ECS Southwest, LLP

Geotechnical Engineering Report

Potranco Loop 1604 Subdivision – Preliminary Soil Survey

West Loop 1604 N.
San Antonio, Texas

ECS Project Number 20:1276

September 8, 2021

September 8, 2021

Mr. Darren Troilo
KH Home
4800 Fredericksburg
San Antonio, Texas 78229

ECS Project No. 20:1276

Subject: Subsurface Exploration and Geotechnical Evaluation
Potranco Loop 1604 Subdivision – Preliminary Soil Survey
West Loop 1604 N
San Antonio, Texas

Dear Mr. Troilo:

We have completed our subsurface exploration and preliminary geotechnical engineering evaluation for the proposed Potranco Loop 1604 subdivision in San Antonio, Texas. Our geotechnical design and construction recommendations for the proposed residential foundations are presented in this report.

We appreciate the opportunity to serve as your geotechnical consultant and look forward to the opportunity to work with you through the construction of this project. Should you have any questions, comments, or concerns regarding this report, please contact the undersigned.

Respectfully,

ECS SOUTHWEST, LLP

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Electronic seal approved by Rene P. Gonzales, P.E. on September 8, 2021

TABLE OF CONTENTS

APPENDICES

Appendix A – Drawings & Reports

- Site Location Diagram
- Boring Location Diagram

Appendix B – Field Operations Reference Notes for Boring Logs

- Subsurface Exploration Procedures
- Boring Logs B-1 through B-5

Appendix C – Laboratory Testing

- Laboratory Test Results Summary
- Grain Size Analyses

EXECUTIVE SUMMARY

The following summarizes the main findings of the exploration, particularly those that may have a cost impact on the planned development. Further, our principal geotechnical recommendations are summarized. Information gleaned from the executive summary should not be utilized in lieu of reading the entire geotechnical report.

- The geotechnical exploration performed for this study consisted of a total of 5 borings drilled to depths of 15 feet.

- The subsurface conditions encountered appeared to be generally consistent with published geological mapping. The explored soils generally consisted of thin veneer of topsoil over limestone bedrock. For specific subsurface information refer to the Boring Logs in the Appendix.

- The underlying geology of the site consists of Austin Chalk limestone (Kau), which generally consists of chalky limestone and marlstone. Although the Austin Chalk is not known to be a karstic limestone, solution cavities have been documented in localized areas of San Antonio.

- We have estimated potential heave for this site using the TxDOT Method (TEX 124-E). We estimate the existing PVR in the area of the borings to be less than 1 inch.

- The proposed residential structures can be supported by a monolithic slab foundation system. The slabs may be reinforced with either conventional reinforcing steel or post-tensioned cables.

- We recommend the proposed grade beams have minimum bearing depth of 18 inches and be sized using an allowable bearing values of 3,000 psf.

- Excavations to install site utilities or below-ground site structures will encounter competent limestone bedrock. Excavations at this site will require heavy duty equipment with rock saws, impact hammers, and other equipment capable of ripping hard limestone bedrock.

1.0 PROJECT OVERVIEW

The purpose of this study was to provide geotechnical information to develop preliminary design values for the planned single-family homes. The development will also include detention ponds, and associated utilities and appurtenances. The proposed site grading information included the planned cut and fill information for the proposed home lots was not available at the time of this preliminary report.

The preliminary foundation design recommendations developed for this report are based on project information provided by the client. This report contains the results of our subsurface explorations and geotechnical laboratory testing programs, site characterization, engineering analyses, and recommendations for the design and construction of the proposed improvements. The pavement analysis recommendations for the proposed subdivision streets are presented in a separate report.

1.1 Scope of Services

To obtain the necessary geotechnical information required for evaluation of subsurface soil conditions supporting the structure the site evaluation will include five (5) soil borings drilled to depths of 15 feet. The borings were performed at the approximate locations selected by ECS. A laboratory testing program was also implemented to characterize the physical and geotechnical engineering properties of the subsurface soils.

This report discusses our exploratory and testing procedures, presents our findings and evaluations and includes the following:

- A brief review and description of our field and laboratory test procedures and the results of testing conducted.
- A review of surface features and site conditions.
- A review of site geologic conditions.
- A review of subsurface soil stratigraphy with pertinent available physical properties.
- Logs of our soil test borings.
- Recommendations for site preparation, grading and drainage of the proposed lots.
- Preliminary design values to assist with the planning and development of the proposed single-family homes.

The scope of services for this project did not include an environmental assessment for determining the presence or absence of wetlands, or corrosive, hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air on or below, or around this site. Any statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.

1.2 Authorization

ECS Southwest, LLP (ECS) conducted this subsurface exploration and geotechnical engineering evaluation as described in ECS Proposal No. 20:0782 dated June 30, 2021. This study was performed in general accordance with Master Contract for Consulting Services Agreement No. 11-2016 between KB Home Lone Star, Inc. and ECS Southwest, LLP dated November 8, 2016. and was authorized by Work Agreement No. 5441529 dated July 15, 2021.

2.0 PROJECT INFORMATION

2.1 Project Location and Site Conditions

The approximate 10 acre site is located off of West Loop 1604 N. in San Antonio, Texas. The site is currently undeveloped and is vegetated with scattered trees and underbrush. A cursory review of the USGS topographic information suggests the site slopes gradually to the southwest.

2.2 Proposed Construction

The project will include the design and construction of a single-family residential development. A final site plan has not been prepared for the project, but we anticipate the project will include new local access public roadways, green areas, site utilities, and associated appurtenances.

A grading plan was not available at the time of this report, and we anticipate that less than 5 feet of cut/fill will be required to reach finished grades in the proposed residential lots.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

Our exploration procedures are explained in greater detail in Appendix B including the insert titled Subsurface Exploration Procedures. Our scope of work included drilling 5 borings. Our borings were located with a handheld GPS unit and their approximate locations are shown on the Boring Location Diagram in Appendix A.

3.1 Local Geology

The Geologic Atlas of Texas – San Antonio Sheet indicates the site is underlain by the Austin Chalk Limestone (Kau). The Austin Chalk consists of a fairly thick-bedded impure chalk, interstratified with marly beds. The rocks are entirely white on the surface, but their subterranean parts have a bluish color, which they lose when dried in air. Lithologies in this formation will vary from a thin veneer of dark brown clays, caliche and limestone rock fragments in the weathering profile, to interbedded hard and soft layers of chalky, marly fossiliferous limestone in the unweathered portion of the formation.

3.2 Summary of Subsurface Conditions

The subsurface conditions encountered appeared to be generally consistent with published geological mapping. The following sections provide generalized characterizations of the soil strata encountered during our subsurface exploration. For specific information refer to the Boring Logs in Appendix B.

The subsurface conditions encountered were generally consistent with published geological mapping. The soil borings generally encountered less than 6 inches of topsoil over tan LIMESTONE. Observations during drilling indicated the limestone was slightly weathered near the surface and became more competent with depth. Please refer to the attached boring logs and laboratory data summary for a more detailed description of the subsurface conditions encountered.

3.3 Depth to Bedrock

The results of the borings indicated excavations at this site will encounter shallow bedrock. The five borings drilled as part of this study encountered bedrock at less than 6 inches below the top of the ground surface. Exposed limestone is visible on the ground surface at various locations of the site.

Shallow bedrock will occur at relatively shallow depths. Significant cuts that extend below the depth of the overburden clays at this site will encountered competent bedrock and will be difficult with standard earthmoving equipment. The weathered bedrock zone near the surface may include interbedded clay seams and layers and boulder-size, broken, bedrock.

Trenches and excavation to install below-ground site utilities, will encounter competent bedrock. Excavations that extend into bedrock will likely require the use of rock saws and hoe rams. Actual field construction techniques should be decided after field tests using proper equipment. Excavations and bracing requirements for site excavations should conform to applicable federal, state, and local regulations.

3.4 Karst Considerations

Although, the Austin Chalk is not considered to be a highly conducive karst formation, localized solution features have been documented to occur in the Austin Chalk. We did not observe caves or exposed solution-widened fractures in the vicinity of our borings at the time of our site visit.

Our experience in the vicinity of the project has been that near-surface karst features commonly encountered during site development tend to be localized and can be addressed by providing engineering measures to allow construction to proceed.

Potential karst features encountered during construction will need to be reported to the Texas Commission on Environmental Quality (TCEQ). If voids or solution features are observed, construction activities should be suspended to allow the TCEQ to review and approve potential mitigation plans. Temporary protection measures and additional information for recommended action plans are provided in the Texas Commission on Environmental Quality Rules and Technical Guidance web page (https://www.tceq.texas.gov/permitting/eapp/rules.html).

3.5 Groundwater Observations

The borings were advanced using relatively dry drilling techniques to their full depths, enabling the potential detection of the presence of groundwater during drilling operations. Groundwater was not encountered during or upon completion of drilling the borings at this site. Upon completion of drilling operations, the boreholes were backfilled with soil cuttings generated during our drilling operations.

It should be noted that water levels in open boreholes may require several hours to several days to stabilize depending on the permeability of the soils and that groundwater levels at the site may be subject to seasonal conditions, recent rainfall, drought or temperature effects. Clays are generally not conducive to the presence of groundwater; however, gravels, sands and silts, and open fractures and solution features; where present, can store and transmit “perched” groundwater flow or seepage. Therefore, groundwater conditions should be evaluated just prior to and during construction.

3.6 Laboratory Testing

Samples were transported to the ECS laboratory where they were examined and visually classified by an ECS geotechnical engineer using the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. To aid in classification of the soils and determination of their selected engineering characteristics, a testing program was conducted on selected samples in general accordance with the following standards:

Laboratory Test	Test Standard
Sieve Analyses	ASTM D 1140 and ASTM D 422
Moisture Content	ASTM D 2216
Atterberg Limits	ASTM D 4318

Results of the laboratory tests are included in the Appendix on the boring logs and on the laboratory test summary tables. Laboratory test results were used to classify the soils encountered as outlined by USCS in general accordance with ASTM D 2487. The USCS group symbols for each soil type are indicated in parentheses with the soil descriptions on the test boring logs. A brief explanation of the USCS is included in the Appendix.

All samples were returned to our laboratory in San Antonio, Texas. Samples not tested in the laboratory will be stored for a period of 60 days subsequent to submittal of this report and will be discarded after this period, unless we receive alternate instructions regarding their disposition.

4.0 ANALYSIS AND RECOMMENDATIONS

4.1 Geotechnical Synopsis

The following preliminary recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions. If there are any changes to the project characteristics or if different subsurface conditions are encountered during construction, ECS should be consulted so that the recommendations of this report can be reviewed. Site grading information was not provided during the preparation of this report; however, we have considered that the foundation elevation will be at or near the existing site elevations. If the finished floor elevation deviates from this grade, the recommendations provided below should be evaluated by our office.

In general, the proposed development at the site is considered geotechnically feasible provided the recommendations of this report are implemented in the design and construction of the project. The predominant geotechnical and geological constraints that need to be addressed at the site are the shallow bedrock and expansive nature of the overburden clay soils.

The proposed residential structures can be supported by a monolithic slab-on-grade foundation system provided the necessary earthwork remediation is constructed as recommended in this report. Specific design recommendations for foundations and other geotechnical related aspects of the project are discussed in the following subsections.

4.2 Potential Vertical Rise

Structural damage and/or cosmetic/operational distress can be caused by volume changes in clay soils. The expansive soils found at this site are capable of swelling and shrinking in volume dependent on potentially changing soil water conditions during or after construction. Clays can shrink when they lose water and swell (grow in volume) when they gain water. The potential of expansive clays to shrink and swell is related to; amongst other things, the Plasticity Index (PI). Clays with a higher PI generally have a greater potential for soil volume changes due to moisture content variations.

We have estimated potential heave for this site utilizing the TxDOT method (Tex 124-E). The Tex 124-E method provides an estimate of potential vertical rise (PVR) using the liquid limits, plasticity indices, and existing water contents for soils. The PVR is estimated in the seasonally active zone. At this site, the active zone is limited to less than 1-foot depth, i.e., the depth to marlstone or limestone bedrock.

Estimated PVR values are based upon assumed typical changes in soil moisture content from a dry (existing) to wet condition; however, soil movements in the field depend on the actual changes in moisture content. Thus, actual soil movements could be less than that calculated if little soil moisture variations occur, or the actual movement could exceed the estimated values if actual soil moisture content changes exceed the PVR methods assumed dry and wet limits. This condition is often the result of excessive droughts, flooding, “perched” groundwater infiltration, poor surface-drainage, excessive irrigation adjacent to building foundations, and/or leaking irrigation lines or plumbing.

We estimate the existing PVR in the proposed building area to be less than 1 inch, and therefore no remedial earthwork is required to reduce the PVR. We recommend site fill placed in the building pad to raise grades consist of select fill materials to maintain the current PVR.

In this general area, most structural and geotechnical engineers consider a PVR of 1 inch 4 inches to be within acceptable tolerances for properly designed slab-on-grade foundation systems for single-family homes. However, this movement does not take into consideration the movement criteria required or perceived by the facility owner or occupants. These “operational” performance criteria may be, and often are, more restrictive than the structural criteria or tolerances.

Grade supported foundation or floor slab movements that approach 1 inch to 4 inches may cause doors to stick, cracks in sheetrock or brittle floor covering, cracks in exterior finishes and other forms of cosmetic distress. Measures can and should be taken during the design and construction of the facility to help limit the extent and severity of these types of distress. However, these magnitudes of movement typically do not cause “structural distress.”

4.3 Slab-on-Grade Foundations

The proposed residential structures and leasing area building at the site can also be supported by a monolithic beam and slab-on-grade foundation system. The rigidity of a beam and slab foundation system can reduce the effects of differential soil movement due to compression of soils due to structural loads or shrink-swell due to expansive soils. This type of slab can be designed with conventionally reinforced perimeter and interior stiffening grade beams, and/or with post-tensioning adequate to provide sufficient rigidity to the slab element. The grade beam width and depth will be determined by the project Structural Engineer. Grade beams may be thickened and widened at column or load bearing wall locations to support concentrated load areas, if necessary. All grade beams and floor slabs should be adequately reinforced

with steel to reduce cracking and support bending moments caused by loading and minor movements of foundation soils.

We have assumed lot fills will be provided to improve site drainage. We have developed slab design values assuming the site grading will be provided using select fill materials as recommended in this report. If the project information changes, we should be contacted to review; and if necessary, provide alternate design parameters based on the changed conditions. These parameters are provided to assist the Structural Engineer in design of a foundation that is stiffened using grade beams (ribs), post tensioning, or a combination thereof.

Post-Tensioned Slab Parameters PTI 3rd Edition with 2008 Supplements	
Design Parameter	**Design Values**
e_m Edge	6.8 Feet
e_m Center	9.0 Feet
y_m Edge	0.4 Inches
y_m Center	0.3 Inches
BRAB/WRI Parameters	
Design Parameter	**Design Values**
Effective PI	15
Climatic Rating	17
Unconfined Compressive Strength (TSF)	1.5
Soil-Climate Support Index (1-C)	0.05

Grade beams and widened column areas at least 12 inches wide and 18 inches deep can be designed using a net allowable bearing capacity of 3,000 psf. This value can be increased by one-third (⅓) when including transient wind or seismic loading. To utilize the parameters listed above, the subgrade should be prepared in accordance with the "Site Preparation, Grading and Drainage" sections of this report.

The proposed foundations should be designed to bear entirely on bedrock or entirely on fill. Foundations bearing on bedrock will be fairly rigid while foundations bearing on fill conditions will undergo minor elastic foundation movements due to the compression of the fill soils. Minor cracking may occur at locations where grade-supported foundations transition from fill to rock bearing conditions.

Foundations at this site should be expected to undergo some vertical movements. These movements can potentially cause cosmetic distress and must be accounted for in the design process. Contraction, control, or 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 which normally occurs due to material shrinkage, thermal effects, soil movements, and other related structural conditions.

Where moisture sensitive floor coverings or equipment will be installed, we recommend that at least a 10 mil vapor retarder be used beneath the slab. The vapor retarder should conform to ASTM E1745, Class C or better and shall have a maximum water vapor permeance of 0.044 when tested in accordance with ASTM E96. Consideration to specifying a thicker, more durable vapor retarder should also be made where anticipated construction traffic dictates. Please refer to the latest edition of ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials and ASTM E 1643 Standard Practice for

Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs for additional guidance on this issue.

5.0 SITE PREPARATION, GRADING AND DRAINAGE

Preparation of the subgrade soils for areas to receive fills or pavements should be conducted in accordance with the recommendations presented in the following sections.

5.1 General Site Preparation

Existing vegetation, organic laden soil, surficial debris, demolished building structures / foundations, abandoned underground utilities, loose or soft soils and any other deleterious materials must be removed from the proposed construction areas and properly disposed. Excavations resulting from the removals should be cleaned down to firm soils and backfilled with general fill in accordance with this report.

After stripping and any required cuts have been completed, the subgrade soils should be scarified, moisture conditioned and compacted to at least 95 percent of the maximum dry density as determined by ASTM D698 to a depth of at least 6 inches. If encountered, clay soils should be moisture conditioned to between optimum and plus four (+4) percentage points of the optimum moisture content just prior to compaction. Where cemented marlstone of limestone bedrock is encountered and verified by ECS, these materials need not be ripped or compacted.

Proof-rolling should be performed where possible with a heavy (minimum 20 ton) rubber-tired vehicle such as a loaded dump truck. Soils that are observed to rut or deflect excessively under the moving load should be under-cut and replaced with compacted structural fill that meets the requirements of the section titled General Fill. All proof-rolling and under-cutting activities should be observed by ECS and should be performed during periods of dry weather.

After stripping, removals, subgrade preparation, proof-rolling and evaluation has been completed, fill placement may begin where required. Excavated soil that meets the material requirements in the General Fill section below may be used as compacted fill. If suitable fill soils have to be imported to the site, they must meet the material and compaction requirements of the General Fill section of this report.

5.2 General Fill

General fill can consist of on-site or imported soils, provided they meet the requirements described below. All general fill materials should be clean of organics, construction debris, deleterious materials, and should be free of rocks larger than 4 inches in greatest dimension. General fill materials which are imported should have a PI of less than 35. Proposed general fill should be evaluated and tested by ECS prior to placement in the field.

ECS recommends that general fill be placed in horizontal loose lifts of not more than 6 inches in thickness. Lift thickness should be decreased when using light compaction equipment. General fill should be compacted to at least 95% of the maximum dry density at moisture contents within the range of optimum to plus four (+4) percentage points of the optimum moisture content (ASTM D 698).

We recommend the proposed lots be sited so that the planned residential structures will not be partially supported on fill and natural subgrade soils. Mass grading should ensure the proposed bearing conditions are consistent across the proposed lots.

5.3 Select Fill

Select fill materials should be clean of organics, construction debris, deleterious materials, and should be free of rocks larger than 4 inches in greatest dimension. Select fill should have a Plasticity Index of between 5 and 20 and should contain at least 20 percent material passing the No. 200 sieve (by dry unit weight) to reduce the potential for a "bathtub effect" in the building pad area. Select fill should be evaluated and tested by ECS prior to placement in the field.

ECS recommends that select fill be placed in horizontal loose lifts of not more than 8 inches in thickness. Select fill should be compacted to at least 95% of the maximum dry density at moisture contents within the range of minus one (-1) to plus three (+3) percentage points of the optimum moisture content (ASTM D698).

5.4 Drainage

Water should not be allowed to collect in the foundation excavations, on foundation surfaces, or on prepared subgrades within the construction area either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater, groundwater, or surface runoff. Final grading should be designed to promote positive drainage away from the structures and pavements. Soil areas within 10 feet of the building should slope at a minimum of 5 percent away from the structure. Adjacent pavements and concrete hardscape should slope at 1½ to 2 percent away from the structure. Roof leaders and downspouts should discharge onto paved surfaces sloping away from the structure or into a closed pipe system which outfalls to the street gutter pan or directly to the storm drain system.

5.5 Allowable Slopes for Mass Grading

We recommend embankment slopes constructed using on-site rock milling be no steeper than 1-vertical on 3-horizontal (1-V on 3-H), and preferably 1-vertical on 4-horizontal. Tractors and other maintenance equipment typically require side slopes of 1-vertical on 3-horizontal or flatter to operate safely. Use of flatter 1-vertical on 4-horizontal side slopes will improve the ease of maintenance and help keep the topsoil in place until a protective grass cover can be established. Embankment slopes in open park space that will be subject to high pedestrian traffic can be designed to be 1-vertical on 5-horizontal.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 Earthwork

Effort should be made to keep fill, slab, pavement, and foundation subgrade areas properly drained and free of ponding water. Vehicle traffic on top of the subgrade should be prevented when the subgrade is visibly wet, and should be kept to a minimum at other times. Site grading and fill placement should preferably be performed during drier seasons of the year.

Fill materials should not be placed on soils that have been recently subjected to precipitation or saturation. All wet soils should be removed or allowed to dry prior to continuation of fill placement operations. Borrow fill materials, if required, should not contain wet materials at the time of placement.

If any problems are encountered during the earthwork operations, or if site conditions deviate from those encountered during our subsurface exploration, the Geotechnical Engineer should be notified immediately to determine the effect on recommendations expressed in this report.

Certain construction practices can reduce the magnitude of problems associated with moisture content increases of subgrade soil for slabs and areas to receive compacted fill. The contractor should seal exposed subgrade areas at the end of the workday with a smooth drum roller to reduce the potential for infiltration of water into the subgrade. Site grading should be continuously evaluated to assure that surface runoff will drain away from slab and fill areas.

6.2 Shallow Foundations

Exposure to the environment may weaken the soils at the foundation bearing level if the foundation excavations remain exposed during periods of inclement weather. Therefore, foundation concrete should be placed as soon as possible after final excavation is achieved and after the subgrade has been evaluated by a representative of the geotechnical engineer. If the bearing soils are softened by surface water absorption or exposure to the environment, the softened soils must be removed from the foundation excavation bottom prior to placement of concrete. If the foundation excavation must remain open an extended period of time, or if rainfall is apparent while the bearing soils are exposed, we suggest that a 1 to 3-inch thick "mud mat" of "lean" concrete be placed over the exposed bearing soils before the placement of reinforcing steel.

6.3 Sidewalks and Flatwork

Where movement sensitive flatwork will be constructed adjacent to the building, consideration should be given to reducing the PVR value in the flatwork areas to reduce differential movements and associated door jamming, tripping hazards, etc. Doweling the flatwork to the building foundations at common openings will further help to reduce the potential for differential movements and trip hazards. Proper drainage around grade supported sidewalks and flatwork is also very important to reduce potential movements. Elevating the sidewalks where possible and providing rapid, positive drainage away from them will reduce moisture variations within the underlying soils, and will therefore provide valuable benefit in reducing the full magnitude of potential movements from being realized.

6.4 Utility Trench Construction

Utility trenches on the planned lots should be backfilled above the utility bedding and shading materials with select fill, and general fill material outside the building pad area. The backfill materials should be placed in lifts not to exceed 8 inches loose measure, or 6 inches compacted measure. Thinner lifts may be required when using handheld compaction equipment. Backfill materials should be moisture conditioned to between optimum and plus four (+4) percentage points of the optimum moisture content and compacted to at least 95 percent of the maximum dry density as determined by ASTM D698.

Utility trenches should be sealed with lean concrete, lean clayey soil, controlled low-strength material or flowable fill where the utility approaches and enters the building pad area. This would reduce the

potential for migration of water beneath the building through the bedding and shading materials in the utility trench.

6.5 Rock Excavation Considerations

Shallow limestone bedrock were encountered at the site during our subsurface exploration, and rock excavation techniques will be necessary for this project. For purposes of contract terms, we recommend that "rock" be defined as follows: "Rock shall be defined as those natural materials which cannot be excavated in an open excavation with a Caterpillar Model No. D-8, heavy duty tract type-tractor, weighted at not less than 285 hp (flywheel power) and equipped with a single-shank hydraulic ripper, capable of exerting not less than 45,000 lbs. breakout force, or equivalent machinery. For footings, utility trenches and pits, rock shall be defined as those materials that cannot be excavated with a Caterpillar Model No. 215D LC tract-type hydraulic excavator, equipped with a 42-inch wide short-tip radius rock bucket, rated at not less than 120 hp flywheel power with bucket-curling force of not less than 25,000 lbs. and stick-crowd force of not less than 18,000 lbs."

Depending on the excavation methods, the rock at this site will typically excavate in relatively large, blocky and platy pieces, which are difficult to compact for suitable long-term performance. Also, these materials experience rapid degradation due to weathering over relatively short periods of time, once exposed to air and water conditions. Therefore, these larger pieces, which break up as rock-like fragments in the initial excavation, must be compacted with sufficient compaction energy to substantially break them down into soil size particles during construction.

The excavated limestone materials may be suitable for fill within the building and paving limits. For the purposes of this report, all rock materials excavated at the site will be considered nondurable. Nondurable rock materials removed during excavations may be used as fill if suitably decomposed by mechanical effort. Durability is the term used to describe the ability of a rock or rock-like material to withstand long term chemical and mechanical weathering without size degradation. Any rock excavated from the site and used as earthwork fill should have a well-graded grain size distribution with rock and soil particles ranging from clay or silt size particles to a maximum size of 4 inches in diameter with 2 inch thick plates. Particles larger than this should be decomposed by mechanical compaction equipment to achieve the desired grain size distribution.

Once appropriately broken down, this material may then be placed and compacted at workable moisture contents above the optimum moisture content and compacted to at least 95% of the Maximum Dry Density as obtained using the Standard Proctor method.

7.0 FIELD OBSERVATIONS & TESTING

Personnel from ECS should perform the field observations and testing recommended in this report because of our familiarity with the project and site conditions. The performance of earthwork and pavements is primarily controlled by the quality of the construction. To prevent misinterpretation of our recommendations, ECS should be retained to perform full time quality control testing, inspection, and documentation during construction of the foundations and pavements.

The performance of pavements placed on new fill material is controlled by the quality of the compaction and the materials selection for the fill material. ECS should be retained to perform quality control testing and inspection during selection, placement, and compaction of the fill material.

Field observations and testing should be performed during the earthwork operations to document proper construction. Stripping should be observed by the Geotechnical Engineer to help locate unsuitable materials that should be removed prior to placement of fill, slab, or pavement materials. Field observation and inspection should include final approval of subgrades prior to placement of compacted fill or pavement materials. Proof-rolling should be performed by a heavy rubber-tired vehicle such as a loaded dump truck on pavement subgrades. Appropriate laboratory tests such as Proctor moisture-density tests and Atterberg Limits should be performed on samples of fill material and pavement base course material. Field moisture-density tests and visual observation of lift thickness and material types should be performed during compaction operations to document that the construction satisfies material and compaction requirements. The frequency of field density tests should be at least 2 tests per lift per 15,000 sf of pavement area. The frequency of field density tests should be in accordance with local or state municipal agency guidelines.

8.0 EXCAVATIONS

Utility, foundation, and earthwork contractors should be prepared with heavy duty rock excavation equipment and tooling to make proposed cuts at the site.

Our comments on excavation are based on our experience in the project vicinity and examination of the recovered samples. Excavation depends on the contractor's equipment, capabilities, and experience. Therefore, it should be the contractor's responsibility to determine the most effective methods for excavation. The above comments are intended for informational purposes for the design team only and may be used to review the contractor's proposed excavation methods.

Excavations that will receive compacted fill should have vertical or benched sidewalls so that lifts of fill material will be placed and compacted on horizontal planes. Stockpiles of soil or materials, and heavy equipment should not be placed immediately above and adjacent to unbraced vertical excavation walls (trenches).

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its “Construction Standards for Excavations, 29 CFR, Part 1926, subpart P”. This document was issued to insure the safety of workmen entering trenches or excavations.

It is mandated by this federal regulation that all excavations such as utility trenches, basement excavation, or footing excavations be constructed in accordance with the new OSHA guidelines. These regulations are enforced.

The contractor is solely responsible for designing and constructing stable, temporary excavations and for shoring, sloping, or benching the sides of excavations as required to maintain stability of both the excavation sides and bottom. The contractor’s responsible person as defined in 29 CFR Part 1926 should evaluate the soil exposed in the excavations as part of the contractor’s safety procedures. In no case

should slope height, slope inclination, or excavation depth exceed those specified in all local, state, and federal safety regulations.

We are providing this information solely as a service to our client. ECS does not assume responsibility for construction site safety or the contractor's or other party's compliance with local, state, and federal regulations.

9.0 CLOSING

ECS has prepared this report to guide the geotechnical-related design and construction aspects of the project. We performed these services in accordance with the standard of care expected of professionals in the industry performing similar services on projects of like size and complexity at this time in the region. No other representation, expressed or implied, and no warranty or guarantee is included or intended in this report.

The description of the proposed project is based on information provided to ECS by Client. If any of this information is inaccurate or changes, either because of our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted so we can review our recommendations and provide additional or alternate recommendations that reflect the proposed construction.

We recommend that ECS review the project plans and specifications so we can confirm that those plans/specifications are in accordance with the recommendations of this geotechnical report.

Field observations, and quality assurance testing during earthwork and foundation installation are an extension of, and integral to, the geotechnical design. We recommend that ECS be retained to apply our expertise throughout the geotechnical phases of construction, and to provide consultation and recommendation should issues arise.

ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

APPENDIX A – Diagrams and Reports

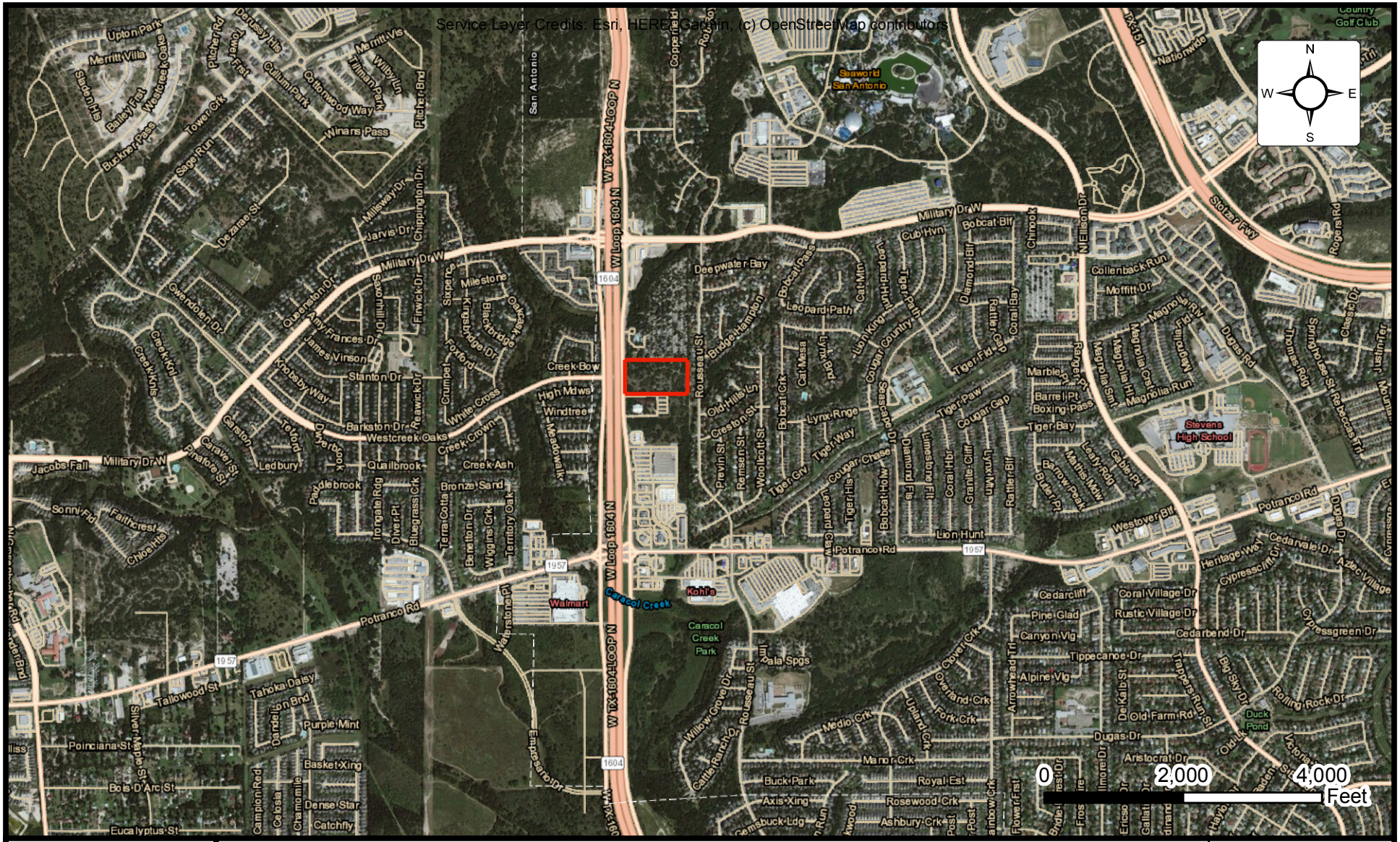
Site Location Diagram

Boring Location Diagram

BORING LOCATION DIAGRAM
KB HOMES - POTRANCO LOOP 1604

WEST LOOP 1604 N, SAN ANTONIO, TEXAS
KB HOME

ENGINEER	MJR1
SCALE	AS NOTED
PROJECT NO.	20:1276
SHEET	1 OF 1
DATE	8/18/2021



SITE LOCATION DIAGRAM
KB HOMES - POTRANCO LOOP 1604

WEST LOOP 1604 N, SAN ANTONIO, TEXAS
KB HOME

ENGINEER	MJR1
SCALE	AS NOTED
PROJECT NO.	20:1276
SHEET	1 OF 1
DATE	8/18/2021

APPENDIX B – Field Operations

Subsurface Exploration Operations

Test Boring Logs

Reference Notes for Boring Logs

SITE EXPLORATION PROCEDURE

The field exploration was planned with the objective of characterizing the project site in general geotechnical and geological terms and to evaluate subsequent field and laboratory data to assist in the determination of geotechnical recommendations.

The subsurface conditions were explored by five borings drilled to depths of 15 feet below the existing site grades. A truck-mounted drill rig with continuous flight augers was utilized to drill the borings.

The boring locations were determined by and identified in the field by ECS personnel using the supplied diagram. The approximate as-drilled boring locations are shown on the Boring Location Diagram in Appendix A. The ground surface elevations noted in this report were estimated using Google Earth Pro.

Standard Penetration Tests (SPTs) were performed to obtain representative samples and penetration resistance measurements in general accordance with ASTM D 1586. Soil samples were obtained at various intervals with the 1.625-inch inside diameter, 2-inch outside diameter, Split Spoon sampler. The Split Spoon sampler was first seated 6 inches to penetrate any loose cuttings, and then was driven an additional 12 inches with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler each 6 inch increment was recorded. The penetration resistance "N-value" is defined as the number of hammer blows required to drive the sampler the final 12 inches and is indicated on the test boring logs. In very dense materials such as weathered rock material, the SPT test is usually stopped after 50 blows from the hammer and the measurement is recorded as 50 blows per distance penetrated (i.e., 50 over 3 inches).

Field logs of the soils encountered in the borings were maintained by the drill crew. After recovery, each geotechnical soil sample was removed from the sampler and visually classified. Representative portions of each soil sample were then wrapped in plastic and transported to our laboratory for further visual examination and laboratory testing. After completion of the drilling operations, the boreholes were backfilled with auger cuttings to the existing ground surface.

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
KB Home	**20:1276**	**B-1**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
KB Homes - Potranco Loop 1604	

SITE LOCATION: **Loop 1604 W, San Antonio, Texas 78250**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
1631969.1	**1548613.0**		

BOTTOM OF CASING

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

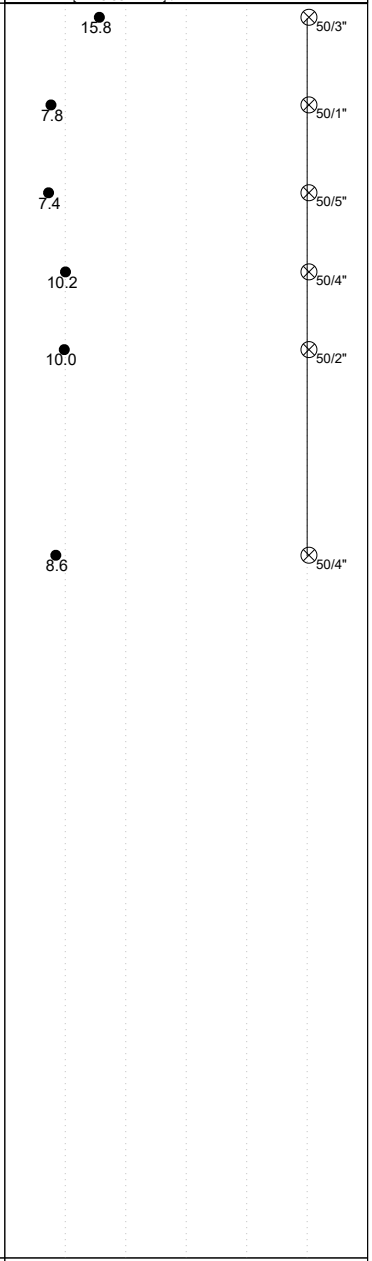
RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	9	9	(GC) CLAYEY GRAVEL WITH SAND, dark brown and tan, very dense		0	22-50/3" (50/3")
	S-2	SS	1	1	LIMESTONE, tan and grayish white, very hard, interbedded with chalk, marl and calcareous deposits			50/1" (50/1")
5	S-3	SS	5	5			-5	50/5" (50/5")
	S-4	SS	4	4				50/4" (50/4")
	S-5	SS	2	2				50/2" (50/2")
10							-10	
	S-6	SS	4	4				50/4" (50/4")
					Refusal encountered at 13.8 feet.			
15							-15	
20							-20	
25							-25	
30							-30	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Aug 04 2021**	CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Aug 04 2021**	HAMMER TYPE: **Auto**
▽ WL (Seasonal High Water)	EQUIPMENT: **Truck** / LOGGED BY:	DRILLING METHOD: **SS, Solid Stem Auger**
▽ WL (Stabilized)		

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
KB Home	**20:1276**	**B-2**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
KB Homes - Potranco Loop 1604	

SITE LOCATION: **Loop 1604 W, San Antonio, Texas 78250**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
1631672.4	**1548673.9**		

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	9	9	(GC) CLAYEY GRAVEL WITH SAND, dark brown and tan, very dense		0	21-50/3" (50/3")
	S-2	SS	1	1	LIMESTONE, tan, very hard, interbedded with chalk and marl			50/1" (50/1")
5	S-3	SS	3	3			-5	50/3" (50/3")
	S-4	SS	2	2				50/2" (50/2")
	S-5	SS	1	1				50/1" (50/1")
10							-10	
	S-6	SS	1	1	Refusal encountered at 13.6 feet.			50/1" (50/1")
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

11.1 [27.6%] 50/3"

9.7 50/1"

50/3"

11.5 50/2"

50/1"

14.9 50/1"

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)

▼ WL (Completion)

▼ WL (Seasonal High Water)

▽ WL (Stabilized)

BORING STARTED: **Aug 04 2021**	CAVE IN DEPTH:
BORING COMPLETED: **Aug 04 2021**	HAMMER TYPE: **Auto**
EQUIPMENT: **Truck**	LOGGED BY:
	DRILLING METHOD: **SS, Solid Stem Auger**

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
KB Home	**20:1276**	**B-3**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
KB Homes - Potranco Loop 1604	

SITE LOCATION: **Loop 1604 W, San Antonio, Texas 78250**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
1631888.2	**1548894.4**		

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	11	11	(GC) CLAYEY GRAVEL WITH SAND, dark brown and tan, very dense			10-50/5" (50/5")
	S-2	SS	2	2	LIMESTONE, tan, very hard, interbedded with chalk, marl and calcareous deposits			50/2" (50/2")
5	S-3	SS	2	2			-5	50/2" (50/2")
	S-4	SS	4	4				50/4" (50/4")
	S-5	SS	4	4				50/4" (50/4")
10							-10	
	S-6	SS	3	3				50/3" (50/3")
					Refusal encountered at 13.8 feet.			
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

STANDARD PENETRATION BLOWS/FT

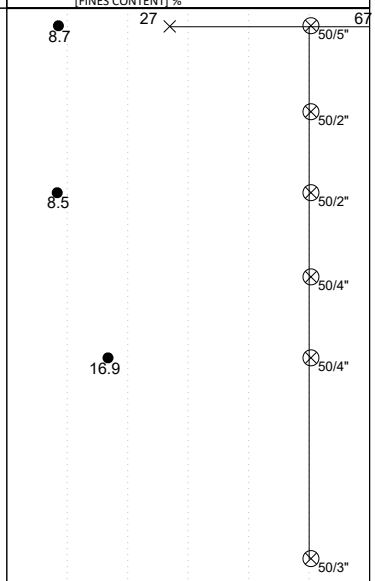
ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Aug 04 2021**	CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Aug 04 2021**	HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Truck** / LOGGED BY:	DRILLING METHOD: **SS, Solid Stem Auger**
▽ WL (Stabilized)		

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
KB Home	**20:1276**	**B-4**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
KB Homes - Potranco Loop 1604	

SITE LOCATION: **Loop 1604 W, San Antonio, Texas 78250**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
1632020.7	**1549288.2**		

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	3	3	LIMESTONE, tan and grayish white, very hard, interbedded with chalk and marl		0	50/3" (50/3")
	S-2	SS	2	2				50/2" (50/2")
	S-3	SS	1	1				50/1" (50/1")
5	S-4	SS	10	10			-5	12-50/4" (50/4")
	S-5	SS	3	3				50/3" (50/3")
10	S-6	SS	3	3			-10	50/3" (50/3")
					Refusal encountered at 13.8 feet.			
15							-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit

X———●———△

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

9.2 50/3"

50/2"

50/1"

50/4"

50/3"

5.2 50/3"

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)	BORING STARTED: **Aug 04 2021**	CAVE IN DEPTH:
▼ WL (Completion)	BORING COMPLETED: **Aug 04 2021**	HAMMER TYPE: **Auto**
▼ WL (Seasonal High Water)	EQUIPMENT: **Truck** / LOGGED BY:	DRILLING METHOD: **SS, Solid Stem Auger**
▽ WL (Stabilized)		

GEOTECHNICAL BOREHOLE LOG

CLIENT:	PROJECT NO.:	BORING NO.:	SHEET:
KB Home	**20:1276**	**B-5**	**1 of 1**

PROJECT NAME:	DRILLER/CONTRACTOR:
KB Homes - Potranco Loop 1604	

SITE LOCATION: **Loop 1604 W, San Antonio, Texas 78250**

LOSS OF CIRCULATION

NORTHING:	EASTING:	STATION:	SURFACE ELEVATION:
1631734.4	**1549352.7**		

BOTTOM OF CASING

DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	5	5	LIMESTONE, tan, very hard, interbedded with chalk, marl and calcareous deposits		0	50/5" (50/5")
	S-2	SS	3	3				50/3" (50/3")
5	S-3	SS	4	4			-5	50/4" (50/4")
	S-4	SS	4	4				50/4" (50/4")
	S-5	SS	2	2				50/2" (50/2")
10	S-6	SS	10	10			-10	50-50/4" (50/4")
15					Refusal encountered at 14.3 feet.		-15	
20							-20	
25							-25	
30							-30	

Plastic Limit Water Content Liquid Limit
X——●——△

⊗ STANDARD PENETRATION BLOWS/FT

ROCK QUALITY DESIGNATION & RECOVERY

RQD

REC

○ CALIBRATED PENETROMETER TON/SF

[FINES CONTENT] %

11.7 50/5" 50/3" 50/4" 50/4" 50/2" 15.1 50/4"

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL

▽ WL (First Encountered)

▼ WL (Completion)

▼ WL (Seasonal High Water)

▽ WL (Stabilized)

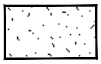
BORING STARTED: **Aug 04 2021**	CAVE IN DEPTH:
BORING COMPLETED: **Aug 04 2021**	HAMMER TYPE: **Auto**
EQUIPMENT: **Truck** / LOGGED BY:	DRILLING METHOD: **SS, Solid Stem Auger**

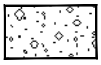
GEOTECHNICAL BOREHOLE LOG

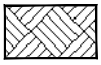
REFERENCE NOTES FOR BORING LOGS

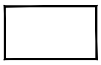
MATERIAL[1,2]

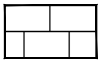

ASPHALT


CONCRETE


GRAVEL

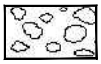

TOPSOIL

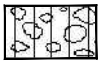

VOID


BRICK

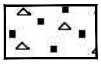

AGGREGATE BASE COURSE

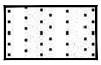

GW **WELL-GRADED GRAVEL**
gravel-sand mixtures, little or no fines

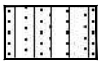

GP **POORLY-GRADED GRAVEL**
gravel-sand mixtures, little or no fines


GM **SILTY GRAVEL**
gravel-sand-silt mixtures

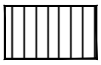

GC **CLAYEY GRAVEL**
gravel-sand-clay mixtures

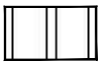

SW **WELL-GRADED SAND**
gravelly sand, little or no fines

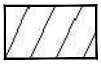

SP **POORLY-GRADED SAND**
gravelly sand, little or no fines


SM **SILTY SAND**
sand-silt mixtures

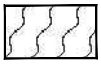

SC **CLAYEY SAND**
sand-clay mixtures

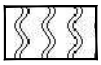

ML **SILT**
non-plastic to medium plasticity

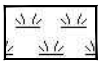

MH **ELASTIC SILT**
high plasticity


CL **LEAN CLAY**
low to medium plasticity


CH **FAT CLAY**
high plasticity


OL **ORGANIC SILT or CLAY**
non-plastic to low plasticity


OH **ORGANIC SILT or CLAY**
high plasticity


PT **PEAT**
highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION		PARTICLE SIZES
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSIVE STRENGTH, Q_P[4]	SPT[5] (BPF)	CONSISTENCY[7] (COHESIVE)
<0.25	<3	Very Soft
0.25 - <0.50	3 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT[5]	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
With	10 - 20	10 - 25
Adjective *(ex: "Silty")*	25 - 45	30 - 45

WATER LEVELS[6]


WL (First Encountered)


WL (Completion)


WL (Seasonal High Water)


WL (Stabilized)

FILL AND ROCK

FILL | POSSIBLE FILL | PROBABLE FILL | ROCK

[1]Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

[2]To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

[3]Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

[4]Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

[5]Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

[6]The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

[7]Minor deviation from ASTM D 2488-17 Note 14.

[8]Percentages are estimated to the nearest 5% per ASTM D 2488-17.

APPENDIX C – Laboratory Testing

Laboratory Test Results Summary

Grain Size Analyses

Laboratory Testing Summary

Sample Location	Sample Number	Depth (feet)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-1	S-1	0-0.75	15.8										
B-1	S-2	2.5-2.58	7.8										
B-1	S-3	4.5-4.92	7.4										
B-1	S-4	6.5-6.83	10.2										
B-1	S-5	8.5-8.67	10										
B-1	S-6	13.5-13.83	8.6										
B-2	S-1	0-0.75	11.1					27.6					
B-2	S-2	2.5-2.58	9.7										
B-2	S-4	6.5-6.67	11.5										
B-2	S-6	13.5-13.58	14.9										

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

Project: KB Homes - Potranco Loop 1604
Client: KB Home

Project No.: 20:1276
Date Reported: 8/18/2021

Office / Lab	Address	Office Number / Fax
ECS Southwest LLP - San Antonio	431 Isom Road Suite 114 San Antonio, TX 78216	(210)528-1430 (214)483-9684

Tested by	Checked by	Approved by	Date Received
nkacchakayala	nkacchakayala	nkacchakayala	

Laboratory Testing Summary

Sample Location	Sample Number	Depth (feet)	^MC (%)	Soil Type	Atterberg Limits			**Percent Passing No. 200 Sieve	Moisture - Density		CBR (%)		#Organic Content (%)
					LL	PL	PI		<Maximum Density (pcf)	<Optimum Moisture (%)	0.1 in.	0.2 in.	
B-3	S-1	0-0.92	8.7		67	27	40						
B-3	S-3	4.5-4.67	8.5										
B-3	S-5	8.5-8.83	16.9										
B-4	S-1	0-0.25	9.2										
B-4	S-6	13.5-13.75	5.2										
B-5	S-1	0-0.42	11.7										
B-5	S-6	13.5-14.33	15.1										

Notes: See test reports for test method, ^ASTM D2216-19, *ASTM D2488, **ASTM D1140-17, #ASTM D2974-20e1 < See test report for D4718 corrected values

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content

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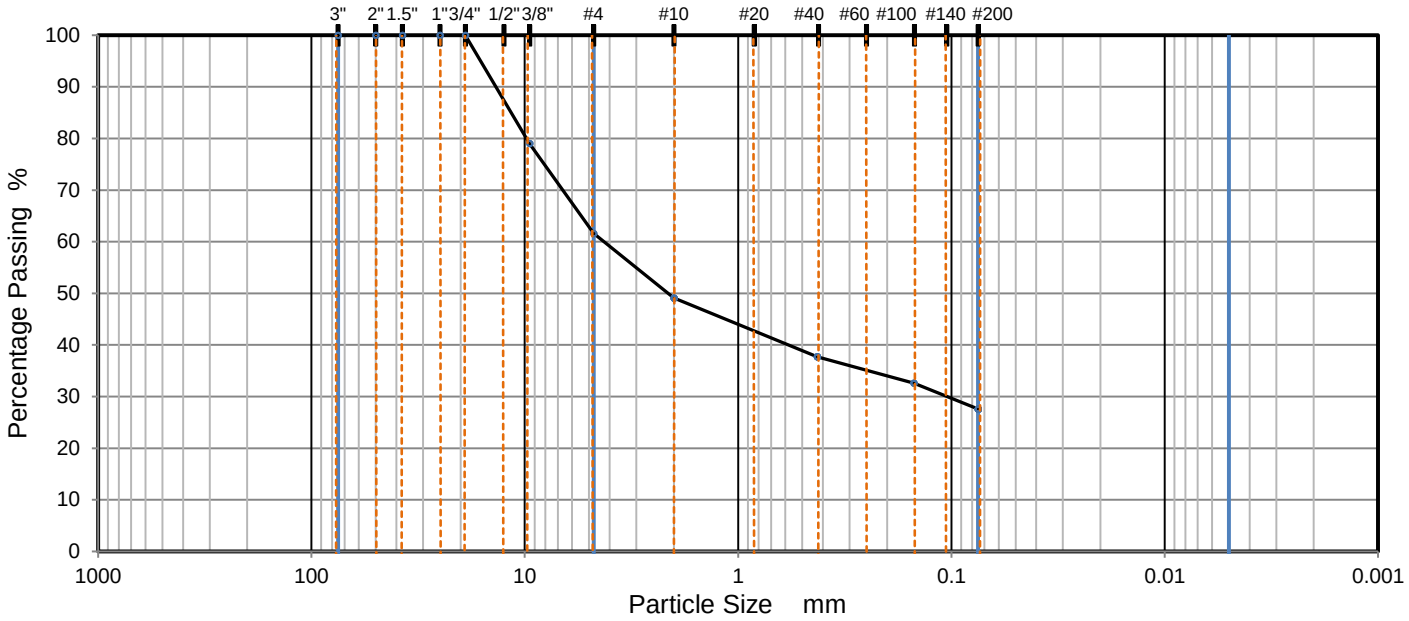
PARTICLE SIZE DISTRIBUTION

Very Coarse	GRAVEL	SAND			SILT	CLAY
		Coarse	Medium	Fine		



TEST RESULTS (ASTM D6913M-17-METHOD B)

Sieving		Hydrometer Sedimentation	
Particle Size	% Passing	Particle Size mm	% Passing
3"	100.0		
2"	100.0		
1 1/2"	100.0		
1"	100.0		
3/4"	100.0		
3/8"	79.0		
#4	61.6		
#10	49.1		
#40	37.7		
#100	32.6		
#200	27.6		

Dry Mass of sample, g	165.9

Sample Proportions	% dry mass
Very coarse, >3" sieve	0.0
Gravel, 3" to # 4 sieve	38.4
Coarse Sand, #4 to #10 sieve	12.5
Medium Sand, #10 to #40	11.4
Fine Sand, #40 to #200	10.1
Fines <#200	27.6

USCS		Liquid Limit		D90	13.659	D50	2.129	D10	0.000
AASHTO	A-2-4	Plastic Limit		D85	11.581	D30	0.105	Cu	0.000
USCS Group Name		Plasticity Index		D60	4.252	D15	0.000	Cc	0.000

Project: KB Homes - Potranco Loop 1604
Client: KB Home
Sample Description:
Sample Source: B-2

Project No.: 20:1276
Depth (ft): 0 - 0.75
Sample No.: S-1
Date Reported: 8/18/2021

Office / Lab	Address	Office Number / Fax
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Tested by	Checked by	Approved by	Date Received	Remarks
nkacchakayala	nkacchakayala	nkacchakayala		