Additional Subsurface Exploration and
Geotechnical Engineering Evaluation
For the Malone Fire Station
5187 9th Avenue
Malone, Jackson County, Florida

Ardaman & Associates, Inc.

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Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

March 1, 2024
Ardaman File No.113-24-40-1854

David Melvin Engineers
2451 Barrington Circle, Suite 101
Tallahassee, Florida 32308
Email: kimholloway@melvineng.com

Attention: Ms. Kimberly M. Holloway, P.E.

Subject: Additional Subsurface Exploration and Geotechnical Engineering Evaluation For the Malone Fire Station 5187 9th Avenue, Malone, Jackson County, Florida

Reference: Ardaman's report of "Subsurface Exploration and Geotechnical Engineering Evaluation For the Malone Fire Station 5187 9th Avenue, Malone, Jackson County, Florida", Ardaman File Number 113-24-40-1854, dated February 8, 2024.

Dear Ms. Holloway:

As requested and authorized, we have completed additional subsurface exploration and geotechnical engineering evaluation for the subject project. The purposes of performing this additional exploration were to evaluate the general subsurface conditions at and around previously performed boring TH-1 where very loose soil conditions were encountered up to about 9 feet below grade, and to provide recommendations for the remediation of loose surficial soil condition. This report documents our findings and presents our engineering recommendations.

FIELD EXPLORATION PROGRAM

Probing

Ardaman performed probing within about 11 feet radius surrounding the previously performed TH-1 boring location. The purposes of the probing were to 1) identify soft/loose condition with depth, 2) assess the horizontal and vertical extents of the encountered loose soil conditions, and 3) to identify locations to perform the additional borings.

SPT Borings

The field exploration program included performing two (2) Standard Penetration Test (SPT) borings near the previously performed soil boring TH-1. The location of the borings were based on the results of the probing performed to identify loose conditions with depth. The SPT borings

were advanced to 20 feet below the existing ground surface generally using the methodology outlined in ASTM D-1586. A summary of this field procedure is included in the Appendix.

Soil samples recovered during performance of the borings were visually classified in the field and representative portions of the samples were transported to our laboratory in sealed sample jars.

The groundwater level at each of the boring locations was estimated during drilling. The borings were backfilled with soil cuttings upon completion.

Test Locations

The approximate locations of the soil borings and probing are schematically illustrated on a site plan shown on Figure 1 and 1A. These locations were determined in the field by tape measuring/estimating distances from existing site features and should be considered accurate only to the degree implied by the method of measurement used. Boring locations should be considered accurate only to the degree implied by the method of locating used.

LABORATORY PROGRAM

Representative soil samples obtained during our field sampling operation were packaged and transferred to our laboratory for further visual examination and classification. The soil samples were classified using visual-manual procedures in general accordance with the Unified Soil Classification System (ASTM D-2488). The resulting soil descriptions are shown on the soil boring profiles presented on Figure 2.

GENERAL SUBSURFACE CONDITIONS

General Soil Profile

The results of the field exploration and laboratory programs are graphically summarized on the soil boring profiles presented on Figure 2. The stratification of the boring profiles represents our interpretation of the field boring logs and the results of laboratory examinations of the recovered samples. The stratification lines represent the approximate boundary between soil types. The actual transitions may be more gradual than implied.

The results of the borings indicate the following general soil profile:

Depth Below Ground Surface (feet)		Description
From	To	
0	8	Brown medium to fine sand (SP-SM to SM)

Depth Below Ground Surface (feet)		Description
From	To	
8	20	Light brown to grayish-brown clayey fine sand (SC)

The above soil profile is outlined in general terms only. Subsurface soil conditions do vary in the borings performed. Please refer to Figure 2 for soil profile details.

We note that the soil borings did not encounter deleterious materials and soil conditions were not indicative of that area being a prior “burn pit” used during prior construction.

Groundwater Level

The groundwater level was estimated in the boreholes during drilling. As shown on Figure 2, groundwater was not encountered on the date drilled. This groundwater level Fluctuation in groundwater levels should be anticipated throughout the year primarily due to seasonal variations in rainfall and other factors that may vary from the time the borings were conducted.

Please note that we encountered groundwater level at about 4.5 feet below grade on our prior exploration which seems to be a perched groundwater level following a rainfall event and appears to have dried out during this phase of exploration.

ENGINEERING EVALUATION AND RECOMMENDATIONS

General

The results of our exploration did not indicate deleterious materials were present and, therefore, does not lead to the conclusion that this area was previously filled or was a prior “burn pit” used during the original construction of the fire station. The results do indicate that the surficial sands (down to about 8 feet deep) are typically loose in this area.

The results of manual probing are presented on Figure 1A which show the depth to which the loose/soft soil conditions were encountered around the prior test boring TH-1. We note that manual probing was also performed at prior TH-3 location and our drillers were able to advance the probe down to about 7 feet below existing grade at this location. Probing at boring TH-3 was performed to somewhat calibrate the results of the probing conditions. The supplemental two (2) SPT borings were performed at two of the locations where probing indicated deeper loose profiles (TH-1A near a location where probing went down about 10 feet indicating “loose” conditions, and TH-1B where probing went down about 9 feet). Furthermore, we note that most of the areas probed required significant effort to advance the probe through the top 5 feet, which indicates that the top 5 feet is typically more dense than between 5 to 7 feet (or down to 9/10 feet in some areas).

Given the results of the probing and test borings performed, it is our opinion that the “weight of hammer” conditions encountered in the top 9 feet in the previously performed boring TH-1 may be an anomaly and not pervasive in this area.

The following are our recommendations to remediate the loose soils conditions encountered on site.

Proof-rolling & Soil Compaction

Proof-rolling of the building areas should consist of at least 10 passes of a compactor capable of achieving the density requirements described in the paragraphs below. Proof-rolling of the building areas should consist of at least 10 passes of a self-propelled vibratory compactor capable of delivering a minimum impact force of 30,000 to 35,000 pounds per drum to the soils. Each pass should overlap the preceding pass by 30 percent to achieve complete coverage.

In the northwest portion of the building (within a 10-foot radius of boring TH-1), where the loose soil conditions were encountered, we recommend over-excavating 2 feet, performing the compaction operations described in the preceding paragraph, and then backfilling with the excavated spoils in 6-inch loose lifts back to existing subgrade. Backfilling operations in this area should achieve the density requirements described in the next paragraph.

During proof-rolling and compaction operations, in areas that "yield", remove all deleterious material and replace with clean, compacted sand backfill. The proof-rolling should occur after cutting and before filling. Proof-rolling should be monitored in the field by an Ardaman representative.

A density equivalent to or greater than 95 percent of the modified Proctor (ASTM D-1557) maximum dry density value for a depth of 2 feet in the building areas. Additional passes and/or over-excavation and re-compaction may be required if these minimum density requirements are not achieved. The soil moisture should be adjusted as necessary during compaction.

Care should be exercised to avoid damaging any neighboring structures while the compaction operation is underway. Prior to commencing compaction, occupants of adjacent structures should be notified and the existing condition (i.e., cracks) of the structures documented with photographs and survey (if deemed necessary). Compaction should cease if deemed detrimental to adjacent structures, and Ardaman & Associates should be notified immediately. Heavy vibratory compaction is cautioned when used within 200 feet of existing structures as damage could result.

CLOSURE

The analyses and recommendations submitted herein are based on the data obtained from the probing performed as presented on Figure 1A and the soil borings presented on Figure 2. This

report does not reflect any variations which may occur adjacent to or between the borings. The nature and extent of the variations between the borings may not become evident until during construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations presented in this report after performing on-site observations during the construction period and noting the characteristics of the variations.

This study is based on a relatively shallow exploration and is not intended to be an evaluation for sinkhole potential. This study does not include an evaluation of the environmental (ecological or hazardous/toxic material related) condition of the site and subsurface.

This report has been prepared for the exclusive use of David Melvin Engineers in accordance with generally accepted geotechnical engineering practices for the purpose of the proposed Malone Fire Station. No other warranty, expressed or implied, is made.

We are pleased to be of assistance to you on this phase of the project. When we may be of further service to you or should you have any questions, please contact us.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.
Florida Registry 5950

Jeremy M Clark

Digitally signed by: Jeremy M Clark
DN: CN = Jeremy M Clark C = US O = ARDAMAN AND ASSOCIATES
Date: 2024.03.01 13:02:14 -05'00'

JEREMY MATTHEW CLARK LICENSE No. 77660 STATE OF FLORIDA PROFESSIONAL ENGINEER

Aayush R. Tiwary, E.I.
Project Engineer

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Senior Engineer
FL License No.: 77660

ART/JMC

This item has been digitally signed and sealed by Jeremy M. Clark, P.E. on the date adjacent to the seal.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

GENERAL TEST LOCATION PLAN
(Image Source: Google Earth)

PLEASE REFER TO FIGURE 1A FOR A ZOOMED IN LOCATION PLAN

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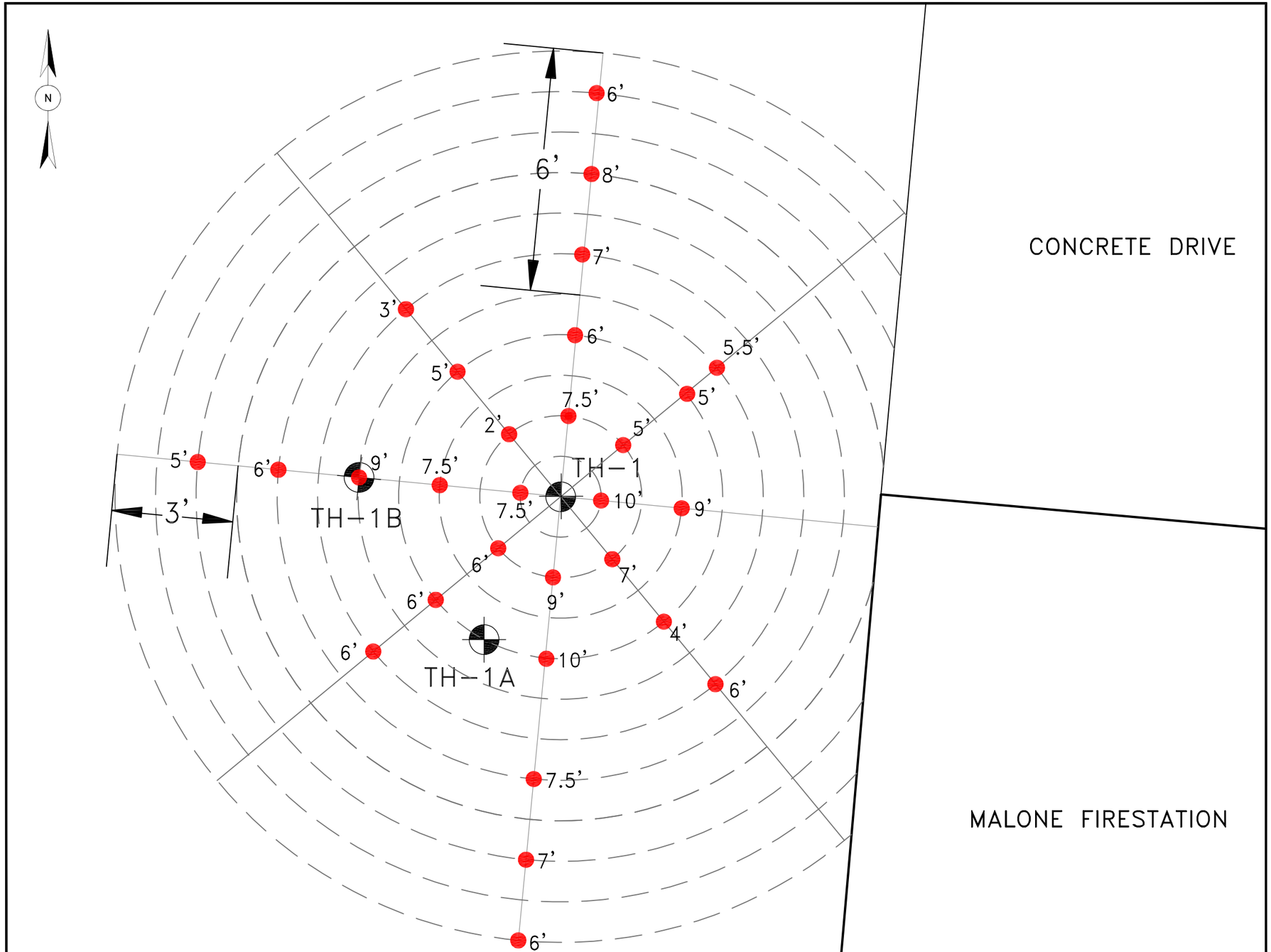
SHEET TITLE:
BORING/PROBING LOCATION PLAN
5187 9th AVENUE
MALONE FIRE STATION
MALONE, JACKSON COUNTY, FLORIDA

DRAWN BY: JMC	CHECKED BY: MSW	DATE: 2/27/24	
FILE NO. 113-24-40-1854	APPROVED BY: M.S. WILSON, P.E.		FIGURE 1

GENERAL TEST BORING/ PROBING LOCATION PLAN



LEGEND

TH STANDARD PENETRATION TEST (SPT) BORING LOCATION

5' PROBED LOCATION WITH SOFT/LOOSE SOILS IN TOP 5 FEET

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BORING PROFILES

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

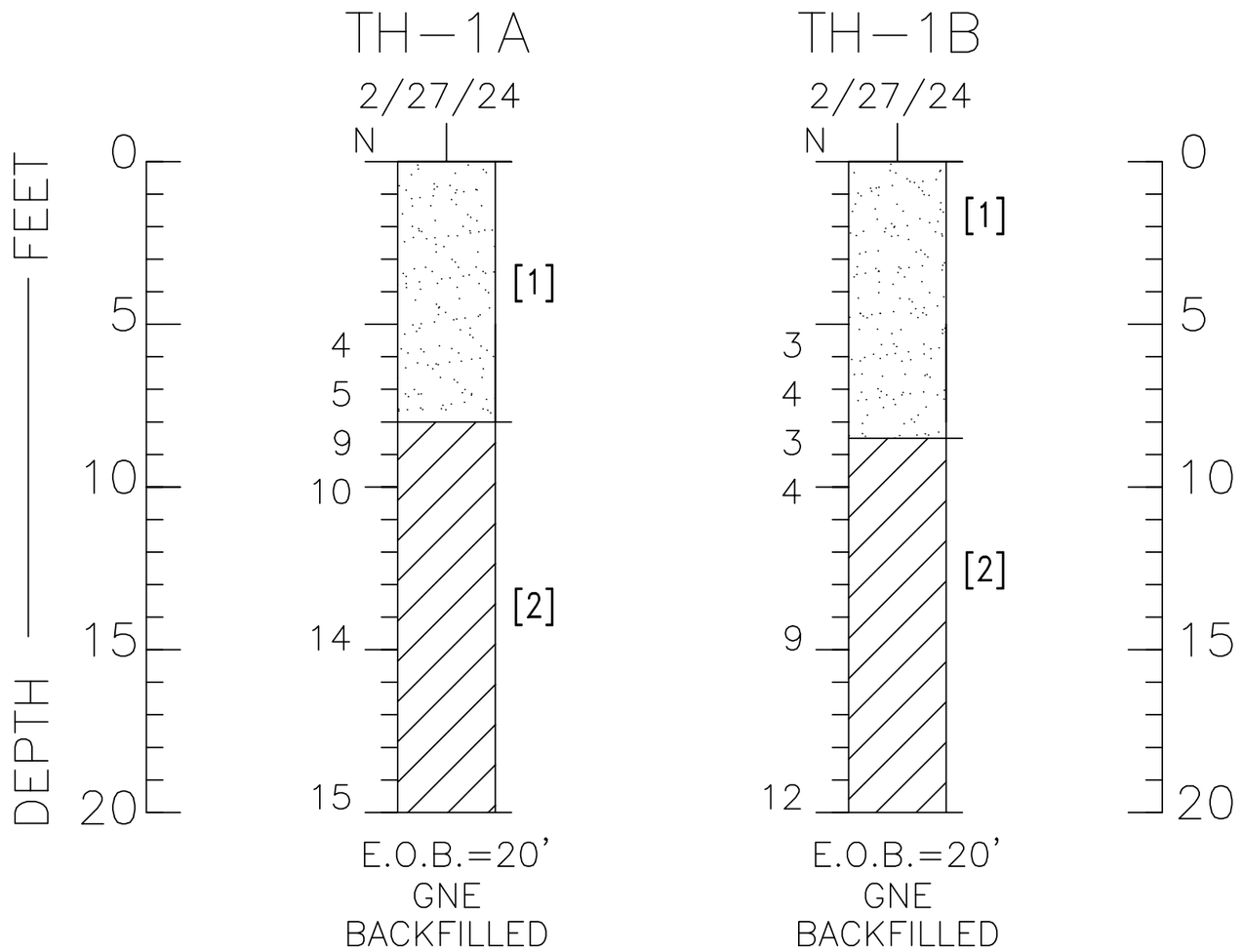
DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	0 TO 2
SOFT	1/4 TO 1/2	2 TO 4
MEDIUM STIFF	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED.

GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR. ABSENCE OF WATER SURFACE DATA ON CERTAIN BORINGS IMPLIES THAT NO GROUNDWATER DATA IS AVAILABLE, BUT DOES NOT NECESSARILY MEAN THAT GROUNDWATER WILL NOT BE ENCOUNTERED AT THESE LOCATIONS OR WITHIN THE VERTICAL REACHES OF THESE BORINGS IN THE FUTURE.



LEGEND

TH	LOCATION OF SPT TEST HOLE
N	STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT (ASTM D-1586)
WOH	SAMPLER ADVANCED BY STATIC WEIGHT OF HAMMER AND RODS
EOB	END OF BORING
▼	GROUNDWATER DEPTH MEASURED ON DATE DRILLED
SP–SM,SM,SC	UNIFIED SOIL CLASSIFICATION SYSTEM
A–3,A–2–4	AASHTO SOIL CLASSIFICATION SYSTEM
DRILLERS:	IDI, RP

SOIL LEGEND

[1]	BROWN MEDIUM TO FINE SAND W/SILT (SP–SM TO SM; A–3 TO A–2–4)
[2]	LIGHT BROWN TO GRAYISH–BROWN CLAYEY FINE SAND (SC; A–2–6)
[3]	LIGHT GRAY W/LIGHT REDDISH–BROWN SEAMS SLIGHTLY SANDY FAT CLAY (CH; A–7)
[3A]	LIGHT GRAY & REDDISH–BROWN VERY CLAYEY FINE SAND (SC; A–6)
[3B]	LIGHT GRAY & REDDISH–BROWN CLAYEY FINE SAND (SC; A–2–6)

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APPENDIX

Standard Penetration Test

STANDARD PENETRATION TEST

The standard penetration test is a widely accepted test method of *in situ* testing of soils (ASTM D 1586), and Ardaman & Associates generally follows this test method. A 2-foot long, 2-inch O.D. split-barrel sampler attached to the end of a string of drilling rods is driven 18 or 24 inches into the ground by successive blows of a 140-pound hammer freely dropping 30 inches. The number of blows needed for each 6 inches of penetration is recorded. The sum of the blows required for penetration of the second and third 6-inch increments of penetration constitutes the test result or N-value. After the test, the sampler is extracted from the ground and opened to allow visual examination and classification of the retained soil sample. The N-value has been empirically correlated with various soil properties.

The tests are usually performed at 5-foot intervals. The test holes are advanced to the test elevations by rotary drilling with a cutting bit, using circulating fluid to remove the cuttings and hold the fine grains in suspension. The circulating fluid, which is a bentonitic drilling mud, is also used to keep the hole open below the water table by maintaining an excess hydrostatic pressure inside the hole. In some soil deposits, particularly highly pervious ones, flush-coupled casing must be driven to just above the testing depth to keep the hole open and/or prevent the loss of circulating fluid.

Representative split-spoon samples from the soils are brought to our laboratory in air-tight jars for further evaluation and testing, if necessary.