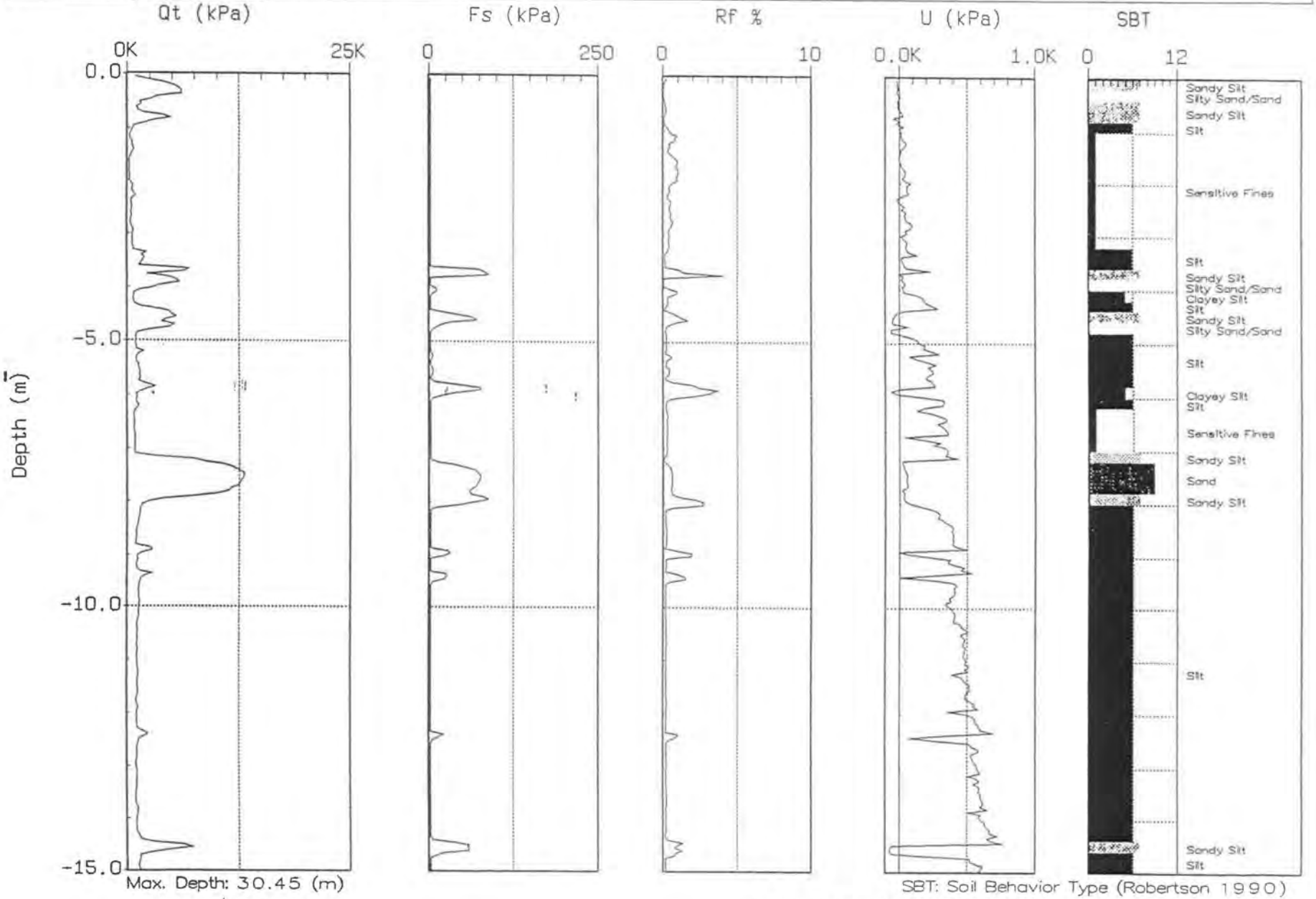
UNDISTURBED SAMPLE — PUSHED; 0.45 ← Torvane (tsf)

OTHER TESTS
UC = Unconfined Compression
CT = Consolidation
DS = Direct Shear
TS = Triaxial Shear
CBR = California Bearing Ratio
= Potential Liquefaction
= Potential Liquefaction & Lateral Spread

Legacy Parkway

Site. -19-277
Station: 50+734.701 0.00 LT
Elevation: 1290.960

Cone: 20 TON A C
Date: 01:31:00 14:01



Max. Depth: 30.45 (m)
Depth Inc.: 0.050 (m)

SBT: Soil Behavior Type (Robertson 1990)

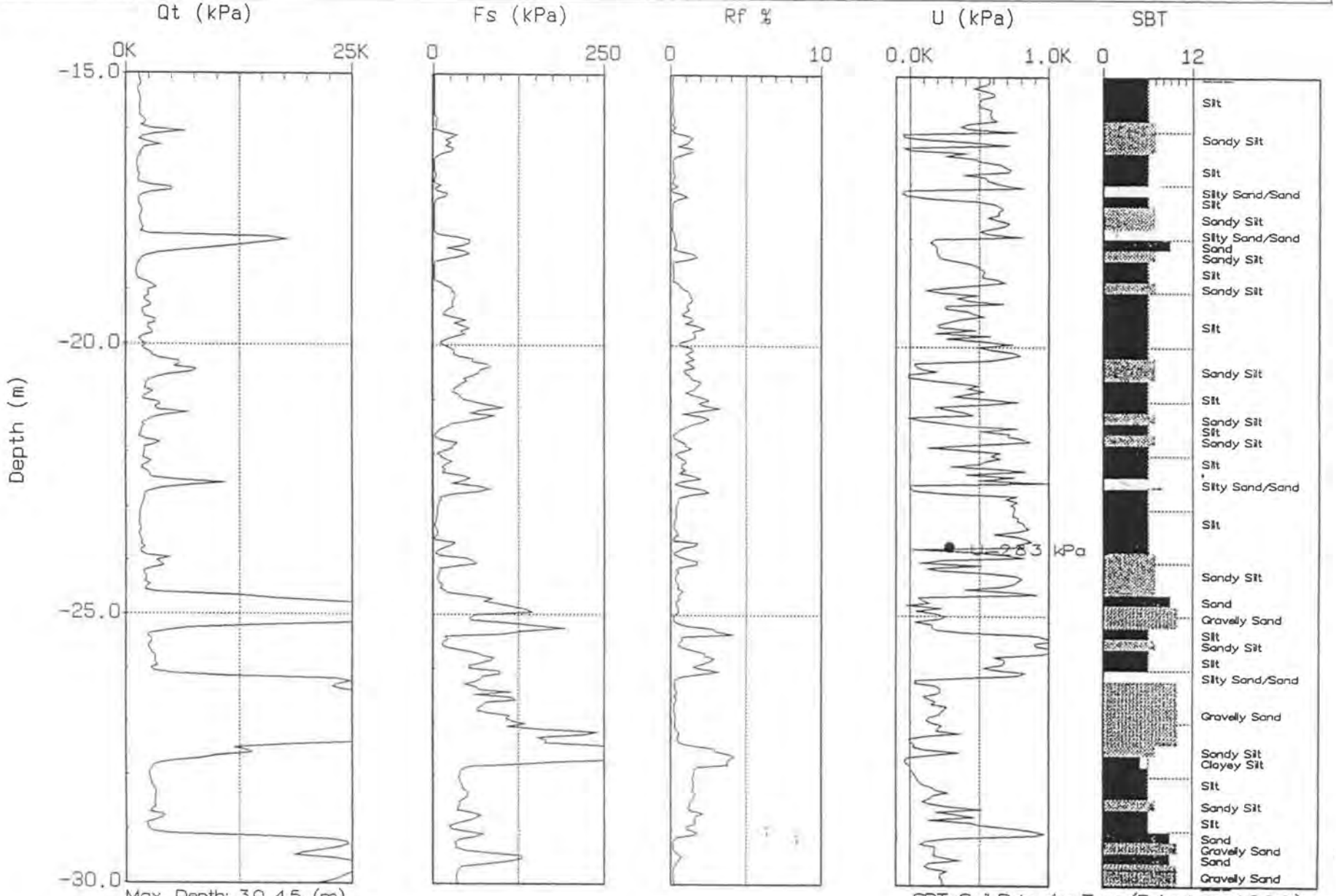
● Equilibrium (or near) Pore Pressure from Dissipation

PLATE B-218

Legacy Parkway

Site: SC-19-277
Station: 50+734.701 0.00 LT
Elevation: 1290.960

Cone: 20 TON A 070
Date: 01:31:00 14:01



Max. Depth: 30.45 (m)
Depth Inc.: 0.050 (m)

SBT: Soil Behavior Type (Robertson 1990)

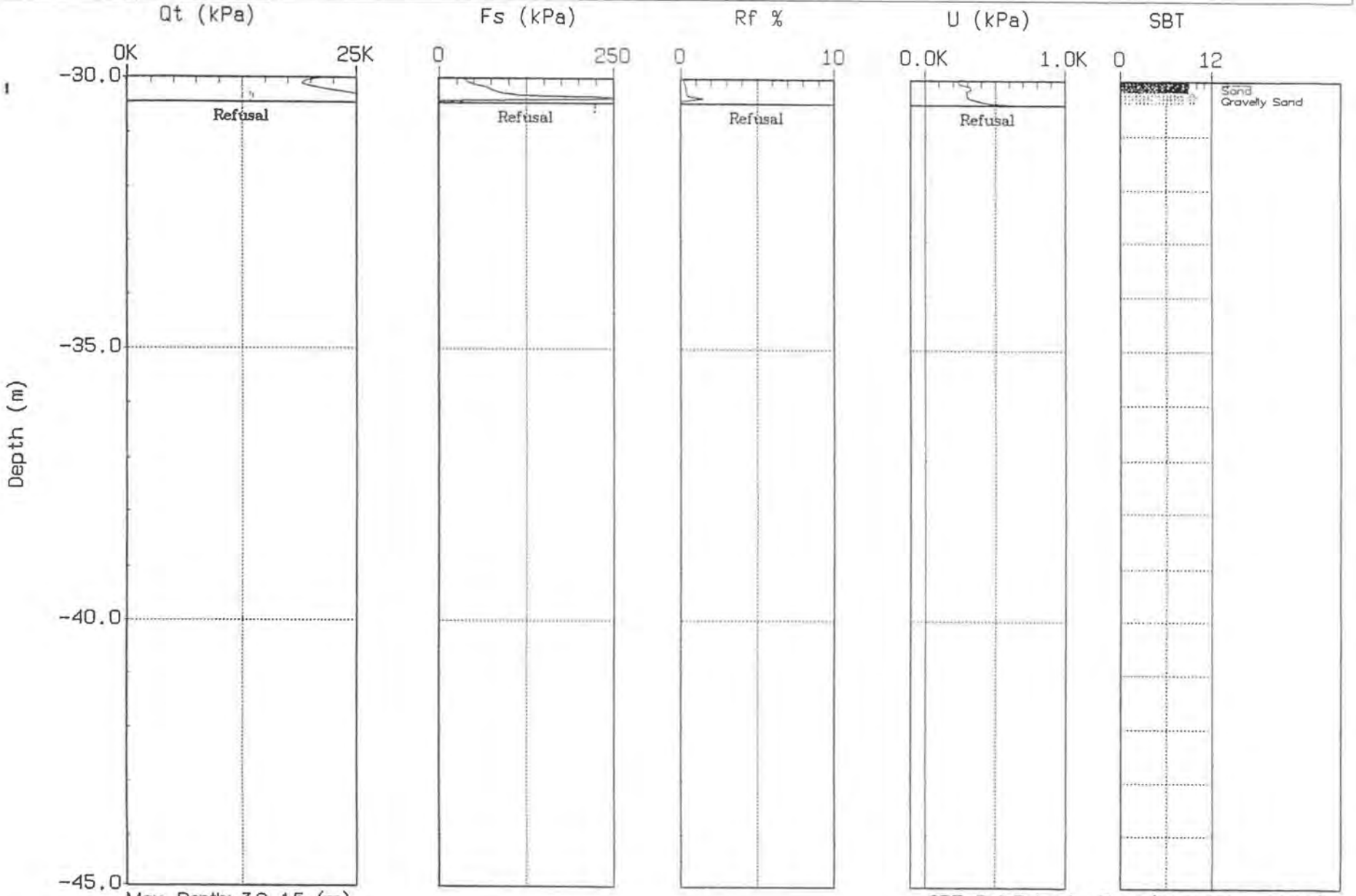
● Equilibrium (or near) Pore Pressure from Dissipation

PLATE B-219

Legacy Parkway

Site: 3C-19-277
Station: 50+734.701 0.00 LT
Elevation: 1290.960

Cone: 20 TON A 0/0
Date: 01:31:00 14:01



Max. Depth: 30.45 (m)
Depth Inc.: 0.050 (m)

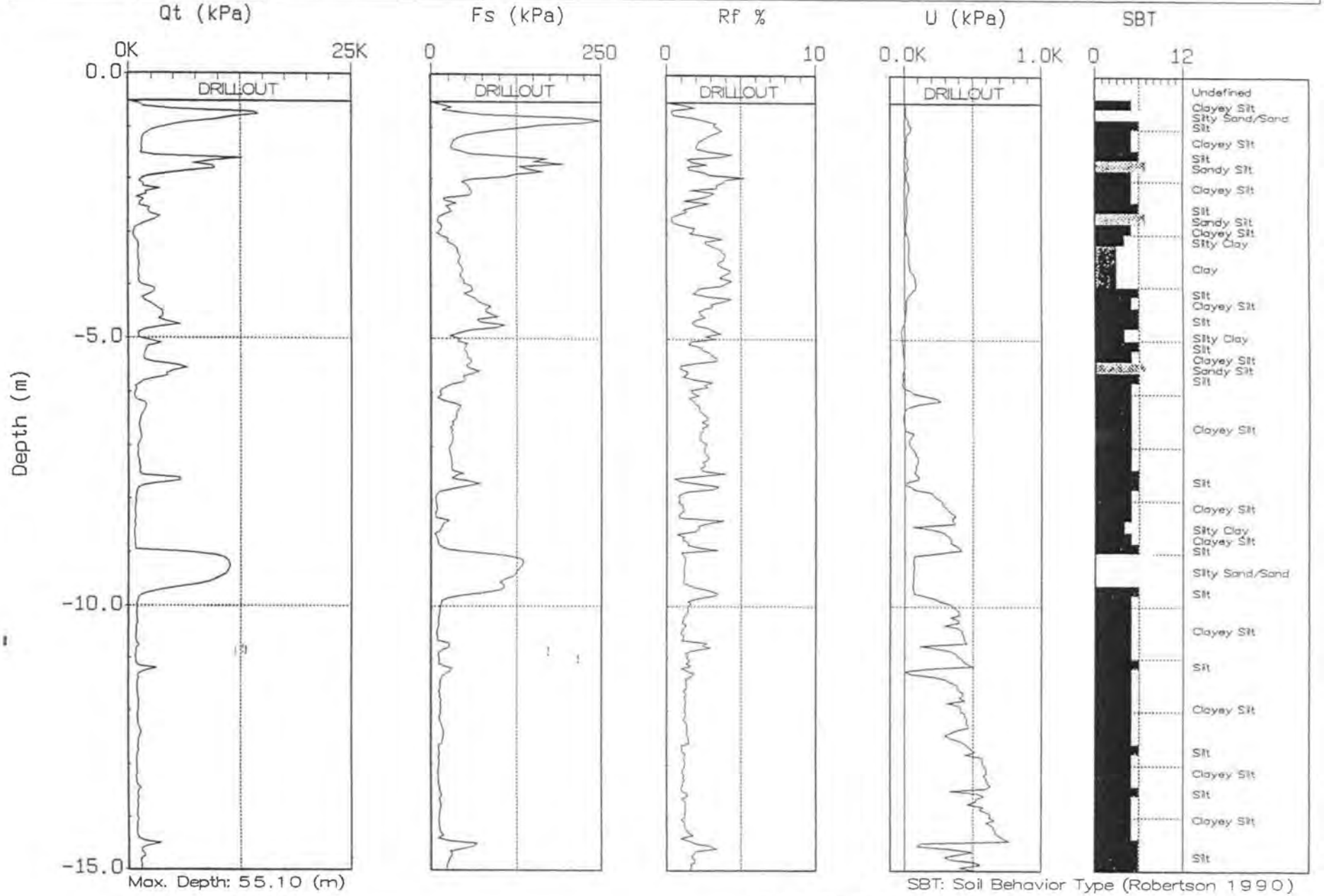
SBT: Soil Behavior Type (Robertson 1990)

● Equilibrium (or near) Pore Pressure from Dissipation

Legacy Parkway

Site: [illegible]-19-278
Station: 50+775.871 5.71 RT
Elevation: 1291.890

Cone: 20 TON A 0[illegible]
Date: 02:14:00 11:39



Max. Depth: 55.10 (m)
Depth Inc.: 0.050 (m)

SBT: Soil Behavior Type (Robertson 1990)

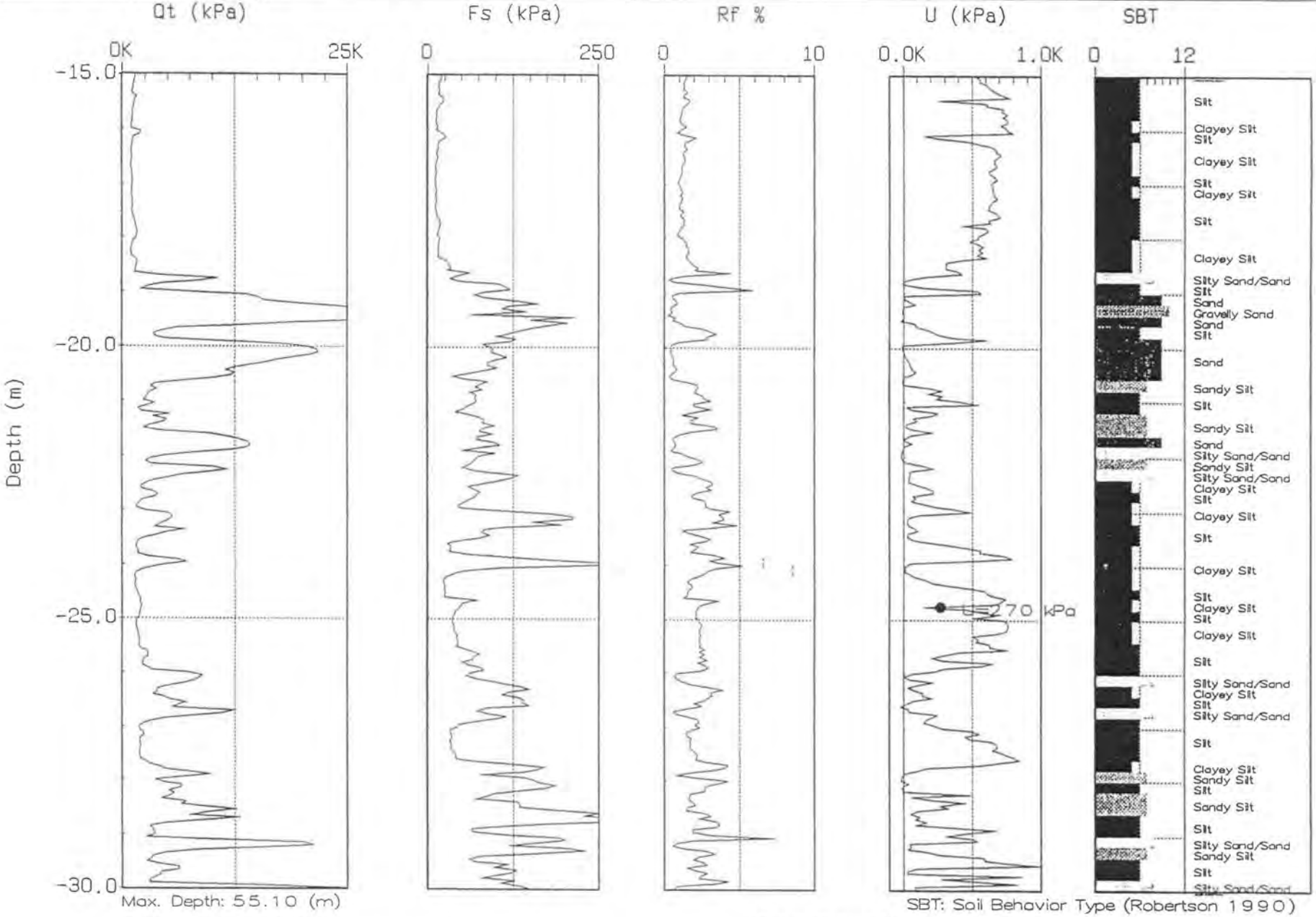
● Equilibrium (or near) Pore Pressure from Dissipation

CONETEC

Legacy Parkway

Site: SC-19-278
Station: 50+775.871 5.71 RT
Elevation: 1291.890

Cone: 20 TON A 092
Date: 02:14:00 11:39



Max. Depth: 55.10 (m)
Depth Inc.: 0.050 (m)

SBT: Soil Behavior Type (Robertson 1990)

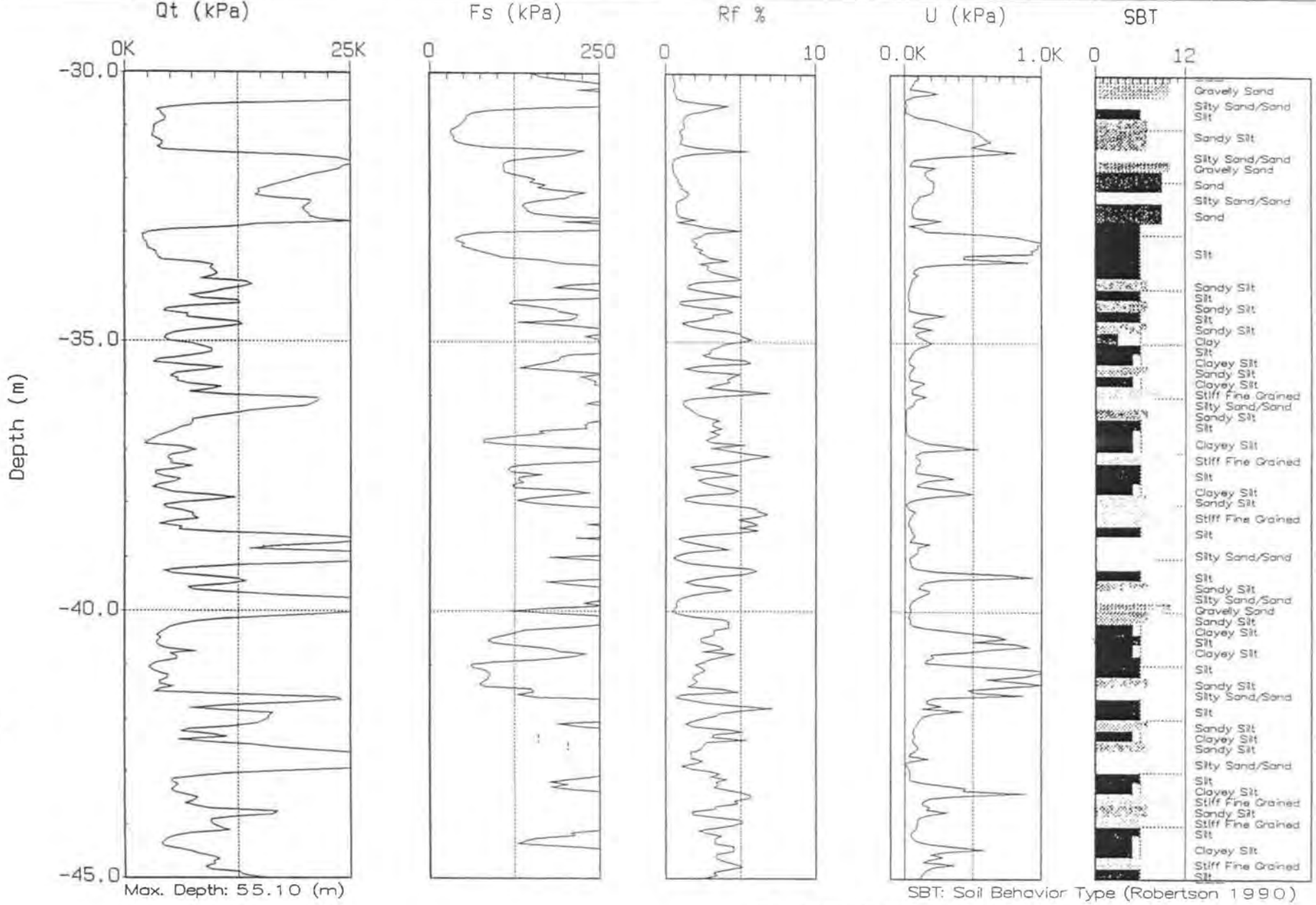
● Equilibrium (or near) Pore Pressure from Dissipation

PLATE B-222

Legacy Parkway

Site: SC-19-278
Station: 50+775.871 5.71 RT
Elevation: 1291.890

Cone: 20 TON A 092
Date: 02:14:00 11:39



Max. Depth: 55.10 (m)

Depth Inc.: 0.050 (m)

SBT: Soil Behavior Type (Robertson 1990)

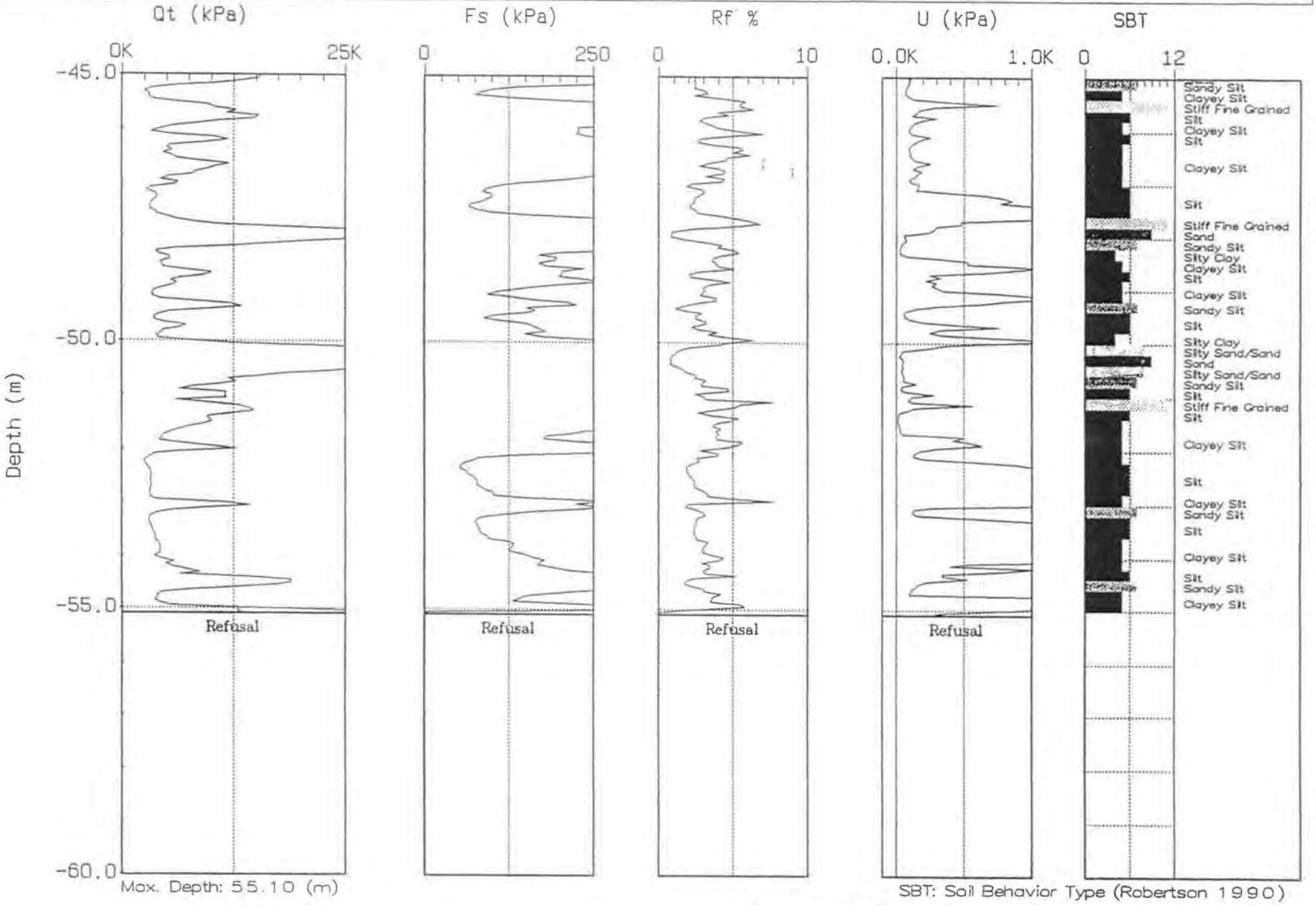
● Equilibrium (or near) Pore Pressure from Dissipation

CONETEC

Legacy Parkway

Site: SC-19-278
Station: 50+775.871 5.71 RT
Elevation: 1291.890

Cone: 20 TON A 092
Date: 02:14:00 11:39



Max. Depth: 55.10 (m)
Depth Inc.: 0.050 (m)

SBT: Soil Behavior Type (Robertson 1990)

● Equilibrium (or near) Pore Pressure from Dissipation

Boring: SB-19-279
Sheet 1 of 3

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Graphic Log	Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	Test Results * S_u kPa (Italicized)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
	FILL: SAND and GRAVEL - medium dense, moist, brownish tan to black, with re-milled asphalt rubble		1													
	Lean CLAY - soft to medium stiff, moist, black, with organics	5	2		P	559	CL	A-6		46	13.8	31	43	17		C SG
1290																
	Poorly Graded SAND - medium dense, moist, gray to black - with GRAVEL	10	3		SPT	305	SP	A-3	4 9 5							
			4													
	- becomes wet - Lean CLAY layer, with organics	15	5		SPT	254			1 2 4							
	Lean CLAY, medium stiff, wet, brown		6				CL	A-6								
	- sand lense	20			SPT	0	CL	A-6	4 1 2							
	Lean CLAY - medium stiff, wet, brown		7		P	610				30 38	14.4	34	38	13	95	DS
1285	- Poorly graded SAND layer, loose, wet, gray	25	8		P	610				43	14.0	34				C SG
	Poorly Graded SAND with silt- dense, wet, gray, fine-grained	30	9		SPT	381	SP-SM	A-1-b	7 9 8						11	
	Lean CLAY - medium stiff, wet, brown, with silt		10				CL	A-6								
		35	11		P	610				44 53	14.8	31	40	19		
1280			12													
	- occasional sand seams	40			SPT	457			1 2 2							
			13													
		45	14		P	610				38						
			15													
	- soft	50			SPT	25			1 1 1							
			16													
1275		55	17													
			18													
		60			P	610				48	14.7	30				C SG
	Poorly Graded SAND - dense, wet, gray, fine to coarse-grained with fine-grained gravel and trace of clay		19				SP	A-1-b								
		65														

● SPT $(N_1)_{60}$ ○ SPT $(N_1)_{60}$ (Greater than 50 Blows)

Legacy Parkway - Preferred Alternative
I-215 to I-15/US 89 Interchange

KLEINFELDER

Project No. 35-8163-05

FIELD TEST BORING LOG

Boring: **SB-19-279**

Sheet 1 of 3

Logged by:	C. Wieden
Date Start:	3/3/00
Date Finish:	3/5/00
Station:	50+775.871 5.71 RT
Line:	GLOVERS LANE
Coordinates (m):	N 121,722.593 E 19,976.723
Elevation (m):	1291.953
Total Depth Drilled (m)	43.1
Drill Contractor:	Haz-tech
Driller:	M. Corn
Rig Type:	Longyear BK-81
Drilling Method:	Mud Rotary
Hammer Type:	Automatic
Rod Type:	NW
Boring Diameter:	121 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

* = See Key to Soil Logs for list of abbreviations and descriptions of tests

SAMPLE TYPE

SPT = Standard Penetration Test, 34.9mm ID and 50.8mm OD split spoon sampler

MC = Modified California Sampler, 50.8mm ID and 63.5mm OD split spoon sampler

P = Piston Sampler, 76.2 mm OD

SH = Shelby Tube, 76.2mm OD, pushed

BAG = Bulk Sample

UTDOT 2003B28B.GPJ 8/3/00

Boring: SB-19-279
Sheet 2 of 3

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Graphic Log	Sample Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	SPT $(N_1)_{60}$ / SPT $(N_1)_{60}$ (Greater than 50 Blows)	Test Results * S_u kPa (Italicized)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
	-Poorly graded SAND, continued				SPT				11 9 10								
	Sandy Lean CLAY - stiff, wet, gray, with frequent clayey sand layers 75 to 100 mm thick	70	21		P	508	CL	A-6			57						
1270			22														
	- occasional sand layers, 75 mm thick	75	23														
			24														
		80	25		SPT				4 3 4	12							
		85	26														
1265			27														
	Silty SAND with gravel - dense, wet, gray, with occasional sandy clay layers 75 mm thick, frequent silt seams	90	28		P SPT	152	SM	A-2-5	2 13 9	34							
	Lean CLAY, stiff, wet, gray	95	29		SPT		CL	A-6	17 10 10	34							
			30														
	Silty SAND with GRAVEL - very dense, wet, gray	100	31		P	610	SM	A-2-4								6	
1260		105	32		SPT				25 33 34								
			33														
	- Lean CLAY layer, very stiff, wet, olive gray, with silt and sand	110	34		SPT				13 9 12	25							
	- Sandy CLAY/Silty SAND layer 300 mm thick - Sandy CLAY layer 300 mm thick, stiff, wet, olive gray	115	35		SPT				7 28 50								
			36														
	- dense	120	37		SPT				17 21 19	42							SV
1255	- gravel layer - medium dense	125	38		SPT				10 13 15	28							
			39														
		130			SPT												

Legacy Parkway - Preferred Alternative
I-215 to I-15/US 89 Interchange
KLEINFELDER
Project No. 35-8163-05

FIELD TEST BORING LOG

Boring: SB-19-279

Sheet 2 of 3

Logged by:	C. Wieden
Date Start:	3/3/00
Date Finish:	3/5/00
Station:	50+775.871 5.71 RT
Line:	GLOVERS LANE
Coordinates (m):	N 121,722.593 E 19,976.723
Elevation (m):	1291.953
Total Depth Drilled (m):	43.1
Drill Contractor:	Haz-tech
Driller:	M. Corn
Rig Type:	Longyear BK-81
Drilling Method.	Mud Rotary
Hammer Type:	Automatic
Rod Type:	NW
Boring Diameter:	121 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

* = See Key to Soil Logs for list of abbreviations and descriptions of tests

SAMPLE TYPE

SPT = Standard Penetration Test, 34 9mm ID and 50.8mm OD split spoon sampler

MC = Modified California Sampler, 50.8mm ID and 63.5mm OD split spoon sampler

P = Piston Sampler, 76.2 mm OD

SH = Shelby Tube, 76.2mm OD, pushed

BAG = Bulk Sample

UTDOT Z0039828.GPJ 9/31/00

Boring: SB-19-279
Sheet 3 of 3

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Graphic Log	Sample Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	SPT $(N_1)_{60}$ / SPT $(N_1)_{60}$ (Greater than 50 Blows) 0 25 50	Su, kPa (torvane in italics)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
	- very dense								40 50/100mm								
		135	41		SPT				16 14 23	34							
1250			42														
	- Lean CLAY layer 600 mm thick, stiff, wet, gray, with silt	140	43		SPT				6 16 16	30							
	- medium dense																
		145	44														
			45														
		150	46														
1245		155	47														
			48														
		160	49														
			50														
		165	51														
1240		170	52														
			53														
		175	54														
		180	55														
			56														
		185	57														
1235																	
		190	58														
			59														
		195															

Legacy Parkway - Preferred Alternative
I-215 to I-15/US 89 Interchange

KLEINFELDER

Project No. 35-8163-05

FIELD TEST BORING LOG

Boring: SB-19-279

Sheet 3 of 3

Logged by:	C. Wieden
Date Start:	3/3/00
Date Finish:	3/5/00
Station:	50+775.871 5.71 RT
Line:	GLOVERS LANE
Coordinates (m):	N 121,722.593 E 19,976.723
Elevation (m):	1291.953
Total Depth Drilled (m):	43.1
Drill Contractor:	Haz-tech
Driller:	M. Corn
Rig Type:	Longyear BK-81
Drilling Method:	Mud Rotary
Hammer Type	Automatic
Rod Type	NW
Boring Diameter:	121 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

* = See Key to Soil Logs for list of abbreviations and descriptions of tests

SAMPLE TYPE

SPT = Standard Penetration Test, 34.9mm ID and 50.8mm OD split spoon sampler

MC = Modified California Sampler, 50.8mm ID and 63.5mm OD split spoon sampler

P = Piston Sampler, 76.2 mm OD

SH = Shelby Tube, 76.2mm OD, pushed

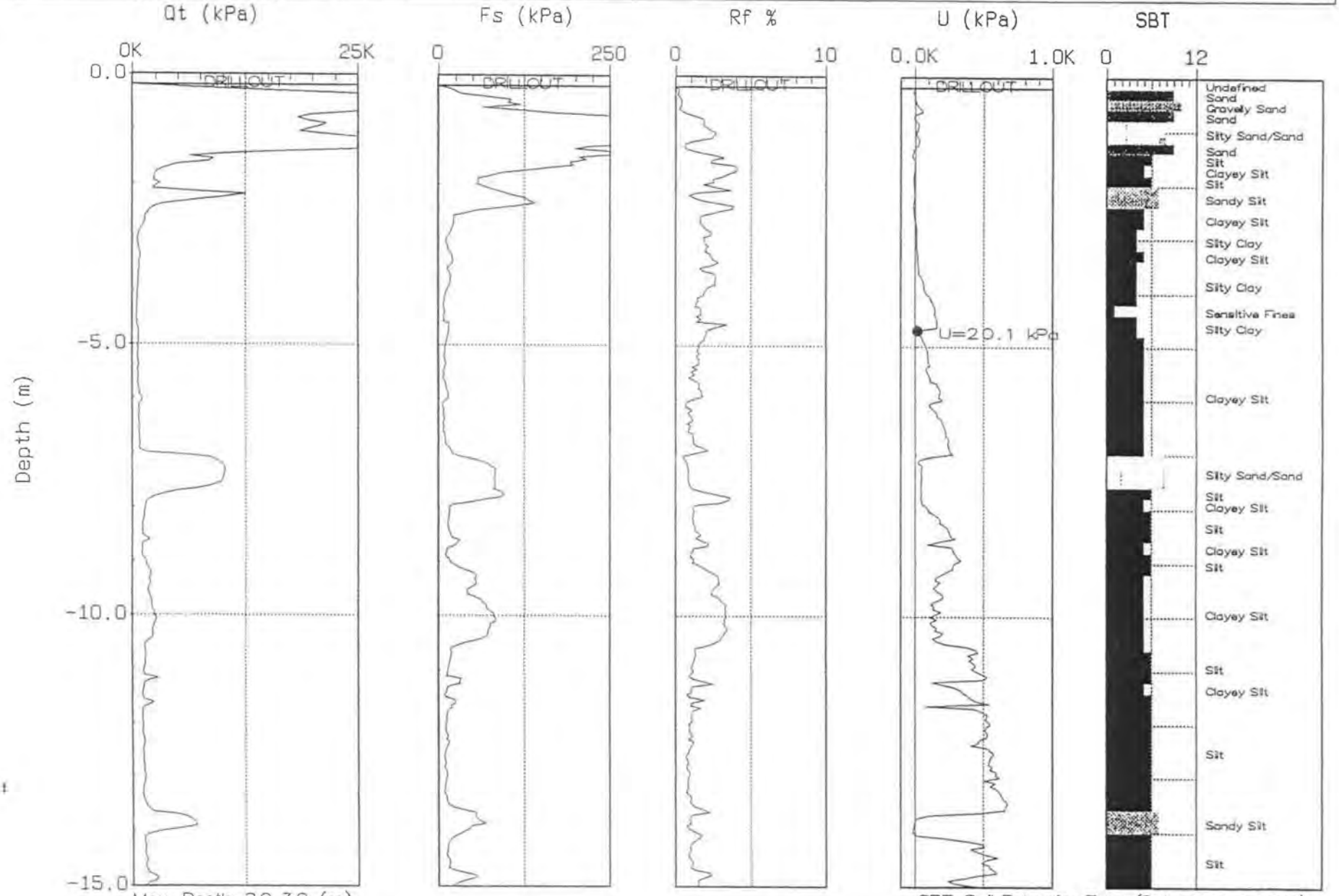
BAG = Bulk Sample

UTDOT 20038828.GPJ 8/31/00

Legacy Parkway

Site: SC-19-280
Station: 50+809.297 1.40 RT
Elevation: 1292.810

Cone: 20 TON A 70
Date: 03:02:00 10:15



Max. Depth: 20.30 (m)
Depth Inc.: 0.050 (m)

SBT: Soil Behavior Type (Robertson 1990)

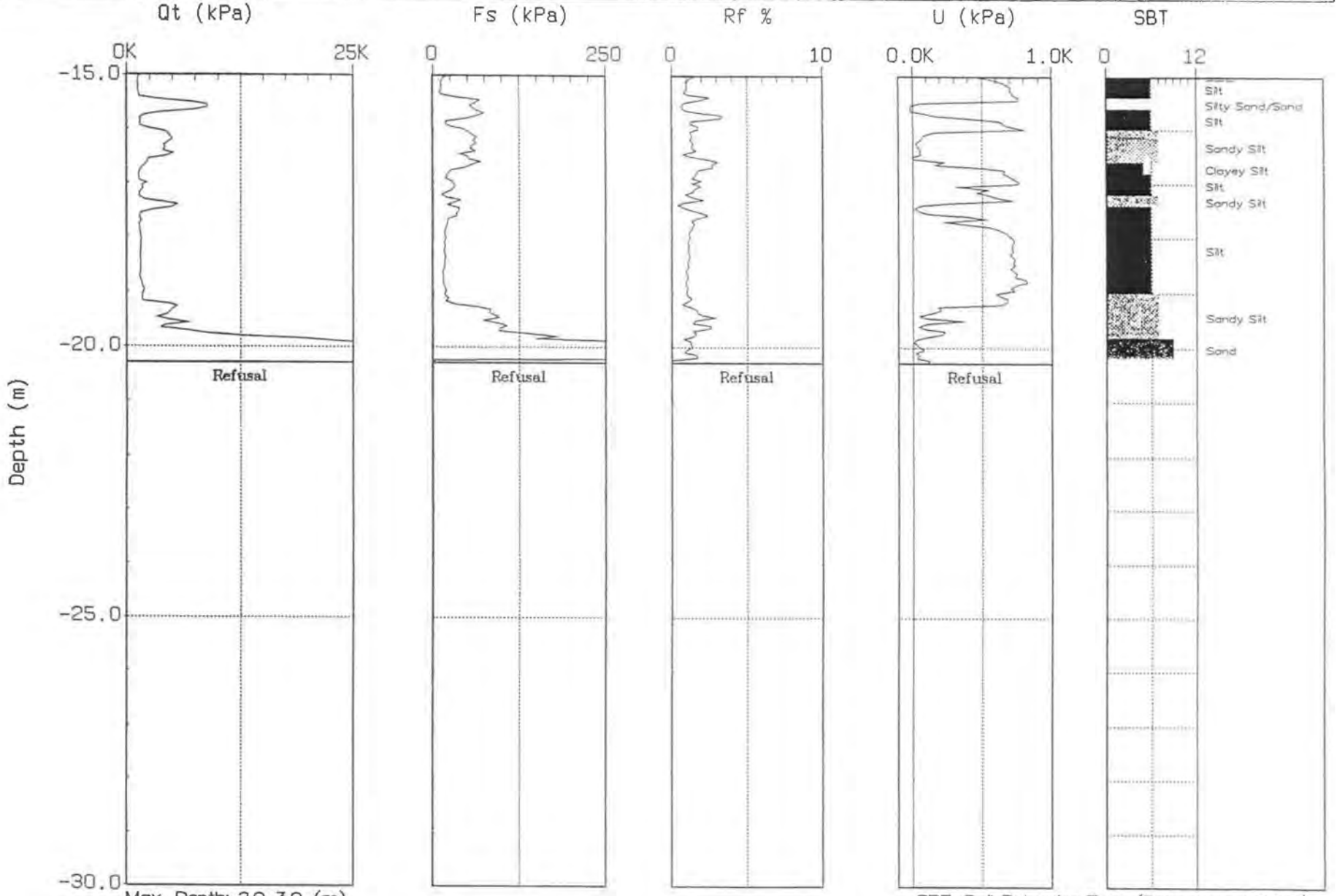
● Equilibrium (or near) Pore Pressure from Dissipation

CONETEC

Legacy Parkway

Site: SC-19-280
Station: 50+809.297 1.40 RT
Elevation: 1292.810

Cone: 20 TON A 070
Date: 03:02:00 10:15



Max. Depth: 20.30 (m)
Depth Inc.: 0.050 (m)

SBT: Soil Behavior Type (Robertson 1990)

● Equilibrium (or near) Pore Pressure from Dissipation

Boring: SB-19-281
Sheet 1 of 3

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Graphic Log	Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	Test Results * S_u, kPa (italics)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
	FILL: SAND and GRAVEL - medium dense to dense, moist, brownish gray		1													
		5			SPT	457	CL	A-6	9 3 1							
1290	Lean CLAY - soft, very moist, black, with organics		2													
		10	3		P	508				43						
			4				ML	A-4								
	SILT - stiff, wet, dark gray, with fine-grained sand	15			SPT	203			3 5 4							
			5													
		20	6		P	610										
	Silty SAND - medium dense, wet, brown, with silt						SM	A-2-5		38						
1285			7													
	Elastic SILT - medium stiff, wet, gray	25					MH	A-7-5								
			8		SPT				0 2 2							
		30	9		P	610				30 48	15.4	31			96	C SG
	- very soft		10													
		35	11		SPT				0 0 0							
1280		40	12		P	508				48						
			13													
		45	14		SPT				0 2 2							
		50	15		P	0										
			16		P	610				46 29	11.8	50	50	16	96	C SG
1275		55	17													
	Poorly Graded SAND with silt - dense, wet, fine-grained						SP-SM	A-1-b								
		60	18		SPT	457			6 12 17							
			19													
		65														

● SPT $(N_1)_{60}$
○ SPT $(N_1)_{60}$ (Greater than 50 Blows)
0 25 50

Legacy Parkway - Preferred Alternative
I-215 to I-15/US 89 Interchange
KLEINFELDER
Project No. 35-8163-05

FIELD TEST BORING LOG

Boring: **SB-19-281**

Sheet 1 of 3

Logged by:	C. Wieden
Date Start:	2/2/00
Date Finish:	2/5/00
Station:	50+840.936 7.44 RT
Line	GLOVERS LANE
Coordinates (m):	N 121,720.587 E 20,041.780
Elevation (m):	1291.983
Total Depth Drilled (m).	44.7
Drill Contractor:	Haz-tech
Driller:	M. Corn
Rig Type.	Longyear BK-81
Drilling Method:	Mud Rotary
Hammer Type:	Automatic
Rod Type:	NW
Boring Diameter:	121 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

* = See Key to Soil Logs for list of abbreviations and descriptions of tests

SAMPLE TYPE

SPT = Standard Penetration Test, 34.9mm ID and 50.8mm OD split spoon sampler

MC = Modified California Sampler, 50.8mm ID and 63.5mm OD split spoon sampler

P = Piston Sampler, 76.2 mm OD

SH = Shelby Tube, 76.2mm OD, pushed

BAG = Bulk Sample

UTDOT 2603B28.GPJ 8/31/00

Boring: SB-19-281
Sheet 2 of 3

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Graphic Log	Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	SPT $(N_1)_{60}$ (Greater than 50 Blows)	S_u kPa (tonnes in italics)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
	- Poorly Graded SAND with silt, continued; medium dense, wet, gray, fine to medium-grained, with some gravel				SPT	457			6 7 9		48						
	SILT - stiff, moist, gray, frequent sand and clay seams and layers	70	21		SPT	457	ML	A-4	3 7 7	14							
1270			22														
		75	23														
	- no visible sand or clay layers		24														
		80	25		P	610					34						
		85	26														
1265	Silty SAND - dense, wet, gray, frequent silt seams and layers, trace gravel	90	27		SPT	457	SM	A-2-5	7 14 14	24							
	SILT - very stiff, moist, gray, with trace of sand and occasional lean clay seams	95	28		SPT	457	ML	A-4	5 8 11	15							
	Silty SAND with GRAVEL - dense, wet, olive gray	100	29		SPT	254	SM	A-2-5	19 23 19	34							
1260	SILT - stiff, wet, interbedded with frequent silty sand layers	105	30		SPT	305	ML	A-4	9 7 10	14							
	Silty SAND with gravel - medium dense, very moist to wet, olive gray, with occasional silt and clay seams and layers	110	31		SPT	356	SM	A-2-5	11 10 9	15							
	- very dense	115	32		SPT	254			21 33 36								
1255	- medium dense	120	33		SPT	102			19 15 20	25							
		125	34		SPT				18 32 25	41							
	SILT - stiff, wet, olive gray, frequent clay layers up to 300 mm thick,	130	35		SPT		ML	A-4		14							

Legacy Parkway - Preferred Alternative
I-215 to I-15/US 89 Interchange

KLEINFELDER

Project No. 35-8163-05

FIELD TEST BORING LOG

Boring: **SB-19-281**

Sheet 2 of 3

Logged by:	C. Wieden
Date Start:	2/2/00
Date Finish:	2/5/00
Station:	50+840.936 7.44 RT
Line:	GLOVERS LANE
Coordinates (m)	N 121,720.587 E 20,041.780
Elevation (m):	1291.983
Total Depth Drilled (m):	44.7
Drill Contractor:	Haz-tech
Driller:	M. Corn
Rig Type:	Longyear BK-81
Drilling Method:	Mud Rotary
Hammer Type:	Automatic
Rod Type:	NW
Boring Diameter:	121 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

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SAMPLE TYPE

SPT = Standard Penetration Test, 34.9mm ID and 50.8mm OD split spoon sampler

MC = Modified California Sampler, 50.8mm ID and 63.5mm OD split spoon sampler

P = Piston Sampler, 76.2 mm OD

SH = Shelby Tube, 76.2mm OD, pushed

BAG = Bulk Sample

UTDOT Z003528.GPJ 8/31/00

Boring: SB-19-281
Sheet 3 of 3

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Graphic Log	Sample Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	SPT $(N_1)_{60}$ / SPT $(N_1)_{60}$ (Greater than 50 Blows)	Test Results * S_u, kPa (torvane in italics)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
	some fine-grained gravel					457	SM	A-2-4	4 10 10								
	Silty SAND - medium dense, wet, olive gray, frequent silt and clay layers, some gravel	135	41		SPT	305			10 8 13	15							
1250	- GRAVEL with cobbles	140	42		SPT	457			53 11 12	15							
	Lean CLAY layer		43														
		145	44		SPT				5 16 15	21							
			45														
		150	46														
1245		155	47														
			48														
		160	49														
		165	50														
			51														
1240		170	52														
		175	53														
			54														
		180	55														
		185	56														
1235			57														
		190	58														
		195	59														

Legacy Parkway - Preferred Alternative
I-215 to I-15/US 89 Interchange

KLEINFELDER

Project No. 35-8163-05

FIELD TEST BORING LOG

Boring: **SB-19-281**

Sheet 3 of 3

Logged by:	C. Wieden
Date Start:	2/2/00
Date Finish:	2/5/00
Station:	50+840.936 7.44 RT
Line	GLOVERS LANE
Coordinates (m):	N 121,720.587 E 20,041.780
Elevation (m):	1291.983
Total Depth Drilled (m).	44.7
Drill Contractor:	Haz-tech
Driller:	M. Corn
Rig Type.	Longyear BK-81
Drilling Method:	Mud Rotary
Hammer Type:	Automatic
Rod Type:	NW
Boring Diameter:	121 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

* = See Key to Soil Logs for list of abbreviations and descriptions of tests

SAMPLE TYPE

SPT = Standard Penetration Test, 34.9mm ID and 50.8mm OD split spoon sampler

MC = Modified California Sampler, 50 8mm ID and 63.5mm OD split spoon sampler

P = Piston Sampler, 76.2 mm OD

SH = Shelby Tube, 76.2mm OD, pushed

BAG = Bulk Sample

UTDOT ZM33B28.GPJ 6/21/00

Boring: LSB-19-473
Sheet 1 of 2

SAMPLE DESCRIPTION
(ASTM D 2488/D 2487)

Elevation (m)	Sample Description	Depth ft	Depth m	Type	Recovery (mm)	USCS	AASHTO	N, Blows per 0.15 m (or interval shown)	S_u, kPa (Italics)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No 200	Other Tests
1295	FILL: Poorly Graded SAND with gravel - medium dense, slightly moist, reddish brown, fine-grained sand						A-3								
			1	G											
		5		SPT	254			6 8 9 10							
			2	SPT	203	CL	A-4	3 2 3 3							
	Lean CLAY with sand - soft to medium stiff, moist to wet, grey	10	3	SPT	457			2 2 2 2				32	10	80	
			4	SPT	508			2 6 7 5							
	∇ - wet, increasing sand content	15	5	SPT	330			2 2 1 1						67	
1290	- occasional brown clay layers			SPT	432			2 4 2 3							
		20	6	SPT	508			2 1 2 1						87	
			7	SPT	229			1 5 7 8							
	Poorly Graded SAND with silt - loose to medium dense, wet, yellow brown, fine-grained sand	25	8	SPT	610	SP-SM	A-3	4 2 6 3						8	
				SPT	508			3 2 2 2							
	Lean CLAY - soft, wet, grey	30	9	SPT	533	CL	A-6	0 2 1 1				30	9	94	
1285			10	SPT	432			1 2 2 2							
	SILT - soft to medium stiff, wet, gray, occasional sand seams and layers	35	11	SPT	610	ML	A-4	4 3 3 4				36	10	94	
				SPT	610			4 3 4 4							
		40	12	SPT	610			1 2 2 1				35	11	96	
			13	SPT	559			2 2 1 3							
	Lean CLAY - soft to medium stiff, wet, gray	45	14	SPT	610	CL	A-6	2 3 3 4				36	14	95	
			15	SPT	610			3 1 2 3							
	- mottled brown and grey	50													
1280	Refer to SB-19-279 for additional lithologybetween 15 2 and 19.8 meters		16												
		55	17												
			18												
		60	19												
		65													

Graphic Log

● SPT $(N_1)_{60}$
○ SPT $(N_1)_{60}$ (Greater than 50 Blows)
0 25 50

Legacy Parkway Design/Build
I-215 to I-15/US 89 Interchange
KLEINFELDER
Project No. 35-8440-08

FIELD TEST BORING LOG

Boring: **LSB-19-473**

Sheet 1 of 2

Logged by	M. Ivers
Date Start	8/14/01
Date Finish	8/17/01
Station	50+814.377 0.0 RT
Line:	GLOVERS LANE
Coordinates (m)	N 121,728.140 E 20,015.253
Elevation (m)	1295.248
Total Depth Drilled (m)	33.5
Drill Contractor	RC Exploration
Driller:	N. Young
Rig Type	Diedrich D-120 Truck
Rig Serial Number	D-120037
Drilling Method	Hollow-Stem Auger
Hammer Type.	Automatic
Rod Type	AW
Boring Diameter	133 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

∇ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

* = See Key to Soil Logs for list of abbreviations and descriptions of tests

SAMPLE TYPE

SPT = Standard Penetration Test, 34 9mm ID and 50 8mm OD split spoon sampler

MC = Modified California Sampler, 50.8mm ID and 63 5mm OD split spoon sampler

P = Piston Sampler, 76.2 mm OD

SH = Shelby Tube, 76 2mm OD, pushed

BAG = Bulk Sample

UTDOT 38112LN.GPJ 12/20/03

PLATE A-7
STRUCTURE 19

Boring: LSB-19-473
Sheet 2 of 2

Elevation (m)	SAMPLE DESCRIPTION (ASTM D 2488/D 2487)	Depth ft	Depth m	Type	Recovery (mm)	Soil Classification USCS	Soil Classification AASHTO	N, Blows per 0.15 m (or interval shown)	SPT $(N_1)_{60}$	Test Results * S_u, kPa (torvane in italics)	Dry Density, kN/m³	Moisture, %	Liquid Limit	Plasticity Index	% Passing No. 200	Other Tests
1275	Silty GRAVEL with sand - loose, wet, fine to coarse grained sand		21	SPT	610	GM	A-2-4	4 4 5 6							24	
	Clayey GRAVEL with sand - medium dense, wet, grey, frequent clay layers	70	22	SPT	584	GC	A-2-6	8 9 7 7	11							
		75	23	SPT												
			24													
	Lean CLAY with gravel - stiff, wet, grey, with frequent silt layers	80	25	SPT	559	CL	A-6	2 3 7 9	7						72	
1270		85	26	SPT	457			4 4 4 8	5				42	18		
			27													
	Silty SAND - medium dense to dense, wet, grey, frequent silt layers	90	28	SPT	406	SM	A-2-4	9 10 10 10	12						44	
		95	29	SPT	559			12 21 19 21	25							
			30													
1265	Lean CLAY - very stiff to hard, wet, grey, occasional clayey gravel layers	100	31	SPT	483	CL	A-6	5 8 12 11	12							
		105	32	SPT	152			48 50/125 mm								
	Clayey GRAVEL - very dense, wet, grey		33	SPT	203	GC	A-2-6	18 35 18 17	31							
		110	34													
1260		115	35													
		120	36													
			37													
		125	38													
			39													
		130														

Legacy Parkway Design/Build
I-215 to I-15/US 89 Interchange
KLEINFELDER
Project No. 35-8440-08

FIELD TEST BORING LOG

Boring: LSB-19-473

Sheet 2 of 2

Logged by:	M. Ivers
Date Start:	8/14/01
Date Finish:	8/17/01
Station:	50+814.377 0.0 RT
Line:	GLOVERS LANE
Coordinates (m):	N 121,728.140 E 20,015.253
Elevation (m):	1295.248
Total Depth Drilled (m):	33.5
Drill Contractor:	RC Exploration
Driller:	N. Young
Rig Type:	Diedrich D-120 Truck
Rig Serial Number:	D-120037
Drilling Method:	Hollow-Stem Auger
Hammer Type:	Automatic
Rod Type:	AW
Boring Diameter:	133 mm

LEGEND/NOTES

Elevations based upon North American Vertical Datum of 1988 (NAVD '88)

Coordinates are NAD '83

▽ = Observed Groundwater depth at time of drilling

Blows = Number of blows required to drive split spoon sampler 150 mm or interval shown

USCS = Unified Soil Classification System

AASHTO = American Association of State Highway and Transportation Officials

* = See Key to Soil Logs for list of abbreviations and descriptions of tests

SAMPLE TYPE

SPT = Standard Penetration Test, 34.9mm ID and 50.8mm OD split spoon sampler

MC = Modified California Sampler, 50.8mm ID and 63.5mm OD split spoon sampler

P = Piston Sampler, 76.2 mm OD

SH = Shelby Tube, 76.2mm OD, pushed

BAG = Bulk Sample

UTDOT 38112LM.GPJ 12/3/02

PLATE A-8
STRUCTURE 19

APPENDIX C
Laboratory Testing

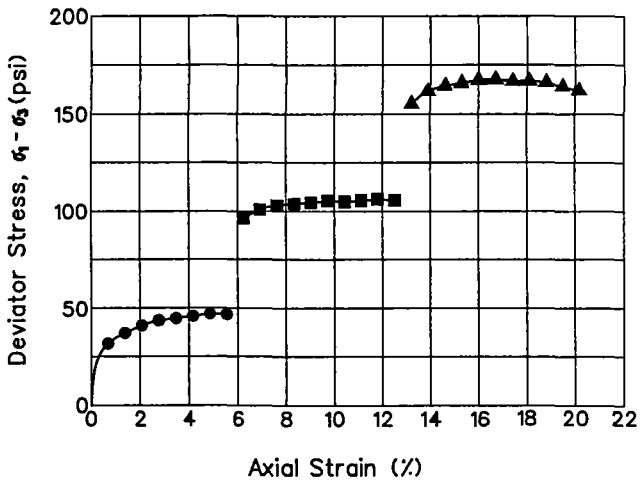
SUMMARY OF TEST DATA

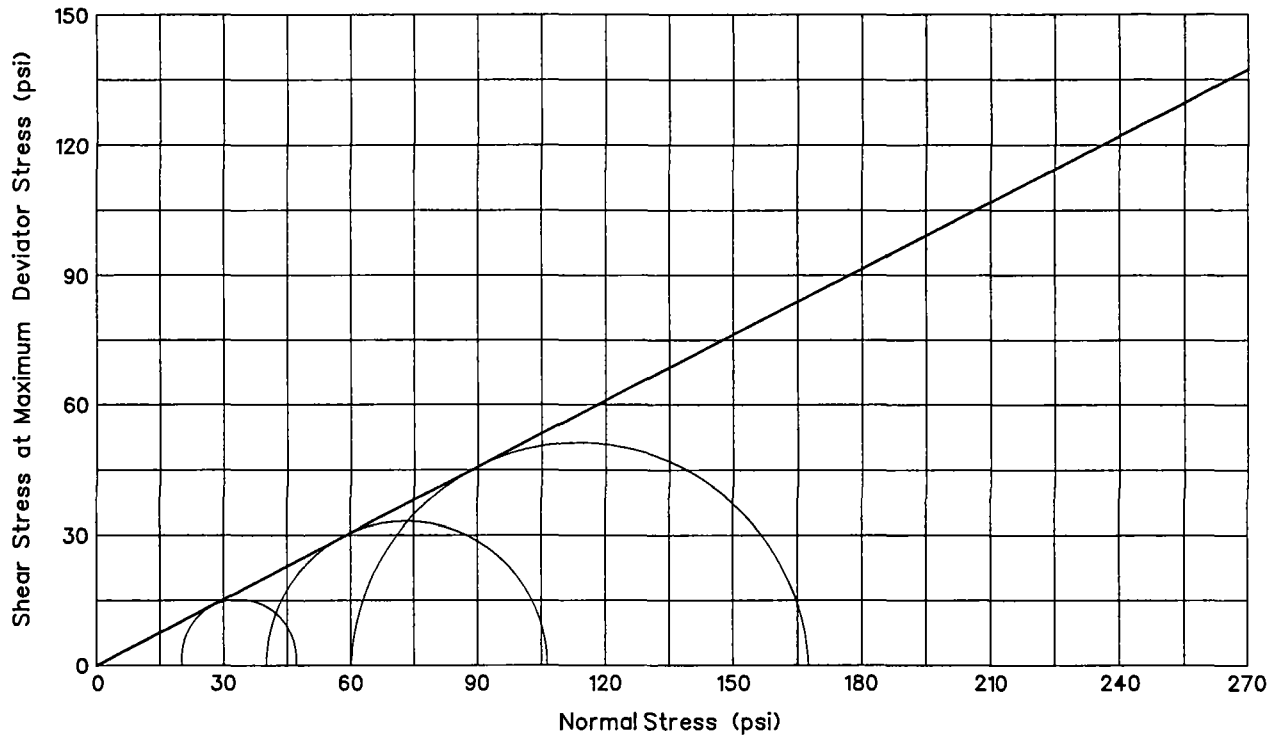
PROJECT Legacy Parkway
LOCATION Structure F-668
(Glover's Lane over Legacy Parkway)

PROJECT NO. 200601-119
FEATURE Foundations

HOLE NO.	DEPTH BELOW GROUND SURFACE (ft)	STANDARD PENETRATION BLOWS PER FOOT	IN-PLACE		UNCONFINED COMPRESSIVE STRENGTH (psf)	ATTERBERG LIMITS			MECHANICAL ANALYSIS			UNIFIED SOIL CLASSIFICATION SYSTEM / (AASHTO Classification)
			DRY UNIT WEIGHT (pcf)	MOISTURE (%)		LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT & CLAY	
RSB-19-611	3-4.5	18		22.3		28	22	16	0	49	51	CL / A-6(1)
	6-7.5			24.0		31	20	11	0	7	93	CL / A-6(14)
	12-13.5	7		30.0				NP	0	48	52	ML / A-4(0)
	23.5-25		88.8	33.4	1153	37	22	15	0	3	97	CL / A-6(12)
	43.5-45		90.8	31.7	1976	36	21	15	0	4	96	CL / A-6(15)
	53.5-55			35.7	3177	37	29	8	0	8	92	ML / A-4(9)
	63.5-65		77.2	43	441	47	23	24	0	26	74	CL / A-7-(17)
	73.5-75			36.0	848	41	22	19	0	4	96	CL / A-7-5(24)
	83.5-85			27.0	1011	45	22	23	0	2	98	CL / A-7-5(22)
	103.5-105	27		13.9				NP	15	56	29	SM / A-2-4

NP=Nonplastic





MULTI-STAGE CONSOLIDATED UNDRAINED W/PORE PRESSURE MEASUREMENTS:

TOTAL STRESS FAILURE ENVELOPE

Test No. or Symbol	Sample Data		Degree of Saturation (%)	Confining Pressure (psi)	Maximum Deviator Stress (psi)	Strength Values at Failure		Sample Size, L/D (inches)	Strain Rate (inches/minute)
	Dry Density (pcf)	Moisture Content (%)				Friction Angle ϕ (degrees)	Cohesion (c/psi)		
●	94.8	29.7	~100	20	47.1	27.0	0	2.88/1.38	0.001
■	94.8	29.7	~100	40	106.4				
▲	94.8	29.7	~100	60	167.6				

RB&G ENGINEERING INC.
Provo, Utah

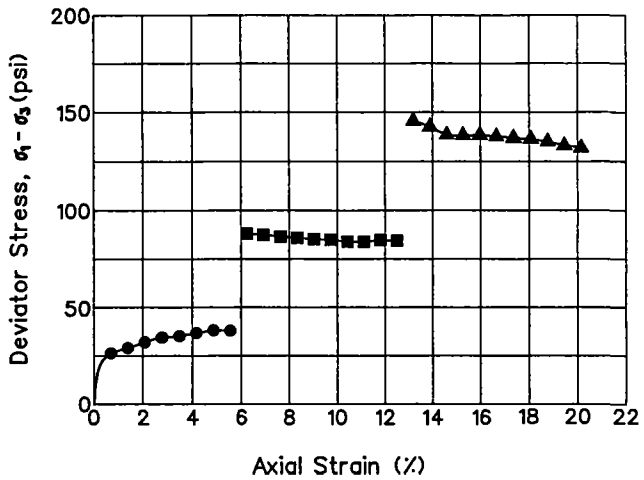
TRIAXIAL SHEAR TEST

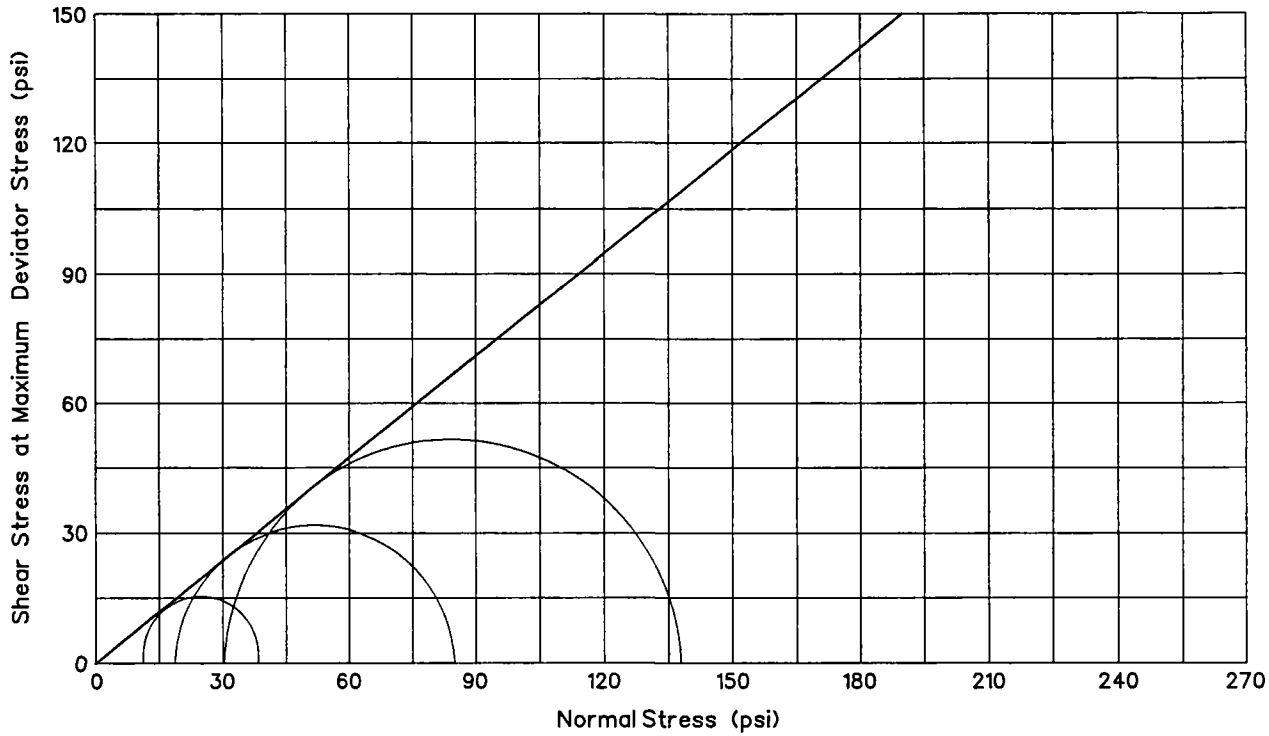
Project: *Legacy Parkway - Structure F-668*
(Glover's Lane Over Legacy Parkway)
Davis County, Utah

HOLE NO.: RSB-19-611

DEPTH: 43.5'-45'

Figure





MULTI-STAGE CONSOLIDATED UNDRAINED W/PORE PRESSURE MEASUREMENTS:

EFFECTIVE STRESS FAILURE ENVELOPE

Test No. or Symbol	Sample Data		Degree of Saturation (%)	Confining Pressure (psi)	Maximum Deviator Stress (psi)	Strength Values at Failure		Sample Size, L/D (inches)	Strain Rate (inches/minute)
	Dry Density (pcf)	Moisture Content (%)				Friction Angle ϕ (degrees)	Cohesion (c/psi)		
●	94.8	29.7	~100	11.2	38.3	38.3	0	2.88/1.38	0.001
■	94.8	29.7	~100	18.5	84.9				
▲	94.8	29.7	~100	30.2	137.9				

RB&G ENGINEERING INC.
Provo, Utah

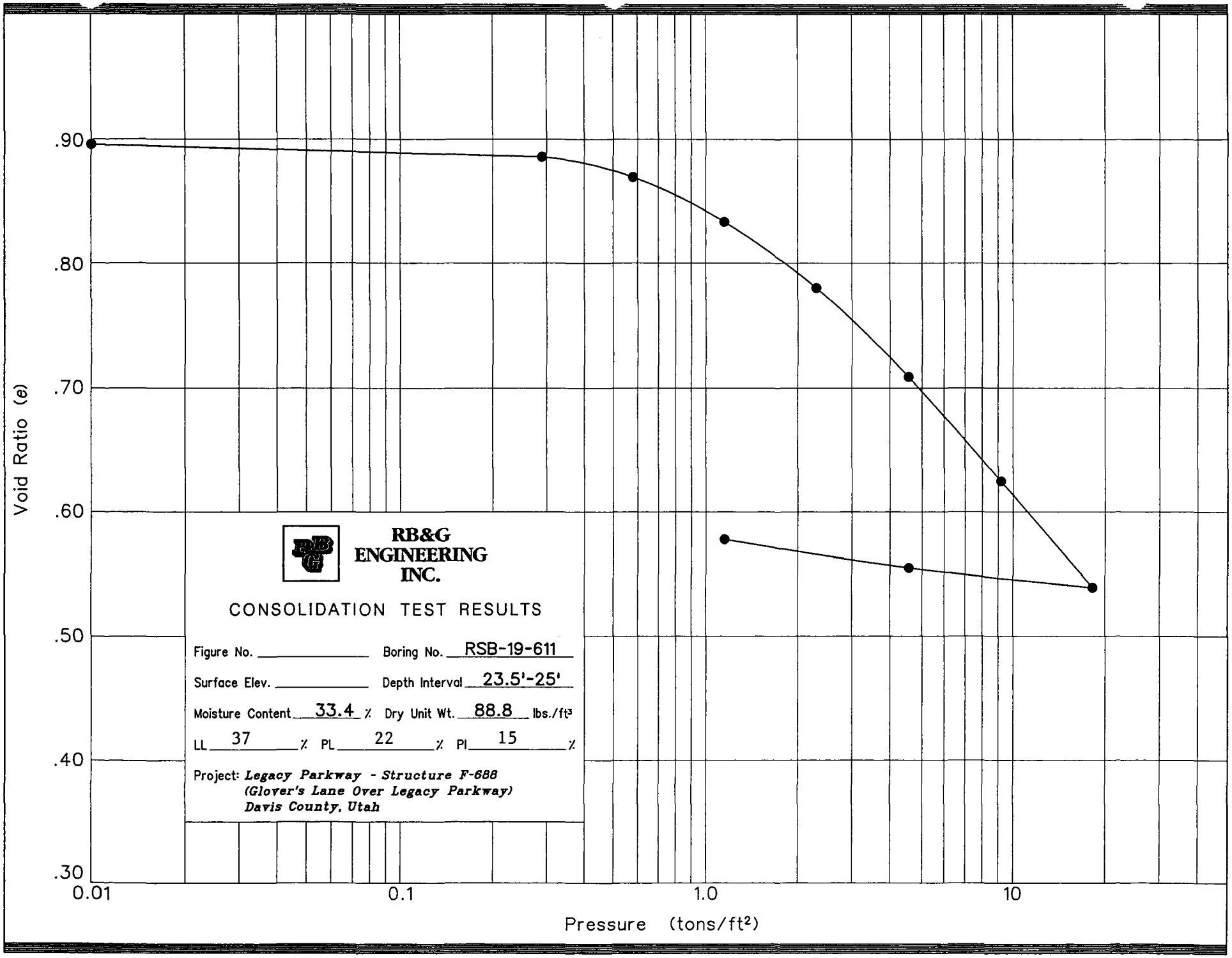
TRIAXIAL SHEAR TEST

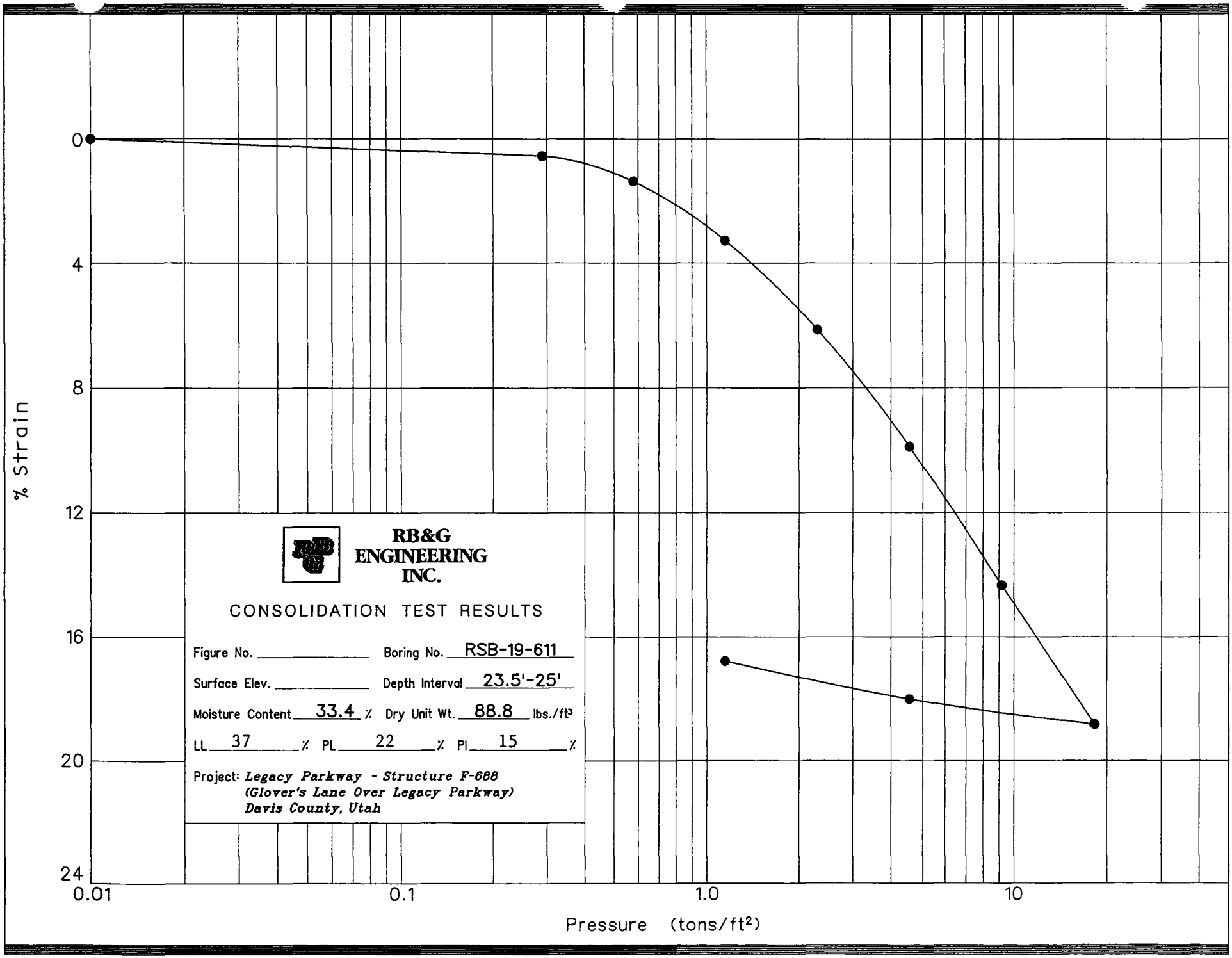
Project: *Legacy Parkway - Structure F-668*
(Glover's Lane Over Legacy Parkway)
Davis County, Utah

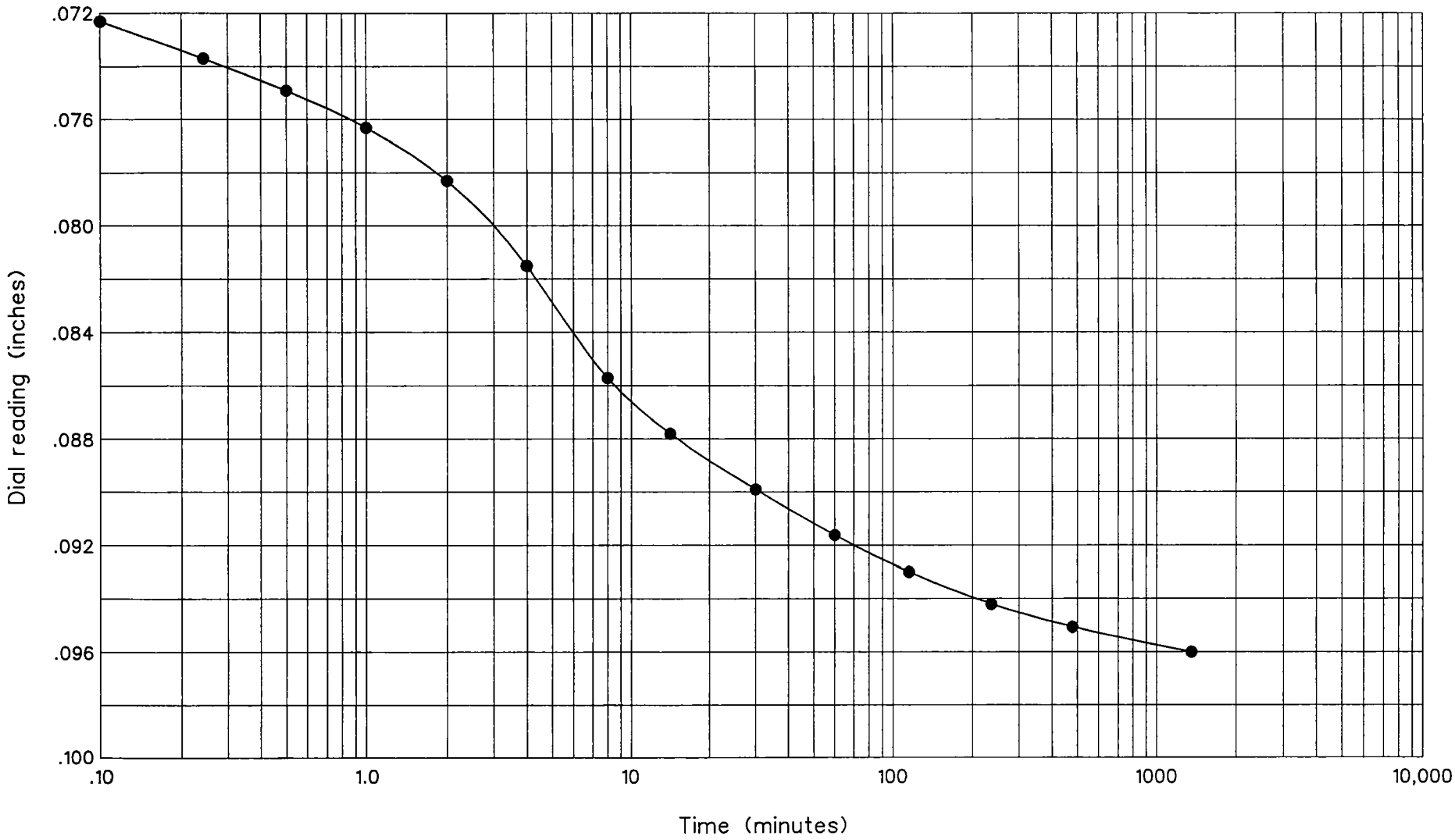
HOLE NO.: RSB-19-611

DEPTH: 43.5'-45'

Figure


.90
.80
.70
.60
.50
.40
.30
Void Ratio (e)
0.01
0.1
1.0
10
Pressure (tons/ft²)
RB&G
ENGINEERING
INC.
CONSOLIDATION TEST RESULTS
Figure No.
Boring No. RSB-19-611
Surface Elev.
Depth Interval 23.5'-25'
Moisture Content 33.4 %
Dry Unit Wt. 88.8 lbs./ft³
LL 37 %
PL 22 %
PI 15 %
Project: Legacy Parkway - Structure F-688
(Glover's Lane Over Legacy Parkway)
Davis County, Utah


% Strain
0
4
8
12
16
20
24
0.01
0.1
1.0
10
Pressure (tons/ft²)
RB&G ENGINEERING INC.
CONSOLIDATION TEST RESULTS
Figure No.
Boring No. RSB-19-611
Surface Elev.
Depth Interval 23.5'-25'
Moisture Content 33.4 % Dry Unit Wt. 88.8 lbs./ft³
LL 37 % PL 22 % PI 15 %
Project: Legacy Parkway - Structure F-688
(Glover's Lane Over Legacy Parkway)
Davis County, Utah



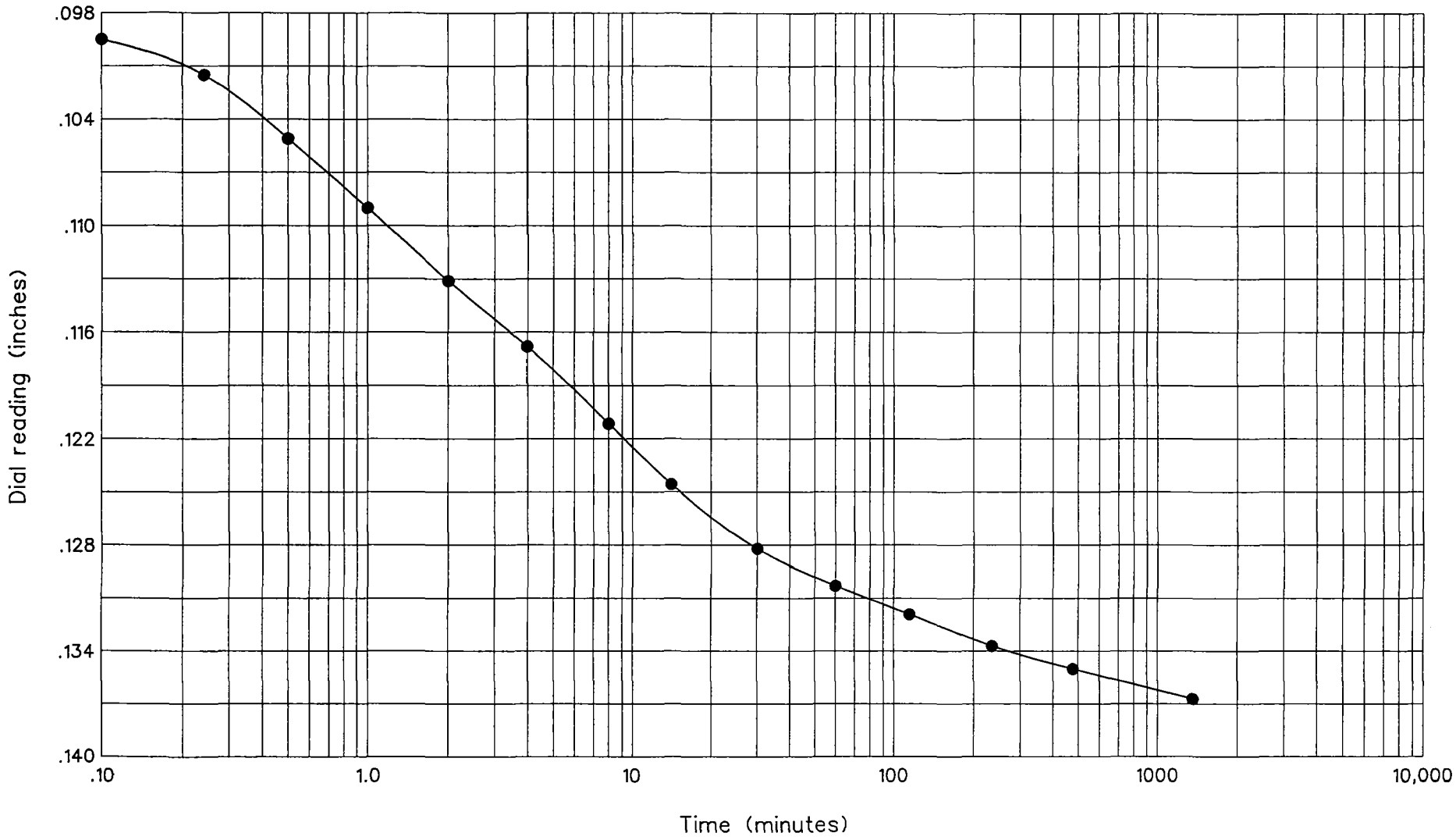
RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-611
Depth: 23.5'-25'
Load: 2.30 to 4.60 tons

TIME CONSOLIDATION

Legacy Parkway - Structure F-668
(Glover's Lane Over Legacy Parkway)
Davis County, Utah

Figure



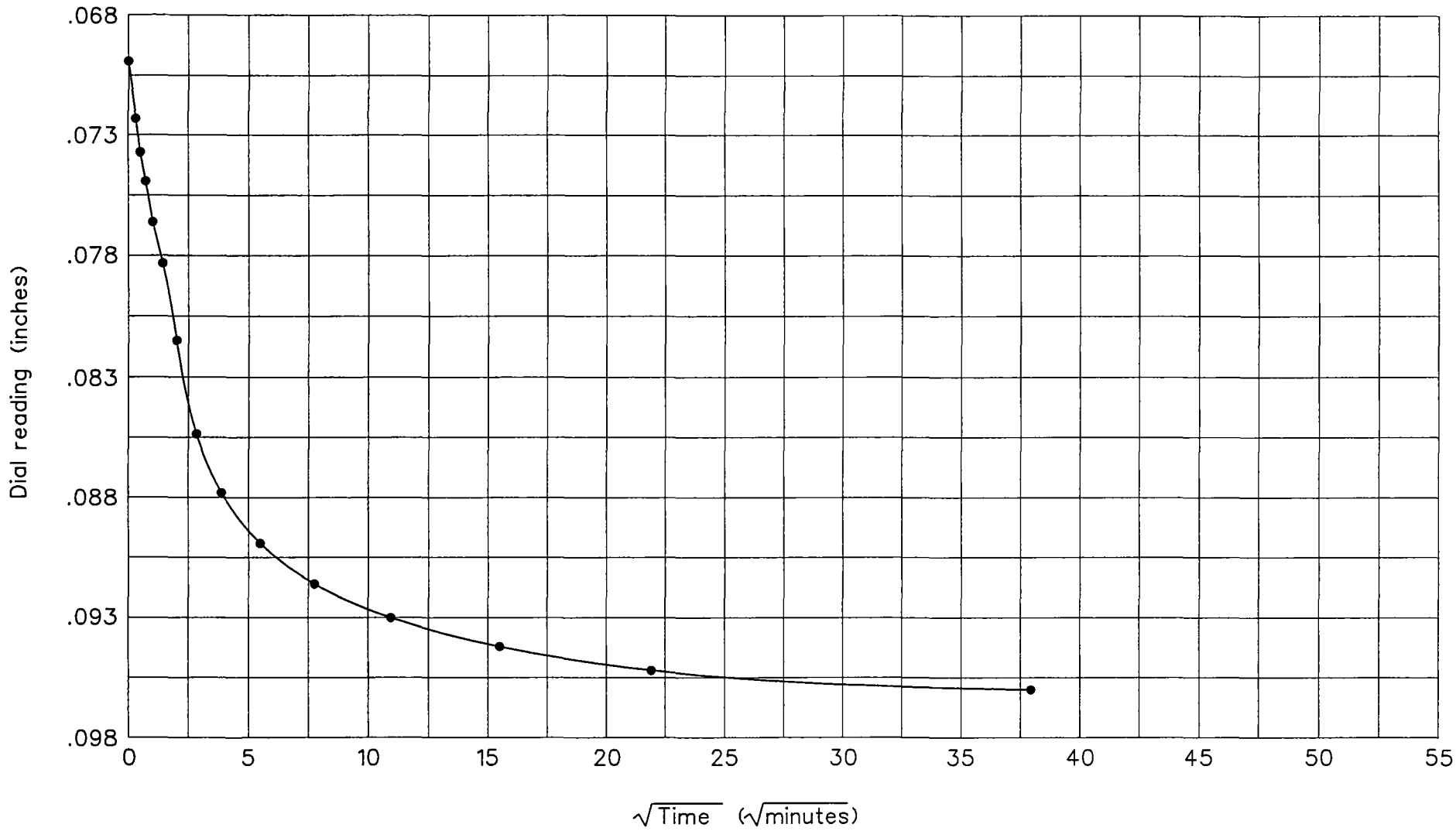
RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-611
Depth: 23.5'-25'
Load: 4.60 to 9.20 tons

TIME CONSOLIDATION

Legacy Parkway - Structure F-668
(Glover's Lane Over Legacy Parkway)
Davis County, Utah

Figure



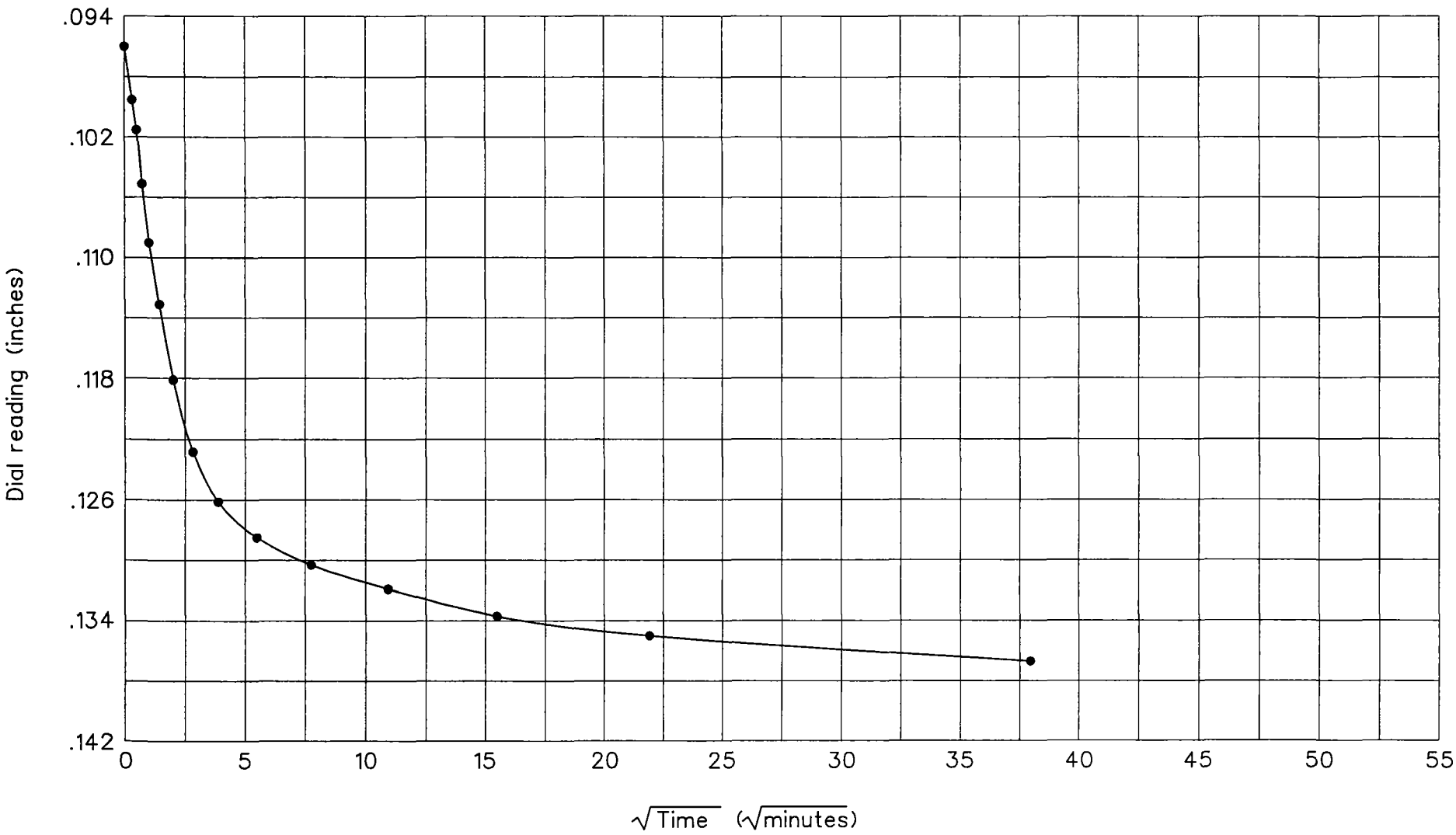
RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-611
Depth: 23.5'-25'
Load: 2.30 to 4.60 tons

TIME CONSOLIDATION

Legacy Parkway - Structure F-668
(Glover's Lane Over Legacy Parkway)
Davis County, Utah

Figure



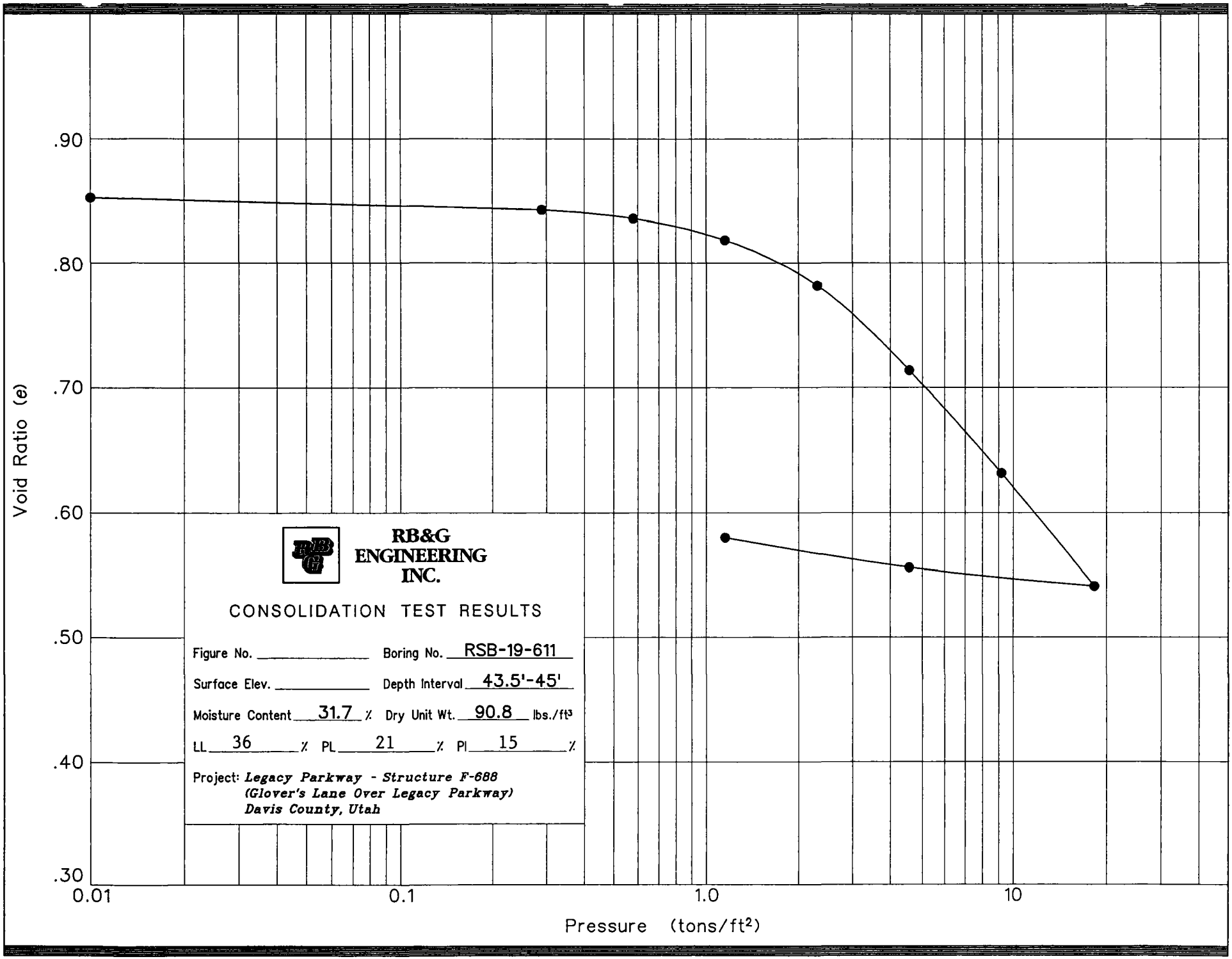
RB&G ENGINEERING INC.
Provo, Utah

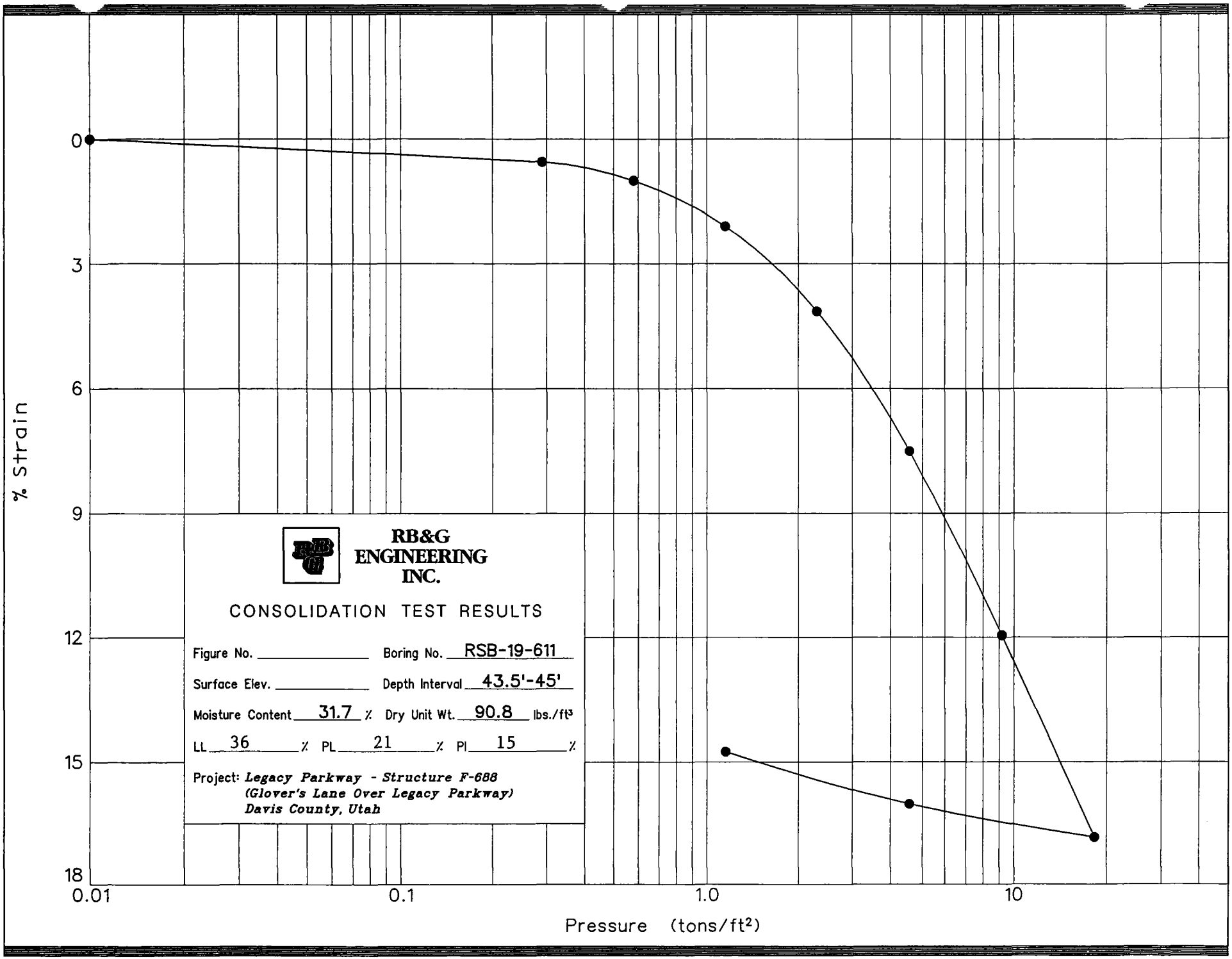
Hole no.: RSB-19-611
Depth: 23.5'-25'
Load: 4.60 to 9.20 tons

TIME CONSOLIDATION

Legacy Parkway - Structure F-668
(Glover's Lane Over Legacy Parkway)
Davis County, Utah

Figure


.90
.80
.70
.60
.50
.40
.30
Void Ratio (e)
0.01
0.1
1.0
10
Pressure (tons/ft²)
RB&G
ENGINEERING
INC.
CONSOLIDATION TEST RESULTS
Figure No.
Boring No. RSB-19-611
Surface Elev.
Depth Interval 43.5'-45'
Moisture Content 31.7 %
Dry Unit Wt. 90.8 lbs./ft³
LL 36 %
PL 21 %
PI 15 %
Project: Legacy Parkway - Structure F-688
(Glover's Lane Over Legacy Parkway)
Davis County, Utah



RB&G ENGINEERING INC.

CONSOLIDATION TEST RESULTS

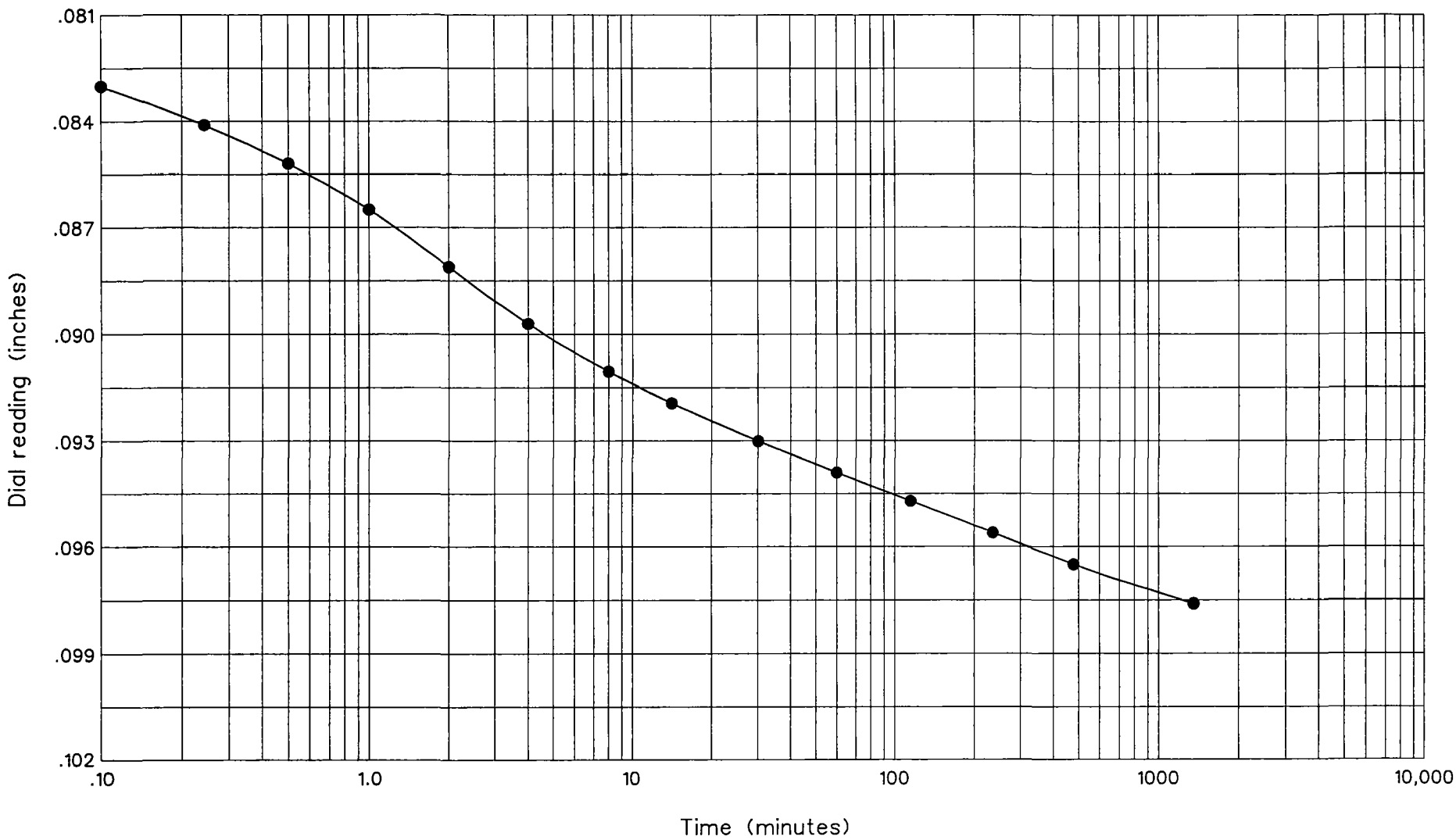
Figure No. _____ Boring No. RSB-19-611

Surface Elev. _____ Depth Interval 43.5'-45'

Moisture Content 31.7 % Dry Unit Wt. 90.8 lbs./ft³

LL 36 % PL 21 % PI 15 %

Project: *Legacy Parkway - Structure F-688*
(Glover's Lane Over Legacy Parkway)
Davis County, Utah



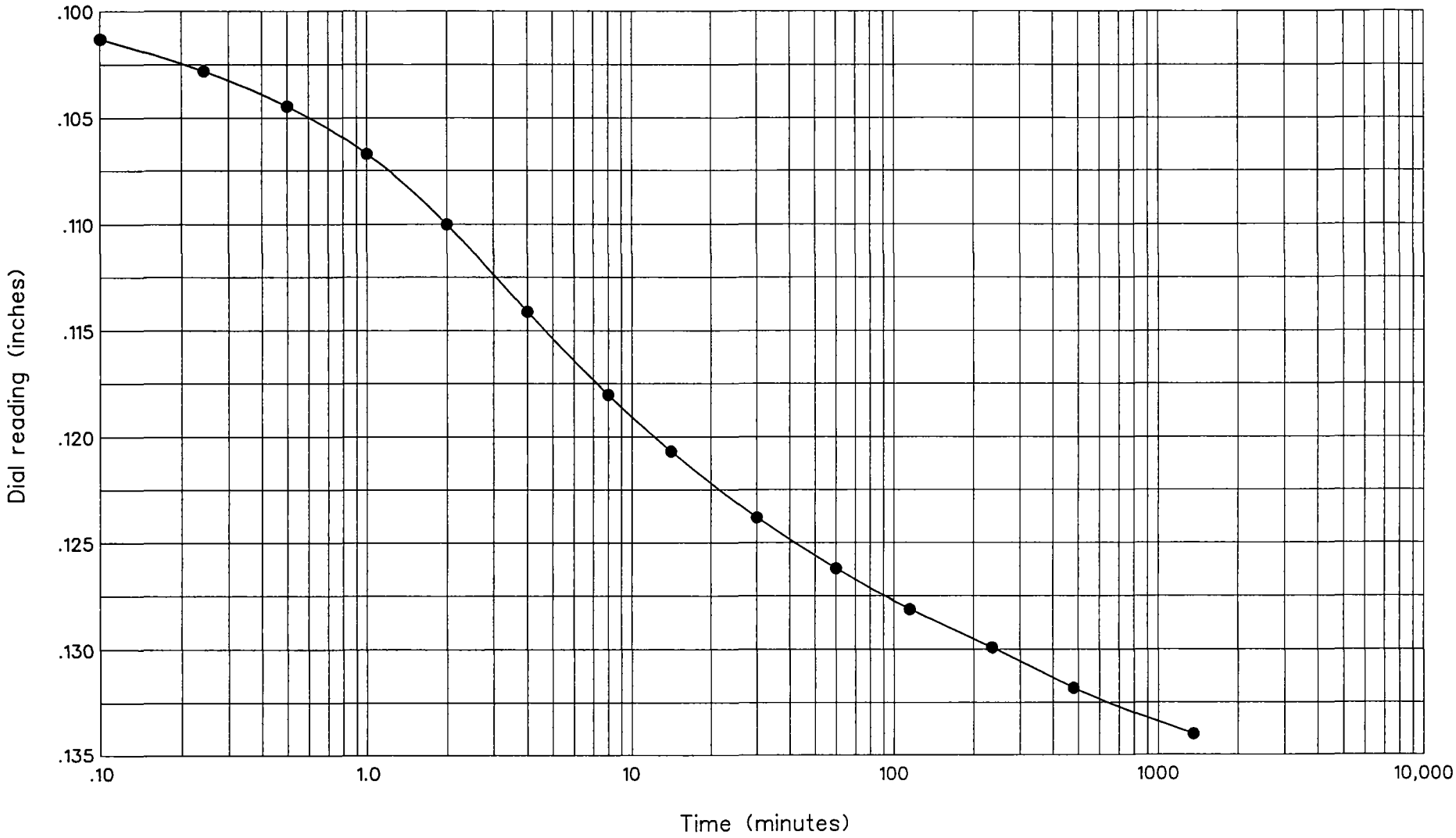
RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-611
Depth: 43.5'-45'
Load: 2.30 to 4.60 tons

TIME CONSOLIDATION

Legacy Parkway - Structure F-668
(Glover's Lane Over Legacy Parkway)
Davis County, Utah

Figure



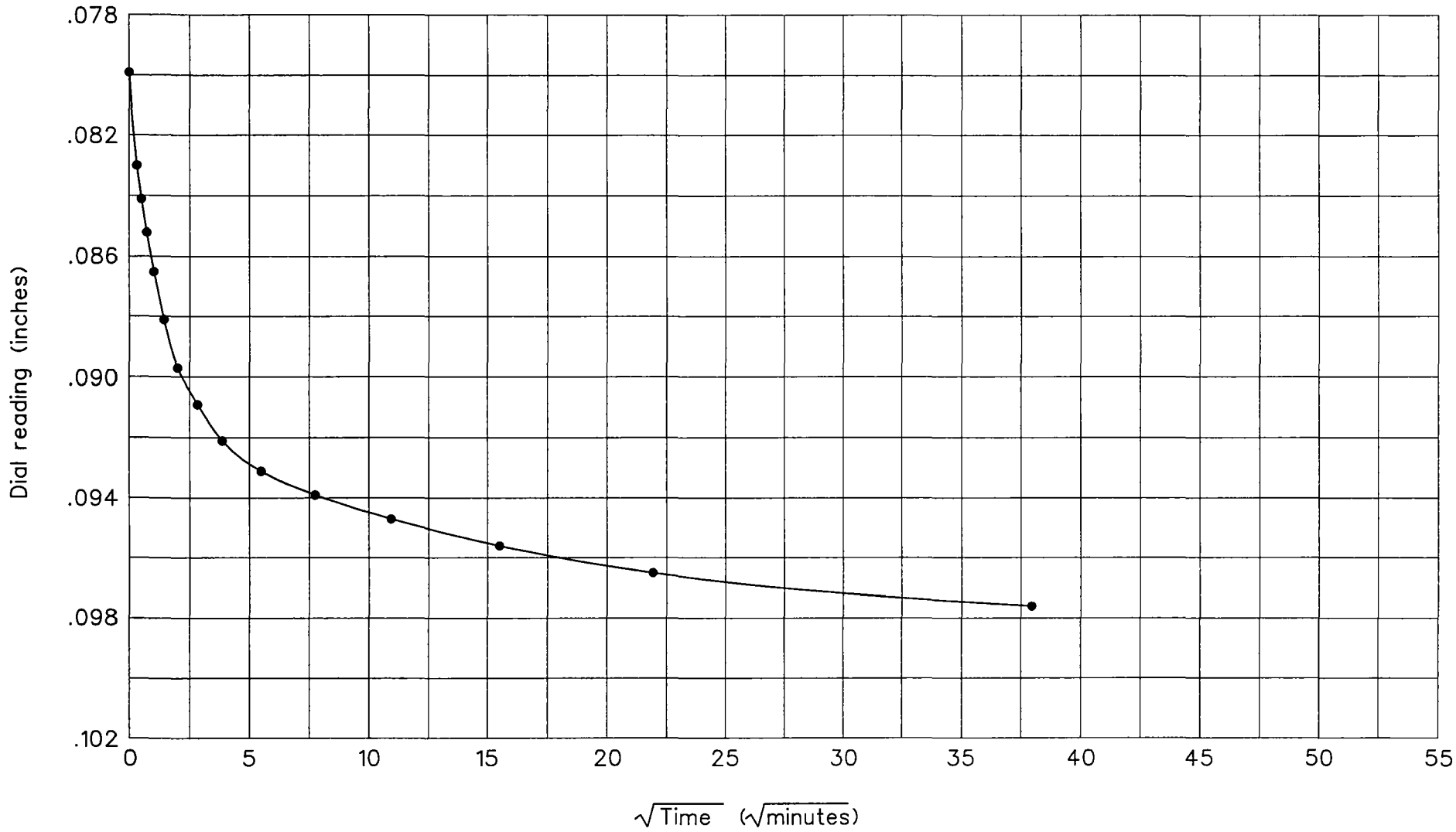
RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-611
Depth: 43.5'-45'
Load: 4.60 to 9.20 tons

TIME CONSOLIDATION

Legacy Parkway - Structure F-668
(Glover's Lane Over Legacy Parkway)
Davis County, Utah

Figure



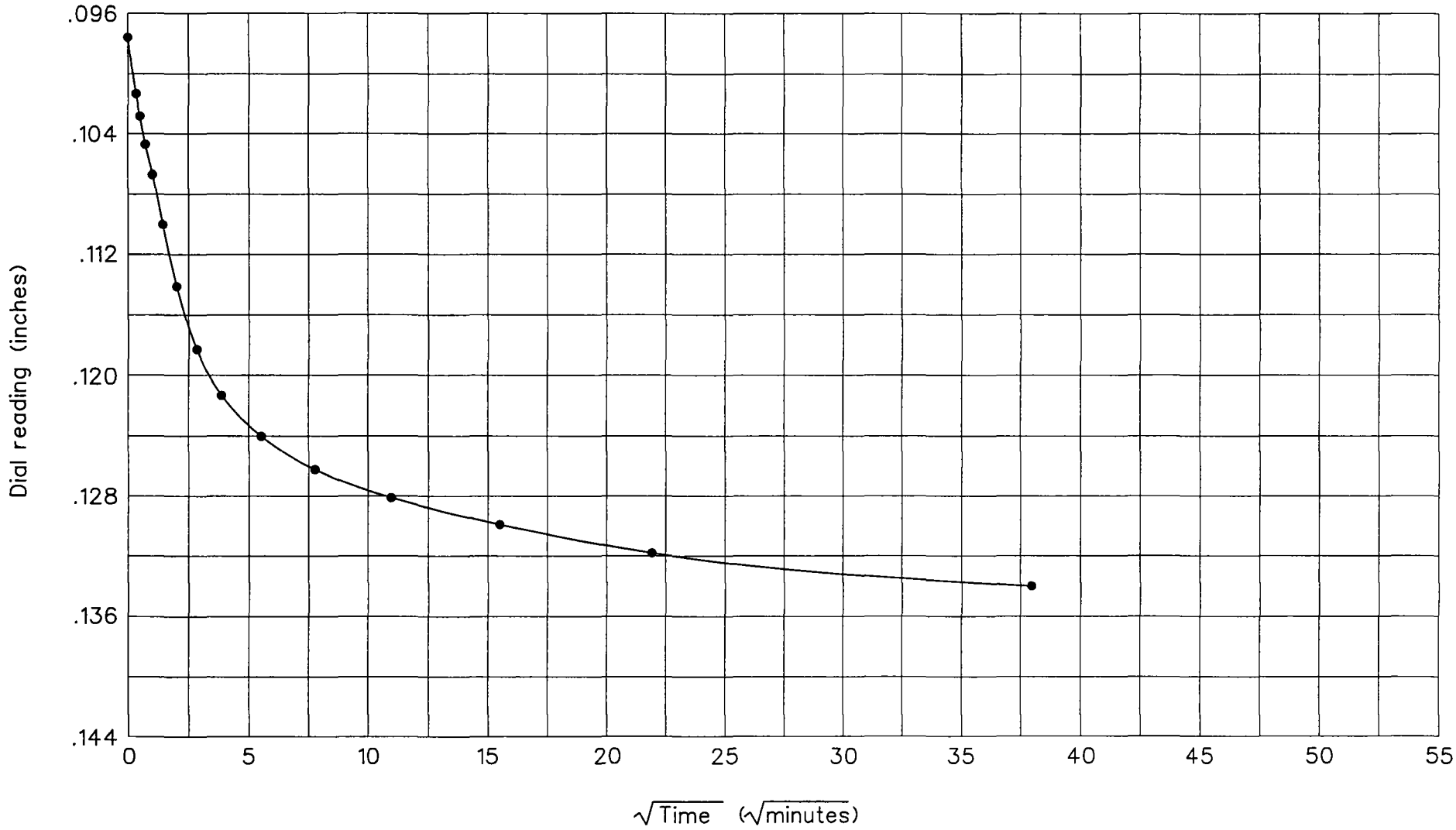
RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-611
Depth: 43.5'-45'
Load: 2.30 to 4.60 tons

TIME CONSOLIDATION

Legacy Parkway - Structure F-668
(Glover's Lane Over Legacy Parkway)
Davis County, Utah

Figure



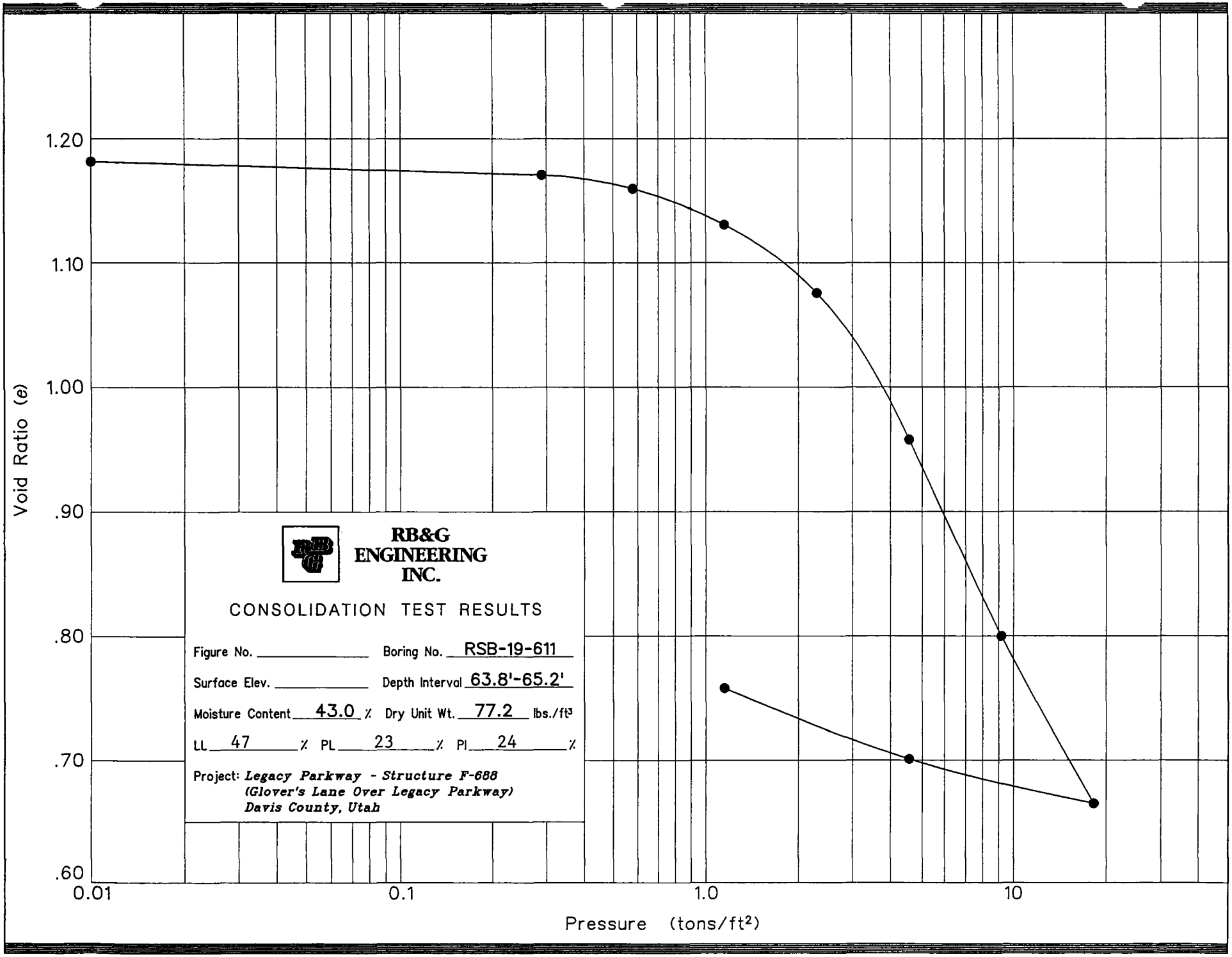
RB&G ENGINEERING INC.
Provo, Utah

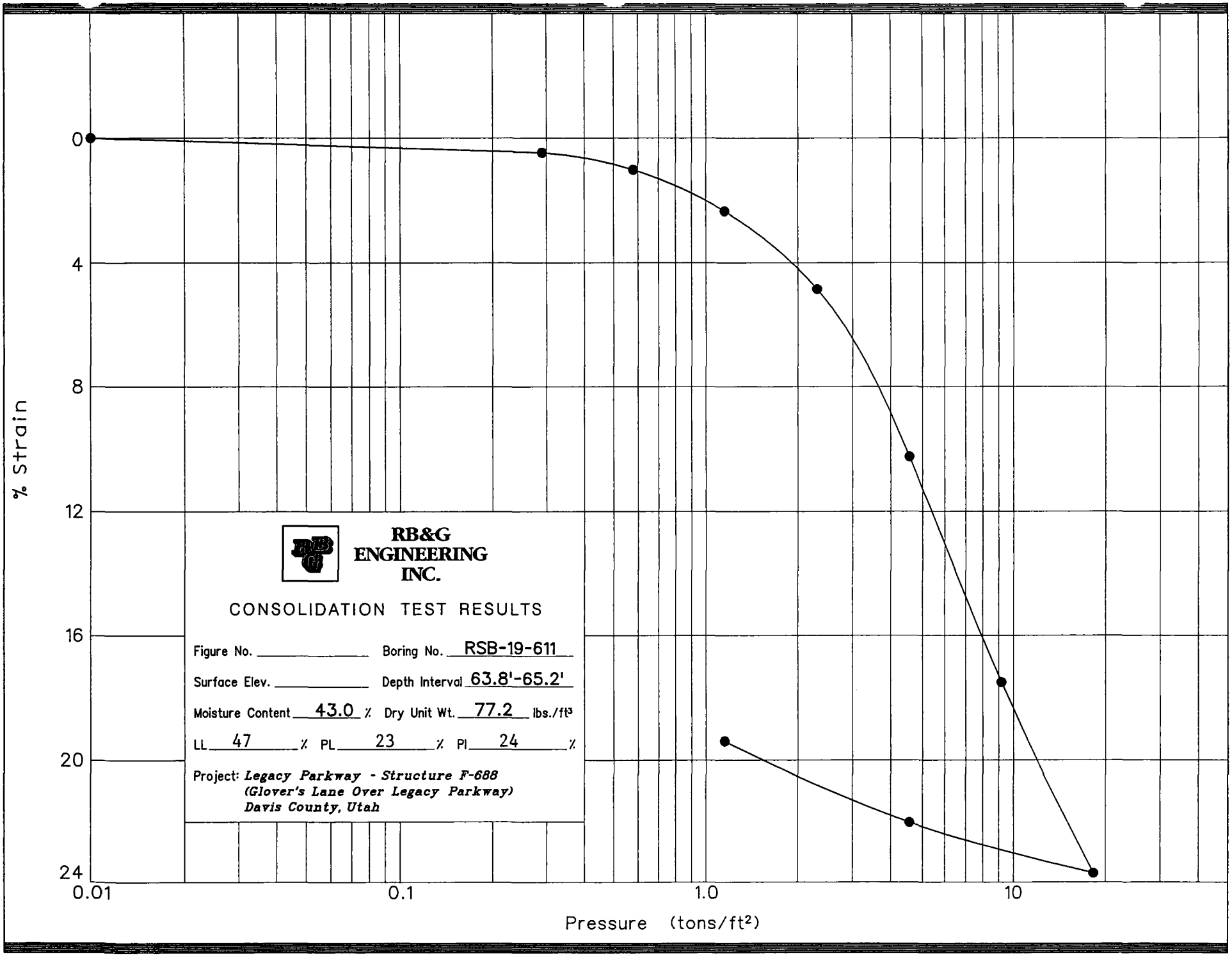
Hole no.: RSB-19-611
Depth: 43.5'-45'
Load: 4.60 to 9.20 tons

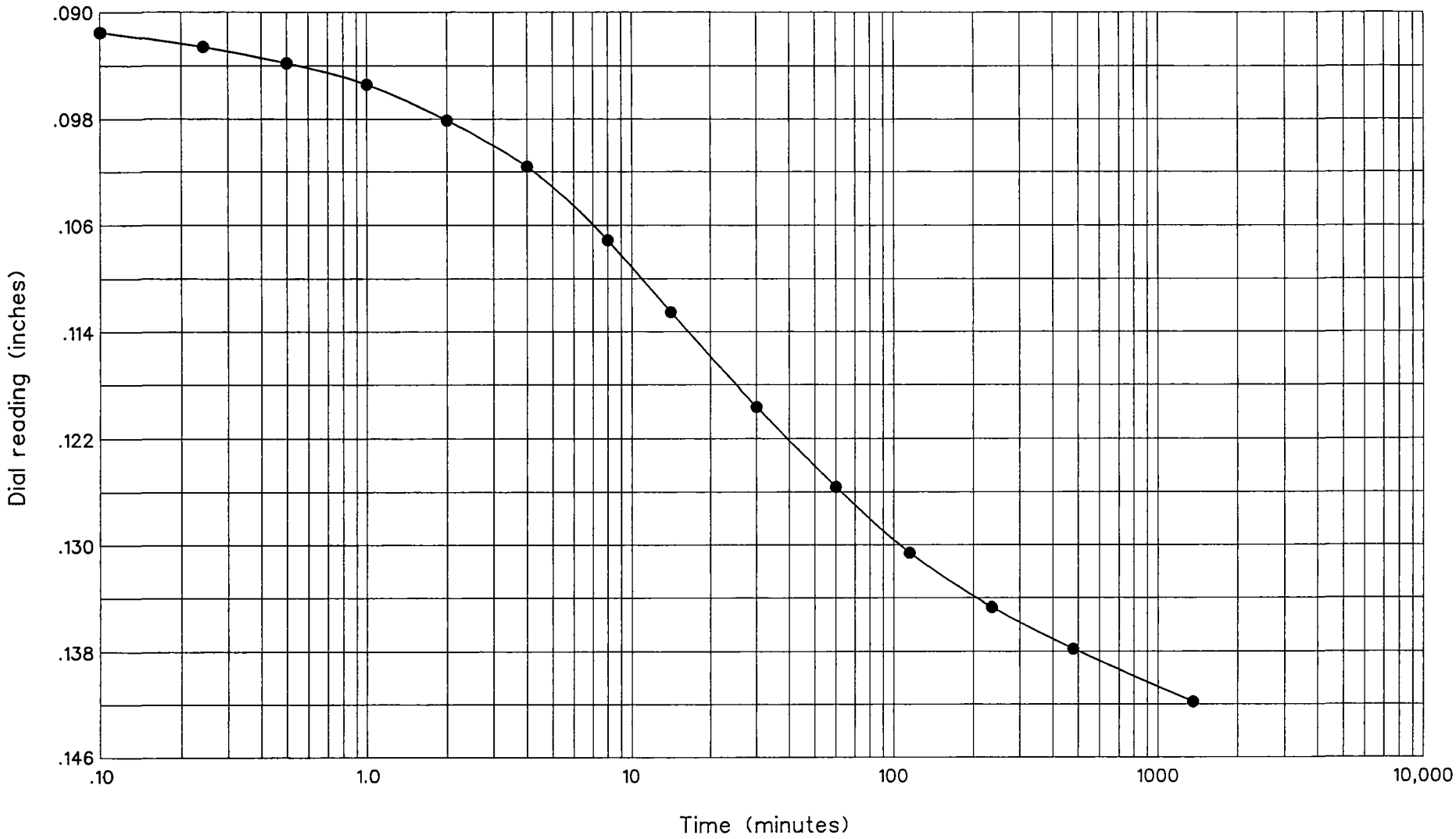
TIME CONSOLIDATION

Legacy Parkway - Structure F-668
(Glover's Lane Over Legacy Parkway)
Davis County, Utah

Figure


1.20
1.10
1.00
.90
.80
.70
.60
Void Ratio (e)
0.01
0.1
1.0
10
Pressure (tons/ft²)
RB&G
ENGINEERING
INC.
CONSOLIDATION TEST RESULTS
Figure No.
Boring No. RSB-19-611
Surface Elev.
Depth Interval 63.8'-65.2'
Moisture Content 43.0 %
Dry Unit Wt. 77.2 lbs./ft³
LL 47 %
PL 23 %
PI 24 %
Project: Legacy Parkway - Structure F-688
(Glover's Lane Over Legacy Parkway)
Davis County, Utah


% Strain
0
4
8
12
16
20
24
0.01
0.1
1.0
10
Pressure (tons/ft²)
RB&G ENGINEERING INC.
CONSOLIDATION TEST RESULTS
Figure No.
Boring No. RSB-19-611
Surface Elev.
Depth Interval 63.8'-65.2'
Moisture Content 43.0 %
Dry Unit Wt. 77.2 lbs./ft³
LL 47 % PL 23 % PI 24 %
Project: Legacy Parkway - Structure F-688
(Glover's Lane Over Legacy Parkway)
Davis County, Utah



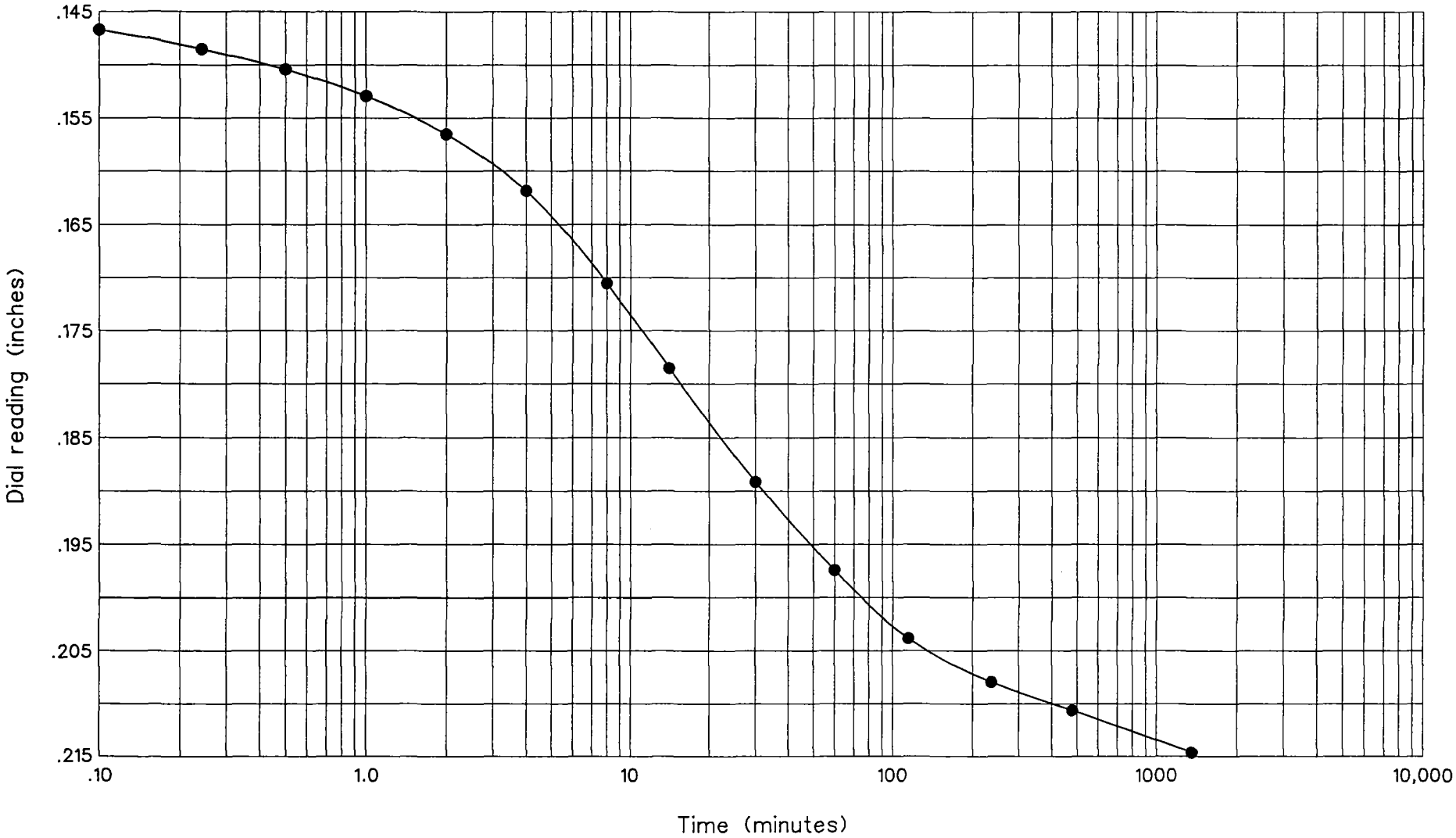
RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-611
Depth: 63.8'-65.2'
Load: 4.60 to 9.20 tons

TIME CONSOLIDATION

Legacy Parkway - Structure F-668
(Glover's Lane Over Legacy Parkway)
Davis County, Utah

Figure



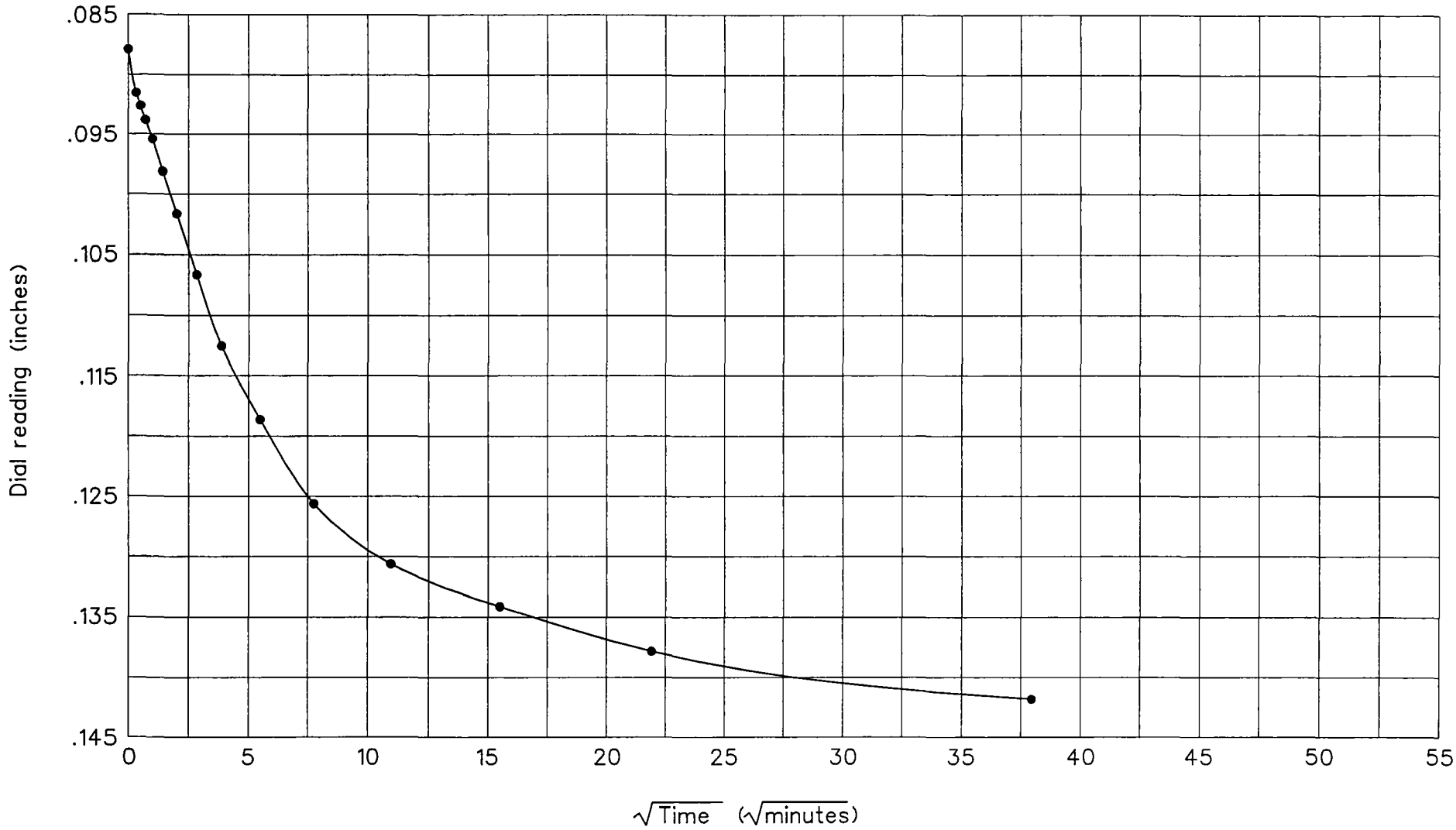
RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-611
Depth: 63.8'-65.2'
Load: 9.20 to 18.40 tons

TIME CONSOLIDATION

Legacy Parkway - Structure F-668
(Glover's Lane Over Legacy Parkway)
Davis County, Utah

Figure



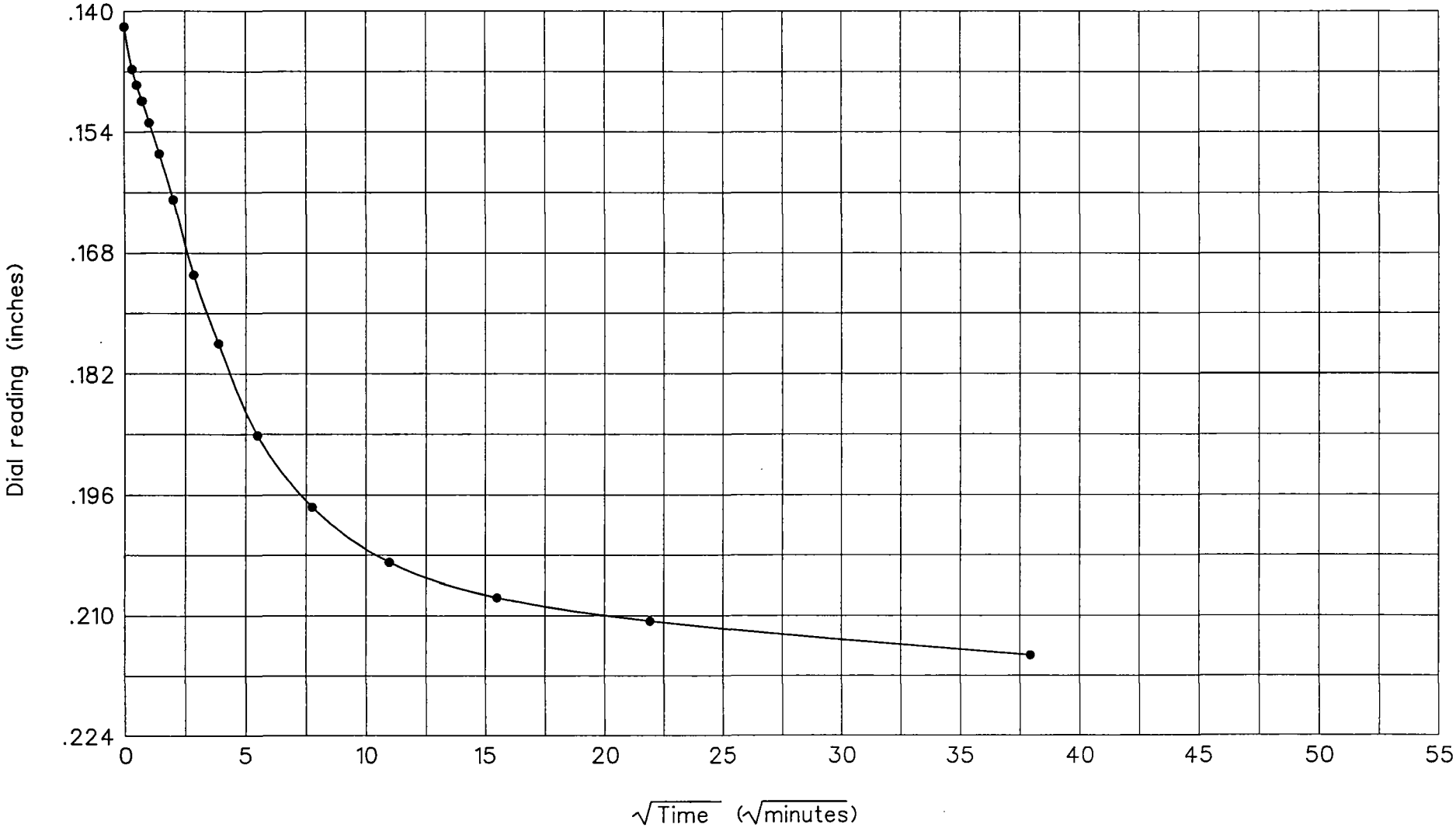
RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-611
Depth: 63.8'-65.2'
Load: 4.60 to 9.20 tons

TIME CONSOLIDATION

Legacy Parkway - Structure F-668
(Glover's Lane Over Legacy Parkway)
Davis County, Utah

Figure



RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-611
Depth: 63.8'-65.2'
Load: 9.20 to 18.40 tons

TIME CONSOLIDATION

Legacy Parkway - Structure F-668
(Glover's Lane Over Legacy Parkway)
Davis County, Utah

Figure

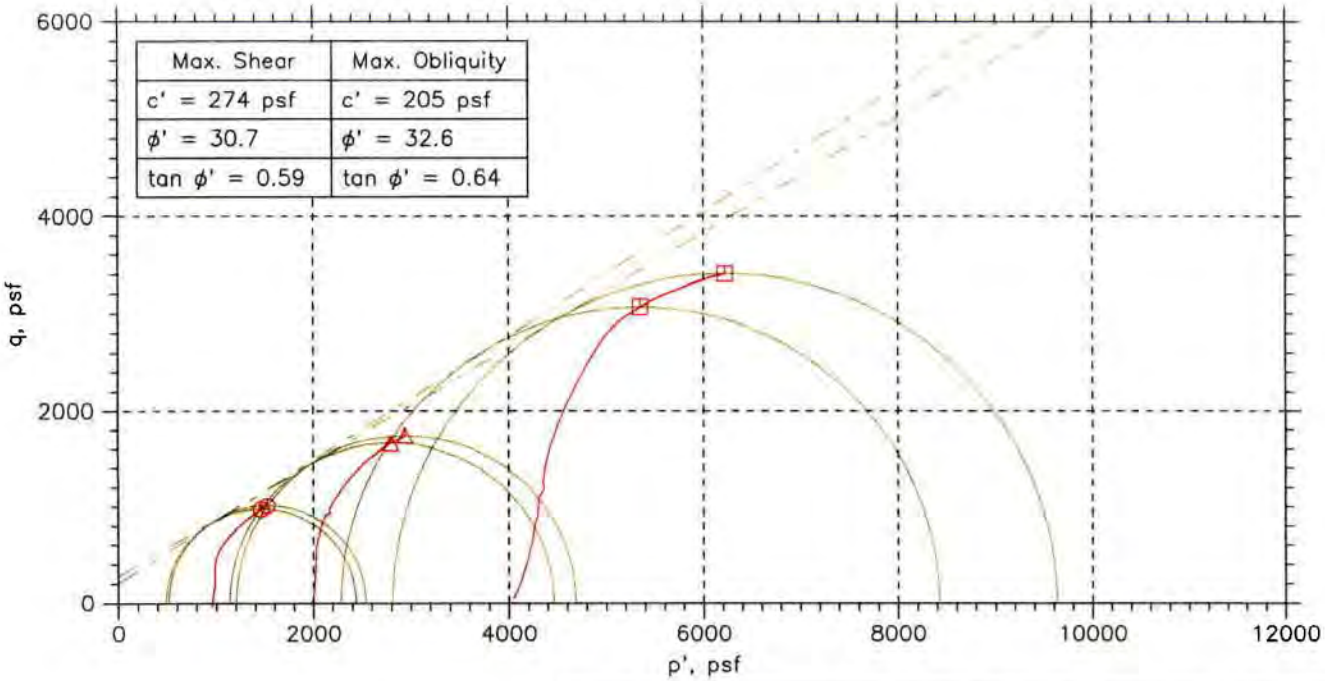
SUMMARY OF TEST DATA

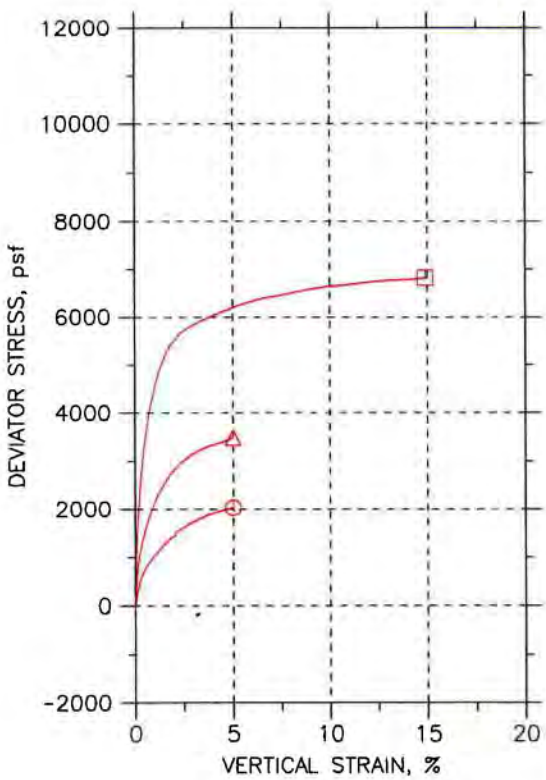
PROJECT LOCATION: Legacy Parkway Structure C-947 (Glover's Lane Pedestrian Bridge over I-15 / UPRR)
PROJECT NO.: 200601-119
FEATURE: Foundations

HOLE NO.	DEPTH BELOW GROUND SURFACE (ft)	STANDARD PENETRATION BLOWS PER FOOT	IN-PLACE		UNCONFINED COMPRESSIVE STRENGTH (psf)	ATTERBERG LIMITS			MECHANICAL ANALYSIS			UNIFIED SOIL CLASSIFICATION SYSTEM / (AASHTO Classification)
			DRY UNIT WEIGHT (pcf)	MOISTURE (%)		LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT & CLAY	
RSB-19-613 (UDOT U1)	5-7.0	2		34		36	18	18	7	35	58	CL / A-6(8)
	7-9.5	Shelby	99	28		30	18	12	1	33	66	CL / A-6(6)
	12.5-14.5	4		36				NP	0	45	55	ML / A-4(0)
	15-17	6		35				NP	1	43	56	ML / A-4(0)
	17-19	0		38		33	20	13	0	5	95	CL / A-6(12)
	25-27	18		29				NP	0	88	12	SM / A-2-4(0)
	30-32.5	Shelby	89	32	725	34	20	14	0	6	94	CL / A-6(13)
	40-42.5	Shelby	100	32		34	20	14	0	4	96	CL / A-6(14)
	55-57.5	Shelby	93	30	1514	32	20	12	0	10	90	CL / A-6(11)
	65-67	11		27				NP	0	69	31	SM / A-2-4(0)
	75-77	7		28		37	23	14	0	46	54	CL / A-6(5)
	85-87	12		32		44	22	22	0	5	95	CL / A-7-6(23)
	90-92	12		33		26	20	6	2	55	43	SC-SM / A-4(0)
	97-99	8		32				NP	0	96	4	SP / A-1-b(0)
	105-107	27		21				NP	1	61	38	SM / A-4(0)
	115-117	27		13				NP	5	66	29	SM / A-2-4(0)
	125-127	78						NP	12	71	17	SM / A-1-b(0)
RSB-16-614	6-7.5	5		24.5		42	19	23	9	34	57	CL / A-7-6(10)
	15-16.5	6		34.0				NP	0	42	58	ML / A-4(0)
	25-26.5	Shelby	85.5	36.1	1280	40	22	18	0	6	94	CL / A-6(18)
	35-36.5	Shelby		32.8		39	21	18	0	5	95	CL / A-6(18)
	55-56.5	Shelby	87.2	34.3	3205	43	23	20	0	8	92	CL / A-7-6(20)
	60-61.5	18		22.6				NP	0	79	21	SM / A-2-4(0)
	69-70.5	13		25.2				NP	0	73	27	SM / A-2-4(0)
	75.5-77	19		10.6				NP	1	85	14	SM / A-1-b(0)
	86-87.5	5		25.9				NP	0	92	8	SP-SM / A-1-b(0)
	94-95.5	35		25.7				NP	5	50	45	SM / A-4(0)
	100.5-102	22		22.3				NP	7	56	37	SM / A-4(0)
	109-110.5	29		19.2				NP	24	52	24	SM / A-1/b(0)

NP=Nonplastic

CONSOLIDATED UNDRAINED TRIAXIAL TEST by AASHTO T297





Symbol		⊙	△	⊡	
Sample No.		U1@9.5a	U1@9.5a	U1@9.5a	
Test No.		1	1	1	
Depth		9.5'	9.5'	9.5'	
Initial	Diameter, in	2.84	2.84	2.84	
	Height, in	5.89	5.89	5.89	
	Water Content, %	27.8	27.8	27.8	
	Dry Density, pcf	99.08	99.08	99.08	
	Saturation, %	0.0	0.0	0.0	
	Void Ratio	-1	-1	-1	
Before Shear	Water Content, %	28.3	29.1	27.8	
	Dry Density, pcf	107.6	102.1	102.1	
	Saturation*, %	0.0	0.0	0.0	
	Void Ratio	0	0	0	
	Back Press., psf	5761	5762	6544	
Ver. Eff. Cons. Stress, psf		997.8	2000	3997	
Shear Strength, psf		1012	1740	3409	
Strain at Failure, %		5	5	14.9	
Strain Rate, %/min		0.015	0.015	0.015	
B-Value		0.95	0.95	0.95	
Estimated Specific Gravity		0	0	0	
Liquid Limit		30	30	30	
Plastic Limit		18	18	18	

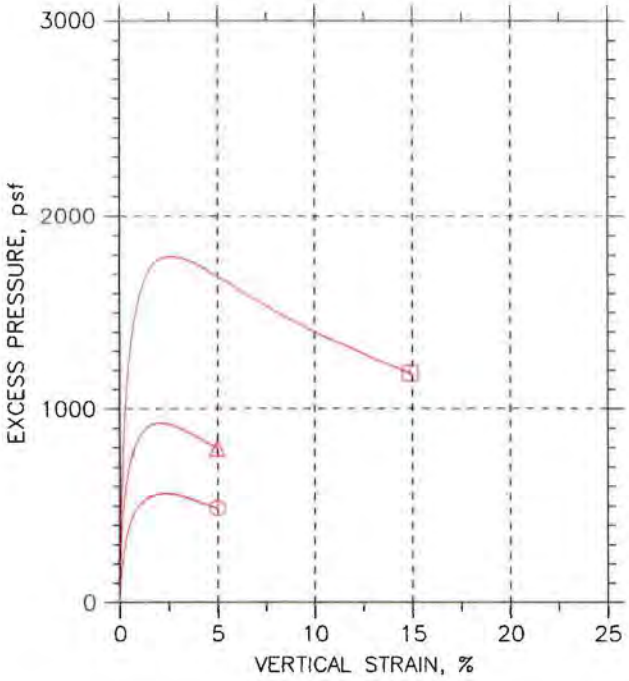
Project: Glovers over Legacy
Location: Glovers Lane
Project No.: SP-0067(5)0
Boring No.: 19-613
Sample Type: Shelby
Description: CL-ML
Remarks: Multi Staged

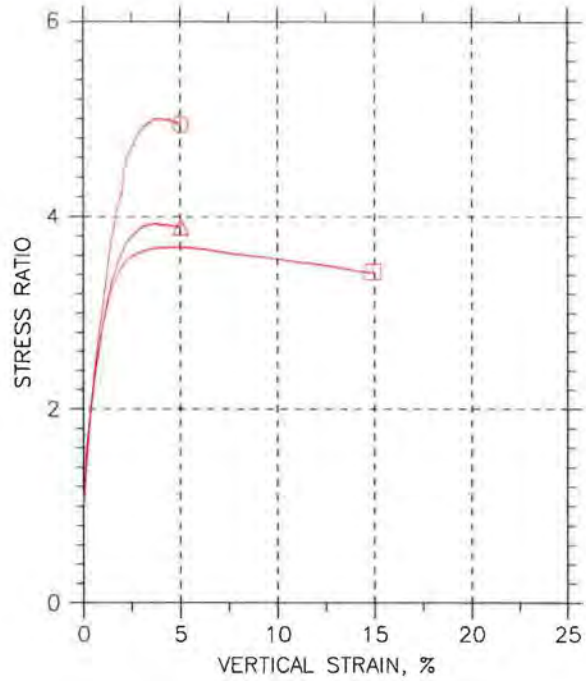
Phase calculations based on start of test.

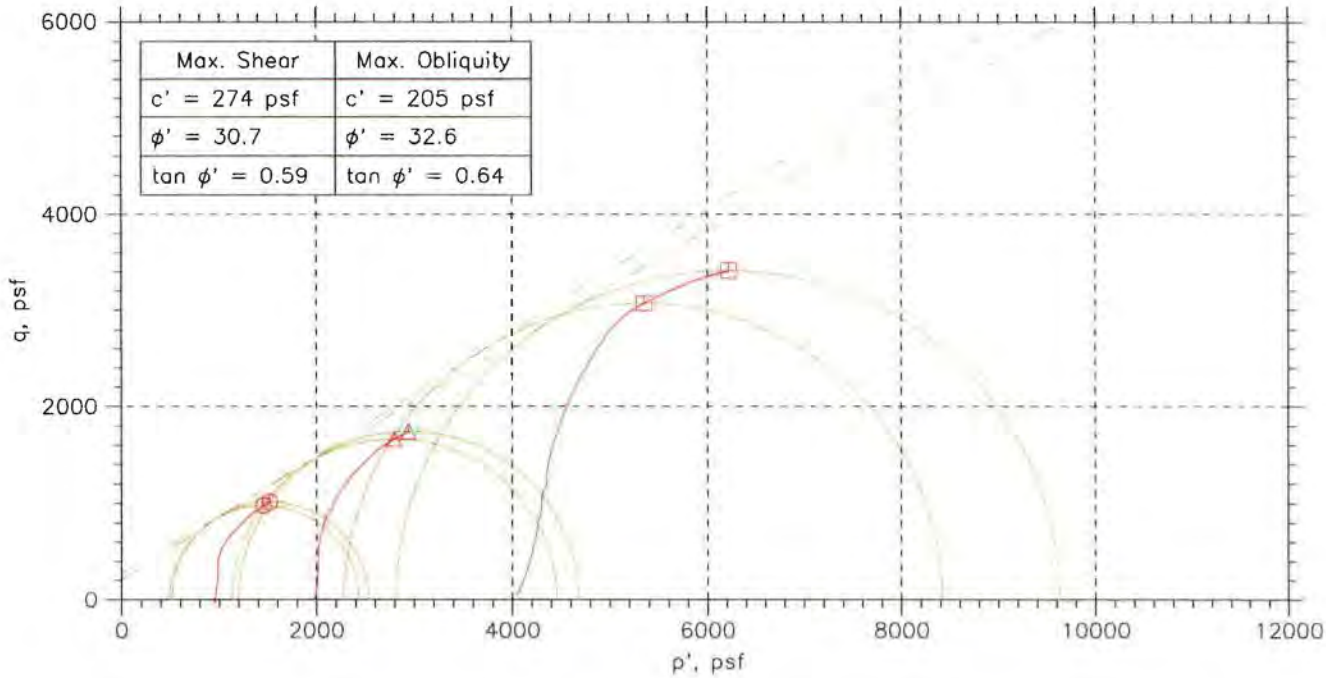
Tue, 30-MAY-2006 08:55:04

* Saturation is set to 100% for phase calculations

CONSOLIDATED UNDRAINED TRIAXIAL TEST by AASHTO T297







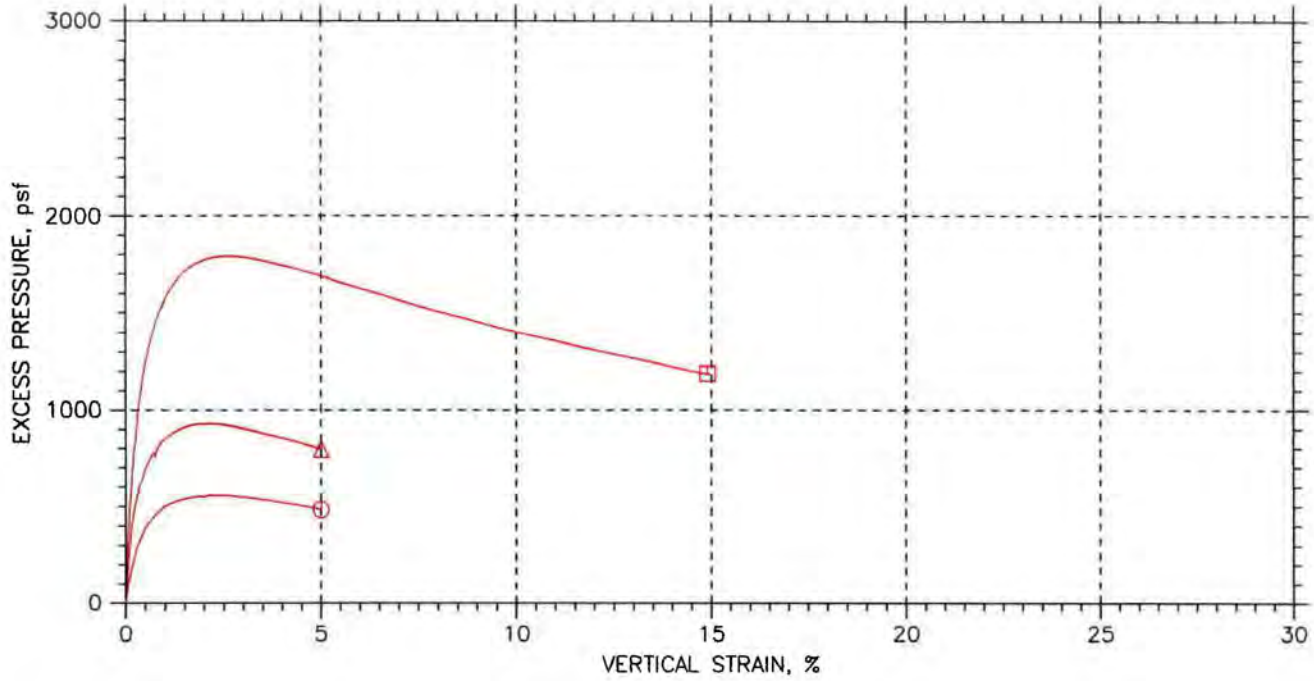
Max. Shear	Max. Obliquity
c' = 274 psf	c' = 205 psf
ϕ' = 30.7	ϕ' = 32.6
tan ϕ' = 0.59	tan ϕ' = 0.64

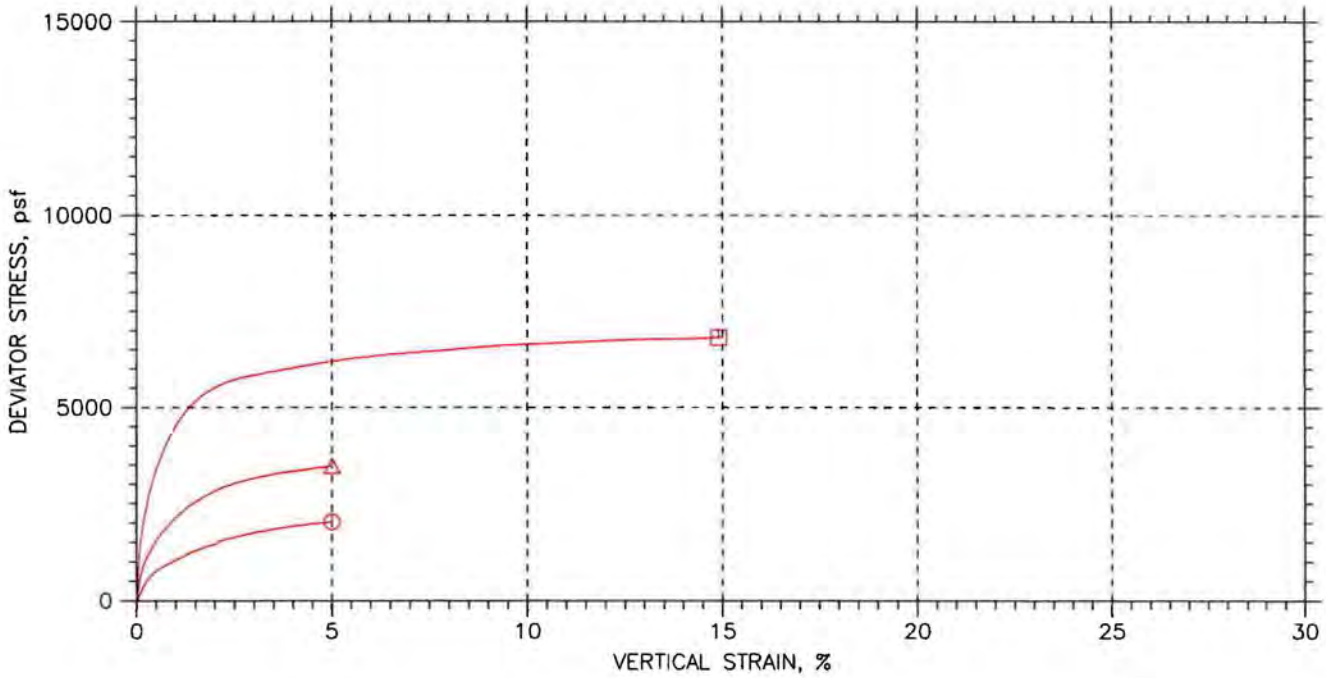
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
○	U1@9.5a	1	9.5'	M. Graham	17 May 06	D. Sjoblom		U1-9.5A.dat
△	U1@9.5a	1	9.5'	M. Graham	17 May 06	D. Sjoblom		U1-9.5B.dat
□	U1@9.5a	1	9.5'	M. Graham	17 May 06	D. Sjoblom		U1-9.5BC.dat

Project: Glovers over Legacy	Location: Glovers Lane	Project No.: SP-0067(5)0
Boring No.: 19-613	Sample Type: Shelby	
Description: CL-ML		
Remarks: Multi Staged		

Tue, 30-MAY-2006 08:55:05

CONSOLIDATED UNDRAINED TRIAXIAL TEST by AASHTO T297



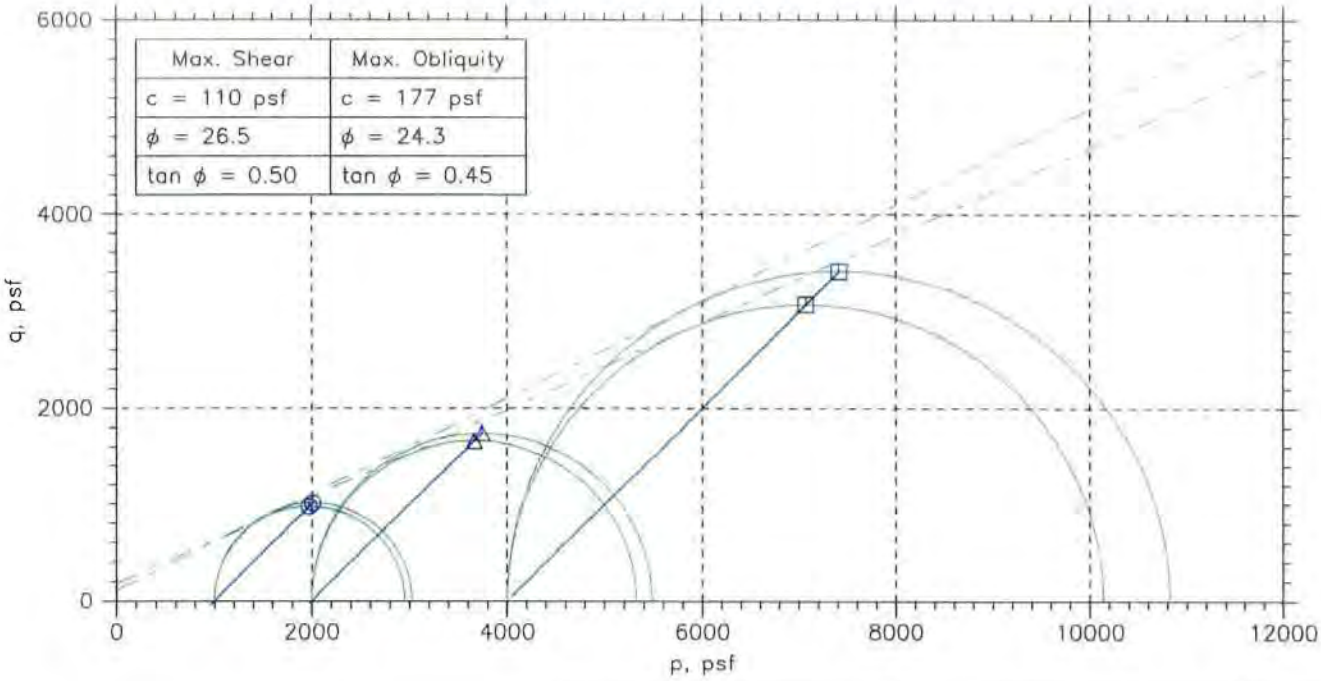


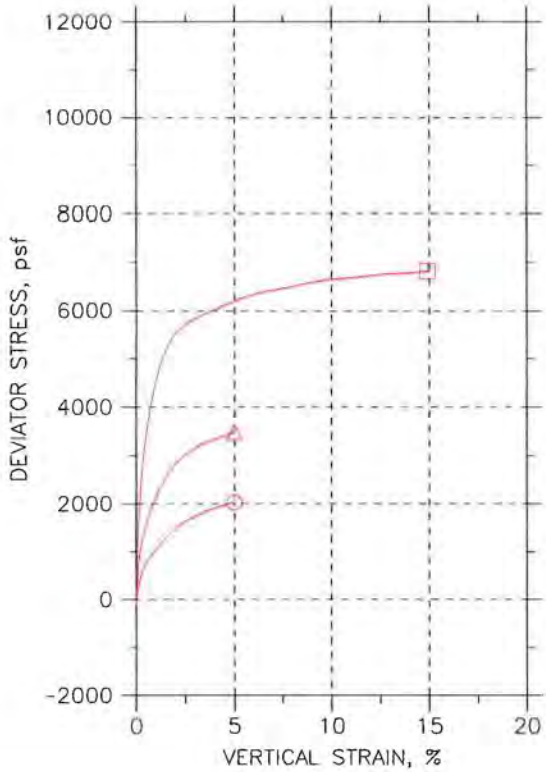
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
○	U1@9.5a	1	9.5'	M. Graham	17 May 06	D. Sjoblom		U1-9.5A.dat
△	U1@9.5a	1	9.5'	M. Graham	17 May 06	D. Sjoblom		U1-9.5B.dat
□	U1@9.5a	1	9.5'	M. Graham	17 May 06	D. Sjoblom		U1-9.5BC.dat

UDOT	Project: Glovers over Legacy	Location: Glovers Lane	Project No.: SP-0067(5)0
	Boring No.: 19-613	Sample Type: Shelby	
	Description: CL-ML		
	Remarks: Multi Staged		

Tue, 30-MAY-2006 08:55:06

CONSOLIDATED UNDRAINED TRIAXIAL TEST by AASHTO T297





Symbol		○	△	□	
Sample No.		U1@9.5a	U1@9.5a	U1@9.5a	
Test No.		1	1	1	
Depth		9.5'	9.5'	9.5'	
Initial	Diameter, in	2.84	2.84	2.84	
	Height, in	5.89	5.89	5.89	
	Water Content, %	27.8	27.8	27.8	
	Dry Density, pcf	99.08	99.08	99.08	
	Saturation, %	0.0	0.0	0.0	
	Void Ratio	-1	-1	-1	
Before Shear	Water Content, %	28.3	29.1	27.8	
	Dry Density, pcf	107.6	102.1	102.1	
	Saturation*, %	0.0	0.0	0.0	
	Void Ratio	0	0	0	
	Back Press., psf	5761	5762	6544	
Ver. Eff. Cons. Stress, psf		997.8	2000	3997	
Shear Strength, psf		1012	1740	3409	
Strain at Failure, %		5	5	14.9	
Strain Rate, %/min		0.015	0.015	0.015	
B-Value		0.95	0.95	0.95	
Estimated Specific Gravity		0	0	0	
Liquid Limit		30	30	30	
Plastic Limit		18	18	18	

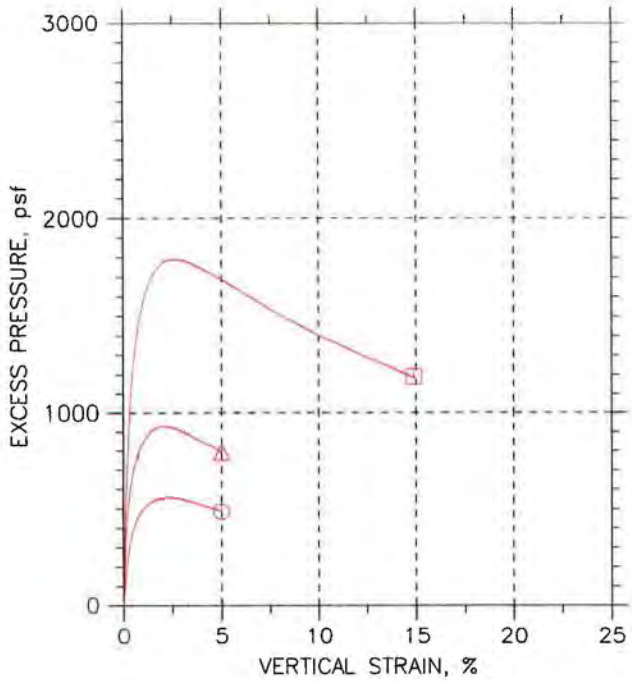
Project: Glovers over Legacy
Location: Glovers Lane
Project No.: SP-0067(5)0
Boring No.: 19-613
Sample Type: Shelby
Description: CL-ML
Remarks: Multi Staged

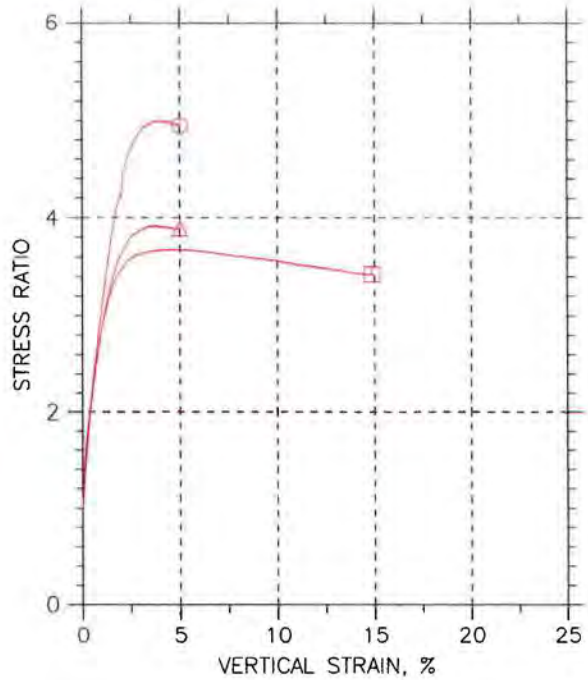
Phase calculations based on start of test.

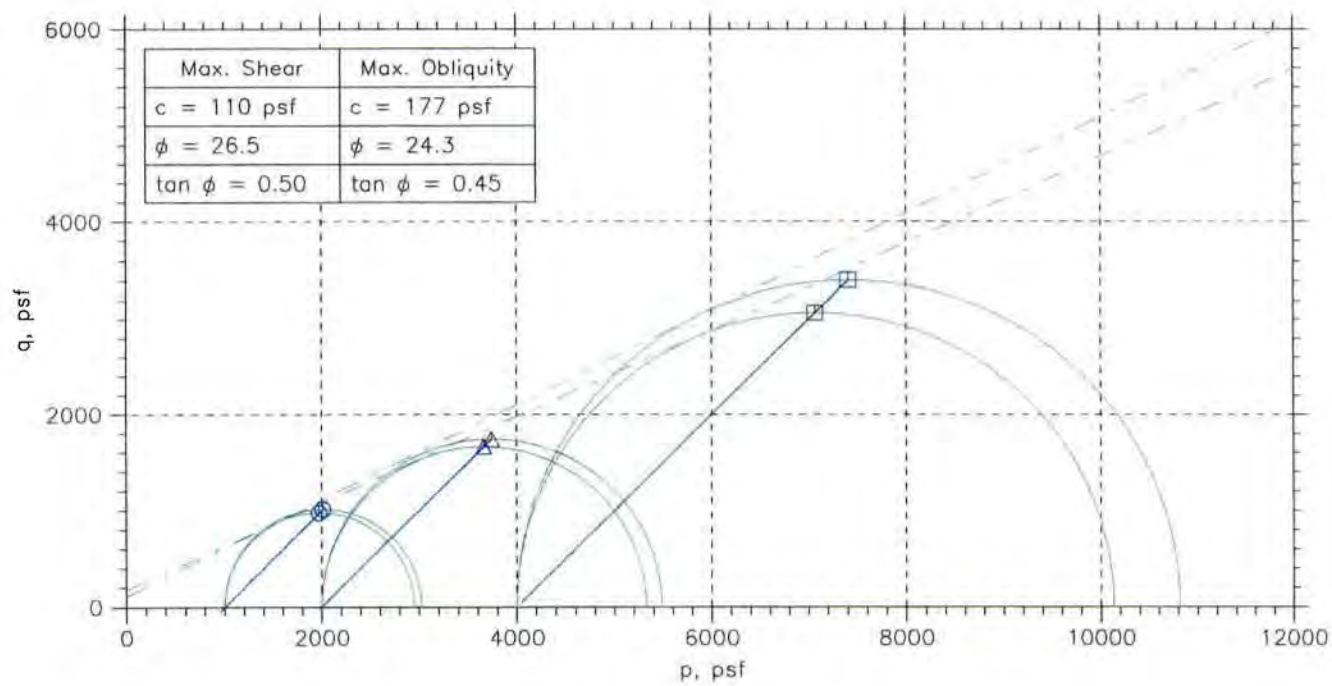
Tue, 30-MAY-2006 09:00:09

* Saturation is set to 100% for phase calculations

CONSOLIDATED UNDRAINED TRIAXIAL TEST by AASHTO T297





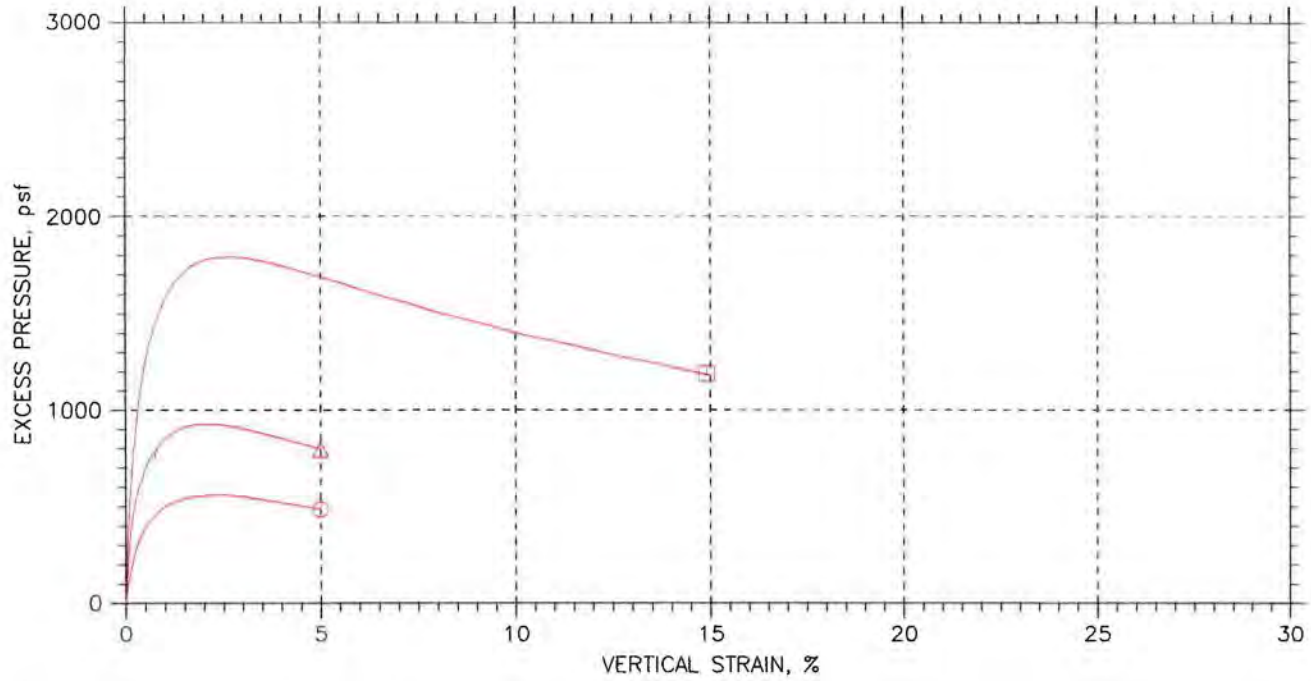


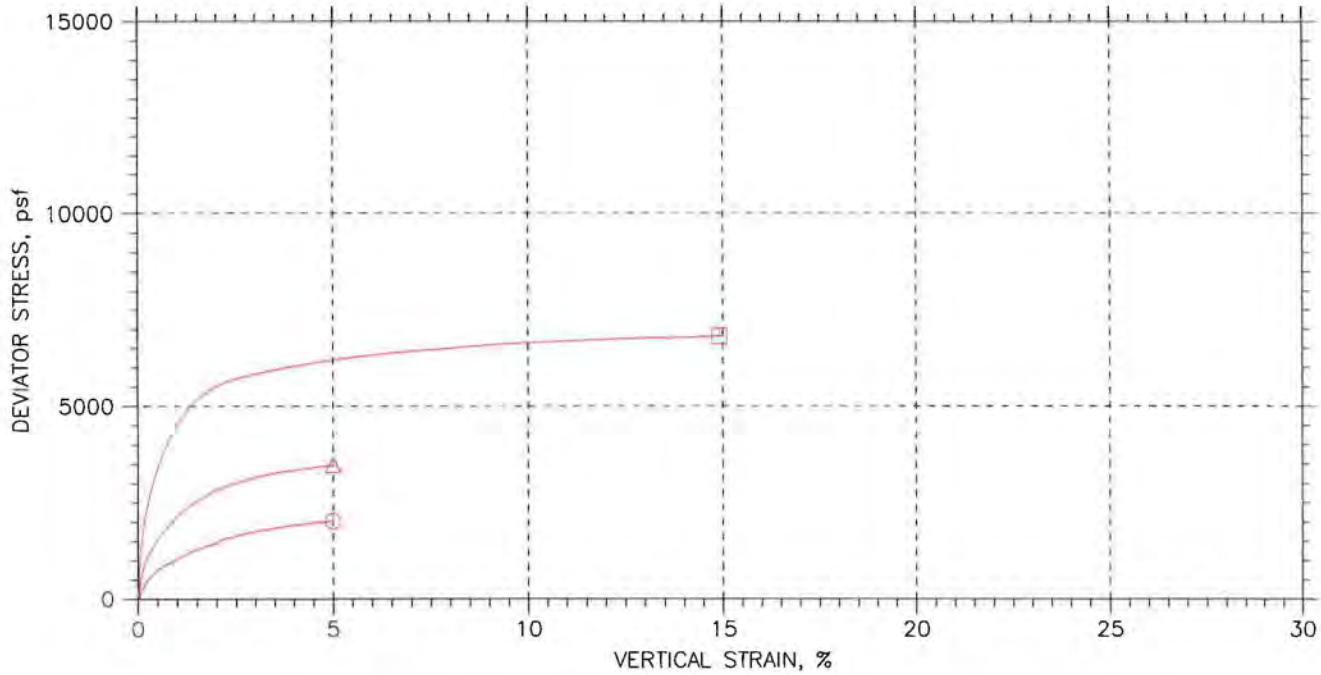
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
○	U1@9.5a	1	9.5'	M. Graham	17 May 06	D. Sjoblom		U1-9.5A.dat
△	U1@9.5a	1	9.5'	M. Graham	17 May 06	D. Sjoblom		U1-9.5B.dat
□	U1@9.5a	1	9.5'	M. Graham	17 May 06	D. Sjoblom		U1-9.5BC.dat

UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Glovers Lane	Project No.: SP-0067(5)0
	Boring No.: 19-613	Sample Type: Shelby	
	Description: CL-ML		
	Remarks: Multi Staged		

Tue, 30-MAY-2006 09:00:11

CONSOLIDATED UNDRAINED TRIAXIAL TEST by AASHTO T297



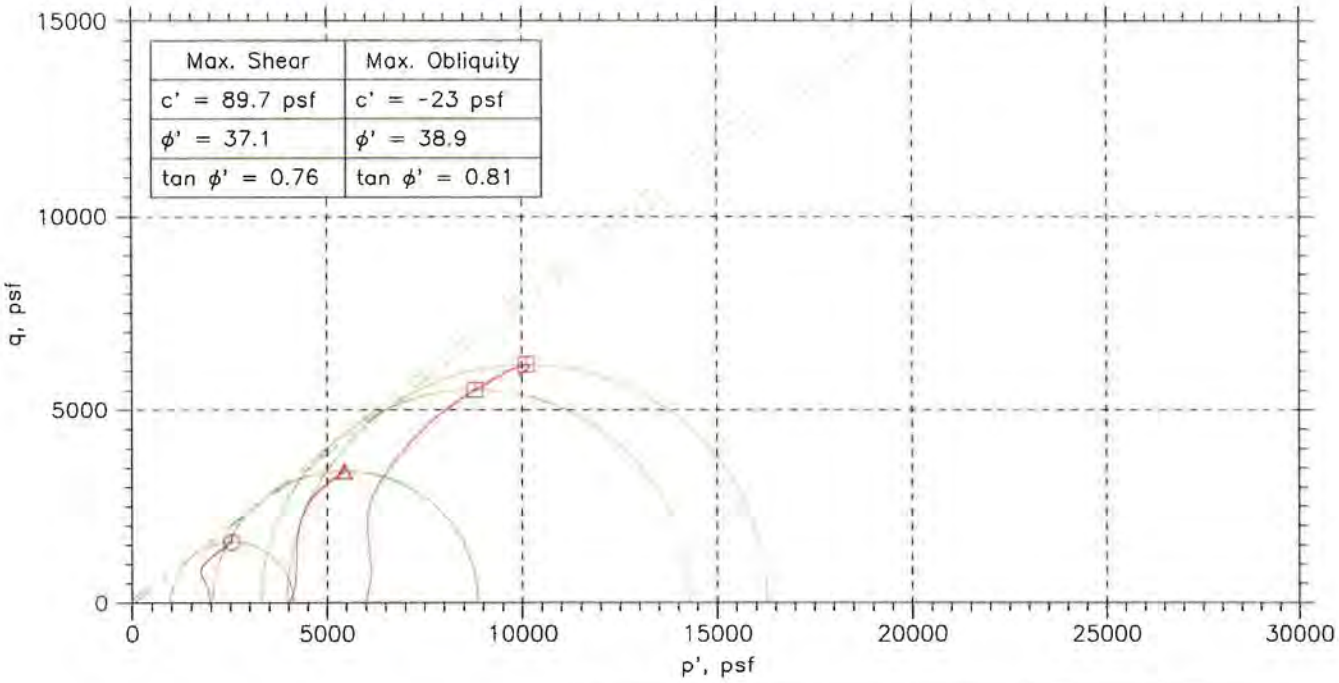


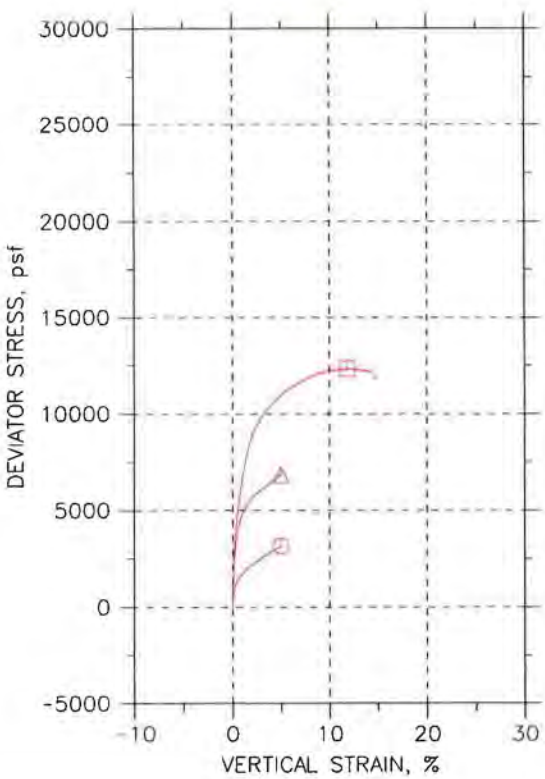
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
⏲	U1@9.5a	1	9.5'	M. Graham	17 May 06	D. Sjoblom		U1-9.5A.dat
△	U1@9.5a	1	9.5'	M. Graham	17 May 06	D. Sjoblom		U1-9.5B.dat
□	U1@9.5a	1	9.5'	M. Graham	17 May 06	D. Sjoblom		U1-9.5BC.dat

Project: Glovers over Legacy	Location: Glovers Lane	Project No.: SP-0067(5)0
Boring No.: 19-613	Sample Type: Shelby	
Description: CL-ML		
Remarks: Multi Staged		

Tue, 30-MAY-2006 09:00:12

CONSOLIDATED UNDRAINED TRIAXIAL TEST by AASHTO T297





Symbol		⊙	△	⊡	
Sample No.		U1@42.5a	U1@42.5a	U1@42.5a	
Test No.		1a	1b	1c	
Depth		42.5'	42.5'	42.5'	
Initial	Diameter, in	2.806	2.806	2.806	
	Height, in	5.907	5.907	5.907	
	Water Content, %	32.3	32.3	32.3	
	Dry Density, pcf	100.5	100.5	100.5	
	Saturation, %	0.0	0.0	0.0	
	Void Ratio	-1	-1	-1	
Before Shear	Water Content, %	32.9	32.3	32.6	
	Dry Density, pcf	103.9	103.1	103.7	
	Saturation*, %	0.0	0.0	0.0	
	Void Ratio	0	0	0	
	Back Press., psf	8352	9393	5760	
Ver. Eff. Cons. Stress, psf		1999	3999	5998	
Shear Strength, psf		1580	3409	6163	
Strain at Failure, %		5	5	11.9	
Strain Rate, %/min		0.015	0.015	0.015	
B-Value		0.95	0.95	0.95	
Estimated Specific Gravity		0	0	0	
Liquid Limit		34	34	34	
Plastic Limit		20	20	20	

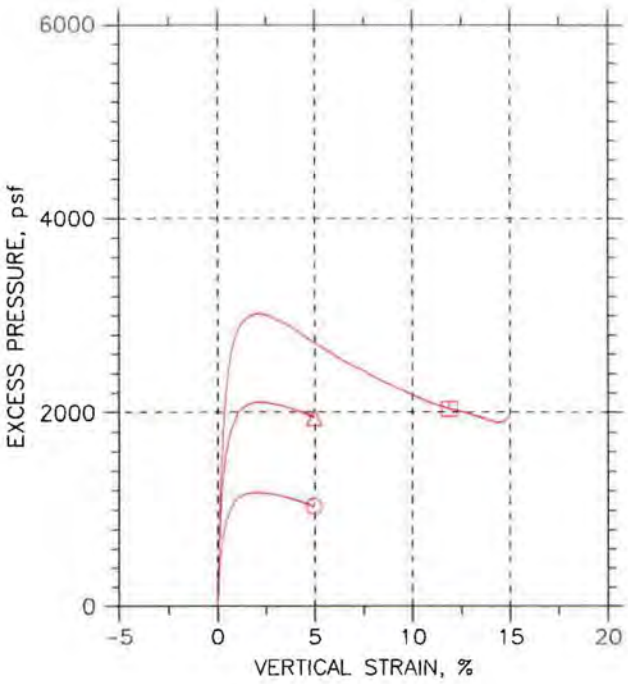
Project: Glovers over Legacy
Location: Glovers Lane
Project No.: SP-0067(5)0
Boring No.: 19-613
Sample Type: Shelby
Description: CL-ML
Remarks: Multi Staged

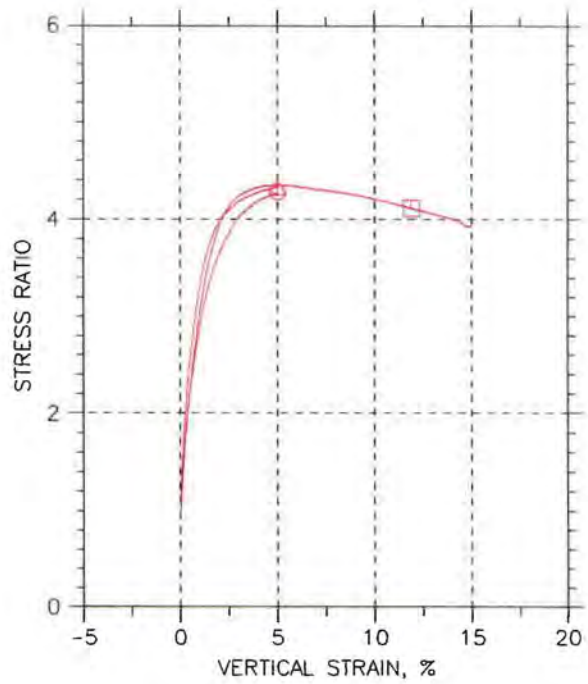
Phase calculations based on start of test.

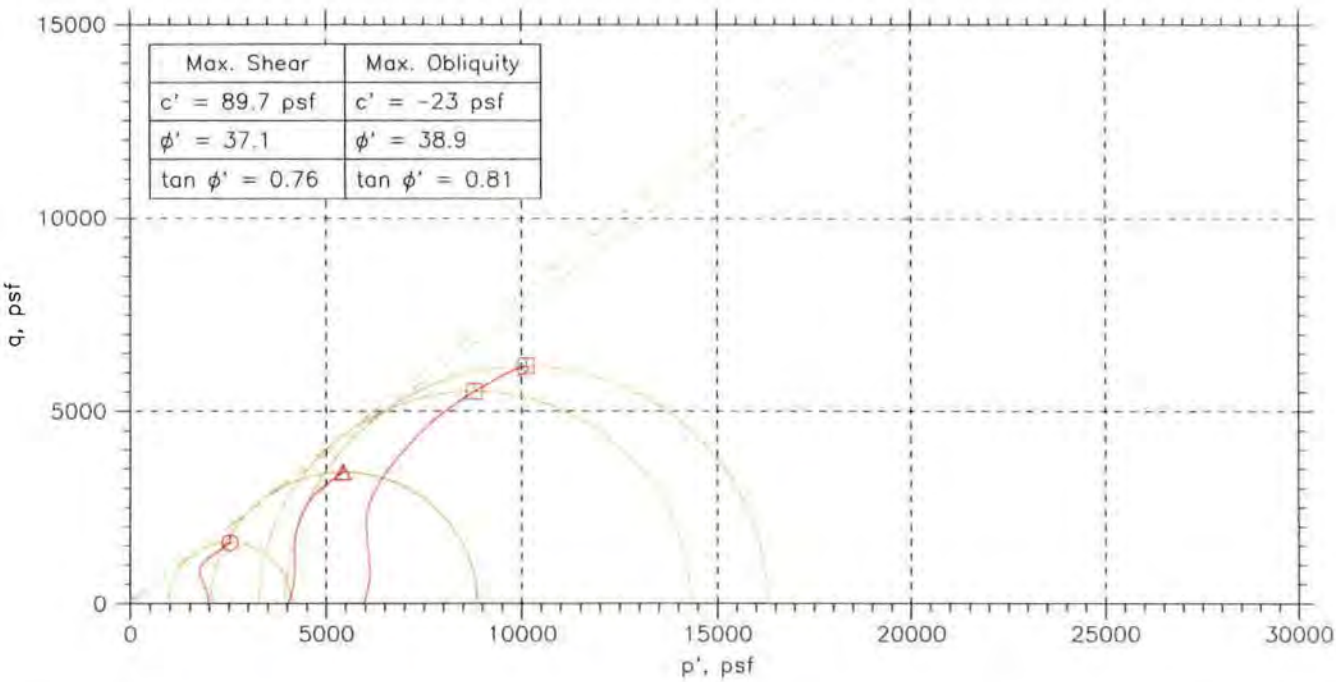
Wed, 31-MAY-2006 07:59:00

* Saturation is not to 100% for phase calculations

CONSOLIDATED UNDRAINED TRIAXIAL TEST by AASHTO T297







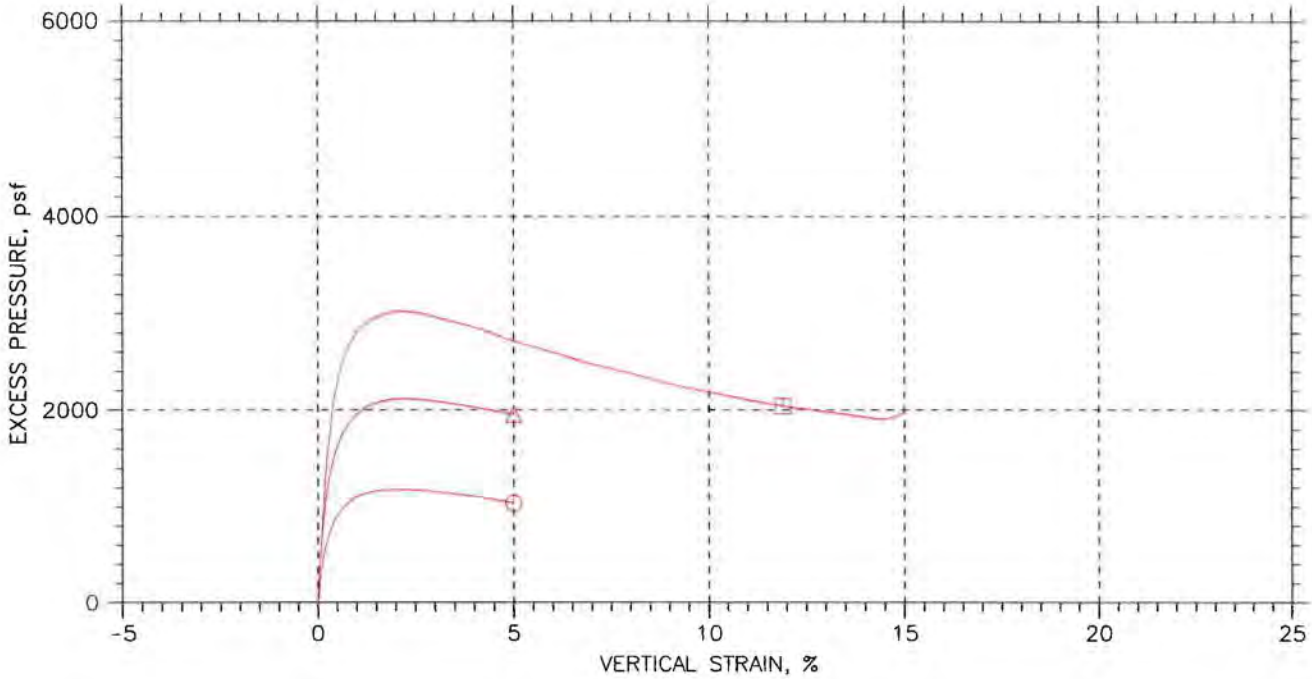
Max. Shear	Max. Obliquity
c' = 89.7 psf	c' = -23 psf
ϕ' = 37.1	ϕ' = 38.9
tan ϕ' = 0.76	tan ϕ' = 0.81

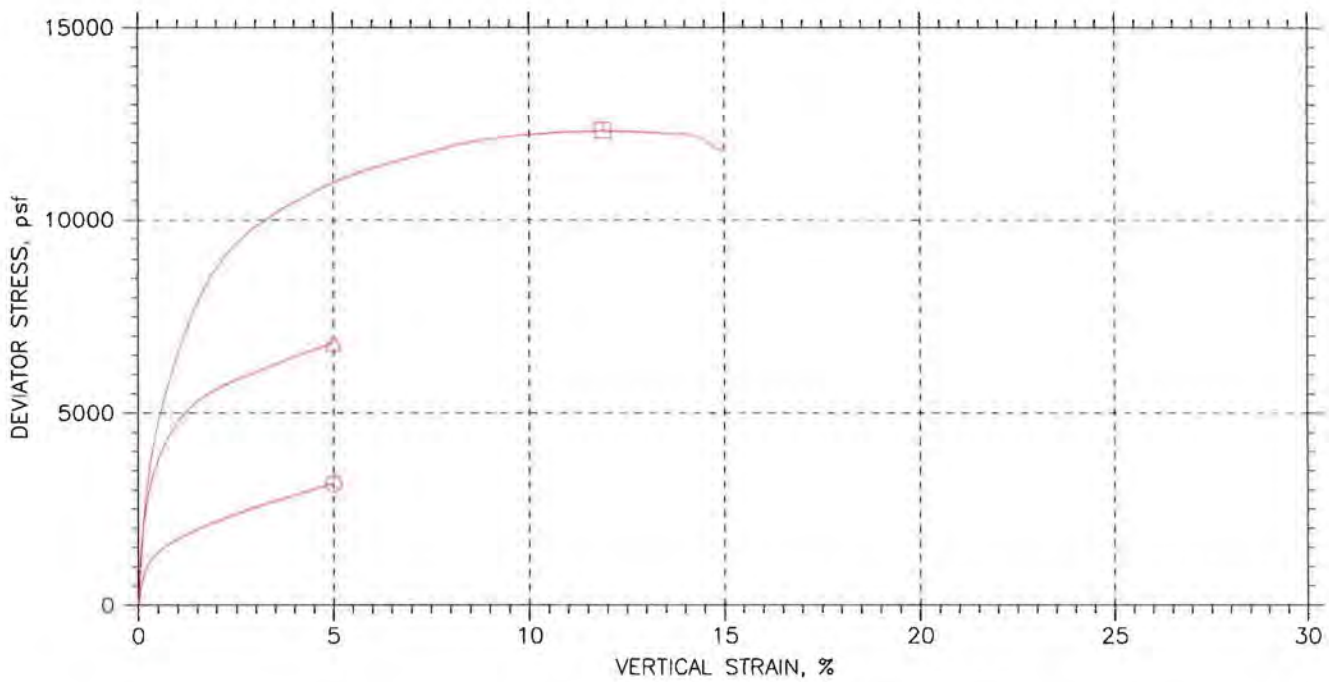
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
○	U1@42.5a	1a	42.5'	M. Graham	23 May 06	D. Sjoblom		U1-42.5A.dat
△	U1@42.5a	1b	42.5'	M. Graham	23 May 06	D. Sjoblom		U1-42.5B.dat
□	U1@42.5a	1c	42.5'	M. Graham	23 May 06	D. Sjoblom		U1-42.5C.dat

Project: Glovers over Legacy	Location: Glovers Lane	Project No.: SP-0067(5)0
Boring No.: 19-613	Sample Type: Shelby	
Description: CL-ML		
Remarks: Multi Staged		

Wed, 31-MAY-2006 07:59:02

CONSOLIDATED UNDRAINED TRIAXIAL TEST by AASHTO T297



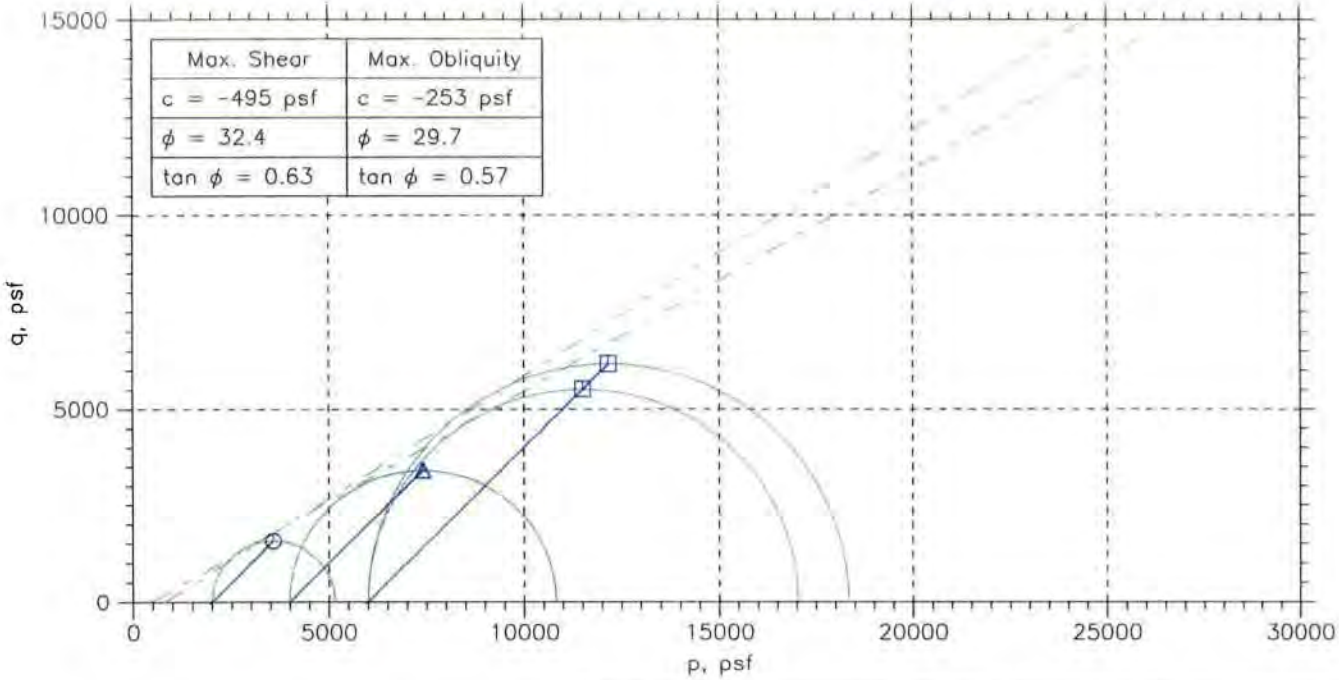


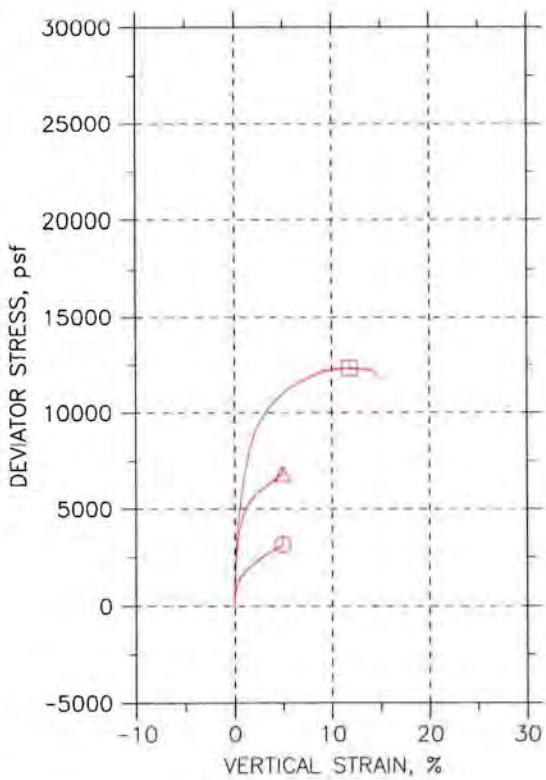
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
○	U1@42.5a	1a	42.5'	M. Graham	23 May 06	D. Sjoblom		U1-42.5A.dat
△	U1@42.5a	1b	42.5'	M. Graham	23 May 06	D. Sjoblom		U1-42.5B.dat
□	U1@42.5a	1c	42.5'	M. Graham	23 May 06	D. Sjoblom		U1-42.5C.dat

Project: Glovers over Legacy	Location: Glovers Lane	Project No.: SP-0067(5)0
Boring No.: 19-613	Sample Type: Shelby	
Description: CL-ML		
Remarks: Multi Staged		

Wed, 31-MAY-2006 07:59:03

CONSOLIDATED UNDRAINED TRIAXIAL TEST by AASHTO T297





Symbol		⊙	△	⊡	
Sample No.		U1@42.5a	U1@42.5a	U1@42.5a	
Test No.		1a	1b	1c	
Depth		42.5'	42.5'	42.5'	
Initial	Diameter, in	2.806	2.806	2.806	
	Height, in	5.907	5.907	5.907	
	Water Content, %	32.3	32.3	32.3	
	Dry Density, pcf	100.5	100.5	100.5	
	Saturation, %	0.0	0.0	0.0	
	Void Ratio	-1	-1	-1	
Before Shear	Water Content, %	32.9	32.3	32.6	
	Dry Density, pcf	103.9	103.1	103.7	
	Saturation*, %	0.0	0.0	0.0	
	Void Ratio	0	0	0	
	Back Press., psf	8352	9393	5760	
Ver. Eff. Cons. Stress, psf		1999	3999	5998	
Shear Strength, psf		1580	3409	6163	
Strain at Failure, %		5	5	11.9	
Strain Rate, %/min		0.015	0.015	0.015	
B-Value		0.95	0.95	0.95	
Estimated Specific Gravity		0	0	0	
Liquid Limit		34	34	34	
Plastic Limit		20	20	20	

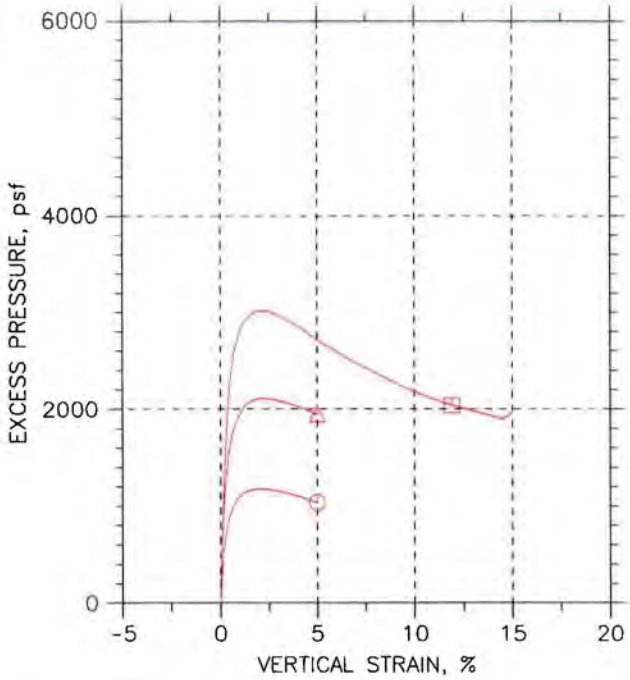
Project: Glovers over Legacy
Location: Glovers Lane
Project No.: SP-0067(5)0
Boring No.: 19-613
Sample Type: Shelby
Description: CL-ML
Remarks: Multi Staged

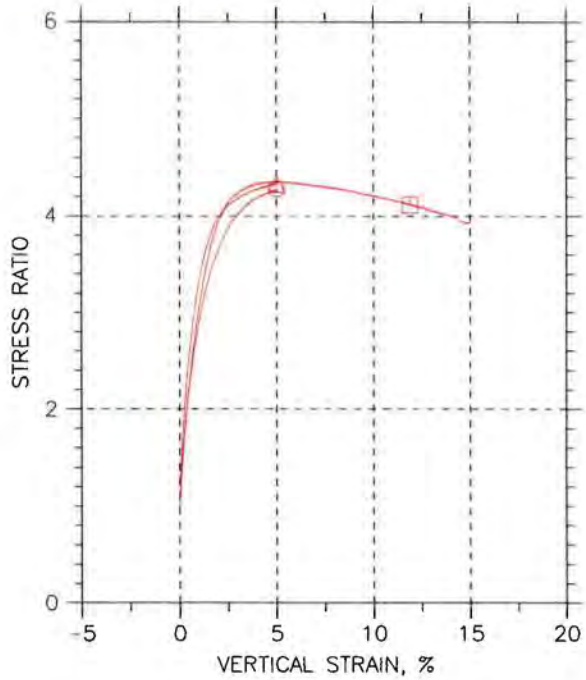
Phase calculations based on start of test.

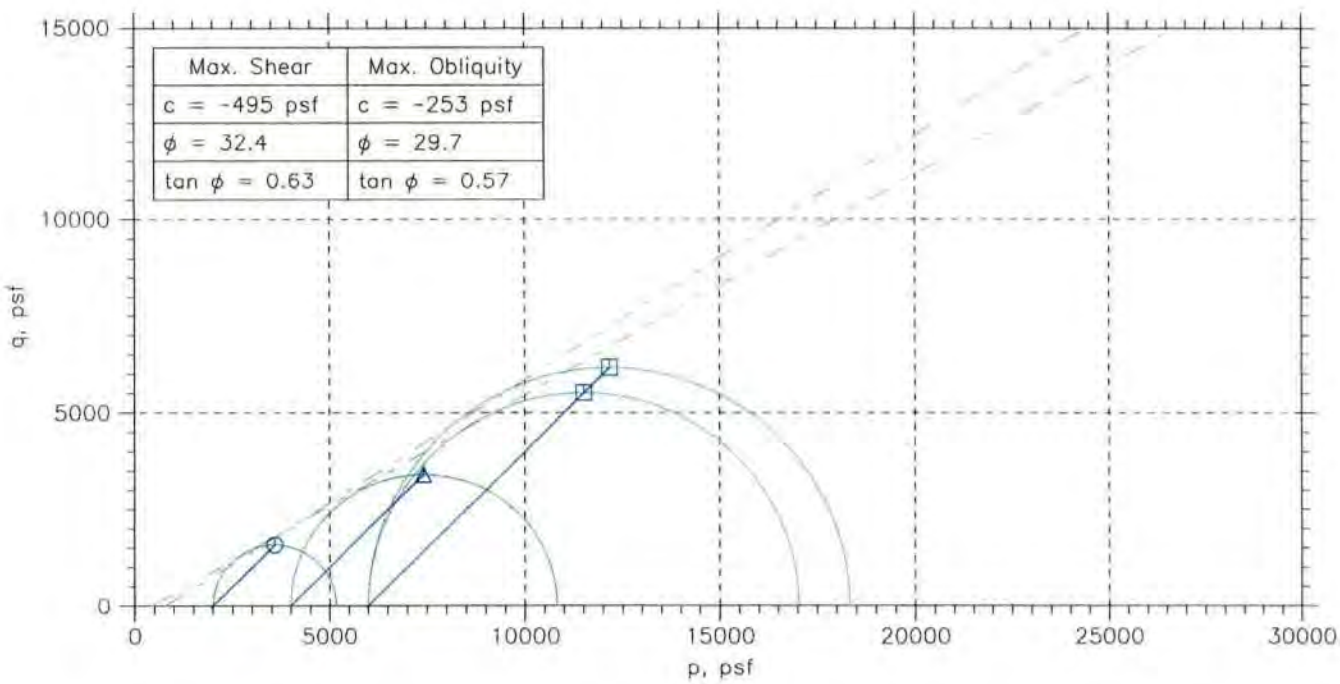
Wed. 31-MAY-2006 08:00:20

* Saturation is set to 100% for phase calculations

CONSOLIDATED UNDRAINED TRIAXIAL TEST by AASHTO T297





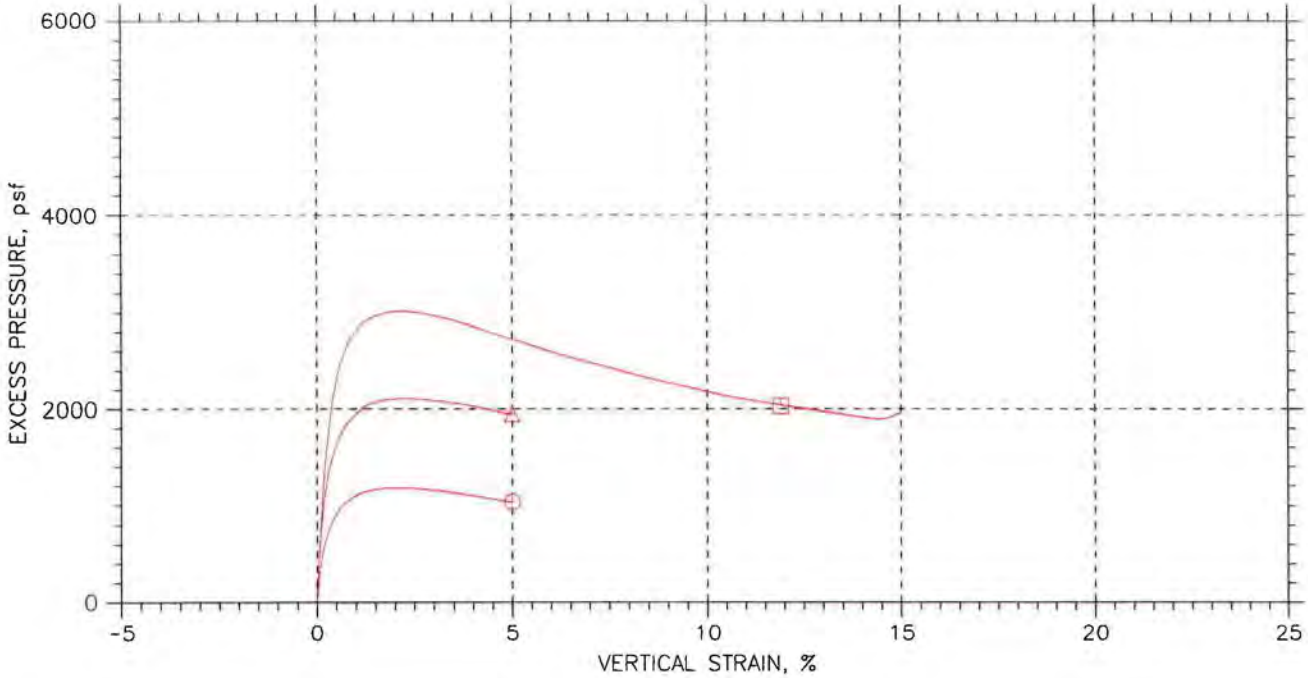


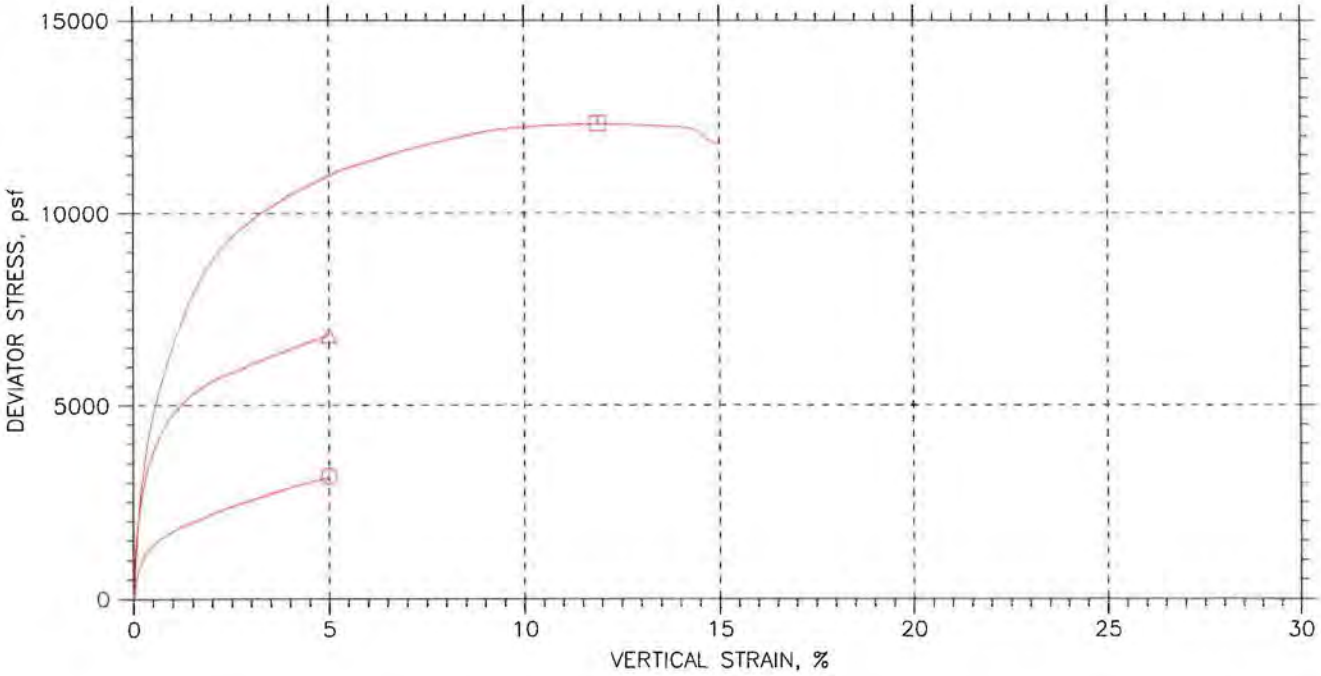
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
○	U1@42.5a	1a	42.5'	M. Graham	23 May 06	D. Sjoblom		U1-42.5A.dat
△	U1@42.5a	1b	42.5'	M. Graham	23 May 06	D. Sjoblom		U1-42.5B.dat
□	U1@42.5a	1c	42.5'	M. Graham	23 May 06	D. Sjoblom		U1-42.5C.dat

UDOT	Project: Glovers over Legacy	Location: Glovers Lane	Project No.: SP-0067(5)0
	Boring No.: 19-613	Sample Type: Shelby	
	Description: CL-ML		
	Remarks: Multi Staged		

Wed, 31-MAY-2006 08:00:21

CONSOLIDATED UNDRAINED TRIAXIAL TEST by AASHTO T297





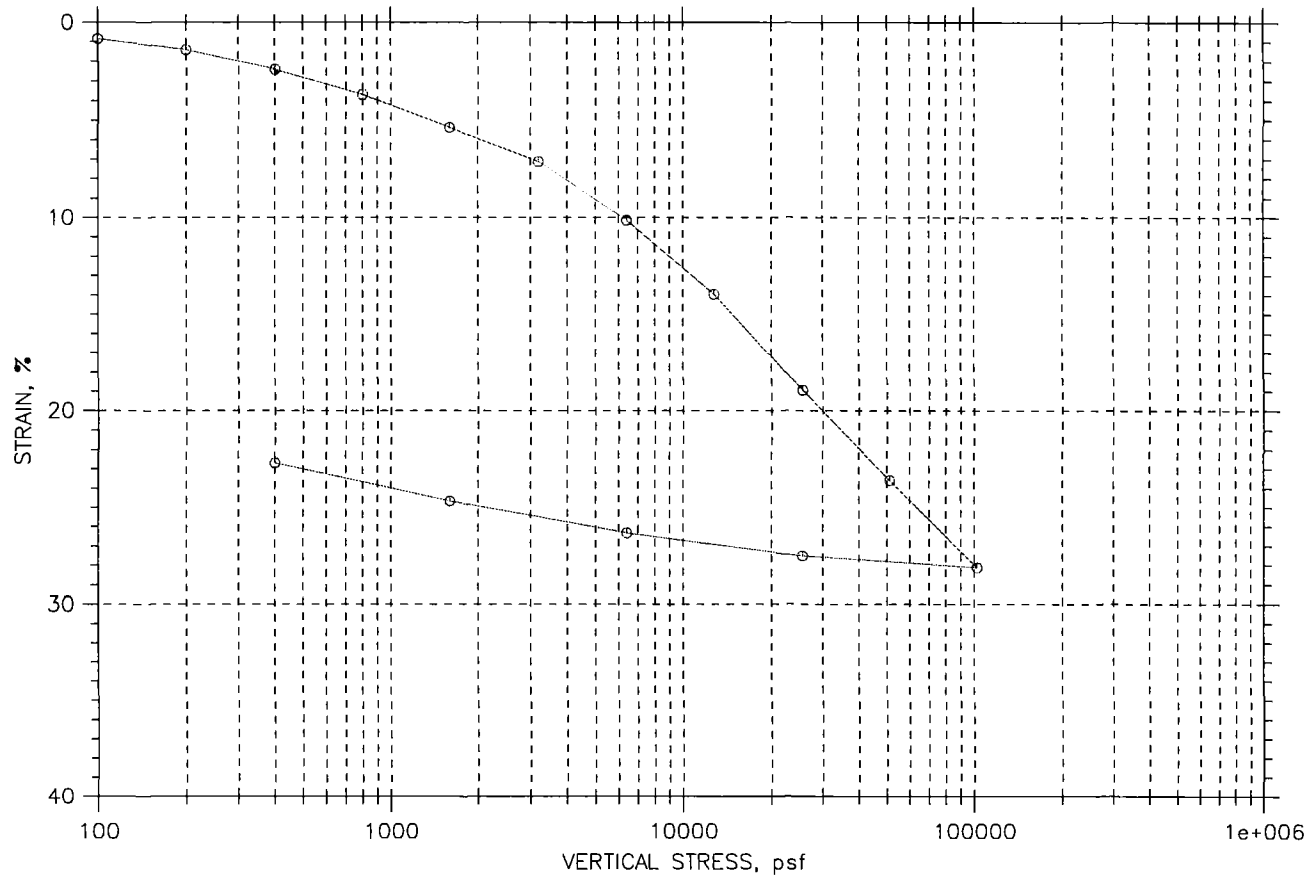
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
○	U1@42.5a	1a	42.5'	M. Graham	23 May 06	D. Sjoblom		U1-42.5A.dat
△	U1@42.5a	1b	42.5'	M. Graham	23 May 06	D. Sjoblom		U1-42.5B.dat
□	U1@42.5a	1c	42.5'	M. Graham	23 May 06	D. Sjoblom		U1-42.5C.dat

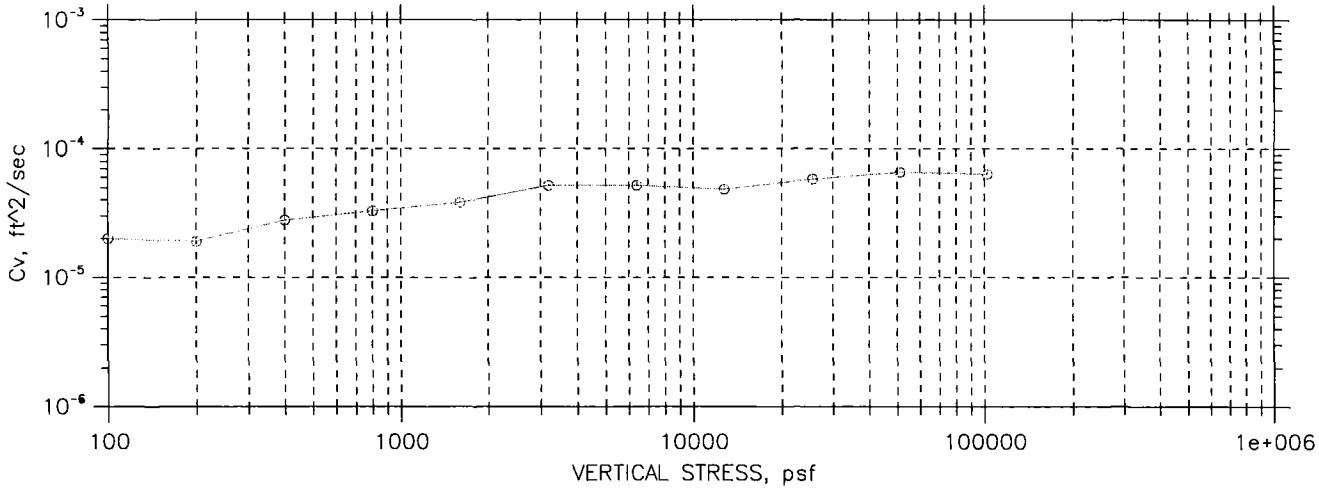
Project: Glovers over Legacy	Location: Glovers Lane	Project No.: SP-0067(5)0
Boring No.: 19-613	Sample Type: Shelby	
Description: CL-ML		
Remarks: Multi Staged		

Wed, 31-MAY-2006 08:00:23

CONSOLIDATION TEST DATA

SUMMARY REPORT





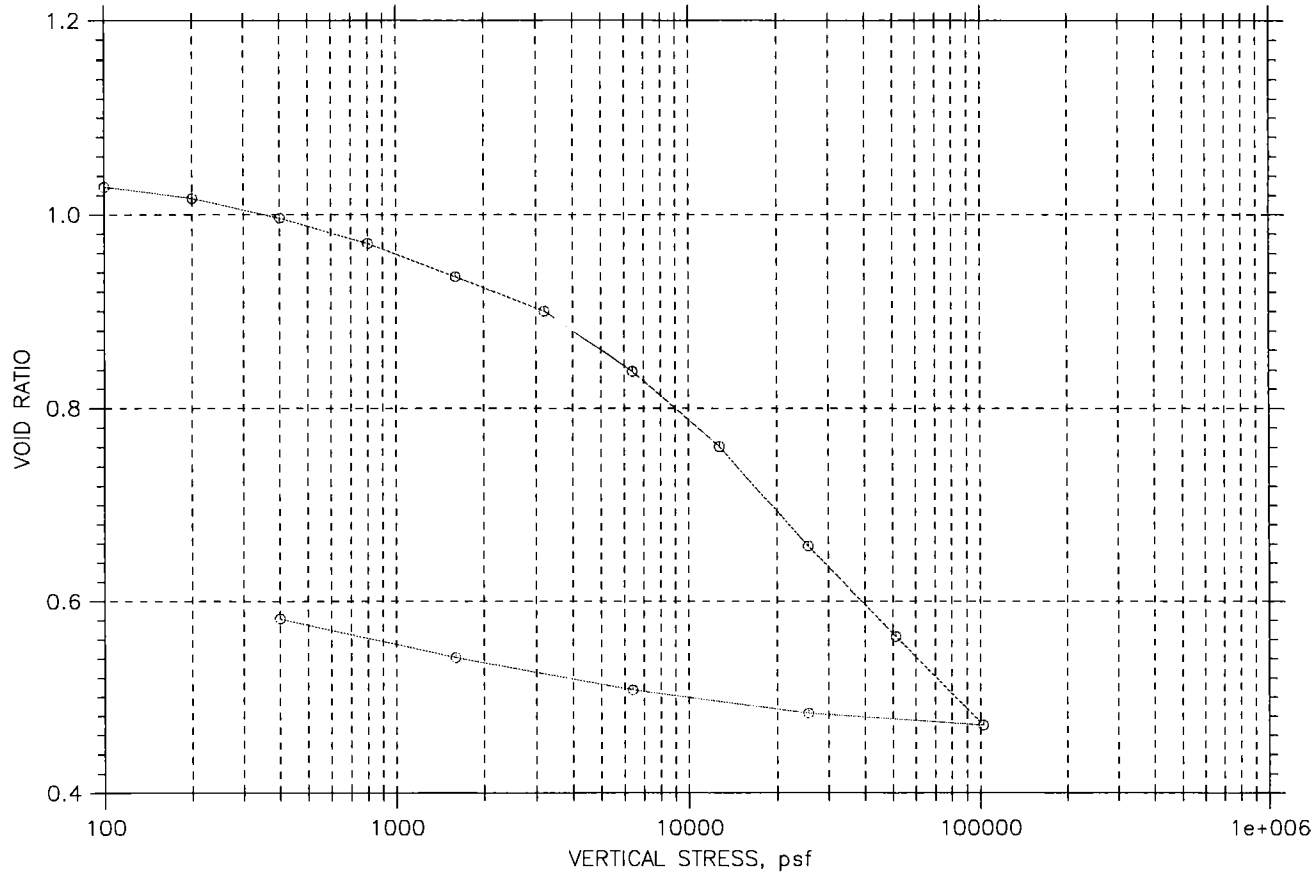
UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

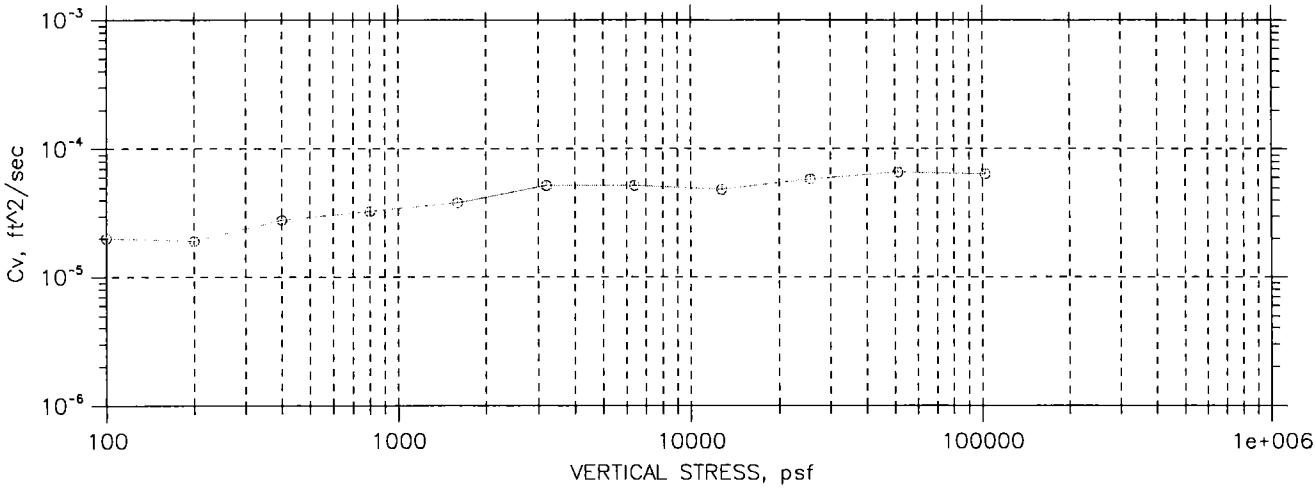
NODE

Fri, 26-MAY-2006 09:44:32

CONSOLIDATION TEST DATA

SUMMARY REPORT





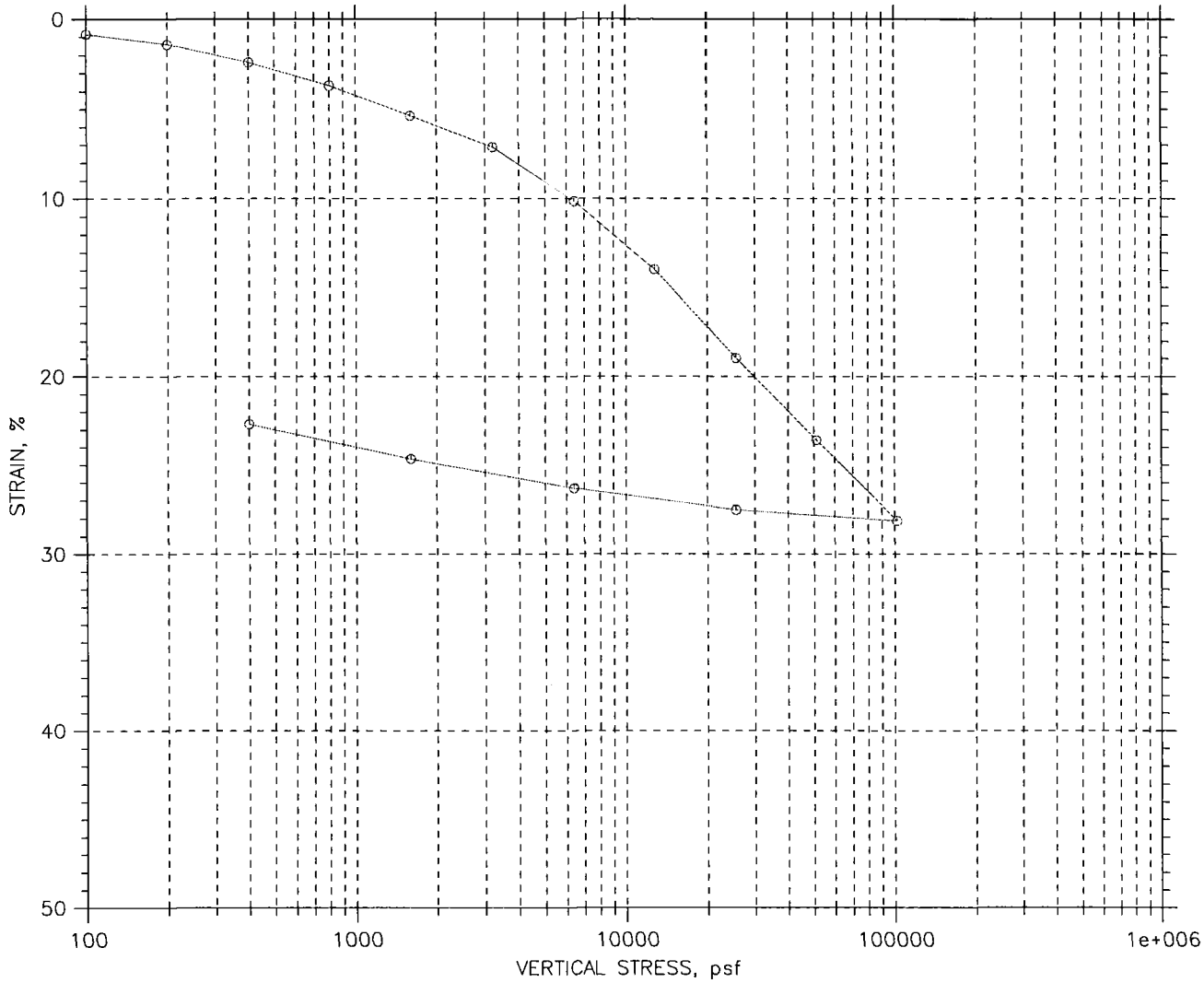
UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

Fri, 26-MAY-2006 10:38:18

CONSOLIDATION TEST DATA

SUMMARY REPORT



					Before Test	After Test
Overburden Pressure: 0 psf				Water Content, %	28.20	19.42
Preconsolidation Pressure: 0 psf				Dry Unit Weight, pcf	91.4	118.2
Compression Index: 3.81959e-313				Saturation, %	80.76	100.00
Diameter: 2.416 in		Height: 1.027 in		Void Ratio	1.05	0.58
LL: 30	PL: 18	PI: 12	GS: 3.00			

UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

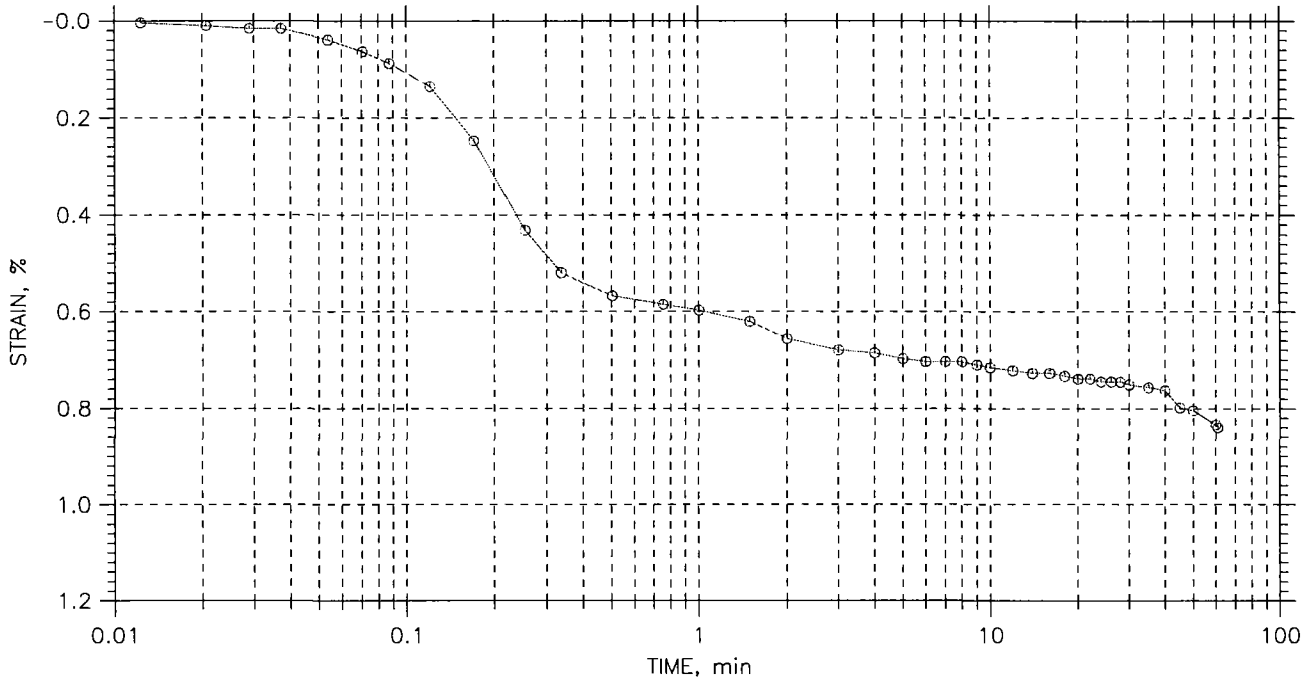
Fri, 26-MAY-2006 09:44:33

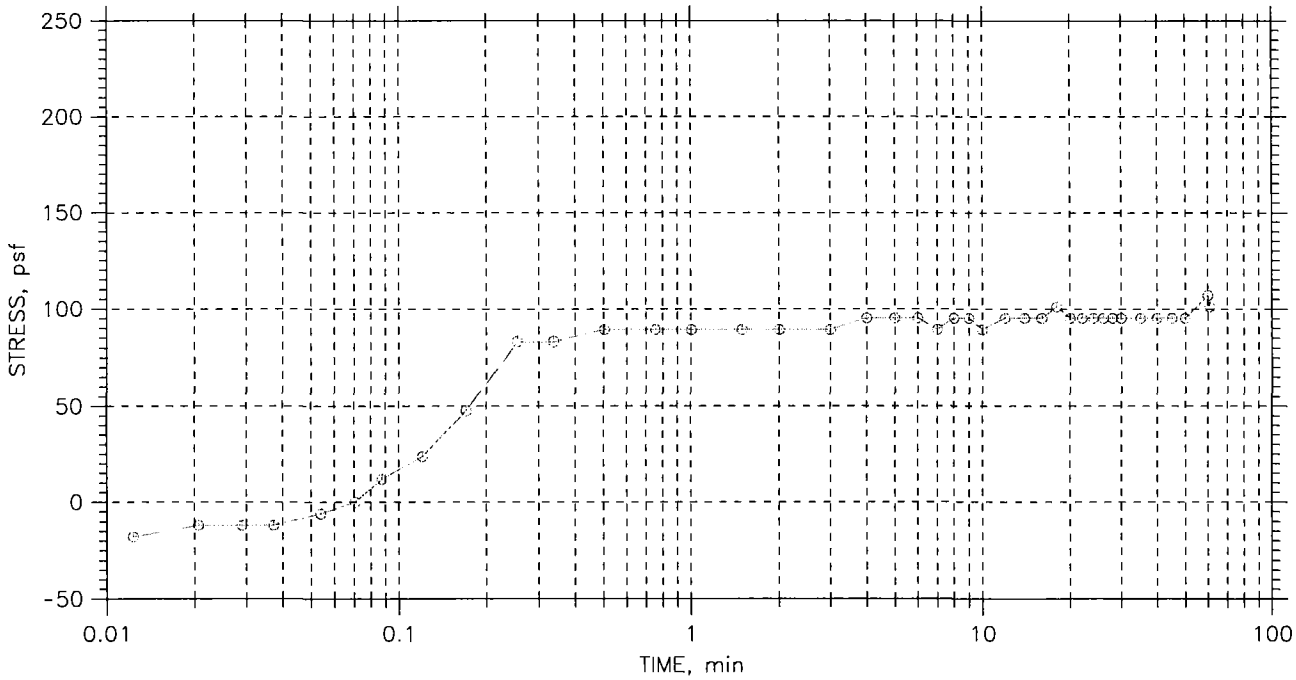
CONSOLIDATION TEST DATA

TIME CURVES

Constant Volume Step: 1 of 15

Stress: 100. psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODE

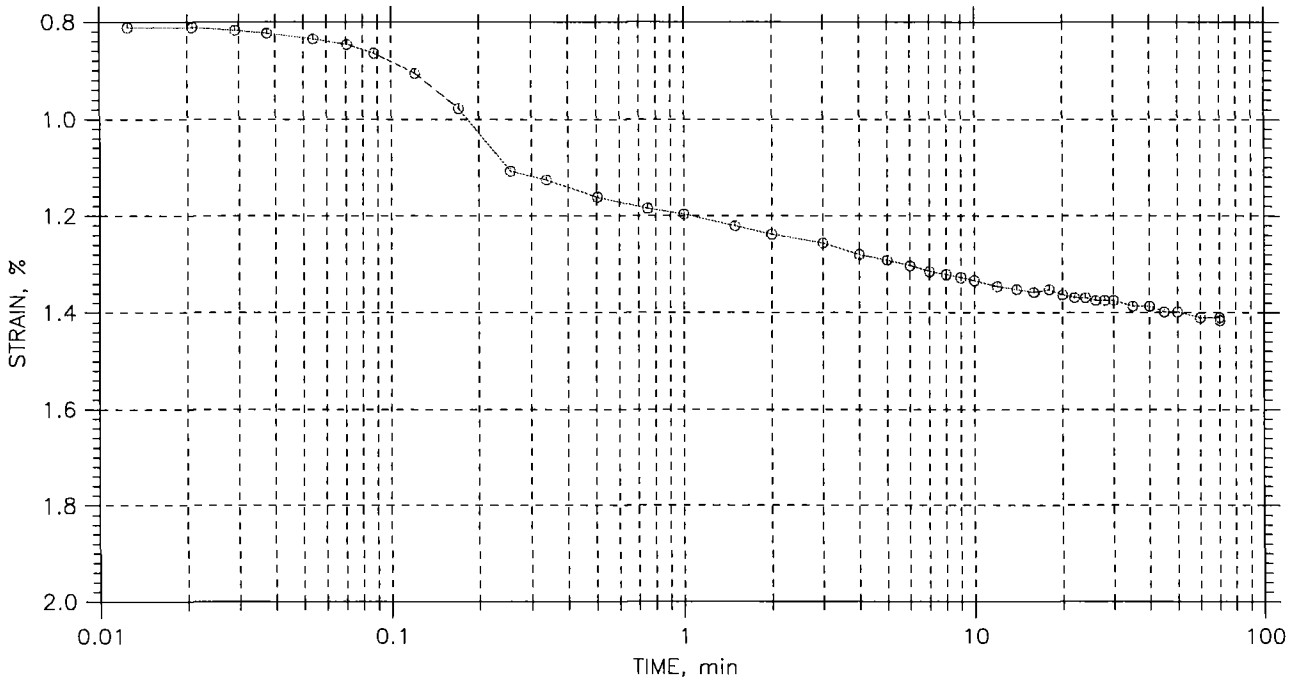
Fri, 26-MAY-2006 09:44:34

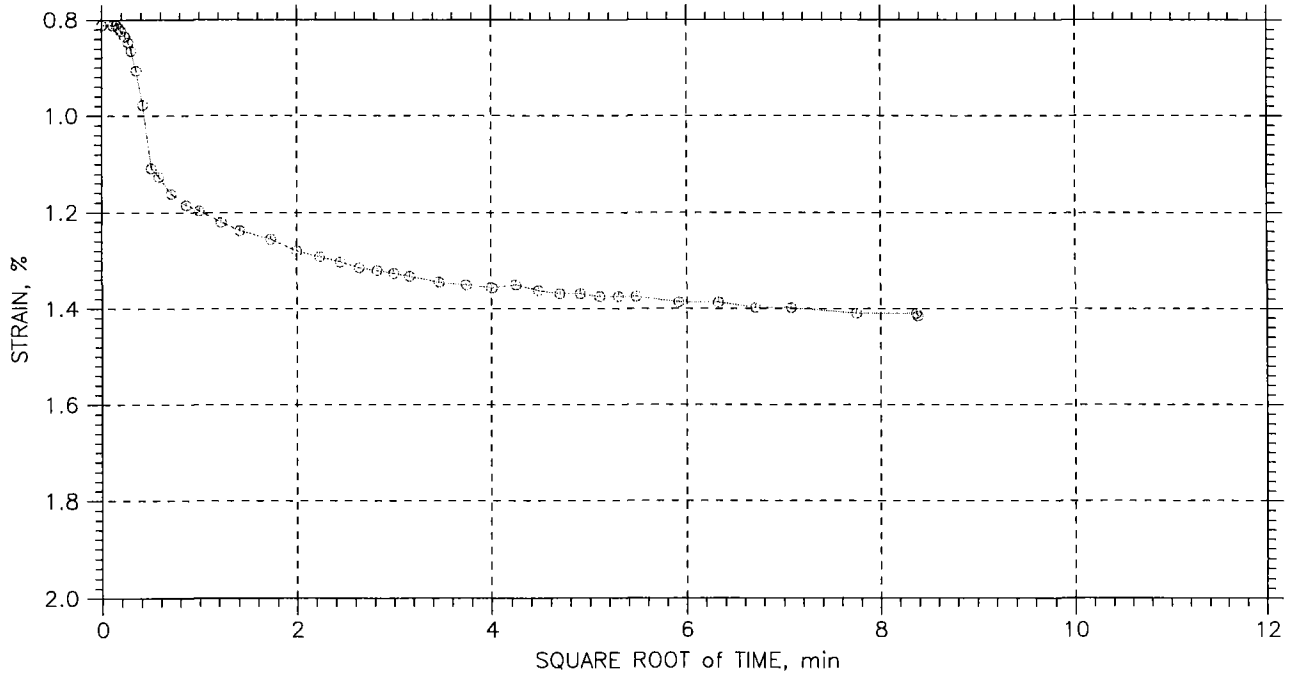
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 2 of 15

Stress: 200. psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

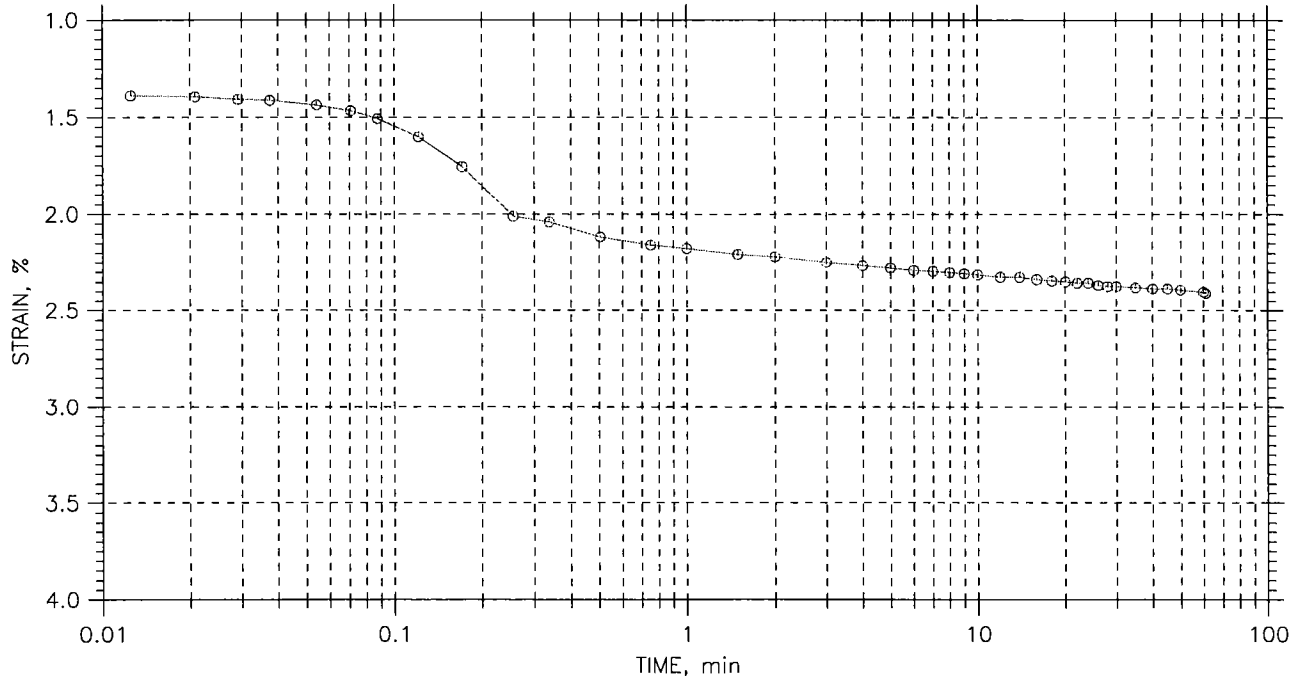
Fri, 26-MAY-2006 09:44:34

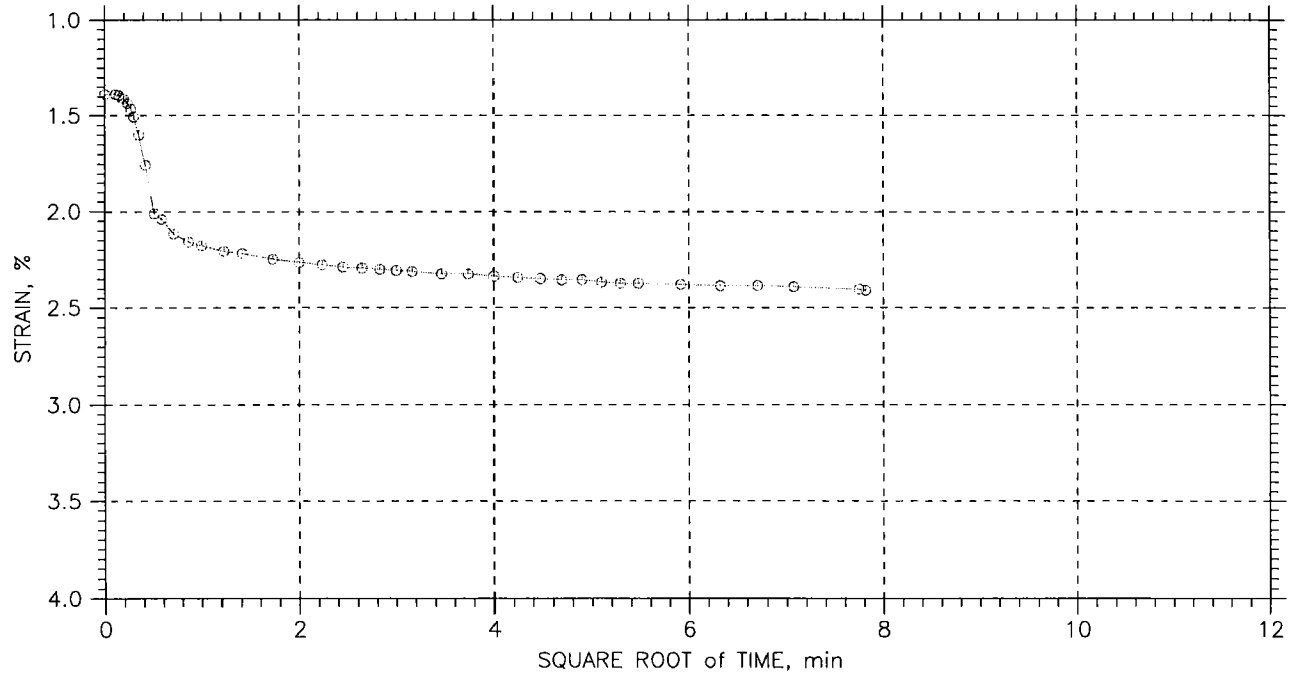
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 3 of 15

Stress: 400. psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODE

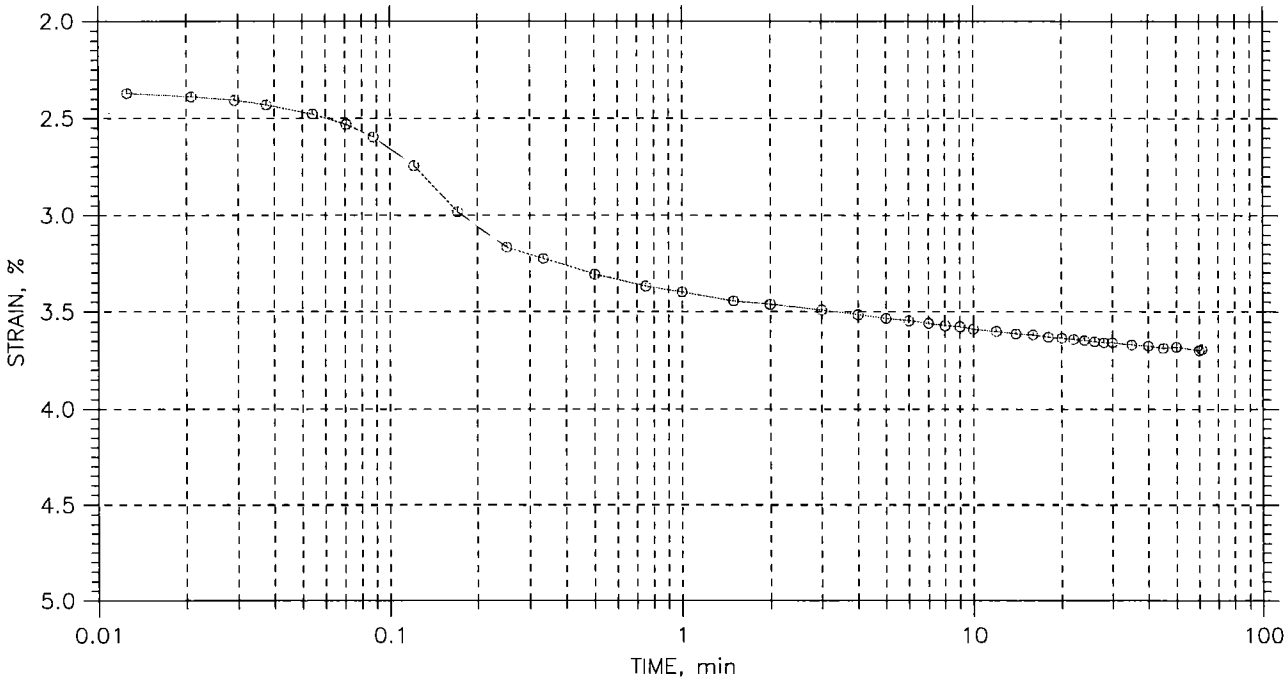
Fri, 26-MAY-2006 09:44:35

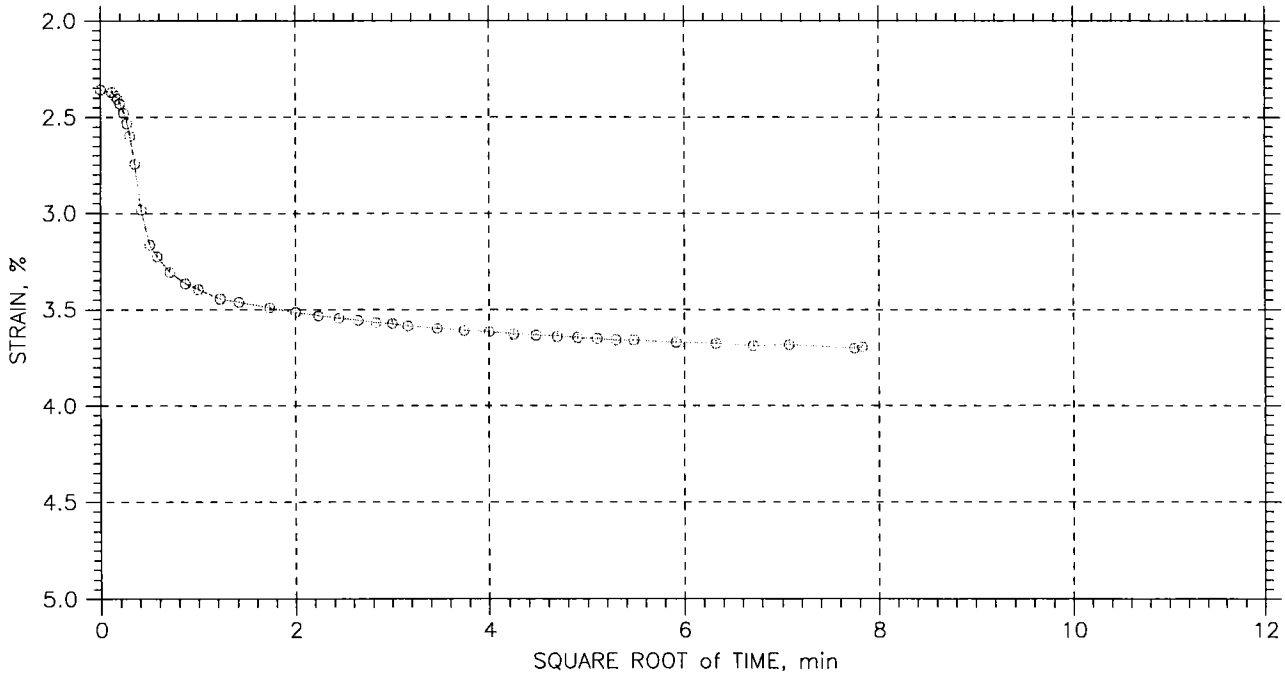
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 4 of 15

Stress: 800. psf





	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODE

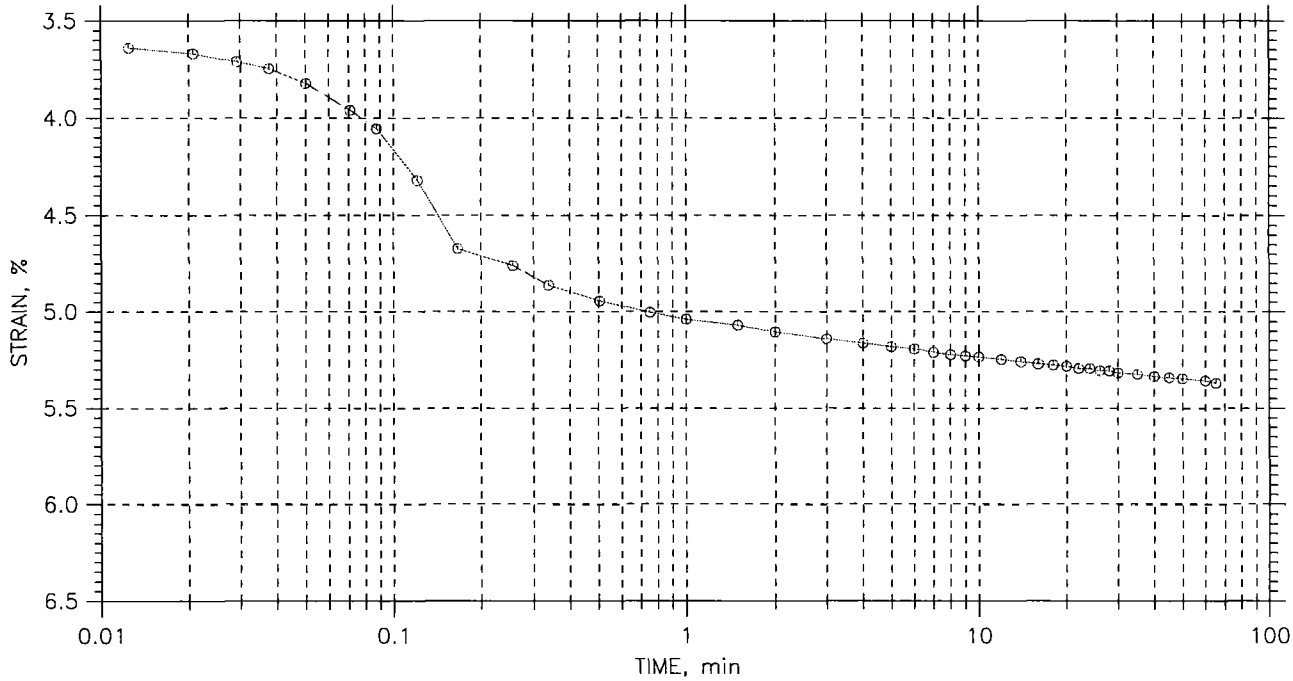
Fri, 26-MAY-2006 09:44:36

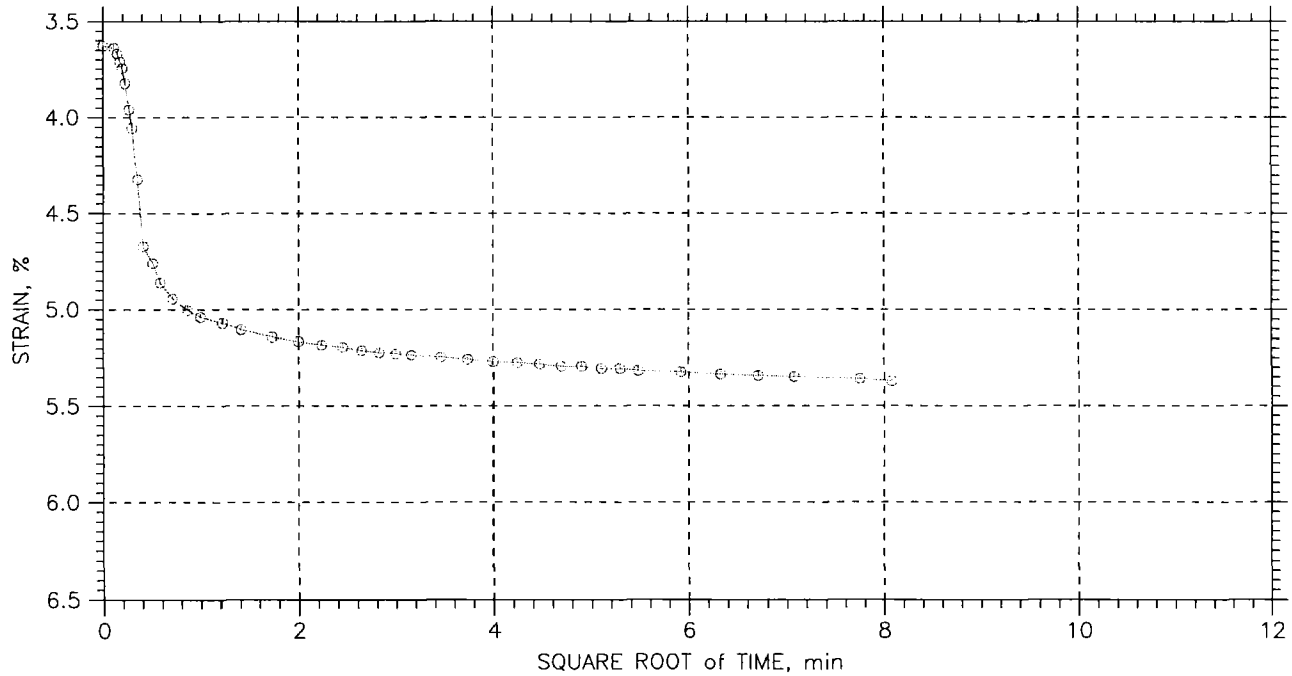
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 5 of 15

Stress: 1600. psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODE

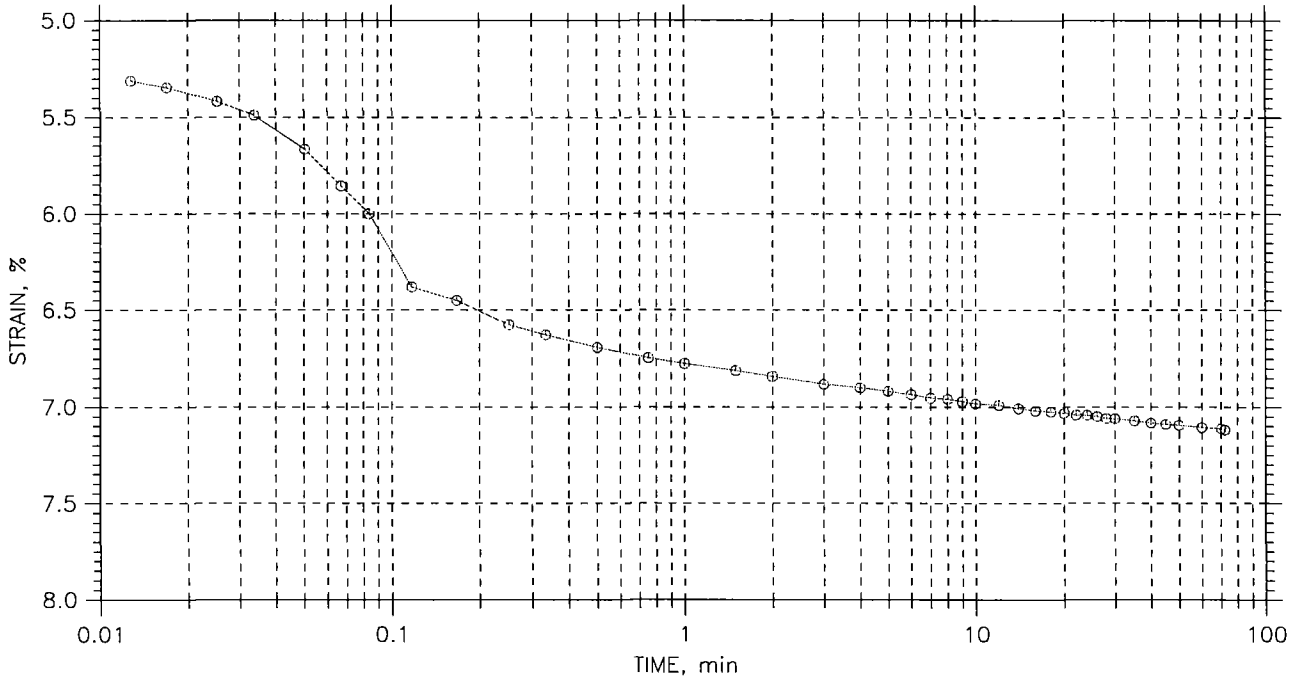
Fri, 26-MAY-2006 09:44:37

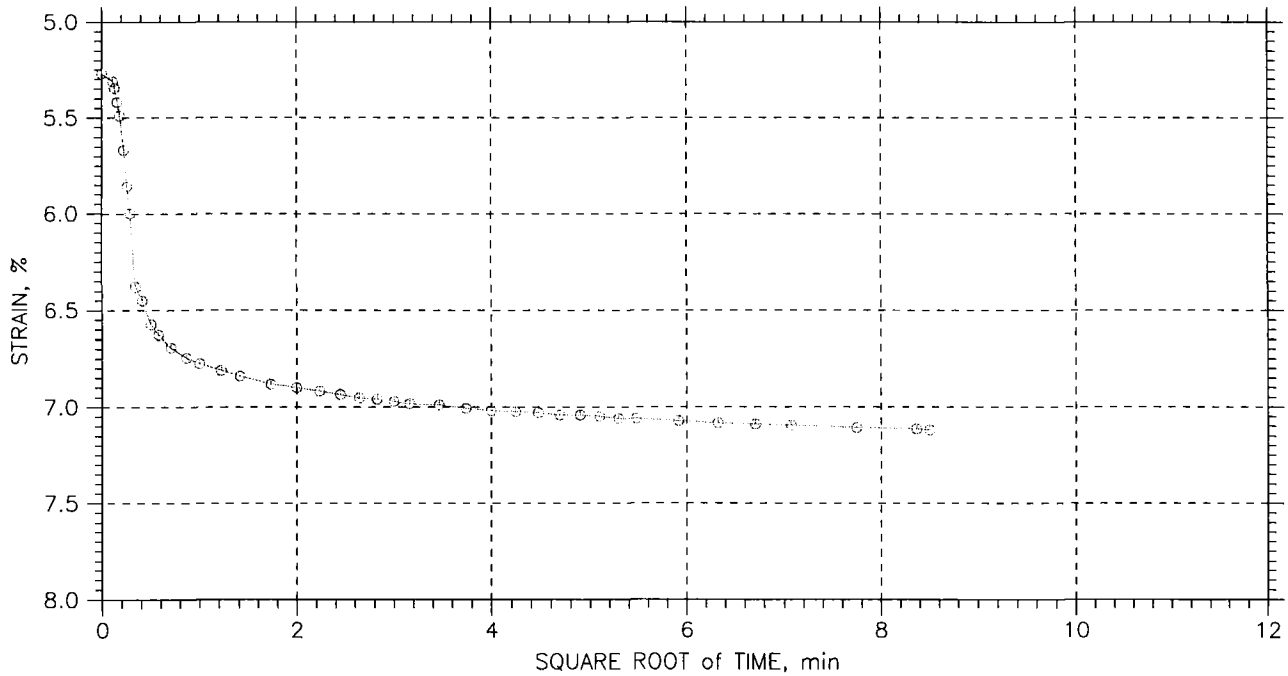
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 6 of 15

Stress: 3200. psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

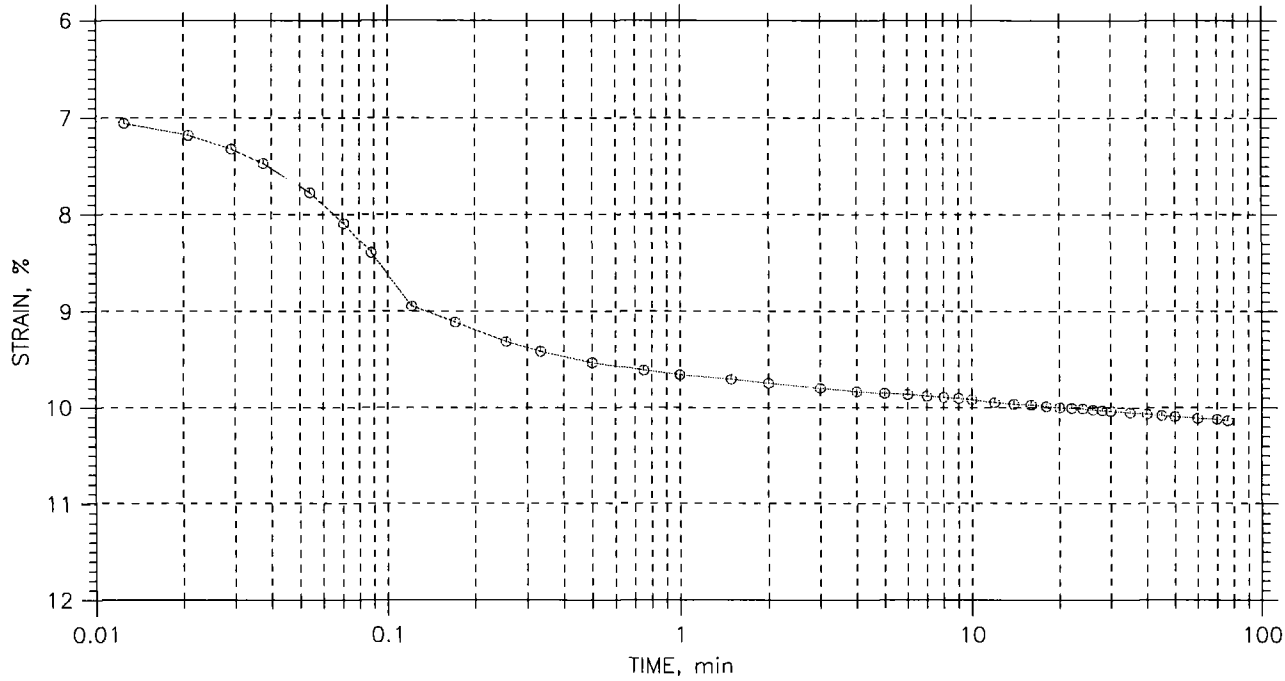
Fri, 26-MAY-2006 09:44:37

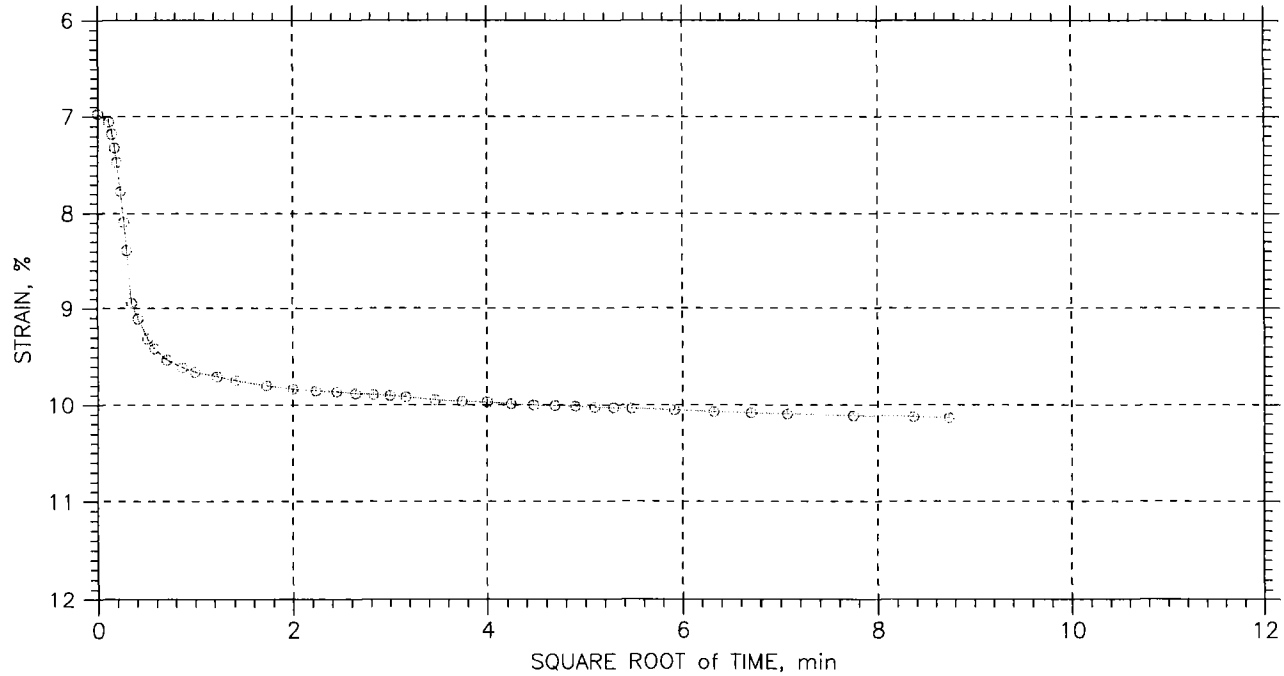
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 7 of 15

Stress: 6400. psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODE

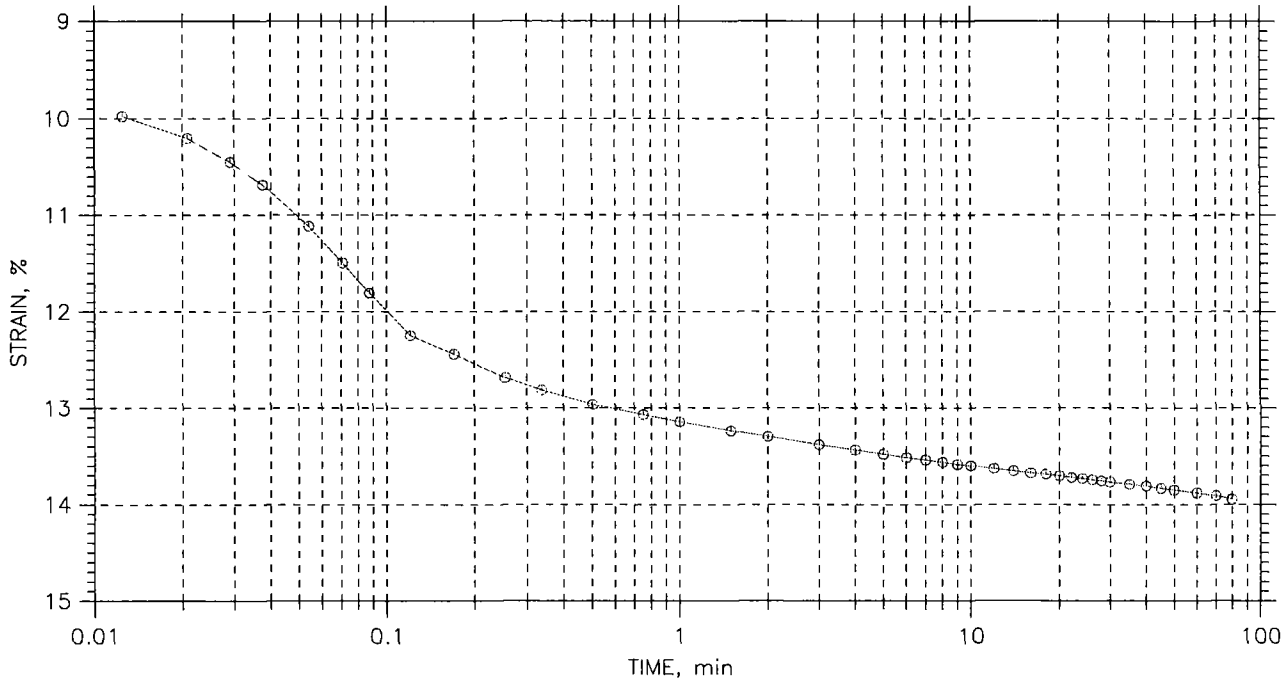
Fri, 26-MAY-2006 09:44:38

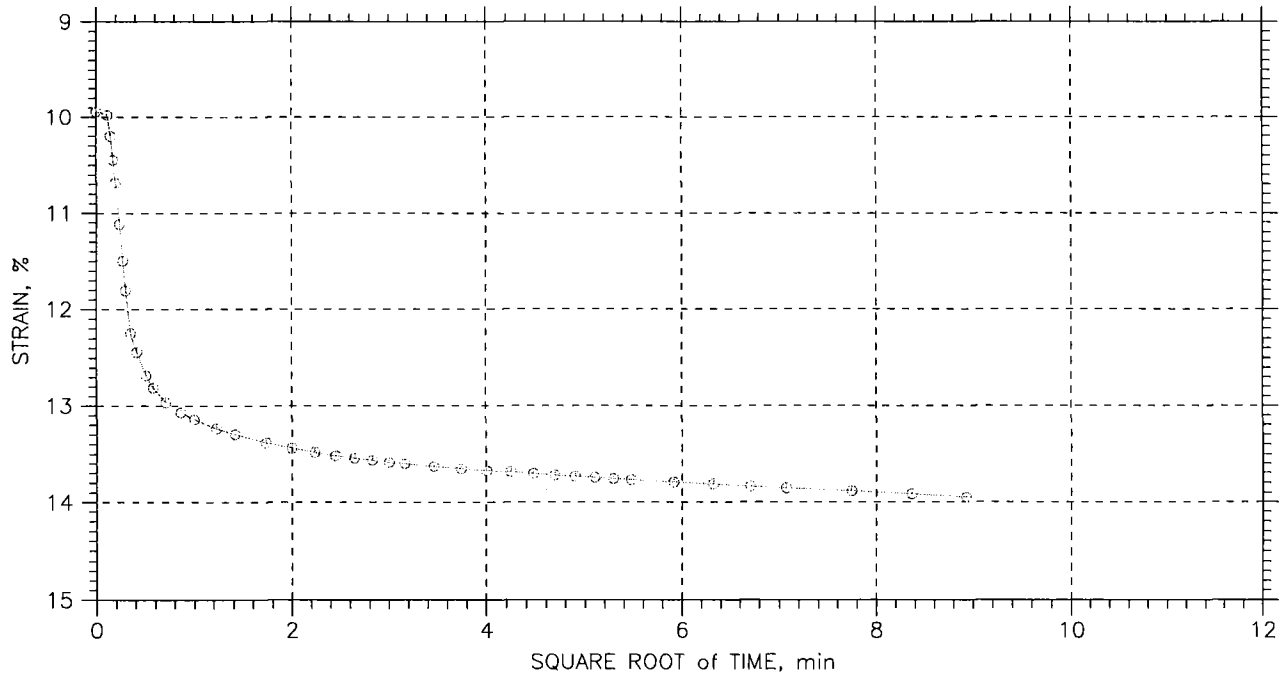
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 8 of 15

Stress: 12800 psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODE

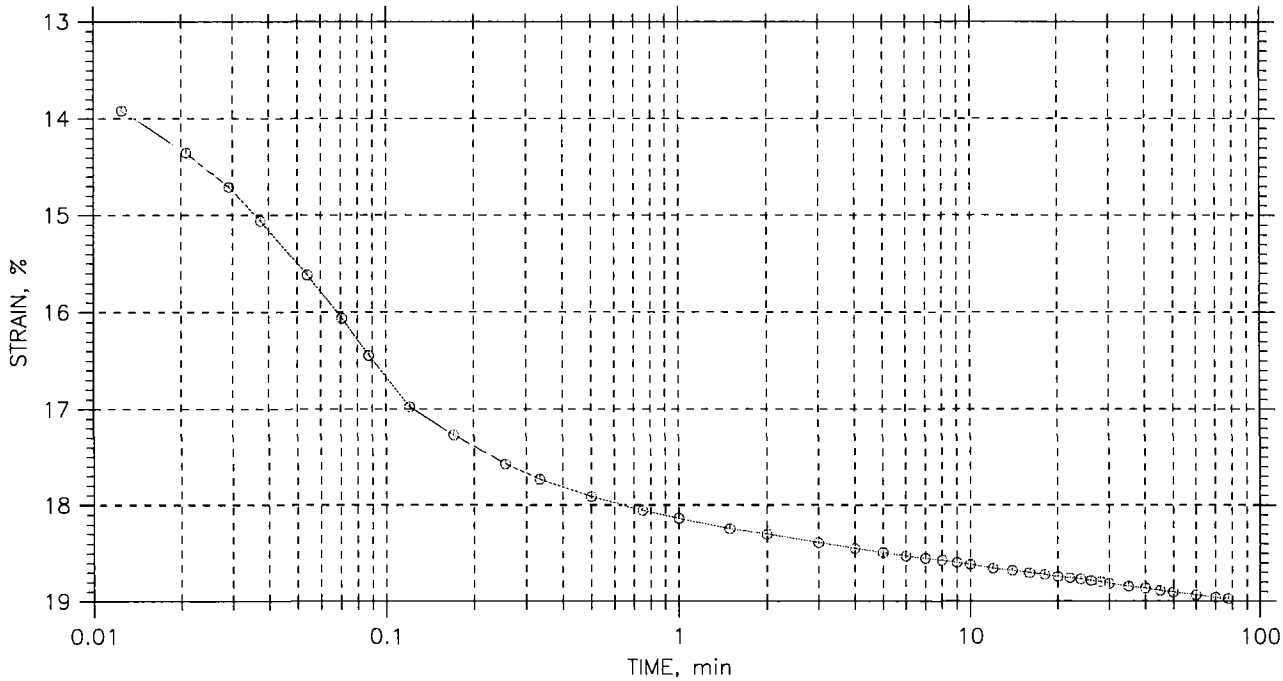
Fri, 26-MAY-2006 09:44:39

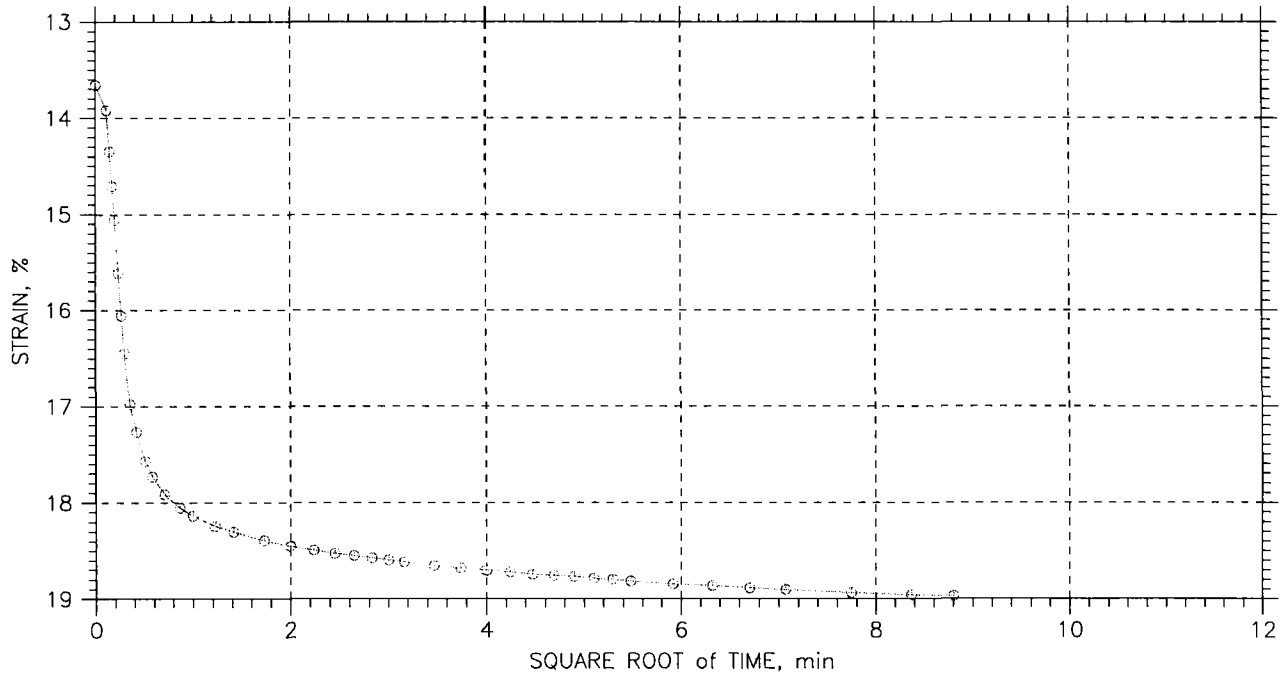
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 9 of 15

Stress: 25600 psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODE

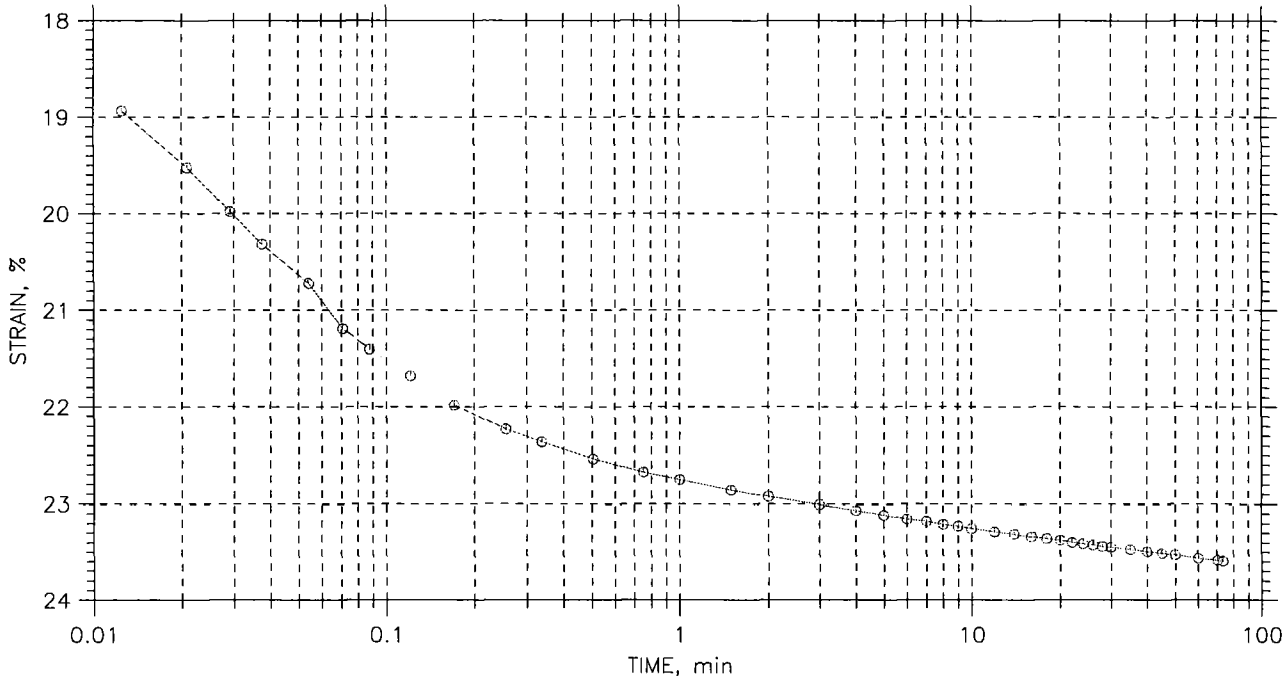
Fri, 26-MAY-2006 09:44:40

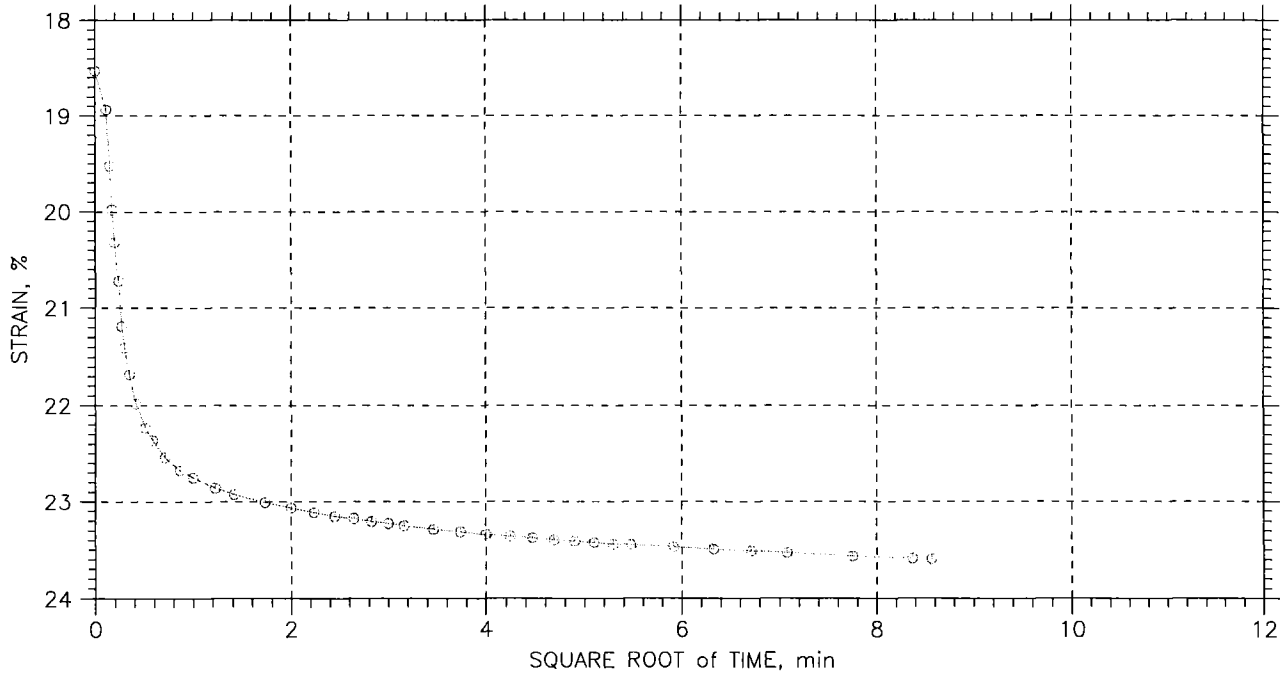
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 10 of 15

Stress: 51200 psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODE

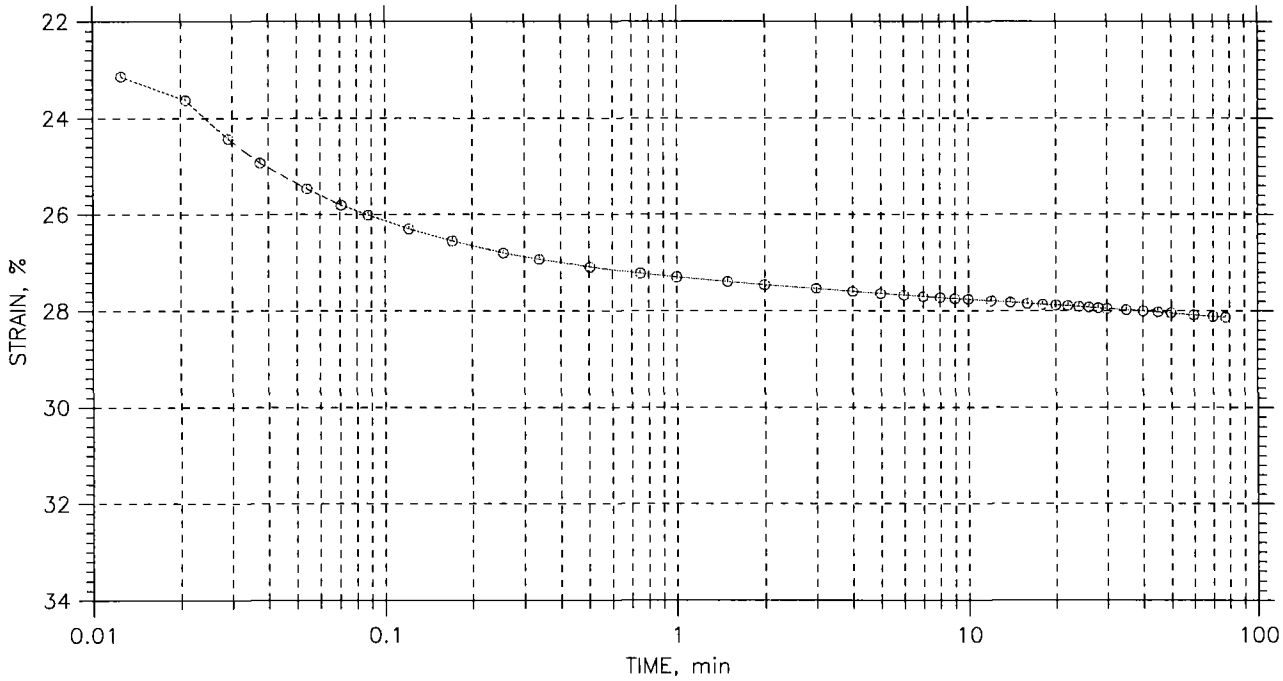
Fri, 26-MAY-2006 09:44:41

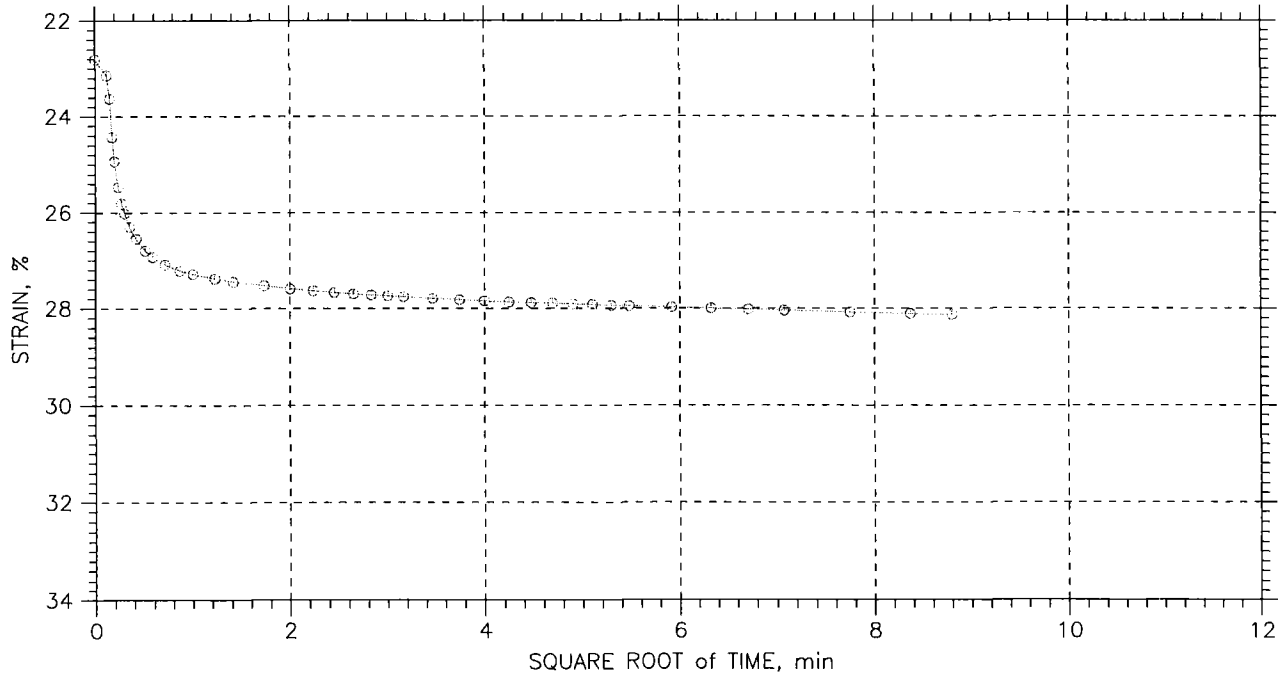
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 11 of 15

Stress: 1.024e+005 psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODE

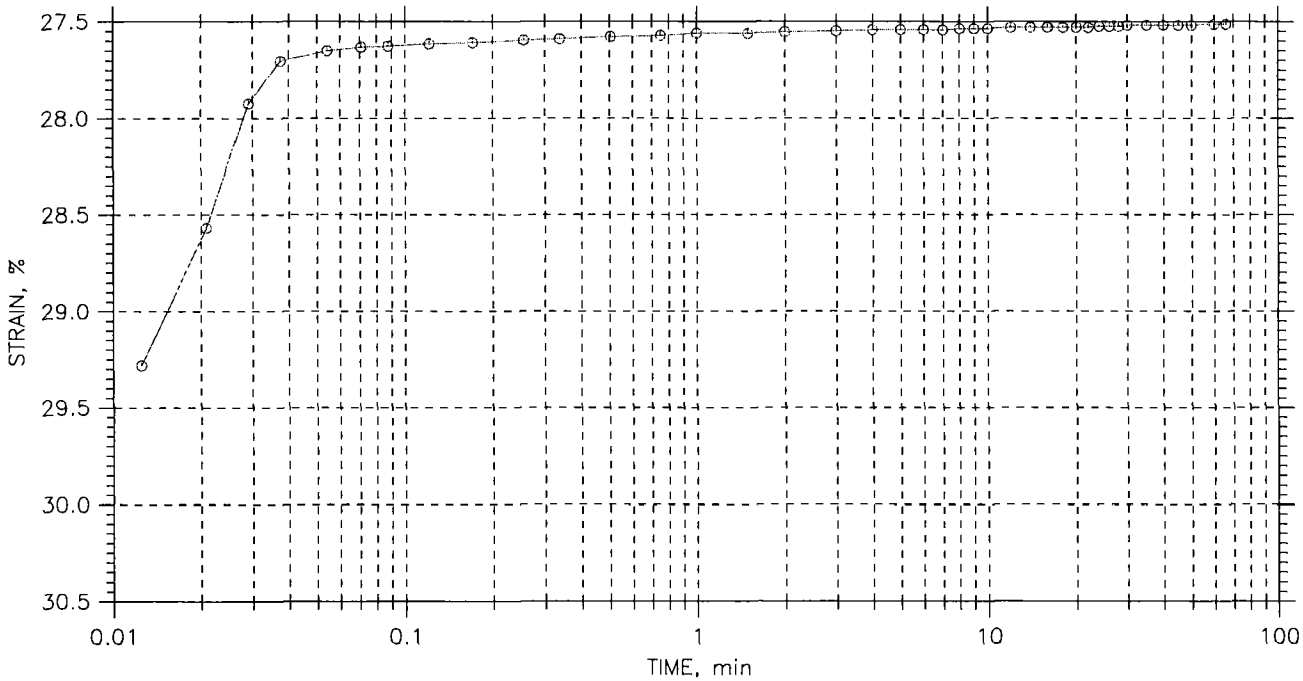
Fri, 26-MAY-2006 09:44:41

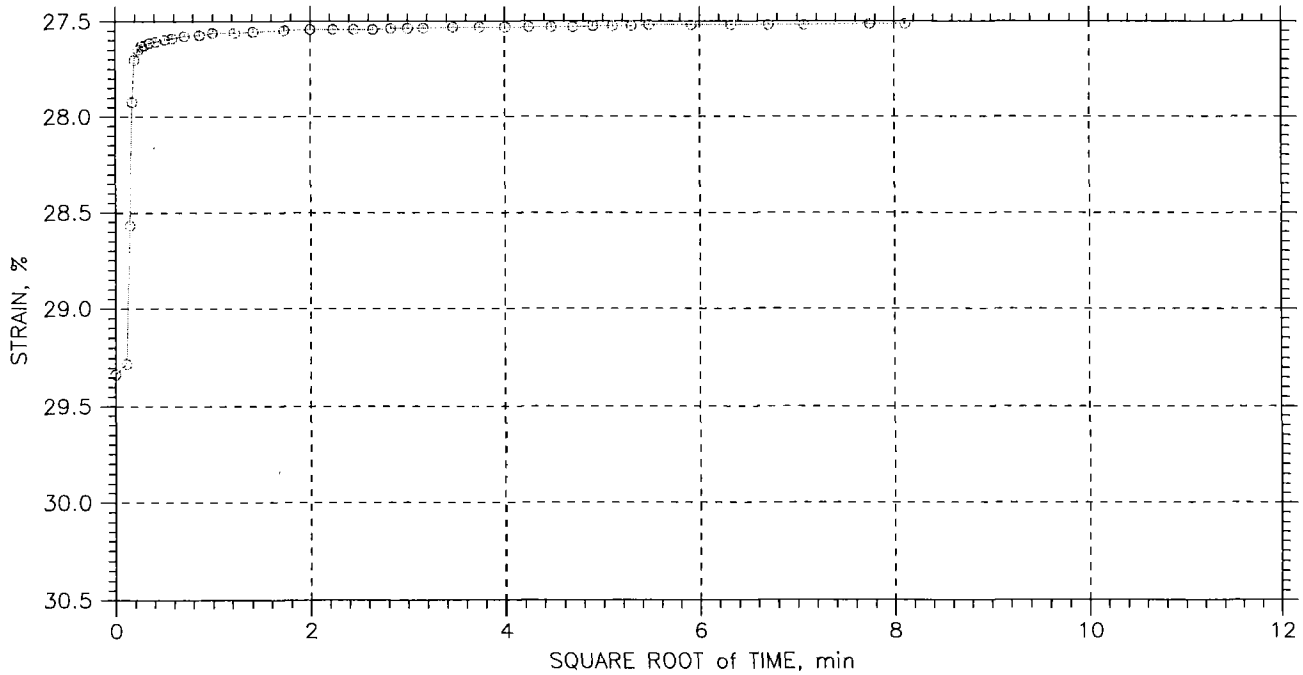
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 12 of 15

Stress: 25600 psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODE

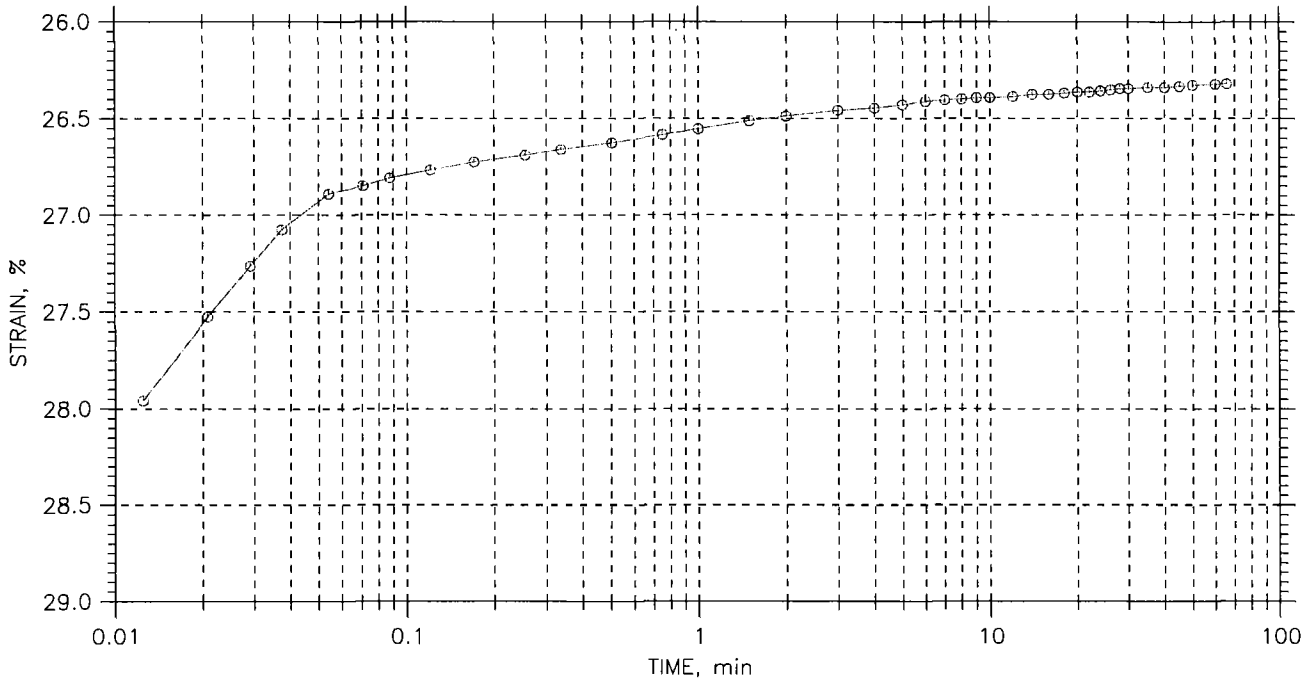
Fri, 26-MAY-2006 09:44:42

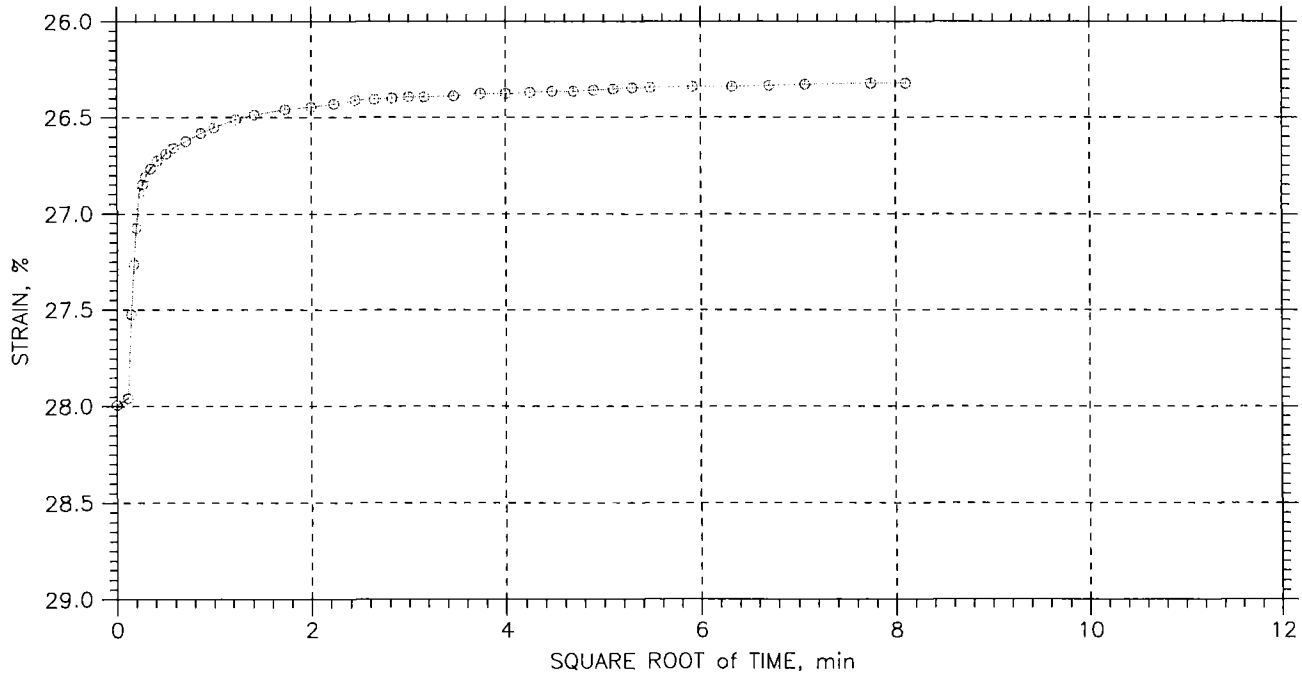
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 13 of 15

Stress: 6400. psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

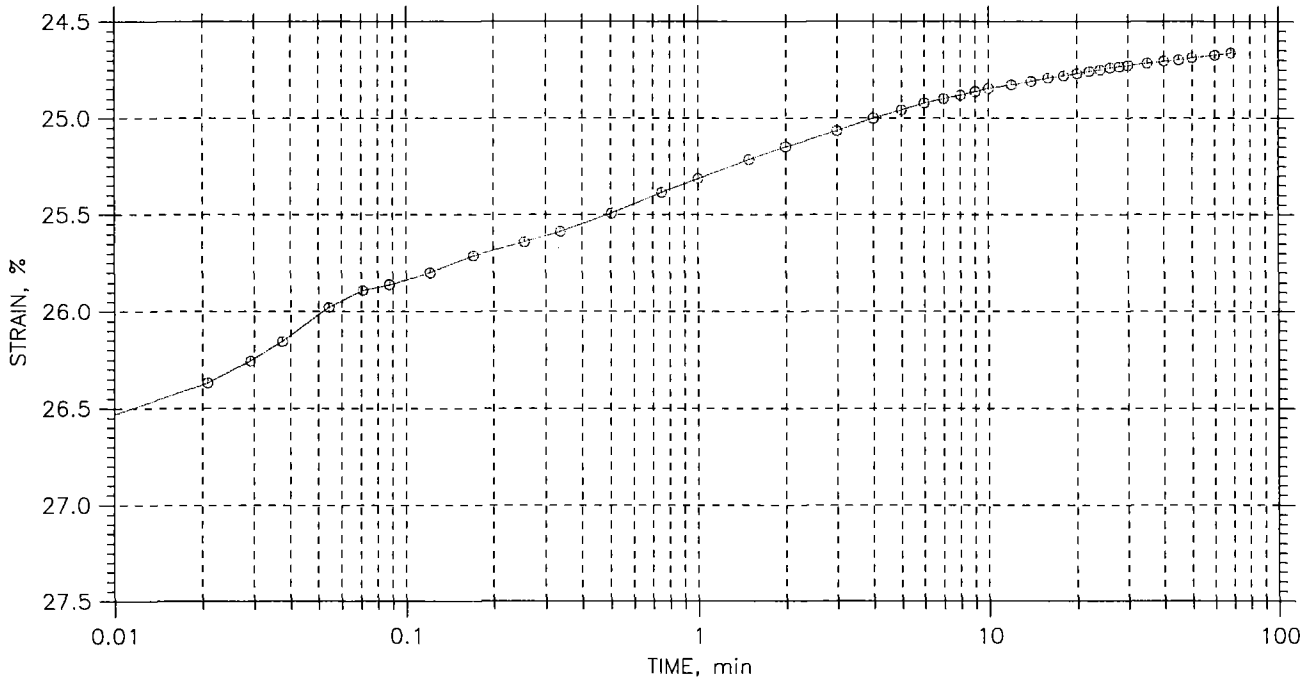
Fri, 26-MAY-2006 09:44:43

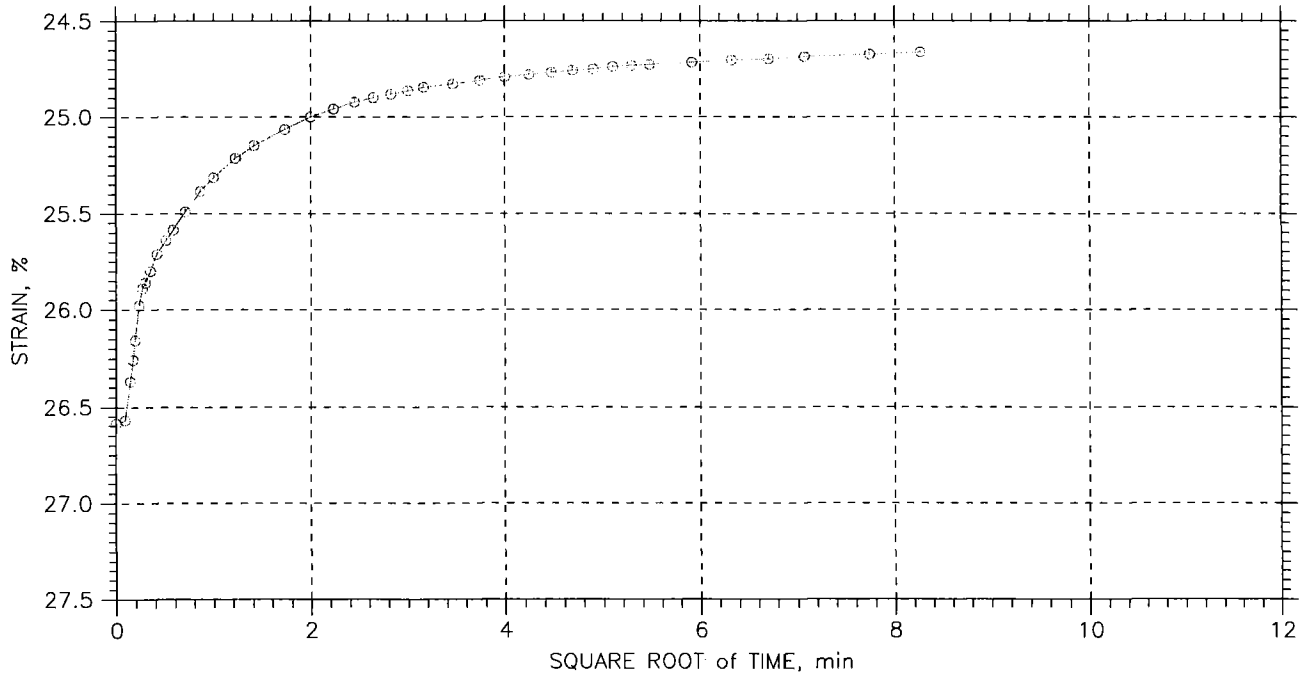
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 14 of 15

Stress: 1600. psf





	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

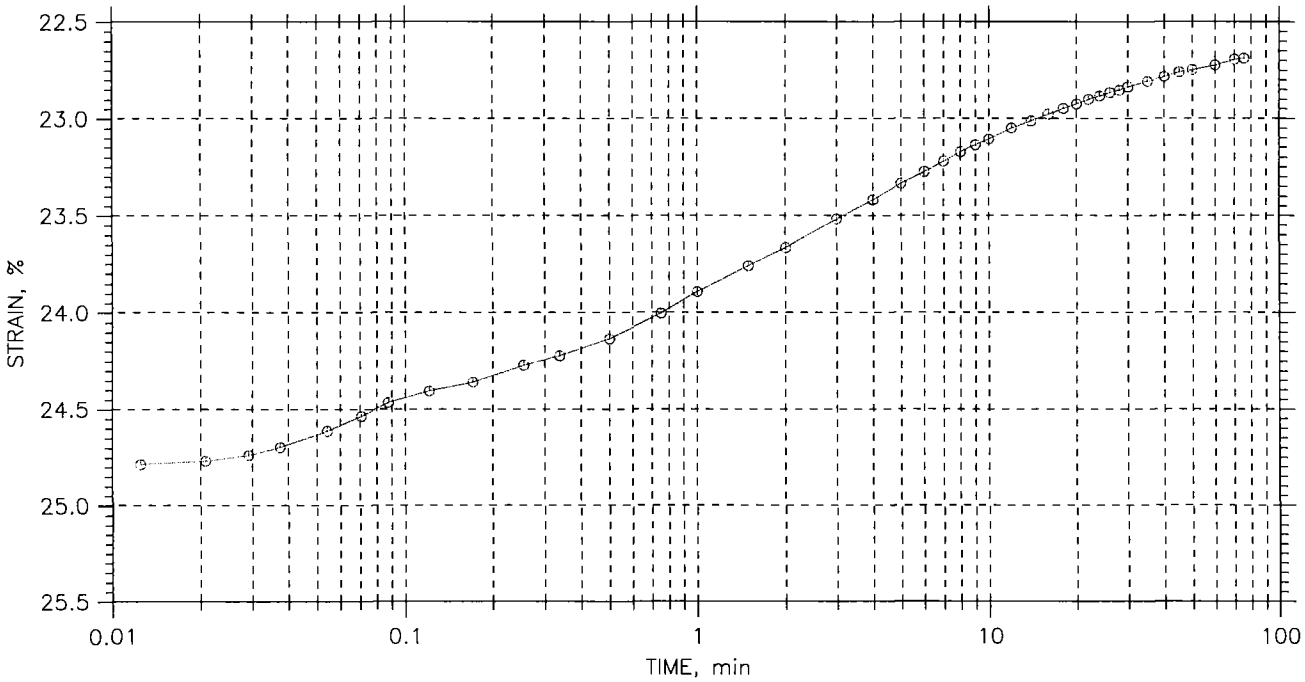
Fri, 26-MAY-2006 09:44:44

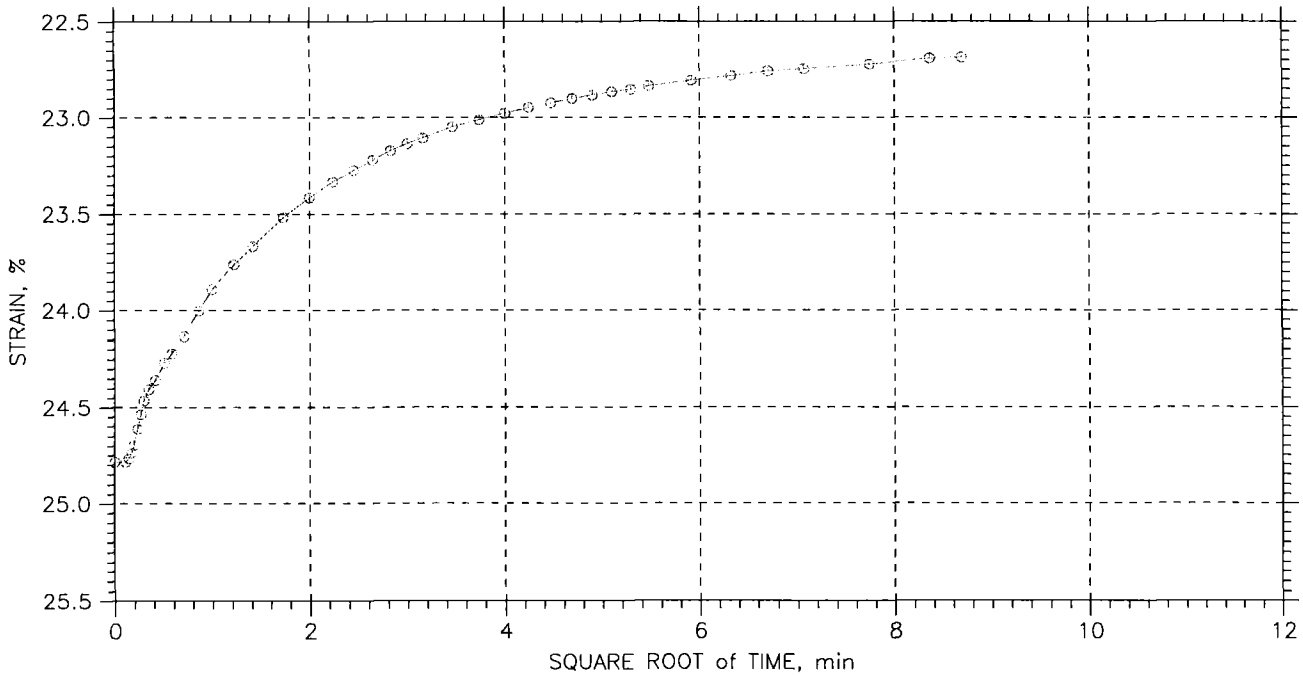
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 15 of 15

Stress: 400. psf





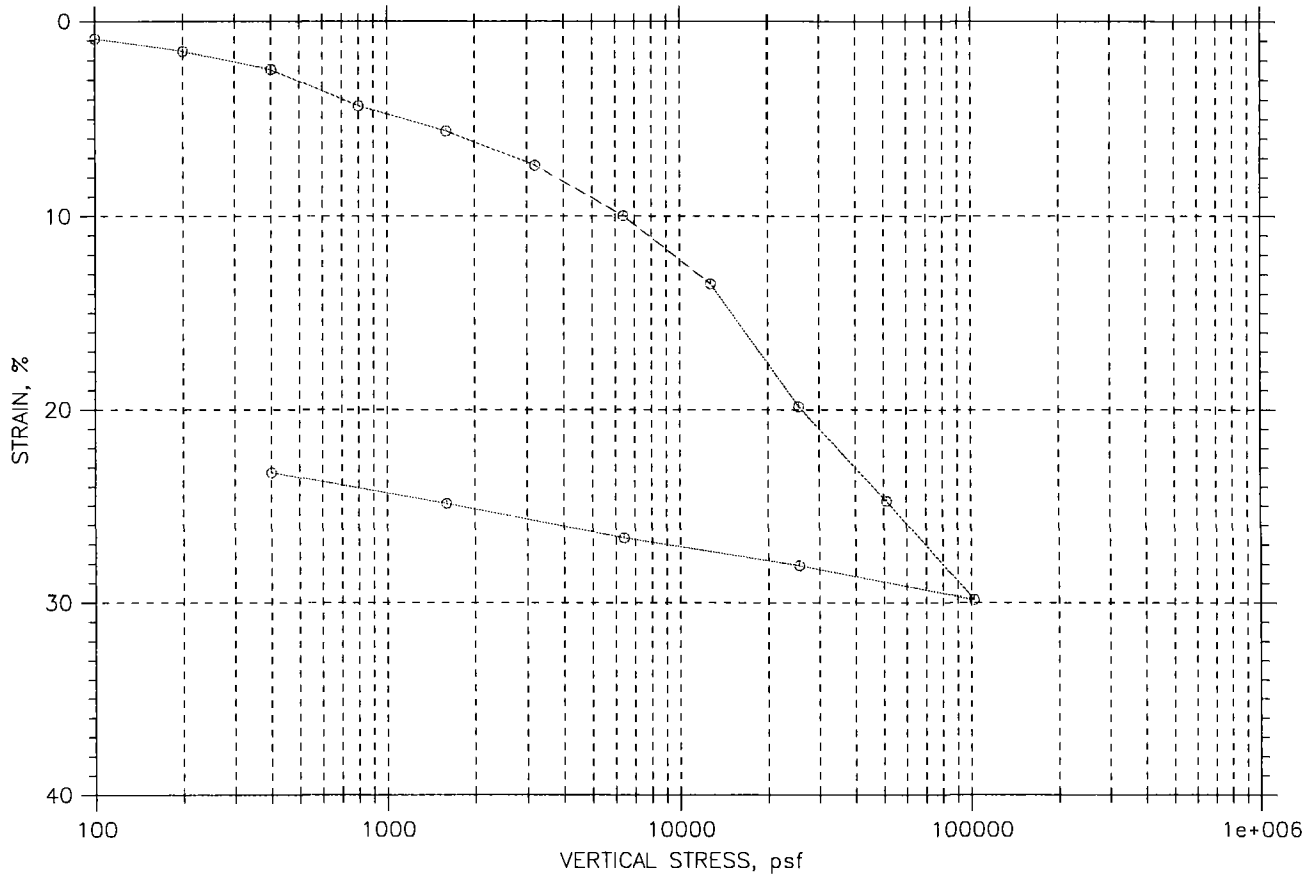
UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-9.5	Test Date: 17May 06	Depth: 9.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

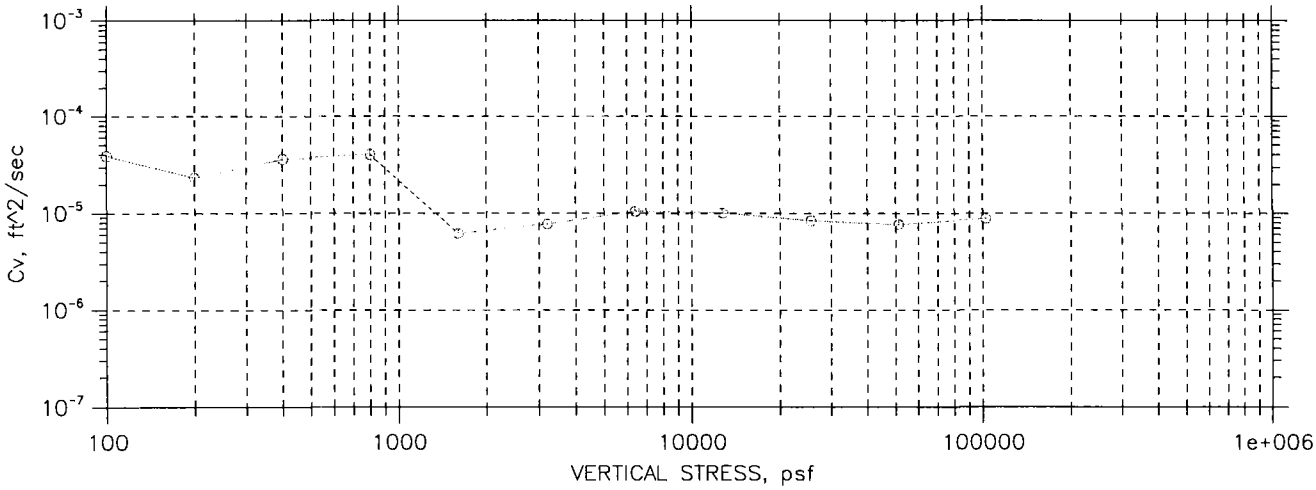
NODI

Fri, 26-MAY-2006 09:44:44

CONSOLIDATION TEST DATA

SUMMARY REPORT



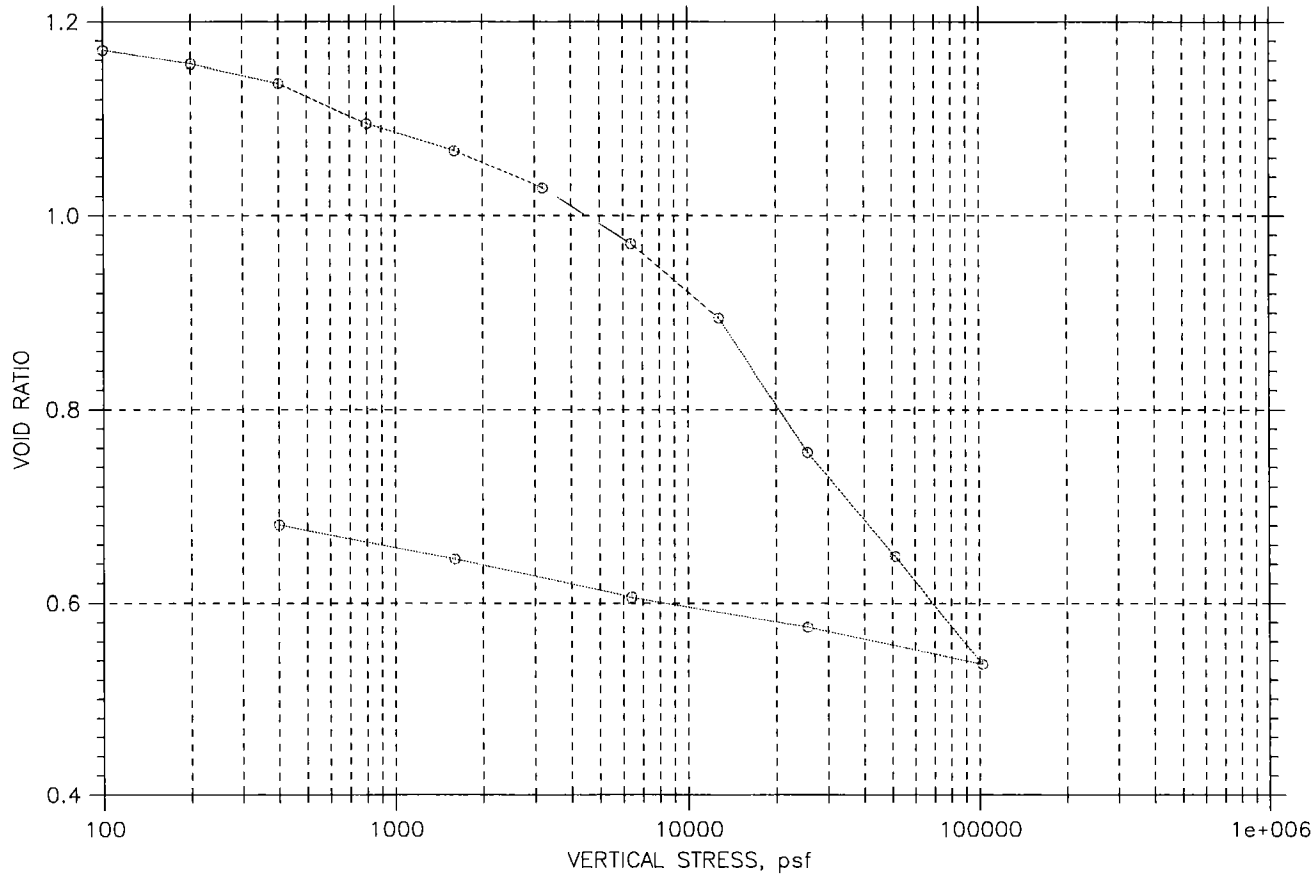


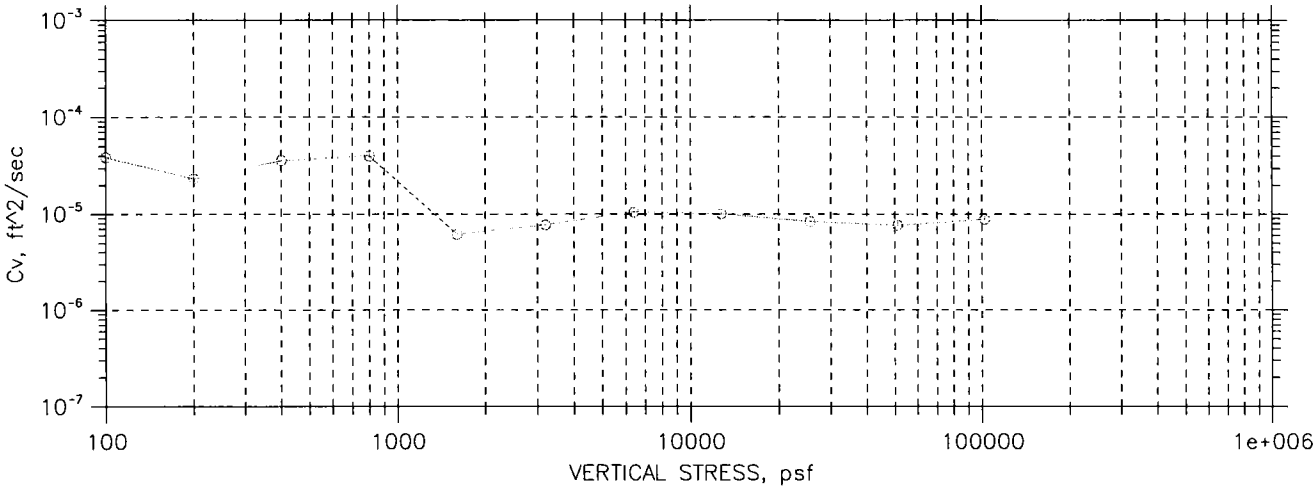
UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

Fri, 26-MAY-2006 10:33:19

CONSOLIDATION TEST DATA

SUMMARY REPORT



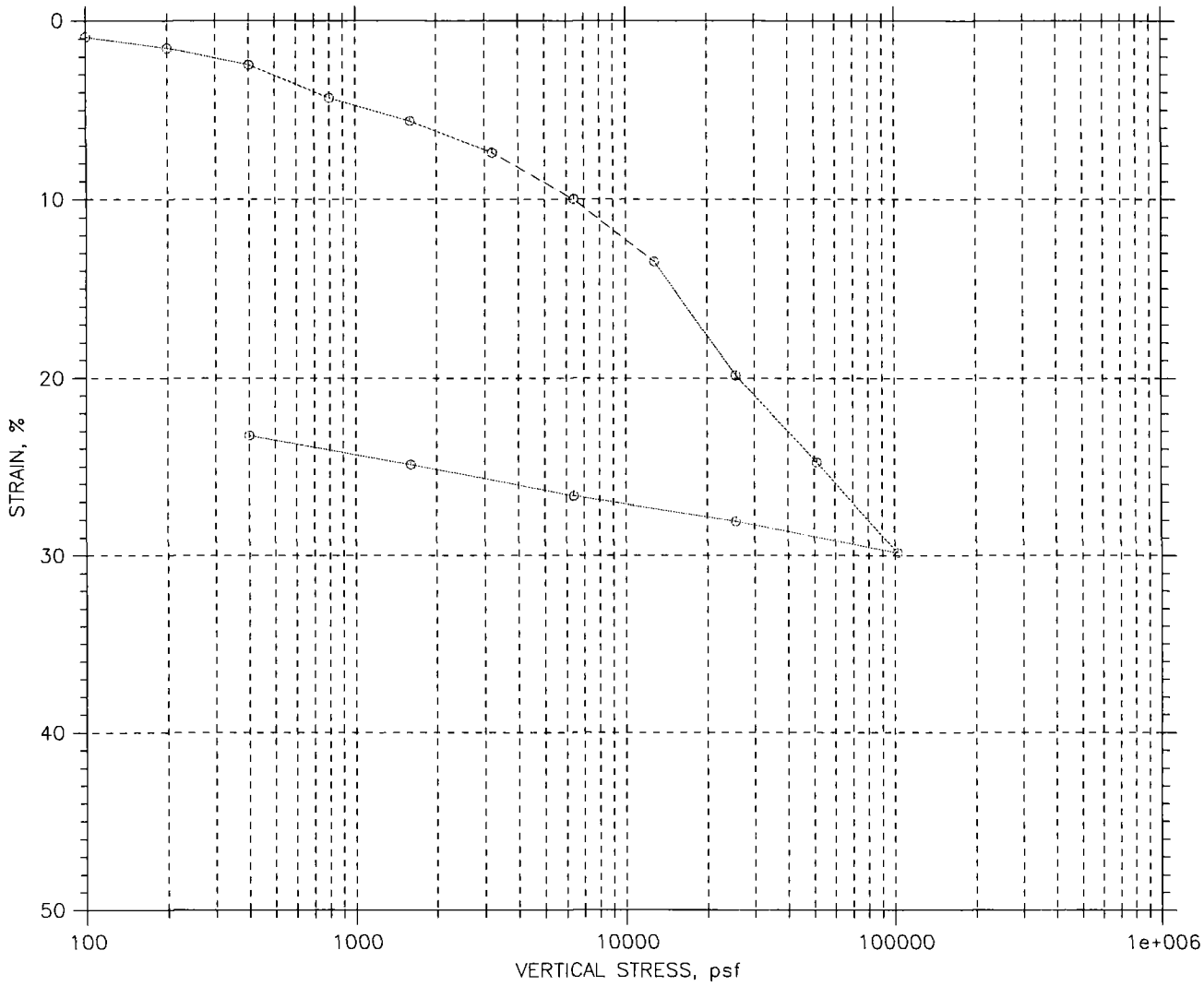


	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

Fri, 26-MAY-2006 10:37:42

CONSOLIDATION TEST DATA

SUMMARY REPORT



					Before Test	After Test
Overburden Pressure: 0 psf				Water Content, %	36.26	22.36
Preconsolidation Pressure: 0 psf				Dry Unit Weight, pcf	86.76	113.1
Compression Index: 3.81959e-313				Saturation, %	92.76	100.00
Diameter: 2.416 in		Height: 1.009 in		Void Ratio	1.19	0.68
LL: 34	PL: 19	PI: 15	GS: 3.04			

UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

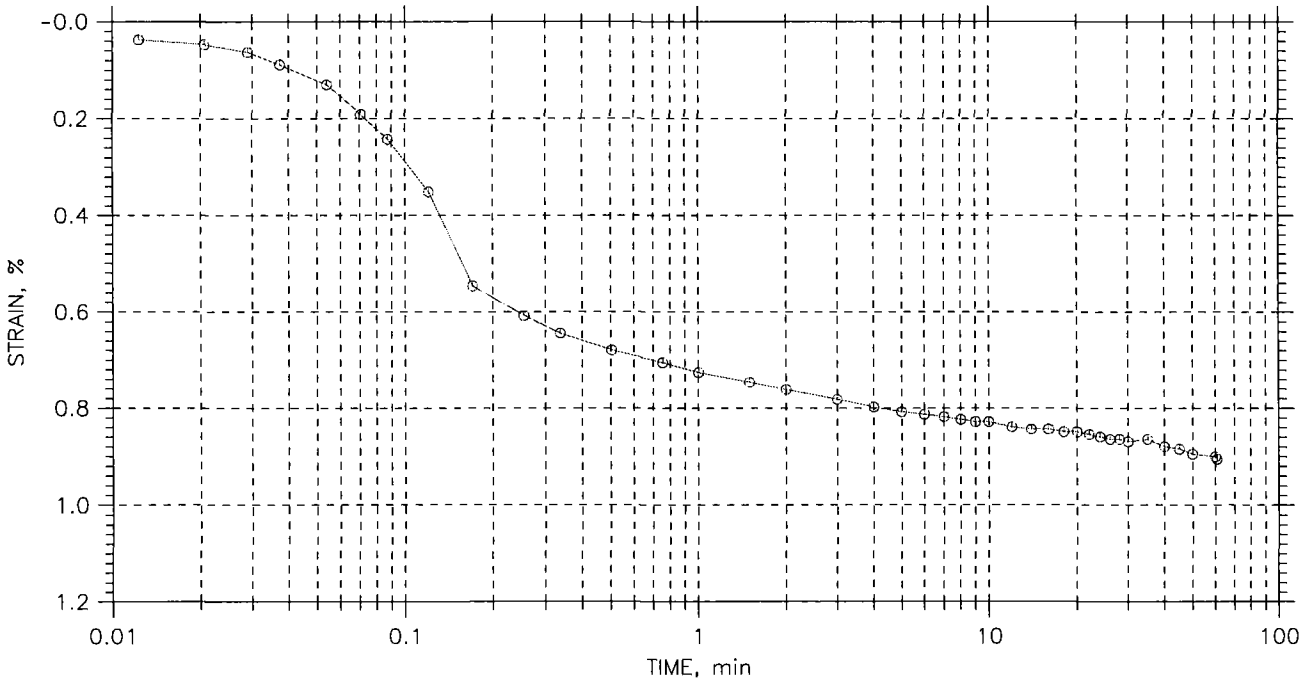
Fri, 26-MAY-2006 10:33:20

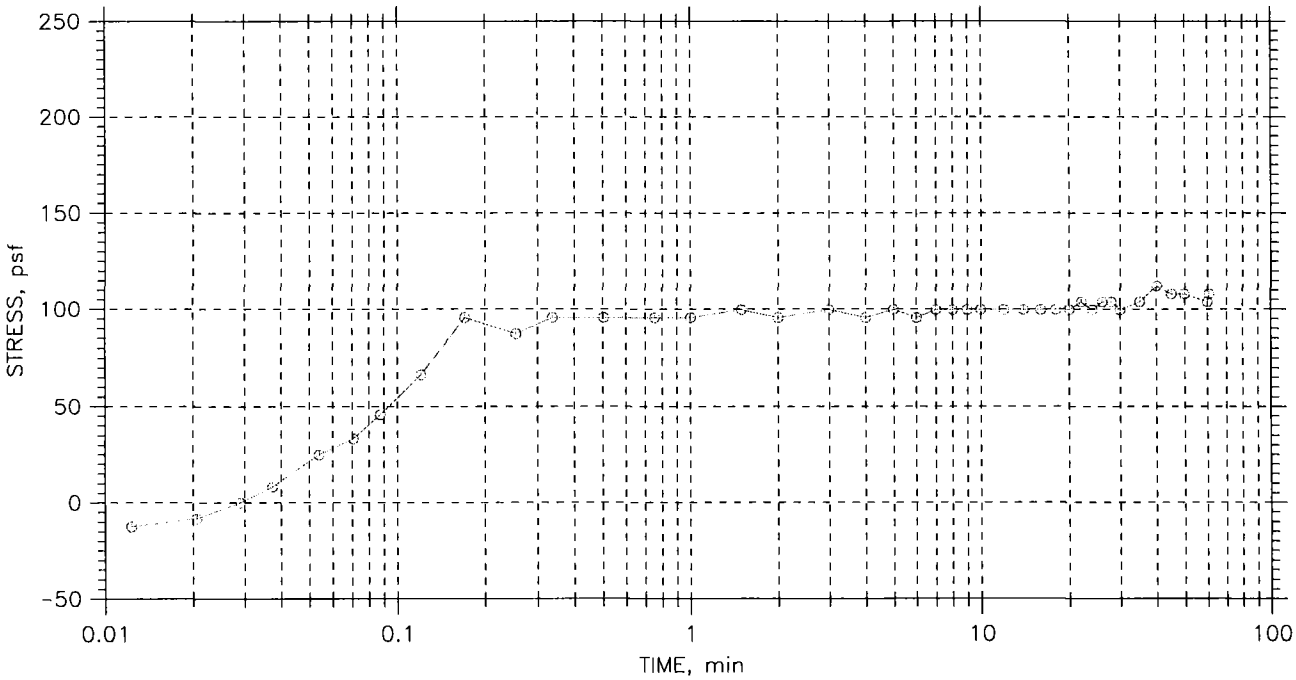
CONSOLIDATION TEST DATA

TIME CURVES

Constant Volume Step: 1 of 15

Stress: 100. psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

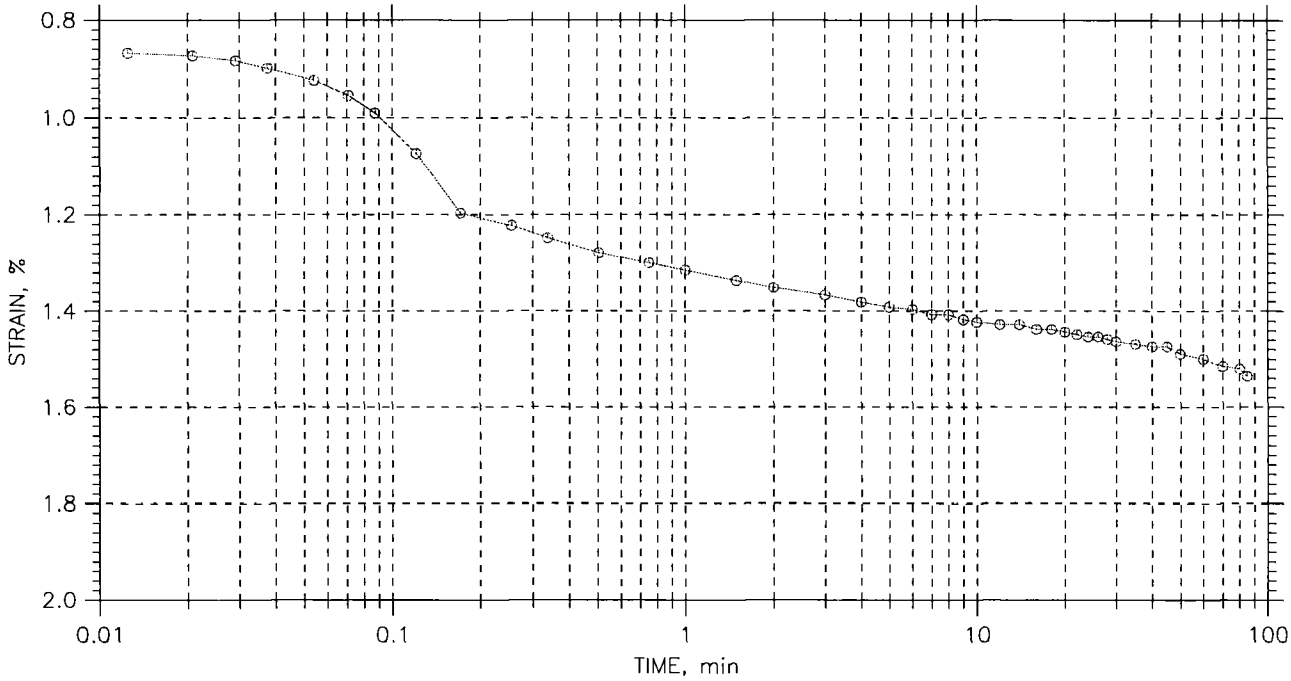
Fri, 26-MAY-2006 10:33:21

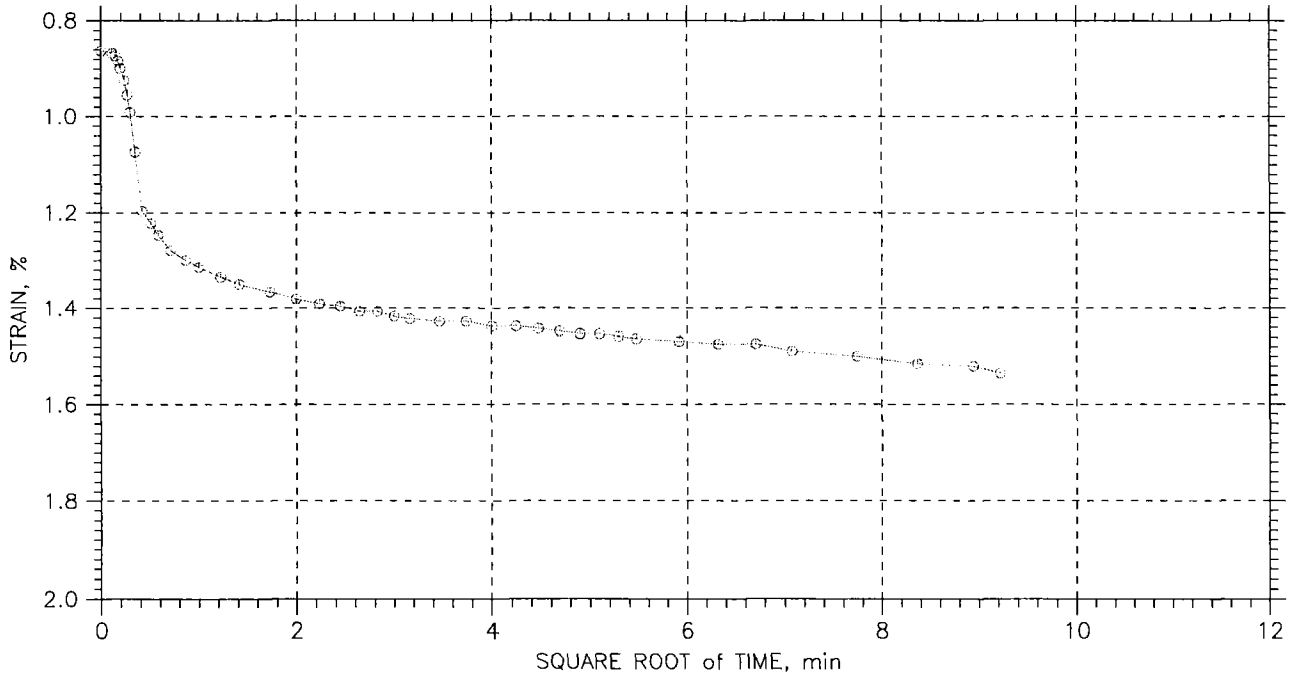
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 2 of 15

Stress: 200. psf





	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

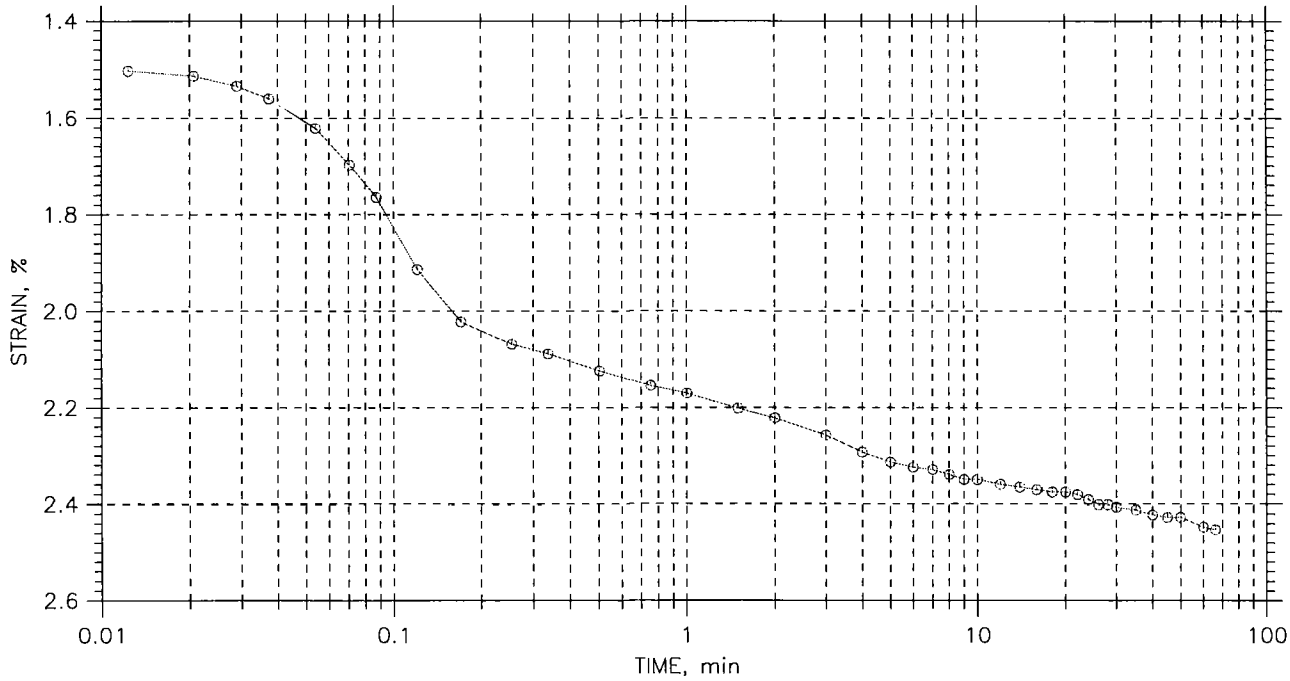
Fri, 26-MAY-2006 10:33:22

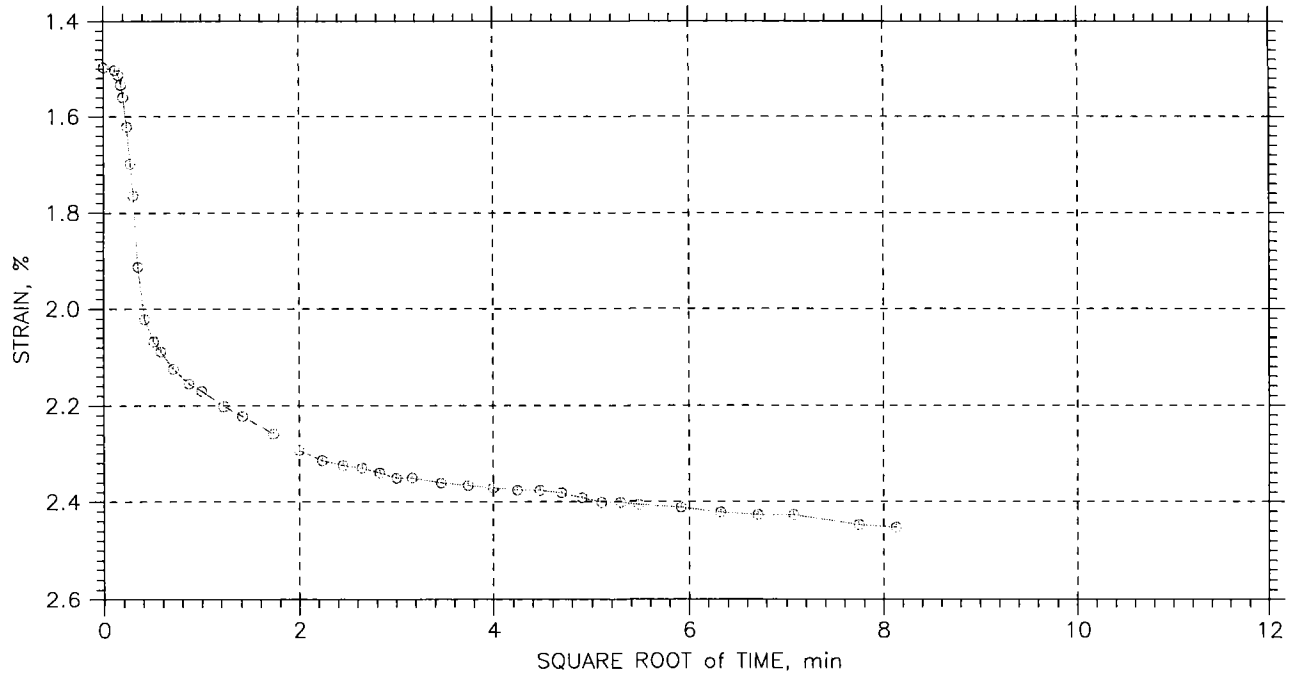
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 3 of 15

Stress: 400. psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

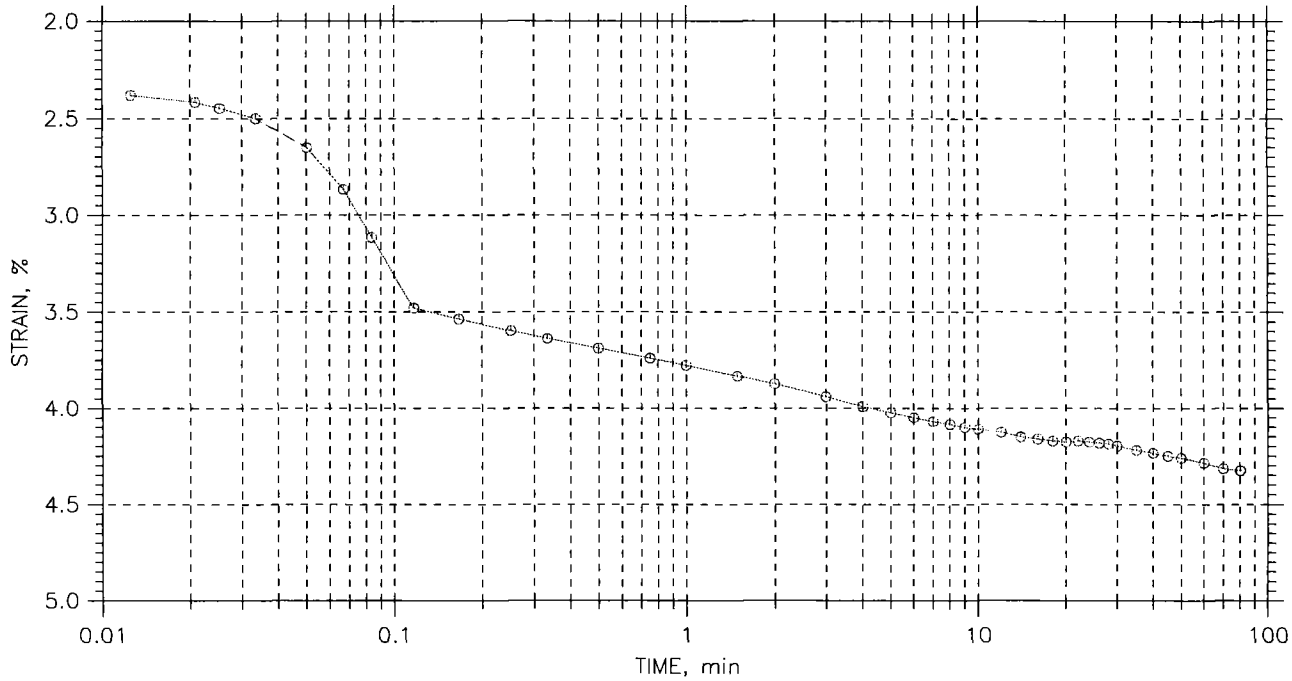
Fri, 26-MAY-2006 10:33:22

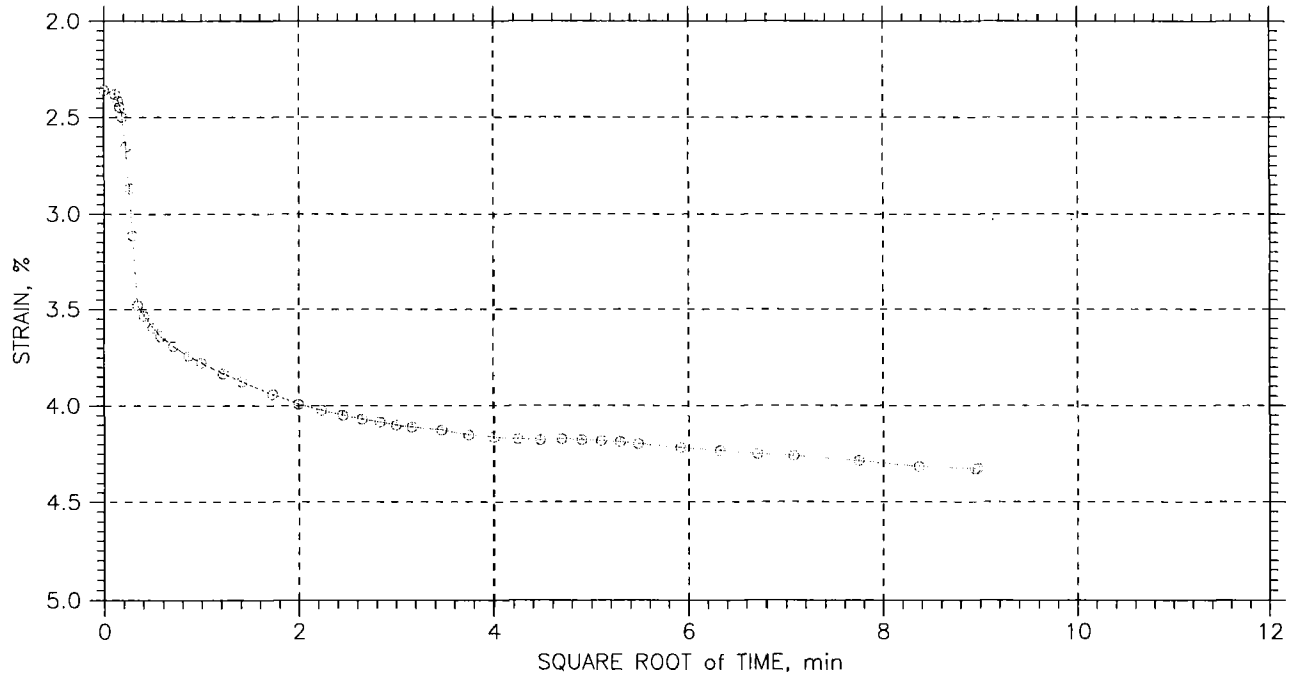
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 4 of 15

Stress: 800. psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

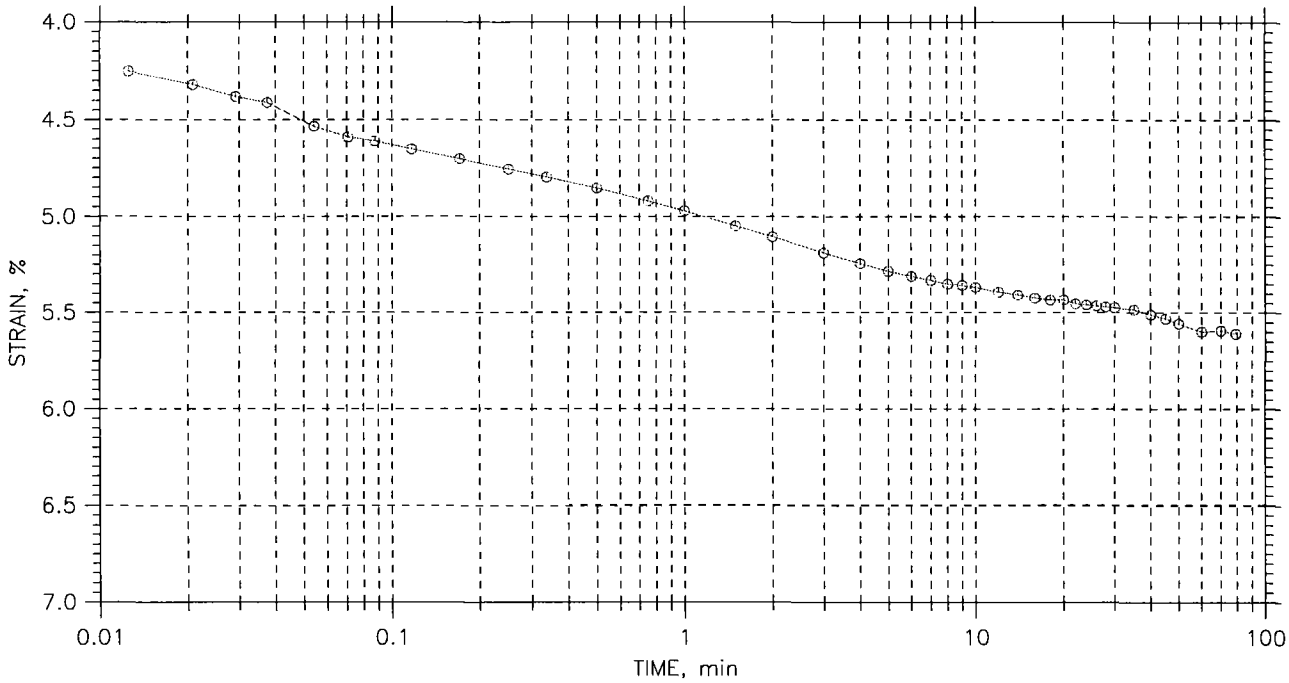
Fri, 26-MAY-2006 10:33:23

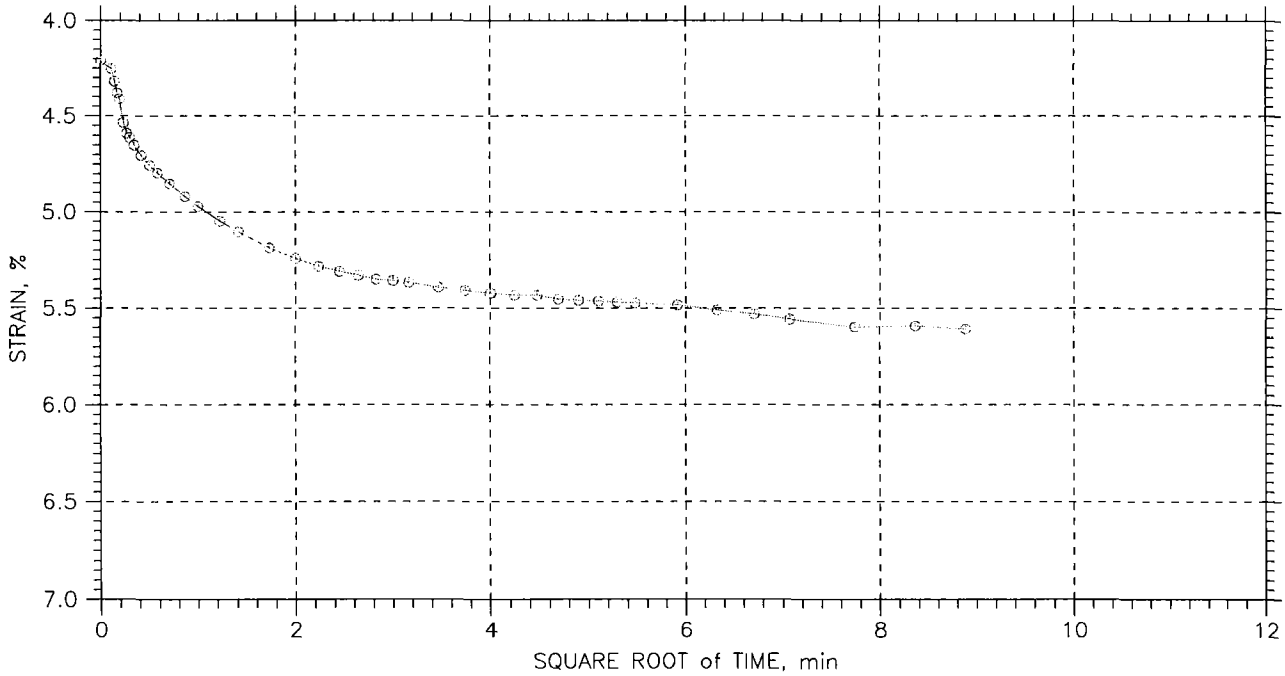
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 5 of 15

Stress: 1600. psf





	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

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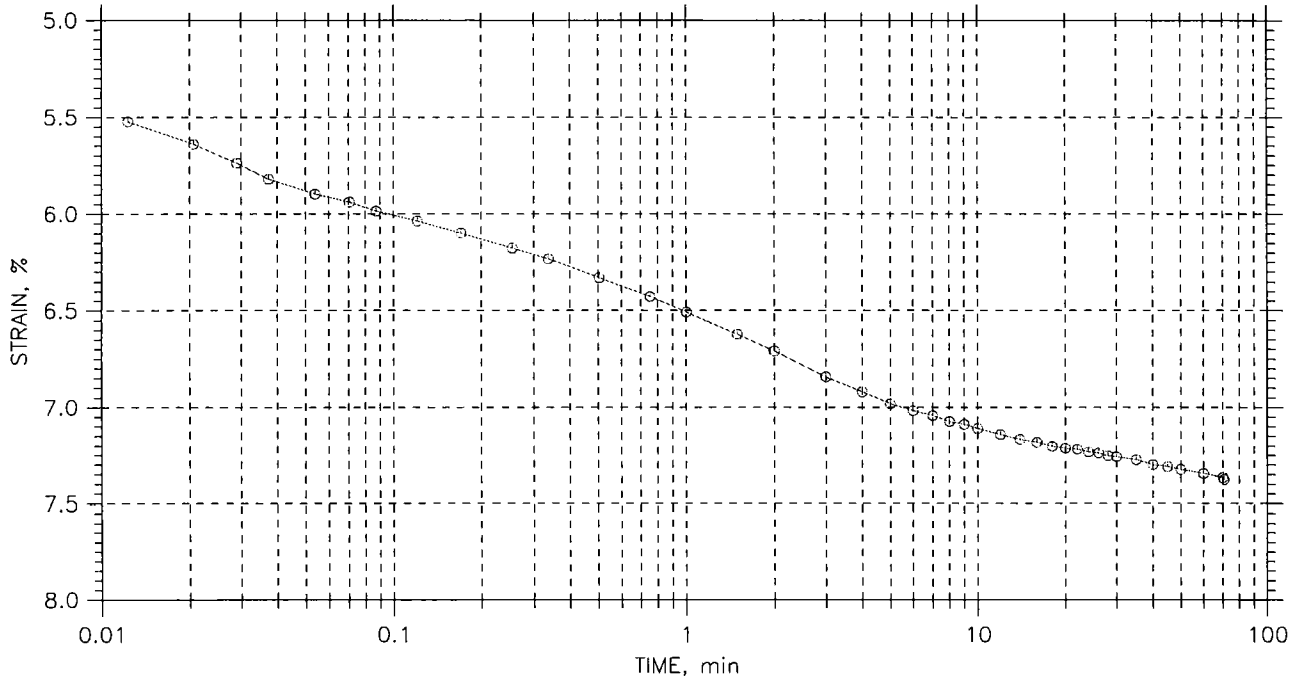
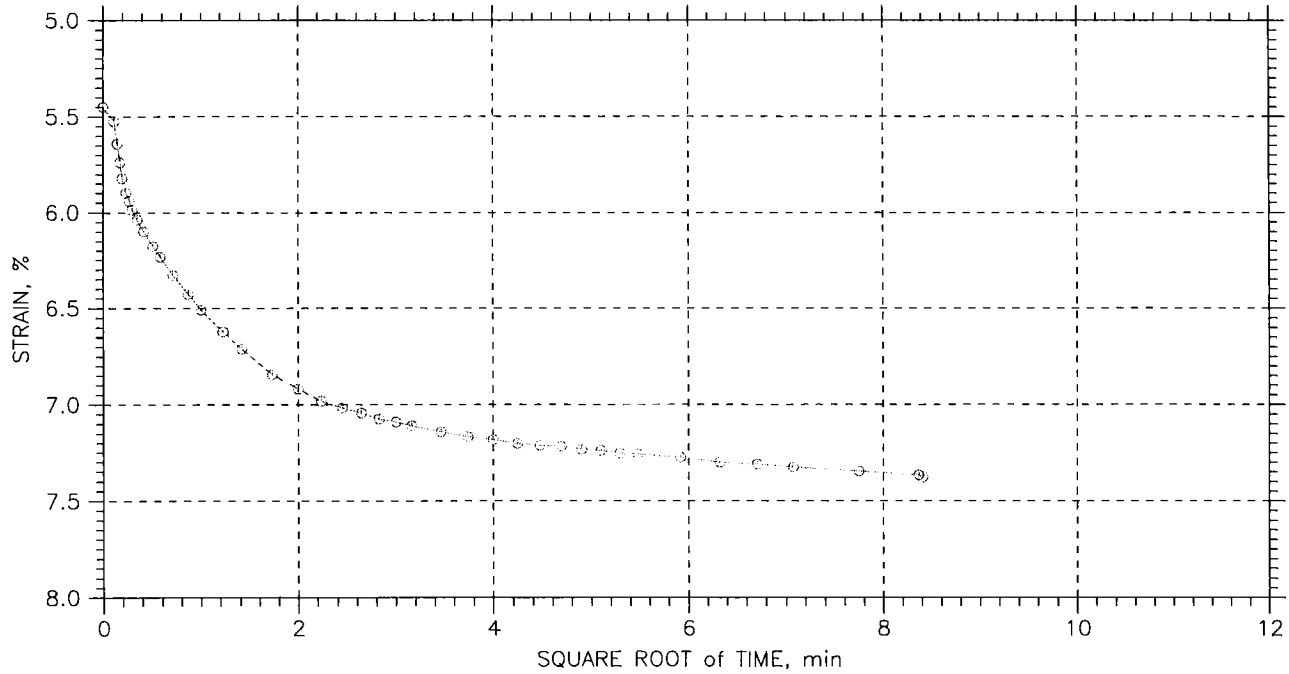
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 6 of 15

Stress: 3200. psf





	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

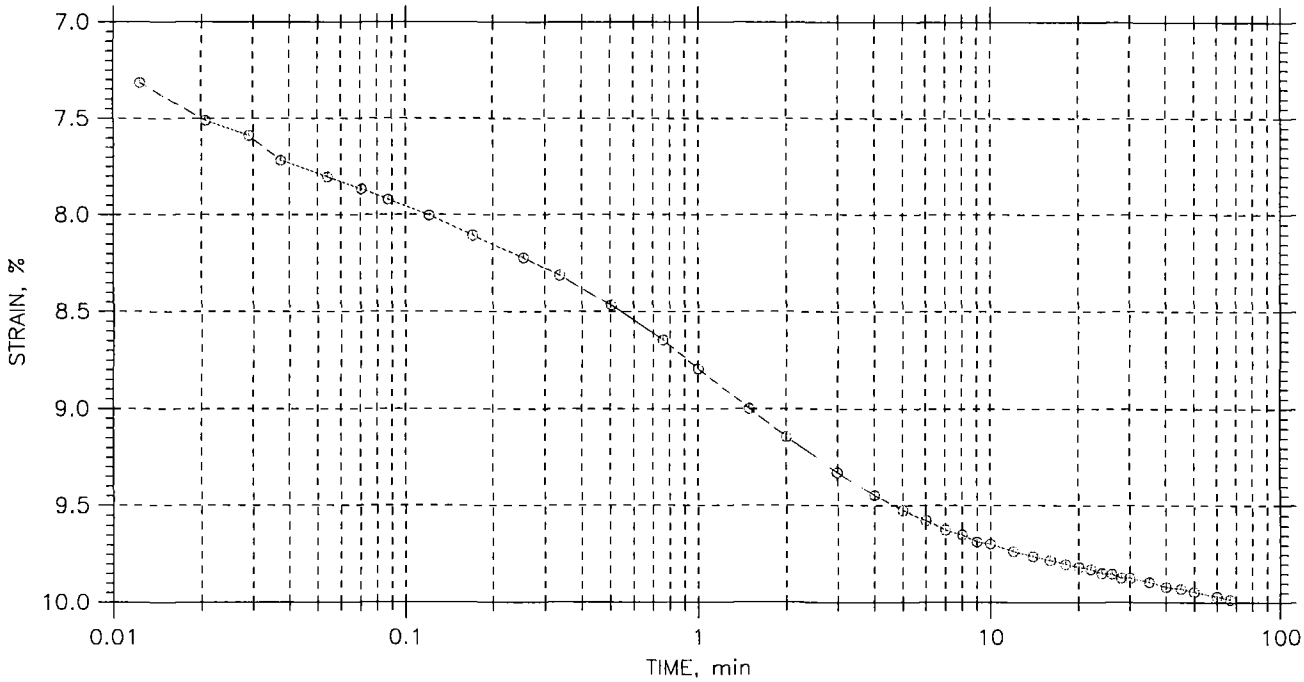
Fri, 26-MAY-2006 10:33:25

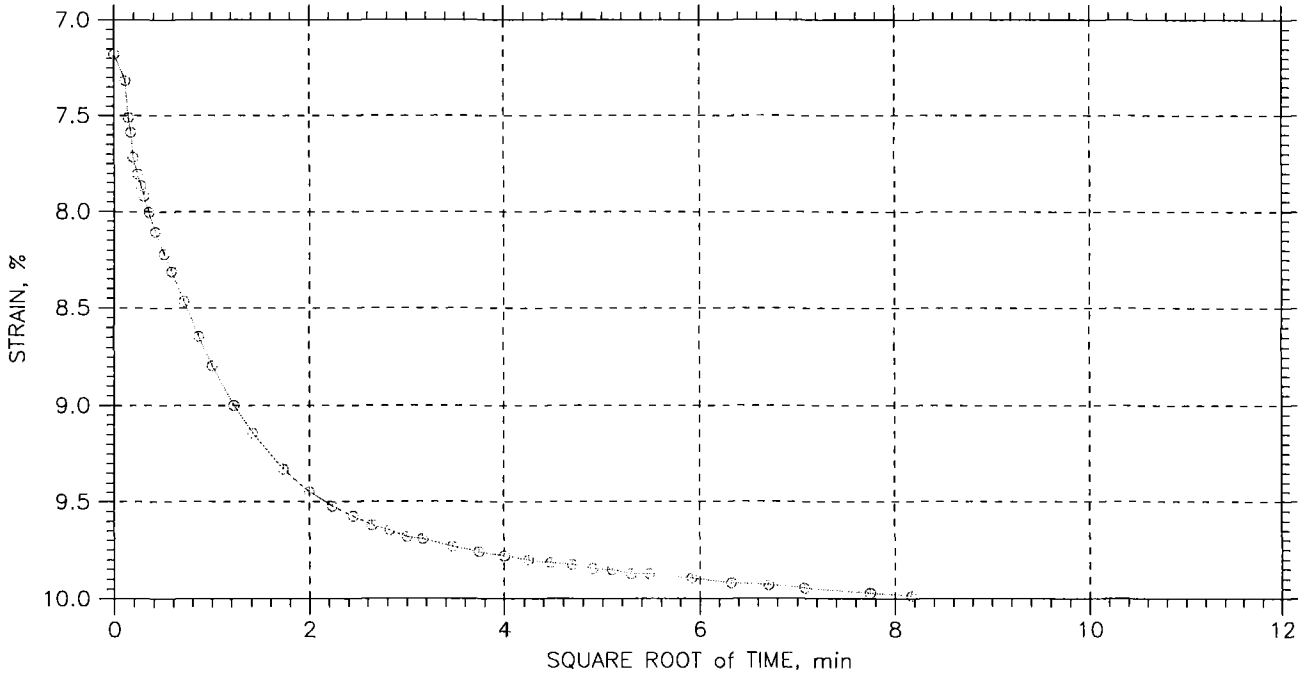
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 7 of 15

Stress: 6400. psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

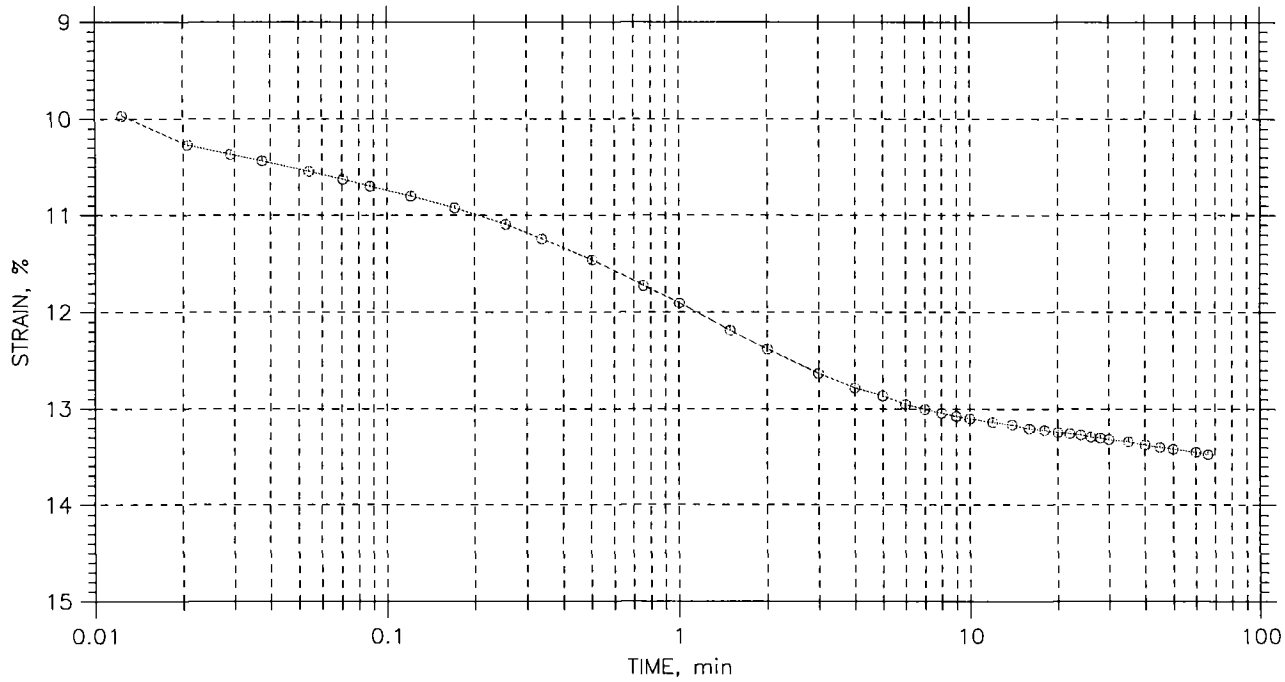
Fri, 26-MAY-2006 10:33:26

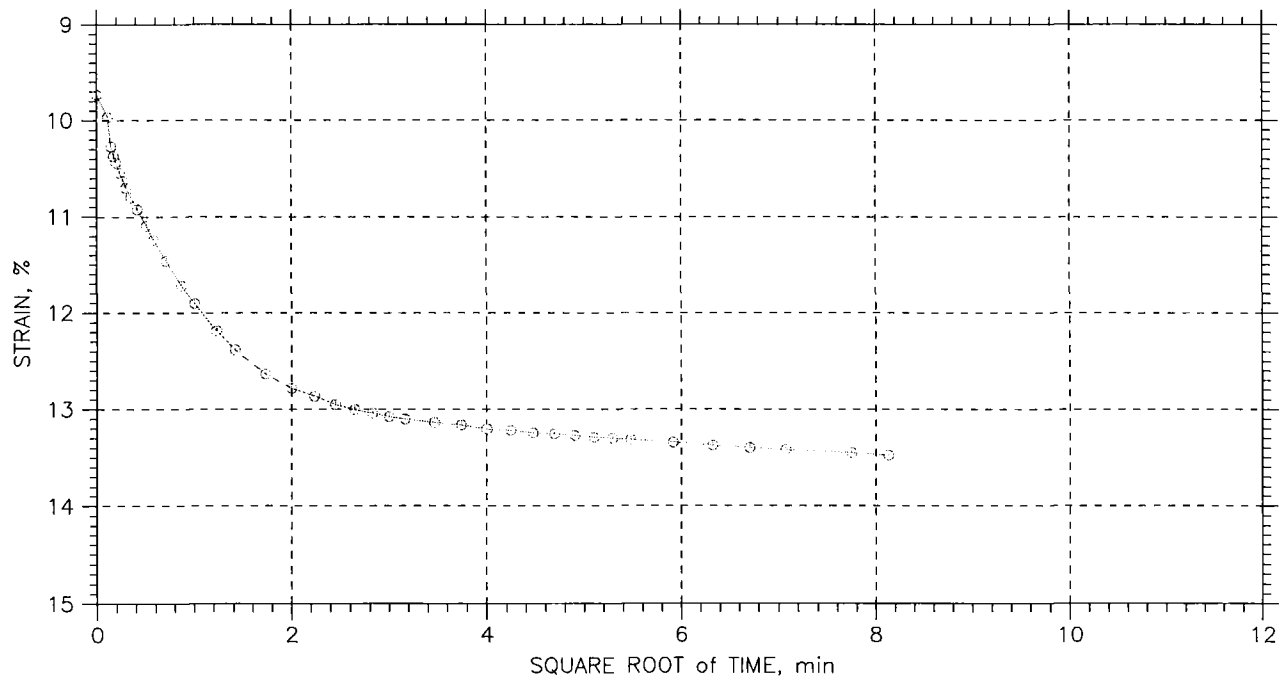
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 8 of 15

Stress: 12800 psf





	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

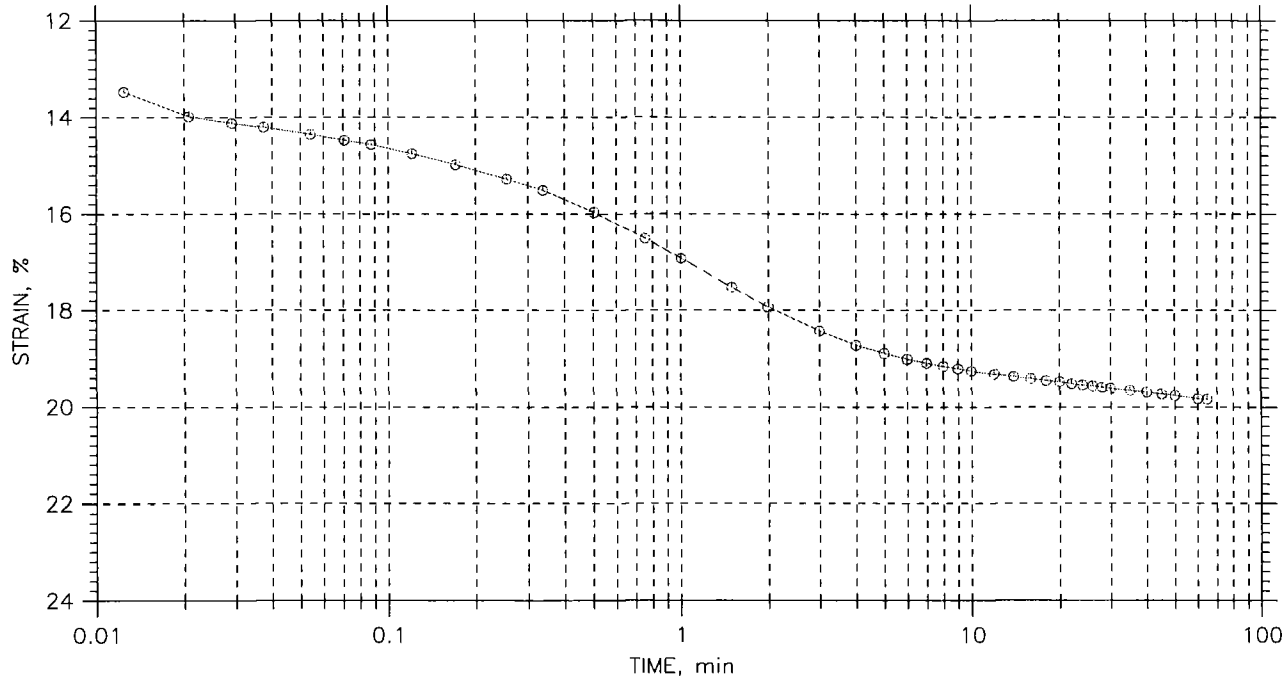
Fri, 26-MAY-2006 10:33:27

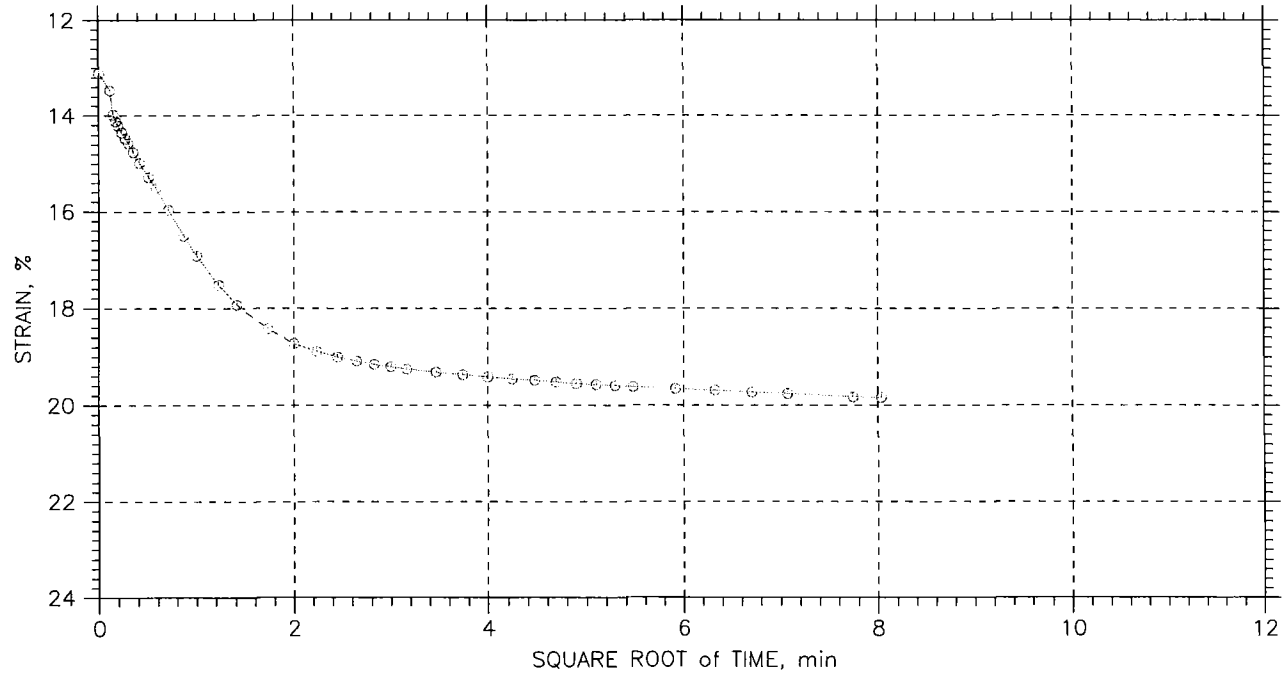
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 9 of 15

Stress: 25600 psf





LTDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

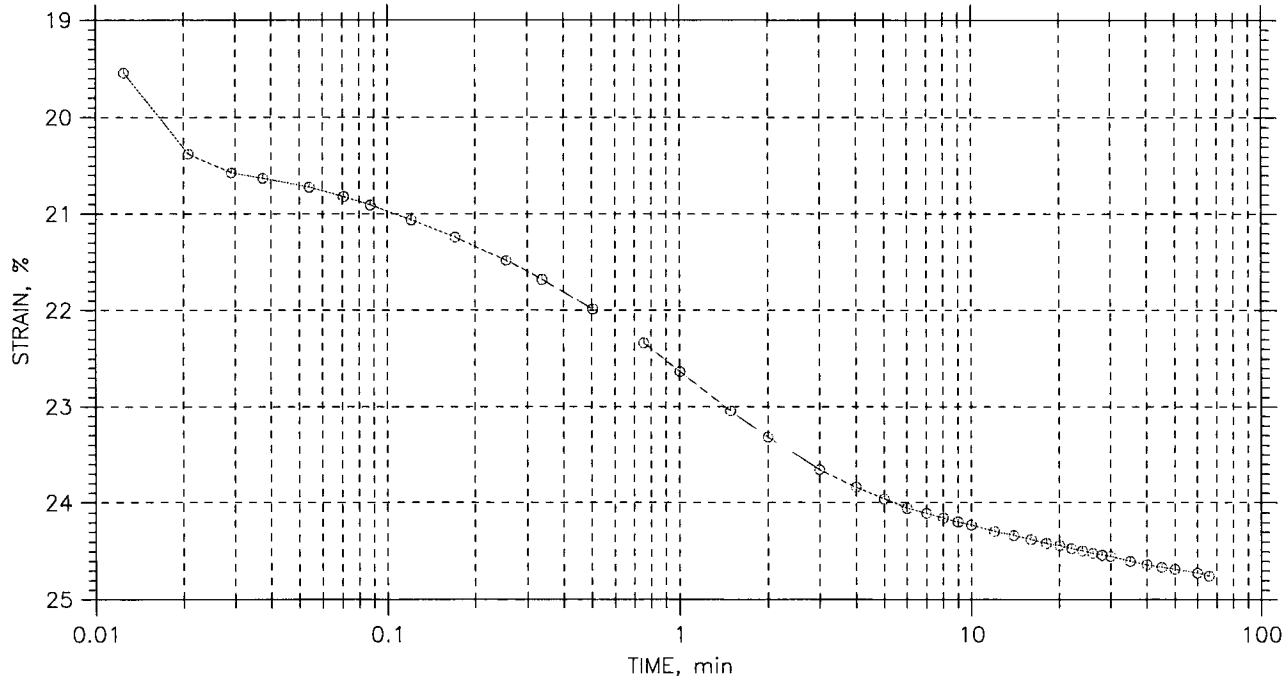
Fri, 26-MAY-2006 10:33:27

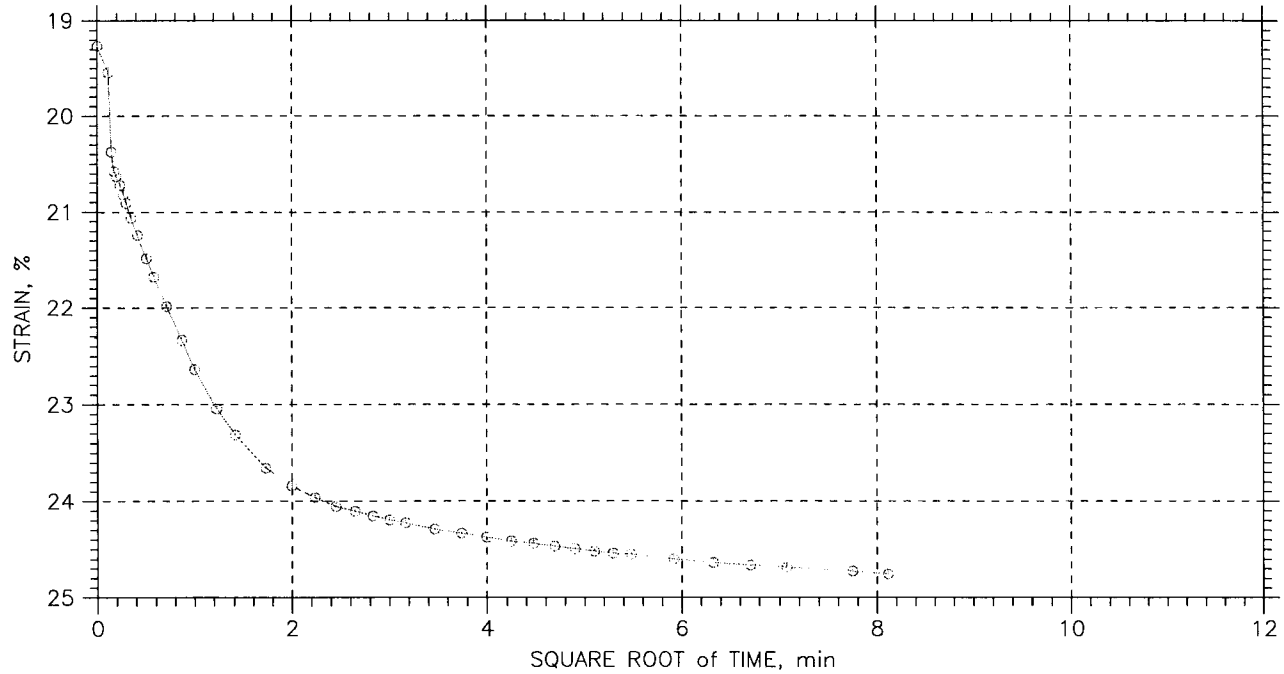
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 10 of 15

Stress: 51200 psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

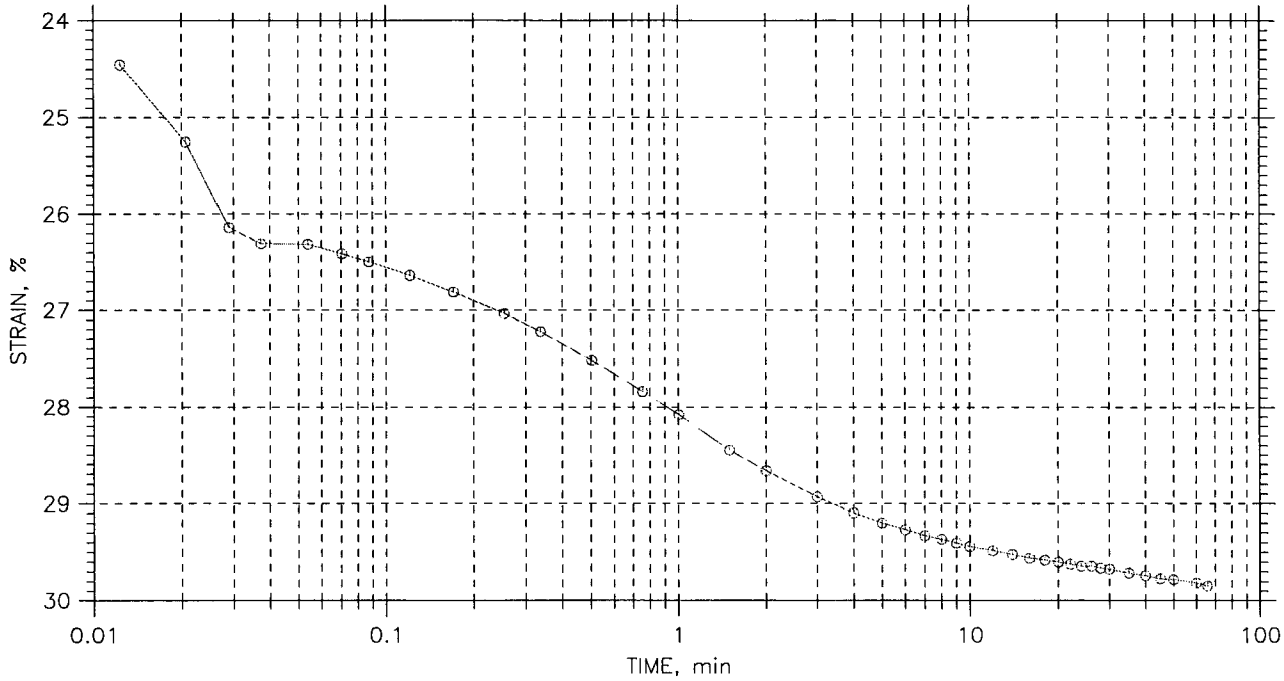
Fri, 26-MAY-2006 10:33:28

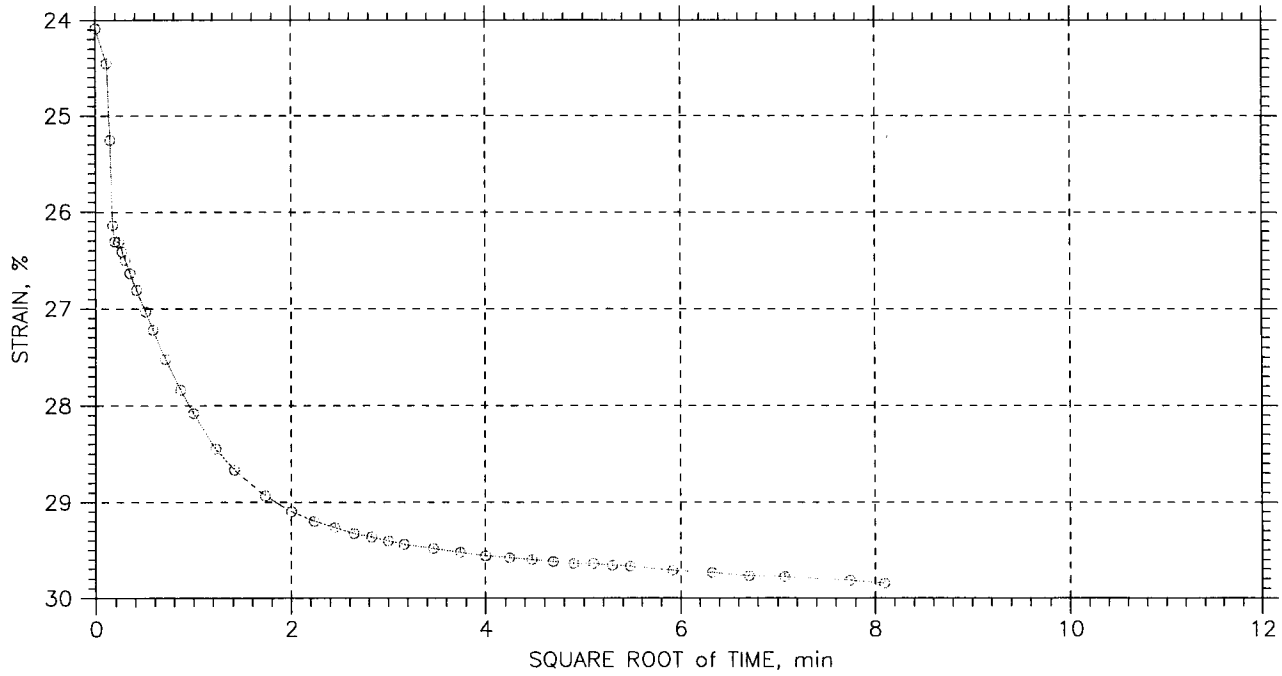
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 11 of 15

Stress: 1.024e+005 psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

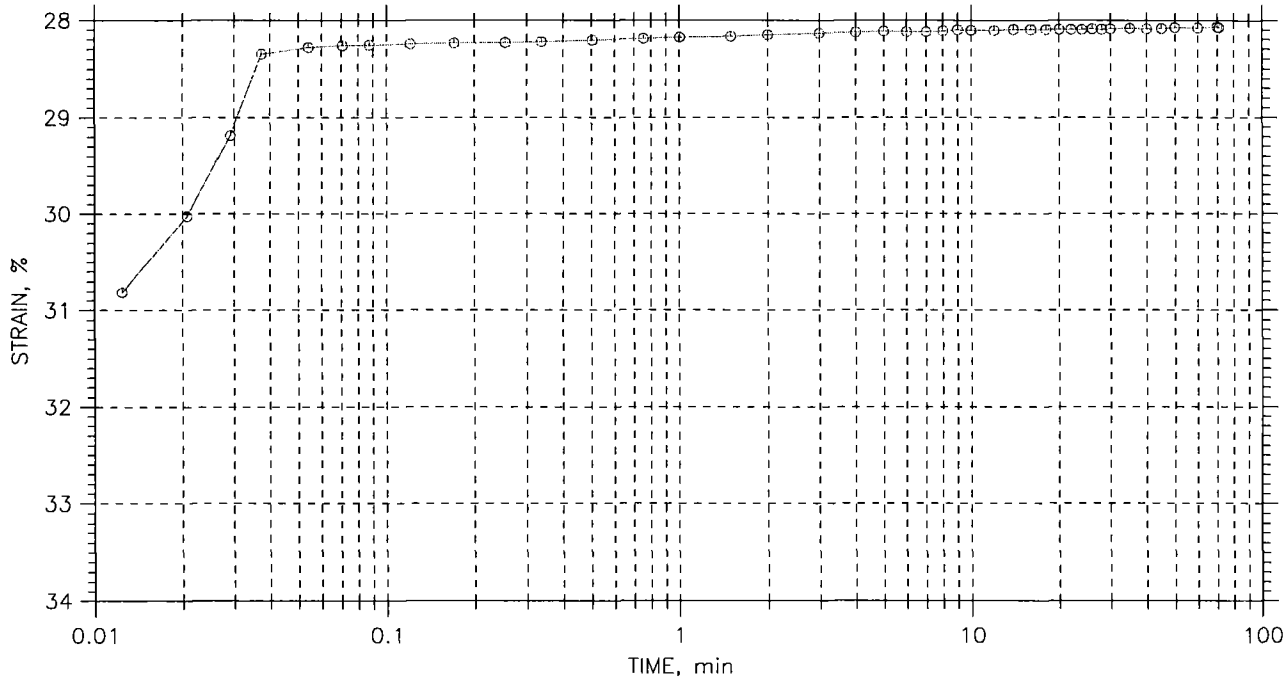
Fri, 26-MAY-2006 10:33:29

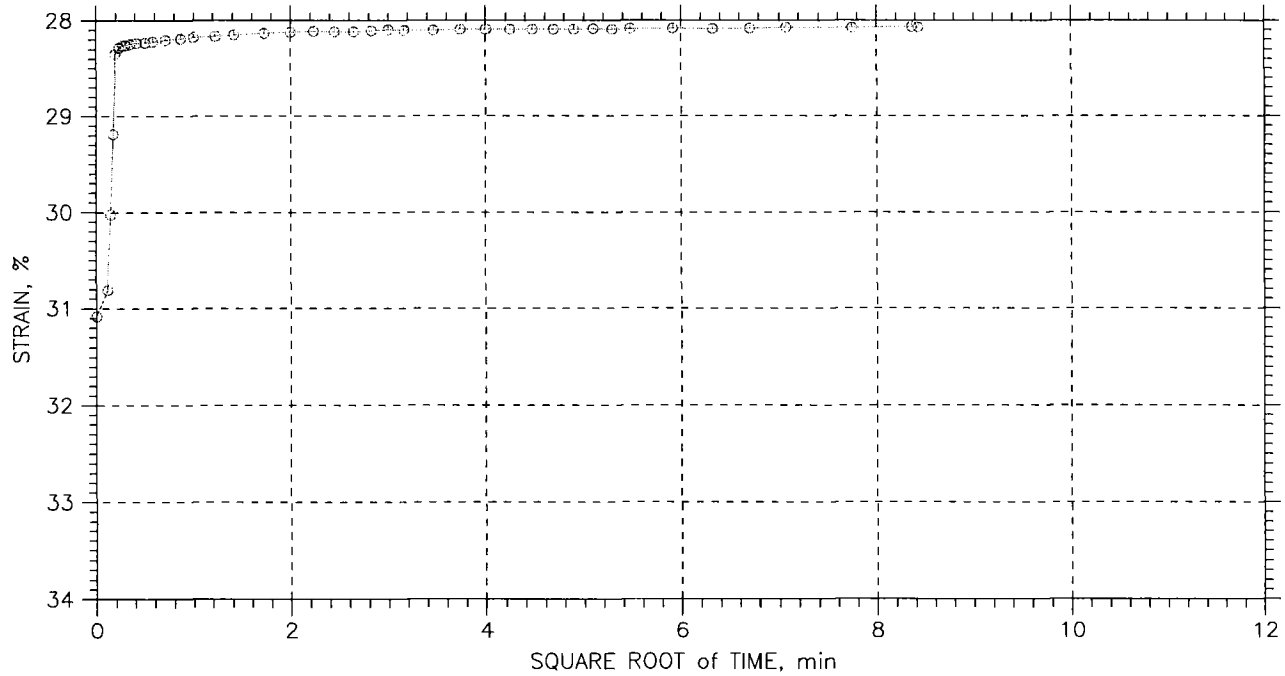
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 12 of 15

Stress: 25600 psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

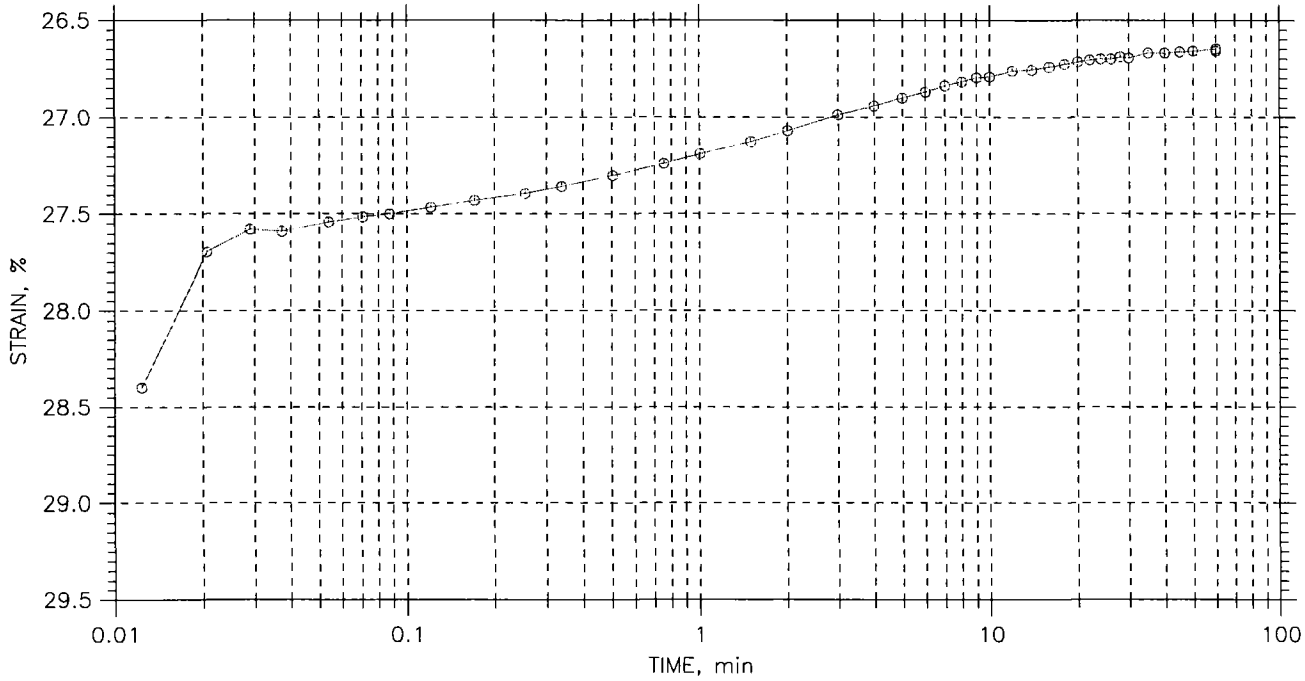
Fri, 26-MAY-2006 10:33:30

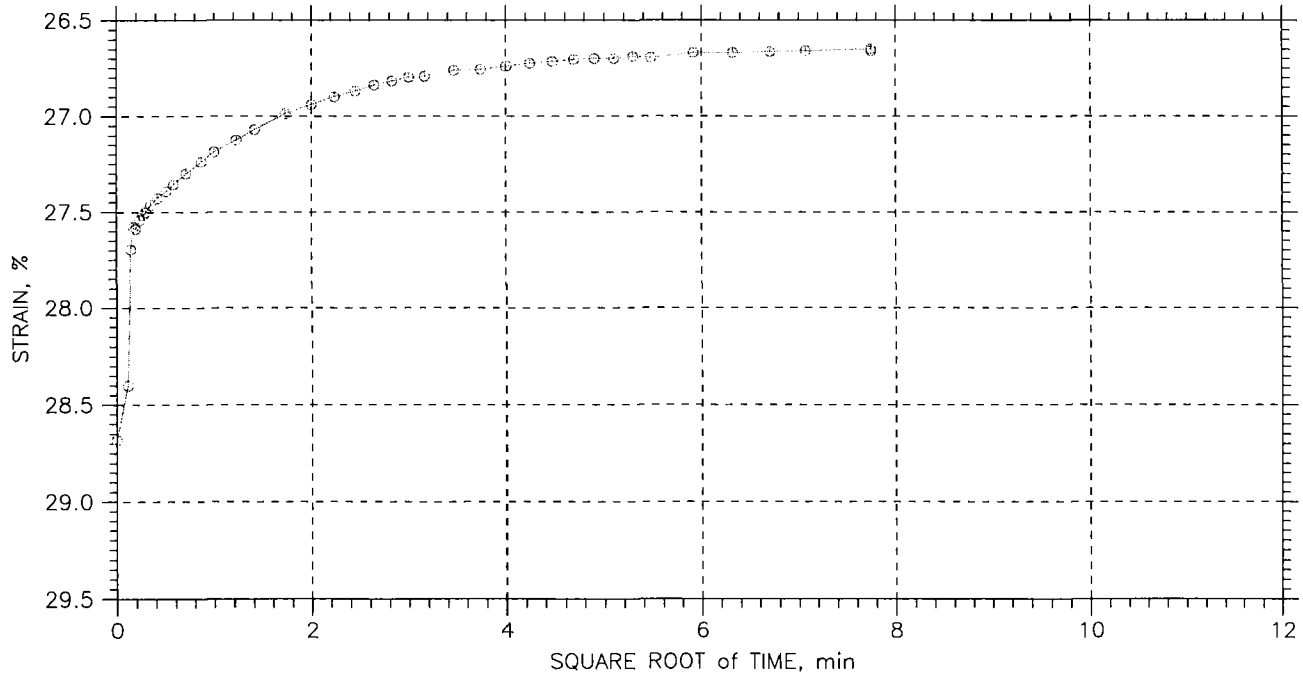
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 13 of 15

Stress: 6400. psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

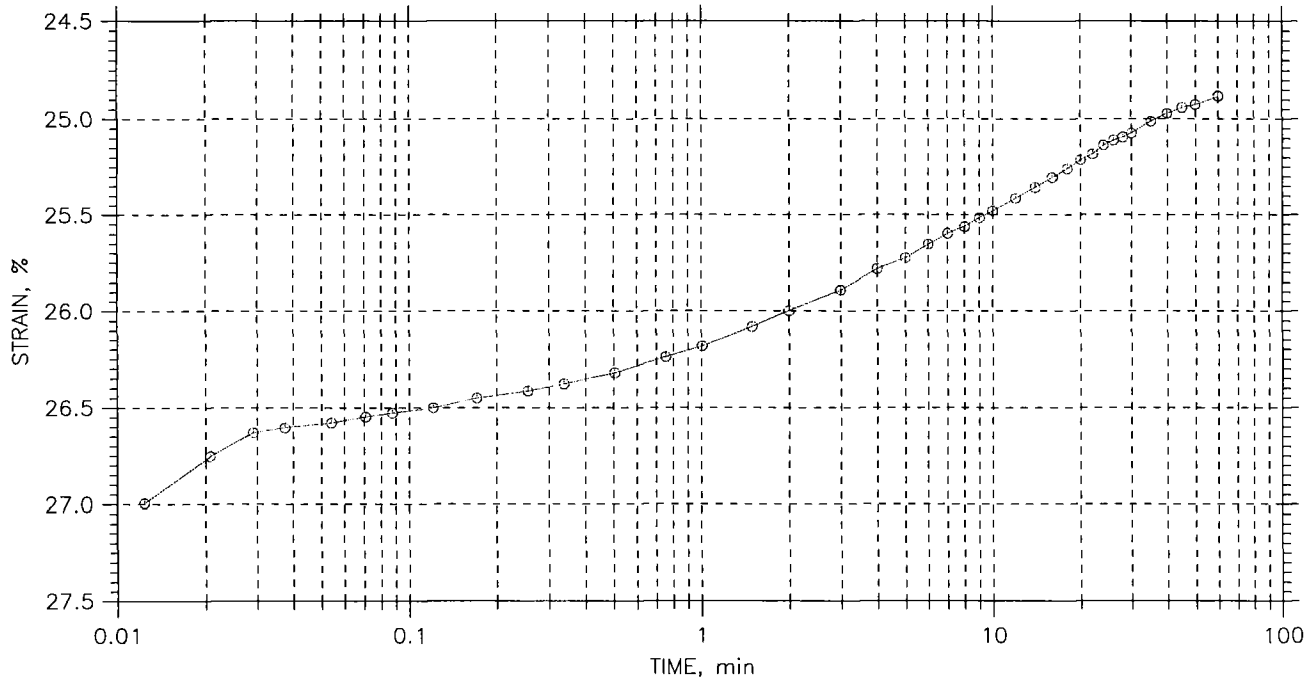
Fri, 26-MAY-2006 10:33:30

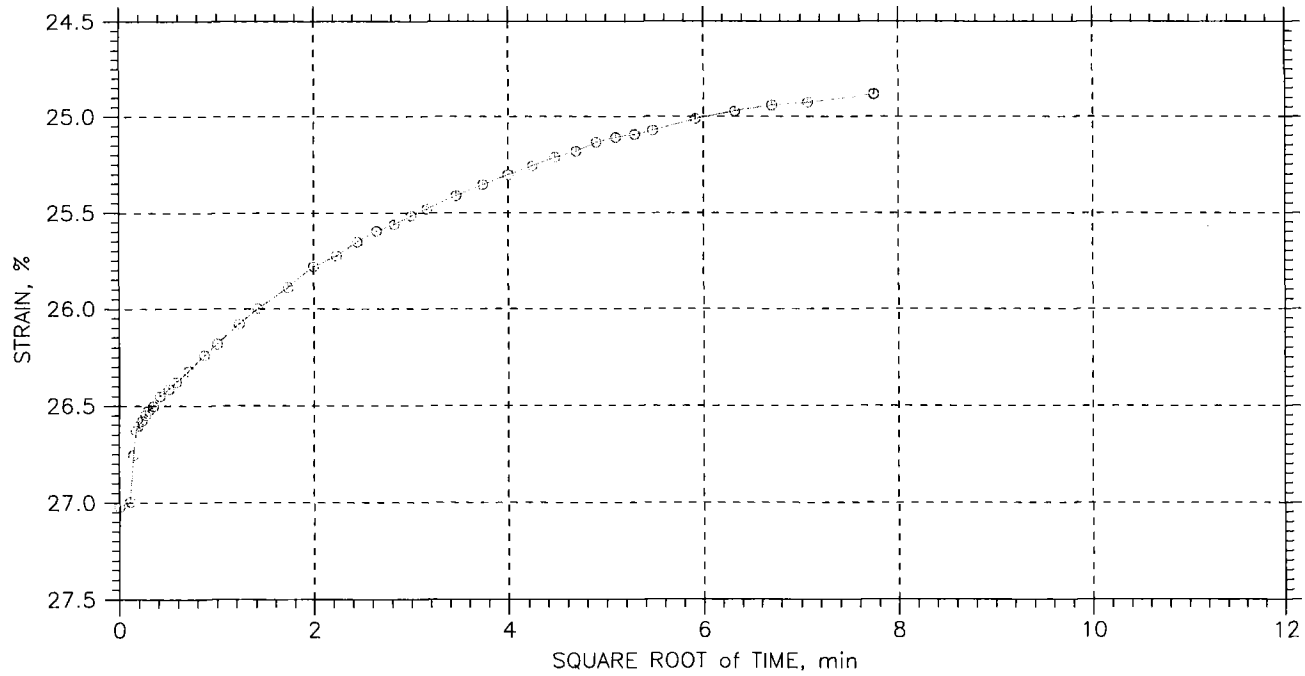
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 14 of 15

Stress: 1600. psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

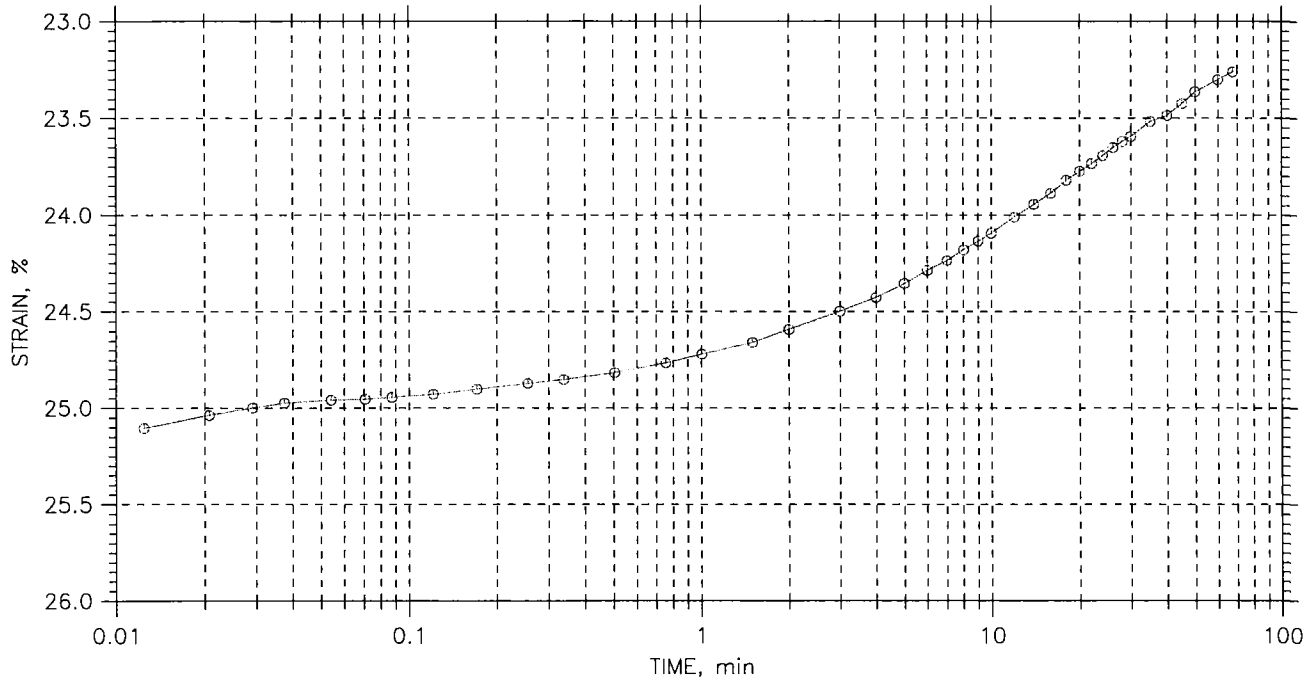
Fri, 26-MAY-2006 10:33:31

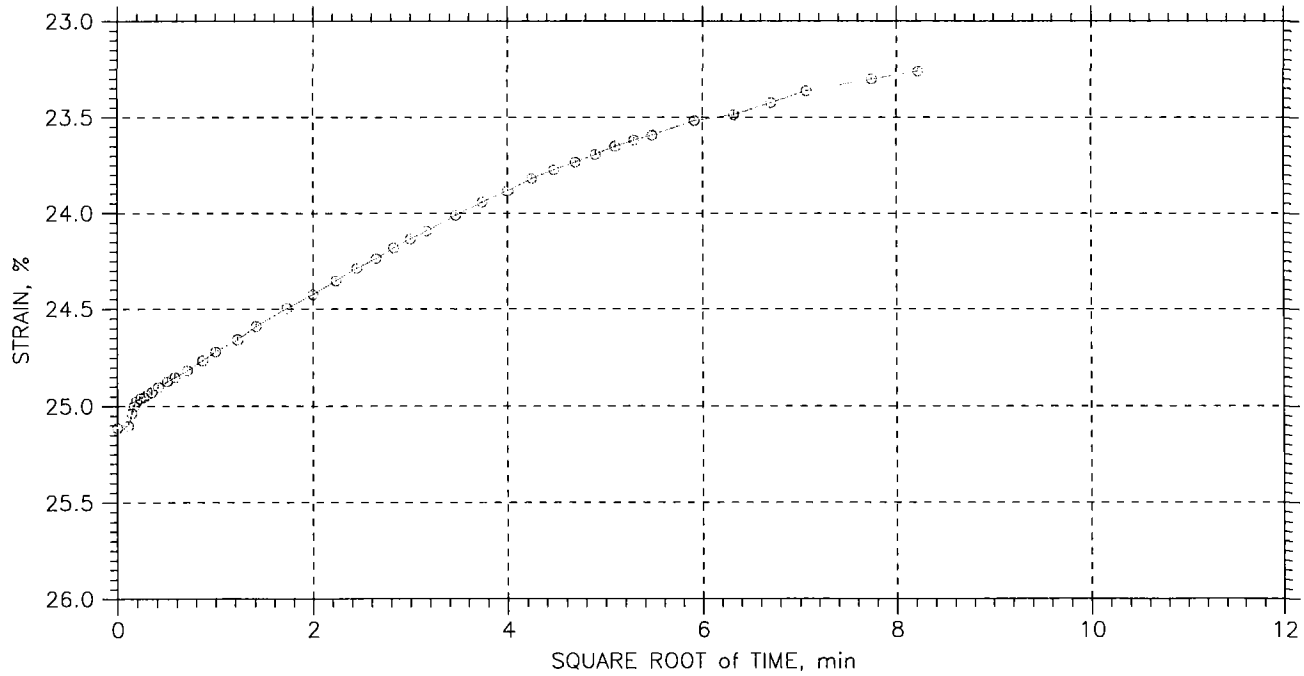
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 15 of 15

Stress: 400. psf



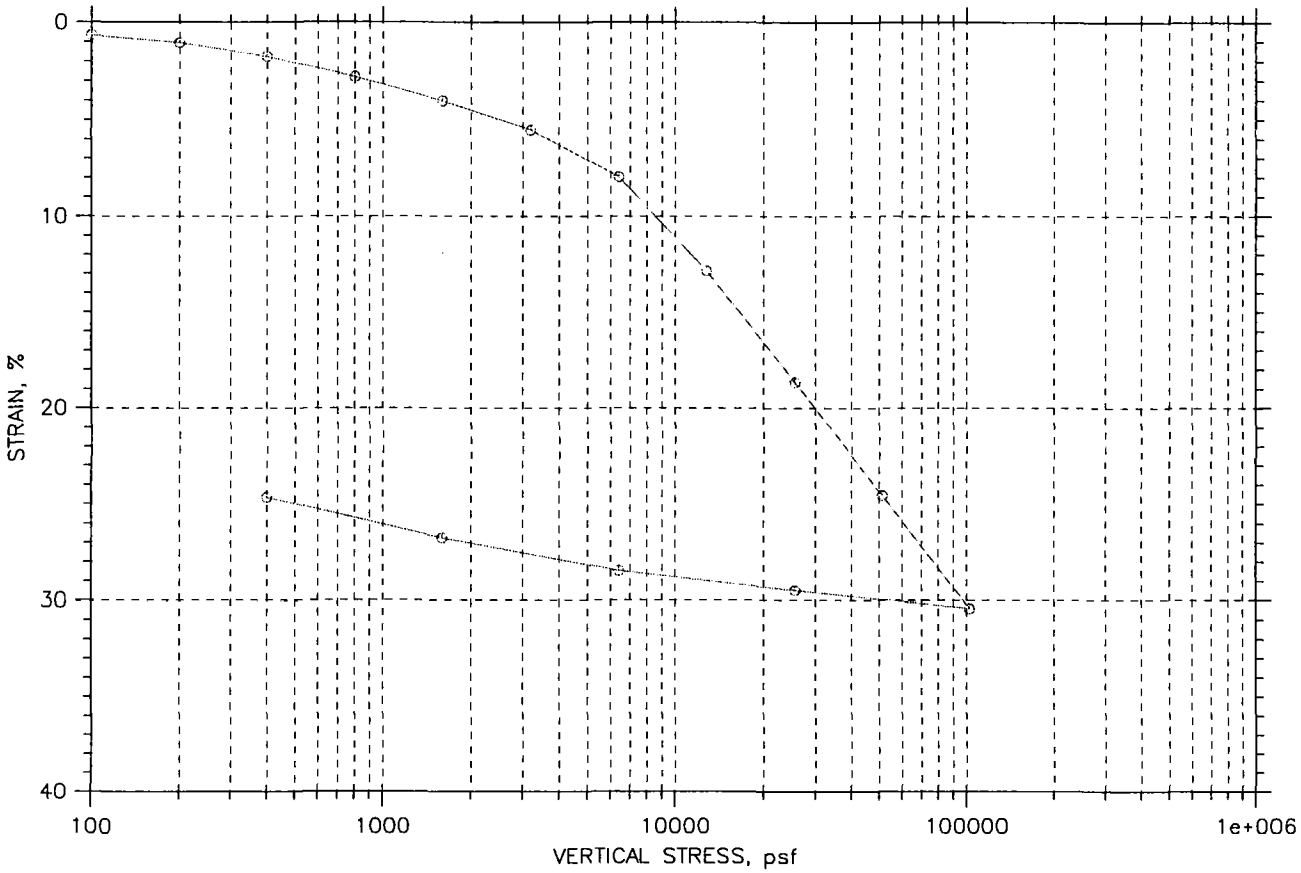


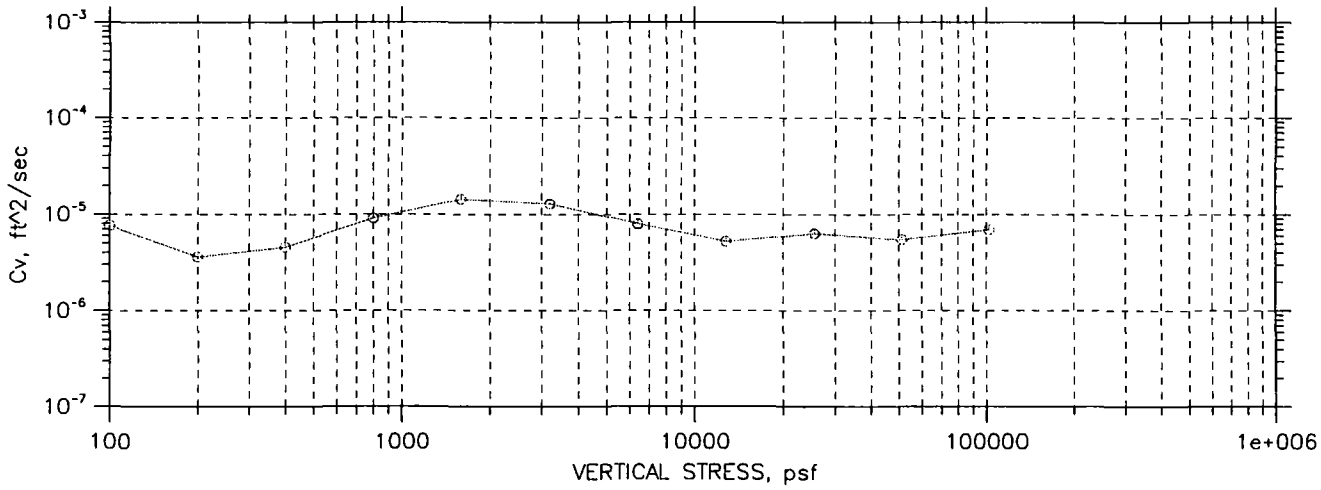
	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-32.5	Test Date: 16 May 06	Depth: 32.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

Fri, 26-MAY-2006 10:33:32

CONSOLIDATION TEST DATA

SUMMARY REPORT





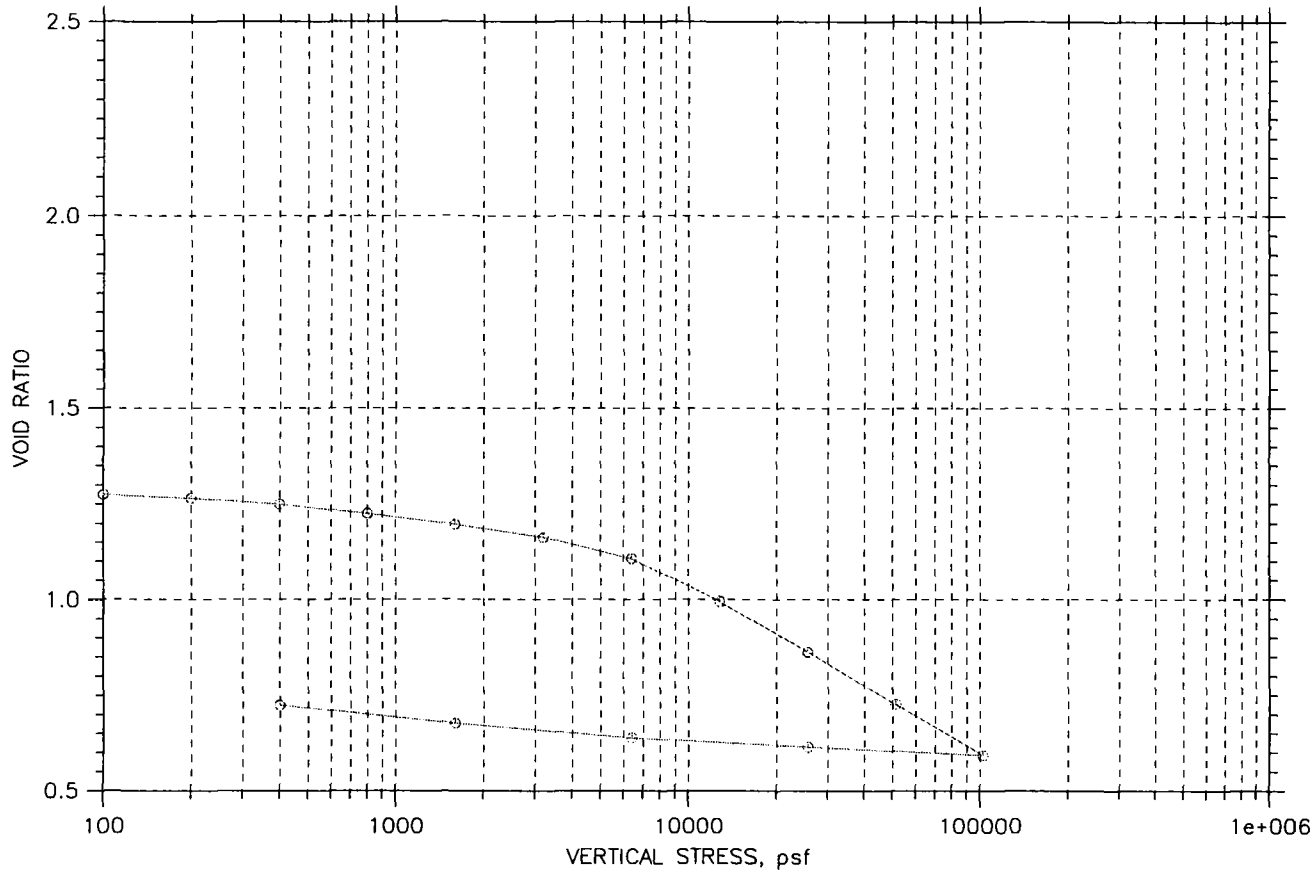
UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

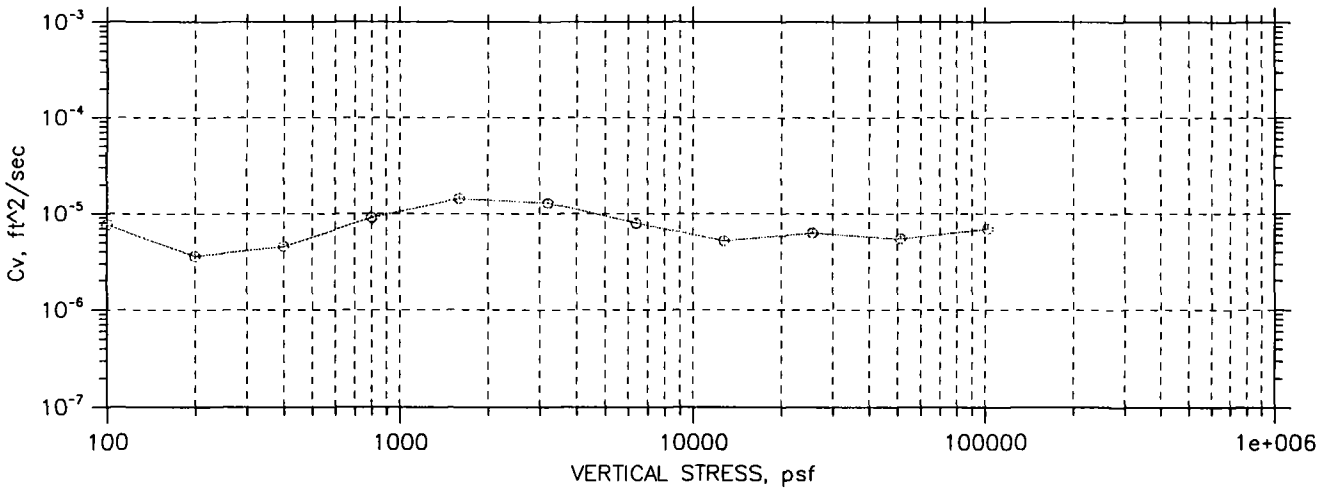
NODI

Fri, 26-MAY-2006 10:34:35

CONSOLIDATION TEST DATA

SUMMARY REPORT





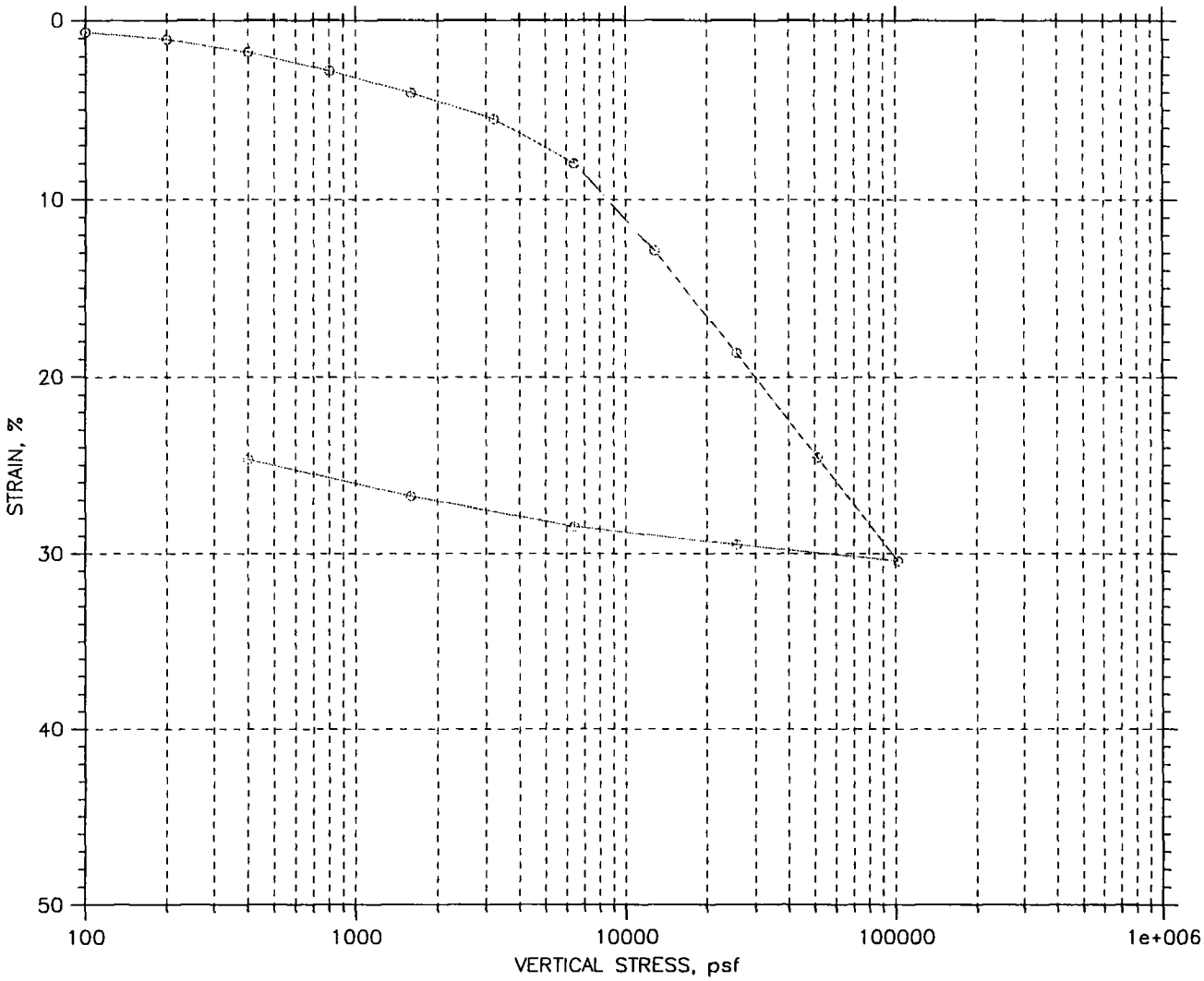
UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

Fri, 26-MAY-2006 10:37:05

CONSOLIDATION TEST DATA

SUMMARY REPORT



					Before Test	After Test
Overburden Pressure: 0 psf				Water Content, %	36.06	23.03
Preconsolidation Pressure: 0 psf				Dry Unit Weight, pcf	85.83	113.9
Compression Index: 3.81959e-313				Saturation, %	88.03	100.00
Diameter: 2.416 in		Height: 1.017 in		Void Ratio	1.29	0.73
LL: 34	PL: 20	PI: 14	GS: 3.15			

UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

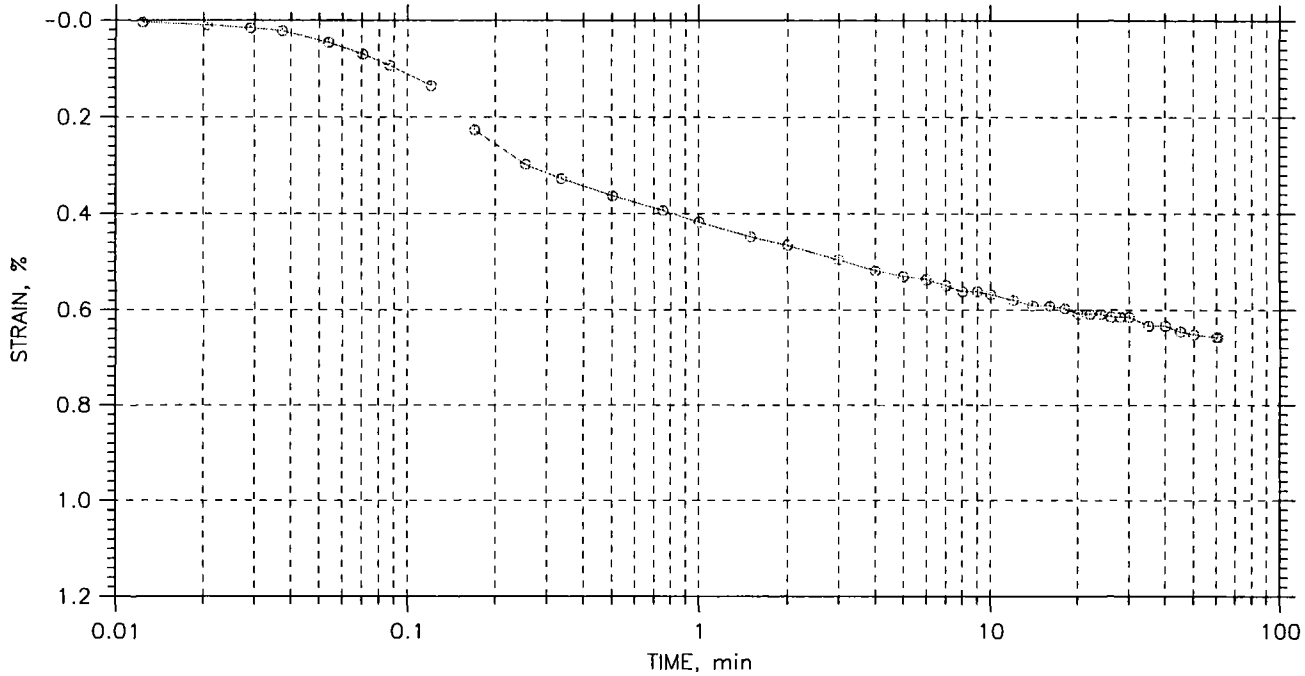
Fri, 26-MAY-2006 10:34:36

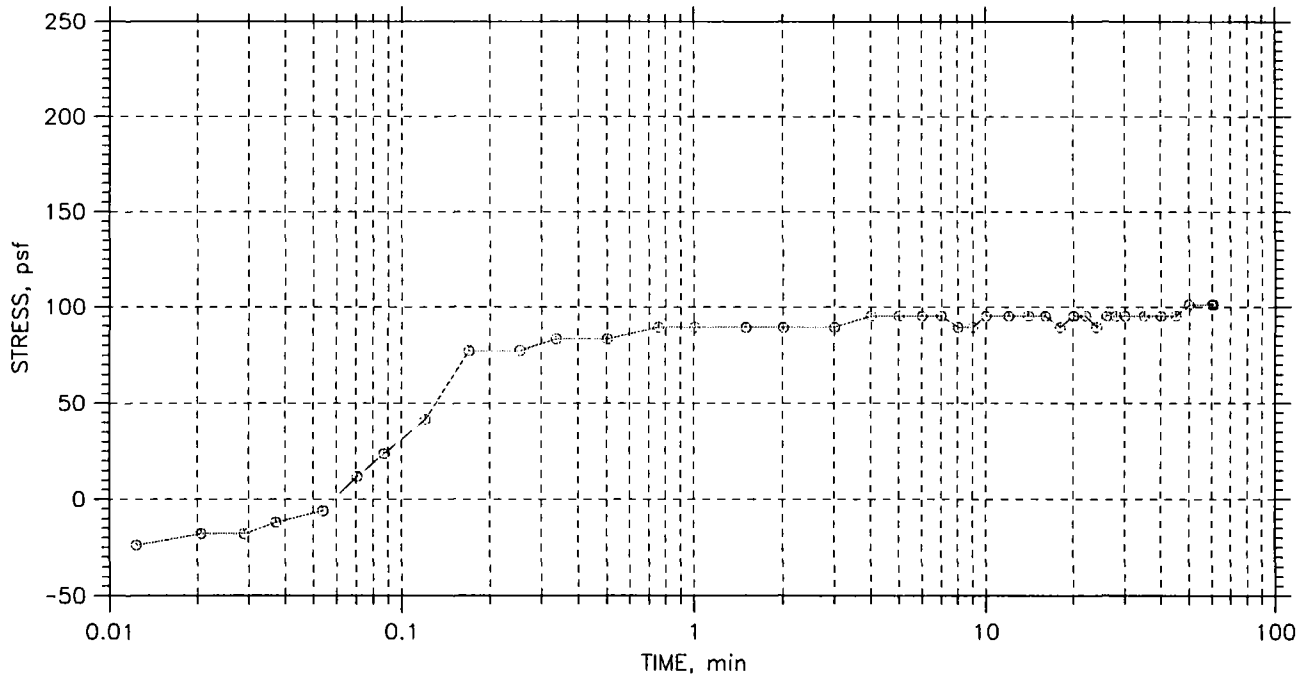
CONSOLIDATION TEST DATA

TIME CURVES

Constant Volume Step: 1 of 15

Stress: 100. psf





	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

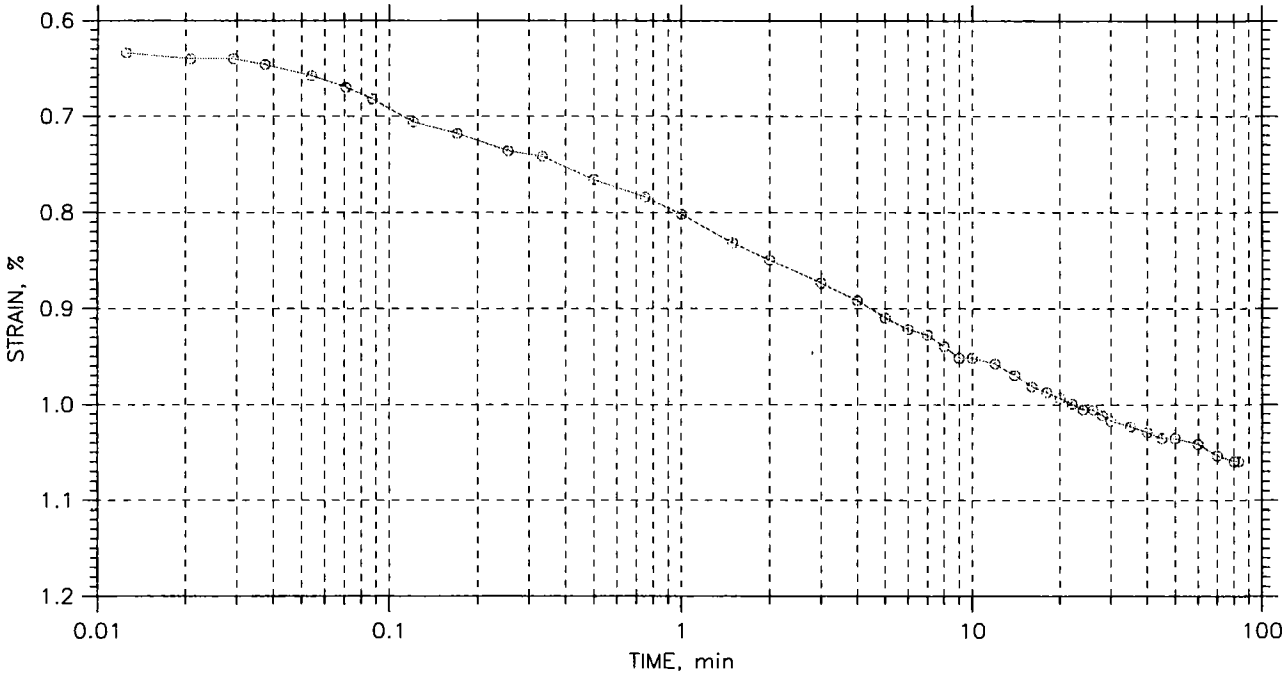
Fri, 26-MAY-2006 10:34:37

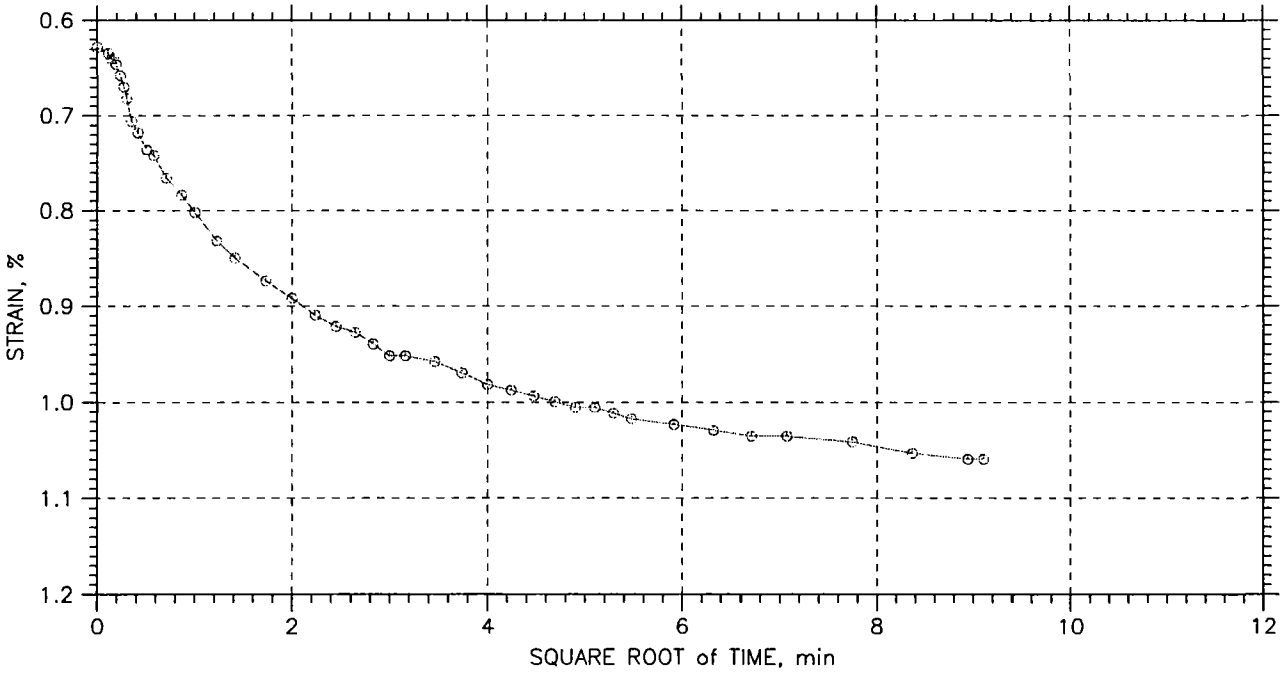
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 2 of 15

Stress: 200. psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

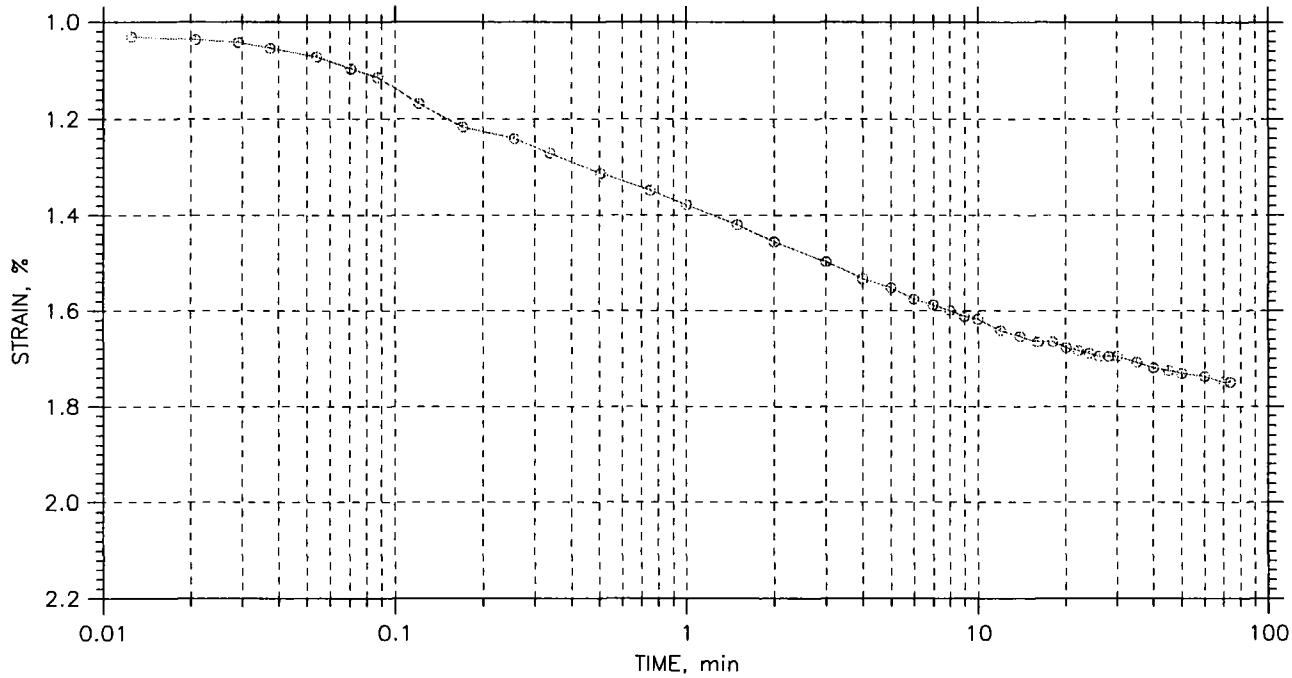
Fri, 26-MAY-2006 10:34:38

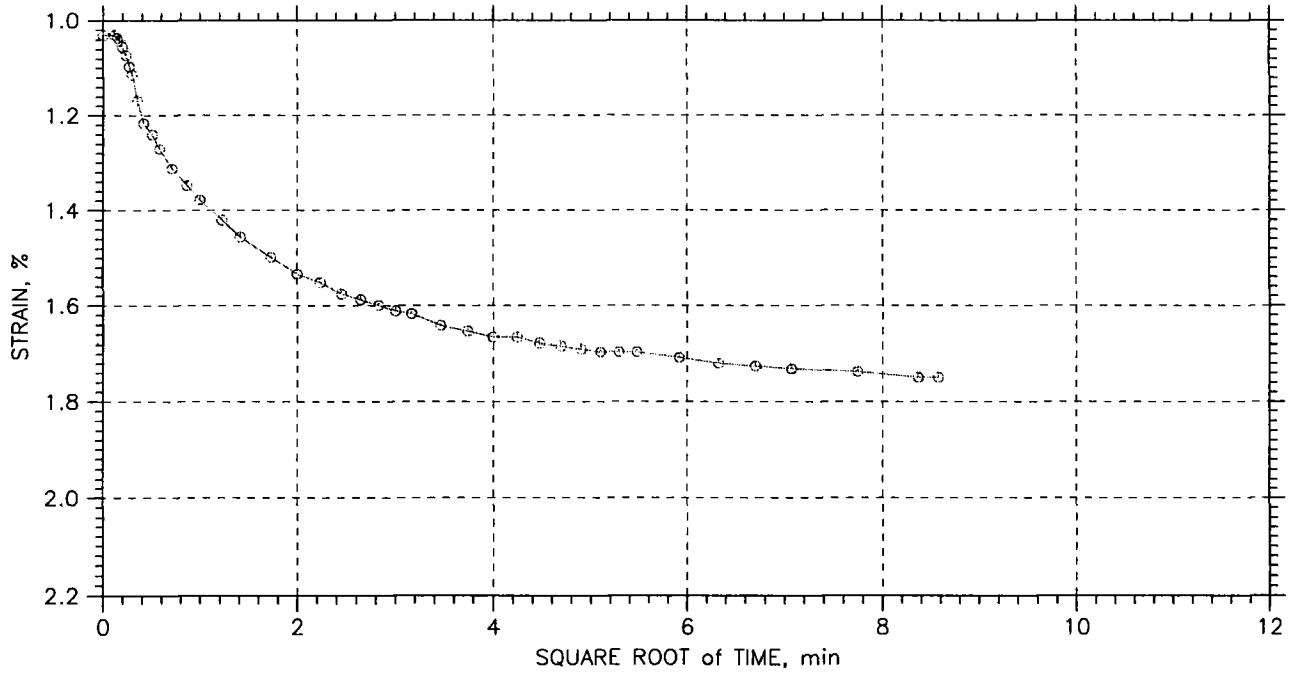
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 3 of 15

Stress: 400. psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

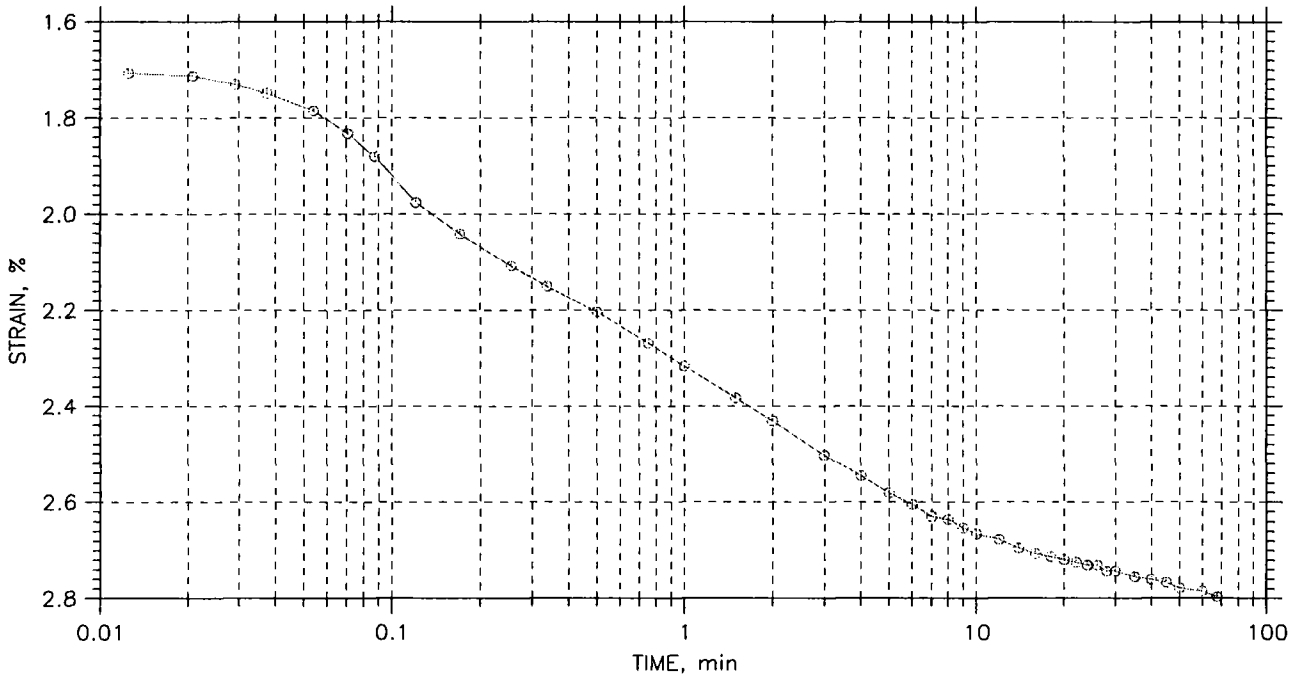
Fri, 26-MAY-2006 10:34:38

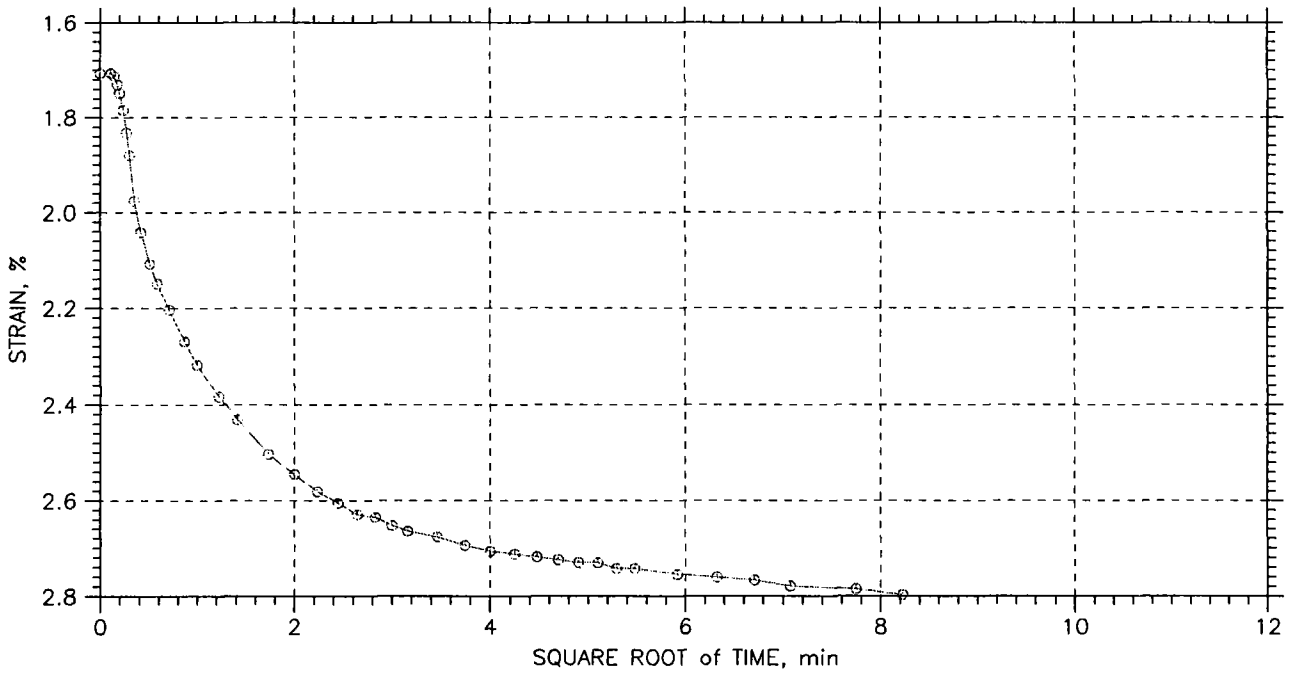
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 4 of 15

Stress: 800. psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

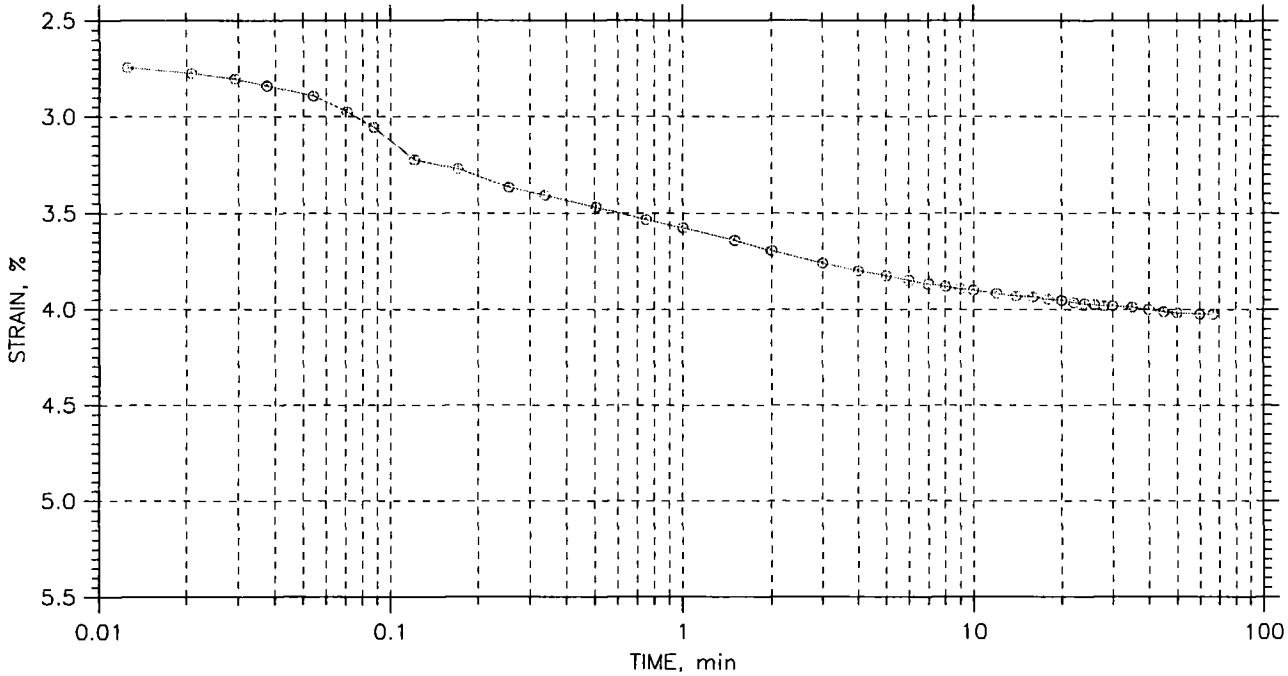
Fri, 26-MAY-2006 10:34:39

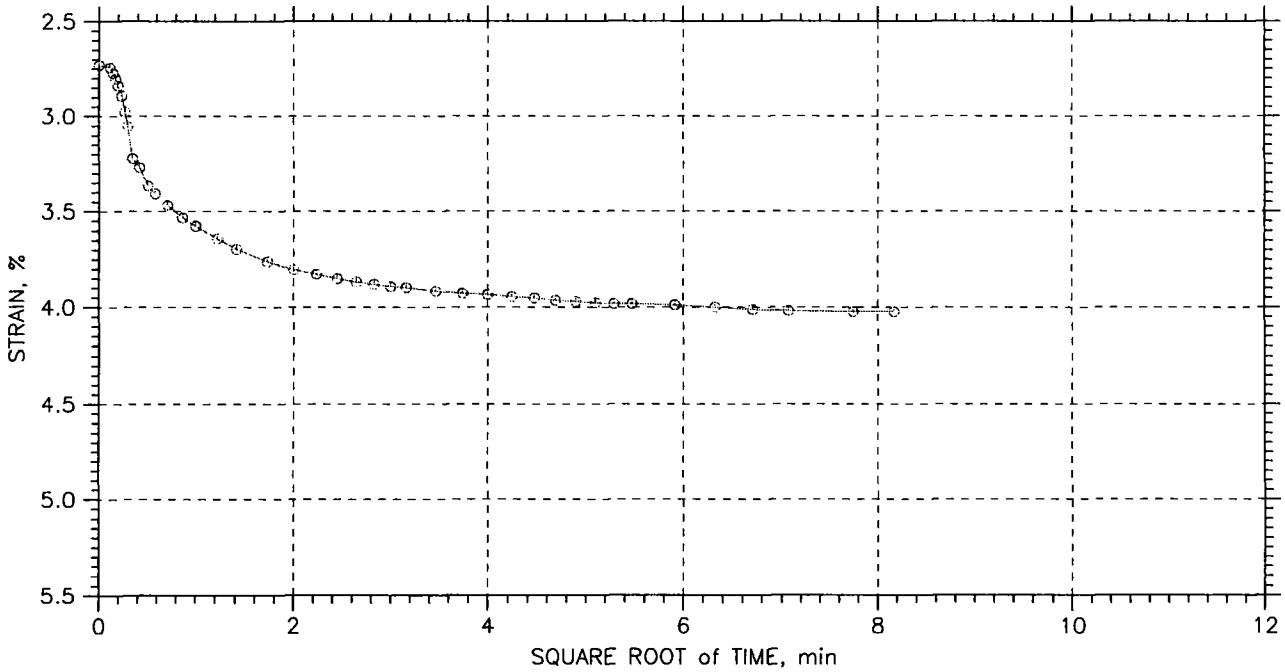
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 5 of 15

Stress: 1600. psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

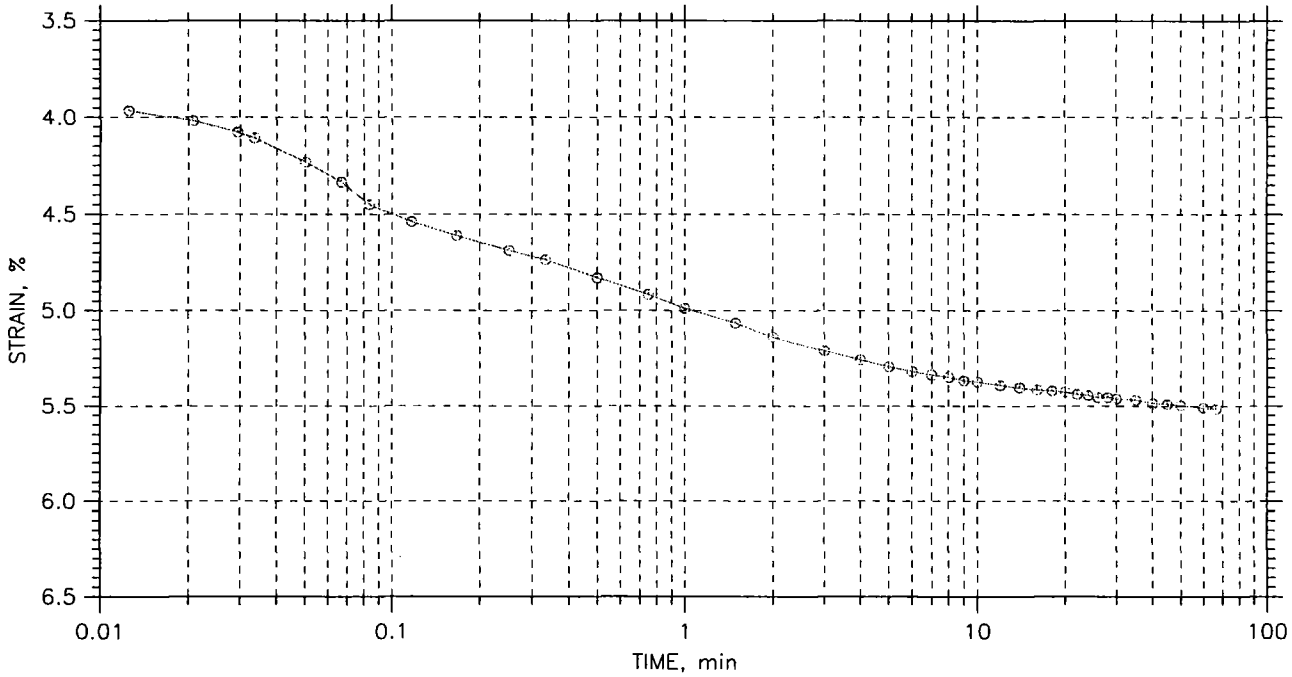
Fri, 26-MAY-2006 10:34:40

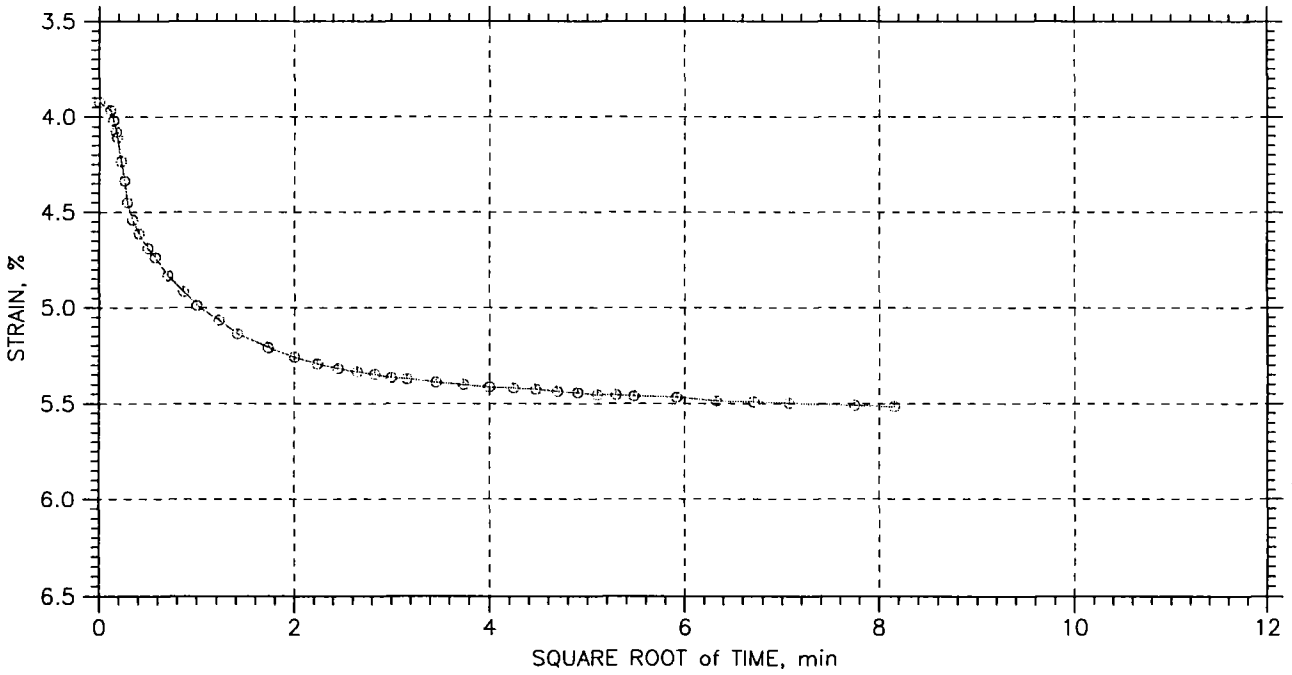
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 6 of 15

Stress: 3200. psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

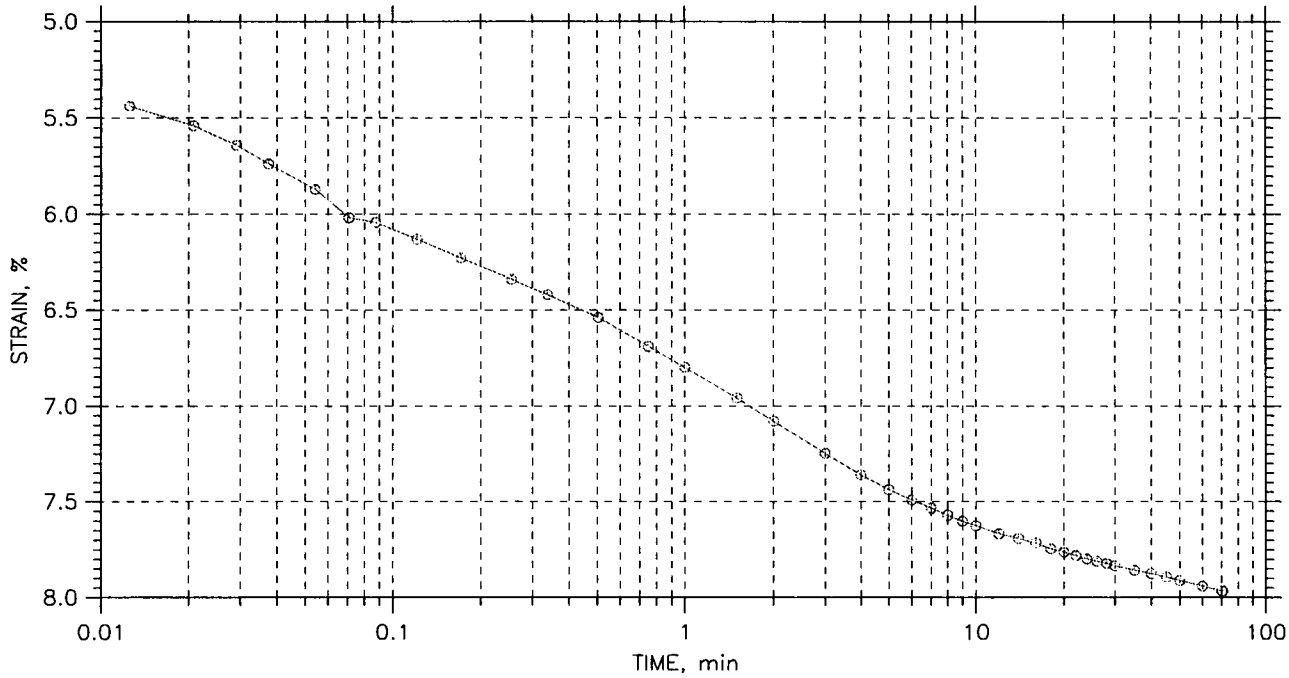
Fri, 26-MAY-2006 10:34:41

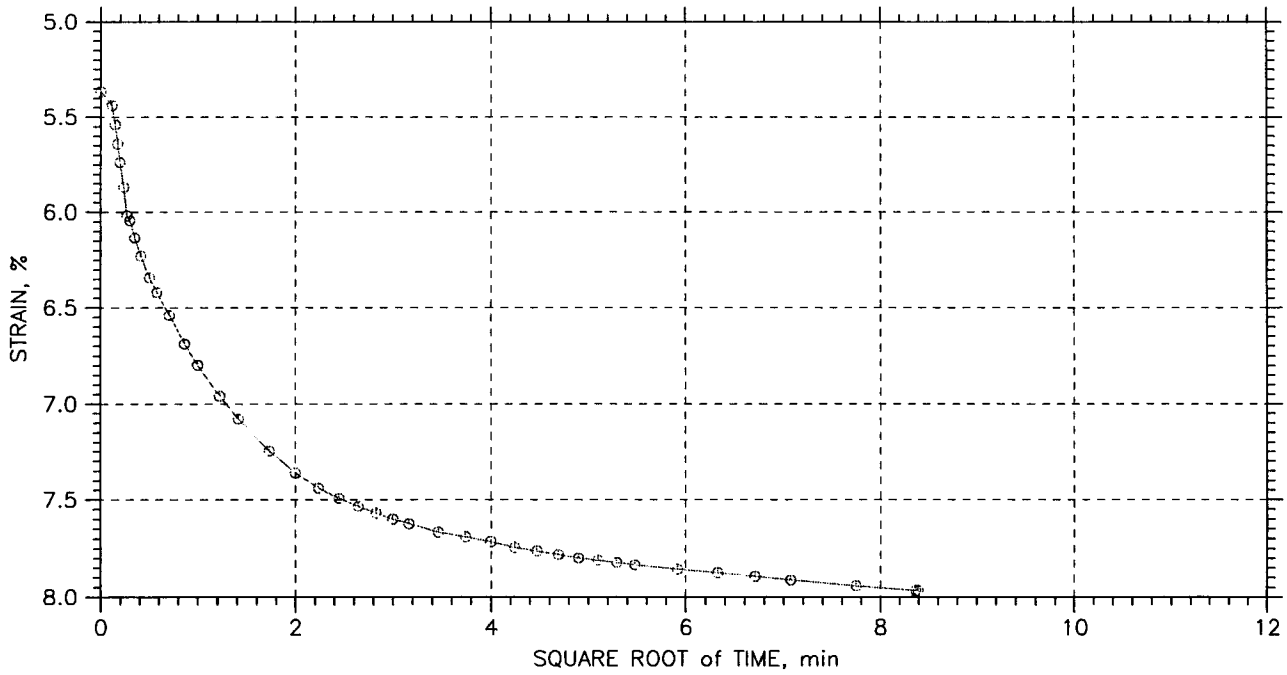
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 7 of 15

Stress: 6400. psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

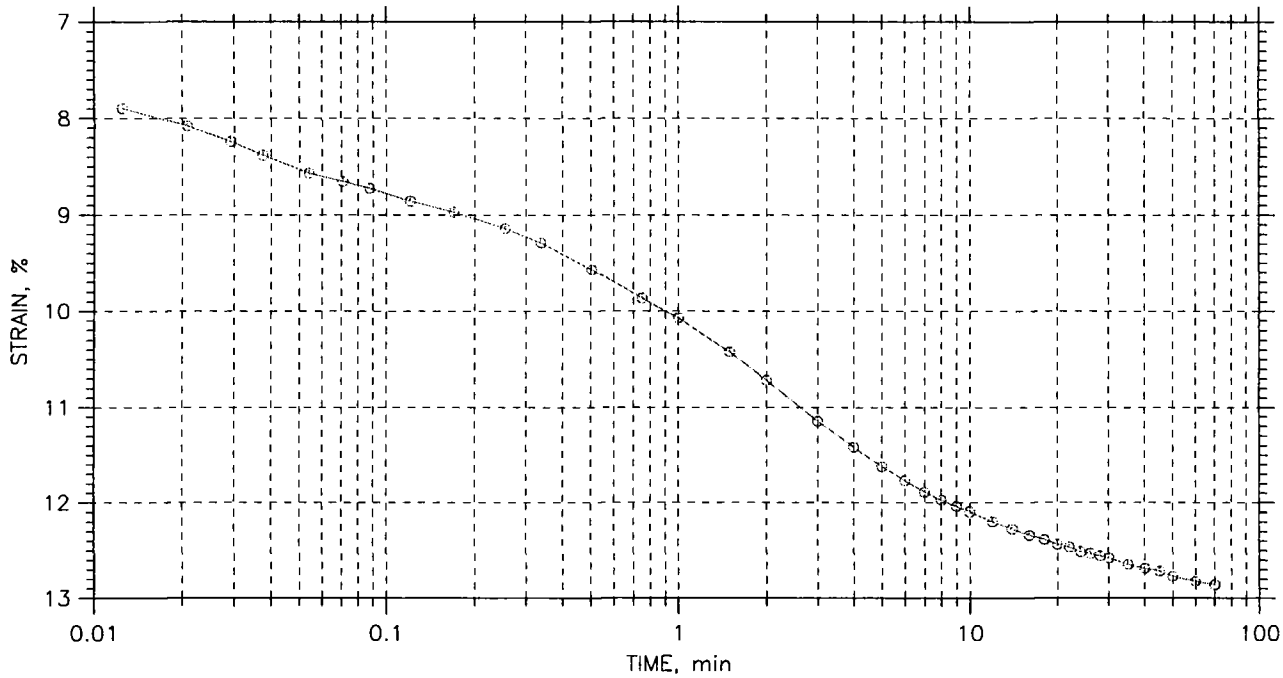
Fri, 26-MAY-2006 10:34:41

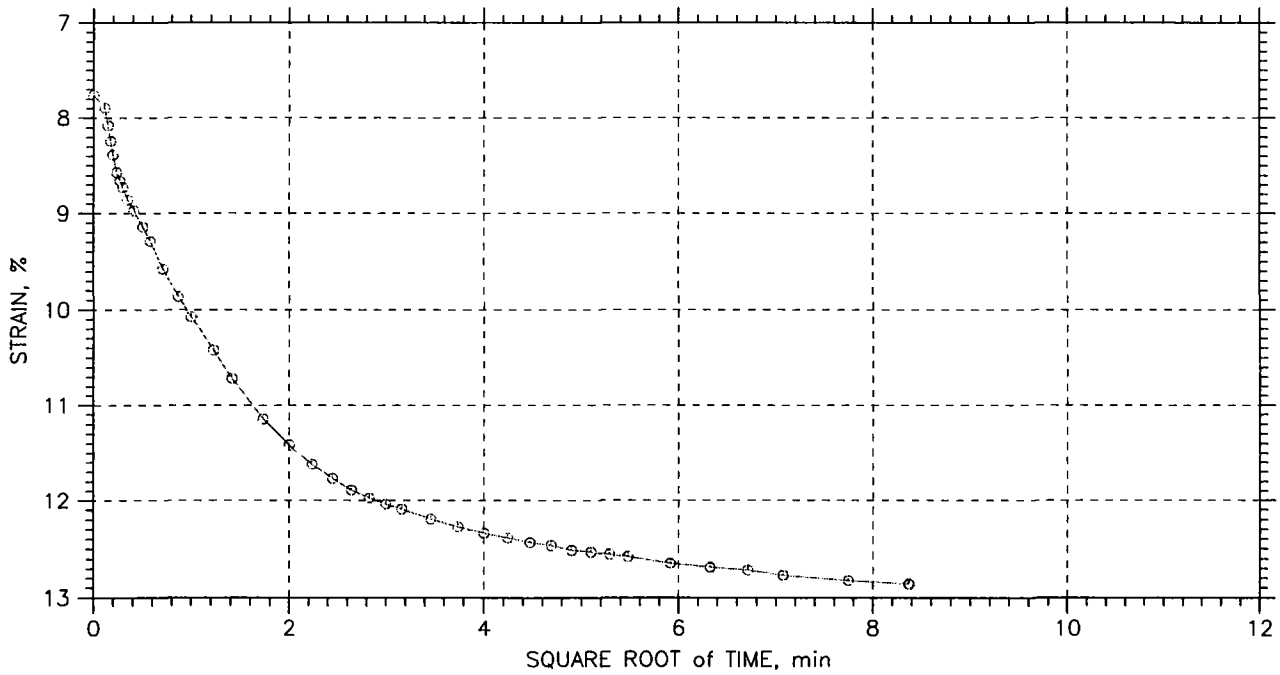
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 8 of 15

Stress: 12800 psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

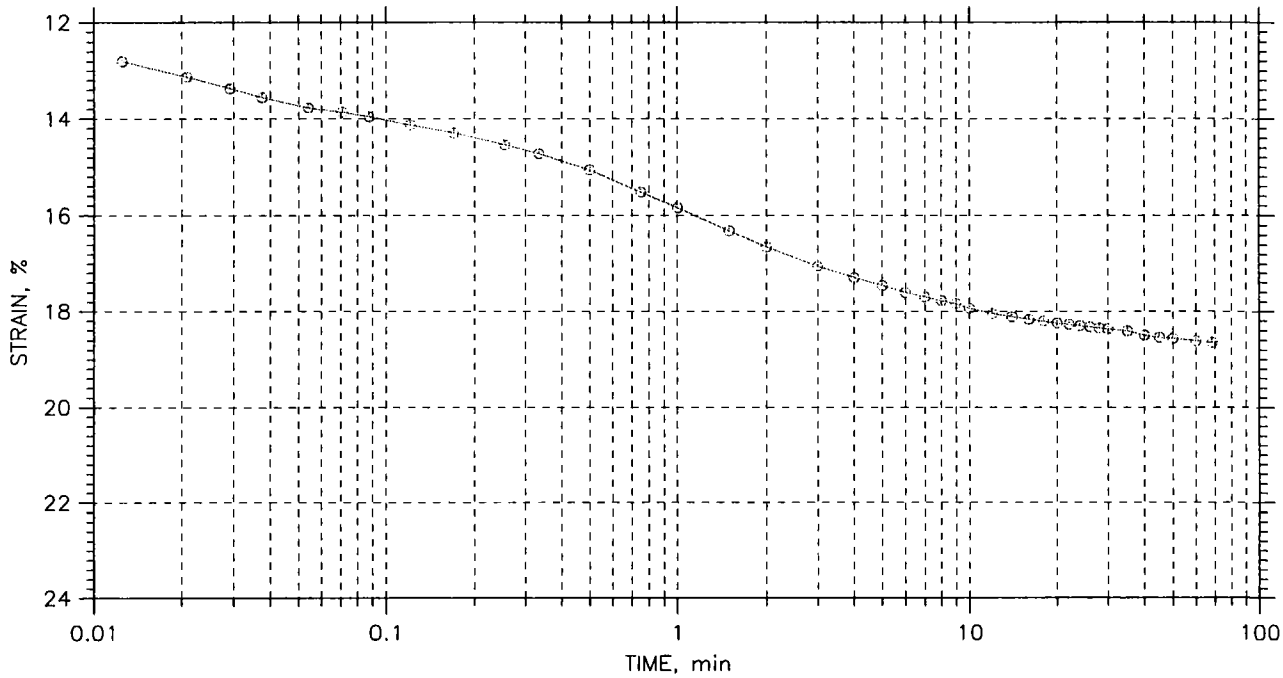
Fri, 26-MAY-2006 10:34:42

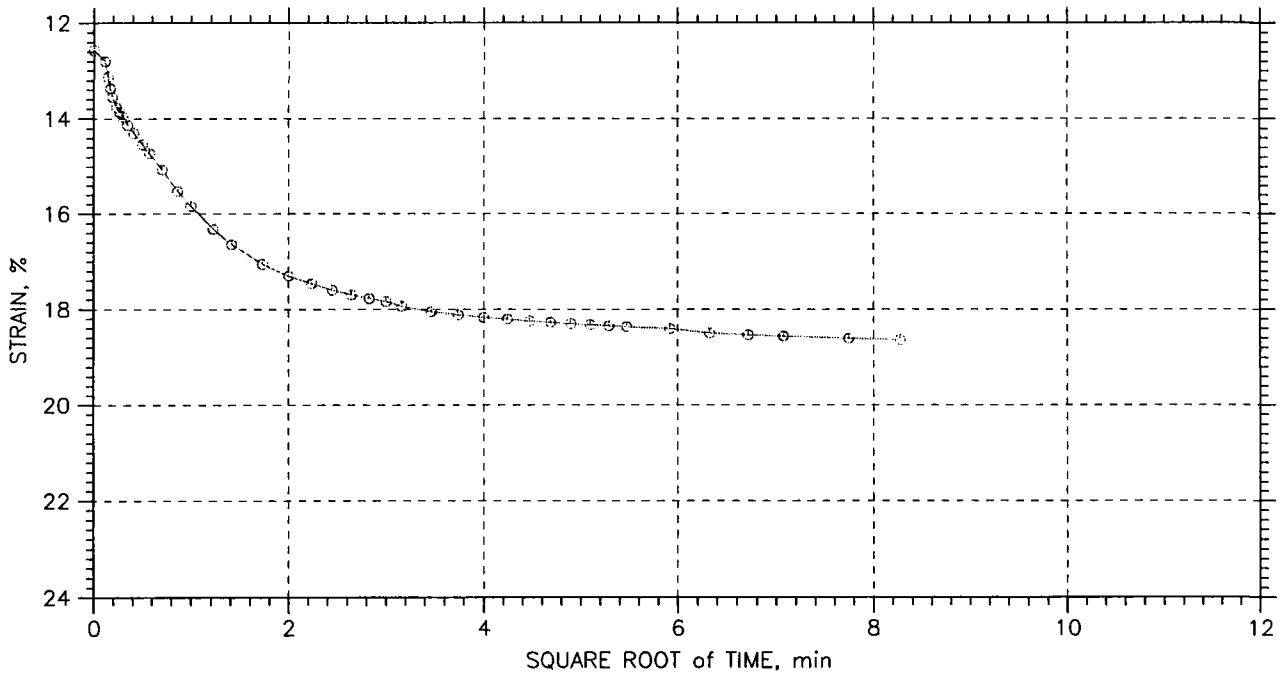
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 9 of 15

Stress: 25600 psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

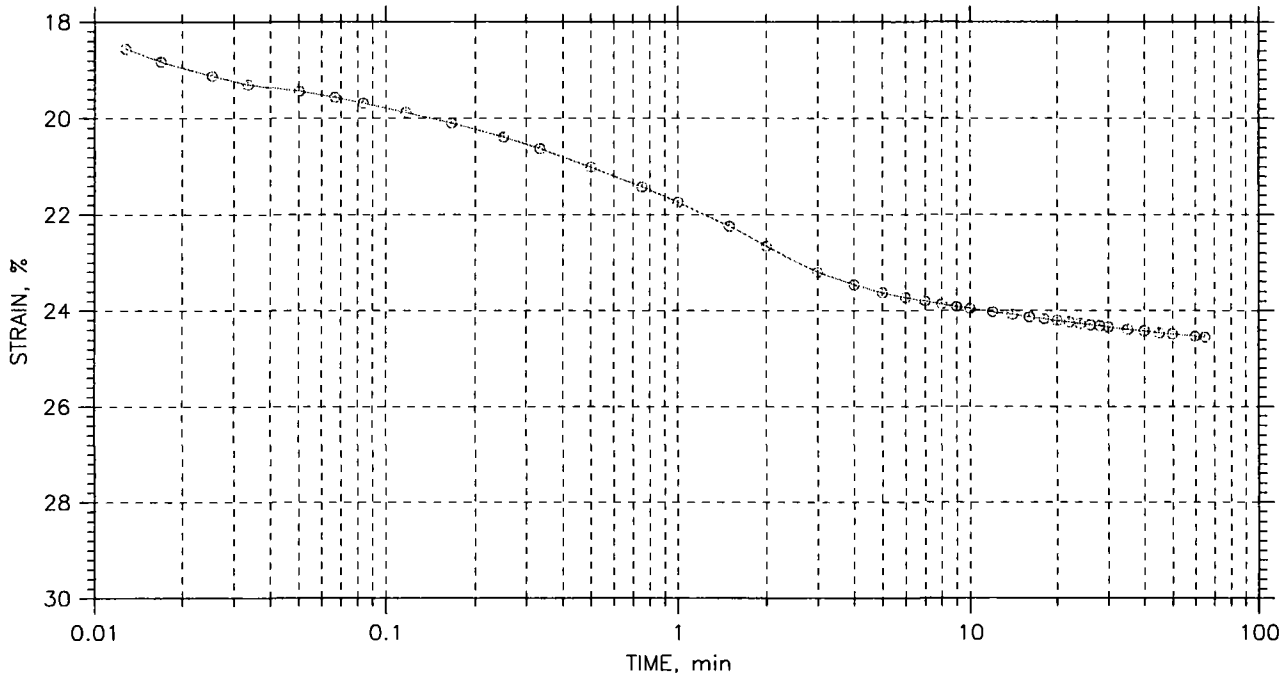
Fri, 26-MAY-2006 10:34:43

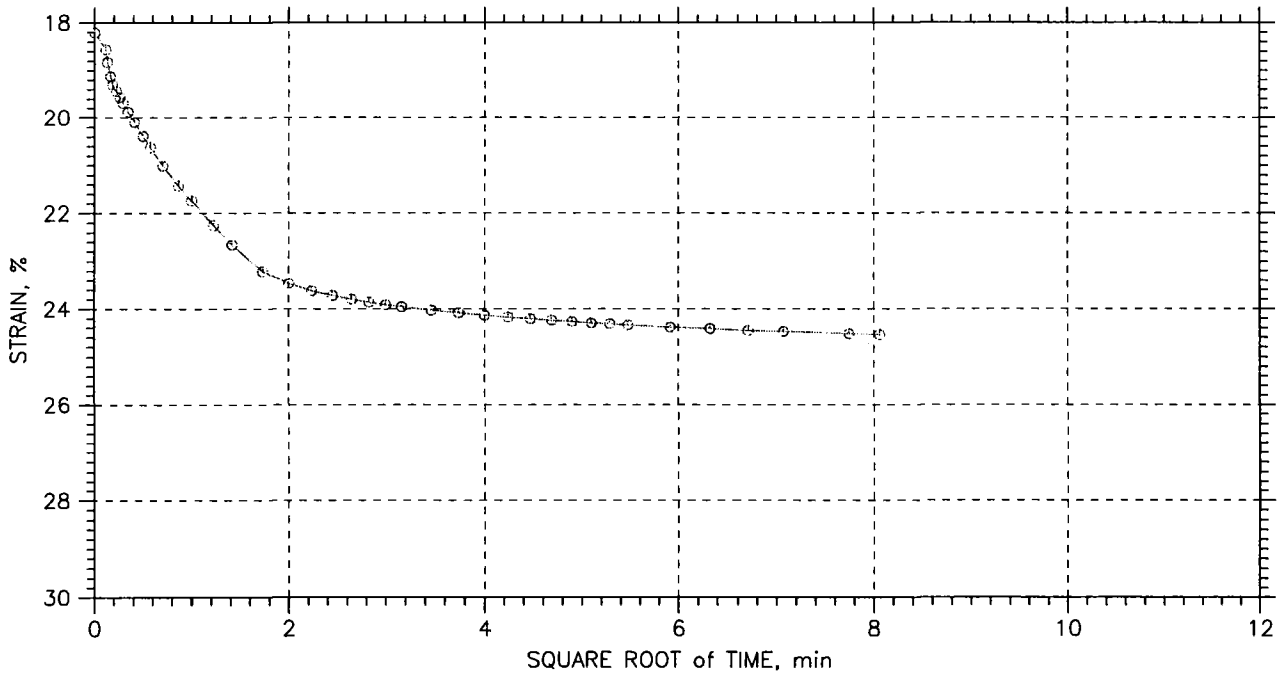
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 10 of 15

Stress: 51200 psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

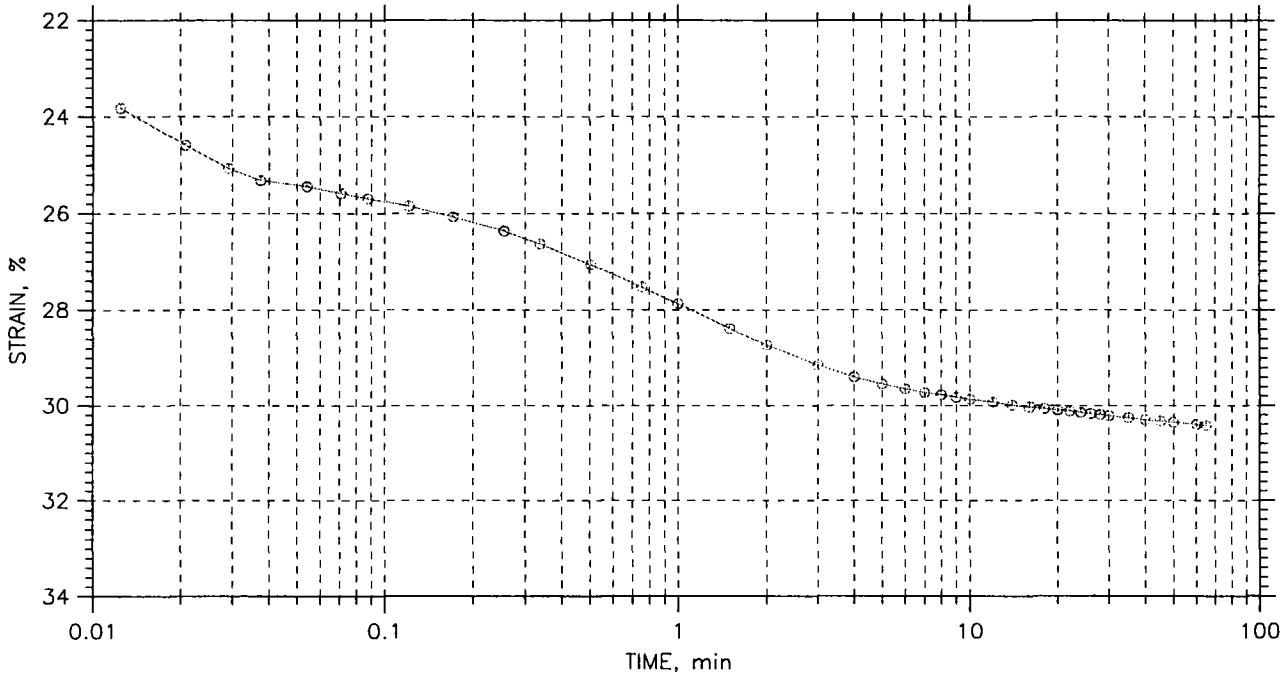
Fri, 26-MAY-2006 10:34:44

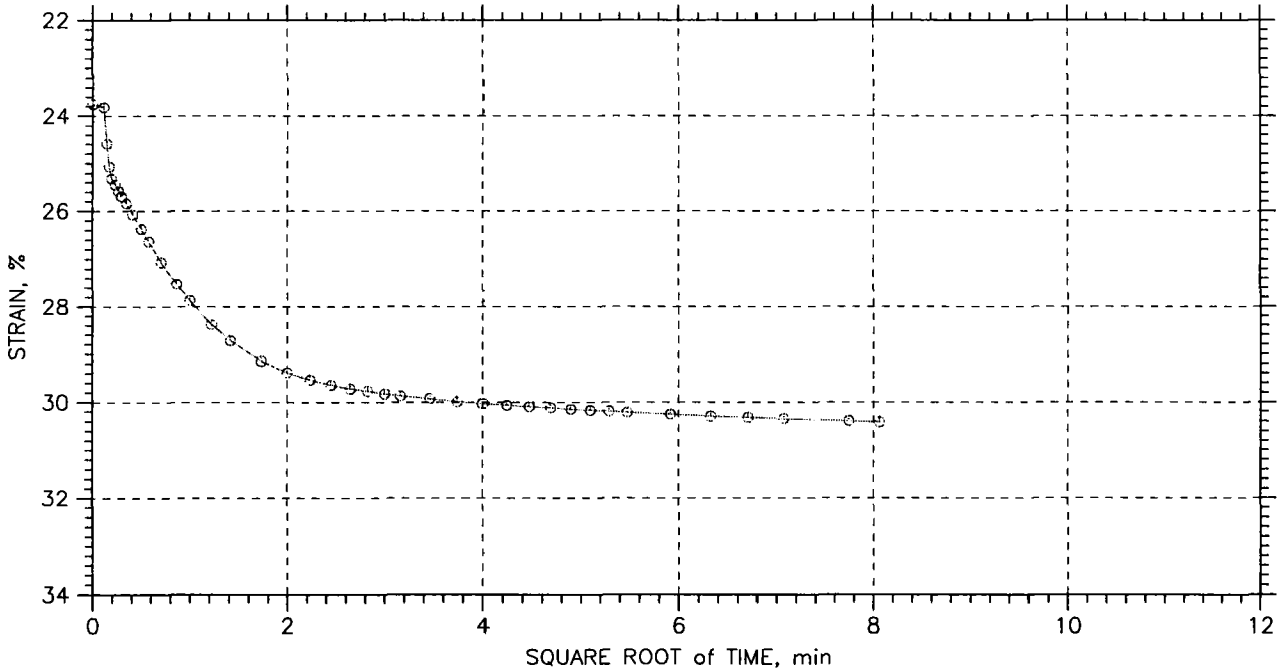
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 11 of 15

Stress: 1.024e+005 psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

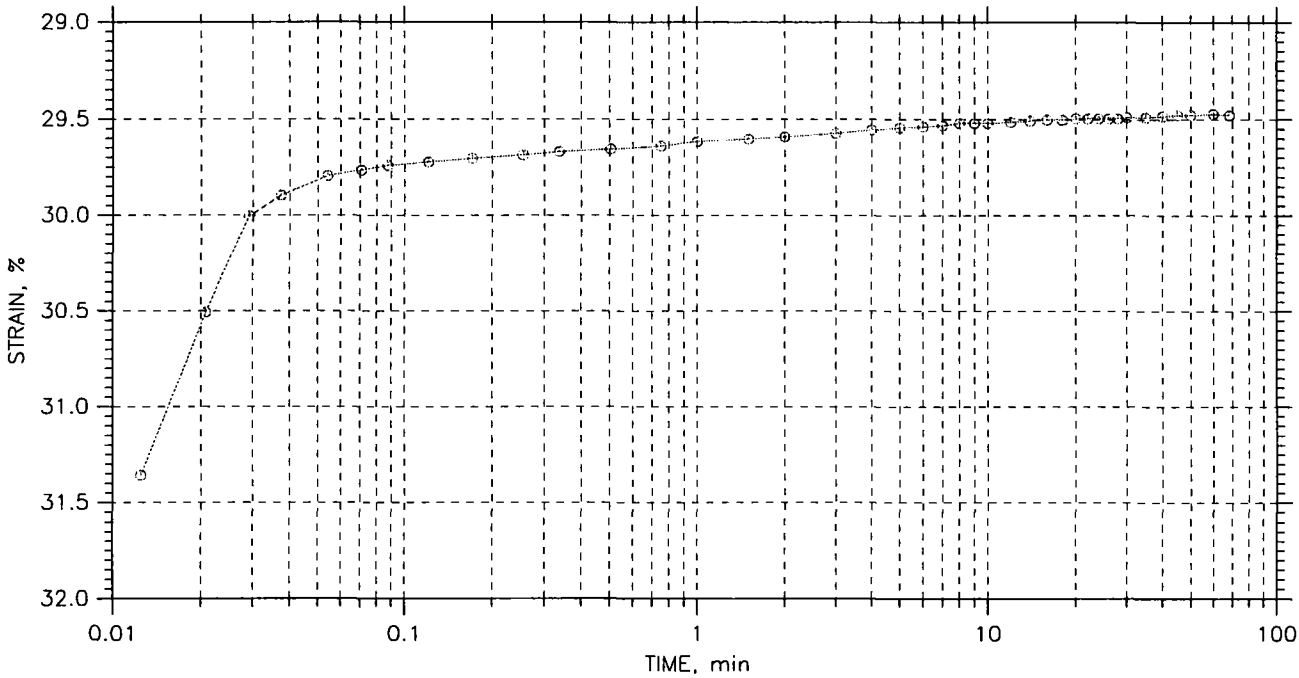
Fri, 26-MAY-2006 10:34:44

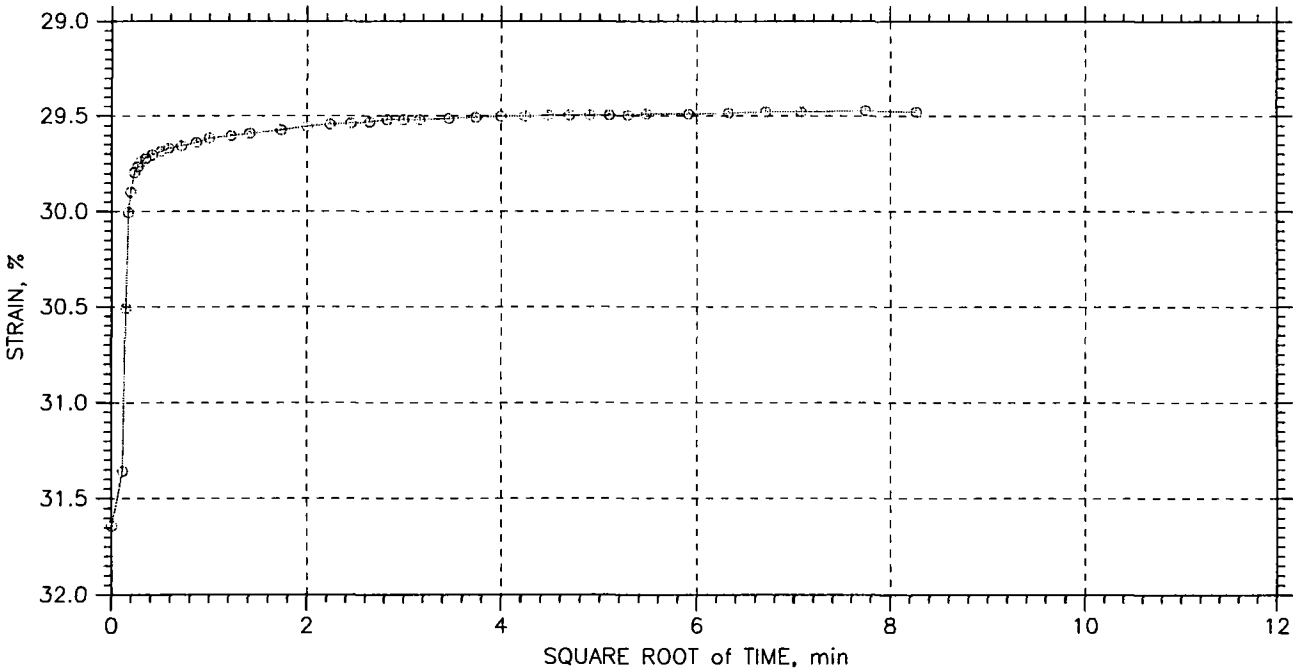
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 12 of 15

Stress: 25600 psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

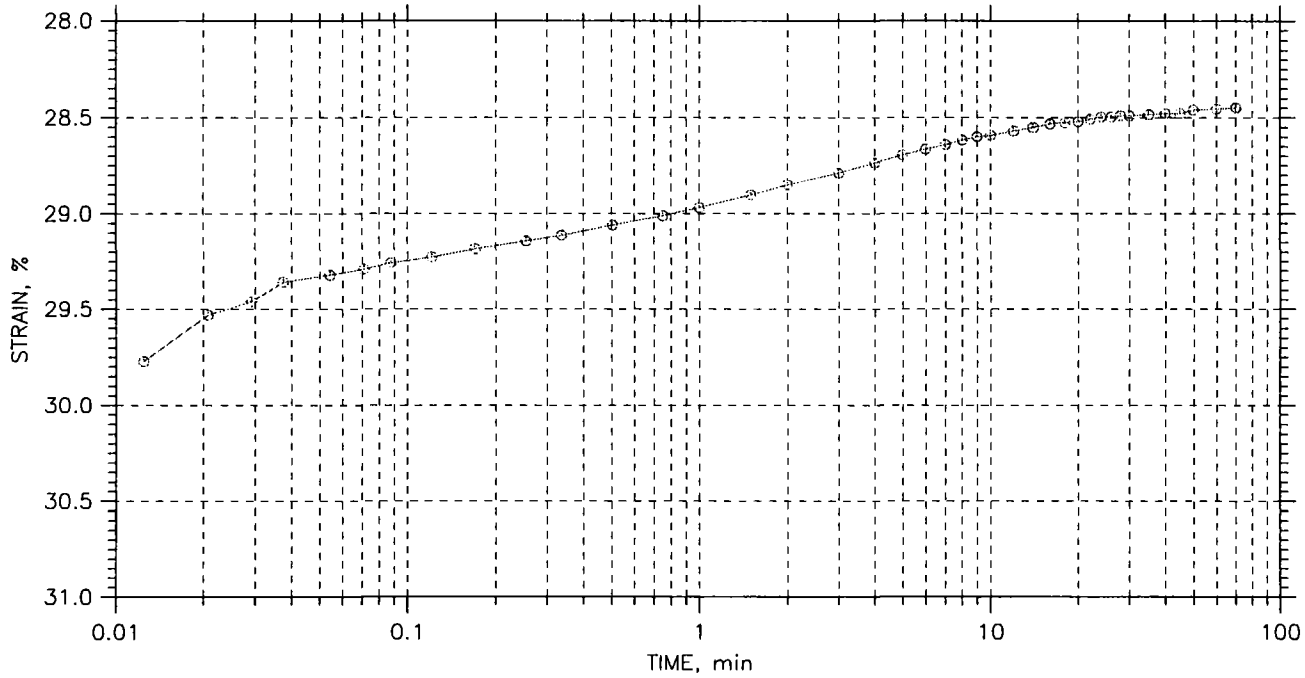
Fri, 26-MAY-2006 10:34:45

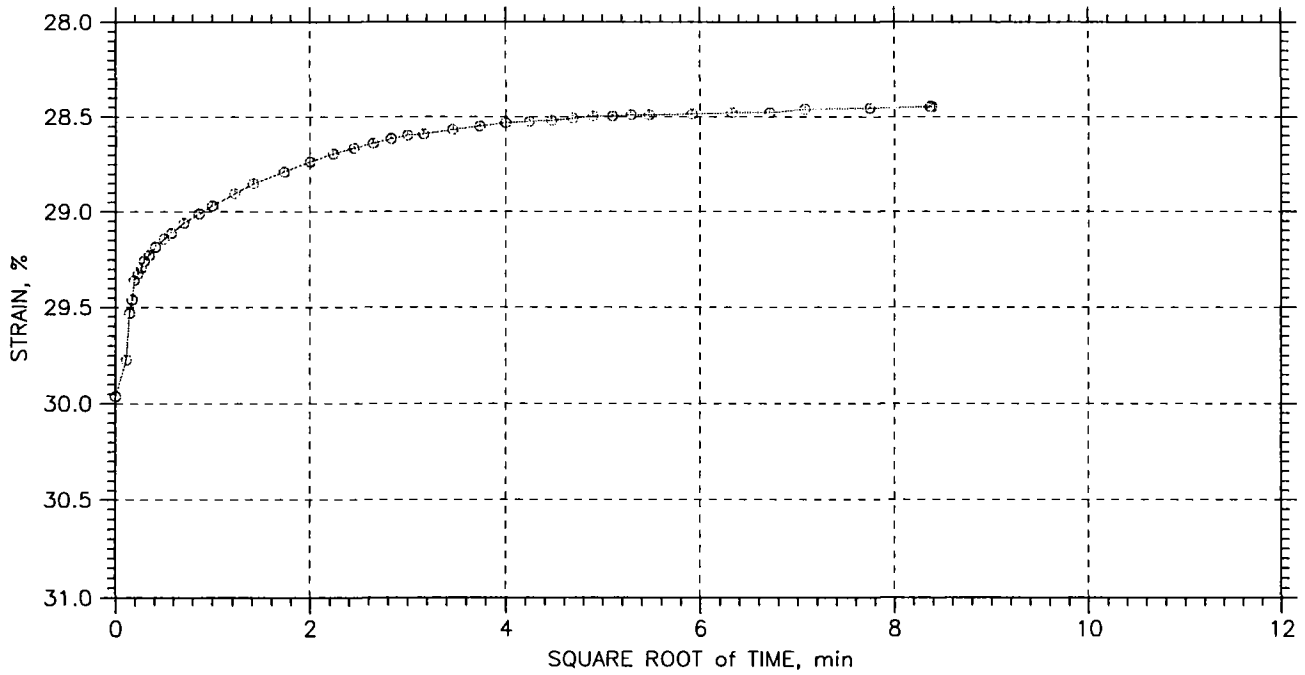
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 13 of 15

Stress: 6400. psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

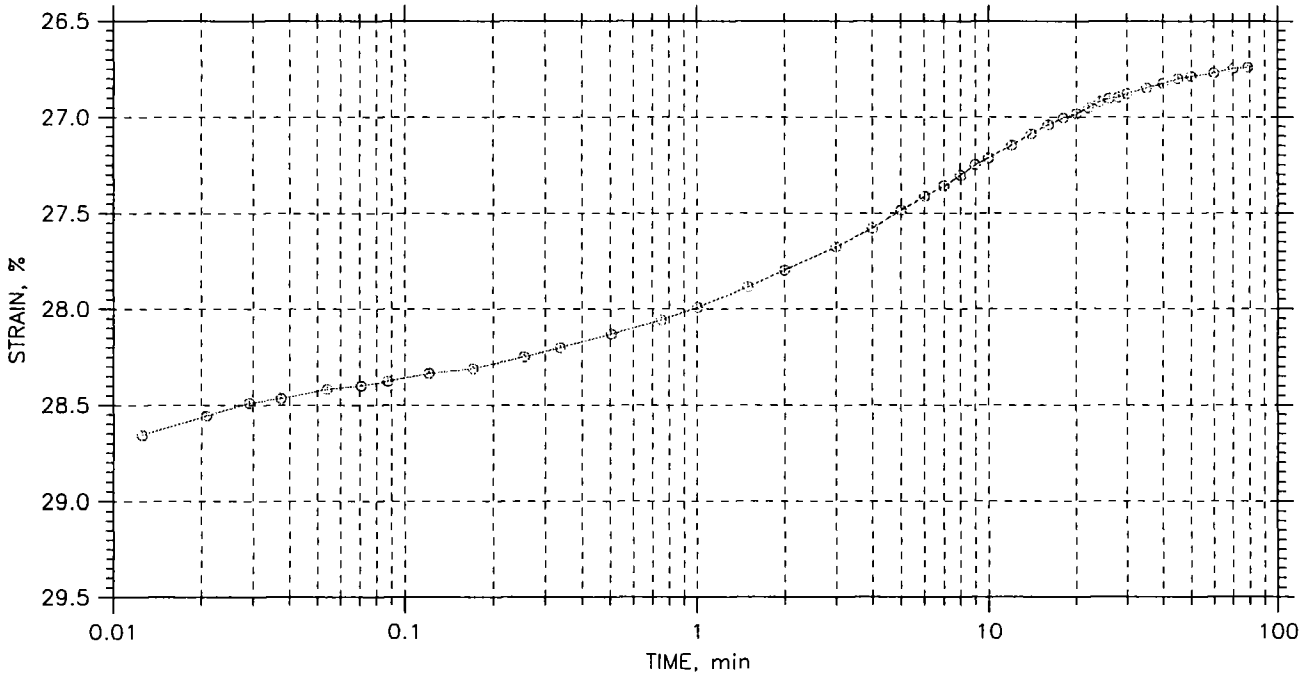
Fri, 26-MAY-2006 10:34:46

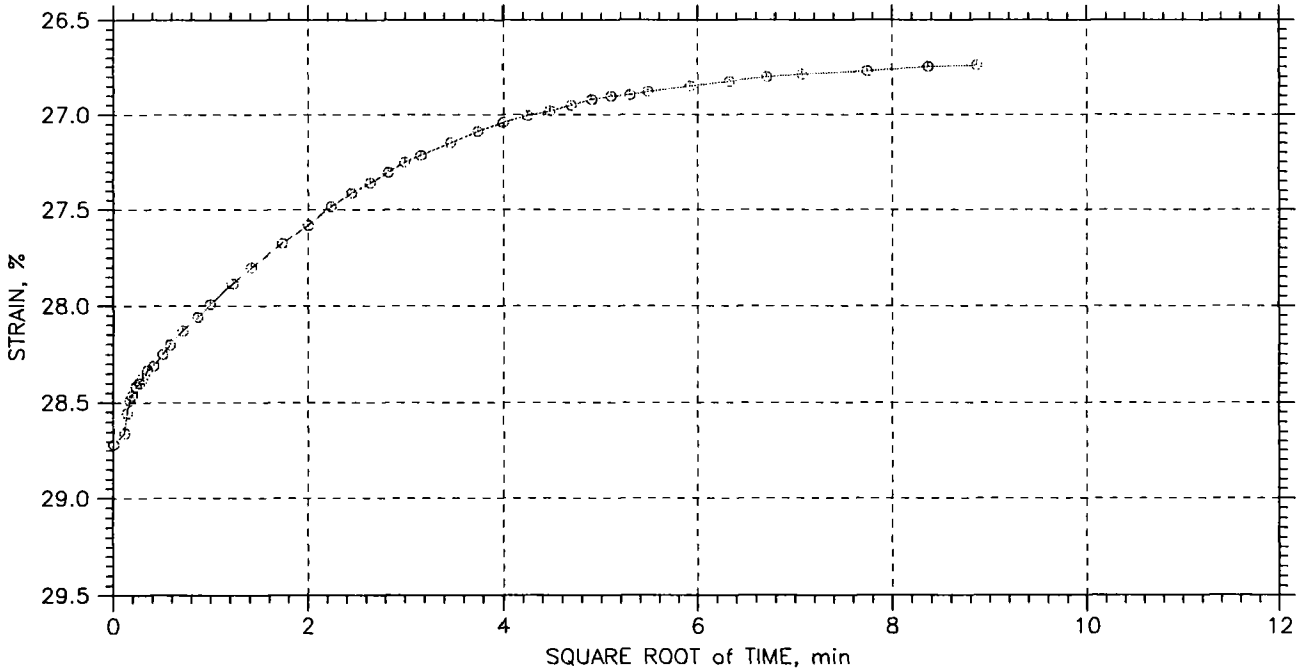
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 14 of 15

Stress: 1600. psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

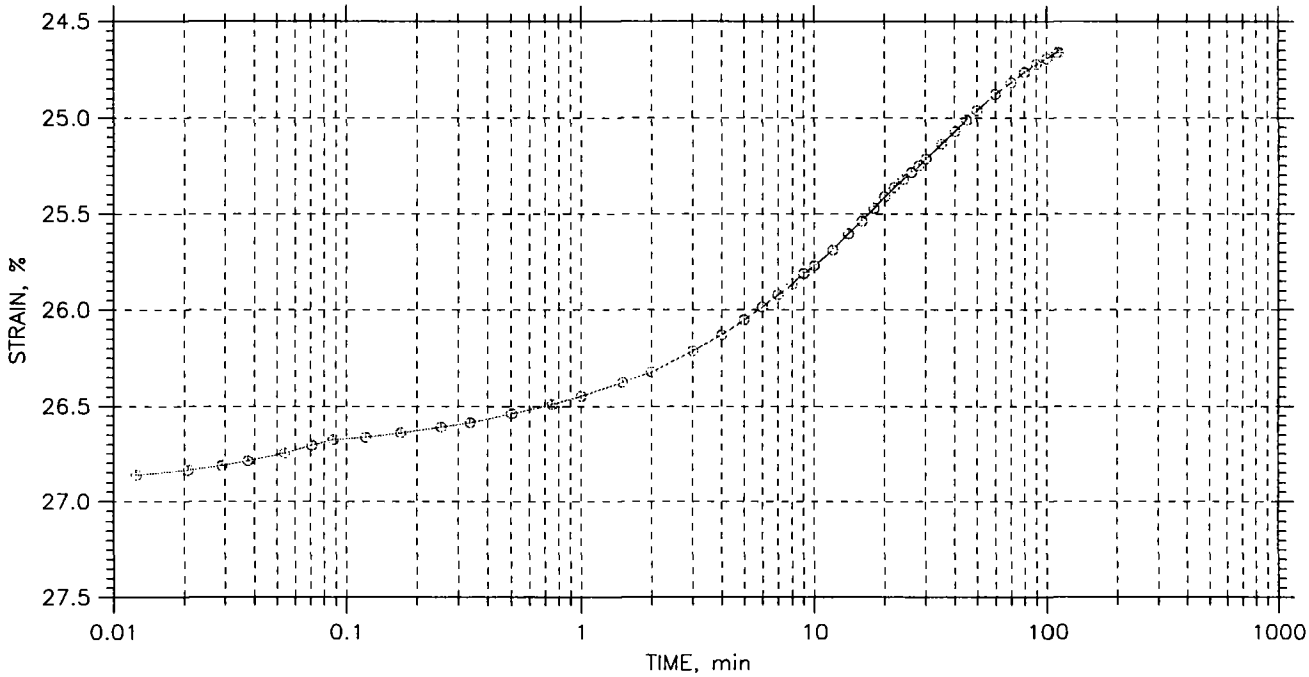
Fri, 26-MAY-2006 10:34:47

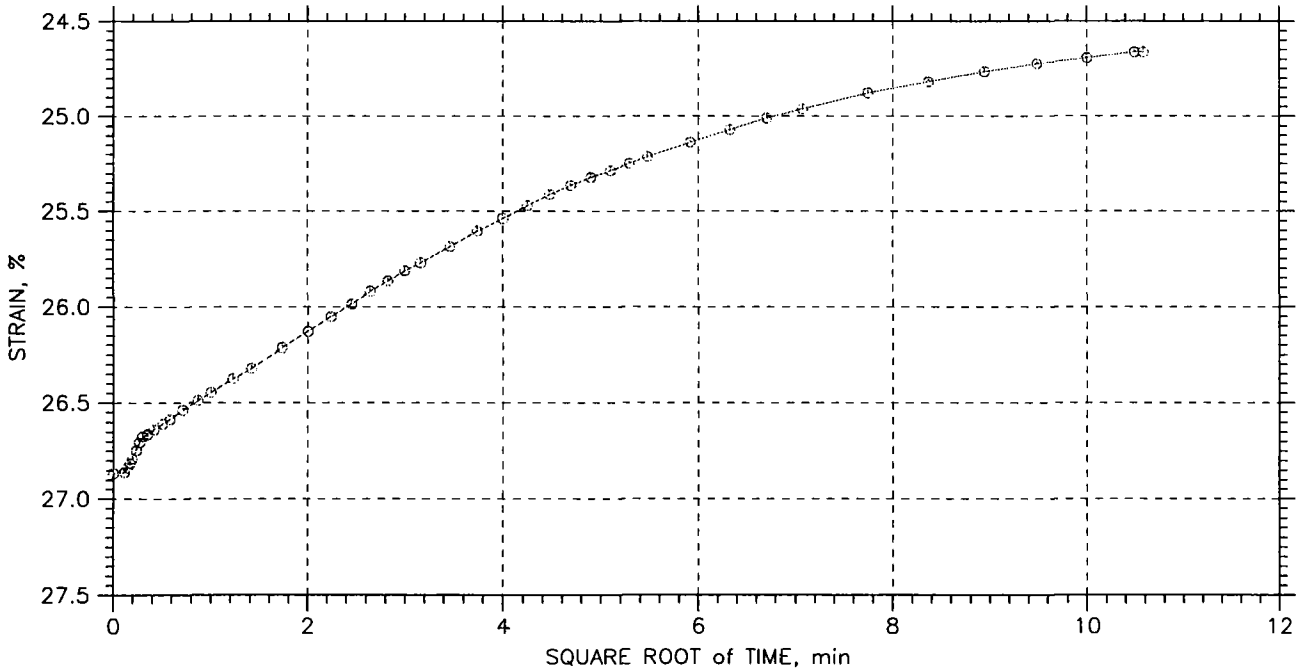
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 15 of 15

Stress: 400. psf





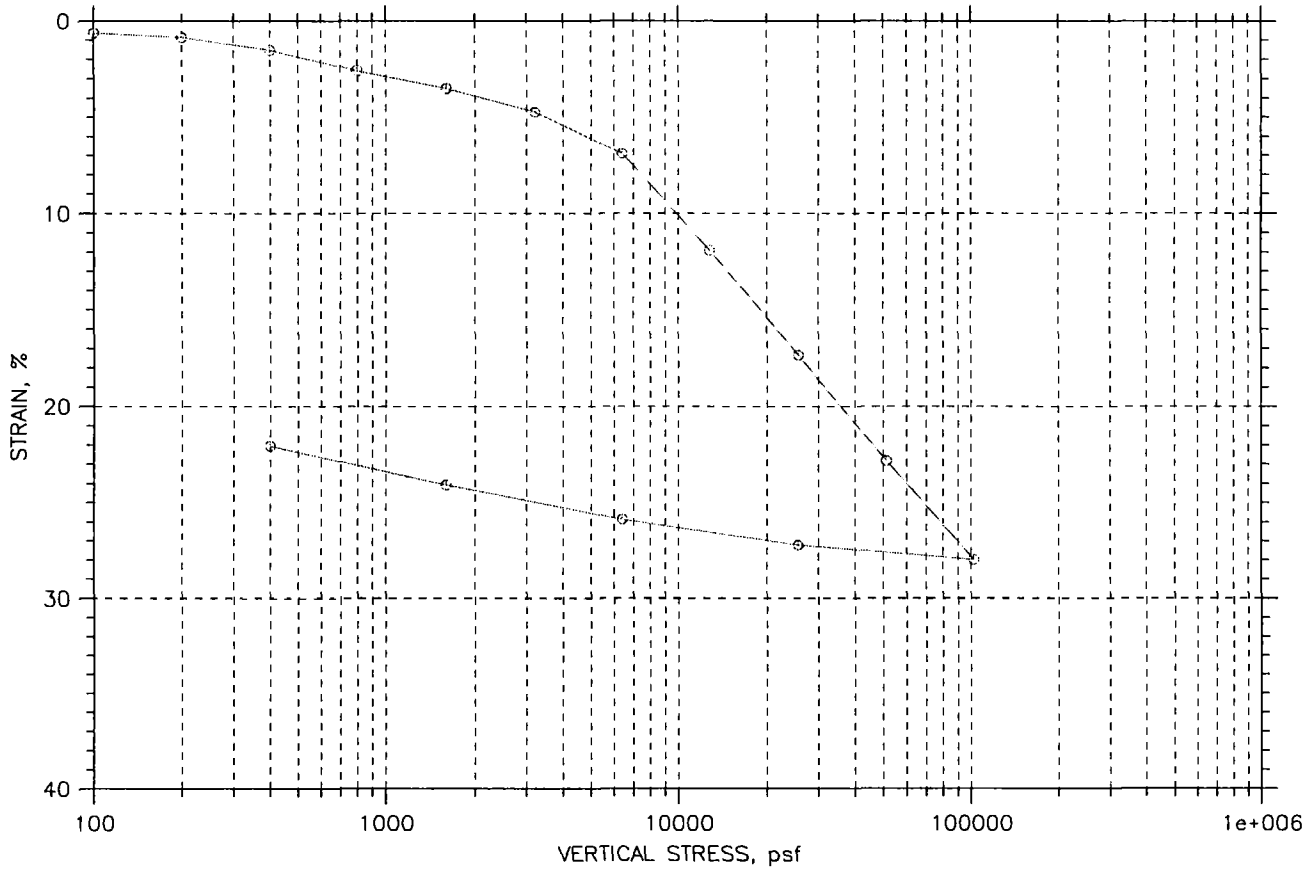
UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-42.5	Test Date: 23 May 06	Depth: 42.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

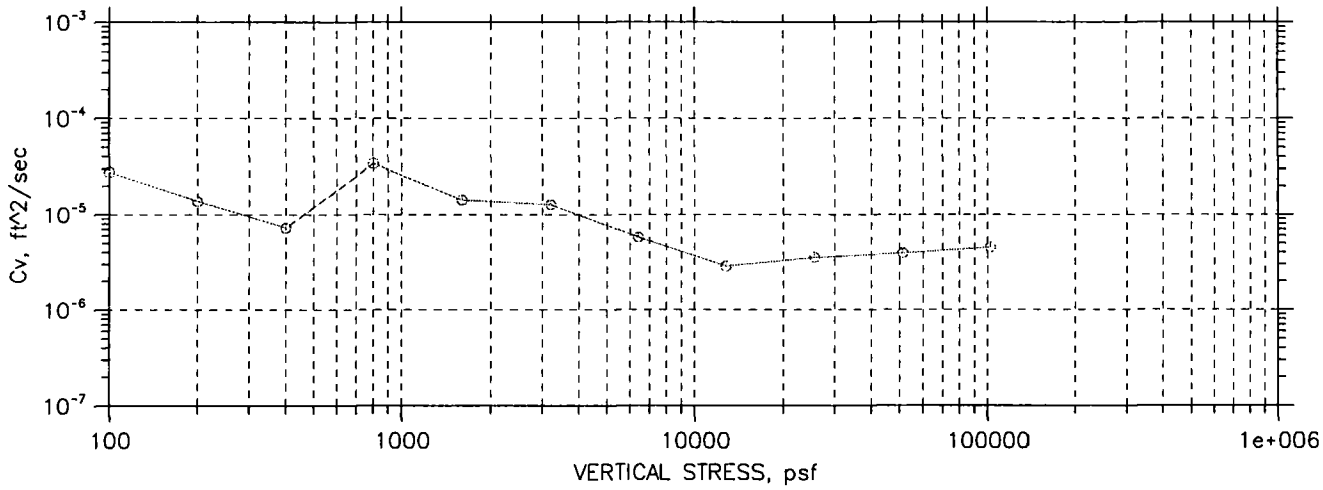
NODI

Fri, 26-MAY-2006 10:34:47

CONSOLIDATION TEST DATA

SUMMARY REPORT





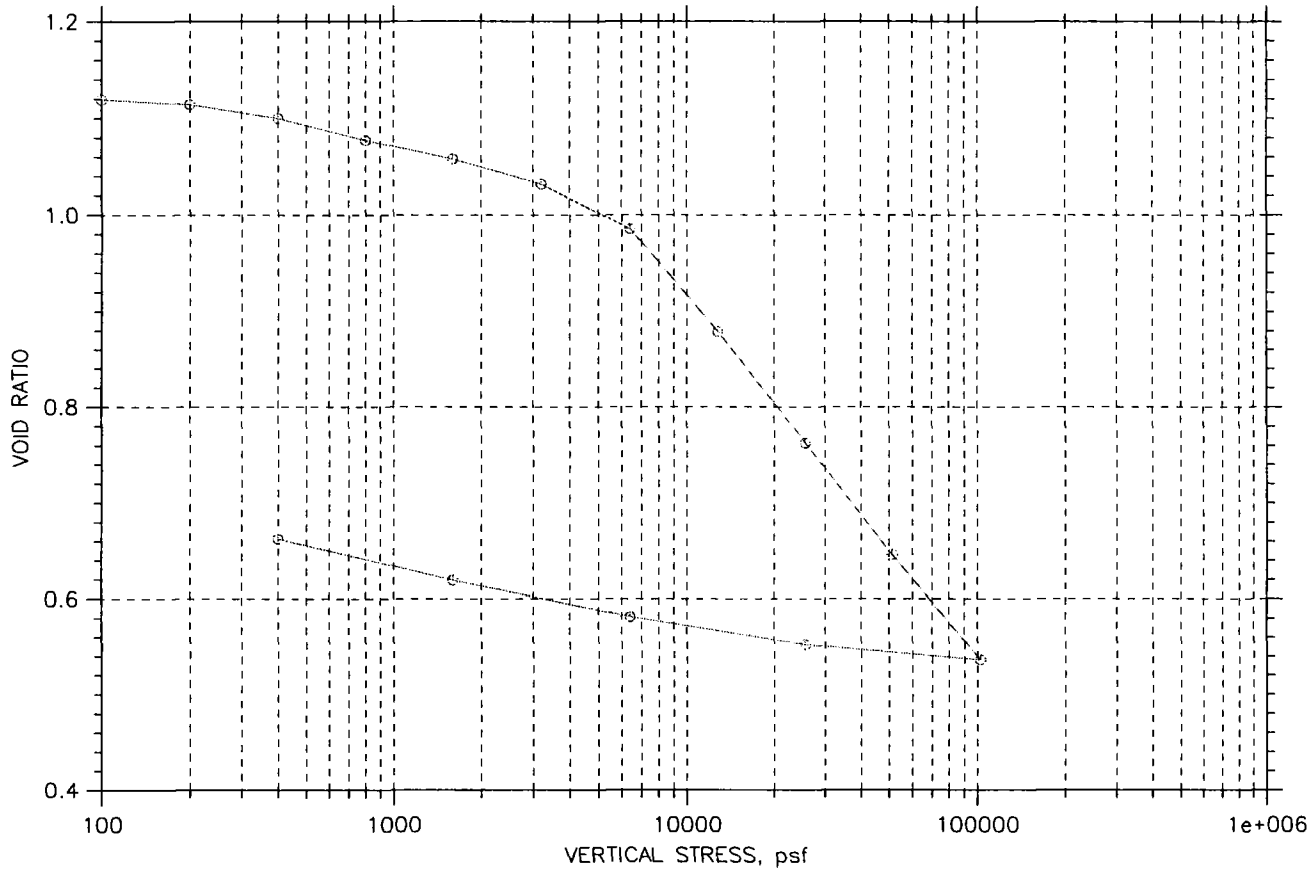
UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

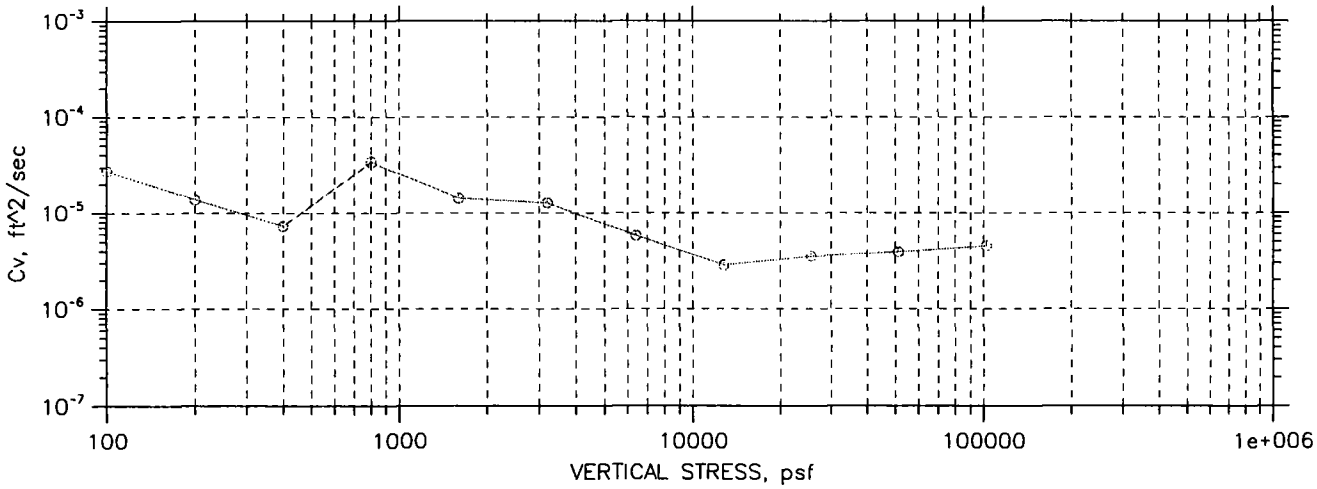
NODI

Tue, 30-MAY-2006 09:19:09

CONSOLIDATION TEST DATA

SUMMARY REPORT





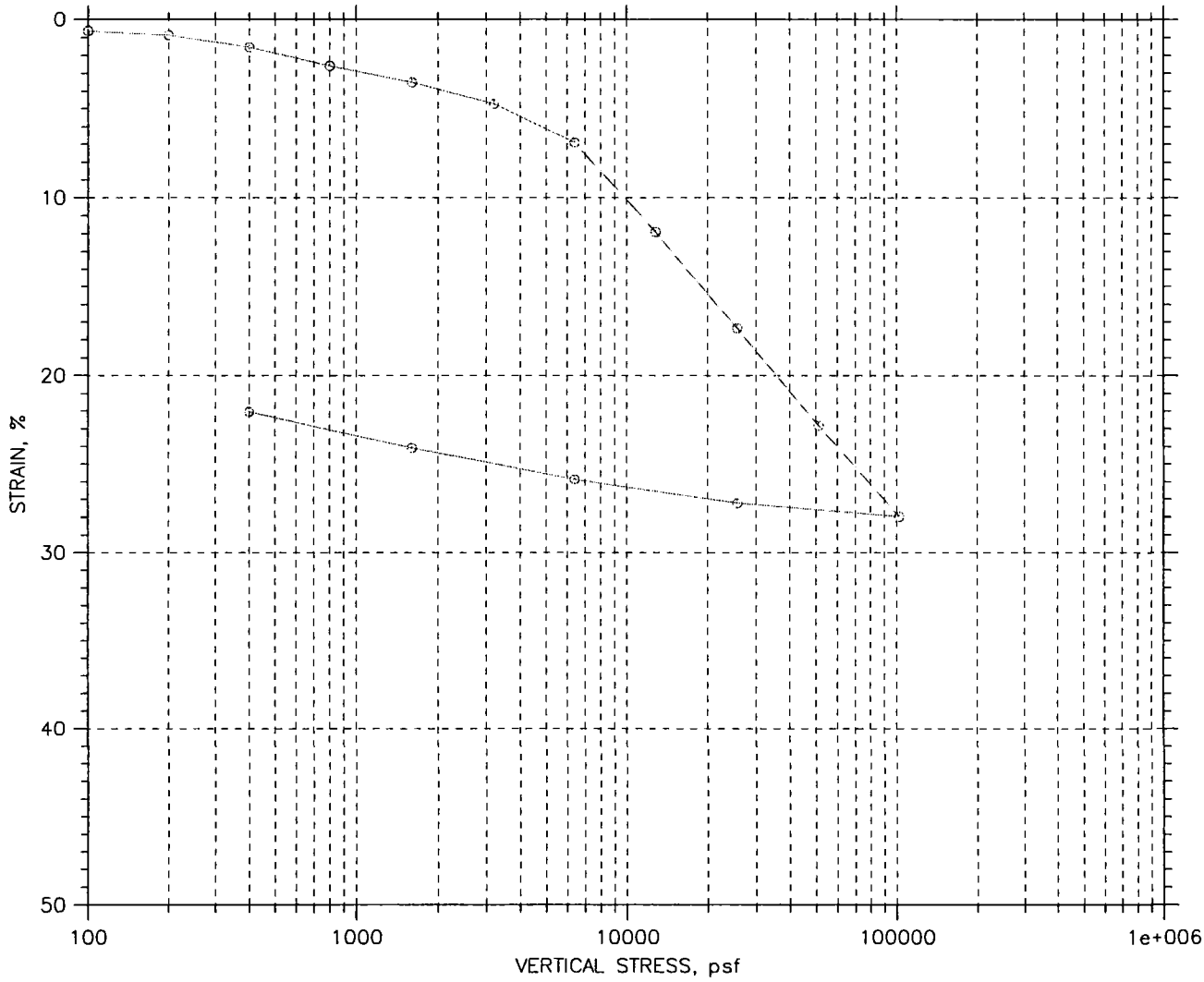
UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

Tue, 30-MAY-2006 09:20:01

CONSOLIDATION TEST DATA

SUMMARY REPORT



					Before Test	After Test
Overburden Pressure: 0 psf				Water Content, %	32.31	21.43
Preconsolidation Pressure: 0 psf				Dry Unit Weight, pcf	90.51	116.1
Compression Index: 3.81959e-313				Saturation, %	88.20	100.00
Diameter: 2.416 in		Height: 1.007 in		Void Ratio	1.13	0.66
LL: 32	PL: 20	PI: 12	GS: 3.09			

UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

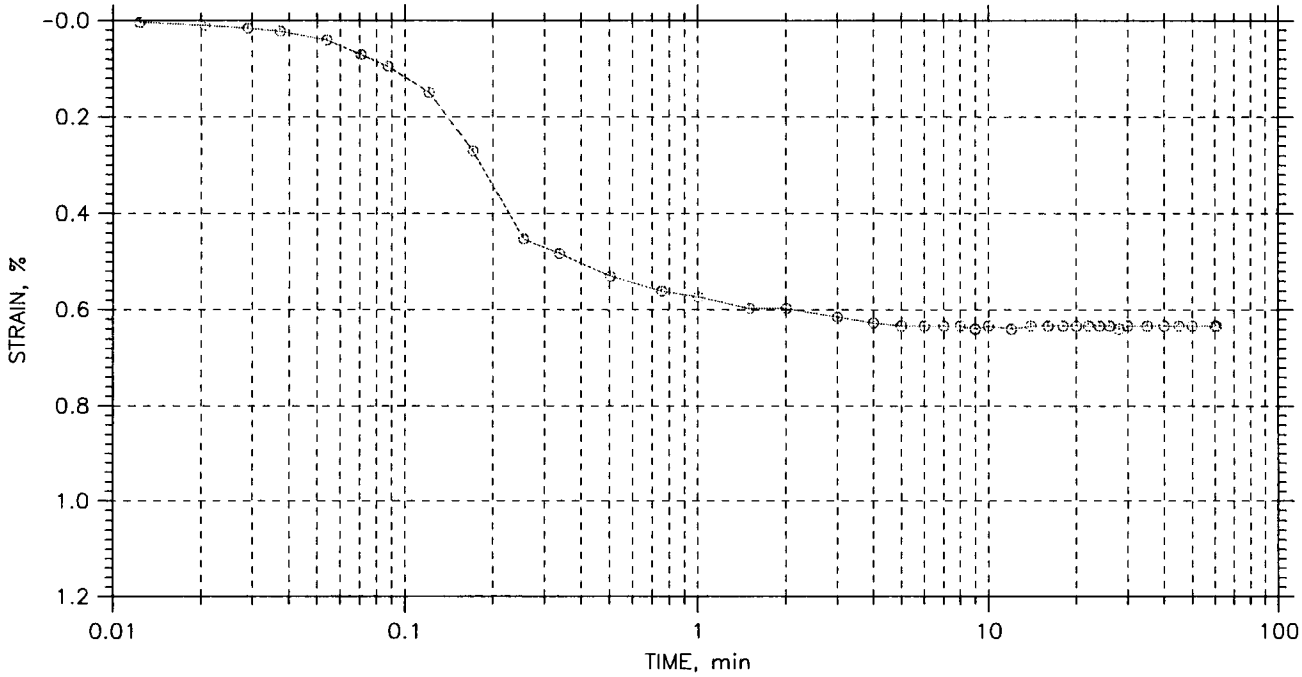
Tue, 30-MAY-2006 09:19:10

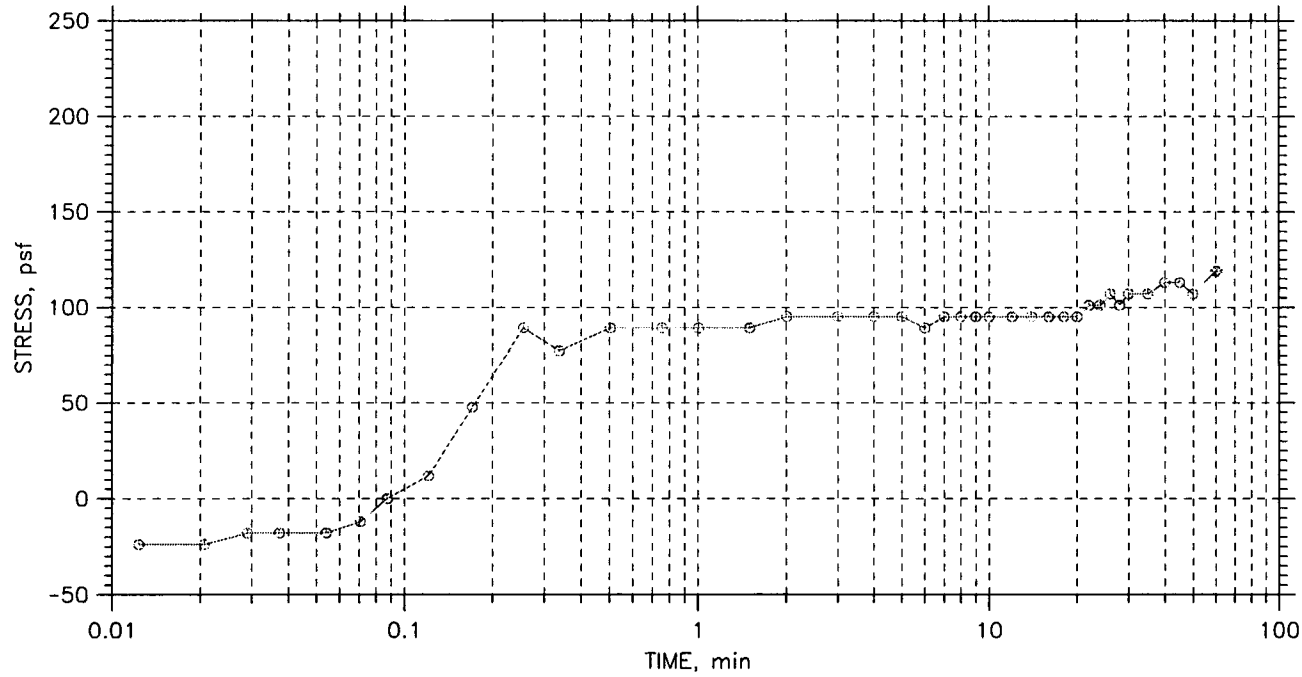
CONSOLIDATION TEST DATA

TIME CURVES

Constant Volume Step: 1 of 15

Stress: 100. psf





	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

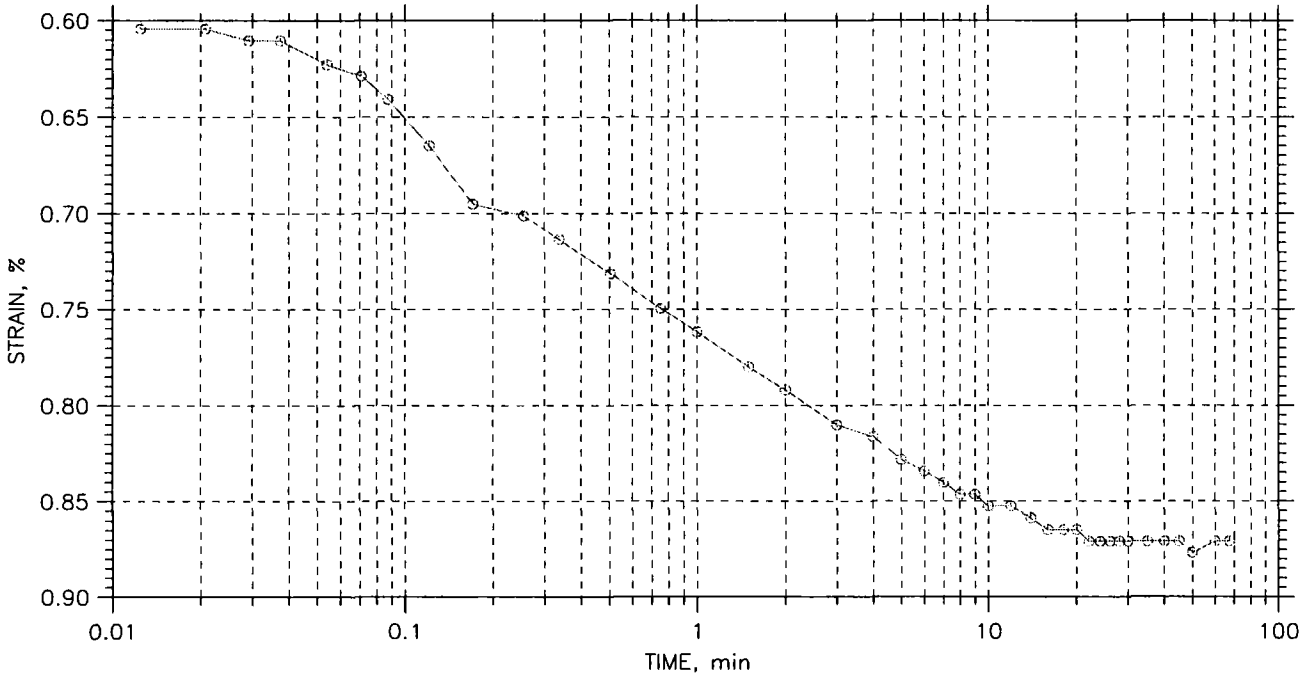
Tue, 30-MAY-2006 09:19:11

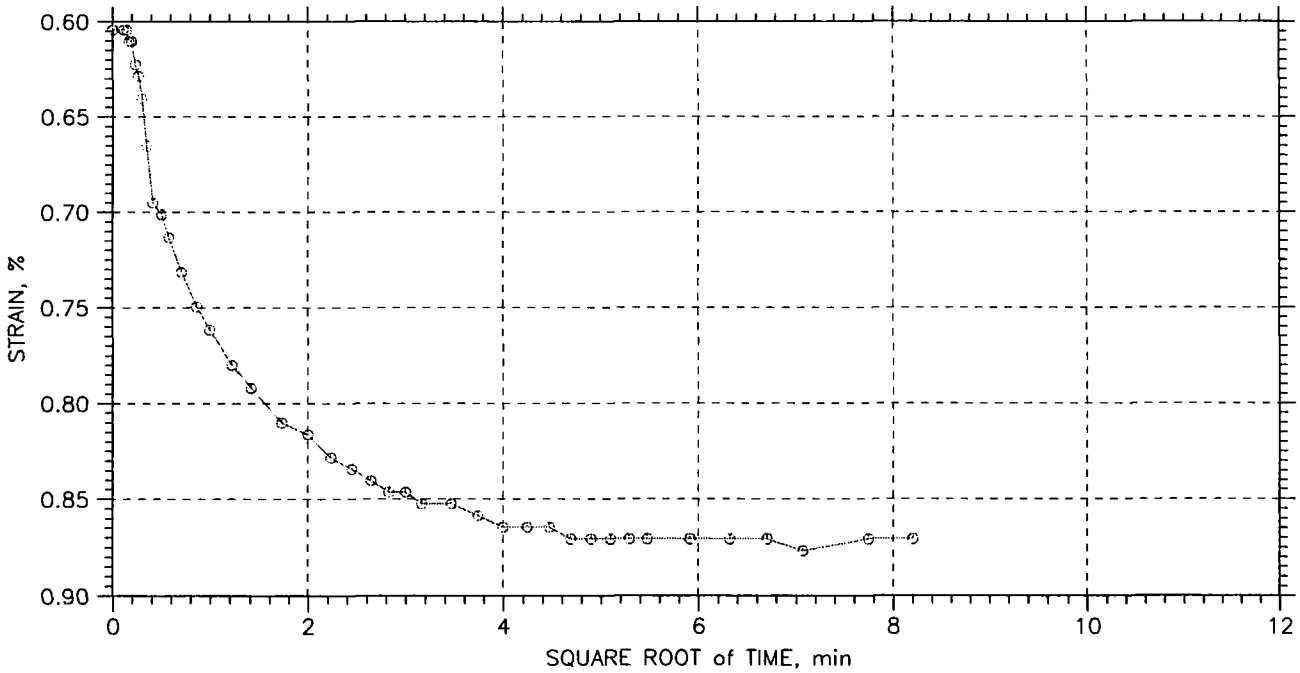
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 2 of 15

Stress: 200. psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

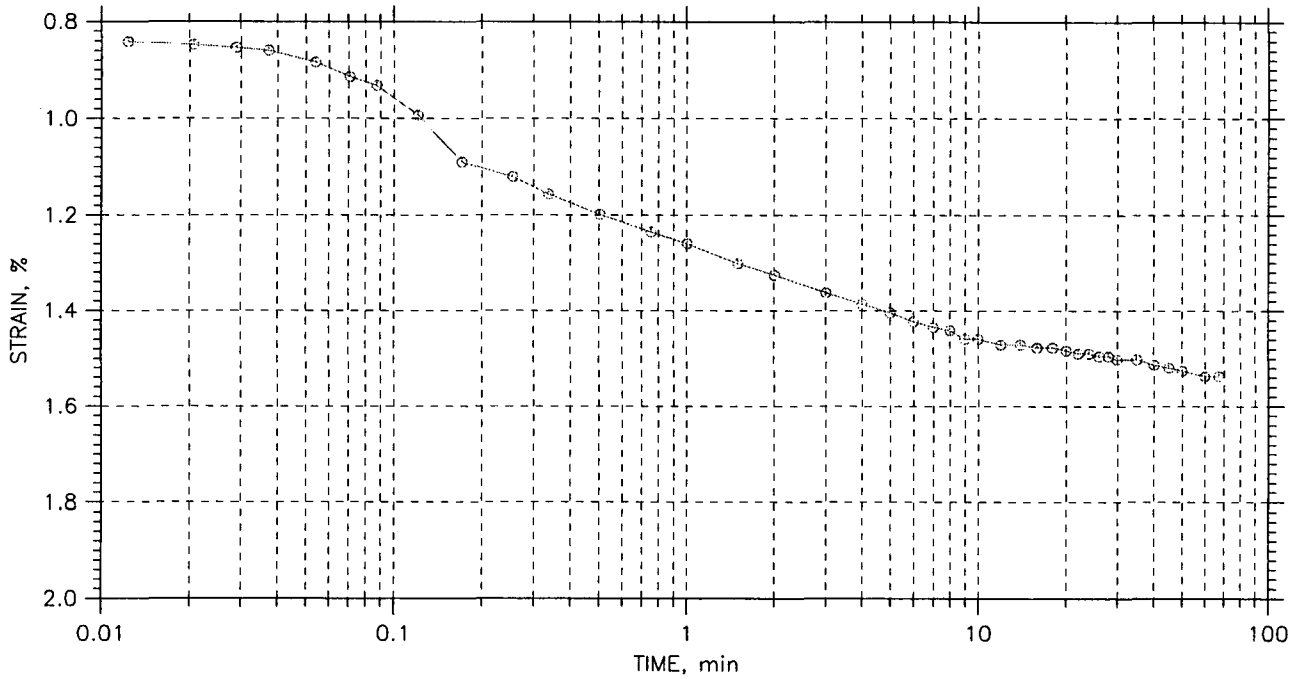
Tue, 30-MAY-2006 09:19:11

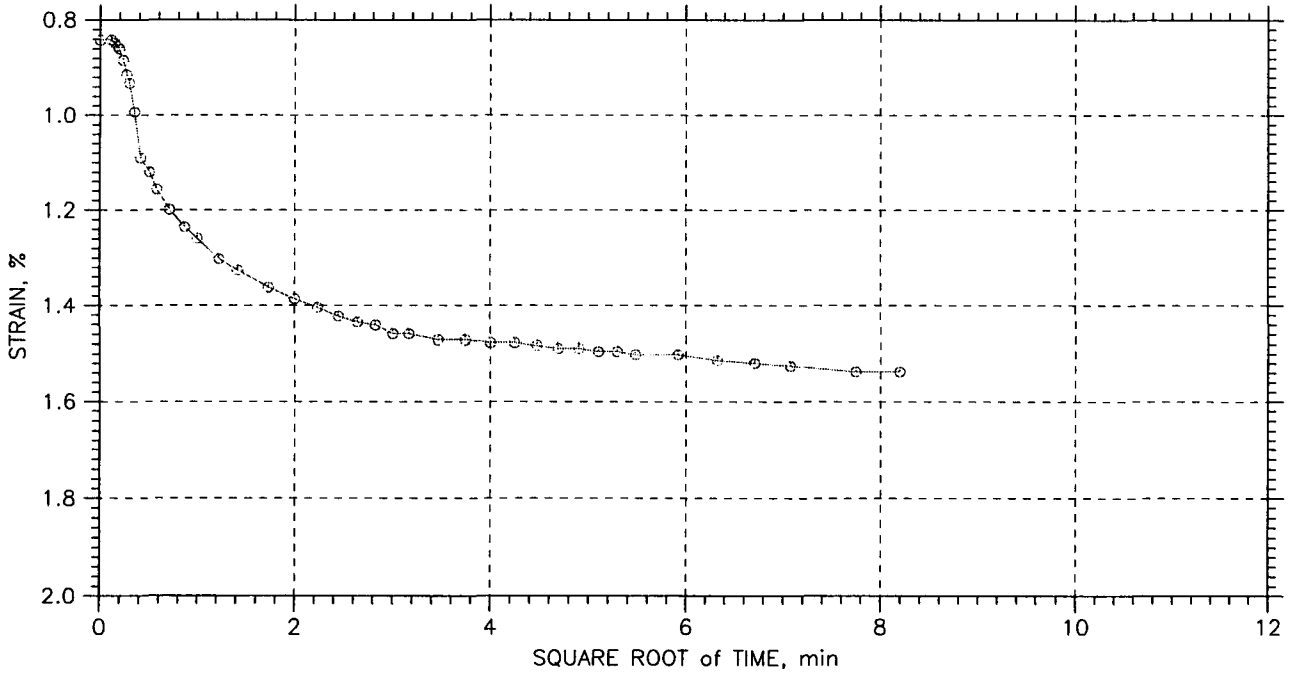
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 3 of 15

Stress: 400. psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

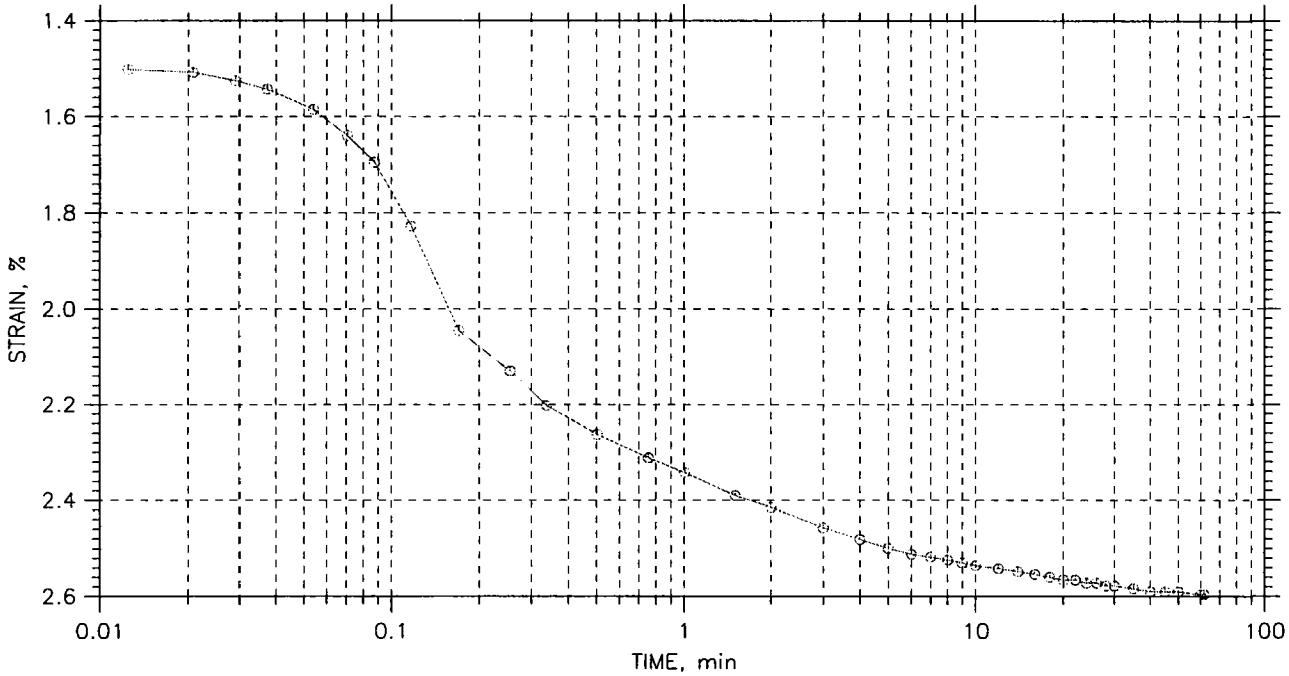
Tue, 30-MAY-2006 09:19:12

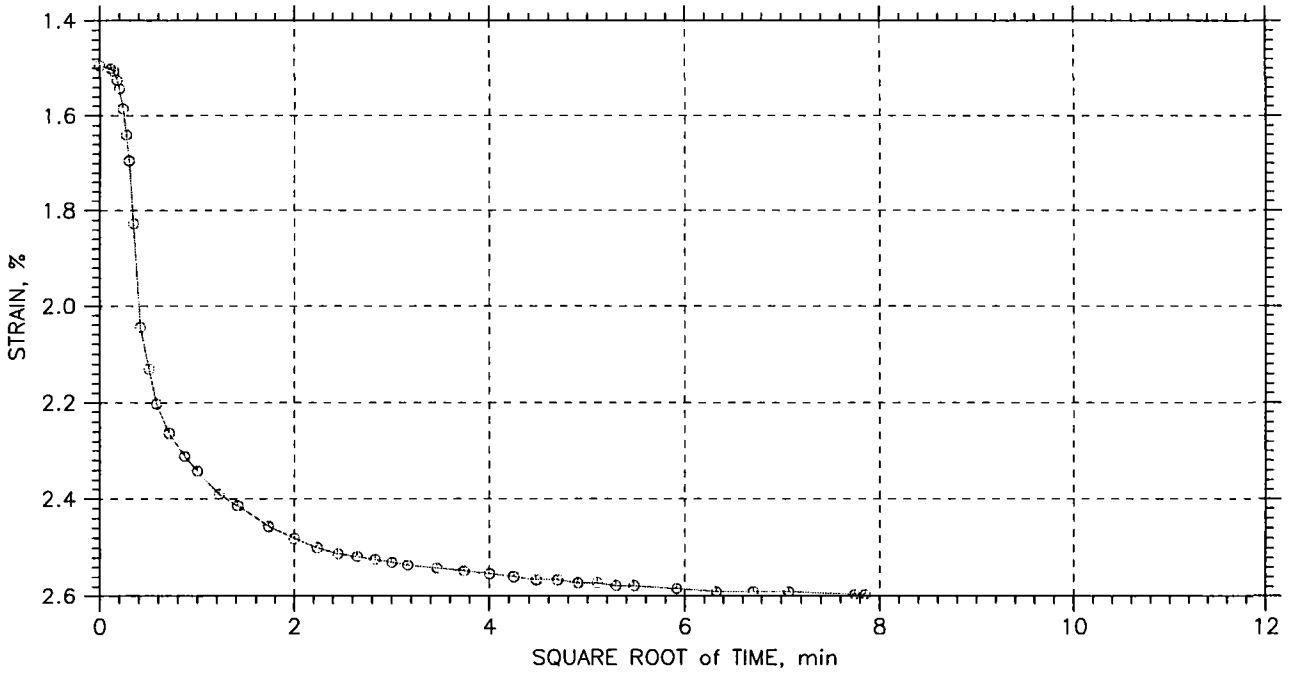
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 4 of 15

Stress: 800. psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

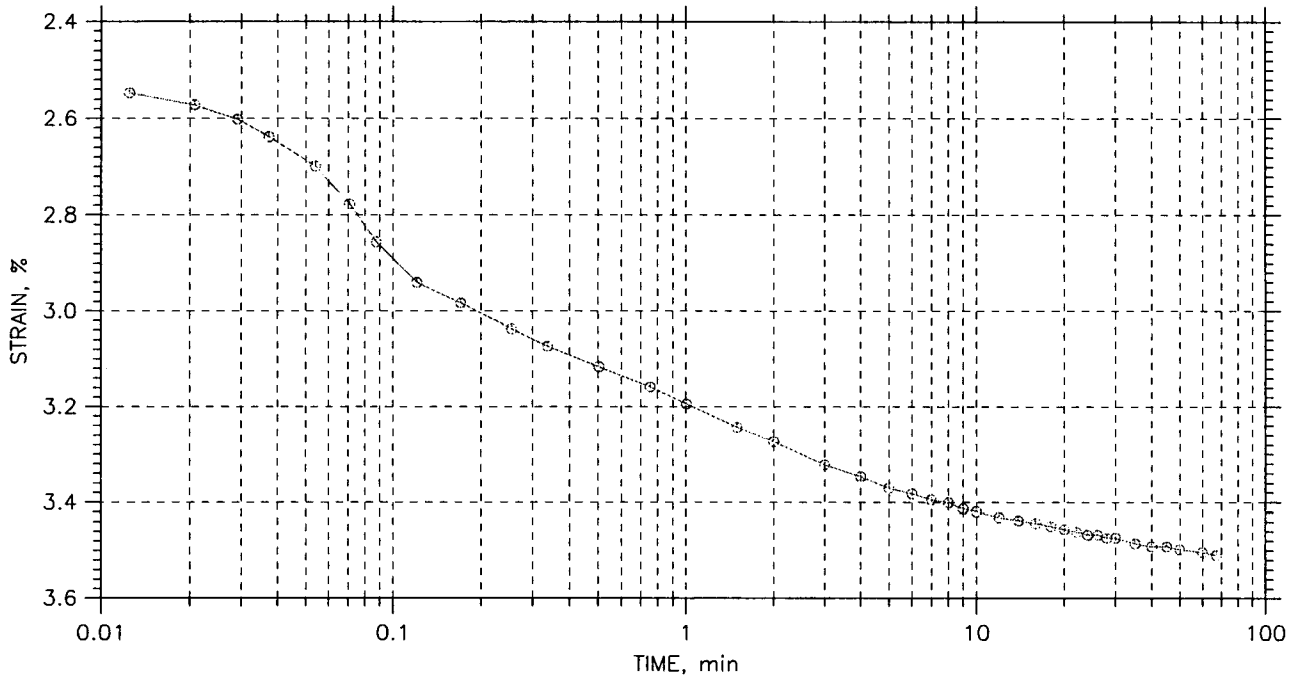
Tue, 30-MAY-2006 09:19:13

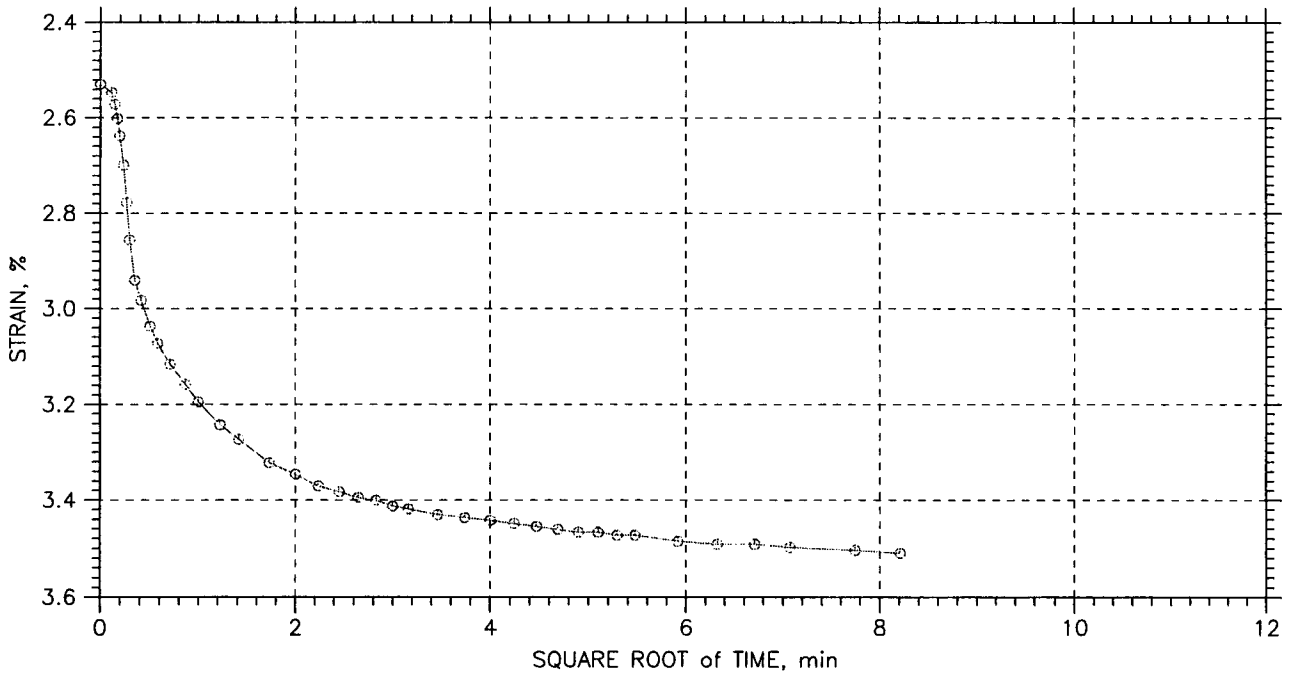
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 5 of 15

Stress: 1600. psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

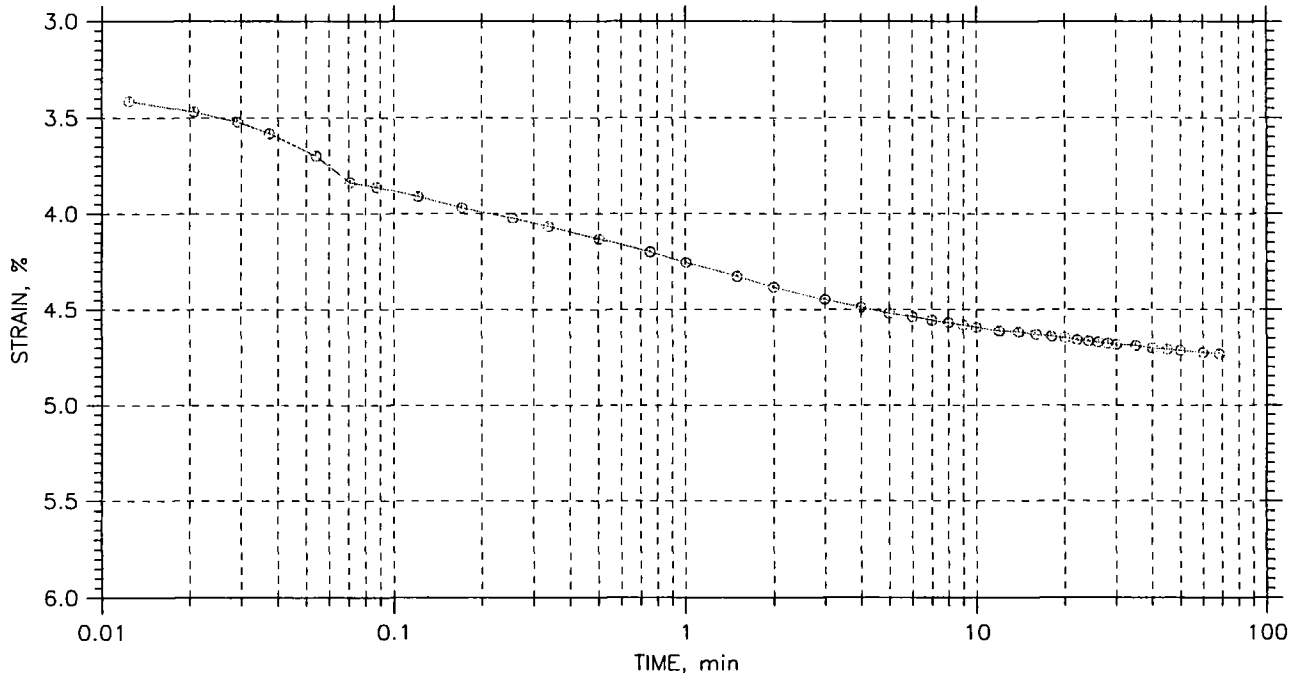
Tue, 30-MAY-2006 09:19:14

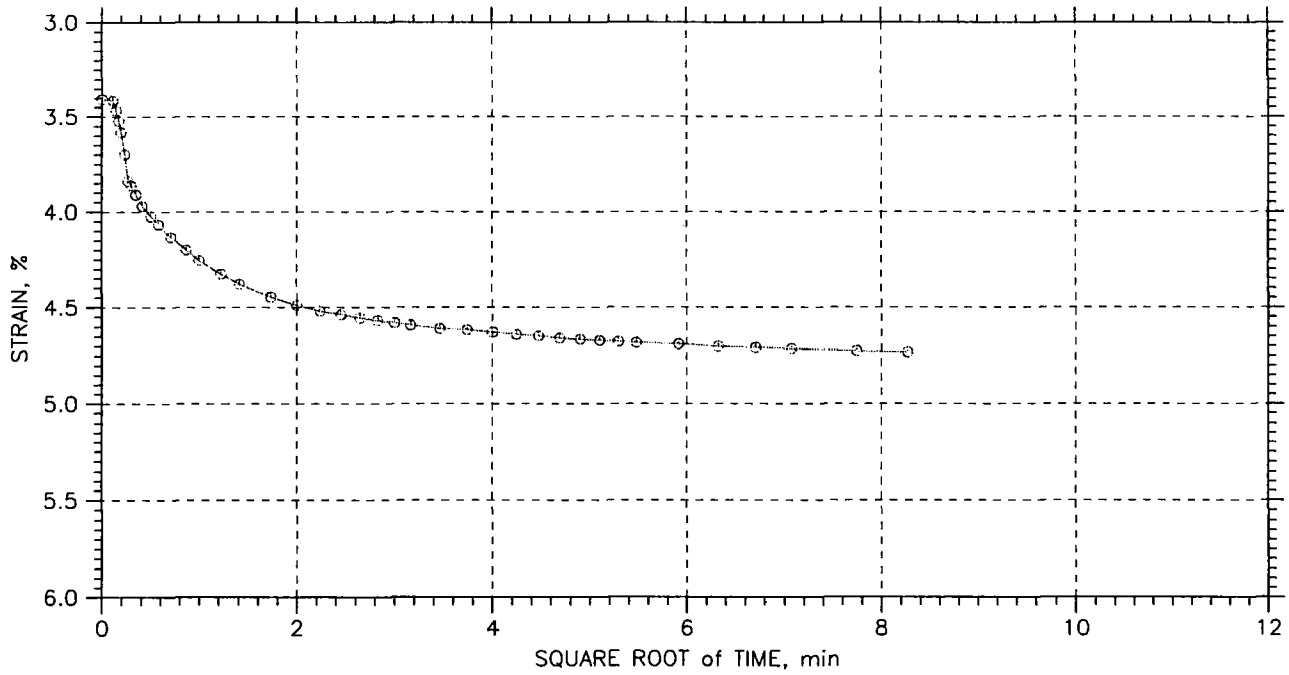
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 6 of 15

Stress: 3200. psf





	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

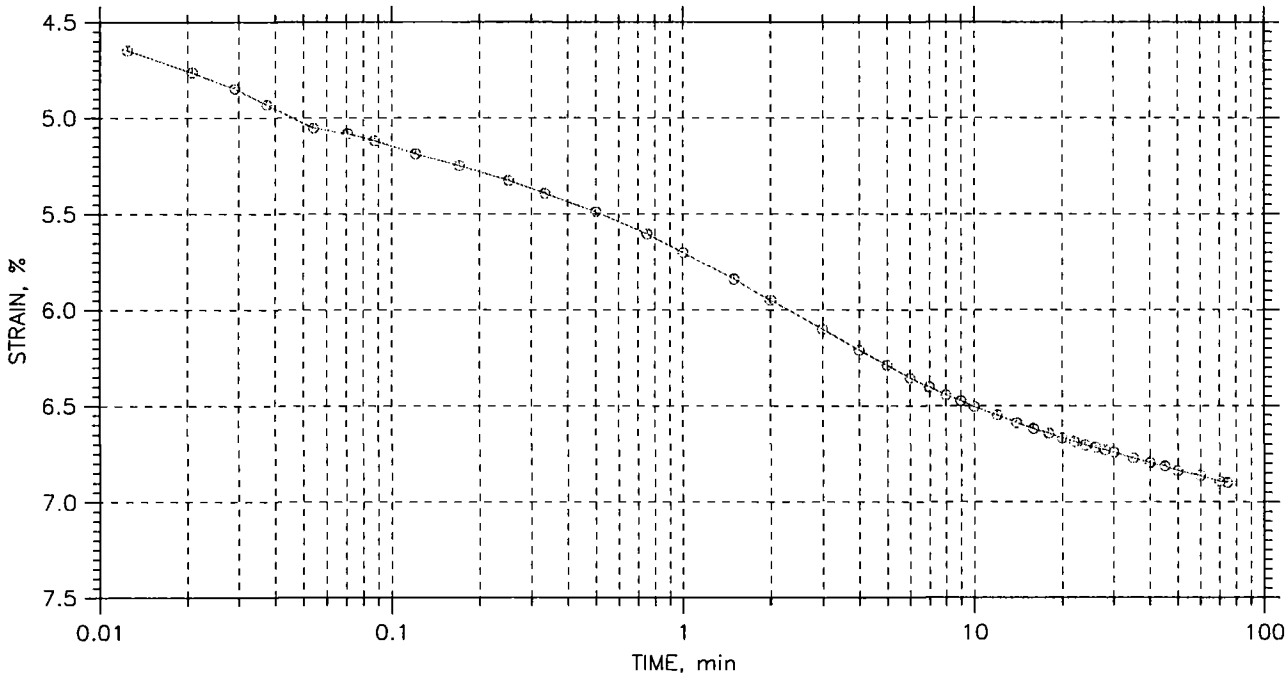
Tue, 30-MAY-2006 09:19:15

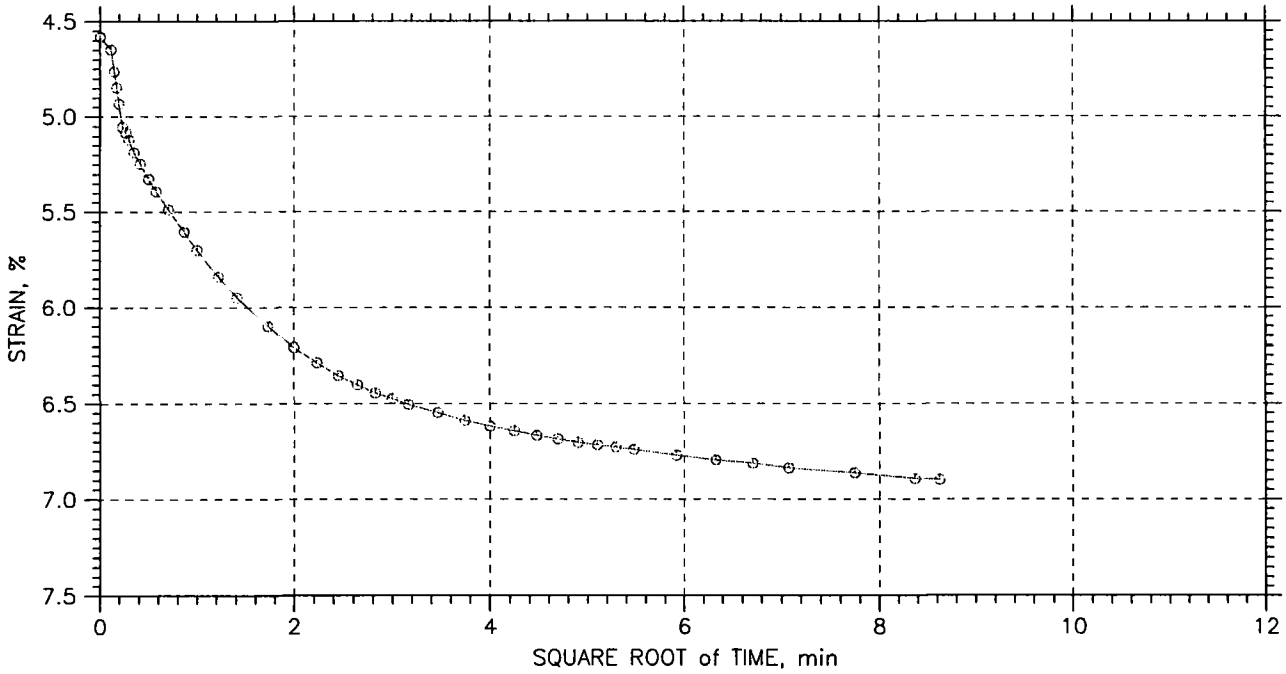
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 7 of 15

Stress: 6400. psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

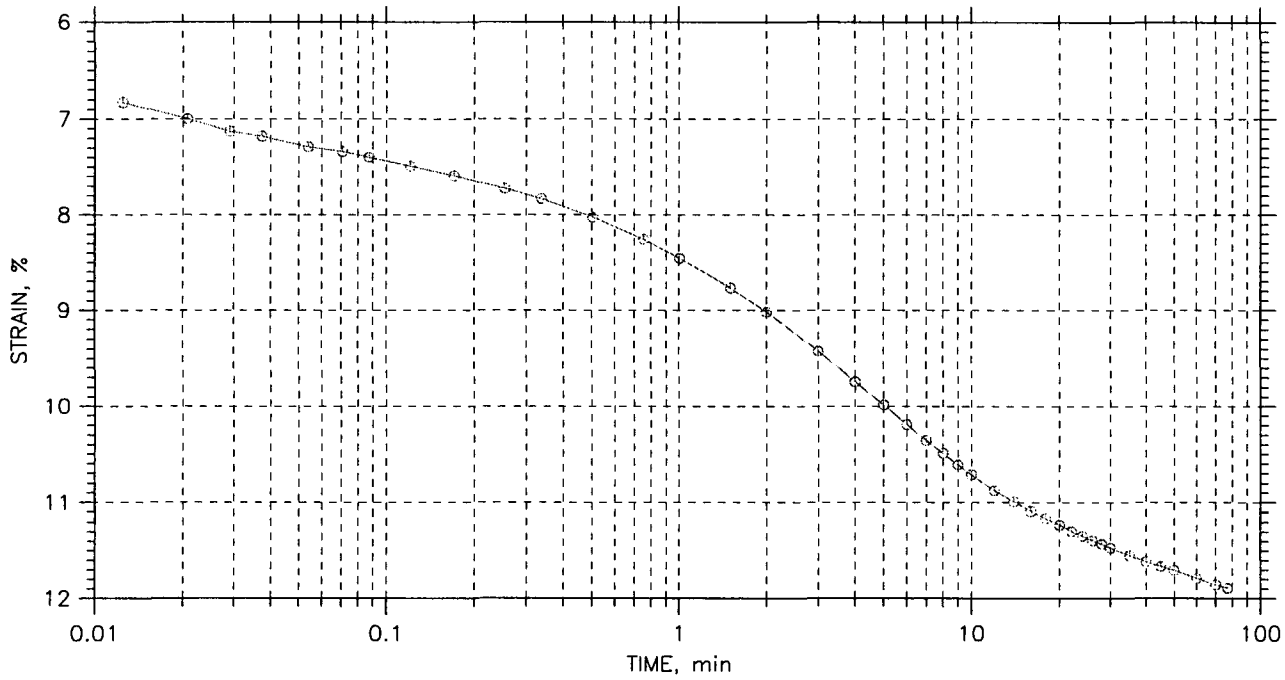
Tue, 30-MAY-2006 09:19:16

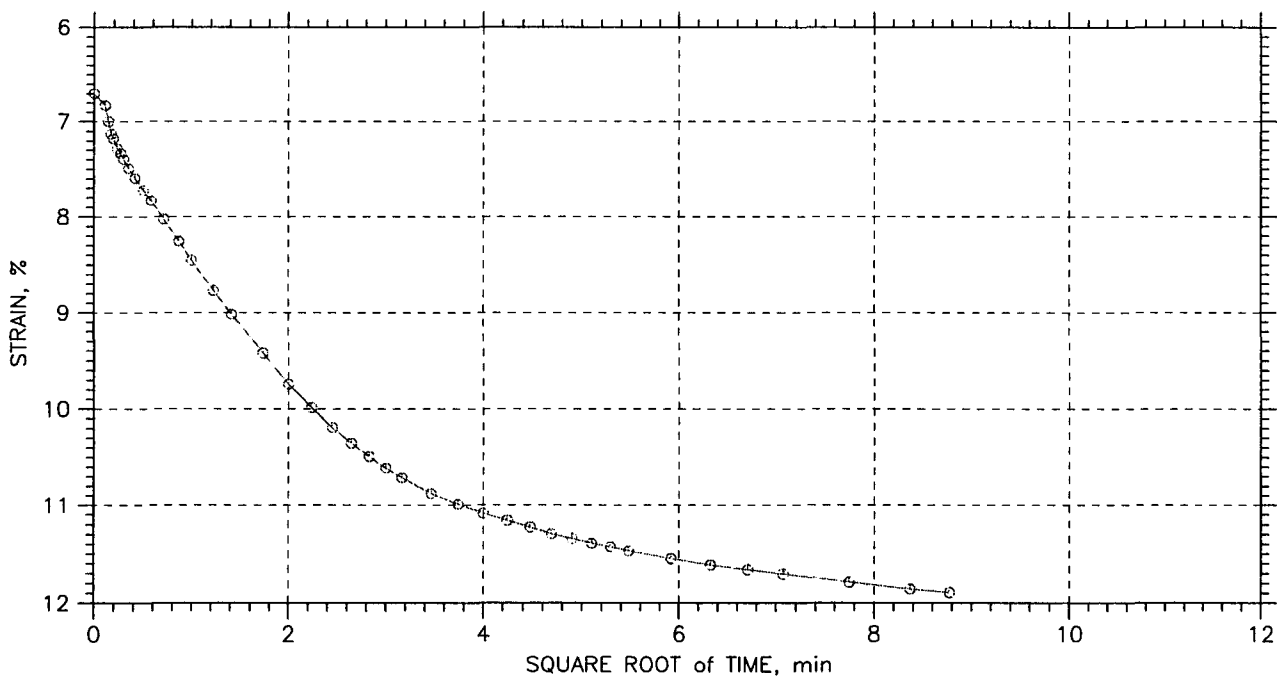
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 8 of 15

Stress: 12800 psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

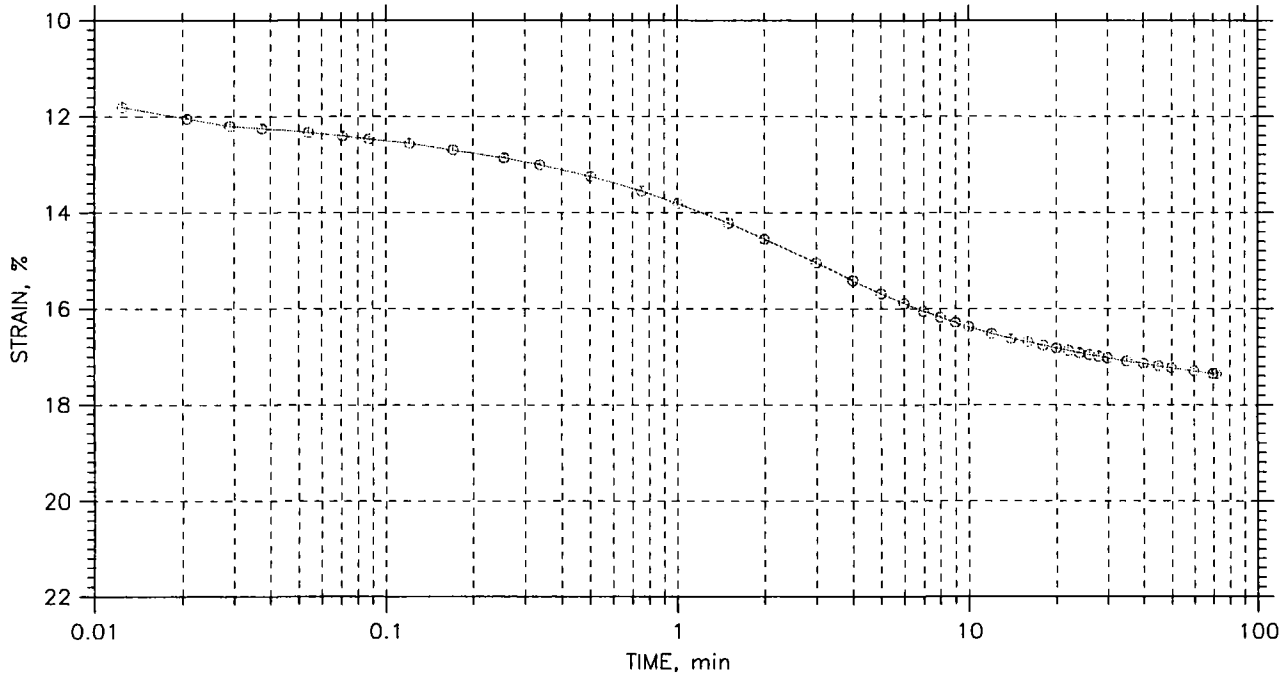
Tue, 30-MAY-2006 09:19:16

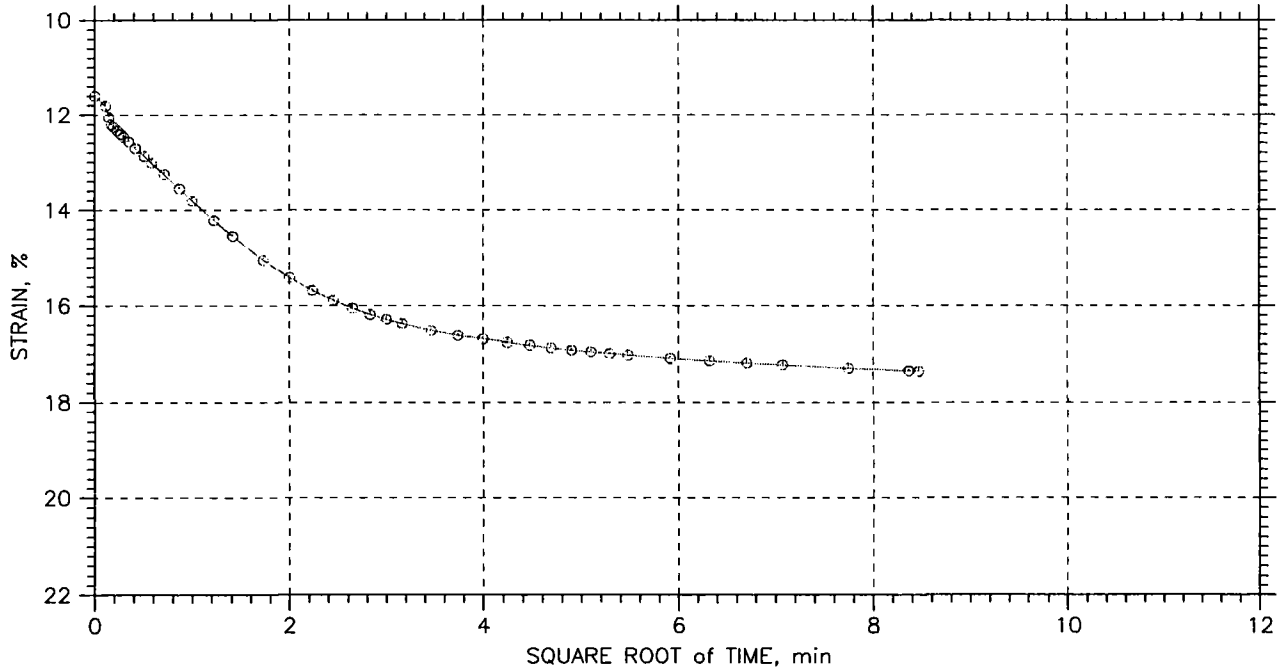
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 9 of 15

Stress: 25600 psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

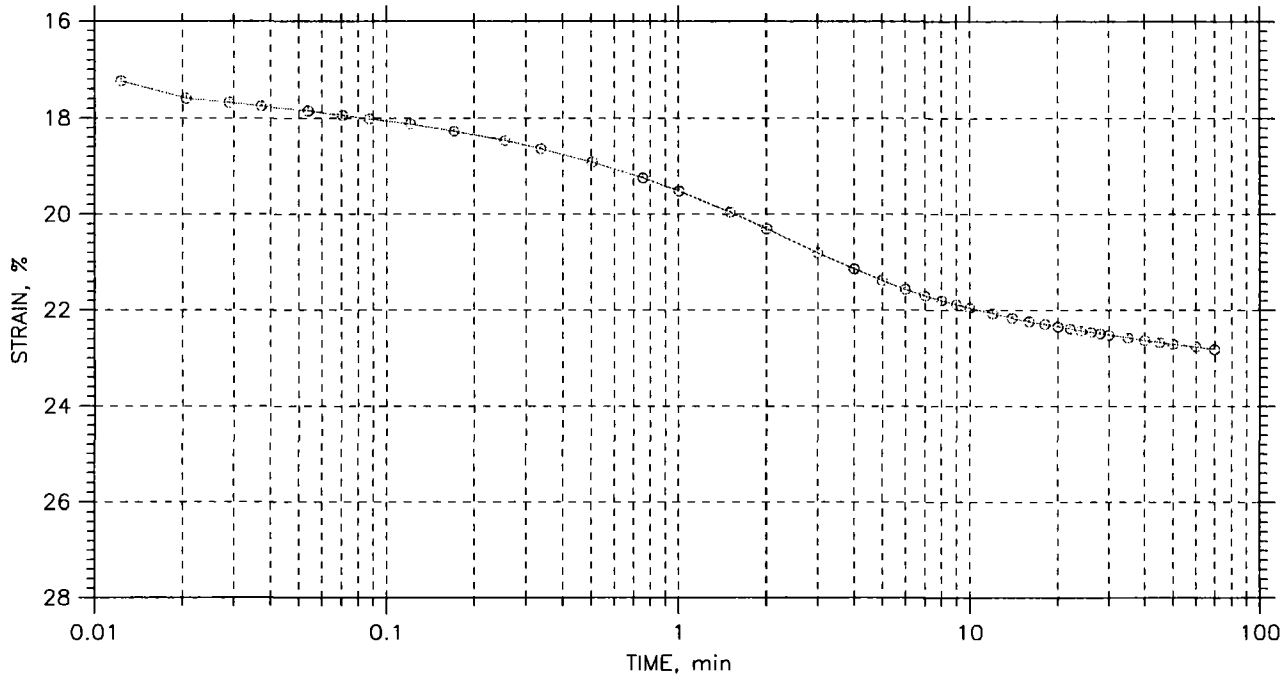
Tue, 30-MAY-2006 09:19:17

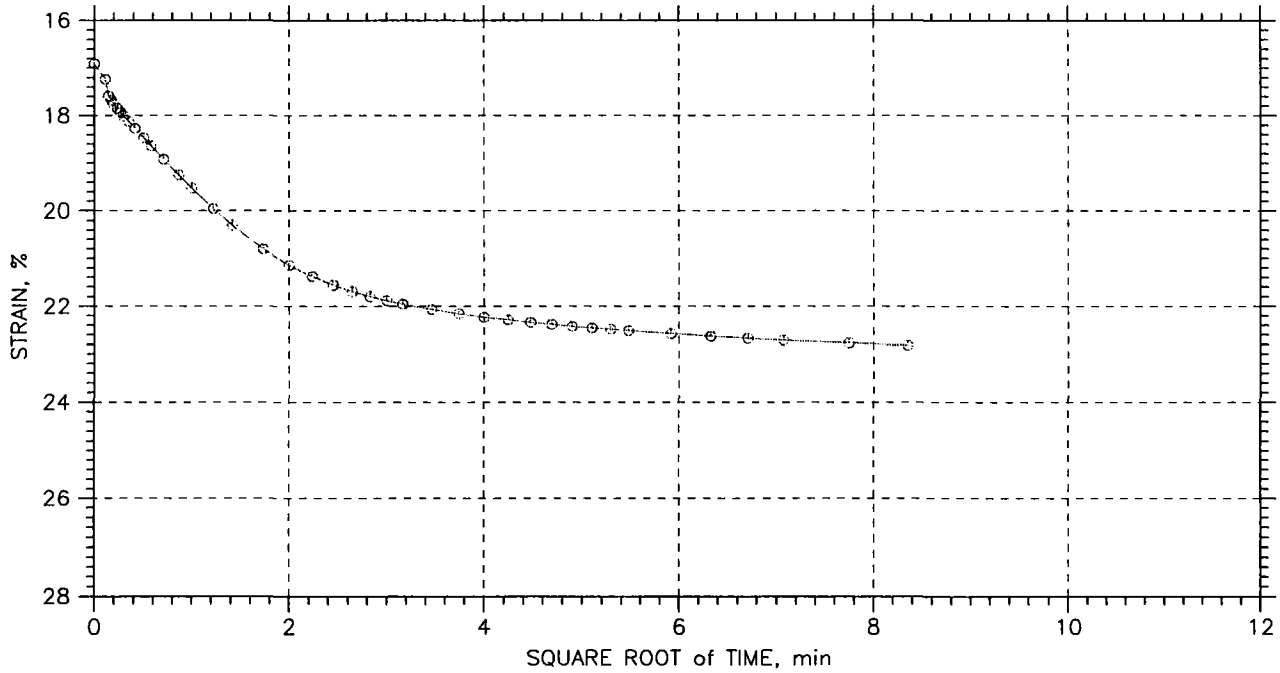
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 10 of 15

Stress: 51200 psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

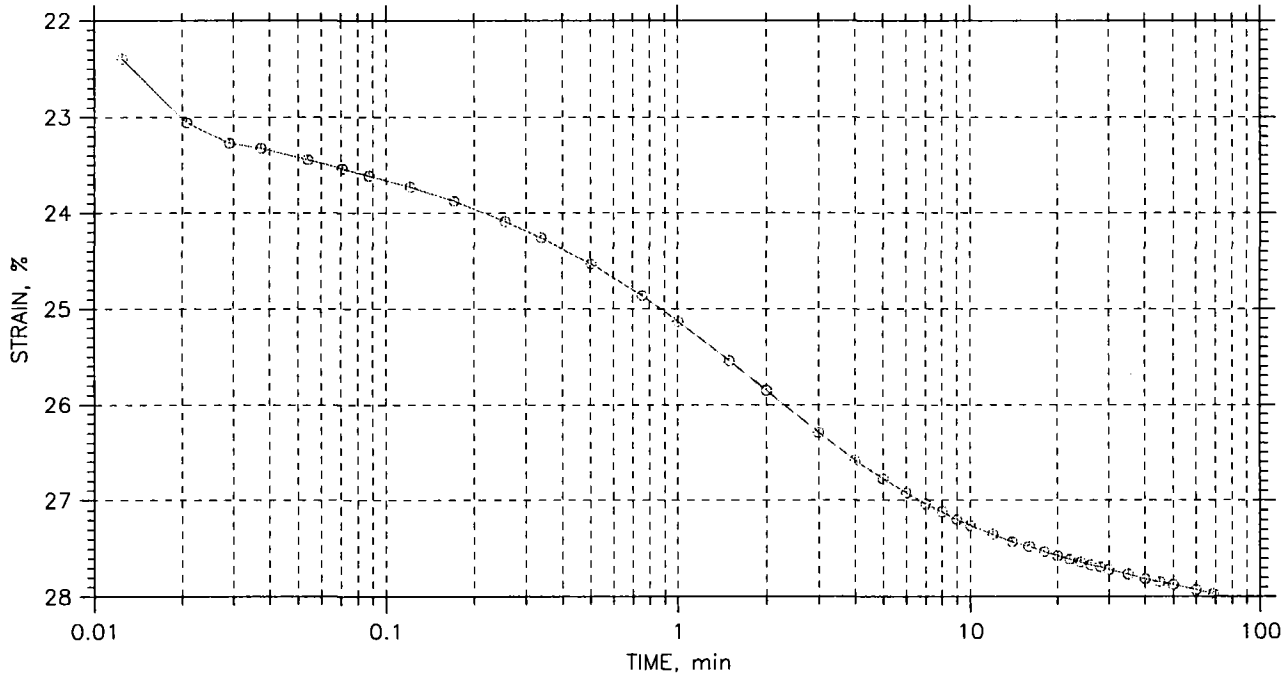
Tue, 30-MAY-2006 09:19:18

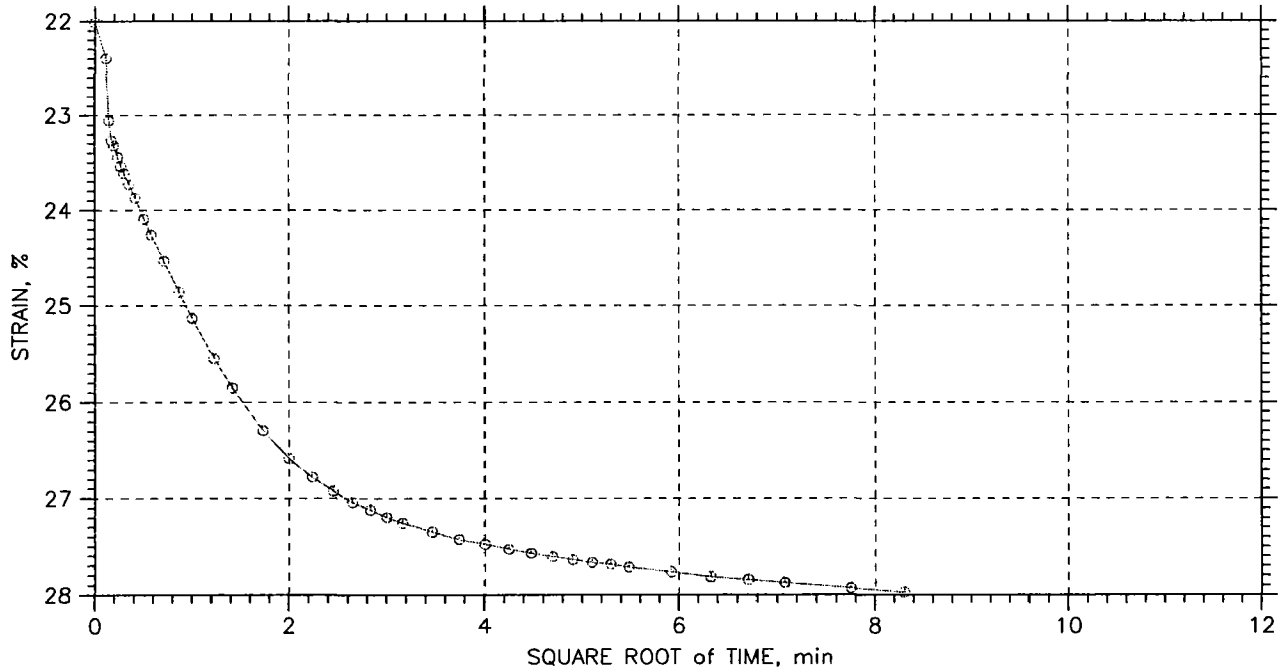
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 11 of 15

Stress: 1.024e+005 psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

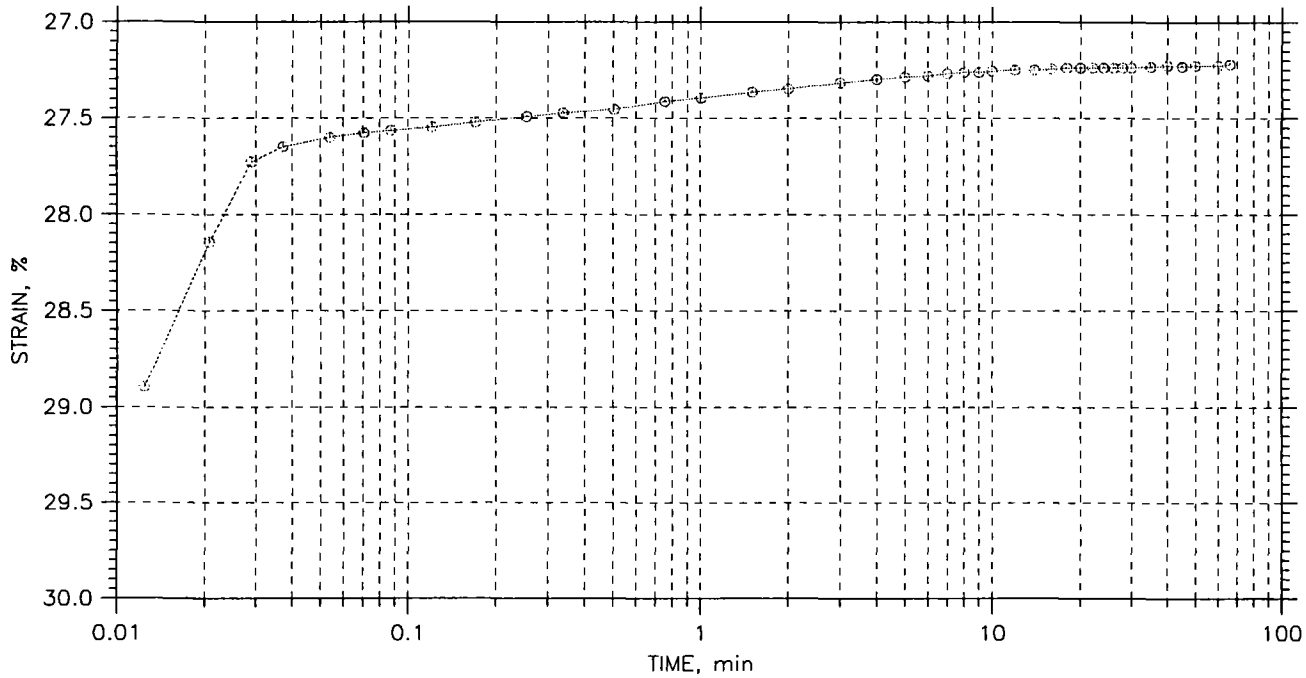
Tue, 30-MAY-2006 09:19:19

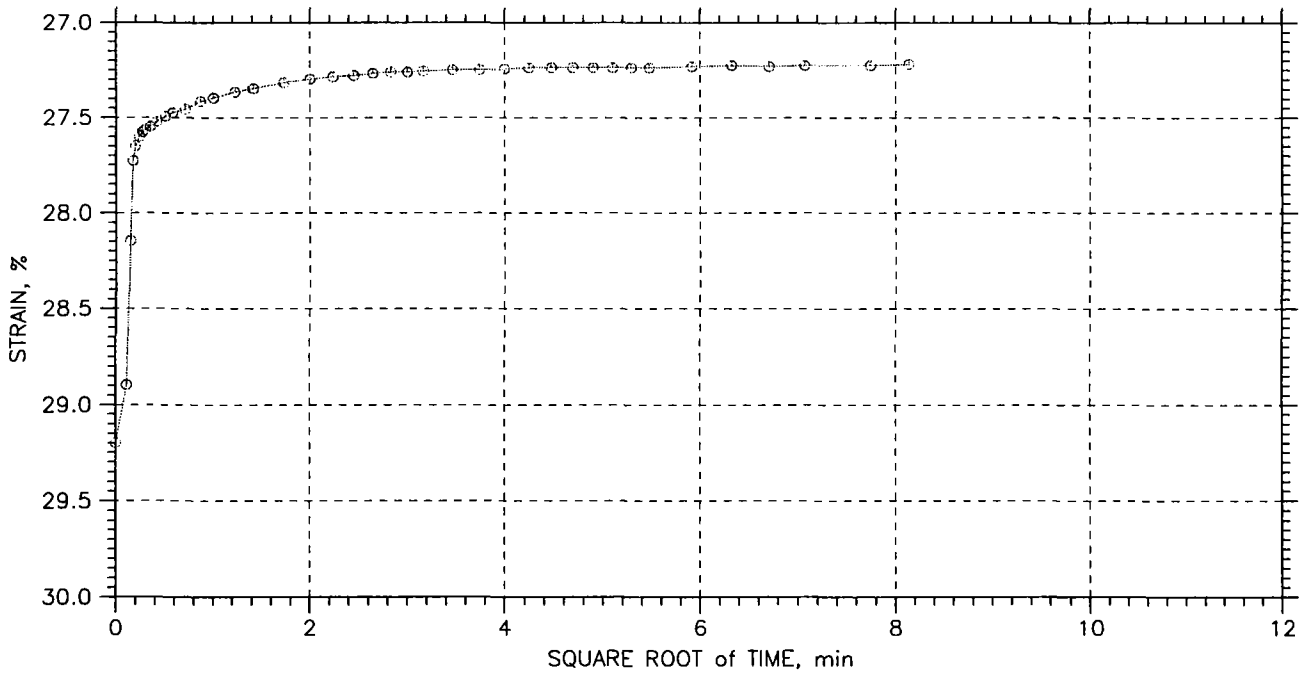
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 12 of 15

Stress: 25600 psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODE

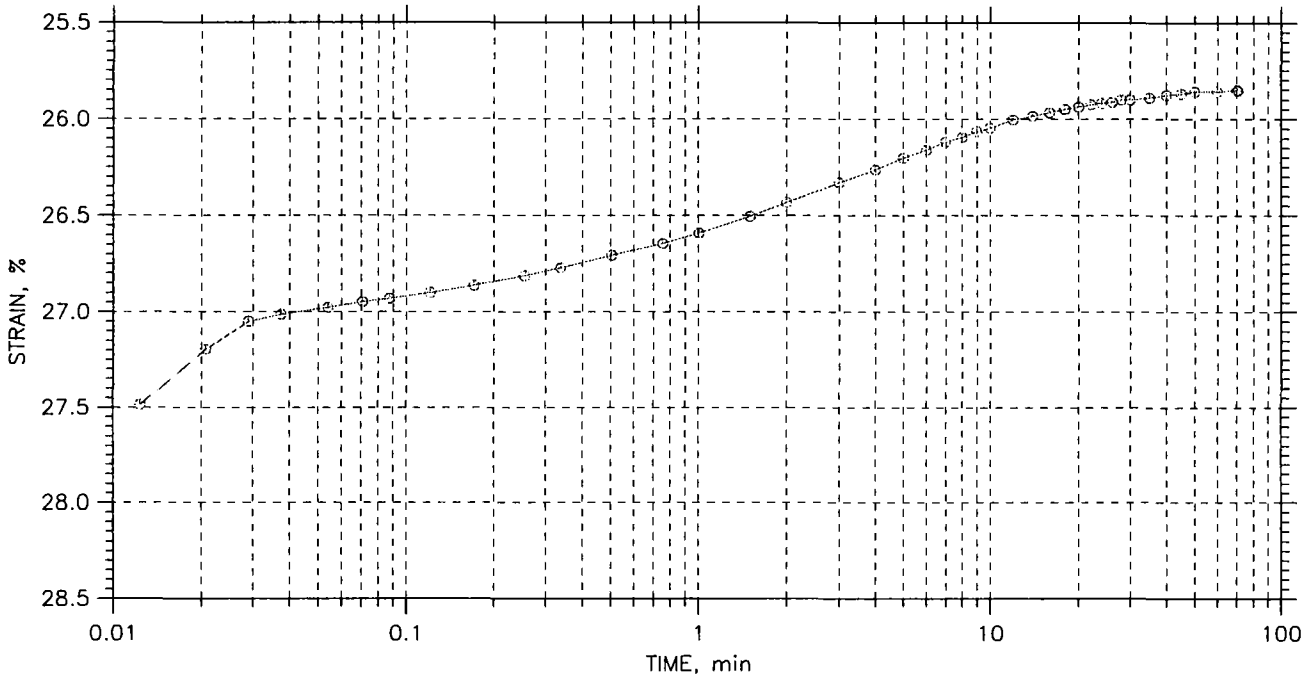
Tue, 30-MAY-2006 09:19:20

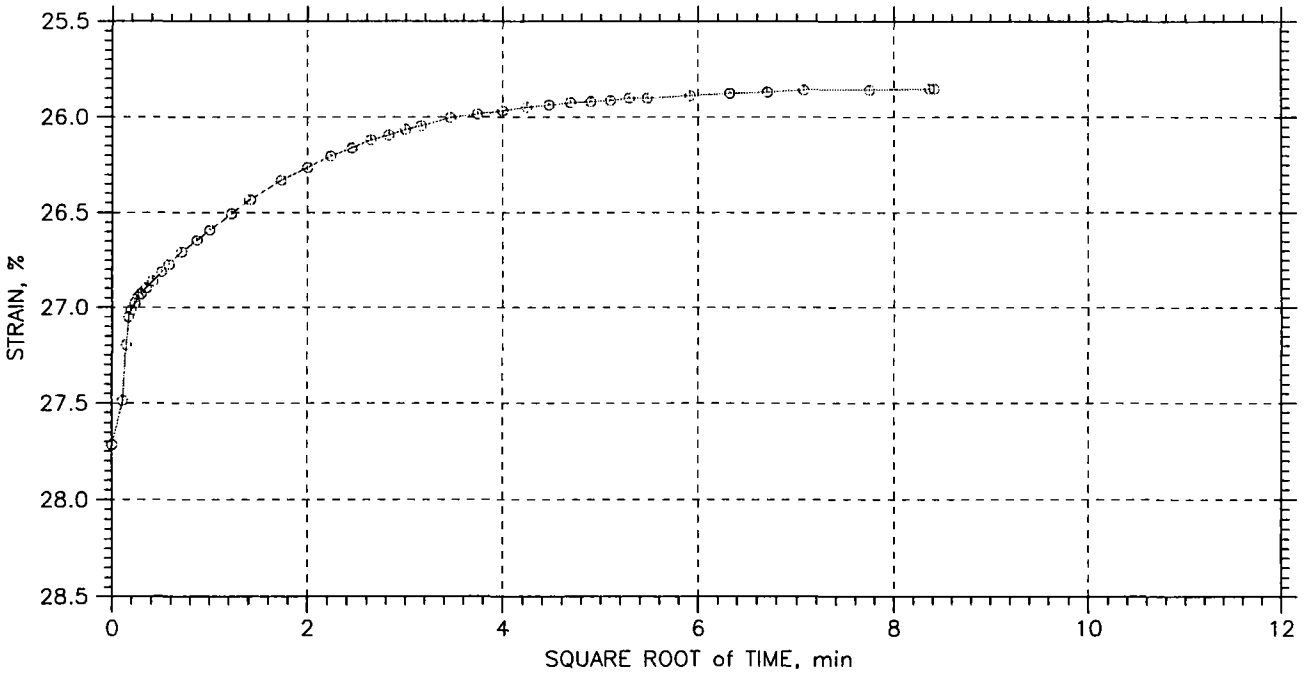
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 13 of 15

Stress: 6400. psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

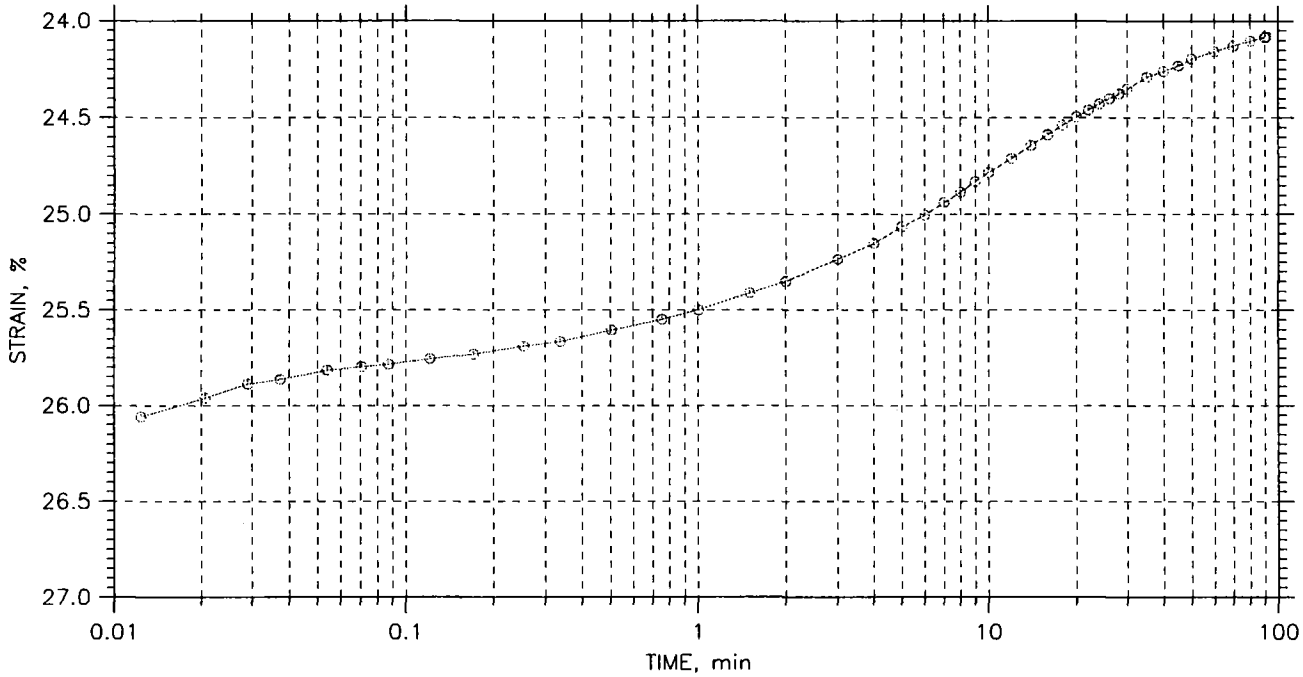
Tue, 30-MAY-2006 09:19:20

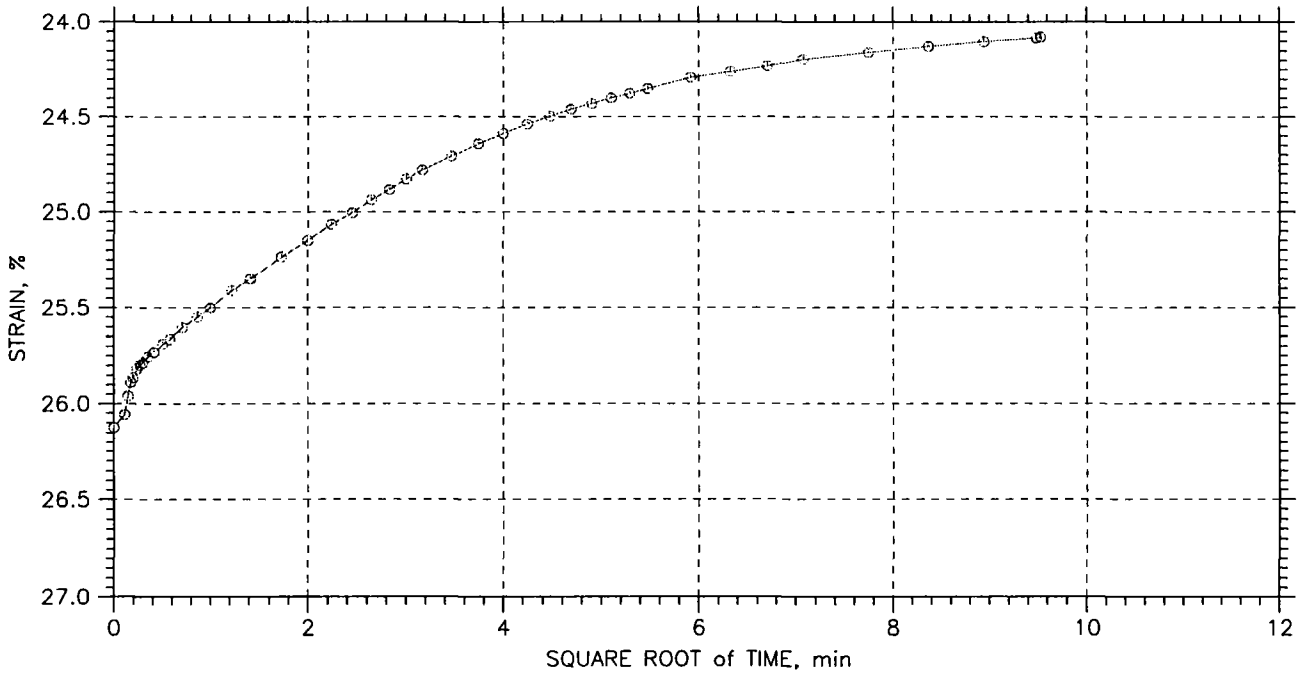
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 14 of 15

Stress: 1600. psf





UDOT	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

NODI

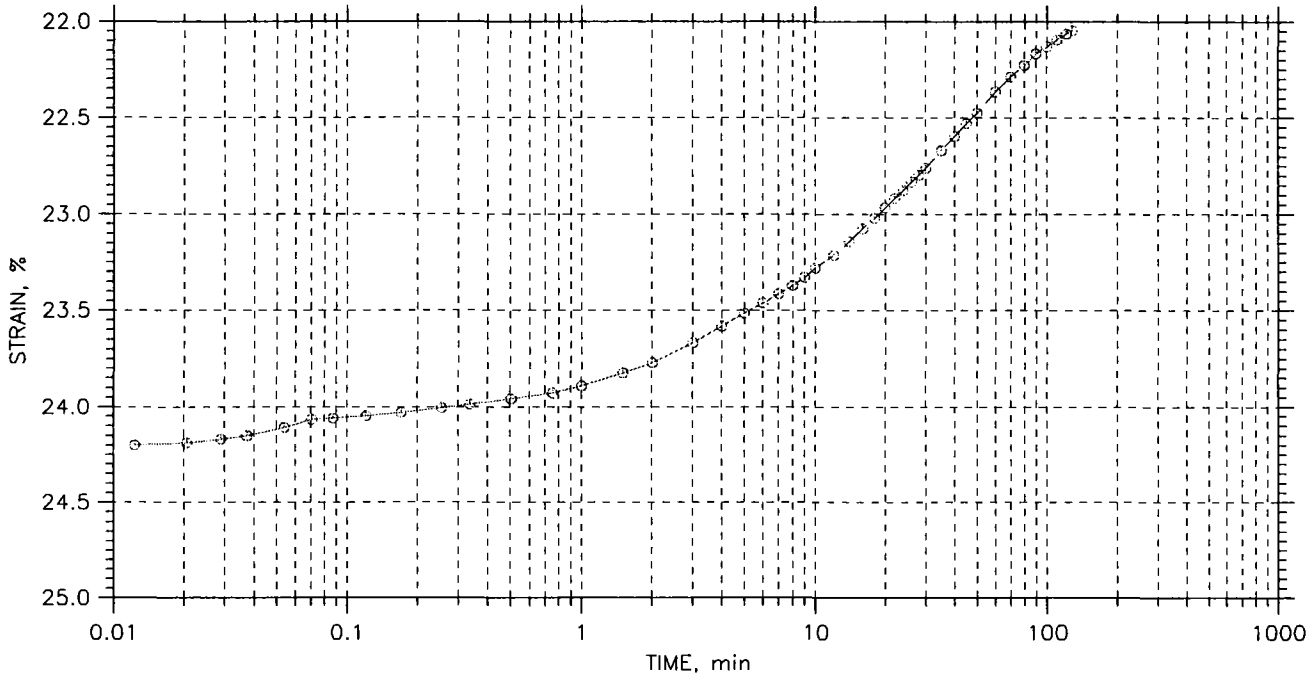
Tue, 30-MAY-2006 09:19:21

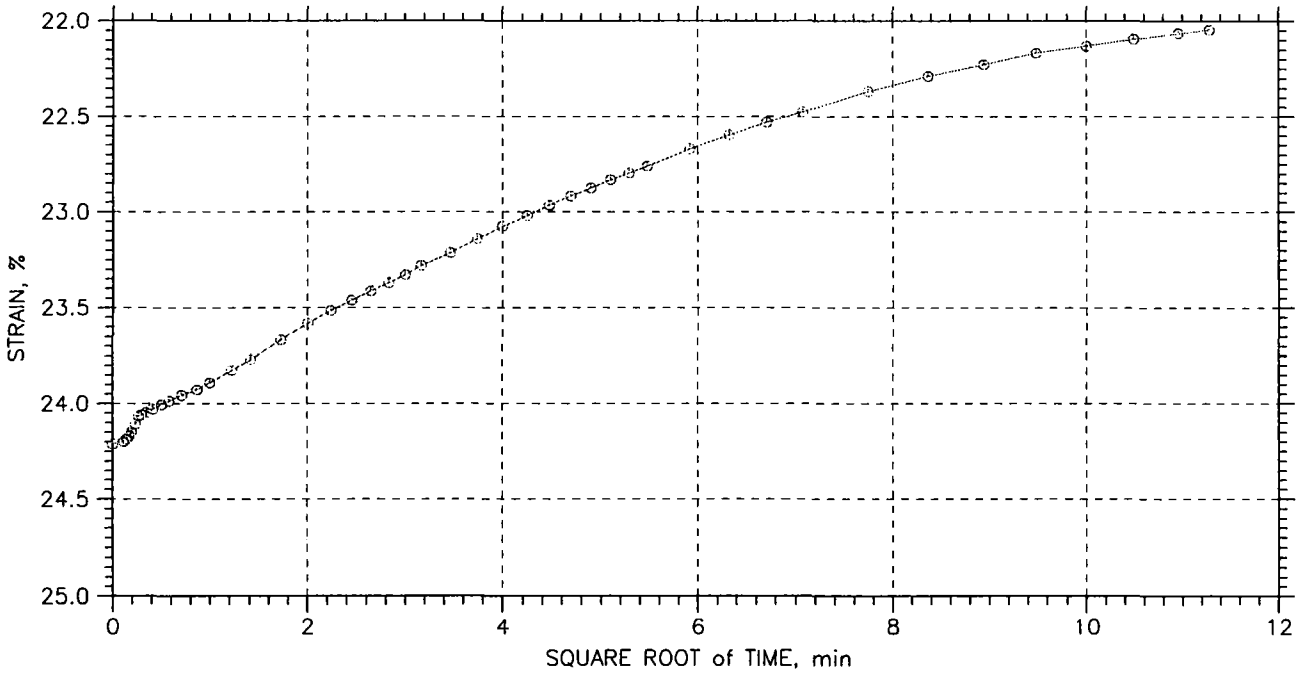
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 15 of 15

Stress: 400. psf





UDOT CONNECTING COMMUNITIES	Project: Glovers over Legacy	Location: Legacy Parkway	Project No.: SP-0067(5)0
	Boring No.: 19-613	Tested By: M. Graham	Checked By: D. Sjoblom
	Sample No.: U1-57.5	Test Date: 16 May 06	Depth: 55.5'
	Test No.: 1	Sample Type: Shelby	Elevation: ---
	Description: CL-ML		
	Remarks: AASHTO T-216		

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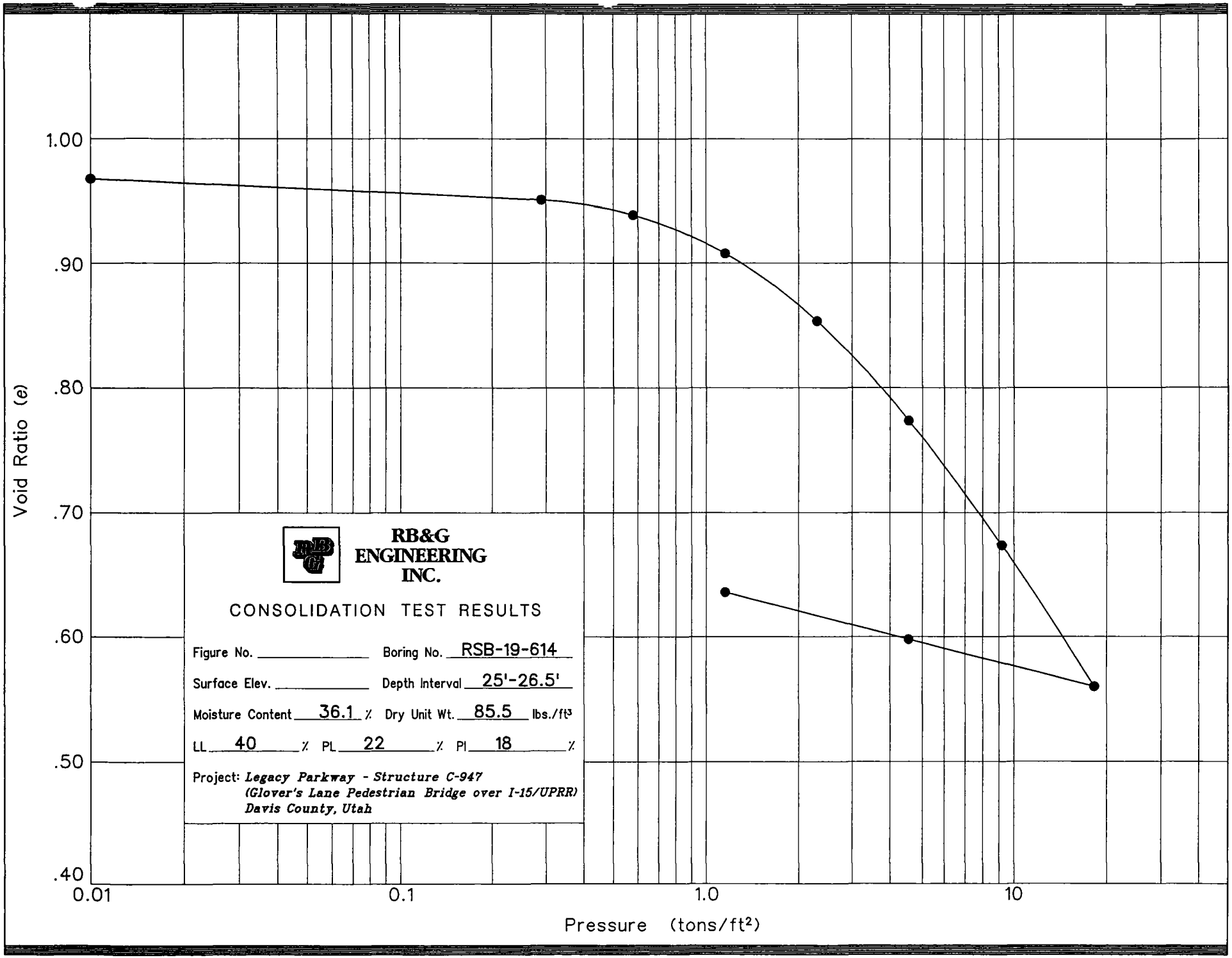
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Void Ratio (e)
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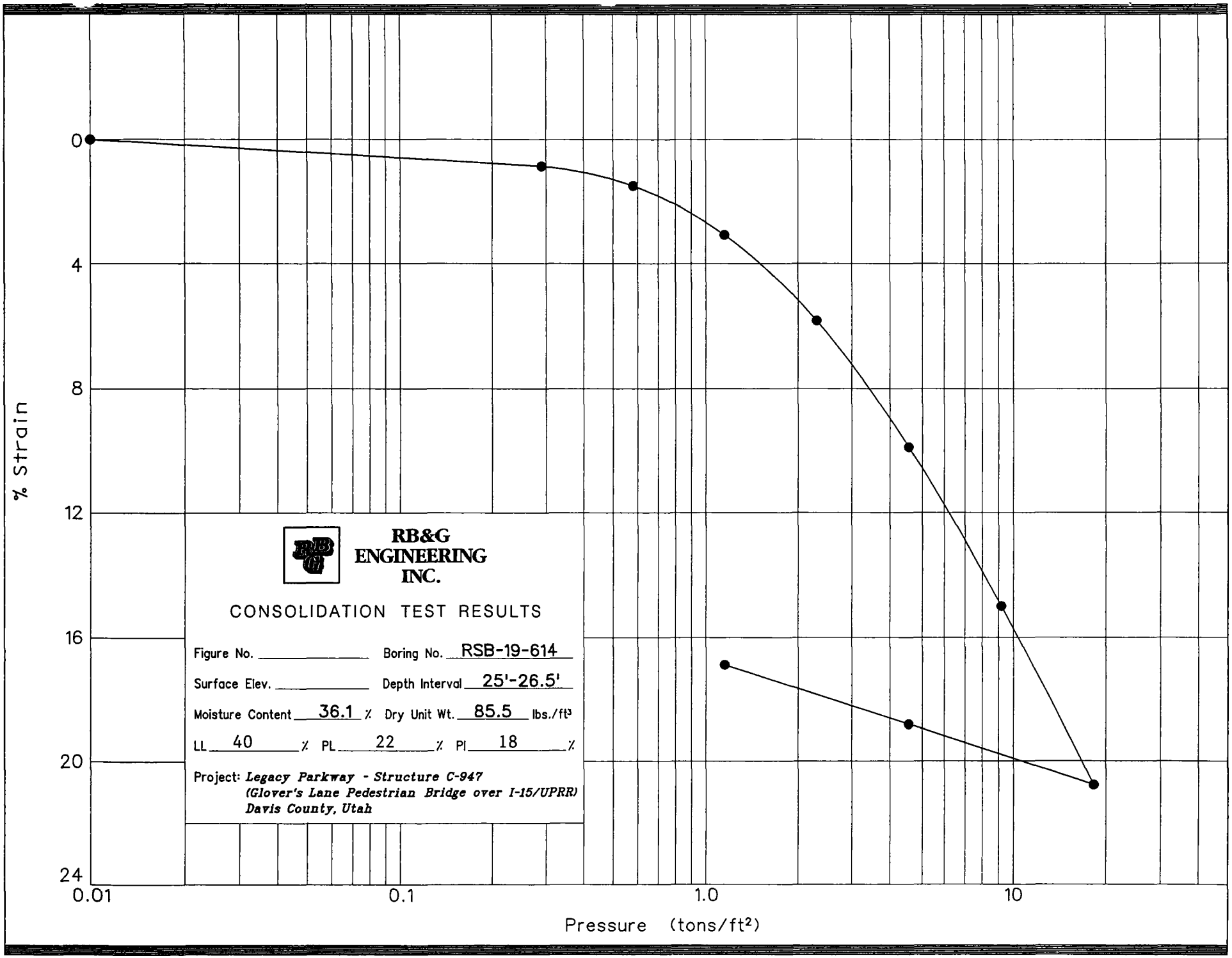
Pressure (tons/ft²)
RB&G
ENGINEERING
INC.
CONSOLIDATION TEST RESULTS
Figure No.
Boring No. RSB-19-614
Surface Elev.
Depth Interval 25'-26.5'
Moisture Content 36.1 %
Dry Unit Wt. 85.5 lbs./ft³
LL 40 %
PL 22 %
PI 18 %
Project: Legacy Parkway - Structure C-947
(Glover's Lane Pedestrian Bridge over I-15/UPRR)
Davis County, Utah


% Strain
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4
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0.1
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Pressure (tons/ft²)
RB&G ENGINEERING INC.
CONSOLIDATION TEST RESULTS
Figure No.
Boring No. RSB-19-614
Surface Elev.
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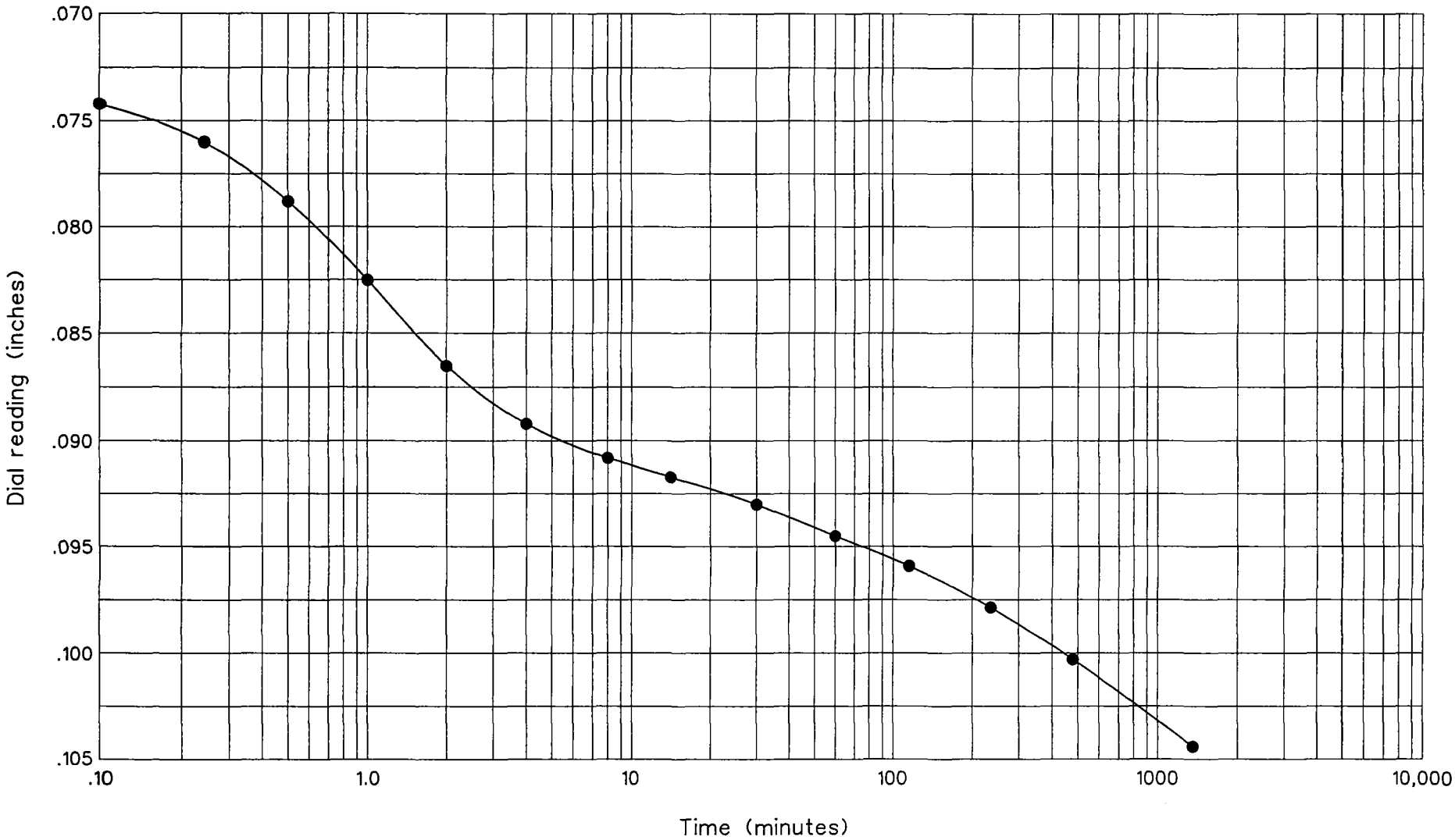


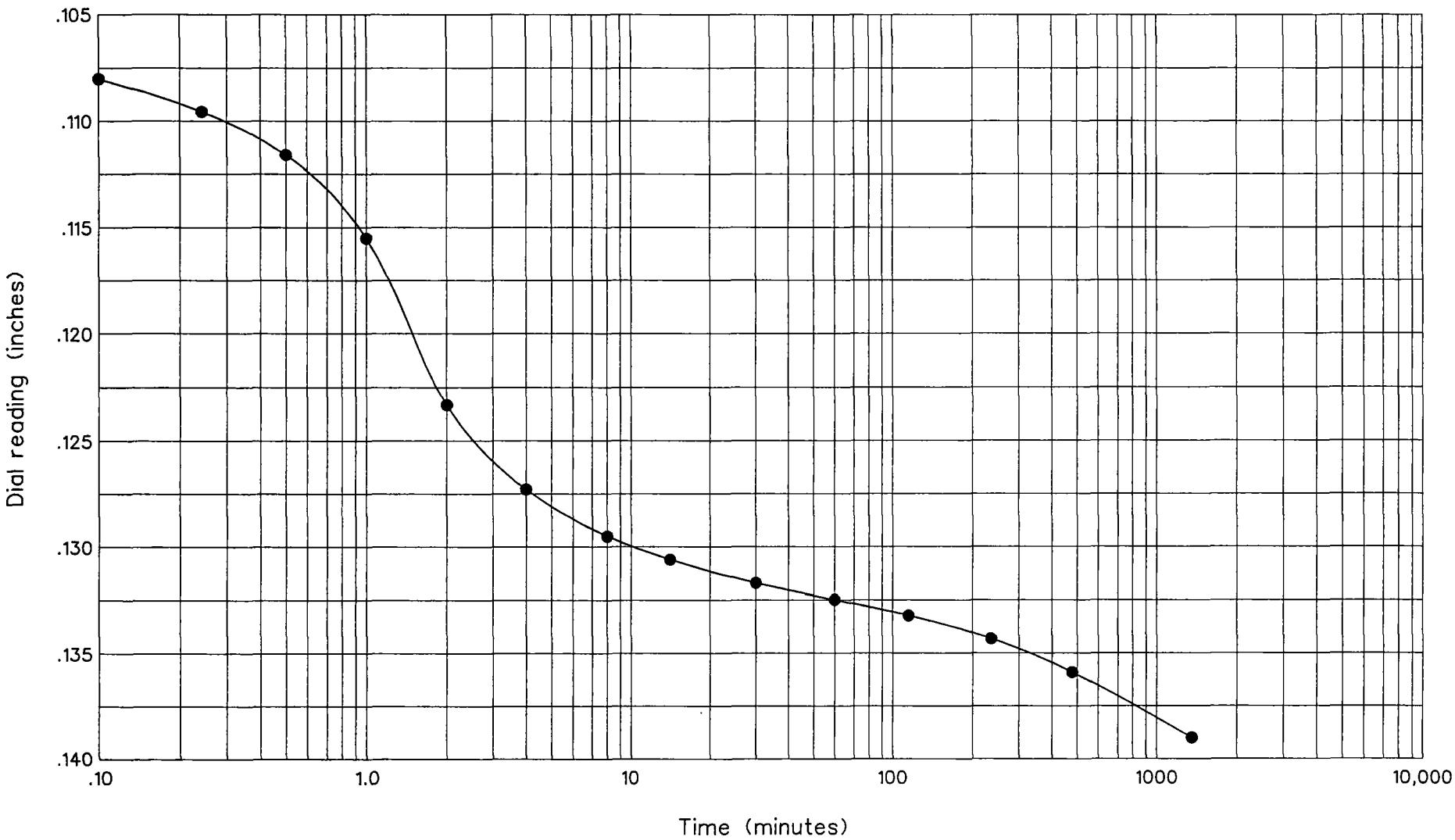
RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-614
Depth: 25'-26.5'
Load: 2.30 to 4.60 tons

TIME CONSOLIDATION

Legacy Parkway - Structure C-947
(Glover's Lane Pedestrian Bridge over I-15/UPRR)
Davis County, Utah

Figure



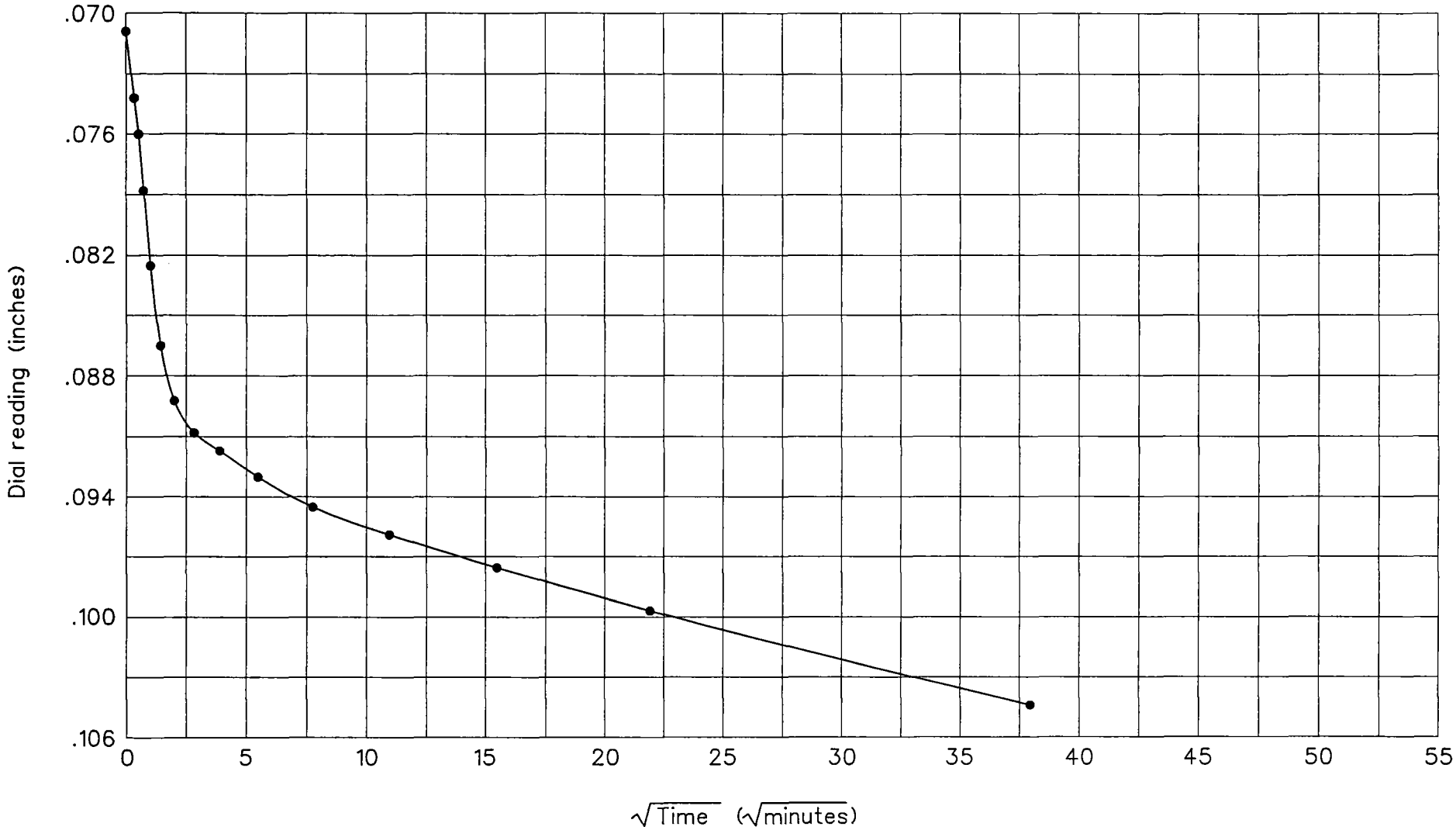
RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-614
Depth: 25'-26.5'
Load: 4.60 to 9.20 tons

TIME CONSOLIDATION

Legacy Parkway - Structure C-947
(Glover's Lane Pedestrian Bridge over I-15/UPRR)
Davis County, Utah

Figure



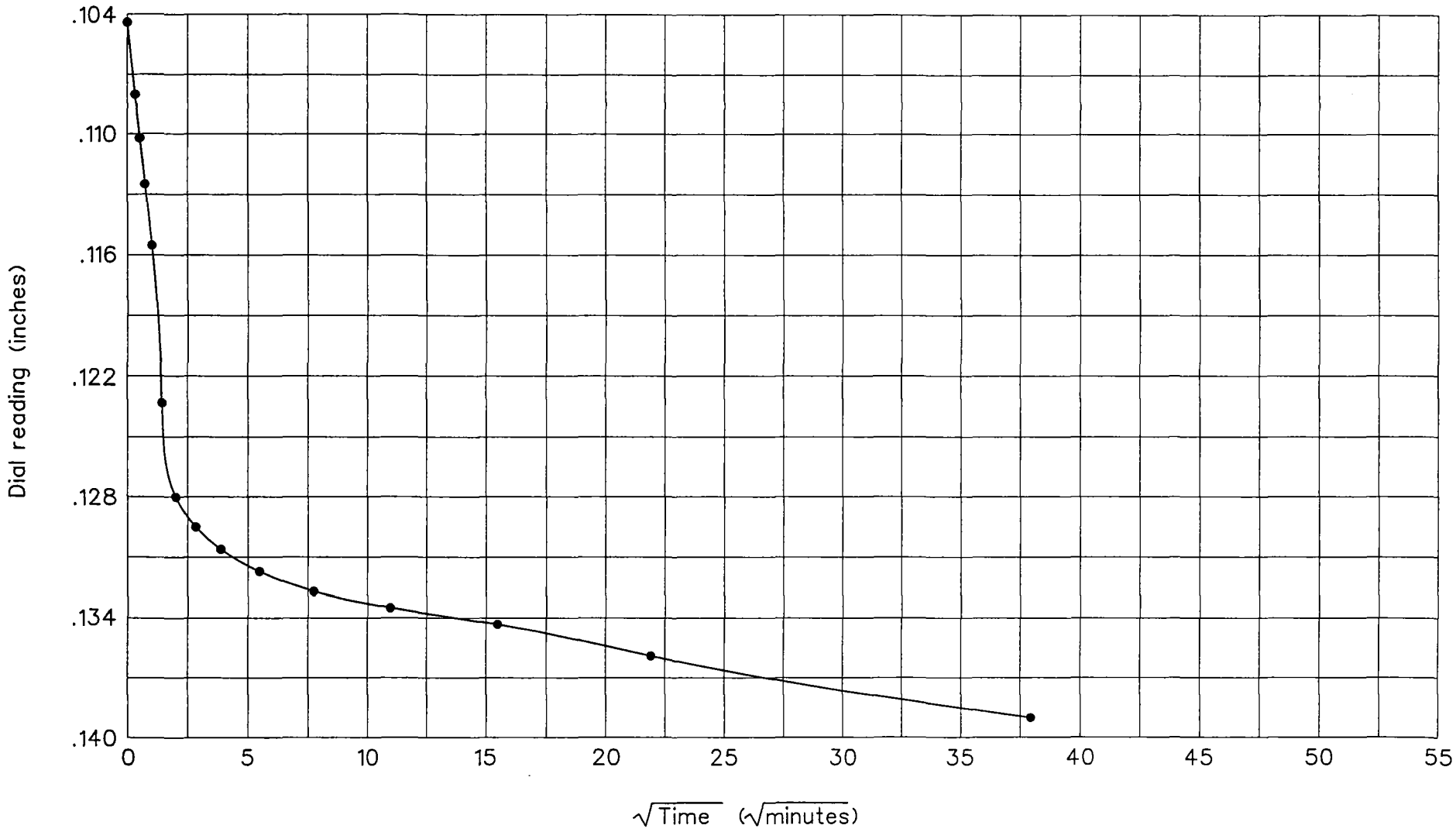
RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-614
Depth: 25'-26.5'
Load: 2.30 to 4.60 tons

TIME CONSOLIDATION

Legacy Parkway - Structure C-947
(Glover's Lane Pedestrian Bridge over I-15/UPRR)
Davis County, Utah

Figure



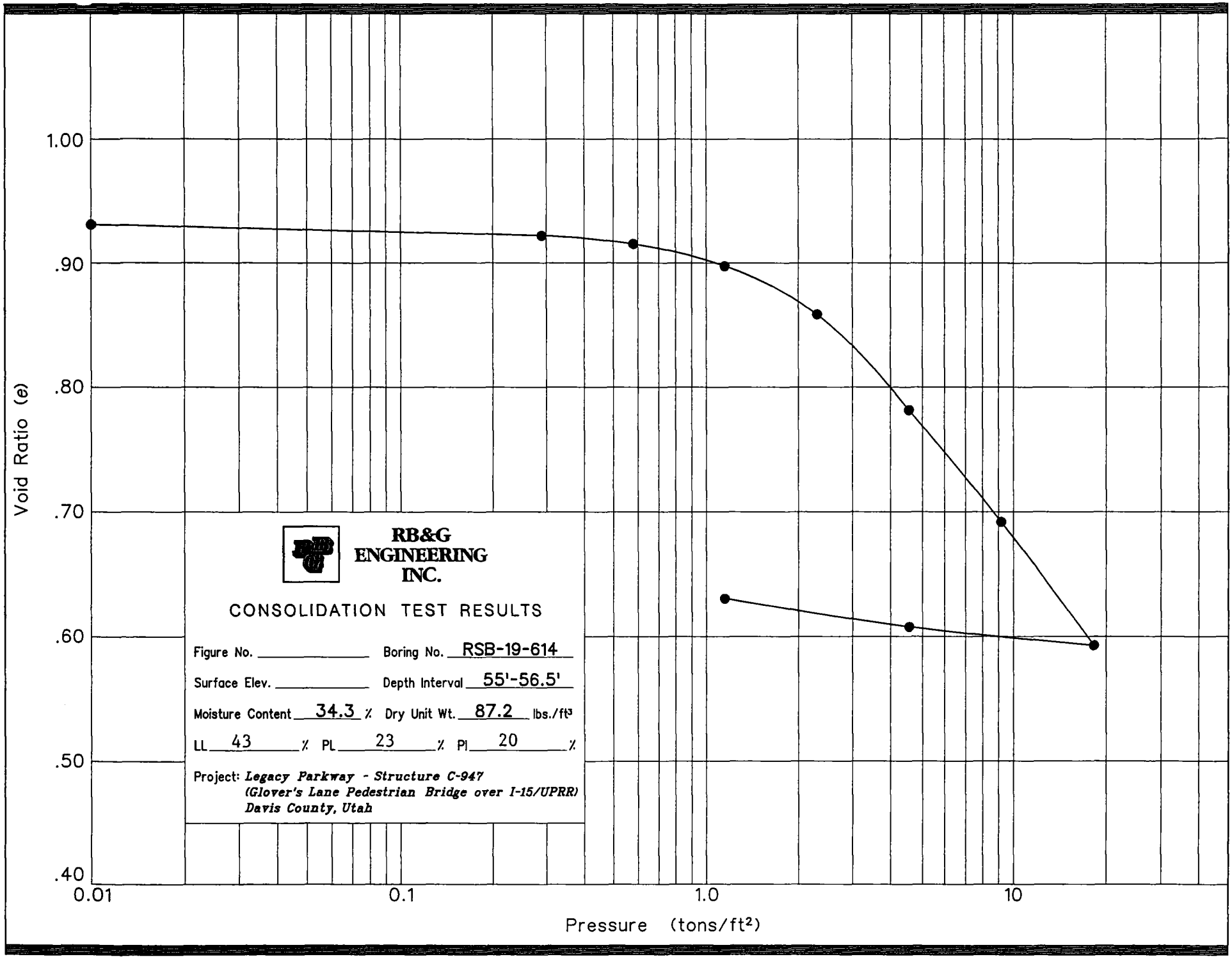
RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-614
Depth: 25'-26.5'
Load: 4.60 to 9.20 tons

TIME CONSOLIDATION

Legacy Parkway - Structure C-947
(Glover's Lane Pedestrian Bridge over I-15/UPRR)
Davis County, Utah

Figure


1.00
.90
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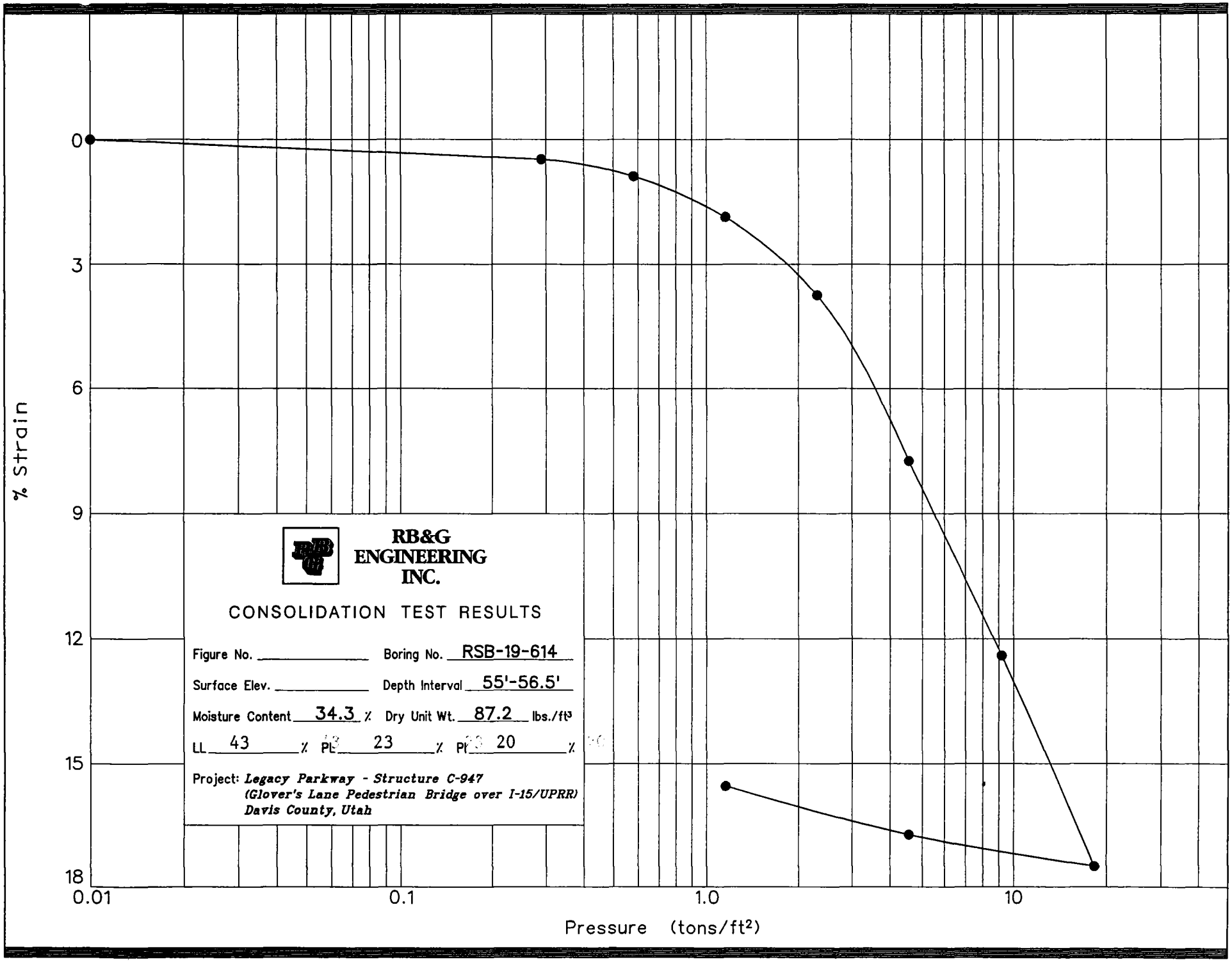
.40
Void Ratio (e)
0.01
0.1
1.0
10
Pressure (tons/ft²)
RB&G
ENGINEERING
INC.
CONSOLIDATION TEST RESULTS
Figure No.
Boring No. RSB-19-614
Surface Elev.
Depth Interval 55'-56.5'
Moisture Content 34.3 %
Dry Unit Wt. 87.2 lbs./ft³
LL 43 % PL 23 % PI 20 %
Project: Legacy Parkway - Structure C-947
(Glover's Lane Pedestrian Bridge over I-15/UPRR)
Davis County, Utah



RB&G ENGINEERING INC.

CONSOLIDATION TEST RESULTS

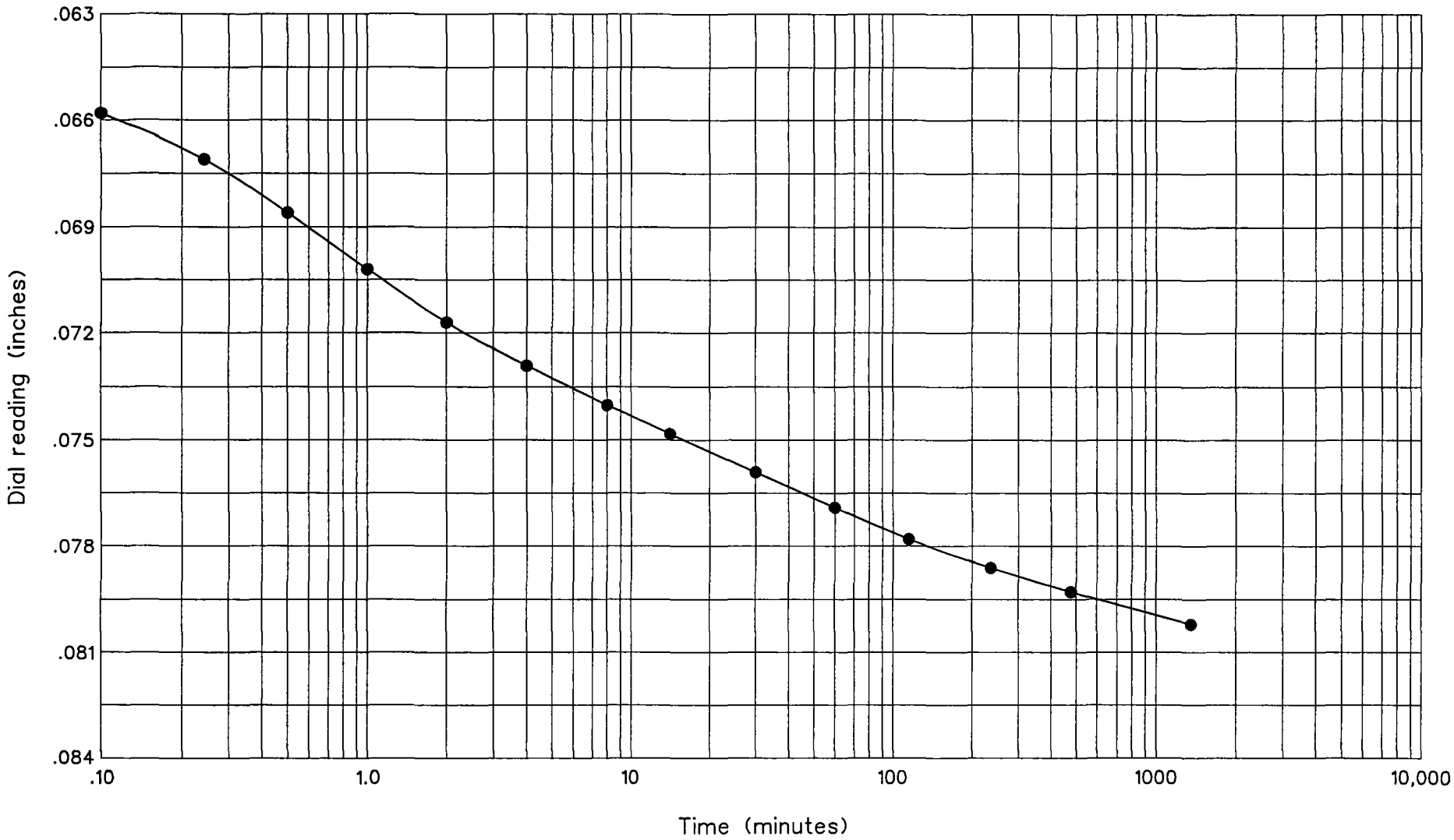
Figure No. _____ Boring No. RSB-19-614

Surface Elev. _____ Depth Interval 55'-56.5'

Moisture Content 34.3 % Dry Unit Wt. 87.2 lbs./ft³

LL 43 % PL 23 % PI 20 %

Project: *Legacy Parkway - Structure C-947*
(Glover's Lane Pedestrian Bridge over I-15/UPRR)
Davis County, Utah



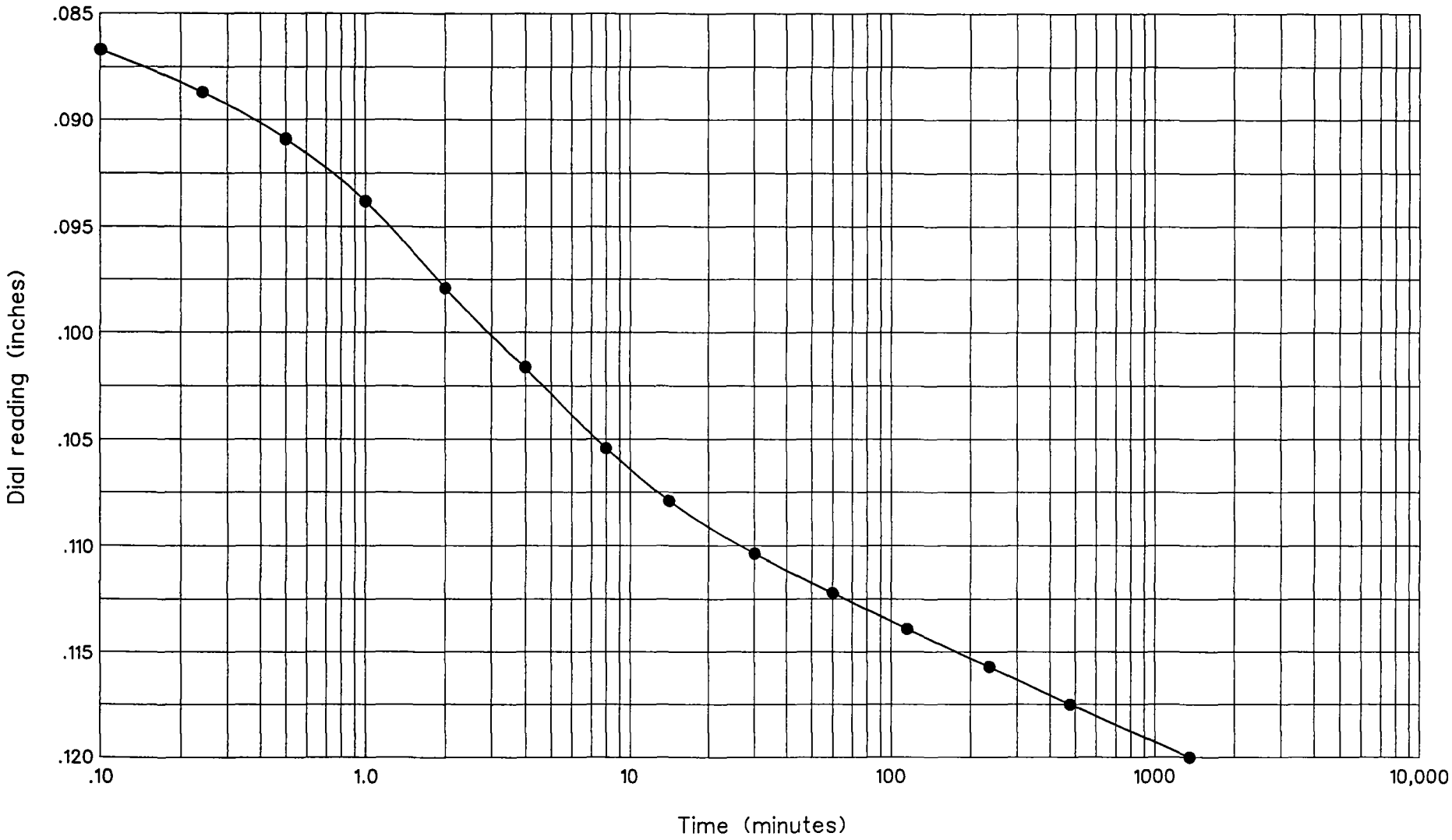
RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-614
Depth: 55'-56.5'
Load: 2.30 to 4.60 tons

TIME CONSOLIDATION

Legacy Parkway - Structure C-947
(Glover's Lane Pedestrian Bridge over I-15/UPRR)
Davis County, Utah

Figure



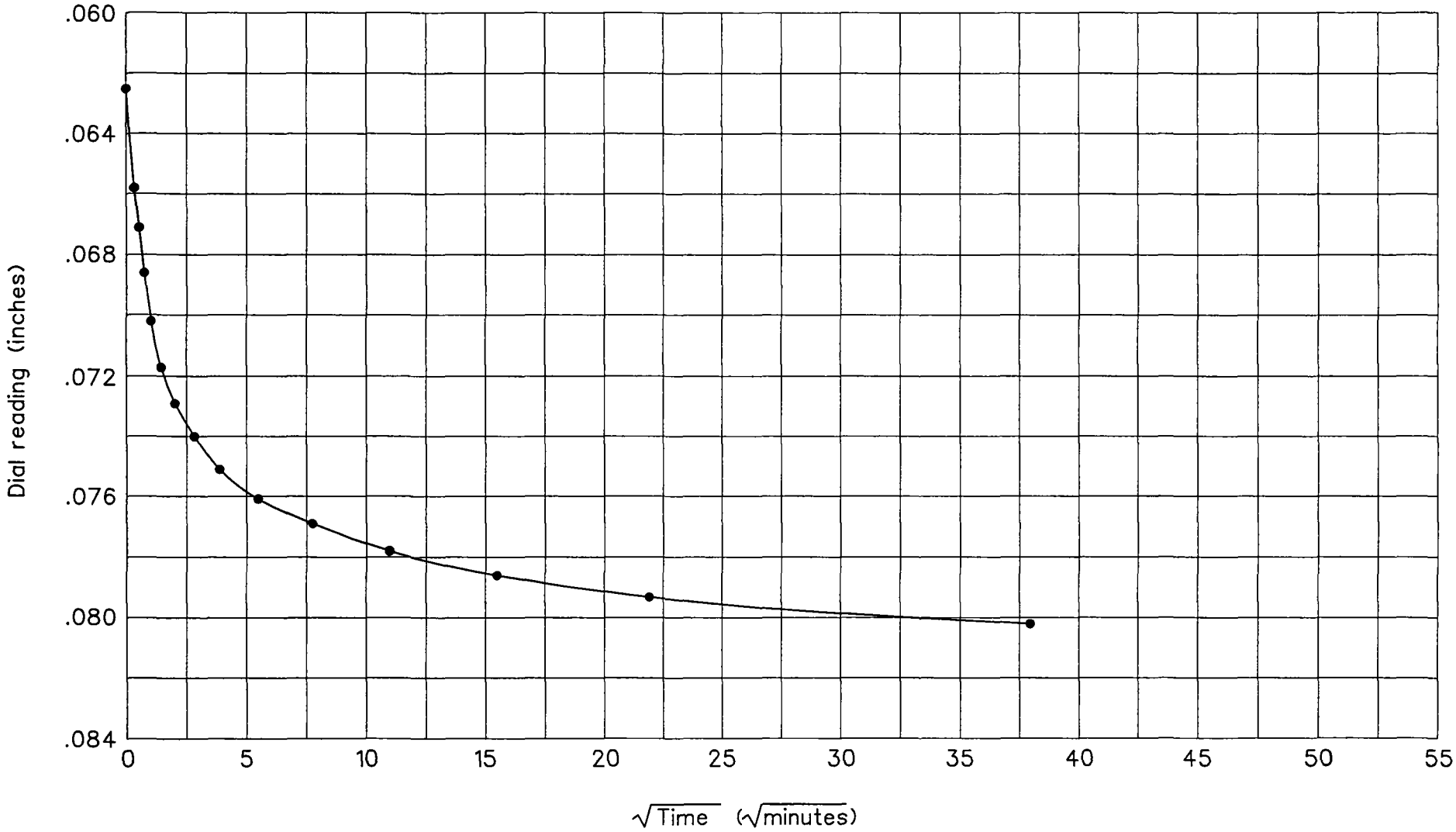
RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-614
Depth: 55'-56.5'
Load: 4.60 to 9.20 tons

TIME CONSOLIDATION

Legacy Parkway - Structure C-947
(Glover's Lane Pedestrian Bridge over I-15/UPRR)
Davis County, Utah

Figure



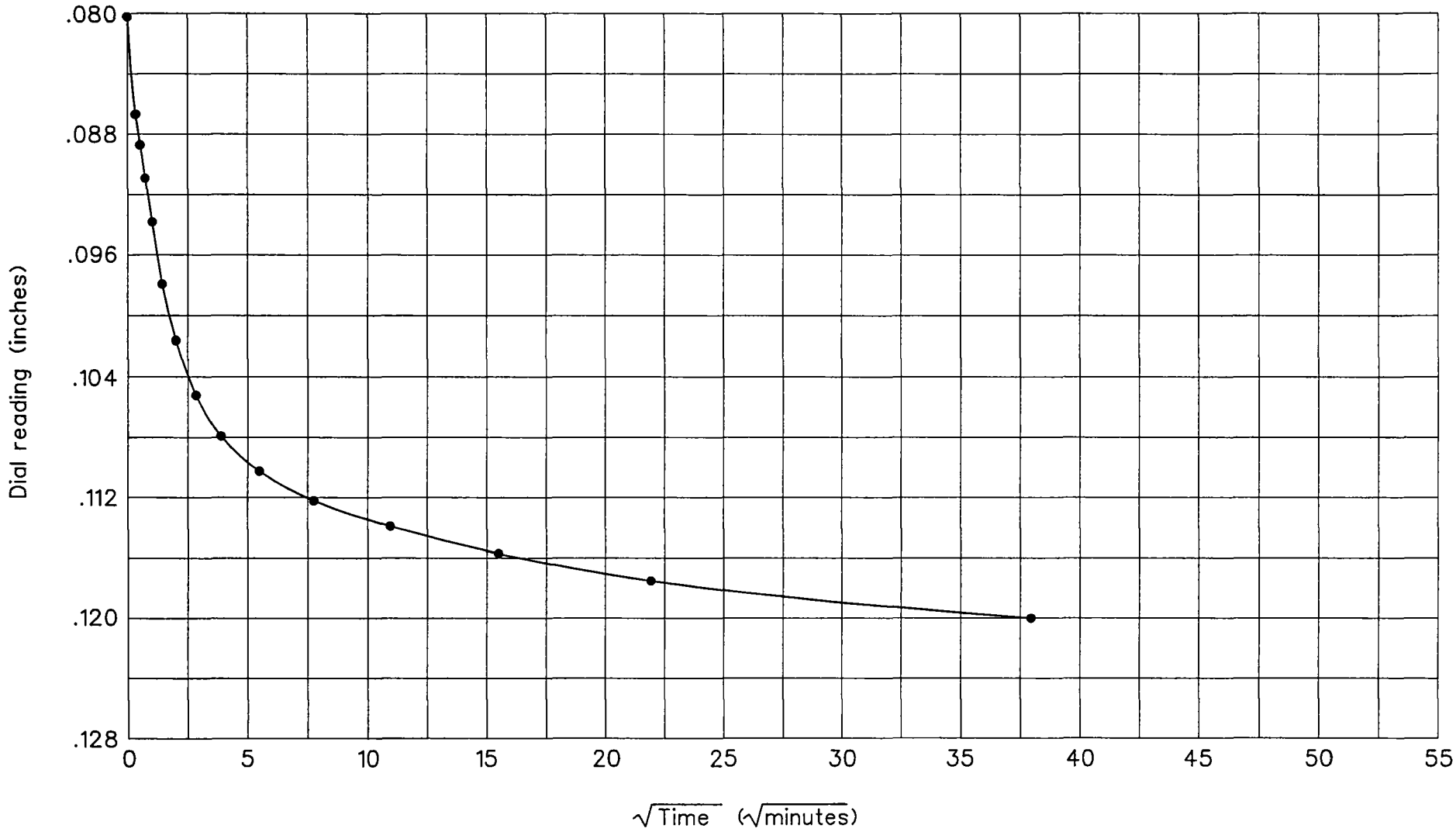
RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-614
Depth: 55'-56.5'
Load: 2.30 to 4.60 tons

TIME CONSOLIDATION

Legacy Parkway - Structure C-947
(Glover's Lane Pedestrian Bridge over I-15/UPRR)
Davis County, Utah

Figure



RB&G ENGINEERING INC.
Provo, Utah

Hole no.: RSB-19-614
Depth: 55'-56.5'
Load: 4.60 to 9.20 tons

TIME CONSOLIDATION

Legacy Parkway - Structure C-947
(Glover's Lane Pedestrian Bridge over I-15/UPRR)
Davis County, Utah

Figure

APPENDIX D
Supplemental Data

Recommendations for LPILE and GROUP analyses.

Project: Legacy Parkway
Structure No: F-668 FAK No: 19
Description: Glover's Lane over Legacy Parkway

by: srj
date: 9/23/2006

Exist. Ground Surface Elev: 4242 ft
Est. Pile Tip Elev: 4134 ft
Pile Length Below Ground: 108 ft

Pile Type: Closed-End Pipe Pile
Size: 16 inch O.D.
Water Table: Upper 3 feet

Soil Layers

Thickness (ft)	Top Elev (ft)	Bottom Elev (ft)	Soil Type (p-y model)	Eff. Unit Wt. (pci)	Cohesion (psi)	Strain Factor ε_{50}	Friction Angle (degrees)	p-y Modulus, k (pci)	Side (psi)	End (psi)
8	4242	4234	Soft Clay (Matlock)	0.033	6.9	0.012	0	55	5.5	0
10	4234	4224	Liquefiable Sand	0.033	0	0	0	10	2.0	0
40	4224	4184	Soft Clay (Matlock)	0.033	5.9	0.015	0	50	5.7	0
29	4184	4155	Soft Clay (Matlock)	0.033	6.3	0.013	0	50	6.1	0
11	4155	4144	Sand (Reese)	0.036	0	0	33	40	21.2	347

Other Considerations

Corrosion of Pipe Pile

Reduce Pipe pile wall thickness by 1/16 inch to account for corrosion.

Group Effects

Use P-Multipliers for pile groups as outlined in AASHTO LRFD 2006 Interim Section 10.7.2.4

Abutment Fill

For the length of the pile extending through the abutment fill:
For Effective Unit Weights use 0.069 pci (regular weight) or 0.046 pci (pumice)
Assume Friction Angle of 38 degrees. Consider reduced parameters for loading towards MSE wall face.

MSE Walls

For piles located less than 6B from MSE wall, use P-Multiplier of 0.3 or less for the MSE fill layer when loading is perpendicular to MSE wall face. MSE wall designer should be notified if MSE fill will be relied upon for lateral pile resistance.

Legacy Parkway Project

Summary of Lateral Earth Pressure Recommendations

Recommended Soil Parameters

Fill Description	Total Unit Weight (pcf)	Internal Friction Angle (degrees)	Cohesion (psf)	Comments
Sandy Gravel	150	38	0	Recommend 150 pcf and 38 degrees for loads, and 125 pcf and 34 degrees for resistance.*
Silty Sand	125	34	0	
Pumice	85	38	0	Recommend 85 pcf for loads and 80 pcf for resistance.*

*Recommendations per Memo dated April 18, 2006

In the equations listed herein:

γ = effective unit weight of soil

H = height of wall

(1) Active Lateral Earth Force (yielding walls)

$P_A = 0.5K_A\gamma H^2$ (triangular distribution)

K_A = 0.24 for Sandy Gravel and Pumice

0.28 for Silty Sand

(2) Passive Lateral Earth Force (yielding walls)

$P_P = 0.5K_P\gamma H^2$ (triangular distribution)

K_P = 4.2 for Sandy Gravel and Pumice

3.5 for Silty Sand

(3) At-Rest Lateral Earth Force (non-yielding walls)

$P_O = 0.5K_O\gamma H^2$ (triangular distribution)

K_O = 0.38 for Sandy Gravel and Pumice

0.44 for Silty Sand

(4) At-Rest Lateral Earth Force Modified for Compaction (non-yielding walls)

Use if activity of mechanical compaction equipment is anticipated within a distance equal to half the wall height.

General Equations for walls less than about 8 feet high

$P_O^* = 0.5K_O\gamma H^2$ (triangular distribution)

K_O^* = 2.8 for Sandy Gravel and Pumice

Walls greater than 8 feet high should be considered on a case-by-case basis. Pressures listed above may be reduced by limiting size of compaction equipment permitted within a distance equal to half the wall height.

(5) Seismic Lateral Earth Forces (yielding walls)

Probabilistic Peak Ground Accelerations

General Bridge Site Location	10% PE in 50 Years	2% PE in 50 Years
From Mill Creek North	0.22g - 0.26g	0.60g - 0.63g
South of Mill Creek	0.26g - 0.30g	0.65g - 0.73g

Equations by Okabe (1926) and Mononobe and Matsuo (1929), referenced in Kramer (1996)

Total Active Thrust

$P_{AE} = 0.5K_{AE}\gamma H^2$

K_{AE} = (see table below)

Dynamic Component

$\Delta P_{AE} = P_{AE} - P_A$

P_A has triangular distribution (resultant at H/3 above base of wall)

ΔP_{AE} acts at about 0.6H above base of wall (same direction as P_A)

(5) Seismic Lateral Earth Forces (continued from previous page)

Total Passive Thrust

$P_{PE} = 0.5K_{PE}\gamma H^2$

K_{PE} = (see table below)

Dynamic Component

$\Delta P_{PE} = P_P - P_{PE}$ P_P has triangular distribution (resultant at H/3 above base of wall)

ΔP_{PE} acts at about 0.6H above base of wall (opposite P_P)

Dynamic Earth Pressure Coefficients (for minimal wall displacement)*

Case	Friction Angle	Peak Ground Acceleration			
		0.25	0.30	0.63	0.73
Active (K_{AE})	38	0.35	0.38	0.65	0.77
	34	0.41	0.44	0.75	0.92
Passive (K_{PE})	38	3.77	3.68	3.01	2.76
	34	3.14	3.05	2.39	2.11

* Assumes k_h = 0.8PGHA. See memo dated April 18, 2006

*Dynamic Earth Pressure Coefficients (for wall displacement up to 10A inches**)*

Case	Friction Angle	Peak Ground Acceleration			
		0.25	0.30	0.63	0.73
Active (K_{AE})	38	0.31	0.32	0.44	0.49
	34	0.36	0.37	0.51	0.56
Passive (K_{PE})	38	3.94	3.89	3.51	3.38
	34	3.29	3.24	2.89	2.77

** Assumes k_h = 0.5PGHA. See memo dated April 18, 2006

(6) Seismic Lateral Earth Pressures (non-yielding walls)

Equations by Wood (1973), referenced in Kramer (1996)

Dynamic Thrust

$\Delta P_{eq} = a_h\gamma H^2$

a_h= Peak Ground Acceleration Coefficient (PGA/g)

Dynamic Overturning Moment

$\Delta M_{eq} = 0.53a_h\gamma H^3$

Point of Application of Dynamic Thrust

$h_{eq} = \Delta M_{eq}/\Delta P_{eq}$

$\approx 0.53H$

References

Kramer, S. (1996). "Geotechnical earthquake engineering," Prentice Hall, Upper Saddle River, NJ.

Mononobe, N. and Matsuo, H. (1929). "On the determination of earth pressures during earthquakes," *Proceedings, World Engineering Congress,* 9 p.

Okabe, S. (1926). "General theory of earth pressures," *Journal of the Japan Society of Civil Engineering*, Vol. 12, No. 1.

RB&G Engineering, Inc.

Memo

To: Sohail T. Khan, P.E; Larry Reasch, P.E.
From: Brad Price / Rob Johnson
CC: Steven K. Doerrer, PE; Brian Byrne, PE
Date: April 18, 2006
Re: Response to Design Criteria Questions

Responses to the questions submitted by Steven Doerrer are listed below. The email listing the questions is also attached for reference:

1) As discussed on last week's conference call (4/26/06), recommended total unit weights for fill material are as follows:

   - Regular-Weight Fill – 150 pcf for load calculations, 125 pcf for resistance calculations
   - Lightweight Fill (Pumice) – 85 pcf for load calculations, 80 pcf for resistance calculations

   It has been noted that the unit weight of regular-weight fill varies widely depending upon the source. However, it is our understanding that it is not desirable to limit the potential regular-weight borrow sources by specifying a permissible range of fill unit weight. In the interest of conservatism, we recommend using the larger unit weight to calculate soil loads, and the smaller unit weight to calculate soil resistance. The following values are recommended for fill friction angle:

   - Regular-Weight Fill – 38 degrees for load calculations, 34 degrees for resistance
   - Lightweight Fill (Pumice) – 38 degrees for load and resistance calculations

2) The Mononobe-Okabe equations are in accordance with AASHTO LRFD A11.1.1.1 and do not include inertia forces. Page 11-85 of the AASHTO LRFD states that it is not conservative to neglect inertia forces of the abutment mass. We believe it is appropriate to add seismic inertia forces of the heel backfill and concrete abutments.

3) The dynamic earth pressure coefficients provided previously, K_{AE} and K_{PE}, are for total active and passive thrust, respectively, and include both static and dynamic components. The dynamic components are ΔK_{AE} and ΔK_{PE} and are computed by subtracting the static force from the total thrust as shown on the memo. It should be noted that the equations by Wood (1973) for non-yielding walls provide only the dynamic thrust components of force and moment, and do not include static components.

4) In the memo dated 04/17/06, the horizontal acceleration coefficient k_h was assumed to be 80% of the peak horizontal ground acceleration coefficient for calculation of the Mononobe-

Okabe coefficients K_{AE} and K_{PE}. AASHTO LRFD A11.1.1.2 states that a k_h value equal to ½ the PHGA is adequate for most design purposes, provided that allowance is made for an outward displacement of the abutment of up to 10A inches (see page 11-88), where A is the maximum acceleration coefficient (PHGA). Mononobe-Okabe coefficients *for the 50% reduction* are summarized below, and may be used if allowance is made for the corresponding displacement.

Case	Friction Angle	Peak Ground Acceleration Coefficient			
		0.25	0.30	0.63	0.73
Active (K_{AE})	38	0.31	0.32	0.44	0.49
	34	0.36	0.37	0.51	0.56
Passive (K_{PE})	38	3.94	3.89	3.51	3.38
	34	3.29	3.24	2.89	2.77

If displacement must be minimized, we recommend that the factors shown in the initial memo (04/17/06) be used.

It should be noted that the Mononobe-Okabe factors provided to date neglect vertical acceleration. Seed and Whitman (1970) concluded that vertical accelerations can be ignored when the Mononobe-Okabe analysis is used to estimate P_{AE} for typical wall design (see Kramer, 1996). It is estimated that positive vertical accelerations, if considered, may increase the Seismic Active Thrust coefficient (K_{AE}) by as much as 30%. If desired, the coefficients on the table above can be refined to consider vertical acceleration once Peak Vertical Ground Accelerations have been determined (see Response No. 7 below).

5) We can evaluate the potential pile capacities at different depths and provide results along with uplift. It is assumed that the request of estimated pile tip elevations for compression resistance of 70, 100, and 120 tons applies only to the Pedestrian Bridge over Legacy Parkway (P-21). At any bridge we can evaluate the potential for providing a specific resistance per pile if we are provided with the desired resistance values (see also Response No. 6 below). The given extreme event capacities assume a resistance factor of 1.0, and are reduced for potential liquefaction.

6) It is possible to consider pile diameters larger than 16", although driven piles with diameters/widths greater than 16" are somewhat rare locally and local pile driving capabilities may be limited. Also, it is our understanding that a consistent pile section is preferred for the project to limit potential errors and confusion (primarily during construction). Is increased axial resistance the only reason for considering larger diameter piles? We would like to know the specific purpose for considering other diameters (such as target resistance values), as it would be inefficient to estimate capacities for an unlimited range of diameters, toe elevations, etc.

7) Kleinfelder is working on site-specific response spectra for 1250 West and State Street. It is our understanding that this data will be used to develop general response spectra (including vertical accelerations) for use at all bridge sites.

8) It was agreed at a previous meeting that the structural firms would perform the LPILE analysis using soil parameters provided by the geotechnical engineer. We recommend that p-

multipliers be used as input in LPILE or GROUP to account for group effects. As noted on the LPILE parameters sheet included with the initial recommendations for each structure, p-multipliers for laterally-loaded pile groups are outlined in AASHTO LRFD 10.7.2.4. The factors listed in the 2006 LRFD interim are in relatively good agreement with full-scale pile group lateral load tests performed at the Salt Lake City International Airport, where shallow soils are reasonably representative of the shallow soils typically encountered at the Legacy bridge sites.