AGEC
Applied GeoTech

Hidden Acres

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL SUBDIVISION
APPROXIMATELY 13200 SOUTH 3300 WEST
RIVERTON, UTAH

PREPARED FOR:

IVORY HOMES
978 EAST WOODOAK LANE
SALT LAKE CITY, UTAH 84107

ATTENTION: DARON YOUNG

PROJECT NO. 1120908 DECEMBER 11, 2012

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EXECUTIVE SUMMARY

1. Up to approximately ½ foot of topsoil was encountered in the upper portion of test pits excavated at the site. The soil encountered below the topsoil consists predominantly of lean clay extending to depths of approximately 10 feet below the surrounding ground surface. The natural soil encountered below the clay consists of layers of silt, silty sand and silty gravel extending the full depth investigated in Test Pits TP-2 and TP-3. Lean clay extends the full depth investigated in Test Pits TP-1 and TP-4.

2. No subsurface water was encountered in the test pits at the time of excavation to the maximum depth investigated, approximately 15½ feet.

3. Based on conditions encountered during our investigation and our experience in the area, the upper clay is sensitive to changes in moisture (collapsible). The clay tested in the laboratory was found to collapse when wetted and becomes significantly more compressible after wetting. The thickness of collapsible soil is approximate 10 feet along the eastern portion of the site (Test Pits TP-1 and TP-4) and up to approximately 6½ feet along the west side of the site (Test Pits TP-2 and TP-3). **In its existing condition, the upper clay extending down to depths of approximately 6½ and 10 feet along the west and east sides of the site, respectively, is not suitable to support the proposed construction.**

   We recommend that the moisture-sensitive soil be removed from below the proposed building areas and replaced with compacted structural fill. As an alternative to removing the moisture-sensitive soil, consideration may be given to supporting the buildings on deep foundations such as helical piers, micropiles or other deep foundation systems to extend support down to suitable materials. Another consideration would be to support the structure on spread footings bearing on improved soils utilizing soil improvement methods such as stone columns.

4. Spread footing bearing on the undisturbed natural nonmoisture-sensitive soil or on at least 2 feet of properly compacted structural fill consisting of fine-grained soil, such as the on-site soil, may be designed using an allowable net bearing pressure of 1,500 pounds per square foot (psf) where at least 2 feet of compacted granular structural fill is provided below the bottom footings and extending out a distance of at least 2 feet beyond the edge of the footings. The footings may be designed using an allowable net bearing pressure of 3,000 psf. Additional foundation recommendations are included in the report.

Executive Summary (continued)

5. **There is a risk of differential settlement for pavement and exterior concrete flatwork where they are constructed above moisture-sensitive soils.** Where the moisture-sensitive soil is left in-place below pavement and other improvements, the soil may collapse and become more compressible when wetted. We estimate potential settlement up to approximately 2 inches if the moisture-sensitive soil remains below pavement and flatwork concrete and becomes wet. Removal of the moisture-sensitive soil below these areas and replacing it with properly compacted fill would eliminate the risk of movement due to moisture-sensitive soil. If the moisture-sensitive soil is to remain below these areas, the potential amount of differential settlement can be reduced by taking precautions to reduce the potential for water being introduced into the natural soil below the pavement and exterior concrete flatwork. A portion of the moisture-sensitive soil could be removed and replaced with low permeable compacted fill to further reduce the amount of potential differential settlement. The on-site clay could be used as low permeable fill if properly placed and compacted at a moisture content within 2 percent of the optimum moisture content.

6. The upper natural soil consists of lean clay. Where the subgrade consists of clay, construction access difficulties may be encountered for rubber-tired construction equipment during periods when the upper soil is very moist to wet. Placement of granular fill may be needed to provide equipment access and to facilitate construction of the pavement when the upper soil is very moist to wet.

7. Geotechnical information related to foundations, subgrade preparation, pavement design and materials is included in the report.

SCOPE

This report presents the results of a geotechnical investigation for the proposed residential subdivision to be constructed at approximately 12300 South 3300 West in Riverton, Utah. The report presents the subsurface conditions encountered, laboratory test results and recommendations for foundations and pavement. The study was conducted in general accordance with our proposal dated November 1, 2012.

Field exploration was conducted 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 conditions at the site and to develop recommendations for the proposed foundations and pavement.

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

The site consists of undeveloped land. There are no permanent structures or pavements on the property. There is a buried sewer line that crosses the site in a north/south direction along approximately 3300 West. The buried sewer line also extends in an east/west direction tying into the stub road off of 3400 West Street.

The ground surface at the site is relatively flat with a gentle slope down to the east. There is approximately 8 feet of elevation difference across the site. Vegetation at the site consists primarily of grass, weeds and occasional trees.

The site is bounded to the north, west and south by residential development which consists of one to two-story residences with basements. An unlined canal extends along the east side of the site. The bottom of the canal is approximately 4 feet below the adjacent ground surface. No water was in the canal at the time of our field study.

FIELD STUDY

Four test pits were excavated at the site on November 20, 2012 at the approximate locations indicated on Figure 1. The test pits were excavated with a rubber-tired backhoe. The test pits were logged and soil samples obtained by an engineer from AGEC. Logs of the subsurface conditions encountered in the test pits are graphically shown on Figure 2 with legend and notes on Figure 3.

The test pits were backfilled without significant compaction. The backfill in the test pits should be removed and properly compacted where it will support proposed buildings, slabs or pavement.

SUBSURFACE CONDITIONS

Up to approximately ½ foot of topsoil was encountered in the upper portion of test pits excavated at the site. The soil encountered below the topsoil consists predominantly of lean clay extending to depths of approximately 10 feet below the surrounding ground surface. The natural soil encountered below the fill consists of layers of silt, silty sand and silty gravel extending the full depth investigated in Test Pits TP-2 and TP-3. Lean clay extends the full depth investigated in Test Pits TP-1 and TP-4.

A description of the various soils encountered in the test pits follows:

Topsoil - The topsoil consists of lean clay with sand. It is sightly moist and brown to dark brown with roots and organics.

Lean Clay - The clay contains small to moderate amounts of silt and sand. The clay has a slight to moderate porous structure. It is stiff to very stiff, slightly moist and brown.

Laboratory tests conducted on samples of the clay indicate that it has natural moisture contents ranging from 7 to 13 percent and natural dry densities ranging from 67 to 86 pounds per cubic foot (pcf).

Consolidation tests conducted on samples of the clay indicate that it will compress a small to moderate amount with the addition of light to moderate loads. The upper clay exhibits sensitivity with changes in moisture. The sample tested from Test Pit TP-3 at a depth of approximately 2 feet collapsed approximately 2 percent under a constant pressure of 1,000 pounds per square foot (psf) when wetted. The samples also exhibited moderate compressibility after wetting. Results of the consolidation tests are presented on Figures 4 through 9.

The results of the consolidation tests presented reflect the measurements obtained in the laboratory. Interpretation of the data should include the uncertainty and variability inherent to the testing process.

Silt - The silt contains moderate amounts of sand. It is occasionally, slightly porous, stiff and orange brown.

Silty Sand - The sand is medium dense, slightly moist and brown.

Silty Gravel - The gravel contains small to moderate amounts of silt, sand and occasional gravel and cobbles up to approximately 6 inches in size. It is medium dense, slightly moist and brown.

Results of the laboratory tests are summarized on Table I and are included on the logs of the exploratory test pits, Figure 2.

SUBSURFACE WATER

No subsurface water was encountered in the test pits at the time of excavation to the maximum depth investigated, approximately 15½ feet.

PROPOSED CONSTRUCTION

We understand that the site consists of approximately 13½ acres and is planned to be subdivided into single-family residential building lots. We anticipate that houses will consist of one to three-story, wood-frame structures with basements. We have assumed building loads will consist of wall loads of up to 3 kips per lineal foot and column loads of up to 25 kips, based on typical residential construction in the area. We anticipate that paved roads will extend through the proposed development. We have assumed traffic consisting of up to 1,000 cars and 5 delivery trucks per day and 2 garbage trucks and 5 buses per week.

If the proposed construction, building loads or anticipated traffic is significantly different from what is described above, we should be notified so that we can reevaluate our recommendations.

RECOMMENDATIONS

Based on the subsurface conditions encountered, laboratory test results and the proposed construction, the following recommendations are given:

A. Moisture-Sensitive Soil

Based on conditions encountered during our investigation and our experience in the area, the upper clay is sensitive to changes in moisture (collapsible). The thickness of collapsible soil is approximate 10 feet along the eastern portion of the site (Test Pits TP-1 and TP-4) and up to approximately 6½ feet along the west side of the site (Test Pits TP-2 and TP-3). **In its existing condition, the upper clay extending down to depths of approximately 6½ and 10 feet along the west and east sides of the site, respectively, is not suitable to support the proposed construction.**

We recommend that the moisture-sensitive soil be removed from below the proposed building areas and replaced with compacted structural fill. As an alternative to removing the moisture-sensitive soil, consideration may be given to supporting the buildings on deep foundations such as helical piers, micropiles or other deep foundation systems to extend support down to suitable materials. Another consideration would be to support the structure on spread footings bearing on improved soils utilizing soil improvement methods such as stone columns.

The presence of moisture-sensitive soil may also affect the performance of pavements and exterior concrete flatwork when the underlying moisture-sensitive soil becomes wetted.

Due to the uncertainty of the depth and extent of the moisture-sensitive soil across the site, a representative of AGEC should observe foundation excavations prior to placement of structural fill to help determine that the moisture-sensitive soil has been removed and to provide additional recommendations and mitigative alternatives as needed.

B. Site Grading

Final site grading plans were not available at the time of our investigation. We anticipate minor amounts of cut and fill (less than 3 feet) will be required to facilitate construction at the site. Site grading fill should be placed well in advance of construction of the proposed structures. Placement of site grading fill above the present grade can result in significant settlement, due to the compressible nature of the underlying soils. Most of this settlement will occur when the soil becomes wetted well after construction has occurred. Thus, the settlement could have negative effects on structures, slabs and pavement. If a significant amount of additional site grading fill is planned to be placed over relatively large areas, we should be notified to provide additional recommendations.

Topsoil, organics, unsuitable, fill, debris and other deleterious materials should be removed from below proposed building and pavement areas.

1. <u>Subgrade Preparation</u>

The presence of moisture-sensitive soil may also affect the performance of pavement and exterior concrete flatwork when the underlying moisture-sensitive soil becomes wetted. When the moisture-sensitive soil below pavement and flatwork areas become wetted, the pavement and other surface facilities may experience uneven settlement.

Where the moisture-sensitive soil is left in-place below pavement and other improvements, the soil may collapse and become more compressible when wetted. We estimate potential settlement up to approximately 2 inches if the moisture-sensitive soil remains below pavement and flatwork concrete and becomes wet. Removal of the moisture-sensitive soil below these areas and replacing it with properly compacted fill would eliminate the risk of movement due to moisture-sensitive soil. If the moisture-sensitive soil is to remain below these areas, the potential amount of differential settlement can be reduced by taking precautions to reduce the potential for water being introduced into the natural soil below the pavement and exterior concrete flatwork. A portion of the moisture-sensitive soil could be removed and replaced with low permeable compacted fill to further reduce the amount of potential differential settlement. The on-site clay could be used as low permeable fill if properly placed and compacted at a moisture content within 2 percent of the optimum moisture content.

Prior to placing grading fill or base course, the subgrade in proposed pavement areas should be scarified to a depth of approximately 8 inches, the moisture adjusted to between optimum and approximately 4 percent above the optimum moisture content and the subgrade compacted to at least 95 percent of the maximum dry density as determined by ASTM D 698. The subgrade should then be proof-rolled to identify soft areas. Soft areas should be removed and replaced with properly compacted low permeable fill.

Construction equipment access difficulties can be expected for rubber-tired construction equipment when the subgrade is very moist to wet, such as in the winter or spring. Placement of 1½ to 2 feet of granular fill will provide equipment access for rubber construction equipment above a very moist to wet clay subgrade.

2. <u>Excavation</u>

We anticipate that excavation at the site can be accomplished with conventional excavation equipment. Consideration should be given to using excavation equipment with a flat cutting edge when excavating in fine-grained soil to minimize disturbance of the bearing soil.

3. <u>Slopes</u>

Temporary unretained cut slopes up to approximately 10 feet high may be constructed at approximately ½ horizontal to 1 vertical or flatter in areas of lean clay. Larger cuts should be considered on an individual basis. The risk of slope instability will be significantly increased if seepage is encountered.

Permanent unretained cut and fill slopes may be constructed at 2 horizontal to 1 vertical or flatter.

Fill slopes should be compacted to at least 90 percent of the maximum dry density as determined by ASTM D 1557 (at least 95 percent when using ASTM D 698). The ground surface underlying the proposed fills should be prepared by removing significant organic matter, debris and other deleterious materials.

Good surface drainage should be provided upslope of cut and fill slopes to direct surface runoff away from the cut or fill face. Slopes should be protected from erosion by revegetation or other methods.

4. Materials

Listed below are materials recommended for imported structural fill.

Fill to Support	Recommendations
Footings	Non-expansive granular soil Passing No. 200 Sieve < 35% Liquid Limit < 30% Maximum size 4 inches
Floor Slab (Upper 4 inches)	Sand and/or Gravel Passing No. 200 Sieve < 5% Maximum size 2 inches
Slab Support	Non-expansive granular soil Passing No. 200 Sieve < 50% Liquid Limit < 30% Maximum size 6 inches

Ideally, the fill placed below building areas would consist of granular soil as indicated above. However, if removal and replacement of the moisture-sensitive soil is selected to mitigate the moisture-sensitive soil concern, the natural clay and silt may be considered for reuse as structural fill below the proposed buildings if the moisture of the soil is adjusted to within 2 percent of the optimum moisture content and full-time observation and testing is provided by a representative of AGEC. Use of the natural soil as structural fill may not be practical during cold or wet times of the year.

The natural soil may also be used as site grading fill below areas of proposed pavement or other site improvements or as utility trench or foundation wall backfill. The wall backfill should consist of low permeable soil such as the natural clay or silt. Where fine-grained soil such as the on-site clay and silt is used as fill, the moisture content of the soil should be adjusted to within 2 percent of the optimum moisture content to facilitate compaction. This will likely require significant moisture conditioning (wetting or drying) depending on whether the moisture of the soil is above or below the optimum moisture content at the time of construction. Drying of the soil may not be practical during cold or wet times of the year.

5. Compaction

The following table presents the compaction criteria for the areas of fill placement and the type of fill placed. **Note the change in the ASTM criteria for each fill material type.**

Fill to Support	Granular Fill (ASTM D 1557)	On-site Fine-grained Fill (ASTM D 698)
Foundations	≥95%	≥100%
Concrete Slabs and Pavement	≥90%	≥95%
Landscaping	≥85%	≥90%
Retaining Wall Backfill	≥85% to 90%	≥90% to 95%

To facilitate the compaction process, the fill should be compacted at a moisture content within approximately 2 percent of the optimum moisture content.

Base course should be compacted to at least 95 percent of the maximum dry density as determined by ASTM D 1557.

Fill and pavement materials placed for the project should be frequently tested for compaction. Full time testing and observations is recommended when placing and compacting fine-grained soil. Fill should be placed in thin enough lifts to allow for proper compaction.

6. Drainage

The ground surface surrounding the proposed buildings should be sloped away from the buildings in all directions. Roof downspouts and drains should discharge beyond the limits of backfill.

Foundation wall backfill should be placed in lifts and properly compacted. The upper 2 feet of foundation wall backfill should consist of compacted clay or silt.

The collection and diversion of drainage away from the pavement is important to the satisfactory performance of the pavement section. Proper drainage should be provided.

C. Foundations

1. Bearing Material

With the proposed construction and the subsurface conditions encountered, the proposed houses may be supported on spread footings bearing on the undisturbed natural non-moisture-sensitive soil or on compacted structural fill extending down to the undisturbed natural nonmoisture-sensitive soil. Structural fill placed below foundations should extend out away from the edge of footings a distance at least equal to the depth of fill beneath footings.

We recommend that the moisture-sensitive soil be removed from below the proposed building areas and replaced with compacted structural fill. As an alternative to removing the moisture-sensitive soil, consideration may be given to supporting the buildings on deep foundations such as helical piers, micropiles or other deep foundation systems to extend support down to suitable materials. Another consideration would be to support the structure on spread footings bearing on improved soils utilizing soil improvement methods such as stone columns.

Unsuitable fill, moisture-sensitive soil, topsoil, organics and other deleterious materials should be removed from below proposed foundation areas.

2. <u>Bearing Pressure</u>

Spread footing bearing on the undisturbed natural nonmoisture-sensitive soil or on at least 2 feet of compacted structural fill consisting of the on-site fine-grained soil, extending down to the undisturbed natural nonmoisture-sensitive soil may be designed using an allowable net bearing pressure of 1,500 psf.

Spread footings bearing on at least 2 feet of properly compacted granular structural fill extending down to the undisturbed natural nonmoisture-sensitive soil may be designed using an allowable net bearing pressure of 3,000 psf.

Footings should have a width of at least 1½ feet and a minimum depth of embedment of 1 foot.

3. Temporary Loading Conditions

The allowable bearing pressure may be increased by one-half for temporary loading conditions such as wind or seismic loads.

4. Settlement

We estimate that total and differential settlement due to the proposed structures will be on the order of 1 and ¾ inches, respectively for footings designed and constructed as indicated above.

Care will be required not to disturb the natural soil at the base of foundation excavations in order to maintain settlement within tolerable limits.

5. Frost Depth

Exterior footings and footings beneath unheated areas should be placed at least 30 inches below grade for frost protection.

6. Foundation Base

The base of foundation excavations should be cleared of loose or deleterious material prior to fill or concrete placement.

7. Construction Observation

A representative of the geotechnical engineer should observe footing excavations prior to structural fill or concrete placement. This is particularly important since moisture-sensitive soil was encountered at the site.

D. Concrete Slab-on-Grade

1. Slab Support

Concrete slabs may be supported on compacted structural fill extending down to the undisturbed natural non-moisture-sensitive soil. Moisture-sensitive soil, unsuitable fill, topsoil, organics, debris and other deleterious materials should be removed from below proposed floor slab areas.

As an alternative to removing the moisture-sensitive soil from below concrete slabs, consideration may be given to providing a structural floor supported by the building foundations or providing ground improvement below slab-on-grade floors.

To reduce the potential of slab distress due to differential movement, consideration may be given to providing a positive joint between the bearing walls and the floor slab to allow unrestrained vertical movement.

2. Underslab Sand and/or Gravel

A 4-inch layer of free draining sand and/or gravel (less than 5 percent passing the No. 200 sieve) should be placed below floor slabs for ease of construction and to promote even curing of the slab concrete.

3. Vapor Barrier

A vapor barrier should be placed under the concrete floor if the floor will receive an impermeable floor covering. The barrier will reduce the amount of water vapor passing from below the slab to the floor covering.

E. Lateral Earth Pressure

1. Lateral Resistance for Footings

Lateral resistance for footings placed on the natural soil or on compacted structural fill is controlled by sliding resistance between the footing and the foundation soils. Friction value of 0.35 and 0.45 may be used in design for ultimate lateral resistance for footings bearing on the fine-grained soil (clay and silt) and granular soil, respectively.

2. Subgrade Walls and Retaining Structures

The following equivalent fluid weights are given for the design of subgrade walls and retaining structures. The active condition is where the wall moves away from the soil. The passive condition is where the wall moves into the soil and the at-rest condition is where the wall does not move. The values listed below assume a horizontal surface adjacent the wall.

Soil Type	Active	At-Rest	Passive
Clay & Silt	50 pcf	65 pcf	250 pcf
Sand & Gravel	40 pcf	55 pcf	300 pcf

3. Seismic Conditions

Under seismic conditions, the equivalent fluid weight should be increased by 32 and 17 pcf for active and at-rest conditions, respectively, and decreased by 32 pcf for passive conditions. This assumes a horizontal ground acceleration of 0.46g for a 2 percent probability of exceedance in a 50-year period (Frankel and others, 2002).

4. Safety Factors

The values recommended above assume mobilization of the soil to achieve the soil strength under active and passive conditions. Conventional safety factors used for structural analysis for such items as overturning and sliding resistance should be used in design.

F. Seismicity, Faulting and Liquefaction

1. Seismicity

Listed below is a summary of the site parameters for the 2009 International Building Code.

a.	Site Class	D
b.	Short Period Spectral Response Acceleration, S_S	1.12g
c.	One Second Period Spectral Response Acceleration, S_1	0.46g

2. Faulting

There are no mapped active faults extending through the subject property. The closest mapped fault to the site considered active is the Wasatch Fault located approximately 6.9 miles east of the site (Salt Lake County, 2002).

3. Liquefaction

The site is located within an area mapped as having a "very low" potential for liquefaction (Salt Lake County, 2002).

The subsurface conditions encountered at the site consist predominantly of clay, sand and gravel. No subsurface water was encountered in the test pits at the time of excavation to the maximum depth investigated, approximately 15½ feet. Clay and soil above the free water level are not susceptible to liquefaction.

Based on the subsurface conditions encountered to the depth investigated and our understanding of the geologic conditions in the area, it is our professional opinion that liquefaction is not considered a hazard for the site.

G. Water Soluble Sulfates

One sample of the natural soil was tested in the laboratory for water soluble sulfate content. Test results indicate there is less than 0.1 percent water soluble sulfate in the sample tested. Based on the test results and published literature, the natural soil possesses negligible sulfate attack potential on concrete. No special cement type is required for concrete placed in contact with the natural soil. Other conditions may dictate the type of cement to be used in concrete for the project.

H. Pavement

Based on the subsoil conditions encountered, laboratory test results and the assumed traffic the following pavement support recommendations are given.

1. Subgrade Support

The near surface soil consists primarily of lean clay. We have assumed a California Bearing Ratio (CBR) value of 3 percent, which assumes a clay subgrade.

2. Pavement Thickness

Based on the subsoil conditions, anticipated traffic, a design life of 20 years for flexible and 30 years for rigid pavement and methods presented by the Utah Department of Transportation, a pavement section consisting of 3 inches of asphaltic concrete overlying 8 inches of base course is calculated. Alternatively, a Portland cement concrete pavement section consisting of 5 inches of Portland cement concrete may be used.

The base course may be reduced to 6 inches in areas where the subgrade consists of at least 6 inches of granular fill or in areas where no significant truck traffic is expected.

Granular borrow may be needed to facilitate pavement construction where the subgrade is very moist to wet as discussed in the Subgrade Preparation section.

3. Pavement Materials and Construction

a. Flexible Pavement (Asphaltic Concrete)

The pavement materials should meet the specifications for the applicable jurisdiction. The use of other materials may result in different pavement material thicknesses.

b. Rigid Pavement (Portland Cement Concrete)

The pavement thickness assumes that the pavement will have aggregate interlock joints and that a concrete shoulder or curb will be provided.

The pavement materials should meet the specifications for the applicable jurisdiction. The pavement thickness indicated above assumes that the concrete will have a 28-day compressive strength of 4,000 pounds per square inch. Concrete should be air entrained with approximately 6 percent air. Maximum allowable slump will depend on the method of placement but should not exceed 4 inches.

4. Jointing

Joints for concrete pavement should be laid out in a square or rectangular pattern. Joint spacings should not exceed 30 times the thickness of the slab. The joint spacings indicated should accommodate the contraction of the concrete and under these conditions steel reinforcing will not be required. The depth of joints should be approximately one-fourth the slab thickness.

LIMITATIONS

This report has been prepared in accordance with generally accepted soil and foundation 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 test pits excavated and the data obtained from laboratory testing. Variations in the subsurface conditions may not become evident until excavation is conducted. If the subsurface conditions or groundwater level is found to be significantly different from what is described above, we should be notified to reevaluate our recommendations.

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

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CJB/rs

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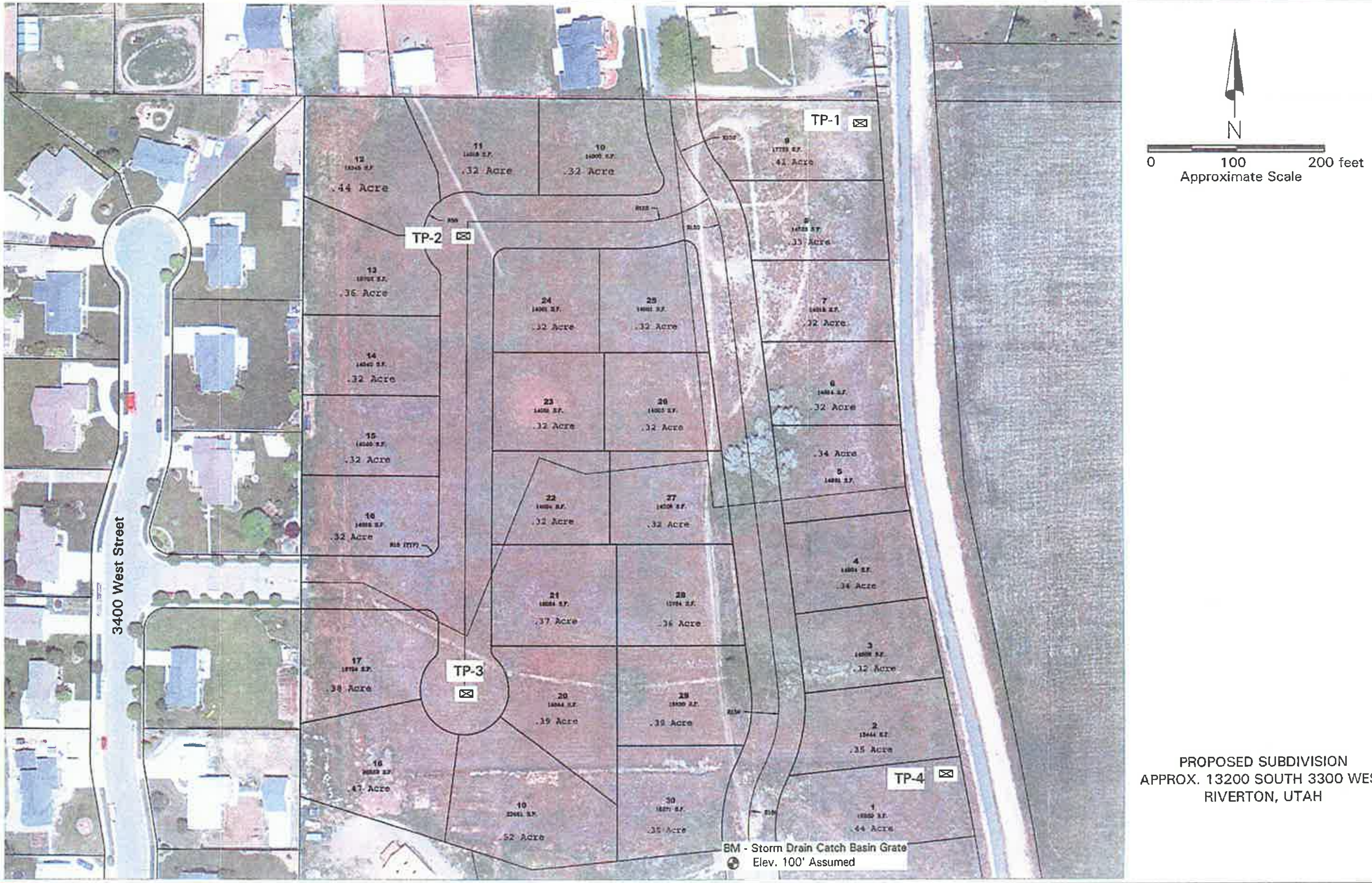
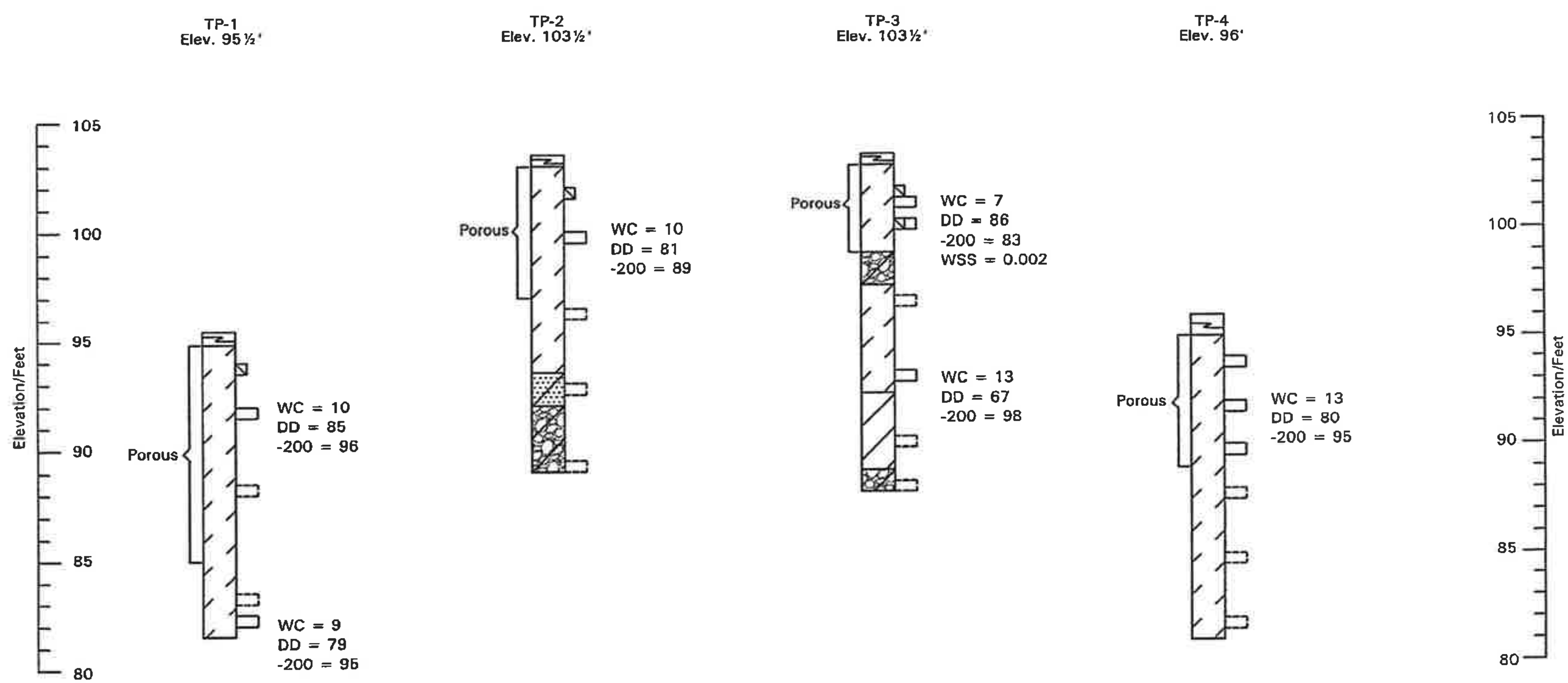
Salt Lake County, 2002; Surface Rupture and Liquefaction Potential Special Study Areas Map, Salt Lake County, Utah, adopted March 31, 1989, updated March 2002, Salt Lake County Public Works - Planning Division, 2001 South State Street, Salt Lake City, Utah.



PROPOSED SUBDIVISION
APPROX. 13200 SOUTH 3300 WEST
RIVERTON, UTAH

1120908	AGEC Applied GeoTech	Locations of Test Pits	Figure 1



Approximate Vertical Scale 1" = 8'

See Figure 3 for Legend and Notes

1120908 | AGEC Applied GeoTech | Logs of Test Pits | Figure 2

LEGEND:

	Topsoil; lean clay with sand, slightly moist, brown to dark brown, roots and organics.
	Lean Clay (CL); small to moderate amounts of silt and sand, slight to moderate porous structure, stiff to very stiff, slightly moist, brown.
	Silt (ML); moderate amounts of sand, occasionally slightly porous, stiff, orange brown.
	Silty Sand (SM); medium dense, slightly moist, brown.
	Silty Gravel (GM); small to moderate amounts of silt and sand, occasional gravel and cobbles up to approximately 6 inches in size, medium dense, slightly moist, brown.
	Indicates relatively undisturbed hand drive sample taken.
	Indicates disturbed sample taken.
	Indicates relatively undisturbed block sample taken.

NOTES:

1. Test pits were excavated on November 20, 2012 with a rubber-tired backhoe.
2. Locations of test pits were measured approximately by pacing from features shown on the site plan provided.
3. Elevations of test pits were measured with an automatic level and refer to the benchmark shown on Figure 1.
4. The test pit 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 test pit logs represent the approximate boundaries between material types and the transitions may be gradual.
6. No free water was encountered in the test pits at the time of excavation.
7. WC = Water Content (%);
   DD = Dry Density (pcf);
   -200 = Percent Passing No. 200 Sieve;
   WSS = Water Soluble Sulfates (%).

1120908	AGEC Applied GeoTech	Legend and Notes of Test Pits	Figure 3

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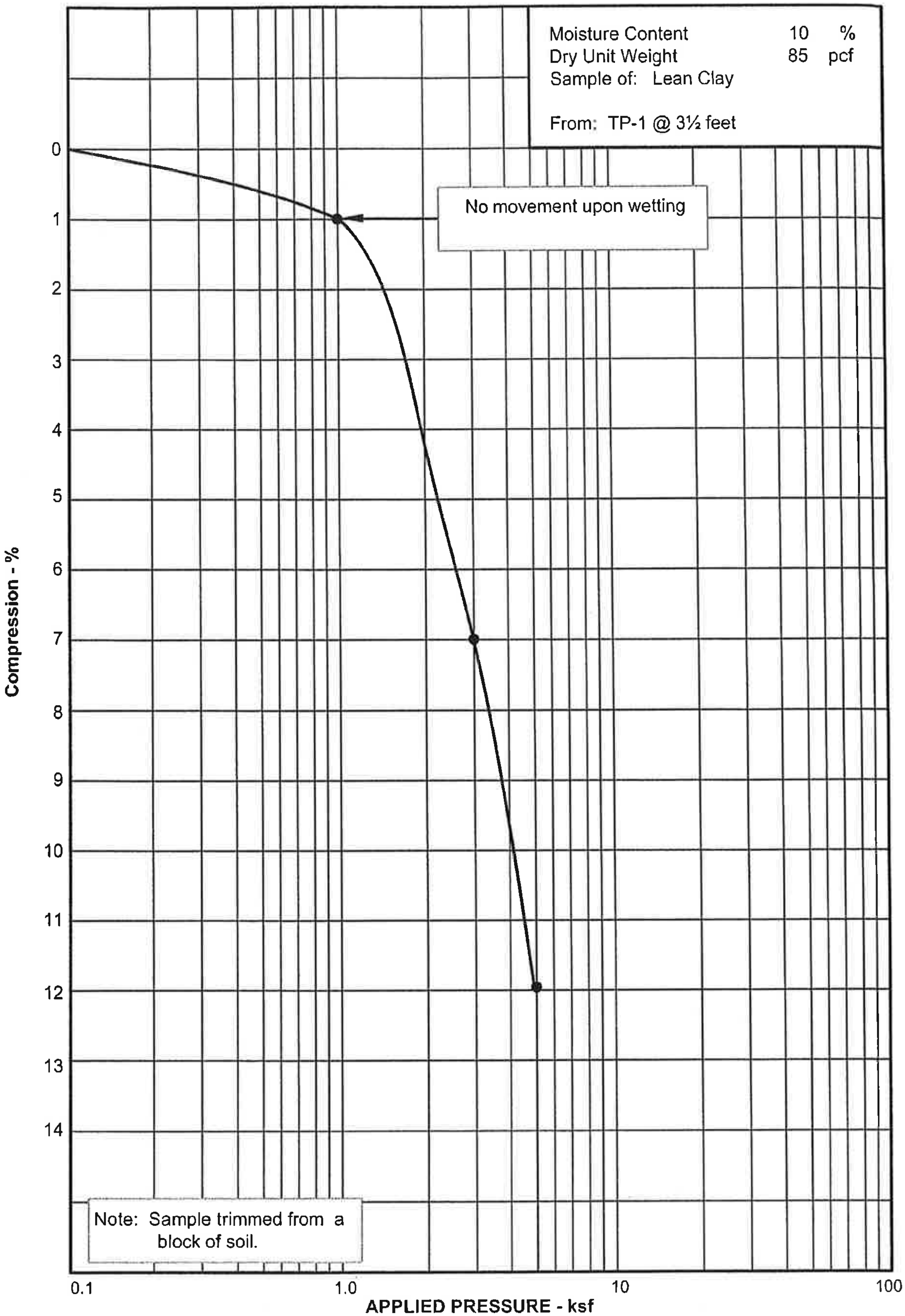

Project No. 1120908 **CONSOLIDATION TEST RESULTS** **Figure 4**

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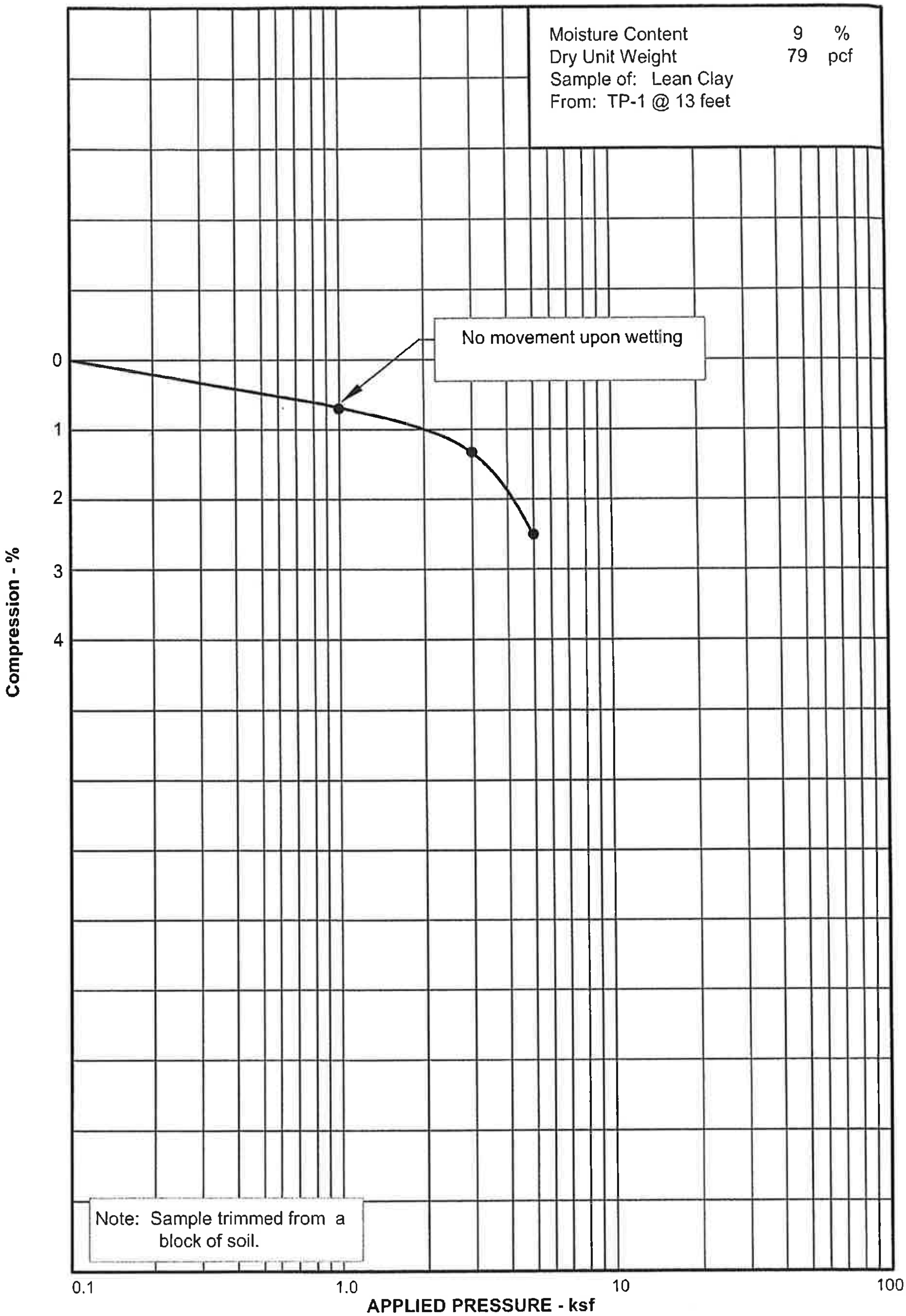
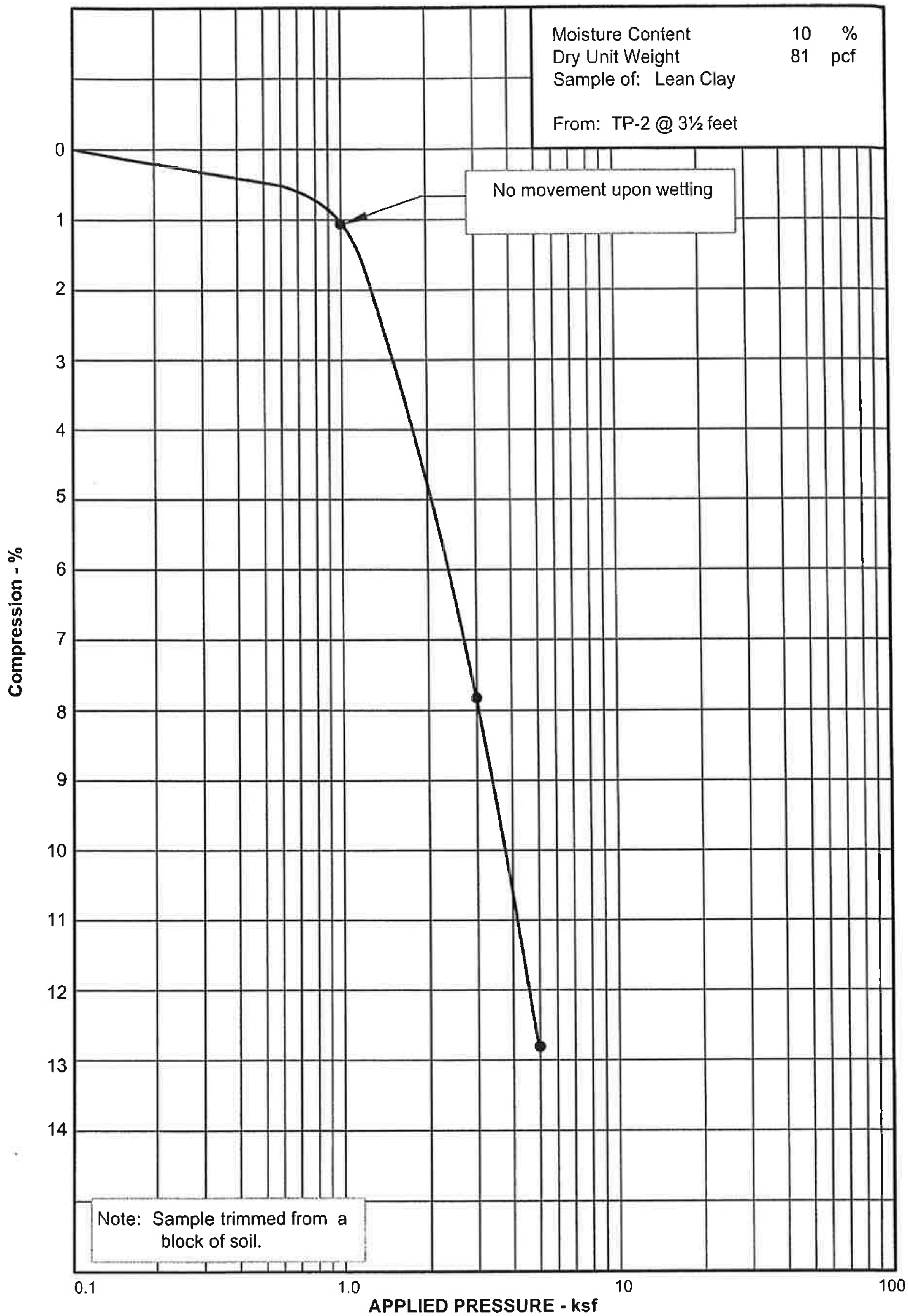


Project No. 1120908

CONSOLIDATION TEST RESULTS

Figure 5

Applied Geotechnical Engineering Consultants, Inc.



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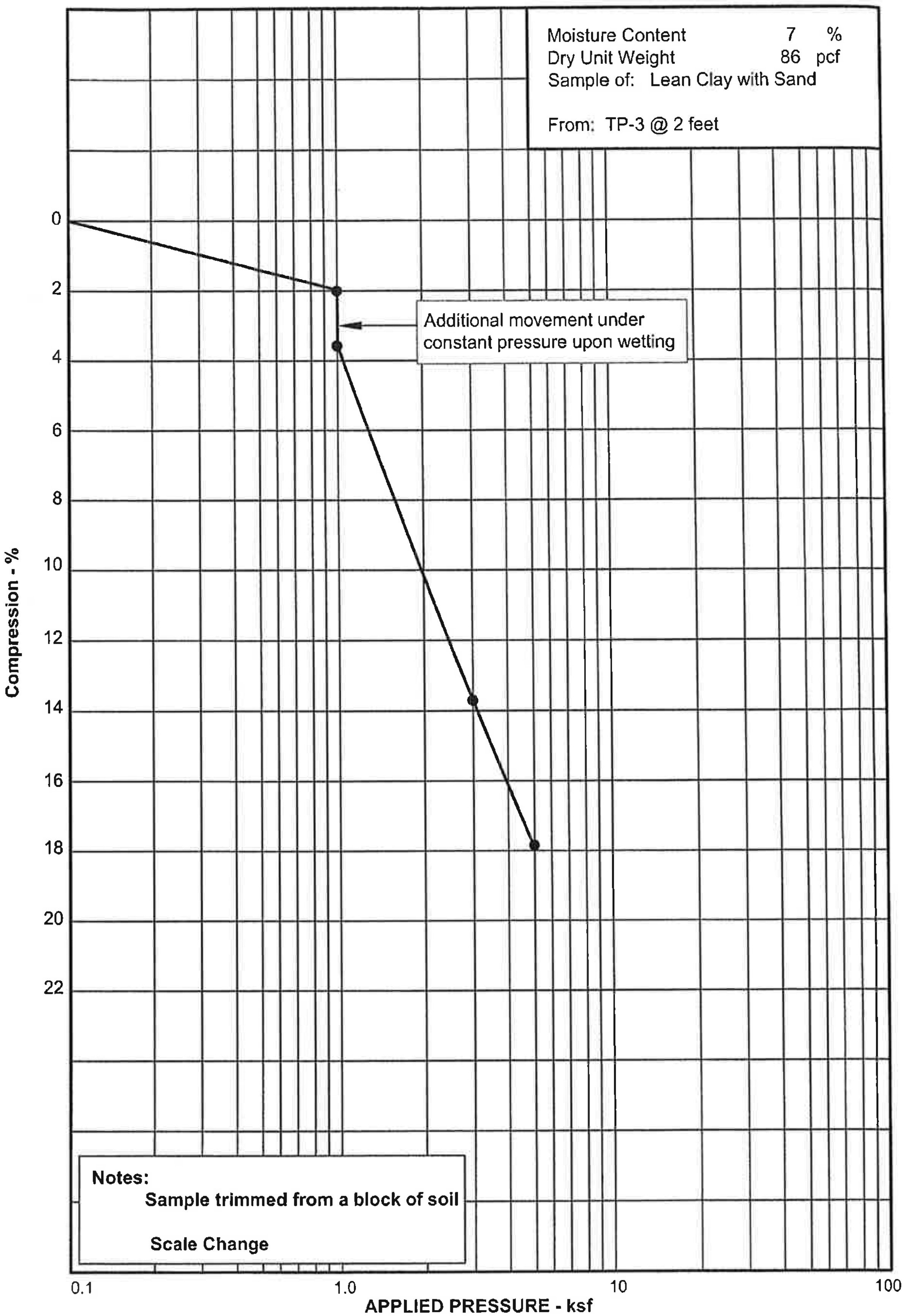
CONSOLIDATION TEST RESULTS

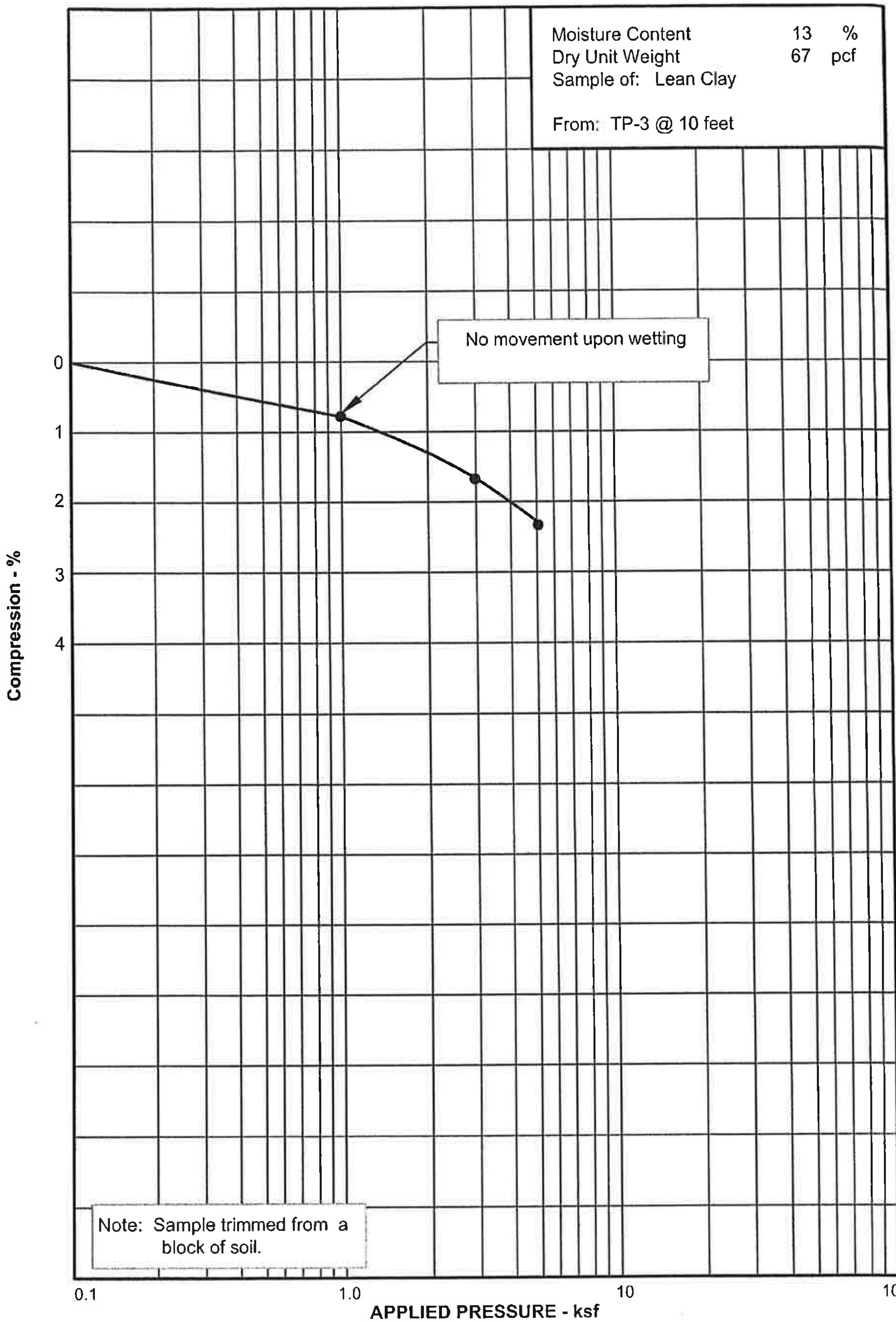
Figure 6

Applied Geotechnical Engineering Consultants, Inc.



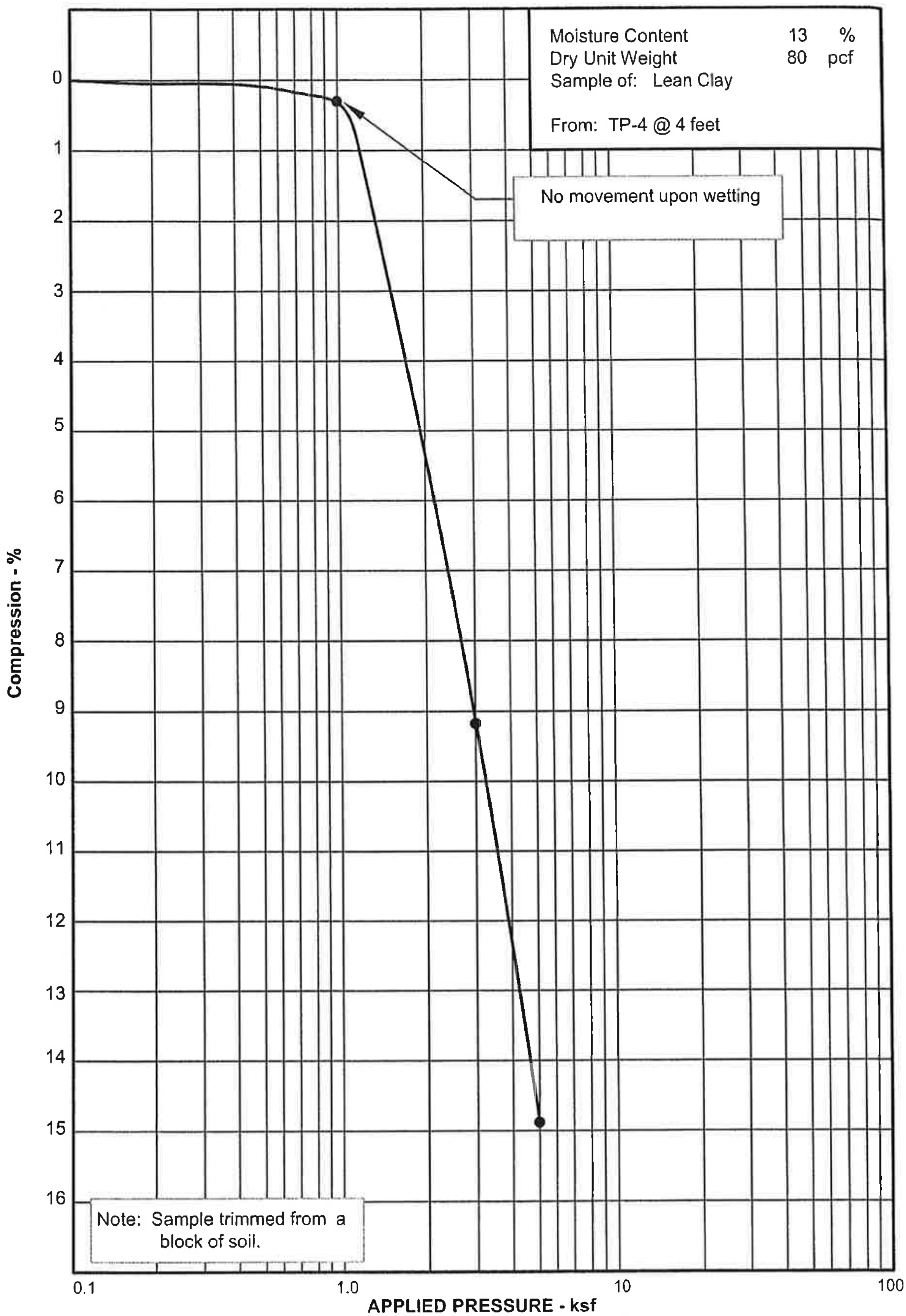
Project No. 1120908 **CONSOLIDATION TEST RESULTS** **Figure 7**

Applied Geotechnical Engineering Consultants, Inc.



Project No. 1120908 **CONSOLIDATION TEST RESULTS** **Figure 8**

Applied Geotechnical Engineering Consultants, Inc.



Project No. 1120908 **CONSOLIDATION TEST RESULTS** **Figure 9**

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

TABLE I

SUMMARY OF LABORATORY TEST RESULTS

PROJECT NUMBER 1120908

SAMPLE LOCATION		NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (PCF)	GRADATION			ATTERBERG LIMITS		UNCONFINED COMPRESSIVE STRENGTH (PSF)	WATER SOLUBLE SULFATE (%)	SAMPLE CLASSIFICATION
TEST PIT	DEPTH (FEET)			GRAVEL (%)	SAND (%)	SILT/ CLAY (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)			
TP-1	3½	10	85			96					Lean Clay (CL)
	13	9	79			95					Lean Clay (CL)
TP-2	3½	10	81			89					Lean Clay (CL)
TP-3	2	7	86			83				0.002	Lean Clay with Sand (CL)
	10	13	67			98					Lean Clay (CL)
TP-4	4	13	80			95					Lean Clay (CL)