GeoScience

# GEOTECHNICAL INVESTIGATION REPORT

**Proposed "Car Wash"**
**1376 Main St**
**Boerne, Texas**

**PROJECT NO. 21-DG6523**

**Prepared for:**

**7B DEVELOPMENT**
**Lubbock, Texas**

**Prepared by:**

**GEOSCIENCE ENGINEERS, LLC.**
**Dallas, Texas**

**August 2021**

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GeoScience

Project No. 21-DG 6523

August 10, 2021

**7B Development**
5709 104th Street
Lubbock, Texas 79424

**Geotechnical Investigation**
**Proposed "Car Wash"**
**1376 Main St**
**Boerne, Texas**

Geoscience Engineers, *LLC*. is pleased to submit this geotechnical investigation for the above referenced project located in Boerne, Texas. This report briefly describes the procedures employed in our subsurface exploration and presents the results of our investigation.

Our Construction Materials Testing Division can provide the materials testing services that will be required during the construction phase of this project. We will be pleased to discuss a scope of work and submit a proposal for these services upon request.

We appreciate the opportunity to be of assistance on this project. Please feel free to contact us if you have any questions or if we can be of further service.

Respectfully,

**Geoscience Engineers, LLC.**
Firm Reg. #F-11285

Amir Shahed
Project Manager

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## INTRODUCTION

### Project Description

This report presents the results of the geotechnical investigation performed at the site of the referenced project located in Boerne, Texas. Based on the project information provided, it is our understanding that construction will consist of a car wash and the associated pavement. Information regarding structural loads was not available at the time of this investigation; however, we anticipate the loads will be light. It is expected that the finished floor elevation of the proposed buildings will be above surrounding ground surface. Grading plans and other information regarding the referenced project were not available at the time of this investigation.

### Site Description

The site of the proposed project is located at 1376 S Main St, Boerne, Texas. At the time of this investigation, the site was developed land with an existing office building. The existing structure will be demolished prior to commencement of new development. The general location and orientation of the site is shown in the Illustrations section of this report.

### Purposes and Scope of Work

The principal purposes of this investigation were to evaluate the general soil conditions at the referenced site and develop recommendations for the design and construction of the proposed building. These purposes were accomplished by:

1) Developing subsurface soil and rock stratigraphy at the boring locations;
2) Evaluating soil swell potential and alternatives to reduce the soil movement;
3) Providing recommendations for foundation design parameters;
4) Providing recommendations for pavement parameters and
5) Providing site preparation recommendations.

### Report Format

The first sections of the report describe the field and laboratory phases of the study. The remaining sections present our recommendations to guide design and preparation of plans and specifications. Boring logs and laboratory test results are presented in the Illustrations section of this report.

## FIELD INVESTIGATION

The field investigation of this study involved drilling and sampling three (3) test borings. Test borings B-1 and B-2 were drilled to a depth of 20 feet in the proposed car wash whereas, test boring B-3 was drilled to a depth of 5 feet below the ground surface in the proposed pavement. The approximate location of the site and borings are shown on the Boring Location Plan Plate A. Logs of the borings with descriptions of the soils sampled are presented on Plate 1 and 3. Soil strata boundaries shown on the boring logs are approximate.

The borings were advanced using continuous flight augers. Undisturbed cohesive soil samples were obtained using a 3-inch diameter thin-walled tube sampler pushed into the soil. The undrained compressive strength of cohesive soils was estimated in the field using a calibrated pocket penetrometer.

All soil samples were extruded from the samplers in the field, visually classified, and placed in appropriate containers to prevent loss of moisture or disturbance during transfer to the laboratory. The borings were drilled using dry auger procedures to observe the water level (if any) at the time of the exploration. These water level observations are recorded on the boring logs.

## LABORATORY TESTING

Engineering properties of the foundation soils were evaluated in the laboratory by tests performed on representative soil samples. A series of moisture content determinations were performed to develop soil moisture profiles and to aid in evaluating the uniformity of soil conditions at the boring locations. Liquid and Plastic limit tests (collectively termed "Atterberg limits"); dry unit weight determinations and the percentage passing the number 200 sieve tests were performed on the selected soil samples from the borings to confirm visual classification and to evaluate soil volume change potentials. Unconfined compressive strength was performed on the clay samples. The results of these tests are presented on the boring logs.

### Review

Descriptions of strata made in the field were modified in accordance with results of laboratory tests and visual examination in the laboratory. All recovered soil samples were examined, classified, and described in accordance with ASTM D 2487, ASTM D 2488, and Unified Soil Classification procedures. Classifications of the soils and finalized descriptions of soil strata are shown on the attached boring logs.

## GENERAL SUBSURFACE CONDITIONS

### Stratigraphy

Based on our interpretations, the overall subsurface stratigraphy at the locations of the test borings drilled for this study consists of asphalt and base course followed by sandy clay and deeper underlain by clayey sand.

More specifically, the subsurface stratigraphy within the depths of the test borings B-2 drilled consisted of asphalt to a depth of 2 inch below which base course was noted to a depth of l 9 inches. Below asphalt at the location of test boring B-2 and below existing ground surface elevation, tan and brown sandy clay with trace of gravel was noted to a completion depth of test borings B-2 and B-3 and to a depth of 18 feet in test boring B-1. Further, yellowish tan clayey sand with occasional gravel was encountered and remained visible to the completion depths of the test boring B-1.

Detailed descriptions of the subsurface stratigraphy encountered at the locations of the test borings drilled for this study are included in the Illustrations section of this report.

### Subsurface Water Conditions

The borings were advanced using auger drilling methods in order to observe groundwater seepage levels. At the time of this investigation, subsurface groundwater seepage was encountered in test boring B-1 at a depth of 18 feet drilled for this study. It should be noted that future construction activities may alter the surface and subsurface drainage characteristics of this site. As such, we suggest re-verifying the depth to groundwater just prior to and during construction. Based on short-term observations, it is not possible to accurately predict the magnitude of subsurface water fluctuations that might occur. In addition, it is not uncommon to detect water seepage occurring in soils fractures, particularly after periods of heavy rainfall.

## ANALYSIS AND RECOMMENDATIONS

### Construction Consultation and Monitoring

We recommend that Geoscience be given the opportunity to review the final design drawings and specifications in order to evaluate if recommendations in this report have been properly interpreted. Wide variations in soil conditions are known to exist between the borings, particularly at this site. Further unanticipated variations in subsurface conditions may become evident during construction. During excavation and foundation phases of the work, we recommend that a reputable geotechnical engineering firm be retained to provide construction surveillance services in order to 1) observe compliance with the geotechnical design concepts, specifications, and recommendations, and 2) to observe subsurface conditions during construction to verify that the conditions are as anticipated, based on the findings of this investigation.

### Soil Movement

The near surface soils encountered at this site exhibited Plasticity Indices of 11to 23. Based on the plasticity indices, these soils are considered as low to moderately expansive in nature. The magnitude of the moisture induced vertical movement was calculated using the Department of Transportation method in conjunction with current moisture content and dry soil condition and using the laboratory data from the results of swell tests performed on the selected samples. Based on the aforementioned methods, the estimated moisture induced Potential vertical movement (PVR) of the soils at the location of the test borings drilled is on the order of one to 1.5 inches.
Considerably more movement will occur in areas where water ponding is allowed to occur during and/or after construction –or- if fill soils other than select fill soils are planned for use. Site grading may also increase or decrease the potential for the movement.
The PVR can vary with prolonged wet or dry period as such we recommend that moisture content for the upper 7 feet of the soils within the building pad and PVR should be evaluated prior to the construction.

## FOUNDATION TYPE

As mentioned, the site was developed with structures and driveways. After the removal of driveways if the soils other than encountered within the borings logs if noted then additional test borings should be performed.

The foundation recommendations provided in the report are based on the soil information obtained from the test borings accessible to the drill rig. During construction if the soils at the other location of building are found to be different than encountered at the location of the test borings then, our recommendations provided in this report will not valid and additional drilling of the test borings will be required.

### Shallow Footings

The foundation of the proposed building can also be supported by spread footings. The spread footings should be installed at a minimum depth of 3 feet from the finished grade elevation installed within the density-controlled soils or select fill soils or flex base material. The spread footings can be designed using a net allowable bearing pressure of 2,500 psf for natural soils and 1,500 psf for compacted and tested soils. These values include a factor of safety of 2.5 with respect to the un-drained shear strength of the foundation soils.

The bottom of the spread footings should be free of any loose and/or soft materials prior to concrete placement. Any areas at the bottom of the footings where soft spots are noted we recommend a) the bottom of the grade beams either is rolled or compacted by re-working with the optimum moisture with a hand compactor. Each foundation excavation should be evaluated by a geotechnical engineer to ensure that the foundation bears within hard stratum - Or - b) reduce the allowable soil bearing capacity. At the time of such evaluation, it may be necessary to perform compaction testing or hand penetrometer probe test in the base of the foundation excavation to assure that the above recommendations are adhered.

### Grade Beams and Floor Slab

Grade beams should be structurally connected into the top of the spread footings. If a ground-supported beam is used, then the grade beam should be installed within the natural soils or compacted and tested fill soils. The grade beam should be a minimum of 2 feet deep and 12 inches wide.

Based on the Terzaghi's Bearing Capacity theory a net allowable soil bearing pressure 1,500 psf for reworked soils and 2,000 psf for natural soils. These bearing pressures include a factor of safety of 2.5 with respect to shear failure. Floor slabs should be adequately reinforced to minimize any future cracking as normal movements occur in the foundation soils. Also, a moisture barrier of polyethylene sheeting or similar material should be placed between the slab and the subgrade soils to retard moisture migration through the slab. It should be understood that a soil-supported foundation system will experience some movement over time.

### Building Pad Preparation

Prior to placing any additional fill material, all the structures and foundation elements of the existing building, all existing surface vegetation, debris, and tree roots should be removed. Any existing utility lines should be capped off at both ends or removed.

After removal of all referenced items, the exposed surface should be proof rolled as per Tx Dot method then the soils should be scarified to a depth of 6 inches watered as required and compacted between optimum and 4 points above optimum and compacted to between 95 and 100 percent of the maximum dry density as defined in ASTM D 698.

Additional fill soils if required should consist of select fill soils. Select Fill materials should be placed in six (6) to eight (8)-inch loose lifts at moisture contents between optimum and 3 percentage points above optimum. Each lift compacted to between 95 and 100 percent of the maximum dry density as defined in ASTM D 698. Field density tests should be taken at the rate of one test per every 2,500 square feet per lift, or a minimum of 3 tests per lift in the area of all compacted fill. For areas where hand tamping is required, the testing frequency should be increased to approximately one test per lift, per 100 linear feet of area.

### Select Fill

"Select fill," as referred to in this report, should consist of clayey sands free of organic materials with a Plasticity Index between 6 and 16, a Liquid Limit of 38 or less, and between 15 and 45 percent passing a No. 200 sieve. Placement and compaction of the select fill should be performed in accordance with the "Building Pad Preparation" section of this report.

### Flex Base

TxDOT 247 Type D Grade 1-2.

## PAVEMENT RECOMMENDATIONS

### General

Specific wheel loading and traffic volume characteristics were not available at the time of this investigation. However, we have assumed that light passenger vehicle traffic will be most predominant in the parking areas and the relatively heavier fire truck traffic will occur in the drive areas area around and behind the structure, and in the fire lane. Based on assumed loading conditions, we have developed the following Portland Cement concrete pavement design sections for use at this site.

| | Minimum Thickness(inches) |
|---|---|
| **Light Traffic** | |
| Portland Cement Concrete | 5 |
| Compacted Subgrade | 6 |
| **Heavy Traffic** | |
| Portland Cement Concrete | 6 |
| Compacted Subgrade | 6 |

Prior to the placement of any fill in the pavement area, we recommend all existing driveways, structures and all foundation elements should be removed and disposed of the site. Existing utility lines should either be capped on both sides or removed completely.

The exposed surface should then be proof rolled with heavy equipment then the exposed subgrade should be scarified to a depth of 6 inches water as required and compacted to 95 and 100 percent of maximum dry density as defined by ASTM D 698 (Standard Proctor Test), at moisture content between optimum and 4 points above optimum.

Design of the concrete pavement should specify a minimum 28-day concrete compressive strength of 3,000 psi for all the pavement with 4 percent to 6 percent entrained air. The concrete should be placed within one and one-half hours of batching. During hot weather, the concrete placement should follow ACI 311 Hot Weather concreting and in no case should the concrete temperature be allowed to exceed 95°F. To avoid excessive heat periods, consideration should be given to limiting concrete placement to a time of day that will minimize large differences in the ambient and concrete temperature.

Past experience indicates that pavements with sealed joints on 15 to 20-foot spacings, cut to a depth of at least one-quarter of the pavement thickness, generally exhibit less uncontrolled post-construction cracking than pavements with wider spacings. As a minimum, expansion joints should be used wherever the pavement abut a structural element subject to a different magnitude of movement, e.g., light poles, retaining walls, existing pavement, building walls, or manholes. After construction, the construction and expansion joints should be inspected periodically and resealed, if necessary. The pavement should be reinforced using at least No. 3 bars; 24 inches on center should be used.

### Flexible Pavement

The following Asphaltic Concrete Pavement section can be used for the above project.

| | Thickness (inches) |
|---|---|
| **Parking Area** | |
| HMAC Type D Surface Course | 2.5 |
| Flex base | 8 |
| Compacted subgrade | 6 |
| **Driveway** | |
| HMAC Type D Surface Course | 3 |
| Flex base | 8 |
| Compacted subgrade | 6 |

The "design life" of a pavement is defined as the expected life at the end of which reconstruction of the pavement will need to occur. Normal maintenance, including crack sealing, slurry sealing, and/or chip sealing, should be performed during the life of the pavement.

Due to the high static loads imposed by parking trucks in loading and unloading areas and at dumpster locations, we recommend that a rigid pavement section be considered for these areas. Bituminous surfacing should be constructed of dense-graded, central plant-mix, asphalt concrete. Base course, Portland cement, and asphalt concrete should conform with Texas Department of Transportation. The pavement subgrade should be prepared as per the recommendations provided in previous sections of this report. The gradient of paved surfaces should ensure positive drainage. Water should not pond in areas directly adjoining paved sections.

Flex base material should then be placed and compacted to a minimum of 98 percent of the maximum dry density with the moisture content between -2 to +3 of optimum moisture as per ASTM D 698. We recommend extending the flex base materials a minimum of 3 feet beyond the asphalt pavement edge to act like shoulder. field density should be taken one test at every 100 linear feet. Prime coat should then be applied on all HMAC receiving areas to ensure proper bonding of the asphalt surface.

Place the recommended asphalt thickness and roll and compact to a tight and smooth finish. A full-time inspection from Geotechnical laboratory is required during placement of asphalt.

The asphalt pavement analysis was performed using the AASHTO design method and the previously stated assumed traffic characteristics. The HMAC should meet the Department of

Transportation specifications.

## LANDSCAPING

Trees will remove water from the soil and, as a result, may cause the soil to shrink; therefore, in areas where pavement is planned, trees should either:

a). not be planted closer than the mature tree height from the building.
b). have a controlled irrigation system, or
c). be planted in containers.

Excess water ponding on or beside roadways, sidewalks and structural slabs may cause an unacceptable heave to these structures. To reduce this potential heave, good surface drainage should be established, and sprinkler systems should be designed and operated to minimize saturation of soil adjacent to these structures. Sprinkler mains next to buildings are not recommended.

Bedding soils for plants may collect and direct water underneath the buildings and pavements; therefore, care should be taken to ensure that water entering the bedding soils drains away from these structures. If positive drainage away from these structures cannot be achieved, an impermeable synthetic membrane should be considered to reduce the risk of water migrating beneath the buildings and pavements. An 18-inch-deep vertical water barrier along the pavement edge fronting landscaped areas may be desirable to help prevent irrigation water from having ready access to the soils beneath the pavement. Special attention should be given to provide good drainage from plantings inside the building courtyards and planter boxes.

The completed landscaping should be carefully inspected to verify that plantings properly drain. Soil in plantings may settle, which will tend to pond water, or plantings may block entrances to surface drains. Therefore, maintaining positive drainage from landscape irrigation will be an ongoing concern.

## SITE GRADING and DRAINAGE

All grading should provide positive drainage away from the proposed structures and should prevent water from collecting or discharging near the foundations. Water must not be permitted to pond adjacent to the structures during or after construction.

Surface drainage gradients should be designed to divert surface water away from the buildings and edges of pavements and towards suitable collection and discharge facilities. Unpaved areas and permeable surfaces should be provided with steeper gradients than paved areas. Pavement drainage gradients within 5 feet of buildings should be constructed with a minimum slope of one inch per foot to prevent negative drainage gradients (ponding water conditions) from developing due to differential upward pavement movements. Sidewalk drainage gradients should be along maximum slopes allowed by local codes.

Roofs should be provided with gutters and downspouts to prevent the discharge of rainwater directly onto the ground adjacent to the building foundations. Downspouts should not discharge into any landscaped bed near the foundations. Downspouts should discharge directly into storm drains or drainage swales, if possible. Roof downspouts and surface drain outlets should discharge into erosion-resistant areas, such as paving or rock riprap. Recessed landscaped areas filled with pervious sandy loam or organic soil should not be used near the foundation. Landscaped beds should be elevated above a compacted and well-graded clay surface. Sealed planters are preferred. All trees should be a minimum of one-half their mature height away from the building or pavement edges to reduce potential moisture losses. Water permitted to pond in planters, open areas, or areas with unsealed joints next to structures can result in on-grade slab or pavement movements, which exceed those, indicated in this report.

Exterior sidewalks and pavements will be subject to some post construction movement as indicated in this report. These potential movements should be considered during preparation of the grading plan. Flat grades should be avoided. Where concrete pavement is used, joints should be sealed to prevent the infiltration of water. Some post-construction movement of pavement and flatwork may occur. Particular attention should be given to joints around the building. These joints should be periodically inspected and resealed where necessary. It should be noted that due to deeper depth of fill soils some settling of the fill soils may occur in future.

## CLOSURE

It should be noted that some variations in soil and moisture conditions may exist between boring locations. Statements in this report as to subsurface variations over given areas are intended as estimations only, based upon the data obtained from specific boring locations.

The results, conclusions, and recommendations contained in this report are directed at, and intended to be utilized within the scope of work outlined in this report. The report is not intended for use in any other manner. Geoscience Engineers, LLC., makes no claim or representation concerning any activity or condition falling outside the specified purposes for which this report is directed; said purposes being specifically limited to the scope of work as defined herein. Inquiries regarding scope of work, activities and/or conditions not specifically outlined herein, should be directed to Geoscience Engineers, LLC.

# ILLUSTRATIONS

## BORING LOCATION PLAN


🔴 Test boring to a depth of 20 feet

🔵 Test boring to a depth of 5 feet

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**BORING LOCATION PLAN**
Proposed "Car Wash"
1376 Main St
Boerne, Texas

Geoscience Project No.: 21-DG6523

**Plate A**

GeoScience Incorporated

# LOG OF BORING NO. B-1

**Proposed Car Wash**
**1376 S Main St**
**Boerne, Texas**

**Project No. 21-DG6523**

**Location:** See Location Plan
**Surface Elevation:** Unknown
**Drilling Method:** CFA
**Date Boring Drilled:** 7/23/2021
**Completion Depth:** 20
**Groundwater Information:**
**Seepage Encountered During Drilling:** 18
**Upon Completion:** 18 Feet

| FIELD DATA | | | | | | LABORATORY DATA | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DEPTH (ft.) | SOIL & ROCK SYMBOL | SAMPLE TYPE | P: HAND PEN., TSF T: THD, BLOWS/FT. N: SPT, BLOWS/FT. | STRATUM DEPTH (FT.) | DESCRIPTION OF STRATUM | WATER CONTENT, % | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | UNIT DRY WEIGHT (PCF) | UNCONFINED STRENGTH (TSF) | % PASSING NO. 200 SIEVE | SOIL SUCTION TEST (TOTAL CM. OF WATER) |
| 0 | | Tube | P4.5+ | | Tan and brown SANDY CLAY with a trace of gravel | 15 | 41 | 18 | 23 | | | | |
| | | Split-spoon | N29 | | | 14 | | | | | | | |
| 5 | | Tube | P4.5+ | | | 17 | | | | 106 | 2.6 | | |
| | | Split-spoon | N40 | | -tan below 6.5' | 7 | | | | | | | |
| 10 | | Split-spoon | N61 | | | 5 | | | | | | | |
| 15 | | Tube | N4.5+ | | | 17 | 40 | 18 | 22 | | | 55 | |
| | | | | 18 | | | | | | | | | |
| 20 | | Split-spoon | N50 | 20 | Yellowish tan Clayey SAND (SC) with occasional gravel | 14 | | | | | | | |

| TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY |
|---|---|---|---|---|---|

REMARKS:

# LOG OF BORING NO. B-2

**Proposed Car Wash**
**1376 S Main St**
**Boerne, Texas**

**Project No. 21-DG6523**

**FIELD DATA**

**Location:** See Location Plan
**Surface Elevation:** Unknown
**Drilling Method:** CFA
**Date Boring Drilled:** 7/23/2021
**Completion Depth:** 20
**Groundwater Information:**
**Seepage Encountered During Drilling:** None
**Upon Completion:** Dry

**LABORATORY DATA**

| DEPTH (ft.) | P: HAND PEN., TSF / T: THD, BLOWS/FT. / N: SPT, BLOWS/FT. | STRATUM DEPTH (FT.) | DESCRIPTION OF STRATUM | WATER CONTENT, % | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | UNIT DRY WEIGHT (PCF) | UNCONFINED STRENGTH (TSF) | % PASSING NO. 200 SIEVE | SOIL SUCTION TEST (TOTAL CM. OF WATER) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 0.16 | Asphalt - 2" | | | | | | | | |
| | | 0.91 | Base Course - 9" | | | | | | | | |
| | | | Brown SAND CLAY(CL)with a trace of gravel | 23 | | | | | | | |
| | P3.0 | | | 20 | 38 | 16 | 22 | 99 | 2.7 | 52 | |
| 5 | P4.5+ | | -tan below 4.5' | 15 | | | | | | | |
| | N39 | | | 18 | | | | | | | |
| | P3.0 | | | 11 | | | | | | | |
| 10 | | | | | | | | | | | |
| 15 | N62 | | | 8 | | | | | | | |
| 20 | N53 | 20 | | 13 | 23 | 12 | 11 | | | | |
| 25 | | | | | | | | | | | |
| 30 | | | | | | | | | | | |

| TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY |
|---|---|---|---|---|---|

REMARKS:

# LOG OF BORING NO. B-3

**Proposed Car Wash**
**1376 S Main St**
**Boerne, Texas**

**Project No. 21-DG6523**

**Location:** See Location Plan
**Surface Elevation:** Unknown
**Drilling Method:** CFA
**Date Boring Drilled:** 7/23/2021
**Completion Depth:** 6
**Groundwater Information:**
**Seepage Encountered During Drilling:** None
**Upon Completion:** Dry

| FIELD DATA | | | | | DESCRIPTION OF STRATUM | LABORATORY DATA | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DEPTH (ft.) | SOIL & ROCK SYMBOL | SAMPLE TYPE | P: HAND PEN., TSF T: THD, BLOWS/FT. N: SPT, BLOWS/FT. | STRATUM DEPTH (FT.) | | WATER CONTENT, % | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | UNIT DRY WEIGHT (PCF) | UNCONFINED STRENGTH (TSF) | % PASSING NO. 200 SIEVE | SOIL SUCTION TEST (TOTAL CM. OF WATER) |
| 0 | | Tube | P4.5+ | | Brown SANDY CLAY (CL) with a trace of gravel | 14 | | | | | | | |
| | | Split-spoon | N32 | | | 14 | 38 | 17 | 21 | | | 56 | |
| | | | | | | 6 | | | | | | | |
| 5 | | Split-spoon | N52 | 6 | | | | | | | | | |
| 10 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

| TUBE SAMPLE | AUGER SAMPLE | SPLIT-SPOON | ROCK CORE | THD CONE PEN. | NO RECOVERY |
|---|---|---|---|---|---|

REMARKS: