- GEOTECHNICAL ENGINEERING
- CONSTRUCTION MATERIALS ENGINEERING & TESTING
- SOILS • ASPHALT • CONCRETE

August 27, 2009

Timbercon Construction, Inc.
1241 Universal City Boulevard
Universal City, Texas 78148

Attention: Gary Shuck

SUBJECT: **SUBSURFACE EXPLORATION, LABORATORY TESTING PROGRAM AND FOUNDATION AND PAVEMENT RECOMMENDATIONS FOR THE PROPOSED TRUE VISION CHURCH ACKERMAN ROAD SAN ANTONIO, TEXAS**
RETL Project Number: G209140

Dear Mr. Shuck,

In accordance with our agreement, we have conducted a subsurface exploration, foundation, and pavement evaluation for the above referenced project. The results of this investigation, together with our recommendations, are to be found in the accompanying report, three copies of which are being transmitted herewith.

Often, because of design and construction details that occur on a project, questions arise concerning soil conditions and Rock Engineering and Testing Laboratory, Inc. (RETL), would be pleased to continue its role as the Geotechnical Engineer during project implementation.

RETL also has great interest in providing materials testing and special inspection services during the construction phase of this project. If you will advise us of the appropriate time to discuss these engineering services, we will be pleased to meet with you at your convenience.

Sincerely,

Kyle D. Hammock, P.E.
Vice President San Antonio

SUBSURFACE EXPLORATION, LABORATORY TESTING PROGRAM, AND FOUNDATION AND PAVEMENT RECOMMENDATIONS FOR THE PROPOSED TRUE VISION CHURCH ACKERMAN ROAD SAN ANTONIO, TEXAS

RETL PROJECT NUMBER: G209140

PREPARED FOR:

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1241 UNIVERSAL CITY BOULEVARD
UNIVERSAL CITY, TEXAS 78148

AUGUST 27, 2009

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INTRODUCTION

This report presents the results of a soil exploration and foundation and pavement analysis for the proposed True Vision Church to be located on Ackerman Road in San Antonio, Texas. This study was conducted for Timbercon Construction, Inc.

Authorization

The work for this project was performed in accordance with RETL Proposal No. P022309B dated February 23, 2009. The proposal contained a scope of work, fee and limitations. The proposal was approved and signed by Gary Shuck of Timbercon Construction, Inc. on July 29, 2009 and returned to our office via fax.

Purpose and Scope

The purpose of this exploration was to evaluate the soil and groundwater conditions at the site and to recommend foundation and pavement systems suitable for the proposed project.

The scope of the exploration and analysis included the subsurface exploration, field and laboratory testing, engineering analysis and evaluation of the subsurface soils, provision of foundation and pavement recommendations and preparation of this report.

The scope of services did not include an environmental assessment. Any statements in this report, or on the boring logs, regarding odors, colors, unusual or suspicious items or conditions are strictly for the information of the client.

General

The exploration and analysis of the subsurface conditions reported herein are considered sufficient in detail and scope to form a reasonable basis for the foundation and pavement designs. The recommendations submitted for the proposed project are based on the available soil information and the preliminary design details provided by Gary Shuck of Timbercon Construction, Inc. If other design criteria are required for the structural and civil engineers to finish the foundation and pavement designs, RETL will provide the requested information as a supplement to this report.

The Geotechnical Engineer states that the findings, recommendations, specifications or professional advice contained herein, have been presented after being prepared in a manner consistent with the level of care and skill ordinarily exercised by reputable members of the Geotechnical Engineer's profession practicing contemporaneously under similar conditions in the locality of the project. RETL operates in general accordance with "*Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction*", (ASTM D 3740). No other representations are expressed or implied, and no warranty or guarantee is included or intended.

This report has been prepared for the exclusive use of Timbercon Construction, Inc. for the specific application to the proposed True Vision Church to be located on Ackerman Road in San Antonio, Texas.

FIELD EXPLORATION

Scope

The field exploration to evaluate the engineering characteristics of the subsurface materials included reconnaissance of the project site, performing the test borings, performing test pits and obtaining disturbed split spoon samples, relatively undisturbed Shelby tube samples and grab samples. During the sample recovery operations the soils encountered were classified and recorded on boring logs in accordance with "*Standard Guide for Field Logging of Subsurface Exploration of Soil and Rock*", (ASTM D 5434).

Five (5) borings were performed, three within the footprint of the proposed new structure and two in the parking and driveway areas. Six test pits were also excavated in the locations selected by RETL. Borings B-1 through B-3 were drilled to depths of 25-feet, and borings B-4 and B-5 were drilled to depths of 5-feet. The borings were located in the field by the Timbercon Construction, Inc. and RETL personnel. A drilling subcontractor to RETL performed the drilling operations under the supervision of an RETL Geotechnician. Upon completion of the drilling operations and performing groundwater observations, the drill holes were backfilled with excavated soil and the site cleaned as required. A Boring Location Plan is included in the Appendix.

Drilling and Sampling Procedures

The borings were performed using a drilling rig equipped with a rotary head turning solid stem flight augers to advance the boreholes to the desired termination depths. Disturbed samples were obtained employing split-barrel sampling procedures in general accordance with the procedures for "*Penetration Test and Split-Barrel Sampling of Soils*" (ASTM Designation D 1586). Undisturbed soil samples were obtained using thin-wall tube sampling procedures in accordance with the procedures for "*Thin Walled Tube Sampling of Soils*" (ASTM D 1587). The samples obtained by this procedure were extruded by a hydraulic ram and classified in the field.

The samples were classified in the field, placed in plastic bags, marked according to boring number, depth and any other pertinent field data, stored in special containers and delivered to the laboratory for testing.

Field Tests and Measurements

Penetration Tests - During the sampling procedures, standard penetration tests (SPT) were performed to obtain the standard penetration value of the soil. The standard penetration value (N) is defined as the number of blows of a 140-pound hammer, falling 30-inches, required to advance the split-barrel sampler 1-foot into the soil. The sampler is lowered to the bottom of the previously cleaned drill hole and advanced by blows from the hammer. The number of blows is recorded for each of three successive 6-inch penetrations. The "N" value is obtained by adding the second and third 6-inch increment number of blows. The results of standard penetration tests indicate the relative density of cohesionless soils and comparative consistency of cohesive soils, thereby providing a basis for estimating the relative strength and compressibility of the soil profile components.

Water Level Measurements - Water level measurements were obtained during the test boring operations and are noted on the boring logs provided in the Appendix. In relatively pervious soils, such as sandy soils, the indicated depths are usually reliable groundwater levels. In relatively impervious soils, a suitable estimate of the groundwater depth may not be possible, even after several days of observation. Seasonal variations, temperature, land-use, proximity to a creek, river or lake and recent rainfall conditions may influence the depth to the groundwater. The amount of water in an open borehole largely depends on the permeability of the soils encountered at the boring location.

Ground Surface Elevation – The ground surface elevations were not provided at the boring locations. Therefore, all depths referred to in this report are from the actual ground surface elevations at the boring locations during the time of our field investigation.

LABORATORY TESTING PROGRAM

A laboratory-testing program was conducted to supplement the information obtained during the field investigation in order to provide additional pertinent engineering characteristics of the subsurface materials necessary in analyzing the behavior of the foundation and pavement systems for the proposed project.

The laboratory-testing program included supplementary visual classification (ASTM D 2487) and water content tests (ASTM D 2216) on all samples. In addition, selected samples were subjected to Atterberg limits tests (ASTM D 4318) and percent material finer than the #200 sieve (ASTM D 1140).

The shear strength of selected cohesive soil samples were evaluated from unconfined compressive strength tests (ASTM D 2166). Estimated soil strengths were obtained using a hand penetrometer.

All phases of the laboratory-testing program were conducted in general accordance with applicable ASTM Specifications. The results of these tests are to be found in this report or on the accompanying boring logs provided in the Appendix.

SUBSURFACE CONDITIONS

General

The types of subsurface bearing materials encountered in the test borings have been visually classified and are described in detail on the boring logs. The results of the field penetration tests, strength tests, water level measurements, and laboratory tests are presented on the boring logs in numerical form. Representative samples of the soils were placed in polyethylene bags and are now stored in the laboratory for further analysis, if desired. Unless notified to the contrary, all samples will be disposed of three months after issuance of this report.

The stratification of the soil, as shown on the boring logs, represents the soil conditions at the actual boring locations. Variations may occur between or beyond the boring locations. Lines of demarcation represent the approximate boundary between different soil types, but the transition may be gradual, or not clearly defined.

It should be noted that, whereas the test borings were drilled and sampled by experienced drillers, it is sometimes difficult to record changes in stratification within narrow limits. In the absence of foreign substances, it is also difficult to distinguish between discolored soils and clean soil fill.

Soil Conditions

The soil conditions encountered in the deep borings performed for the new structure have been summarized and soil properties including soil classification, strength, grain size, and plasticity are provided in the following tables:

BORING B-1								
D	**Description**	**LL**	**PI**	**C**	**ϕ**	**γ_e**	**-#200**	**N or P**
0-15	Clayey Gravel and Lean Clay **FILL**	22-49	10-32	2000	0	120	32-91	N= 14-26
15-25	Fat **CLAY**	--	--	4000	0	120	99	P= 4.5+

BORINGS B-2 AND B-3								
D	**Description**	**LL**	**PI**	**C**	**ϕ**	**γ_e**	**-#200**	**N or P**
0-4	Fat **CLAY**	50-59	28-39	2000	0	120	73-87	N= 17-24
4-13	Silty **CLAY**, Silty **SAND** and Clayey **SAND (Caliche)**	20-25	6-12	4000	0	120	37-68	N= 39-50/4”
13-25	Fat **CLAY**	53-72	33-47	4000	0	120	82-100	N= 43 P= 4.0-4.5+

Where: D = Depth in feet below existing grade
LL = Liquid Limit (%)
PI = Plasticity Index
C = Average Soil Cohesion, psf (undrained)
ϕ = Angle of Internal Friction, deg. (undrained)
γ_e = Effective Soil Unit Weight, pcf
-#200 = Percent Material Finer than a #200 Sieve
N = Standard Penetration Value range, blows per foot
P= Pocket penetrometer value range, tsf

Detailed descriptions of the soils encountered at the boring locations are provided on the boring logs included in the Appendix.

Test Pit Excavations

Boring B-1 indicated as much as 15-feet of fill may be present in the vicinity of what appeared to be an abandoned underground shelter at the site. Therefore, six test pits were excavated with a backhoe to identify the presence of additional fill material within the foot print area of the structure to the west of the underground shelter. The results of the test pit fill material observations are as follow:

TEST PIT FILL DEPTHS	
Building Location	**Fill Depth (ft)**
Northeast Corner	3
Northwest Corner	1
West Side	0
Southwest Corner	1
South Side	1 ½
Directly West of Underground Shelter	2

Below the fill materials, natural dark gray fat clay soils and tan caliche soils were encountered. Grab samples of these materials from the test pits were subjected to Atterberg limits tests. The results indicated the fat clay soil at a depth of 2-feet in Test Pit #2 had a plasticity index (PI) of 45 and the caliche soil at a depth of about 5-feet in Test Pits #1 and #4 had a plasticity index (PI) of 16 and 17, respectively.

The following is a photo of Test Pit #2 indicating approximately 1-foot of clay and gravel fill, 2-feet of dark gray fat clay with tan caliche below the 3-foot depth.

Seismic Site Class

The field investigation did not include a 100-foot deep soil boring, therefore, the soil properties are not known in sufficient detail to determine the Site Class per IBC. This site has stiff to hard clays and caliche materials to the 25-foot depth. Table 1615.1.1-Site Class Definitions, indicates that Site Class D materials should have soil undrained shear strengths between 1,000 and 2,000 psf and standard penetration resistances between 15 and 50 blows per foot. The on-site soils have strengths similar to Site Class D materials; therefore, RETL recommends that Site Class D, "stiff soil profile" be assumed.

Groundwater Observations

Groundwater was not encountered in the borings during the drilling operations. Based on observations made in the field and moisture contents obtained in the laboratory, it appears that groundwater at this site during the time of our field investigation is greater than the 25-foot depth. It should be noted that the water level in an open borehole may require several hours to several days to stabilize depending on the permeability of the soils and that groundwater levels at this site may be subject to seasonal conditions, recent rainfall, drought or temperature effects.

FOUNDATION DISCUSSION

Project Description

Based on the information provided to RETL, it is understood that the project will consist of the construction of a 25,000 square foot steel-framed church building. The structure contains a sanctuary, offices, restrooms, and classrooms. Loads were not provided, but, based on our experience with similar type structures, maximum concentrated loads on the order of 100 kips and wall loads in the range of ½ to 2 kips/lf are anticipated. It is anticipated that a slab on grade type foundation will be utilized. Additionally, parking and drive areas will be constructed to accommodate primarily automobiles and light trucks.

PVR Discussion

The laboratory test results indicate the upper clay fill soils and natural fat clay soils are high in plasticity and the underlying caliche soils are low in plasticity. **The maximum calculated total potential vertical rise (PVR) based on the soils encountered in the borings performed at this site is in the range of 1 ¼ to 1 ½-inch, depending on the thickness of the upper fat clay layer.** The PVR was calculated using the Texas Department of Transportation Method TEX-124E and took into account the depth of the active zone, estimated to extend to a depth of approximately 15-feet, and the Atterberg limits test results of the soils encountered within the active zone.

The estimated PVR value provided is based on a slab on grade foundation, ground supported floor or flatwork system or paving applying a sustained surcharge load of approximately 1.0 pound per square inch on the subgrade soils. The value represents the vertical rise that can be experienced by dry subsoils if they are subjected to conditions that allow them to become saturated, such as poor drainage. Using dry soil conditions to calculate the PVR is generally considered the worst-case scenario. The actual movement of the subsoils is dependent upon their change in moisture content. Differential vertical movements can potentially be equal to the expected total movements. Differential vertical movements associated with the soils at this site may occur over a distance of 15-feet, or approximately the depth of the active zone.

Undercutting the upper expansive natural fat clay soils and fill soils at this site and replacing them with properly compacted non-expansive select fill soils should reduce the PVR. **As a minimum, RETL recommends reducing the PVR to approximately 1-inch by undercutting the subgrade soils to a minimum depth of 2-feet, moisture conditioning and compacting the upper 12-inches of exposed subgrade soils, and placing properly compacted non-expansive select fill soils into the excavation to raise the building pad to the final grade.**

Foundation Selection Criteria

The type and depth of a foundation system suitable for a given structure depends on several factors including the subsurface conditions, the function of the structure and the loads it will carry. Ultimately the acceptable performance criteria with respect to allowable vertical and differential movements should be agreed upon between the Owner and the Design Team.

The soil and groundwater design considerations affecting the choice of foundation type for the proposed addition structure at this site, based on a review of the boring information and engineering characteristics determined by the field testing and laboratory test results, are outlined below:

- The strengths of the subsurface materials encountered at this site are suitable to support a shallow slab on grade type foundation and a deep drilled pier type foundation. However, the structure should be relocated to the west of the underground shelter to prevent the foundation being supported partially on natural soils and partially on fill.
- Upper expansive fat clay soils encountered at this site are high in plasticity, resulting in a calculated PVR in the 1 ¼ to 1 ½-inch range.
- If the required magnitude of removal and replacement of the existing soils is not desired to reduce the PVR to approximately 1-inch for a slab on grade foundation, drilled piers and a structurally suspended floor slab should be utilized.
- Groundwater, at the time of our field investigation, appears to be greater than the 25-foot depth.

Considering the subsurface conditions encountered at this site, recommendations for a stiffened slab on grade type foundation will be provided in this report. Recommendations for drilled piers used in conjunction with a structural floor slab can be provided in a Supplemental Report, if a deep foundation is preferred for the structure.

FOUNDATION RECOMMENDATIONS

Slab on Grade Foundation

A stiffened slab on grade type foundation may be utilized at this site for support of the new structure, provided some foundation movements can be tolerated and the structure footprint is relocated to the west of the underground shelter to prevent the foundation from being supported partially on natural soils and partially on fill. For a stiffened slab on grade type foundation, the PVR must be reduced to approximately one (1) inch by performing undercutting and replacement as discussed in the “PVR Discussion” and “Site Preparation” sections of this report.

Grade beams and spread footings bearing in the natural soils or compacted select fill can be designed for an allowable soil bearing capacity of 2,000 psf. The bearing capacity value includes a safety factor of at least 3.0 and may be increased 33% for total loads. The grade beams and spread footings should be a minimum of 12-inches and 36-inches wide, respectively. Grade beams and footings should be founded a minimum of 2-feet below the finished floor slab elevation and a minimum of 1 ½-feet below the final exterior grades. Maximum foundation settlement should not exceed 1-inch with differential settlement being approximately ½-inch.

The *"Design of Slab-On-Ground Foundations"* published by the Wire Reinforcement Institute, Inc. (Aug., 1981) utilizes the design criteria provided in the table below for design of a stiffened slab on grade foundation with site improvements to reduce the PVR to approximately one (1) inch:

WRI Design Criteria	
Climatic Rating (Cw)	17
Effective Plasticity Index	22
Soil/Climatic Rating Factor (1-C)	0.08
Maximum Beam Spacing (ft)	20

Soil supported floor slabs are subject to vertical movements, as discussed earlier in this report. Even slight differential movements may cause distress to interior wall partitions and rigid exterior facades supported by shallow slab-on-grade foundations resulting in cosmetic damage. This amount of movement should be understood and addressed during the design phase of the proposed structure planned for construction at this site.

Utilities which project through slab-on-grade floors should be designed with either some degree of flexibility, or with sleeves, in order to prevent damage to these lines should movement occur.

The foundation excavations should be observed by a representative of RETL prior to steel or concrete placement to assess that the foundation materials are capable of supporting the design loads and to identify the acceptability of the natural soils or select fill material under the beams and footings. Soft or loose zones encountered at the bottom of the beam or footing excavations should be removed to the level of competent materials as directed by the Geotechnical Engineer. Cavities formed as a result of excavation of soft or loose zones should be backfilled with compacted select fill.

After opening, beam and footing excavations should be observed and concrete placed as quickly as possible to avoid exposure of the beam and footing bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. If it is required that beam and footing excavations be left open an extended period, they should be protected to reduce evaporation or entry of moisture.

SITE IMPROVEMENT METHODS

General Considerations

A majority of foundation related problems in the project area are attributable, at least in part, to poor drainage. Poor drainage, and the resulting ponded water, can result in non-uniform moisture conditions and differential movements in clay soils and can even induce settlements in very low plasticity silts or coarser grained materials. Reducing a soil's variation in moisture content will therefore reduce its variation in volume. A number of measures may be used to attain a reduction in subsoil moisture content variations; some of these measures are outlined below:

- During construction, a positive drainage scheme should be implemented to prevent ponding of water on the subgrade.
- Positive drainage should be maintained around structure through a roof/gutter system connected to piping or directed to paved surfaces, transmitting water away from the foundation perimeters. In addition, positive grades sloping away from the foundation should be designed and implemented. We recommend that an effective site drainage plan be devised by others prior to commencement of construction to provide positive drainage away from the foundation perimeters and off the site, both during, and after construction.
- Utility trenches should not be backfilled with sand or gravel materials. Trenches can serve as aqueducts that transport water beneath the structure and into foundation excavations causing foundation and floor slab distress and moisture transmission related problems.
- Vegetation placed in landscape beds that are adjacent to the structure should be limited to plants and shrubs that will not exceed a mature height of 3-feet. Large bushes and trees should be planted away from the slab foundation at a distance that will exceed their full mature height and canopy width.

All project features beyond the scope of those discussed above should be planned and designed similarly to attain a region of relatively uniform moisture content within the foundation area. Poor drainage schemes are generally the primary cause of slab on grade foundation related problems.

PAVEMENT CONSIDERATIONS

In designing new parking areas and driveways, the existing subgrade conditions must be considered together with the expected traffic use and loading conditions.

The conditions that influence pavement design can be summarized as follows:

1. Bearing values of the subgrade. These values can be represented by a California Bearing Ratio (CBR) for the design of flexible asphalt pavements, or a Modulus of Subgrade Reaction (K) for rigid concrete pavements.

2. Vehicular traffic, in terms of the number and frequency of vehicles and their range of axle loads.

3. Probable increase in vehicular use over the life of the pavement.

4. The availability of suitable materials to be used in the construction of the pavement and their relative costs.

Specific laboratory testing to define the subgrade strength (i.e. CBR/K values) have not been performed for this analysis. Based upon local experience and the plasticity indices and strengths of the existing fill soils and natural subgrade soils, the CBR and K value are estimated at 3 and 100 pci, respectively.

Since traffic counts and design vehicles have not been provided, it is possible to provide a non-engineered pavement section suitable for light and heavy-duty service based on pavement sections that have provided adequate serviceability for similar type applications. Automobile parking areas and driveways can be designed with either a flexible or rigid pavement. It is important that the exposed subgrade is properly prepared prior to pavement installation.

Flexible Asphaltic Concrete Pavements

The recommended light and medium-duty flexible pavement sections, using the locally available base material, are provided in the following tables:

Light Duty Flexible Pavement (Passenger Car Parking Areas)		
Hot Mix Asphaltic Concrete	2"	2"
Limestone Base Material (TxDOT Item 247 Grade 2)	9"	6"
TENSAR Geogrid	---	BX-1100
Compacted Subgrade	6"	6"

Medium Duty Flexible Pavement (Driveways and Service Areas)		
Hot Mix Asphaltic Concrete	2"	2"
Limestone Base Material (TxDOT Item 247 Grade 2)	11"	8"
TENSAR Geogrid	---	BX-1100
Compacted Subgrade	6"	6"

Compacted Subgrade - After all surface organics and deleterious materials have been removed and the desired subgrade elevation has been achieved, the upper 6-inches of exposed subgrade soils should be compacted to a minimum density of 95% of the maximum dry density as determined by the standard Proctor test (ASTM D 698) and between –1 to +3 percent of the optimum moisture content.

General fill soils with a maximum plasticity index (PI) of 20 can be used to raise the paving grades as necessary. The general fill should be compacted as specified above for the subgrade.

Geogrid - A single layer of TENSAR BX1100 Geogrid may be placed on top of the compacted subgrade and below the base section to reduce the thickness of the base. **Geogrid is recommended to increase resistance to surface cracking in the pavements and significantly improve the long term performance of the pavements.** The Geogrid should be installed and overlapped in accordance with the manufacturer's recommendations. Geogrid Specifications are provided in the Appendix.

Base Material - Base materials in flexible pavement areas should meet the requirements set forth in the Texas Department of Transportation (TxDOT) 2004 Standard Specifications for Construction of Highways, Streets and Bridges; Item 247, Type A, Grade 2 or better. The base material should be placed in maximum 8-inch thick loose lifts and compacted to a minimum density of 95% of the maximum dry density as determined by the modified Proctor test (ASTM D 1557) and within – 2 to +2 percent of the optimum moisture content.

Hot Mix Asphaltic Concrete - Hot mix asphaltic concrete should meet the requirements set forth in TxDOT Item 340; Type C or D.

Allowances for proper drainage and proper material selection of base materials are most important for performance of asphaltic pavements. Ruts and birdbaths in asphalt pavements allow for quick deterioration of the pavement primarily due to saturation of the underlying base materials and subgrade soils.

Rigid Concrete Pavements

The recommended light and medium-duty rigid concrete pavement sections are provided in the following table:

Rigid Pavement	Light Duty (Passenger Car Areas)	Medium Duty (Driveway and Service Areas)
Reinforced Concrete	5 ½"	6"
Compacted Subgrade	6"	6"

Concrete pavement is recommended in areas that receive continuous repetitive traffic such as parking lot entrances, service vehicle areas and trash dump approach areas. The exposed subgrade in concrete pavement areas should be prepared as stated earlier for flexible pavements.

Based on past experience with concrete pavements supported on similar subgrade soils, RETL recommends that reinforcement for concrete pavement consist of #3 bars (3/8–inch diameter) spaced at 12-inches on center each way. The splice length for #3 bars should not be less than 15-inches.

The concrete pavement should be properly jointed, as per ACI, and should have a minimum 28-day compressive strength of 3000 psi. Expansion joints should spaced no greater than 60-feet and should be sealed with an appropriate sealant so that moisture infiltration into the subgrade soils and resultant concrete deterioration at the joints is minimized. Control joint spacing should not exceed 15-feet and preferably less to adequately control cracking. The joints should be thoroughly cleaned and sealant should be installed without overfilling before the pavement is opened to traffic.

The concrete at the location of trash dumpsters should be 7-inches in thickness and be large enough to accommodate both the front and rear wheels of the vehicles used to pick up the trash dumpsters. Maintenance personnel need to stress the importance of placing the trash dumpsters in their proper locations to reduce the distress trash pickup operations place on the pavement.

CONSTRUCTION CONSIDERATIONS

Site Preparation

PVR = +/- 1-inch - Within the building areas, topsoil, organic materials, fill materials and the fat clay subgrade soils should be stripped to a minimum depth 2-feet and replaced with compacted select fill to reduce the PVR to approximately 1-inch. Stripping should extend a minimum of 5-feet outside the perimeter of the proposed structure (building and any appurtenances including sidewalks, ramps, stoops and canopies constructed adjacent to the building).

Prior to compaction, the exposed subgrade should be proof-rolled with a minimum 20-ton rubber tired vehicle under the supervision of RETL. If any soft or loose areas are identified, the soils should be removed and replaced with compacted select fill. The upper 12-inches of exposed subgrade soil should then moisture conditioned and compacted to at least 95 percent of the standard Proctor (ASTM D698) maximum dry density with a moisture content between –1 to +3 percent of the optimum moisture content.

Upon completion of the subgrade preparation, properly compacted select fill soils should be placed to raise the building pad to the final grade elevation. Excavation of beams, footings and utility trenches may proceed after placement of select fill is complete.

Select Fill

Select fill material used at this site for the building pad may be a pit run gravel material or a crushed limestone base material. Limestone base should meet requirements set forth in Texas Standard Specifications 2004; Item 247, Type A, Grade 2. Pit run materials should have a maximum liquid limit of 40 percent, a plasticity index (PI) between 5 and 18, and a maximum size of 3-inches. All select fill should be placed in no greater than 8-inch thick loose lifts and compacted to at least 95 percent of the modified Proctor (ASTM D1557) maximum dry density and within -2 to +2 percent the optimum moisture content.

Earthwork and Foundation Acceptance

Exposure to the environment may weaken the soils at the foundation bearing level if excavations remain open for long periods of time. Therefore, it is recommended that the foundation excavations and footings be extended to final grade and that the foundation be constructed as soon as possible to minimize potential damage to the bearing soils. The foundation bearing level should be free of loose soil, ponded water, or debris and should be observed prior to concreting by the Geotechnical Engineer, or his designated representative.

Foundation concrete should not be placed on soils that have been disturbed by rainfall or seepage. If the bearing materials are softened by surface water intrusion, or by desiccation, the unsuitable soils must be removed from the foundation excavations and be replaced with properly compacted select fill prior to placement of concrete.
The Geotechnical Engineer, or his designated representative, should monitor subgrade preparation. As a guideline, a minimum of one in-place density tests should be performed for each 2,000 sq. ft. of subgrade and each subsequent lift of select fill, or a minimum of 3 tests per testing interval, within the building pad area. Any areas not meeting the required compaction should be re-compacted and retested until compliance is met.

Vapor Retarder

A vapor retarder with a permeance of less than 0.3 US perms (ASTM E 96) should be placed under the concrete floor slab on the ground to reduce the transmission of water vapor from the supporting soil through the concrete slab and to function as a slip sheet to reduce subgrade drag friction. Polyethylene film with a minimum thickness of 10 mils (0.25 mm) is typically used for reduced vapor transmission and durability during and after its installation.

The vapor retarder should be installed according to the ASTM E 1634, "*Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs*." All penetrations through the vapor retarder should be sealed to ensure its integrity. The vapor retarder should be taped around all openings to ensure the effectiveness of the barrier. Grade stakes should not be driven through the barrier and care should be taken to avoid punctures during reinforcement and concrete placement.

Placement of slab concrete directly on the vapor retarder increases the risks of surface dusting, blistering and slab curling making good concrete practice critical. A low water to cement ratio concrete mix design combined with proper and adequate curing procedures will help ensure a good quality slab.

Where vapor transmission is not a concern, elimination of the vapor retarder may provide improvements in finishing characteristics and reductions in the risks of surface dusting, blistering and slab curling. However, exposure of portions of the supporting soils or granular layer, such as at blockouts for columns or utility penetrations, to inclement weather during construction, may create excessive or deficient moisture conditions beneath portions of the slab that have already been placed. Blockouts for slab penetrations should be protected if a vapor retarder is omitted. ACI 302.1R-96 "*Guide for Concrete Floor and Slab Construction*" recommends that a vapor retarder or vapor barrier be used only when required by the specific application.

Utilities

Utilities that project through slab-on-grade floors should be designed with either some degree of flexibility, or with sleeves, in order to prevent damage to these lines should movement occur.

Expansion Joints

Expansion joints should be designed and placed in various portions of the structure. Properly planned placement of these joints will assist in controlling the degree and location of material cracking that normally occurs due to material shrinkage, thermal affects, soil movements and other related structural conditions

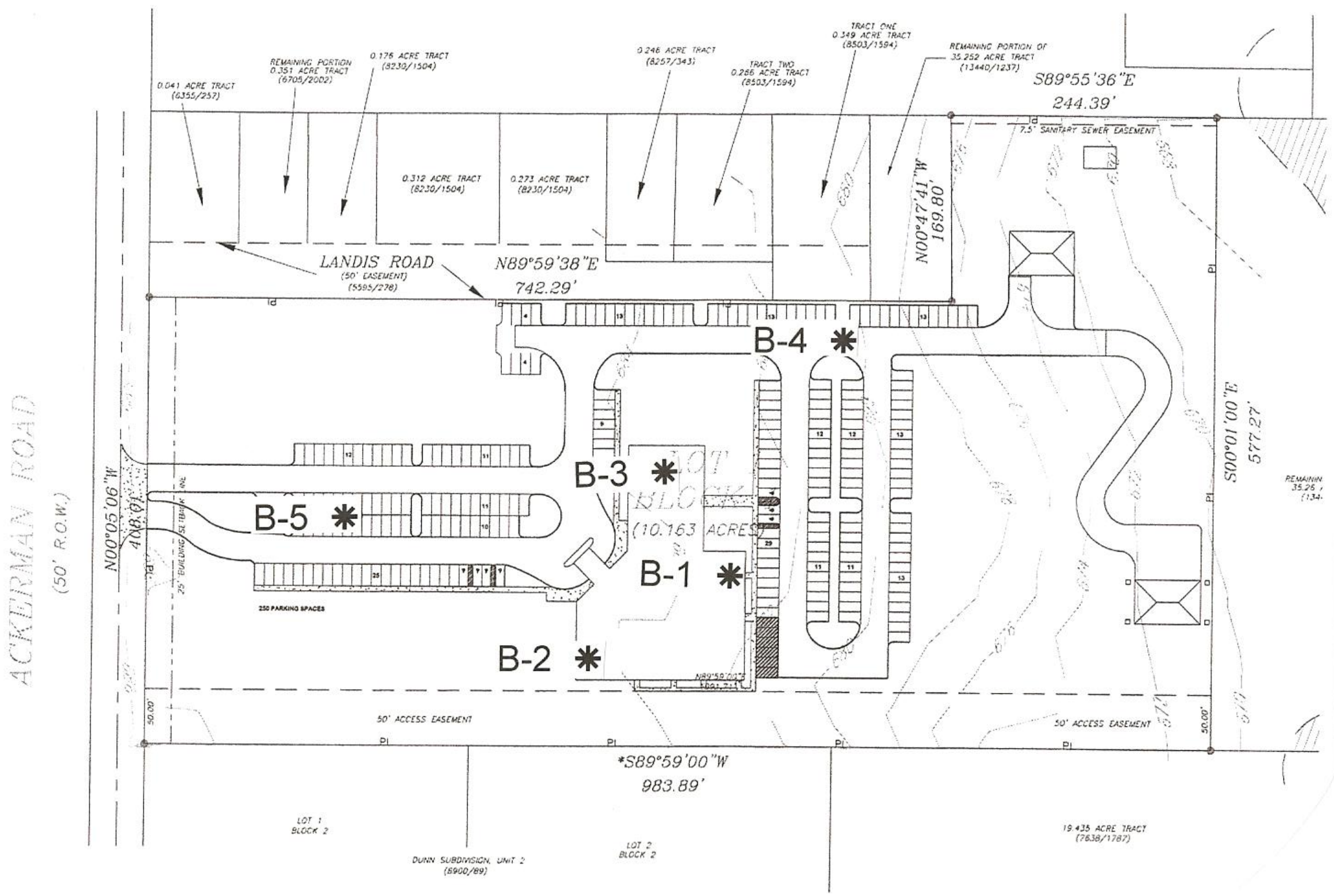
GENERAL COMMENTS

If significant changes are made in the character or location of the proposed project, a consultation should be arranged to review any changes with respect to the prevailing soil conditions. At that time, it may be necessary to submit supplementary recommendations.

It is recommended that the services of RETL be engaged to test and evaluate the soils in the undercut excavation prior to placing select fill and in the foundation excavations prior to concreting in order to verify that the bearing soils are consistent with those encountered in the borings. RETL cannot accept any responsibility for any conditions that deviate from those described in this report, nor for the performance of the foundation and pavements if not engaged to also provide construction observation and testing for this project. If it is required for RETL to accept any liability, then RETL must agree with the plans and perform such observation during construction as we recommend.

All sheeting, shoring and bracing of trenches, pits and excavations should be made the responsibility of the contractor and should comply with all current and applicable local, state and federal safety codes, regulations and practices, including the Occupational Safety and Health Administration.

APPENDIX



BORING LOCATION PLAN

NO SCALE

August 27, 2009
Timbercon Construction, Inc.
RETL Project No.: G209140

PROPOSED TRUE VISION CHURCH
Ackerman Road
San Antonio, Texas

ROCK ENGINEERING AND TESTING LABORATORY, INC.
18847 REDLAND ROAD #202
SAN ANTONIO, TX 78259
(210) 495-8000

LOG OF BORING 1

Rock Engineering & Testing Laboratory Inc.
4910 Neptune
Corpus Christi, TX 78405
Telephone: 361-883-4555
Fax: 361-883-4711

CLIENT: Timbercon Construction, Inc.
PROJECT: True Vision Church
LOCATION: Ackerman Road - San Antonio, Texas
NUMBER: G209140

DATE(S) DRILLED: 08/05/09 - 08/05/09

DRILLING METHOD(S):
Solid Stem Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling.

SURFACE ELEVATION: N/A

DEPTH (FT)	SAMPLE NUMBER	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
	SS S-1	N = 26	2							**CLAYEY GRAVEL FILL**, gray and white, dry, medium dense.
	SS S-2	N = 22	4	22	12	10			32	Same as above. (GC)
5	SS S-3	N = 19	5							Same as above.
	SS S-4	N = 22	17	49	17	32			91	**LEAN CLAY FILL**, trace gravel, gray, moist, very stiff. (CL)
	SS S-5	N = 21	8							Same as above, dry.
10										
	SS S-6	N = 14	11	42	19	23			54	Same as above, gravelly, stiff. (CL)
15										
	SH S-7	P = 4.5+	19							**FAT CLAY**, brown and light gray, moist, hard.
20										
	SH S-8	P = 4.5+	23				105	7.5	99	Same as above.
25										Boring terminated at a depth of 25-feet.

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:
Boring location determined by Timbercon Construction, Inc. Boring operations performed by a drilling subcontractor to RETL.

LOG OF BORING 2

Rock Engineering & Testing Laboratory Inc.
4910 Neptune
Corpus Christi, TX 78405
Telephone: 361-883-4555
Fax: 361-883-4711

CLIENT: Timbercon Construction, Inc.
PROJECT: True Vision Church
LOCATION: Ackerman Road - San Antonio, Texas
NUMBER: G209140

DATE(S) DRILLED: 08/05/09 - 08/05/09

DRILLING METHOD(S):
Solid Stem Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling.

SURFACE ELEVATION: N/A

FIELD DATA				LABORATORY DATA							
DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
	SS S-1		N = 17	14	50	22	28			87	**FAT CLAY**, dark gray, dry, very stiff. (CH)
	SS S-2		N = 23	12							Same as above.
5	SS S-3		N = 83	6	21	14	7			68	**SANDY SILTY CLAY**, tan, dry, very hard. (CL-ML)(caliche)
	SS S-4		N = 48	13							**CLAYEY SILTY SAND**, tan, moist, hard. (caliche)
	SS S-5		N = 81	14	20	14	6			37	Same as above, very hard. (SC-SM)
10											
	SH S-6		P = 4.0	25							**FAT CLAY**, light brown and light gray, moist, very stiff.
15											
	SH S-7		P = 4.5+	22	53	20	33	102	2.5	98	Same as above, hard. (CH)
20											
	SH S-8		P = 4.5+	23							Same as above.
25											Boring terminated at a depth of 25-feet.

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:
Boring location determined by Timbercon Construction, Inc. Boring operations performed by a drilling subcontractor to RETL.

LOG OF BORING 3

Rock Engineering & Testing Laboratory Inc.
4910 Neptune
Corpus Christi, TX 78405
Telephone: 361-883-4555
Fax: 361-883-4711

CLIENT: Timbercon Construction, Inc.
PROJECT: True Vision Church
LOCATION: Ackerman Road - San Antonio, Texas
NUMBER: G209140

DATE(S) DRILLED: 08/05/09 - 08/05/09

DRILLING METHOD(S):
Solid Stem Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling.

SURFACE ELEVATION: N/A

DEPTH (FT)	SAMPLE NUMBER	N: BLOWS/FT; P: TONS/SQ FT; T: TONS/SQ FT; PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
	SS S-1	N = 23	9							**FAT CLAY FILL**, with sand and gravel, dark gray, dry, very stiff.
	SS S-2	N = 24	11	59	20	39			73	**FAY CLAY**, with sand, dark gray, dry, very stiff. (CH)
5	SS S-3	N = 39	8							**CLAYEY SAND**, tan, dry, hard. (caliche)
	SS S-4	N = 50/4"	5	25	13	12			46	Same as above, very hard. (SC)
10	SS S-5	N = 49 50/5"	6							Same as above, with gravel.
15	SS S-6	N = 43	13						82	**FAT CLAY**, light brown and light gray, dry, hard.
20	SH S-7	P = 4.5+	18							Same as above.
25	SH S-8	P = 4.5+	19	72	25	47	108	5.6	100	Same as above. (CH)
										Boring terminated at a depth of 25-feet.

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:
Boring location determined by Timbercon Construction, Inc. Boring operations performed by a drilling subcontractor to RETL.

LOG OF BORING 4

Rock Engineering & Testing Laboratory Inc.
4910 Neptune
Corpus Christi, TX 78405
Telephone: 361-883-4555
Fax: 361-883-4711

CLIENT: Timbercon Construction, Inc.
PROJECT: True Vision Church
LOCATION: Ackerman Road - San Antonio, Texas
NUMBER: G209140

DATE(S) DRILLED: 08/05/09 - 08/05/09

DRILLING METHOD(S):
Solid Stem Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
	1	SS S-1		N = 19	4	43	18	25			43	**CLAYEY GRAVEL FILL**, gray, dry, very stiff. (GC)
	2											
	3	SS S-2		N = 34	4							Same as above, hard.
	4											
	5	SS S-3		N = 17	4							Same as above.
												Boring terminated at a depth of 5-feet.

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:
Boring location determined by Timbercon Construction, Inc. Boring operations performed by a drilling subcontractor to RETL.

LOG OF BORING 5

Rock Engineering & Testing Laboratory Inc.
4910 Neptune
Corpus Christi, TX 78405
Telephone: 361-883-4555
Fax: 361-883-4711

CLIENT: Timbercon Construction, Inc.
PROJECT: True Vision Church
LOCATION: Ackerman Road - San Antonio, Texas
NUMBER: G209140

DATE(S) DRILLED: 08/05/09 - 08/05/09

DRILLING METHOD(S):
Solid Stem Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling.

SURFACE ELEVATION: N/A

FIELD DATA				LABORATORY DATA							
SOIL SYMBOL / DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
0–1	SS S-1		N = 12	9	58	20	38			80	**FAT CLAY**, with sand, dark gray, dry, stiff. (CH)
2.5–4	SS S-2		N = 22	14							Same as above, very stiff.
4–5.5	SS S-3		N = 46	8						52	**CLAYEY SAND**, tan, dry, hard. (caliche)
											Boring terminated at a depth of 5-feet.

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:
Boring location determined by Timbercon Construction, Inc. Boring operations performed by a drilling subcontractor to RETL.

Engineering & Testing Laboratory, Inc.

4910 Neptune Street
Corpus Christi, Texas 78405
Office: (361) 883-4555 Fax: (361) 883-4711

KEY TO SOIL CLASSIFICATIONS AND SYMBOLS

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		Letter	Symbol: Hatching	Symbol: Color	NAME
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW		RED	Well – graded gravels or gravel – sand mixtures, little or no fines
		GP		RED	Poorly-graded gravels or gravel – sand mixtures, little or no fines
		GM		YELLOW	Silty gravels, gravel – sand – silt mixtures
		GC		YELLOW	Clayey gravels, gravel - sand – clay mixtures
	SAND AND SANDY SOILS	SW		RED	Well - graded sands or gravelly sands, little or no fines
		SP		RED	Poorly – graded sands or gravelly sands, little or no fines
		SM		YELLOW	Silty sands, sand – silt mixtures
		SC		YELLOW	Clayey sands, sand – clay mixtures
FINE GRAINED SOILS	SILTS AND CLAYS LL < 50	ML		GREEN	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with
		CL		GREEN	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL		GREEN	Organic silts and organic silt-clays of low plasticity
	SILTS AND CLAYS LL > 50	MH		BLUE	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH		BLUE	Inorganic clays of high plasticity, fat clays
		OH		BLUE	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		Pt		ORANGE	Peat and other highly organic soils

TERMS CHARACTERIZING SOIL STRUCTURE

SLICKENSIDED – having inclined planes Of weakness that are slick and glossy in appearance

FISSURED – containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical

LAMINATED (VARVED) – composed of thin layers of varying color and texture, usually grading from sand or silt at the bottom to clay at the top.

CRUMBLY – cohesive soils which break into small blocks or crumbs on drying

CALCAREOUS – containing appreciable quantities of calcium carbonate, generally nodular.

WELL GRADED – having wide range in grain sizes and substantial amounts of all intermediate particle sizes.

POORLY GRADED - predominantly of one grain size (uniformly graded) or having a range of sizes with some intermediate size missing (gap or skip graded)

SYMBOLS FOR TEST DATA

M/C = 15 – Natural moisture content in percent.

γ = 95 – Dry unit weight in lbs/cu ft.

Qu = 1.23 – Unconfined compression strength in tons/ sq ft.

51 – 21 – 30 – Liquid limit, Plastic limit, and Plasticity index.

30% FINER – Percent finer than No. 200 mesh sieve

30 B/F – Blows per foot, standard penetration test.

▼ – Ground water table.

TERMS DESCRIBING CONSISTENCY OF SOIL (2)

COARSE GRAINED SOILS: DESCRIPTIVE TERM	COARSE GRAINED SOILS: NO. BLOWS / FT. STANDARD PEN. TEST	FINE GRAINED SOILS: DESCRIPTIVE TERM	FINE GRAINED SOILS: NO. BLOWS / FT. STANDARD PEN. TEST	FINE GRAINED SOILS: UNCONFINED COMPRESSION TONS PER SQ. FT.
Very loose	0 – 4	Very Soft	< 2	< 0.25
Loose	4 – 10	Soft	2 – 4	0.25 – 0.50
Firm (medium)	10 – 30	Plastic (med. Stiff)	4 – 8	0.50- 1.00
Dense	30 – 50	Stiff	8 – 15	1.0 – 2.00
Very Dense	over 50	Very Stiff	15 – 30	2.00 – 4.00
		Hard	over 30	over 4.00

Field classification for "Consistency" is determined with a 0.25" diameter penetrometer.