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

September 26, 2012

Kenedy Retail, LLC
3737 Executive Center Dr., Suite 105
Austin, Texas 78731

Attention: Justin T. Day/ Evan Williams, Managers

SUBJECT: **SUBSURFACE EXPLORATION, LABORATORY TESTING PROGRAM AND FOUNDATION AND PAVEMENT RECOMMENDATIONS FOR THE PROPOSED COMMERCIAL PROJECT HWY 181 & BUSINESS PARK BLVD. KENEDY, TEXAS**
RETL Job No.: G212253

Dear Mr. Day and Mr. Williams,

In accordance with our agreement, we have conducted a subsurface exploration and foundation and pavement evaluation for the above referenced project. The results of this exploration, together with our recommendations, are to be found in the accompanying report, two 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 COMMERCIAL PROJECT HWY 181 & BUSINESS PARK BLVD. KENEDY, TEXAS

RETL JOB NUMBER: G212253

PREPARED FOR:

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3737 EXECUTIVE CENTER DR., SUITE 105
AUSTIN, TEXAS 78731

SEPTEMBER 26, 2012

PREPARED BY:

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Kyle D. Hammock
Vice President San Antonio

TABLE OF CONTENTS

Page

INTRODUCTION

This report presents the results of a soils exploration and foundation and pavement evaluation for the proposed Commercial Project to be located at Hwy 181 and Business Park Blvd., in Kenedy, Texas. This study was conducted for Kenedy Retail, LLC.

Authorization

The work for this project was performed in accordance with RETL Proposal Number P090612D (Revision No.2) dated September 10, 2012. The proposal contained a scope of work, lump sum fee and limitations. The proposal was approved and signed by Justin T. Day on September 11, 2012 and was returned to RETL via email.

Purpose and Scope

The purpose of this exploration was to evaluate the soil and groundwater conditions at the site and to provide recommendations for the foundation and pavements suitable for the proposed project.

The scope of the exploration and evaluation 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 Justin T. Day of Kenedy Retail, LLC. If the structural or civil engineers require additional soil parameters to complete 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 D3740).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 Kenedy Retail, LLC for the specific application towards the proposed Commercial Project to be located at Hwy 181 and Business Park Blvd., in Kenedy, Texas.

FIELD EXPLORATION

Scope

The field exploration completed in order to evaluate the engineering characteristics of the foundation and pavement materials included reconnaissance of the project site, drilling the test borings, and recovering disturbed split spoon samples and relatively undisturbed Shelby tube samples.

Four (4) borings were performed at the site. Borings B-1 and B-2 were drilled to a depth of 30-feet within the proposed building area and borings B-3 and B-4 were drilled to a depth of 5-feet in the paving areas. RETL determined the number, depth and general location of the borings and staked the borings in the field. A drilling subcontractor to RETL performed the boring operations. Upon completion of the drilling operations and obtaining the groundwater observations, the bore holes were backfilled with excavated soil and the site cleaned as required.

A Boring Location Plan, which is a reproduction of a drawing provided to RETL by Kenedy Retail, LLC, is provided in the Appendix of this report.

Drilling and Sampling Procedures

The borings were performed using a drilling rig equipped with a rotary head and solid stem auger drilling methods were used to advance the boreholes to their 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 D1586). Undisturbed soil samples were obtained using thin-wall tube sampling procedures in accordance with the procedures for "*Thin Walled Tube Sampling of Soils*" (ASTM D1587).

The samples were classified in the field, placed in plastic bags, marked according to their 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 Observations - Water level observations were obtained during the test boring operations and are noted on the boring logs provided in the Appendix. The amount of water in open boreholes largely depends on the permeability of the soils encountered at the boring locations. 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 body of water, and recent rainfall conditions may influence the depth to the groundwater.

Ground Surface Elevations – Ground surface elevations were not provided at the boring locations. All depths referred to in this report are reported from the level of the ground surface elevations at the boring locations during the time of our field investigation.

LABORATORY TESTING PROGRAM

In addition to the field investigation, a laboratory-testing program was conducted to determine 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 D2487) and water content tests (ASTM D2216) on all samples. In addition, selected samples were subjected to Atterberg limits tests (ASTM D4318) and percent material finer than the #200 sieve. The estimated soil strengths were obtained in the field 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 on the accompanying boring logs provided in the Appendix.

SUBSURFACE CONDITIONS

General

The types of foundation bearing materials encountered in the test borings have been visually classified and are described in detail on the boring logs. The results of the standard penetration tests, strength tests, water level observations 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 6 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, whereby the test borings were drilled and sampled by experienced technicians, 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 subsurface conditions encountered at the project site have been summarized and soil properties including classification, strength, plasticity and grain size are provided in the following table:

D	Description	LL	PI	C	θ	γ_e	-#200	N or P
0-2	Sandy Lean/Fat **CLAY**	30-58	16-34	1500	0	120	56-61	N= 8-15 P= 4.5+
2-8	Clayey **SAND**	29-39	15-24	2000	0	120	29-42	N= 12-28 P= 3.0-4.5+
8-30	Sandy Lean **CLAY** and Lean **CLAY**	31-49	16-35	3000	0	120	61-77	N= 18-55

Where: D = Depth in feet below existing grade
LL = Liquid Limit (%)
PI = Plasticity Index
C = Average Soil Cohesion, psf (undrained)
θ = 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.

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 clayey soils extending to the 30-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 extending to the 30-foot depth 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 during the drilling nor measured in the borings upon completion of the drilling. 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 30-foot depth, the deepest boring termination depth. It should be noted that water levels in open boreholes may require anywhere from 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 RECOMMENDATIONS

Project Description

Based on the information provided, it is understood that the proposed project will consist of the construction of a new 12,000 SF single-story retail building using CMU block or concrete tilt wall construction with a structural steel roof system. Anticipated loads were not provided, however, based on our experience with similar types of structures, maximum concentrated loads on the order of 100 kips are expected, with wall loads in the range of 1 to 2 ½-kips per linear foot. New pavements are planned to accommodate primarily passenger car and light trucks.

PVR Discussion

The soils at this site are generally low to moderate in plasticity. **The maximum calculated total potential vertical rise (PVR) in the building area for slab on grade type construction is in the range of approximately 1 ¼ to 1 ¾-inch.** The PVR was calculated using the Texas Department of Transportation Method TEX-124E and into account the depth of 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 system 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, within the footprint of a slab-on-grade.

To consistently reduce the PVR to approximately 1-inch at this site, it will be necessary to undercut the subgrade soils to a minimum depth of 2-feet and provide a minimum of 3-feet of properly compacted select fill below the floor slabs.

Slab-on-Grade Recommendations

The proposed structure can utilize a stiffened slab-on-grade foundation at this site. Interior and exterior grade beams should be founded in the natural soils or on compacted select fill at a minimum depth of 2-feet below the finished floor slab elevation. The exterior beams should also penetrate a minimum of 2-feet below the final exterior grades. Interior and exterior grade beams can be designed for a net allowable unit soil bearing pressure of **2,500 psf**. The net allowable unit soil bearing pressure provided utilizes a safety factor of at least 3.

The beams should be a minimum of 12-inches wide to reduce the potential for localized shear failure and the beams should be spaced a maximum of 20-feet apart, in both directions. The Structural Engineer may vary beam depths and spacing based experience designing and constructing similar type structures on sites with similar subsurface soil conditions.

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 a slab on grade foundation at this site with a PVR of approximately 1-inch:

WRI DESIGN CRITERIA	
Climatic Rating (Cw)	17
Effective Plasticity Index	24
Soil/Climatic Rating Factor (1-C)	0.10
Maximum Beam Spacing (ft)	20

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 materials 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 properly 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.

Straight Shaft Drilled Piers

Straight shaft drilled piers may be used at this site and shall be founded at a minimum depth of 15-feet below the existing or final ground surface elevation, whichever is deeper. The structural designer can utilize the allowable unit skin friction values for the range in depths included in the following table for straight shaft drilled piers to resist axial compression loads given the strengths of the subsurface soils encountered:

Depth Below Existing Grade (ft)	Allowable Unit Skin Friction (psf)
0-5	Neglect
5-8	550
18-30	825

All depths are referenced from the existing ground surface elevation at the boring locations at the time of our field investigation. The allowable unit skin friction values provided above are based on the average strengths of the in-situ soils and utilize a safety factor of 2.0 to prevent shear failure. An allowable end bearing pressure of 9,000 psf may also be used for piers founded at or below a depth of 20-feet. Resistance to uplift can be calculated by taking 60-percent of the axial capacity of a straight shaft drilled pier.

Straight shaft drilled piers designed as friction elements using the design parameters provided generally undergo very little permanent settlement. Down-drag or negative skin friction is not a design consideration. Straight shaft drilled piers shall be spaced a minimum distance measured center to center of three times the diameter. A minimum of 1-percent reinforcing steel is recommended.

Based on observations made in the field, temporary steel casing or slurry should not be required to successfully install straight shaft drilled piers. Pier excavations shall not be allowed to stay open overnight. Concrete shall be placed as soon as possible after all loose material has been removed, the pier excavation inspected and reinforcing steel installed. A relatively high slump concrete mix (7 to 8-inches) is suggested to minimize aggregate segregation caused by the reinforcing steel.

Free fall of concrete into the pier excavation is permitted provided the concrete can be placed into the pier excavation without striking the sides of the excavation or hitting the rebar. In situations where it is impossible for the concrete to fall freely without striking the rebar cage or sides of the pier excavation, the free fall shall be limited to 10-feet, or placed with a tremie. Pier excavations shall not be allowed to stay open overnight.

The successful installation of a drilled pier foundation system is dependent on the expertise of the drilled pier foundation contractor. A test pier excavation shall be performed at the site to verify the contractor's construction methods and to identify any potential groundwater infiltration and soil sloughing problems. The Geotechnical Engineer, or his designated representative, shall be present to witness the installation of all the drilled piers, including the test pier excavation.

It is feasible to use a grade supported concrete floor slabs in conjunction with the drilled piers. The slabs will, however, be subjected to potential vertical movement (PVR) as noted previously. Appropriate structural design details are required to account for differential movements that may occur between the relatively fixed foundation elements and a soil supported floor slab.

Soil supported floor slabs will be subject to vertical movements. It should be understood that even PVR values on the order of 1-inch could result in differential movements that could cause distress and cosmetic damage to rigid interior walls, floor coverings and partitions. Potential foundation movements and the likelihood that cosmetic damage could occur should be understood and addressed in the design phase of this project. It is recommended that the site improvement recommendations provided in the **"PVR Discussion" and "Site Preparation"** sections of this report be performed if a soil supported interior floor slab system is selected. To reduce the PVR to approximately 1-inch at this site, it will be necessary to undercut the subgrade soils to a minimum depth of 2-feet and provide a minimum of 3-feet of properly compacted select fill below the floor slabs.

Grade supported floor slabs may be separated from the pier supported foundation elements by a permanent expansion joint, which allows free vertical movement of the slab. The floor slabs could alternatively be attached to the pier supported foundation elements. If the floor slabs are separated from the pier supported foundation elements, differential vertical movements may cause problems at critical points such as doors.

If the floor slabs are connected to pier supported foundation elements, a plastic hinge crack may develop approximately 3 to 10-feet away from and parallel to pier supported foundation elements. Installing a joint parallel to the pier supported foundation element can assist with controlling the location of the plastic hinge crack. Typically the joint should be constructed 5 to 7-feet away from the pier supported foundation elements.

PAVEMENT CONSIDERATIONS

In designing the proposed automobile 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 of the in-situ subgrade soils, the CBR and K value for design has been selected as 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 medium-duty service based on pavement sections that have provided adequate serviceability for similar type applications.

Automobile parking areas and driveways and can be designed with either a flexible or rigid pavement. It is important that the exposed subgrade is properly prepared prior to pavement installation.

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

Light Duty Flexible Pavement (Passenger Car & Light Truck Parking Areas)		
Hot Mix Asphaltic Concrete	2"	2"
Crushed Limestone Base Material (TxDOT Item 247 Type A; Gr. 2)	10"	6"
Geogrid	---	TX-5
Compacted Subgrade	6"	6"

Medium Duty Flexible Pavement (Driveways and Service Areas)		
Hot Mix Asphaltic Concrete	2"	2"
Crushed Limestone Base Material (TxDOT Item 247 Type A; Grade 2)	12"	8"
Geogrid	---	TX-5
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-percent of the maximum dry unit weight of the subgrade soils as determined by a standard Proctor test (ASTM D698) and within 3-percent of the optimum moisture content.

On-site or off-site 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.

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. The base material should be placed in maximum 8-inch thick loose lifts and compacted to a minimum density of 95-percent of the maximum dry density as determined by the modified Proctor test (ASTM D1557) and within 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 surface course. The asphaltic concrete should be compacted to between 92 and 96-percent of the laboratory density. 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.

The use of concrete for paving has become more prevalent in recent years due to the long term maintenance cost benefits of concrete pavement compared to asphalt pavements. The recommended light and medium-duty rigid concrete pavement sections are provided in the following table:

Rigid Pavement	Light Duty	Medium Duty
Reinforced Concrete	5 ½"	6"
Compacted Subgrade	6"	6"

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

The concrete pavement should be properly reinforced and jointed, as per ACI, and should have a minimum 28-day compressive strength of 3000 psi. Expansion joints should be 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.

Based on past experience with concrete pavements supported on similar subgrade soils, RETL recommends that reinforcement for concrete pavement consist of #4 bars (1/2–inch diameter) spaced at 18-inches on center each way. The splice length for #4 bars should not be less than 20-inches.

The heavy duty concrete at the location of the trash dumpster should be 8-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 or operations managers 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.

SITE IMPROVEMENT METHODS

General Considerations

A majority of foundation related problems in the project area are attributable, at least in part, to poor drainage. Cohesive soils expand or shrink by absorbing or losing water. Reducing a soil's variation in moisture content will reduce its variation in volume. A number of measures may be used to attain a reduction in subsoil moisture content variations, thus reducing the soil's shrink/swell volume change potential. 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 foundations should be designed and implemented. We recommend that others devise an effective site drainage plan prior to commencement of construction to provide positive drainage away from the foundation perimeters and off the site, both during, and after construction.
- The top 2-feet of utility trenches should be backfilled with low plasticity clays to assure the trenches do not serve as aqueducts that could transport water beneath the structure due to excessive surface water infiltration.
- 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 any slab foundations 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 areas. Poor drainage schemes are generally the primary cause of foundation problems on clay soils.

Concrete Flatwork

Concrete site flatwork such as sidewalks will be subject to PVR movements when constructed over plastic clay soils. Changes in the moisture content of the supporting clay soils causes volumetric changes, resulting in differential movements of the flatwork. Provisions in the site development should be made in order to maintain relative uniform moisture contents of the supporting soils.

Individual concrete panels of concrete flatwork should be dowelled together to minimize trip hazards as a result of differential movements within the flatwork. All efforts should be made to avoid having situations where site flatwork panels are partially supported on compacted select fill soils and partially supported on natural plastic clay soils which will result in differential movement and may also result in a negative slope back to the building causing ponding of water next to the structure. If it is desired to increase the performance level and reduce the PVR for concrete flatwork, the clay soils should be undercut and replaced with select fill as discussed in the **"PVR Discussion" and "Site Preparation"** sections of this report.

CONSTRUCTION CONSIDERATIONS

Site Preparation

All organic materials, loose debris and other objectionable materials should initially be stripped from the surface of the site and discarded. In the building area, RETL recommends removing a minimum of 2-feet of the on-site clay soils to a distance of 5-feet beyond the slab perimeter.

Prior to compaction, the exposed subgrade in the building area 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 6-inches of exposed subgrade soil in the building area should then be moisture conditioned and compacted to at least 95-percent of the standard Proctor (ASTM D698) maximum dry density and within 3-percent of the optimum moisture content.

Upon completion of the subgrade preparation, a minimum of 3-feet compacted select fill soils should be placed to fill the undercut excavation. Any additional fill required to raise the building pad to the final grade elevation should be select fill. The select fill building pad 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). Excavation of beams, footings and utility trenches may proceed after placement of select fill is complete.

Select Fill

Imported select fill material used at this site should have a maximum liquid limit of 40-percent and a plasticity index (PI) between 5 and 18. The select fill should be placed in no greater than 8-inch thick loose lifts and shall be compacted to a minimum density of 95-percent of the maximum dry density as determined by the standard Proctor (ASTM D698) and within 2-percent of the optimum moisture content. The Geotechnical Engineer shall approve select fill utilized at this site.

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 be extended to final grade and that the foundations 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 soils are softened by surface water intrusion, or by desiccation, the unsuitable soils must be removed from the foundation excavation and be replaced with properly compacted select fill prior to placement of concrete.

The Geotechnical Engineer, or his designated representative, should monitor subgrade preparation and placement of select fill. As a guideline, a minimum of one in-place density test should be performed on the subgrade soils and each subsequent lift of fill for each 2,000 SF of slab area, or a minimum of three in-place density tests per testing interval, whichever is greater. Any areas not meeting the required compaction should be recompacted and retested until compliance is met.

Vapor Retarder

A vapor retarder with a permeance of less than 0.3 US perms (ASTM E96) 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 E1643, "*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.

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/Control Joints

Expansion and or control joints should be designed and placed in various portions of the structure, especially rigid brick or block walls. 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.

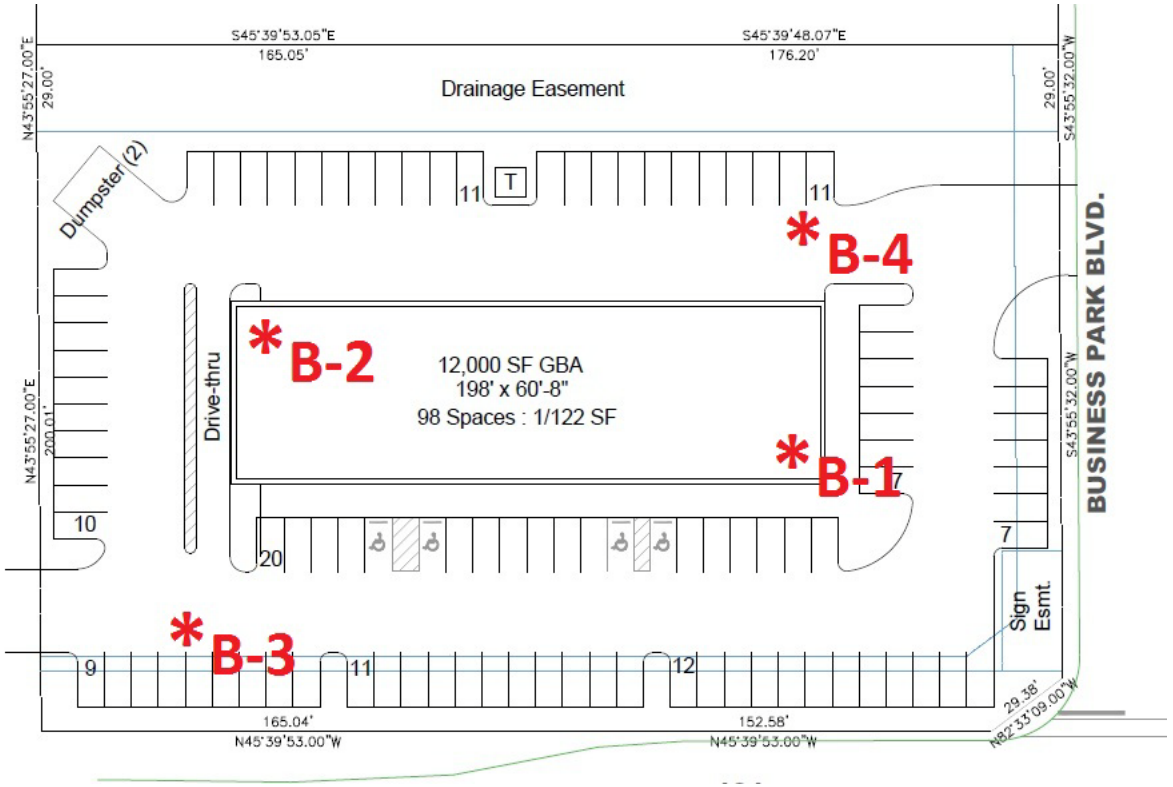
GENERAL COMMENTS

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 foundation excavation or pavement areas prior to concreting or placing pavement constituents 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

September 26, 2012
Kenedy Retail, LLC
RETL Job No.: G212253

PROPOSED COMMERCIAL PROJECT
Hwy 181 and Business Park Blvd.
Kenedy, Texas

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

LOG OF BORING 01

Rock Engineering & Testing Laboratory
18847 Redland Rd., Suite 202
San Antonio, Texas 78259
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: Kenedy Retail, LLC
PROJECT: Commercial Project
LOCATION: Hwy 181 & Bus. Park Blvd. - Kenedy, Texas
NUMBER: G212253
DATE(S) DRILLED: 09/13/2012 - 09/13/2012

DRILLING METHOD(S):
Solid Stem Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling, nor measured in the boring upon completion of the 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 (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		SPT S-1		N= 8	11	46	18	28			60	**SANDY LEAN CLAY**, black, slightly moist, stiff. (CL)
		SPT S-2		N= 12	8							**CLAYEY SAND**, dark gray, dry, stiff.
	5	SPT S-3		N= 22	10	39	15	24			42	Same as above, slightly moist, very stiff. (SC)
		SPT S-4		N= 17	10							Same as above.
		SPT S-5		N= 29	16	47	15	32			70	**LEAN CLAY**, with sand and calcareous material, light brown, moist, very stiff. (CL)
	10											
		SPT S-6		N= 21	21							Same as above, sans calcareous material.
	15											
		SPT S-7		N= 37	16	31	15	16			77	Same as above, hard. (CL)
	20											
		SPT S-8		N= 29	13							**SANDY LEAN CLAY**, with calcareous material, light brown, slightly moist, very stiff.
	25											
		SPT S-9		N= 55	14							Same as above, hard.
	30											Boring terminated at depth of 30-feet.

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

REMARKS:
Boring location determined by RETL. Drilling operations performed by a drilling subcontractor to RETL.

LOG OF BORING 02

Rock Engineering & Testing Laboratory
18847 Redland Rd., Suite 202
San Antonio, Texas 78259
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: Kenedy Retail, LLC
PROJECT: Commercial Project
LOCATION: Hwy 181 & Bus. Park Blvd. - Kenedy, Texas
NUMBER: G212253
DATE(S) DRILLED: 09/13/2012 - 09/13/2012

DRILLING METHOD(S):
Solid Stem Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling, nor measured in the boring upon completion of the 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 (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		SH S-1		P= 4.5+	10	30	14	16			56	**SANDY LEAN CLAY**, black, slightly moist, very stiff. (CL)
		SH S-2		P= 4.5+	7	29	13	16			39	**CLAYEY SAND**, dark gray, dry, very stiff. (SC)
	5	SH S-3		P= 3.0	9							Same as above.
		SPT S-4		N= 28	6	29	14	15			29	Same as above, very stiff. (SC)
		SPT S-5		N= 18	12	48	13	35			61	**SANDY LEAN CLAY**, with calcareous material, light brown, slightly moist, very stiff. (CL)
	10											
		SPT S-6		N= 19	19	49	15	34			71	Same as above, sans calcareous material, moist. (CL)
	15											
		SH S-7		P= 4.5+	17							Same as above.
	20											
		SPT S-8		N= 40	18							**SANDY LEAN CLAY**, with calcareous material, light brown, moist, hard.
	25											
		SPT S-9		N= 49	15							Same as above.
	30											Boring terminated at depth of 30-feet.

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

REMARKS:
Boring location determined by RETL. Drilling operations performed by a drilling subcontractor to RETL.

LOG OF BORING 03

Rock Engineering & Testing Laboratory
18847 Redland Rd., Suite 202
San Antonio, Texas 78259
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: Kenedy Retail, LLC
PROJECT: Commercial Project
LOCATION: Hwy 181 & Bus. Park Blvd. - Kenedy, Texas
NUMBER: G212253

DATE(S) DRILLED: 09/13/2012 - 09/13/2012

DRILLING METHOD(S):
Solid Stem Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling, nor measured in the boring upon completion of the 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 (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
	1	SH S-1		P= 4.5+	14	58	24	34			61	**SANDY FAT CLAY**, black, slightly moist, very stiff. (CH)
	2											
	3											
	4	SPT S-2		N= 12	11							**CLAYEY SAND**, black, slightly moist, stiff.
	5											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 RETL. Drilling operations performed by a drilling subcontractor to RETL.

LOG OF BORING 04

Rock Engineering & Testing Laboratory
18847 Redland Rd., Suite 202
San Antonio, Texas 78259
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: Kenedy Retail, LLC
PROJECT: Commercial Project
LOCATION: Hwy 181 & Bus. Park Blvd. - Kenedy, Texas
NUMBER: G212253
DATE(S) DRILLED: 09/13/2012 - 09/13/2012

DRILLING METHOD(S):
Solid Stem Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling, nor measured in the boring upon completion of the 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 (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
	1	SPT S-1		N= 15	10							**SANDY LEAN CLAY**, black, slightly moist, stiff.
	2											
	3	SH S-2		P= 4.5+	7	31	13	18			37	**CLAYEY SAND**, black, dry, very stiff. (SC)
	4	NR S-3		*NO RECOVERY*								
	5											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 RETL. Drilling operations performed by a drilling subcontractor to RETL.

Engineering & Testing
Laboratory, Inc.

6817 Leopard Street
Corpus Christi, Texas 78409
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			Poorly-graded gravels or gravel – sand mixtures, little or no fines
		GM		YELLOW	Silty gravels, gravel – sand – silt mixtures
		GC			Clayey gravels, gravel - sand – clay mixtures
	SAND AND SANDY SOILS	SW		RED	Well - graded sands or gravelly sands, little or no fines
		SP			Poorly – graded sands or gravelly sands, little or no fines
		SM		YELLOW	Silty sands, sand – silt mixtures
		SC			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			Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL			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			Inorganic clays of high plasticity, fat clays
		OH			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		FINE GRAINED SOILS		
DESCRIPTIVE TERM	NO. BLOWS / FT. STANDARD PEN. TEST	DESCRIPTIVE TERM	NO. BLOWS / FT. STANDARD PEN. TEST	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.