REPORT OF

GEOTECHNICAL ENGINEERING STUDY
VILLARET SUBDIVISION
1507-1527 VILLARET BOULEVARD
SAN ANTONIO, TEXAS

BEA PROJECT NO. 12-24-0302

FOR

ONWARD DEVELOPMENT, LLC
PO BOX 1666
HELOTES, TEXAS 78023

JULY 2, 2024

BURGE ENGINEERING & ASSOCIATES
Geotechnical Engineering • Environmental • Testing

July 2, 2024

Mr. Noe Garza
Onward Development, LLC
PO Box 1666
Helotes, Texas 78023

RE: Geotechnical Engineering Study
Villaret Subdivision
1507-1527 Villaret Boulevard
San Antonio, Texas
BEA Project No. 12-24-0302

Dear Mr. Garza:

Burge Engineering & Associates (BEA) has completed the subsurface exploration and geotechnical engineering analysis for the above-referenced project, in accordance with BEA Proposal No. P12-24-082, dated May 20, 2024. Our report, which includes the results of our subsurface exploration program, laboratory testing program, and geotechnical engineering analysis, is enclosed with this letter.

Based on the results of the field exploration and laboratory testing programs, the site is considered suitable for the proposed development, provided that the recommendations enclosed in this report are followed.

We appreciate the opportunity to be of service to you during the design phase of this project. We look forward to continuing our involvement with this project during the construction phase by providing the materials testing and inspection services. If you have any questions regarding the information contained in this report or if we can be of further assistance to you, please feel free to contact us.

Respectfully submitted,
BURGE ENGINEERING & ASSOCIATES
Texas Registered Engineering Firm F-7740
Geotechnical Engineering Services

7/2/24

Benny J. Krieger, Jr., P.E.
Principal

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TABLE OF CONTENTS

PROJECT OVERVIEW

Project Location

This report presents the results of our subsurface exploration and engineering analysis for the proposed residential development located at 1507 to 1527 Villaret Boulevard in San Antonio, Texas. The approximate site location is shown on the *Site Vicinity Map* provided in the Appendix.

Scope of Work

The conclusions and recommendations contained in this report are based on 20 soil borings (B-01 through B-15 and P-1 through P-5) performed by BEA on May 28 and 29, 2024. Borings P-1 through P-5 were drilled in the proposed roadways and were terminated at a depth of six (6) feet below the existing ground surface elevations. Borings B-01 through B-15 were drilled within the residential lots and were terminated at depths ranging from 15 to 20 feet below the existing ground surface elevations. In addition to the boreholes, a bulk composite sample of the predominant subgrade material was collected near Boring P-3. This bulk sample was used to perform the soil-lime series laboratory testing.

Proposed Construction

Based on information provided to us, the project will consist of the design and construction of numerous duplex homes and single-family homes situated on an approximate 7.5-acre site. We anticipate that the lightly-loaded structures will be supported by monolithic slab-on-grade foundation systems. The roadways associated with the project are considered private and do not need to meet City of San Antonio (CoSA) design standards with regard to structural capacity. The proposed road and lot layout are shown in relation to the soil borings on the *Boring Location Plan*, provided in the Appendix.

It should be noted that BEA was not provided with any structural information, existing or proposed grades, or information on the planned residential development. Based on our understanding of the proposed construction and our site observations, we estimate that there will less than two (2) feet of cut/fill within the building areas as part of the mass grading associated with the development.

The *Boring Location Plan* was developed from the *Exhibit - 09* prepared by ADA Consulting Group, Inc., dated April 18, 2024. Since topographic information was not available, the elevations are not included on the boring logs. The borings were located in the field based on an overlay of the plan on aerial imagery, as well as pacing/taping procedures from existing property boundaries identified on the available plan.

Purposes of Exploration

The purposes of this study were to explore the subsurface soil and groundwater conditions at the site and to develop engineering recommendations to guide design and construction of the soil-supported elements of the project. We accomplished these purposes by:

1. reviewing available geologic and soil survey maps of the project area,
2. drilling 20 borings to explore the subsurface soil and groundwater conditions,
3. performing laboratory tests on selected representative soil samples from the borings and a bulk sample to evaluate pertinent engineering properties, and
4. analyzing the field and laboratory data to develop appropriate engineering recommendations.

EXPLORATION PROCEDURES

Subsurface Exploration Procedures

The soil borings were performed with a standard, truck-mounted drill rig, which utilized continuous, solid-stem flight augers to advance the boreholes. No drilling fluid was used during the drilling program. Upon completion of the borings, the boreholes were backfilled with spoils generated during the drilling process and capped with asphalt cold patch material.

Representative samples of the subsurface soil were obtained employing split-spoon sampling procedures in general accordance with ASTM D-1586. The split-spoon sampler collects relatively disturbed samples at selected depths in the boring by driving a standard two (2) inch outer diameter split-spoon sampler 18 inches into the subsurface material using a 140 pound hammer falling 30 inches. The number of blows required to drive the split-spoon sampler the final 12 inches of penetration (N-value) is recorded in the "SPT N-value" column of the boring logs.

The drilling crew maintained field logs of the soil encountered in the borings. After recovery, each sample was removed from the sampler and visually classified. Representative portions of each sample were then sealed and delivered to our laboratory for further visual examination and laboratory testing.

Laboratory Testing Program

Representative soil samples were selected and tested in our laboratory to check field classifications and to determine pertinent engineering properties. The laboratory testing program included visual classifications, moisture contents, soil-lime series, soluble sulfate testing, sieve analyses, and Atterberg Limits tests. Visual classifications conducted in the laboratory were performed by a licensed geotechnical engineer. All data obtained from the laboratory tests are included on the respective boring logs or as separate attachments in the Appendix.

Each soil sample was classified on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS). A brief explanation of the USCS is included with this report. The various soil types were grouped into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs and profiles are approximate; in situ, the transitions may be gradual. The soil samples will be retained in our laboratory for a period of 30 days, after which, they will be discarded unless other instructions are received by the client.

EXPLORATION RESULTS

Site Conditions

At the time of our field exploration, the site was primarily undeveloped and covered with overgrown vegetation and trees. However, there were also two (2) single-family residential structures accessed from Villaret Boulevard. There were interior fences and the property was also surrounded by fencing. Some clearing was occurring during our field exploration activities. The property has fair drainage and slopes down to the west and southwest towards the adjacent property or roadway. The neighboring properties include schools, residential development and undeveloped land.

Regional Geology and Soil Survey

According to the Bureau of Economic Geology at The University of Texas at Austin, Geologic Atlas of Texas, San Antonio Sheet, the proposed site is located in the Wilcox Group (Ewi). This Tertiary Age Formation consists mostly of mudstone with varying amounts of sandstone and lignite. Material is commonly glauconitic in the uppermost and lowermost parts. Mudstone is massive to thin-bedded, some silt and very fine sand laminae, pale brown to yellowish brown in upper part, and medium to dark gray in lower part. Sandstone in upper part is medium to fine-grained and light gray to pale yellowish brown, while lower part is fine-grained and yellowish brown to brown. Lignite is mostly found in middle part. Thickness is about 440 to 1,200 feet.

The Soil Survey of Bexar County, Texas published by the United States Department of Agriculture, National Cooperative Soil Survey, indicates that the shallow soils across the lot are classified as Houston Black Gravelly Clay, 1 to 3 percent slopes (HuB). This Series consists of clayey soils that are deep, dark gray to black, and calcareous. The subsurface layer is black clay about 36 inches thick and contains 10 to 18 percent gravel, by volume. The subsurface layer, about 12 inches thick, is clay or gravelly clay. The gravel is discontinuous, but where it occurs, it makes up 30 to 60 percent, by volume. This soil has slow to rapid surface drainage, internal drainage is slow, and water erosion is a hazard. Rainfall is very rapidly absorbed when the soil is dry and cracked, but practically all of it runs off after the water content of the soil has reached full capacity.

Soil Conditions

The natural, near surface deposits, which were studied by our field exploration program, are generally consistent with the local soil survey and regional geology. Based on our observations at the time of our field study, the stratigraphy of the subsurface materials at this site can generally be described as presented in the following table:

Stratum	Range in Depth (ft)	Soil Description and Classification
I	0 – 6.5	Stiff to hard, dark gray, dark grayish brown, dark brown, brown, gray and pale brown FAT CLAY (CH)
II	2 – 11	Medium dense to very dense, gray or brown CLAYEY GRAVEL WITH SAND (GC), CLAYEY SAND WITH GRAVEL (SC) or POORLY-GRADED GRAVEL (GP-GC) with clay and sand or very stiff to hard, brown, tan, pale brown, light gray or light gray and tan, calcareous LEAN CLAY (CL)
III	4.5 – 20	Very stiff to hard, pale brown, tan, pale brown and light gray or tan and light gray FAT CLAY (CH) and LEAN CLAY (CL) with trace gypsum, red sandstone lenses and calcareous deposits in some samples

Stratum I – This stratum was comprised of stiff to hard, dark gray, dark grayish brown, dark brown, brown, gray and pale brown FAT CLAY (CH) with trace gravel in some samples. Atterberg Limits tests conducted on representative samples of this stratum indicated this clay to have Liquid Limits (LL's) ranging from 56 to 88 with corresponding Plasticity Indices (PI's) ranging from 37 to 64. Based on these measured indices, this stratum has a high to very high potential for large changes in volume if fluctuations in the clay's moisture content occur.

Stratum II – This stratum was comprised of medium dense to very dense, gray or brown CLAYEY GRAVEL WITH SAND (GC), CLAYEY SAND WITH GRAVEL (SC) and POORLY-GRADED GRAVEL (GP-GC) with clay and sand or very stiff to hard, brown, tan, pale brown, light gray or light gray and tan, calcareous LEAN CLAY (CL). Atterberg Limits tests conducted on representative samples of this stratum indicated this material has LL's ranging from 26 to 47 with corresponding PI's ranging from 9 to 31. Sieve analyses performed indicated these materials have 11 to 25 percent, by dry weight, passing a No. 200 Sieve and 29 to 59 percent, by dry weight, retained on the No. 4 Sieve. Based on these measured indices, this stratum has a low to high potential for changes in volume if fluctuations in the material's moisture content occur.

Stratum III – This stratum was comprised of very stiff to hard, pale brown, tan, pale brown and light gray or tan and light gray FAT CLAY (CH) and LEAN CLAY (CL) with trace gypsum, red sandstone lenses and calcareous deposits in some samples. Atterberg Limits tests conducted on representative samples of this stratum indicated this soil to have LL's ranging from 42 to 98 with corresponding PI's ranging from 25 to 67. Based on these measured indices, this stratum has a high to very high potential for large changes in volume if fluctuations in the clay's moisture content occur.

Groundwater Observations

Groundwater was not encountered during drilling operations. However, given the presence of highly calcareous soils and the gravel layer throughout, we would anticipate that groundwater would be encountered during high precipitation seasons. In dry auger drilling operations, water is not introduced into the boreholes, and the groundwater position can often be determined by observing water flowing into or out of the boreholes. Furthermore, visual observation of the soil samples retrieved during the auger drilling operations can often be used in evaluating the groundwater conditions. It should be noted that groundwater conditions can fluctuate due to seasonal and climatic variations, and should be measured (checked) prior to construction activities.

ANALYSIS AND RECOMMENDATIONS

The following recommendations are based on the 20 borings performed at the site, laboratory test results, and the limited design information provided to us. Based on our observations made during our field program, we anticipate that the building pad areas will require less than two (2) feet of cut/fill as part of mass grading operations. We recommend that if there are any changes to the project characteristics as discussed in this report, BEA should be retained to review them so it can be determined if changes to the recommendations are necessary.

This study includes recommendations for supporting the proposed residential structures on monolithic slab-on-grade foundation systems. The following sections discuss this foundation system, along with recommendations for design and construction of the roadway and installation of utilities.

Expansive Soil Conditions

Based on the existing subsurface soil conditions, the project site is considered to be expansive, as defined by the 2021 International Building Code (IBC) Section 1803.5.3 and 2021 International Residential Code (IRC) Section R403.1.8. Although we have provided measures to reduce the magnitude of movements, these measures are not as stringent as outlined by the IBC to classify the site as non-expansive.

The potential vertical rise (PVR) for the subsurface soil stratigraphy encountered in the borings drilled at this site was calculated using the Texas Department of Transportation (TxDOT) Method TEX-124-E. These calculations indicate potential vertical movements ranging from two (2) inches to five (5) inches with corresponding effective design plasticity indices ranging from 28 to 51. These calculations are based on the existing site conditions, an active zone of about 15 feet, and accounts for an approximate 1 psi of overburden pressure. Given the highly variable soil conditions, the approximate PVR values for each boring location are also summarized in the table on the following page.

Boring No.	Existing PVR	Effective Design PI[1]
B-01	4-¼ inches	43
B-02	3 inches	37
B-03	3-½ inches	39
B-04	2-¼ inches	29
B-05	3-½ inches	40
B-06	4-¾ inches	49
B-07	3 inches	37
B-08	5 inches	51
B-09	4-½ inches	42
B-10	2 inches	28
B-11	4-¼ inches	43
B-12	4-¼ inches	45
B-13	3-½ inches	40
B-14	4-½ inches	45
B-15	3 inches	33

Notes: (1) The effective design PI is the weighted average of all PI values within the active zone utilizing a PI value no less than 15.

For monolithic slab-on-grade foundation systems, the potential differential movements associated with the existing site conditions may be reduced using cut and fill modifications (CASES I through VI), as identified in the following table. We have also made an indication of the improvement areas on the attached *Soil Improvement Area Plan*, included as Figure 3 in the Appendix.

Cut/Fill Modification Conditions

Building Area (Borings)	CASE	Cut/Fill Modification	PVR[1]	Effective Design PI[2]
Area "A" (B-10)	III	Note 3	2 inches	28
	II	1-½ feet	1-½ inches	25
	I	3 feet	1 inch	21
Area "B" (B-04)	III	1 foot	2 inches	28
	II	2 feet	1-½ inches	25
Area "C" (B-02, B-07 & B-15)	IV	1 foot	2-½ inches	32
	III	2 feet	2 inches	28
	II	3 feet	1-½ inches	25
Area "D" (B-03 & B-13)	V	1 foot	3 inches	36
	IV	2 feet	2-½ inches	32
	III	3-½ feet	2 inches	28

Cut/Fill Modification Conditions (Cont.)

Area "E" (B-05)	V	2 feet	3 inches	36
	IV	4 feet	2-½ inches	32
Area "F" (B-01, B-11 & B-12)	V	3 feet	3 inches	36
	IV	4 feet	2-½ inches	32
Area "G" (B-06, B-08, B-09 & B-14)	VI	2 feet	3-½ inches	40
	V	3 feet	3 inches	36
	IV	4-½ feet	2-½ inches	32
	III	6 feet	2 inches	28

Notes: (1) The PVR calculations are based on the existing clay soils being removed and replaced with select structural fill material having a maximum PI of 17.
(2) The effective design PI is the weighted average of all PI values within the upper 15 feet utilizing a PI value no less than 15.
(3) Over-excavate as necessary to provide at least 8-12 inches of select structural fill material below the floor slab.

Typically, residential structures are designed for the existing site conditions. However, we generally recommend that the PVR is reduced to more tolerable levels (1 to 1-½ inches) for at-grade construction. The soils at this site are too expansive to practically and economically improve the PVR to 1 or 1-½ inches throughout; therefore, we have included various cut/fill options for the design team's consideration. Although the grade-supported foundation systems can be designed structurally to withstand a higher PVR (>1-½ inches), the owner would have to accept the increased probability that foundation movement will occur, plumbing leaks may occur, and aesthetic issues will develop (i.e., cracking drywall, separations on exterior siding, sticking doorways and windows, etc.). In order to reduce the PVR to more tolerable levels, we have provided options to over-excavate a portion of the expansive soil and replace it with select structural fill material. The over-excavation area should extend a minimum of three (3) feet beyond the horizontal limits of the proposed building footprints, where permissible. In addition, entries into the structures and surrounding flatwork will be subjected to similar potential movements, unless the soil improvement is extended to include these areas.

Despite the design condition, this does not mean that foundation movements are eliminated. It only means that the monolithic foundation system can be structurally designed for the magnitude of movement without failure of the foundation system. However, this movement does not take into account the movement criteria that is required or perceived by the building owner/occupants. These "operational" performance criteria may be, and often are, more restrictive than the structural criteria or tolerances.

The recommendations for building pad improvement are provided in the *Subgrade Preparation and Earthwork Operations* section and *Slab-on-Grade Foundation Systems* section. We can also provide additional soil movement reduction options, upon request, if the design team and owner feel that more or less potential movement is deemed acceptable or required of the structures. Furthermore, the recommendations presented in the study can be modified, if needed, once more detailed information of the final topography and the finished floor elevations for the proposed structures are established by the design team.

Slab-on-Grade Foundation Systems

The subsurface conditions encountered at the site are determined to be suitable for supporting the proposed buildings on monolithic slab-on-grade foundation systems provided some improvement is conducted to reduce the very expansive clay soils. Based on the anticipated structural loading and SPT values, as monitored during drilling of our borings, we recommend that the monolithic slab-on-grade foundation system be designed for a maximum net allowable end bearing capacity of 2,000 psf into approved in-situ soil or compacted select structural fill material. At beam intersections, or as required at column locations, the grade beams may be widened to support additional loads. At these areas, the bearing capacity may be increased to 2,300 psf; however, the beams must be at least 30 inches in the smallest dimension and poured monolithically with the slab.

We recommend that the beams have a minimum width of 12 inches and extend a minimum of 18 inches into the compacted select structural fill material. The exterior grade beams should bear a minimum of 24 inches below the exterior finished grade. These recommendations are for proper development of bearing capacity for the continuous beam sections of the foundation system and are NOT based on structural considerations. Grade beam widths and depths for structural considerations may need to be greater than recommended herein and should be properly evaluated and designed by the structural engineer.

The following tables presents the design criteria published by the Building Research Advisory Board (BRAB), Wire Reinforcement Institute (WRI), and the Post-Tensioning Institute (PTI), 3rd Edition. These values were based on our understanding of the proposed project, our interpretation of the information and data collected as part of this study, the criteria publications, and on our past experience with similar projects.

Based on the soil conditions, the proposed structures may be supported using Type III reinforced slab-on-grade foundation systems in accordance with BRAB (or suitable alternative).

Recommended BRAB, WRI, & PTI Criteria For Slab-on-Grade Foundations	**Modified Conditions**		
Design Criteria	**CASE III**	**CASE II**	**CASE I**
Over-excavation / Select Fill Pad Thickness	Note 1	Note 1	Note 1
Potential Vertical Rise (PVR)	2 inches	1-½ inches	1 inch
Effective Design Plasticity Index (PI) / BRAB PI	28	25	21
Slope Correction Coefficient	1.0	1.0	1.0
Constant Soil Suction, pF	3.8	3.8	3.8
Climatic Rating (C_w)	17	17	17
Unconfined Compressive Strength (tsf)	2.0	2.0	2.0
Soil Support Index, c	0.86	0.89	0.94
Edge Moisture Variation Distance, e_m, Center	8.3 feet	8.5 feet	8.8 feet
Edge Moisture Variation Distance, e_m, Edge	4.2 feet	4.3 feet	4.5 feet
Thornthwaite Index (I_m)	-14	-14	-14
Differential Soil Movement, y_m, Center Lift	0.6 inch	0.5 inch	0.4 inch
Differential Soil Movement, y_m, Edge Lift	1.2 inches	1 inch	0.8 inch

Note 1) Over-excavation and select fill pad thickness requirements should be in accordance with the levels provided in the *Expansive Soil Conditions* section.

Recommended BRAB, WRI, & PTI Criteria For Slab-on-Grade Foundations	**Modified Conditions**		
Design Criteria	**CASE VI**	**CASE V**	**CASE IV**
Over-excavation / Select Fill Pad Thickness	Note 1	Note 1	Note 1
Potential Vertical Rise (PVR)	3-½ inches	3 inches	2-½ inches
Effective Design Plasticity Index (PI) / BRAB PI	40	36	32
Slope Correction Coefficient	1.0	1.0	1.0
Constant Soil Suction, pF	3.8	3.8	3.8
Climatic Rating (C_w)	17	17	17
Unconfined Compressive Strength (tsf)	2.0	2.0	2.0
Soil Support Index, c	0.74	0.77	0.82
Edge Moisture Variation Distance, e_m, Center	7.5 feet	7.6 feet	7.8 feet
Edge Moisture Variation Distance, e_m, Edge	3.6 feet	3.9 feet	4.0 feet
Thornthwaite Index (I_m)	-14	-14	-14
Differential Soil Movement, y_m, Center Lift	1 inch	0.9 inch	0.7 inch
Differential Soil Movement, y_m, Edge Lift	2 inches	1.7 inches	1.4 inches

Note 1) Over-excavation and select fill pad thickness requirements should be in accordance with the levels provided in the *Expansive Soil Conditions* section.

Following any over-excavation and site preparation processes and if required by final grade elevations, the proposed building pads can be built-up and leveled using additional select structural fill material, as detailed in the *Subgrade Preparation and Earthwork Operations* section.

For monolithic slab-on-grade foundation systems, designed and constructed as recommended in this report, post construction settlements should be one (1) inch or less. Settlement response of fill supported slabs is influenced more by the quality of construction than by soil-structure interaction. Therefore, it is essential that the recommendations for both the foundation and the building pad construction be strictly followed throughout the construction phase of the proposed building's foundation.

Subgrade Preparation and Earthwork Operations

After excavating to the desired depth within the building pad areas, and prior to fill placement, the exposed subgrade surfaces should be observed by the Geotechnical Engineer or authorized representative. The following site preparation would be necessary for the monolithic slab-on-grade foundation systems:

1) Existing vegetation, topsoil, or any existing loose materials should be stripped and removed from the proposed building areas.

2) Following stripping operations, the floor slab areas should be over-excavated as required and identified in the *Expansive Soil Conditions* section, depending on the level of performance the design team selects. The over-excavation area should extend a minimum of three (3) feet beyond the horizontal limits of each proposed structures footprint area. A qualified geotechnical engineer, or representative, should be on-site during earthwork operations to observe and approve any cut areas prior to fill placement.

3) Following over-excavation, the exposed subgrade soils should be scarified to a depth of six (6) inches, moisture-conditioned between 0 and +4 percentage points above optimum moisture content and compacted to at least 95 percent of the maximum dry density as determined in accordance with ASTM D698. If the Stratum II gravel is the exposed subgrade, then a proofroll would be acceptable for approval of the subgrade.

4) Following approval of the subgrade, the select fill should be placed up to the desired final building pad elevations. The select fill should be placed in eight (8) inch maximum thick loose lifts. The select fill should be moisture-conditioned between -3 and +3 percentage points of optimum moisture content and compacted to a minimum of 95 percent of the maximum dry density as determined in accordance with ASTM D698, Standard Proctor Method. **Where the fill depths are six (6) feet deep or greater, the entire fill depth should be compacted to a minimum of 98 percent of the maximum dry density.** A minimum of three (3) nuclear density tests should be performed per lift, per structure.

We suggest placing a clay cap outside the limits of the buildings. The final 12 to 18 inches of the pad, outside the limits of each building, should consist of cohesive clay with a plasticity index between 20 and 35. This procedure will help to reduce the potential for water migrating into the deep building pad. The on-site soils are not suitable for the clay cap given their very high shrink-swell potential. Where concrete flatwork or pavements abut the structures, the clay cap may be eliminated. The clay cap should be placed in eight (8) inch maximum thick loose lifts, moisture-conditioned between 0 and +4 percentage points above optimum moisture content, and compacted to 95 percent of the maximum dry density as determined in accordance with ASTM D698.

When placing the select fill, care should be taken to avoid water ponding in the select fill layer. This could cause post-construction movements, which exceed the estimated values. Care must be taken to prevent landscape watering, surface drainage, leaking utility lines or other sources of water from entering the select fill.

Any import or select fill should be an approved inorganic material, free of debris. The select fill material should be approved by the Geotechnical Engineer prior to importing on site. The on-site soils are not considered suitable as select fill material. Select fill material should be placed in lifts not exceeding eight (8) inches in loose thickness, moisture-conditioned to within $\pm$3 percentage points of the optimum moisture content, and compacted to a minimum of 95 percent of the maximum dry density as determined in accordance with ASTM D698, Standard Proctor Method. **If the total fill depth is six (6) feet or greater, then the entire fill depth must be compacted to a minimum of 98 percent of the maximum dry density.** Select fill material should have a Plasticity Index (PI) ranging between 5 and 17 and have a maximum particle size of three (3) inches.

The design team should also consider the use of a vapor retarder (or damp-proofing) as required to meet moisture protection requirements of the interior finishing materials. However, where utilized, special consideration should be given to the surface curing of the slab in order to minimize uneven drying of the slab and associated cracking.

Seismic Considerations

According to the 2021 IBC (Section 1613.2.2), the site shall be classified in accordance with Chapter 20 of ASCE 7-22: Minimum Design Loads and Associated Criteria for Buildings and Other Structures. According to the ASCE 7-22 and IBC documents, the site classification is based on the subsurface soil/rock profile to a depth of 100 feet. Since the maximum depth explored for this study was 20 feet, we have assumed that the geologic formation condition extends to a depth of at least 100 feet. Based on the soil/rock profile encountered and these assumptions, the Site Class is "D" as defined by ASCE 7-22.

Pavement Design

General parking areas and drive areas will be provided primarily for general automobile traffic, and some heavy truck traffic for deliveries and trash pick-up. Although the primary roadway is not considered a City Street per City of San Antonio design guidelines, it is understood that the Private roadway must still meet some minimum design requirements with regard to subgrade improvement. Although detailed information regarding the expected traffic loads were known at the time of our report preparation, assumptions were made regarding the anticipated traffic conditions.

Our pavement analysis was generally based on the design procedure developed by AASHTO's *Guide for Design of Pavement Structures*, 1993, as well as the American Concrete Institute's (ACI's) *Commercial Concrete Parking Lots and Site Paving Design and Construction Guide*, ACI PRC-330-21.

Based on the site location and facility type, we utilized an effective pavement life of 20 years. Also for this analysis, we estimated a CBR (California Bearing Ratio) value of 2.5 percent for the Stratum I Clay, which will likely be the predominant subgrade materials following rough grading operations. We estimated this CBR value since evaluation of CBR values by either field or laboratory testing was not included in the scope of our services. We selected this value based on our knowledge and extensive experience with similar soil conditions throughout San Antonio. If desired, additional testing, including CBR testing and Atterberg Limits, may be conducted on the actual subgrade materials at the time of construction in order to verify the assumptions in this report.

The following design parameters and criteria were considered in our analyses:

- Resilient Modulus: 3,750 psi
- Reliability: 70 percent
- Overall Standard Deviation: 0.45 for flexible pavement
- Initial Serviceability: 4.2
- Terminal Serviceability: 2.0

The minimum recommended thicknesses for flexible pavement sections (asphaltic concrete) are presented in the table on the following page. Entrances to the new development as well as areas expected to require excessive maneuvering, such as dumpster areas or areas expected to

accommodate heavy truck traffic, should consists of a rigid (concrete) pavement system. Minimum thicknesses for rigid pavement sections are also provided.

	Light Duty Pavement Section	**Medium Duty Pavement Section**	**Heavy Duty Pavement Section**
Pavement Material	**Thickness, (in)**	**Thickness, (in)**	**Thickness, (in)**
Reinforced Concrete	---	---	6
Type D, Hot Mix Asphaltic Concrete	1.5	1.5	---
Crushed Limestone Base	7	11	Note 1
Lime-Stabilized Subgrade	6	6	6

Notes 1.) Although not required as a structural layer, crushed limestone base may be used as a level-up course.

Soluble sulfate testing was conducted on a grab sample of the Stratum I clay collected from the top 24 inches of P-3, which showed a concentrations of 144 mg/Kg (see attached results). Based on the National Lime Association's *Lime-Treated Soil Construction Manual* (January 2004), sulfate concentrations less than 3,000 ppm are unlikely to cause problems when soils are stabilized with lime. Therefore, lime-stabilization is a viable alternative for the Stratum I clays.

For the above pavement sections, we have calculated traffic loading conditions equal to or greater than 24,000 18-kip equivalent single-axle loads (ESALs) for the light-duty section and 106,000 for the medium-duty section. Typically, the light-duty section will meet the requirements for the parking spaces, while the medium-duty section will meet the requirements for the Private roadways and any emergency vehicle access lanes, due to infrequency of loading. If our assumptions or the traffic loading conditions do not meet the intended use or if further information comes available, we would be happy to provide further design recommendations.

The following paragraphs specify the pavement materials to be used to construct the proposed pavement areas:

Reinforced Concrete - Concrete should be designed to exhibit a flexural strength (third point loading) of at least 630 psi at 28 days (this is a compressive strength of about 4,000 psi). The flexural strength (M_r) may be approximated by the following formula from ACI 330R-08: $M_r=10\ (f_c')^{1/2,}$ where f_c' is the average 28 day compressive strength of the concrete test cylinders. The actual relationship between flexural and compressive strength for the proposed mix should be evaluated in the laboratory.

Hot Mix Asphaltic Concrete Surface Course - The asphaltic concrete surface course should be plant mixed, hot laid Type D (Fine Graded Surface Course) meeting the 2014 Texas Department of Transportation (TxDOT) specification, Item 340 and specific criteria for the job mix formula. The mix should be designed for a stability of at least 40 and should be compacted to between 91 and 95 percent of the maximum theoretical density as determined in accordance with Tex-207-F. The asphalt cement content by percent of total mixture weight should fall within a tolerance of $\pm$ 0.3 percent asphalt cement from the specific mix design. In addition, the mix should be designed so that 75 to 85 percent of the voids in the mineral aggregate (VMA) are filled with asphalt cement.

Crushed Limestone Base - Base material should be composed of crushed limestone meeting the requirements of TxDOT Item 247, Grade 1-2, Type A. The base should be compacted to a minimum of 95 percent of the maximum dry density as determined by the standard moisture-density relationship (ASTM D 698) at -2 to +2 percentage points of optimum moisture content. The base material should be placed in loose lifts measuring no greater than eight (8) inch in thickness.

Lime-Stabilized Subgrade - The clay subgrade shall be stabilized with hydrated lime in accordance with TxDOT Items 260 and 264. The lime should be blended with a mixing device such as a Pulvermixer, sufficient water added, and be allowed to cure for at least 48 hours. Based on our experience with similar soils, five (5) percent lime, by dry weight, will be required to adequately stabilize the subgrade soils at this site. This is approximately 22 pounds per square yard for a six (6) inch deep treatment for the subgrade soils. After curing, the lime-soil blend should be remixed and compacted to at least 95 percent of the maximum dry density as determined in accordance with either ASTM D698 or TEX-114-E at moisture contents ranging from 0 to +4 percentage points of optimum moisture content. The elapse of time after mixing of the lime and soil has an effect on the maximum dry density, which decreases with time. For any mixture older than three (3) days, a new moisture-density relationship is required.

If the design team is considering the use of rigid pavement in-lieu of flexible pavement throughout, then it is our recommendation that the rigid pavement be at least six (6) inches thick. The following recommendations are also provided for reinforcement and jointing.

Type of Joint	Joint Spacing	Joint Depth	Joint Width[2]
Contraction (Control)	15 feet each way	One-fourth (¼) of slab thickness	One-eighth (⅛) to one-fourth (¼) inch
Construction	At location of contraction joints	Full depth of pavement thickness	One-eighth (⅛) to one-fourth (¼) inch
Isolation	As required to isolate from structures	Full depth of pavement thickness	Three-fourths (¾) to one (1) inch
Expansion[1]	60 feet each way	Full depth of pavement thickness	Three-fourths (¾) to one (1) inch

Notes: 1.) Serious consideration should be given to the total elimination of expansion joints. In this region, drying shrinkage of concrete typically significantly exceeds anticipated expansion due to thermal affects. As a result, the need for expansion joints is eliminated. Construction of an unnecessary joint may be also become a maintenance problem.

2.) All joint widths should be as noted above or as required by the joint sealant manufacturer.

Distributed Steel: Steel reinforcement may consist of either steel bars or welded wire fabric (WWF) described below:

No. 3 reinforcing steel bars at 18 inches on center each way, Grade 60; or

WWF: W2.9 X W2.9, six (6) inches by six (6) inches, flat sheets only; or W1.4 X W1.4, four (4) inches by four (4) inches, flat sheets only.

Note: It is imperative that the distributed steel be positioned accurately in the pavement cross section. Properly supported, this is typically easier to accomplish with steel bars than with WWF.

All construction joints shall have dowels, and dowel information varies with pavement thickness. The applicable dowel information for this project is provided below:

Pavement Thickness:	6 inches
Dowels	¾-inch diameter
Dowel Spacing	12 inches on center
Dowel Length	14 inches long
Dowel Embedment	6 inches minimum

Any general fill material placed in the pavement areas should be an approved inorganic material, free of debris, and have a maximum particle size of three (3) inches. Any import fill material should be approved by the Geotechnical Engineer prior to importing on site. The on-site soils may be utilized provided the recommendations provided herein are met. This material should be placed in lifts not exceeding eight (8) inches in loose thickness. Coarse-grained soils (SC, GC, or more granular) should be moisture-conditioned to within $\pm$3 percentage points of the optimum moisture content and compacted to a minimum of 95 percent of the maximum dry density as determined in accordance with ASTM D698. Fine-grained soils (CH, CL, ML, or CL-ML) should be moisture-conditioned between 0 and +4 percentage points above optimum moisture content and compacted to a minimum of 95 percent of the maximum dry density as determined in accordance with ASTM D698.

Proper perimeter drainage in and around pavement sections is very important, and should be provided so that infiltration of surface water from unpaved areas surrounding the pavement areas is minimized. We do not recommend installation of landscape beds or islands in the pavement. Such features provide an avenue for water to enter into the pavement section and the underlying subgrade soil. Water penetration usually results in degradation of the pavement section with time, and as vehicular traffic traverses the area of moisture infiltration. Above grade planter boxes, with drainage discharging onto the top of the pavement, or directed into storm sewers, should be considered if landscape features are desired.

If landscaping is used adjacent to the paved areas, we recommend the curbs extend through the base and at least six (6) inches into the subgrade. This will help reduce migration of groundwater into the pavement base course from adjacent areas. A crack sealant compatible to both asphalt and concrete should be provided at all concrete-asphalt interfaces, and at all interfaces of existing/new pavement areas.

Cracking, particularly longitudinal cracking within one (1) to five (5) feet of the pavement edges, should be expected of any asphalt pavements constructed where expansive soil is the subgrade material. Although not common, this longitudinal cracking may even occur further than this distance from the curb line. The cracking occurs as the expansive soils adjacent to and below the pavements shrink and swell with seasonal moisture fluctuations. Therefore, proper maintenance, including sealing all cracks on a timely manner, should be conducted throughout the life of any asphalt pavements.

Utility Trench Recommendations

The contractor should take the necessary precautions with regard to sloping, benching, and shoring these soils on this site to maintain stability of the excavations sides and bottom. Furthermore, the contractor should evaluate the soil exposed in the excavations as part of their safety precautions. It should be noted that any trench and excavation safety recommendations presented in this report does not relieve the contractor from performing additional safety measures that are required to maintain health and safety. Furthermore, it is the contractor's sole responsibility to maintain safety at all times.

It is vital that all backfill being placed into utility trenches be moisture-conditioned and compacted to a degree that meets or exceeds the compaction of the adjacent areas, so that no settlement will occur. Additionally, it is important that proper backfill material be used. Generally, the material that is excavated from the trenches is stockpiled on site and subsequently used as backfill material in the trenches. **It is important that the excavated material is not stockpiled near the edge of the unsupported sloped/benched areas as that material will add additional surcharge pressures to the slope.**

Additionally, it is our recommendation that all backfill material used in the utility trenches be moisture-conditioned to within three (3) percentage points of the optimum moisture content and compacted to at least 95 percent of the maximum dry density as determined in accordance with ASTM D-698. Furthermore, it is our recommendation that the backfill material be placed in six (6) inch compacted lifts. The backfill material should be tested for moisture content and compaction for each six (6) inch lift at a minimum frequency of one (1) test per 100 linear feet. For narrow trenches that would be too confined to sufficiently compact the backfill materials, it is our recommendation that a flowable fill material be used to backfill the trench. In non-structural (grassy) areas, the utilities should be backfilled to at least 90 percent of the maximum dry density, as determined by ASTM D-698, or in accordance with local requirements, whichever is more stringent.

Note: Although the above recommendations are provided, local requirements may supersede these recommendations. It is the contractor's responsibility to adhere to any local requirements for installation and backfill of on-site utilities. Specifically, SAWS requires that all utilities are compacted to at least 98 percent of the maximum dry density.

General Construction Considerations

The site should be graded such that surface water runoff is directed away from any excavations during construction. In addition, site grading should allow for surface and roof drainage away from the structures during their design lives. We suggest verifying grades around the structures to document that effective drainage has been achieved.

Exposure to the environment may weaken the soils at the foundation bearing level if the excavations remain open for extended periods of time. Therefore, foundation concrete and select fill material should be placed as soon as possible after the excavations are completed. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete or

select fill material. If rainfall becomes imminent while the bearing soils are exposed, we recommend that a 1-to 3-inch thick "mud-mat" of "lean" concrete be placed on the bearing soils.

In a dry and undisturbed state, the surficial soil at the site will provide sufficient subgrade support for fill placement and construction operations. However, when wet, these soils will degrade with disturbance from contractor operations. Therefore, good site drainage should be maintained during earthwork operations which will help maintain the integrity of the soil.

Limitations

This report has been prepared to aid in the evaluation of subsurface conditions at this site and to assist design professionals in the geotechnical related design of this project. It is intended for use with regard to the specific project as described in this report. Any substantial changes or differences in assumed building conditions should be brought to our attention so that we may determine any effect on the recommendations provided in this report.

The scope of our study did not include an environmental assessment of the soil or water conditions either on or adjacent to the site. As such, no environmental opinions are presented in this report.

The opinions and conclusions expressed in this report are those of BEA and represent interpretation of the subsurface conditions based on tests and the results of our analyses. BEA is not responsible for the interpretation or implementation by others of recommendations provided in this report. This report has been prepared in accordance with generally accepted principles of geotechnical engineering practice and no warranties are included, expressed, or implied, as to the professional services provided under the terms of our agreement.

The analysis and recommendations submitted in this report are based upon the data obtained from the test borings performed at the locations indicated in the *Boring Location Plan*, and from other information described in this report. This report does not reflect any variations that may occur around the test borings. In the performance of the subsurface exploration, specific information is obtained at specific locations and times. However, it should be noted that variations in soil conditions exist on most sites between the test boring locations, and conditions such as groundwater levels vary from time to time. The nature and extent of variations may not become evident until the course of construction.

If variations appear evident, BEA should be allowed to perform on-site observations during the construction period and note characteristics and variations to determine if a re-evaluation of the recommendations in this report will be necessary.

Closing

We recommend that the construction activities be monitored on a call-out basis by a qualified Geotechnical Engineer, or representative. We also recommend that once the plans are prepared, BEA be retained to review them so it can be determined if changes to the recommendations are necessary or if additional recommendations are required.

APPENDIX

Figure 1: Site Vicinity Map

Figure 2: Boring Location Plan

Figure 3: Soil Improvement Area Plan

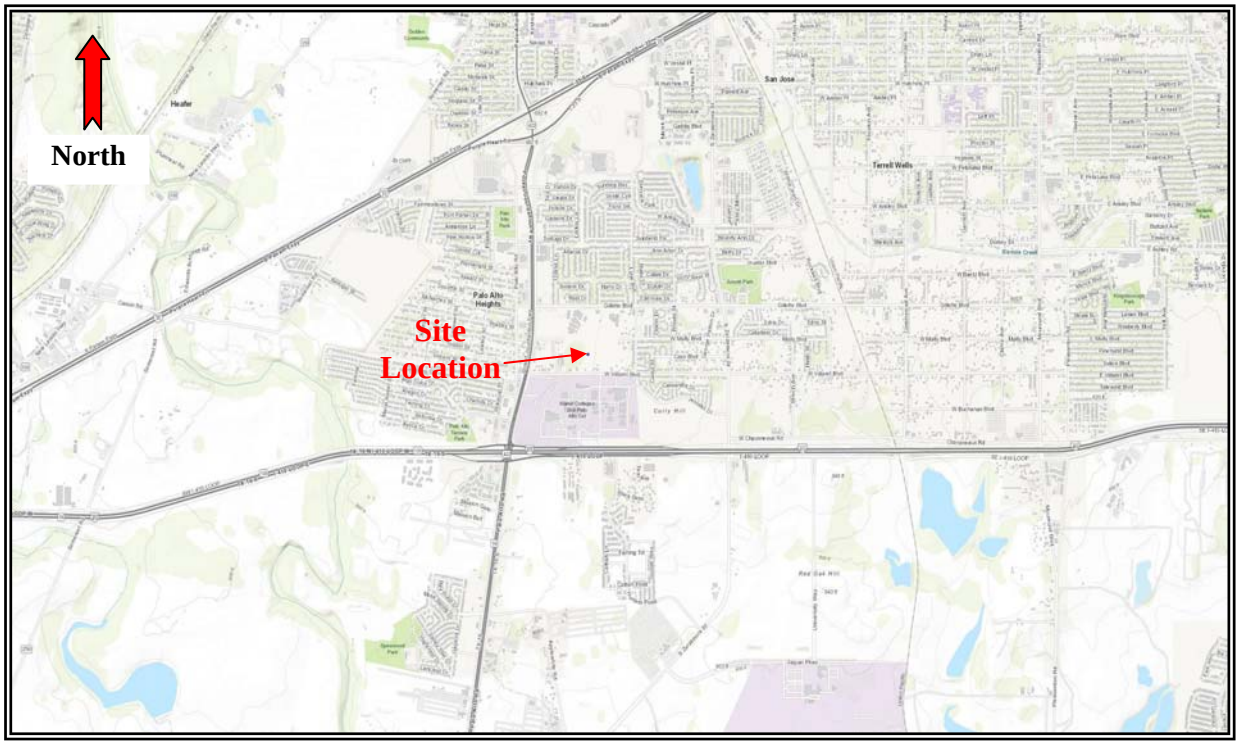
Boring Logs (B-01 through B-15 and P-1 through P-5)

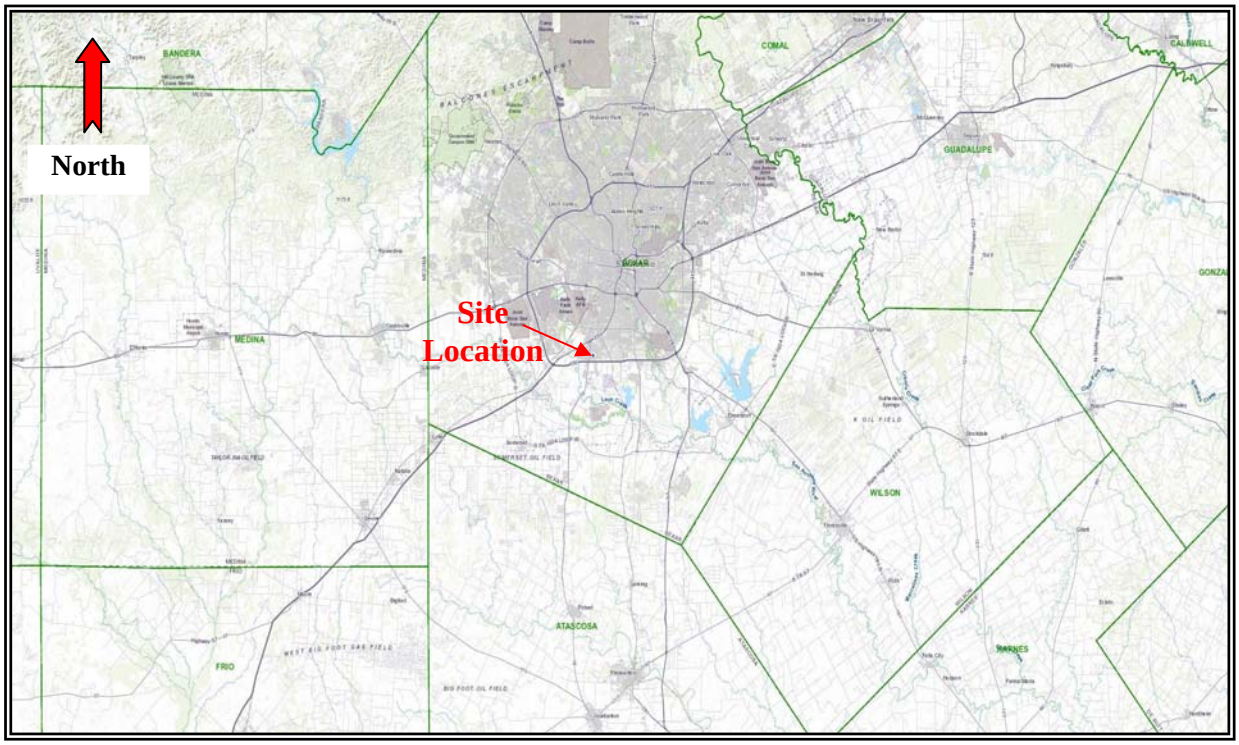
Soil Classification Chart

Lime Series Graphs (3 pages)

Laboratory and Field Test Procedures

Soluble Sulfate Analytical Report (5 pages)





Geotechnical Engineering Study
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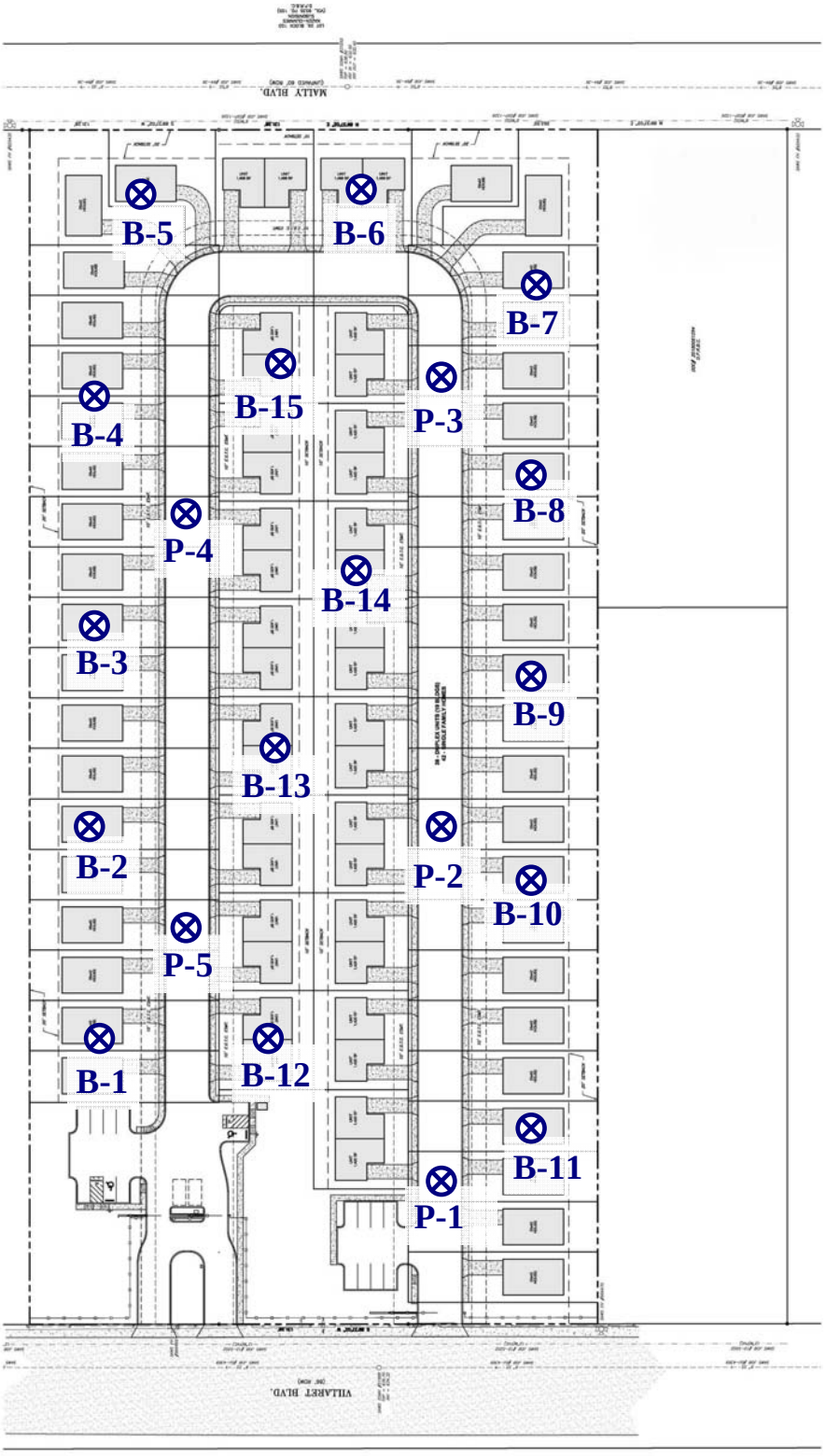
San Antonio, Texas
BEA Project No. 12-24-0302

FIGURE 1

SITE VICINITY MAP



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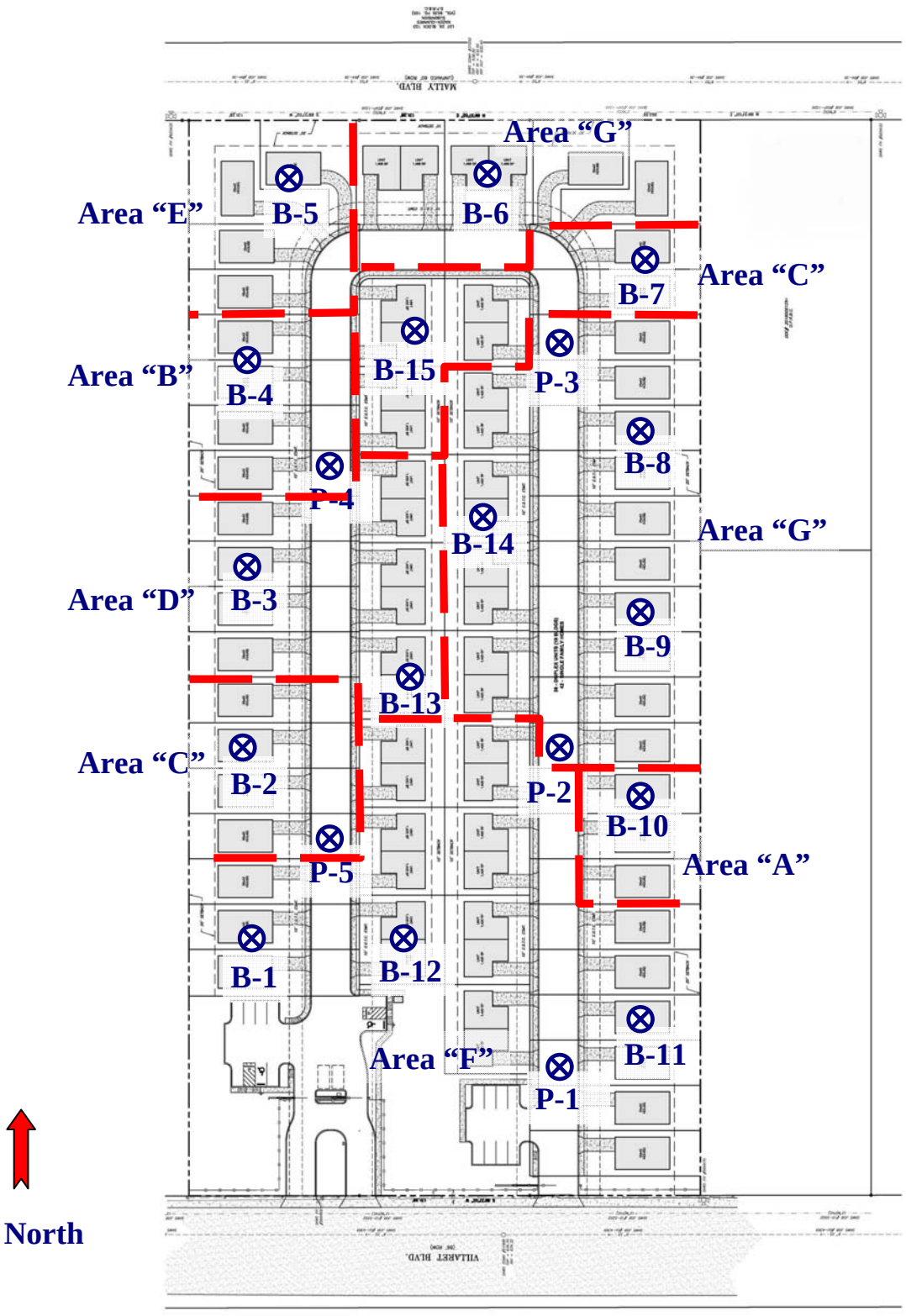
San Antonio, Texas
BEA Project No. 12-24-0302

FIGURE 2

BORING LOCATION PLAN



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San Antonio, Texas
BEA Project No. 12-24-0302

FIGURE 3

SOIL IMPROVEMENT AREA PLAN

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Fax: 210-590-7476

BORING NUMBER B-01

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/28/24 **COMPLETED** 5/28/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jackson **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Very stiff to hard, dark gray FAT CLAY (CH)	SS 1		3-8-10 (18)			13	62	22	40	
			SS 2		12-15-19 (34)			11				
5		Stratum II: Very dense, gray CLAYEY GRAVEL WITH SAND (GC)	SS 3		18-31-34 (65)			9	47	16	31	
		- grades to very stiff, light gray, calcareous LEAN CLAY (CL)	SS 4		8-11-11 (22)			5				
10		Stratum III: Very stiff to hard, light gray and tan FAT CLAY (CH) - trace calcareous deposits in sample SS5	SS 5		10-14-14 (28)			8	92	26	66	
15			SS 6		16-15-18 (33)			25				
20			SS 7		12-15-21 (36)			26				
		Bottom of hole at 20.0 feet.										

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Fax: 210-590-7476

BORING NUMBER B-02

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/28/24 **COMPLETED** 5/28/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jackson **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Stiff, dark grayish brown FAT CLAY (CH)	SS 1		4-5-5 (10)			20	72	26	46	
		Stratum II: Very dense, gray CLAYEY GRAVEL WITH SAND (GC) - 40% gravel, 40% sand & 20% fines	SS 2		19-27-28 (55)			5				20
5			SS 3		31-26-25 (51)			8				
		- grades to very stiff, light gray and tan, calcareous LEAN CLAY (CL)	SS 4		12-9-10 (19)			19	28	16	12	
		Stratum III: Very stiff, tan and light gray FAT CLAY (CH) with calcareous deposits and trace gravel	SS 5		7-9-15 (24)			24				
10												
15			SS 6		10-11-14 (25)			25	88	34	54	
		Bottom of hole at 15.0 feet.										

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BORING NUMBER B-03

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/28/24 **COMPLETED** 5/28/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jackson **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Very stiff to hard, dark gray FAT CLAY (CH)	SS 1		6-8-8 (16)			16				
		- grades to dark brown in color with gravel	SS 2		12-15-16 (31)			15	63	21	42	
5		Stratum II: Very dense, brown CLAYEY GRAVEL WITH SAND (GC)	SS 3		15-24-27 (51)			3				
		Stratum III: Very stiff, tan and light gray FAT CLAY (CH) - with calcareous deposits in sample SS4	SS 4		8-12-15 (27)			25	53	20	33	
10			SS 5		8-8-10 (18)			27				
15			SS 6		6-9-13 (22)			27				
		Bottom of hole at 15.0 feet.										

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BORING NUMBER B-04

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/28/24 **COMPLETED** 5/28/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jackson **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Stiff, dark gray FAT CLAY (CH), trace gravel	SS 1		4-7-7 (14)			15	63	21	42	
		Stratum II: Medium dense to dense, gray to brown CLAYEY GRAVEL WITH SAND (GC)	SS 2		14-15-27 (42)			4				
5		- 38% gravel, 38% sand & 24% fines	SS 3		14-14-14 (28)			6				24
		- grades to very stiff to hard, tan, calcareous LEAN CLAY (CL)	SS 4		12-14-19 (33)			5				
10			SS 5		12-11-12 (23)			10	26	17	9	
		Stratum III: Very stiff, tan and light gray FAT CLAY (CH)										
15			SS 6		7-10-13 (23)			30				
20			SS 7		6-6-13 (19)			27				
		Bottom of hole at 20.0 feet.										

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BORING NUMBER B-05

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PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/28/24 **COMPLETED** 5/28/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jackson **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Stiff to very stiff, dark gray FAT CLAY (CH)	SS 1		5-7-8 (15)			15				
		- grades to dark gray and gray in color	SS 2		8-10-15 (25)			13	60	20	40	
5		Stratum II: Dense, gray CLAYEY GRAVEL WITH SAND (GC)	SS 3		20-27-14 (41)			15				
		Stratum III: Very stiff, pale brown FAT CLAY (CH) - trace calcareous deposits and gypsum from 6.5 to 12 feet	SS 4		8-12-15 (27)			19	67	19	48	
10			SS 5		6-11-12 (23)			19				
		- grades to tan and light gray in color										
15			SS 6		9-12-16 (28)			25				
		Bottom of hole at 15.0 feet.										

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BORING NUMBER B-06

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/28/24 **COMPLETED** 5/28/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jackson **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Stiff to very stiff, dark gray FAT CLAY (CH)	SS 1		4-6-7 (13)			17				
		- grades to dark gray and gray in color	SS 2		8-9-12 (21)			16	82	22	60	
5		Stratum III: Very stiff, pale brown FAT CLAY (CH)	SS 3		6-8-11 (19)			17	63	18	45	
			SS 4		8-12-15 (27)			20				
10		- grades to very stiff to hard, tan and light gray FAT CLAY (CH) with trace calcareous deposits	SS 5		7-13-14 (27)			20				
15			SS 6		11-14-22 (36)			23				
20			SS 7		12-17-20 (37)			21				
		Bottom of hole at 20.0 feet.										

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BORING NUMBER B-07

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/28/24 **COMPLETED** 5/29/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Dylan **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Stiff, dark grayish brown FAT CLAY (CH)	SS 1		4-4-6 (10)			15				
		- grades to dark grayish brown and brown in color	SS 2		7-5-5 (10)			13	67	21	46	
5		Stratum II: Dense, brown CLAYEY GRAVEL WITH SAND (GC) - 57% gravel, 29% sand & 14% fines	SS 3		22-29-21 (50)			6				14
		- grades to very stiff, light gray, calcareous LEAN CLAY (CL)	SS 4		8-10-13 (23)			5	45	17	28	
10		Stratum III: Very stiff, tan and light gray FAT CLAY (CH) with calcareous deposits	SS 5		8-9-9 (18)			20				
15		- grades to hard, tan and light gray LEAN CLAY (CL) with trace red sandstone lenses	SS 6		16-21-13 (34)			13	46	21	25	
		Bottom of hole at 15.0 feet.										

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Fax: 210-590-7476

BORING NUMBER B-08

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/29/24 **COMPLETED** 5/29/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jackson **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Very stiff, dark gray FAT CLAY (CH)	SS 1		6-8-8 (16)			10				
			SS 2		6-9-14 (23)			16	88	24	64	
5		- grades to dark gray and pale brown in color	SS 3		7-12-16 (28)			17				
		Stratum III: Very stiff to hard, tan and light gray FAT CLAY (CH)	SS 4		7-10-12 (22)			20	64	23	41	
		- trace red sandstone lenses in samples below 8.5 feet	SS 5		8-12-18 (30)			20				
10												
			SS 6		10-13-19 (32)			22				
15												
			SS 7		12-16-23 (39)			23				
20		Bottom of hole at 20.0 feet.										

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BORING NUMBER B-09

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/29/24 **COMPLETED** 5/29/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jackson **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Stiff to very stiff, dark gray FAT CLAY (CH)	SS 1		4-5-8 (13)			16				
		- grades to dark gray and gray in color	SS 2		5-11-11 (22)			14	61	20	41	
5		Stratum II: Dense, gray CLAYEY GRAVEL WITH SAND (GC)	SS 3		8-12-32 (44)			14				
		Stratum III: Very stiff, tan and light gray LEAN CLAY (CL) with calcareous deposits - trace calcareous deposits and gypsum from 6.5 to 12 feet	SS 4		7-10-11 (21)			10	42	17	25	
10		- grades to FAT CLAY (CH) with trace calcareous deposits	SS 5		7-10-15 (25)			22				
15			SS 6		9-13-17 (30)			25	98	31	67	
		Bottom of hole at 15.0 feet.										

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BORING NUMBER B-10

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/29/24 **COMPLETED** 5/29/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jackson **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Stiff to hard, dark grayish brown FAT CLAY (CH)	SS 1		4-6-9 (15)			14				
		- grades to gray in color with trace gravel below 2.5 feet	SS 2		11-16-19 (35)			12	56	19	37	
5		Stratum II: Dense, tan CLAYEY GRAVEL WITH SAND (GC) - 45% gravel, 33% sand, & 22% fines	SS 3		21-22-22 (44)			4				22
		- grades to hard, light gray, calcareous LEAN CLAY (CL)	SS 4		13-17-20 (37)			12	26	13	13	
10		Stratum III: Hard, tan and light gray LEAN CLAY (CL) with calcareous deposits	SS 5		19-21-26 (47)			10				
15			GB 6					14				
		Bottom of hole at 15.0 feet.										

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BORING NUMBER B-11

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/29/24 **COMPLETED** 5/29/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Dylan **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Stratum I: Stiff to very stiff, dark grayish brown FAT CLAY (CH)	SS 1		5-6-8 (14)			14	64	22	42	
			SS 2		10-10-20 (30)			14				
5		Stratum II: Dense to very dense, gray CLAYEY SAND WITH GRAVEL (SC) - 29% gravel, 46% sand & 25% fines	SS 3		21-46-33 (79)			11				25
		Stratum III: Very stiff to hard, tan FAT CLAY (CH), trace calcareous deposits and gravel in sample SS4	SS 4		10-11-11 (22)			10				
10		- grades to tan and light gray in color below 8.5 feet	SS 5		8-10-12 (22)			12	90	29	61	
15			SS 6		8-12-17 (29)			26				
20			SS 7		11-16-18 (34)			26				
		Bottom of hole at 20.0 feet.										

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BORING NUMBER B-12

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/28/24 **COMPLETED** 5/28/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jackson **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Stiff to very stiff, dark gray FAT CLAY (CH)	SS 1		4-6-7 (13)			13				
			SS 2		7-8-10 (18)			17	79	19	60	
5		- grades to dark gray, gray and pale brown in color	SS 3		6-8-10 (18)			14				
		Stratum II: Very stiff to hard, pale brown to light gray, calcareous LEAN CLAY (CL)	SS 4		11-14-19 (33)			12	27	14	13	
			SS 5		11-16-18 (34)			12				
10		Stratum III: Hard, tan and light gray FAT CLAY (CH), trace calcareous deposits										
			SS 6		9-14-20 (34)			15	93	30	63	
15		Bottom of hole at 15.0 feet.										

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BORING NUMBER B-13

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/28/24 **COMPLETED** 5/28/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jackson **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Very stiff, dark grayish brown FAT CLAY (CH)	SS 1		6-8-8 (16)			10				
			SS 2		7-8-11 (19)			18	87	23	64	
5		Stratum II: Very dense, brown POORLY-GRADED GRAVEL (GP-GC) with clay and sand - 59% gravel, 30% sand, & 11% fines	SS 3		18-27-33 (60)			5				11
		- grades to hard, tan, calcareous LEAN CLAY (CL) with gravel	SS 4		25-38-42 (80)			7	31	16	15	
		Stratum III: Hard, tan and light gray FAT CLAY (CH) - trace calcareous deposits in sample SS5	SS 5		11-13-17 (30)			25				
10												
			SS 6		8-14-17 (31)			26				
15		Bottom of hole at 15.0 feet.										

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BORING NUMBER B-14

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/28/24 **COMPLETED** 5/28/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jackson **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Stiff to very stiff, dark gray to dark gray and gray FAT CLAY (CH)	SS 1		4-6-6 (12)			16	62	23	39	
			SS 2		6-8-9 (17)			15				
5		Stratum III: Very stiff, pale brown and light gray FAT CLAY (CH)	SS 3		7-8-10 (18)			19				
			SS 4		6-9-13 (22)			21	73	21	52	
		- with calcareous deposits in sample SS5	SS 5		5-9-10 (19)			24				
10												
		- grades to tan and light gray in color	SS 6		8-11-15 (26)			27				
15		Bottom of hole at 15.0 feet.										

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BORING NUMBER B-15

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/28/24 **COMPLETED** 5/28/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jackson **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Stiff to very stiff, dark gray FAT CLAY (CH)	SS 1		4-5-8 (13)			19	72	25	47	
		Stratum II: Dense, gray to brown POORLY-GRADED GRAVEL (GP-GC) with clay and sand	SS 2		11-20-22 (42)			6				
5		- 50% gravel, 38% sand, & 12% fines	SS 3		19-18-18 (36)			8				12
		- grades to hard, tan, calcareous LEAN CLAY (CL)	SS 4		14-18-17 (35)			11				
			SS 5		50/5"			10	36	17	19	
10		Stratum III: Very stiff, tan and light gray FAT CLAY (CH)										
			SS 6		10-13-15 (28)			23				
15		Bottom of hole at 15.0 feet.										

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BORING NUMBER P-1

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/29/24 **COMPLETED** 5/29/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Dylan **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Very stiff, dark grayish brown FAT CLAY (CH)	SS 1		5-7-10 (17)			14	60	21	39	
		Stratum II: Dense, brown CLAYEY GRAVEL WITH SAND (GC)	SS 2		23-21-23 (44)			7				
5			SS 3		25-22-15 (37)			7				
		Bottom of hole at 6.0 feet.										

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BORING NUMBER P-2

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/29/24 **COMPLETED** 5/29/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jackson **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Stiff to very stiff, dark gray FAT CLAY (CH)	SS 1		4-6-7 (13)			14				
			SS 2		7-10-11 (21)			15	61	23	38	
5		- grades to dark gray, gray and pale brown in color	SS 3		6-7-11 (18)			15				
		Bottom of hole at 6.0 feet.										

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BORING NUMBER P-3

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/29/24 **COMPLETED** 5/29/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jackson **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Stiff to very stiff, dark gray FAT CLAY (CH)	SS 1		3-5-6 (11)			15	73	24	49	
		- trace gravel in samples below 2.5 feet	SS 2		7-9-10 (19)			21				
5		Stratum III: Very stiff, pale brown and light gray FAT CLAY (CH), trace calcareous deposits	GB 3					14				
		Bottom of hole at 6.0 feet.										

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BORING NUMBER P-4

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/29/24 **COMPLETED** 5/29/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jackson **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Very stiff, dark grayish brown FAT CLAY (CH), trace gravel	SS 1		4-11-13 (24)			13				
		Stratum II: Dense, brown CLAYEY GRAVEL WITH SAND (GC)										
		- 50% gravel, 35% sand, & 15% fines	SS 2		25-19-23 (42)			9				15
5		- grades to hard, brown and tan, calcareous LEAN CLAY (CL), trace gravel	SS 3		14-17-24 (41)			4				
		Bottom of hole at 6.0 feet.										

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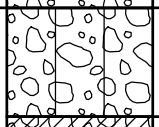
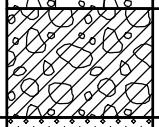
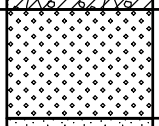
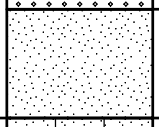
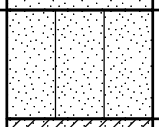
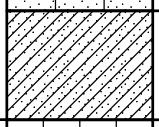
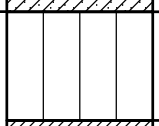
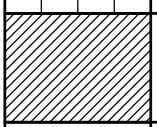
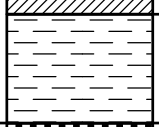
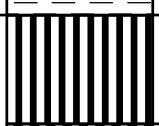
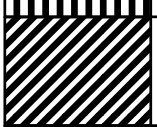
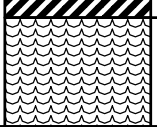
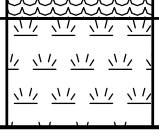
BORING NUMBER P-5

CLIENT Onward Development, LLC
PROJECT NAME Villaret Subdivision
PROJECT NUMBER 12-24-0302
PROJECT LOCATION 1507-1527 Villaret Blvd., San Antonio, Tx
DATE STARTED 5/29/24 **COMPLETED** 5/29/24
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jackson **CHECKED BY** B. Krieger
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling.
AFTER DRILLING ---

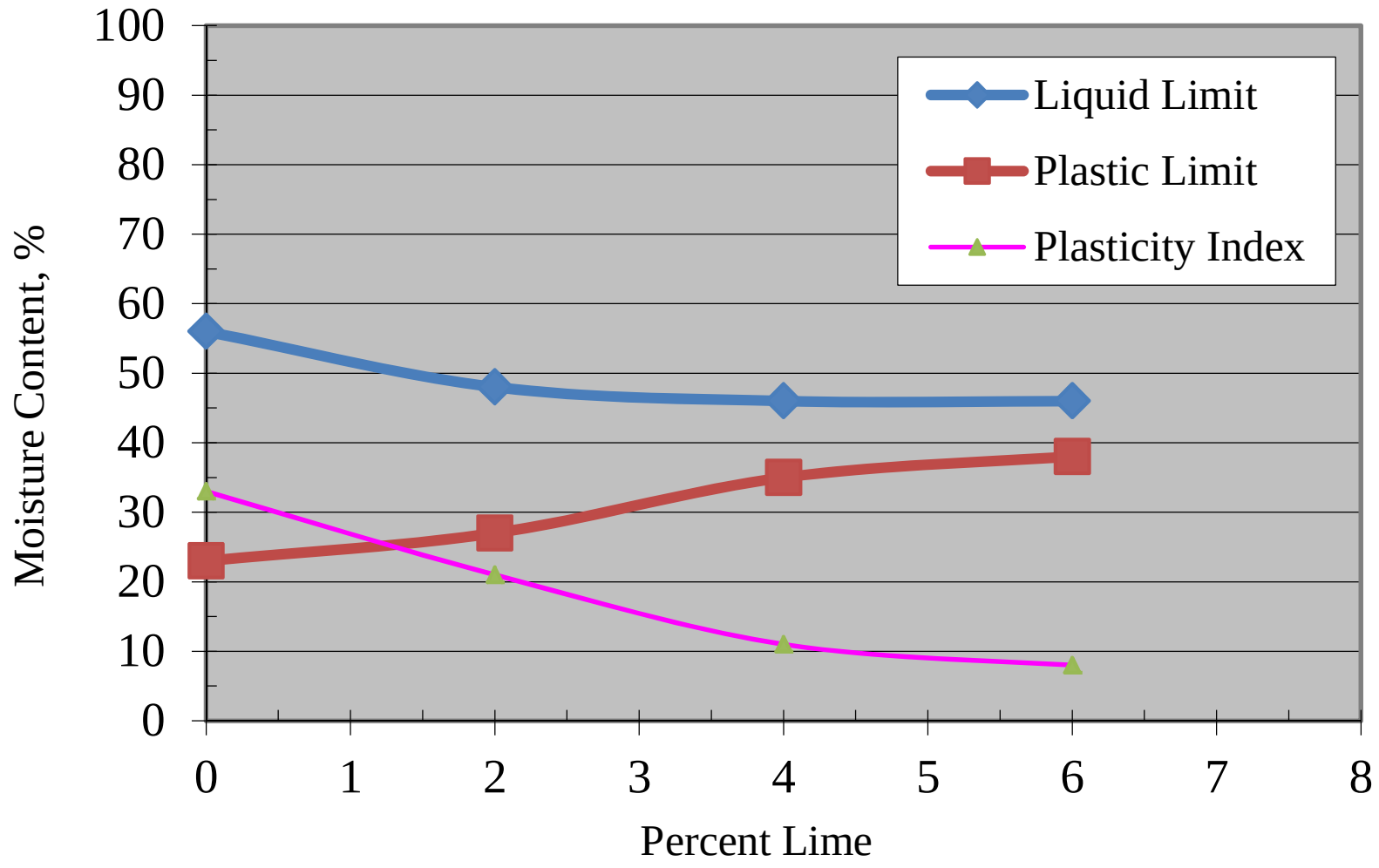
DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Stratum I: Stiff to very stiff, dark grayish brown FAT CLAY (CH)	SS 1		4-6-9 (15)			13	61	23	38	
		Stratum II: Dense, gray CLAYEY GRAVEL WITH SAND (GC)	SS 2		14-14-25 (39)			8				
5			SS 3		24-17-21 (38)			6				
		Bottom of hole at 6.0 feet.										

SOIL CLASSIFICATION CHART

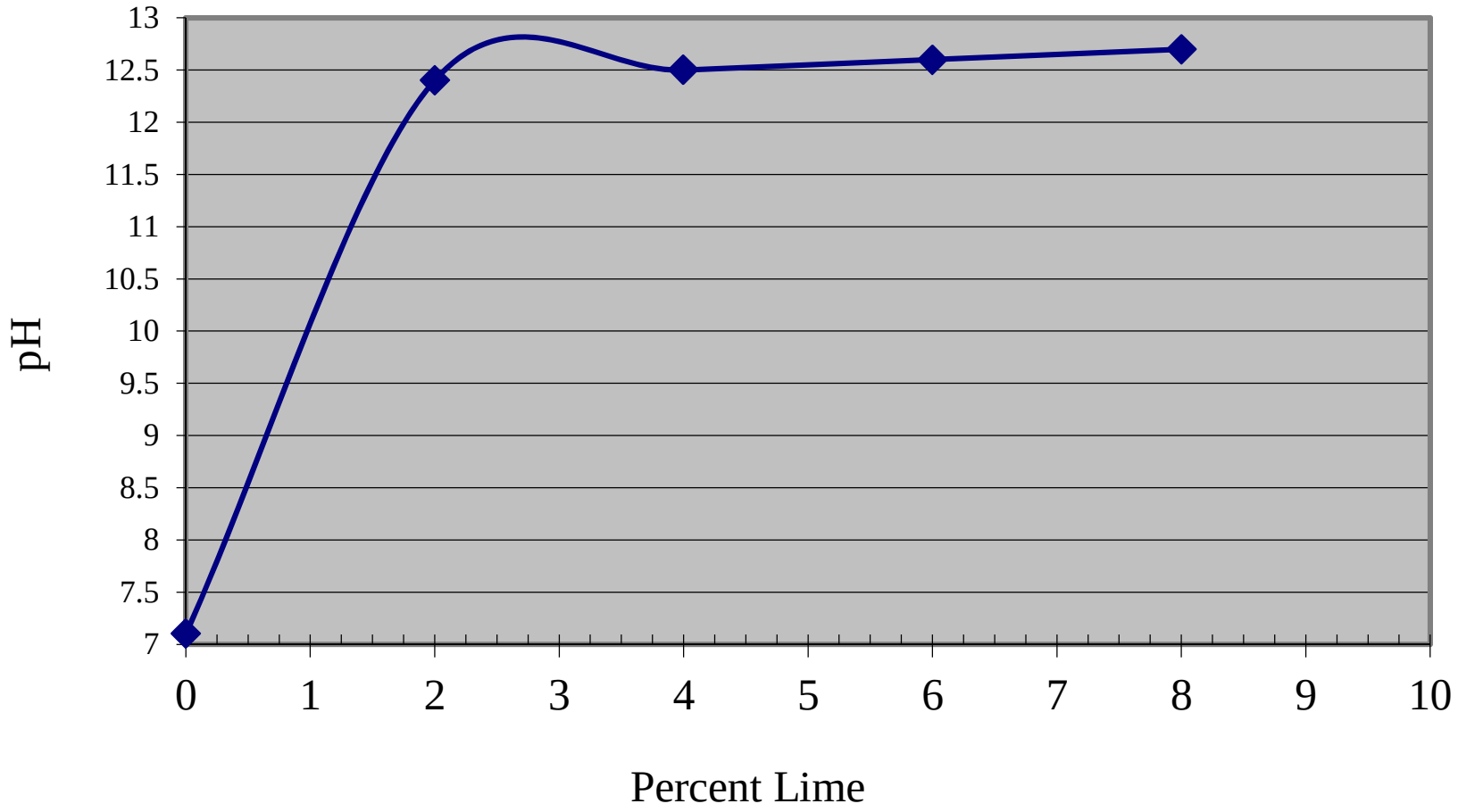
MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

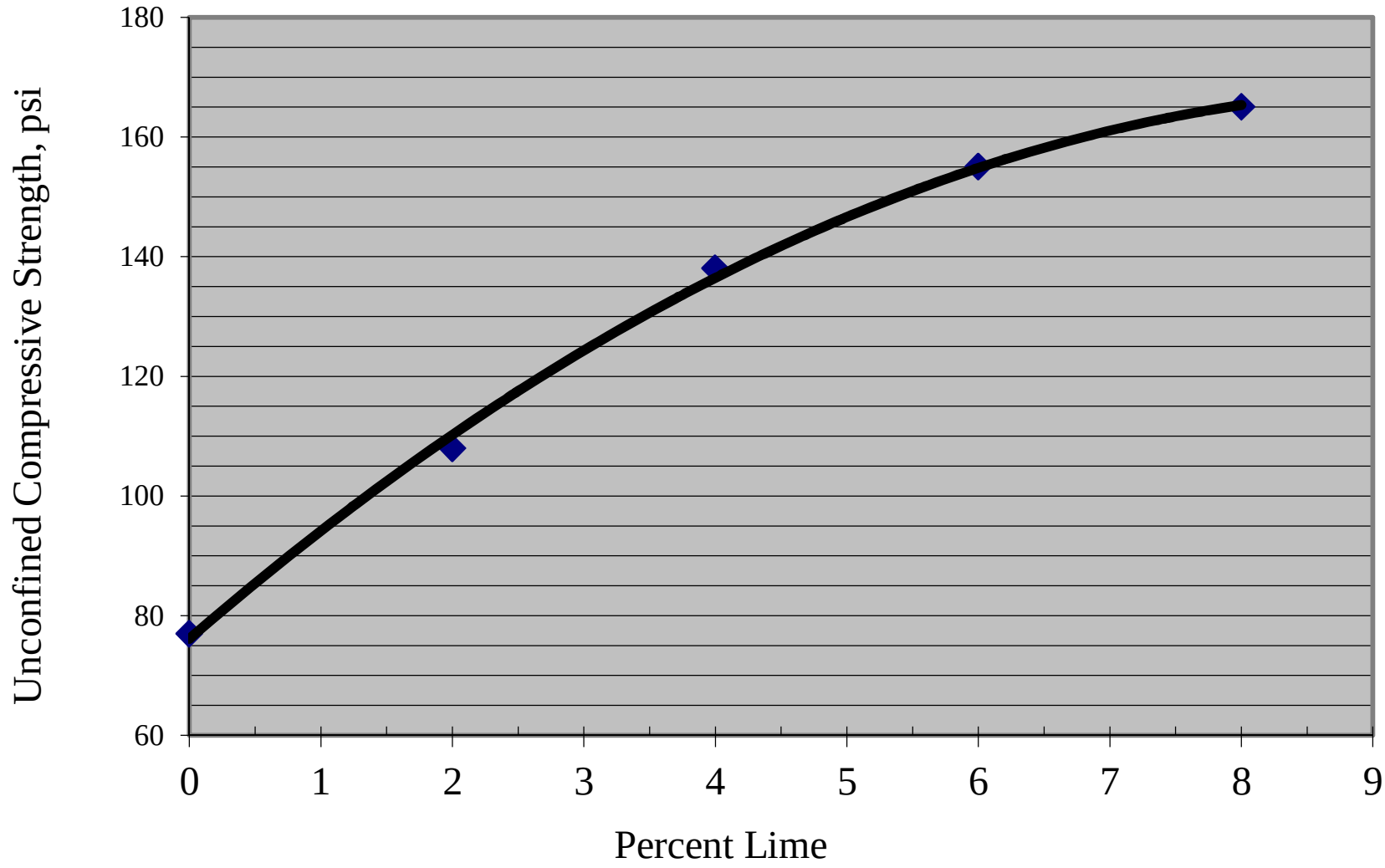
LIME SERIES CURVE
Villaret Subdivision - P-3 (0-2')



LIME SERIES CURVE
Villaret Subdivision - P-3 (0-2')



LIME SERIES CURVE
Villaret Subdivision - P-3 (0 to 2')



Laboratory and Field Test Procedures

Soil Classification per ASTM D2487
This soil testing standard was used for classifying soils according to the Unified Soil Classification System. The soil classifications of the earth materials encountered are as noted in the attached boring logs.

Soil Water Content per ASTM D2216
This test determines the water content of soil or rock expressed as a percentage of the solid mass of the soil. The test results are listed under Moisture Content in the attached boring logs.

Soil Liquid Limit per ASTM D4318
The soil Liquid Limit identifies the upper limit soil water content at which the soil changes from a moldable (plastic) physical state to a liquid state. The Liquid Limit water content is expressed as a percentage of the solid mass of the soil.

Soil Plastic Limit per ASTM D4318
The soil Plastic Limit identifies a lower limit soil water content at which the soil changes from a moldable (plastic) physical state to a non-moldable (semi-solid) physical state. The Plastic Limit water content is expressed as a percentage of the solid mass of the soil.

Plasticity Index per ASTM D4318
This is the numeric difference between the Liquid Limit and Plastic Limit. This index also defines the range of water content over which the soil-water system acts as a moldable (plastic) material. Higher Plasticity Index (PI) values indicate that the soil has a greater ability to change in soil volume or shrink and swell with lower or higher water contents, respectively.

Standard Penetration Test (SPT) and Split Spoon Sampler (SS) per ASTM D1586
This is the standard test method for both the penetration test and split-barrel (spoon) sampling of soils. This sampling method is used for soils or rock too hard for sampling using Shelby Tubes. The method involves penetration of a split spoon sampler into the soil or rock through successive blows of a 140 pound hammer in a prescribed manner.

Blow Counts (N) per ASTM D1586
This is the number of blows required to drive a Split Spoon Sampler by means of a 140 pound hammer for a distance of 12 inches in accordance with the variables stated in the test procedures.

Thin-walled Tube Sampling (Shelby Tube - ST) per ASTM D1587
This is the standard test method for sampling fine-grained soils using a thin-walled metal tube. Relatively undisturbed samples are recovered for laboratory testing of physical properties.

Dry Density per ASTM D2937
This procedure allows for the determination of the dry density of soil obtained via Shelby-Tube sampling. The test results are measured in pounds per cubic foot (pcf).

Unconfined Compression Test (UC) per ASTM D2166
This test method covers the determination of the unconfined compressive strength of cohesive soils in the undisturbed, remolded, or compacted condition. The test is performed using a strain-controlled application of the axial load, and results are reported in tons per square foot (tsf).

Pocket Penetrometer (PP): This test method is an accepted modification of ASTM D1558 test method for establishing the moisture-penetration resistance relationships of fine-grained soils. The test results are measured in tons per square foot (tsf). The strength values provided by this method should be considered qualitatively.

Minus No. 200 Sieve per ASTM D1140
This test method covers determination of the amount of material finer than a #200 (75 μm) sieve by washing. The results are stated as a percentage of the total dry weight of the sample.

Boring Logs: This is a summary of the above described information at each boring location.

ALAMO ANALYTICAL LABORATORIES, LTD.
Main: 10526 Gulfdale • San Antonio, Texas 78216-3601 • (210) 340-8121 . Fax. (210) 340-8123

REPORT NARRATIVE 6/14/2024

Benny Krieger
Burge Engineering & Associates, Inc.
3453 N PanAm Expressway
Ste 201
San Antonio , TX - 78219
TEL: (210) 646-8566 Email: Benny@burge-eng.com
FAX: (210) 590-7476

RE: 12-24-0302 Villaret Subd.

Dear Benny Krieger: Order No.: 2406018

Enclosed please find the analytical report for the sample/s received on 6/7/2024.

SAMPLE RECEIPT: Samples were received intact and with chain of custody documentation.
HOLDING TIMES: All samples were analyzed within prescribed holding times and/or in accordance with the Sample Acceptance Policy unless otherwise noted in the report.

COMMENTS: No significant observations were made.

If you have any questions regarding these test results call (210) 340-8121.

Thank you,

Reddy Gosala, Ph.D
Laboratory Director

Report of Laboratory Analysis

NELAP Certificate# San Antonio : T104704367-22-19

Analytical Results Report

Client: Burge Engineering & Associates, Inc.
Collection Date: 5/31/2024 11:00:00 AM
Lab Order: 2406018
Matrix: SOIL
Project ID:
Lab ID: 2406018-01A
Project Name: 12-24-0302 Villaret Subd.
Client Sample ID: CBR P - 3 Bulk

Analyses	Result	Report Limit	Units	Dilution	Date Analyzed
TEX-620-J-SO4			**TX620J**	Analyst: **YK**	
Sulfate	144	25	mg/Kg	1	10-Jun-24

Approved by: Reddy Gosala, Laboratory Direc

Report of Laboratory Analysis

ALAMO ANALYTICAL LABORATORIES, LTD.

Date: *14-Jun-24*

CLIENT: Burge Engineering & Associates, Inc.

Work Order: 2406018 **Project:** 12-24-0302 Villaret Subd.

QC SUMMARY REPORT

Analyte	BLK	SPK value	%REC LCS	%REC MS	%REC MSD	RPD %	RPD Limit	Low - High Limit
Batch ID: TX620J-SO4-6/10/2024	**TestName:** TEX-620-J-SO4							
Run ID: UV1_240610B	**Test Code:** TX620J		**Units:** mg/Kg		**Analysis Date:** 6/10/2024 1:00:00 PM		**Prep Date:** 6/7/2024 4:00:00 P	
Sulfate	<25	250	95.7%	91.4%	95.0%	4.000	30.0	80 - 120

Approved by:

Laboratory QC Report

ALAMO ANALYTICAL LABORATORIES LTD.

CHAIN OF CUSTODY RECORD

COC#: 034043

Main Office: 10526 Gulfdale
San Antonio, Texas 78216
(210) 340-8121 • Fax (210) 340-8123

Branch: 2500 Montana Avenue
El Paso, Texas 79903
(915) 599-2182

www.alamoanalytical.com
reports@alamoanalytical.com

AAL Rev. 001

MUST BE COMPLETED BY CLIENT

Alamo's Client: BEA	Client's P.O. #:
Project Manager: Benny Krieger	Phone #: 210-646-8566
Address: 3453 N. Panam Exp. Ste. 201	Email: benny@burge-eng.com
Project Number: 12-24-0302	Project Name: Villaret Subd.
Project Location: Villaret Rd, SA, TX	Sampler Signature:

Turnaround time: Standard (7) ☑ **(in working days)**

RUSH: 1 ☐ **2** ☐ **3-5** ☐ **Days** (additional charges)

TRRP 13 Report: Yes ☐ **No** ☒ (additional charges)

Analysis for Permit Compliance: Yes ☐ **No** ☒

DMR Form Required: Yes ☐ **No** ☒

LAB ID# (Do not use)	Sampling Date	Sampling Time	Composite	Grab	Matrix	FIELD ID#	FIELD DESCRIPTION	No. of Containers	ANALYSIS: Texas Surface	REMARKS (Preservation, Size/Amount, Etc.)
2406018-01	5/31/24	1100		X	Soil	CBR	P-3 Bulk	1	X	

Relinquished by: (Signature / Print Name)	Date	Time	Received by (Signature)
Benny Krieger	6/7/24	1515	
Relinquished by: (Signature / Print Name)	Date	Time	Received by (Signature)
Relinquished by: (Signature / Print Name)	Date	Time	Received by (Signature)
Relinquished by: (Signature / Print Name) 6/7/2024	Date	Time 15:15	Received by (Signature)

Headspace			If Yes, Amt. N/A
Properly Sealed	✓		If No, Explain
Chilled ≤ 4° C		✓	If No, Temp.

Comments:

Figure 3

Sample Log-In Checklist

DATE: 6 / 7 /2024 **TIME:** 15:15 **INITIALS:** CG

CLIENT: Burge Monh **PROJECT: W.O#** 240601781 8

1. Is a Chain of Custody present? (Yes) No
2. Is a Chain of Custody properly completed? (Yes) No
3. Are custody seals present? Yes (No)
   If yes, are they intact? Yes No
   Are they on: Sample _____ or on Shipping Container _____
4. Are all samples tagged or labeled? (Yes) No
   If yes, do the labels match the Chain of Custody? (Yes) No
5. Do all shipping documents agree (i.e., number of coolers arrived vs. on tickets)
   If not, describe below. Yes No (N/A)
6. Are samples preserved properly? *If not*, describe below. (Yes) No
7. Are all samples within holding times on arrival? (Yes) No
   If not, describe below.
8. Condition of shipping container: Intact ✓ or _____
9. Condition of samples: Intact _____ or _____
10. Temperature of samples: Temp. (°C): 29.6 Corrected Temp. (°C): 29.6 Thermometer ID : (DT1 or L2)
11. pH strip lot#: — Samples pH range: <2 _____ >12 _____ _____
12. Delivery agent: Client ✓ UPS ____ Fed-Ex____ Alamo P/U __ Other_____
13. Sample disposal: Return to client_____ Alamo Analytical Disposal ✓
14. Location: WI (walk-in)/ F2 (Freezer 2 for TPH1005 soils)/ R2 (Refrigerator 2 for TPH & VOC water)

Comments: (Reference checklist item number from above, or for comments on resolution below):

Solid.

Record of contacting client for resolution of sample discrepancies (first and retry contact)

Contacted How?

Name: _____ Phone _____ Fax_____ Date: __/__/____ Time: _____
Name: _____ Phone _____ Fax_____ Date: __/__/____ Time: _____