HEFFNER DESIGN TEAM, PLLC

ADDENDUM NO. THREE

Villa Garza Flores Park
March 1, 2019

Each bidder shall acknowledge receipt of this addendum on the bid form and shall incorporate all changes in the bid.

A. DESCRIPTION OF CHANGES
1. None.

B. DRAWING CHANGES
1. None

C. GENERAL INFORMATION
1. Geotechnical report is attached.

END OF ADDENDUM

03-01-19

MEG GEOTECHNICAL ENGINEERING REPORT

PROPOSED
FLORES PARK

HIDALGO, HIDALGO COUNTY, TEXAS

Geotechnical Engineering • Construction Materials Engineering & Testing
Environmental • Consulting • Forensics

GEOTECHNICAL ENGINEERING REPORT
FOUNDATION AND PAVEMENT RECOMMENDATIONS
PROPOSED FLORES PARK
HIDALGO, HIDALGO COUNTY, TEXAS

Prepared For
Mr. Javier Hinojosa, P.E.
Javier Hinojosa Engineering

MEG Report No. 01-18-29193

December 13, 2018

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December 13, 2018

Mr. Javier Hinojosa, P.E.
Javier Hinojosa Engineering
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McAllen, Engineering
(956) 668-1588
javhin@rgv.rr.com

Subject: **Geotechnical Engineering Report**
MEG Report No. 01-18-29193
Foundation and Pavement Recommendations
Proposed Flores Park
Hidalgo, Hidalgo County, Texas

Dear Mr. Hinojosa:

Millennium Engineers Group, Inc. is pleased to submit the enclosed geotechnical engineering report that was prepared for the above subject project. This report addresses the procedures and findings of our geotechnical engineering study. Our recommendations should be incorporated into the design and construction documents for the proposed development. Please consult with us, as needed, during the design and construction process.

We want to emphasize that our firm be retained to ensure that actual field conditions are those described in our geotechnical report. We cannot over emphasize the importance that all our recommendations presented in this report and/or addendums to this report be followed. We look forward to continuing our involvement in the project by providing construction monitoring in accordance with the report recommendations and materials testing services during construction. We strongly recommend that we be a part of the preconstruction meeting to address any specific issues that are pertinent to this project.

Thank you for the opportunity to be of service to you in this phase of the project and we would like the opportunity to assist you in the upcoming phases of the project. If you have any questions, please contact our office at the address, telephone, fax or electronic address listed below.

STATE OF TEXAS
RAUL PALMA
65656
LICENSED
PROFESSIONAL ENGINEER
12/13/18

Cordially,
Millennium Engineers Group, Inc.
TBPE Firm No. F-3913

Raul Palma, P.E.
President

Cc: 1 Original and PDF Document

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APPENDIX

1.0 INTRODUCTION

Millennium Engineers Group, Inc. (MEG) has completed and is pleased to submit this document that presents our findings as a result of a geotechnical engineering study of this project to our client. The project site is located to the southwest corner of the west end of Flores Street in Hidalgo, Hidalgo County, Texas. The project location is shown on the Project Location Map, found in the Appendix section of this report. This report briefly describes the procedures utilized during this study and presents our findings along with our recommendation, for foundation design and construction considerations.

Our scope of services for the project was outlined in MEG proposal No. 01-18-250GR, dated September 6, 2018 and approved on September 12, 2018.

2.0 PROJECT DESCRIPTION

It is our understanding that the proposed site will accommodate the construction of a new city park. It is also our understanding that the proposed city park will consist of walk trails, play areas, picnic areas, basketball court, soccer field and restrooms facilities. The site construction for the proposed restroom facility and basketball court structure are anticipated to be on a slab-on-grade or on-fill foundation provided expansive, soil-related movements will not impair the performance of the structure.

The site will also accommodate the construction of either a rigid or flexible pavement that will serve for light duty and/or heavy duty traffic. Both flexible and rigid pavement types are viable and the selection on the type to be used will depend on the specific needs and criteria of this project site.

3.0 SCOPE AND LIMITATIONS OF STUDY

This engineering report has been prepared in accordance with accepted geotechnical engineering practices currently exercised by geotechnical engineers in this area. No warranty, expressed or implied, is made or intended. This report is intended for the exclusive use by the client and client's authorized project team for use in preparing design and construction documents for this project only. This report may only be reproduced in its entirety for inclusion in construction documents. This report in its entirety shall not be reproduced or used for any other purposes without the written consent of our firm. This report may not contain sufficient information for purposes of other parties or other uses and is not intended for use in determining construction means and methods.

The recommendations presented in this report are based on data obtained from the soil borings drilled at this site and our understanding of the project information provided to us by our client and other project team members, and the assumption that site grading will result in only minor changes in the existing topography. Subsurface soil conditions have been observed and interpreted at the boring locations only.

This report may not reflect the actual variations of the subsurface conditions across the subject site. It is important to understand that variations may occur due to real geologic

conditions or previous uses of the site. The nature and extent of variations across the subject site may not become evident until specific design locations are identified and/or construction commences. The construction process itself may also alter subsurface conditions. If variations appear evident at the time during the design phase and/or construction phase, we should be notified immediately to determine if our opinions, conclusions and recommendations need to be reevaluated. It may be necessary to perform additional field and laboratory tests and engineering analyses to establish the engineering impact of such variations. These services are additional and are not a part of our project scope.

The engineering report was conducted for the proposed project site described in this report. The conclusions and recommendations contained in this report are not valid for any other project sites. If the project information described in this report is incorrect, is altered, or if new information becomes available, we should be retained to review and modify our recommendations. These services are additional and are not a part of our project scope.

Our scope of services was limited to the proposed work described in this report, and did not address other items or areas. The scope of our geotechnical engineering study does not include environmental assessment of the air, soil, rock or water conditions on or adjacent to the site. No environmental opinions are presented in this report. If the client is concerned with environmental risk at this project site, the client should perform an environmental site assessment.

If final grade elevations are significantly different from existing grades at the time of our field activities (more than plus or minus one (1) foot), our office should be informed about these changes. If desired, we will reexamine our analyses and make supplemental recommendations.

4.0 FIELD EXPLORATION PROCEDURES

Subsurface conditions at the subject site were evaluated by two (2) 20-foot soil borings and four (4) 5-foot soil borings. The Borings were drilled at the locations shown on the Borings Location Map, found in the Appendix section of this report. This location is approximate and distances were measured using a measuring wheel, tape, angles, and/or pacing from existing references. The structural soil borings were drilled in general accordance with American Society of Testing Materials (ASTM) D 420 procedures.

As part of our sampling procedures, the samples were collected in general conformance with ASTM D 1586 procedures. Representative portions of the samples were sealed in containers to reduce moisture loss, identified, packaged, and transported to our laboratory for subsequent testing. In the laboratory, each sample was evaluated and visually classified by a member of our Geotechnical Engineering staff. The geotechnical engineering properties of the strata were evaluated by a series of laboratory tests. The results of the laboratory and field-testing are tabulated on the boring logs and Summary of Soil Sample Analyses which are found in the Attachments section of this report.

Standard penetration test results are noted on the boring logs as blows per 12 inches of penetration. Two 6 inch increments are performed for each standard penetration test. The sum of the blows for the two 6 inch increments is considered the "standard penetration resistance value" or "N-value." Where hard or very dense materials were encountered, the tests are terminated as follows: (1) when a total of 50 blows have been applied in any of the 6 inch increments, or (2) when a total of 100 blows have been applied, or (3) when there is no observed advance of the sampler in the application of 10 successive blows. The boring logs in the case of hard or very dense materials will be noted as follows: 50/3", where 50 is the number of blows applied in 3 inches of penetration, or 100/7½" where 100 is the number of blows applied in a total of 7 ½ inches of penetration, or 10/0", where 10 is the number of blows applied in 0 inches of penetration.

Samples will be retained in our laboratory for 30 days after submittal of this report. Other arrangements may be provided at the request of the Client.

5.0 GENERAL SITE CONDITIONS

5.1 Site Description

The project site is located to the southwest corner of the west end of Flores Street in Hidalgo, Hidalgo County, Texas. The project location is shown on the Project Location Map, found in the Appendix section of this report. At the time of our field operations, the subject site can be described as an undeveloped tract of land. The general topography of the site is relatively flat with a visually estimated vertical relief of less than 3 feet. Surface drainage is visually estimated to be poor to fair.

5.2 Site Geology

According to the Soil Survey of Hidalgo County, Texas, published by the United States Department of Agriculture – Soil Conservation Service, the project site appears to be located within two (2) different soil associations.

- The Cameron series consist of deep, moderately well drained, clayey soils, nearly level soil on ancient stream terraces. These soils formed in thick beds of calcareous clayey and loamy alluvium. Slopes range from 0 to 1 percent. Areas are small and irregular in shape and range from 10 to 45 acres. The corresponding soil symbol is 7, Cameron silty clay.
- The Runn series consist of deep, moderately well drained, clayey soils, surface runoff is slow and permeability is slow, nearly level soil in areas of ancient stream terraces. These soils formed in thick beds of clayey alluvium. Slopes range from 0 to 1 percent. Areas are small and irregular in shape and range from 10 to 250 acres. The corresponding soil symbol is 64, Runn silty clay.

5.3 Subsurface Conditions

On the basis of our borings, three (3) generalized strata that possess similar physical and engineering characteristics can describe the subsurface stratigraphy at this site. Table 5.1 summarizes the approximate strata range in our boring logs. These were prepared by visual classification and were aided by laboratory analyses of selected soil samples. The lines designating the interfaces between strata on the boring logs represent approximate boundaries. Transitions between strata may be gradual details for each of the borings can be found on the boring logs in the appendix of this report.

Table 5.1. Approximate Subsurface Stratigraphy Depths.

Stratum	Range in Depth, ft[1]	Stratum Description[1]
I	0 – 2	lean CLAY to fat CLAY, dk. brown to brown, moist, stiff
II	2 – 15	lean CLAY, brown, moist to wet, soft to stiff
III	15 – 25	clayey SAND, brown, wet, loose

Note 1: The stratum thickness and depths to strata interfaces are approximate. Our measurements are rounded off to the nearest foot increment and are referenced from ground surface at the time of our drilling activities. Subsurface conditions may vary between the boring locations.

5.4 Groundwater Conditions

The dry auger drilling technique was used to complete the soil borings in an attempt to observe the presence of subsurface water. During our drilling operations we encountered the groundwater table to be at approximately seven (7) feet below natural ground elevation for short term conditions. Moisture content test exhibited high moisture content at a depth of six (6) feet below natural ground elevation. Table 5.2 summarizes the approximate groundwater and cave in depths measured in our explorations. It should be noted that the groundwater level measurements recorded are accurate only for the specific dates on which measurement were obtained and does not show fluctuations throughout the year.

Fluctuations in Groundwater levels are influenced by variations in rainfall and surface water run-off from season to season. The construction process itself may also cause variations in the groundwater level. If the subsurface water elevation is critical to the construction process the contractor should check the subsurface water conditions just prior to construction excavation activities.

Table 5.2. Approximate Groundwater and Cave-in Depths.

Boring No.	Depth to Subsurface Water, Ft[1]		Depth to Cave-In, Ft[1]	
	Time of Drilling	24 Hr. Reading	Time of Drilling	24 Hr. Reading
B-1	13	7	15	8
B-2	13	8	16	9
P-1	None	None	4	4
P-2	None	None	4	4
P-3	None	None	4	4
P-4	None	None	4	4

Note 1: Subsurface water levels and cave-in depths have been rounded to the nearest foot.

Based on the findings in our borings and on our experience in this region, we believe that groundwater seepage may be encountered during site earthwork activities. If groundwater seepage is encountered during site earthwork activities, it may be controlled using temporary earthen berms and/or conventional sump-and-pump dewatering methods.

6.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS

6.1 General

The analysis and recommendations presented in this report are applicable specifically to the proposed foundation structure. The data gathered from both the field and laboratory testing programs on soil samples obtained from the borings was utilized to establish geotechnical engineering parameters to develop recommendations for the proposed structure. The foundation system(s) considered in this report to provide support for the proposed structure must meet two independent criteria. One of the criteria is that the movement below the foundation structure due to compression (consolidation) or expansion (swell) of the underlying soils must be within tolerable limits. This criterion is addressed in the Soil Related Movements section of this report. The other criterion is that the dead and live loads must be distributed appropriately and the foundation structure designed with an acceptable factor of safety to minimize the potential for bearing capacity failure of the underlying soils.

Geotechnical and structural engineers in this general area consider soil movements or Potential Vertical Rise (PVR) of approximately one (1) inch or less to be within acceptable structural design tolerances for most structures but may be different depending on structure use and the desired performance of the foundation. Therefore, movements of the underlying soils are not eliminated and thus one should expect a slab foundation structure to exhibit differential vertical movements. However, structural engineers design slab foundations for the expected magnitude of soil movements without failure of the

structure. More stringent soil movement criteria may be established but the owner should consider the exponential increase in cost required to design and construct a structure for such soil movements. Data obtained in this study indicate that the soils at this site have strength characteristics capable of supporting the foundation and structure if designed appropriately. Stratum I is composed of lean clay to fat clay and has a high potential to exhibit volumetric changes (contraction and expansion). Stratum II is composed of lean clay and has a moderate potential to exhibit volumetric changes. Stratum III is composed of clayey sand and has a low potential to exhibit volumetric changes. The potential for soil volumetric changes is dependent on variations in moisture contents of the underlying soils. Based on this data, this site is suitable for a slab foundation provided the subgrade is modified in accordance with the recommendations established in this report to reduce the potential for these soil volumetric changes.

6.2 Soil-Related Movements

The anticipated ground movements due to swelling of the underlying soils at this site were estimated for slab foundation construction using the Texas Department of Transportation (TxDOT) procedures of test method TEX-124-E for determining Potential Vertical Rise (PVR). A PVR value of one and one half (1 1/2) inches was estimated for the stratigraphic conditions encountered in our subsurface borings. A surcharge of 1 pound per square inch for the concrete slab, an active zone of 15 feet, and dry subsurface moisture conditions were assumed in estimating the above PVR values.

The following methods are generally acceptable for use in modifying the subgrade to reduce the potential for soil movements and volumetric changes below the foundation structure.

Excavate expansive clay soils and replace with select fill.
Chemical injection of expansive clay soils.
A combination of methods 1 and 2.

The method to be used is dependent on specific site conditions. At this site the grade will most likely need to be raised to obtain the proposed Finished Floor Elevation (FFE). As of the date of this report the CLIENT/OWNER has not provided the proposed FFE. We recommend that the project civil engineer evaluate the proposed FFE with our recommendations to ensure that the subgrade modifications presented in the report are not diminished or compromised. Adding select fill is generally the most cost effective method for reducing the potential for soil related movements. Therefore, we only discuss this method in this report but we can provide details for the other methods if requested.

Based on the data obtained, the proposed FFE, information provided by our client and our analysis of the site, we recommend the following modification (Table 6.1. Subgrade Modifications) of the subgrade at this area to accomplished finish floor elevation of the subgrade at this site. This method will maintain the potential for soil related movements to an approximate PVR value of less than one (1) inch, which is generally desired for projects of this type.

Table 6.1. Subgrade Modifications

Item	Description
1	See and adhere to the Site Preparation Recommendations section of this report.
2	Excavate existing soils to a depth of two (2) feet below natural ground elevation in accordance with the Site Preparation Recommendations section of this report.
3	Condition and compact twelve (12) inches of subgrade below excavated soils in accordance with the Site Preparation Recommendations section of this report.
4	Place **select fill,** (a minimum of one (1) foot above natural ground) condition and compact up to the proposed FFE in accordance with the Select Fill Recommendations section of this report.

The PVR method of estimating expansive, soil-related movements is based on empirical correlations utilizing the measured plasticity indices and assuming typical seasonal fluctuations in moisture content. If desired, other methods of estimating expansive, soil-related movements are available, such as estimations based on swell tests and/or soil-suction analyses. However, the performance of these tests and the detailed analyses of expansive, soil-related movements were beyond the scope of the current study. It should also be noted that actual movements can exceed the calculated PVR values as a result of isolated changes in moisture content (such as leaks, landscape watering, etc.) or if water seeps into the soils to greater depths than the assumed active zone depth due to deep trenching and/or excavations.

6.3 Conventional Shallow Slab-on-Grade Foundation Design Criteria

As indicated previously a slab foundation may be used at this site in conjunction with the subgrade modifications listed under the Soils Related Movements section. We recommend the following soil bearing pressures, and dimensional criteria for the slab grade beams. These recommendations ensure proper utilization of soil bearing capacity of continuous beam sections in the slab-on-grade foundation and reduce the potential of water migration from the outside to beneath the slab foundation. For structural considerations the beams may need to be greater and should be evaluated and designed by the structural engineer. Where concentrated load areas are present the grade beams or slab may be thickened and widened to serve as spread footings. Soil bearing pressures and beam dimensional criteria are as follows:

Table 6.2. Bearing Criteria

Grade Beams and Continuous Footings	
Minimum depth below finished grade:	24 inches
Maximum depth below finished grade:	36 inches
Maximum width:	30 inches
Maximum allowable bearing pressure:	1,500 psf
Spread Footings (square)	
Minimum depth below finished grade:	24 inches
Maximum depth below finished grade:	36 inches
Maximum width:	60 inches
Maximum allowable bearing pressure:	1,500 psf

The above-presented maximum allowable bearing pressures will provide a factor of safety of 3 with respect to the design soil strengths. For a slab foundation structure designed and constructed in accordance with the recommendations of this report, it is anticipated that total settlements will be in the order of one (1) inch or less. If lower anticipated total settlements are required for this project further mitigation may be required and MEG must be consulted for further recommendations.

Furthermore, the above design parameters are contingent upon the fill materials (if utilized) being selected and placed in accordance with the recommendations presented in the Select Fill Recommendations section of this report. Should select fill selection and placement differ from the recommendations presented herein, MEG should be informed of the deviations in order to reevaluate our recommendations and design criteria.

Excavations for slab on grade and spread footing foundations should be performed relatively clean and with an undisturbed bearing area. The bottom 6 inches of the excavation should be performed using a flat plate excavation bucket. The excavations should be neatly excavated. No foreign debris or undisturbed soil should be left in the footing bottom. Should there be any abundance of foreign debris or disturbed soil found, it may be necessary to re-assess the fill site of its bearing capacity suitability. If the bearing area is found to be disturbed, the bearing area will require preparation and compaction for the entire depth of the disturbance in accordance with the Site Preparation and/or the Select Fill sections of this report.

The bearing surface of the grade beams and spread footings should be evaluated after excavation and immediately prior to concrete placement. We recommend that footing inspections be performed by a representative of MEG. The required inspections shall include inspecting for clean, dry (The moisture content should be within limits specified by the appropriate section in this report.) and undisturbed footing bottom, depth of footing,

clearances from sides and size and spacing of reinforcing steel. Test results shall comply with the recommendations of this geotechnical report and shall be verified by an on-site representative of MEG.

Over excavation, if necessary, for compacted backfill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of over excavation depth below footing base elevation. The over excavation should then be backfilled up to the footing base elevation select fill placed in lifts of 8 inches or less in loose thickness and prepared and compacted in accordance with the Site Preparation and/or the Select Fill sections of this report. Equipment should not be operated and materials should not be placed or stockpiled within a horizontal distance equal to the excavation depth from the edge of the excavation. Excavations should not be placed next to existing structures or buried utilities/structures closer than a horizontal distance equal to the excavation depth unless some form of protection for the facilities is provided.

Water should not be allowed to accumulate at the bottom of the foundation excavation. Proper barriers such as berms or swales should be placed to divert any surface runoff away from excavations. To reduce the potential for groundwater seepage into the excavations and to minimize disturbance to the bearing area, we recommend that steel and concrete be placed as soon as possible after the excavations are completed, properly prepared and cleaned. Excavations should not be left open overnight.

6.4 BRAB Design Criteria for Slab-on-Grade Foundations

Table 6.3 list the values for criteria developed by the Building Research Advisory Board (BRAB) for the design of shallow slab-on-grade foundations. On the basis of stratigraphy encountered and the anticipated site modifications discussed earlier, the design criteria are as follows:

Table 6.3. BRAB Values

For Existing Conditions	
Effective Plasticity Index	23
Climatic Rating Cw.	15
Soil Support Index, (c)	0.91
For Proposed Conditions	
Effective Plasticity Index	19
Climatic Rating Cw.	15
Soil Support Index, (c)	0.95

Note 1: Subgrade Modifications as outlined in the recommendations of this report;

6.5 Post Tension Institute Design Parameters

The structural design procedure as recommended by the Post Tension Institute (PTI) in their design manual "Design of Post Tensioned Slabs on Ground," Third Edition dated 2004 should be used in the design. The Post Tension Institute (PTI) provides design standards for post tensioned slabs on grade. The PTI foundation parameters are selected based on the predominant soil type, type of clay, and percentage of clay. The recommended PTI foundation parameters are applicable to climate-controlled soil conditions only. The soil movements are affected by non-climate related factors such as grading, drainage, irrigation, vegetation, landscaping, trees, downspouts, plumbing line leaks, construction methods, land use and other factors. Consideration of these items should be taken into account to mitigate these factors influencing soil movement. If non-climate related factors are present in the project, the CLIENT should contact MEG to evaluate the effect of non-climate related factors. Assuming that the recommendations are followed from the Subgrade Modification section of this report, the recommended foundation design parameters based on information published by the Post Tension Institute (PTI) are as follows:

Table 6.4. Soil Criteria, Post Tension Institute Design Parameters[1]

Design criteria	
Predominant Soil Type	lean CLAY (CL)
Continuous Grade Beams / Footings	1,500 psf
Thornthwaite Moisture Index (I_m)	-33
Depth to Constant Soil Suction (assumed)	8.0 feet
Constant Soil Suction (pF)	4.1
Coefficient of Slab-Subgrade Friction (u)	0.75 to 1.00
For Proposed Conditions[2]	
Edge Moisture Variation Distance (e_m)	
Center Lift (shrink)	9.0 feet
Edge Lift (swell)	7.7 feet
Differential Soil Movement (Y_m)	
Center Lift (shrink)	0.60 Inches
Edge Lift (swell)	1.20 Inches

Note 1: For beam dimensional criteria and depth of footings see section 6.4 Conventional Shallow Slab Foundation Design Criteria of this report.
Note 2: Proposed condition with site preparation in accordance with section 6.2 Soil Related Movements of this report.

7.0 CONSIDERATIONS DURING CONSTRUCTION

7.1 Site Grading Recommendations

Site grading plans can result in changes in almost all aspects of foundation recommendations. We have prepared the foundation recommendations based on the existing ground surface; there is a one (1) foot surcharge addition for the stratigraphic conditions encountered at the time of our study. If site grading plans differ from existing grades by more than plus or minus 1 foot, we must be retained to review the site grading plans prior to bidding the project for construction. This will enable us to provide input for any changes in our original recommendations that may be required as a result of site grading operations or other considerations.

7.2 Site Drainage Recommendations

Drainage is one of the most important aspects to be addressed to ensure the successful performance of any foundation. Positive surface drainage should be implemented prior to, during and maintained after construction to prevent water ponding at or adjacent to the building facilities. It is recommended that the building and site design include rain gutters, downspouts and concrete gutters to channel runoff to paving or storm drains.

7.3 Site Preparation Recommendations

Building areas and all area to support select fill should be stripped of all vegetation and organic topsoil up to a minimum of 5 ft. beyond the building perimeters. After stripping, remove at least six (6) inches of on-site soil as measured from existing grade when excavation of existing subgrade is not recommended in other sections of this report. The excavated material, if free of organic and/or deleterious material, may be stockpiled for use in the non-structural areas of the site. Where excavation of the subgrade is recommended in this report, the bottom of the excavation will extend at least five (5) feet beyond the limits of the planned building perimeter including canopies and sidewalks. Exposed subgrades should be thoroughly proof rolled in order to locate and compact any weak, compressible and soft spots. Proof rolling shall be in accordance with TxDOT 2014 Specification Item 216. Proof rolling operations should be observed by the Geotechnical Engineer or his representative to document subgrade condition and preparation. Weak or soft areas identified during proof rolling or areas where large tree roots have been removed within the limits of excavation should be removed and replaced with a suitable, compacted select fill in accordance with the recommendations presented under the Select Fill Recommendations section of this report. Proof rolling operations and any excavation/backfill activities should be observed by **MEG** representatives to document subgrade preparation.

Prior to fill placement, the exposed subgrade shall be prepared based on what option is selected from the foundation and pavement recommendations. The exposed subgrade should be prepared, moisture-conditioned by scarifying to a minimum depth as recommended in the foundation and pavement recommendations and recompacting to a

minimum 95 percent of the maximum dry density as determined in accordance with ASTM D 698, moisture-density relationship. The moisture content of the subgrade should be maintained within the range of minus two (-2) percentage points below optimum to plus four (+2) percentage points above the optimum moisture content until the fill is permanently covered. The soil should be properly compacted in accordance with these recommendations and tested by **MEG** personnel for compaction as specified.

7.4 Select Fill Recommendations

Materials used for select fill shall meet the following requirements:

1. Material shall conform to TxDOT 2014 Specification Item 247, Flexible Base; Type A, Grades 1 through 3.
2. Material shall conform to TxDOT 2014 Specification Item 247, Flexible Base, Types B or C, Grades 1 through 5 with a minimum plasticity index of 7.
3. Material shall conform to TxDOT 2014 Specification Item 247, Flexible Base, Type E, Grade 4 with a plasticity index between and inclusive of 7 and 15. Type E material shall be defined as Caliche (argillaceous limestone, calcareous or calcareous clay particles) and may contain stone, conglomerate, gravel, sand or granular materials when these materials are in situ with the caliche. Flexible Base (Type E, Grade 4) shall conform to the following requirements:

Table 7.1. Type D, Grade 6 Requirements

Retained on Sq. Sieve	Percent Retained
2”	0
½”	20-60
No. 4	40-75
No. 40	70-90
Max. PI:	15
Max. Wet Ball PI:	15
Wet Ball Mill Max Amount:	50
Wet Ball Increase, Max Passing No. 40 sieve	20

4. Soils classified according to USCS as SM, SC, GM, GC, CL, ML and combinations of these soils. The soils shall be relatively free of organic matter. In addition to the USCS classification, select materials shall have a liquid limit of less than 40 and a plasticity index between and inclusive of 10 and 17.
5. Soils classified, as CH, MH, OH, OL and PT, under the USCS are not considered suitable for use as select fill materials at this site.

Select fill shall be placed in loose lifts not to exceed 8 inches (6 inches compacted) and compacted to a minimum 95 percent of the maximum dry density as determined in accordance with ASTM D 698. The moisture content of the fill shall be maintained within

the range of minus two (-2) percentage points below optimum to plus two (+2) percentage points above the optimum moisture content until the fill is permanently covered. The select fill should be properly compacted in accordance with these recommendations and tested by **MEG** personnel for compaction as specified.

7.5 Site Fill Recommendations

Site fill shall be placed in loose lifts not to exceed 8 inches (6 inches compacted) and compacted to a minimum 95 percent of the maximum dry density as determined in accordance with ASTM D 698. The moisture content of the fill shall be maintained within the range of minus two (-2) percentage points below optimum to plus two (+2) percentage points above the optimum moisture content until the fill is permanently covered. The site fill should be properly compacted in accordance with these recommendations and tested by **MEG** personnel for compaction as specified.

7.6 Back Fill Recommendations

Back fill shall be placed in loose lifts not to exceed 8 inches (6 inches compacted) and compacted to a minimum 95 percent of the maximum dry density as determined in accordance with ASTM D 698. The moisture content of the fill shall be maintained within the range of minus two (-2) percentage points below optimum to plus two (+2) percentage points above the optimum moisture content until the fill is permanently covered. The back fill should be properly compacted in accordance with these recommendations and tested by **MEG** personnel for compaction as specified.

7.7 Utility Considerations

Utilities that project through the slab-on-grade, slab-on-fill, floating floor slabs, or any other rigid unit should be designed with some degree of flexibility or with sleeves. Such features will help reduce the risk of damage to utility facilities from soil movements related to shrinkage and expansion.

7.8 Utility Trench Recommendations

Bedding and initial backfill are buried around utility lines to support and protect the utility. The secondary backfill above the initial backfill also helps protect and support the foundation and/or pavement above. To ensure that settlement is not excessive in this secondary backfill we recommend the following:

1) If possible, trench and install utilities prior to work such as lime treatment and/or compaction of subgrade or placement of other fills or bases.
2) Place, moisture condition and compact the secondary backfill in accordance with the pertinent project requirements. Within the footprint of a building pad the secondary backfill should meet the same compaction requirements for select fill. Within the footprint of a pavement structure the secondary backfill should meet the same compaction requirements for the subgrade. When compaction of the subgrade is not specified it should meet the same compaction level of the adjacent

natural ground. An alternative to compaction of secondary backfill is the use of flowable fill where secondary backfill is to be placed. If properly designed, the flowable fill can be excavated easily at a later date if necessary. No compaction and no testing is required when properly designed flowable fill is used.

7.9 Excavation, Sloping and Benching Considerations

If trenches are to extend to or below a depth of five (5) ft., the contractor or persons doing the trenching should adhere to the current Occupational Health and Safety Administration (OSHA) guidelines on trench excavation safety and protection measures. Other industry standards may be applicable. The collection of specific geotechnical data and development of a plan for trench safety, sloping, benching or various types of temporary shoring, is beyond the scope of this study.

7.10 Shallow Foundation Excavation Considerations

The Geotechnical Engineer or his representative prior to the placement of reinforcing steel and concrete should observe shallow foundation excavations. This is necessary to verify that the bearing soils at the bottom of the excavations are similar to those encountered during the subsurface soil exploration phase and that excessive loose materials and water are not present in the excavations. If soft pockets of soil are encountered in the foundation excavations, they should be removed and replaced with a compacted non-expansive fill material or lean concrete up to the design foundation bearing elevation.

7.11 Landscaping Considerations

Even though landscaping is a vital aesthetic component of any project, the owner, client and design team should be aware that placing trees or large bushes adjacent to any structure may distress the structure in the future. It is recommended that if any landscaping is to be placed adjacent to the structure in this project, it should be limited to small plants and shrubs. Trees and large bushes should be placed at a distance such that at their mature height, their canopy or “drip line” does not extend over the structures. The owner, client and design team should also be aware that if any watering is to be done in connection with the landscaping for this project it should be controlled, consistent and timely. Excessive or prolonged watering is not recommended. If watering is part of the landscaping plan, termination of watering for any extended period of time may also be detrimental to the structure. It is important that the moisture level in the subsurface soils remain constant so that shrinking and swelling of soils may be mitigated.

7.12 Perimeter Foundation Cap

We recommend that a cap of impervious fill be placed around the perimeter of the foundation to mitigate the intrusion of moisture into the soils surrounding the foundation. The top eighteen inches of fill around the foundation structure should be a low permeance clay cap to keep surface water away from the foundation. The low permeance clay cap should be sloped away from the foundation at a minimum slope of 2% and the surrounding

areas should have positive drainage. The low permeance clay shall meet the USCS classification of CL and meeting the requirements in Tables 7.2 Gradation Requirements and Table 7.3 Atterberg Limits Requirements. The low permeance clay shall be compacted to minimum of 95 percent of the maximum dry density as determined in accordance with ASTM D 698. The moisture content of the subgrade should be maintained within the range of optimum to four (4) percentage points above the optimum moisture. If plantings are intended, add 4 to 6 inches of loam on top of the clay cap.

Table 7.2. Gradation Requirements

Sieve Size	Percent Passing (by dry weight)
1/2 inch	100
No 4	70-100
No. 200	50 – 100

Table 7.3. Atterberg Limits Requirements

Test / ASTM	Requirement
Atterberg Limits D4318	LL ≤ 45 20 ≤ PI ≤ 30

7.13 Existing Trees

Some trees are located at the site. These trees may be within the construction limits of the planned structure and/or pavement areas. There are concerns regarding the location of the existing trees or any recently cleared trees in the immediate vicinity of planned improvements. Based on the present layout of the planned structure and/or pavement areas and the location of the existing trees in the area, it is our opinion there is a moderate potential for distress to the planned improvements in the future, if the trees and root systems are not completely removed or corrective measures are not taken.

Distress to the structure can be caused by existing trees and vegetation if the root systems extend under the planned foundation system. The potential distress to the structure can be caused in several ways which may include one or more of the following:

- Settlement beneath the foundation due to decay of the tree roots should the trees die or be cut down.
- Uplift forces on the foundations due to growth of the tree roots pushing up on the foundation system. Foundations and Concrete sidewalks are very susceptible to this type of distress.
- Volume reduction or shrinkage of the subsurface soils due to loss of moisture content from the tree root systems adjacent to and beneath the improvements, which may cause settlement.

Solutions and/or remedies to this situation may include the following:

- Remove (cut down) the trees, grub the roots as completely as possible and replace the area of soil and roots with select fill.
- Cutting the roots extending under foundations and/or pavements to prevent moisture loss and installing a root barrier to retard future growth of roots under the foundations. Grub the cut roots as completely as possible. Depending on the size and density of the existing root system left in place this may cause future settlement due to the eventual decay of the roots. However, this may take 5 to 10 years; or
- Leave the trees in place but construct a “cut-off wall” or “root barrier” between the foundations and/or pavements and trees. The cut off wall should be at least 12 inches in width and a minimum of 5 feet deep. However, the actual depth should be based on the type of root system the tree has, i.e., shallow or deep root, etc. A landscape consultant should be retained to assess this situation. If the tree has a shallow root system, the 5-foot cut-off wall depth should be adequate. The cut-off wall may need to extend deeper than 5 feet if the roots are deep, in addition a controlled watering program will need to be developed so the tree root systems maintain a good water balance thus the root systems will not want to extract moisture from beneath the foundation and/or pavements.

8.0 PAVEMENT SECTION RECOMMENDATIONS

8.1 General Information

The study was performed to determine recommendations for the construction of a flexible pavement and these recommendations are presented in this report. The pavement recommendations are limited to samples taken from the existing soils within the roadway areas present at the site. The pavement design implemented for this project should be evaluated the civil engineer based on a traffic and design analysis for this project.

Recommendations for both flexible and rigid pavements are presented in this report for further evaluation by the project civil engineer. Both pavement types are viable and the selection on the type to be used will depend on the specific needs and criteria of this project site. Generally, flexible pavements have a lower initial construction cost when compared to rigid pavements. On the other hand a rigid pavement has lower maintenance cost throughout the life of the pavement structure as compared to flexible pavements. Flexible pavements generally require more frequent repairs and overlays at intervals from 6 to 10 years to meet the structural and functional requirements of the pavement during the design life. All pavements are very dependent on the condition of the soil platform on which they are supported and thus moisture conditions will play an important role in the performance of the pavement during its structure life. Proper consideration to drainage of the pavement structure and the surrounding areas is essential to the successful performance of a pavement structure.

After proof rolling and repairing deep subgrade deficiencies, the entire subgrade should be scarified and developed as recommended in the Site Preparation section of this report to provide a uniform subgrade for pavement construction. Areas that appear severely

desiccated following site stripping may require further undercutting and moisture conditioning. If a significant precipitation event occurs after the evaluation or if the surface becomes disturbed, the subgrade should be reviewed by qualified personnel immediately prior to paving. The subgrade should be in its finished form at the time of the final review.

8.2 Soil Stabilization Recommendations

The plasticity index of the surface soils at this site is approximately 24 to 32 percent. The existing subgrade soils do require lime stabilization for soil shrink and swell mitigate. We recommend the addition of four and a half (4 1/2) percent lime by weight to the existing surface soils. We recommend that the existing soils be tested after the pavement areas have been excavated or filled to the top of the subgrade elevation to verify the soil stabilization requirements. The natural ground should then be prepared as stated in the Site Preparation Recommendations of the pavement section. Proper consideration to drainage of the pavement structure and the surrounding areas is essential to the successful performance of a pavement structure.

8.3 Design Methodology and Traffic Information

Our engineering analysis of the pavement type considered the information obtained from our soil borings, the field and laboratory testing, our past experience with similar soils and site conditions. Design of new pavements for the project has been based on the procedures outlined in the 1993 Guide for Design of Pavement Structures by the American Association of State Highway and Transportation Officials (AASHTO). The client did not provide projected ESALs. We recommend that the project Civil Engineer or a Traffic Engineer review the project for the appropriate traffic levels and design periods to ensure that they are appropriate and consistent with the specific project site requirements. The assumptions for traffic used in the pavement design analysis are as follows:

Table 8.1. Flexible Pavement Traffic Criteria Utilized

Criteria	Value[1]
Reliability Level	80%
Standard Deviation	0.45
Initial Serviceability level	4.0
Terminal Serviceability level	2.0

Note 1: The above traffic criteria as per 1993 AASHTO Pavement Design Guidelines.

Table 8.2. Rigid Pavement Traffic Criteria Utilized

Criteria	Value[1]
Reliability Level	95%
Standard Deviation	0.35
Initial Serviceability level	4.0
Terminal Serviceability level	2.0

Note 1: The above traffic criteria as per 1993 AASHTO Pavement Design Guidelines.

8.4 Recommended Pavement Sections

The proposed pavement section for entrances, drives and parking areas may be chosen from one of the following options in the tables below.

The selection process of the appropriate pavement option should consider the following:

1. The client should consider the options presented as minimum pavement sections for the appropriate use and expected traffic levels. The civil engineer of record should evaluate the minimum pavement sections recommended with the appropriate class of pavement required for this project. The local government requirements should be met when they are more stringent than the minimum pavement sections recommended in our report.

Table 8.3. Flexible Pavement Options

Materials	Light Duty[1]	Heavy Duty[2]
Asphaltic Concrete (In)	2.0	3.0
Untreated Caliche Base (In)	8.0	10.0
Limed Treated Subgrade (In)	6.0	10.0

Note 1: Light Duty Pavement (ESALS = 12,000)
Note 2: Heavy Duty Pavement (ESALs = 130,000)

Table 8.4. Rigid Concrete Pavement Options

Materials	Light Duty[1]	Heavy Duty[2]
Reinforced Concrete Pavement (In)	5.0	7.0
Untreated Caliche Base or Limed Treated Subgrade (In)	8.0	12.0

Note 1: Light Duty Pavement (ESALs =12,000)
Note 2: Heavy Duty Pavement (ESALs = 130,000)

It is recommended that concrete pavements be reinforced. At a minimum, the reinforcing bars should be placed as follows:

Table 8.5. Longitudinal Drives and Entrances

Thickness (in)	Bar Size	Longitudal Spacing (in)	Transverse Spacing (in)
<=6	3	12	24
<=7	4	12	24

Table 8.6. Parking Areas

Thickness (in)	Bar Size	Longitudal Spacing (in)	Transverse Spacing (in)
<=6	3	16	16
<=7	4	16	16

Longitudinal reinforcement should be placed at ½ the slab depth +/- ½ inch from the surface. At a longitudinal edge, the first two spacing's for longitudinal reinforcement shall be at ½ the normal longitudinal spacing. At transverse construction joints, additional longitudinal reinforcement shall be placed at a spacing one half the normal longitudinal spacing for a length of 42 inches. At transverse joints, the first two spacing's for transverse reinforcement shall be at ½ the normal transverse spacing. All reinforcement should be specified as deformed steel meeting the requirement of ASTM A-615 (Grade 60) or ASTM A-616 (Grade 60). Splices should be a minimum of 33 nominal bar diameters. Reinforcing should not extend across longitudinal and expansion joints. Dowels across longitudinal and expansion joints are recommended to be 7/8 inch diameter, smooth bars with a length of 42 inches and spaced at a maximum 24 inches on center.

Longitudinal and transverse joints are recommended at a maximum spacing of 10 feet for pavements with a thickness of less than 6 inches and at a maximum spacing of 15 feet for pavements with a thickness of 6 inches or greater. The longitudinal and transverse joints should be formed or saw cut to a depth of 1/3 of the slab depth for concrete containing siliceous coarse aggregate and ¼ of the slab depth for limestone aggregate. Sawing of joints should begin as soon as the concrete will not chip and ravel. It is recommended that longitudinal and expansion joints be doweled to promote load transfer. Expansion joint spacings are not to exceed a maximum of 75 feet and no expansion or contraction joints should be located within a swale or drainage collection area. Expansion joints are also needed to separate the concrete slab from fixed objects such as inlets, light standards and buildings.

It is recommended that the concrete pavement surface have a minimum slope of 0.015 ft/ft to provide adequate surface drainage. It is recommended that the concrete pavement

should cure a minimum 7 days before allowing any traffic provided that adequate concrete strength has been attained as determined by the project Civil Engineer.

The curb shall be constructed in lengths equal to the adjoining pavement slab lengths, and expansion joints shall be provided in the curb opposite each transverse expansion joint in the pavement. Expansion joint material shall be of the same thickness, type and quality as specified for the pavement and shall be of the section as shown for the curb. All expansion joints shall be carried through the curb. Transverse contraction joints shall be sawed across the curb at the same time as sawing of the transverse contraction joints in the pavement are sawed. The curb shall be placed monolithically with the pavement for edge support and reinforced with a minimum one (1) #5 rebar. A finish coat of mortar shall be applied on the exposed surfaces of monolithic curbs.

8.5 Garbage Dumpster Considerations

Within flexible pavement areas, it is recommended that reinforced concrete pads be provided in front of and beneath garbage dumpsters. Concrete paving is also recommended in areas where the dumpster trucks make turns with small radii to access the dumpsters. The pads should be a thickened concrete slab and reinforced similar to the concrete pavement recommendations or a minimum 10 inches thick.

8.6 Jogging Trail Recommendations

The jogging trail recommendations are limited to samples taken from the existing soils within the footprint areas present at the site. The jogging trail design implemented for this project shall come from the civil engineer based on a traffic and design analysis for this project.

Recommendations for flexible jogging trails are presented in this report for further evaluation by the project civil engineer. All jogging trails are very dependent on the condition of the soil platform on which they are supported and thus moisture conditions will play an important role in the performance of the jogging trails during its structure life. Proper consideration to drainage of the jogging trail structure and the surrounding areas is essential to the successful performance of a jogging trail structure. The proposed jogging trail section may be chosen from one of the following options:

Table 8.7 Jogging Trail Pavement Structure Options

Materials	Option 1	Option 2	Option 3
Asphaltic Concrete (In)	2	2	2
Untreated Caliche Base (In)	6	6	6
Select Fill (In)	24	12	12
Lime Treated Subgrade (In)	-	12	-
Moisture Conditioned Subgrade (In)	-		12

Note 1: Option 1 is the preferred option with the least risk with the presence of expansive soils.
Note 2: Option 3 has a higher level of risk due to expansive clays and the narrow pavement structure.
Note 3: The caliche base, lime treated subgrade, select fill and moisture conditioned subgrade shall extend a minimum of two (2) feet beyond the surface paving limits.

9.0 PAVEMENT MATERIAL SPECIFICATION SECTIONS

9.1 Pavement Preparation Recommendations

Pavement areas should be stripped of all vegetation and organic topsoil up to a minimum of two (2) feet beyond the pavement perimeters. After stripping, remove at least six (6) inches of on-site soil as measured from existing grade when excavation of existing subgrade is not recommended in other sections of this report. The excavated material, if free of organic and/or deleterious material, may be stockpiled for use in the non-pavement areas of the site. Where excavation of the subgrade is recommended in this report, the bottom of the excavation will extend at least two (2) feet beyond the limits of the planned pavement perimeter including canopies and sidewalks. Exposed subgrades should be thoroughly proof rolled in order to locate and compact any weak, compressible and soft spots. Proof rolling shall be in accordance with TxDOT 2014 Specification Item 216. Proof rolling operations should be observed by the Geotechnical Engineer or his representative to document subgrade condition and preparation. Weak or soft areas identified during proof rolling or areas where large tree roots have been removed within the limits of excavation should be removed and replaced with a suitable, compacted fill in accordance with the recommendations presented in TxDOT 2014 Specification Item 132 for density control and material requirements for Types A and B. If the fill is a clay it shall meet USCS Classification CL. Proof rolling operations and any excavation/backfill activities should be observed by MEG representatives to document subgrade preparation.

The exposed subgrade shall then be prepared based on what option is selected from the pavement recommendations. The soil should be worked in accordance with the recommendations and tested by MEG personnel for compaction as specified.

9.2 Hot Mix Asphaltic Concrete Surface

The asphaltic surface shall meet the requirements of the current TxDOT 2014 Specification Item 340 for Dense Graded Hot Mix Asphalt (small quantity) for projects with total production of less than 5,000 tons and TxDOT 2014 Specifications Item 341 Dense Graded Hot Mix Asphalt for projects with total production of 5,000 tons or greater. The hot mix asphaltic surface will be compacted to between 3.0 and 8.5 percent in place air voids in conformance with the specification. It is recommended that the testing required by this specification be performed during production.

Table 9.1. Dense Grade Hot Mix Asphalt Additional Requirements

Test Procedure	Requirement
Target Design Laboratory Density, %	97.0 (for light duty areas)
	96.5 (for heavy duty areas)

9.3 Reinforced Concrete

Concrete shall meet a minimum 28-day compressive strength of 3200 psi for light duty pavements and 4000 psi for medium and heavy duty pavements and a maximum water/cement ratio of 0.45. The concrete for concrete paving shall meet the requirements for Class P Concrete of TxDOT 2014 Specification Items 360 and 421. Aggregates used in the concrete design should meet the requirements of TxDOT 2014 Specification Item 421 or ASTM C33.

9.4 Untreated Caliche Base

The base shall be caliche base and meet the requirements of TxDOT 2014 Specification Item 247 Type E, Grade 3 or better and including the requirements of Table 9.2 shown below. The base shall be compacted to a minimum 98 percent of the maximum dry density as determined by the standard moisture density relation (ASTM D 698) at moisture contents ranging between minus two (-2) and plus two (+2) percentage points of the optimum moisture content. The base shall be placed in loose lifts not to exceed 8 inches (6 inches compacted) and not less than 5 ½ inches (4 inches compacted).

Table 9.2. Flexible Base Type E, Additional Requirements

Retained Procedure	Requirements
Max. PI:	12 (15 for treated base)
Max. Wet Ball PI:	12 (15 for treated base)
Wet Ball Mill Max Amount:	50
Wet Ball Increase, Max Passing No. 40 sieve	20

9.5 Lime Treated Caliche Base

The base shall meet all the requirements of untreated caliche base. In addition the base shall be treated with a minimum one and a half (1 ½) percent lime or Portland cement by weight. Lime shall meet the requirements of TxDOT 2014 Specification Item 260. Portland cement shall be Type I meeting ASTM C150 or Type IP meeting ASTM C595. Lime treatment will be in accordance with TxDOT 2014 Specification Item 260 or 263 for base courses and Item 260 for subgrades. Cement treatment shall be in accordance with TxDOT 2014 Specification Item 275 or 276. The base shall be compacted to a minimum 98 percent of the maximum dry density as determined by the standard moisture density relation (ASTM D 698) at moisture contents ranging between minus two (-2) and plus two

(+2) percentage points of the optimum moisture content. The base shall be placed in loose lifts not to exceed 8 inches (6 inches compacted) and not less than 5 ½ inches (4 inches compacted).

9.6 Lime Treated Subgrade

Lime stabilization of the soils may be used for soil shrink and swell mitigation and to increase the structural capacity of the subgrade as platform for the pavement. It is recommended that the subgrade plasticity index be verified after the site is stripped of the loose topsoil and the subgrade is exposed up to the subgrade elevation. Stabilization treatment of the subgrade soils may also be utilized to provide a platform for the base for resistance to moisture intrusion and changes. Prevention of moisture intrusion is extremely important to the life of a pavement. Increases in moisture content of the subgrade and the base will significantly reduce the material's structural ability to carry loads. The optimum lime content should reduce the PI of the soil to 20 or less and should result in a soil lime mixture with a pH of at least 12.4 when tested in accordance with ASTM C 977, Appendix XI. The lime should be blended with a mixing device such as a pulvermixer to produce a soil mixture passing water added and be allowed to cure for at least 48 hours. After curing the lime soil mixture it shall pass the grading requirements of TxDOT 2014 Specification Item 260 and compacted to a minimum 95 percent of the maximum dry density determined in accordance with ASTM D 698 at moisture contents ranging from minus two (-2) percentage points below optimum to plus two (+2) percentage points above optimum moisture content. If the in place gradation requirements can be achieved during the initial mixing, the remixing after the curing period can be eliminated. Please note that there is a relationship between the time of mixing of the lime and soils with the maximum dry density. Any mixture older than three (3) days will require determination of new moisture density relationships.

Portland cement may be considered instead of lime to treat the subgrade. See the cement treated subgrade section of this report.

9.7 Cement Treated Subgrade

Cement treatment of the on-site subgrade soils may be used for soil shrink and swell mitigation and to increase the structural capacity of the subgrade as a platform for the pavement. It is recommended that the subgrade plasticity index be verified after the site is stripped of the loose topsoil and the subgrade is exposed up to the subgrade elevation. Treatment of the subgrade soils may be utilized to provide a uniform platform for the base for resistance to moisture intrusion and changes. Prevention of moisture intrusion is extremely important to the life of a pavement. Increases in moisture content of the subgrade and the base will significantly reduce the material's structural ability to carry loads. The optimum cement content should be determined in accordance with TxDOT 2014 Specifications Item 275 and with a minimum dry strength requirement of 175 psi. It is anticipated that the soils will require about 2 to 3 percent cement by dry weight of the soils to meet the specification requirements. The cement should be blended into the soil and preferably with a mixing device such as a pulvermixer to produce a uniform soil-cement mixture. The soil-cement mixture shall be placed in accordance with TxDOT 2014

Specification Item 275 and compacted to a minimum 95 percent of the maximum dry density determined in accordance with ASTM D 698 at moisture contents ranging from minus two (-2) percentage points below optimum to plus two (+2) percentage points above the optimum moisture content.

Cracking of the subgrade can be expected when using cement treatment due to the increased rigidity of the soil. Maintenance of any reflected cracks will require immediate sealing to keep moisture from penetrating to the pavement layers below the surface. If reflective cracking on the pavement from the treated subgrade is a concern, we recommend that microcracking of the subgrade be performed and the procedure outlined in TxDOT 2014 Specification Item 275 be used to mitigate reflective cracking. Microcracking should be performed on treated subgrade layers not to exceed 8 inches compacted thickness.

9.8 Moisture Conditioned Subgrade

The subgrade shall be scarified to a depth of eight (8) inches and moisture conditioned to within the range of minus two (-2) percentage points below optimum to plus two (+2) percentage points above the optimum moisture content. The subgrade shall be compacted to a minimum 95 percent of the maximum dry density determined in accordance with ASTM D 698.

10.0 OTHER CONSIDERATIONS

10.1 Drainage

Adequate perimeter drainage is essential for long-term performance of any pavement structure. Infiltration of surface water from unpaved areas surrounding the pavement should be minimized. We do not recommend the placement of landscape beds on the paved areas. Such design features provide a potential for water to enter into the pavement section and the underlying soil subgrade. This is especially true with time in paved areas that have limited traffic and lead to accelerated asphalt oxidation and thus cracking. Water intrusion will result in the deterioration of the pavement materials with time as vehicular traffic passes over affected areas. Above grade planter boxes with drainage discharge onto the top of the pavement or directed into storm sewers should be considered if landscape features are to be used.

10.2 Curb & Gutters

Base material under curb and gutters and curbs shall be compacted to the same requirements as other areas. It is recommended that the base shall be placed below the curb & gutter and extended past the back of the curb & gutter a minimum of one and a half (1 ½) feet. The thickness of the base below the curb & gutter shall be the required pavement base thickness less six (6) inches. An adequate seal should be provided at all concrete- asphalt interfaces. It is recommended that a crack sealant compatible to both asphalt and concrete be used.

10.3 Maintenance

A maintenance plan is recommended for the long-term performance of the paved areas. Asphaltic pavements have a tendency to strip and become oxidized with exposure to the elements. Thus cracks may become present in the pavement. It is recommended that a maintenance schedule of crack sealing, fog seals and overlays be used over the life of the pavement.

11.0 PROJECT REVIEW AND QUALITY CONTROL

Each project site is unique and it is important that the appropriate design data, construction drawings, specifications, change orders and related documents be reviewed by the respective design and construction professionals participating in this project. The performance of foundations, construction building pads and/or parking areas for this project will depend on correct interpretation of our geotechnical engineering report and proper compliance of and adherence to our geotechnical recommendations and to the construction drawings and specifications.

It is important that **MEG** be provided the opportunity to review the final design and construction documents to check that our geotechnical recommendations are properly interpreted and incorporated in the design and construction documents. We cannot be responsible for misinterpretations of our geotechnical recommendations if we have not had the opportunity to review these documents. This review is an additional service and not part of our project scope.

MEG should be retained to provide construction materials testing and observation services during all phases of the construction process of this project. As the Geotechnical Engineer of Record, it is important to let our technical personnel provide these services to make certain that our recommendations are interpreted properly and to ensure that actual field conditions are those described in our geotechnical report. Since our personnel are familiar with this project, **MEG**'s participation during the construction phase of this project would help mitigate any problems resulting from variations or anomalies in subsurface conditions, which are among the most prevalent on construction projects and often lead to delays, changes, costs overruns, and disputes. If the client does not follow all of our recommendations presented in this report and/or addendums to this report, the client assumes the responsibility and liability of such actions and will hold our firm harmless and without responsibility and liability for client's actions.

A construction testing frequency plan and budget needs to be developed for the required construction materials engineering and testing services for this project. Before construction, we recommend that **MEG**, the project design team members and the project general contractor meet and jointly develop the testing plan and budget, as well as review the testing specifications as it pertains to this project. **A failure to implement a complete testing plan will negate the recommendations provided in this report.**

MEG looks forward to the opportunity to provide continued support on this project.

APPENDIX A

CUSTOM SOIL RESOURCE REPORT

Map Unit Name—Hidalgo County, Texas
(01-18-29193 - Proposed Flores Park)

Map Scale: 1:1,850 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 25 50 100 150

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Cameron silty clay
- Reynosa-Urban land complex, 0 to 1 percent slopes
- Runn silty clay
- Not rated or not available

Soil Rating Lines
- Cameron silty clay
- Reynosa-Urban land complex, 0 to 1 percent slopes
- Runn silty clay
- Not rated or not available

Soil Rating Points
- Cameron silty clay
- Reynosa-Urban land complex, 0 to 1 percent slopes
- Runn silty clay
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hidalgo County, Texas
Survey Area Data: Version 17, Sep 15, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 8, 2015—Feb 18, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Name

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
7	Cameron silty clay	Cameron silty clay	7.5	70.1%
57	Reynosa-Urban land complex, 0 to 1 percent slopes	Reynosa-Urban land complex, 0 to 1 percent slopes	0.4	4.1%
64	Runn silty clay	Runn silty clay	2.8	25.8%
Totals for Area of Interest			**10.7**	**100.0%**

Description

A soil map unit is a collection of soil areas or nonsoil areas (miscellaneous areas) delineated in a soil survey. Each map unit is given a name that uniquely identifies the unit in a particular soil survey area.

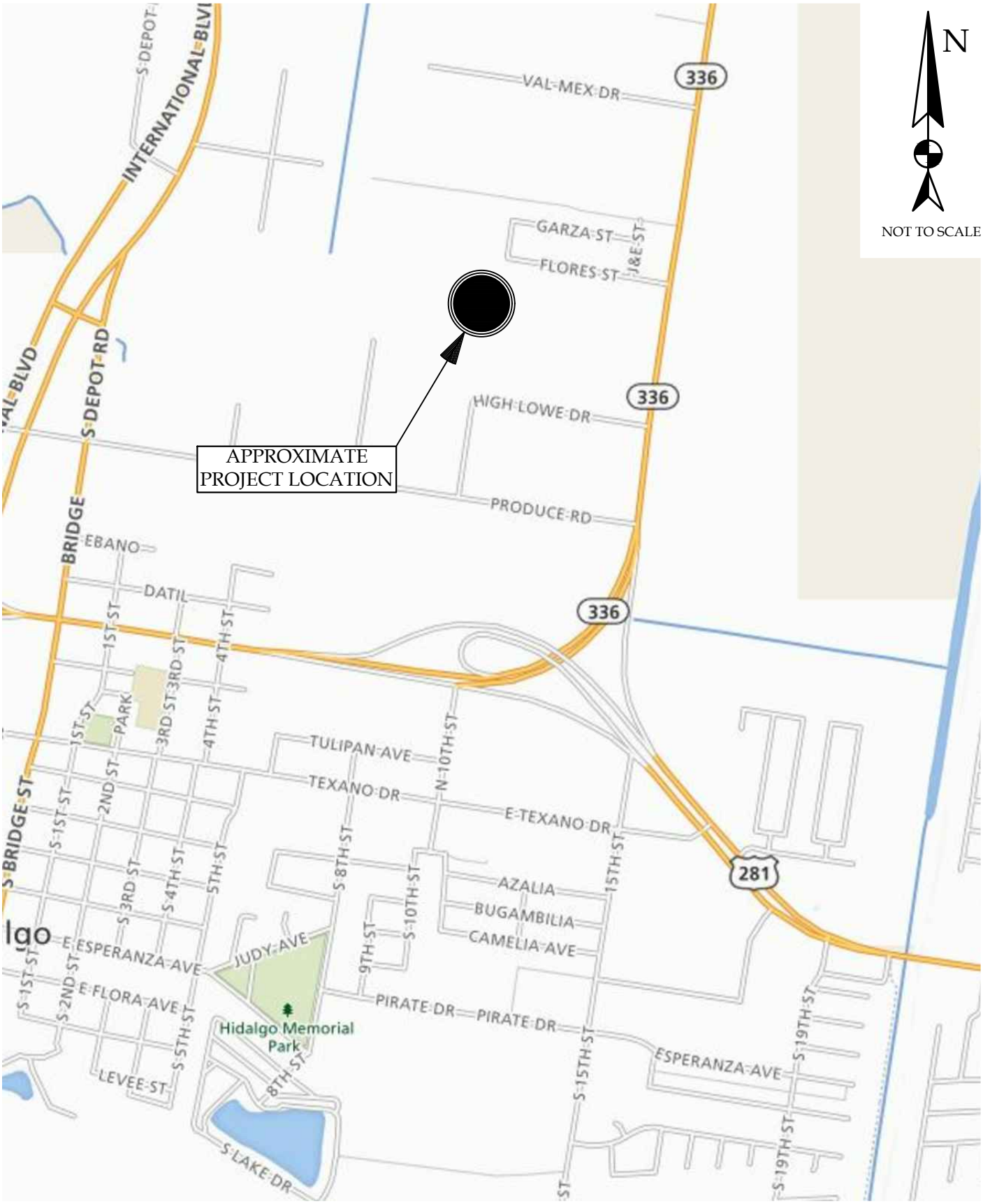
Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

APPENDIX B

PROJECT LOCATION, TOPOGRAPHIC AND BOREHOLE LOCATION MAPS



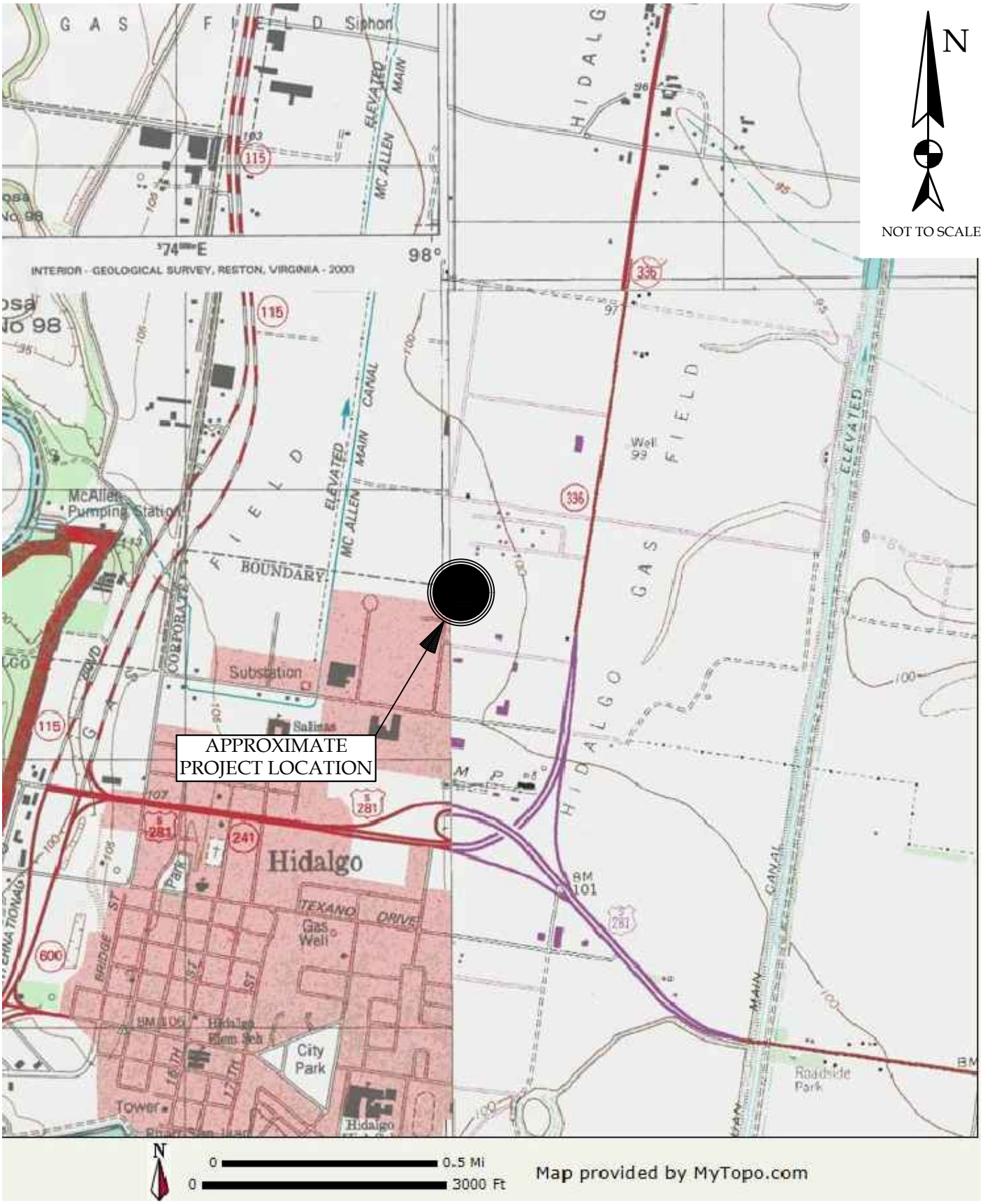
PROJECT SITE LOCATION MAP

PROPOSED
FLORES PARK

HIDALGO, HIDALGO COUNTY, TEXAS

MILLENNIUM ENGINEERS GROUP, INC.
5804 N. GUMWOOD AVENUE
PHARR, TEXAS 78577
WWW.MEGENGINEERS.COM
TEL: 956-702-8500
FAX: 956-702-8140

MEG PROJECT: 01-18-29193 / DATE: 12/13/2018 / APPROVED BY: A. PALMA / DRAWN BY: J. PALMA



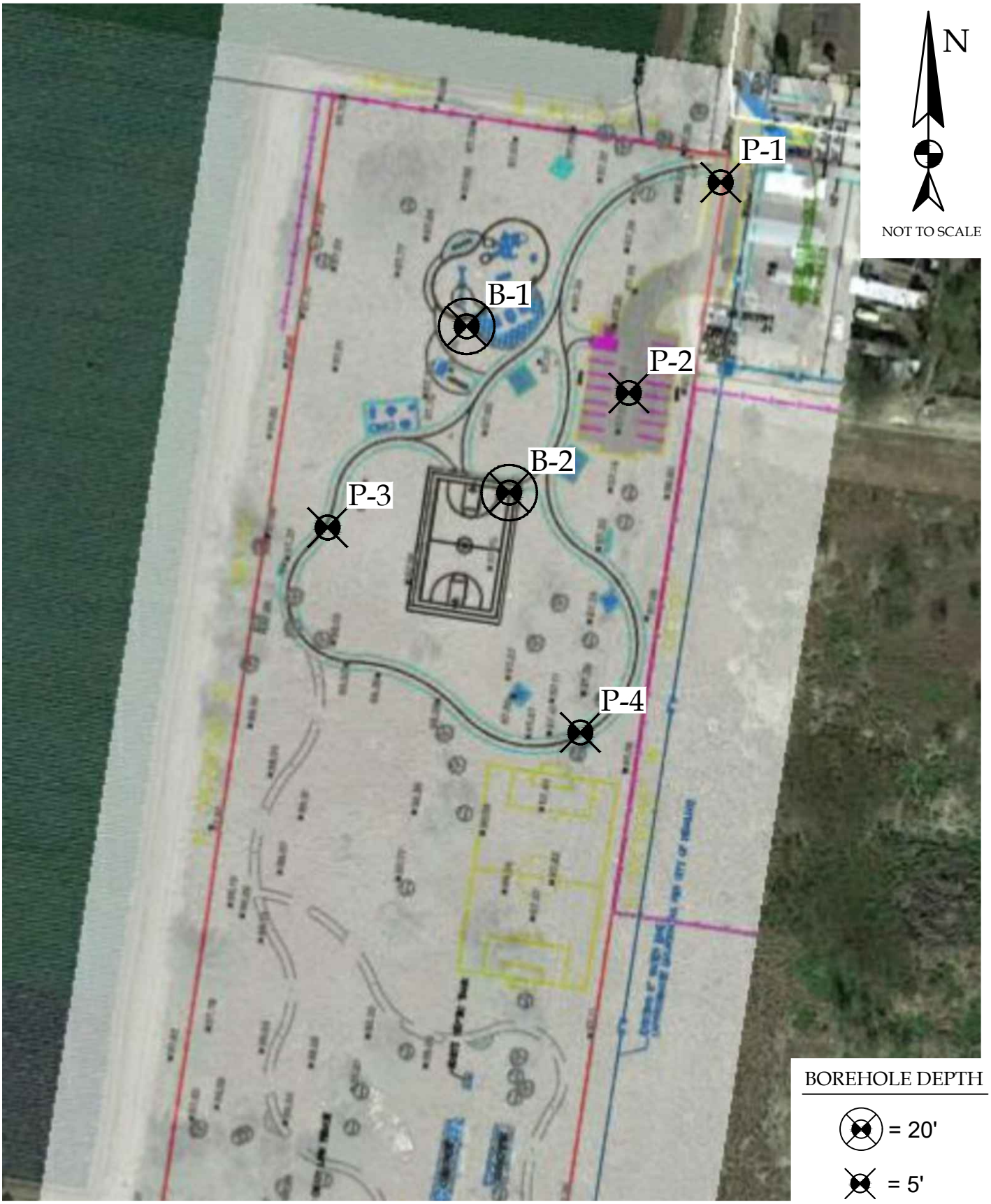
PROJECT TOPOGRAPHY MAP

PROPOSED
FLORES PARK

HIDALGO, HIDALGO COUNTY, TEXAS

MILLENNIUM ENGINEERS GROUP, INC.
5804 N. GUMWOOD AVENUE
PHARR, TEXAS 78577
WWW.MEGENGINEERS.COM
TEL: 956-702-8500
FAX: 956-702-8140

MEG PROJECT: 01-18-29193 / DATE: 12/13/2018 / APPROVED BY: A. PALMA / DRAWN BY: J. PALMA



PROJECT BOREHOLE LOCATION MAP

PROPOSED
FLORES PARK

HIDALGO, HIDALGO COUNTY, TEXAS

MILLENNIUM ENGINEERS GROUP, INC.
5804 N. GUMWOOD AVENUE
PHARR, TEXAS 78577
WWW.MEGENGINEERS.COM
TEL: 956-702-8500
FAX: 956-702-8140

MEG PROJECT: 01-18-29193 / DATE: 12/13/2018 / APPROVED BY: A. PALMA / DRAWN BY: J. PALMA

APPENDIX C

PROJECT BORING LOGS AND PROFILE

Project: **Proposed Flores Park**

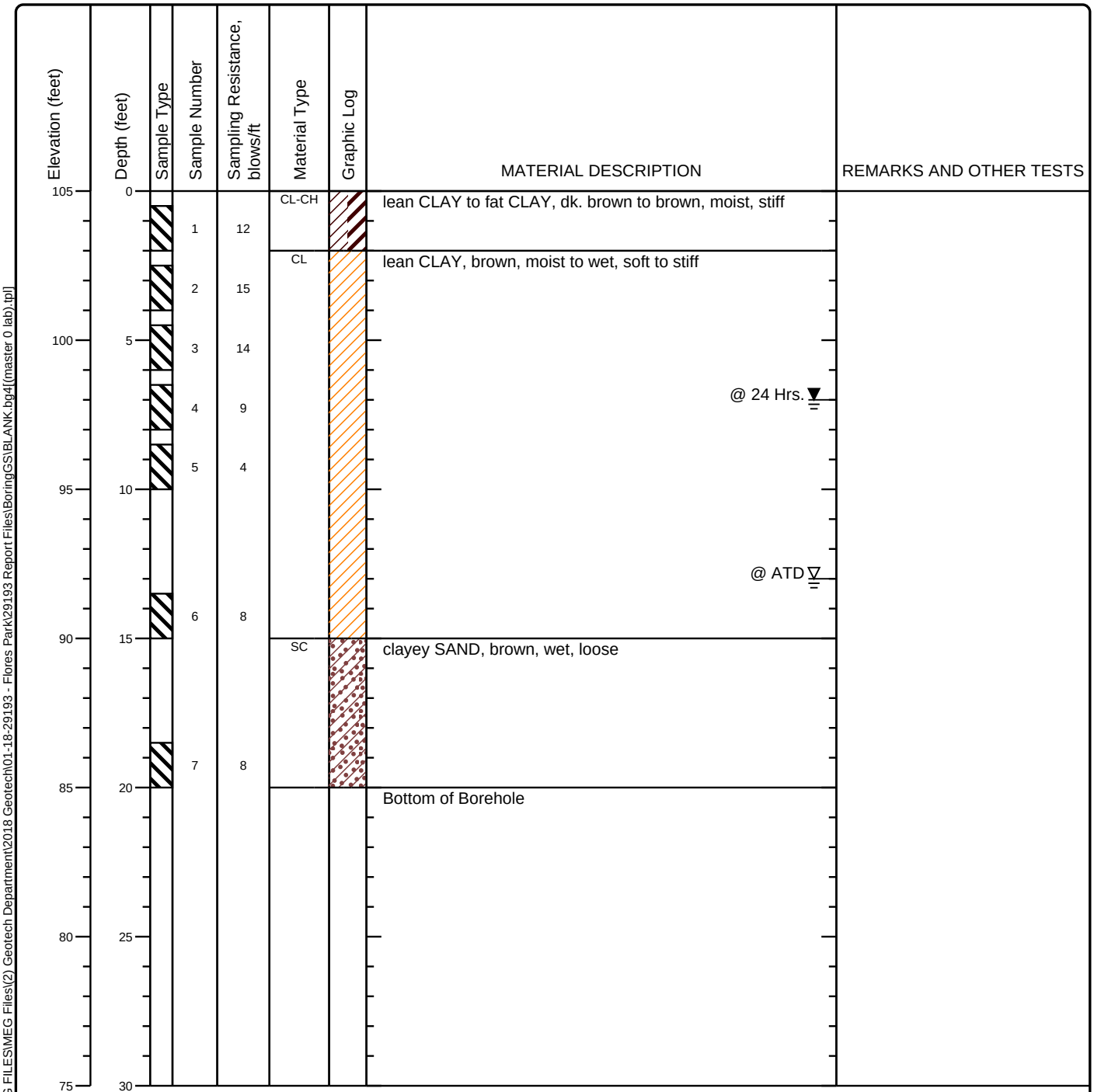
Project Location: **Hidalgo, Hidalgo County, Texas**

Project Number: **01-18-29193**

Log of Boring B-1

Sheet 1 of 1

Date(s) Drilled **11/27/2018**	Logged By **J. Palma**	Checked By **Raul Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4" soil bit**	Total Depth of Borehole **20 feet bgs**
Drill Rig Type **CME 55**	Drilling Contractor **MEG**	Approximate Surface Elevation **105.0 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **13 feet ATD, 7 feet after 24 Hrs.**	Sampling Method(s) **SPT**	Hammer Data **140 lb., 30 in. drop, auto trip**
Borehole Backfill **Subgrade Cuttings**	Location **See Boring Location Map**	



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Project: **Proposed Flores Park** Project Location: **Hidalgo, Hidalgo County, Texas** Project Number: **01-18-29193**	Log of Boring B-2 **Sheet 1 of 1**

Date(s) Drilled **11/27/2018**	Logged By **J. Palma**	Checked By **Raul Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4" soil bit**	Total Depth of Borehole **20 feet bgs**
Drill Rig Type **CME 55**	Drilling Contractor **MEG**	Approximate Surface Elevation **105.0 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **13 feet ATD, 8 feet after 24 Hrs.**	Sampling Method(s) **SPT**	Hammer Data **140 lb., 30 in. drop, auto trip**
Borehole Backfill **Subgrade Cuttings**	Location **See Boring Location Map**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
105	0				CL-CH		lean CLAY to fat CLAY, dk. brown to brown, moist, stiff	
			1	9				
					CL		lean CLAY, brown, moist to wet, soft to stiff	
			2	14				
100	5		3	13				
			4	3			@ 24 Hrs. ▼	
			5	6				
95	10						@ ATD ▽	
			6	6				
90	15				SC		clayey SAND, brown, wet, loose	
			7	10				
85	20						Bottom of Borehole	
80	25							
75	30							

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Project: **Proposed Flores Park** Project Location: **Hidalgo, Hidalgo County, Texas** Project Number: **01-18-29193**	Log of Boring P-1 **Sheet 1 of 1**

Date(s) Drilled **11/27/2018**	Logged By **J. Palma**	Checked By **Raul Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4" soil bit**	Total Depth of Borehole **5 feet bgs**
Drill Rig Type **CME 55**	Drilling Contractor **MEG**	Approximate Surface Elevation **105.0 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **Not Encountered**	Sampling Method(s) **SPT**	Hammer Data **140 lb., 30 in. drop, auto trip**
Borehole Backfill **Subgrade Cuttings**	Location **See Boring Location Map**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
105	0				CL-CH		lean CLAY to fat CLAY, dk. brown to brown, moist, stiff	
			1	12				
					CL		lean CLAY, brown, moist to wet, soft to stiff	
			2	13				
100	5						Bottom of Borehole	
95	10							
90	15							
85	20							
80	25							
75	30							

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Project: **Proposed Flores Park**

Project Location: **Hidalgo, Hidalgo County, Texas**

Project Number: **01-18-29193**

Log of Boring P-2

Sheet 1 of 1

Date(s) Drilled **11/27/2018**	Logged By **J. Palma**	Checked By **Raul Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4" soil bit**	Total Depth of Borehole **5 feet bgs**
Drill Rig Type **CME 55**	Drilling Contractor **MEG**	Approximate Surface Elevation **105.0 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **Not Encountered**	Sampling Method(s) **SPT**	Hammer Data **140 lb., 30 in. drop, auto trip**
Borehole Backfill **Subgrade Cuttings**	Location **See Boring Location Map**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
105	0		1	14	CL-CH		lean CLAY to fat CLAY, dk. brown to brown, moist, stiff	
					CL		lean CLAY, brown, moist to wet, soft to stiff	
100	5		2	13			Bottom of Borehole	
95	10							
90	15							
85	20							
80	25							
75	30							

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Project: **Proposed Flores Park**

Project Location: **Hidalgo, Hidalgo County, Texas**

Project Number: **01-18-29193**

Log of Boring P-3

Sheet 1 of 1

Date(s) Drilled **11/27/2018**	Logged By **J. Palma**	Checked By **Raul Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4" soil bit**	Total Depth of Borehole **5 feet bgs**
Drill Rig Type **CME 55**	Drilling Contractor **MEG**	Approximate Surface Elevation **105.0 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **Not Encountered**	Sampling Method(s) **SPT**	Hammer Data **140 lb., 30 in. drop, auto trip**
Borehole Backfill **Subgrade Cuttings**	Location **See Boring Location Map**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
105	0		1	13	CL-CH		lean CLAY to fat CLAY, dk. brown to brown, moist, stiff	
					CL		lean CLAY, brown, moist to wet, soft to stiff	
100	5		2	5			Bottom of Borehole	
95	10							
90	15							
85	20							
80	25							
75	30							

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Project: **Proposed Flores Park**

Project Location: **Hidalgo, Hidalgo County, Texas**

Project Number: **01-18-29193**

Log of Boring P-4

Sheet 1 of 1

Date(s) Drilled **11/27/2018**	Logged By **J. Palma**	Checked By **Raul Palma**
Drilling Method **Straight Flight**	Drill Bit Size/Type **4" soil bit**	Total Depth of Borehole **5 feet bgs**
Drill Rig Type **CME 55**	Drilling Contractor **MEG**	Approximate Surface Elevation **105.0 feet Natural Ground (assumed)**
Groundwater Level and Date Measured **Not Encountered**	Sampling Method(s) **SPT**	Hammer Data **140 lb., 30 in. drop, auto trip**
Borehole Backfill **Subgrade Cuttings**	Location **See Boring Location Map**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
105	0		1	12	CL-CH		lean CLAY to fat CLAY, dk. brown to brown, moist, stiff	
					CL		lean CLAY, brown, moist to wet, soft to stiff	
100	5		2	13			Bottom of Borehole	
95	10							
90	15							
85	20							
80	25							
75	30							

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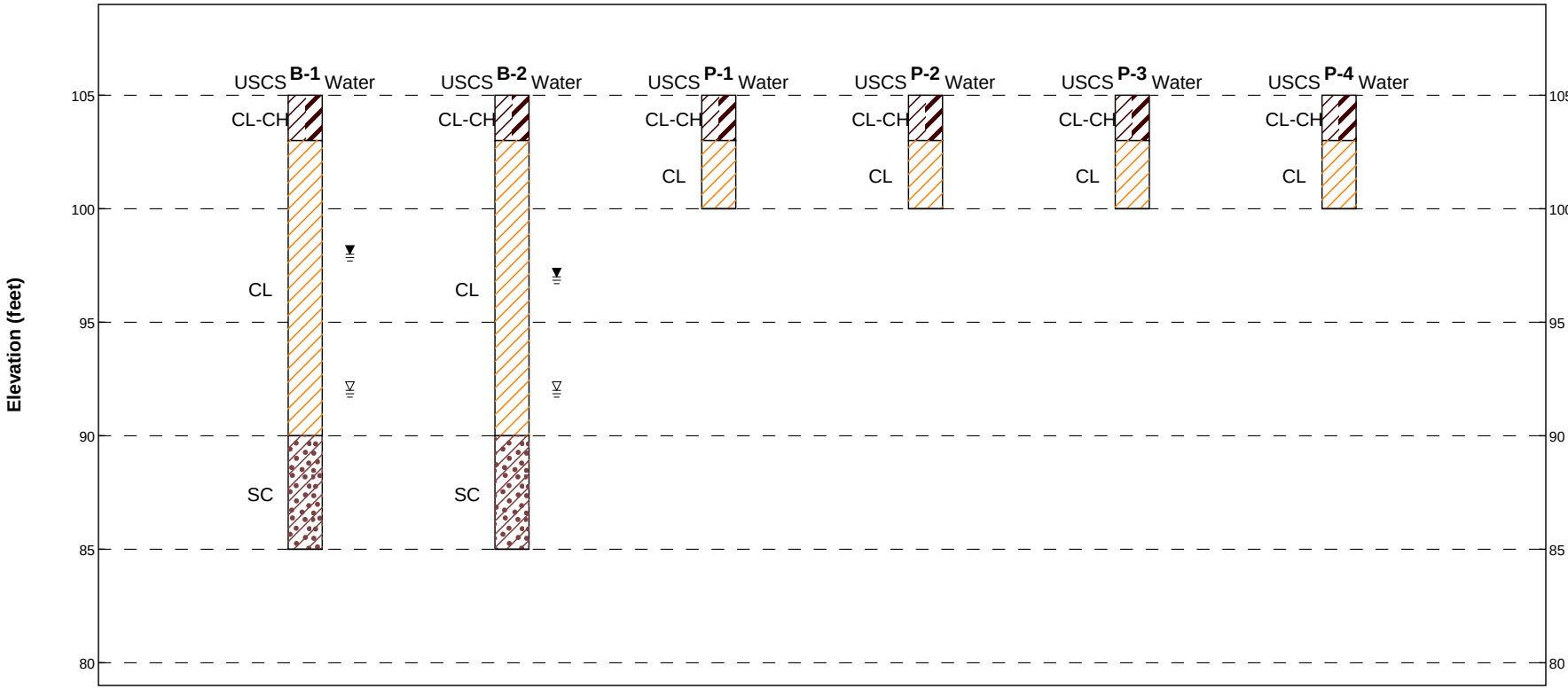

MATERIAL GRAPHIC SYMBOLS

Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)

Lean-Fat CLAY, CLAY w/SAND, SANDY CLAY (CL-CH)

Clayey SAND (SC)

Millenium Engineers Group, Inc.	
Proposed Flores Park	
Project No.	**Figure No.**
01-18-29193	C-1

Project: **Proposed Flores Park**
Project Location: **Hidalgo, Hidalgo County, Texas**
Project Number: **01-18-29193**

Key to Log of Boring
Sheet 1 of 1

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9

COLUMN DESCRIPTIONS

1 Elevation (feet): Elevation (MSL, feet).
2 Depth (feet): Depth in feet below the ground surface.
3 Sample Type: Type of soil sample collected at the depth interval shown.
4 Sample Number: Sample identification number.
5 Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6 Material Type: Type of material encountered.
7 Graphic Log: Graphic depiction of the subsurface material encountered.
8 MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
9 REMARKS AND OTHER TESTS: Comments and observations regarding drilling or sampling made by driller or field personnel.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)
Lean-Fat CLAY, CLAY w/SAND, SANDY CLAY (CL-CH)
Clayey SAND (SC)

TYPICAL SAMPLER GRAPHIC SYMBOLS

Auger sampler
Bulk Sample
3-inch-OD California w/ brass rings
CME Sampler
Grab Sample
2.5-inch-OD Modified California w/ brass liners
Pitcher Sample
2-inch-OD unlined split spoon (SPT)
Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)
Water level (after waiting)
Minor change in material properties within a stratum
Inferred/gradational contact between strata
Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

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Figure B-1

APPENDIX D

SUMMARY OF SOIL SAMPLE ANALYSIS

Summary of Soil Sample Analyses

Project Name: Proposed Flores Park

Boring No.	Sample Depth (ft)	Blows Per (ft)	Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index	-200% Sieve	Shear Strength (tsf)	Dry Unit Weight (pcf)	USCS
B-1	.5 - 2	12	17	47	24	24				CL
	2.5 - 4	15	19							
	4.5 - 6	14	24							
	6.5 - 8	9	26	44	19	25				CL
	8.5 - 10	4	27				91			
	13.5 - 15	8	23	44	23	21				CL
	18.5 - 20	8	27				39			
B-2	.5 - 2	9	24				96			
	2.5 - 4	14	16	46	24	23				CL
	4.5 - 6	13	22							
	6.5 - 8	3	27				88			
	8.5 - 10	6	25	24	13	11				CL
	13.5 - 15	6	27							
	18.5 - 20	10	27	40	21	19				CL
P-1	.5 - 2	12	22	50	18	32				CH
	3.5 - 5	13	18				93			
P-2	.5 - 2	14	15	51	23	28				CH
	3.5 - 5	13	23							
P-3	.5 - 2	13	19	47	23	24				CL
	3.5 - 5	5	24				99			
P-4	.5 - 2	12	15	50	19	31				CL
	3.5 - 5	13	21							

APPENDIX E

LABORATORY AND FIELD PROCEDURES

Laboratory and Field Test Procedures

Soil Classification Per ASTM D2487-93:

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 D2216-92:

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 **MC** in the attached boring logs.

Soil Liquid Limit Per ASTM D4318-93:

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. The test results are listed under **LL** in the attached boring logs.

Soil Plastic Limit Per ASTM D4318-93:

The soil Plastic Limit identifies 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. The test results are listed under **PL** in the attached boring logs.

Plasticity Index Per ASTM D4318-93:

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. The test results are listed under **PI** in the attached boring logs.

Standard Penetration Test (SPT) and Split Spoon Sampler (SS) per ASTM D 1586:

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 D 1586:

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.

Shelby Tube (ST) per ASTM D 1587:

This procedure is for using a thin-walled metal tube to recover relatively undisturbed soil samples suitable for laboratory tests of physical properties.

Dry Density (DD) per ASTM D 2937:

This procedure is for the determination of in-place density of soil. The test results are measured in pounds per cubic foot, pcf.

Unconfined Compression Test (Uc) per ASTM D 2166:

This test method covers the determination of the unconfined compressive strength of cohesive soil in the undisturbed, remolded, or compacted condition, using strain-controlled application of the axial load.

Minus No. 200 Sieve per ASTM D 1140:

This test method covers determination of the amount of material finer than a Number 200 sieve by washing. The results are stated as a percent of the total dry weight of the sample.

Pocket Penetrometer (PP):

This test method is an accepted modification of ASTM D 1558 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.

Rock Quality Designation (RQD):

The measure of the quality of a rock mass defined by adding intact rock core pieces greater than four inches in length by the total length of core advance.

Recovery Ratio (REC):

The Recovery Ratio is equal to the total length of core recovered divided by the total length of core advance.

Boring Logs:

This is a summary of the above-described information at each boring location.

January 17, 2019

Mr. Javier Hinojosa, P.E.
Javier Hinojosa Engineering
416 E. Dove Avenue
McAllen, Engineering
(956) 668-1588
javhin@rgv.rr.com

Subject: **Addendum No. 1, Engineering Analysis and Recommendations**
MEG Geotechnical Report No. 01-18-29193
Foundation and Pavement Recommendations
Proposed Flores Park
Hidalgo, Hidalgo County, Texas

Dear Mr. Hinojosa:

Millennium Engineers Group, Inc. is pleased to submit this addendum to the Geotechnical Report as requested by the CLIENT representative. This addendum was requested on behalf of the CLIENT by Mr. Andrew Heffner with Heffner Design Team. This addendum replaces Tables in section Soil Related Movements of the subject report (MEG Geotechnical Report No. 01-18-29193). This addendum in no way should be used or interpreted on its own. The contents of this addendum should only be used and interpreted in conjunction with the subject report. The information and/or recommendations provided herein should be reviewed by the Owner and Owner's Representative(s). This addendum replaces or revises the subject report as follows:

I: The following Replaces Table 6.1. Subgrade Modifications in Section 6.2 Soil Related Movements of the subject report:

6.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS

6.2 Soil Related Movements

As requested by our CLIENT representative by Mr. Andrew Heffner with Heffner Design Team we are revising subgrade modifications. FFE will be at 100.00 feet AMSL natural ground elevation is varying from 97.17 feet to 97.70 feet AMSL.

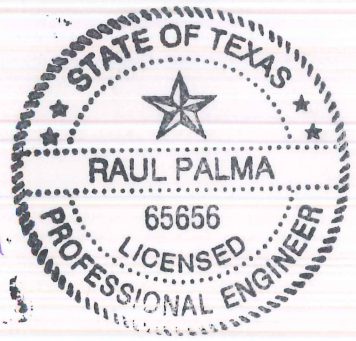
Table 6.1 Subgrade Modifications

Item	Description
1	See and adhere to the Site Preparation Recommendations section of this report.
2	Excavate existing soils to an elevation of 95.50 feet AMSL in accordance with the Site Preparation Recommendations section of this report.
3	Condition and compact twelve (12) inches of subgrade below excavated soils in accordance with the Site Preparation Recommendations section of this report.
4	Place **select fill,** to an elevation of 99.50 AMSL (a minimum of four (4) feet of select fill) condition and compact up to the proposed FFE in accordance with the Select Fill Recommendations section of this report.

II. ADDENDUM PROJECT REVIEW AND QUALITY CONTROL

Recommendations found in the subject report shall be followed unless in conflict with the recommendations made in this addendum. If conflicting information is found between this addendum, previous applicable addendums if any, and the subject report, **MEG** should be contacted for clarification. Interpretation or clarification by other parties besides **MEG** may be performed incorrectly without complete knowledge of the project site, testing program, engineering analysis and information obtained during the project site visits. Interpretations or clarifications made by other parties are performed entirely at their own risk and liability. Our recommendations should be incorporated into the construction documents for the proposed development. We recommend that the above recommendations and the requirements noted in this addendum, previous applicable addendums and the subject report should be followed by the contractor and that representatives of MEG evaluate the implementation of the recommendations herein and of the construction process. If you have any questions regarding this addendum please contact our office.

Respectfully submitted,
MILLENNIUM ENGINEERS GROUP, INC.
TBPE Firm No. F-3913



Raul Palma, P.E.
President
1/17/19