CITY OF BLUE RIDGE, TEXAS
PROFESSIONAL ENGINEERING SERVICES
For
2019 Texas Community Development Block Grant Program
Sanitary Sewer Rehabilitation Project

PART IV - TERMS AND CONDITIONS

1. Termination of Agreement for Cause. If the Firm fails to fulfill in a timely and proper manner its obligations under this Agreement, or if the Firm violates any of the covenants, conditions, agreements, or stipulations of this Agreement, the City shall have the right to terminate this Agreement by giving written notice to the Firm of such termination and specifying the effective date thereof, which shall be at least five days before the effective date of such termination. In the event of termination for cause, all finished or unfinished documents, data, studies, surveys, drawings, maps, models, photographs and reports prepared by the Firm pursuant to this Agreement shall, at the option of the City, be turned over to the City and become the property of the City. In the event of termination for cause, the Firm shall be entitled to receive reasonable compensation for any necessary services actually and satisfactorily performed prior to the date of termination.

   Notwithstanding the above, the Firm shall not be relieved of liability to the City for damages sustained by the City by virtue of any breach of the Agreement by the Firm, and the City may set-off the damages it incurred as a result of the Firm's breach of the contract from any amounts it might otherwise owe the Firm.

2. Termination for Convenience of the City. The City may terminate this Agreement at any time by giving at least ten (10) days' notice in writing to the Firm. If this Agreement is terminated for convenience, the City will pay the Firm for actual services rendered up to the termination date, based on the charges for time, labor, expenses and other items specified in the Agreement.

3. Changes. The City may, from time to time, request changes in the services the Firm will perform under this Agreement. Such changes, including any increase or decrease in the amount of the Firm's compensation, must be agreed to by all parties and finalized through a signed, written amendment to this Agreement.

4. Resolution of Program Non-Compliance and Disallowed Costs. In the event of any dispute, claim, question, or disagreement arising from or relating to this Agreement, or the breach thereof, including determination of responsibility for any costs disallowed as a result of non-compliance with federal, state or TxCDBG program requirements, the parties hereto shall use their best efforts to settle the dispute, claim, question or disagreement. To this effect, the parties shall consult and negotiate with each other in good faith within 30 days of receipt of a written notice of the dispute or invitation to negotiate, and attempt to reach a just and equitable solution satisfactory to both parties. If the matter is not resolved by negotiation within 30 days of receipt of written notice or invitation to negotiate, the parties agree first to try in good faith to settle the matter by mediation administered by the American Arbitration Association under its Commercial Mediation Procedures before

resorting to arbitration, litigation, or some other dispute resolution procedure. The parties may enter into a written amendment to this Amendment and choose a mediator that is not affiliated with the American Arbitration Association. The parties shall bear the costs of such mediation equally. If the matter is not resolved through such mediation within 60 days of the initiation of that procedure, either party may proceed to file suit.

5. Personnel.

   a) The Firm represents that he/she/it has, or will secure at its own expense, all personnel required in performing the services under this Agreement. Such personnel shall not be employees of or have any contractual relationship with the City.

   b) All of the services required hereunder will be performed by the Firm or under its supervision and all personnel engaged in the work shall be fully qualified and shall be authorized or permitted under State and Local law to perform such services.

   c) None of the work or services covered by this Agreement shall be subcontracted without the prior written approval of the City. Any work or services subcontracted hereunder shall be specified by written contract or agreement and shall be subject to each provision of this Agreement.

6. Assignability. The Firm shall not assign any interest on this Agreement, and shall not transfer any interest in the same (whether by assignment or novation), without the prior written consent of the City thereto; Provided, however, that claims for money by the Firm from the City under this Agreement may be assigned to a bank, trust company, or other financial institution without such approval. Written notice of any such assignment or transfer shall be furnished promptly to the City.

7. Reports and Information. The Firm, at such times and in such forms as the City may require, shall furnish the City such periodic reports as it may request pertaining to the work or services undertaken pursuant to this Agreement, the costs and obligations incurred or to be incurred in connection therewith, and any other matters covered by this Agreement.

8. Records and Audits. The Firm shall endeavor to insure that the City maintains fiscal records and supporting documentation for all expenditures of funds made under this contract in a manner that conforms to 2 CFR 200.300-.309, 24 CFR 570.490, and this Agreement. Such records must include data on the racial, ethnic, and gender characteristics of persons who are applicants for, participants in, or beneficiaries of the funds provided under this Agreement. The Firm and the City shall retain such records, and any supporting documentation, for the greater of three years from closeout of the Agreement or the period required by other applicable laws and regulations.

9. Findings Confidential. All of the reports, information, data, etc., prepared or assembled by the Firm under this contract are confidential and the Firm agrees that they shall not be made available to any individual or organization without the prior written approval of the City.

10. Copyright. No report, maps, or other documents produced in whole or in part under this Agreement shall be the subject of an application for copyright by or on behalf of the Firm.

11. Compliance with Local Laws. The Firm shall comply with all applicable laws, ordinances and codes of the State and local governments, and the Firm shall save the City harmless with respect to any damages arising from any tort done in performing any of the work embraced by this Agreement.

12. Conflicts of interest.

    a) Governing Body. No member of the governing body of the City and no other officer, employee, or agent of the City, who exercises any functions or responsibilities in connection with administration, construction, engineering, or implementation of TxCDBG award between TDA and the City, shall have any personal financial interest, direct or indirect, in the Firm or this Agreement; and the Firm shall take appropriate steps to assure compliance.

    b) Other Local Public Officials. No other public official, who exercises any functions or responsibilities in connection with the planning and carrying out of administration, construction, engineering or implementation of the TxCDBG award between TDA and the City, shall have any personal financial interest, direct or indirect, in the Firm or this Agreement; and the Firm shall take appropriate steps to assure compliance.

    c) The Firm and Employees. The Firm warrants and represents that it has no conflict of interest associated with the TxCDBG award between TDA and the City or this Agreement. The Firm further warrants and represents that it shall not acquire an interest, direct or indirect, in any geographic area that may benefit from the TxCDBG award between TDA and the City or in any business, entity, organization or person that may benefit from the award. The Firm further agrees that it will not employ an individual with a conflict of interest as described herein.

13. Debarment and Suspension (Executive Orders 12549 and 12689)
    The Firm certifies, by entering into this Agreement, that neither it nor its principals are presently debarred, suspended, or otherwise excluded from or ineligible for participation in federally-assisted programs under Executive Orders 12549 (3 CFR Part 1986 Comp., p. 189) and 12689 (3 CFR Part 1989 Comp., p. 235). The term "principal" for purposes of this Agreement is defined as an officer, director, owner, partner, key employee, or other person with primary management or supervisory responsibilities, or a person who has a critical influence on or substantive control over the operations of the Firm. The Firm understands that it must not make any award or permit any award (or contract) at any tier to any party which is debarred or suspended or is otherwise excluded from or ineligible for participation in Federal assistance programs under Executive Order 12549, "Debarment and Suspension."

Federal Civil Rights Compliance.

14. Equal Opportunity Clause (applicable to contracts and subcontracts over $10,000).
    During the performance of this contract, the Firm agrees as follows:

    a) The Firm will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The Firm will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:

Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Firm agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

b) The Firm will, in all solicitations or advertisements for employees placed by or on behalf of the Firm, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

c) The Firm will not discourage or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

d) The Firm will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the Firm's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

e) The Firm will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

f) The Firm will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

g) In the event of the Firm's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the Firm may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

h) The Firm will include the portion of the sentence immediately preceding paragraph (a) and the provisions of paragraphs (a) through (h) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to

Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Firm will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event a Firm becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the Firm may request the United States to enter into such litigation to protect the interests of the United States.

15. Civil Rights Act of 1964. Under Title VI of the Civil Rights Act of 1964, no person shall, on the grounds of race, color, religion, sex, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.

16. Section 109 of the Housing and Community Development Act of 1974. The Firm shall comply with the provisions of Section 109 of the Housing and Community Development Act of 1974. No person in the United States shall on the ground of race, color, national origin, religion, or sex be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity funded in whole or in part with funds made available under this title.

17. Section 504 of the Rehabilitation Act of 1973, as amended. The Firm agrees that no otherwise qualified individual with disabilities shall, solely by reason of his/her disability, be denied the benefits of, or be subjected to discrimination, including discrimination in employment, under any program or activity receiving federal financial assistance.

18. Age Discrimination Act of 1975. The Firm shall comply with the Age Discrimination Act of 1975 which provides that no person in the United States shall on the basis of age be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance.

19. Byrd Anti-Lobbying Amendment (31 U.S.C. 1352) (if contract greater than or equal to $100,000) The Firm certifies that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining this contract. The Firm shall disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award.

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

Complete Nos. 1 - 4 and 6 if there are interested parties.
Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

OFFICE USE ONLY
CERTIFICATION OF FILING

Certificate Number:
2019-458914

Date Filed:
03/01/2019

Date Acknowledged:

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.
Birkhoff, Hendricks & Carter
Dallas, TX United States

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.
City of Blue Ridge

3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the services, goods, or other property to be provided under the contract.
2019 TxCDBG Grant Project
Professional Engineering Services

4 Name of Interested Party	City, State, Country (place of business)	Nature of interest (check applicable)	
		Controlling	Intermediary
Kerkhoff, Craig	Dallas, TX United States	X	
Birkhoff, John	Dallas, TX United States	X	
Carter, Joe	Dallas, TX United States	X	
Hendricks, Gary	Dallas, TX United States	X	
Hickey, Matt	Dallas, TX United States	X	
Mata, Andrew	Dallas, TX United States	X	

5 Check only if there is NO Interested Party. ☐

6 UNSWORN DECLARATION

My name is Craig M. Kerkhoff, and my date of birth is October 10, 1982.

My address is 11910 Greenville Ave, Suite 600 (street), Dallas (city), Texas (state), 75243 (zip code), USA (country).

I declare under penalty of perjury that the foregoing is true and correct.

Executed in Dallas County, State of Texas, on the 1st day of March (month), 20 19 (year).

Signature of authorized agent of contracting business entity
(Declarant)

HENLEY | JOHNSTON
& ASSOCIATES

geotechnical and construction materials consultants

November 1, 2019
Report No. 19823Q

City of Blue Ridge
200 S Main Street
Blue Ridge, Texas 75424
ATTN: Ms. Edie Sims – City Secretary
Phone: 972-752-5791
Email: esims@blueridgecity.com

RE: Geotechnical Investigation
Ridgeway Drive Roadway
Ridgeway Drive, between Crestside Drive and Hilltop Circle
Blue Ridge, Texas

Ms. Sims:

Presented herein is the report of a geotechnical investigation conducted by Henley-Johnston & Associates, Inc. for the above referenced project.

We appreciate the opportunity to provide this report to you. If we can be of further service or if you desire any additional information, please do not hesitate to call.

Signed,

HENLEY-JOHNSTON & Associates, Inc.

Benjamin Clarke, E.I.T.
Project Manager

Douglas Greenwood, P.E.
Geotechnical Engineer

STATE OF TEXAS
DOUGLAS GREENWOOD
119347
LICENSED
PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by Douglas Greenwood, P.E. 119347 On November 1, 2019.

Firm Registration No.: F-1238
Copies submitted: City of Blue Ridge – Ms. Edie Sims

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INVESTIGATION AND ANALYSIS

Introduction

This report presents the results of a limited subsurface investigation for a relatively newly paved stretch of asphalt roadway along Ridgeway Drive in Blue Ridge, Texas. It is understood that the roadway surface has shown signs of distress and cracking along the southern edge of the roadway in the eastbound lane that have developed shortly after completion of construction. The distress is generally characterized by longitudinal and edge cracking in the eastbound lane of asphalt pavement. At the time of this investigation, the distressed pavement appeared to be primarily within the eastbound lane between Station 6+00 and Station 17+50, with the most severe distress noted between Station 8+00 and Station 16+00.

The purpose of this investigation was to evaluate surface and subsurface conditions, analyze the potential cause(s) of the distress, and provide general recommendations for remediation of the distress.

This report is specific to this site. Persons using the recommendations herein for projects and/or designs not covered by this report do so at their own risk.

Field and Laboratory Investigation

The subsurface conditions were evaluated with a total of four soil borings which were located in the field by a Henley-Johnston & Associates, Inc. (HJA), Geotechnical Engineer. Locations of the borings were dictated by the degree of distress noted in the pavement and site accessibility. Approximate locates are presented on Plate 1. Boring Nos. 1 through 3 were conducted through distressed areas of the roadway, approximately 3 to 5 feet from the south edge of the roadway, while Boring No. 4 was conducted just off of the roadway through the southern roadway shoulder, approximately 6 inches from the south edge of the roadway. All four borings were conducted using a truck-mounted rig equipped with continuous flight augers and extended to approximate depths of 4 to 10 feet below existing (September 2019) grades.

Drilling and sampling were carried out by an HJA drill crew in general accordance with ASTM methods and standards. Samples of cohesive soils encountered in the borings were obtained by means of a thin-walled, seamless, Shelby-tube sampler advanced into the formation by a rapid, continuous thrust from a hydraulic ram on the drilling rig in general accordance with ASTM D-1587.

All samples were encased in polyethylene plastic to prevent changes in moisture content and to preserve in situ physical properties. The samples were classified as to basic type and texture, labeled as to appropriate boring number and depth and placed in boxes for transport to the HJA laboratory.

Soil samples were visually classified according to the Unified Soil Classification System (USCS). The "Log of Boring" illustration for each boring and a key to terms and symbols used on the logs are attached.

To aid in the classification process, Atterberg Limits (ASTM D-4318) and moisture content determinations (ASTM D-2216) were performed on representative samples. Atterberg Limits were determined for portions of selected cohesive samples to estimate the plasticity characteristics of the materials. The Plasticity Index is representative of this characteristic and is bracketed by the Liquid Limit (LL) and the Plastic Limit (PL). The Liquid Limit is the moisture content at and above which the soil will flow as a heavy viscous fluid. The Plastic Limit is the lowest moisture content at which the soil remains plastic. All of the above test data is summarized on Plates 2 and 3.

The potential for heave of the subgrade soils was evaluated using Free-Swell tests. This test involves placing a 1-inch thick sample of soil in a 2.5-inch ID confining ring into a consolidation machine and adding weight equal to the load imposed by the overburden soils at the sample depth. The soil is then inundated with water and allowed to swell freely until movement has stopped. Results of these tests are summarized on Plate 3.

The strength of each cohesive sample was estimated using a hand penetrometer. The results of these estimates are recorded graphically on the "Log of Boring" illustrations. The strength properties of selected soil samples were investigated by Unconfined Compression tests. In the Unconfined Compression test, axial load is applied to a laterally unsupported cylindrical sample until failure occurs within the sample. This test is conducted fairly rapidly (failure within about 10 minutes) and generally conforms to ASTM D-2166 for soil samples. Results of the Unconfined Compression tests performed are summarized on Plate 3.

Selected samples of fill materials were submitted for grain-size analysis (ASTM D-7928) to evaluate the percentage of coarse and fine-grained materials. Results of these tests are presented graphically on Plates 4 through 7.

Surface and Subsurface Conditions

Ridgeway Drive is approximately 1,800 linear feet in length and is generally situated in the eastern portion of Blue Ridge, Texas. Ridgeway Drive runs east-west between Texas Highway 78 and Texas Highway 78 Business. While the distressed portions of the roadway run approximately from Porter Drive to near TX-78 Business, this investigation focused on the most distressed portion of pavement between Crestside Drive and Hilltop Circle, measuring approximately 550 feet in length. This stretch of Ridgeway Drive is bordered by a drainage ditch and single-family residential properties to the north, and undeveloped land to the south primarily occupied by trees and other vegetation. The residential properties to the north of Ridgeway Drive generally slope down towards the roadway, while the undeveloped property to the south slopes down and away from the pavement.

Within the locations drilled, subsurface conditions consisted of fill materials and residual (i.e. formed-in-place) clay soils associated with the Upper Cretaceous Ozan Formation. The specific type, depth, and thickness of materials penetrated by the borings are reflected on the individual "Log of Boring" illustrations, which follow the illustrations for this report.

To access soils below the existing paving at Boring Nos. 1 through 3, the asphalt pavement was cored utilizing a hand operated wet-rotary core drill. The asphalt measured approximately 4-1/8 to 4-1/4 inches in thickness at the locations cored.

Fill materials were encountered directly below the paving at these locations. These fill materials can generally be split into two different strata. The uppermost portion of the fill materials primarily consisted of a combination of light brown to dark brown, highly plastic (CH) to moderately plastic (CL) clay soils with varying concentrations of milled asphalt from the previously existing asphalt roadway, and crushed limestone and concrete that appear to be from the addition of flexible base during the grading process for the new roadway. The milled asphalt and flexible base materials ranged in size from sand sized particles to larger gravel size fragments up to 2-1/2 inches in size. The combination of clay, milled asphalt, and crushed stone and concrete extended to depths of 1-1/2 to 3 feet below existing grades in Boring Nos. 1 through 3, and through the termination depth of 4 feet in Boring No. 4.

Underlying the milled asphalt and flexible base fill materials, the lower stratum of fill materials was encountered. This lower stratum of fill generally consisted of clay soils that were highly plastic (CH), ranged from light brown to dark brown in appearance, contained varying concentrations of ironstones, and extended to depths of 2-1/2 to 6 feet below existing grades. Tree roots measuring approximately 1/8 inch in diameter were encountered in these clay fill materials at an approximate depth of 3-1/2 feet below existing grades in Boring No. 2. Additionally, a thin seam of crushed stone and concrete fragments were encountered in these clay fill materials at an approximate depth of 4-1/2 feet below existing grades in Boring No. 2. It is unknown if this second stratum of clay fill materials is present due to the recent reconstruction, or if this is a remnant of previous construction.

Residual clay soils associated with the Upper Cretaceous Ozan Formation were encountered directly underlying the fill materials in Boring Nos. 1 through 3 at depths of 2-1/2 to 6 feet below existing grades. The residual clay soils were brown, light brown, and light gray in appearance, and ranged from highly plastic (CH) to moderately plastic (CL). The clay soils contained varying concentrations of tree roots, calcareous nodules, iron staining, and ironstones, and continued through the termination depth of 10 feet below existing grades in all three borings.

Soil Moisture and Ground Water Observations

Based on soil moisture and pocket penetrometer values, while isolated samples appeared to be in relatively average to moist conditions in the bottom 2 to 3 feet of the depths drilled for Boring Nos. 1 and 3, the subsurface soil profiles generally appeared to be in a dry moisture condition at the time of the field investigation.

Ground water was not observed during drilling operations or at end of day observations. The presence and depth to ground water is expected to change with seasonal rainfall and irrigation.

Liquidity Index (LI) is a measure of relative moisture content. LI is determined as the difference between the existing moisture content and the Plastic Limit divided by the Plasticity Index. An LI

of 1 or more indicates that the soil moisture content is at or greater than the Liquid Limit. An LI of 0 or less indicates that the moisture content is at or below the Plastic Limit. An LI between 0 and 1 indicates moisture contents in the plastic range between the Plastic Limit and the Liquid Limit. The LIs calculated relative to depth below existing grade are presented in Table No. 1. Plots of the LI versus depth for each boring are presented graphically on the attached Plates 8 through 10.

Table No. 1
LIQUIDITY INDEX VALUES RELATIVE to DEPTH BELOW EXISTING GRADES
Ridgeway Drive - Blue Ridge, Texas

Depth	Boring No. B1	B2	B3	B4
0.0 - 1.0	**-0.20**	**-0.43**	**-0.20**	**-0.53**
1.0 - 2.0	**-0.03**	**-0.25**	**-0.19**	**-0.47**
2.0 - 3.0	**-0.06**	**-0.13**	**-0.10**	**-0.33**
3.0 - 4.0	**-0.05**	**-0.12**	**-0.25**	**-0.55**
4.0 - 5.0	0.02	**-0.12**	**-0.18**	--
5.0 - 6.0	0.03	**-0.17**	**-0.15**	--
6.0 - 7.0	0.07	**-0.05**	**-0.06**	--
7.0 - 8.0	0.10	**-0.04**	0.03	--
8.0 - 9.0	0.12	**-0.04**	0.12	--
9.0 - 10.0	0.28	0.07	0.20	--

From the LI plots on Plates 8 through 10 and the table above, the LI values for Boring No. 1 show the fill and upper foot of the undisturbed clay subgrade to be below 0, indicating dry conditions. Below a depth of 4 feet the LI values are positive, indicating moisture conditions that are relatively less dry and above the plastic limit. For Boring Nos. 2 and 3, fill and clay subgrade soils appear significantly dry to depths of 7 to 9 feet from the pavement surface.

Observations, Findings and Discussion

It is understood that the previous asphalt paving, base, and clay subgrade were milled and mixed together to create the base layer for the new 4-inch asphalt pavement roadway. Additionally, it is understood that flexible base was brought in to raise the grade in some areas. Based on provided information and a review of existing reports, it appears that the new asphalt roadway was approximately constructed during the months of May, June, and July 2019.

Shortly following completion of construction, a representative of HJA visited the site per client request on July 30, 2019. The purpose of this first site visit was to observe the distress that had begun to develop in the eastbound lane near the southern edge of the roadway. During this site visit, several small longitudinal and/or edge cracks were observed in the pavement surface in the eastbound lane. An example of the cracking present at the time of this first site visit is presented in the following Image No. 1. Representatives of both the contractor and project civil engineer were on-site at the time of this site visit. While on-site, the contractor was able to penetrate one of the more developed cracks with the metal wire stem from a survey flag to a depth greater than

12 inches below the existing asphalt surface. The ease with which the metal wire stem penetrated the cracked pavement structure indicates that the cracks developing in the asphalt pavement are most likely a result of reflective cracking due to issues in the underlying base and subgrade rather than fatigue cracking of the asphalt pavement due to loading only.

Image No. 1: Longitudinal cracking near southern edge of Ridgeway Drive, Blue Ridge, Texas, July 30, 2019.

A second site visit was conducted August 23, 2019, at the request of the project civil engineer. The purpose of this site visit was to make additional visual observations concerning the distress developing at the roadway surface. Between the first and second site visit, the initial cracks had been sealed at the surface with a crack sealant material. Although the original cracks had been sealed, the second visit revealed what appeared to be the development of additional distress adjacent to the original cracks. The sealed cracks also appeared to be growing larger in length and width in some areas, resulting in a visible elongation or stretching of the overlying crack sealant. The pavement surface between the cracks and the southern edge of pavement appeared to have dropped or fallen slightly in elevation relative to the majority of the pavement surface. An example of a sealed crack and additional developing cracks noted at the time of the second site visit are presented in the following Image No. 2. Based on the observations collected during the first and second visits, it appeared that cracks were developing in the eastbound lane of pavement due to potential issues in the underlying base and subgrade and adjacent shoulder, and that the distress was worsening over time.

During both the first and second site visit, it was noted that the roadway shoulder along the southern edge of the pavement was at a relatively steep incline. Additionally, the surface of the southern roadway shoulder appeared to primarily consist of loosely placed or dumped soils.

Image No. 2: Sealed crack and new developing cracks near southern edge of Ridgeway Drive, Blue Ridge, Texas, August 23, 2019.

Following the second site visit, the City of Blue Ridge requested that the limited geotechnical investigation presented herein be conducted to determine the potential causes of the developing cracks and distress and provide recommendations for remediation of the distressed pavement. The field investigation was conducted on September 17, 2019 and consisted of gathering further site observations and drilling the four soil borings described in the preceding section. At the time of the field investigation, the cracking in the pavement visually appeared to have worsened since the second site visit conducted by HJA. An example of the extent of pavement cracking at the time of the field investigation adjacent to Boring No. 2 is presented in Image No. 3. In this image, a previously sealed crack can be seen south of the boring location, while a newer large developing crack can be seen just north of the boring location.

Based on the consistency of the materials encountered in the borings conducted for this investigation, the conditions visually observed onsite, review of publicly available aerial imagery, and a review of construction plans, documents, and reports, there appear to be a number of probable causes of distress. These likely causes include potential consolidation and settlement of underlying clay soils due to the presence of heavy vegetation and tree cover directly south of the roadway, possible settlement due to improperly placed fill, and lack of pavement edge support due to poorly placed fill and steep side slopes on the southern shoulder.

Image No. 3: Sealed crack and new developing cracks near southern edge of Ridgeway Drive, adjacent to Boring No. 2, Blue Ridge, Texas, September 17, 2019.

Land south of the pavement edge is occupied by heavy vegetation and tree cover which are adjacent to the pavement edge as presented in Image No. 4. A number of large trees are near the roadway edge, with canopies spanning over the eastbound lane. Over time, trees and other vegetation will desiccate clay soils, resulting in shrinkage of the subgrade. This shrinkage will typically manifest as settlement of ground supported features, including pavement. This is supported by the soils encountered below the paving being in a dry condition, evidenced by the Liquidity Index results of less than zero extending to depths of 4 to 9 feet below existing grades as well as the low moisture contents and high free-swell potential of the clay subgrade soils. Based on the depths the dry materials extend to, and the degree to which the soils had dried out, these conditions can be attributed in part to desiccation of the clays by the adjacent trees.

Image No. 4: Heavy tree cover near presence southern edge of Ridgeway Drive, Blue Ridge, Texas
Google Earth V 7.3.2.5776. (September 6, 2017). Blue Ridge, Texas, United States of America
33° 17' 55.83" N, 96° 23' 49.28" W, Eye alt 1964 feet.
Google Earth. http://www.earth.google.com [October 10, 2019].

The dry unit weights of the upper fill materials sampled from the geotechnical borings were compared to the maximum dry unit weight as determined from the Standard Proctor (ASTM D-698) results developed during construction. These comparisons are presented graphically on Plate 11. Based on these comparisons, samples of fill materials below finished subgrade elevation in Boring Nos. 1, 2 and 4 have dry unit weights less than the specified minimum compaction level of 95% of the maximum dry unit weight as determined by ASTM D-698. If a portion of the fill materials placed below the new pavement surface were placed at lower than specified dry unit weights, these materials would be expected to potentially experience some settlement over time following the completion of construction.

In addition to the low dry unit weight value determined for a portion of the fill encountered in Boring No. 4, the southern shoulder appears to have been raised by several feet in some areas and slopes down away from the roadway at a relatively steep incline. The steep incline of the shoulder in some areas could result in a reduction to the slope stability of the shoulder, particularly at times when the pavement is subjected to traffic loads. The incline of the shoulder slope, in addition to some fill materials in the roadway shoulder appearing as if they were placed at lower than specified densities, appears to have resulted in a loss of lateral support at the pavement edge.

In conclusion, the cracking, lateral movement, and settlement observed in the pavement surface are believed to be a result of one or more of the factors described in this section. Based on the observations made to date and the information developed from the field density testing and geotechnical borings, it appears the deeper fill materials below the asphalt pavement and in the

shoulder were not compacted sufficiently. In addition, the slope of the shoulder appears to be sufficiently steep enough to create an unstable condition, particularly when subjected to heavy or multiple traffic loads. Furthermore, the drying of the native clay soils by the adjacent trees appears to also be contributing to the observed settlement of the southern portion of the asphalt pavement.

Recommendations

Based on the results of this investigation and observations to date, the distress developing in the pavement surface appears to be a result of downwards and lateral movement of the underlying soil strata due to desiccation of the clay soils by the adjacent vegetation and trees, possible settlement of improperly placed fill, and a lack of lateral pavement support due to improperly placed fill and steep roadway shoulder slopes. Currently the pavement is in a serviceable and useable condition and may remain this way for several years. However, based on the short history of this project, major repairs consisting of reworking portions of the subgrade and replacing the asphalt paving should be anticipated within the next few years. This is due not to excessive traffic loads, but to a loss of subgrade support below the pavement and lateral support adjacent to the pavement structure.

Based on this conclusion, three different options are recommended for remediation of the distressed areas with varying degrees of cost and time.

Option 1 – The first option would consist of leaving the trees, vegetation, and pavement in place for the foreseeable future while also regularly monitoring movement and sealing cracks in the pavement. Once movement of the pavement appears to have ceased significantly, repair the pavement surface by either removing and replacing, or overlaying the asphalt surface as needed. Note that this option allows for the greatest amount of future movement of the paving subgrade. Additionally, the pavement may continue to move to the extent that portions of the distressed pavement become unserviceable prior to the movement stopping significantly, resulting in the need for additional pavement and subgrade repairs.

Option 2 – The second option would consist of leaving the pavement in place while removing all trees and vegetation adjacent to the roadway and extending the roadway shoulder to create a minimum 5 Horizontal to 1 Vertical (5H:1V) slope. Upon removal of the trees and vegetation and repair of the roadway shoulder, it is anticipated that a portion of the fill materials will continue to settle while the underlying clay subgrade soils are expected to rehydrate and heave to an extent. It is recommended that the distressed areas of pavement be monitored during this time for movement, and all cracks that develop be sealed regularly. Once movements have stabilized, it is recommended that the distressed areas of asphalt be removed and replaced. Additional amounts of movement and cracking should be anticipated that will require continued maintenance, greater than what is typically expected for low volume asphalt roads. Additionally, the pavement may continue to move to the extent that portions of the distressed pavement become unserviceable prior to the movement stopping significantly, resulting in the need for additional pavement and subgrade repairs.

Option 3 – The third option would consist of full reconstruction of the distressed areas. Full reconstruction would include removal of all trees and vegetation adjacent to the roadway, removal of the asphalt pavement, and moisture conditioning a minimum of 4 feet of existing materials below finished subgrade elevation. This process would consist of excavating to a depth of 3-1/2 feet below final grade, ripping and compacting the base of the excavation to a depth of 6 inches, and then replacing the excavated materials in a controlled manner. All fill should be placed as outlined in the **Earthwork Recommendations** section of this report. Simultaneous to the moisture conditioning operations, it is recommended that the shoulder be reconstructed to a maximum 5H:1V slope. The asphalt paving section may then be replaced per the project plans. As with all asphalt roads and streets, annual maintenance will be necessary to ensure a trafficable surface until the estimated lifespan is exceeded.

Positive drainage away from the paving should be established during construction and maintained throughout the life of the road. The roadway shoulders should be maintained and protected from erosion. Landscaping beds should be designed and maintained to prevent water from ponding next to the foundation.

If possible, trees should not be allowed to grow next to the paving and/or shoulder. Over time, vegetation will desiccate the clays, resulting in shrinkage of the subgrade. This shrinkage will be manifested as settlement of ground supported foundations. All trees should be planted a minimum of 1-1/2 times the mature height of the tree from the edge of the roadway. If trees will be planted next to the paving, future distress in the form and cracking, separation and settlement should be anticipated. To limit the impact heavy vegetation would have on pavement performance, consideration should be given to installing a vertical root barrier between the tree and the foundation. As a minimum the barrier should consist of a four-inch wide lean concrete wall extending to a depth of 6 feet from finished grades. An alternative is to use a minimum 6-mil thick plastic sheet draped within the excavation and backfilled using sand or gravel. Alternatively, a "root-barrier" system similar to that produced by DeepRoot® may be installed along the edge of the shoulder. Vegetation must not be allowed to grow between the pavement edge and root barrier.

Any trees to be cleared from or within ten feet of the roadway should have the root systems removed and the excavations filled with on-site soils placed under controlled conditions. Soils should be placed as presented in the **Earthwork Recommendations** section.

Earthwork Recommendations

Areas that will underlie fill or pavement should be ripped to a depth of 6 inches and compacted to a minimum of 95% of the maximum dry unit weight as determined by ASTM D-698. Moisture contents of the in-place soils should be at least +2 percentage points above optimum.

On-site soils to be used as fill should be placed in maximum eight-inch loose lifts and compacted to a minimum of 95% of the maximum density as determined by ASTM D-698. Moisture content should be at least +2 percentage points above optimum. Each lift placed below fill or the pavement surface should be kept in a moist condition until the following lift of fill is placed.

If additional fill will be required to bring the subgrade to finished elevation, on-site soils or equivalent should be used. These soils should be placed and compacted to the moisture and density as outlined above.

Soils used to backfill around and above below grade utilities should consist of on-site materials. Trench backfill should be placed in eight-inch loose lifts and compacted to a minimum of 95% of the maximum dry unit weight as determined by ASTM D-698. Moisture contents for compacted soils should be at least +2 percentage points above the optimum moisture content as determined by ASTM D-698.

Construction Testing and Observation

Field density tests on any remediated subgrade should be taken at a rate of one test for every 5,000 square-feet of fill, or fraction thereof, per lift within the limits of the pavement and roadway shoulder to confirm that compaction and soil moisture meet the requirements presented herein. Field density testing must be conducted during placement of fill. Samples of the fill material should be submitted to the testing laboratory a minimum of 72 hours prior to commencing earthwork operations to allow for evaluation of the maximum density and optimum moisture of the fill soils.

Qualifications

The analyses and recommendations submitted in this report are based upon the data obtained from the borings drilled for this project and data developed from previous investigations. The nature and extent of subsurface variations at the site may not become evident until repairs and/or new construction is undertaken. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

It is recommended that the geotechnical engineer be provided the opportunity for general review of final design drawings and specifications in order that earthwork and subgrade recommendations may be properly interpreted and implemented in the design drawings and specifications.

LEGEND

SOIL BORING

N

NOT TO SCALE

HENLEY | JOHNSTON & ASSOCIATES 235 MORGAN AVE. DALLAS, TX 75203 I 214.941.3808 I WWW.HJA-ENG.COM TEXAS FIRM REGISTRATION NO. F-1238	RIDGEWAY DRIVE ROADWAY/WATERLINE REPLACEMENT RIDGEWAY DRIVE, BETWEEN CRESTSIDE DRIVE AND HILLTOP CIRCLE BLUE RIDGE, TEXAS BORING LOCATION PLAN	HJA No.: 19823Q DATE: SEPTEMBER 2019 PLATE 1

GEOTECHNICAL INVESTIGATION
REPORT NO. 19823Q
RIDGEWAY DRIVE ROADWAY
RIDGEWAY DRIVE, BETWEEN CRESTSIDE DRIVE AND HILLTOP CIRCLE
BLUE RIDGE, TEXAS

SUMMARY OF INDEX PROPERTIES

BORING NUMBER	DEPTH (ft.)	LIQUID LIMIT (%)	PLASTIC INDEX	DUW (pcf)	FINER #200 (%)	MOISTURE CONTENT (%)	UNIFIED SOIL CLASSIFICATION
1	0.4 – 1.0			115.3	28.9	9.5	
1	1.0 – 2.0	60	42	105.1		16.6	CH
1	2.0 – 3.0			106.6		15.5	
1	3.0 – 4.0			103.2		18.9	
1	4.0 – 5.0	61	40	102.8		21.8	CH
1	5.0 – 6.0					22.2	
1	6.0 – 7.0					20.5	
1	7.0 – 8.0	55	37	102.9		23.1	CH
1	8.0 – 9.0					22.6	
1	9.0 – 10.0					28.2	
2	0.3 – 1.0			119.2		11.3	
2	1.0 – 2.0	47	25		33.8	15.8	CL
2	2.0 – 3.0			105.7		18.7	
2	3.0 – 4.0					15.1	
2	4.0 – 5.0					15.1	
2	5.0 – 6.0	51	32	118.9		13.5	CH
2	6.0 – 7.0					13.2	
2	7.0 – 8.0	49	34	119.2		14.4	CL
2	8.0 – 9.0					13.8	
2	9.0 – 10.0			114.0		17.4	
3	0.3 – 1.0			120.8		9.7	
3	1.0 – 2.0			110.2	15.3	10.1	
3	2.0 – 3.0			113.8		13.6	
3	3.0 – 4.0			117.6		13.3	
3	4.0 – 5.0					15.5	
3	5.0 – 6.0	52	31	113.5		16.2	CH
3	6.0 – 7.0					19.1	
3	7.0 – 8.0			110.5		19.1	
3	8.0 – 9.0	55	35	99.7		22.4	CH
3	9.0 – 10.0					25.4	

GEOTECHNICAL INVESTIGATION
REPORT NO. 19823Q
RIDGEWAY DRIVE ROADWAY
RIDGEWAY DRIVE, BETWEEN CRESTSIDE DRIVE AND HILLTOP CIRCLE
BLUE RIDGE, TEXAS

SUMMARY OF INDEX PROPERTIES

BORING NUMBER	DEPTH (ft.)	LIQUID LIMIT (%)	PLASTIC INDEX	DUW (pcf)	FINER #200 (%)	MOISTURE CONTENT (%)	UNIFIED SOIL CLASSIFICATION
4	0.0 – 1.0				33.4	8.8	GC
4	1.0 – 2.0			106.1		10.2	
4	2.0 – 3.0					13.8	
4	3.0 – 4.0					8.3	

SUMMARY OF FREE-SWELL TESTS

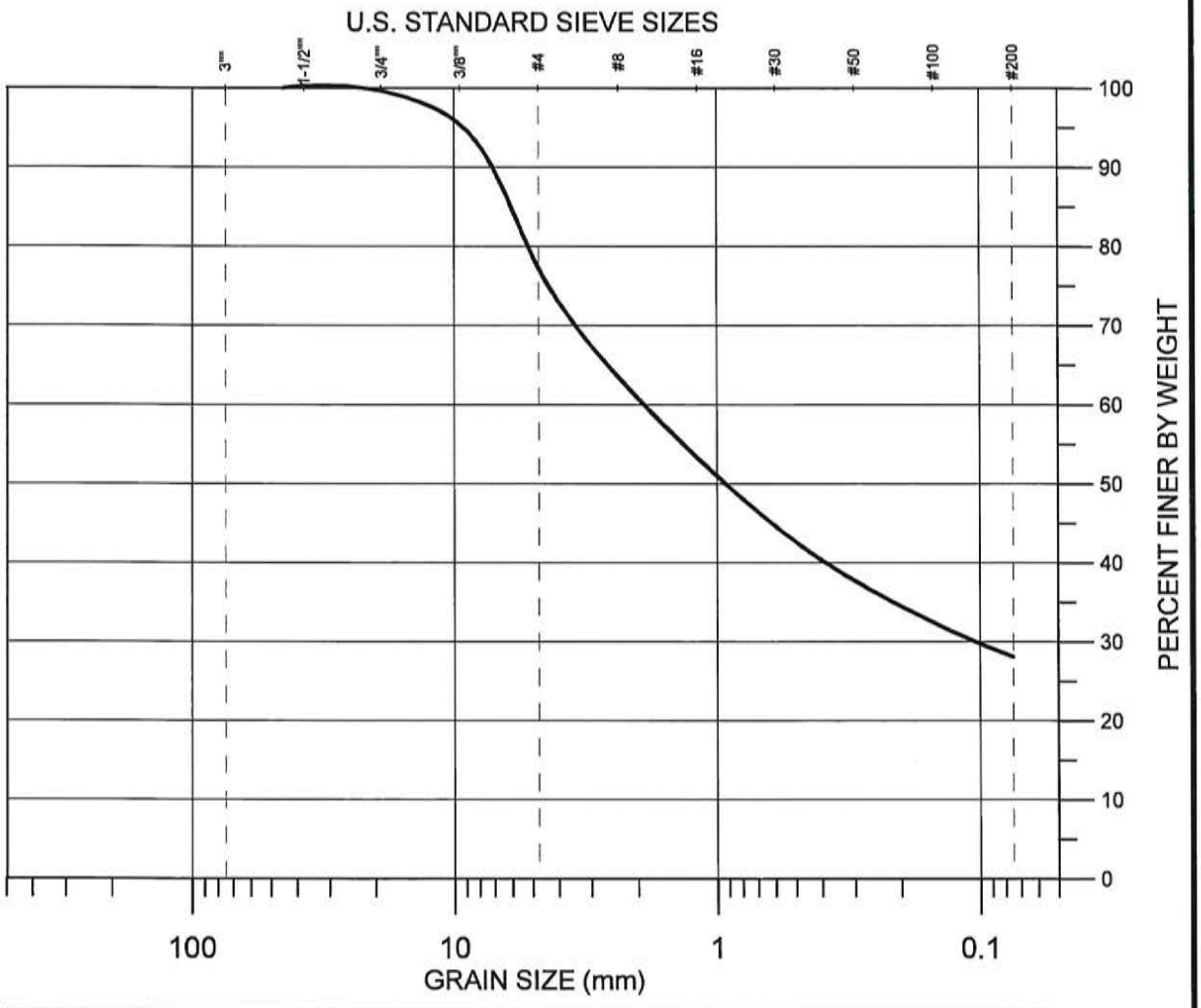
BORING NUMBER	DEPTH (ft.)	SWELL PRESSURE (psf)	GAIN IN MOISTURE (%)	PERCENT SWELL (%)	MATERIAL DESCRIPTION
1	4.0 – 5.0	578.0	4.3	2.9	CLAY, very stiff to hard, brown
1	7.0 – 8.0	1,012.0	2.4	1.2	CLAY, very stiff to hard, light brown and light gray
2	5.0 – 6.0	723.0	7.3	8.5	FILL: CLAY, hard, dark brown
2	7.0 – 8.0	1,009.0	6.9	8.1	CLAY, hard, brown, light brown and light gray
3	5.0 – 6.0	722.0	6.0	6.5	CLAY, very stiff to hard, brown
3	8.0 – 9.0	1,158.0	3.6	1.2	CLAY, very stiff to hard, brown

SUMMARY OF UNCONFINED COMPRESSION TESTS - SOIL

BORING NUMBER	DEPTH (ft.)	PEAK STRESS (psi)	FAILURE STRAIN (%)	MATERIAL DESCRIPTION
1	2.0 – 3.0	57.7	3.1	FILL: CLAY, hard, brown and light brown
1	3.0 – 4.0	60.1	4.0	CLAY, very stiff to hard, brown
2	0.3 – 1.0	22.3	3.5	FILL: CLAY, hard, brown
2	2.0 – 3.0	95.2	3.4	FILL: CLAY, hard, brown
3	0.3 – 1.0	93.4	4.2	FILL: CLAY, hard, light brown
3	2.0 – 3.0	128.3	5.0	FILL: CLAY, hard, light brown
3	3.0 – 4.0	186.8	5.3	CLAY, very stiff to hard, brown

TEST TYPE:GRAIN SIZE ANALYSIS
(ASTM D 7928)

BORING No.: 1
SAMPLE DEPTH (FT.): 0.0-1.0
FILL: CLAY, with milled asphalt and crushed limestone fragments, hard, brown



COBBLES	GRAVEL		SAND			SILT or CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

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RIDGEWAY DRIVE ROADWAY/WATERLINE REPLACEMENT
RIDGEWAY DRIVE, BETWEEN CRESTSIDE DRIVE AND HILLTOP CIRCLE
BLUE RIDGE, TEXAS

HJA NO.: 19823Q

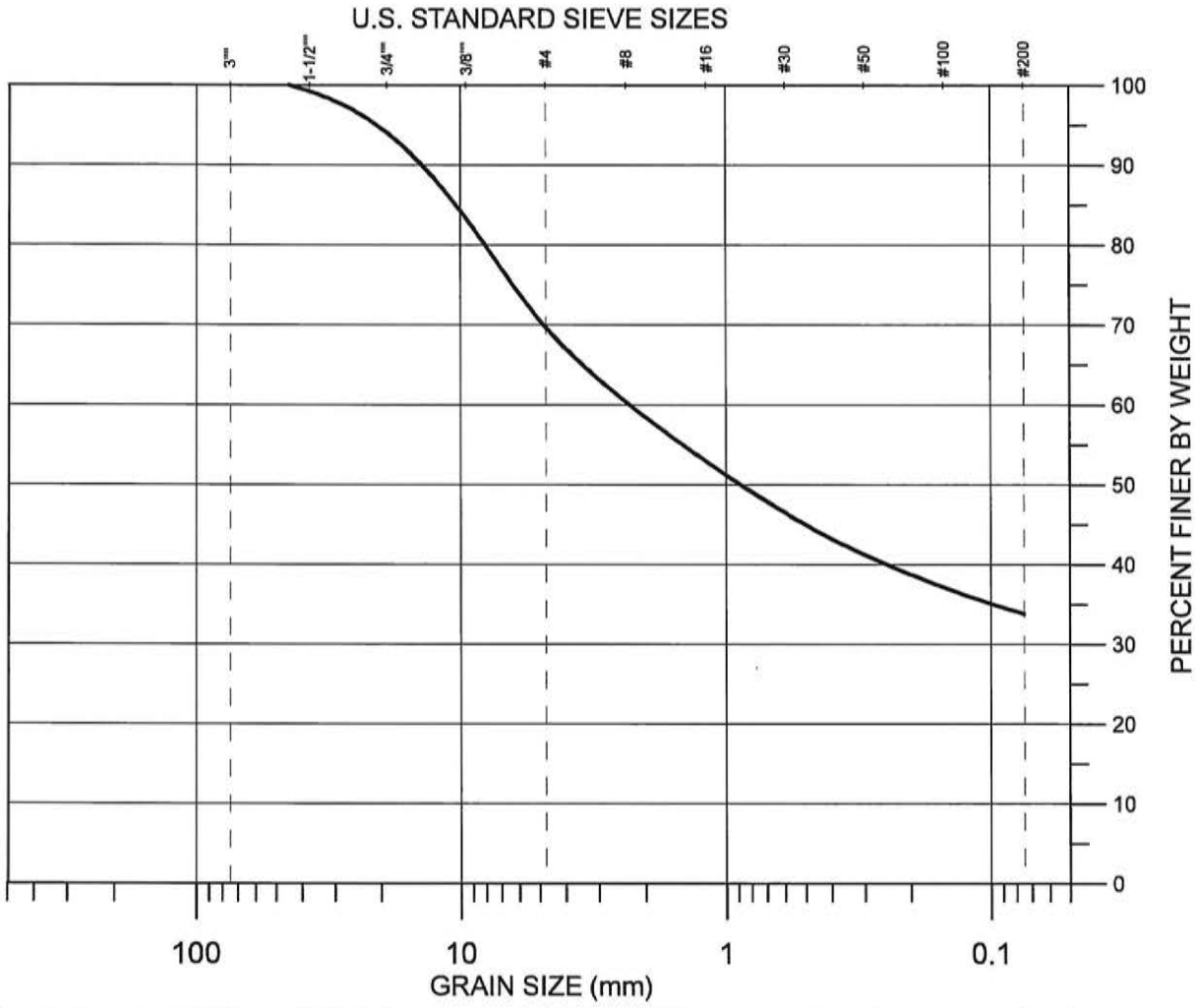
DATE TESTED: 09/27/19

GRAIN SIZE DISTRIBUTION

PLATE 4

TEST TYPE:GRAIN SIZE ANALYSIS
(ASTM D 7928)

BORING No.: 2
SAMPLE DEPTH (FT.): 1.0-2.0
FILL: CLAY, with trace milled asphalt and crushed stone/concrete fragments, hard, brown



COBBLES	GRAVEL		SAND			SILT or CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

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RIDGEWAY DRIVE, BETWEEN CRESTSIDE DRIVE AND HILLTOP CIRCLE
BLUE RIDGE, TEXAS

HJA NO.: 19823Q

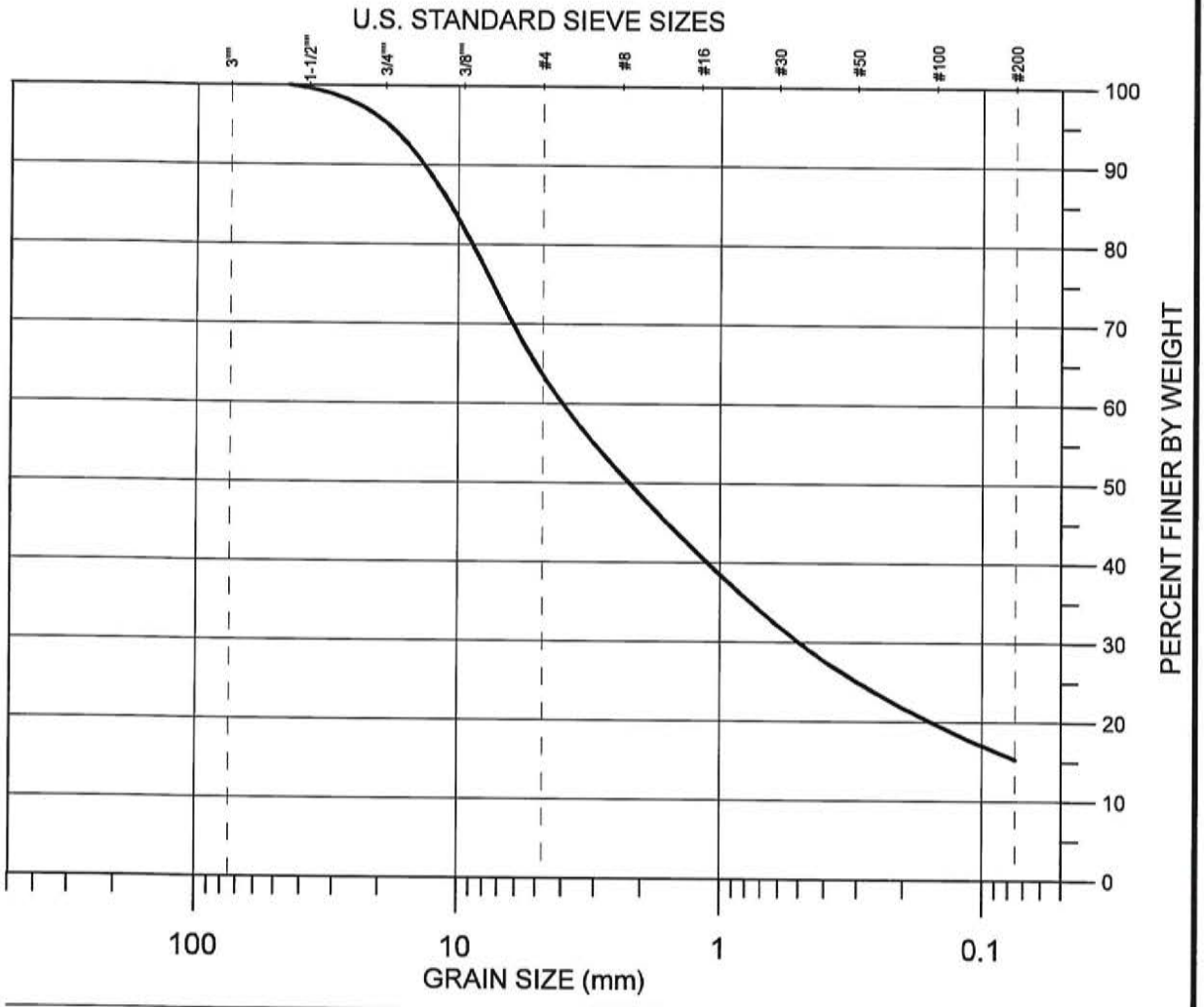
DATE TESTED: 09/27/19

GRAIN SIZE DISTRIBUTION

PLATE 5

TEST TYPE:GRAIN SIZE ANALYSIS
(ASTM D 7928)

BORING No.: 3
SAMPLE DEPTH (FT.): 1.0-2.0
FILL: CLAY, with trace milled asphalt and crushed limestone fragments, hard, light brown



COBBLES	GRAVEL		SAND			SILT or CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

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BLUE RIDGE, TEXAS

HJA NO.: 19823Q

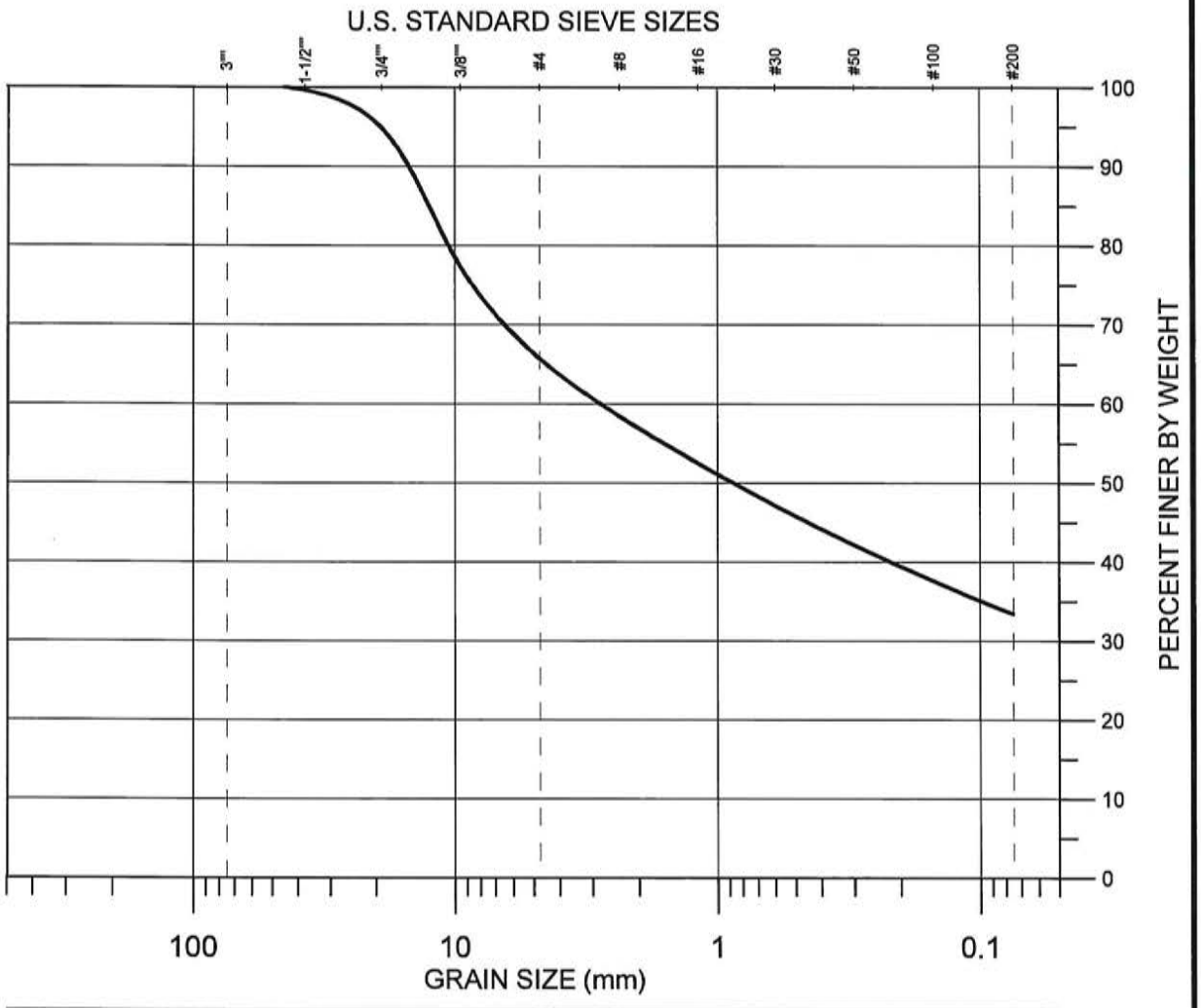
DATE TESTED: 09/27/19

GRAIN SIZE DISTRIBUTION

PLATE 6

TEST TYPE:GRAIN SIZE ANALYSIS
(ASTM D 7928)

BORING No.: 4
SAMPLE DEPTH (FT.): 0.0-1.0
FILL: CLAY, with milled asphalt and crushed stone/concrete fragments, very stiff, brown



COBBLES	GRAVEL		SAND			SILT or CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

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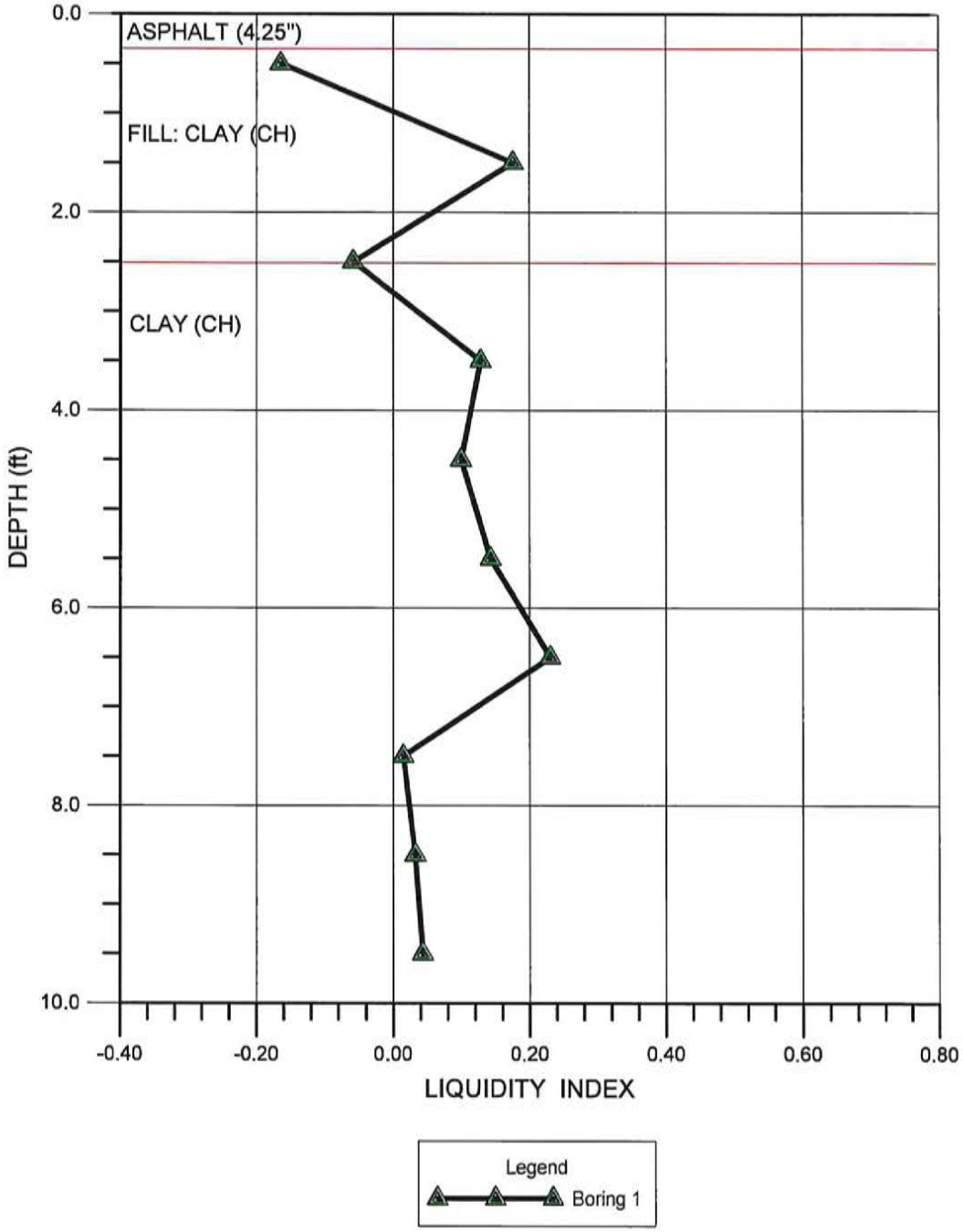
RIDGEWAY DRIVE, BETWEEN CRESTSIDE DRIVE AND HILLTOP CIRCLE
BLUE RIDGE, TEXAS

HJA NO.: 19823Q

DATE TESTED: 09/27/19

GRAIN SIZE DISTRIBUTION

PLATE 7



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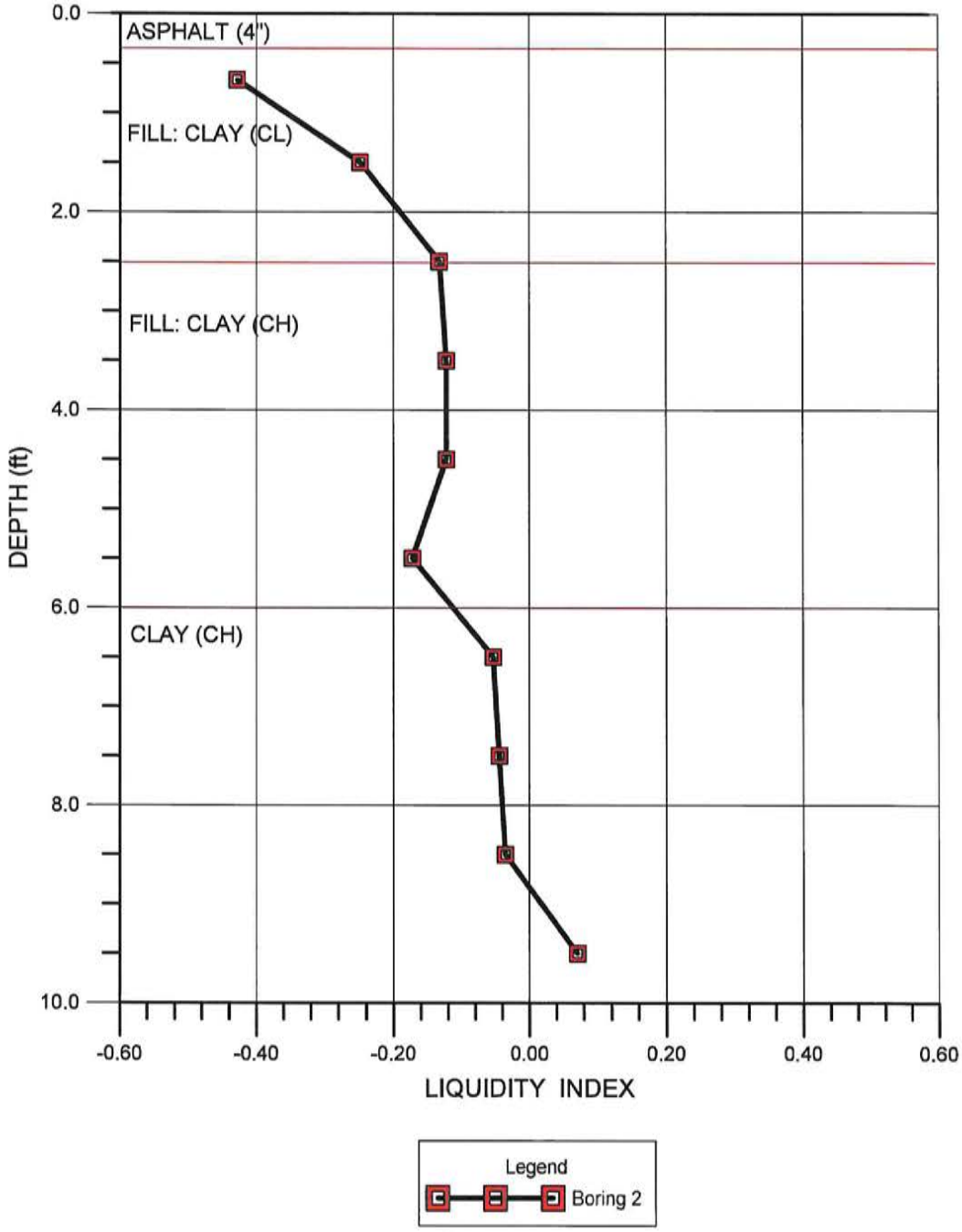

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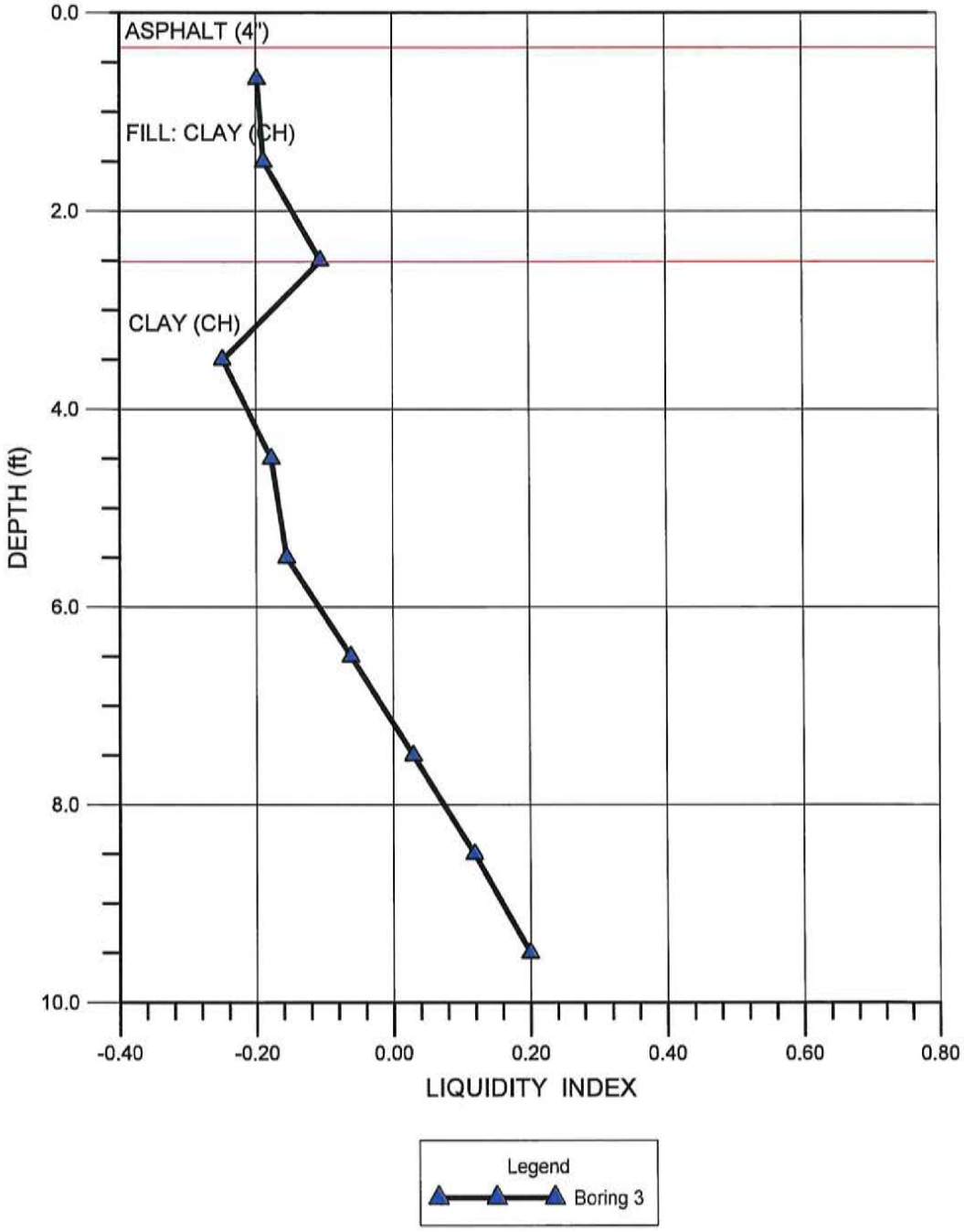
LIQUIDITY INDEX

PLATE 9



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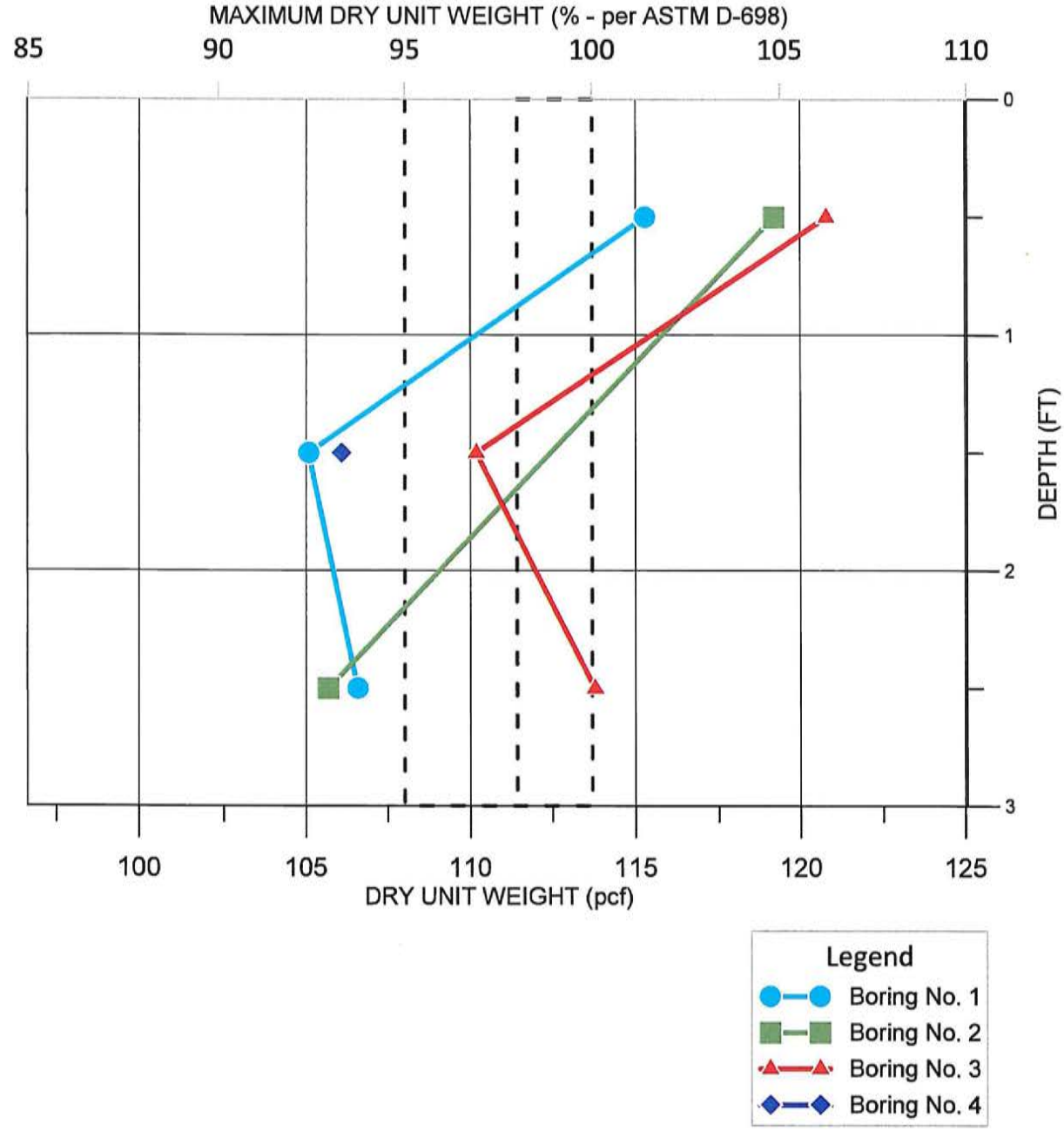

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RIDGEWAY DRIVE, BETWEEN CRESTSIDE DRIVE
AND HILLTOP CIRCLE
BLUE RIDGE, TEXAS

HJA NO.: 19823Q

DATE TESTED: 09/27/19

DRY UNIT WEIGHT COMPARISON

PLATE 11

HENLEY | JOHNSTON & ASSOCIATES TEXAS FIRM REGISTRATION NO. F-1238	LEGEND, LITHOLOGY, SOIL CONSISTENCY & RELATIVE ROCK HARDNESS Ridgeway Drive Roadway Ridgeway Drive, between Crestside Drive and Hilltop Circle Blue Ridge, Texas	# OF BORINGS: 4 PROJECT No.: 19823Q DRILL DATE: 9/17/19 METHOD: Shelby Tube to 4'

Strata symbols

- PAVEMENT
- FILL
- HIGH PLASTICITY CLAYS (CH)
- LOW PLASTICITY CLAYS, SANDY CLAYS, OR GRAVELLY CLAYS (CL)

Misc. Symbols

- Pocket Penetrometer (tsf)

Soil Samplers

- Undisturbed thick wall Shelby tube
- Auger bag sample

FOR SANDS, GRAVELS, & SANDY SILTS

Modified from Peak, Hanson & Thornburn (1974)

Consistency	Standard Penetration Resistance (N)
Very Loose	Less than 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	Greater than 50

FOR CLAYS AND SANDY CLAYS
(COHESIVE SOILS)

Modified from Peak, Hanson & Thornburn (1974)

Consistency	Unconfined Compression (tsf)	Standard Penetration Resistance (N)
Very Soft	Less than 0.25	Less than 2
Soft	0.25 to 0.5	2 to 4
Medium Stiff	0.5 to 1.0	4 to 8
Stiff	1.0 to 2.0	8 to 15
Very Stiff	2.0 to 4.0	15 to 30
Hard	Greater than 4.0	Greater than 30

RELATIVE HARDNESS MODIFIERS (ROCK)
(RELATED TO FRESH SAMPLE)

Modified from SCS EWP, Tech Guide No. 4

Hardness	Rule of Thumb Test
Soft	Permits denting by moderate finger pressure
Firm	Resists denting by fingers but can be penetrated by pencil point to medium to shallow depth (No. 2 pencil)
Mod. Hard	Very shallow penetration of pencil point, can be scratched by knife and in some instances cut with knife
Hard	No pencil penetration, can be scratched with knife, can be broken by light to moderate hammer blows
Very Hard	Cannot be scratched by knife, can be broken by repeated hammer blows

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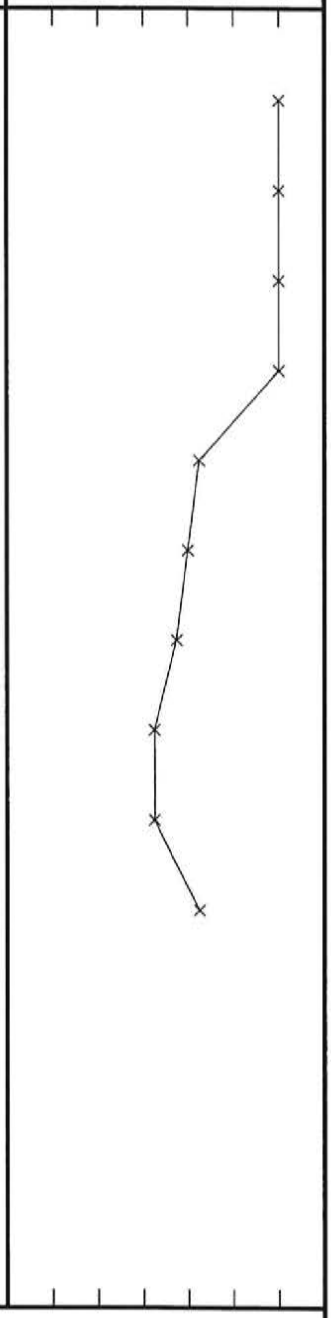
DRILL DATE: 9/17/19
METHOD: Shelby Tube to 10'

LOG OF BORING

Ridgeway Drive Roadway
Ridgeway Drive, between Crestside Drive and Hilltop Circle
Blue Ridge, Texas

PROJECT No.: 19823Q
BORING No.: 1
STATION:
SHEET: 1 of 1
LOCATION: See Plate 1
GROUND ELEVATION:

DEPTH (feet)	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	ELEVATION (feet)	CORE RECOVERED (ft.)	CORE RQD (%)
0			ASPHALT (4.25")			
			FILL: CLAY, with milled asphalt and crushed limestone fragments (approximate average nominal size 1/4" to 1/2"), hard, brown			
2			FILL: CLAY, hard, brown and light brown			
			CLAY, with calcareous nodules and fine tree roots, very stiff to hard, brown			
4						
6			CLAY, with calcareous nodules and iron staining, very stiff to hard, light brown and light gray			
8						
10			TOTAL DEPTH: 10.0'			
12						
14						



Ground Water During Drilling (ft.): DRY

Ground Water After Drilling (ft.): DRY

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DRILL DATE: 9/17/19
METHOD: Shelby Tube to 10'

LOG OF BORING

Ridgeway Drive Roadway
Ridgeway Drive, between Crestside Drive and Hilltop Circle
Blue Ridge, Texas

PROJECT No.: 19823Q
BORING No.: 2
STATION:
SHEET: 1 of 1
LOCATION: See Plate 1
GROUND ELEVATION:

DEPTH (feet)	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	ELEVATION (feet)	CORE RECOVERED (ft.)	CORE RQD (%)
0			ASPHALT (4.125")			
			FILL: CLAY, with milled asphalt and crushed stone/concrete fragments (approximate average nominal size 1" to 2"), hard, brown			
			FILL: CLAY, with trace milled asphalt and crushed stone/concrete fragments, brown			
2			FILL: CLAY, with crushed stone/concrete fragments, hard, brown			
			FILL: CLAY, with ironstones, hard, dark brown - tree roots (approximately 1/8" diameter)			
4			- seam of crushed stone/concrete fragments encountered at a depth of 4-1/2 feet			
6			CLAY, with calcareous nodules and ironstones, hard, brown, light brown and light gray			
8						
10			TOTAL DEPTH: 10.0'			
12						
14						

TxDOT CPT (inches per 100 blows) 1 2 3 4 5 6

STANDARD PENETRATION (BPF) + 10 20 30 40 50 60

POCKET PENETROMETER × (tsf) 1 2 3 4 + ++

Ground Water During Drilling (ft.): DRY

Ground Water After Drilling (ft.): DRY

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DRILL DATE: 9/17/19
METHOD: Shelby Tube to 10'

LOG OF BORING

Ridgeway Drive Roadway
Ridgeway Drive, between Crestside Drive and Hilltop Circle
Blue Ridge, Texas

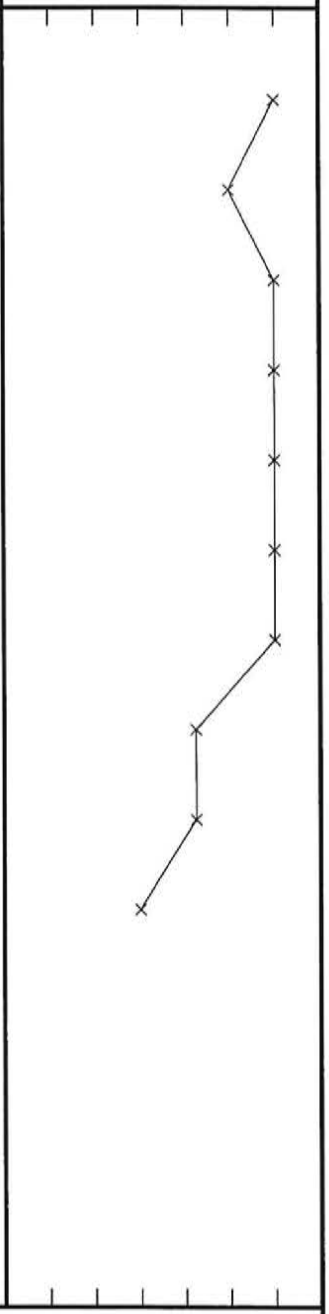
PROJECT No.: 19823Q
BORING No.: 3
STATION:
SHEET: 1 of 1
LOCATION: See Plate 1
GROUND ELEVATION:

DEPTH (feet)	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	ELEVATION (feet)	CORE RECOVERED (ft.)	CORE RQD (%)
0			ASPHALT (4.25")			
			FILL: CLAY, with milled asphalt and crushed limestone fragments (approximate average nominal size 1/4" to 1/2"), hard, light brown			
			FILL: CLAY, with trace milled asphalt and crushed limestone fragments, hard, light brown			
2			FILL: CLAY, hard, light brown			
			CLAY, with calcareous nodules, very stiff to hard, brown			
4						
6						
8						
10			TOTAL DEPTH: 10.0'			
12						
14						

TxDOT CPT @ (inches per 100 blows) 1 2 3 4 5 6

STANDARD PENETRATION (BPF) + 10 20 30 40 50 60

POCKET PENETROMETER × (tsf) 1 2 3 4 + ++



Ground Water During Drilling (ft.): DRY

Ground Water After Drilling (ft.): DRY

HJA HENLEY | JOHNSTON

DRILL DATE: 9/17/19
METHOD: Shelby Tube to 4'

LOG OF BORING

Ridgeway Drive Roadway
Ridgeway Drive, between Crestside Drive and Hilltop Circle
Blue Ridge, Texas

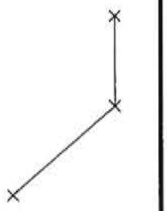
PROJECT No.: 19823Q
BORING No.: 4
STATION:
SHEET: 1 of 1
LOCATION: See Plate 1
GROUND ELEVATION:

DEPTH (feet)	SYMBOL	SAMPLES	MATERIAL DESCRIPTION	ELEVATION (feet)	CORE RECOVERED (ft.)	CORE RQD (%)
0			FILL: CLAY, calcareous, with milled asphalt and crushed stone/ concrete fragments (approximate average nominal size 1/2" to 1-1/2"), very stiff, brown			
2			FILL: CRUSHED STONE/CONCRETE FRAGMENTS (approximate average nominal size 1/4" to 2-1/2"), clayey, light gray and brown			
			- tree roots (approximately 1/2" diameter)			
4			TOTAL DEPTH: 4.0'			
6						
8						
10						
12						
14						

TxDOT CPT (inches per 100 blows) 1 2 3 4 5 6

STANDARD PENETRATION (BPF) + 10 20 30 40 50 60

POCKET PENETROMETER × (tsf) 1 2 3 4 + ++



Ground Water During Drilling (ft.): DRY

Ground Water After Drilling (ft.): DRY