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PAVEMENT DESIGN REPORT
FLYING HORSE NORTH, FILING NO. 3
EL PASO COUNTY, COLORADO

PCD File No. SF2326

Prepared for:
Flying Horse North, LLC
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Colorado Springs, CO 80904

Attn: Adam Doyle

November 4, 2024

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Lucas Morrison
Geotechnical Engineering Staff

Reviewed by:

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Date: 11/04/24

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Date: 11/13/2024 3:19:04 PM
El Paso County Department of Public Works

LJM:JCG/ljm

Entech Job No. 231192

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1 Introduction

Entech Engineering, Inc. (Entech) completed a subsurface exploration program, laboratory testing, and pavement design for roadways within the Flying Horse North, Filing No. 3. This report describes the subsurface exploration program conducted for the proposed roadway improvements and provides pavement section alternatives and construction recommendations. Entech participated in this project as a subconsultant to Classic Communities. The contents of this report, including the pavement design recommendations, are subject to the limitations and assumptions presented in Section 7.

2 Project Description

The site is located southwest of the intersection of Hodgen Road and Black Forest Road within Flying Horse North, Filing No. 3, in El Paso County, Colorado (Figure 1). The proposed improvements include the paving of sections of Allen Ranch Road, Quartz Creek Drive, and the entirety of Bourbon Court. The extent of our investigation is shown in Figure 2.

At the time of our subsurface exploration program, the existing roadway had been rough-graded and utilities had been installed. Surrounding properties are comprised of vacant land, land being developed for future residential lots, and an existing subdivision. Based on the development plans, the roadways are designated as urban local roadways.

3 Subsurface Explorations and Laboratory Testing

3.1 Subsurface Exploration Program

Subsurface conditions at the project site were explored by 26 test borings, designated TB-1 through TB-26, drilled on October 16, 2024. The locations of the test borings are shown on the Site and Exploration Plan (Figure 2). The borings were drilled to depths of 5 to 10 feet below the existing ground surface (bgs). The drilling was performed using a truck-mounted, continuous flight auger drill rig supplied and operated by Entech. Descriptive boring logs providing the lithologies of the subsurface conditions encountered during drilling are presented in Appendix A. Groundwater levels were measured in each of the open boreholes at the conclusion of drilling.

Soil and bedrock samples were obtained from the borings utilizing the Standard Penetration Test (ASTM D1586) using a split-barrel California sampler. Results of the Standard Penetration Test (SPT) are included on the boring logs in terms of N-values expressed in blows per foot (bpf). Soil

and bedrock samples recovered from the borings were visually classified and recorded on the boring logs. The soil classifications were later verified utilizing laboratory testing and grouped by soil type. The soil type numbers are included on the boring logs. It should be understood that the soil descriptions shown on the boring logs may vary between boring location and sample depths. It should also be noted that the lines of stratigraphic separation shown on the boring logs represent approximate boundaries between soil types and the actual stratigraphic transitions may be more gradual or variable with location.

3.2 Geotechnical Index and Engineering Property Testing

Water content testing (ASTM D2216) was performed on the samples recovered from the borings, and the results are shown on the boring logs. Grain-Size Analysis (ASTM D422) and Atterberg Limits testing (ASTM D4318) were performed on selected samples to assist in classifying the materials encountered in the borings.

One-dimensional swell or collapse testing (ASTM D4546) was performed on select samples to determine the swell or collapse potential of the soil. For pavement design, a modified proctor (ASTM D1557) and California Bearing Ratio (CBR) test (ASTM D1883) were completed. Soluble sulfate testing was performed on select soil samples to evaluate the potential for below-grade degradation of concrete due to sulfate attack. The laboratory testing results are presented in Appendix B and summarized in Table B-1.

Strength testing was performed on two sets of soil/cement composite samples for both, Soil Type 1 and Soil Type 2. Testing was performed on soil samples prepared with 2% and 4% Portland Cement Type 1L. A compression strength of 125 pounds per square inch (psi) is recommended for cement-stabilized subgrade. The 6-day average strength value of the 2% mix was 205 psi and 184 psi, respectively and the 6-day strength of the 4% mix was 232 psi and 211 psi, respectively. A 2% mix is recommended based on the laboratory test results. A summary of the testing results is attached in Appendix B, Table B-2.

4 Subgrade Conditions

Two primary soil types and one bedrock type were encountered in the test borings drilled for the subsurface investigation. Each soil type was classified in accordance with the Unified Soil Classification System (USCS) and the American Association of State Highway and Transportation

Officials (AASHTO) soil classification system using the laboratory testing results and the observations made during drilling.

4.1 Subsurface Conditions

Subsurface conditions along the proposed roadways consisted of loose to dense silty sand and sand with silt fill (Soil Type 1, AASHTO A-1-b, A-2-4, and A-2-6) and loose to dense clayey to silty sand fill and stiff to very stiff sandy clay fill (Soil Type 2, AASHTO A-4 and A-6). Extremely weak to very weak sandstone bedrock, or very dense silty sand or sand with silt when classified as a soil (Soil Type 3, AASHTO A-1-b, A-2-6) was encountered in three of the test borings. Water soluble sulfate testing results showed 0.00% sulfates which indicates that the soils exhibit a negligible potential for sulfate attack.

4.2 Groundwater

Groundwater was not encountered in the test borings. Groundwater fluctuations are possible and will depend on seasonal variations, local precipitation, runoff, and other factors, however, we do not anticipate groundwater to affect the proposed construction.

5 Pavement Design Recommendations

Pavement design recommendations were made in accordance with the *El Paso County Engineering Criteria Manual (ECM).*

5.1 Subgrade Conditions

California Bearing Ratio (CBR) testing was performed on representative samples of the Soil Type 1 silty sand fill subgrade from TB-3 and from Soil Type 2 clayey sand fill from TB-21 to determine the support characteristic of the subgrade soils. The results of the CBR testing are presented in Appendix B and summarized in Exhibit 1.

Exhibit 1: Subsurface Laboratory Testing Summary

Design Parameter	Value	
Soil Type	1 – Silty Sand Fill	2 – Clayey Sand Fill
CBR at 95%	18.2	6.5
Design CBR	10	6.5
Liquid Limit	NV	28
Plasticity Index	NP	7
Percent Passing 200	27.9	48.3
AASHTO Classification	A-2-4	A-4
Unified Soils Classification	SC	SC

5.2 Swell Mitigation

El Paso County requires swell mitigation for soils with swell testing results greater than 2% under a 150 pounds per square foot (psf) surcharge. Based on the subgrade soils classification and swell testing, mitigation for expansive soils will not be required on this site.

5.3 Traffic Loading

Traffic data is not available for the future interior roads in the Flying Horse North, Filing No. 3 subdivision; however, the Quartz Creek Drive, Bourbon Court and portions of Allen Ranch Road, are classified as rural local roadways based on current development plans. Allen Ranch Road is also classified as an urban local roadway between STA 52+79.43 and STA 78+06.31 where the proposed roadway ties into the existing Allen Ranch Road. Refer to the Traffic Impact Study, *Flying Horse North Filing 3 / Traffic Generation Analysis PCD File No. SF2326, SM ROCHA, LLC TRAFFIC AND TRANSPORTATION CONSULTANTS* for additional information. The *El Paso County Engineering Criteria Manual* provides default 18-kip equivalent single axle loadings (ESAL) based on the street classifications (ECM Section D.3.3, Table D-2). For design, default ESAL values of 292,000 and 36,500 were used for the urban local roadway (Allen Ranch Road) and rural local roadway (Quartz Creek Drive, Bourbon Court, and portions of Allen Ranch Road) designations, respectively.

5.4 Pavement Design

The pavement sections were determined utilizing the *El Paso County Engineering Criteria Manual*, the CBR testing, and default ESALs. Design parameters used in the pavement analysis are presented in Exhibit 2.

Exhibit 2: Pavement Design Parameters

Design Parameter	Value
Reliability - Urban Local	80%
Reliability – Rural Local	75%
Standard Deviation	0.45
Serviceability Loss (Δ psi)	2.5
Design CBR	6.5
Resilient Modulus	9,750 psi
Structural Coefficients	
Hot Bituminous Pavement	0.44
Aggregate Base Course	0.11
Recycled Concrete Base	0.11
Cement Stabilized Subgrade	0.11

Pavement section alternatives recommended for the roadways included in this phase filing are summarized in Exhibit 3. The pavement design calculations are presented in Appendix C.

Exhibit 3: Recommended Pavement Sections

Pavement Area	Roadway Classification	Design ESAL	Alternative [1]
Allen Ranch Road	Urban Local	292,000	1. 3.5 inches HMA over 8.0 inches ABC/RCB
			2. 3.5 inches HMA over 8.0 inches CTS
Allen Ranch Road, Quartz Creek Drive, Bourbon Court	Rural Local	36,500	1. 3.0 inches HMA over 4.0 inches ABC/RCB
			2. 3.0 inches HMA over 8.0 inches CTS

ABC = Aggregate Base Course; ESAL = equivalent single axle loads; HMA = Hot Mix Asphalt; CTS = Cement Treated Soil; RCB= Recycled Concrete Base

Notes:

1. The use of CTS will require a deviation request approval.

6 Construction Recommendations

Pavement design recommendations provided herein are contingent on good construction practices, and poor construction techniques may result in poor performance. Our analyses assumed that this project will be constructed according to the *El Paso County Engineering Criteria Manual* and the *Pikes Peak Region Asphalt Paving Specifications*.

6.1 Earthwork Recommendations for Pavement Subgrade

Proper subgrade preparation is required for adequate pavement performance. Paving areas should be cleared of all deleterious materials including but not limited to: existing pavements, utility poles, and fence poles. Surface vegetation, if any, should be removed by stripping, with the

depth to be field determined. Isolated pockets of high cohesive soils such as those encountered in boring TB-22 should be removed and replaced with granular fill. Granular soils can be placed in accordance with Section 6.1.3.

6.1.1 Subgrade Preparation – Unbound Base Alternatives

If pavement section alternatives are selected utilizing aggregate base course (ABC) or Recycled Concrete Base (RCB), the final subgrade surface should be scarified to a depth of 8 inches, moisture conditioned within +/- 2% of the optimum water content, and recompacted to 95% of the Modified Proctor (ASTM 1557) maximum dry density.

The compacted surface below pavements should be proof-rolled with a fully loaded, tandem-axle, 10-yard dump truck or equivalent. Any areas, that are delineated to be soft, loose, or yielding during proof-rolling should be removed and reconditioned or replaced.

6.1.2 Subgrade Preparation – Cement Treated Subgrade

Prior to placement of cement stabilization a preliminary proof roll should be completed with a fully loaded, tandem-axle, 10-yard dump truck or equivalent. Any areas that are delineated to be soft, loose, or yielding during proof-rolling should be removed and reconditioned or replaced.

Following the preliminary proof roll, the subgrade shall be stabilized by the addition of cement. The amount of cement applied shall be a minimum of 2% (by weight) of the subgrade's maximum dry density as determined by the Modified Proctor (ASTM D1557) for granular soils or by the Standard Proctor (ASTM D698) for cohesive soils. The cement should be spread evenly on the subgrade surface and be thoroughly mixed into the subgrade such that a uniform blend of soil and cement is achieved to the CTS design depth. Compaction of the cement-stabilized subgrade should be completed to obtain at least 95% of the subgrade maximum dry density as determined by the Modified Proctor (ASTM D1557) or by the Standard Proctor (ASTM D698). Satisfactory compaction of the subgrade shall occur within 90 minutes from the time of mixing the cement into the subgrade.

The following conditions shall be observed as part of the subgrade stabilization:

- Type I/II or Type 1L cement as supplied; a local supplier shall be used. All cement used for stabilization should come from the same source. If cement sources are changed, a new laboratory mix design should be completed.
- Moisture conditioning of the subgrade and/or mixing of the cement into the subgrade shall not

occur when soil temperatures are below 40 degrees F. Cement treated subgrades should be maintained at a temperature of 40 degrees F or greater until the subgrade has been compacted as required.

- Cement placement, cement mixing, and compaction of the cement treated subgrade should be observed by Entech Engineering. Testing should include in-situ compaction tests and representative compacted specimens of the treated subgrade material for subsequent laboratory quality assurance testing. Testing reports will be provided to El Paso County as construction progresses.
- A minimum 7-day CTS compressive strength of 125 psi must be achieved.
- Soil strengths in excess of 275 psi will require microfracturing. Microfracturing will be completed using the Standard Method as defined by the *City of Colorado Springs Draft Standard Specification,* Section 305 – Chemically Treated Subgrade. Microfracturing will be performed with the same (or equivalent tonnage) steel drum vibratory roller used for compaction of the CTS. A minimum of 12-ton roller shall be used. Three full passes with the roller operating at maximum amplitude and traveling at 2- 3 mph shall be applied. If the treated material breaks up excessively at the surface, the vibration amplitude shall be decreased or eliminated.

6.1.3 Fill Placement and Compaction

Granular fill placed as part of the pavement subgrade shall consist of non-expansive, granular soil, free of organic matter, unsuitable materials, debris, and cobbles greater than 3 inches in diameter. Additionally, any granular fill placed as part of the roadway subgrade should have a minimum CBR of 6. All granular fill placed within the pavement subgrade should be compacted to a minimum of 95% of the Modified Proctor (ASTM D1557) maximum dry density at +/-2% of optimum moisture content. Fill material should be placed in horizontal lifts such that each finished lift has a compacted thickness of 6 inches or less. Entech should approve any imported fill to be used within the pavement subgrade area prior to delivery to the site.

6.1.4 Aggregate Base Course and Recycled Concrete Base

ABC or RCB materials shall conform to the *El Paso County Standard Specifications Manual*, Section 300 Aggregate Base Course. ABC or RCB materials should be compacted to a minimum of 95% of the Modified Proctor (ASTM D1557) maximum dry density within +/-2% of optimum moisture content.

6.2 Concrete Degradation Due to Sulfate Attack

Sulfate solubility testing was conducted on several samples recovered from the test borings to evaluate the potential for sulfate attack on concrete. The test results indicated less than 0.01% soluble sulfate (by weight). The test results indicate the sulfate component of the in-place soils presents a negligible to severe exposure threat to concrete placed below the site grade.

As presented in *Evaluation of Selected Pavement Specifications and Responses to Questions Relevant to Design and Construction of Cement-Treated Soil and Aggregate Layers in El Paso County, Colorado* report from Spencer Gutherie and Robert Stevens dated March 13, 2024 soils with less than 3,000 ppm (0.3%) do not require special construction practices.

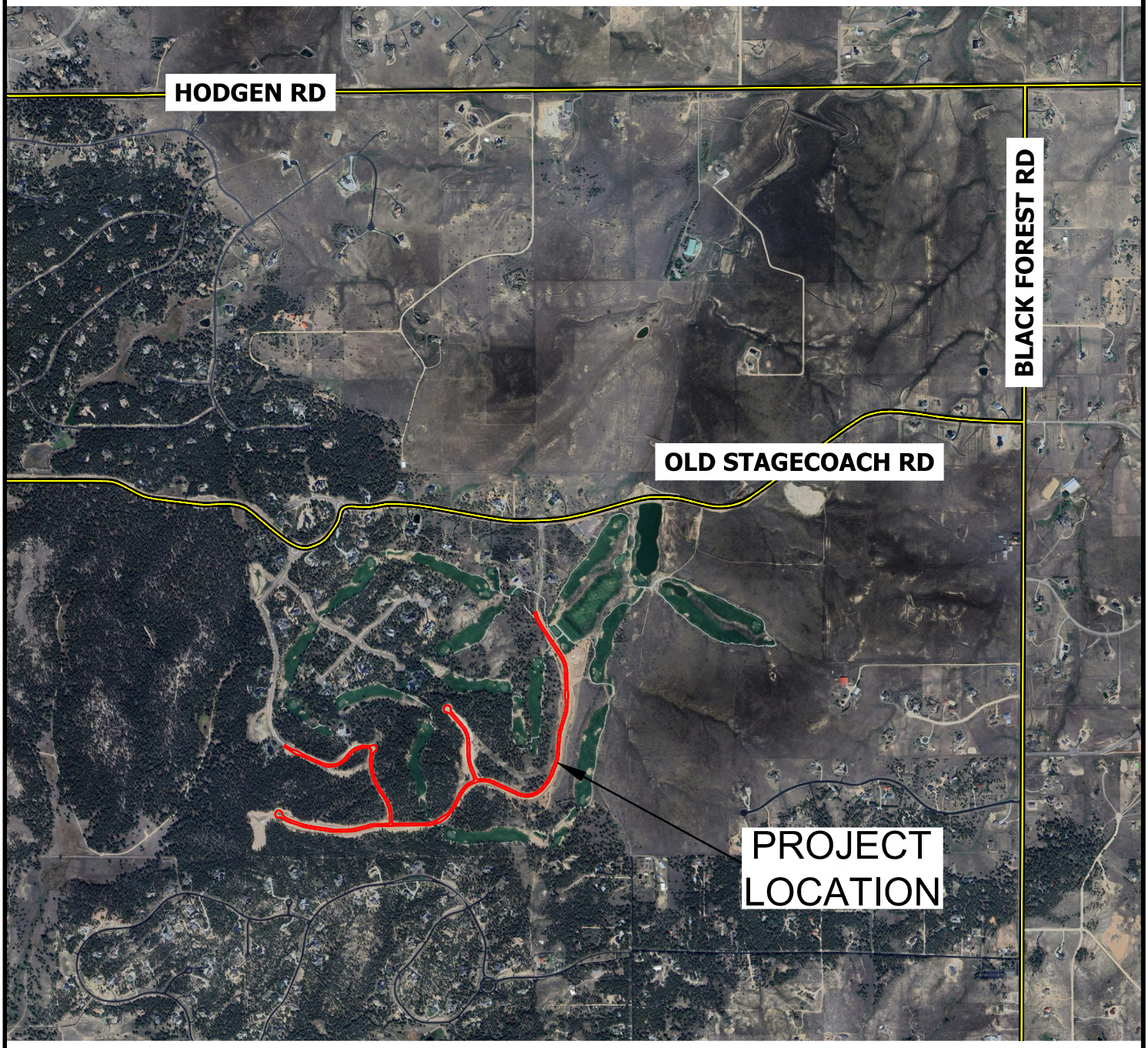
6.3 Construction Observation

Subgrade preparation for pavement structures should be observed by Entech in order to verify that (1) no anomalies are present, (2) materials similar to those described in this report have been encountered or placed, and (3) no soft spots, expansive or organic soil, or debris are present in the pavement subgrade prior to paving. Construction observation requirements as presented in the Use of CTS for Paving Season Memorandum should be followed.

7 Closure

The subsurface investigation, geotechnical evaluation, and recommendations presented in this report are intended for use by Classic Communities with application to the paving of the Flying Horse North, Filing No. 3 project in El Paso County, Colorado. In conducting the subsurface investigation, laboratory testing, engineering evaluation, and reporting, Entech Engineering, Inc. endeavored to work in accordance with generally accepted professional geotechnical and geologic practices and principles consistent with the level of care and skill ordinarily exercised by members of the geotechnical profession currently practicing in the same locality and under similar conditions. No other warranty, expressed or implied, is made. During final design and/or construction, if conditions are encountered that appear different from those described in this report, Entech Engineering, Inc. requests to be notified so that the evaluation and recommendations presented herein can be reviewed and modified as appropriate.

If there are any questions regarding the information provided herein, or if Entech Engineering, Inc. can be of further assistance, please do not hesitate to contact us.



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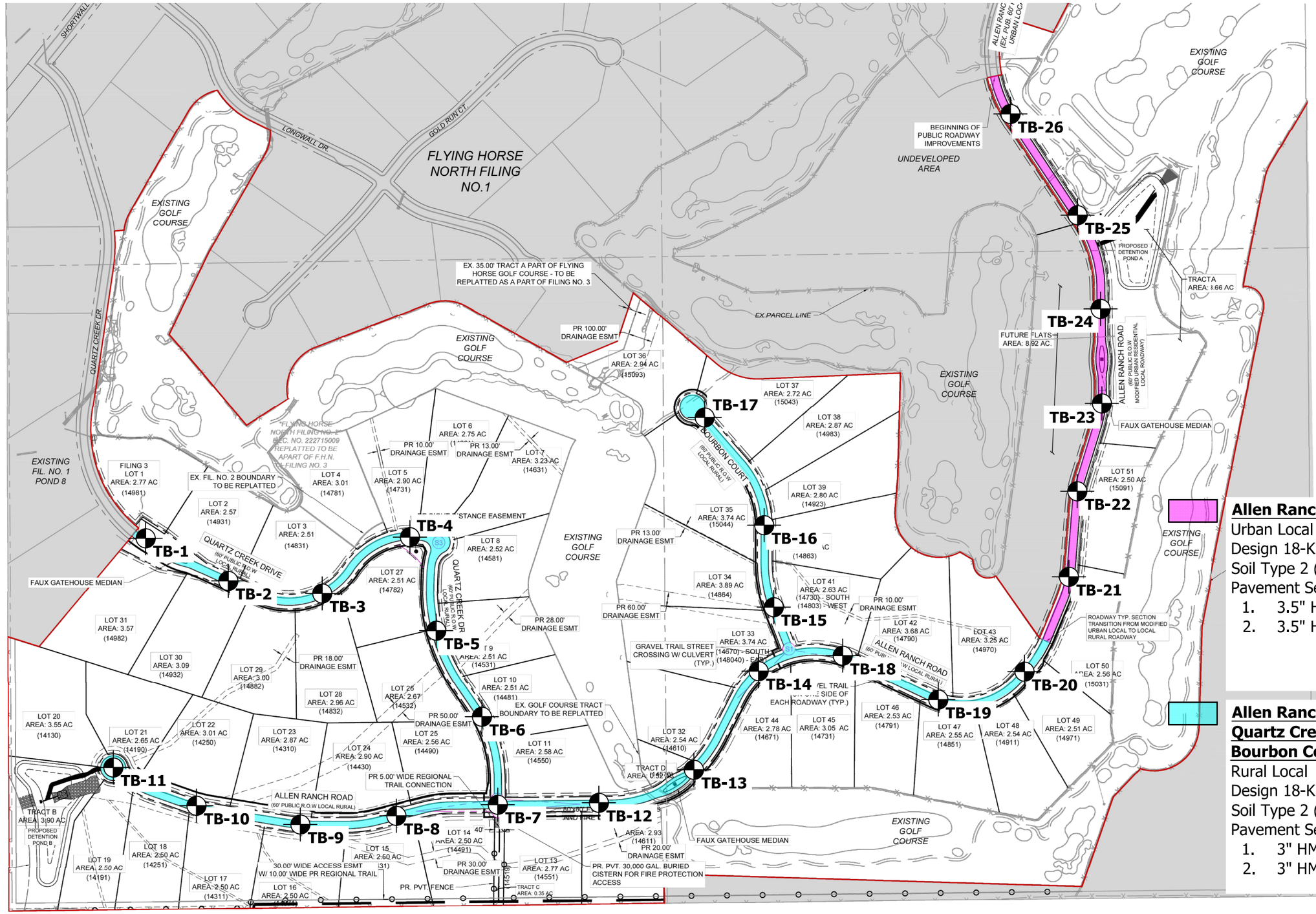
VICINITY MAP

FLYING HORSE NORTH, FILING N0. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. 1



Allen Ranch Road
Urban Local
Design 18-KIP ESAL=292,000
Soil Type 2 (AASHTO A-4)
Pavement Section:
1. 3.5" HMA over 8" ABC/RCB
2. 3.5" HMA over 8" CTS

Allen Ranch Road, Quartz Creek Drive, Bourbon Court
Rural Local
Design 18-KIP ESAL= 36,500
Soil Type 2 (AASHTO A-4)
Pavement Section:
1. 3" HMA over 4" ABC/RCB
2. 3" HMA over 8" CTS

TB- APPROXIMATE TEST BORING LOCATION AND NUMBER

ENTECH ENGINEERING, INC.

SITE AND EXPLORATION PLAN

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

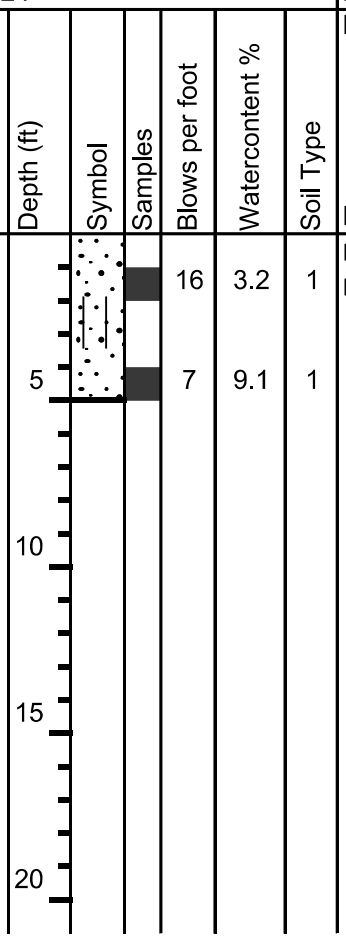
FIG. 2

APPENDIX A: Test Boring Logs

TEST BORING 1
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24

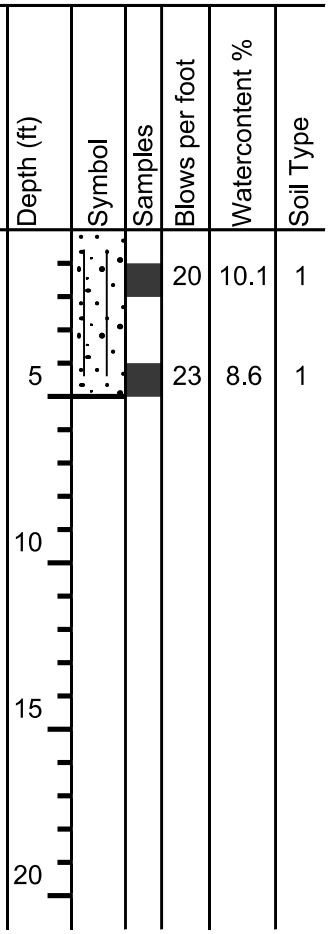


FILL 0-5', SAND, WITH SILT, BROWN to TAN, MEDIUM DENSE to LOOSE, MOIST	16	3.2	1
	7	9.1	1

TEST BORING 2
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24



FILL 0-5', SAND, SILTY, TAN, MEDIUM DENSE, MOIST	20	10.1	1
	23	8.6	1

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TEST BORING LOGS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. A-1

TEST BORING 3
DATE DRILLED 10/16/2024

REMARKS

DRY TO 10', 10/16/24

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			25	8.6	1
5			25	7.4	1
10			11	13.1	1
15					
20					

FILL 0-10', SAND, SILTY, TAN, MEDIUM DENSE, MOIST

TEST BORING 4
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			50/7"	9.6	3
5			50/7"	6.8	3
10					
15					
20					

SANDSTONE, VERY WEAK, TAN, MODERATELY WEATHERED (SAND, SILTY, VERY DENSE, MOIST)

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TEST BORING LOGS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

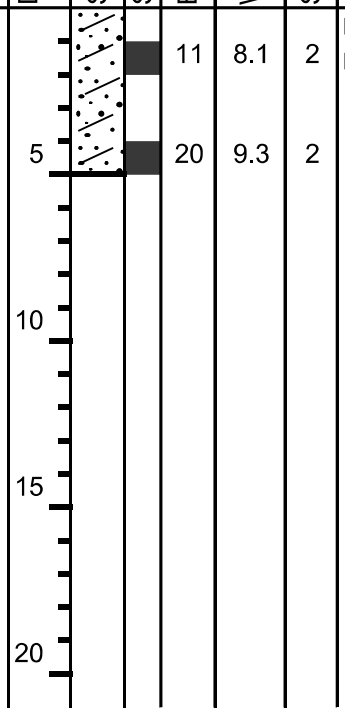
FIG. A-2

TEST BORING 5
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24

FILL 0-5', SAND, CLAYEY, TAN, MEDIUM DENSE, MOIST



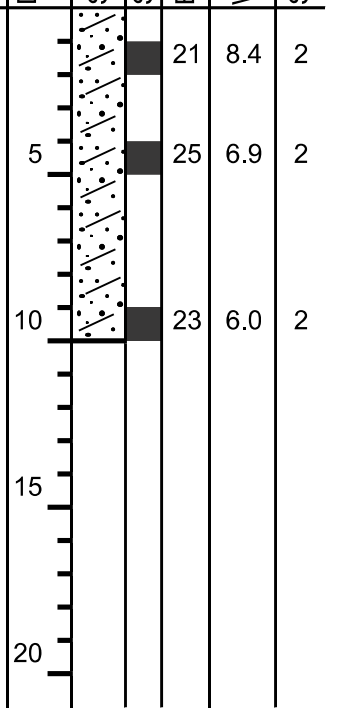
Blows per foot	Watercontent %	Soil Type
11	8.1	2
20	9.3	2

TEST BORING 6
DATE DRILLED 10/16/2024

REMARKS

DRY TO 10', 10/16/24

FILL 0-10', SAND, CLAYEY, TAN, MEDIUM DENSE, MOIST



Blows per foot	Watercontent %	Soil Type
21	8.4	2
25	6.9	2
23	6.0	2

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TEST BORING LOGS

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FIG. A-3

TEST BORING 7
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			16	8.4	1
5			19	8.2	1
10					
15					
20					

FILL 0-5', SAND, CLAYEY, TAN, MEDIUM DENSE, MOIST

TEST BORING 8
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			20	7.6	2
5			15	8.7	2
10					
15					
20					

FILL 0-5', SAND, CLAYEY, TAN, MEDIUM DENSE, MOIST

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TEST BORING LOGS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

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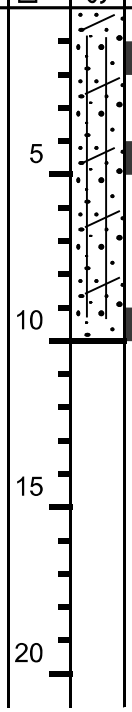
FIG. A-4

TEST BORING 9
DATE DRILLED 10/16/2024

REMARKS

DRY TO 10', 10/16/24

FILL 0-10', SAND, CLAYEY, SILTY, TAN, MEDIUM DENSE to DENSE, MOIST



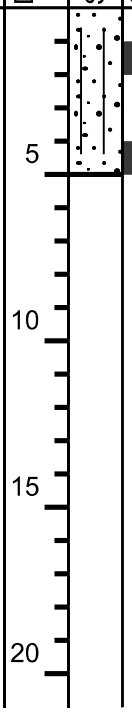
Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			15	6.6	1
5			33	12.1	1
10			21	5.4	1

TEST BORING 10
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24

FILL 0-5', SAND, SILTY, BROWN, MEDIUM DENSE to DENSE, MOIST



Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			29	6.3	1
5			35	7.4	1

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TEST BORING LOGS

FLYING HORSE NORTH, FILING NO. 3
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FIG. A-5

TEST BORING 11
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
FILL 0-5', SAND, SILTY, BROWN, MEDIUM DENSE to DENSE, MOIST					
			19	7.6	1
5			24	6.1	1
10					
15					
20					

TEST BORING 12
DATE DRILLED 10/16/2024

REMARKS

DRY TO 10', 10/16/24

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
FILL 0-4', SAND, SILTY, TAN, DENSE, MOIST					
			36	15.2	2
5			50/9"	8.3	3
SANDSTONE, EXTREMELY WEAK, TAN, MODERATELY WEATHERED (SAND, SILTY, VERY DENSE, MOIST)					
10			50/8"	11.1	3
15					
20					

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TEST BORING LOGS

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FIG. A-6

TEST BORING 13
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
FILL 0-5', SAND, CLAYEY, LIGHT BROWN, MEDIUM DENSE, MOIST			24	7.0	1
5			18	6.8	1
10					
15					
20					

TEST BORING 14
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
FILL 0-5', CLAY, SANDY, BROWN, VERY STIFF, MOIST			17	8.5	2
5			17	7.1	2
10					
15					
20					

ENTECH ENGINEERING, INC.

TEST BORING LOGS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

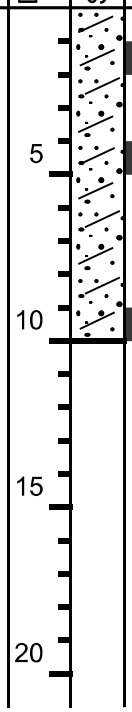
FIG. A-7

TEST BORING 15
DATE DRILLED 10/16/2024

REMARKS

DRY TO 10', 10/16/24

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
FILL 0-10', SAND, CLAYEY, BROWN to TAN, MEDIUM DENSE, MOIST					
			24	8.0	2
5			11	6.7	2
10			14	9.5	2
15					
20					



TEST BORING 16
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
FILL 0-5', SAND, WITH SILT, TAN, DENSE, MOIST					
			38	9.6	1
5			40	14.6	1
10					
15					
20					

ENTECH ENGINEERING, INC.

TEST BORING LOGS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. A-8

TEST BORING 17
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
FILL 0-5', SAND, SILTY, TAN, MEDIUM DENSE, MOIST					
			18	6.1	1
5			13	8.5	1
10					
15					
20					

TEST BORING 18
DATE DRILLED 10/16/2024

REMARKS

DRY TO 10', 10/16/24

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
FILL 0-6', SAND, CLAYEY, BROWN, DENSE to MEDIUM DENSE, MOIST					
			30	9.7	1
5			28	15.3	1
SANDSTONE, VERY WEAK, TAN, MODERATELY WEATHERED (SAND, WITH SILT, VERY DENSE, MOIST)					
10			50/8"	8.1	3
15					
20					

ENTECH ENGINEERING, INC.

TEST BORING LOGS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

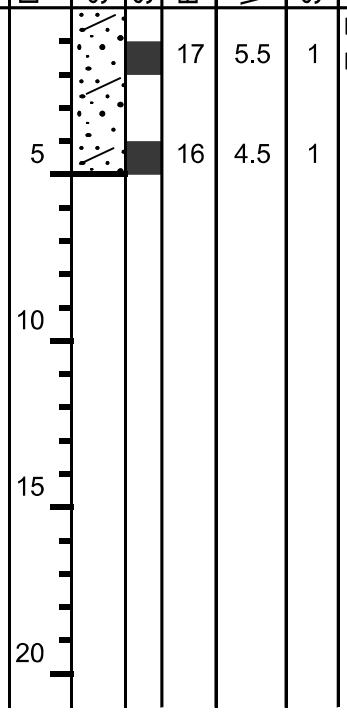
FIG. A-9

TEST BORING 19
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24

FILL 0-5', SAND, CLAYEY, TAN, MEDIUM DENSE, MOIST



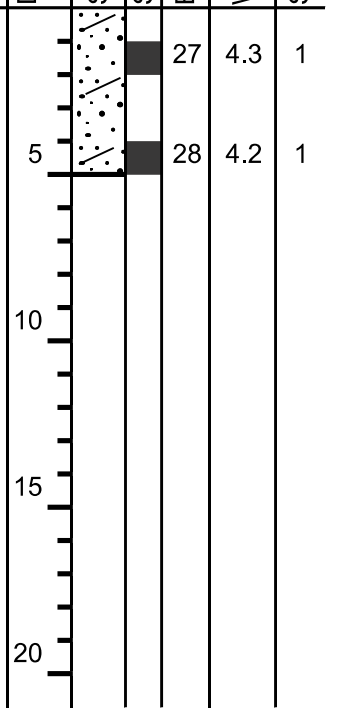
Blows per foot	Watercontent %	Soil Type
17	5.5	1
16	4.5	1

TEST BORING 20
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24

FILL 0-5', SAND, CLAYEY, TAN, MEDIUM DENSE, MOIST



Blows per foot	Watercontent %	Soil Type
27	4.3	1
28	4.2	1

ENTECH ENGINEERING, INC.

TEST BORING LOGS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

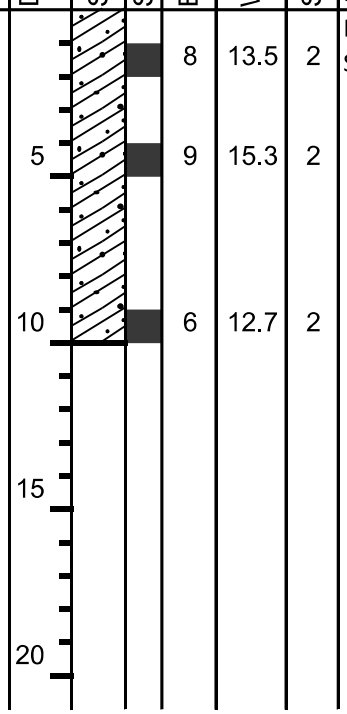
FIG. A-10

TEST BORING 21
DATE DRILLED 10/16/2024

REMARKS

DRY TO 10', 10/16/24

FILL 0-10', CLAY, SANDY, BROWN, STIFF to MEDIUM STIFF, MOIST



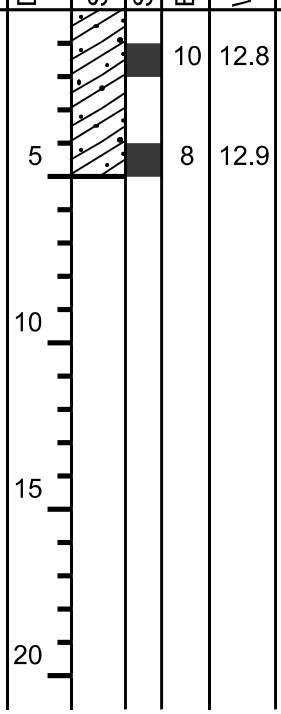
Blows per foot	Watercontent %	Soil Type
8	13.5	2
9	15.3	2
6	12.7	2

TEST BORING 22
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24

FILL 0-5', CLAY, WITH SAND, TAN, STIFF, MOIST



Blows per foot	Watercontent %	Soil Type
10	12.8	2
8	12.9	2

ENTECH ENGINEERING, INC.

TEST BORING LOGS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

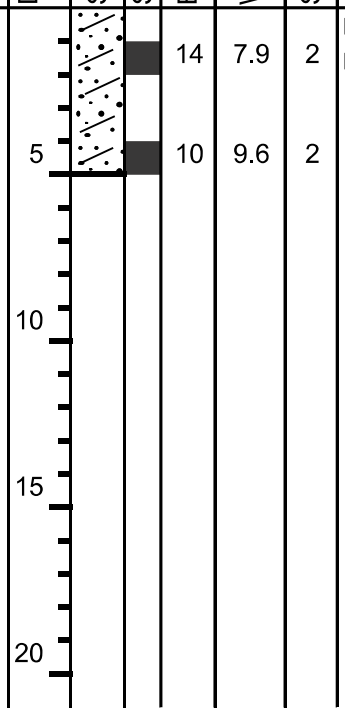
FIG. A-11

TEST BORING 23
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24

FILL 0-5', SAND, CLAYEY, TAN, MEDIUM DENSE, MOIST



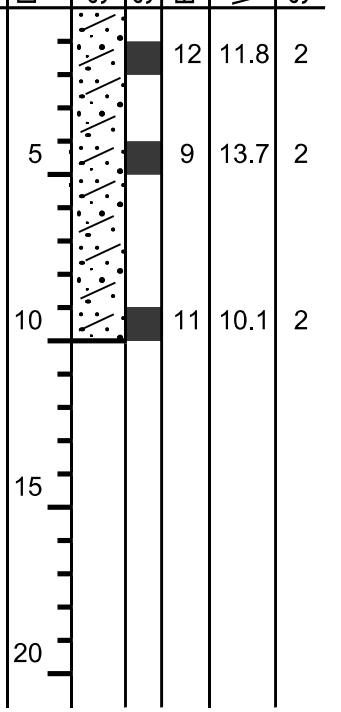
Blows per foot	Watercontent %	Soil Type
14	7.9	2
10	9.6	2

TEST BORING 24
DATE DRILLED 10/16/2024

REMARKS

DRY TO 10', 10/16/24

FILL 0-10', SAND, CLAYEY, TAN, MEDIUM DENSE to LOOSE, MOIST



Blows per foot	Watercontent %	Soil Type
12	11.8	2
9	13.7	2
11	10.1	2

ENTECH ENGINEERING, INC.

TEST BORING LOGS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

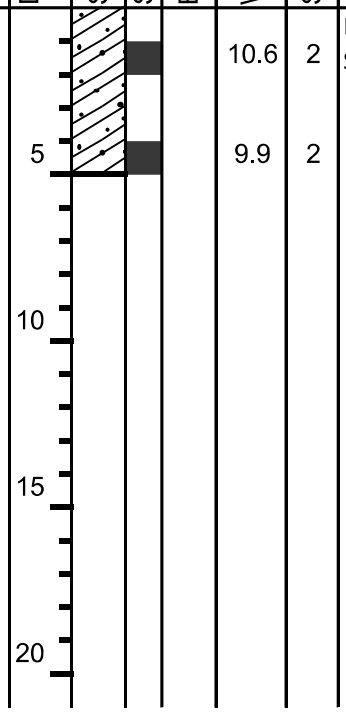
FIG. A-12

TEST BORING 25
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24

FILL 0-5', CLAY, SANDY, TAN, STIFF, MOIST



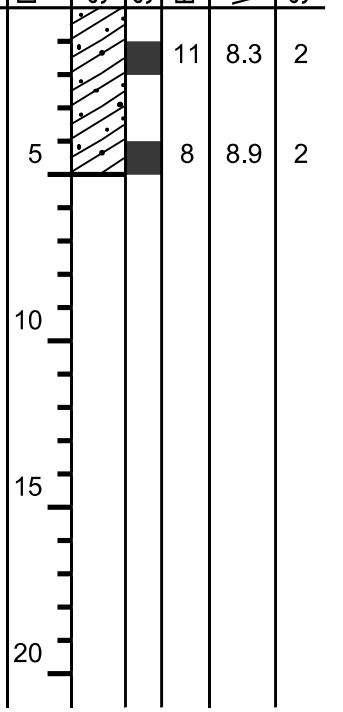
Watercontent %	Soil Type
10.6	2
9.9	2

TEST BORING 26
DATE DRILLED 10/16/2024

REMARKS

DRY TO 5', 10/16/24

FILL 0-5', CLAY, SANDY, TAN, STIFF, MOIST



Blows per foot	Watercontent %	Soil Type
11	8.3	2
8	8.9	2

ENTECH ENGINEERING, INC.

TEST BORING LOGS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. A-13

APPENDIX B: Laboratory Test Results

TABLE B-1
SUMMARY OF LABORATORY TEST RESULTS

ENTECH ENGINEERING, INC.

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX	SULFATE (WT %)	SWELL/ COLLAPSE (%)	AASHTO CLASS. (GROUP INDEX)	USCS	SOIL DESCRIPTION
1, CBR	3	0-3	7.9		27.9	NV	NP	NP			A-2-4 (0)	SM	FILL, SAND, SILTY
1	1	1-2	3.1		8.2	NV	NP	NP	0.00		A-1-b (0)	SW-SM	FILL, SAND, WITH SILT
1	2	1-2	10.1		15.3	NV	NP	NP			A-1-b (0)	SM	FILL, SAND, SILTY
1	3	1-2	8.6		19.0	NV	NP	NP			A-1-b (0)	SM	FILL, SAND, SILTY
1	7	1-2	8.4		33.8	29	19	10			A-2-4 (0)	SC	FILL, SAND, CLAYEY
1	9	1-2	6.6		32.3	25	18	7			A-2-4 (0)	SC-SM	FILL, SAND, CLAYEY, SILTY
1	10	1-2	6.3		15.3	NV	NP	NP			A-1-b (0)	SM	FILL, SAND, SILTY
1	11	1-2	7.6		21.9	23	19	4			A-2-4 (0)	SM	FILL, SAND, SILTY
1	13	1-2	7.0		30.0	30	20	10			A-2-4 (0)	SC	FILL, SAND, CLAYEY
1	16	1-2	9.6		11.1	NV	NP	NP	0.00		A-1-b (0)	SW-SM	FILL, SAND, WITH SILT
1	17	1-2	6.1		12.3	NV	NP	NP			A-1-b (0)	SM	FILL, SAND, SILTY
1	18	1-2	9.7		16.9	39	23	16			A-2-6 (0)	SC	FILL, SAND, CLAYEY
1	19	1-2	5.5		24.1	27	19	8			A-2-4 (0)	SC	FILL, SAND, CLAYEY
2, CBR	21	0-3	14.0		48.3	28	21	7			A-4 (1)	SC	FILL, SAND, CLAYEY
2	5	1-2	8.1		43.6	27	19	8			A-4 (1)	SC	FILL, SAND, CLAYEY
2	6	1-2	8.4		38.0	31	22	9			A-4 (0)	SC	FILL, SAND, CLAYEY
2	8	1-2	9.8	103.9	44.4	29	19	10		0.1	A-6 (2)	SC	FILL, SAND, CLAYEY
2	12	1-2	16.6	105.6	37.7	NV	NP	NP		0.2	A-4 (0)	SM	FILL, SAND, SILTY
2	14	1-2	16.1	108.6	62.9	30	19	11		0.6	A-6 (5)	CL	FILL, CLAY, SANDY
2	15	1-2	8.0		42.7	28	20	8			A-4 (0)	SC	FILL, SAND, CLAYEY
2	20	1-2	4.3		45.4	23	14	9			A-4 (1)	SC	FILL, SAND, CLAYEY
2	21	1-2	14.0	107.5	54.0	30	21	9		0.7	A-4 (3)	CL	FILL, CLAY, SANDY
2	22	1-2	14.8	99.4	76.2	28	19	9	0.00	0.9	A-4 (5)	CL	FILL, CLAY, WITH SAND
2	23	1-2	7.6	106.2	44.4	23	14	9		-0.5	A-4 (1)	SC	FILL, SAND, CLAYEY
2	24	1-2	11.8		47.9	28	19	9			A-4 (2)	SC	SAND, CLAYEY
2	25	1-2	10.1	115.3	51.2	27	17	10		0.3	A-4 (2)	CL	FILL, CLAY, SANDY
2	26	1-2	8.3		54.9	28	20	8			A-4 (2)	CL	FILL, CLAY, SANDY
2	15	0-3	5.4		40.3	29	21	8			A-4 (0)	SC	FILL, SAND, CLAYEY
3	4	1-2	9.6		17.0	44	27	17	0.00		A-2-6 (0)	SM	SANDSTONE (SAND, SILTY)
3	12	10	11.1		14.3	NV	NP	NP	0.00		A-1-b (0)	SM	SANDSTONE (SAND, SILTY)
3	18	10	8.1		10.2	NV	NP	NP			A-1-b (0)	SW-SM	SANDSTONE (SAND, WITH SILT)

Project: Flying Horse North, Filing No. 3
Client: Flying Horse North, LLC
Job No: 231192

ENTECH ENGINEERING, INC.

TABLE B-2

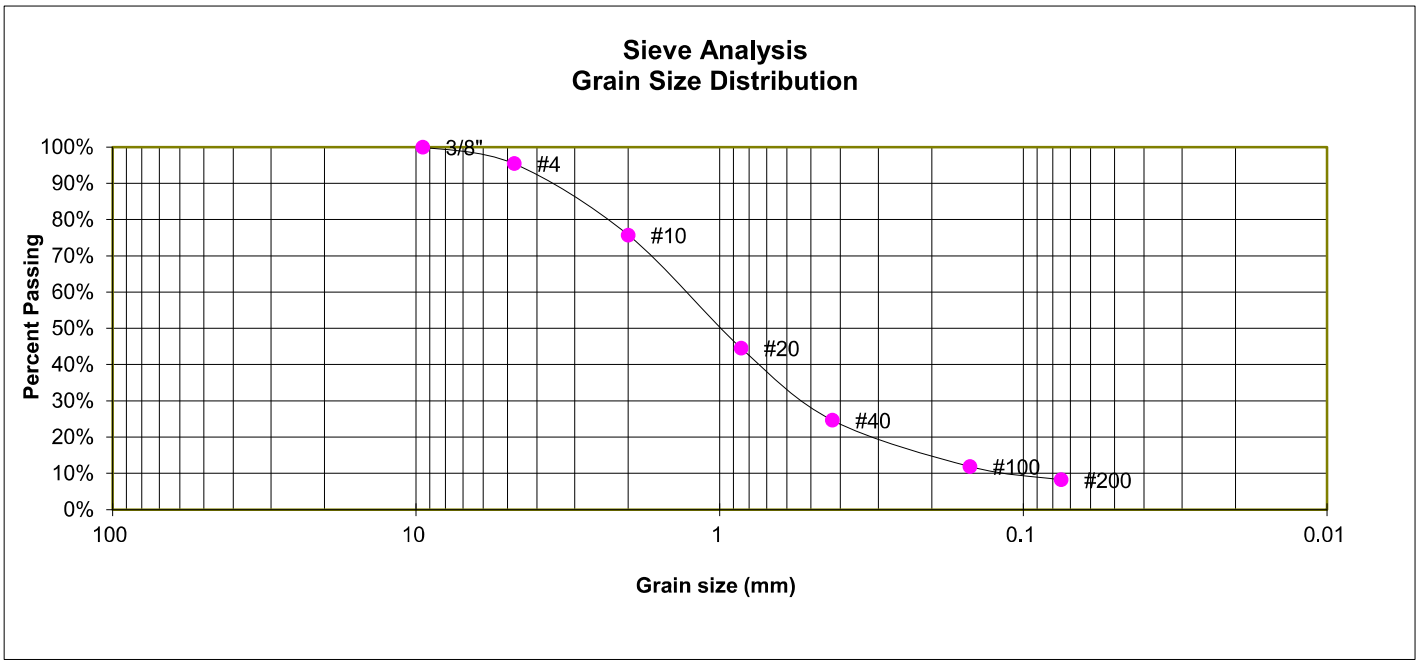
SUMMARY OF CTS TEST RESULTS

FIELD SAMPLE ID	*SOIL ADDITIVE*	*ADDITIVE PERCENTAGE (%)*	*WATER CONTENT (%)*	*DENSITY (dry)*	*AGE (days)*	*STRENGTH (psi)*
TB-3 @ 0-3'	TYPE IL CEMENT	2	7.1	120.4	5	204
				120.7		213
				120.5		199
					AVERAGE:	**205**
TB-3 @ 0-3'	TYPE IL CEMENT	4	7.1	121.1	5	244
				120.3		238
				120.6		214
					AVERAGE:	**232**
TB-21 @ 0-3'	TYPE IL CEMENT	2	14.9	104.4	5	192
				104.5		176
				104.3		183
					AVERAGE:	**184**
TB-21 @ 0-3'	TYPE IL CEMENT	4	14.9	104.6	5	210
				104.6		223
				104.6		200
					AVERAGE:	**211**

Notes:

1. CURING METHOD: 100° HUMIDIFIED OVEN

TEST BORING 1	SOIL DESCRIPTION FILL, SAND, WITH SILT
DEPTH (FT) 1-2	SOIL TYPE 1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.5%
10	75.7%
20	44.6%
40	24.7%
100	11.9%
200	8.2%

ATTERBERG LIMITS

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

SOIL CLASSIFICATION

USCS CLASSIFICATION: SW-SM
AASHTO CLASSIFICATION: A-1-b
AASHTO GROUP INDEX: 0

ENTECH ENGINEERING, INC.

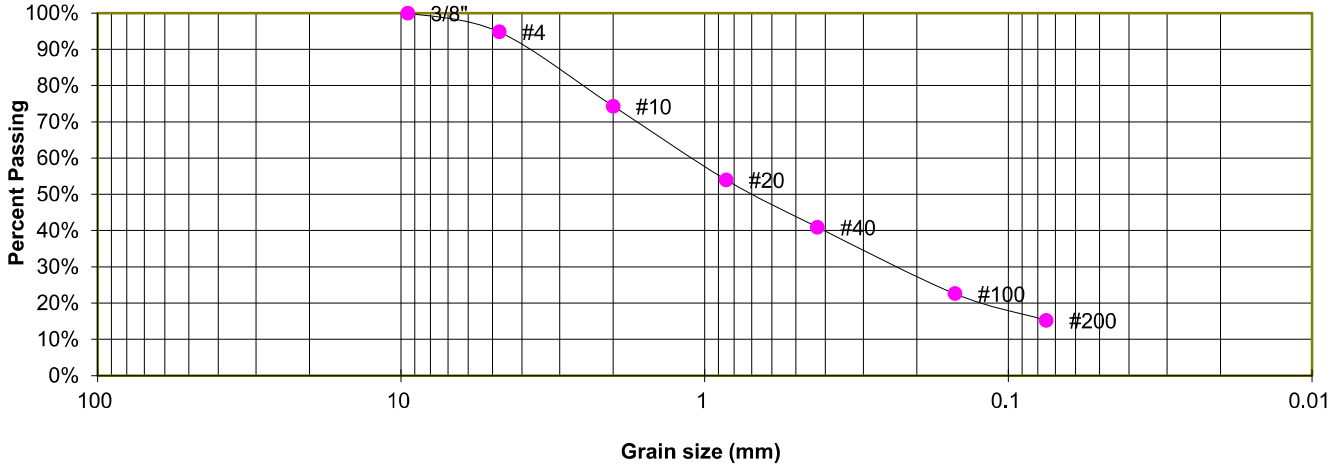
LABORATORY TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-1

TEST BORING	2	SOIL DESCRIPTION	FILL, SAND, SILTY
DEPTH (FT)	1-2	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	94.8%
10	74.3%
20	54.0%
40	40.9%
100	22.6%
200	15.3%

ATTERBERG LIMITS

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SM
AASHTO CLASSIFICATION:	A-1-b
AASHTO GROUP INDEX:	0

ENTECH ENGINEERING, INC.

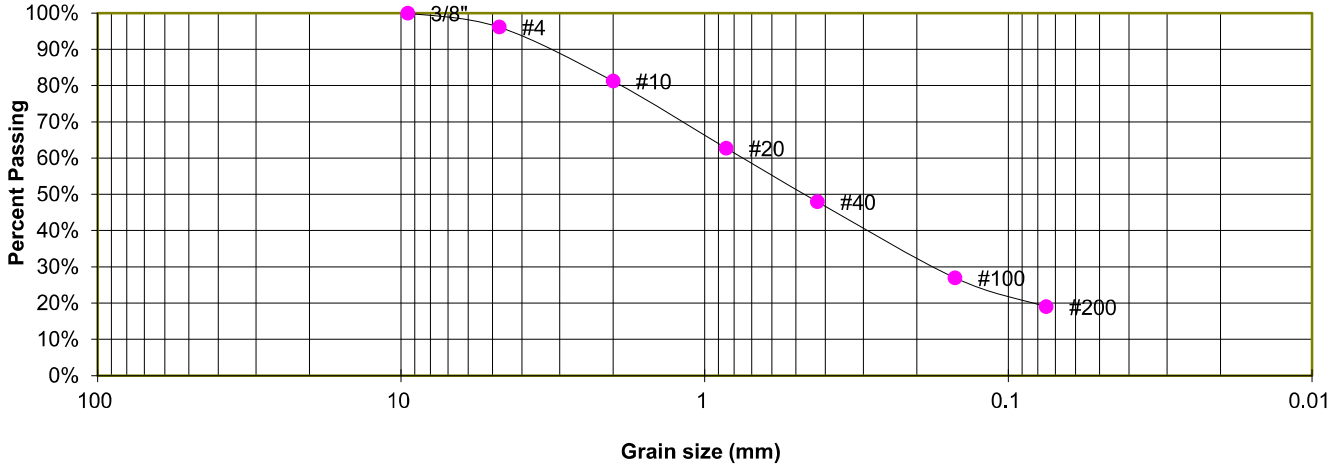
LABORATORY TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-2

TEST BORING	3	SOIL DESCRIPTION	FILL, SAND, SILTY
DEPTH (FT)	1-2	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.2%
10	81.2%
20	62.8%
40	48.0%
100	27.0%
200	19.0%

ATTERBERG LIMITS

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SM
AASHTO CLASSIFICATION:	A-1-b
AASHTO GROUP INDEX:	0

ENTECH ENGINEERING, INC.

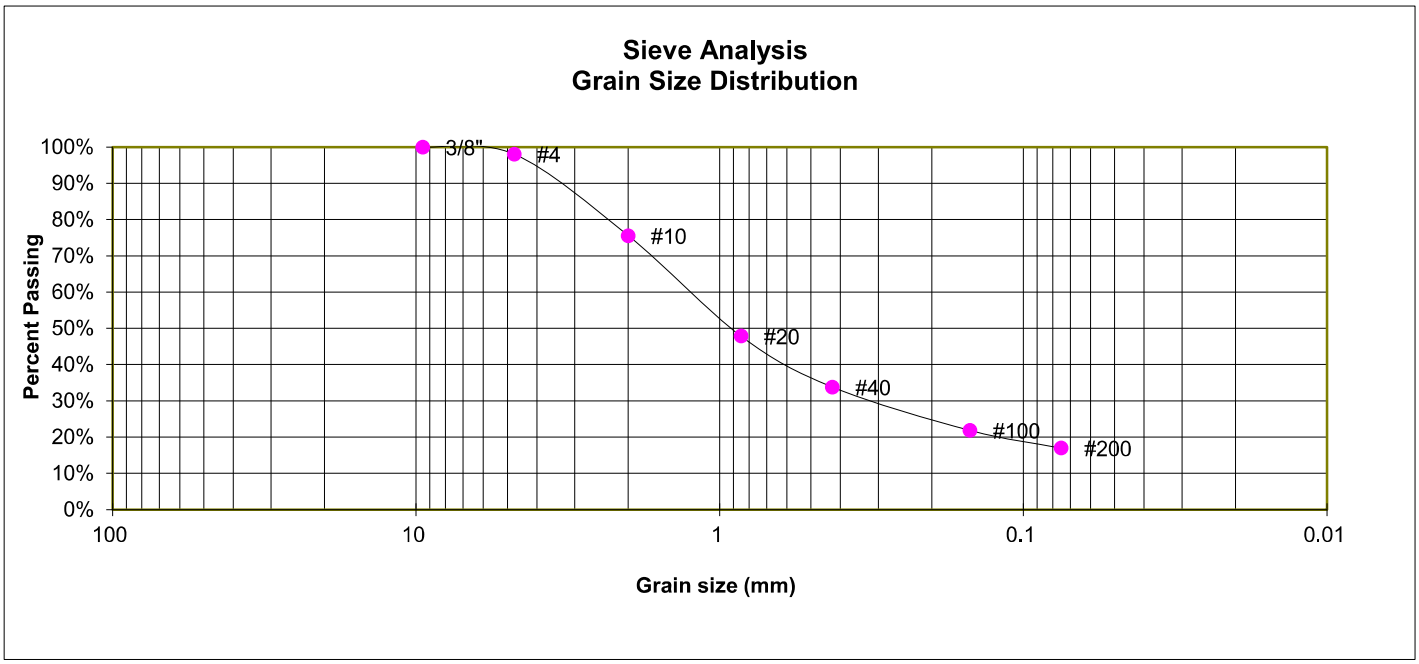
LABORATORY TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-3

TEST BORING	4	SOIL DESCRIPTION	SANDSTONE (SAND, SILTY)
DEPTH (FT)	1-2	SOIL TYPE	3



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.1%
10	75.6%
20	47.9%
40	33.8%
100	21.9%
200	17.0%

ATTERBERG LIMITS

Plastic Limit	27
Liquid Limit	44
Plastic Index	17

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SM
AASHTO CLASSIFICATION:	A-2-6
AASHTO GROUP INDEX:	0

ENTECH ENGINEERING, INC.

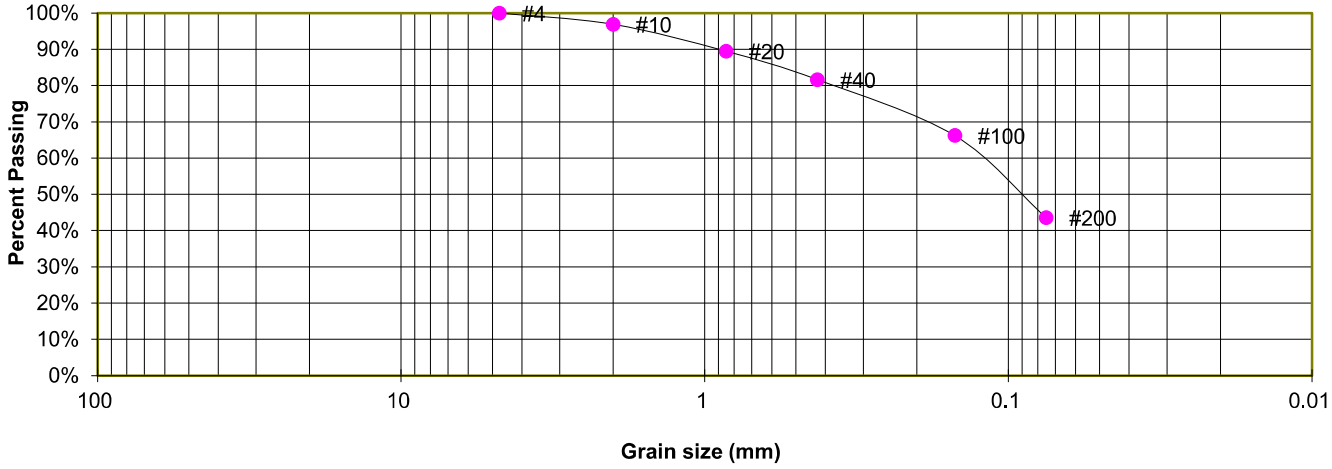
LABORATORY TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-4

TEST BORING	5	SOIL DESCRIPTION	FILL, SAND, CLAYEY
DEPTH (FT)	1-2	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	96.9%
20	89.5%
40	81.6%
100	66.2%
200	43.6%

ATTERBERG LIMITS

Plastic Limit	19
Liquid Limit	27
Plastic Index	8

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	1

ENTECH ENGINEERING, INC.

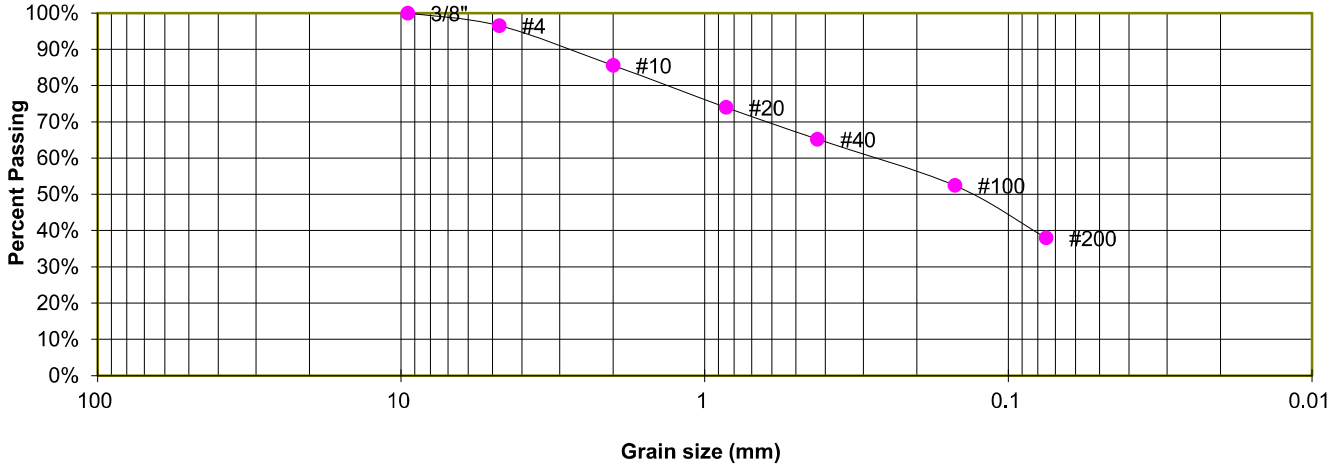
LABORATORY TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-5

TEST BORING	6	SOIL DESCRIPTION	FILL, SAND, CLAYEY
DEPTH (FT)	1-2	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.6%
10	85.6%
20	74.0%
40	65.2%
100	52.5%
200	38.0%

ATTERBERG LIMITS

Plastic Limit	22
Liquid Limit	31
Plastic Index	9

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	0

ENTECH ENGINEERING, INC.

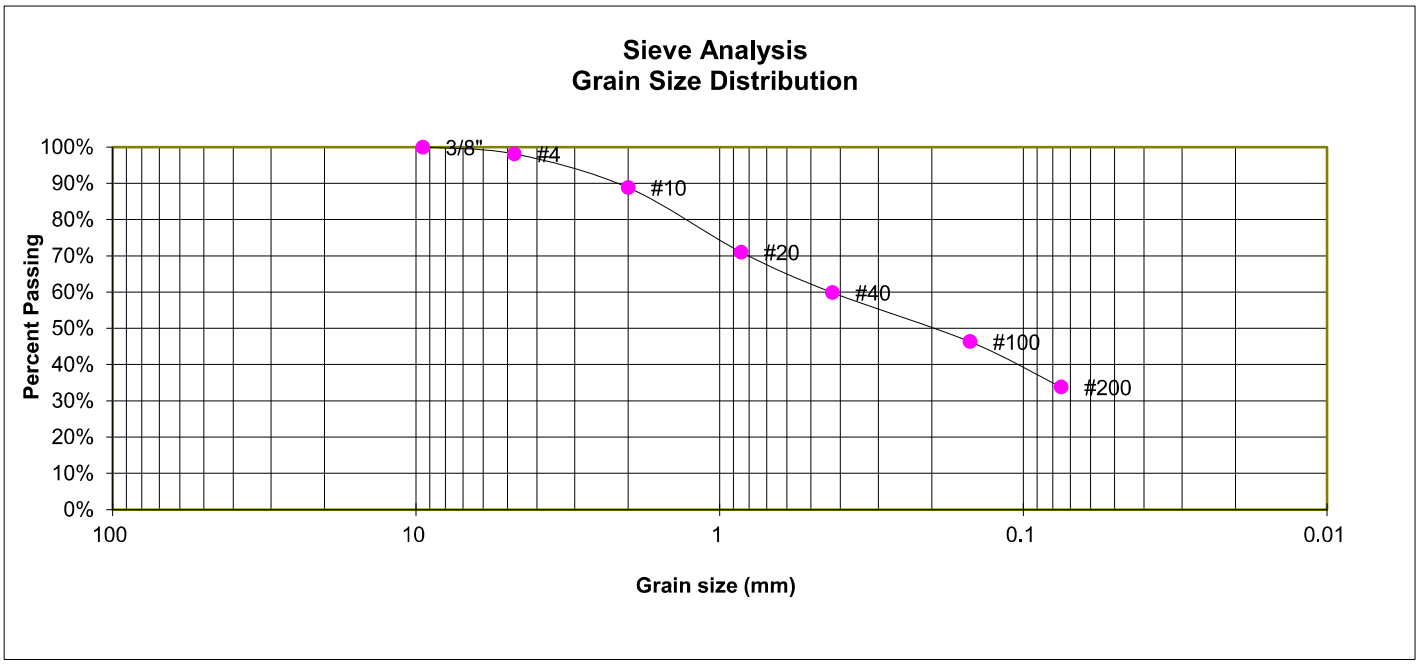
LABORATORY TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-6

TEST BORING	7	SOIL DESCRIPTION	FILL, SAND, CLAYEY
DEPTH (FT)	1-2	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.2%
10	88.9%
20	71.1%
40	59.9%
100	46.4%
200	33.8%

ATTERBERG LIMITS

Plastic Limit	19
Liquid Limit	29
Plastic Index	10

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-2-4
AASHTO GROUP INDEX:	0

ENTECH ENGINEERING, INC.

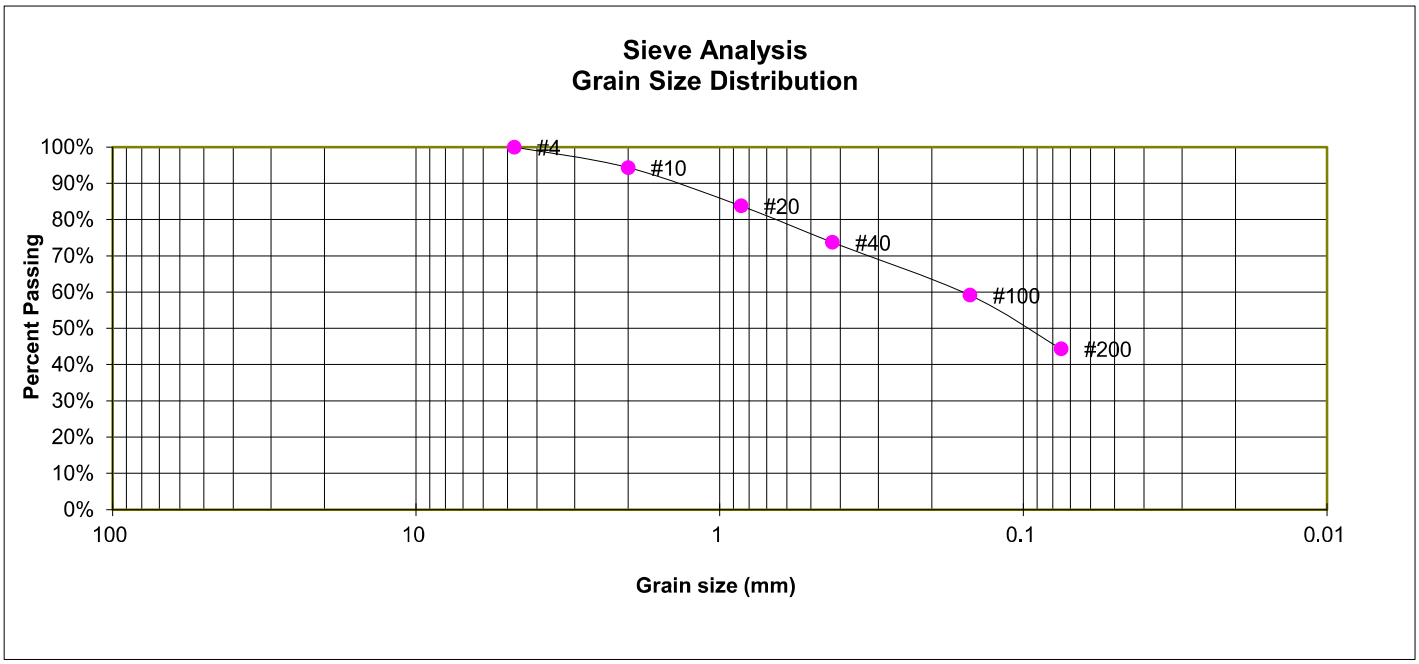
LABORATORY TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-7

TEST BORING	8	SOIL DESCRIPTION	FILL, SAND, CLAYEY
DEPTH (FT)	1-2	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	94.4%
20	83.8%
40	73.7%
100	59.2%
200	44.4%

ATTERBERG LIMITS

Plastic Limit	19
Liquid Limit	29
Plastic Index	10

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-6
AASHTO GROUP INDEX:	2

ENTECH ENGINEERING, INC.

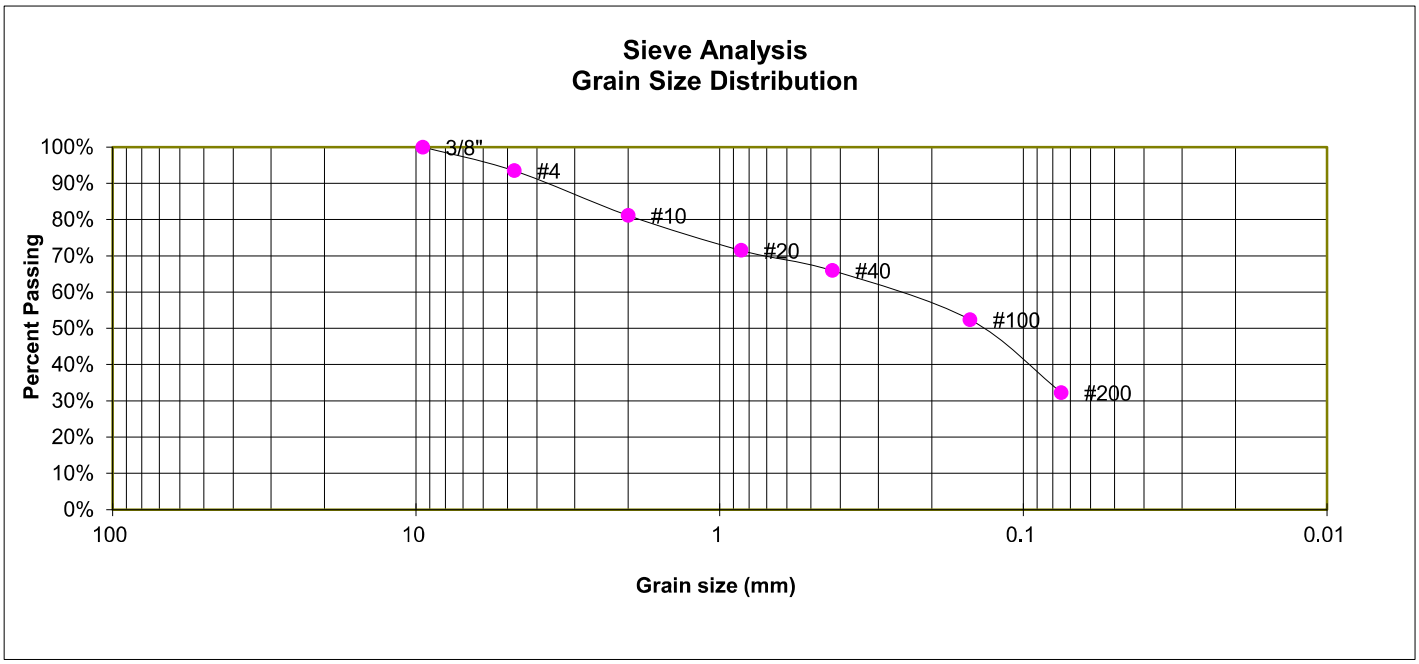
LABORATORY TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-8

TEST BORING	9	SOIL DESCRIPTION	FILL, SAND, CLAYEY, SILTY
DEPTH (FT)	1-2	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	93.5%
10	81.2%
20	71.5%
40	66.0%
100	52.4%
200	32.3%

ATTERBERG LIMITS

Plastic Limit	18
Liquid Limit	25
Plastic Index	7

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SC-SM
AASHTO CLASSIFICATION:	A-2-4
AASHTO GROUP INDEX:	0

ENTECH ENGINEERING, INC.

LABORATORY TEST RESULTS

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FLYING HORSE NORTH, LLC

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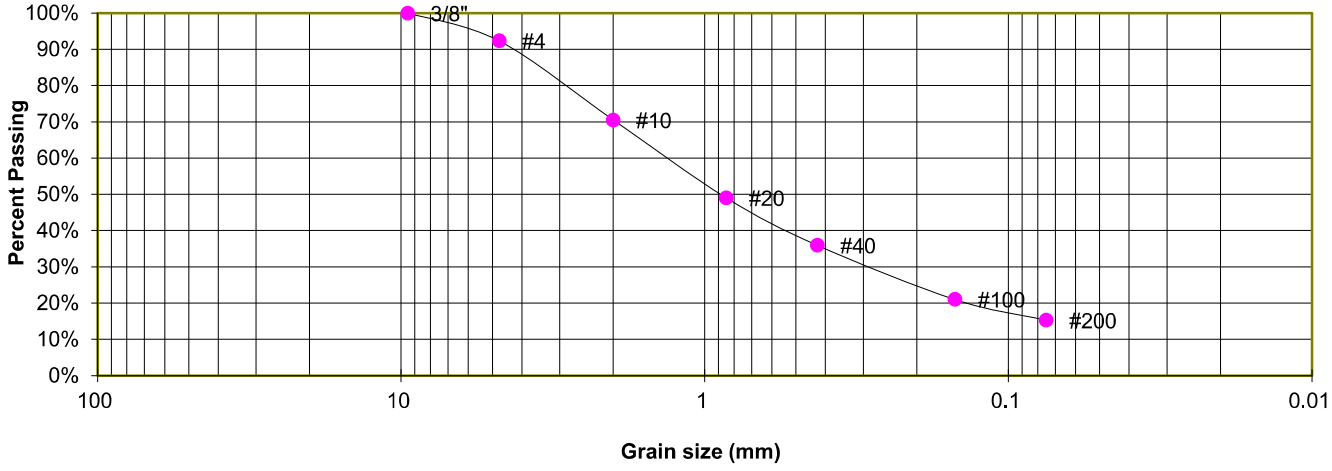
FIG. B-9

TEST BORING	10	SOIL DESCRIPTION	FILL, SAND, SILTY
DEPTH (FT)	1-2	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	92.4%
10	70.5%
20	49.1%
40	36.0%
100	21.0%
200	15.3%

ATTERBERG LIMITS

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SM
AASHTO CLASSIFICATION:	A-1-b
AASHTO GROUP INDEX:	0

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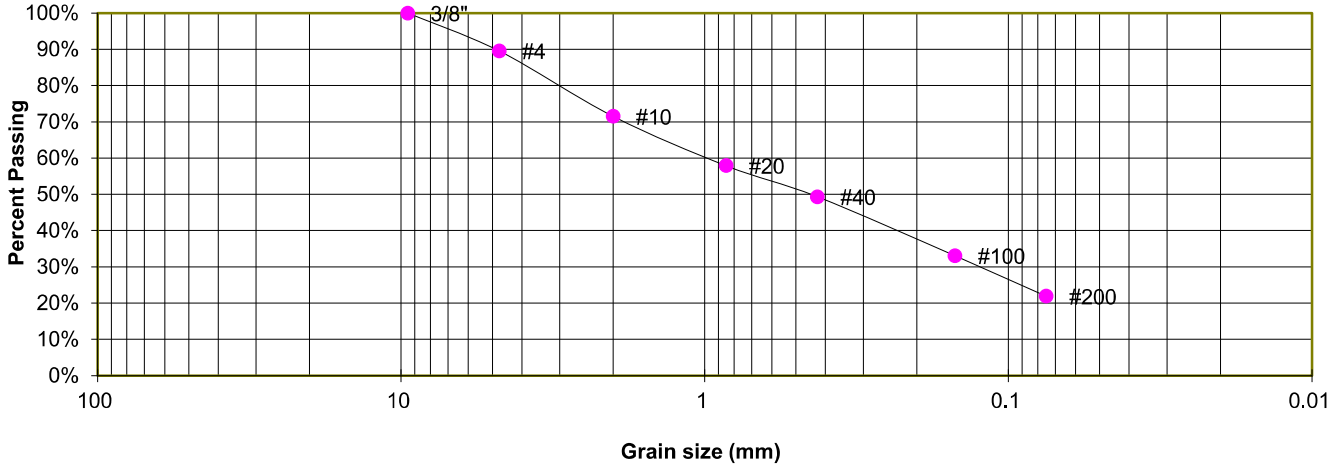
FIG. B-10

TEST BORING	11	SOIL DESCRIPTION	FILL, SAND, SILTY
DEPTH (FT)	1-2	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	89.6%
10	71.5%
20	57.9%
40	49.3%
100	33.1%
200	21.9%

ATTERBERG LIMITS

Plastic Limit	19
Liquid Limit	23
Plastic Index	4

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SM
AASHTO CLASSIFICATION:	A-2-4
AASHTO GROUP INDEX:	0

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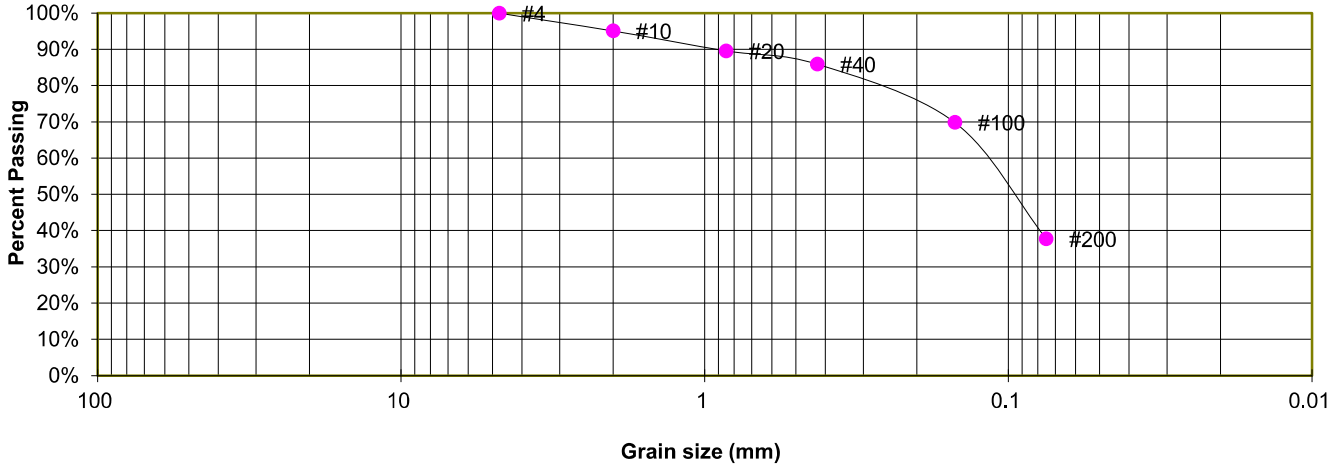
FIG. B-11

TEST BORING	12	SOIL DESCRIPTION	FILL, SAND, SILTY
DEPTH (FT)	1-2	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	95.1%
20	89.6%
40	85.9%
100	69.9%
200	37.7%

ATTERBERG LIMITS

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SM
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	0

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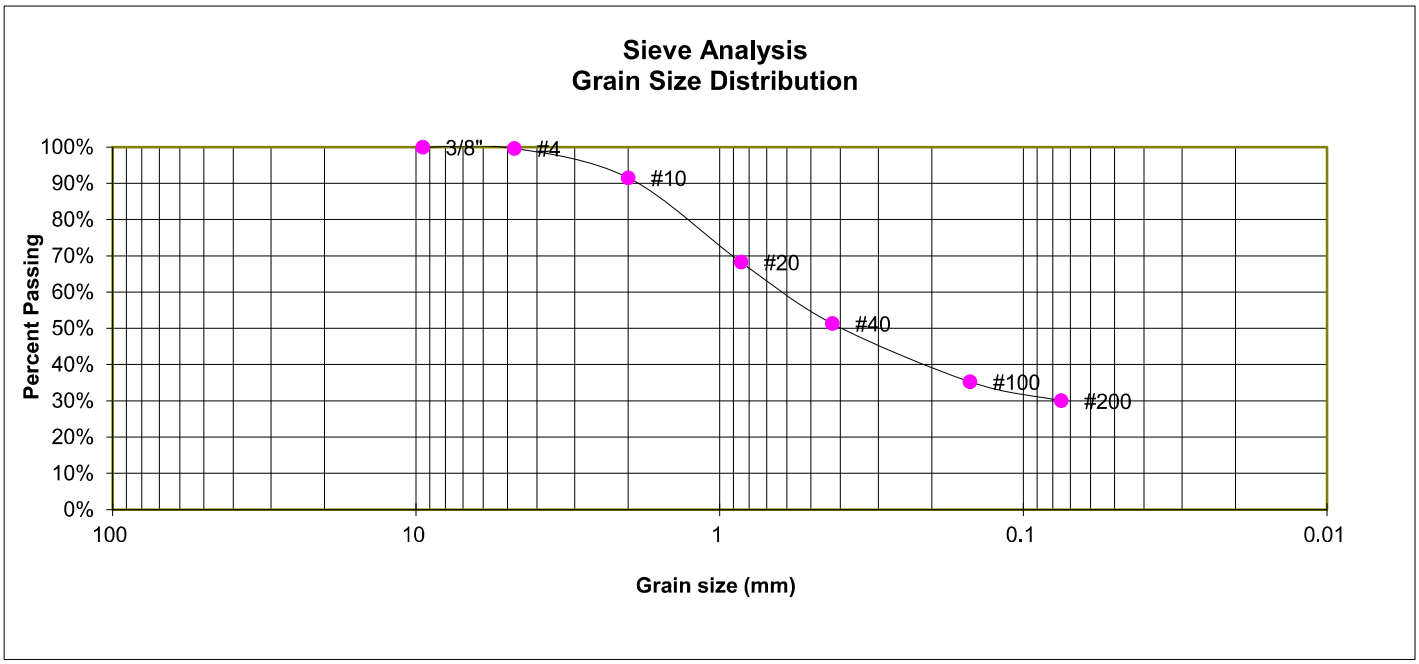
FIG. B-12

TEST BORING	13	SOIL DESCRIPTION	FILL, SAND, CLAYEY
DEPTH (FT)	1-2	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.7%
10	91.5%
20	68.3%
40	51.3%
100	35.3%
200	30.0%

ATTERBERG LIMITS

Plastic Limit	20
Liquid Limit	30
Plastic Index	10

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-2-4
AASHTO GROUP INDEX:	0

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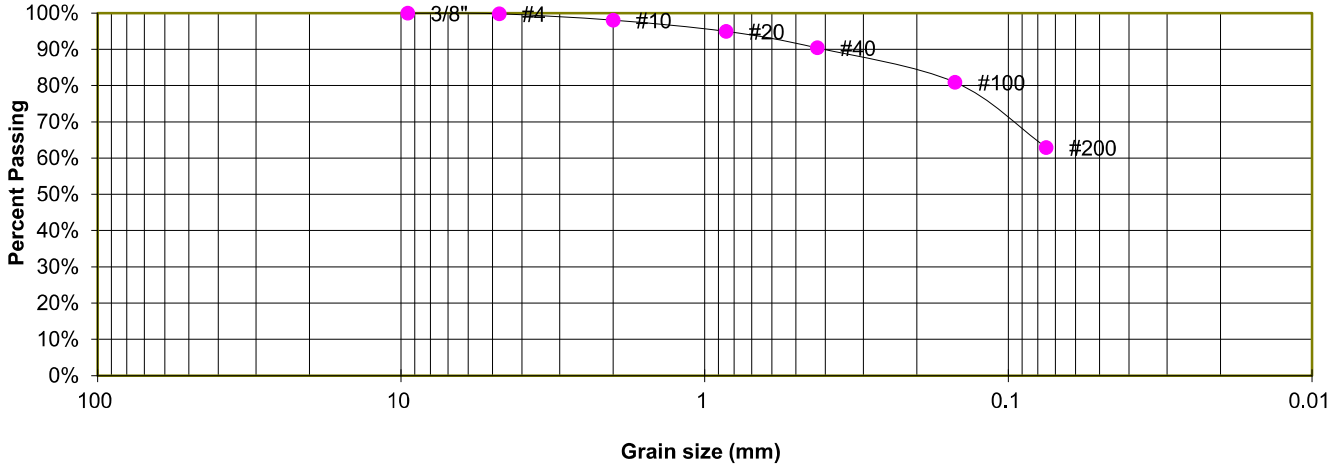
FIG. B-13

TEST BORING	14	SOIL DESCRIPTION	FILL, CLAY, SANDY
DEPTH (FT)	1-2	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.8%
10	98.1%
20	95.0%
40	90.4%
100	80.9%
200	62.9%

ATTERBERG LIMITS

Plastic Limit	19
Liquid Limit	30
Plastic Index	11

SOIL CLASSIFICATION

USCS CLASSIFICATION:	CL
AASHTO CLASSIFICATION:	A-6
AASHTO GROUP INDEX:	5

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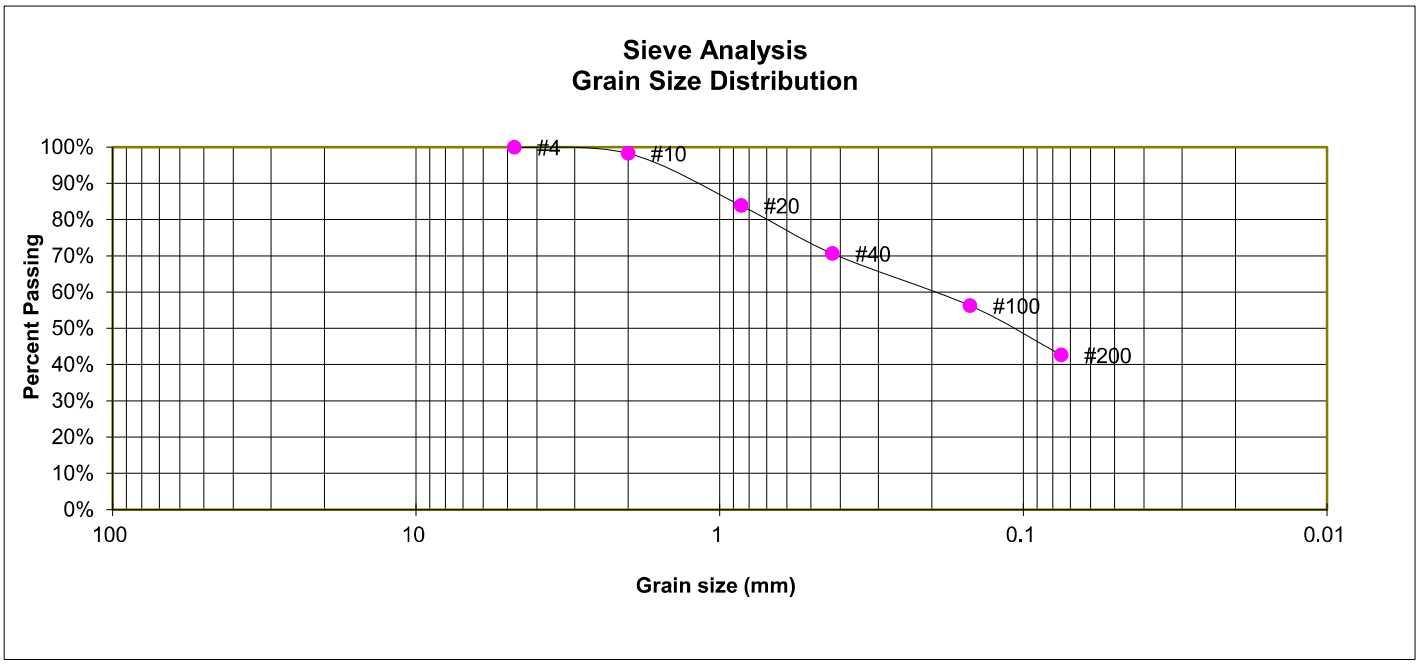
FIG. B-14

TEST BORING	15	SOIL DESCRIPTION	FILL, SAND, CLAYEY
DEPTH (FT)	1-2	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.3%
20	83.9%
40	70.6%
100	56.3%
200	42.7%

ATTERBERG LIMITS

Plastic Limit	20
Liquid Limit	28
Plastic Index	8

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	0

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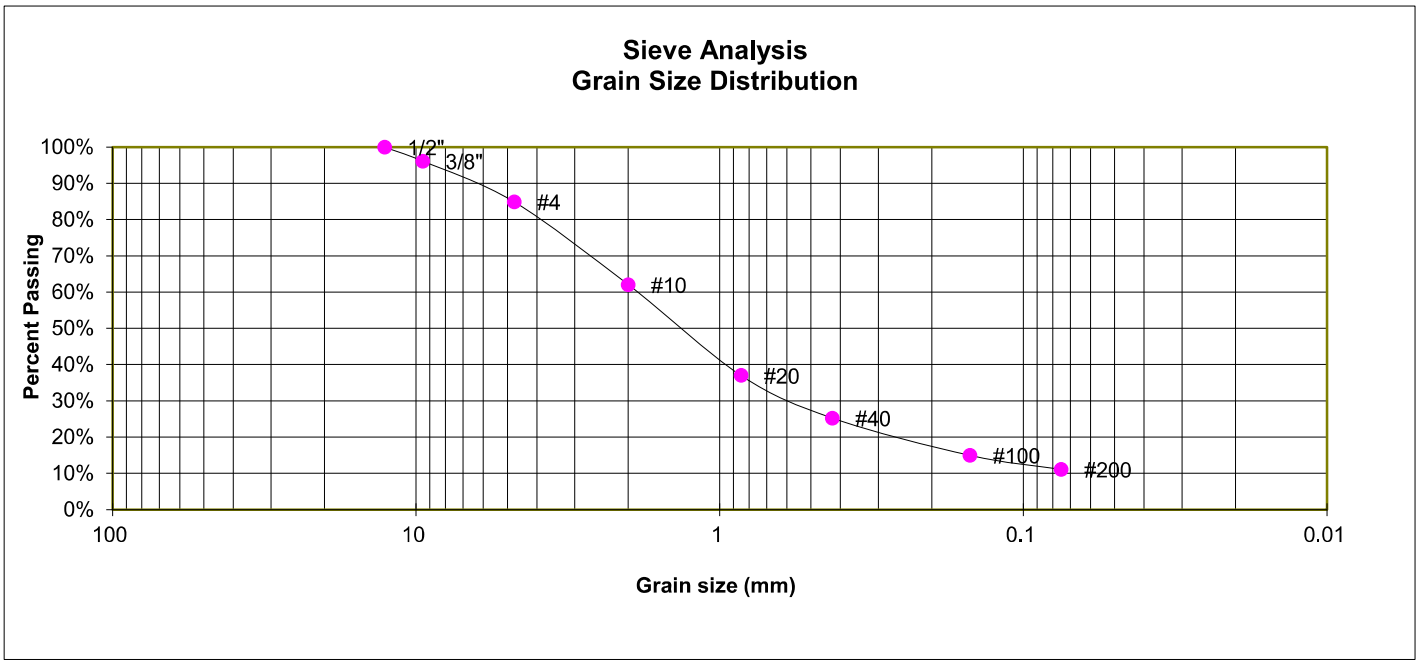
FIG. B-15

TEST BORING	16	SOIL DESCRIPTION	FILL, SAND, WITH SILT
DEPTH (FT)	1-2	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	96.1%
4	84.9%
10	62.0%
20	37.0%
40	25.2%
100	15.0%
200	11.1%

ATTERBERG LIMITS

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

SOIL CLASSIFICATION

USCS CLASSIFICATION: SW-SM
AASHTO CLASSIFICATION: A-1-b
AASHTO GROUP INDEX: 0

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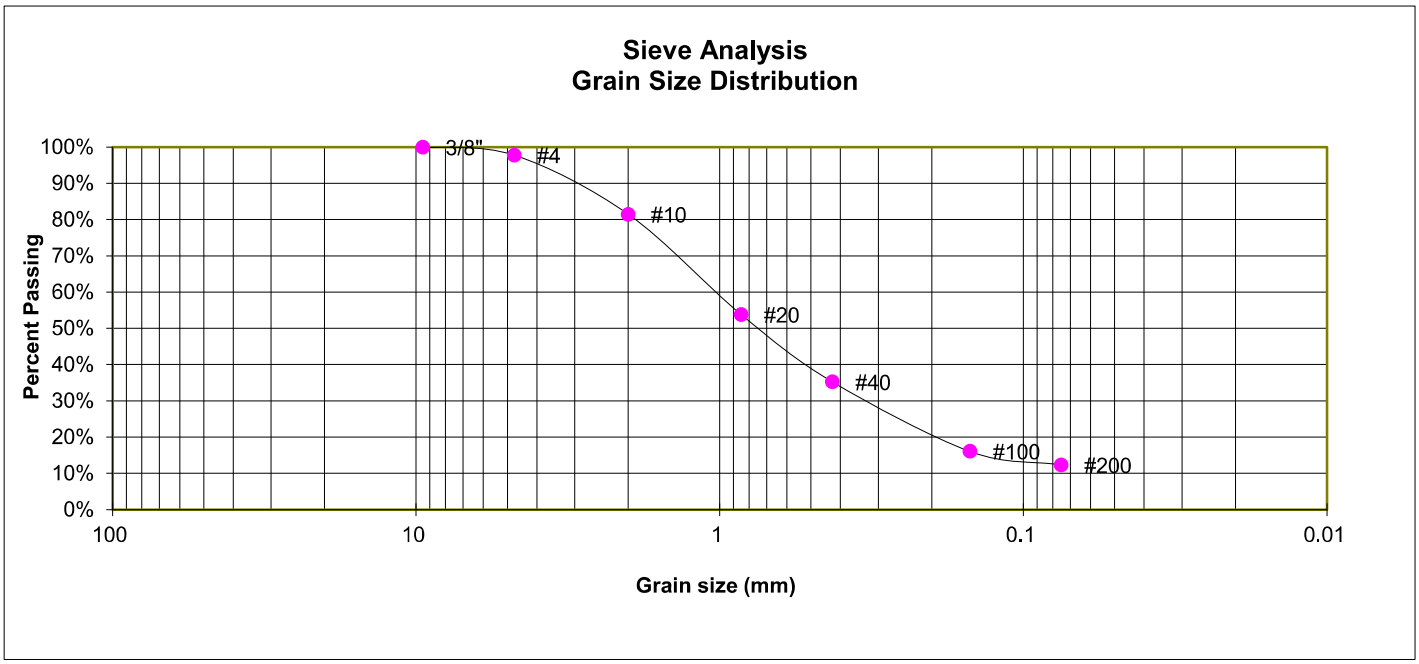
FIG. B-16

TEST BORING	17	SOIL DESCRIPTION	FILL, SAND, SILTY
DEPTH (FT)	1-2	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.8%
10	81.5%
20	53.8%
40	35.2%
100	16.1%
200	12.3%

ATTERBERG LIMITS

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SM
AASHTO CLASSIFICATION:	A-1-b
AASHTO GROUP INDEX:	0

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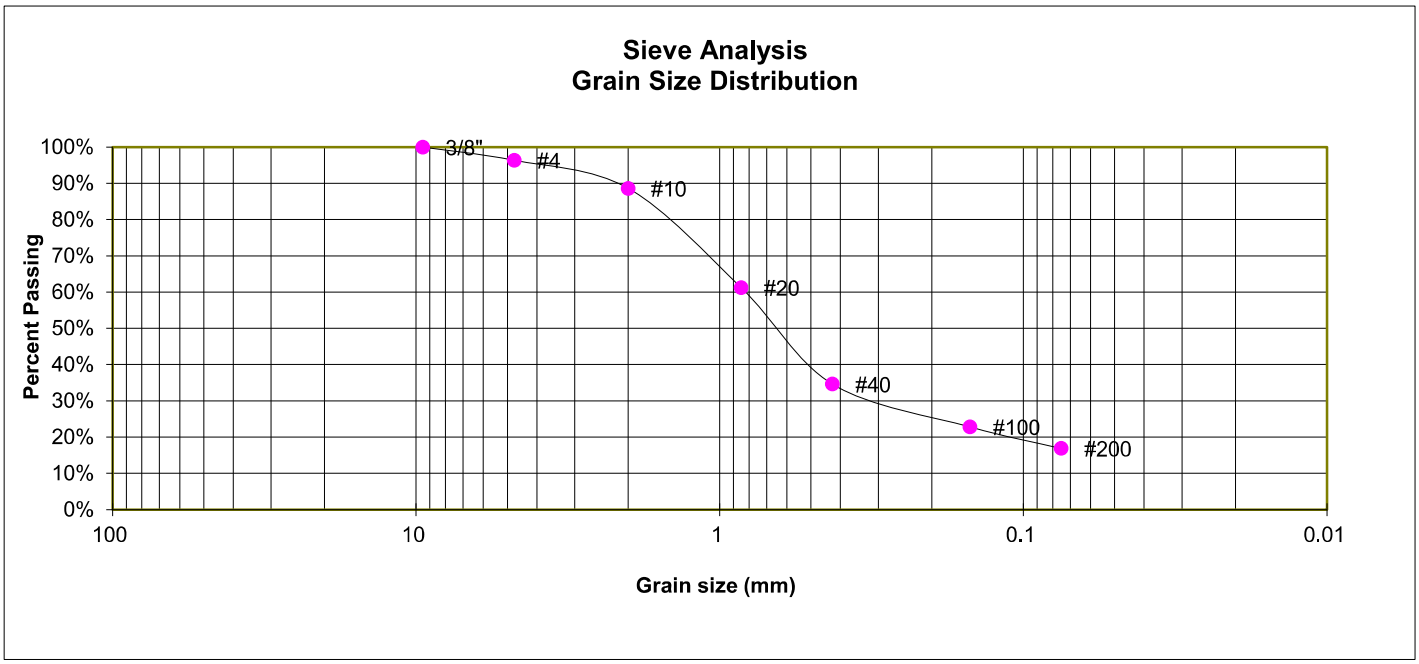
FIG. B-17

TEST BORING	18	SOIL DESCRIPTION	FILL, SAND, CLAYEY
DEPTH (FT)	1-2	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.4%
10	88.6%
20	61.3%
40	34.6%
100	22.8%
200	16.9%

ATTERBERG LIMITS

Plastic Limit	23
Liquid Limit	39
Plastic Index	16

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-2-6
AASHTO GROUP INDEX:	0

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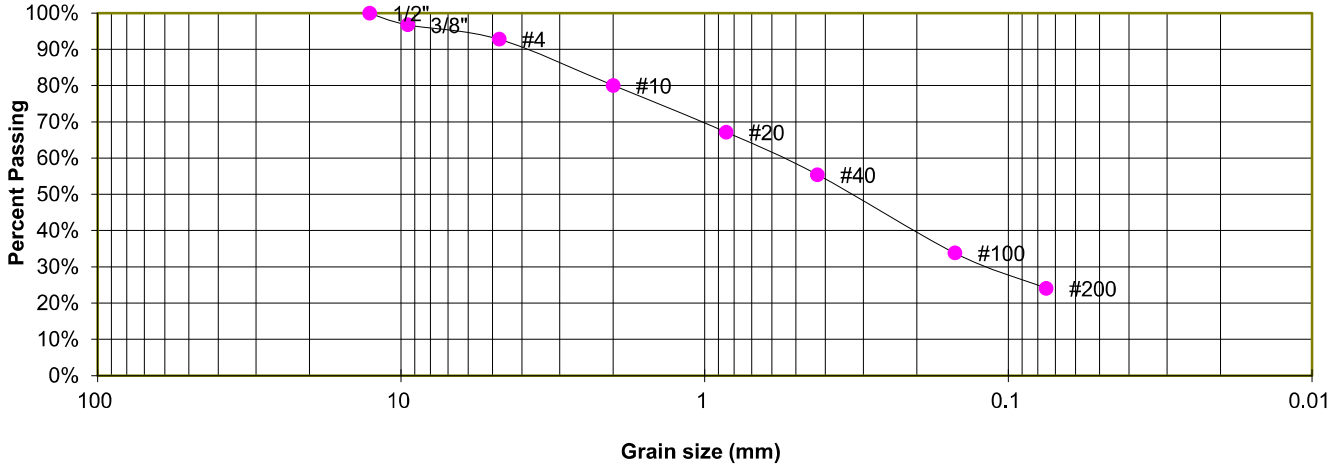
FIG. B-18

TEST BORING	19	SOIL DESCRIPTION	FILL, SAND, CLAYEY
DEPTH (FT)	1-2	SOIL TYPE	1



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	96.8%
4	92.8%
10	80.1%
20	67.2%
40	55.4%
100	33.9%
200	24.1%

ATTERBERG LIMITS

Plastic Limit	19
Liquid Limit	27
Plastic Index	8

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-2-4
AASHTO GROUP INDEX:	0

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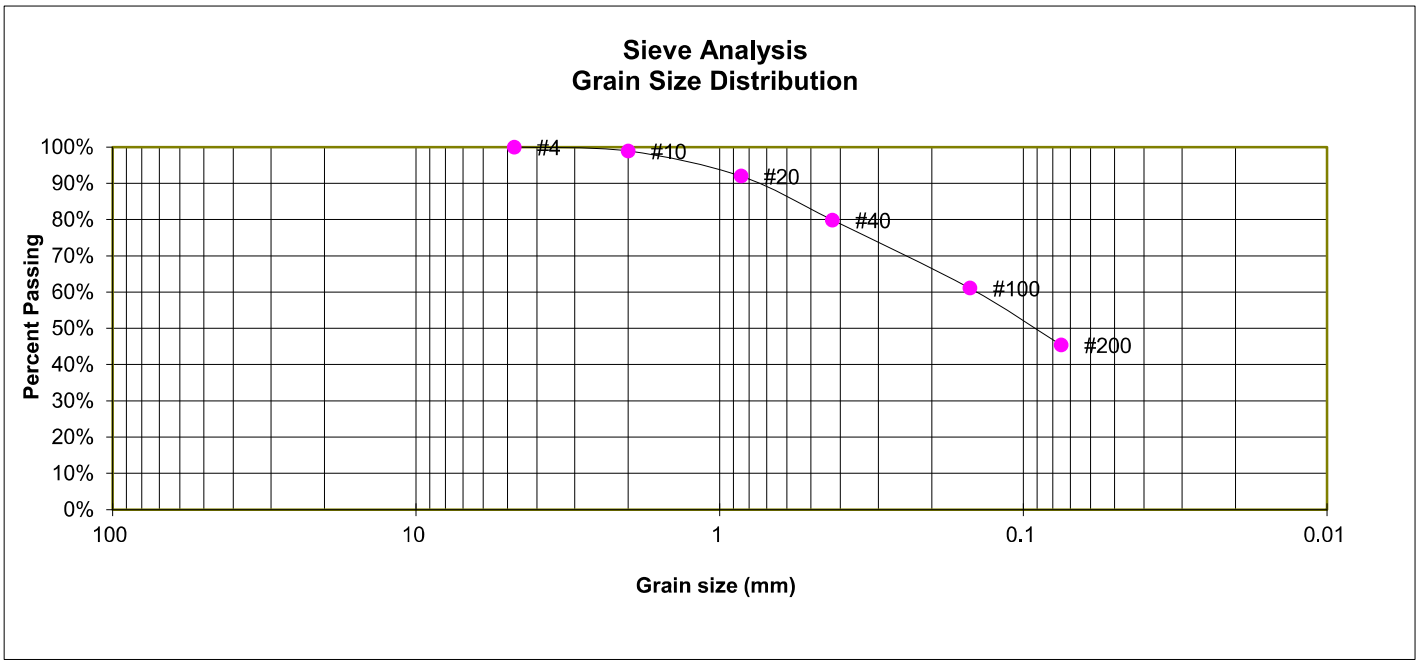
FIG. B-19

TEST BORING	20	SOIL DESCRIPTION	FILL, SAND, CLAYEY
DEPTH (FT)	1-2	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.9%
20	92.0%
40	79.9%
100	61.1%
200	45.4%

ATTERBERG LIMITS

Plastic Limit	14
Liquid Limit	23
Plastic Index	9

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	1

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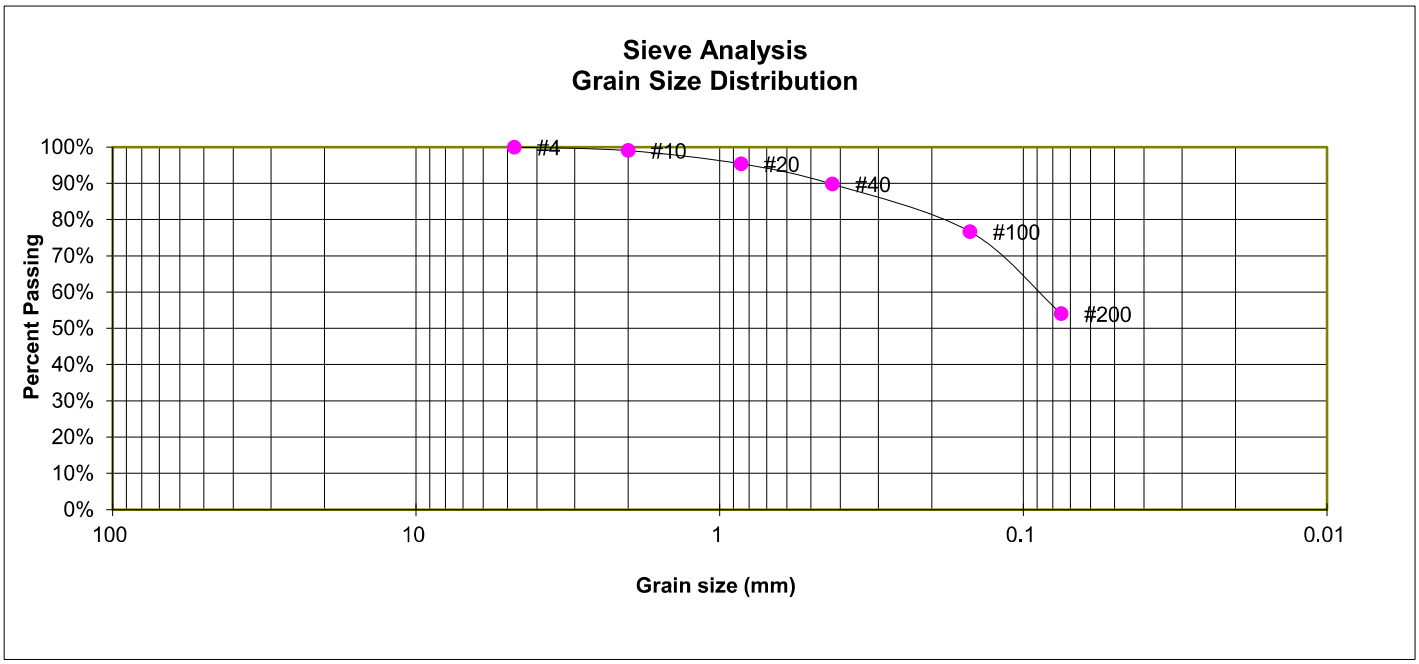
FIG. B-20

TEST BORING	21	SOIL DESCRIPTION	FILL, CLAY, SANDY
DEPTH (FT)	1-2	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.1%
20	95.4%
40	89.8%
100	76.7%
200	54.0%

ATTERBERG LIMITS

Plastic Limit	21
Liquid Limit	30
Plastic Index	9

SOIL CLASSIFICATION

USCS CLASSIFICATION:	CL
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	3

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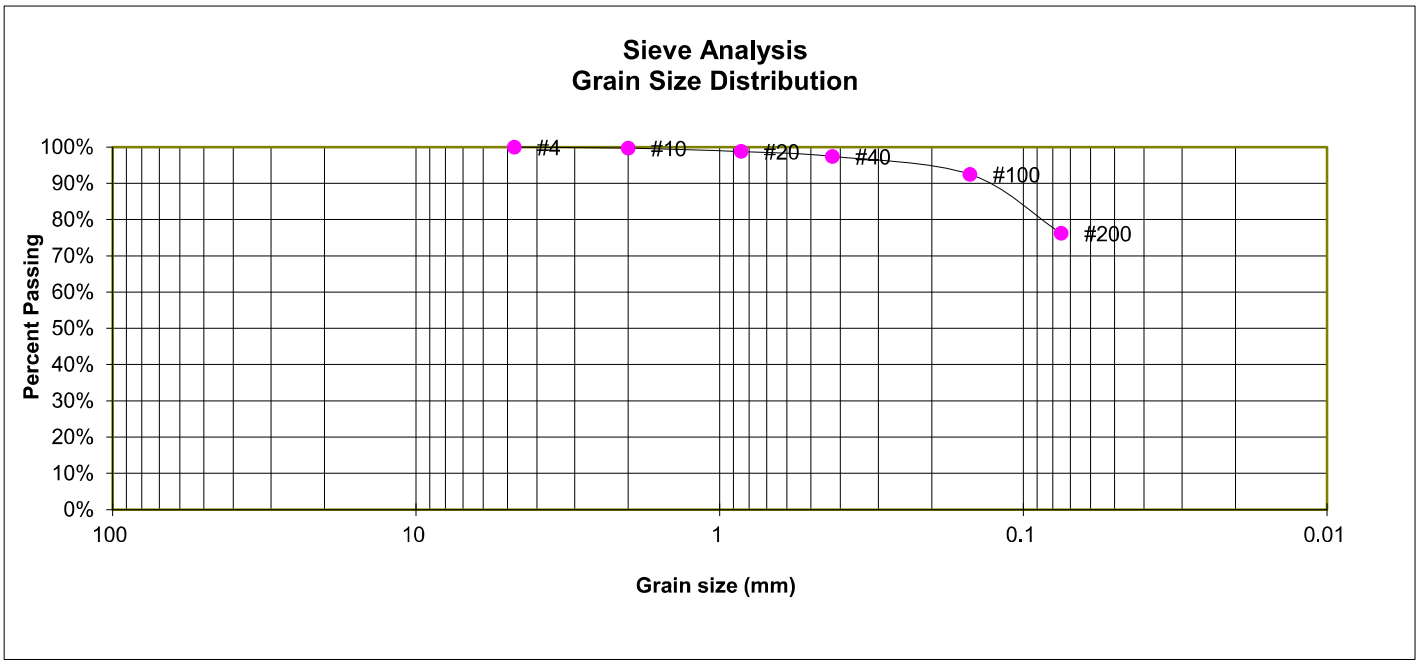
FIG. B-21

TEST BORING	22	SOIL DESCRIPTION	FILL, CLAY, WITH SAND
DEPTH (FT)	1-2	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.7%
20	98.8%
40	97.4%
100	92.5%
200	76.2%

ATTERBERG LIMITS

Plastic Limit	19
Liquid Limit	28
Plastic Index	9

SOIL CLASSIFICATION

USCS CLASSIFICATION:	CL
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	5

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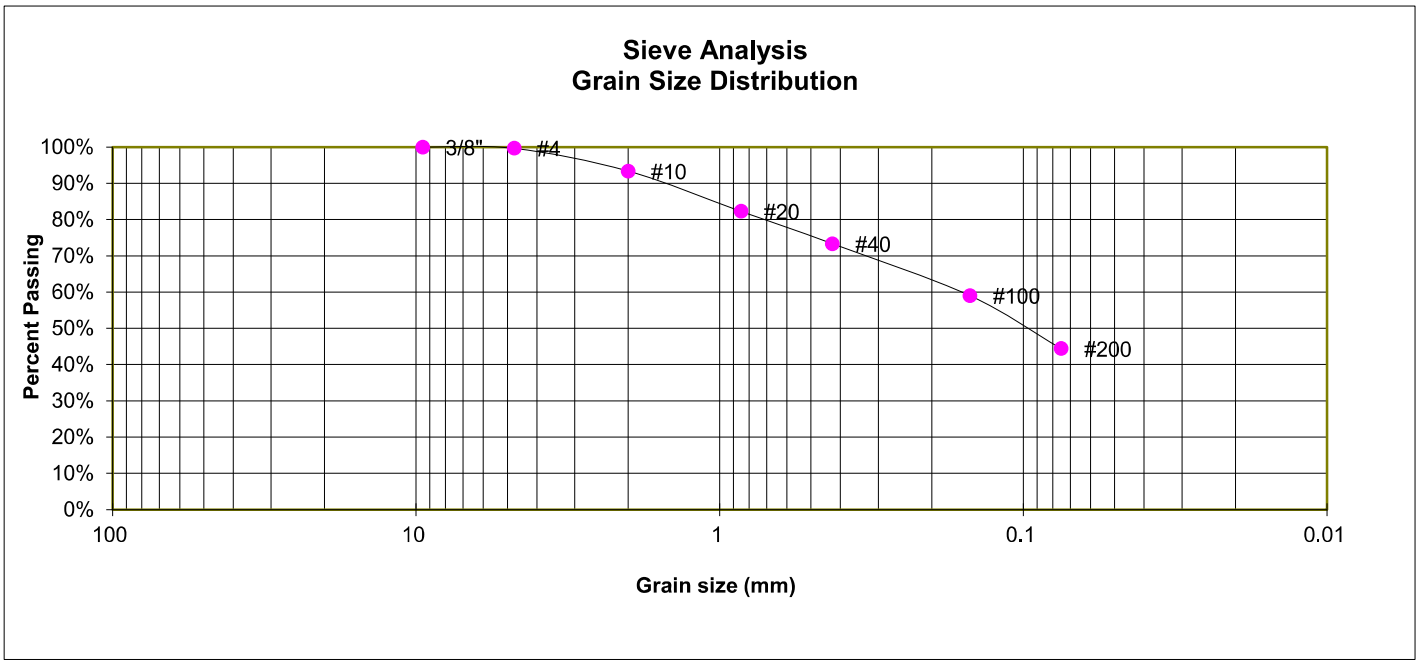
FIG. B-22

TEST BORING	23	SOIL DESCRIPTION	FILL, SAND, CLAYEY
DEPTH (FT)	1-2	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.7%
10	93.4%
20	82.3%
40	73.4%
100	59.1%
200	44.4%

ATTERBERG LIMITS

Plastic Limit	14
Liquid Limit	23
Plastic Index	9

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	1

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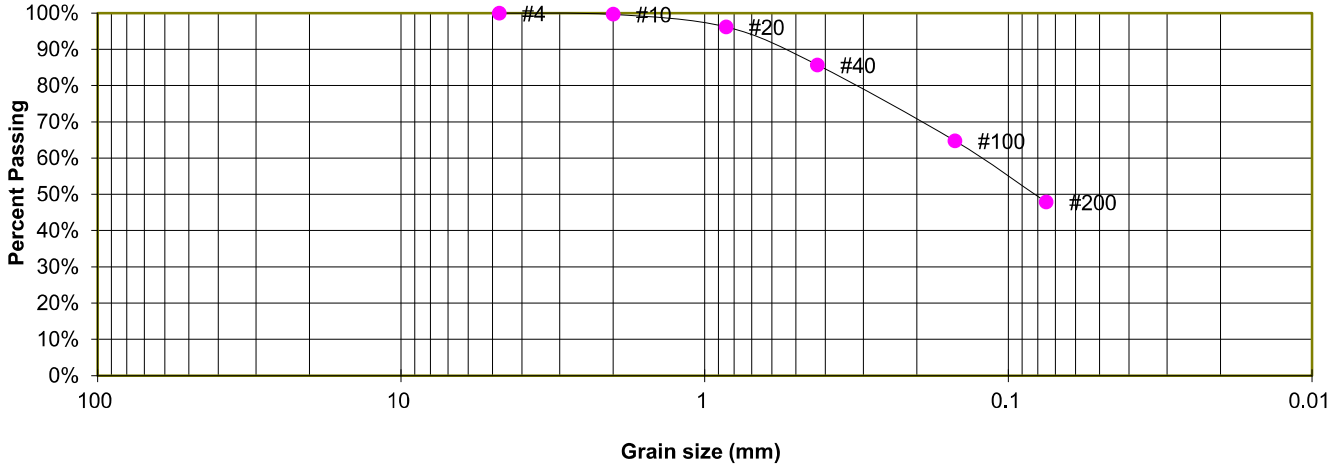
FIG. B-23

TEST BORING	24	SOIL DESCRIPTION	SAND, CLAYEY
DEPTH (FT)	1-2	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.7%
20	96.2%
40	85.7%
100	64.8%
200	47.9%

ATTERBERG LIMITS

Plastic Limit	19
Liquid Limit	28
Plastic Index	9

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	2

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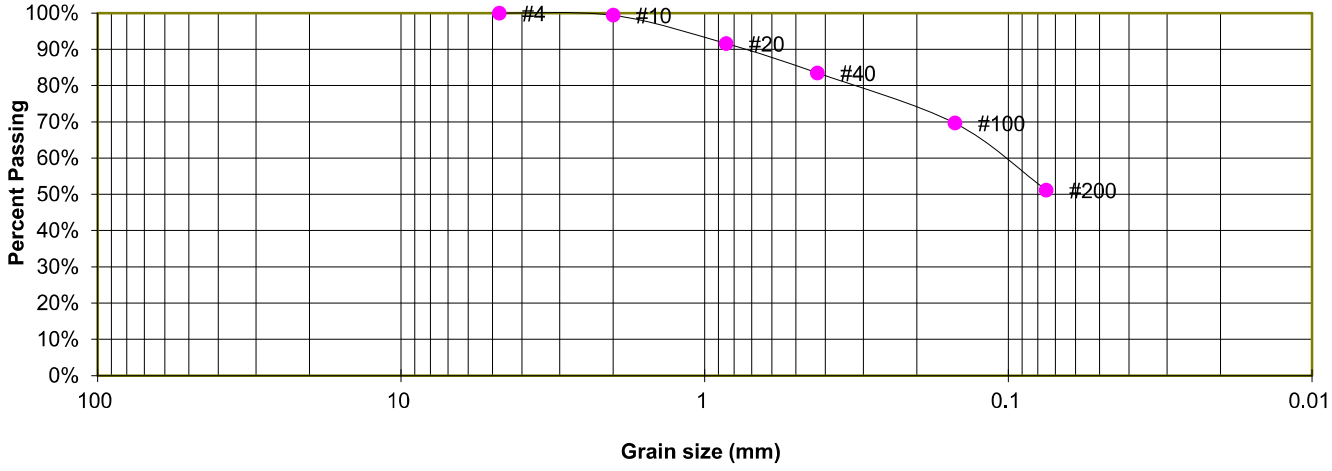
FIG. B-24

TEST BORING	25	SOIL DESCRIPTION	FILL, CLAY, SANDY
DEPTH (FT)	1-2	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.5%
20	91.6%
40	83.5%
100	69.7%
200	51.2%

ATTERBERG LIMITS

Plastic Limit	17
Liquid Limit	27
Plastic Index	10

SOIL CLASSIFICATION

USCS CLASSIFICATION:	CL
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	2

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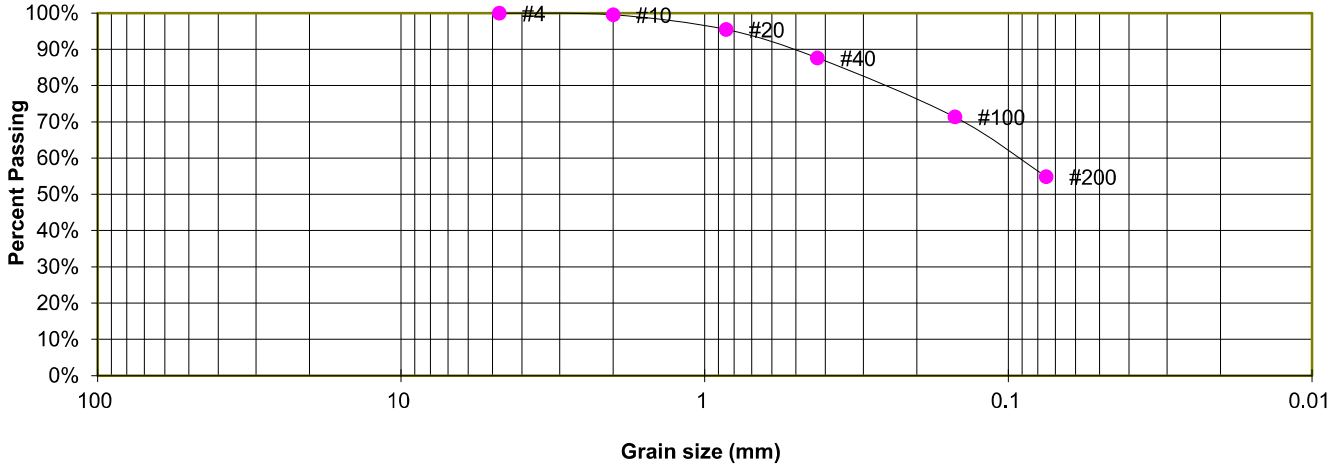
FIG. B-25

TEST BORING	26	SOIL DESCRIPTION	FILL, CLAY, SANDY
DEPTH (FT)	1-2	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.5%
20	95.5%
40	87.6%
100	71.4%
200	54.9%

ATTERBERG LIMITS

Plastic Limit	20
Liquid Limit	28
Plastic Index	8

SOIL CLASSIFICATION

USCS CLASSIFICATION:	CL
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	2

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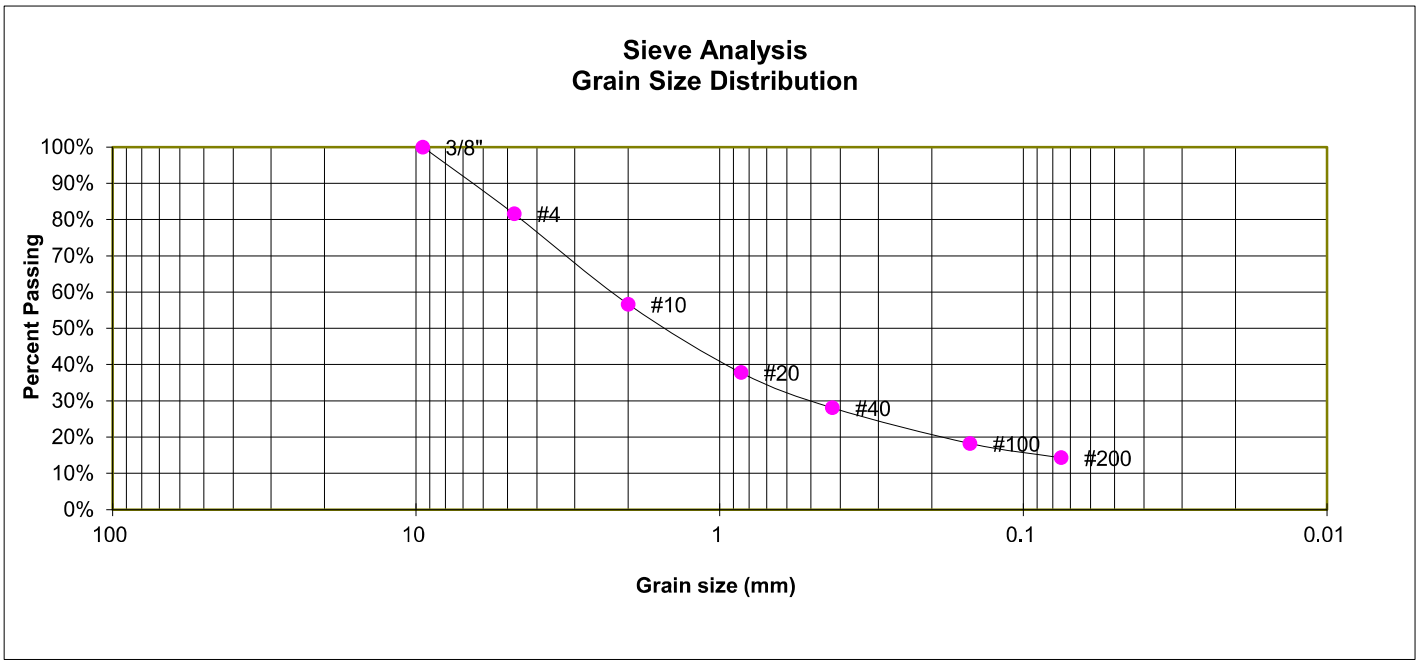
FIG. B-26

TEST BORING	12	SOIL DESCRIPTION	SANDSTONE (SAND, SILTY)
DEPTH (FT)	10	SOIL TYPE	3



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	81.6%
10	56.6%
20	37.8%
40	28.1%
100	18.2%
200	14.3%

ATTERBERG LIMITS

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SM
AASHTO CLASSIFICATION:	A-1-b
AASHTO GROUP INDEX:	0

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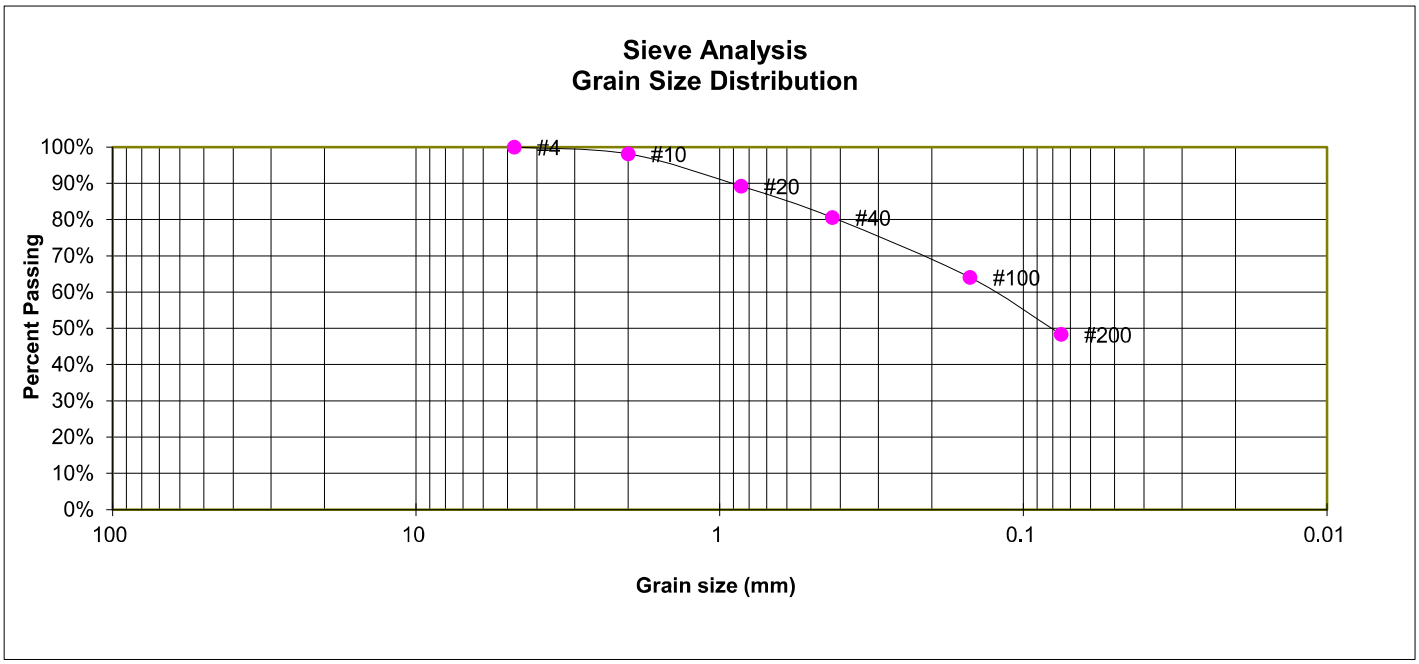
FIG. B-27

TEST BORING	21	SOIL DESCRIPTION	FILL, SAND, CLAYEY
DEPTH (FT)	0-3	SOIL TYPE	2, CBR



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.2%
20	89.2%
40	80.6%
100	64.1%
200	48.3%

ATTERBERG LIMITS

Plastic Limit	21
Liquid Limit	28
Plastic Index	7

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	1

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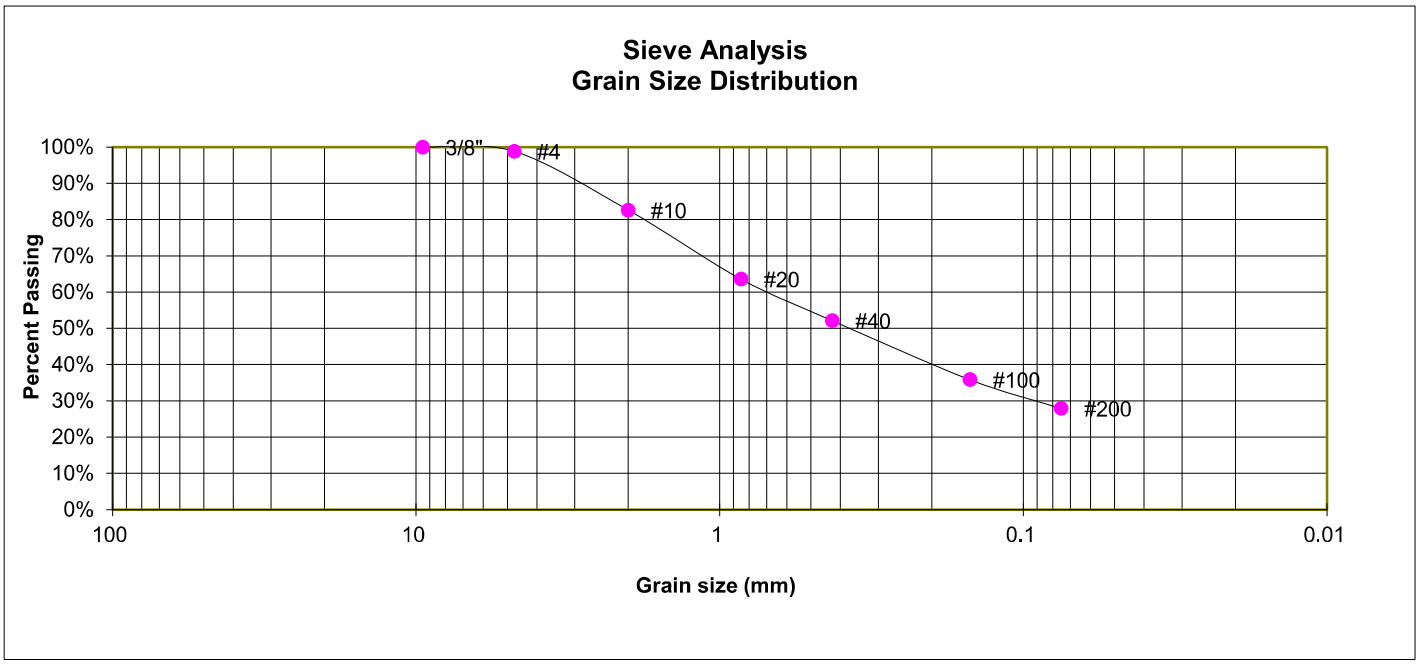
FIG. B-28

TEST BORING	3	SOIL DESCRIPTION	FILL, SAND, SILTY
DEPTH (FT)	0-3	SOIL TYPE	1, CBR



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.8%
10	82.6%
20	63.6%
40	52.1%
100	35.9%
200	27.9%

ATTERBERG LIMITS

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SM
AASHTO CLASSIFICATION:	A-2-4
AASHTO GROUP INDEX:	0

ENTECH ENGINEERING, INC.

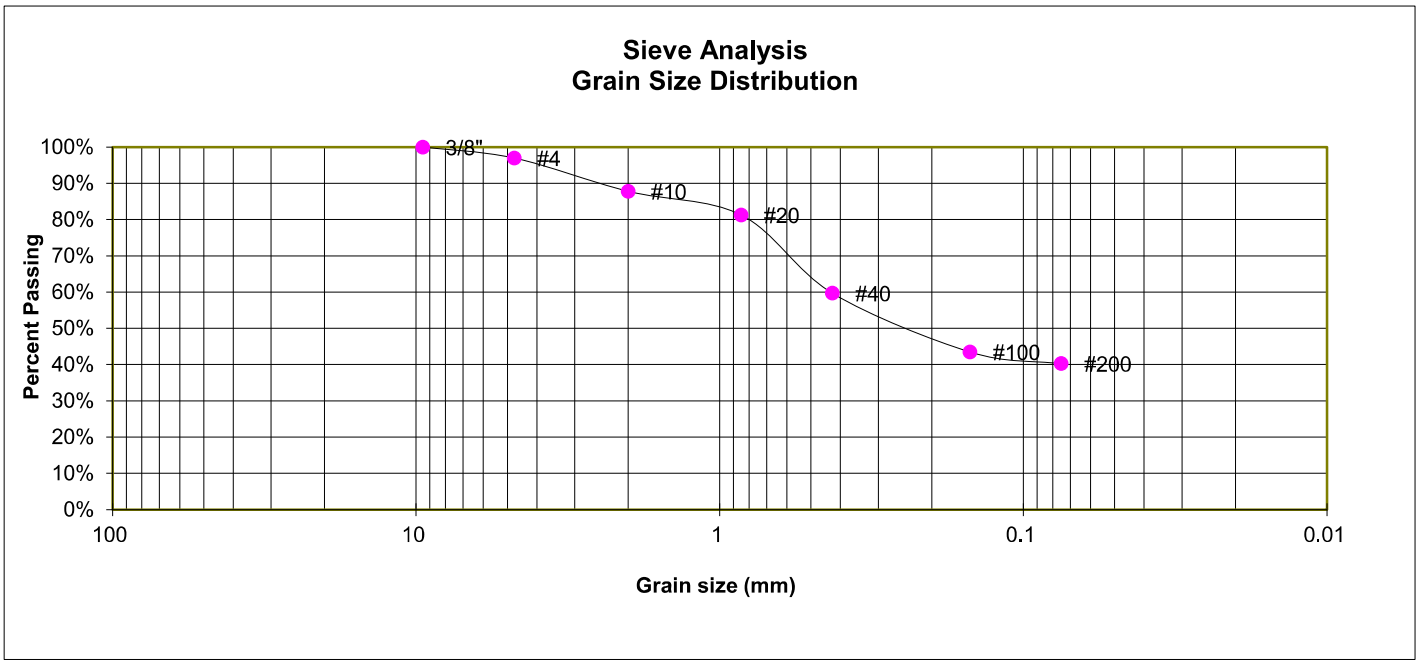
LABORATORY TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-29

TEST BORING	15	SOIL DESCRIPTION	FILL, SAND, CLAYEY
DEPTH (FT)	0-3	SOIL TYPE	2



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.0%
10	87.8%
20	81.3%
40	59.7%
100	43.5%
200	40.3%

ATTERBERG LIMITS

Plastic Limit	21
Liquid Limit	29
Plastic Index	8

SOIL CLASSIFICATION

USCS CLASSIFICATION:	SC
AASHTO CLASSIFICATION:	A-4
AASHTO GROUP INDEX:	0

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LABORATORY TEST RESULTS

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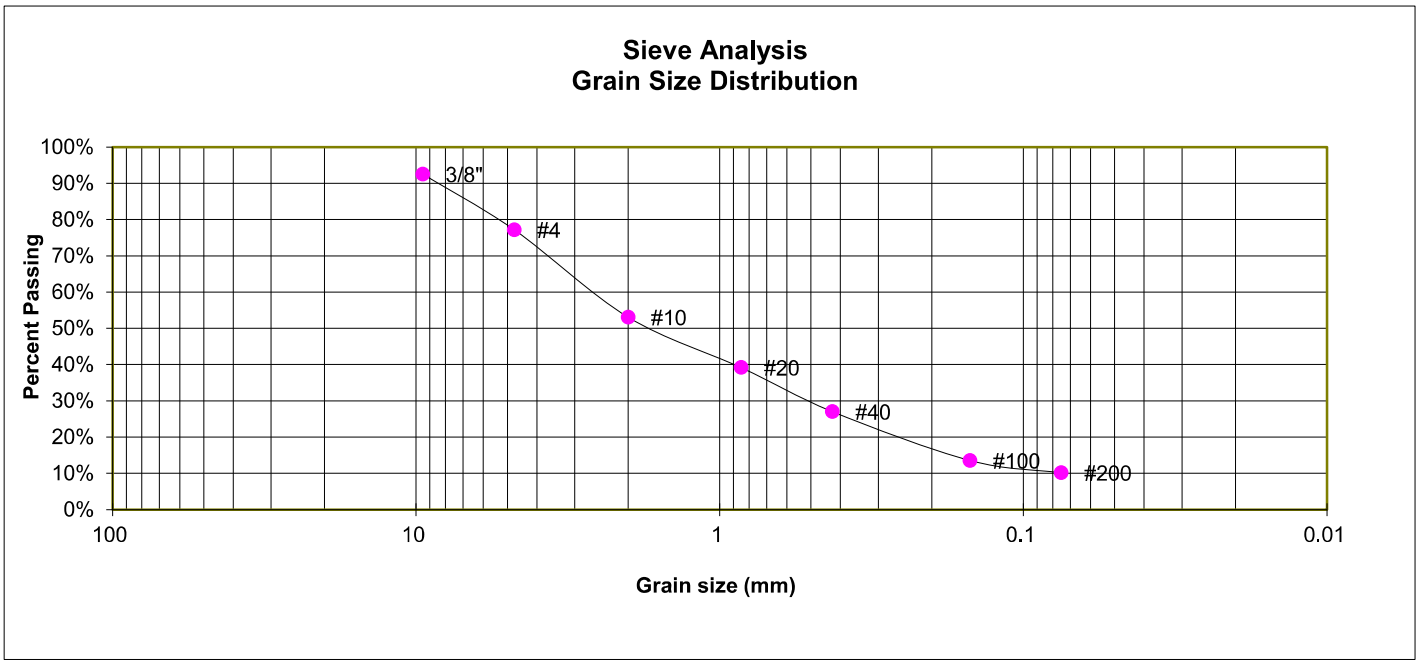
FIG. B-30

TEST BORING	18	SOIL DESCRIPTION	SANDSTONE (SAND, WITH SILT)
DEPTH (FT)	10	SOIL TYPE	3



GRAIN SIZE ANALYSIS

U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	92.5%
4	77.2%
10	53.1%
20	39.2%
40	27.0%
100	13.6%
200	10.2%

ATTERBERG LIMITS

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

SOIL CLASSIFICATION

USCS CLASSIFICATION: SW-SM
AASHTO CLASSIFICATION: A-1-b
AASHTO GROUP INDEX: 0

ENTECH ENGINEERING, INC.

LABORATORY TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

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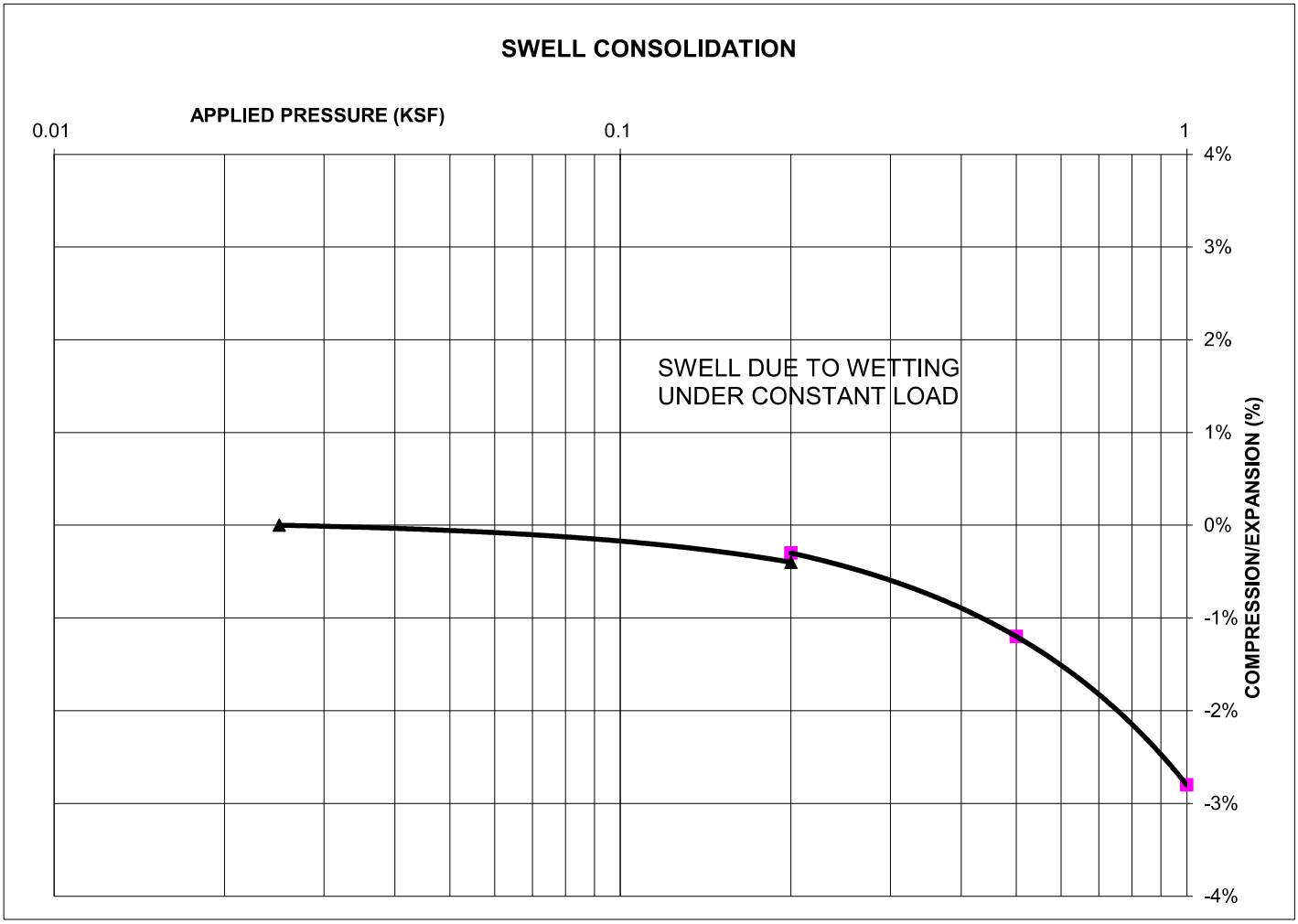
FIG. B-31

TEST BORING	8	SOIL DESCRIPTION	FILL, SAND, CLAYEY
DEPTH (FT)	1-2	SOIL TYPE	2



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF):	104
NATURAL MOISTURE CONTENT:	9.8%
SWELL/COLLAPSE (%):	0.1%

ENTECH ENGINEERING, INC.

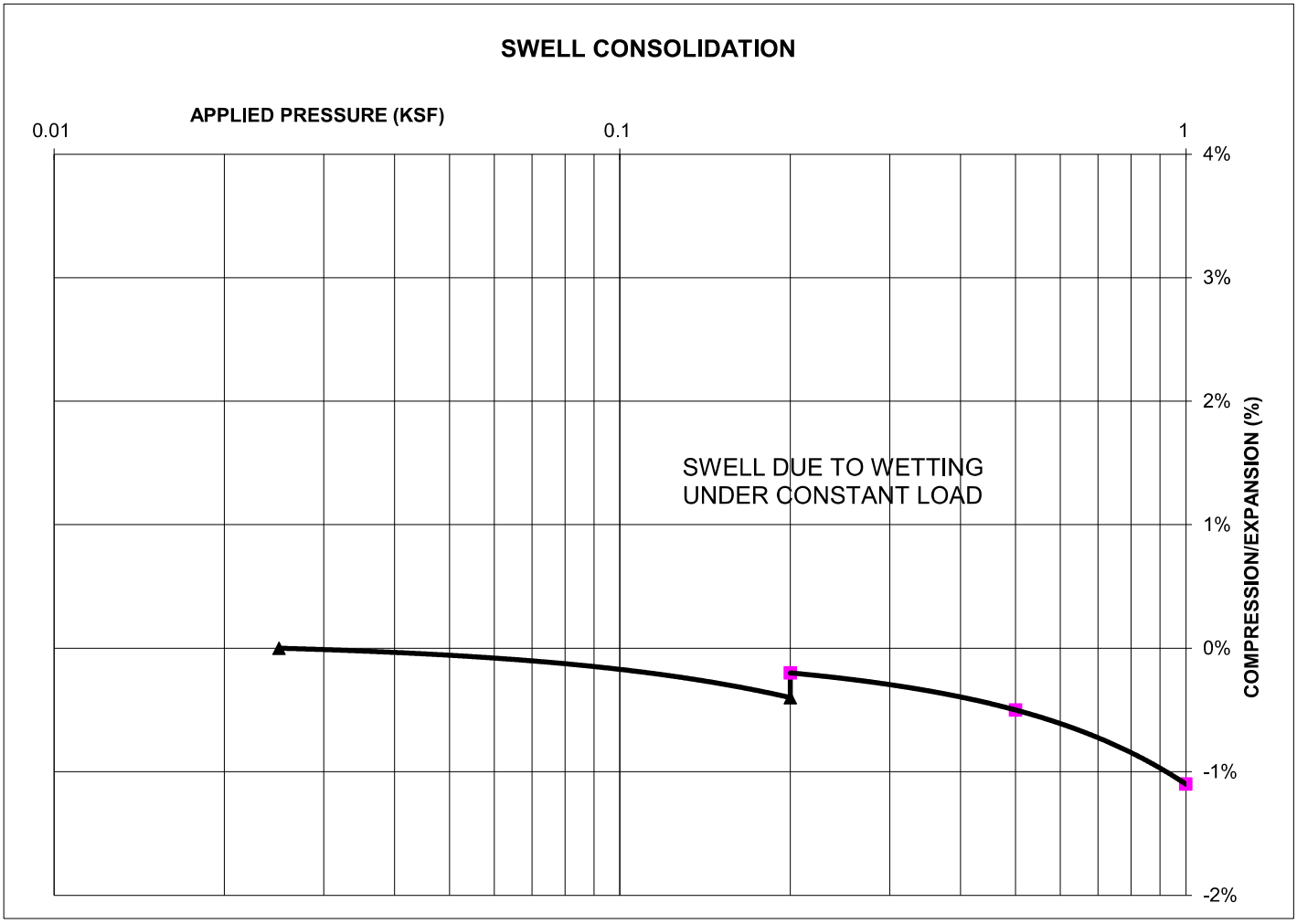
SWELL TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-32

TEST BORING	12	SOIL DESCRIPTION	FILL, SAND, SILTY
DEPTH (FT)	1-2	SOIL TYPE	2



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF):	106
NATURAL MOISTURE CONTENT:	16.6%
SWELL/COLLAPSE (%):	0.2%

ENTECH ENGINEERING, INC.

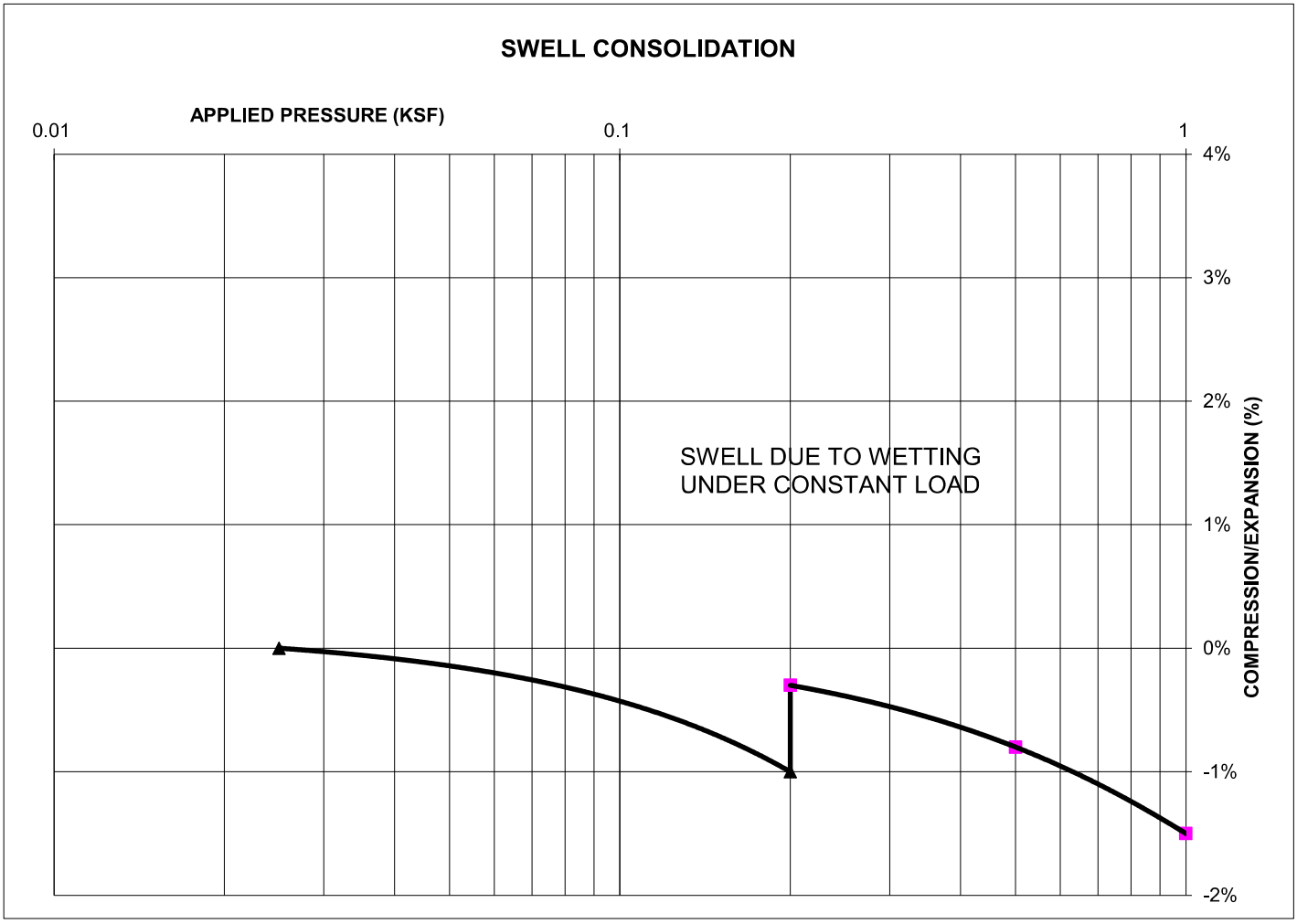
SWELL TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-33

TEST BORING	21	SOIL DESCRIPTION	FILL, CLAY, SANDY
DEPTH (FT)	1-2	SOIL TYPE	2



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF):	108
NATURAL MOISTURE CONTENT:	14.0%
SWELL/COLLAPSE (%):	0.7%

ENTECH ENGINEERING, INC.

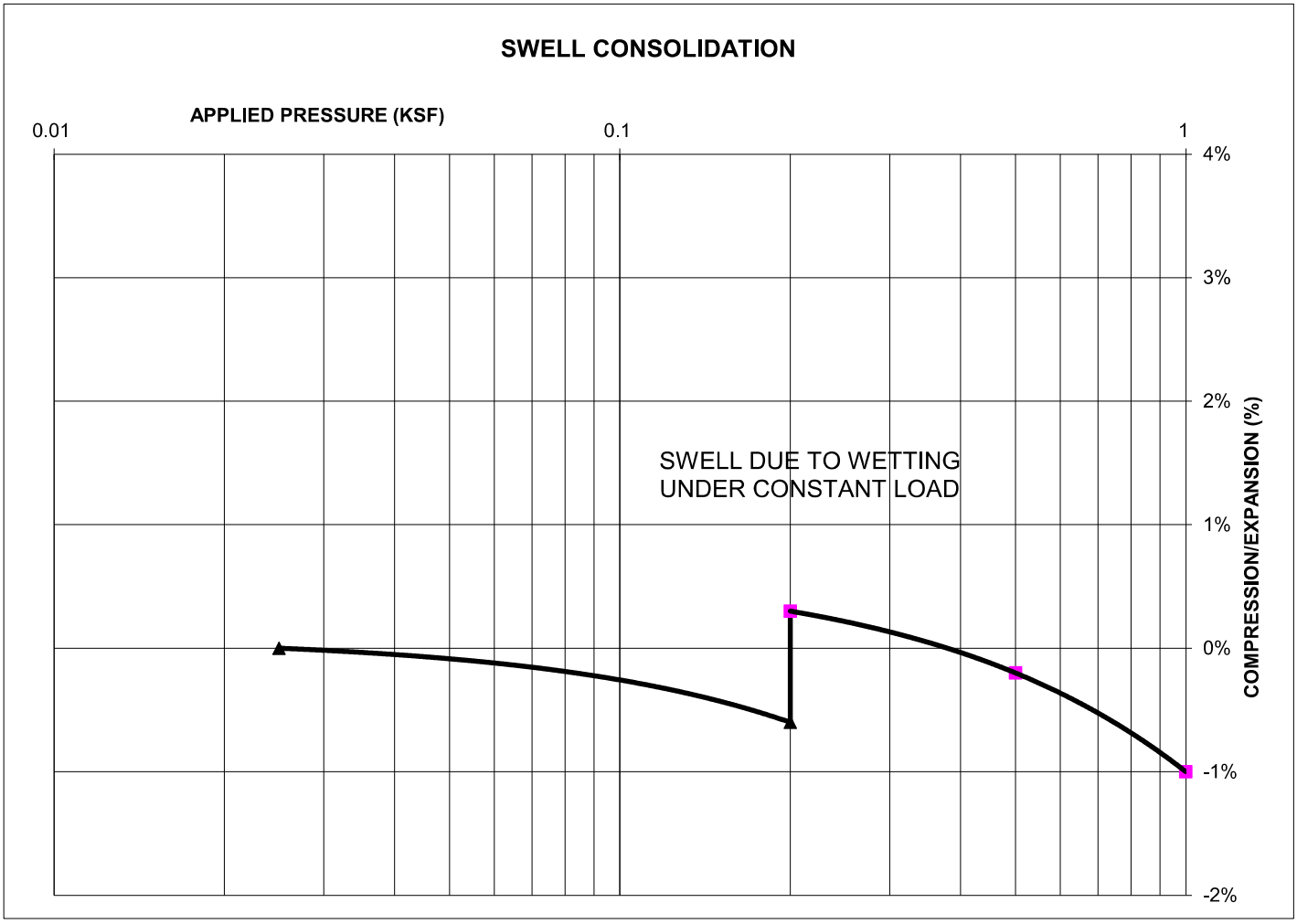
SWELL TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-34

TEST BORING	22	SOIL DESCRIPTION	FILL, CLAY, SANDY
DEPTH (FT)	1-2	SOIL TYPE	2



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 99
NATURAL MOISTURE CONTENT: 14.8%
SWELL/COLLAPSE (%): 0.9%

ENTECH ENGINEERING, INC.

SWELL TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
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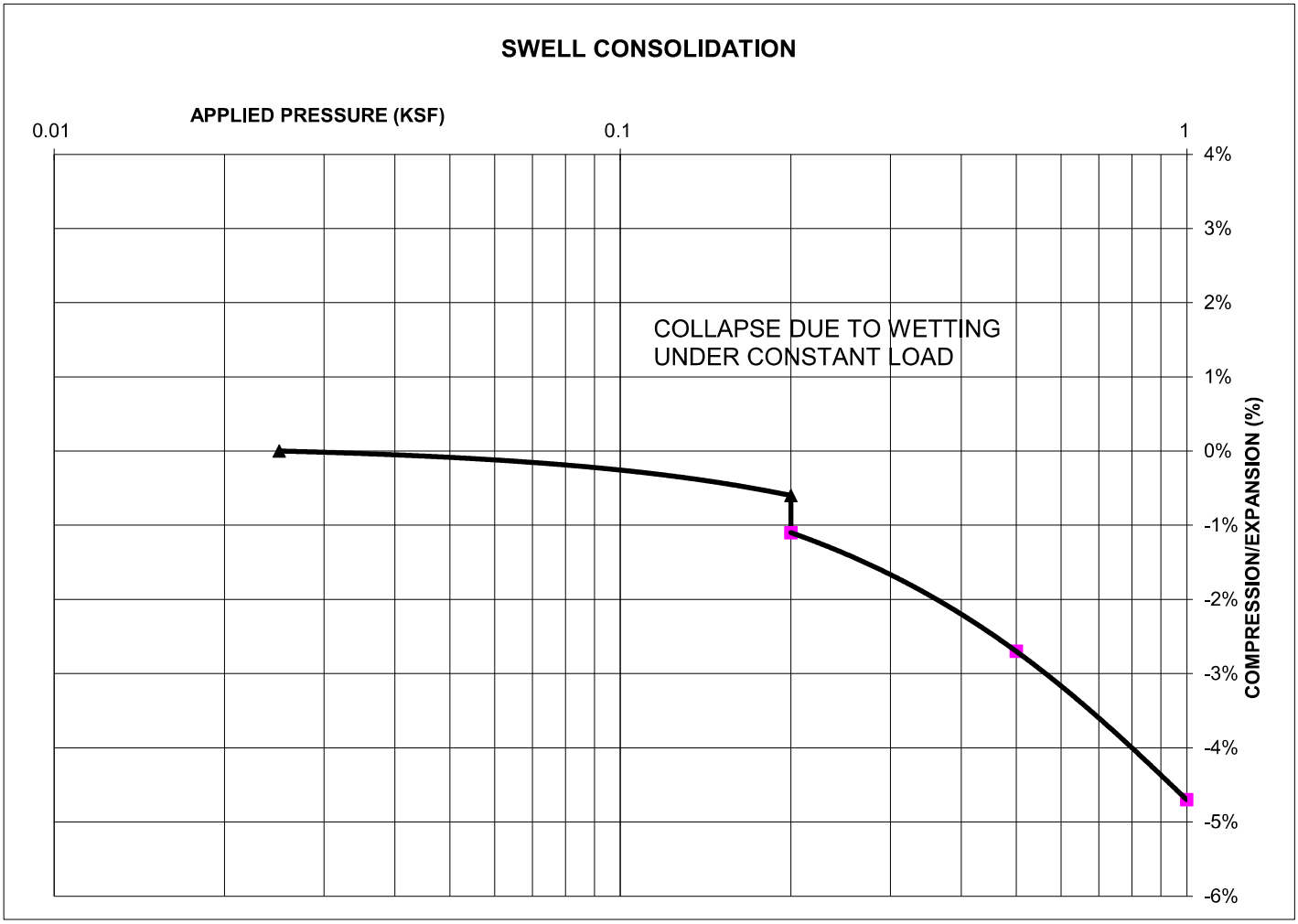
FIG. B-35

TEST BORING	23	SOIL DESCRIPTION	FILL, SAND, CLAYEY
DEPTH (FT)	1-2	SOIL TYPE	2



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF): 106
NATURAL MOISTURE CONTENT: 7.6%
SWELL/COLLAPSE (%): -0.5%

ENTECH ENGINEERING, INC.

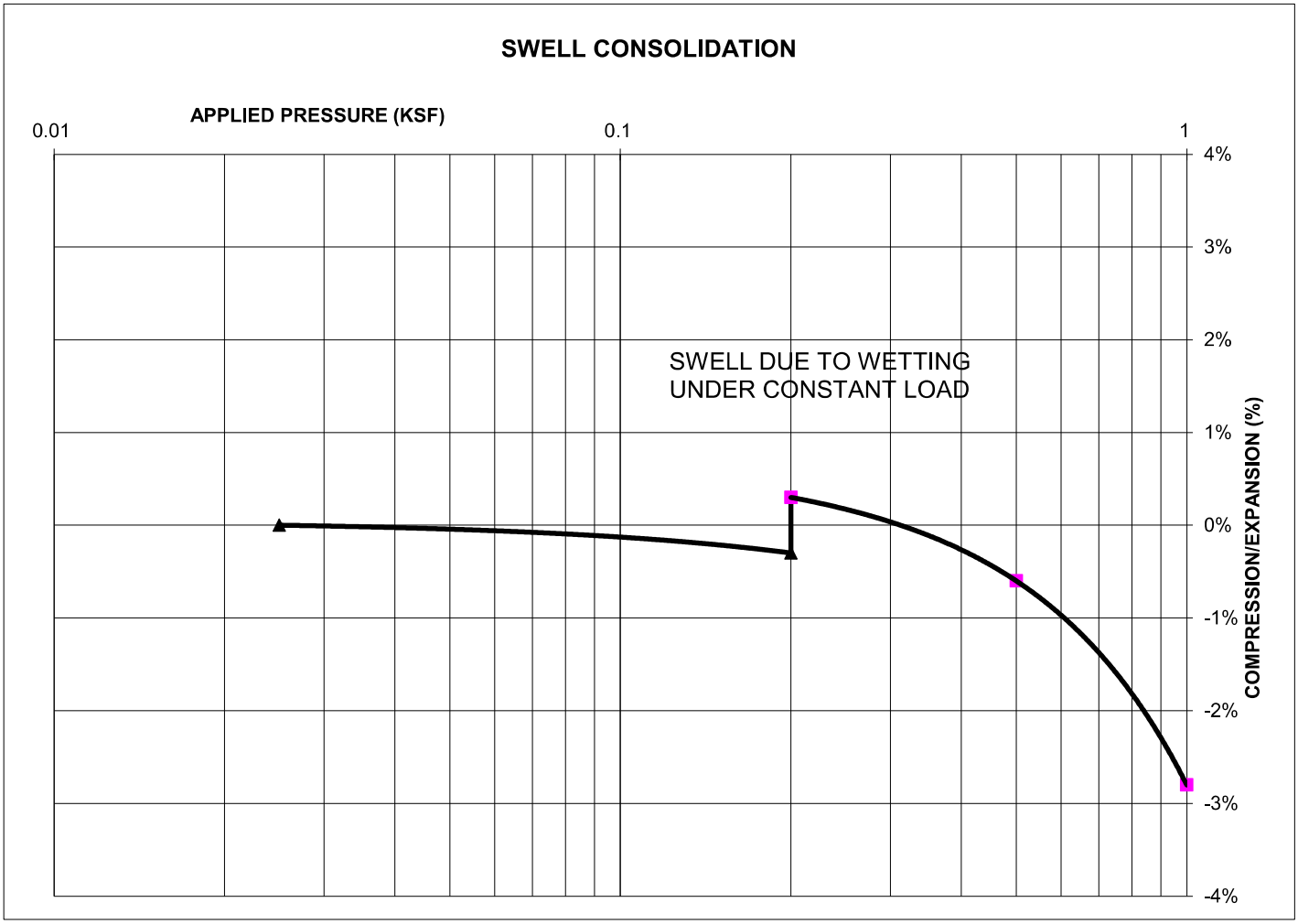
SWELL TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-36

TEST BORING	14	SOIL DESCRIPTION	FILL, CLAY, SANDY
DEPTH (FT)	1-2	SOIL TYPE	2



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF):	109
NATURAL MOISTURE CONTENT:	16.1%
SWELL/COLLAPSE (%):	0.6%

ENTECH ENGINEERING, INC.

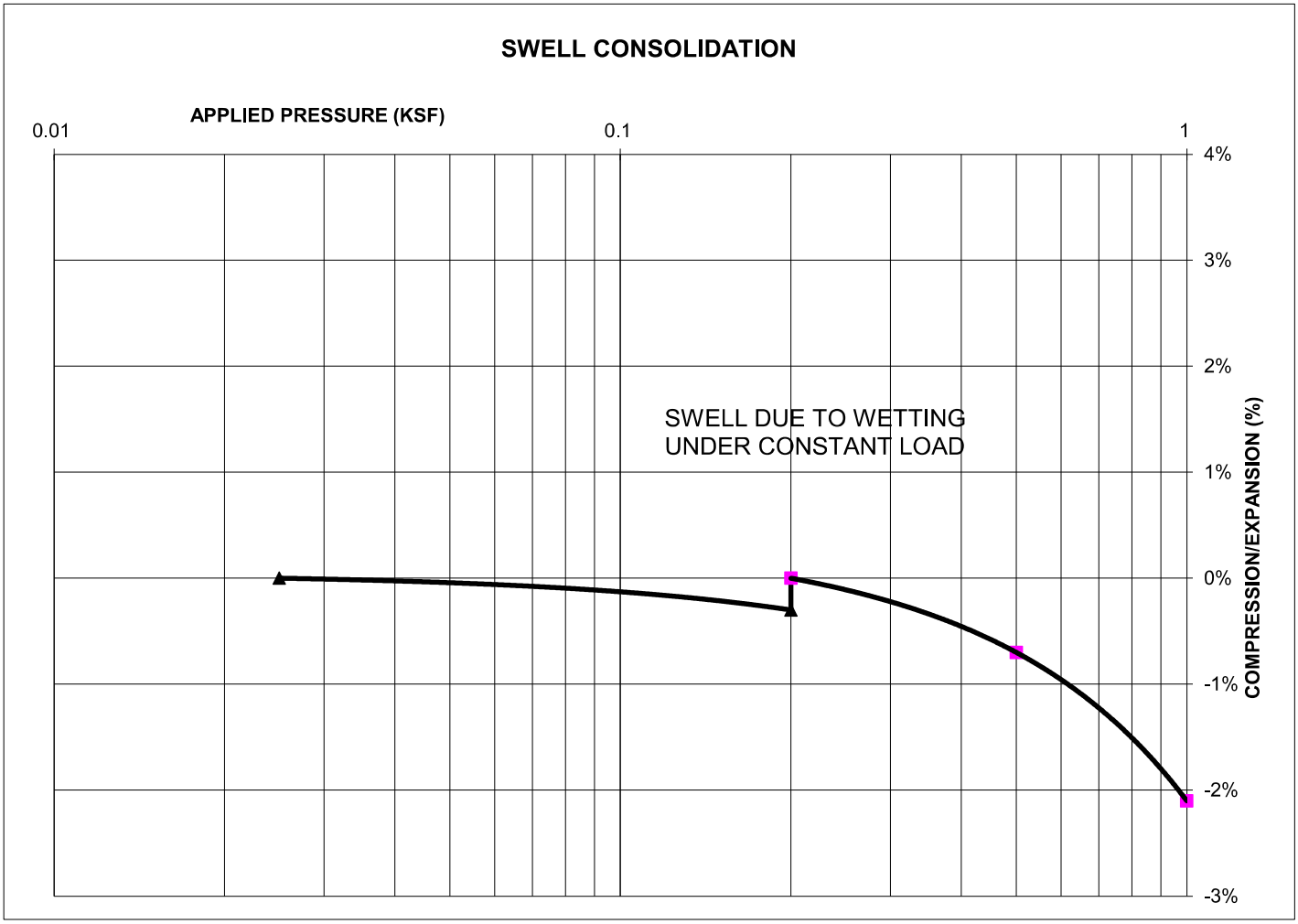
SWELL TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-37

TEST BORING	25	SOIL DESCRIPTION	FILL, CLAY, SANDY
DEPTH (FT)	1-2	SOIL TYPE	2



SWELL/COLLAPSE TEST RESULTS

NATURAL UNIT DRY WEIGHT (PCF):	115
NATURAL MOISTURE CONTENT:	10.1%
SWELL/COLLAPSE (%):	0.3%

ENTECH ENGINEERING, INC.

SWELL TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

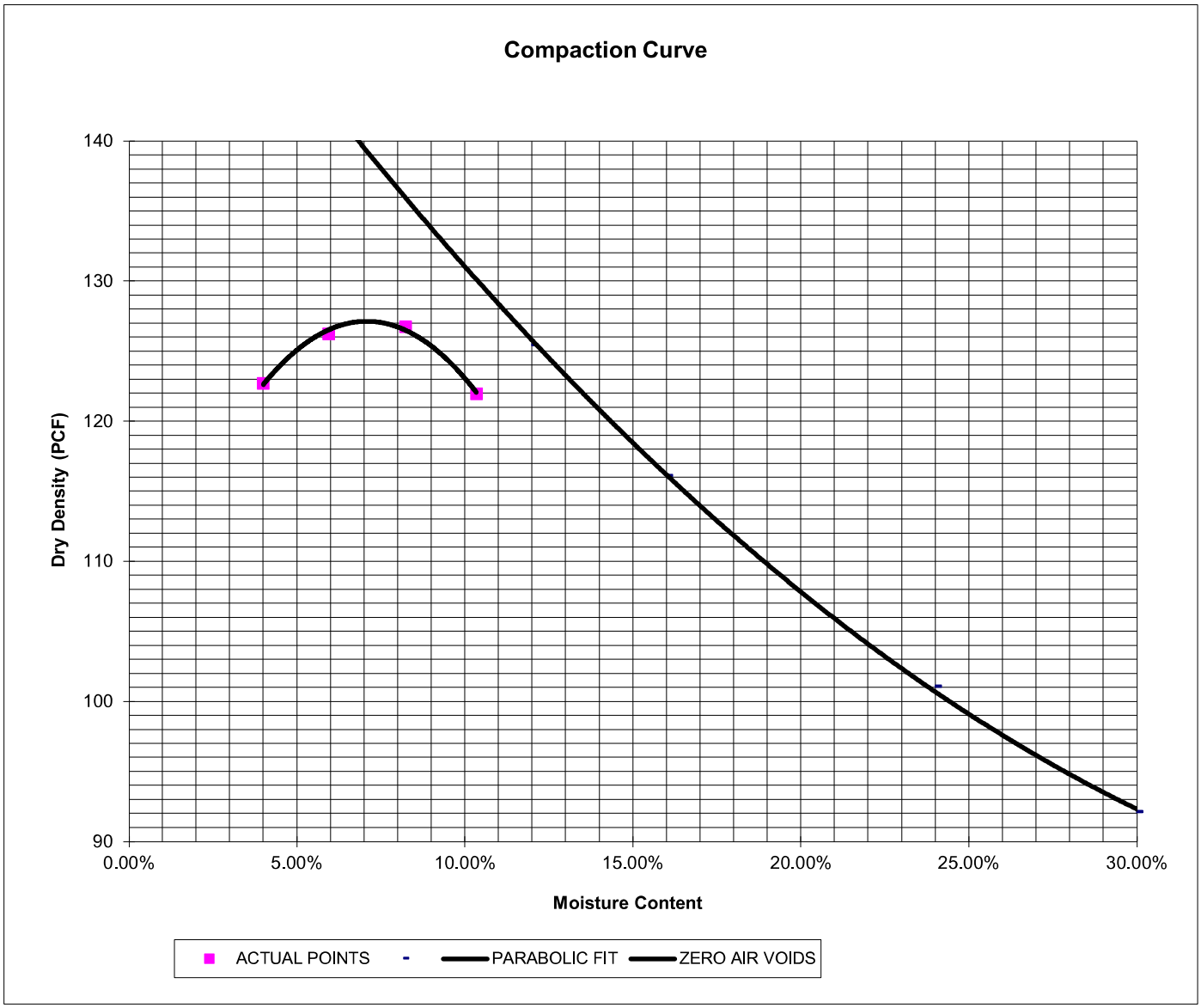
JOB NO. 231192

FIG. B-38

SAMPLE LOCATION TB-3 @ 0-3'	SOIL DESCRIPTION FILL, SAND, SILTY, BROWN
	SOIL TYPE 1

PROCTOR DATA

IDENTIFICATION:	SM
PROCTOR TEST #:	1
TEST BY:	PH
TEST DESIGNATION:	ASTM-1557-A
MAXIMUM DRY DENSITY (PCF):	127.1
OPTIMUM MOISTURE:	7.1



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LABORATORY TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-39

SAMPLE LOCATION TB-3 @ 0-3' | SOIL DESCRIPTION FILL, SAND, SILTY, BROWN
SOIL TYPE 1

CBR TEST LOAD DATA

Piston Diameter (cm): 4.958
Piston Area (in^2): 2.993

Penetration Depth (inches)	*10 BLOWS* Mold # 1 Load (lbs)	Stress (psi)	*25 BLOWS* Mold # 2 Load (lbs)	Stress (psi)	*56 BLOWS* Mold # 3 Load (lbs)	Stress (psi)
0.000	0	0.00	0	0.00	0	0.00
0.025	117	39.10	197	65.83	263	87.89
0.050	222	74.19	278	92.90	427	142.69
0.075	271	90.56	379	126.65	540	180.45
0.100	289	96.57	508	169.76	653	218.21
0.125	322	107.60	701	234.25	823	275.02
0.150	331	110.61	804	268.67	914	305.43
0.175	347	115.96	1009	337.18	1215	406.01
0.200	374	124.98	1095	365.91	1469	490.89
0.300	427	142.69	1334	445.78	2338	781.28
0.400	480	160.40	1548	517.29	3012	1006.51
0.500	538	179.78	1737	580.45	3796	1268.50

MOISTURE AND DENSITY DATA

	Mold # 1	Mold # 2	Mold # 3
Can #	340	349	117
Wt. Can	8.67	8.93	8.6
Wt. Can+Wet	141.72	150.74	127.9
Wt. Can+Dry	124.62	133.57	112.92
Wt. H20	17.1	17.17	14.98
Wt. Dry Soil	115.95	124.64	104.32
Moisture Content	14.75%	13.78%	14.36%
Wet Density (PCF)	121.5	127.5	134.6
Dry Density (PCF)	113.5	119.0	125.6
% Compaction	89%	94%	99%
CBR	9.66	16.98	21.82

PROCTOR DATA

Maximum Dry Density (pcf)	127.1
Optimum Moisture	7.1
90% of Max. Dry Density (pcf)	114.4
95% of Max. Dry Density (pcf)	120.7

CBR at 90% of Max. Density = 10.9 ~ R VALUE 30
CBR at 95% of Max. Density = 18.2 ~ R VALUE 65

ENTECH ENGINEERING, INC.

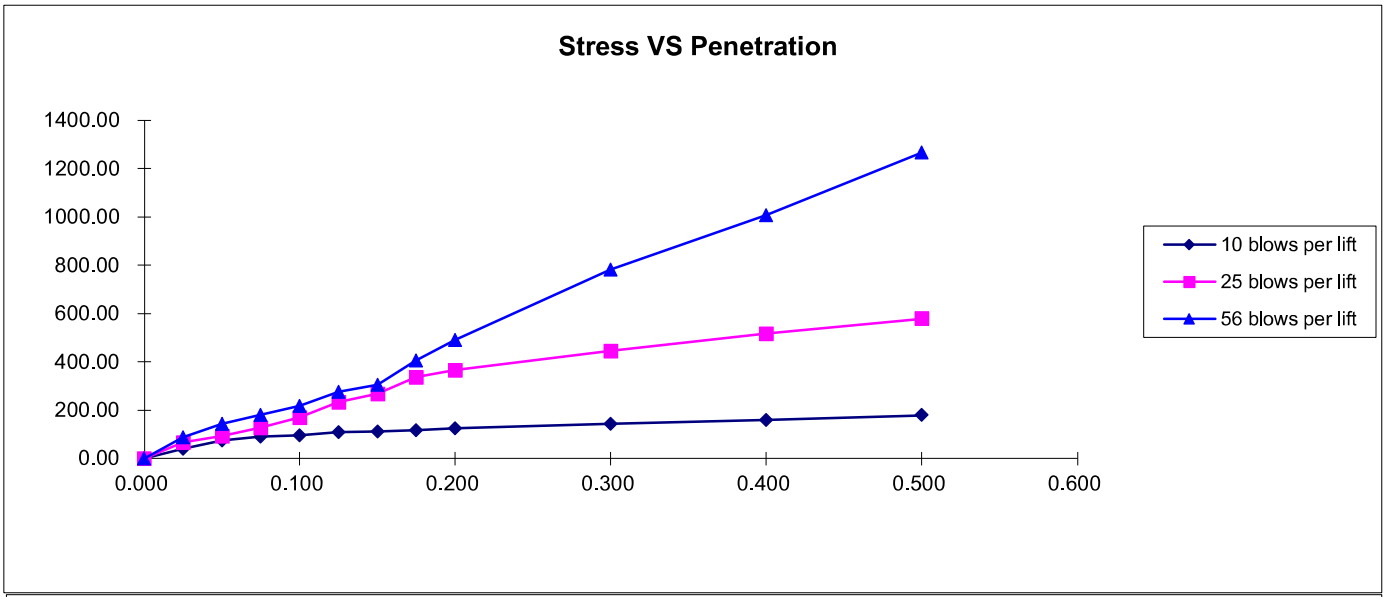
LABORATORY TEST RESULTS

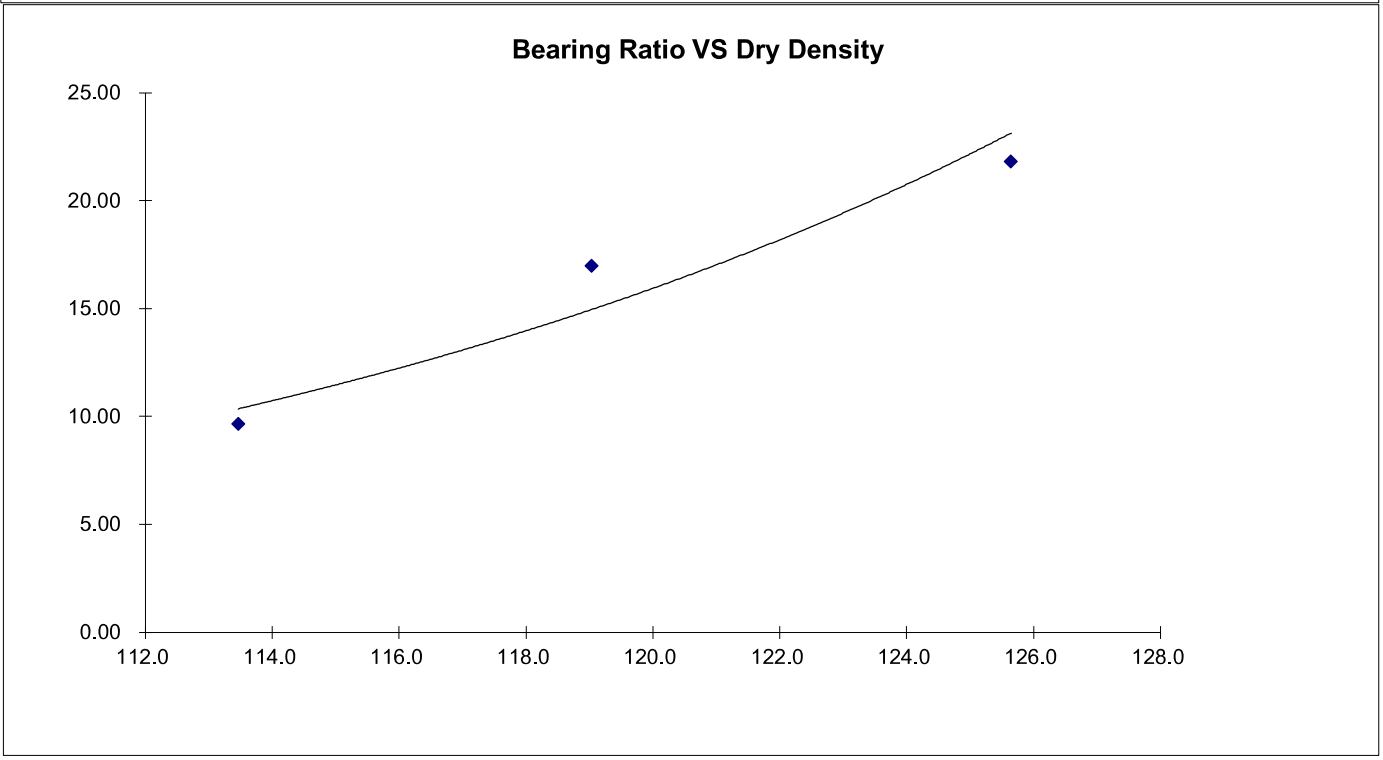
FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-40

SAMPLE LOCATION TB-3 @ 0-3'	SOIL DESCRIPTION FILL, SAND, SILTY, BROWN SOIL TYPE 1





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LABORATORY TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

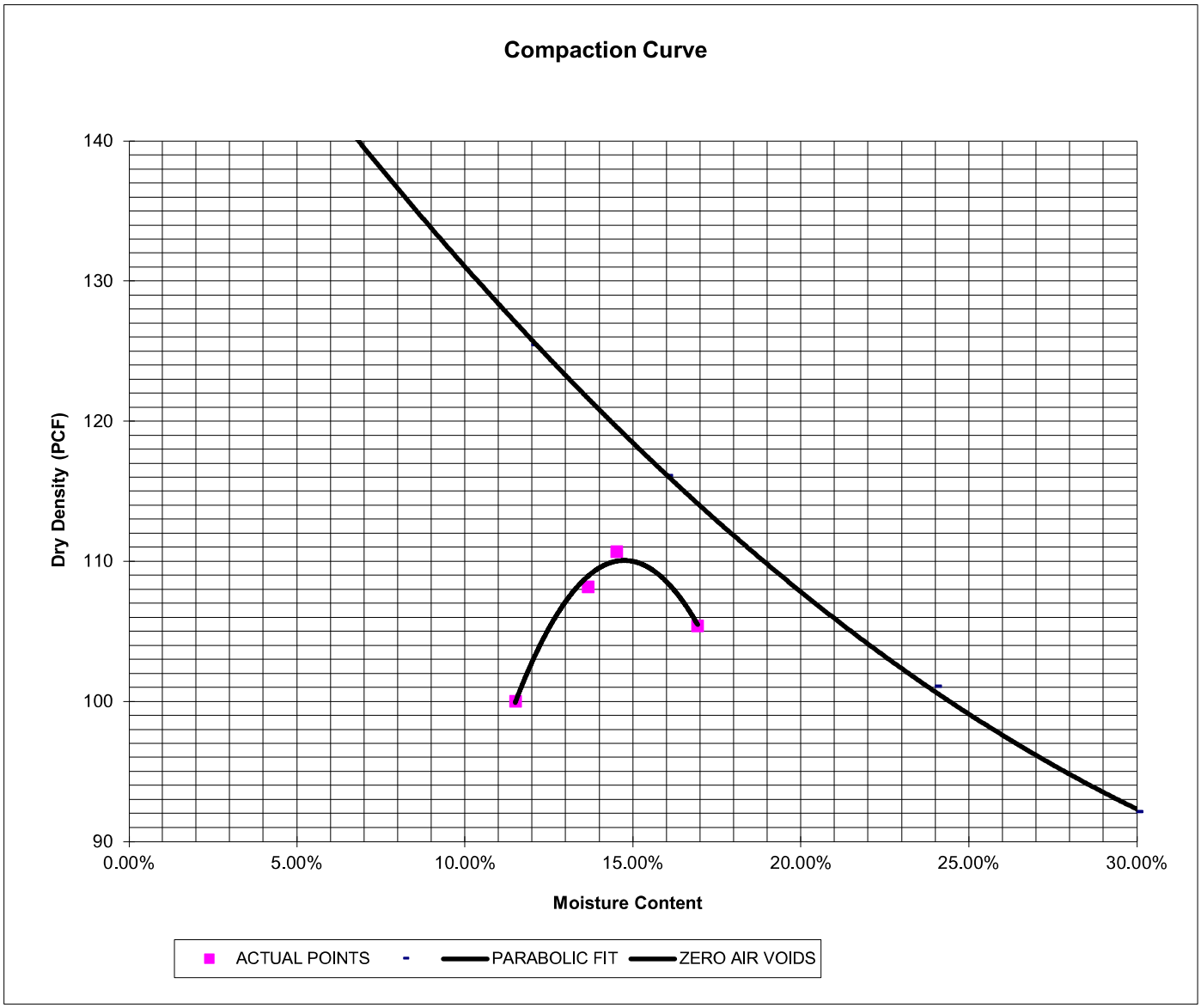
JOB NO. 231192

FIG. B-41

SAMPLE LOCATION TB-21 @ 0-3'	SOIL DESCRIPTION FILL, SAND, CLAYEY, TAN SOIL TYPE 1

PROCTOR DATA

IDENTIFICATION:	CL
PROCTOR TEST #:	2
TEST BY:	PH
TEST DESIGNATION:	ASTM-698-A
MAXIMUM DRY DENSITY (PCF):	109.9
OPTIMUM MOISTURE:	14.9



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LABORATORY TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-42

SAMPLE LOCATION TB-21 @ 0-3' | SOIL DESCRIPTION FILL, SAND, CLAYEY, TAN
SOIL TYPE 1

CBR TEST LOAD DATA

Piston Diameter (cm): 4.958
Piston Area (in^2): 2.993

Penetration Depth (inches)	*10 BLOWS* Mold # 1 Load (lbs)	Stress (psi)	*25 BLOWS* Mold # 2 Load (lbs)	Stress (psi)	*56 BLOWS* Mold # 3 Load (lbs)	Stress (psi)
0.000	0	0.00	0	0.00	0	0.00
0.025	18	6.02	97	32.41	145	48.45
0.050	26	8.69	123	41.10	234	78.20
0.075	28	9.36	136	45.45	267	89.22
0.100	30	10.03	146	48.79	292	97.58
0.125	33	11.03	154	51.46	320	106.93
0.150	35	11.70	161	53.80	337	112.61
0.175	38	12.70	168	56.14	347	115.96
0.200	41	13.70	173	57.81	360	120.30
0.300	46	15.37	186	62.16	407	136.01
0.400	46	15.37	197	65.83	458	153.05
0.500	48	16.04	211	70.51	510	170.43

MOISTURE AND DENSITY DATA

	Mold # 1	Mold # 2	Mold # 3
Can #	347	354	361
Wt. Can	8.93	8.09	8.51
Wt. Can+Wet	202.45	155.01	169.18
Wt. Can+Dry	159.67	131.24	141.75
Wt. H20	42.78	23.77	27.43
Wt. Dry Soil	150.74	123.15	133.24
Moisture Content	28.38%	19.30%	20.59%
Wet Density (PCF)	112.3	117.9	124.2
Dry Density (PCF)	97.7	102.6	108.1
% Compaction	89%	93%	98%
CBR	1.00	4.88	9.76

PROCTOR DATA

Maximum Dry Density (pcf)	109.9
Optimum Moisture	14.9
90% of Max. Dry Density (pcf)	98.9
95% of Max. Dry Density (pcf)	104.4

CBR at 90% of Max. Density = 1.9 ~ R VALUE 1
CBR at 95% of Max. Density = 6.5 ~ R VALUE 14

ENTECH ENGINEERING, INC.

LABORATORY TEST RESULTS

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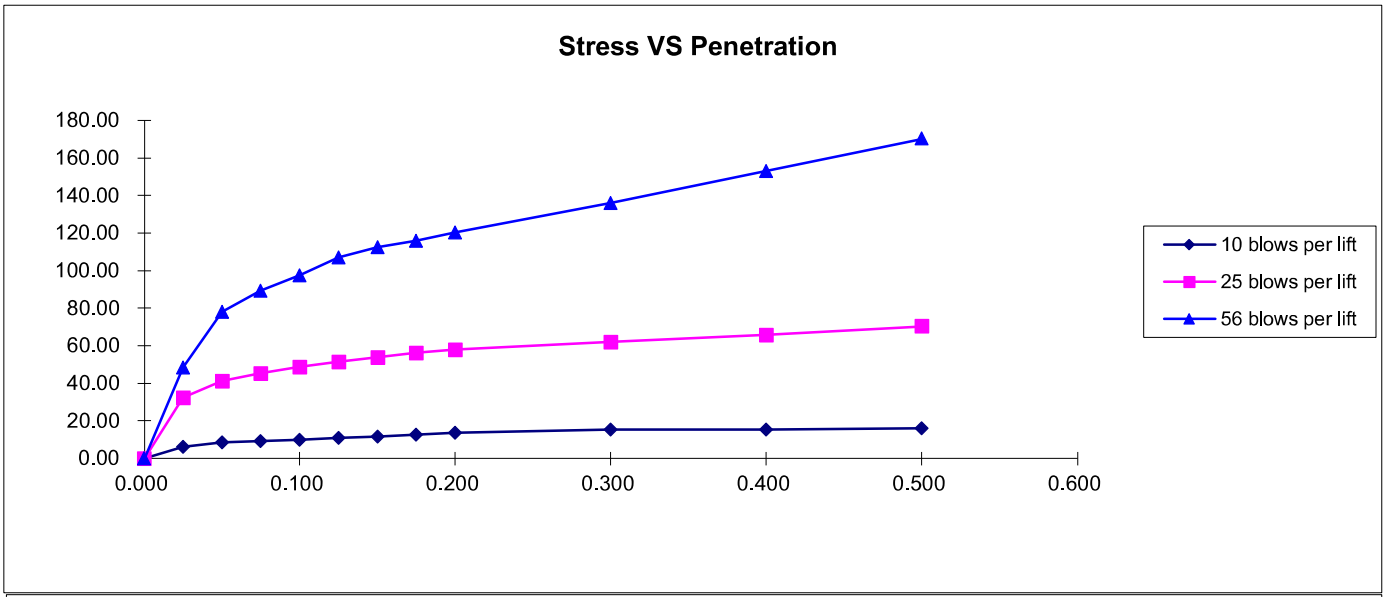
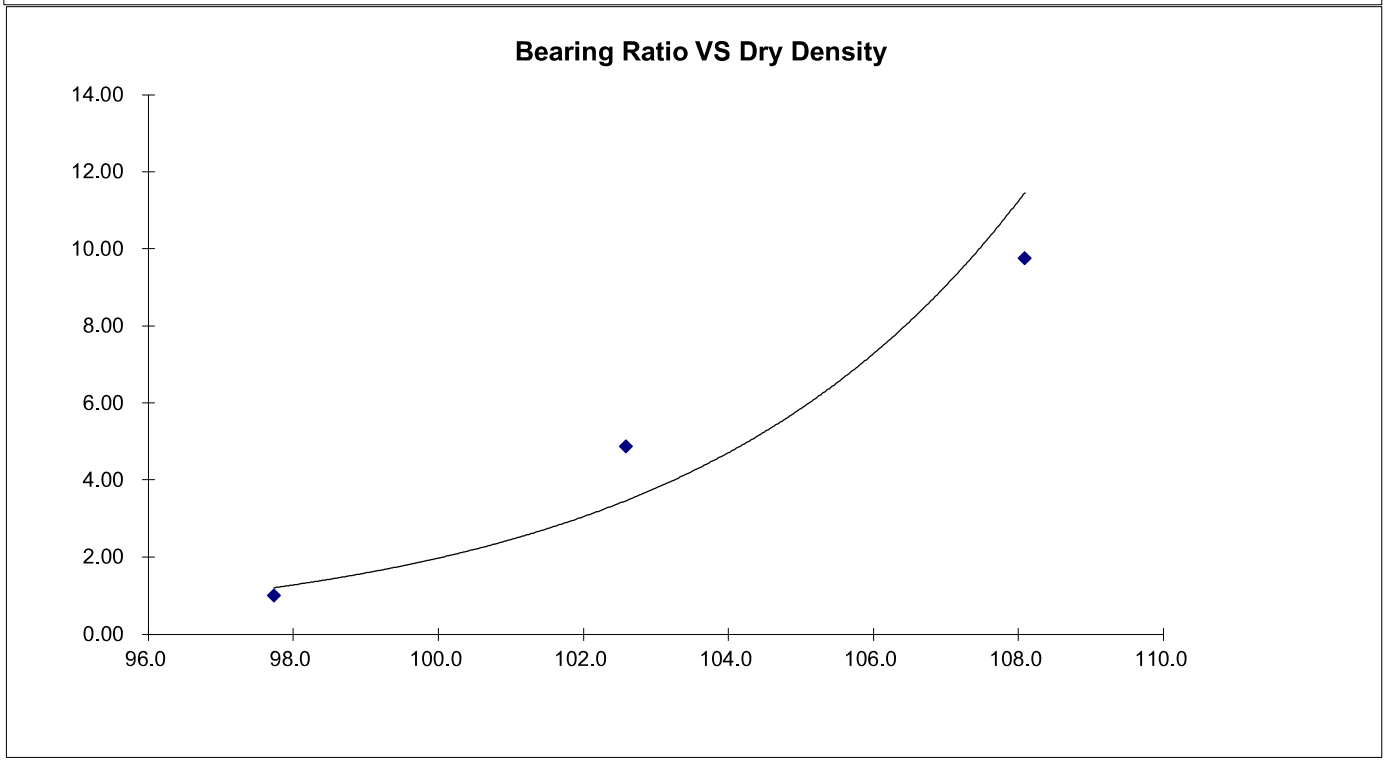
FIG. B-43

SAMPLE LOCATION TB-21 @ 0-3' | SOIL DESCRIPTION FILL, SAND, CLAYEY, TAN
SOIL TYPE 1





ENTECH ENGINEERING, INC.

LABORATORY TEST RESULTS

FLYING HORSE NORTH, FILING NO. 3
FLYING HORSE NORTH, LLC

JOB NO. 231192

FIG. B-44

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APPENDIX C: Pavement Design Calculations

FLEXIBLE PAVEMENT DESIGN

PROJECT DATA

Project Location: Sterling Ranch, Filing No. 5

Job Number: 240368

DESIGN DATA

Equivalent (18-kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	292,000
Design CBR	CBR =	6.5
Standard Deviation	S_o =	0.45
Loss in Serviceability	Δpsi =	2.5
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	9,750 psi

Required Structural Number (SN): → SN = 2.32

DESIGN EQUATIONS

Resilient Modulus

If using CBR:

M_R = (CBR) x 1,500

If using R-Value:

$M_R = 10^{[(S_1 + 18.72) / 6.24]}$ where: S_1 = [(R-value - 5) / 11.29] + 3

Required Structural Number

$$\log_{10}W_{18} = Z_R * S_O + 9.36*\log_{10}(SN+1) - 0.20 + \frac{\log_{10}\left[\frac{\Delta PSI}{4.2 - 1.5}\right]}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32*\log_{10}M_R - 8.07$$

Pavement Section Thickness

$SN^* = C_1D_1 + C_2D_2$ where:

C_1 = Strength Coefficient - HMA

C_2 = Strength Coefficient - ABC/RCB

D_1 = Depth of HMA (inches)

D_2 = Depth of ABC/RCB (inches)

RECOMMENED THICKNESSES

Layer	Material	Coefficient	Thickness (D^*_i)	SN^*_i	SN
1	HMA	C_1 = 0.44	3.5 inches	1.540	-
2	ABC/RCB	C_2 = 0.11	8.0 inches	0.880	
			SN* =	2.420	2.32

Pavement SN > Required SN, Design is Acceptable

FIG. C-1

FLEXIBLE PAVEMENT DESIGN

PROJECT DATA

Project Location: Sterling Ranch, Filing No. 5

Job Number: 240368

DESIGN DATA

Equivalent (18-kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	292,000
Design CBR	CBR =	6.5
Standard Deviation	S_o =	0.45
Loss in Serviceability	Δpsi =	2.5
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	9,750 psi

Required Structural Number (SN): → SN = 2.32

DESIGN EQUATIONS

Resilient Modulus

If using CBR:

M_R = (CBR) x 1,500

If using R-Value:

$M_R = 10^{[(S_1 + 18.72) / 6.24]}$ where: S_1 = [(R-value - 5) / 11.29] + 3

Required Structural Number

$$\log_{10}W_{18} = Z_R * S_O + 9.36*\log_{10}(SN+1) - 0.20 + \frac{\log_{10}\left[\frac{\Delta PSI}{4.2 - 1.5}\right]}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32*\log_{10}M_R - 8.07$$

Pavement Section Thickness

$SN^* = C_1D_1 + C_2D_2$ where:

C_1 = Strength Coefficient - HMA

C_2 = Strength Coefficient - CTS

D_1 = Depth of HMA (inches)

D_2 = Depth of CTS (inches)

RECOMMENED THICKNESSES

Layer	Material	Coefficient	Thickness (D^*_i)	SN^*_i	SN
1	HMA	C_1 = 0.44	3.5 inches	1.540	-
2	CTS	C_2 = 0.11	8.0 inches	0.880	
			SN* =	2.420	2.32

Pavement SN > Required SN, Design is Acceptable

FIG. C-2

FLEXIBLE PAVEMENT DESIGN

PROJECT DATA

Project Location: Sterling Ranch, Filing No. 5

Job Number: 240368

DESIGN DATA

Equivalent (18-kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	36,500
Design CBR	CBR =	6.5
Standard Deviation	S_o =	0.45
Loss in Serviceability	Δpsi =	2.5
Reliability	Reliability =	75
Reliability (z-statistic)	Z_R =	-0.67
Soil Resilient Modulus	M_R =	9,750 psi

Required Structural Number (SN): → SN = 1.60

DESIGN EQUATIONS

Resilient Modulus

If using CBR: $M_R = (CBR) \times 1{,}500$

If using R-Value: $M_R = 10^{[(S_1 + 18.72) / 6.24]}$ where: $S_1 = [(R\text{-value} - 5) / 11.29] + 3$

Required Structural Number

$$\log_{10}W_{18} = Z_R * S_O + 9.36*\log_{10}(SN+1) - 0.20 + \frac{\log_{10}\left[\frac{\Delta PSI}{4.2 - 1.5}\right]}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32*\log_{10}M_R - 8.07$$

Pavement Section Thickness

$SN^* = C_1D_1 + C_2D_2$ where:

C_1 = Strength Coefficient - HMA

C_2 = Strength Coefficient - ABC/RCB

D_1 = Depth of HMA (inches)

D_2 = Depth of ABC/RCB (inches)

RECOMMENED THICKNESSES

Layer	Material	Coefficient	Thickness (D^*_i)	SN^*_i	SN
1	HMA	C_1 = 0.44	3.0 inches	1.320	-
2	ABC/RCB	C_2 = 0.11	4.0 inches	0.440	
			SN* =	1.760	1.60

Pavement SN > Required SN, Design is Acceptable

FIG. C-3

FLEXIBLE PAVEMENT DESIGN

PROJECT DATA

Project Location: Sterling Ranch, Filing No. 5

Job Number: 240368

DESIGN DATA

Equivalent (18-kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	36,500
Design CBR	CBR =	6.5
Standard Deviation	S_o =	0.45
Loss in Serviceability	Δpsi =	2.5
Reliability	Reliability =	75
Reliability (z-statistic)	Z_R =	-0.67
Soil Resilient Modulus	M_R =	9,750 psi

Required Structural Number (SN): → SN = 1.60

DESIGN EQUATIONS

Resilient Modulus

If using CBR:

$M_R = (CBR) \times 1{,}500$

If using R-Value:

$M_R = 10^{[(S_1 + 18.72) / 6.24]}$ where: $S_1 = [(R\text{-value} - 5) / 11.29] + 3$

Required Structural Number

$$\log_{10}W_{18} = Z_R * S_O + 9.36*\log_{10}(SN+1) - 0.20 + \frac{\log_{10}\left[\frac{\Delta PSI}{4.2 - 1.5}\right]}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32*\log_{10}M_R - 8.07$$

Pavement Section Thickness

$SN^* = C_1D_1 + C_2D_2$ where:

C_1 = Strength Coefficient - HMA

C_2 = Strength Coefficient - CTS

D_1 = Depth of HMA (inches)

D_2 = Depth of CTS (inches)

RECOMMENED THICKNESSES

Layer	Material	Coefficient	Thickness (D^*_i)	SN^*_i	SN
1	HMA	C_1 = 0.44	3.0 inches	1.320	-
2	CTS	C_2 = 0.11	8.0 inches	0.880	
			SN* =	2.200	1.60

Pavement SN > Required SN, Design is Acceptable

FIG. C-4