Applied Geotechnical Engineering Consultants, P.C.

GEOTECHNICAL INVESTIGATION

PROPOSED 13400 SOUTH WIDENING

BANGERTER HIGHWAY TO 5600 WEST

RIVERTON, UTAH

PREPARED FOR:

MERIDIAN ENGINEERING AND SURVEYING
9217 SOUTH REDWOOD ROAD, SUITE A
WEST JORDAN, UTAH 84088

ATTENTION: STEVE JOHNSON

PROJECT NO. 1050146

APRIL 20, 2005

600 West Sandy Parkway • Sandy, Utah 84070 • (801) 566-6399 • FAX (801) 566-6493

TABLE OF CONTENTS

EXECUTIVE SUMMARY

1. The subsurface materials encountered in borings drilled in the existing road consist of approximately 3½ to 6 inches of asphaltic concrete overlying 3½ to 18 inches of base course. Approximately 2½ feet of fill was encountered below the base course in Boring B-11. Gravel was encountered below the base course in Borings B-1 and B-2 and extends the full depth of these borings. Clay was encountered below the base course or fill in the other borings in the pavement. Sand and/or gravel was encountered below the clay in Borings B-3, B-4, B-5 and B-9 at depths of approximately 4, 5, 3 and 5 feet, respectively. Borings B-6, B-7, B-8 and B-10 were drilled out of pavement areas and encountered clay except in Boring B-10 where approximately ½ foot of fill overlying clay was encountered.

2. No subsurface water was encountered to the maximum depth investigated, approximately 15½ feet in Boring B-9 and 5½ feet in the other borings.

3. Based on traffic information provided by Interplan Company and truck traffic distribution numbers for UDOT roads in the area, subsurface conditions encountered in the borings and design methods presented by UDOT, a surface course consisting of 1 inch of plant mix seal coat overlying 6 inches of hot mix asphalt is recommended for the road west of the proposed Mountain View corridor. Seven inches of untreated base course overlying 12 inches of granular borrow are recommended below the asphaltic concrete. The natural gravel could be considered equivalent to granular borrow and thus granular borrow would not be needed where the subgrade consists of at least 12 inches of gravel.

   For the portion of the road east of the proposed Mountain View corridor, the pavement section recommended consists of 1 inch of plant mix seal coat overlying 7 inches of hot mix asphalt. Eight inches of untreated base course overlying 12 inches of granular borrow are recommended below the asphaltic concrete.

   Rigid pavement sections consisting of 10 and 11 inches of Portland cement concrete for the portion of the road west of the proposed Mountain View corridor and east of the proposed Mountain View corridor, respectively, may be used for a 20 year design life.

4. The pavement materials should meet the specifications for the applicable jurisdiction.

5. Geotechnical information related to subgrade preparation, materials and compaction is included in the report.

SCOPE

This report presents the results of a geotechnical investigation for the proposed 13400 South Street between Bangerter Highway and 5600 West in Riverton, Utah. The report presents the subsurface conditions encountered, laboratory test results and recommendations for the pavement. The study was performed in general accordance with our proposal dated February 9, 2005.

The borings were drilled to obtain information on the subsurface conditions and to obtain samples for laboratory testing. Information obtained from the field and laboratory was used to define the subgrade conditions and to develop recommendations for the proposed pavement reconstruction.

This report has been prepared to summarize the data obtained during the study and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of geotechnical engineering considerations related to construction are included in the report.

SITE CONDITIONS

At the time of our field investigation, 13400 South Street consisted of a one to three-lane, asphalt-paved road in good condition.

The ground surface at the site generally slopes down at a relatively gentle slope to the east.

The areas north and south of the road generally consist of farm fields. There are some subdivisions and commercial buildings along the road. There is a canal crossing near Boring B-9.

FIELD STUDY

The field study was conducted on March 1, 2005. Eleven borings were drilled at the approximately locations indicated on Figure 1. The borings were drilled with 8-inch diameter hollow-stem auger powered by a truck-mounted drill rig. The borings were logged and soil samples obtained by a representative from AGEC. Logs of the subsurface conditions encountered in the borings are shown graphically on Figure 2 with legend and notes on Figure 3.

SUBSURFACE CONDITIONS

The subsurface materials encountered in borings drilled in the existing road consist of approximately 3½ to 6 inches of asphaltic concrete overlying 3½ to 18 inches of base course. Approximately 2½ feet of fill was encountered below the base course in Boring B-11. Gravel was encountered below the base course in Borings B-1 and B-2 and extends the full depth of these borings. Clay was encountered below the base course or fill in the other borings in the pavement. Sand and/or gravel was encountered below the clay in Borings B-3, B-4, B-5 and B-9 at depths of approximately 4, 5, 3 and 5 feet, respectively. Borings B-6, B-7, B-8 and B-10 were drilled out of pavement areas and encountered clay except in Boring B-10 where approximately ½ foot of fill overlying clay was encountered.

A description of the various soils encountered in the borings follows:

Base Course - The base course consists of silty sand and gravel which is moist to very moist and brown. Results of gradation tests performed on samples of the base course are presented on Figure 8. The gradation of the material generally meets the UDOT specifications for base course with the exception of slightly greater fines.

Fill - The fill consists of silty sand with gravel which is moist and brown.

Lean Clay - The clay contains small to large amounts of sand and gravel and some sand and gravel layers. It is medium stiff to hard, moist to very moist and brown to dark brown.

Laboratory tests performed on a sample of the clay indicate that it has a natural moisture content of 25 percent and a natural dry density of 95 pounds per cubic foot (pcf). Results of Moisture/Density Relationship and California Bearing Ratio (CBR) tests are presented on Figures 4 through 7.

Silty Sand - The sand contains some gravel and occasional clayey layers. It is medium dense, moist and brown.

Clayey Gravel - The gravel contains a moderate amount of sand and some clay layers. It is medium to very dense, moist and brown.

Results of laboratory tests indicate that the gravel has a natural moisture content of 12 percent and a natural dry density of 113 pcf.

Silty Gravel - The gravel contains a moderate amount of sand. It is very dense, moist and brown.

Results of the laboratory tests are summarized on Table I and are included on the logs of the exploratory borings.

SUBSURFACE WATER

No subsurface water was encountered to the maximum depth investigated, approximately 15½ feet in Boring B-9 and 5½ feet in the other borings.

PROPOSED CONSTRUCTION

We understand that the portion of the road west of the proposed Mountain View corridor will be four lanes and the portion east of the corridor will be six lanes.

Based on information provided by Interplan Company, the projected traffic for the year 2030 for the western portion of the road will be approximately 30,000 vehicles per day and for the portion of the road east of the proposed corridor, 56,000 vehicles per day. We have assumed approximately 10,000 and 20,000 vehicles per day for current traffic west and east of the proposed corridor, respectively. We have assumed that traffic would increase linearly from today's volume to the projected future volume, but have assumed that this would occur over a 20 year period. We have assumed 45 percent of the trucks in the design lane for the four-lane road and 40 percent for the six-lane road. Based on the assumptions, the following traffic has been used in design of the road.

Road Section	Pavement Type	ESAL/Day
Four Lane	Flexible	605
Four Lane	Rigid	880
Six Lane	Flexible	1,024
Six Lane	Rigid	1,500

The term ESAL/Day represents equivalent 18 kip single-axle loads per day.

If the anticipated traffic is significantly different from what is described, we should be notified so that we can reevaluate the recommendations given.

RECOMMENDATIONS

Based on the subsurface conditions encountered, laboratory test results and the assumed traffic for the road, the following recommendations are given:

A. Subgrade Preparation

We understand that existing asphalt material will be removed.

Topsoil, organics, unsuitable fill and other deleterious materials should be removed. The subgrade should be proof-rolled with moderately loaded rubber-tired equipment to identify soft areas. Soft areas should be removed and replaced with properly compacted granular borrow.

B. Compaction

Materials placed during grading or replacement of soft areas should be compacted to at least 90 percent of the maximum dry density as determined by AASHTO T-180.

Granular borrow and base course should be compacted to at least 95 percent of the maximum dry density as determined by AASHTO T-180.

Fill, granular borrow and base course should be compacted at a moisture content within 2 percent of the optimum moisture content.

LIMITATIONS

This report has been prepared in accordance with generally accepted soil engineering practices in the area for the use of the client for design purposes. The conclusions and recommendations included within the report are based on the information obtained from the borings drilled at the approximate locations indicated on Figure 1 and the data obtained from laboratory testing. Variations in the subsurface conditions may not become evident until additional excavation or exploration is conducted. If the subsurface soil conditions or water level is found to be significantly different from what is described above, we should be notified to reevaluate the recommendations given.

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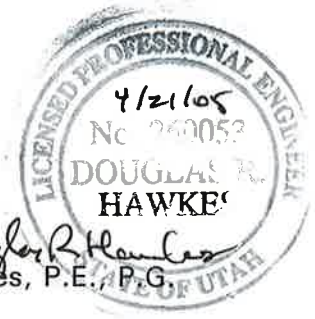
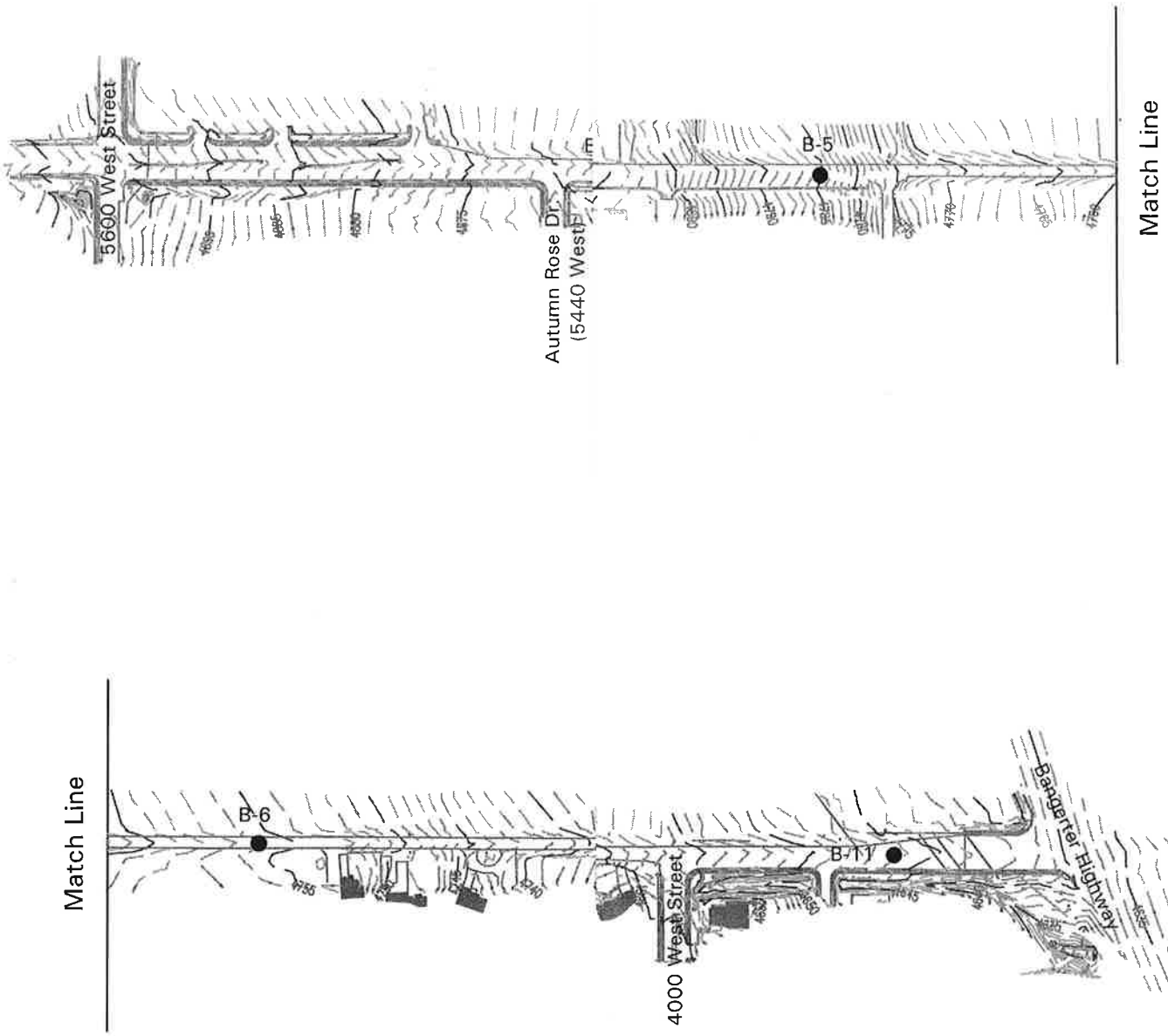


Douglas R. Hawkes, P.E., P.G.

Reviewed by Jay R. McQuivey, P.E.

DRH/dc



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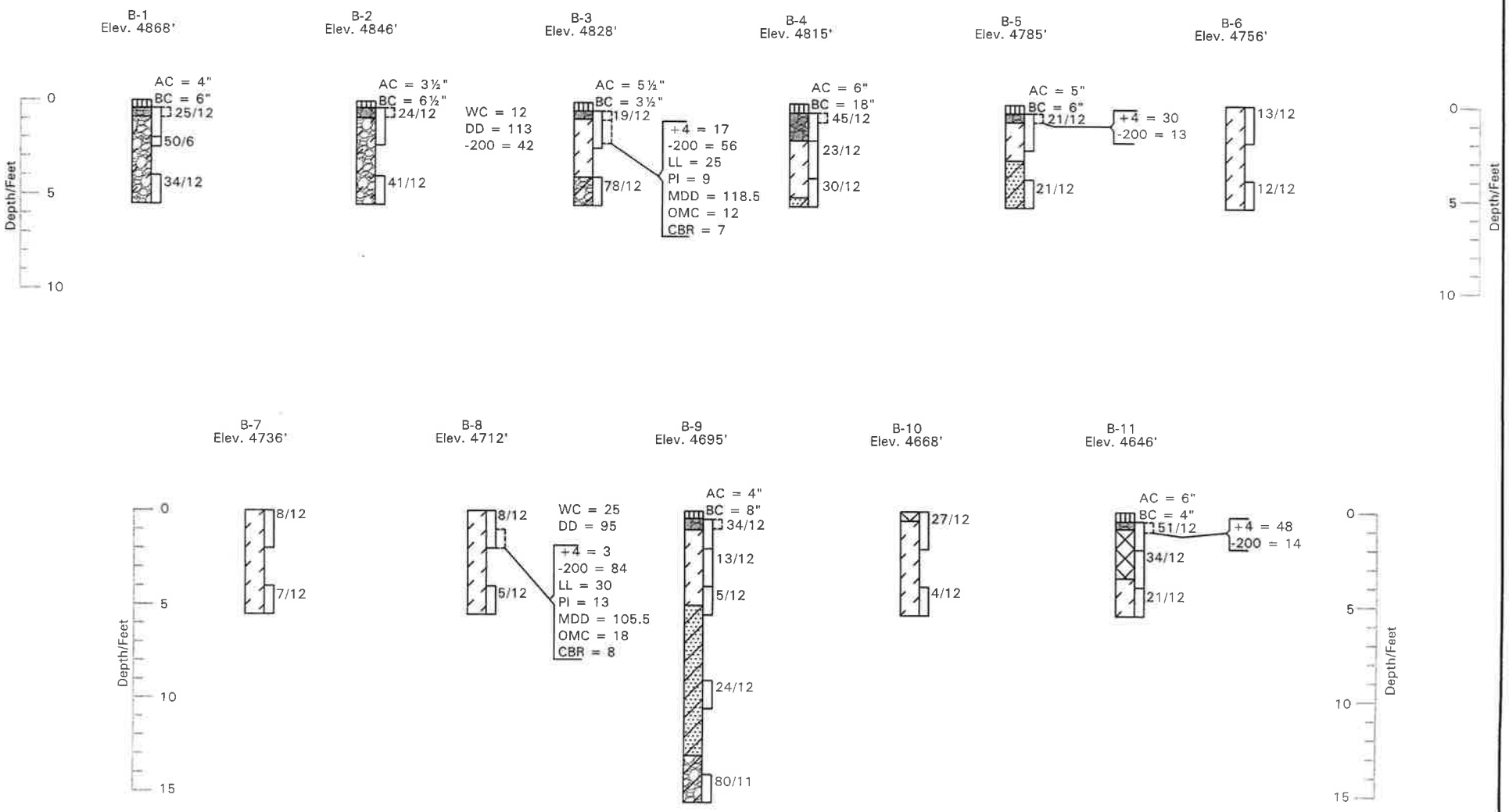
1050146	AGEC	Loca	Figure 1



Approximate Vertical Scale 1" = 8'

See Figure 3 for Legend and Notes

1050146	AGEC	Logs of Exploratory Borings	Figure 2

LEGEND:


Asphaltic Concrete.


Base Course; silty sand and gravel, moist to very moist, brown.


Fill; silty sand with gravel, moist, brown.


Lean Clay (CL); small to large amount of sand and gravel, some sand and gravel layers, medium stiff to hard, moist to very moist, brown to dark brown.


Silty Sand (SM); some gravel, occasional clayey layers, medium dense, moist, brown.


Clayey Gravel with Sand (GC); clay layers, medium to very dense, moist, brown.


Silty Gravel with Sand (GM); very dense, moist, brown.


10/12 California Drive sample taken. The symbol 10/12 indicates that 10 blows from a 140 pound hammer falling 30 inches were required to drive the sampler 12 inches.


Indicates disturbed sample taken.

NOTES:

1. Borings were drilled on March 1, 2005 with 8-inch diameter hollowstem auger.
2. Locations of borings were measured approximately by pacing from features shown on the site plan provided.
3. Elevations of borings were determined by interpolating between contours shown on the site plan provided.
4. The boring locations and elevations should be considered accurate only to the degree implied by the method used.
5. The lines between the materials shown on the boring logs represent the approximate boundaries between material types and the transitions may be gradual.
6. No free water was encountered in the borings at the time of drilling.
7. WC = Water Content (%);
   DD = Dry Density (pcf);
   +4 = Percent Retained on No. 4 Sieve;
   -200 = Percent Passing No. 200 Sieve;
   MDD = Maximum Dry Density (pcf);
   OMC = Optimum Moisture Content (%);
   CBR = California Bearing Ratio (%);
   AC = Asphaltic Concrete Thickness;
   BC = Base Course Thickness.

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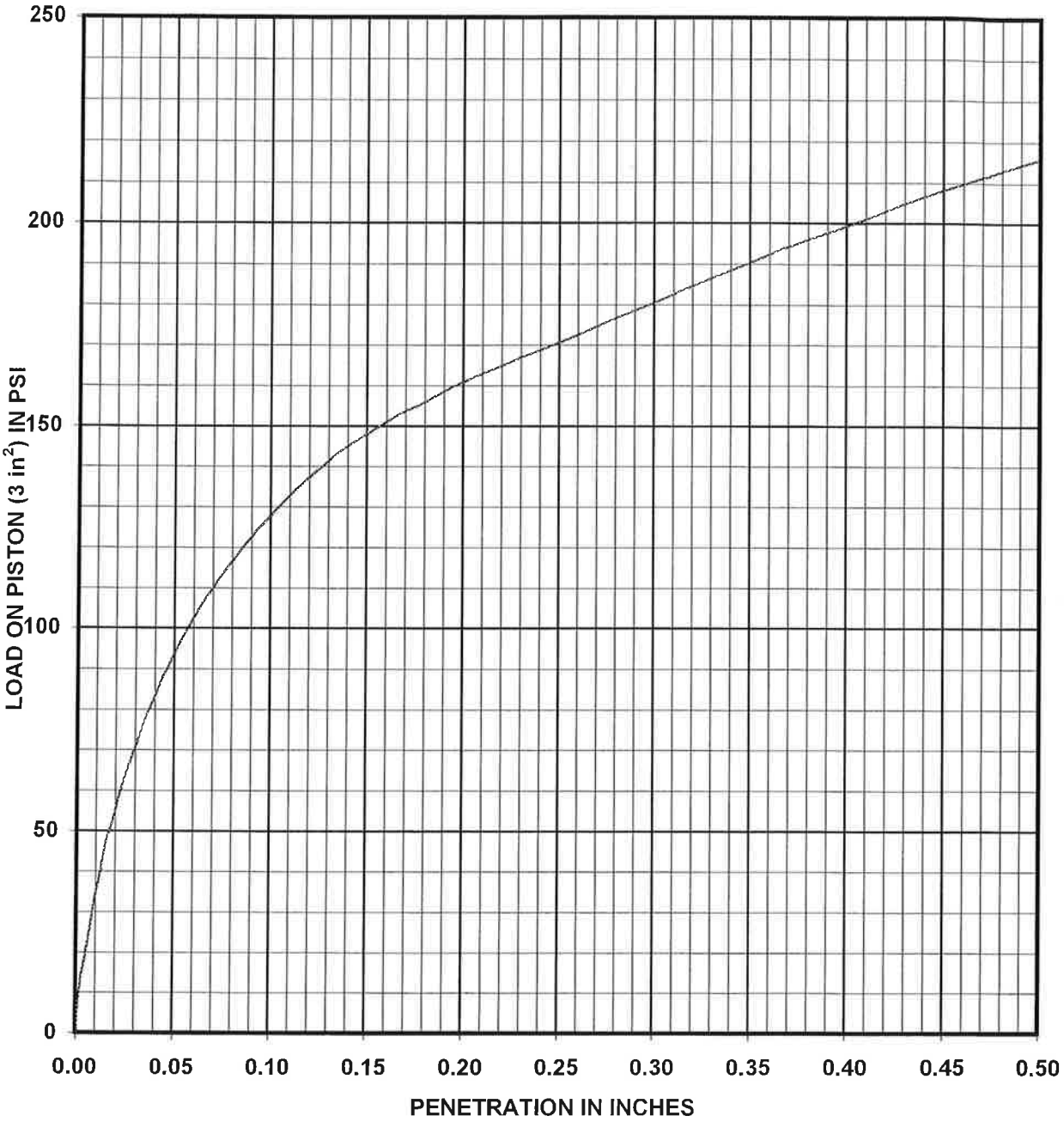

Sample of Sandy Lean Clay with Gravel (CL)
Location: B-3 @ 1-2'
Method of sample preparation: Remolded to approximately 100% of the maximum dry density near the optimum moisture content as per AASHTO T-99

Sample penetration after soaking for 96 hours

Dry Density:	as molded	118 pcf	Moisture Content:	as molded	12	percent
	after soaking	119 pcf		top 1-inch after soaking	13	percent
Swell:	after soaking	0.0 percent		average after soaking	13	percent

Bearing Ratio of Sample, **CBR =** 7* percent with a surcharge of 25 lb

Proj. No. 1050146 **CALIFORNIA BEARING RATIO TEST RESULTS** Figure 4

*Adusted as recommended by UDOT for 95% compaction.

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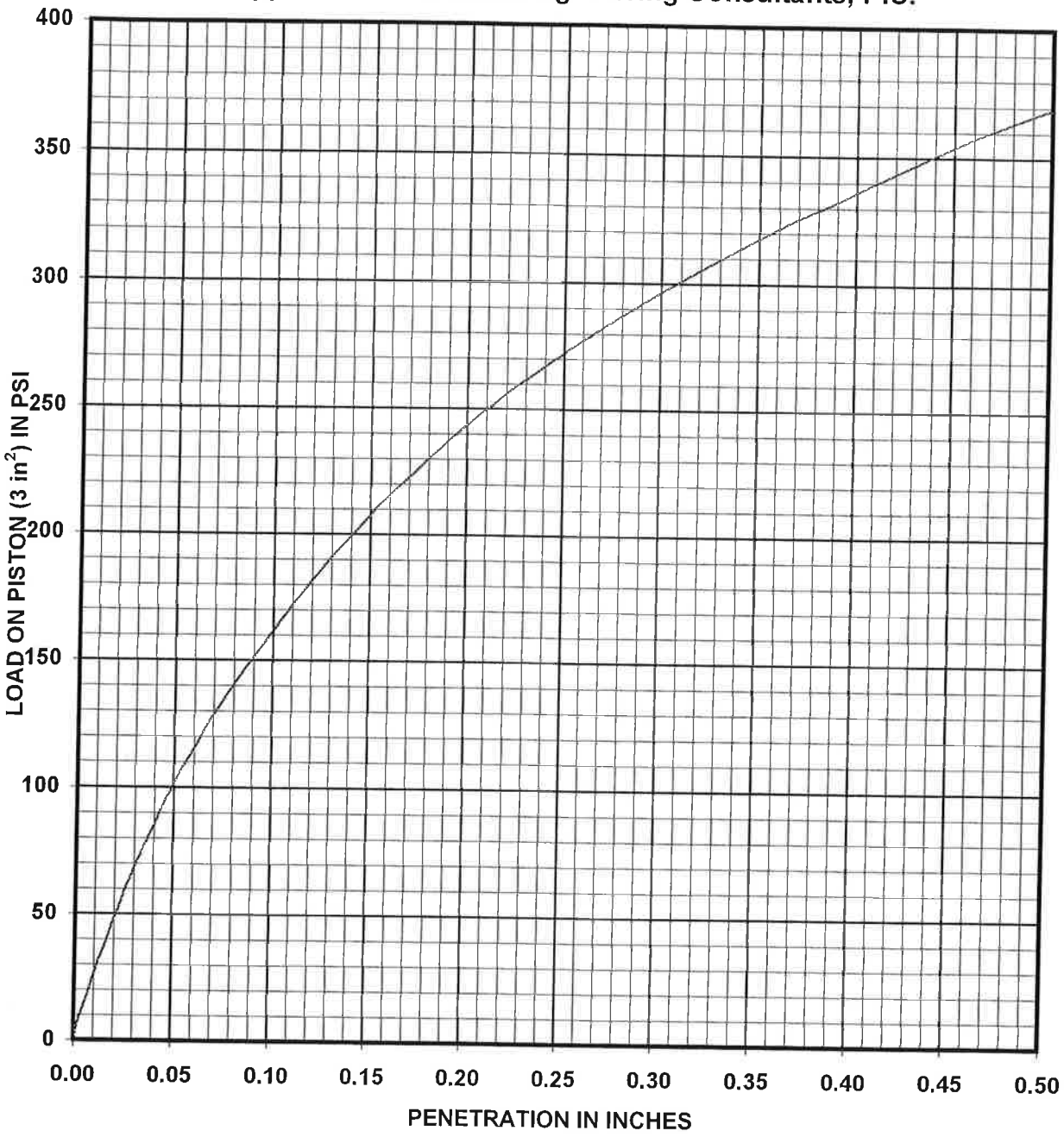

Sample of Lean Clay with Sand (CL)

Location: B-8 @ 1-2'

Method of sample preparation: Remolded to approximately 100% of the maximum dry density near the optimum moisture content as per AASHTO T-99

Sample penetration after soaking for 96 hours

Dry Density:	as molded	106 pcf	Moisture Content:	as molded	18	percent
	after soaking	108 pcf		top 1-inch after soaking	17	percent
Swell:	after soaking	0.0 percent		average after soaking	18	percent

Bearing Ratio of Sample, **CBR =** 8* percent with a surcharge of 25 lb

Proj. No. 1050146 **CALIFORNIA BEARING RATIO TEST RESULTS** Figure 5

*Adjusted as recommended by UDOT for 95% compaction.