MOORE TWINING
ASSOCIATES, INC.
Since 1898

November 2, 2020

D050R0.01
G74101.01

Home Depot U.S.A., Inc.
4000 West Metropolitan Drive
Orange, CA 92868

Attention: Mr. Bob Burnside

Subject: **Response to City of San Diego Geology Review Comments, and Update to Preliminary Geotechnical Engineering Investigation Reports 1561/1545 Camino Del Rio South; San Diego, California**

References: Preliminary Geotechnical Engineering Investigation, Proposed Home Depot Store - Mission Valley, 1895 Camino Del Rio South, San Diego, California, prepared by Moore Twining Associates, Inc., dated January 10, 2020

Preliminary Geotechnical Engineering Investigation, Proposed 2-Story Office Building Scottish Rite Cooperate Business Center, 1561 Camino Del Rio South, San Diego, California, prepared by Moore Twining Associates, Inc., dated January 13, 2020

Addendum to Preliminary Geotechnical Engineering Investigation Reports and Response to City of San Diego Geology Review Comments, prepared by Moore Twining Associates, Inc., dated May 27, 2020 (referenced as Addendum No. 1)

Response to City of San Diego Geology Cycle 3 Review Comments, prepared by Moore Twining Associates, Inc. dated August 11, 2020

Response to Cycle 4 City of San Diego Geology Review Comments, and Addendum 2 to Preliminary Geotechnical Engineering Investigation Reports, October 7, 2020

Mr. Burnside:

We are pleased to submit this update letter in regards to the review comments from the City of San Diego LDR-Geology Review. The City review comments were provided in reference to the preliminary geotechnical engineering investigation and addendum reports prepared by Moore Twining Associates, Inc. for the entitlement phase to develop the above referenced projects in the Mission Valley area of the City of San Diego, California.

The following lists the City Review Comments requiring responses in *italic print* with the original comment number, followed by Moore Twining's responses.

28. Per SDMC 142.0133, slope steeper than those specified in Section 142.0133 (b) and © shall be vegetated in accordance with a plan prepared by a licenced landscape architect. Submit a copy of the landscape architectural plan. The landscape architect should indicate if the proposed plant pallet shown on the landscape plan is designed for the proposed steeper 1.75H to 1V slopes. In addition, the landscape architect should indicate if the plant pallet incorporates deep rooted bushes & trees to improve resistance to surficial stability & erosion as recommended by the project's geotechnical consultant. (New Issue)

Moore Twining Response: The landscape architect JPBLA, Inc. has indicated that all of the plants selected for the slope are deep rooted species. We understand that the proposed landscape plans will be provided for LDR-Geology review and confirmation from the landscape design professional affirming that the plant pallet incorporates the recommendations of the geotechnical report under a separate cover.

31. Submit an addendum geotechnical report or update letter that specifically addresses the following comments.

Moore Twining Response: This update response letter, and enclosed drawing address the new LDR-Geology comments provided.

32. The project's geotechnical consultant has indicated that it may be feasible to grade the proposed slopes in the side canyon area to 2H to 1V or flatter. Unless extraordinary conditions exist, the proposed slope in the "side canyon" area shall be 2H to 1V. The proposed grading plan should be revised to show the 2H to 1V slope and clearly indicate slope ratio transitions to 1.75H to 1V. (New Issue)

Moore Twining Response: Fuscoe Engineering has prepared a revised slope grading plan (enclosed sheet C-HD-6, dated October 29, 2020), indicating the section of the slope below the "side canyon" area over the storm drain will be graded at 2H to 1V without extending the slope beyond the limits of past disturbance. The plan revisions show the grading using slope transitions from the adjacent 1.75H to 1V slopes to 2H to 1V or flatter within the area requested.

33. NOTE - Due to the proposed non-standard slope gradient, a "Notice of Geologic and Geotechnical Conditions" shall be recorded against the property prior to recordation of the Site Development Permit. Please provide the Geology Section the name of the owner, APN, street address, and legal description of the subject site to complete the draft document.. (New Issue)

Moore Twining Response: The requested owner and property information is as follows (from Cover Sheet SC-1 of the project plans):

Site Owner: Scottish Rite Cathedral of San Diego, Inc.
APN: 4380903300 and 4380903400
Addresses: 1895 & 1561 Camino Del Rio S; San Diego California.
Legal Description:

LOT 1 OF BOWLERO, IN THE CITY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF NO. 3546, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY

CLOSING

This response was provided to supplement the referenced reports and respond to the City review comments is subject to notifications and limitations of the referenced preliminary reports for the Home Depot and Scottish Rite projects, dated January 10, 2020 and January 13, 2020, respectively. The recommendations of these reports apply and should be followed unless specifically amended. None of the conclusions provided in this update supercede any of the recommendations included in the Home Depot and Scottish Rite Preliminary Geotechnical Reports.

We appreciate the opportunity to be of service to Home Depot U.S.A., Inc. If you have any questions regarding this report, or if we can be of further assistance, please contact us at your convenience.

Sincerely,

MOORE TWINING ASSOCIATES, INC.
Geotechnical Engineering Division

Scott W. Krauter, RGE
Assistant Manager

Read L. Andersen, RGE
Manager

REGISTERED PROFESSIONAL ENGINEER
SCOTT KRAUTER
No. C049956
No. GE-2358
Exp. 12/31/20
CIVIL-GEOTECHNICAL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
READ L. ANDERSEN
2810
EXP. 12-31-20
GEOTECHNICAL
STATE OF CALIFORNIA

SECTION "F-F"
SCALE: 1"=20'

SECTION "G-G"
SCALE: 1"=20'

SECTION "H-H"
SCALE: 1"=20'

CONSTRUCTION NOTES

① REGRADE SLOPE AT 1.75:1 PER GEOTECHNICAL ENGINEER REQUIREMENTS

LEGEND

CONCRETE	▨
TERRACE DITCH PER SDD-106	═
RETAINING WALL TYPE 5 PER C-5	▬

SCALE: 1"=30'-0"
0 15 30 60 90 120

NORTH

FUSCOE
ENGINEERING
6390 Greenwich Dr., Suite 170
San Diego, California 92122
tel 858.554.1500 ∘ fax 858.597.0335
www.fuscoe.com

BRYAN D. SMITH
C 75822
EXP. 06-30-22

WARE MALCOMB
Leading Design for Commercial Real Estate

SCOTTISH RITE /
HOME DEPOT
1895 & 1561 CAMINO DEL RIO S
SAN DIEGO, CA 92108

SLOPE TERRACING
AND DRAINAGE PLAN
C-HD-6
08.17.2020
18134.00

MOORE TWINING ASSOCIATES, INC.
Since 1898

PRELIMINARY GEOTECHNICAL ENGINEERING INVESTIGATION

PROPOSED HOME DEPOT STORE - MISSION VALLEY

1895 CAMINO DEL RIO SOUTH

SAN DIEGO, CALIFORNIA

Project Number: D050R0.01

For:

Home Depot U.S.A., Inc.
4000 West Metropolitan Drive
Orange, CA 92868

January 10, 2020

MOORE TWINING
ASSOCIATES, INC.
Since 1898

January 10, 2020 D050R0.01

Home Depot U.S.A., Inc.
4000 West Metropolitan Drive
Orange, CA 92868

Attention: Mr. Bob Burnside

Subject: **Preliminary Geotechnical Engineering Investigation Report**
New Home Depot Store - Mission Valley
1895 Camino Del Rio South
San Diego, California

Dear Mr. Burnside:

We are pleased to submit this preliminary geotechnical engineering investigation report prepared for the Entitlement phase of the project to develop a proposed Home Depot store to be located at 1895 Camino Del Rio South (Mission Valley area) in San Diego, California. This report is considered preliminary since the project details had not been finalized at the time this report was completed. The contents of this report include the purpose of the investigation, scope of services, background information, investigative procedures, our findings, evaluation, conclusions, and recommendations.

Since this report is considered preliminary for Entitlement review, it is recommended that Moore Twining Associates, Inc. (Moore Twining) be provided with updated plans that pertain to the anticipated grading and structure details. Once these details are provided, a design level geotechnical report should be prepared to provide specific recommendations for design and construction.

In addition, it is recommended that Moore Twining be retained to final plans and specifications, as well as to conduct inspection and testing services for the excavation, earthwork, and foundation phases of construction. These services are necessary to determine if the subsurface conditions are consistent with those used in the analyses and formulation of recommendations for this investigation, and if the construction complies with our recommendations. These services are not, however, part of this current contractual agreement.

We appreciate the opportunity to be of service to Home Depot U.S.A., Inc. If you have any questions regarding this report, or if we can be of further assistance, please contact us at your convenience.

Sincerely,

MOORE TWINING ASSOCIATES, INC.

Scott W. Krauter, RGE
Assistant Manager
Geotechnical Engineering Division

REGISTERED PROFESSIONAL ENGINEER
SCOTT KRAUTER
No. C049956
No. GE-2358
Exp. 12/31/20
CIVIL-GEOTECHNICAL
STATE OF CALIFORNIA

EXECUTIVE SUMMARY

Moore Twining Associates, Inc. (Moore Twining) was authorized by Home Depot U.S.A., Inc. to conduct a preliminary geotechnical engineering investigation for the proposed Home Depot store to be located at 1895 Camino Del Rio South (Mission Valley area) in San Diego, California. The subject property comprises a 14.05 acre parcel.

The subject property was being utilized as a Scottish Rite Event Center at the time of our investigation. The existing facility includes an events center building in the east portion of the site that occupies about 70,000 square feet. An existing asphalt concrete parking lot occupies the central and west portions of the site. The proposed Home Depot site/store extends into a portion of the auto dealership parking lot west of the existing Scottish Rite parking lot.

The project will involve the demolition of the existing Scottish Rite Event Center and associated parking lot to construct a new Home Depot store. Current plans indicate the store footprint will occupy about 106,688 square feet with a 17,913 square foot Garden Center. The planned store structure will extend north from the base of the existing cut slope (separated by a 35 foot driveway) across areas currently occupied by the Scottish Rite building and main parking lot. The new store will be served by a new three level parking garage to be located between the proposed store structure and Camino Del Rio South (roadway). The store will include a tool rental center, a lumber canopy and a depressed loading dock. The remainder of the site will generally be covered with asphalt concrete and Portland cement concrete paving.

A total of one hundred-twelve (112) test boring were drilled for this preliminary investigation. From February 25 to March 14, 2019, eighty-eight (88) test borings were drilled in the store building and site areas to depths of between 2 and 51 feet below site grade (BSG). After this initial drilling, a supplemental field investigation for the proposed parking structure was completed on September 17 through 20, 2019 and on December 27, 2019 to drill an additional twenty-four (24) test borings in the area of the proposed parking garage. It should be noted that auger refusal due to cobbles and dense gravels were encountered at depths of 10 feet or less in thirty-nine (39) of the borings drilled.

The near surface soils within the proposed Home Depot store were generally found to be stiff lean clays and loose clayey sands to depths of about 1 to 3 feet. These upper soils were likely disturbed native soils resulting from the extensive cut and fine grading of the existing parking lot areas of the site when developed in the 1950's. These upper loose, or stiff disturbed soils, will not provide uniform support for the proposed floor slabs or foundations. As a part of site preparation, these loose soils should be excavated to expose undisturbed native soils and in order to support the proposed foundations on engineered fill. Below these upper soils, similarly classified sandy clay and clayey sand soils were encountered in hard and dense conditions in the range of 3 to 10 feet below site grade (BSG).

EXECUTIVE SUMMARY (Continued)

The soil conditions in the north portion of the site proposed for the Parking Structure are highly variable and appear to be less consolidated (weaker) compared to the area of proposed for the Home Depot Store. Soils consisting of loose to medium dense silty sands and stiff clays with more dense and hard soil profiles in adjacent borings suggest more variable conditions. Based on the higher compressible soil conditions expected, the parking garage will require deeper over-excavation depending on column loads of the final design or a ground modification program such as Geopiers could be a effective method to densify the upper variable soils to reduce foundation settlements to tolerable levels. Also, the structure could be supported on a continuous mat type foundation to reduce applied soil bearing pressures and to resist higher levels differential settlements expected by the variable conditions.

The on-site clay soils encountered have a medium expansion potential as indicated by expansion index values of 77 and 81. Medium expansive material would cause heave/shrinkage exceeding ½ inch in 50 feet resulting in post construction damage to lightly loaded slabs on grade supported directly on these materials. Therefore, it is recommended to support floor slabs on non-expansive aggregate base and imported non-expansive granular fill; and, extend perimeter foundations below where seasonal moisture fluctuations typically occur.

Variable amounts of fine to coarse gravel and cobbles are present within the lean clay/clayey sand strata encountered at the site. These soils with coarse materials are usually characterized by hard or very dense conditions on the boring logs (N-values greater than 50 blows per foot). These hard and dense conditions and coarse gravel and cobble materials will require more effort to excavate and process than typical soils without coarse materials. Further, oversized materials placed and/or compacted directly below foundations and floor slabs can cause hard points resulting in excessive differential movement and cracking of over-lying footings or slabs on grade. Due to the presence of cobbles and gravel, oversized rock material should be removed by methods such as screening prior to placement and compaction as engineered fill.

A 4.66 acre area of the south portion of the property is occupied by a north facing hillside. Also, an ascending west facing cut slope is also present along the south portion of the east boundary of the site between the adjacent church property above the site. Based on aerial images and the site topographic exhibit provided, the lower portion of the north facing slope, in the southern portion of the site, is a cut slope with graded terraces and a native hillside above. The native hillside extends hundreds of feet above and beyond the subject property line to the south. The total height to the top of the slope, which is located beyond the property line, is estimated to be about 285 feet above the base of the slope, with the upper native slope occupying about 210 vertical feet and the lower graded cut slope occupying about 75 vertical feet of the overall slope.

The lower portion of the existing cut portion of the north-facing slope was observed and evidence of previous erosion, shallow soil slips, remedial erosion control measures, surficial slope repairs, and drainage improvements added after initial construction were noted. The majority of the erosion and soil movement observed was identified in the eastern portion of the north facing slope. In this eastern portion of the slope, the slope was not covered with mature bushes or established native grasses and evidence of significant erosion, shallow sliding of surface materials, failed erosion control measures, and accumulation of sediments were noted. However, the western portion of the north facing cut slope did not exhibit significant erosion issues or evidence of surficial instability. This area of the slope contained better established vegetation.

The existing north facing native slope above the cut slope area was evaluated to identify unfavorable geologic structures as a part of this investigation. No unfavorable geologic structures were identified and this upper native slope has been performing well for quite some time. Therefore, the slope is considered stable and potential instability of the upper native slope is low.

The existing north facing lower cut was inspected above and below the slope. These observations did not identify evidence of scarps, lateral displacement, bulging at the base (retaining wall displacement), or unfavorable geologic structures suggesting that any deep seated instability of the overall slope had occurred. Further, deeper soils encountered in the borings drilled on the exhibited good shear strength characteristics. Given these conditions and the overall 2H to 1V slope across the cut, it was concluded that deep seated slope instability is not a concern since the project does not propose to significantly alter the existing cut slope.

The existing north facing cut slope has an area that has been impacted from past washouts, with exposed cobble deposits, and exposed predominantly granular, low cohesion, soils that have exhibited high erosion and shallow soil slips 1 to 2 feet deep. Also, observations indicate the slope drainage needs improvement. Drainage improvements will reduce, but not eliminate the surficial and erosion issues that have occurred. Thus, some surficial slope movements are anticipated to continue. Considering that the building improvements are planned to be setback at least 35 feet from the slope, impacts to the proposed structures due to shallow slope instability are not anticipated. The current approach by Scottish Rite of maintenance and spot repairs where erosion and slippage has occurred on the cut slopes has been sufficient to maintain function. A similar level of maintenance and repair should be anticipated. In addition, this report recommends that a program of regular inspection of the slopes be implemented to identify conditions that could further degrade shallow slope stability, and to identify areas requiring maintenance and repair/restoration.

An inlet structure which collects runoff from a side canyon area within above and to the south of the site has become blocked in the past, causing runoff to flow around or over the inlet structure. The runoff appears to have drained onto the adjacent terraces and flowed over the north facing cut slopes in the past, contributing to erosion and surficial soil slips within the lower portion of the cut slope. Therefore, it has been concluded that the current drainage inlet structure and the maintenance (i.e., debris removal) are not adequate for the runoff conditions experienced. Thus, to reduce the impacts associated with the blocking of the current inlet structure at the outlet of the side canyon, appropriate debris catchments and inlet structure design should be incorporated into the drainage improvements as a part of construction. The drainage structure and catchments should include redundant systems to reduce the potential for clogging.

EXECUTIVE SUMMARY (Continued)

Also, a variable height cut slope that supports the elevation transitions up to the adjacent church property along the east boundary of the site was observed. In addition, considering that no unfavorable geologic structures were identified and the existing west-facing cut slope has performed

well for quite some time, there is also a low potential for impacts from movement of this slope. Although significant slope movement is not anticipated, it is recommended to provide a minimum setback of at least ½ the slope height from the toe of the slope to the nearest structure.

The results of the liquefaction analyses indicate that some medium dense silty sands encountered in two of the five deeper areas explored at the site below 30 to 40 feet are susceptible to liquefaction in isolated zones. The associated differential seismic settlements were estimated to be ½ inch in the Home Depot store, and ¾ inch within the parking garage.

The results of the R-value tests indicate the near surface soils exhibit poor to good pavement support characteristics as indicated by R-value results ranging from 19 to 22 for most of the clay soils with a result of 63 in some isolated silty sands. Based on the R-values conducted for this investigation, an R-value of 15 was used for design.

Chemical testing of soil samples indicated the soils exhibit a “highly corrosive” to “corrosive” potential for metallic corrosion and a “negligible” potential for sulfate attack on concrete placed in contact with the near surface soils.

This executive summary should not be used for preliminary design and should be reviewed in conjunction with the details included in the attached report.

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

PRELIMINARY GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED HOME DEPOT STORE - MISSION VALLEY
1895 CAMINO DEL RIO SOUTH
SAN DIEGO, CALIFORNIA

Project Number: D05R0.01

1.0 INTRODUCTION

This report presents the results of a preliminary geotechnical engineering investigation for the proposed Home Depot store to be located at 1895 Camino Del Rio South in the Mission Valley area of San Diego, California. Moore Twining Associates, Inc. (Moore Twining) was authorized by Home Depot U.S.A., Inc. to perform this investigation. This report was prepared for Entitlement purposes.

The contents of this report include the purpose of the investigation and the scope of services provided. The site history, previous studies, existing site features, and anticipated construction are discussed. In addition, a description of the investigative procedures used and the subsequent findings obtained are presented. Finally, the report provides an evaluation of the findings, general conclusions, and related recommendations. The report appendices contain the drawings and site photographs (Appendix A), the logs of borings (Appendix B), the results of laboratory tests (Appendix C), the results of percolation tests (Appendix D), and the results of liquefaction analysis (Appendix E).

2.0 PURPOSE AND SCOPE OF INVESTIGATION

2.1 Purpose: The purpose of the preliminary investigation was to conduct a field exploration, a laboratory testing program, evaluate the data collected during the field and laboratory portions of the investigation, and provide the following:

2.1.1 Evaluation of the near surface soils within the zone of influence of the proposed foundations, exterior slabs-on-grade, and pavements with regard to the Home Depot design criteria;

2.1.2 Conclusions regarding the potential for liquefaction, magnitude of seismic settlement, and recommendations for CBC seismic near source factors and coefficients;

2.1.3 Preliminary geotechnical parameters for use in design of foundations and slabs-on-grade, (e.g., soil bearing capacity and settlement), and development of lateral resistance;

2.1.4 Preliminary recommendations for site preparation including placement, moisture conditioning, and compaction of engineered fill soils;

2.1.5 Assessment of the infiltration characteristics of the soils in the proposed infiltration system location;

2.1.6 Preliminary evaluation of the stability of the existing adjacent slopes;

2.1.7 Recommendations for the design and construction of new asphaltic concrete (AC) and Portland cement concrete (PCC) pavements;

2.1.8 Recommendations for temporary excavations and trench backfill; and

2.1.9 Conclusions regarding soil corrosion potential.

This report is provided specifically for the proposed project referenced in the Anticipated Construction section of this report. This report does not include recommendations for offsite improvements. This investigation did not include a floodplain investigation, quantitative slope stability analysis, environmental investigation, or environmental audit.

2.2 **Scope:** Our proposal, dated December 17, 2018 outlined the original scope fo services and contract amendments No.1, dated August 23, 2019 and No. 2 dated December 9, 2019, outlined supplemental scopes of our services. It was not the intent of this investigation to fully comply with the Home Depot Design Manual requirements for the number of borings on the site since soil borings could not be conducted within the existing building nor within the existing hillside areas that could not be accessed with exploration equipment. Therefore, the spacing of the soil borings conducted in some areas of the site was not intended to comply with the Home Depot Criteria in all areas. The actions undertaken during the investigation are summarized as follows.

2.2.1 The Home Depot Design Criteria Manual (dated October 17, 2016) was reviewed.

2.2.2 The City of San Diego Guidelines for Geotechnical Reports, (2018) and the City of San Diego, Storm Water Standards (2018) were reviewed

2.2.3 Several versions of site plans for the proposed project were provided for review during the investigation prepared by Lars Andersen & Associates, Inc. The initial field exploration program utilized a site plan (LA-G.2) revision dated February 19, 2019 prepared by Lars Andersen & Associates, Inc. After initiation of the investigation, revised site plans showing the parking structure and updated preliminary building and site improvements was provided by Lars Andersen & Associates, Inc, dated December 12, 2019. This plan is referred to as the site plan in this report.

2.2.4 San Dieguito Engineering, Inc. provided several versions of slope maintenance and improvement plans dated March 26, 2019 through January **, 2020 that were reviewed. Also, an exhibit showing existing topography of the site, prepared by K&S Engineering, Inc. was provided for review and reference to existing site elevations.

2.2.5 Historical aerial photographs of the site and surrounding area, produced by EDR, for the years 1928, 1949, 1953, 1964, 1966, 1970, 1979, and 1985 were reviewed.

2.2.6 Research regarding the existing site and regional geology was conducted, and the following maps and reports were reviewed and utilized during this investigation:

- Geologic Map of the San Diego 30'x60' Quadrangle, California, Regional Geologic Map Series, prepared by the California Geological Survey and compiled by Michael P. Kennedy and Siang S. Tan, dated 2008;

- City of San Diego's Seismic Safety Study, Geologic Hazards and Faults, Grid Title 21, dated April 3, 2008;

- California Division of Mines and Geology (CDMG) Open File report 95-03 by Tan (1995) titled Landslide Identification Map No. 33; Landslide Hazards in the Southern Part of the San Diego Metropolitan Area; and,

- Revised Desktop Geotechnical Geotechnical and Geologic Hazard Evaluation, prepared by The Bodhi Group, dated January 8, 2019.

2.2.7 City of San Diego Building Records were reviewed to identify geotechnical engineering investigation reports prepared for previous developments along the south flank of Mission Valley. These reports are identified in Section 5.1.4 of this report.

2.2.8 Boring permit numbers LMWP-003844 and 004155 were obtained from the County of San Diego for the two phases of subsurface investigation conducted.

2.2.9 Visual site reconnaissance and subsurface exploration were conducted.

2.2.10 Laboratory tests were conducted to determine selected physical and engineering properties of the subsurface soils encountered.

2.2.11 Mr. Bob Burnside (Home Depot), Mr. Scott Mommer (Lars Andersen Associates), Mr. Michael Wolfe (San Dieguito Engineering, Inc.), Mr. Brian James (James Company), and representatives from the Scottish Rite Events

Center were consulted during the investigation. Also, for parking garage information, Mr. Jason Rupp (Architects Orange, LLP) and Mr. Bryan Allred (Seneca Structural Engineering, Inc.) were consulted.

2.2.12 The data obtained from the investigation were evaluated to develop an understanding of the subsurface soil conditions and engineering properties of the subsurface soils.

2.2.13 This report was prepared to present the purpose and scope, background information, field exploration procedures, findings, and preliminary evaluation, as well as preliminary conclusions and recommendations.

3.0 BACKGROUND INFORMATION

The existing site features, site history, previous studies, and the anticipated construction are summarized in the following subsections.

3.1 Site Description: The subject site comprises a 14.05 acre parcel located at 1895 Camino Del Rio South in the City of San Diego, California (see Drawing Nos. 1 and 2 in Appendix A). For the purpose of this report, project north is considered to be towards Camino Del Rio South, which is about 15 degrees to the west of true north. The site is bordered to the north by Camino Del Rio South, which is a frontage road for Interstate 8 beyond; to the west by an existing auto dealership; to the east by an office building and an ascending slope and church facility beyond; and to the south by an ascending slope and a residential neighborhood beyond that has an elevation about 285 feet higher than the relatively flat portion of the subject site. Descriptions of the slopes on and near the site are provided in Section 5.3 of this report.

The subject property was being utilized as a Scottish Rite Event Center at the time of our investigation. The existing facility includes an events center building in the east portion of the site that occupies about 70,000 square feet. An existing asphalt concrete parking lot occupies the central and west portions of the site. The proposed Home Depot site/store extends into a portion of the existing auto dealership parking lot west of the existing Scottish Rite parking lot.

The existing Event Center building is a single-story structure with ground floor levels that vary in elevation. Observation of the building exterior indicates most of the structure has reinforced concrete walls (tilt-up or prefabricated). However, some portions of the existing building in the south and east portions were noted to have masonry walls possibly associated with additions or remodel of the original structure. Observations of the interior of the building indicate that the floors are concrete slabs-on-grade with an elevated slab about 6 feet higher along the west portion of the building, and a lower level slab in the center and east portions of the building. Steps and elevated doorways to the exterior indicate that the interior floors are as much as 6 feet below the exterior grades along the south side of the structure. Thus, the existing south wall of the building acts as a retaining wall.

The subject site also includes some minor structures and sheds located east of the main Events Center structure between southeast driveway and the ascending slopes. Also, a masonry block retaining wall about 4 feet high was noted at the base of the ascending slopes south and east of the existing structures.

The other developed portions of the site are occupied by asphalt paved parking lots and driveways. Evidence of underground utilities was noted mostly in the area north and east of the existing Scottish Rite building. Other underground utilities, such as electrical for parking lot lighting, were noted. Overhead utility lines were also noted at the time of our field investigation.

A 4.66 acre area of the south portion of the property is occupied by a southerly ascending hillside which ascends well beyond the south property line. The lower portion of the slope within the subject property appears to have been previously graded (cut) and the upper portion of the slope generally appears to be native. Graded cut and fill slopes with terraces are present below the native slope, proximal to the proposed Home Depot store. The native hillside extends hundreds of feet horizontally beyond the subject property line to the south. The total height of the slope to the south of the proposed Home Depot building area is estimated to be about 285 feet, with the upper native slope occupying about 210 vertical feet and the lower graded cut slope occupying about 75 vertical feet of the overall slope.

A south-north trending natural drainage area (side canyon) which receives runoff from areas south of the site including a City Park, and the neighborhood above the site is directed into an inlet structure and drainage pipe in the southeast portion of the property above the developed portion of the site. The 30-inch diameter collection pipe is located in a drainage easement that curves west of the existing events center building and runs north below the existing parking lot to carry the drainage from the side canyon offsite to the north (see Drawing No. 2 in Appendix A of this report).

Also, a west facing hillside is located east of the proposed Home Depot building. More detailed descriptions of this slope, drainage, and features are presented in the Findings Sections of this preliminary report.

3.2 **<u>Site History and Previous Studies</u>**: It is our understanding that the existing site was originally developed as a bowling alley in the 1950's and that the site use was converted to the existing Scottish Rite Event Center in the 1970's.

A historical aerial photograph from 1928 shows most of the site as undeveloped sloped rangeland, with some small scale agricultural activities noted along the north edge of the site. The 1928 image shows the existing natural drainage course (side canyon) with some scattered trees traversing south to north across the eastern quarter of the site. Native bushes and trees provide a relatively dense cover on the slope above the site, while the site area appears covered with grasses. With the exception of the drainage area, the south slope appears as a broad sloped south boundary (bluff) of the San Diego River Valley. North of the site, a two-lane road is present with undeveloped areas on the banks of the San Diego River which is further north.

The next available aerial image from 1949 shows that some grading of the site had begun by cutting into the slope to the south. A 1953 aerial image shows the south slope had been cut with terraces and the cut slope area appears to be exposed with no vegetation cover. Also, it was noted that the properties east and west of the site were still native and had not been graded.

The next available aerial image from 1964 shows cut grading of the south slope had been completed and the bowling alley structure appears to be under construction and nearing completion (parking lot was not paved). Also, the commercial building and church east of the site appear to be under construction. The church development also includes a cut slope at the toe of the native hillside to the south. The image shows a completed Camino Del Rio South roadway and adjacent multi-lane freeway with a shopping center beyond between the freeway and the San Diego River.

The 1966 aerial image shows the bowling alley in use. It was noted that the original main building was smaller than the current facility. The area southeast of the building and below the east slope was occupied by a small parking lot. A 1970 image shows a building addition on the east side of the original building. This configuration of the site is shown in aerial images through 1979. However, between 1979 and 1985, the detached minor structures and sheds were added to the site at the base of the ascending east slope. After 1985, the site appears to have been unchanged.

Additionally, it was reported by Scottish Rite staff that the James Company had been retained over the years to repair portions of the south slope from erosion. At the time of our field investigation, James Company had equipment mobilized onto the slope through a temporary access route from the parking lot. Mr. James reported that some recent repairs of smaller washouts had been completed in the central area of the slope.

Further descriptions of the slope observations, including a description of observed soil slips, erosion etc., are included in Section 5.3 of this report.

No other geotechnical or environmental assessment reports had been provided to Moore Twining at the time of this investigation. If available, these reports should be provided to Moore Twining for review.

3.3 **<u>Anticipated Construction</u>**: Based on review of the site plan for the proposed project, the existing events center building will be demolished and a Home Depot store will be constructed on the site. The current plans indicate the store footprint will occupy about 106,688 square feet with a 17,913 square foot garden center. The planned structure will be located about 35 feet from the toe of the south slope approximately as noted on Drawing No. 2 in Appendix A of this report. A parking lot and parking structure will be constructed between the store and Camino Del Rio north of the site. The Home Depot store will include a tool rental center, a lumber canopy and a depressed loading dock. The remainder of the site will generally be covered with asphalt concrete and Portland cement concrete paving.

It is expected the store building will include concrete tilt-up perimeter walls, a steel frame roof structure supported on isolated interior columns spaced about 50 feet apart. The October 17, 2016 Home Depot Design Criteria Manual indicates maximum column loads of about 76 kips and wall loads of about 4.6 kips per foot for a prototype store. The maximum uniform floor slab load for the slab-on-grade sales floor area will be 325 pounds per square foot. According to the Home Depot Design Criteria, maximum allowable total settlement for floor slabs and foundations shall not exceed 1 inch. The maximum allowable differential settlement for floor slabs and foundations shall not exceed ½ inch in 50 lineal feet. In addition, the maximum total heave of the floor slab and foundations shall not exceed 1 inch and the maximum differential heave of the floor slab and foundations shall not exceed ½ inch.

At this preliminary stage of development, the parking structure is expected to be a three level (two elevated levels plus an at-grade level) post tensioned concrete structure that will occupy about 60,000 square feet in plan area. The details of the parking structure are not known, but we understand one option could include widely spaced interior columns with dead loads as much as 360 kips and live loads of 190 kips supported on shallow spread foundations. However, an alternate structure with more interior columns supported on a continuous mat type foundation was also being considered. The parking structure design engineer reported tolerable settlements of 1½ inches total; and ¾ inch differential for the structure.

The proposed development will include driveways and parking for automobile and truck traffic. Equivalent 18 kip axle loads (EAL) of 50,000 and 220,000 for a design life of 10 years were stated in the Design Criteria Manual for the Home Depot "standard duty" and “heavy duty” pavement sections, respectively.

At the time this preliminary report was issued, the latest version of the grading plan (December 12, 2019.) indicates a finished floor elevation for the Home Depot store and garden center of 52.50 feet AMSL with a finished pad grade of 51.50 feet AMSL is being proposed. Based on the contour elevations in this area, cuts up to 5 feet are anticipated along the south wall of the building with the north wall in less than 1 foot of cut or fill to grade the building pad.

Also, improvements to the existing slope south of the site are planned to improve drainage, provide erosion protection and to improve shallow slope instability. These improvements may include new lined (concrete or asphalt) brow and terrace ditches, debris fences, drainage structures, etc. A new drainage inlet structure is also planned at the outlet of the side canyon to collect runoff. In addition, the reference plans indicate the existing drainage pipe and easement which trends through the center of the site will be abandoned and relocated to extend along the south driveway and to the west of the proposed store.

4.0 INVESTIGATIVE PROCEDURES

The field exploration and laboratory testing programs conducted for this investigation are summarized in the following subsections.

4.1 Field Exploration: The field exploration consisted of a site reconnaissance, drilling test borings, conducting standard penetration tests, soil sampling, and percolation testing.

4.1.1 Site Reconnaissance: The site reconnaissance consisted of walking the site and noting visible surface features. A site reconnaissance was conducted by Mr. Scott Krauter (Geotechnical Engineer with Moore Twining) on February 20, and 21, 2019. A site reconnaissance was also conducted by Mr. Ken Clark (Certified Engineering Geologist with Moore Twining) on June 7, 2019. Also, site reconnaissance was conducted by staff geologists and engineers during the drilling operations. The features noted are described in the background information.

During our site reconnaissance, two (2) areas of the existing cut slopes that had exposed native soils (devoid of vegetation) were logged by a Moore Twining staff geologist. The approximate locations of the exposed cut slopes which were logged are noted on Drawing Nos. 2 and 3 in Appendix A. Descriptions of the soils logged and sequence of strata are illustrated on Drawing Nos. 8 and 9 included in Appendix A of this report.

4.1.2 Drilling Test Borings: The number of soil borings drilled in the proposed building area was based on the general requirements of Section 9 of the Home Depot Design Criteria Manual for geotechnical engineering investigations based on the areas which were accessible to exploration equipment at the site. The spacing of the borings drilled for this investigation was generally 40 feet in the proposed Home Depot building and parking structure area; and 80 feet in the parking lot and accessible slope areas.

A total of one hundred-twelve (112) test borings were drilled for this preliminary investigation during two separate phases of the investigation. The initial field investigation was conducted from February 25 to March 14, 2019, and included drilling eighty-eight (88) test borings in the store building and site areas to depths of between 2 and 51 feet below site grade (BSG). At the time of the initial investigation, a parking structure was not planned as part of the development. After the initial drilling, a supplemental field investigation for the proposed parking structure was conducted on September 17 through 20, 2019 and December 27, 2019 to drill an additional twenty-four (24) test borings in the area of the proposed parking structure. It should be noted that auger refusal due to cobbles and dense gravels were encountered in seventy-two (72) of the borings drilled before the intended maximum depth of exploration was achieved.

These test borings were drilled using a CME-75 drill rig equipped with 6⅝-inch outside diameter (O.D.) hollow-stem augers and a Fastre SPT track mounted rig equipped with 6 inch outside diameter hollow stem augers. Also, to penetrate deeper gravel and cobble materials in an attempt to explore to 50 feet BSG in the liquefaction zone, a larger higher capacity Marl Industries Yeti-10 drilling rig was used to extend a supplemental boring at location M-8 below the depth of auger refusal in a previous boring drilled at this location.

The test borings were drilled under the direction of a Moore Twining geotechnical engineer. The soils encountered in the test borings were logged. The field soil classification was in accordance with the Unified Soil Classification System and consisted of particle size, color, and other distinguishing features of the soil. Soil samples were collected and returned to our laboratory for classification and testing.

The presence and elevation of free water, if any, in the borings were noted and recorded during drilling and immediately following completion of borings.

Test boring locations were determined by using a measuring wheel with reference to the existing site features. The locations, as shown on Drawing No. 2 in Appendix A, should be considered approximate. Elevations of the test borings were not surveyed as a part of the investigation since surveys were completed prior to completion of the borings. However, spot elevations and topographic data provided by the project civil engineer were interpolated to estimate the boring elevations to approximately one-half (½) foot. In accordance with the boring permits issued by the County of San Diego, the test borings were backfilled with neat cement. The neat cement backfill was capped with cold patch asphalt in the pavements areas. Some settlement should be anticipated at the boring locations.

4.1.3 **Soil Sampling:** Standard penetration tests were conducted in the test borings, and both disturbed and relatively undisturbed soil samples were obtained.

The standard penetration resistance, N-value, is defined as the number of blows required to drive a standard split barrel sampler into the soil. The standard split barrel sampler has a 2-inch O.D. and a 1⅜-inch inside diameter (I.D.). The sampler is driven by a 140-pound weight free falling 30 inches. The sampler is lowered to the bottom of the bore hole and set by driving it an initial 6 inches. It is then driven an additional 12 inches and the number of blows required to advance the sampler the additional 12 inches is recorded as the N-value.

Relatively undisturbed soil samples for laboratory tests were obtained by driving California modified split barrel ring samplers into the soil using a drill rig mounted 140 pound trip hammer. In addition, some relatively undisturbed soil samples of the soils exposed on the cut slopes were collected for laboratory tests were obtained by driving a split barrel ring sampler into the subgrade soil using a 35 pound hand operated slide hammer. The soil was retained in brass rings, 2.5 inches O.D. and 1-inch in height. The lower 6-inch portion of the samples were placed in close-fitting, plastic, airtight containers which, in turn, were placed in cushioned boxes for transport to the laboratory. Soil samples obtained were taken to Moore Twining's laboratory for classification and testing.

4.1.4 **Percolation Test Holes and Testing**: Based on the subsurface soil conditions encountered, and our consultation with San Dieguito Engineering, Inc., three (3) percolation tests were installed at depths of about 6 , 10 and 15 feet BSG along the east portion of the site frontage in the northeast portion of the parking lot (referenced boring locations J-8, I-8 and L-8 on Drawing No. 2).

The percolation tests were installed with a PVC pipe in the borings and the bottom of each boring was packed with gravel to stabilize the boreholes. The details of the test hole construction are shown on the percolation test sheets enclosed in Appendix D of this report.

The percolation tests were conducted on March 12 and 18, 2019. Percolation testing was performed in general accordance with Section D.3.3.2 - "Borehole Percolation Tests of the City of San Diego Storm Water Standards, dated October 1, 2018."

The percolation test holes were pre-saturated the day prior to conducting the tests. Percolation testing included adding water to the test holes periodically and measuring the drop in water level over time until a stabilized rate was measured. Measurements of water levels and the time of each reading were recorded during testing. The depth measurements versus time are presented on the percolation test sheets enclosed in Appendix D of this report.

4.2 Laboratory Testing: The laboratory testing was programmed to determine selected physical and engineering properties of the soils underlying the site. The tests were conducted on disturbed and relatively undisturbed samples representative of the subsurface materials.

The results of laboratory tests are summarized in Appendix C. These data, along with the field observations, were used to prepare the final test boring logs in Appendix B.

5.0 FINDINGS AND RESULTS

The findings and results of the research, field exploration and laboratory testing are summarized in the following subsections.

5.1 Research: Several sources of information were reviewed as a part of this investigation. These sources included published geologic maps and seismic hazard data; historical aerial photographs; the City of San Diego Seismic Safety Study; and historic USGS 7½ minute topographic maps. Also, City of San Diego building records were researched to identify nearby geotechnical and geologic investigations that included information pertaining to the slopes along the south side of Mission Valley.

5.1.1 Past Site Grading: The site was graded over 65 years ago by cutting into the hillside to the south to establish a relatively flat area for the existing development. Prior to grading, aerial photographs indicate the south slope appeared to have relatively consistent grades east and west of the site, except for the side canyon drainage area noted in the east portion of the site.

An aerial photograph shows that the previous site grading generally occurred from at least 1949 through 1953. These same images show that the sloped areas east and west of the site were still native and had not been graded in that time period. The height of the slope east of the site (adjacent the church facility)provide an indication of the amount of material cut to grade the subject site. Topography indicates this east slope is as high as 50 feet at the base of the cut in the south portion of the pad, and reduces to at-grade in the north.

Review of the aerial photographs indicate the existing hillsides on properties to the west of the site were generally graded in a similar manner as the subject site by cutting in the 1950s to 1960s.

5.1.2 Geologic Setting and Site Geology: The site is located within the Peninsular Ranges geomorphic province. The project site is located on the southern edge of Mission Valley, which is a narrow valley cut by the west flowing San Diego River drainage. The San Diego River has cut the Mission Valley through older geologic formations which are described in the following sections. The river is also responsible for fluvial sediments deposited within the valley, including a part of the site. The referenced 1928 aerial photograph shows fluvial deposition north of agricultural fields, within a few hundred feet of the site.

The “Geologic Map of the San Diego 30' x 60' Quadrangle, California,” prepared by the California Geological Survey and compiled by Michael P. Kennedy and Siang S. Tan, dated 2005, indicates the south portion of the site (including most of the south slope) is mapped as being underlain by Mission Valley Formation (Middle Eocene), and the northern portion of the site is mapped as underlain by younger colluvial deposits (Holocene and late Pleistocene).

Descriptions of local formations presented in Bulletin 200 - “Geology of the San Diego Metropolitan Area,” prepared by Michael P. Kennedy and the California Division of Mines and Geology, dated 1975, indicate the Mission Valley Formation is a marine sandstone unit which is soft and friable with cobble conglomerate tongues comprising up to 30 percent of the section mapped. The formation description also indicates that interbeds and tongues of claystone of brackish water origin locally comprise 20 percent of the section.

Some loose soils deposited on the terraces that have been experiencing erosion appear to be relatively young colluvial soils.

The younger colluvial deposits in the north portion of the site are described as poorly consolidated, poorly sorted, permeable flood-plain deposits of sandy, silty or clay-bearing alluvium.

The Geologic Map of the San Diego 30' x 60' Quadrangle, California also indicates numerous bedding dips in the site region, measured in the Mission Valley Formation, the underlying Stadium Conglomerate, and the overlying San Diego Formation. These bedding dips predominantly range from about 2 to 5 degrees from horizontal in the general site vicinity. The portion of this regional geologic map showing the site location is presented on Drawing No. 4 in Appendix A. The referenced geologic map indicates the existing hillside within the south portion of the site has geologic conditions which are consistent with the existing hillside areas which border the south side of the site, and extending west and east of the site. These adjacent slopes to the west and east border numerous existing developed properties along the south side of Mission Valley.

Also, a site geologic map and cross section showing the Mission Valley and younger colluvial deposit geologic units identified are presented on Drawing Nos. 6 and 7 in Appendix A

5.1.3 **Geologic Hazards**: The City of San Diego Seismic Safety Study, "Geologic Hazards and Faults", was reviewed. The site is located on Grid Map 21 of the Hazard Map Series. The map shows the northern portion of the site in the area where the parking structure is planned is located within a zone of high potential liquefaction (category 31). However, the Home Depot store area is located outside the liquefaction hazard zone.

Based on Grid Map 21, the ascending slope area in the south portion of the site is located in a zone indicated as "sloping terrain, unfavorable geologic structure, low to moderate risk" (category 53). The map also indicates a concealed segment of a fault is located adjacent to the northeast corner of the site. However, the fault category is described as "Potentially Active, Inactive, Presumed Inactive, or Activity Unknown".

Also, as required by City of San Diego Geotechnical Report guidelines, the potential for tsunamis to impact the site were considered. The California State Department of Conservation published Tsunami Inundation Maps for San Diego County do not include the non-coastal site area. Due to the inland location and elevation of the site, tsunamis are not considered a significant hazard for the project.

5.1.4 **Landslide Hazards**: The subject site is located at the base of an ascending slope that forms the south flank of Mission Valley. The existing slope extends well beyond the limits of the subject property. Similar slope conditions occur within numerous developed properties to the east and west of the subject site.

Various geologic maps and reports were reviewed for background information with regard to the stability of the geologic materials within the subject slope. The geologic maps (see Drawing Nos. 4 through 7 in Appendix A) indicate the Mission Valley Formation comprises most of the hillside, with only thin sections of San Diego and Pomerado Formation conglomerates within the upper portion of the slope.

A California Division of Mines and Geology (CDMG) Open File report 95-03 by Tan (1995) titled *Landslide Identification Map No. 33; Landslide Hazards in the Southern Part of the San Diego Metropolitan Area*. This mapping indicates the hillside south of the site is "generally susceptible" to landsliding. The mapping identifies a slide area on an east facing slope within the side canyon which is located south of the site as having the "most susceptible" designation. See Drawing No. 5 in Appendix A for an excerpt of this landslide map in the vicinity of the site. However, no landslides are mapped within the subject site.

The City of San Diego Building Records were reviewed to identify geotechnical engineering investigation reports prepared for previous developments along the south flank of Mission Valley with generally similar topographic and geologic conditions as the subject site. Although numerous reports were reviewed, three geotechnical engineering reports were identified that included conclusions regarding the stability of the native and cut slopes along the south side of Mission Valley that possess similar geologic conditions as that of the subject site.

Lennart and Associates conducted a Soils Investigation for the adjacent First Methodist Church of San Diego in 1962. The property borders the subject site to the east, and includes a steep, north facing cut slope on the south side of the site which is mapped as Mission Valley Formation material. The report included an evaluation of proposed cut slopes that were extended into the "steeply sloping upper southerly site area" to accommodate the current church development. The report indicated the materials in this area of the slope were a rock material which was indicated to be "clastic sediment of Tertiary age, mainly sandstone and conglomerate." The description indicates the bedding is nearly level with a slight dip to the south (which is consistent with the geologic map referenced in Section 5.1.1 of this report). The report further states: "*The rock is well indurated, reasonably well cemented, and is resistant to erosion.*" The report further indicates that cut slopes in this rock can be graded to 1H to 1V with some shorter sections of 0.5H to 1V.

Research of more recent geotechnical engineering investigations identified two Professional Service Industries, Inc. geotechnical engineering reports for hotels that were constructed on Hotel Circle South. The sites are located about 2 miles west of the site, at the base of the slope on the south side of Mission Valley. A report for the Marriott Residence Inn California (1865 Hotel Circle South), dated February 28, 2000, and a report for a La Quinta Inn, dated November 30, 1997 were reviewed regarding the stability of the slopes to the south.

The Marriott Residence Inn report states the following with respect to the stability of the slope on the south side of Mission Valley:

> *"A relatively steep natural slope was observed to extend upward from the rear of the property at an approximate gradient of up to 1:1 (horizontal to vertical) to a maximum height of 160 feet. Review of geologic maps (Kennedy and Petersen, 1975) indicate the slope is composed of Stadium Conglomerate within the bottom third of the slope, with the Mission Valley Formation comprising the portion of the exposed slope face extending from the top of the Stadium Conglomerate to the crest of the slope. Both of these formations are generally considered stable with respect to landsliding and even steep slopes. This is due to several features of the slope formational units including: their composition (high percentage of sand and silt as opposed to clay); their moderate to high degree of cementation; their relatively high consolidated and cohesive nature; and their conformable and massive nature. Furthermore, although the Seismic Safety Study for the City of San Diego classifies the materials as possessing unfavorable geologic structure (Risk Category 53), we found the materials to exhibit favorable sub-horizontal structure, which is typically favorable with respect to slope stability."*

The La Quinta Inn report states the following with respect to stability of the native slope at the base of the slope on the south side of Mission Valley:

> "*Significant natural slopes, located on both the project site and along the southern perimeter of the site, were observed to have an approximate inclinations of 1:1 (horizontal to vertical) or steeper. However, it is our opinion that the potential for slope failure is relatively low. This opinion is based upon the sub-horizontal bedding of both the Stadium Conglomerate and Mission Valley Formations, the weakly to moderately cemented nature of these formational units, the conformable contact between theses formational units, and the fact that these formational materials, along with the encountered stiff/dense to hard/very dense slopewash/colluvial materials, are generally considered non-susceptible to slope failures, provided the earthwork recommendations in this report are followed. It should be noted that a detailed deterministic evaluation of the on-site and adjacent slope areas was not included within our scope of services, PSI would be pleased to provide such an evaluation, if required, upon request.*"

5.2 Surface Conditions in Existing Developed Area of Site: As noted in this report, at the time of our field investigation, the site was occupied by an events center building, parking lot, minor outbuildings and sheds, retaining walls, and an ascending slope.

Observations of the existing building were conducted as a part of our site reconnaissance. The observation of the exterior walls did not identify any significant distress beyond minor shrinkage cracking over some doorways, and horizontal movement and construction joints. On the interior, some evidence of distress along a line of VCT tile flooring was noted in the building interior running north-south about half the distance across the lower level of the floor. The distress may have been associated with a control joint in the underlying slab or differential movement of the slab on grade. No evidence of excessive differential movement caused by settlement or heave was noted in the walls, or exterior sidewalks around the building.

The conditions of the existing asphalt concrete pavement at the site varied from fair to good in the low traffic open parking areas to poor in the higher traffic driveway area that runs to the east of the existing building. Block cracking of the pavements was the principal distress type noted in the parking lot areas. Meanwhile, the east driveway was noted to have areas of alligator cracking (suggesting structural failures). This driveway is used for frequent truck deliveries for the events center and a catering business that operates out of the southeast portion of the facility.

The borings in the pavement areas encountered a wide range of thicknesses of asphalt and base materials. The existing thicknesses of the asphalt concrete (AC) encountered at the site were quite variable and ranged from about 3 to 10 inches. A majority of the AC sections were underlain by highly variable thicknesses of aggregate base materials ranging from about 1 inch to 12 inches, with most sections measured between about 2 and 6 inches thick. However, numerous borings did not encounter aggregate base material below the AC section.

The 4 foot tall CMU block retaining wall at the base of the slope along the south boundary of the parking lot and driveway did not indicate any significant distress or evidence of rotation. We understand that washouts have displaced materials over the top of the wall in the past and no significant damage to the wall was noted (or prior repair of the wall reported).

It should be noted that the minor structures present south of the driveway were in active use during the field investigation and Scottish Rite staff requested that these areas used for catering operations not be impacted by this investigation. So the minor structures and any portion of the retaining wall in the east areas were not observed to identify any distress.

5.3 Existing Slope Conditions: Various slopes are located within or adjacent to the property. The surface conditions of the existing slopes descending toward the proposed building and pavement areas were observed to assess the performance of the slopes. The existing hillside to the south extends hundreds of feet horizontally beyond the south property line and appears to be about 285 feet in total height to the top of slope. However, the height of the lower portion of the slope from the existing parking lot to the subject property line is about 120 vertical feet. Thus, the majority of the existing slope is outside of the subject property. The lower portion of this hillside (estimated to be about 75 vertical feet) on the subject property was cut (steepened) from previous grading conducted in the 1950s and includes several terraces. The overall average gradient of the lower (cut) portion of the slope is about 2 horizontal (H) to 1 vertical (V). However, the gradient of the intermediate slopes between existing benches is steeper than 2H:1V. Above the cut portion of the slope, the slope appears to be native. The overall average gradient of the upper (native) portion of the slope, based on limited topographic information, is about 1.5H to 1V.

An existing variable height slope also occurs within a portion of the eastern side of the property. However, much of this slope is offsite.

The following subsections describe the different portions of the slopes observed on and adjacent to the site.

Photographs of the overall slope and notable features are included in Appendix A of this report; and a general cross-section of the overall slope and proposed building location is included on Drawing No. 7 in Appendix A.

5.3.1 Lower Portion of South Cut Slope: Based on the topographic maps provided by San Dieguito Engineering (referenced in this report), the lower cut portion of the slope within the southern portion of the site is about 75 feet high. The cut slope includes three (3) separate 20 to 30 foot high sections that are separated by two flat terraces which are 15 to 20 feet wide. The slopes between the terraces have variable inclinations with the steepest portions about 1H to 1V in the area west of the outlet of the side canyon drainage and most of the other areas of the slope range from about 1.5H to 1V to 1.75H to 1V. The existing cut slope configuration appears to be generally similar to the steep terraced cut slopes which commonly occur within the lower portion of the slopes on the south flank of Mission Valley between Mission Center Road and Qualcomm Way.

In general, it appears that the lower portion of the slope was cut throughout the 1950's to increase the usable area of the property. However, some limited fill soils were encountered at the east end of the upper terrace (see boring log from location S-1). Considering the prior grading, these fill soils were likely placed in the later 1950's to allow access to the upper terrace from the adjacent church property which was graded after the grading of the subject site. A large surface drain pipe located at the west end of the terraces carries runoff to the toe of the slope at the west boundary of the property.

In general, the soils exposed in the central portion of the upper part of the cut slope were noted to be granular, including an abundance of sub-rounded gravel and cobble materials (see photographs 8 through 11 in Appendix A). Also, a section of fluvial deposits were exposed in a temporary cut made to access the lower terrace from the base of the slope (see photographs 14 and 15 in Appendix A). In general, these granular soils appear to be more prone to erosion than other areas of the slope. It is our understanding cobbles, gravel and sediment that accumulates below the slope from erosion, etc. have been periodically removed for many years (see photographs 2 and 7 in Appendix A).

The lower portion of the cut slope area was observed and evidence of previous rill type erosion, shallow soil slips (less than 1 to 2 feet in depth), remedial erosion control measures and slope repairs, accumulated sediment and drainage improvements added after initial construction were noted. The majority of the erosion and soil movement was noted in the central and western portion of the north facing cut slope as indicated on Drawing No. 3 in Appendix A. In this central portion of the slope, the slope is not covered with mature bushes or established native grasses. However, the eastern half of the cut slope did not exhibit significant erosion features or evidence of surficial instability. This area of the slope generally contained well established vegetation.

Further, a drainage inlet on the upper terrace, not associated with the main drainage features, suggests attempts to remedy past drainage problems. Also, poor drainage was noted within the existing terraces as exhibited by standing water from recent rainfall along many portions of the upper and lower terraces (shown in Photograph No. 9). In general, the central section of the cut slope area appears to be impacted by continued erosion of the more granular, less cohesive soils exposed on these portions of the slope. Larger cobble and coarse gravel materials were noted accumulate at the base of the slopes. This condition restricts the intended drainage to the west, and allows surface runoff to pond on the terraces.

Also, it is our understanding that the inlet of the pipeline collecting runoff from the existing natural drainage in the southeastern portion of the site (at the outlet of the canyon) has been blocked during intense rain storms over the years. Once this inlet is blocked, the flow redirects along the upper terrace and down across the middle section of the slope, resulting in erosion of the slopes and terraces below. Mr. Brian James (James Company) indicated that the middle portion of the south cut slope below the outlet of the side canyon had “washed out” several times in the past. One particular washout was severe enough that three or more feet of the lower terrace to the west of the drainage outlet (in the middle portion of the slope) had eroded into the existing parking lot area below the slope. Mr. James reported that the washout was repaired with a geogrid reinforced fill. In addition, Mr. James (James Construction) reported that repairs of a past washout included filling two erosion features that were about 6 feet wide.

5.3.2 Upper North Facing Native Slope: The native slope above the existing cut portion of the north facing hillside has a natural grade of about 1.5H to 1V, which flattens slightly to a 2H to 1V slope just above the cut portion of the slope. The upper native slope has an elevation at the top of about 340 feet AMSL compared to the elevation of about 130 feet to the top of the lower cut slope. This results in an overall native slope height of about 210 feet above the cut portion of the slope.

The upper about 170 feet of slope height is outside of the subject property. The upper, north facing native slope (above the existing graded cut slope) was observed to be covered with native grasses, dense bushes, and trees (see photographs 4 and 5 in Appendix A). Based on our site observations, we did not identify any significant soil slips or excessive erosion within the native slope which would require repair. The native slopes appeared to be performing well. The dense vegetation growth covering the slope seems to provide adequate resistance to erosion and shallow slope movements.

5.3.3 Upper Drainage Side Slopes: Landslide mapping by Tan (1995) indicates the presence of a slide area on the east facing slope of the upper drainage (side canyon). This area is identified on the map included as Drawing No. 5 and photograph 6 of this east facing slope is included in Appendix A of this report .

Based on our observations, a large amount of cobbles had accumulated near the existing drain pipe inlet and along the flow line at the outlet of the side canyon. At the time of our observations, the drainage area did not contain flowing water. In this area, a chain link (debris) fence had been placed above the existing drain pipe inlet and wing wall structure to prevent cobbles from entering the pipe and clogging the inlet. However, erosion had occurred around the fence, and numerous cobbles were noted between the fence and the pipe inlet. It is expected that the cobbles and sediments will continue to migrate toward the drainage inlet due to sedimentation, and erosion of up-slope areas from the natural drainage area in the future. In addition, the presence of a mapped landslide in the canyon above could contribute a higher potential for sediment transport within the natural drainage.

5.3.4 Eastern Property Boundary Cut Slopes: The subject site also includes a variable height cut slope which is located southeast of the proposed Home Depot building. The adjacent church property is located near the top of the slope. The slope grades in this area are about 1.5H to 1V and the slope varies in height from 40 to 50 feet at the south end of the slope. The northern extension of this slope is offsite to the east. At the time of our site observations, this slope was covered with mature trees with a native grass undergrowth and bushes. No evidence of sliding, soil slips, erosion or washouts was noted in this eastern slope area. Thus, this area of slope appeared to be performing well and contained mature vegetation which has provided effective resistance to surficial instability and erosion. A paved driveway with curbs associated with the adjacent church development is located above the slope. Thus, the slope does not receive any up-slope surface drainage.

5.4 Soil Profile: Subsurface exploration was conducted during this investigation in the proposed building, pavement areas and within the lower portion of the hillside area to the south. The following descriptions constitute a general summary of the soil conditions encountered in the test borings drilled for this investigation. Detailed descriptions of the soils encountered at each test boring are presented on the logs of borings in Appendix B. The stratification lines shown on the logs represent the approximate boundary between soil types; the actual in-situ transition may be gradual.

5.4.1 Home Depot Building Area: The borings drilled in the area of the proposed Home Depot building were drilled through existing asphalt pavements. Based on the geologic maps, the subsurface soils encountered in the test borings drilled in the south deep cut portion of the site are designated for the Home Depot store are considered to be Mission Valley Formation materials.

The soils encountered generally consisted of sandy lean clays and clayey sands. Field classifications noted that variable amounts of fine to coarse gravel and cobbles are present within the lean clay/clayey sand stratum. These coarse grained gravel and cobble materials typically encountered about 2 to 5 foot thick layers at isolated depths and locations. The larger rock materials often resulted in drilling auger refusal at depths as shallow as about 2 feet in the south portion of the proposed Home Depot building pad. In addition to gravel and cobbles, non-plastic silty sands, and sandy silts with occasional layers of poorly graded sands were encountered in zones only a few inches thick, to layers about 5 to 10 feet thick.

Also, some fill soils were encountered in the boring drilled in the north portion of the auto dealership property (Boring A-1) to a depth of about 4 feet. Fills were not encountered in any adjacent borings, so although the extent of the fill soils is unknown.

5.4.2 Parking Structure and Parking Lot: The soils encountered within borings drilled within the northern portion of the site were somewhat similar as the soils encountered in the Home Depot building area. Based on the geologic maps, the subsurface soils encountered in the test borings are likely colluvial deposits possibly underlain by and irregular Mission Valley Formation deposits.

The upper 5 to 10 feet BSG did encounter more granular silty sands, and non-plastic sandy silts compared to the Home Depot pad. Also, deeper layers of cobbles and sands were encountered below the typical sandy lean clays and clayey sands.

Larger rock materials resulting in drilling auger refusal at depths as shallow as about 2 feet were also encountered in the eastern portion of the proposed parking structure (such as borings H-8B, J-7.3 and J-8B). Also, areas of fill soils (identified by buried pavements and construction debris) were encountered near the north boundary of the parking structure and parking lot (Camino Del Rio South frontage) at boring locations A-8, C-8, E-7.6, E-8, F-7B, I-8A K-7.6, M-8A and N-8. Also, although debris was not noted, the lower N-values from Standard Penetration Testing indicate variable thicknesses of fill soils are likely present within the northern portion of the site near the Camino Del Rio South frontage.

Since the parking structure area is located within a zone of high potential liquefaction according to City of San Diego geologic hazard maps, the supplemental field investigation included extending borings to 50 feet BSG to evaluate liquefaction and seismic settlement potential. Initially, two borings were intended to be advanced to 50 feet, however, auger refusal in a gravel/cobble stratum at 30 to 35 feet BSG prevented deeper exploration. After three attempts to penetrate this deep stratum with a CME-75 drill rig failed, a higher torque drill rig was used to extend one boring to deeper depths near the northeast corner of the proposed parking structure. This supplemental boring was advanced through gravel/cobble material to a depth of 45 feet, were auger refusal on larger material (likely boulder size) was encountered.

In these deeper borings, the soil stratum encountered below the upper fine grained sandy lean clays sandy silts, and clayey sands (encountered to about 25 to 30 feet BSG) included predominantly coarse grained granular materials including interbedded layers of gravels, cobbles, poorly graded sands and silty sands to the maximum depths explored, 45 feet BSG.

5.4.3 South (North Facing) Slope: This investigation included drilling soil borings within the lower portion of the ascending south slope. These borings, designated S-1 through S-8 (see Appendix B) were drilled on the accessible upper terrace with surface elevations ranging from 107 to 115 feet. The soils encountered were generally sandy lean clays with some minor fractions of gravel and some cobbles to depths of about 35 to 40 feet BSG. The upper lean clays were interbedded with low to non-plastic sandy silt layers about 5 to 10 feet thick. Also, an approximately five (5) foot thick layer of clayey gravel was encountered at a depth of 10 feet BSG in the middle section of the slope, and some of the borings encountered auger refusal on cobbles at depths ranging from about 3 to 9½ feet BSG.

Below the upper sandy lean clays encountered at the site, a stratum of poorly graded sand was encountered in the deepest boring drilled to a depth of 47½ feet BSG (elevation 60 feet). This stratum was encountered in the bottom of both borings at the east and south slope areas explored beginning at an elevation of about 80 feet. These granular soils were also exposed in a cut slope in the west portion of the slope, just above the retaining wall and parking lot. The soils exposed in the cut were described as poorly graded sands with varied amounts of gravel and cobbles.

Distinct bedding was not noted in the small diameter borings drilled, nor the surface cuts logged for this investigation.

It should be noted that fill soils were encountered at the eastern end of the slope terrace. The fill soils were also sandy lean clays but were mixed with wood debris and were found to extend to depths between about 10 and 15 feet BSG. The other soils encountered on the upper slope terrace were native soils. It is possible that this fill was placed at the east end to allow access to the terrace from the adjacent church parking lot.

Generalized logs of the soils exposed on the lower cut slope are illustrated on Drawing Nos. 8 and 9 in Appendix A of this report.

5.5 Laboratory Testing: Laboratory testing of soil samples was conducted to determine selected properties of the soils. The results of laboratory tests are included on the boring logs in Appendix B and on the laboratory test reports included in Appendix C.

The consolidation characteristics of the sandy lean clay and clayey sand soils were determined by seven (7) consolidation tests. The tests measured consolidation of from 5.9 to 11 percent under a load of 16 kips per square foot. The samples tested indicated a slight to moderate collapse (ranging from 0.3 to 2.3 percent) when inundated with water under a load of 2 kips per square foot. However, one sample from the north parking structure location indicated more consolidation (13.2 percent at 16 kips per square foot) and a swell of 1.7 percent when inundated with water under a load of 2 kips per square foot. This indicates different consolidation characteristics of the soils in the north portion of the site in the more recent colluvial material compared to the conditions encountered in the Home Depot building pad area where the soils had likely been subject to overburden from the former slope.

Shear strength tests were conducted on five (5) samples of the various soils encountered using direct shear methods. Sandy lean clay samples indicated angles of internal friction ranging from 18 to 36 degrees with cohesion values ranging from 1,080 to 50 pounds per square foot, respectively. Also, to evaluate the shear strength of engineered fill soils, four (4) samples of clayey sands and sandy lean clays were remolded at 90 percent of the maximum dry density (ASTM D1557) for shear strength testing. The remolded samples indicated angles of internal friction ranging from 19 to 35 degrees with cohesion values ranging from 410 to 190 pounds per square foot, respectively.

The expansion potential of the clay soils was evaluated by expansion index tests. The clay soils within the building pad were found to exhibit a medium expansion potential as indicated by two expansion index results of 77 and 81. Tests conducted on sandy lean clay and clayey sand samples indicated maximum dry densities of 126.5, 126.8, 126.8 and 129.3 pounds per cubic foot with optimum moisture contents of 8.3, 9.9, 10.1 and 10.4 percent.

R-value tests conducted on three sandy lean clay samples indicated R-values of 19, 20 and 22. One R-value test conducted on a clayey sand sample indicated an R-value of 22. One R-value test conducted on a silty sand sample from the south portion of the site indicated an R-value of 63.

5.6 **Groundwater Conditions:** Groundwater was encountered in six (6) of the soil borings. Groundwater was encountered at a depth of about 29½ feet BSG (elevation of about 24½ feet) in boring A-2 drilled in the southwest corner of the site. Groundwater was encountered at a depth of about 30 feet BSG (elevation of about 21 feet) in boring F-6, which was drilled in the middle portion of the north wall of the proposed Home Depot store. In the parking structure, groundwater depths ranged from 25 feet at location G-8 (elevation about 26 feet), 30 feet BSG at location E-7.6 (elevation about 18 feet), and 30 feet at location M-8A drilled in September of 2019 (elevation of 21 feet), and 26 feet at location M-8B drilled in December of 2019 (elevation of 25 feet). Note that 24 hour measurements, as required by Home Depot Guidelines, could not be taken to comply with Scottish Rite (site owners) requirement to backfill borings each day since the site was open to the public.

Based on our review of California Department of Water Resources Control Board Geotracker data, Two sites were identified within ½ mile of the Home Depot project that included groundwater data. Research identified five (5) monitoring wells installed at a fuel station about one-half (½) mile northeast of the site in 2004 indicated groundwater depths ranging from about 27 to 28 feet BSG. These wells are on a property near the San Diego River, which has a similar elevation to the site of about 58 feet AMSL. A second site about one-half (½) mile west of the site in 2003 and 2004 indicated groundwater depths ranging from about 20 to 21 feet BSG. Although the elelvation fo wells was not indicated, this site was an auto dealership south of Camino Del Rio too, so site elelvaitons are likley similar to the project site.

To research historical groundwater levels, groundwater data on the Department of Water Resources Water Well Data Library was reviewed. The nearest well to the site in this database (16S03W13Q004S) has groundwater elevation measurements from 1978 to 1990 and is located about ½ mile north of the site (north of the San Diego River). This well has a surface elevation of about 45 feet which is about 5 to 10 feet lower than the project site. The elevations of groundwater in this well ranged from elevation 33 feet in 1980, elevation 25 feet 1989.

Considering the locations and elevations of researched well data, and the range of groundwater depths encountered during the field investigation, a historic high groundwater of about 20 feet was used for analysis.

It should be recognized that groundwater elevations fluctuate with time, since they are dependent upon seasonal precipitation, irrigation, land use, and climatic conditions as well as other factors. Therefore, water level observations at the time of the field investigation/measurements may vary from those encountered both during the construction phase and the design life of the project. The evaluation of such factors was beyond the scope of this investigation and report.

5.7 **Percolation Test Results:** The infiltration rates estimated from the percolation test data are summarized in Table No. 1 below. The field measurements for each percolation test are included in Appendix D.

Table No. 1
Results of Percolation Testing

Location and Depth	**Field (Unfactored) Infiltration Rate (Inches per Hour)[1]**	**Subgrade Soil Type**
P-1 at J-8; 6 feet BSG	0.1	Silty Sand
P-2 at I-8; 10 feet BSG	0.5	Clayey Sand
P-3 at L-9; 15 feet BSG	0.4	Silty Sand

Notes:
BSG - Below site grade
1. Includes no factor of safety

The unfactored estimated infiltration rates do not take into account the long term effects of subgrade saturation, silt accumulation, groundwater influence, nor densification as a result of the construction process. Percolation/infiltration rate of the soils will decrease when the soils are saturated and the percolation/infiltration rate is further reduced the longer the soils are saturated. Published studies indicate short term field infiltration rates can significantly overestimate the saturated permeability. In addition, soil bed consolidation, sediment, suspended soils, etc. in the discharge water can result in clogging of the pore spaces in the soil. This clogging effect can also reduce the long term infiltration rate. Numerous other factors, such as variations in soil type and soil density across the entire area of the system, can influence the percolation/infiltration rate, both short and long term.

The percolation test data are included in Appendix D of this report.

6.0 EVALUATION

The data and methodology used to develop conclusions and recommendations for project design and preparation of geotechnical related construction specifications are summarized in the following subsections. The evaluations were based upon the subsurface conditions determined from the investigation, our review of the project site plans, research of available maps and reports, and our understanding of the proposed construction. The conclusions obtained from the results of our evaluations are described in the Conclusions section of this report (Section 7.0).

6.1 Existing Surface Conditions in New Buildings: Due to the existing development, demolition and removal of the existing site improvements will be required as part of site preparation. The existing structure and facility consist of foundations, retaining walls, sub-level slabs-on-grade, utilities and other improvements. All of these features will need to be removed and the resulting excavations properly prepared and backfilled. All existing surface and subsurface structures, such as shallow foundations, retaining walls, floor slabs, utilities, etc., should be removed entirely and not buried in place. Areas with existing improvements should be over-excavated to at least 12 inches below the bottom of the existing improvements to be removed, or to the depth to remove disturbed soils from the demolition activity, whichever is greater. The existing 30 inch storm drain that will be abandoned and relocated should be excavated, completely removed, and backfilled as an engineered fill (not abandoned in-place) as a part of site preparation. The location of this existing storm drain line is shown on Drawing No. 2 in Appendix A.

After excavation and removal, the exposed soils should then be scarified to a minimum depth of 8 inches, moisture conditioned, and compacted as engineered fill. All excavations conducted as part of the demolition should be backfilled with engineered fill. All existing underground utilities and the associated fill soils should be removed and replaced with engineered fill.

6.1.1 Oversize Rock / Soil Processing: Fine to coarse gravel and cobbles were commonly encountered at shallow depths throughout the site. Drilling auger refusal was encountered in seventy-two (72) of the one hundred-twelve (112) borings at depths as shallow as about 2 feet BSG (thirty-nine borings encountered refusal within the upper 10 feet or less). The soils with coarse materials were usually characterized as hard or very dense on the boring logs (N-values greater than 50 blows per foot). These oversized materials are typical of the "cobble conglomerate" deposits described by the regional geologic reports. It was noted that more cobbles were generally encountered in the near surface soils (upper 3 to 5 feet) in the eastern portions of the Home Depot and parking structure buildings. Less cobbles were encountered in the near surface soils in the western portion of the building pads (although cobbles were encountered).

These hard and dense conditions and coarse gravel and cobble materials will require more effort to excavate and process. Further, oversized materials placed and/or compacted directly below foundations and floor slabs can result in hard points resulting in differential movement and cracking. To provide uniform support, the Site Preparation and Earthwork recommendations of this report indicate that if on-site soils are to be used as engineered fill, cobble material should removed by screening prior to placement and compaction as engineered fill. In order for the onsite soils to be used as fill on the site, removal of over-sized rock should be anticipated. Screening should be anticipated due to the presence of cobbles and coarse gravel. In order to reduce export of materials screened from the soils, it may be possible to crush the oversized material on-site to sizes suitable for use in engineered fill.

In order to obtain additional information for use in bidding the screening type requirements for over-size materials in the onsite soils, a supplemental investigation is recommended. The investigation should include subsurface exploration using test pits in order to document the fraction of rock and range of sizes that anticipated to be encountered during grading.

6.1.2 Undocumented Fill: Fill soils were identified in the area of the proposed parking garage (north portion of the site) as indicated by buried pavements and construction debris encountered to depths of about 5 to 6 feet along the east section of the roadway frontage and to a depth of about 10 feet in the northwest corner of the site (boring locations A-8, L-8 and N-8). The other borings along this north lowest portion of the site did not identify debris or buried features (borings C-8, E-7.6, E-8, F-7B, I-8A K-7.6, and M-8A) but did indicate lower N-values in the upper soils, which suggest the potential for undocumented fill placed during past mass grading of the north portion of the site. The undocumented site fill soils along the north side of the site should be identified during site preparation for the parking structure and pavement areas, excavated to expose undisturbed soils, and replaced as engineered fill to final grades.

Also, fill soils were encountered in the boring drilled in the north portion of the auto dealership property (Boring A-1) to a depth of about 4 feet. Since these soils are located in an future pavement area for the rear driveway, the fill should be excavated and compacted as engineered fill as a part of site preparation.

Some fill soils were also encountered at the east end of the upper slope terrace to a depth of about 15 feet BSG. These soils were likely placed so the upper slope terrace and drainage area inlet structure could be accessed from the adjacent property parking lot. Since these fills were found to have relatively high shear strength, slope instability was not noted in this area, and the fills do not support any permanent pavement or structural improvements, these soils can remain in-place.

6.1.3 Wet, Unstable Soils: During the February and March 2019 field investigations, moisture contents as high as 30 percent in some of the sandy lean clays were measured in the soil samples collected within the upper approximately 5 feet BSG. About 10 percent of the samples of clays within the upper approximately 5 feet were found to be 10 to 20 percent above the optimum moisture content. Accordingly, it is anticipated that the some of the clay soils excavated during site grading will need to be aerated, i.e. dried, to meet the moisture conditioning requirements of this report (between at least two (2) percent and five (5) percent above optimum moisture content) and to allow compaction of the wet soils as engineered fill. Due to the high soil moisture contents, these wet soils could be exported from the site, or spread and repeatedly mixed/disced, or chemically treated to dry the soils in order to achieve proper compaction.

In addition, where wet, unstable soil conditions are encountered, methods such as aeration, mixing wet soils with drier soils, chemical treatment, or the use of aggregate base or crushed rock and a geotextile stabilization fabric may be required to achieve a stable condition at the bottom of the excavations and in areas that require subgrade preparation. Thus, the contractor will be required to treat wet, unstable soils to obtain the compaction requirements of this report and establish stable subgrade soil conditions prior to placement of fill.

6.2 Static Settlement and Bearing Capacity of Shallow Foundations: The potential for excessive total and differential static settlements of foundations and slabs-on-grade is a geotechnical concern evaluated for this building site. The increases in effective stress to underlying soils which can occur from new foundations and structures and placement of fill, etc. can cause vertical deformation of the soils, which can result in damage to the overlying structure and improvements. The differential component of the settlement is often the most damaging. In addition, the allowable bearing pressures of the soils supporting the foundations were evaluated for shear and punching type failure of the soils resulting from the imposed foundation loads.

Since the proposed development includes a new Home Depot Store and a parking structure, and considering the different soil conditions and structure types expected, the evaluation of foundation design parameters and site preparation for these two structures are presented in the following separate subsections.

6.2.1 **<u>Home Depot Store</u>:** Considering the anticipated wall and column loads for the Home Depot building, the consolidation and hydro-collapse characteristics of the soils encountered below the Home Depot Store, conventional shallow building foundations and floor slabs would meet Home Depots criteria for total static settlements. However, conventional footings supported on the variable very dense gravel/cobble materials and the stiff to hard sandy lean clays would be subject to excessive static differential settlements (more than ½ inch in 50 feet).

In order to provide more uniform support of foundations to meet Home Depot differential settlement requirements, over-excavation would need to occur to a depth of about 3 feet below the existing site grade to remove the upper disturbed soils and any undocumented fill soils; and to provide at least 2 feet of engineered fill below all foundations, whichever provides the deepest over-excavation. The allowable soil bearing pressure for spread foundations supported on engineered fill is 2,500 pounds per square foot for dead-plus-live loads. Based on this bearing capacity, the following settlements are anticipated for the foundations and slabs on grade: 1) a total static settlement of ¾ inch and 2) a differential static settlement of ½ inch in 50 linear feet.

6.2.2 **<u>Parking Structure</u>:** The soil conditions in the north portion of the site proposed for the parking structure are highly variable and appear to be less consolidated (weaker) compared to the area of proposed for the Home Depot Store. Based on the higher compressible soil conditions expected, it is estimated 2 to 3 inches of static settlement could occur under the typical interior column (360 kips dead load and 190 kips live load for 550 kips total) using a recommended allowable bearing capacity of 2,500 psf.

The most direct method to reduce the settlements would be to over-excavate the variable compressible soils and replace these materials as densified engineered fill. Significant over-excavation would be required to place engineered fill below footings to limit static settlements. As an alternative, considering the depth of removal, ground modification such as Geopiers could be a effective method to densify the upper variable soils and reduce foundation settlements to tolerable levels.

Also, the designers for the parking garage have indicated that the garage structure spans could be reduced (add more columns) and the structure could be supported on a continuous mat type foundation. Mat foundations would reduce the applied soil pressures by increasing the bearing area, and typically can resist more differential settlements than similar structures supported on isolated shallow spread foundations.

The costs of the structures and different site preparation recommendations should be evaluated to identify the type of foundation to be used based on the preliminary recommendations provided in this initial report.

6.3 **<u>Expansive Soils</u>:** One of the potential geotechnical hazards evaluated at this site is the expansion potential of the near surface soils. Over time, expansive soils will experience cyclic drying and wetting as the dry and wet seasons pass. Expansive soils experience volumetric changes (shrink/swell) as the moisture content of the clayey soils fluctuate. These shrink/swell cycles can impact foundations and lightly loaded slabs-on-grade when not designed for the anticipated expansive soil pressures. Expansive soils cause more damage to structures, particularly light buildings and pavements, than any other natural hazard, including earthquakes and floods (Jones and Holtz, 1973). Expansion potential may not manifest itself until months or years after construction. The potential for damage to slabs-on-grade supported on expansive soils can be reduced by placing non-expansive fill underlying the slabs-on-grade and extending the perimeter foundations to depths necessary to establish a moisture cutoff.

Expansion index (swell) testing was performed on samples of the near surface lean clay soils collected from the proposed building pad subgrade at the site. The tests indicated a medium expansion potential, with expansion index values of 77 and 81. Medium expansive material would be expected to cause heave/shrinkage exceeding ½ inch in 50 feet. Thus, it is recommended to support Home Depot floor slab on at least 6 inches of aggregate base underlain by 18 inches of imported non-expansive fill (EI less than 20) for a total depth of 24 inches of non-expansive materials. Foundations can also be damaged by expansive soils, so it is recommended to extend perimeter continuous foundations to at least 30 inches below the lowest adjacent grade, below where seasonal moisture fluctuations typically occur.

6.4 **<u>Seismic Ground Rupture and Design Parameters</u>:** The project site is not located in an Alquist-Priolo Earthquake Fault Zone. The closest active fault is the Rose Canyon Fault Zone, which is located approximately 4 miles west of the site. The City of San Diego Seismic Safety Study indicates a concealed segment of the Texas Street fault is located adjacent to the northwest corner of the site. However, the fault category is described as "potentially active, inactive, presumed inactive, or activity unknown." Accordingly, the potential for ground rupture at the site is considered low.

Seismic coefficients and spectral response acceleration values were developed in accordance with the 2019 California Building Code (CBC). The CBC methodology for determining design ground motion values is based on U.S Geological Survey seismic hazard maps, which incorporate both probabilistic and deterministic seismic ground motion.

A table providing the recommended seismic coefficient and earthquake spectral response acceleration values for the project site is included in the "Seismic Factors" recommendations section of this report. The standard penetration test results indicate a Site Class D based upon N-values between 15 and 50 blows per foot, for the upper 100 feet BSG. These field N-value results indicate the subgrade soils are considered a stiff soil site based on the method included in ASCE 7-16, Section 20.4.2.

A Maximum Considered Earthquake (geometric mean) peak ground acceleration adjusted for site effects (PGA_M) of 0.617g was determined for the site using the Ground Motion Parameter Calculator from the Structural Engineer's Associates of California (https://seismicmaps.org). A Maximum Considered Earthquake magnitude of 6.89 was determined for the site based on deaggregation analysis (United States Geological Survey deaggregation website (https://earthquake.usgs.gov/hazards/interactive/).

6.5 Liquefaction and Seismic Settlement: Based on Grid Tile 21 of the City of San Diego Seismic Safety Study Geologic Hazards and Faults, dated April 3, 2008, prepared by the City of San Diego Development Services Department, the northern portion of the subject site within the parking structure area is located in a liquefaction hazard zone. The Home Depot building area is not located in the liquefaction hazard area.

Liquefaction and seismic settlements are conditions that can occur under seismic shaking from earthquake events. Liquefaction describes a phenomenon in which a saturated, cohesionless soil loses strength during an earthquake as a result of induced shearing strains. Lateral and vertical movements of the soil mass, combined with loss of bearing can result. Fine, well sorted, loose sand, shallow groundwater conditions, higher intensity earthquakes, and particularly long duration of ground shaking are the common characteristics for liquefaction.

Liquefaction and seismic settlement analyses were conducted based on soil properties revealed by the test borings and the results of laboratory testing. The analyses were conducted for soils encountered in the deeper borings for the Home Depot store (A-2 and F-6). Also, the analysis was conducted for the deeper borings drilled in the parking structure location (G-8 and M-8). The analysis was conducted using the software program LiquefyPro developed by CivilTech. A horizontal ground acceleration of 0.617g, a maximum considered earthquake of 6.89 and a high groundwater depth of 20 feet were used in the analysis. Soil parameters, such as wet unit weight, N-value, fines content, and depth of N-value tests, were input for the soil layers encountered throughout the depths explored (see test boring logs, Appendix B).

The N-values generated were used to determine the cyclic stress ratio needed to initiate liquefaction. For the borings drilled using the CME-75 drill rig, a hammer energy ratio correction of 1.5 was applied to the field N-value results based on the results of equipment specific hammer energy calibrations. The hammer energy ratio correction was based on overall transfer efficiency of 89 percent for the hammer as indicated in the report titled: "Energy Measurement for Dynamic Penetrometers," prepared by GRL Engineers, Inc., dated July 10, 2019 (included in Appendix E of this report). For the boring drilled using the Yeti-10 drill rig, a hammer energy ratio correction of 1.6 was applied to the field N-value results based on the energy transfer data provided by the Marl Industries eSPT system output with an average transfer efficiency of 96 percent for the hammer.

One of the most common phenomena that occurs during seismic shaking is the induced settlement of loose, unconsolidated sediments. This can occur in unsaturated and saturated granular soils, however, seismic settlements are typically largest where liquefaction occurs (saturated soils).

For the Home Depot store, the results of the liquefaction analyses indicate that a thin layer of medium dense silty sands encountered at a depth of about 40 feet at test boring A-2 would be susceptible to liquefaction (A-2 is located along the east wall of the building). The total estimated seismic settlement was 0.9 inch.

For the parking garage location, the results of the liquefaction analyses indicate that some loose to medium dense poorly graded gravels and sands and silty sands encountered between the depths of 28 to 38 feet near the northeast corner of the area proposed for the parking structure (boring M-8C) are also susceptible to liquefaction. The total seismic settlement was estimated to be about 1.1 inches.

Given the depth and relatively thin layer thickness where liquefaction is expected to occur, it is not expected that the loss of strength associated would impact the ability of the soils to support the proposed foundations or surface improvements. Also, considering the depth and isolated nature of these zones susceptible to seismic settlements, the Home Depot store should be designed for a estimated surface seismic settlements of about ½ inch in 50 feet. Given that more seismic settlement was indicated in the parking garage area, the parking structure should be designed for a differential seismic settlement of ¾ inch in 50 feet.

The liquefaction and seismic settlement analysis output are included in Appendix E of this report.

6.6 Slope Stability: The City of San Diego Seismic Safety Study classifies the ascending slope area in the southern portion of the site as: "sloping terrain, unfavorable geologic structure, low to moderate risk" (category 53). Given the low to moderate risk, the focus of the evaluation of slope stability was to conduct a qualitative assessment of slope stability considering the geologic nature of the material, the potential unfavorable geologic structures and past performance of the slopes on and near the site. For the purpose of evaluation, the slope areas are described separately including: 1) the undisturbed native slope that extends above the cut slope beyond the property line; 2) the lower south facing cut slope areas; and 3) the shorter transition slope located east of the proposed building site and adjacent to the church driveway.

6.6.1 Upper Native Slope: The existing undisturbed native slope has a height of about 210 feet and a natural grade of about 1.5H to 1V, which flattens slightly to a 2H to 1V slope within the property just above the lower cut portion of the slope. The majority of this slope is located offsite.

Further, since subsurface exploration of the upper native slope was not feasible due to the terrain and offsite conditions, site observations and research were used to develop opinions about the stability of the upper native slope. This upper slope is covered with thick scrub brush type vegetation. No visual evidence of slope instability or disturbed vegetation was noted within this slope during our site reconnaissance and no indications of significant slope movement was noted in the historic photographs reviewed. Thus, the slope appears to be performing well with respect to stability. A similar slope condition occurs with respect to topographic and geologic conditions along the south flank of Mission Valley to the west and east of the site and no mapped landslide features are known on these north facing slopes. The Kennedy and Tan (2005) geologic map (see drawing No. 4 in Appendix A) indicates bedding of the Mission Valley Formation at several nearby locations was found to dip slightly to the south (into the slope) at about 3 to 5 degrees. This indicates that the geologic structure is generally neutral and is not considered unfavorable with regard to slope stability.

As indicated in Section 5.1.4 of this report, previous geotechnical investigations by others noted that the existing hillsides adjacent to other nearby sites along the south flank of Mission Valley (including the property immediately to the east of the subject site) were not considered to have unfavorable geology and the geotechnical reports concluded the slopes were stable.

Considering that no unfavorable geologic structures were identified, the existing native slope has been performing well for quite some time, and the geologic nature of the slope materials, the slope is considered stable and the potential for instability of the upper native slope is low.

However, it is recommended to have a geologist or geotechnical engineer observe the upper native slopes periodically to note any changing conditions that could impact the site.

6.6.2 Lower North Facing Cut Slope: The existing cut portion of the south slope is about 75 feet high, and includes three (3) separate 20 to 30 foot high sections that are separated by two 15 to 20 foot wide terraces. The steepest portion of the slope between terraces has a gradient of about 1H to 1V in the area west of the outlet of the side canyon drainage. However, most of the other areas between terraces have intermediate slopes ranging from about 1.5H to 1V to 1.75H to 1V. The overall grade of the slope from the top to the toe of the cut portion of the slope is about 2H to 1V. Site reconnaissance above and below the slope by the undersigned Certified Engineering Geologist did not identify evidence of scarps, lateral displacement, bulging at the base (retaining wall displacement), or steep bedding dipping towards the slope inclination (unfavorable geologic structure) suggesting concerns with deep seated instability. Further, deeper soils encountered in the borings drilled on the slope exhibited good shear strength characteristics and the existing hillsides within and adjacent to the site have performed well with respect to deep seated stability for quite some time. Thus, it was concluded that deep seated slope instability is not a significant concern since the project does not propose to significantly alter the existing cut slope.

However, areas of the middle and lower sections of the slope have exhibited areas surface erosion and shallow slips (see Drawing No. 3 in Appendix A). The center section of the slope has deposits with abundant cobble fraction, and exposed predominantly granular, low cohesion, soils have exhibited high erosion and shallow soil slips 1 to 2 feet deep. Further, significant slope erosion has reportedly occurred from past washouts caused by blockage of the existing drainage inlet structure above the upper terrace, It was reported that the middle and lower slopes have been repaired over time after washouts and when significant sediments accumulate at the base of the slopes on the terraces (an aerial photograph from 2005 shows this area of the slope without vegetation). Also, inspection of these slopes for this investigation have identified drainage issues. Drainage improvements will reduce, but not eliminate the surficial and erosion issues that have occurred. Thus, some surficial slope movements are anticipated to continue. Considering that the building improvements are planned to be setback at least 35 feet from the slope, significant potential impacts to the structure due to shallow slope instability are not anticipated. The current approach by Scottish Rite of maintenance and spot repairs where erosion and slippage has occurred on the cut slopes has been sufficient to maintain function. A similar level of maintenance and repair should be anticipated. However, in addition, it is recommended that a program of regular inspection of the slopes be implemented to identify conditions that could further degrade shallow slope stability, and to identify areas requiring maintenance and repair/restoration. The Slope Improvement and Maintenance Section (Section 6.6.2.1) of this report details recommendations to address these issues during and after construction.

It should be noted that only a portion of the cut slope has experienced erosion and shallow slips. The west portion of the slope (see area west of section line A-A’ on Drawing No. 6 in Appendix A) is covered with native grasses and larger established bushes and trees. No evidence of surficial instability or erosion has been noted in the western portion of the slope. Since this west section of the slope has been performing well for over 65 years, it is recommended to not disturb this area of the slope.

6.6.2.1 Slope Improvement and Maintenance: Since the existing north facing cut slope has experienced drainage and erosion issues, slope improvements to improve drainage and reduce the potential for excessive erosion of the slope are recommended. In addition, to reduce potential impacts from cobble (rock) fall, debris fences should be incorporated at the base of slope on each terrace (per City of San Diego standards). Also, at the base of the slope, a retaining wall with a minimum of three (3) feet of freeboard should be implemented to reduce potential migration of cobbles and sediment onto the pavement areas below the slope. Sediment will need to be regularly cleared from the slope to maintain drainage.

To improve drainage, concrete or asphalt line drainage V-ditches should be provided to intercept surface runoff and drain the flow away from sloped surfaces such that runoff is not allowed to accumulate on the terraces and flow over the tops of lower slopes or retaining walls.

In addition, it is recommended, to implement effective erosion control such as by establishing deep rooted vegetation on the portions of the slopes not covered with established deep rooted bushes and trees to improve resistance to surficial stability and erosion. A regular inspection and maintenance program should be established to monitor drainage and maintain deep rooted vegetative cover.

Regular inspections of slopes, debris fences, inlets, and drainage ditches should be conducted to determine when slope maintenance and sediment removal is required. Thus, it will be critical to ensure access to the slope for sediment removal.

As indicated in this report, the existing inlet structure which currently collects runoff from the side canyon area within the southern portion of the site has become blocked in the past, causing runoff to flow around or over the inlet structure. The runoff appears to have drained onto the adjacent terraces and flowed over the north facing cut slopes in the past, contributing to erosion and surficial soil slips within the lower portion of the cut slope. Therefore, it has been concluded that the current drainage inlet structure and/or the maintenance (i.e., debris removal) are not adequate for the runoff conditions experienced. Thus, to reduce the impacts associated with the blocking of the current inlet structure at the outlet of the side canyon, appropriate debris catchments and inlet structure design and maintenance should be incorporated into the drainage improvements as a part of construction. The drainage structure and catchments should include redundant systems to reduce the potential for clogging. In addition, a detailed maintenance plan should be established to regularly inspect the performance of the inlet structure and remove sediment and debris to maintain functionality and reduce potential impacts to the slope. It should be noted that a landslide has been mapped within the side canyon in the southeast portion of the site and therefore significant debris and sediment would be expected to be transported along the drainage if earth movements from the side canyon occur. Thus, redundant measures to intercept cobbles and sediments that will continue to migrate down the drainage will be critical in the design of the project.

6.6.3 **East Transition Cut Slope**: The east boundary of the site includes a variable height, west facing cut slope that transitions the site grade to the adjacent church property to the east. The inclination of this slope is mostly about 1.5H to 1V. However, the slope steepens to the north (off site) to about 1.3H to 1V. This slope was observed to be covered with mature trees with established native grass undergrowth and bushes. No evidence of slope instability was noted in this eastern slope area and this slope has not exhibited shallow slips or erosion, such as has occurred in the middle of the north facing cut slope. Historic photographs also did not suggest the occurrence of any significant slope movement for the west facing cut slope. Thus, the slope appears to be performing well for over 65 years.

It should be noted that presently structures are located at the toe of the slope (almost zero setback). The proposed project will include a paved driveway at least 35 feet in width at the toe of the slope. Thus, the setback to the proposed structure will be significantly increased from the existing conditions.

Considering that no unfavorable geologic structures were identified and the existing west facing cut slope has been performing well for quite some time, and relatively dense vegetation is established on the slope, it is recommended to not alter or disturb this east transition slope as a part of the proposed construction operations. Modifying the slope by grading would require a significant length of time to re-establish a similar vegetative cover. Until the vegetation would establish, the slope would be prone to potentially significant erosion issues.

6.7 Asphaltic Concrete (AC) Pavements: Recommendations for asphaltic concrete pavement structural sections are presented in the "Recommendations" section of this report. The thicknesses of the asphalt concrete and the underlying aggregate base materials are based upon the amount and type of traffic loads being considered and the Resistance or R-value of the subgrade soils which will support the pavements. The measure of the amount and type of traffic loads are based upon an index of equivalent single axle loads (ESAL) from loading of heavy trucks, i.e., a traffic index (T.I). As a part of the evaluation of the pavement design for this project, samples of the onsite soils anticipated to be representative of the soils which will support pavements were obtained and R-value testing was performed in accordance with ASTM D2844. The R-value test results are summarized in Appendix C of this report.

The structural sections were designed using the gravel equivalent method in accordance with the California Department of Transportation Highways Design Manual. The traffic loading data were obtained from the Design Criteria Manual provided by Home Depot U.S.A., Inc. For the proposed Home Depot store, the "standard duty" pavement should be designed for a life of 10 years and an EAL (18 kips) of 50,000 axles. An EAL of 50,000 equates to a traffic index of 6.5. The "heavy duty" pavement was designed for a life of 10 years and an EAL (18 kips) of 220,000 axles. This equates to a traffic index of 7.5. If traffic loading is anticipated to be greater than assumed, the pavement sections should be re-evaluated.

The results of the R-value tests indicate the near surface soils exhibit poor to good pavement support characteristics as indicated by R-value results ranging from 19 to 22 for most of the clay soil samples tested. Based on the R-values determined for this investigation, an R-value of 15 was used for design.

6.8 Portland Cement Concrete (PCC) Pavements: Recommendations for Portland cement concrete pavement structural sections are presented in the "Recommendations" section of this report. The PCC pavement sections are based upon the amount and type of traffic loads being considered and the Resistance or R-value of the subgrade soils which will support the pavement. The measure of the amount and type of traffic loads are based upon an index of equivalent axle loads (EAL) from the loading of heavy trucks, i.e, a traffic index (T.I).

As a part of the evaluation of the PCC pavement design for this project, samples of the onsite soils anticipated to be representative of the soils which will support PCC pavements were obtained and R-value testing performed in accordance with ASTM D2844. The R-value test results are summarized in Appendix C of this report.

The EALs for each of the PCC pavement sections were converted to the number of 5-axle trucks per day, one direction, anticipated for the proposed store. The EAL for the "standard duty" pavement section of 50,000 was converted to 14 axles or 6 five-axle trucks per day. The EAL for the "heavy duty" pavement section is 220,000 or 26 five-axle trucks per day. The recommended structural sections were based primarily on the Portland Cement Association "Thickness Design of Highway and Street Pavements."

The PCC pavement sections were designed for a life of 10 years, a load safety factor of 1.1, a single axle weight of 12,000 pounds, and a tandem axle weight of 36,000 pounds. A modulus of subgrade reaction, K-value, for the pavement section, considering a minimum 6-inch layer of aggregate base material (minimum R-value of 78) was used for pavement design.

6.9 **Stormwater Infiltration**: Percolation tests were conducted along the east frontage near Camino Del Rio South as part of this investigation based on the slightly more granular nature of the materials identified in the initial test borings in this area. Percolation tests were conducted at depths of 6, 10, and 15 feet BSG as requested by the project Civil Engineer based on the types of infiltration systems being considered for the project. The soils encountered in the test borings drilled for the percolation tests (P-1, P-2, and P-3) comprised silty sands and clayey sands. The infiltration rates ranged from 0.1 to 0.5 inches per hour. These rates indicate the soils have a limited infiltration capacity and, at these rates, the soils would not meet City of San Diego Storm Water Standards for a full infiltration type system (which requires a minimum factored rate of 0.5 inches per hour).

Considering the results of the infiltration rate tests, and the presence of clays in the area, an average un-factored infiltration rate of 0.1 inches per hour should be used for infiltration system design. At this rate, according to the City of San Diego Storm Water Standards, a partial infiltration type system may be feasible. Minimum factors of safety as required by the City of San Diego Storm Water Standards should be applied.

In order to reduce potential impacts to the proposed structure from expansion of clays or settlements of sands, storm water systems which allow infiltration of water into the soils should be setback at least 30 feet from the structure and building foundations. Storm water systems which allow infiltration that meet these criteria should not adversely impact the structures.

6.10 **Soil Corrosion:** The risk of corrosion of construction materials relates to the potential for soil-induced chemical reaction. Corrosion is a naturally occurring process whereby the surface of a metallic structure is oxidized or reduced to a corrosion product such as iron oxide (i.e., rust). The metallic surface is attacked through the migration of ions and loses its original strength by the thinning of the member.

Soils make up a complex environment for potential metallic corrosion. The corrosion potential of a soil depends on numerous factors including soil resistivity, texture, acidity, field moisture and chemical concentrations. In order to evaluate the potential for corrosion of metallic objects in contact with the onsite soils, chemical testing of soil samples was performed by Moore Twining as part of this report. The results of soil sample analyses on native clay and silty sand samples indicate minimum resistivity values of 1,801, 2,201, and 4,602 ohms-centimeter (full results included in Appendix C of this report). The National Association of Corrosion Engineers (NACE) provides corrosion severity ratings listed in the Table No. 2 below.

Table No. 2
Soil Resistivity and Corrosion Potential Ratings

Soil Resistivity (ohm cm)	Corrosion Potential Rating
>20,000	Essentially non-corrosive
10,000 - 20,000	Mildly corrosive
5,000 - 10,000	Moderately corrosive
3,000 - 5,000	Corrosive
1,000 - 3,000	Highly corrosive
<1,000	Extremely corrosive

Therefore, the near-surface soils exhibit a “highly corrosive” to “corrosive” potential to buried metal objects. Appropriate corrosion protection should be provided for buried improvements based on the “highly corrosive” corrosion potential. If piping or concrete are placed in contact with imported soils, these soils should be analyzed to evaluate the corrosion potential of these soils.

If the manufacturers or suppliers cannot determine if materials are compatible with the soil corrosion conditions, a professional consultant, i.e., a corrosion engineer, with experience in corrosion protection should be consulted to provide design parameters. Moore Twining does not provide corrosion engineering services.

6.11 **Sulfate Attack of Concrete:** Degradation of concrete in contact with soils due to sulfate attack involves complex physical and chemical processes. When sulfate attack occurs, these processes can reduce the durability of concrete by altering the chemical and microstructural nature of the cement paste. Sulfate attack is dependent on a variety of conditions including concrete quality, exposure to sulfates in soil/groundwater and environmental factors. The standard practice for geotechnical engineers in evaluation of the soils anticipated to be in contact with concrete is to perform testing to determine the sulfates present in the soils. The results of the sulfate analysis of three near surface samples indicated 0.0021, 0.0033, and 0.0042 percent by weight. These test results are then compared with the provisions of ACI 318, section 4.3 to provide guidelines for concrete exposed to sulfate-containing solutions. Common methods used to resist the potential for degradation of concrete due to sulfate attack from soils include, but are not limited to the use of sulfate-resisting cements, air-entrainment and reduced water to cement ratios. The test results are included in Appendix C of this report. Conclusions regarding the sulfate test results are included in the Conclusions section of this report.

The soil corrosion data should be provided to the manufacturers or suppliers of materials that will be in contact with soils (pipes or ferrous metal objects, etc.) to provide assistance in selecting the protection and materials for the proposed products or materials. If the manufacturers or suppliers cannot determine if materials are compatible with the soil corrosion conditions, a professional consultant, i.e., a corrosion engineer, with experience in corrosion protection should be consulted to provide design parameters.

7.0 CONCLUSIONS

Based on the data collected during the field and laboratory investigations, our geotechnical experience in the vicinity of the project site, and our understanding of the anticipated construction, we present the following general conclusions.

7.1 The site is considered geotechnically and geologically suitable for the proposed construction with regard to support of the proposed improvements, provided the recommendations contained in this report, and future design level geotechnical investigation reports, are followed. It should be noted that the recommended design consultation and observations during construction by Moore Twining are integral to this conclusion.

7.2 The near surface soils encountered below the existing pavements within the proposed Home Depot store area were generally found to be stiff lean clays or loose clayey sands to depths of about 1 to 3 feet. These upper loose, or stiff disturbed soils will not provide uniform support of proposed settlement sensitive floor slabs or foundations. Thus, as a part of the site preparation, these soils should be excavated to expose undisturbed native soils and to achieve the minimum recommended depth of engineered fill below the foundations before filling the building pad to grade. Below these upper soils, similarly classified sandy clay and clayey sand soils were encountered in hard and dense conditions in the approximately upper 3 to 10 foot BSG.

7.3 The soil conditions below the existing pavements in the northern portion of the site where the parking structure is planned are highly variable and appear to be less consolidated (weaker) compared to the soils in the area of proposed for the Home Depot Store. Soils consisting of loose to medium dense silty sands and stiff clays with more dense and hard soil profiles in adjacent borings suggest more variable conditions. Based on the higher compressible soil conditions expected, the parking garage will require deeper over-excavation depending on column loads of the final design, or a ground modification program such as Geopiers could be a effective method to densify the upper variable soils, and reduce foundation settlements to tolerable levels. As another alternative, the structure could be supported on a continuous mat type foundation to reduce applied soil bearing pressures and to resist higher levels differential settlements expected by the variable conditions. Since the parking structure details were not known at the time this report was prepared, final recommendations for the parking structure are deferred to the design level geotechnical report.

7.4 Variable amounts of fine to coarse gravel and cobbles are present in about 2 to 5 foot thick layers within the lean clay/clayey sand strata. These soils with coarse materials are usually characterized by hard or very dense conditions on the boring logs(N-values greater than 50 blows per foot). In addition, shallow drilling auger refusal (10 feet or less) was encountered in thirty-nine (39) of the one-hundred-twelve (112) borings (refer to Boring Logs in Appendix B). These hard and dense conditions and coarse gravel and cobble materials will require more effort to excavate and process than typical soils without coarse materials. Due to the oversize rock, the cobble material will need to be removed such as by screening prior to placement and compaction as engineered fill.

7.5 The on-site clay soils have a medium expansion potential as indicated by expansion index values of 77 and 81. Medium expansive material would cause heave/shrinkage exceeding ½ inch in 50 feet. Thus, it is recommended to support floor slabs on non-expansive aggregate base and imported non-expansive granular fill; and extend perimeter foundations below where seasonal moisture fluctuations typically occur.

7.6 The existing hillside south of the site is located in City of San Diego geologic hazard category 53, which indicates: “sloping terrain, unfavorable geologic structure, low to moderate risk.” The existing north facing native slope was evaluated to identify unfavorable geologic structures as a part of this investigation. No unfavorable geologic structures were identified and this upper native slope has been performing well for quite some time. Geologic mapping referenced herein indicates bedding local to the site is neutral with respect to gross stability. Therefore, the slope is considered stable and potential gross instability of the upper native slope is low.

7.7 Shallow soil slips, erosion, and concentrations of cobble material from the up-slope side canyon drainage has blocked the existing drainage inlet for the side canyon drainage, causing runoff to flow over or around the inlet and flow over the top of areas of the lower slopes. These conditions, along with inadequate drainage of the existing terraces and poor maintenance have caused erosion and surficial slippage of areas of the lower cut slope. Thus, to reduce the impacts associated with the blocking of the current drainage inlet, appropriate debris catchments and inlet structure design should be incorporated into the drainage improvements. It should be noted that a landslide has been mapped within the side canyon in the southeast portion of the site and therefore significant debris and sediment could be transported along the side canyon drainage. Thus, measures to intercept cobbles and sediments that will continue to migrate down the drainage should be incorporated in the project design. Also, a regular inspection and maintenance program including sediment removal, etc. should be implemented to maintain the new drainage facilities.

7.8 The existing north facing lower cut was inspected below the upper native slope. These observations did not identify evidence of scarps, lateral displacement, bulging at the base (retaining wall displacement), or steep bedding dipping towards the slope inclination (unfavorable geologic structure) suggesting that deep seated instability of the overall slope had occurred. Further, deeper soils encountered in the borings drilled on the exhibited good shear strength characteristics. The existing adjacent hillsides have performed well with respect to global stability for quite some time. Given these conditions, the geologic nature of the material, and the average 2H to 1V slope inclination, it was concluded that deep seated slope instability is not a concern since the project does not propose to significantly alter the existing cut slope.

7.9 The existing north facing cut slope has a central/eastern area that has been impacted from past washouts, with abundant exposed cobble deposits, and exposed predominantly granular, low cohesion, soils that have exhibited high erosion and shallow slides 1 to 2 feet deep. Also, observations indicate the slope drainage needs improvement. Drainage improvements will reduce, but not eliminate the surficial and erosion issues that have occurred. Thus, some surficial slope movements are anticipated to continue. Considering that the building improvements are planned to be setback at least 35 feet from the slope, impacts to the proposed structures due to shallow slope instability are not anticipated. The current approach by Scottish Rite of maintenance and spot repairs where erosion and slippage has occurred on the cut slopes has been sufficient to maintain function. A similar level of maintenance and repair should be anticipated. In addition, this report recommends that a program of regular inspection of the slopes be implemented to identify conditions that could further degrade shallow slope stability, and to identify areas requiring maintenance and repair/restoration. Slope improvement and slope maintenance recommendations are provided in this report (Sections 8.3 and 8.4) to address these issues during and after construction.

7.10 The western portion of the existing north facing cut slope has areas with mature trees with established native grass undergrowth and bushes which has performed well with respect to gross and surficial stability for quite some time. Therefore, it is recommended not to alter or disturb this western portion of the north facing cut slope.

7.11 The existing variable height cut slope that supports the elevation transitions up to the adjacent church property was observed to be mostly covered with mature trees with established native grass undergrowth and bushes. Considering that no unfavorable geologic structures were identified, the existing slope has performed well for quite some time, and considering that part of the slope extends offsite, it is recommended not to alter this east transition slope.

7.12 Groundwater depths and elevations varied across the site. Groundwater was encountered at a depth of about 29½ feet BSG (elevation of about 24½ feet) in boring A-2, which was drilled in the southwest corner of the site, while in the north portion of the site (proposed Parking Structure) groundwater was encountered at depths ranging from 25 feet to 30 feet BSG. Considering the site elevations, the researched well data, and the range of groundwater depths encountered during the field investigation, a historic high groundwater of about 20 feet was used for analysis.

7.13 The infiltration rates estimated from the percolation tests ranged from 0.1 to 0.5 inches per hour. These rates indicate the soils have a limited infiltration capacity. Based on the results of percolation tests in the silty sands and clays sands, stormwater infiltration systems should consider an un-factored infiltration rate of 0.1 inches per hour. Thus, the infiltration characteristics of the soils tested are poor. However, at this rate, the site may be feasible for a partial infiltration system as defined by the City of San Diego Storm Water Standards.

7.14 The City of San Diego Seismic Safety Study, “Geologic Hazards and Faults”, was reviewed. The site is located on Grid Map 21 of the Hazard Map Series. The map shows the northern portion of the site in the area where the parking structure is planned is located within a zone of high potential liquefaction (category 31). However, the Home Depot store area is located outside the liquefaction hazard zone. The results of the liquefaction analyses indicate the potential for liquefaction to impact the site improvements is low due to the depth of soils susceptible to liquefaction. The associated differential seismic settlements were estimated to be ½ inch across the Home Depot store area and ¾ inch across the planned parking structure area.

7.15 The site is not located in a mapped fault rupture hazard zone. The potential for fault rupture on the site is estimated to be low.

7.16 The analytical results of a soil sample analysis indicate that the near-surface soils exhibit a “highly corrosive” to “corrosive” corrosion potential to buried metal objects.

7.17 Chemical analyses indicated a “negligible” potential for sulfate attack on concrete placed in contact with the near surface soils.

8.0 PRELIMINARY RECOMMENDATIONS

Based on the evaluation of the field and laboratory data and our geotechnical experience in the vicinity of the project, the following recommendations are presented for use in the project design and construction. However, this report should be considered in its entirety. When applying the recommendations for design, the background information, procedures used, findings, evaluation, and conclusions should be considered.

This report is considered preliminary since the project site and structural details of all the planned improvements were not determined at this time this report was completed.

Where the requirements of a governing agency, utility agency or pipe manufacturer differ from the recommendations of this report, the more stringent recommendations should be applied to the project.

8.1 General

8.1.1 Updated grading and drainage plans, and foundation plans, when available, should be provided to Moore Twining for review to determine if the following preliminary recommendations need to be updated or revised. Once these details are provided, a design level geotechnical report should be prepared to provide specific recommendations for final design prior to bidding and construction. The recommendations presented in this report could change depending on the extent of proposed grading, etc. Therefore, it is critical that updated improvement plans, when available, be provided to Moore Twining for review.

8.1.2 Preliminary foundation loading information was used as noted in the Anticipated Construction section of this report. Once the initial structural design is completed, the column and wall loading information should be provided to Moore Twining for review to determine if the recommendations for site preparation are suitable for the actual design loads.

8.1.3 In order to obtain additional information for use in contractor's bidding the project, a supplemental investigation is recommended to assess the gradation and range in size of the over-size materials contained in soils within the excavation areas. The investigation should include subsurface exploration using test pits located in areas and through depths of identified cobble layers to note the fraction and range of sizes that could be encountered during grading.

8.1.4 A preconstruction meeting including, as a minimum, the owner, general contractor, specialty ground improvement contractor, earthwork contractor, contractor's land surveyor, foundation and paving subcontractors, and Moore Twining should be scheduled by the general contractor at least one week prior to the start of clearing and grubbing. The purpose of the meeting should be to discuss critical project issues, concerns and scheduling.

8.1.5 The subsurface soils encountered include cobble sized rock material (3 to 12 inches in diameter) and very dense gravel material. These materials were encountered at depths as shallow as about 2 feet BSG in the building pad area. Cobbles were encountered in areas and depths across the building pad area which resulted in drilling auger refusal using a CME-75 drill rig in over half the borings drilled for this investigation. Also, cobbles were noted on the cut slopes to the south, and are common in the Mission Valley Formation which underlies much of the site. Cobble materials (exceeding 6 inches in diameter) should not be used as engineered fill within 36 inches of the final pad grade or for trench backfill. Therefore, earthwork bids will be required to include removal of rock, such as by screening/crushing type operations. Also, it should be expected that additional effort may be required to excavate these layers or dense gravels and cobbles during mass grading and installation of deeper utilities. Further, if the native soils are to be used as engineered fill, screening of the excavated soils should be anticipated to remove oversize materials that will allow testing of the precessed soils for compaction and provide uniform support of foundations and floor slabs. Recommendations for the gradation of onsite soils used as engineered fill are included in the Engineered Fill section of this report.

8.1.6 A demolition plan should be developed to identify the existing surface and subsurface improvements to be removed and those which are to remain.

8.1.7 The Contractor(s) bidding on this project should determine if the information included in the construction documents and this geotechnical engineering investigation report are sufficient for accurate bid purposes. If the data are not sufficient, the Contractor shall notify Home Depot in writing that insufficient data are available to prepare an accurate bid for the project.

8.1.8 Contractors should also be aware that wet soils are anticipated that will likely be significantly above the optimum moisture content required for proper compaction and could require soil drying or chemical treatment for stabilization to achieve the required relative compaction. No change orders will be allowed for wet weather conditions, wet soil, soil instability, etc. including chemical treatment, geotextile fabric, rock, soil import, etc.

8.1.9 Appropriate construction methods and equipment, such as low vibration equipment, should be used adjacent to the existing improvements (such as retaining walls) so as not to damage existing improvements which are to remain.

8.2 Building Slope Setbacks, Site Grading, and Drainage for Building Pads

8.2.1 The proposed Home Depot building should be setback horizontally a minimum of 30 feet from the toe of (or retaining wall constructed at the base) of the north facing cut slope. A retaining wall with a minimum of 3 feet of freeboard, as recommended in Section 8.8 of this report, should be placed at the base of the north facing slopes.

8.2.2 The proposed building should also be setback from the toe (or retaining wall constructed at the base) of the west facing transition cut slope by a horizontal distance of at least ½ the height of the slope. A retaining wall with a minimum freeboard of 3 feet, as recommended in Section 8.9 of this report, should be placed at the base of the west facing slope.

8.2.3 It is critical to develop and maintain site grades which will drain surface and roof runoff away from foundations and floor slabs - both during and after construction. Adjacent exterior finished grades should be sloped a minimum of five percent for a distance of at least ten feet away from the structures to preclude ponding of water adjacent to foundations. Adjacent exterior grades which are paved should be sloped at least 2 percent away from the foundations.

8.2.4 Landscaping after construction should direct rainfall and irrigation runoff away from the structure and not promote ponding of water adjacent to the structures. Care should be taken to maintain a leak-free sprinkler system.

8.2.5 Landscape and planter areas should be irrigated using low flow irrigation (such as drip, bubblers or mist type emitters). The use of plants with low water requirements are recommended.

8.2.6 Perimeter curbs should be extended to the bottom of the aggregate base section, where irrigated landscape areas meet pavements.

8.2.7 It is recommended that landscape planted areas, etc. not be placed adjacent to the building foundations and/or interior slabs-on-grade. Trees should be setback from proposed structures at least 10 feet or a distance equal to the anticipated drip line radius of the mature tree. For example, if a tree has an anticipated drip-line diameter of 30 feet, the tree should be planted at least 15 feet away (radius) from proposed or existing buildings.

8.2.8 Rain gutters and roof drains should be provided, and connected directly to the site storm drain system. As an alternative, the roof drains should extend a minimum of 5 feet away from the structures and the resulting runoff directed away from the structures.

8.3 Slope Drainage and Debris Catchments

8.3.1 Erosion control including but not limited to establishment of deep rooted vegetation should be provided on the portions of the existing north facing cut slope not covered with deep rooted vegetation such as the scrub brush and thick growth native grasses. On uncovered slopes, appropriate vegetation cover (or other forms of erosion protection as appropriate) should be placed and established on the slopes to provide initial erosion protection until the deeper rooted vegetation can be established.

8.3.2 Irrigation in the areas of the slope where vegetation is to be established should be of a drip type system without surface runoff. Lines in sloping areas should not be pressurized when not in use. All irrigation lines and sprinklers should be periodically monitored for leaks. All leaks and damage should be repaired promptly.

8.3.3 Drainage terraces should be designed and constructed to allow for access to clean sediment from ditches, debris catchments, repair any damage to concrete ditches, and to allow inspection of slopes as a part of on-going maintenance.

8.3.4 Concrete lined drainage ditches and downdrains should be provided to intercept surface runoff and drain the flow away from sloped surfaces such that runoff is not allowed to accumulate on the terraces and flow over the tops of lower slopes or retaining walls. Longer surface ditches on the existing terraces graded to drain to the west end have a higher potential for blockage, so it is recommended to intercept ditch flow by use of frequent down drains.

8.3.5 As a minimum, debris fences should be provided on each terrace at the base of the intermediate slopes to intercept cobbles and sediment between the toe and the recommended drainage ditches.

8.3.6 A retaining wall should be placed at the bottom of the north facing slope and should incorporate a 6 foot level drainage terrace behind the wall. Also, a retaining wall should be provided at the base of the west facing slope. These retaining walls at the base of the slopes should be designed with at least 3 feet of “freeboard” to reduce the potential for migration of sediment and other debris such as cobbles.

8.3.7 A debris catchment and inlet structure design should be incorporated into the drainage improvements to collect drainage and debris from the outlet of the side canyon. The drainage catchment should include redundant systems to collect sediment, trash, cobbles, etc. to reduce the potential for clogging.

8.4 Slope Inspection and Maintenance

8.4.1 Inspections of slopes, debris collection areas, drain inlets, and drainage ditches should be performed on a regular basis prior to the start of the wet season, and after major storm events. If any accumulated material is identified behind debris fences, at pipe inlets, or energy dissipation features that could block drainage ditches, pipe inlets; equipment should be mobilized to remove materials and maintain all slope features. Failure to remove accumulated debris, repair shallow slides, or repair damaged fences or ditches will likely result in damage to sloped surfaces and possible damage to the pavement and building improvements at the base of the slope.

8.4.2 If future erosion or instability in the form of slides, debris or earth flow, accelerated erosion, or other forms of slope instability occur on native or graded slopes, Moore Twining should be contacted to provide recommendations for repair, and the distressed areas should be repaired as soon as possible under the direction of Moore Twining. If instability is allowed to continue, these types of conditions could be an impact to the improvements.

8.5 Site Preparation

The following recommendations are for preparation of planned building areas in the relatively flat northern portion of the site. These recommendations assume that significant grading of sloped areas (slopes steeper than 5:1) does not occur. If grading plans change, and slopes will be significantly re-graded (beyond the recommended drainage and erosion control recommended), Moore Twining should be contacted to provide modified recommendations for earthwork on slopes.

8.5.1 Existing surface and subsurface improvements (including buildings, foundations, pavements, canopies, light poles etc.) in the areas of new construction should be excavated and removed from the site and all soils disturbed from the demolition and removal of these improvements should be over-excavated to expose undisturbed soils. The existing 30 inch storm drain pipe that will be abandoned and relocated is shown on Drawing No. 2 in Appendix A. Where present, existing utility trench and retaining wall backfill soils should be excavated from within a zone extending from 1 foot below the wall, foundation, or pipe at a 1H to 1V slope to the ground surface. Foundations, walls and utilities lines should be completely removed and disposed of off-site. Excavations to remove existing improvements should extend to at least 12 inches below the bottom of the improvements to be removed or to the depth required to remove all soils disturbed from demolition, whichever is greater. After over-excavation, and prior to backfill, the bottom of the excavation should be scarified to a minimum depth of 8 inches, moisture conditioned, and compacted as engineered fill. Any existing deep foundations encountered during the demolition activities should be removed to a depth of at least 5 feet below finished grade and to the depth necessary to allow for installation of the proposed improvements, whichever is deeper.

8.5.2 All surface topsoil, vegetation, trees, roots, organics, surface and subsurface improvements (if any) should be removed from all work areas. The general depth of stripping should be sufficiently deep to remove the root systems and organic top soils. All roots larger than ¼ inch in diameter or any accumulation of organic matter that will result in an organic content more than 3 percent should be removed and not used as engineered fill. The depth of stripping should be reviewed by our firm at the time of construction.

8.5.3 Oversized (cobble) materials (exceeding 3 inches in diameter) should not be used as engineered fill within 36 inches of the final pad grade or for trench backfill. Also, it should be expected that additional effort may be required to excavate these layers or dense gravels and cobbles during mass grading and installation of deeper utilities. Further, if the native soils are to be used as engineered fill, screening of the excavated soils should be anticipated to remove oversize materials that will allow the placement, compaction, and testing of the processed soils and provide uniform support of foundations and floor slabs.

8.5.4 For the Home Depot store, after stripping and removal of the existing surface and subsurface improvements, the proposed building pad area should be over-excavated to meet all of the following criteria:

1) over-excavate to at least 3 feet below the pre-construction site grade and finished subgrade;

2) over-excavate to at least 2 feet below the bottom of the proposed foundations;

3) over-excavate to the depths required to remove all existing surface and subsurface improvements; and

4) over-excavate to the depth required to remove all undocumented fill and all soils disturbed from demolition.

The limits of the over-excavation for the building pad should include the footprint of the entire building, all foundations, vestibules, the building exterior concrete apron, lumber canopy, drive-though area, materials storage areas, exterior walkways, stairs, stoops, loading dock, and a minimum of five (5) feet beyond the edges of these improvements and all the foundations. It is recommended that extra care be taken by the contractor to ensure that the horizontal and vertical extent of the over-excavation and compaction conform to the site preparation recommendations presented in this report. Moore Twining is not responsible for surveying and measuring to verify the horizontal and vertical extent of over-excavation and compaction. The contractor should verify in writing to the owner and Moore Twining that the horizontal and vertical over-excavation limits were completed in conformance with the recommendations of this report, the project plans, and the specifications (the most stringent applies). This verification should be performed by a licensed surveyor and should include a scaled plan showing the "as-graded" limits (i.e., horizontal and vertical extent) in relation to the proposed pad improvements and the elevations of the bottom of the over-excavation. This verification should be provided prior to placing fill and prior to requesting pad certification from Moore Twining or excavating for foundations. Upon approval of the over-excavation limits (horizontal and vertical) by Moore Twining based on survey data by a licensed surveyor provided by the contractor, the soils exposed at the bottom of the excavation should be should be scarified to a minimum depth of 8 inches, aerated or moisture conditioned to between one (1) and four (4) percent above optimum moisture content, and compacted as engineered fill to achieve a stable condition in accordance with the recommendations of this report.

8.5.5 Since the Parking Garage foundation type and loading was not known at the time this preliminary report was completed, site preparation recommendations are not included in this report. The future Design Level Geotechnical report(s) should include specific recommendations for the site preparation of the north portion of the site designated for the Parking Garage.

8.5.6 Across both the Home Depot and Parking structure areas, some of the clay soils encountered were as much as 10 percent above optimum moisture during our Spring 2019 initial field investigation. At these moisture contents, these soils will need to be aerated, i.e. dried to with 4 percent of optimum, or stabilized to achieve the recommended subgrade compaction. Due to the high soil moisture conditions, it is recommended soil stabilization be included in contractor's bids for the bottom of the over-excavation. For the purpose of preliminary estimates, the contractors should assume that 12 inches of a 1 to ½ inch crushed rock, fully encapsulated in a geotextile filter fabric will be required to stabilize the bottom of the excavation.

8.5.7 The subgrade below the interior Home Depot store concrete slabs-on-grade within the building pad limits should be underlain by 6 inches of aggregate base compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557; placed over 18 inches of imported, non-expansive granular fill compacted as recommended in this report. Note that the slab-on-grade ground floor of the parking structure can be prepared per PCC pavement requirements.

8.5.8 After footing excavations are completed, the moisture content and compaction should be maintained until the reinforcement and concrete are placed.

8.5.9 All undocumented fill soils should be excavated and replaced as engineered fill as part of the site preparation. The boring locations where fill soils were encountered are indicated on Drawing No. 2 in Appendix A. Undocumented fills were identified during this investigation at the following locations and estimated depths:

1) Along Camino Del Rio South roadway frontage to depths of 5 to 6 feet along the east section (various boring locations along line 8) and to a depth of 10 feet in the northwest corner of the site (boring location A-8); and,

2) In the driveway area at the southwest corner of the facility (boring location A-1) to a depth of 4 feet BSG.

It should be noted that due to past grading, larger areas of the frontage along Camino Del Rio South, as well as other areas within the site not identified on the boring logs, may also include undocumented fill soils. The overall extent of the undocumented fill soils will not be known until grading.

Following excavation and removal, the exposed subgrade soils shall be scarified to a minimum depth of 12 inches, moisture conditioned to above optimum moisture content as recommended and compacted to at least 95 percent relative compaction of the maximum dry density as determined by ASTM Test Method D1557 to achieve a stable compacted subgrade.

8.5.10 For pavement areas, exterior slabs outside the building pad preparation limits and areas to receive fill outside the building pad limits, after stripping and removal of existing improvements and undocumented fills, the native subgrade should be prepared by over-excavation to at least 12 inches below the pre-construction subgrade elevation, and to the depth required to remove undocumented fills and soils disturbed during the demolition activity, whichever is greater. As an option to Home Depot, if a higher potential for settlement and maintenance of pavement areas is tolerable to Home Depot, and to limit earthwork costs, the existing fill soils could be left in place. For contractors providing construction estimates or bids on the project, assume that the existing fill soils in the pavement areas will be removed and replaced as engineered fill per Section 8.6 of this report. Optional cost credits should be provided to Home Depot for their consideration to prepare pavement and site areas without over-excavation of the undocumented fill soils.

8.5.11 For retaining walls and miscellaneous lightly loaded foundations for non-building structures, after stripping and removal of existing improvements and undocumented fills, the native subgrade should be prepared by over-excavation to at least 12 inches below the pre-construction site grade, to the depth required to remove undocumented fill, and to 12 inches below the bottom of the foundations, whichever is deeper. Following excavation, the exposed subgrade soils shall be scarified to a minimum depth of 8 inches, moisture conditioned to between one (1) and four (4) percent above optimum moisture content and compacted to at least 95 percent relative compaction of the maximum dry density as determined by ASTM Test Method D1557 to achieve a stable compacted subgrade. The moisture content of the subgrade soils should be maintained until placement of the aggregate base.

8.5.12 Exterior slabs-on-grade outside the building pad limits should be underlain by 6 inches of aggregate base compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557; placed over 12 inches of imported, non-expansive granular fill compacted as recommended in this report. The subgrade soils should be prepared as recommended for the pavement areas in Section 8.5.10 of this report.

8.5.13 All fill required to bring the site to final grades should be placed as engineered fill. In addition, all native soils over-excavated should be compacted as engineered fill.

8.5.14 The moisture content and density of the compacted soils should be maintained until the placement of concrete. If soft or unstable soils are encountered during excavation or compaction operations, our firm should be notified so the soils conditions can be examined and additional recommendations provided to address the pliant areas.

8.5.15 The Contractor should use appropriate equipment, such as low pressure equipment, to achieve the required over-excavation, compaction and subgrade stabilization to prevent rutting and subgrade instability.

8.5.16 Final grading should produce a building pad and prepared subgrade ready to receive the slab-on-grade which is smooth, planar, and resistant to rutting. Both the finished pad (before aggregate base is placed) and the aggregate base section should not depress more than one-half (½) inch under the wheels of a fully loaded concrete truck. If depressions more than one-half (½) inch occur, the contractor shall perform remedial grading to achieve this requirement at no cost to the Owner.

8.5.17 The Contractor should be responsible for the disposal of concrete, asphaltic concrete, soil, spoils, etc. that must be exported from the site. Individuals, facilities, agencies, etc. may require analytical testing and other assessments of these materials to determine if these materials are acceptable. The Contractor should be responsible to perform the tests, assessments, etc. to determine the appropriate method of disposal. In addition, the Contractor is responsible for all costs to dispose of these materials in a legal manner.

8.6 Engineered Fill

8.6.1 Interior and exterior concrete slabs on grade within the building pad preparation limits (which includes the building floor slab and all concrete slabs adjacent to the building) should be supported on a minimum of 6 inches of non-recycled aggregate base over 18 inches of non-expansive import fill materials. Exterior concrete slabs-on-grade and PCC paving outside the building pad preparation limits should be supported on a minimum of 6 inches of aggregate base placed over 12 inches of non-expansive import fill materials.

8.6.2 The on-site near surface soils encountered include medium expansive clay materials with areas and depths of high moisture contents and oversized cobble materials. The on-site soils will likely require mechanical screening and or laborers for hand picking to remove over-sized cobble materials and achieve compliance with the requirements of this report for use of the onsite soils as engineered fill. Also, due to expansion characteristics, the onsite soils cannot be used as engineered fill within 24 inches of the bottom of the concrete slabs on grade within the building pad preparation limits, nor within 18 inches of the bottom of exterior slabs and PCC pavement sections which are recommended to be non-expansive materials.

8.6.3 For the building pads and pavement sections, the on-site soils may be used as engineered fill below the recommended non-expansive fill, provided the soils are conditioned/dried to a suitable moisture content, do not contain more than 3 percent organics, and are processed so the soils do not contain particles larger than 3-inches in the top 36 inches of the pad subgrade and not larger than 6 inches for other areas, are processed such that a minimum of 70 percent passes a 3/4 inch sieve, are free of debris and are properly aerated/moisture conditioned to achieve the recommendations of this report. Screening and crushing of the rock fraction may be required to achieve the gradation requirements for reuse of the onsite soils as engineered fill.

8.6.4 Flyash may not be used for treatment of soils on the project.

8.6.5 If soils other than those considered in this report are encountered, Moore Twining should be notified to provide alternate recommendations.

8.6.6 The compactability of the native soils is dependent upon the moisture contents, subgrade conditions, degree of mixing, type of equipment, as well as other factors. The evaluation of such factors was beyond the scope of this report; therefore, it is recommended that they be evaluated by the contractor during preparation of bids and construction of the project.

8.6.7 Import fill soil (if any) should be non-recycled, non-expansive and granular in nature with the following acceptance criteria recommended.

Percent Passing 3-Inch Sieve	100
Percent Passing No. 4 Sieve	75 - 100
Percent Passing No. 200 Sieve	10 - 40
Expansion Index (ASTM D4829)	Less than 20
Plasticity Index (ASTM D4318)	Less than 15
Organics	Less than 3 percent by weight
Sulfates	< 0.05 percent by weight
Resistivity	> 3,000 ohms-cm
R-value	≥25

Prior to importing fill, the import material shall be certified by the Contractor and the supplier (to the satisfaction of the Owner) that the soils do not contain any environmental contaminates regulated by local, state or federal agencies having jurisdiction. The Contractor shall pay for the environmental testing required to determine compliance with the requirements of this report. This certification shall consist of, as a minimum, recent analytical data specific to the source of the import material including proper chain-of-custody documentation. Moore Twining will sample and test the material after the environmental certification submittal is approved to verify that the proposed material complies with the geotechnical engineering recommendations of this report. The Contractor shall allow a minimum of seven (7) working days for each import source to be tested for the geotechnical properties.

8.6.8 On-site, processed clayey soils should be placed in loose lifts approximately 8 inches thick, moisture-conditioned to between one (1) and four (4) percent above optimum moisture content, and compacted to at least 90 percent of the maximum dry density as determined by ASTM Test Method D1557, with exception that the upper 12 inches of subgrade below the aggregate base for pavements should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557. Additional lifts of fill should not be placed if the previous lift or subgrade is not stable.

8.6.9 On-site non-plastic granular soils or imported granular soils should be placed in loose lifts approximately 8 inches thick, moisture-conditioned to between optimum and three (3) percent above optimum moisture content, and compacted to at least 92 percent of the maximum dry density as determined by ASTM Test Method D1557, with exception that the upper 12 inches of subgrade below the aggregate base for pavements should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557. Additional lifts of fill should not be placed if the previous lift or subgrade is not stable.

8.6.10 Utility trenches should be a minimum of 24 inches in width to allow for in-place density testing by traditional (nuclear density test) methods and the backfill should be compacted in accordance with the recommendations for engineered fill.

8.6.11 In-place density testing should be conducted in accordance with ASTM D 6938 (nuclear methods) at the minimum frequency listed in Table No. 3, below.

Table No. 3
Minimum In-place Density Test Frequency

Area	**Minimum Test Frequency**
Building Pad	1 test per 2,500 square feet per lift

Pavements and Slope Grading	1 test per 5,000 square feet per lift
Utility Pipe and Structure Backfill	1 test per 100 linear feet of trench per compacted lift

8.6.12 Open graded gravel and rock material such as ¾-inch crushed rock or ½-inch crushed rock should not be used as backfill including trench backfill. In the event gravel or rock is required by a regulatory agency or pipe manufacturer for use as backfill, or for stabilization of trenches, all open graded materials shall be fully encased in a geotextile filter fabric, such as Mirafi 140N, to prevent migration of fine grained soils into the porous material. In addition, periodic slurry cutoffs should be provided along trenches where gravel is placed to reduce potential impacts from groundwater migration through the gravel materials. Gravel and rock cannot be used without the written approval of Moore Twining. If the contractor elects to use crushed rock (and if approved by Moore Twining), the contractor will be responsible for slurry cut off walls at the locations directed by Moore Twining. Materials such as crushed rock should be placed in thin (less than 8 inches) lifts and each lift should be compacted with a minimum of three (3) passes with a vibratory compactor.

8.6.13 Aggregate base below the building slab should comply with State of California Department of Transportation requirements for a non-recycled Class 2 aggregate base or Crushed Aggregate Base (CAB) from the Standard Specifications for Public Works Construction. The aggregate base used below the building pad should not contain recycled materials. However, a recycled aggregate base may be used for pavement areas outside the building pad, provided that the recycled materials are accepted by the Owner and adequate quality control testing is conducted. Aggregate base should be compacted to a minimum relative compaction of 95 percent. Prior to importing the aggregate base material, the contractor should submit documentation demonstrating that the material meets all the quality requirements (i.e., gradation, R-value, sand equivalent, durability, etc.) for the applicable aggregate base. Also, the Contractor shall test the aggregate base for sulfate content. Documentation should be provided to the Owner, Architect and Moore Twining and reviewed and approved prior to delivery of the aggregate base to the site.

8.7 Foundations

8.7.1 Spread and continuous footings supported on engineered fill soils prepared as recommended in this report may be designed for a maximum net allowable soil bearing pressure of 2,500 pounds per square foot for dead-plus-live loads. This value may be increased by one-third for short duration wind or seismic loads. The weight of the footing and the soil backfill may be ignored in design. The building pad should be prepared in accordance with the recommendations included in the "Site Preparation" section of this report.

8.7.2 Perimeter foundations should extend to a minimum depth of 30 inches below the top of the floor slab. Interior footings should extend to a minimum of 24 inches below the top of the interior floor slab. All footings should have a minimum width of 15 inches, regardless of load.

8.7.3 The foundations should be designed and reinforced for the anticipated settlements and for temperature and shrinkage effects. A structural engineer experienced in foundation design should recommend the thickness, design details and concrete specifications for the foundations. For the Home Depot store, structural deign should be based on: 1) a total static settlement and heave of ¾ inch, 2) a differential static settlement of ½ inch in 50 feet, and 3) and a differential seismic settlement of ½ inch in 50 feet.

8.7.4 Parking Garage static settlements will be dependant on the foundation type used and applied loading that have not been determined yet. The future Design Level Geotechnical report should include specific settlement recommendations based on the site preparation of the north portion of the site designated for the Parking Garage. However, based on current analysis, the Parking Structure area of the site could experience post-liquefaction differential seismic settlements of up to ¾ inch in 50 feet.

8.7.5 The foundations should be continuous around the perimeter of the structure to reduce moisture migration beneath the structure. Continuous perimeter foundations should be extended through doorways and/or openings that are not needed for support of loads.

8.7.6 Pylon signs (if any) may be supported on a drilled-cast-in-hole reinforced concrete foundation (pier). An allowable skin friction of 150 pounds per square foot per foot of embedment may be used to resist axial loads. Lateral load resistance may be estimated using the CBC non-constrained design. A value of 150 pounds per square foot per foot of depth may be used.

8.7.7 At the time of pier construction and until the concrete is placed, the shaft excavation should have stable sidewalls and all sloughed soil should be completely removed from the bottom of the excavation. If the drilled hole exhibits instability, it should be cased. Moore Twining should observe the excavation to confirm that the pier was constructed as described above, and the soils encountered are similar to those indicated in this report.

8.7.8 Moore Twining should observe the bottom of foundation excavations prior to the placement of reinforcing steel and utilities. The Contractor shall provide a minimum of 48 hours notice for these observations.

8.8 Seismic Design Factors

The following seismic factors were developed for the site using the Ground Motion Parameter Calculator provided by SEOAC and OSHPD (http://seismicmaps.org), based upon a site latitude of 32.76707 degrees and a site longitude of -117.143846 degrees. The data provided in Table No. 5 are based upon the procedures of Sections 1613.2.1 through 1613.2.4 of the 2019 California Building Code, ASCE 7-16 Chapter 11 and Supplement No. 1. The data in Table No. 5 were not determined based upon a ground motion hazard analysis. The structural engineer should review the values in Table No. 5 and determine whether a ground motion hazard analysis is required for the project considering the seismic design category, structural details, and requirements of ASCE 7-16 (Section 11.4.8 and other applicable sections). If required, Moore Twining should be notified and requested to conduct the additional analysis, develop updated seismic factors for the project, and update the following values.

Table No. 4

Item	CBC Value
Site Class	D
Maximum Considered Earthquake (geometric mean) peak ground acceleration adjusted for site effects (PGA_M)	0.617
Mapped Maximum Considered Earthquake (geometric mean) peak ground acceleration ASCE 7-16 (PGA)	0.561
Spectral Response At Short Period (0.2 Second), Ss	1.244
Spectral Response At 1-Second Period, S_1	0.428
Site Coefficient (based on Spectral Response Short Period), Fa	1.002
Site Coefficient, (based on Spectral Response 1-Second Period) Fv	See Note 1
Maximum considered earthquake spectral response acceleration for short period, S_{MS}	1.247

Item	CBC Value
Maximum considered earthquake spectral response acceleration for 1-second period, S_{M1}	See Note 1
Five percent damped design spectral response acceleration for short period, S_{DS}	0.831

Note 1: Requires ground motion hazard analysis per ASCE Section 21.2 (ASCE 7-16, Section 11.4.8), unless the structural engineer determines that an Exception of Section 11.4.8 of ASCE 7-16 is applicable for the project design.

8.9 Site and Loading Dock Retaining Walls

8.9.1 A retaining wall should be placed at the bottom of the north facing slope and should incorporate a 6 foot level drainage terrace behind the wall. Also, a retaining wall should be provided at the base of the west facing slope. These retaining walls at the base of the slopes should be designed with at least 3 feet of "freeboard" to reduce the potential for migration of sediment and other debris such as cobbles.

8.9.2 The planned retaining walls at the base of the cut slopes may be designed for a maximum net allowable soil bearing pressure of 2,500 pounds per square foot if supported on at least 12-inches of engineered fill (compact the bottoms of footing excavations). However, other on-site lightly loaded retaining wall foundations (i.e., less than 1.5 kips/foot line loading) may be designed using an allowable soil bearing pressure of 1,500 pounds per square foot or less may be supported on shallow footings placed entirely on 6 inches of engineered fill.

8.9.3 Retaining walls should be constructed with imported granular backfill placed within the zone extending from a distance of 1 foot laterally from the bottom of the wall footing at a 1 horizontal to 1 vertical gradient to the surface. This requirement should be detailed on the construction drawings. Granular backfill will reduce the effects of expansive soil pressures on the wall. Granular wall backfill should meet the following requirements:

Percent Passing 3-Inch Sieve	100
Percent Passing No. 4 Sieve	70 - 100
Percent Passing No. 200 Sieve	10 - 15
Plasticity Index	Less than 5

8.9.4 The import fill material should be tested and approved as recommended under the subsection entitled "Engineered Fill" in the recommendations section of this report.

8.9.5 Retaining walls should be constructed with a drain system including, as a minimum, drain pipes surrounded by at least 1 cubic foot of crushed ¾ inch or ½ inch rock backfill fully encapsulated in Mirafi 140 N, or equivalent. The final selection of filter fabric should be as recommended by the fabric manufacturer for the specific site conditions. Drain pipes should be located near the wall to adequately reduce the potential for hydrostatic pressures behind the wall. Drainage should be directed to pipes which gravity drain to closed pipes of the storm drain or subdrain system. Drain pipe outlet invert elevations should be sufficient (a bypass should be constructed if necessary) to preclude hydrostatic surcharge to the wall in the event the storm drain system did not function properly. Drainage should be directed to the site storm drain system. The drainage system should be designed by the wall designer and detailed on the plans.

8.9.6 For loading dock area retaining walls only, as an alternative to using drain pipes behind the wall to adequately reduce the potential for hydrostatic pressures behind the wall, weep holes may be used, provided that a continuous crushed rock (minimum 1 cubic foot per lineal foot) and filter fabric section is provided directly behind the wall. The weep holes cannot have the potential for clogging. The weep holes should discharge directly to an approved drainage.

8.9.7 The bottom surface area of concrete footings in direct contact with engineered fill can be used to resist lateral loads. An allowable coefficient of friction of 0.35 can be used for design.

8.9.8 The allowable passive resistance of the onsite soils and engineered fill may be assumed to be equal to the pressure developed by a fluid with a density of 275 pounds per cubic foot. The upper 12 inches of subgrade should be neglected in determining the total passive resistance.

8.9.9 The active and at-rest pressures of the wall backfill using onsite soils in a drained condition may be assumed to be equal to the pressures developed by a fluid with a density of 40 and 60 pounds per cubic foot, respectively. These pressures also assume level ground surface and do not include the surcharge effects of construction equipment, loads imposed by nearby foundations and roadways and hydrostatic water pressure.

8.9.10 Since a new retaining wall will be constructed at the base of the cut slopes, for 1.5H to 1V sloped backfill the active and at-rest pressures of the engineered fill may be assumed to be equal to fluids with a density of 77 and 90 pounds per cubic foot, respectively. These pressures do not include the surcharge effects of construction equipment, loads imposed by nearby foundations and roadways and hydrostatic water pressure.

8.9.11 The at-rest pressure should be used in determining lateral earth pressures against walls which are not free to deflect. For walls which are free to deflect at least one percent of the wall height at the top, the active earth pressure may be used.

8.9.12 The above earth pressures assume that the backfill soils will be drained. Therefore, all retaining walls should incorporate the use of a backdrain as recommended in this report.

8.9.13 The wall designer should determine if seismic increments are required. If seismic increments are required, Moore Twining should be contacted for recommendations for seismic geotechnical design considerations for the retaining structures.

8.9.14 It is recommended to use lighter hand operated or walk behind compaction equipment in the zone equal to one wall height behind the wall to reduce the potential for damage to the wall during construction. Heavier compaction equipment could cause loads in excess of design loads which could result in cracking, excessive rotation, or failure of a retaining structure.

8.9.15 If retaining walls are to be finished with dry wall, plaster, decorative stone, etc., or if effervescence is undesirable, waterproofing measures should be applied to walls. Waterproofing systems should be designed by a qualified professional.

8.10 Interior Concrete Slabs-on-Grade

8.10.1 The recommendations provided herein are intended only for the design of concrete slabs on grade within the building pad and their proposed uses, which do not include construction traffic (i.e., cranes, ready mix concrete mixers, and rock trucks, etc.). The building contractor should assess the slab section and determine its adequacy to support any proposed construction loading.

8.10.2 A structural engineer experienced in slab-on-grade design should recommend the thickness, design details and concrete specifications for the proposed floor slab. Concrete slabs on grade supported on subgrade soils prepared as recommended in this report should be designed for a total settlement and heave of 1 inch total and ½ inch differential over 50 feet.

8.10.3 A modulus of subgrade reaction of 150 psi/inch may be used for design of the interior floor slab when the subgrade preparation is conducted in accordance with the recommendations of this report. This value is based on a 1 foot square plate and should be adjusted for the size effects based on the plan area of the applied loads.

8.10.4 Concrete slabs on grade within the building pad should be supported on a minimum of 6 inches of non-recycled aggregate base placed over 18 inches of imported, non-expansive granular fill over the depth of engineered fill required below the foundations. The minimum thickness of AB is recommended directly below the slabs-on-grade to improve the slab support characteristics and for construction stability purposes.

8.10.5 The slabs and underlying subgrade should be constructed in accordance with current American Concrete Institute (ACI) standards.

8.10.6 The moisture content of the subgrade below the aggregate base section should be verified to be optimum to 3 percent above optimum moisture content within 48 hours prior to placing the overlying layer.

8.10.7 ACI recommends that the interior slab-on-grade should be placed directly on a vapor retarder when the potential exists that the underlying subgrade or sand layer could be wet or saturated prior to placement of the slab-on-grade. It is recommended that Stegowrap 15 should be used where floor coverings, such as carpet and tile, are anticipated or where moisture could permeate into the interior and create problems. The vapor retarder should overly the compacted aggregate base. It should be noted that placing the PCC slab directly on the vapor barrier will increase the potential for cracking and curling; however, ACI recommends the placement of the vapor retarding membrane directly below the slab to reduce the amount vapor emission through the slab-on-grade. Based on discussions with Stego Industries, L.L.C. (telephone 949-493-5460), the Stegowrap can be placed directly on the aggregate base and the concrete can be placed directly on the Stegowrap. It is recommended that the design professional obtain written confirmation from Stego Industries that this product is suitable for the specific project application. It is recommended that the slab be moist cured for a minimum of 7 days to reduce the potential for excessive cracking. The underslab membrane should have a high puncture resistance (minimum of approximately 2,400 grams of puncture resistance), high abrasion resistance, rot resistant, and mildew resistant. It is recommended that the membrane be selected in accordance with the current ASTM C 755, Standard

Practice For Selection of Vapor Retarder For Thermal Insulation and conform to the current ASTM E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Waters, or as Ground Cover. It is recommended that the vapor barrier selection and installation conform to the current ACI Manual of Concrete Practice, Guide for Concrete Floor and Slab Construction (302.1R), Addendum, Vapor Retarder Location and current ASTM E 1643, Standard Practice for Installation of Water Vapor Retarders Used In Contact with Earth or Granular Fill Under Concrete Slabs. In addition, it is recommended that the manufacturer of the floor covering and floor covering adhesive be consulted to determine if the manufacturers have additional recommendations regarding the design and construction of the slab-on-grade, testing of the slab-on-grade, slab preparation, application of the adhesive, installation of the floor covering and maintenance requirements. It should be noted that the recommendations presented in this report are not intended to achieve a specific vapor emission rate.

8.10.8 The membrane should be installed so that there are no holes or uncovered areas. All seams should be overlapped and sealed with the manufacturer approved tape continuous at the laps so they are vapor tight. All perimeter edges of the membrane, such as pipe penetrations, interior and exterior footings, joints, etc., should be caulked per manufacturer’s recommendations.

8.10.9 Tears or punctures that may occur in the membrane should be repaired prior to placement of concrete per manufacturer’s recommendations.

8.10.10 The moisture retarding membrane is not required beneath exposed concrete floors, such as warehouses and garages, provided that moisture intrusions into the structure are permissible for the design life of the structure.

8.10.11 Additional measures to reduce moisture migration should be implemented for floors that will receive moisture sensitive coverings. These include: 1) constructing a less pervious concrete floor slab by maintaining a water-cement ratio of 0.52 lb./lb. or less in the concrete for slabs-on-grade, 2) ensuring that all seams and utility protrusions are sealed with tape to create a "water tight" moisture barrier, 3) placing concrete walkways or pavements adjacent to the structure, 4) providing adequate drainage away from the structure, 5) moist cure the slabs for at least 7 days, and 6) locating lawns, irrigated landscape areas, and flower beds away from the structure.

8.10.12 The Contractor shall test the moisture vapor transmission through the slab, the pH, internal relative humidity of the floor slab, etc., at a frequency and method as specified by the flooring manufacturer, adhesive manufacturer, underlayment manufacturer, etc. or as required by the plans and specifications, whichever is most stringent. The tests should be conducted in accordance with the applicable ASTM test methods. The results of vapor transmission tests, pH tests, internal relative humidity tests of the floor slab, ambient building conditions, etc. should be within floor manufacturer's, adhesive manufacturer's and underlayment manufacturer's specifications at the time the floor is placed. It is recommended that the floor, adhesive and underlayment manufacturers and subcontractor review and approve the test data prior to floor covering installation.

8.10.13 To reduce the potential for damaging slabs during construction the following recommendations are presented: 1) use perimeter pour-strips at tilt-wall locations to avoid damage to slab-wall connections; 2) design for a differential slab movement of ½ inch relative to interior columns; 3) provide aggregate base below the slabs, 4) it is expected that erection of concrete tilt-up wall panels and roof steel may require cranes. The loaded track and/or pad pressure of any crane which will operate on slabs or pavements should be evaluated by the contractor prior to loading the slab.

8.10.14 For tilt up construction, a perimeter pour strip between the wall footing and the adjacent interior slab should be incorporated into the project design. After the walls are erected and a majority of the differential movement has occurred, the pour strip should be placed.

8.10.15 Backfill the zone above the top of footings at interior column locations, building perimeters, and below the bottom of slabs with an approved backfill and/or an aggregate base section as recommended herein for the area below interior slabs-on-grade. This procedure should provide more uniform support for the slabs which may reduce the potential for cracking.

8.10.16 If the pad subgrade or the aggregate base will be used as a working surface, the Contractor should determine an adequate aggregate base section thickness for the type and methods of construction proposed for the project. The proposed compacted subgrade can experience instability under construction loading.

8.10.17 Aggregate base shall comply with the requirements for non-recycled Class 2 Aggregate Base in the Caltrans Standard Specifications and should have negligible concentrations of sulfates. Aggregate base shall be compacted to a minimum relative compaction of 95 percent of the maximum dry density determined in accordance with ASTM D1557. The Contractor shall test the aggregate base for sulfate content and provide the results to the Owner, Architect and Moore Twining for approval prior to delivery of the aggregate base to the site.

8.11 Exterior Slabs-On-Grade

The recommendations for exterior slabs provided below are not intended for use for slabs subjected to vehicular traffic, rather lightly loaded sidewalks, curbs, and planters, etc. outside the building pad.

8.11.1 Exterior improvements that subject the subgrade soils to a sustained load greater than 150 pounds per square foot should be prepared in accordance with recommendations presented in this report for interior slabs-on-grade. Moore Twining can provide alternative design recommendations for exterior slabs, if requested.

8.11.2 Subgrade soils for exterior slabs should be prepared as recommended in the "Site Preparation" section of this report. Upon completion of the over-excavation and compaction of subgrade soils, the exterior slabs should be supported on 6 inches of aggregate base placed over 12 inches of imported, non-expansive granular fill overlying subgrade soils prepared in accordance with the recommendations provided in the "Site Preparation“ section of this report.

8.11.3 The moisture content of the subgrade soils should be verified to be at least optimum moisture content within 48 hours of placement of the slab-on-grade. In addition, the density and stability of the prepared subgrade should be verified prior to placement of the aggregate base. If necessary to achieve the recommended moisture content, the subgrade could be over-excavated, moisture conditioned as necessary and compacted as engineered fill.

8.11.4 The exterior slabs-on-grade adjacent to landscape areas should be designed with thickened edges which extend to at least a depth of 6 inches below the bottom of the slabs-on-grade.

8.11.5 Since exterior sidewalks, curbs, etc. are typically constructed at the end of the construction process, the moisture conditioning conducted during earthwork can revert to natural dry conditions. Placing concrete walks and finish work over dry or slightly moist subgrade should be avoided. It is recommended that the general contractor notify Moore Twining to conduct in-place moisture and density tests prior to placing concrete flatwork. Written test results indicating passing density and moisture tests should be in the general contractor's possession prior to placing concrete for exterior flatwork.

8.12 Asphaltic Concrete (AC) Pavements

8.12.1 Areas for AC pavement should be prepared in accordance with the recommendations section entitled, "Site Preparation." The upper 12 inches of subgrade beneath the aggregate base should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557.

8.12.2 The following pavement sections are based on an R-value of 15, a traffic index of 6.5 for the "Standard Duty Pavements," and a traffic index of 7.5 for the "Heavy Duty Pavements." If the paved areas are to be used during construction, or if the type and frequency of traffic are greater than assumed in design, the pavement section should be re-evaluated for the anticipated traffic.

Traffic Index = 6.5 "Standard Duty Pavements"

AC Thickness, inches	AB Thickness, inches (Min. R-value = 78)	Min. Compacted Subgrade, inches
3.5	12	12

Traffic Index = 7.5 "Heavy Duty Pavements"

AC Thickness, inches	AB Thickness, inches (Min. R-value = 78)	Min. Compacted Subgrade, inches
4.0	15	12

AC - Asphaltic Concrete compacted as recommended in Section 8.12.9 of this report
AB - Aggregate Base compacted to at least 95 percent relative compaction (ASTM D1557)
Subgrade - Subgrade soils compacted to at least 95 percent relative compaction (ASTM D1557)

8.12.3 The curbs where pavements meet irrigated landscape areas or uncovered open areas should be extended to the bottom of the aggregate base section. This should reduce the potential for subgrade moisture from irrigation and runoff from migrating into the base section and reducing the life of the pavements.

8.12.4 If actual pavement subgrade materials are significantly different from those tested for this study due to unanticipated grading or soil importing, the pavement sections should be re-evaluated for the changed subgrade conditions.

8.12.5 If the paved areas are to be used during construction, or if the type and frequency of traffic are greater than assumed in design, the pavement sections should be re-evaluated for the anticipated traffic.

8.12.6 Pavement section design assumes that proper maintenance, such as sealing and repair of localized distress, will be performed on an as needed basis for longevity and safety.

8.12.7 Pavement materials and construction method should conform to Sections 25, 26, and 39 of the State of California Standard Specification Requirements.

8.12.8 It is recommended that the base 2 inch thick course of asphaltic concrete consist of a ¾ inch maximum medium gradation. The top course or wear course should consist of a ½ inch maximum medium gradation.

8.12.9 The asphaltic concrete, including the joint density, should be compacted to a minimum average relative compaction of 93 percent, with no single test value being below a relative compaction of 91 percent and no single test value being above a relative compaction of 97 percent of the referenced laboratory density according to ASTM D2041.

8.12.10 The asphalt concrete should comply with Type "A" asphalt concrete as described in Section 39 of the State of California Standard Specifications. The Contractor shall provide an asphalt concrete mix design prepared and signed by a California registered civil engineer and approved by Moore Twining and Home Depot prior to construction.

8.13 Portland Cement Concrete (PCC) Pavements

Recommendations for Portland Cement Concrete pavement structural sections are presented in the following subsections. The PCC pavement design assumes a minimum modulus of rupture of 500 psi and was based on the Home Depot traffic loading requirements. A qualified design professional should specify where heavy duty and standard duty slabs are used based on the anticipated type and frequency of traffic.

8.13.1 Areas to receive PCC slabs-on-grade should be prepared in accordance with the recommendations section entitled, “Site Preparation.” After over-excavation and compaction, the upper 12 inches of subgrade beneath the aggregate base should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Test Method D1557.

8.13.2 The "standard duty" pavements and light vehicular loaded pavements were designed based on an 18 kip ESAL of 50,000 using a 10 year design. A design k-value of 200 psi/in considering a recommended 6-inch layer of Class 2 aggregate base material (R-value of 78) over 12 inches of imported non-expansive fill, over the native compacted soils.

Pavement Component	Thickness, Inches
Portland Cement Concrete	6.0
Class 2 Aggregate Base (95% Minimum Relative Compaction)	6.0
Imported Granular Fill* (95% Minimum Relative Compaction)	12.0
Compacted Subgrade (95% Minimum Relative Compaction)	12.0

* Imported Non-Expansive Fill per the gradation requirements of Section 8.6.7

8.13.3 The "heavy duty" pavement section was designed based on an 18 kip ESAL of 220,000, a design period of 10 years, and a k-value of 200 psi/in considering a recommended 6-inch layer of Class 2 aggregate base material (R-value of 78) over 12 inches of imported non-expansive fill, over the native compacted soils.

Pavement Component	Thickness, Inches
Portland Cement Concrete	6.5
Class 2 Aggregate Base (95% Minimum Relative Compaction)	6.0
Imported Granular Fill* (95% Minimum Relative Compaction)	12.0
Compacted Subgrade (95% Minimum Relative Compaction)	12.0

* Imported Non-Expansive Fill per the gradation requirements of Section 8.6.7

8.13.4 The PCC pavement should be constructed in accordance with American Concrete Institute requirements, the requirements of the project plans and specifications, whichever is the most stringent. The pavement design engineer should include appropriate construction details and specifications for construction joints, contraction joints, joint filler, concrete specifications, curing methods, etc.

8.13.5 Concrete used for PCC pavements shall possess a minimum flexural strength (modulus of rupture) of 500 pounds per square inch. A minimum compressive strength of 3,500 pounds per square inch, or greater as required by the pavement designer, is recommended. Specifications for the concrete to reduce the effects of excessive shrinkage, such as maximum water requirements for the concrete mix, allowable shrinkage limits, contraction joint construction requirements, etc. should be provided by the designer of the PCC pavement.

8.13.6 The pavement section thickness design provided above assumes the design and construction will include sufficient load transfer at construction joints. Coated dowels, keyed joints, Diamond Dowels, etc. are recommended for construction joints to transfer loads. The joint details should be specified by the pavement design engineer and provided on the plans.

8.13.7 Contraction and construction joints should include a joint filler/sealer to prevent migration of water into the subgrade soils. The type of joint filler should be specified by the pavement designer. The joint sealer and filler material should be maintained throughout the life of the pavement.

8.13.8 Contraction joints should have a depth of at least one-fourth the slab thickness, e.g., 1.5-inch for a 6-inch slab. Specifications for contraction joint spacing, timing and depth of sawcuts should be included in the plans and specifications.

8.13.9 Stresses are anticipated to be greater at the edges and construction joints of the pavement section. A thickened edge is recommended on the outside of slabs subjected to wheel loads.

8.13.10 Joint spacing in feet should not exceed twice the slab thickness in inches, e.g., 12 feet by 12 feet for a 6-inch slab thickness. Regardless of slab thickness, joint spacing should not exceed 15 feet.

8.13.11 Lay out joints to form square panels. When this is not practical, rectangular panels can be used if the long dimension is no more than 1.5 times the short.

8.13.12 Isolation (expansion) joints should extend the full depth and should be used only to isolate fixed objects abutting or within paved areas.

8.13.13 Pavement section design assumes that proper maintenance such as sealing and repair of localized distress will be performed on a periodic basis.

8.13.14 Pavement construction should conform to the State of California Standard Specifications.

8.14 Underground Storm Water Infiltration Systems

8.14.1 In general, due to the potential for expansion related heave, or settlement from the introduction of water and long term saturation, stormwater infiltration systems which concentrate surface or subsurface water below or adjacent to existing slopes or proposed improvements are not recommended. If these types of features are required, sufficient setbacks to existing improvements and slopes should be maintained. Alternatively, specific measures such as deepened curbs, cutoffs, liners, etc. could be incorporated in the designs to reduce the potential for excessive settlement of improvements due to moisture and free-water migration from storm water systems. Where onsite stormwater system features are required for the project by a regulatory agency, these systems should be setback as far as possible from the proposed structures and improvements which are sensitive to settlement. At a minimum, it is recommended that storm water disposal systems be setback at least 30 feet from the proposed building and all foundations. Storm water infiltration systems below pavements should be expected to require added maintenance and pavement repairs due to differential settlement of the pavements.

8.14.2 A variety of soil types were encountered in the east portion of the Camino Del Rio South frontage proposed for the infiltration system. The soils encountered in the test borings drilled for the percolation tests comprised silty sands and clayey sands. The estimated infiltration rates of the materials tested ranged from 0.1 to 0.5 inches per hour. Considering that clays with less infiltration likely exist, stormwater infiltration systems should be designed for an average un-factored infiltration rate of 0.1 inches per hour. At this rate, the site may be feasible for a partial infiltration system as defined by the City of San Diego Storm Water Standards.

8.14.3 Since the percolation tests do not take into account the long term effects of subgrade saturation, silt accumulation, vegetation, and deeper impermeable clay layers underlying the depths tested for percolation, an appropriate safety factor ranging from 3 to 10 is recommended or as required by the permitting agency, whichever is more stringent. The safety factor should be determined by the designer and should account for the consequences of exceeding the system capacity, regulatory agency requirements, uncertainty in the inflow rate calculations, the potential for artificial compaction of the soils (and subsequent reduction in permeability) during installation of the storm water system, the degree of maintenance that can be relied upon, and such factors as reduction in infiltration rate due to siltation.

8.14.4 The Contractor shall schedule Moore Twining to observe the bottom of the excavation for the subsurface storm water infiltration systems to observe the exposed soil conditions at the bottom of the excavation for consistency with the infiltration characteristics of the soils anticipated based on this investigation. Cemented soils encountered in the excavation (if any) should be removed from the bottom of the infiltration areas and replaced with a suitable drainage/filter material specified by the designer. The Contractor shall schedule Moore Twining to observe the removal of the cemented materials and replacement with the suitable drainage/filter material.

8.14.5 The bottom of the excavations for the infiltration systems should be excavated to a neat, undisturbed condition prior to construction of the storm water infiltration system. Equipment shall not be allowed to operate in the excavation and the contractor's installation procedures should be performed so that compaction of the soils at the bottom of the excavation does not occur. The contractor shall use such procedures as necessary to achieve a smooth, undisturbed condition at the bottom of the excavations.

8.14.6 If an open graded material such as crushed rock is required around the storm water pipes, a crushed rock may be used as bedding, haunching and to 12 inches above the pipe, provided these materials are fully encapsulated in a geotextile filter fabric, such as Mirafi 140N, to prevent migration of fine grained soils into the porous material. Open-graded rock, such as gravel, should be placed in thin horizontal lifts (6 to 8 inch lift thickness) and compacted with vibratory equipment. A sufficient space should be provided beyond the storm drain pipes to allow for proper placement and compaction of the haunching and initial fill materials. Native on-site soils or import soils, may be used for the final fill from 12 inches above the pipe to final design grades. Where infiltration systems are buried below pavements, a layer of Mirafi 600X should be placed below the aggregate base layer over the top of the entire storm water disposal system and extending a horizontal distance of 10 feet beyond the outside edge of the storm water disposal system.

8.14.7 Our experience with infiltration systems is that they have a limited life span. Thus, regular maintenance should be expected to maximize the useful life of these facilities and future expansion or modification of these systems should be anticipated to maintain functionality.

8.14.8 After installation, the bottom of storm water system areas should be flooded with a head of six (6) inches of water to induce settlement prior to construction of the overlying pavements. The objective is for the soils below the proposed infiltration system to receive sufficient water that is evenly distributed to saturate the entire bottom and sides of these trenches prior to placement of aggregate base. The contractor will be required to conduct the flooding under the observation of Moore Twining. These requirements should be specified on the plans.

8.14.9 The Contractor should be responsible for arranging for the manufacturer of the infiltration system (i.e., prefabricated infiltration chambers, etc.) to certify in writing that the pipes have been installed in accordance with their standards. The Contractor is responsible to have the manufacturer conduct sufficient site visits and have the manufacturer to verify that the pipes were installed in accordance with the minimum requirements of the manufacturer. These requirements should be specified on the plans.

8.14.10 For the remainder of the storm water system that consists of solid pipe (not perforated), the system should be designed to be “watertight.” The manufacturer should certify that the pipes proposed for the project are “watertight.” If encountered, leaks should be immediately repaired. Leaking storm drain could result in settlements, sloughing, etc. causing damage to surface and subsurface structures, pavements, flatwork, etc. The Contractor shall inspect the stormwater pipes associated with the storm water disposal system using a video camera inspection prior to placement of pavements and after pre-loading to verify that the pipelines are constructed properly and are “watertight.” The Contractor shall provide the video on both tape and CD with an audio and written narration by the video inspection firm to the Owner, confirming the watertight conditions prior to placing pavements or slabs in these areas.

8.15 Temporary Slopes and Excavations

8.15.1 It is the responsibility of the contractor to provide safe working conditions with respect to excavation slope stability. The contractor is responsible for site slope safety, classification of materials for excavation purposes, and maintaining slopes in a safe manner during construction. The grades, classification and height recommendations presented for temporary slopes are for consideration in preparing budget estimates and evaluating construction procedures.

8.15.2 Temporary excavations should be constructed in accordance with CAL OSHA requirements. However, temporary cut slopes should also not be steeper than 1.5 to 1, horizontal to vertical, and flatter if possible. If excavations cannot meet these criteria, the temporary excavations should be supported by engineered shoring systems.

8.15.3 In no case should non-shored excavations extend below a 1.5H to 1V zone below existing offsite improvements, utilities, foundations and/or floor slabs which are to remain after construction. Excavations which are required to be advanced below the 1.5H to 1V envelope should be shored to support the soils, foundations, and slabs.

8.15.4 Shoring systems (if required) should be designed by an engineer with experience in designing shoring systems and registered in the State of California. Moore Twining should be provided with the shoring plan to assess whether the plan incorporates the recommendations in this geotechnical report.

8.15.5 Surface sheet flow drainage shall be directed away from the tops of all excavations. Positive drainage shall be established and maintained throughout the construction process.

8.15.6 Excavation and shoring stability should be monitored by the Contractor. Slope gradient estimates provided in this report do not relieve the Contractor of the responsibility for excavation safety. In the event that tension cracks or distress to the structure occurs, during or after excavation, the owners and Moore Twining should be notified immediately and the Contractor should take appropriate actions to minimize further damage or injury.

8.15.7 Utility trenches should not be constructed within a zone defined by a line that extends at an inclination of 1.5 horizontal to 1 vertical downward from the bottom of building foundations.

8.16 Utility Trenches

8.16.1 The utility trench subgrade should be prepared by excavation of a neat trench without disturbance to the bottom of the trench. If sidewalls are unstable the Contractor shall either slope the excavation to create a stable sidewall or shore the excavation. All trench subgrade soils disturbed during excavation, such as by accidental over-excavation of the trench bottom, or by excavation equipment with cutting teeth, should be compacted to a minimum of 92 percent relative compaction prior to placement of bedding material. The Contractor is responsible for notifying Moore Twining when these conditions occur and arrange for Moore Twining to observe and test these areas prior to placement of pipe bedding. The Contractor shall use such equipment as necessary to achieve a smooth undisturbed native soil surface at the bottom of the trench with no loose material at the bottom of the trench. The Contractor shall either remove all loose soils or compact the loose soils as engineered fill prior to placement of pipe and backfill of the trench.

8.16.2 The trench width, type of pipe bedding, the type of initial backfill, and the compaction requirements of bedding and initial backfill material for utility trenches (storm drainage, sewer, water, electrical, gas, cable, phone, irrigation, etc.) should be specified by the project Civil Engineer or applicable design professional in compliance with the manufacturer's requirements, governing agency requirements and this report, whichever is more stringent. The contractor is responsible for contacting the governing agency to determine the requirements for pipe bedding, pipe zone and final backfill. The contractor is responsible for notifying the Owner and Moore Twining if the requirements of the agency and this report conflict, the most stringent applies. For flexible polyvinylchloride (PVC) pipes, these requirements should be in accordance with the manufacturer's requirements or ASTM D-2321, whichever is more stringent, assuming a hydraulic gradient exists (gravel, rock, crushed gravel, etc. cannot be used as backfill on the project). The width of the trench should provide a minimum clearance of 8 inches between the sidewalls of the pipe and the trench, or as necessary to provide a trench width that is 12 inches greater than 1.25 times the outside diameter of the pipe, whichever is greater. As a minimum, the pipe bedding should consist of 4 inches of compacted (92 percent relative compaction) select sand with a minimum sand equivalent of 30 and meeting the following requirements: 100 percent passing the 1/4 inch sieve, a minimum of 90 percent passing the No. 4 sieve and not more than 10 percent passing the No. 200 sieve. The bottom of the trench should be compacted as engineered fill prior to placement of the pipe bedding. The haunches and initial backfill (12 inches above the top of pipe) should consist of a select sand meeting these sand equivalent and gradation requirements that is placed in maximum 6-inch thick lifts and compacted to a minimum relative compaction of 92 percent using hand equipment. The final fill (12 inches above the pipe to the surface) should be on-site or imported, non-expansive materials moisture conditioned to within optimum to three (3) percent above optimum moisture content and compacted to a minimum of 92 percent relative compaction. The project civil engineer should take measures to control migration of moisture in the trenches such as slurry collars, etc.

8.16.3 If ribbed or corrugated HDPE or metal pipes are used on the project, then the backfill should consist of select sand with a minimum sand equivalent of 30, 100 percent passing the 1/4 inch sieve, a minimum of 90 percent passing the No. 4 sieve and not more than 10 percent passing the No. 200 sieve. The sand should be placed in maximum 6-inch thick lifts, extending to at least 1 foot above the top of pipe, and compacted to a minimum relative compaction of 92 percent using hand equipment. Prior to placement of the pipe, as a minimum, the pipe bedding should consist of 4 inches of compacted (92 percent relative compaction) sand meeting the above sand equivalent and gradation requirements for select sand bedding. The width of the trench should meet the requirements of ASTM D2321 listed in Table No. 5, below (minimum manufacturer requirements). As an alternative to the trench width recommended above and the use of the select sand bedding, a lesser trench width for HDPE pipes may be used if the trench is backfilled with a 2-sack sand-cement slurry from the bottom of the trench to 1 foot above the top of the pipe.

Table No. 5
Minimum Trench Widths for HDPE Pipe with Sand (Caltrans Sand Bedding) Initial Backfill

Inside Diameter of HDPE Pipe (inches)	Outside Diameter of HDPE Pipe (inches)	Minimum Trench Width (inches) per ASTM D2321
12	14.2	30
18	21.5	39
24	28.4	48
36	41.4	64
48	55	80
60	67.3	96

8.16.4 Open graded gravel and rock material such as ¾-inch crushed rock or ½-inch crushed rock should not be used as backfill including trench backfill. In the event gravel or rock is required by a regulatory agency for use as backfill (Contractor to obtain a letter from the agency stating the requirement for rock and/or gravel as backfill), all open graded materials shall be fully encased in a geotextile filter fabric, such as Mirafi 140N, to reduce the potential for migration of fine grained soils into the porous material. Gravel and rock cannot be used without the written approval of Moore Twining.

8.16.5 Utility trench backfill should be compacted in accordance with the recommendations for engineered fill included in Section 8.6.10 of this report. The Contractor should use appropriate equipment and methods to avoid damage to utilities and/or structures during placement and compaction of the backfill materials.

8.16.6 On-site soils and approved imported engineered fill may be used as final backfill in trenches.

8.16.7 Jetting of trench backfill is not allowed to compact the backfill soils.

8.16.8 Where utility trenches extend from the exterior to the interior limits of a building, lean concrete should be used as backfill material for a minimum distance of 2 feet laterally on each side of the exterior building line to prevent the trench from acting as a conduit to exterior surface water.

8.16.9 Storm drains and/or utility lines should be designed to be watertight. If encountered, leaks should be immediately repaired. Leaking storm drain and/or utility lines could result in trench failure, sloughing and/or soil heave causing damage to surface and subsurface structures, pavements, flatwork, etc. In addition, landscaping irrigation systems should be monitored for leaks. It is recommended that the pipelines, stormwater, sewer, water, retaining wall drains, etc. be inspected by video inspection prior to placement of foundations, slabs-on-grade or pavements to verify that the pipelines are constructed properly and are watertight. The Contractor shall provide to Home Depot and Moore Twining a copy of video tape and a written description of the pipe condition prepared by the video inspection firm prior to placement of improvements above the utilities. In addition, the Contractor is required to inspect and test the utility lines as required by the pipe manufacturer and governing agencies.

8.16.10Utility trenches should not be constructed within a zone defined by a line that extends at an inclination of 1.5 horizontal to 1 vertical downward from the bottom of building foundations.

8.16.11 The project Civil Engineer should include slurry type cutoff collars along utility trenches at critical locations to prevent the surface water and groundwater from draining along the trench backfill/bedding material. For bidding purposes, the Contractor should assume for the project a minimum of ten (10) 18- inch wide collars with 1.5 cubic yards of 2-sack concrete per collar.

8.17 Corrosion Protection

8.17.1 Based on the National Association of Corrosion Engineers corrosion severity rating listed in Section 6.10 of this report, the analytical results of sample analyses indicate a “highly corrosive” to “corrosive” corrosion potential. Therefore, buried metal objects should be protected in accordance with the manufacturer's recommendations based on these conditions. The evaluation was limited to the effects of soils to metal objects; corrosion due to other potential sources, such as stray currents and groundwater, was not evaluated. If piping or concrete are placed in contact with deeper soils or engineered fill, these soils should be analyzed to evaluate the corrosion potential of these soils.

8.17.2 Corrosion of concrete due to sulfate attack is not anticipated based on the concentration of sulfates determined for the near-surface soils (negligible exposure). According to provisions of ACI 318, section 4.3, the sulfate concentration falls in the negligible classification (0.00 to 0.10 percent by weight) for concrete. Therefore, no restrictions are required regarding the type, water-to-cement ratio, or strength of the concrete used for foundation and slabs due to the sulfate content. However, a low water to cement ratio is recommended for slabs on grade as recommended for exposed concrete slabs to reduce shrinkage.

8.17.3 These soil corrosion data should be provided to the manufacturers or suppliers of materials that will be in contact with soils (pipes or ferrous metal objects, etc.) to provide assistance in selecting the protection and materials for the proposed products or materials. If the manufacturers or suppliers cannot determine if materials are compatible with the soil corrosion conditions, a professional consultant, i.e., a corrosion engineer, with experience in corrosion protection should be consulted to design parameters. Moore Twining is not a corrosion engineer; thus, cannot provide recommendations for mitigation of corrosive soil conditions. It is recommended that a corrosion engineer be consulted for the site specific conditions.

9.0 DESIGN CONSULTATION

9.1 Moore Twining should be retained to review those portions of the contract drawings and specifications that pertain to earthwork operations and foundations prior to finalization to determine whether they are consistent with our recommendations. This service is not part of this current contractual agreement.

9.2 It is the client's responsibility to provide plans and specification documents for our review prior to their issuance for construction bidding purposes.

9.3 If Moore Twining is not retained for the plan review, we assume no liability for the misinterpretation of our conclusions and recommendations. This review is documented by a formal plan/specification review report provided by Moore Twining.

10.0 CONSTRUCTION MONITORING

10.1 It is recommended that Moore Twining be retained to observe the excavation, earthwork, and foundation phases of work to determine that the subsurface conditions are compatible with those used in the analysis and design.

10.2 Moore Twining can conduct the necessary observation and field testing to provide results so that action necessary to remedy indicated deficiencies can be taken in accordance with the plans and specifications. Upon completion of the work, a written summary of our observations, field testing and conclusions will be provided regarding the conformance of the completed work to the intent of the plans and specifications. This service is not, however, part of this current contractual agreement.

10.3 In the event that the earthwork operations for this project are conducted such that the construction sequence is not continuous, (or if construction operations disturb the surface soils) it is recommended that the exposed subgrade that will receive floor slabs be tested to verify adequate compaction and/or moisture conditioning. If adequate compaction or moisture contents are not verified, the fill soils should be over-excavated, scarified, moisture conditioned and compacted are recommended in the Recommendations of this report.

10.4 The construction monitoring is an integral part of this investigation. This phase of the work provides Moore Twining the opportunity to verify the subsurface conditions interpolated from the soil borings and make alternative recommendations if the conditions differ from those anticipated.

10.5 If Moore Twining is not afforded the opportunity to provide engineering observation and field-testing services during construction activities related to earthwork, foundations, pavements and trenches; then, Moore Twining will not be responsible for compliance of any aspect of the construction with our recommendations or performance of the structures or improvements if the recommendations of this report are not followed. After their review, the firm should, in writing, state that they understand and agree with the conclusions and recommendations of this report and agree to conduct sufficient observations and testing to ensure the construction complies with this report's recommendations. Moore Twining should be notified, in writing, if another firm is selected to conduct observations and field-testing services prior to construction.

10.6 Upon the completion of work, a final report should be prepared by Moore Twining. This report is essential to ensure that the recommendations presented are incorporated into the project construction, and to note any deviations from the project plans and specifications. The client should notify Moore Twining upon the completion of work to prepare a final report summarizing the observations during site preparation activities relative to the recommendations of this report. This service is not, however, part of this current contractual agreement.

11.0 NOTIFICATION AND LIMITATIONS

11.1 The conclusions and recommendations presented in this report are based on the information provided regarding the proposed construction, and the results of the field and laboratory investigation, combined with interpolation of the subsurface conditions between boring locations. The nature and extent of subsurface variations between borings may not become evident until construction.

11.2 If variations or undesirable conditions are encountered during construction, Moore Twining should be notified promptly so that these conditions can be reviewed and our recommendations reconsidered where necessary. It should be noted that unexpected conditions frequently require additional expenditures for proper construction of the project.

11.3 If the proposed construction is relocated or redesigned, or if there is a substantial lapse of time between the submission of our report and the start of work (over 12 months) at the site, or if conditions have changed due to natural cause or construction operations at or adjacent to the site, the conclusions and recommendations contained in this report should be considered invalid unless the changes are reviewed and our conclusions and recommendations modified or approved in writing.

11.4 Changed site conditions, or relocation of proposed structures, may require additional field and laboratory investigations to determine if our conclusions and recommendations are applicable considering the changed conditions or time lapse.

11.5 The conclusions and recommendations contained in this report are valid only for the project discussed in the Anticipated Construction section of this report. The use of the information and recommendations contained in this report for structures on this site not discussed herein or for structures on other sites not discussed in this report is not recommended. The entity or entities that use or cause to use this report or any portion thereof for other structures or site not covered by this report shall hold Moore Twining, its officers and employees harmless from any and all claims and provide Moore Twining's defense in the event of a claim.

11.6 This report is issued with the understanding that it is the responsibility of the client to transmit the information and recommendations of this report to developers, owners, buyers, architects, engineers, designers, contractors, subcontractors, and other parties having interest in the project so that the steps necessary to carry out these recommendations in the design, construction and maintenance of the project are taken by the appropriate party.

11.7 This report presents the results of a geotechnical engineering investigation only and should not be construed as an environmental audit or study.

11.8 Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally-accepted engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied.

11.9 Reliance on this report by a third party (i.e., that is not a party to our written agreement) is at the party's sole risk. If the project and/or site are purchased by another party, the purchaser must obtain written authorization and sign an agreement with Moore Twining in order to rely upon the information provided in this report for design or construction of the project.

We appreciate the opportunity to be of service to Home Depot U.S.A., Inc. on this project. If you have any questions regarding this report, or if we can be of further assistance, please contact us at your convenience at (800) 268-7201.

Sincerely,
MOORE TWINING ASSOCIATES, INC.
Geotechnical Engineering Division

Scott W. Krauter, RGE
Assistant Manager

SCOTT KRAUTER
No. C049956
No. GE-2358
Exp. 12/31/20

KENNETH JAMES CLARK
No EG 1854
Exp. 5-31-21

Kenneth J. Clark, CEG
Engineering Supervisor

Read L. Andersen, RGE
Manager

READ L. ANDERSEN
2810
EXP. 12-31-20

List of References

California Division of Mines and Geology (CDMG) Open File report 95-03 titled Landslide Identification Map No. 33; Landslide Hazards in the Southern Part of the San Diego Metropolitan Area by Tan (1995).

CDMG "Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Landslide Hazards in California (2002)

CDMG Bulletin 200 - "Geology of the San Diego Metropolitan Area," prepared by Michael P. Kennedy and the California Division of Mines and Geology, (1975)

City of San Diego, Guidelines for Geotechnical Reports, (2018)

City of San Diego, Seismic Safety Study, "Geologic Hazards and Faults" (Grid 21 of the Hazard Map Series) dated April 3, 2008.

City of San Diego, Storm Water Standard - prepared by Geosyntec, effective date October 1, 2018

EDR - Aerial Photo Decade Package for the years 1928, 1949, 1953, 1964, 1966, 1970, 1979, and 1985 of the site (1561 Camino Del Rio South)

Home Depot Design Criteria Manual (dated October 17, 2016)

Geologic Map of the San Diego 30'x60' Quadrangle, California, Regional Geologic Map Series, prepared by the California Geological Survey and compiled by Michael P. Kennedy and Siang S. Tan, dated 2008

K&S Engineering, Inc. - Undated exhibit showing existing topography of the Scottish Rite Events Center property

Lars Andersen & Associates - Various Site plans site plan showing existing topography and the proposed building and improvements dated March 26, 2019 through December 12, 2019.

Lennart and Associates - Soils Investigations and Design Recommendations for First Methodist Church of San Diego; Alvarado Freeway and Texas Street; San Diego, California , dated 1962

Professional Service Industries, Inc. - Geotechnical Engineering Services; Proposed Marriott Residence Inn; Hotel Circle South; Sand Diego, California, dated February 28, 2000

Professional Service Industries, Inc. - Geotechnical Engineering Services; Proposed La Quinta Inn; Hotel Circle South; Sand Diego, California, dated November 30, 1997

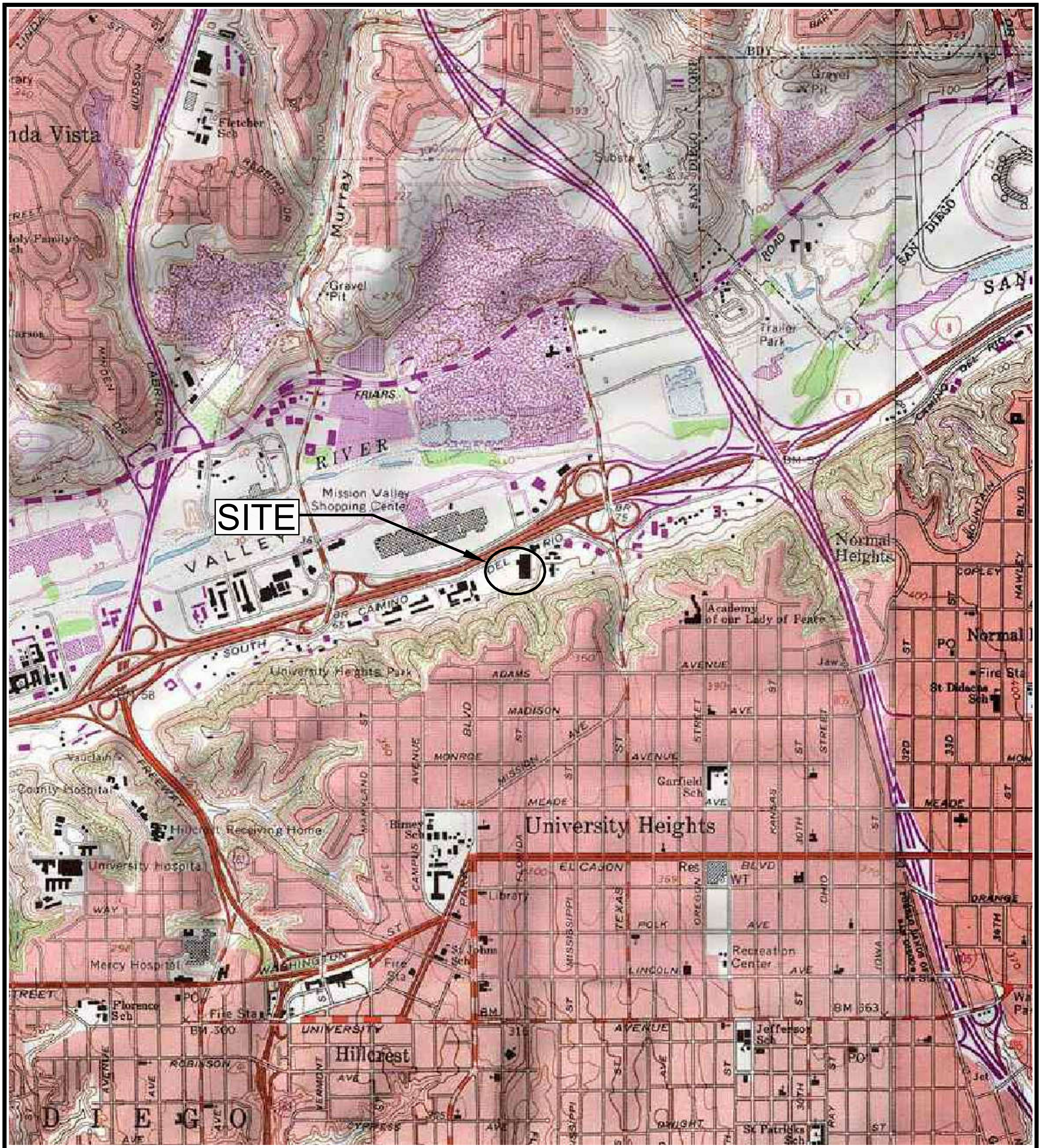
List of References - Continued

San Dieguito Engineering, Inc. - several versions of slope maintenance and improvement plans dated March 26, 2019 through December 2020.

U.S. Geological Survey Professional Paper 851 - Soil Slips, Debris Flows, and Rainstorms in the Santa Monica Mountains and Vicinity, Southern California, prepared by Russell H. Campbell, dated 1975, first printing.

APPENDIX A

DRAWINGS



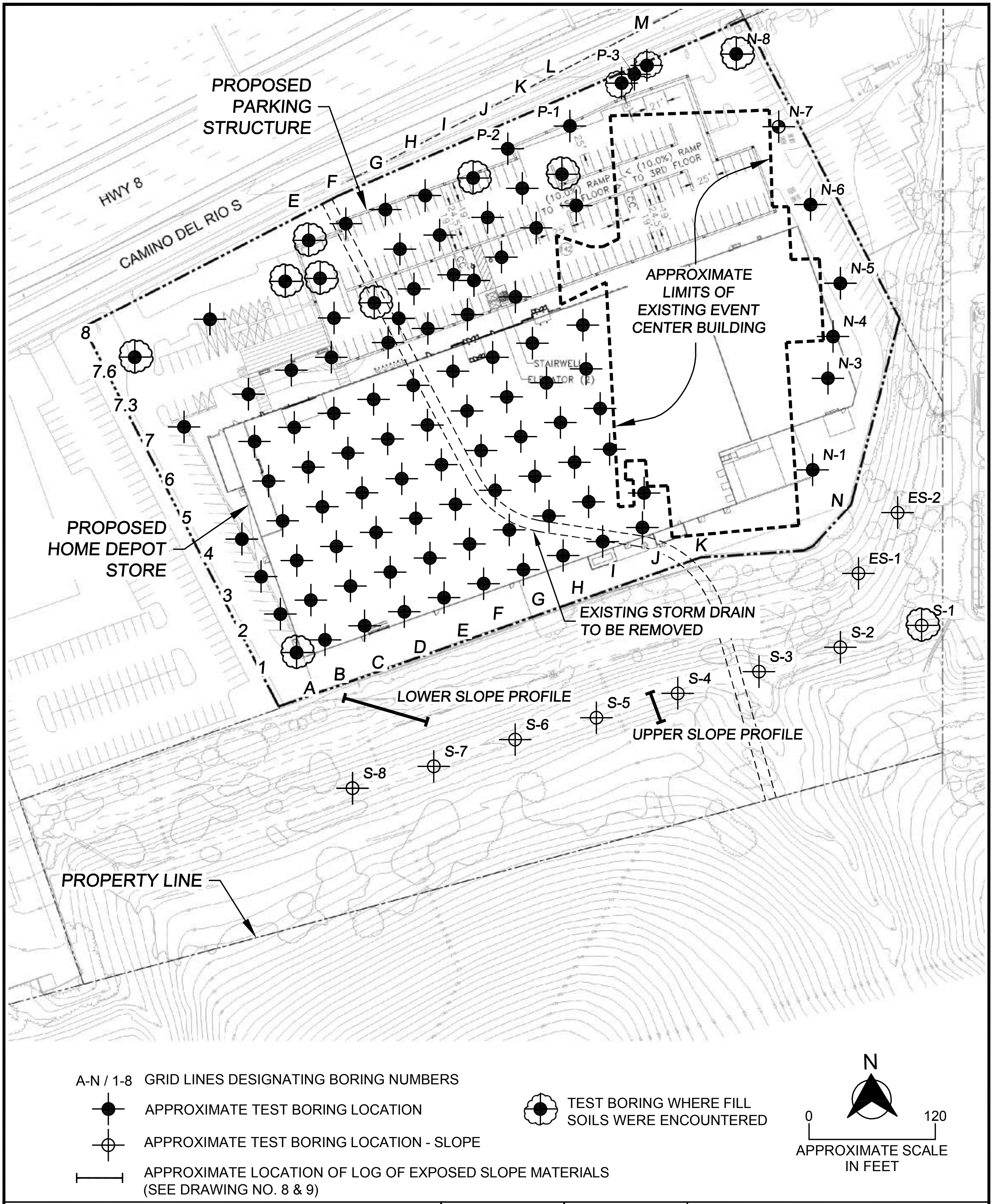
SOURCE: U.S.G.S. TOPOGRAPHIC MAP, 7 ½ MINUTE SERIES
LA JOLLA, CALIFORNIA QUADRANGLE 1996

0 2000
APPROXIMATE SCALE
IN FEET

SITE LOCATION MAP
PROPOSED HOME DEPOT STORE
1895 CAMINO DEL RIO SOUTH
SAN DIEGO, CALIFORNIA

FILE NO.: 050R0-01-01	DATE: 12/20/19
DRAWN BY: RM	APPROVED BY:
PROJECT NO. D050R0.01	DRAWING NO. 1

MOORE TWINING
ASSOCIATES, INC.



A-N / 1-8 GRID LINES DESIGNATING BORING NUMBERS

● APPROXIMATE TEST BORING LOCATION

○ APPROXIMATE TEST BORING LOCATION - SLOPE

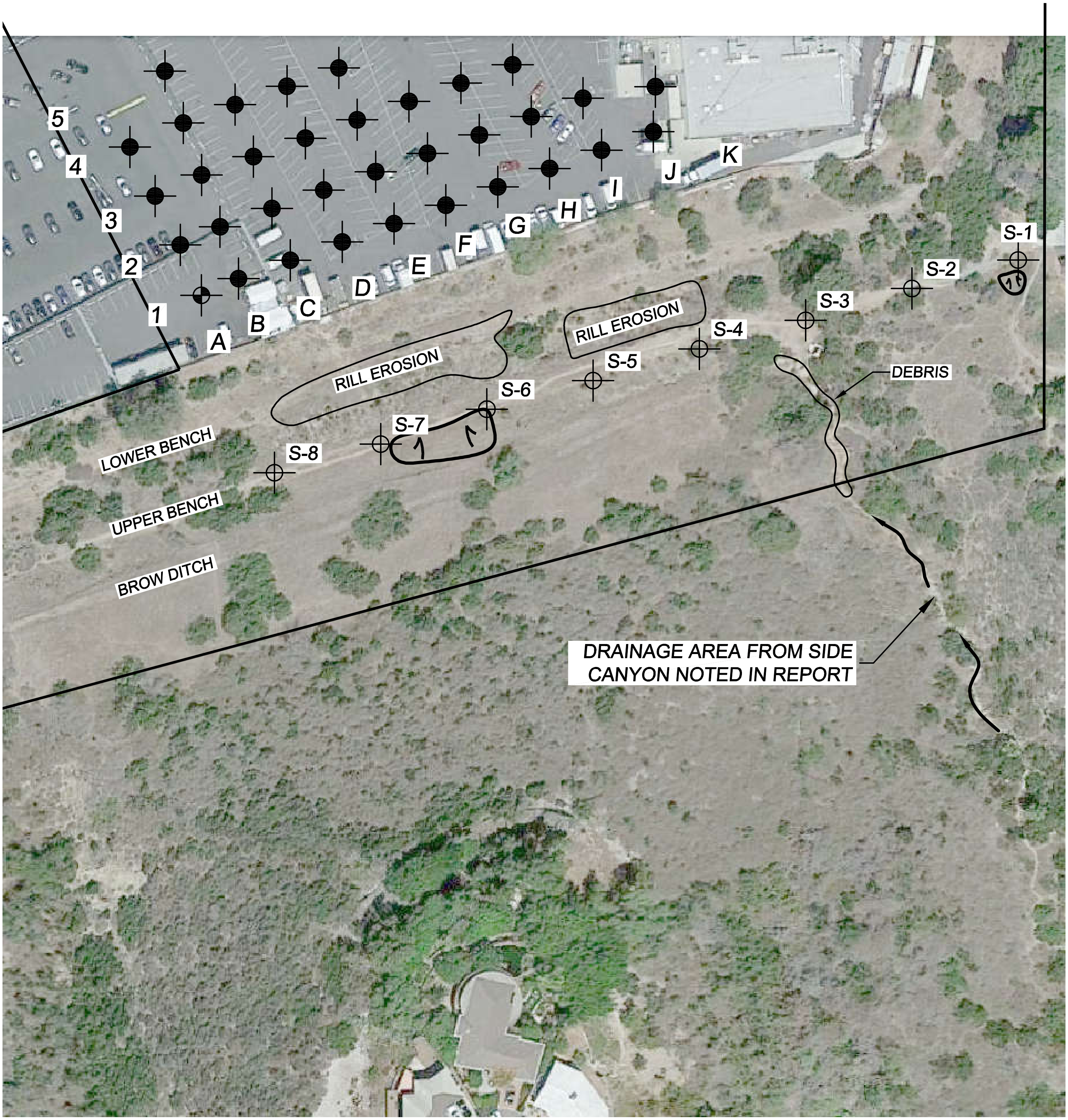
├─┤ APPROXIMATE LOCATION OF LOG OF EXPOSED SLOPE MATERIALS (SEE DRAWING NO. 8 & 9)

● TEST BORING WHERE FILL SOILS WERE ENCOUNTERED

TEST BORING LOCATION MAP
PROPOSED HOME DEPOT STORE
1895 CAMINO DEL RIO SOUTH
SAN DIEGO, CALIFORNIA

FILE NO. 050R0-01-02	DATE DRAWN: 01/09/20
DRAWN BY: RM	APPROVED BY:
PROJECT NO. D050R0.01	DRAWING NO. 2

MOORE TWINING ASSOCIATES, INC.



⌒	APPROXIMATE AREA OF LARGER, SHALLOW SOIL SLIPS
⌖	APPROXIMATE TEST BORING LOCATION - SLOPE
●	APPROXIMATE TEST BORING LOCATION

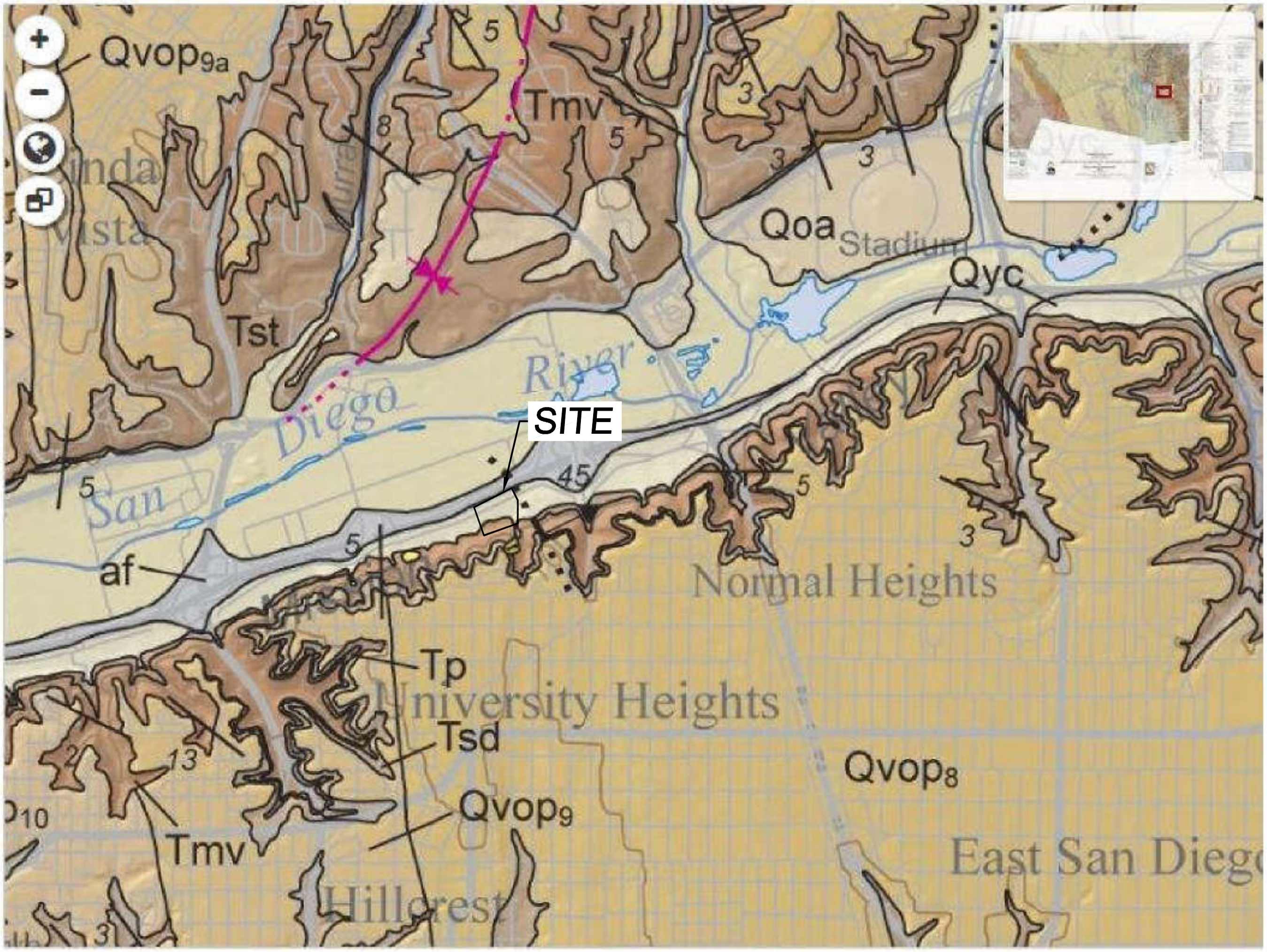
N

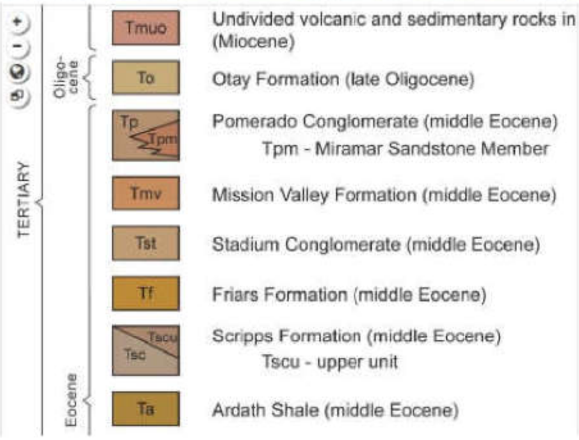
0 100
APPROXIMATE SCALE
IN FEET

SLOPE OBSERVED CONDITIONS
PROPOSED HOME DEPOT STORE
1895 CAMINO DEL RIO SOUTH
SAN DIEGO, CALIFORNIA

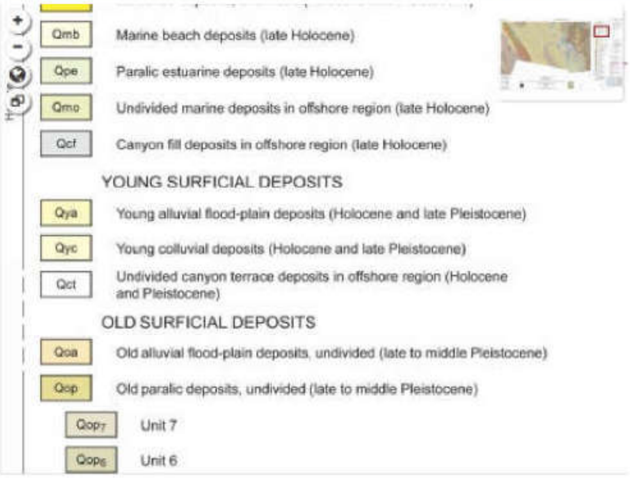
FILE NO. 050R0-01-02	DATE DRAWN: 01/09/20
DRAWN BY: RM	APPROVED BY:
PROJECT NO. D050R0.01	DRAWING NO. 3

MOORE TWINING
ASSOCIATES, INC.





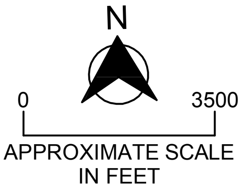
Oligo-cene	Tmuo	Undivided volcanic and sedimentary rocks in (Miocene)
	To	Otay Formation (late Oligocene)
TERTIARY	Tp Tpm	Pomerado Conglomerate (middle Eocene) Tpm - Miramar Sandstone Member
	Tmv	Mission Valley Formation (middle Eocene)
	Tst	Stadium Conglomerate (middle Eocene)
	Tf	Friars Formation (middle Eocene)
	Tscu Tsc	Scripps Formation (middle Eocene) Tscu - upper unit
Eocene	Ta	Ardath Shale (middle Eocene)



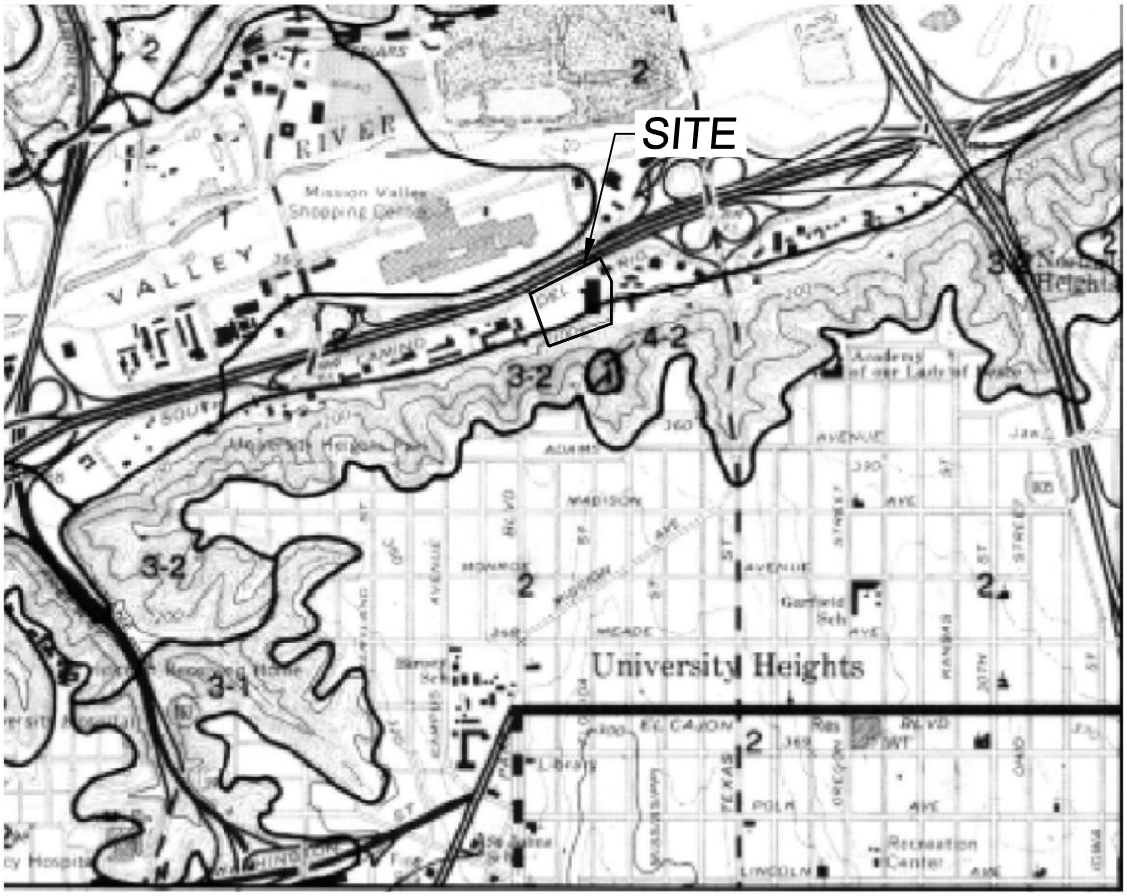
Qmb	Marine beach deposits (late Holocene)
Qpe	Paralic estuarine deposits (late Holocene)
Qmo	Undivided marine deposits in offshore region (late Holocene)
Qcf	Canyon fill deposits in offshore region (late Holocene)
	YOUNG SURFICIAL DEPOSITS
Qya	Young alluvial flood-plain deposits (Holocene and late Pleistocene)
Qyc	Young colluvial deposits (Holocene and late Pleistocene)
Qct	Undivided canyon terrace deposits in offshore region (Holocene and Pleistocene)
	OLD SURFICIAL DEPOSITS
Qoa	Old alluvial flood-plain deposits, undivided (late to middle Pleistocene)
Qop	Old paralic deposits, undivided (late to middle Pleistocene)
Qop_7	Unit 7
Qop_6	Unit 6

GEOLOGIC MAP OF THE SAN DIEGO 30' x 60' QUADRANGLE, CALIFORNIA
By
Michael P. Kennedy[1] and Siang S. Tan[1]
2008
Digital preparation by
Kelly R. Bovard[2], Anne G. Garcia[2], Diane Burns[2], and Carlos I. Gutierrez[1]

[1] Department of Conservation, California Geological Survey
[2] U.S. Geological Survey, Department of Earth Sciences, University of California, Riverside



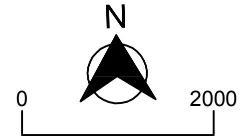
SITE GEOLOGIC MAP PROPOSED HOME DEPOT STORE 1895 CAMINO DEL RIO SOUTH SAN DIEGO, CALIFORNIA	FILE NO. 050R0-01-02	DATE DRAWN: 12/20/19	MOORE TWINING ASSOCIATES, INC.
	DRAWN BY: RM	APPROVED BY:	
	PROJECT NO. D050R0.01	DRAWING NO. 4	



RELATIVE LANDSLIDE SUSCEPTIBILITY AREAS

1	2	3-1	3-2	4-1	4-2
Least Susceptible	Marginally Susceptible	Generally Susceptible		Most Susceptible	

--------------------------------Increasing landslide susceptibility------------------------------>



APPROXIMATE SCALE
IN FEET

LANDSLIDE HAZARDS IN THE SOUTHERN PART OF THE SAN DIEGO METROPOLITAN AREA, SAN DIEGO COUNTY, CALIFORNIA

by

Siang S. Tan
Geologist

1995

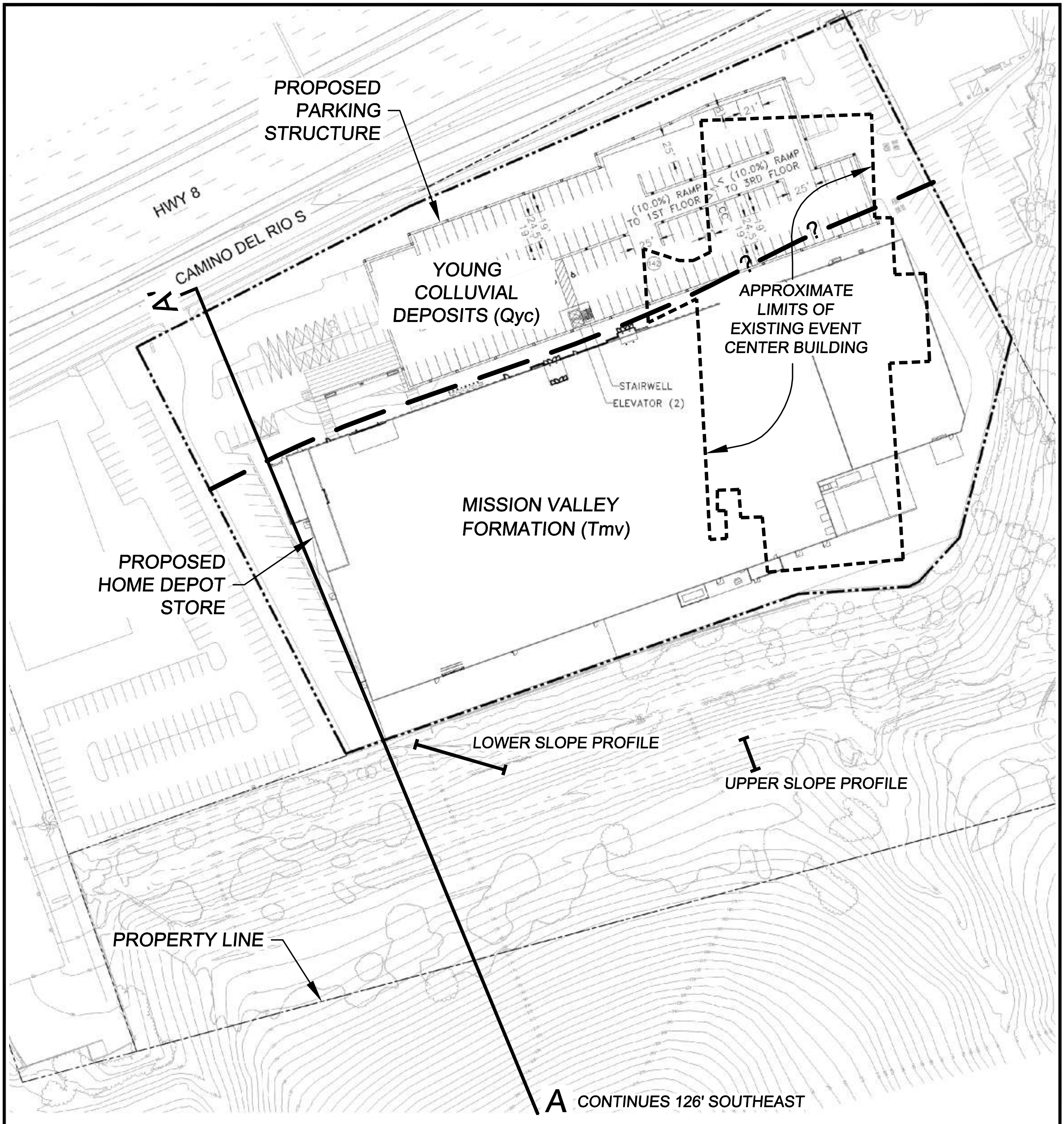
RELATIVE LANDSLIDE SUSCEPTIBILITY AND LANDSLIDE DISTRIBUTION MAP

LA JOLLA QUADRANGLE
(PLATE A)

MAPPED LANDSLIDE REFERENCED IN REPORT
PROPOSED HOME DEPOT STORE
1895 CAMINO DEL RIO SOUTH
SAN DIEGO, CALIFORNIA

FILE NO. 050R0-01-02	DATE DRAWN: 12/20/19
DRAWN BY: RM	APPROVED BY:
PROJECT NO. D050R0.01	DRAWING NO. 5

MOORE TWINING ASSOCIATES, INC.



A A' CROSS SECTION (SEE DRAWING NO. 7)

APPROXIMATE LOCATION OF LOG OF EXPOSED SLOPE MATERIALS
(SEE DRAWING NO. 8 & 9)

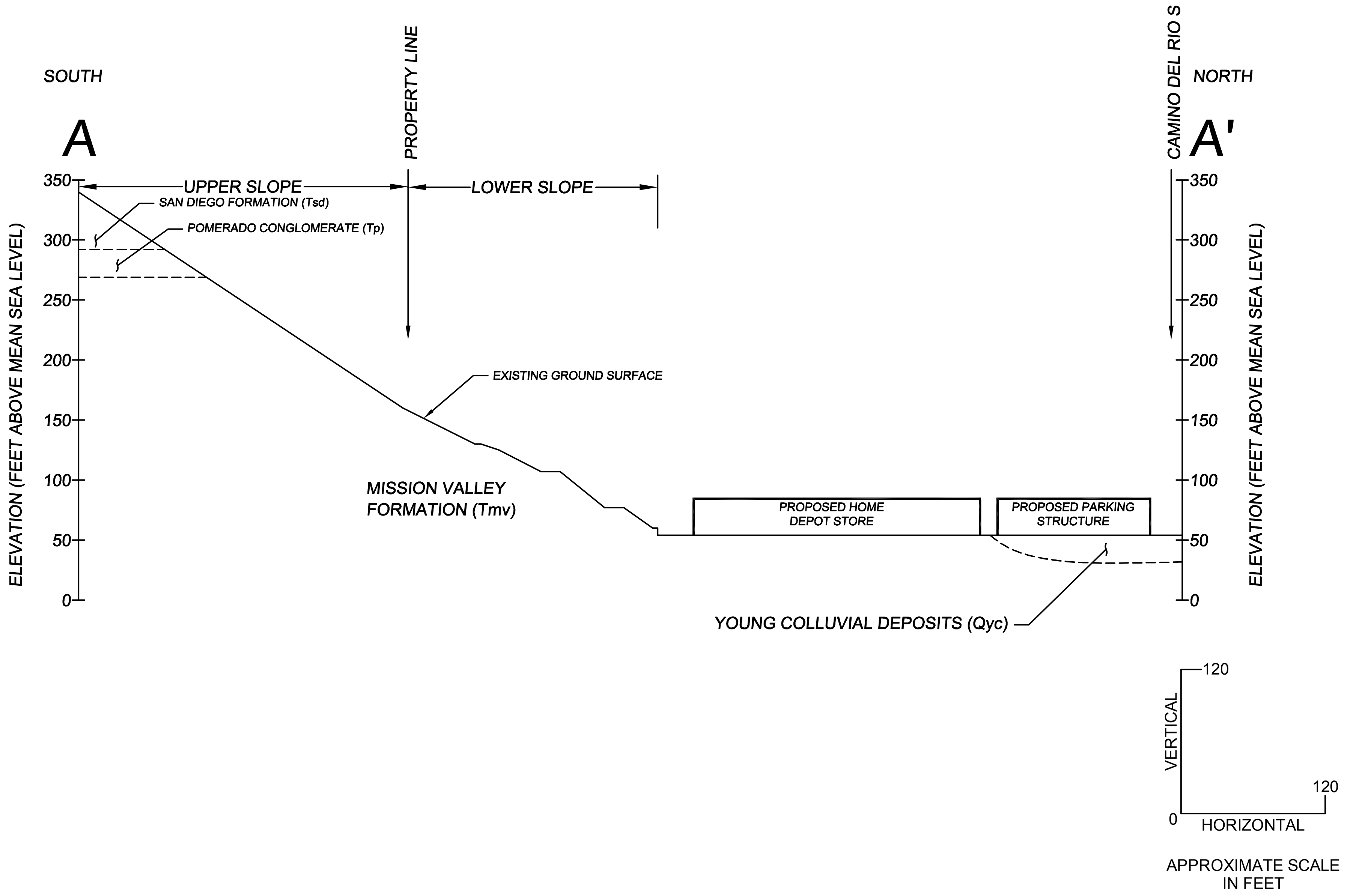
N

0 120
APPROXIMATE SCALE
IN FEET

SITE GEOLOGIC MAP
PROPOSED HOME DEPOT STORE
1895 CAMINO DEL RIO SOUTH
SAN DIEGO, CALIFORNIA

FILE NO. 050R0-01-02	DATE DRAWN: 01/09/20
DRAWN BY: RM	APPROVED BY:
PROJECT NO. D050R0.01	DRAWING NO. 6

MOORE TWINING ASSOCIATES, INC.

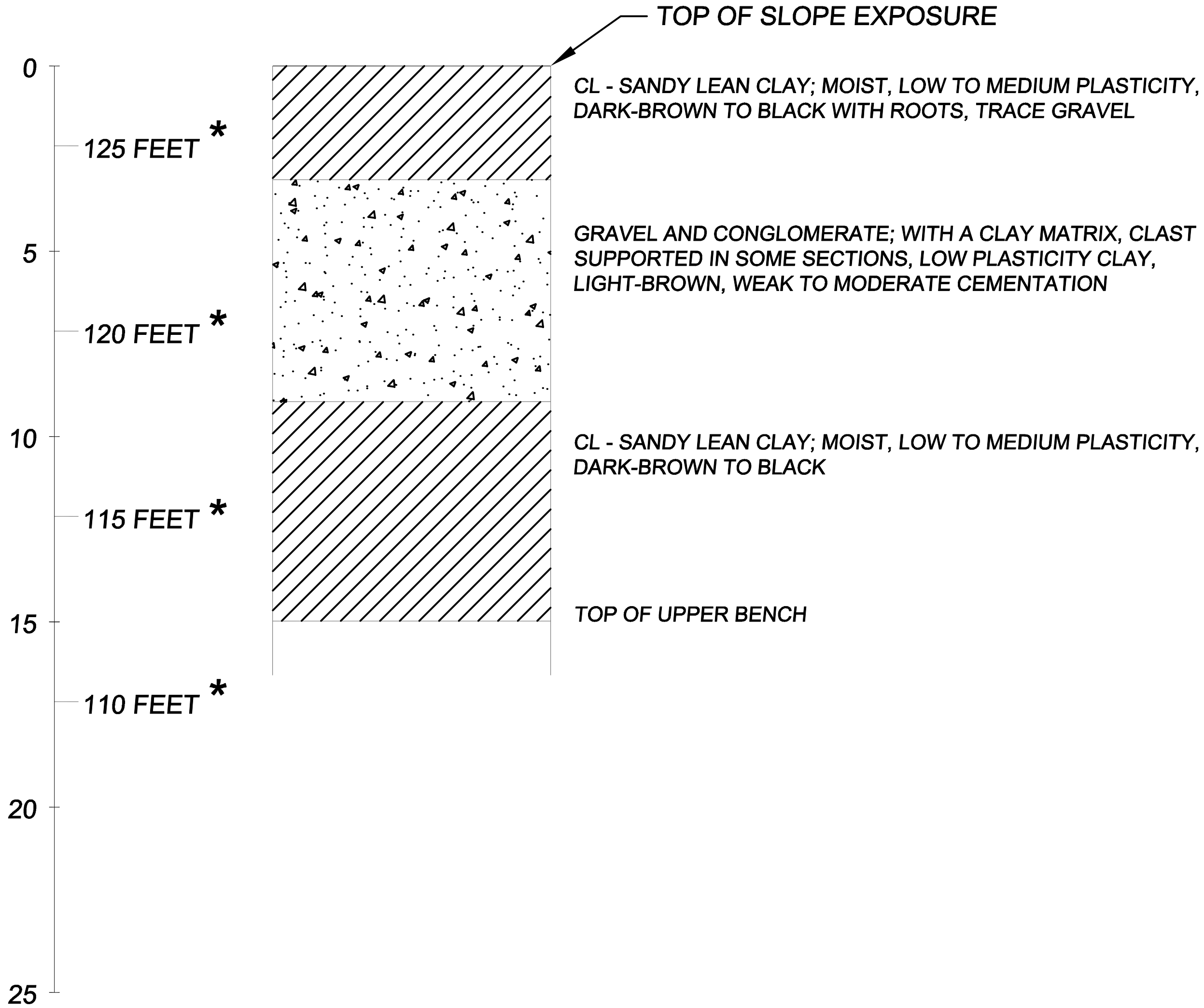


SITE GEOLOGIC CROSS SECTION A-A'
PROPOSED HOME DEPOT STORE
1895 CAMINO DEL RIO SOUTH
SAN DIEGO, CALIFORNIA

FILE NO. 050R0-01-02	DATE DRAWN: 01/09/20
DRAWN BY: RM	APPROVED BY:
PROJECT NO. D050R0.01	DRAWING NO. 7

MOORE TWINING
ASSOCIATES, INC.

LOG OF "UPPER SLOPE" EXPOSURE



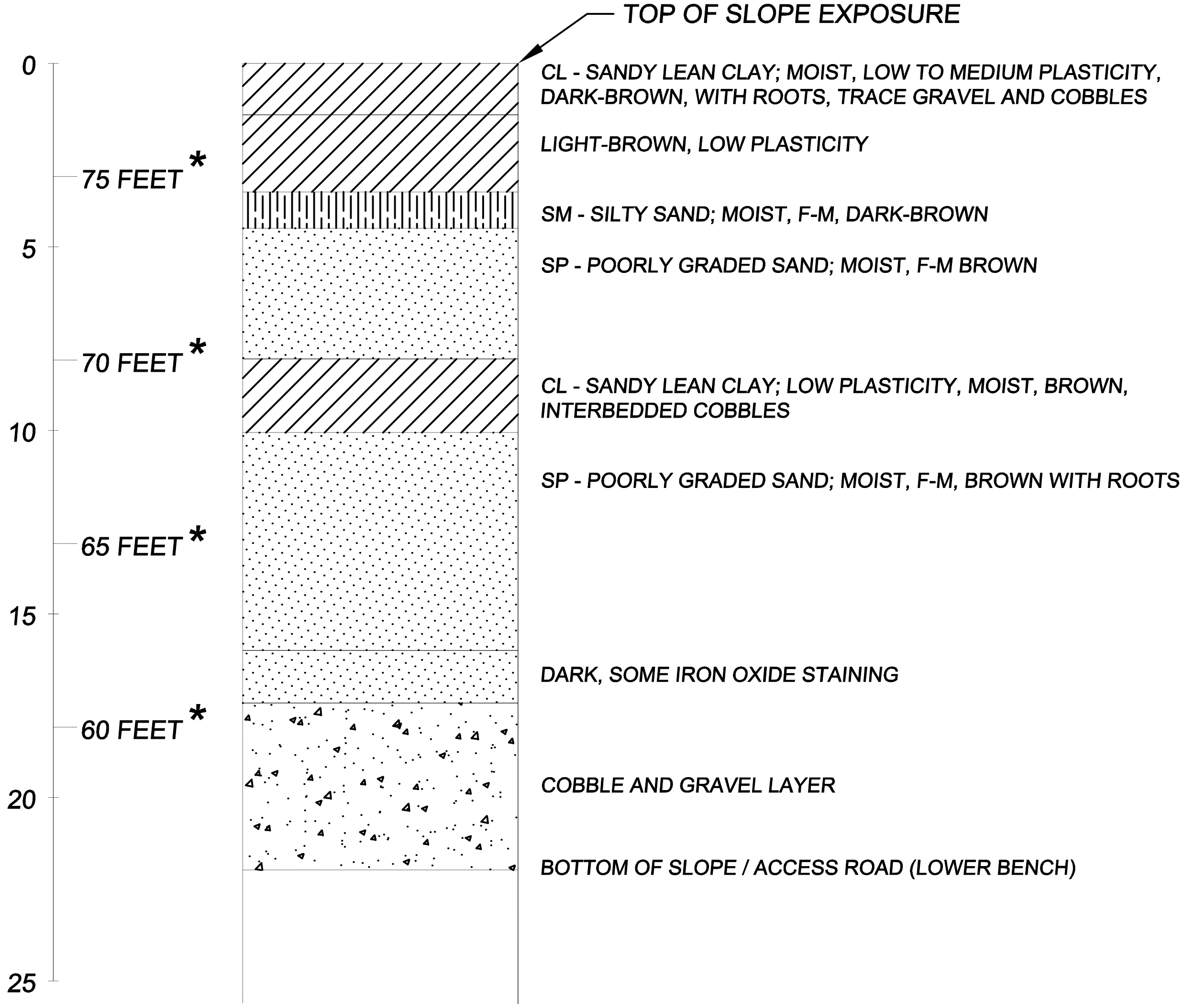
* ESTIMATED ELEVATION IN FEET BASED ON ELEVATION CONTOURS PROVIDED ON SITE PLAN BY SAN DIEGUITO ENGINEERING INC.

UPPER SLOPE SURFACE SOIL STRATIGRAPHY PROFILE
PROPOSED HOME DEPOT STORE
1895 CAMINO DEL RIO SOUTH
SAN DIEGO, CALIFORNIA

FILE NO. 050R0-01-02	DATE DRAWN: 01/09/20
DRAWN BY: RM	APPROVED BY:
PROJECT NO. D050R0.01	DRAWING NO. 8

MOORE TWINING ASSOCIATES, INC.

LOG OF "LOWER SLOPE" EXPOSURE



* ESTIMATED ELEVATION IN FEET BASED ON ELEVATION CONTOURS PROVIDED ON SITE PLAN BY SAN DIEGUITO ENGINEERING INC.

LOWER SLOPE SURFACE SOIL STRATIGRAPHY PROFILE
(EXPOSED TEMPORARY ROAD CUT)
PROPOSED HOME DEPOT STORE
1895 CAMINO DEL RIO SOUTH
SAN DIEGO, CALIFORNIA

FILE NO. 050R0-01-02	DATE DRAWN: 01/09/20
DRAWN BY: RM	APPROVED BY:
PROJECT NO. D050R0.01	DRAWING NO. 9

MOORE TWINING ASSOCIATES, INC.

Photograph No.1 – Looking south across Interstate 8 at the site. The upper native and lower benched cut slopes in the background. Also, note drainage canyon in the upper left.

Photograph No. 2 - On the lower cut slope bench looking west. Note recent washout yet to be repaired, and masonry erosion protection features at the base of this section of the middle slope.

Photograph No. 3 - On the upper cut slope bench looking west. Note accumulation of cobble and sediments at the base of the slope.

Photograph No. 4 - Looking west at native slope area above the cut slope (near south property line). Evidence of a brow ditch was noted, but ditch does not show any flow. Note that native grasses are not disturbed, and no evidence of erosion or instability was observed.

Photograph No. 5 - Looking southwest at the native slope area above the cut slope. Note the lower grass covered area and steeper upper potion are covered with undisturbed vegetation. No evidence of erosion, surface sliding, scarps or other features suggesting any recent slope instability are present.

Photograph No. 6 – Looking southwest at east facing drainage canyon slope from the east canyon area. This is the area above the site mapped by Tan (1995) as a slide area. No recent evidence of surface sliding, scarps or other features were noted suggesting recent slope instability.

Photograph No. 7 - Looking to the south at the slope section between upper and lower benches. Note surficial slumps, erosion, exposed soils with cobble material.

Photograph No. 8 - Showing typical a surficial slump observed in east section of upper cut slope (above upper bench)

Photograph No. 9 – Showing standing water on upper bench after recent rain. Bench grades in the area are toward the top of the middle slope section, and drainage blocked from moving west by accumulated sediments at the base of the slope.

Photograph No. 10 - Showing upper cut slope (section west of drainage). Note abundant cobbles, surface erosion and low cohesive soils

Photograph No. 11 - Showing upper cut slope (west section beyond Photograph No. 10 above). Note some surface slumps but less active erosion as noted in section with more granular materials.

Photograph No. 12 - Showing fine grained soils in the upper portion of exposed temporary road cut between base of slope and lower bench.

Photograph No. 13 - closeup of native Sandy Lean Clay Unit.

Photograph No. 14 - Showing granular soils in lower portion of exposed temporary road cut between base of slope and lower bench.

Photograph No. 15 - closeup of native Sand/Gravel/Cobble Unit.

APPENDIX B

LOGS OF BORINGS

This appendix contains the final logs of borings. These logs represent our interpretation of the contents of the field logs and the results of the field and laboratory tests.

The logs and related information depict subsurface conditions only at these locations and at the particular time designated on the logs. Soil conditions at other locations may differ from conditions occurring at these test boring locations. Also, the passage of time may result in changes in the soil conditions at these test boring locations.

In addition, an explanation of the abbreviations used in the preparation of the logs and a description of the Unified Soil Classification System are provided at the end of Appendix B.

MOORE TWINING ASSOCIATES, INC.

Test Boring: A-1

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

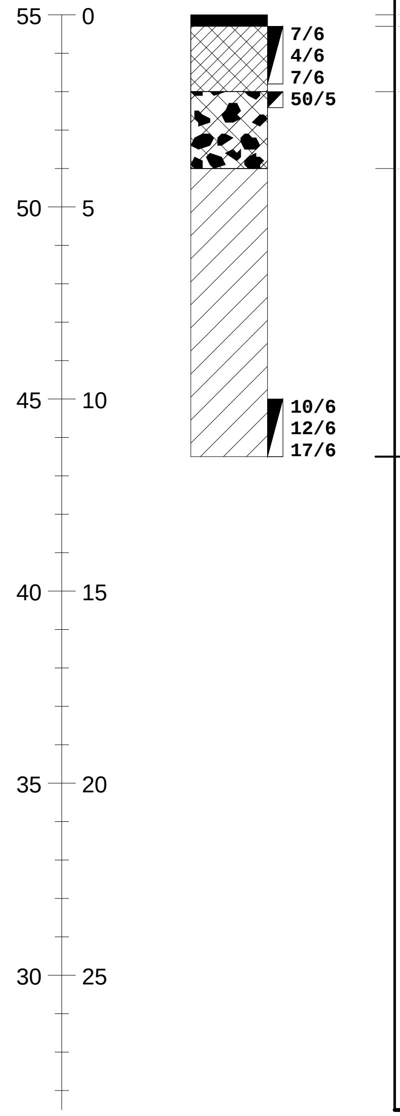
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/11/2019

Elevation: 55 Feet AMSL

Depth to Groundwater
First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
55 / 0	7/6 4/6 7/6	CL	AC = 3-1/4 inches AB = 1 inch		11	
	50/5	GC	FILL; SANDY LEAN CLAY, medium stiff, damp, low plastic, brown		>50	
		CL	FILL; CLAYEY GRAVEL with Cobbles, very dense coarse gravel and 3 to 5 inch cobbles at 3.5 feet, wire debris in cobbles			
	10/6 12/6 17/6		NATIVE: SANDY LEAN CLAY; stiff, damp, low to moderate plasticity, light brown with some fine to medium gravel		29	
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: A-2

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Logged By: JC

Date: 3/11/2019

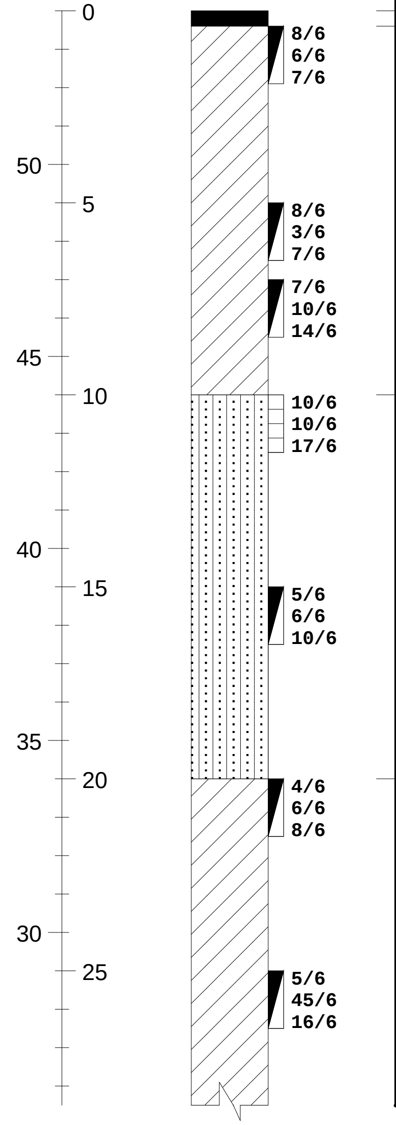
Drill Type: CME-75

Elevation: 54 Feet AMSL

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

Depth to Groundwater First Encountered During Drilling: 29.4 feet



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	8/6 6/6 7/6	CL	AC = 3 inches AB = 1½ inches SANDY LEAN CLAY; medium stiff, damp, low to moderate plasticity, brown to light brown	RV = 20	13	9
	8/6 3/6 7/6		At 5.5 feet, loose Silty Sand layer about 6 inches thick		10	7
	7/6 10/6 14/6		at 7 feet, iron oxide stains, sand content increase in 3 inch thick layers		24	20
	10/6 10/6 17/6	SM	SILTY SAND; medium dense, damp, fine grained, gray to gray-brown, some clay	DD= 107.7pcf -200= 33.8% LL = NP	27	7
	5/6 6/6 10/6		Color is brown		16	10
	4/6 6/6 8/6	CL	SANDY LEAN CLAY; medium stiff, moist, medium plastic, brown trace of fine gravel		14	16
	5/6 45/6 16/6		very dense Clayey Sand layer		61	13

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: A-2

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

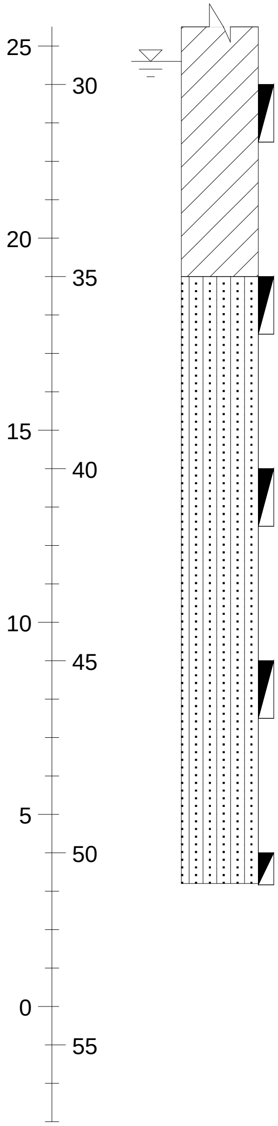
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/11/2019

Elevation: 54 Feet AMSL

Depth to Groundwater
First Encountered During Drilling: 29.4 feet



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
30	11/6 7/6 8/6		very moist, low plasticity, color is brown to light brown some coarse gravel		15	11
35	8/6 11/6 13/6	SM	SILTY SAND; medium dense, wet, fine grained, brown, trace clay		24	25
40	2/6 7/6 9/6		some fine gravel	-200 = 15.5%	16	21
45	25/6 38/6 43/6		Very dense with coarse gravel present		81	18
50	26/6 50/4				>50	12
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: A-3

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 3/12/2019

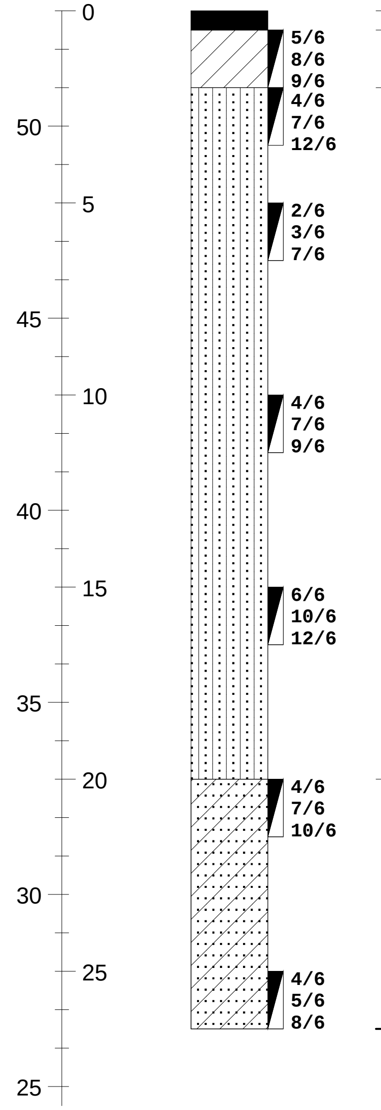
Drill Type: CME-75

Elevation: 53 Feet AMSL

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

Depth to Groundwater First Encountered During Drilling: N/A



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0	5/6 8/6 9/6	CL	AC = 4 inches AB = 2 inches SANDY LEAN CLAY; medium stiff, damp, low to moderate plasticity, brown with fine gravel		17	6
	4/6 7/6 12/6	SM	SILTY SAND, medium dense, damp, fine to coarse grained, brown with fine gravel and trace clay		19	9
5	2/6 3/6 7/6		at 5 feet, more fine grained silt		10	21
10	4/6 7/6 9/6		interbedded with Clayey Sand layers		16	
15	6/6 10/6 12/6		No Clayey Sand layers		22	
20	4/6 7/6 10/6	SC	CLAYEY SAND; medium dense, moist, fine grained, low plastic, brown trace fine gravel		17	
25	4/6 5/6 8/6		Grading to Sandy Lean Clay		17	
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: A-4

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

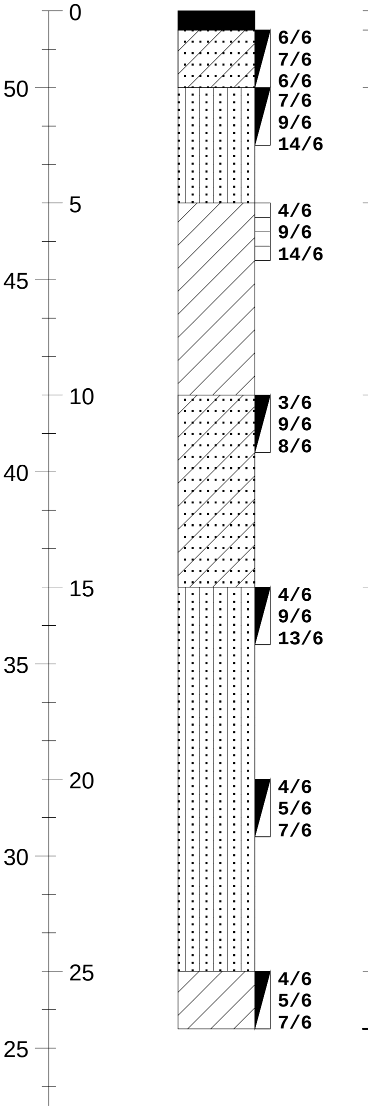
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/12/2019

Elevation: 52 Feet AMSL

Depth to Groundwater
First Encountered During Drilling: N/A



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0	6/6 7/6 6/6	SC	AC = 4½ inches AB = 1½ inches CLAYEY SAND: medium dense, damp, fine grained, light brown, some fine gravel		13	10
50	7/6 9/6 14/6	SM	SILTY SAND; medium dense, damp, fine grained, light gray, trace of caly		23	4
5	4/6 9/6 14/6	CL	SANDY LEAN CLAY; stiff, moist, low to moderate plasticity, brown interbedded with Silty Sand zones	DD= 99.6 pcf	23	14
10	3/6 9/6 8/6	SC	CLAYEY SAND; medium dense, moist, fine grained, brown		17	
15	4/6 9/6 13/6	SM	SILTY SAND; medium dense, moist, fine grained, light brown to light gray, trace of clay		22	
20	4/6 5/6 7/6		interbedded with Clayey Sand layers		12	
25	4/6 5/6 7/6	CL	SANDY LEAN CLAY; medium stiff, moist, low to moderate plasticity, brown to dark brown		12	
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: A-7

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

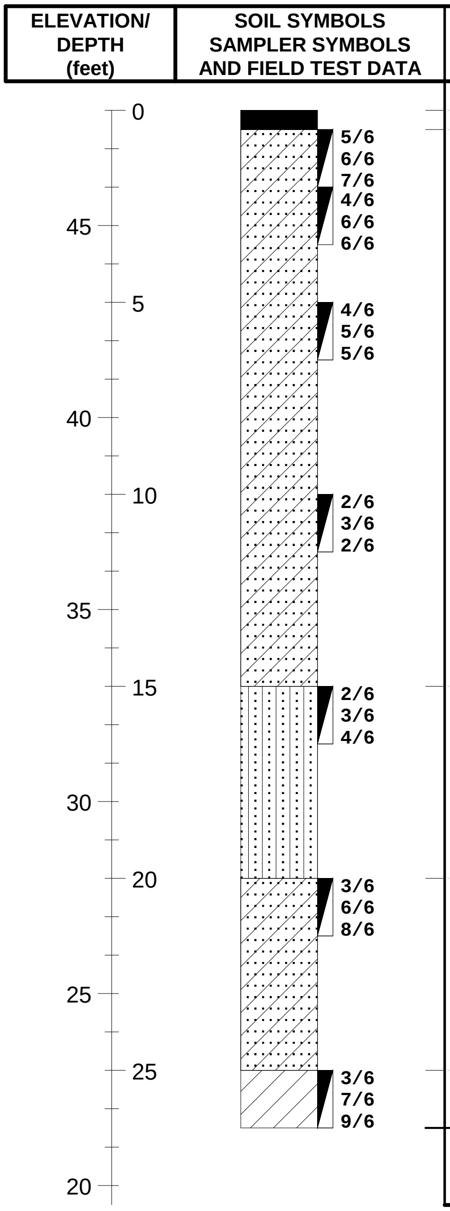
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/13/2019

Elevation: 48 Feet AMSL

Depth to Groundwater First Encountered During Drilling: N/A



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
SC	AC = 5-3/4 inches AB = 1 inch CLAYEY SAND with Gravel: medium dense, damp, fine grained sand to fine gravel, brown		13	11
		no recovery	12	
	Loose at 5 feet		10	9
	Loose, color is dark brown		5	
SM	SILTY SAND; loose, damp, fine grained, brown with some clay		7	
SC	CLAYEY SAND; medium dense, moist, fine grained, brown		14	
CL	SANDY LEAN CLAY; medium stiff, moist, low to moderate plasticity, brown		16	
	Bottom of Boring			

Notes:

Figure Number

Test Boring: A-8

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

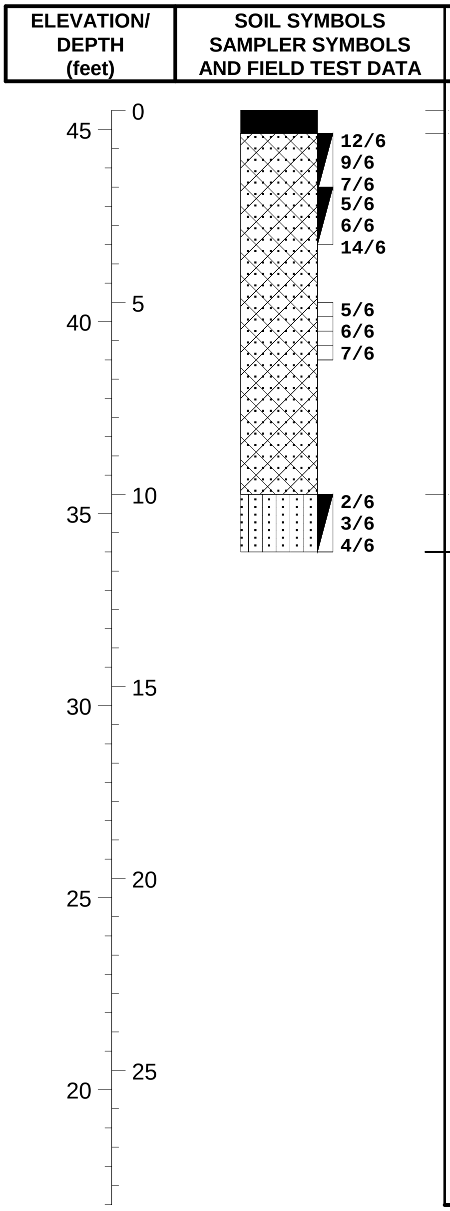
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/13/2019

Elevation: 45.5 Feet AMSL

Depth to Groundwater First Encountered During Drilling: N/A



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	AC = 4-3/4 inches AB = 1-1/2 inches			
SC	FILL; CLAYEY SAND; medium dense, damp, fine grained, brown, with fine to coarse gravel		16 20	8 12
	wood present, color is brown grading to gray	DD= 105.7 pcf	13	15
SM	SILTY SAND: loose, damp, fine grained, dark gray, trace of clay		7	
	Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: B-1

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem auger

Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3-11-2019

Elevation: 55 Feet AMSL

Depth to Groundwater First Encountered During Drilling: N/A

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
55 — 0	3/6 4/6 7/6	CL	AC = 4 inches AB = None SANDY LEAN CLAY: medium stiff, damp, low to moderate plasticity, light brown to gray, trace coarse gravel		11	14
50 — 5	22/6 17/6 23/6		Hard with fine and coarse gravel		40	5
	9/6 9/6 14/6		Stiff with fine and coarse gravel		23	10
45 — 10	10/6 10/6 18/6		Coarse gravel to fine cobbles	Low Recovery	28	13
40 — 15	15/6 18/6 29/6		trace coarse gravel, brown		47	
	16/6 12/6 16/6		stiff with fine and coarse gravel		28	
35 — 20			Auger refusal at 17 feet BSG, sample extended to 18.5 feet BSG			
30 — 25						

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: B-2

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem auger

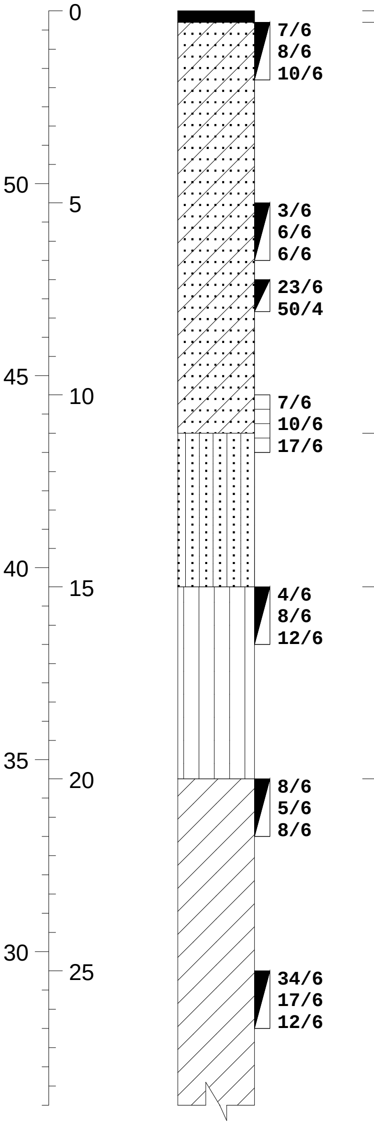
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3-12-2019

Elevation: 54.5 Feet AMSL

Depth to Groundwater
First Encountered During Drilling: N/A



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	7/6 8/6 10/6	SC	AC = 3-3/4 inches AB = 1 inch CLAYEY SAND with Gravel: medium dense, damp, fine grained sand and fine gravel, brown		18	
	3/6 6/6 6/6		At 5 feet, interbedded Sandy Lean Clay layer		12	
	23/6 50/4		Coarse grained gravel present, interbedded with Sandy Lean Clay		>50	
	7/6 10/6 17/6				27	
		SM	SILTY SAND: medium dense, damp, fine to coarse grained, light brown to gray-brown, trace of clay			
	4/6 8/6 12/6	ML	SANDY SILT; stiff, moist, slight plasticity, brown		20	
	8/6 5/6 8/6	CL	SANDY LEAN CLAY; medium stiff, moist, low plasticity, brown		13	
	34/6 17/6 12/6		Very stiff, increase in plasticity		29	

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: B-2

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 3-12-2019

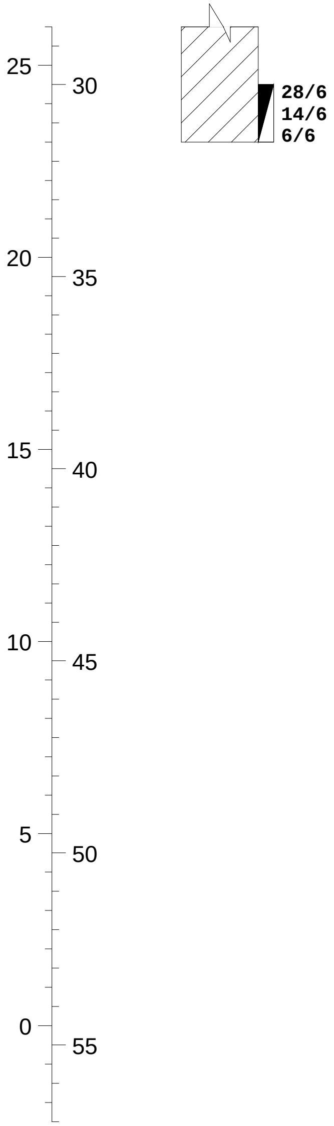
Drill Type: CME-75

Elevation: 54.5 Feet AMSL

Auger Type: 6-5/8 inch hollow stem auger

Depth to Groundwater First Encountered During Drilling: N/A

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	28/6 14/6 6/6				20	
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: B-3

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem auger

Hammer Type: 140 pound auto trip

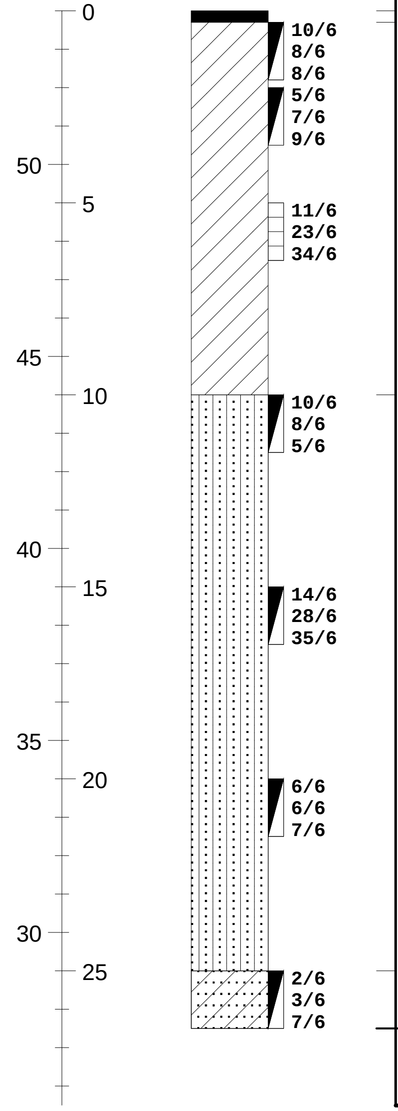
Logged By: JC

Date: 3-12-2019

Elevation: 54 Feet AMSL

Depth to Groundwater First Encountered During Drilling: N/A

ELEVATION/ DEPTH (feet) | **SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA**



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
CL	AC = 4-3/4 inches AB = none		16	
	SANDY LEAN CLAY with Gravel: medium stiff, damp, low to moderate plasticity, brown with fine gravel, interbedded with Silty Sand zones At 2 feet, no Silty SAND and no gravel Hard at 5 feet		16	
		sample disturbed	57	12
SM	SILTY SAND; medium dense, damp, fine grained, light gray to gray-brown, trace of clay		13	
		No Recovery	63	
	Interbedded with Sandy Lean Clay layers		13	
SC	CLAYEY SAND; loose, moist, fine grained, brown, trace of fine gravel		10	
	Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: B-4

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem auger

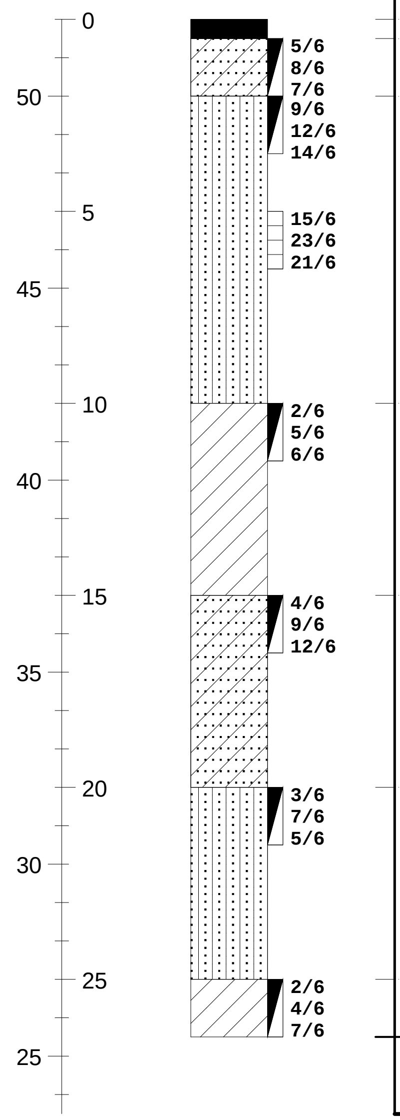
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3-12-2019

Elevation: 52 Feet AMSL

Depth to Groundwater First Encountered During Drilling: N/A



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 4 inches			
			AB = 2 inches			
	5/6 8/6 7/6	SC	CLAYEY SAND; medium dense, damp, fine grained, interbdded non-plastic zones, brown, with trace fine gravel		15	
	9/6 12/6 14/6 15/6 23/6 21/6	SM	SILTY SAND; medium dense, damp, fine grained, light gray, trace of clay		26 44	13
	2/6 5/6 6/6	CL	SANDY LEAN CLAY; medium stiff, damp, low to moderate plasticity, gray brown, interbedded with Clayey SAND zones		11	
	4/6 9/6 12/6	SC	CLAYEY SAND; medium dense, damp, fine grained, brown, interbedded Silty SAND zones		21	
	3/6 7/6 5/6	SM	SILTY SAND; medium dense, damp, fine grained, brown		12	
	2/6 4/6 7/6	CL	SANDY LEAN CLAY; medium stiff, damp, low to moderate plasticity, gray brown		11	
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: B-5

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 2-28-2019

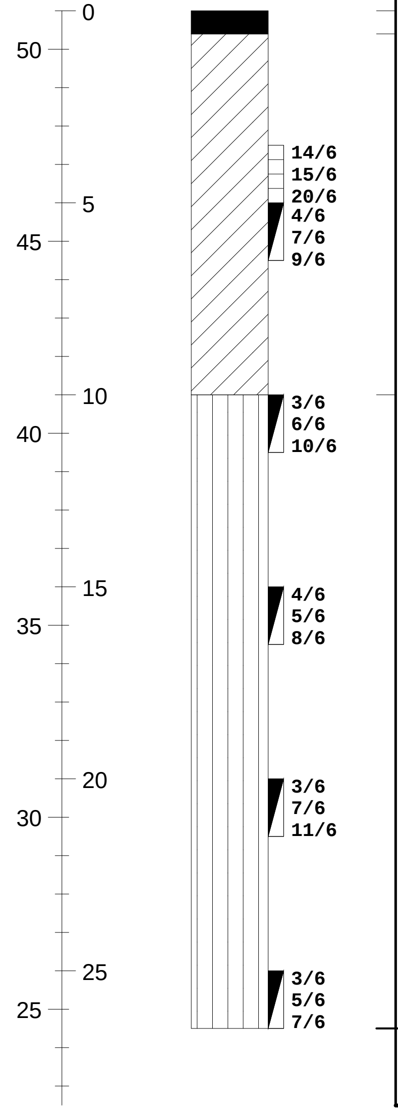
Drill Type: CME-75

Elevation: 51 Feet AMSL

Auger Type: 6-5/8 inch hollow stem auger

Depth to Groundwater First Encountered During Drilling: N/A

Hammer Type: 140 pound auto trip



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	AC = 4 inches AB = 3 inches			
CL	SANDY LEAN CLAY; very stiff, moist, low plasticity, dark brown			
	at 3.5 feet, increase in sand, 3 inch thick clay seam		35	
	at 5 feet, decrease in sand		16	
ML	SANDY SILT; very stiff, moist, non-plastic, dark brown		16	
	stiff		13	
	very stiff, slight plasticity		18	
	grading to brown Sandy LEAN CLAY		12	
	Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: B-6

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 2/26/2019

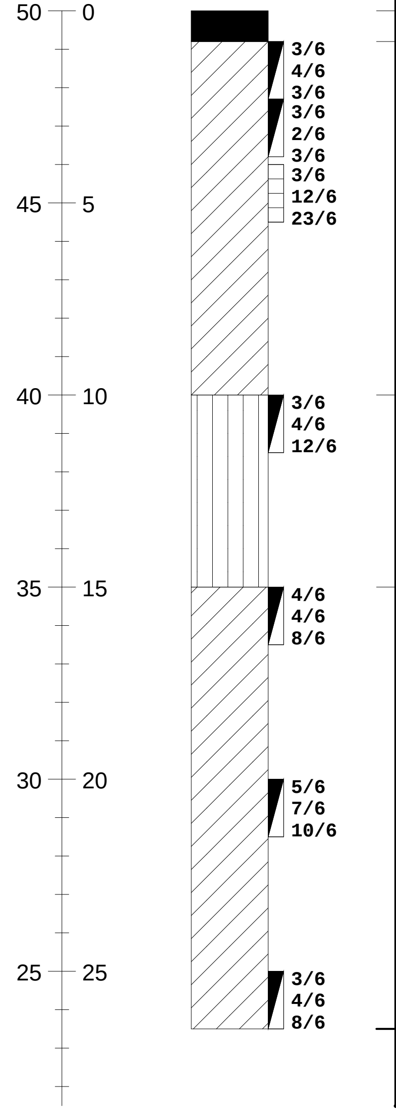
Drill Type: CME-75

Elevation: 50 Feet AMSL

Auger Type: 6-5/8 inch hollow stem auger

Depth to Groundwater First Encountered During Drilling: N/A

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
50 0			AC = 5 inches AB = 4½ inches			
	3/6 4/6 3/6	CL	SANDY LEAN CLAY; medium stiff, moist, low plasticity, dark brown, trace gravel		7	14
	3/6 2/6 3/6		at 2.5 2 inch thick clay seam		5	20
45 5	3/6 12/6 23/6		at 4.5, becoming hard, increase in moisture	DD = 98.4 pcf	35	13
40 10	3/6 4/6 12/6	ML	SANDY SILT; very stiff, moist, non-plastic, dark brown		16	10
35 15	4/6 4/6 8/6	CL	SANDY LEAN CLAY; stiff, moist, low plasticity, dark brown		12	25
30 20	5/6 7/6 10/6		very stiff, gray-brown, slight increase in sand fraction		17	18
25 25	3/6 4/6 8/6		stiff, low to moderate plasticity		12	20
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: B-7

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 2/28/2019

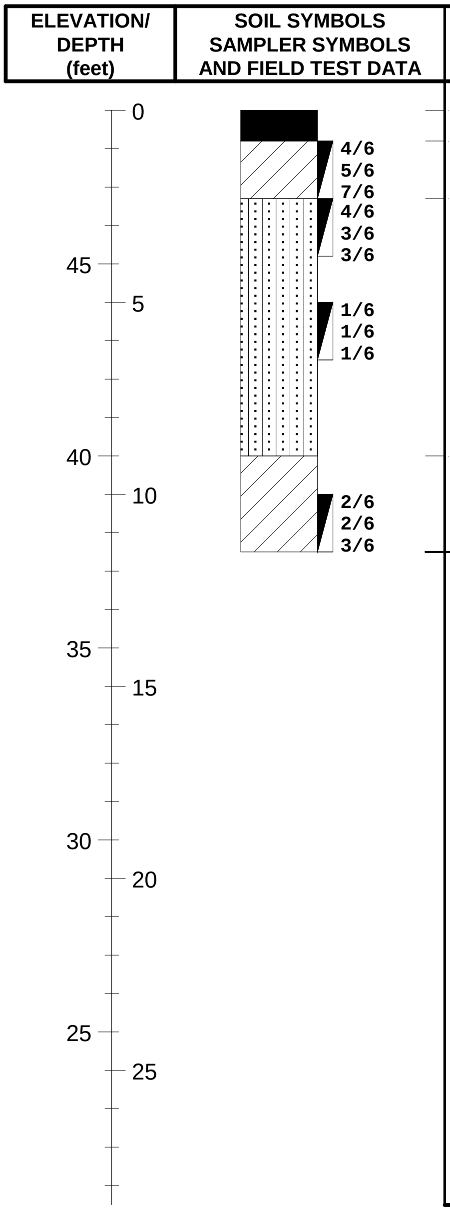
Drill Type: CME-75

Elevation: 49 Feet AMSL

Auger Type: 6-5/8 inch hollow stem auger

Depth to Groundwater First Encountered During Drilling: N/A

Hammer Type: 140 pound auto trip



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	AC = 6.5 inches AB = 3.5 inches			
CL	SAND LEAN CLAY; stiff, moist, low plasticity, brown to dark brown; trace gravel		12	
SM	SILTY SAND; loose, moist, fine to medium grained, dark brown, clay lumps very loose at 5 feet		6 3	
CL	SANDY LEAN CLAY; medium stiff, moist, low plasticity, dark brown		5	
	Bottom of Boring			

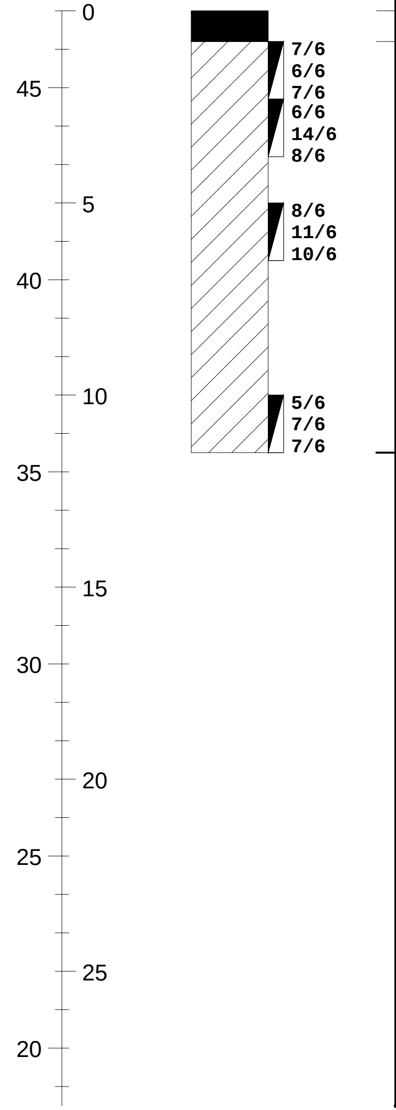
Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: B-8

Project: Home Depot Store - Mission Valley - San Diego, CA
Project Number: D050R0.01
Logged By: JC
Drilled By: JC
Date: 2/28/2019
Drill Type: CME-75
Elevation: 47 Feet AMSL
Auger Type: 6-5/8 inch hollow stem auger
Depth to Groundwater First Encountered During Drilling: N/A
Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 7 inches			
		CL	AB = 2 inches		13	
			SANDY LEAN CLAY; stiff, moist, low plasticity; brown, trace gravel at 2.5 feet, increase to very stiff		22	
			color is brown to black		21	
					14	
			Bottom of boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Since 1898

Test Boring: C-1

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: VB

Drilled By: JC

Date: 2/25/2019

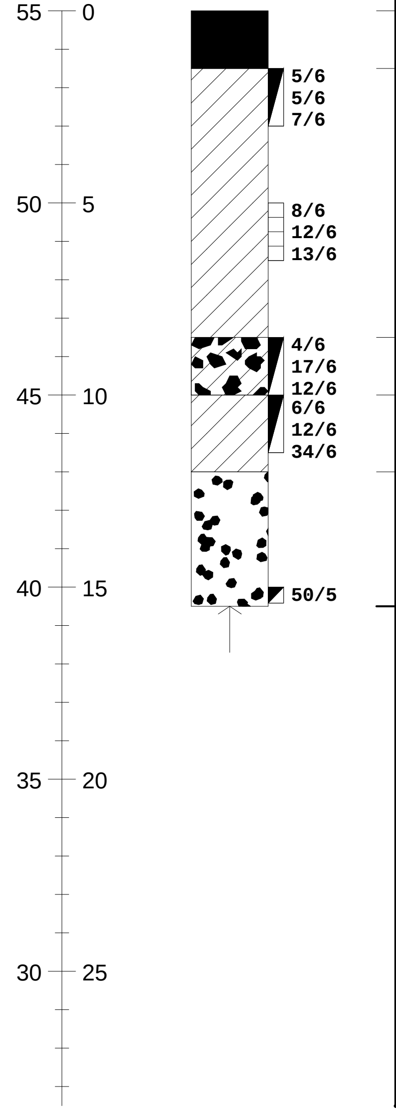
Drill Type: CME-75

Elevation: 55 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

Depth to Groundwater First Encountered During Drilling: NA



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 6 inches AB = 12 inches			
	5/6 5/6 7/6	CL	SANDY LEAN CLAY; medium stiff, moist, moderate plasticity; brown		12	13
	8/6 12/6 13/6			DD = 98.9 pcf	25	14
	4/6 17/6 12/6	GC	CLAYEY GRAVEL; medium dense, moist, fine to medium grained, subangular, brown		29	10
	6/6 12/6 34/6	CL	SANDY LEAN CLAY w gravel; hard, moist, low plasticty, brown		46	12
	50/5	GP	POORLY GRADED GRAVEL; very dense, moist, medium to coarse grained, sub-rounded, difficult drilling			
			Auger refusal on dense cobbles			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: C-2

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: VB

Drilled By: JC

Date: 2/25/2019

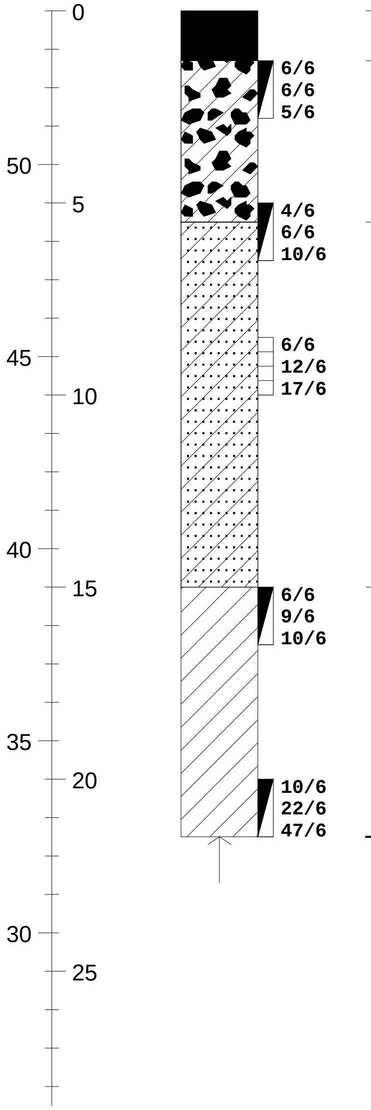
Drill Type: CME-75

Elevation: 54 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

Depth to Groundwater First Encountered During Drilling: NA



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 6 inches AB = 7½ inches			
	6/6 6/6 5/6	GC	CLAYEY GRAVEL; medium dense, damp, fine to medium sub-rounded gravel		11	3
	4/6 6/6 10/6		at 5 feet interbedded clay layer 6 inches thick		16	11
		SC	CLAYEY SAND; dense, moist, fine to medium grained, brown			
	6/6 12/6 17/6			DD= 102.8 pcf	29	17
	6/6 9/6 10/6	CL	SANDY LEAN CLAY; very stiff, moist, low plastic, brown		19	15
	10/6 22/6 47/6		reddish sand grains Grading to Poorly Graded Gravel		69	15
			Auger Refusal on dense gravels and cobbles			

Notes:

Figure Number

Test Boring: C-3

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: VB

Drilled By: JC

Date: 2/25/2019

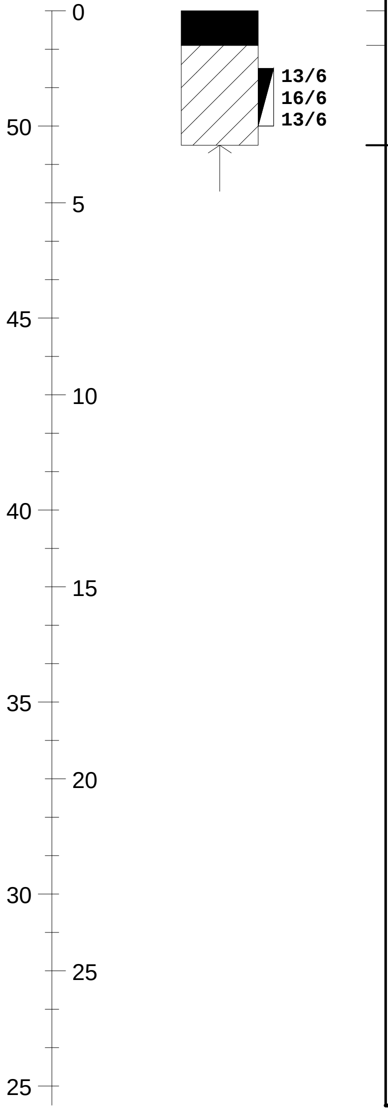
Drill Type: CME-75

Elevation: 53 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: NA

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0			AC = 8 inches			
			AB = 2 inches			
	13/6 16/6 13/6	CL	SANDY LEAN CLAY with Gravel; very stiff, moist, low plasticity, brown		29	11
			Auger Refusal on rounded cobble and dense gravel			

Notes:

Figure Number

Test Boring: C-3B

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: VB

Drilled By: JC

Date: 2/25/2019

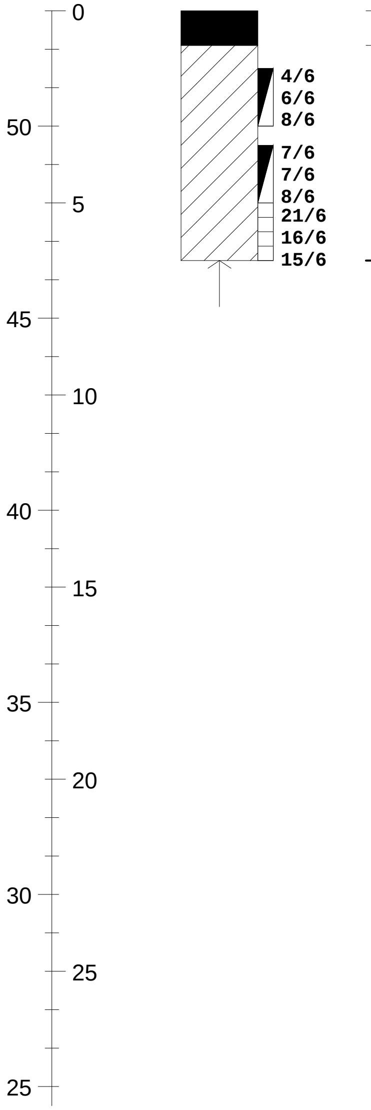
Drill Type: CME-75

Elevation: 53 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: NA

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 8 inches			
			AB = 2 inches			
		CL	SANDY LEAN CLAY with Gravel; very stiff, moist, low plasticity, brown		14	14
					15	18
				DD= 107.5 pcf	31	16
			Auger Refusal on rounded cobble and dense gravel			

Notes: *boring drilled 5 feet north of B-3*

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: C-4

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

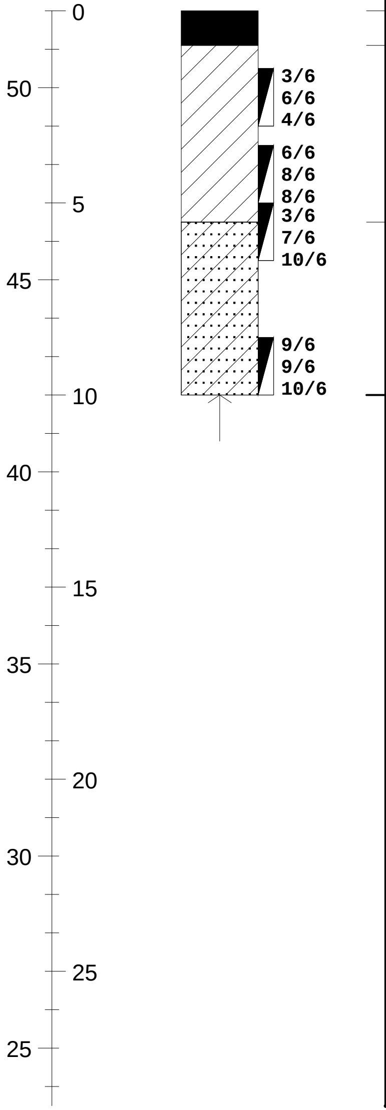
Hammer Type: 140 pound auto trip

Logged By: VB

Date: 2/25/2019

Elevation: 52 feet AMSL

Depth to Groundwater First Encountered During Drilling: NA

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 8 inches AB = 2 inches			
		CL	SANDY LEAN CLAY; very stiff, moist, low plasticity, brown		10	17
					16	16
					17	11
		SC	CLAYEY SAND; medium dense, moist, low plastic, brown		19	12
			Auger Refusal on Cobble Material			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.
Since 1898

Test Boring: C-5

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

Logged By: VB

Date: 2/26/2019

Elevation: 51 feet AMSL

Depth to Groundwater First Encountered During Drilling: NA

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0	■		AC = 8 inches			
50	▨	CL	AB = none encountered			
	▨ 5/6 5/6 9/6		SANDY LEAN CLAY; stiff, moist, moderate plasticity; dark brown		14	13
	▨ 6/6 9/6 11/6		at 3.5 feet, color change to light brown		20	25
5 45	▨ 4/6 9/6 15/6		increase in sand	DD= 103.4 pcf ø = 35° c = 290 psf	24	16
10 40	▨ 5/6 7/6 11/6				18	26
15 35	▨ 5/6 9/6 10/6		less plastic, possibly silt		19	19
20 30	▨ 6/6 7/6 8/6				15	18
25 25	▨ 8/6 5/6 7/6				12	20
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Since 1898

Test Boring: C-6

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 2/26/2019

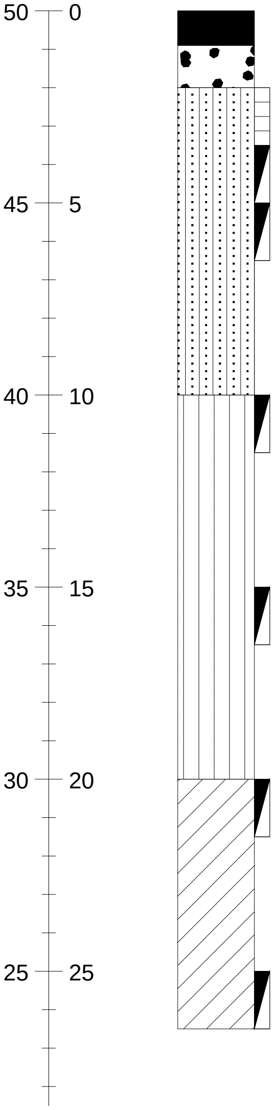
Drill Type: CME-75

Elevation: 50 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: NA

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
50 / 0			AC = 7 inches			
		GP	AB = 4 inches			
	7/6 11/6 19/6	SM	GRAVEL and COBBLES 3 to 6 inchs; sub-rounded	DD= 91.8 pcf	30	19
	3/6 4/6 7/6		SILTY SAND; medium dense, moist, fine to medium grained, dark brown with iron oxide staining At 3.5 feet; 3 inch thick clay seam At 5 feet, color is light brown, iron oxide staining		11	29
45 / 5	5/6 10/6 11/6				21	4
40 / 10	5/6 8/6 8/6	ML	SANDY SILT; very stiff, moist, non-plastic, dark brown		16	24
35 / 15	5/6 8/6 8/6		decrease in sand content		16	24
30 / 20	4/6 4/6 6/6	CL	SANDY LEAN CLAY; stiff, moist, low plasticity, gray brown		10	17
25 / 25	3/6 5/6 6/6		low to medium plasticity; iron oxide staining		11	21
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Since 1898

Test Boring: C-7

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 2/28/2019

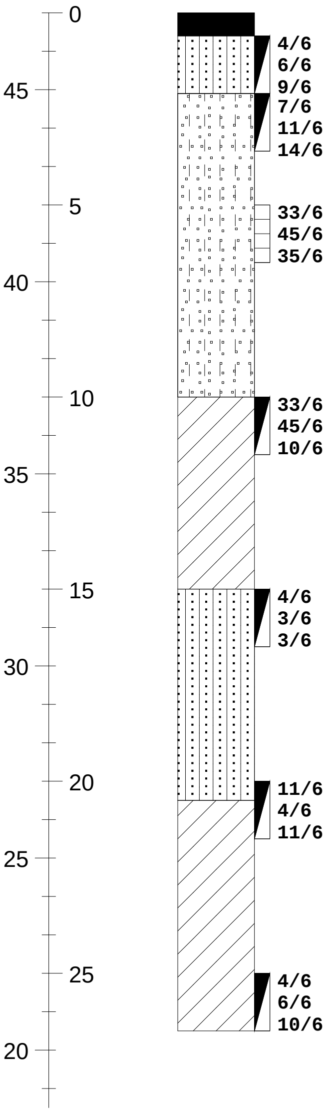
Drill Type: CME-75

Elevation: 47 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater
First Encountered During Drilling: NA

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0	4/6 6/6 9/6	SM	AC = 5 inches AB = 2 inches		15	
	7/6 11/6 14/6	SP-SM	SILTY SAND; medium dense, moist, fine to medium grained, brown, clay lumps		25	
5	33/6 45/6 35/6		POORLY GRADED SAND with silt; medium dense, moist, fine to medium grained, brown at 5 feet, becoming dense		54	
10	33/6 45/6 10/6	CL	SANDY LEAN CLAY; hard, moist, low plasticity, dark brown, iron oxide stains		55	
15	4/6 3/6 3/6	SM	SILTY SAND; loose, moist, fine to medium grained, dark brown, 3 inch thick clay seam		6	
20	11/6 4/6 11/6	CL	SANDY LEAN CLAY; stiff, moist, low to moderate plasticity, dark brown		15	
25	4/6 6/6 10/6				16	
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: C-8

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JS

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

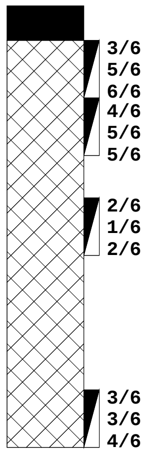
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 2/28/2019

Elevation: 45 feet AMSL

Depth to Groundwater First Encountered During Drilling: NA



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
45 — 0			AC = 8 inches AB = 3 inches			
	3/6 5/6 6/6	CL	FILL; SANDY LEAN CLAY; stiff, moist, low plastic, brown to dark brown trace gravel		11	
	4/6 5/6 5/6				10	
40 — 5	2/6 1/6 2/6				3	
35 — 10	3/6 3/6 4/6		medium stiff, color is black		7	
			Bottom of Boring			
30 — 15						
25 — 20						
20 — 25						

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.
Since 1898

Test Boring: D-1

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

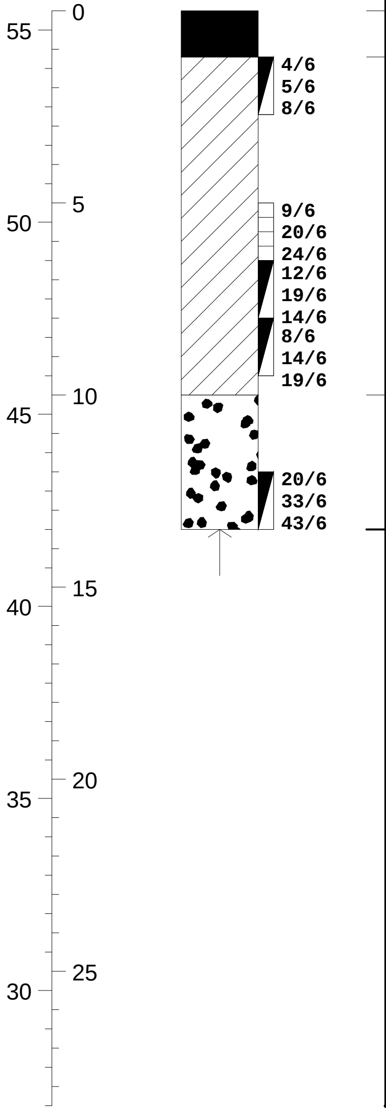
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 2/25/2019

Elevation: 55.5 feet AMSL

Depth to Groundwater
First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 6 inches AB = 8 inches			
		CL	SANDY LEAN CLAY; stiff, moist, low to moderate plasticty, light brown to brown	RV = 22	13	14
			hard, increase in sand, color is dark brown	DD= 101.3 pcf	44	12
				No sample recovery	33	
			color is light brown, coarse gravel present		33	5
		GP	POORLY GRADED GRAVEL with Cobbles and lean clay, hard drilling			
			no clay fraction		76	4
			Auger refusal in dense gravels and cobbles			

Notes:

Figure Number

Test Boring: D-2

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 2/25/2019

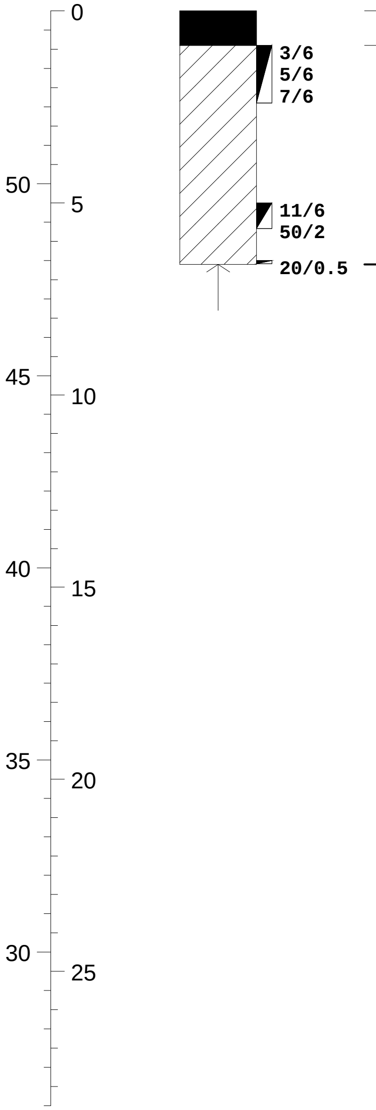
Drill Type: CME-75

Elevation: 54.5 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0			AC = 6.5 inches AB = 4 inches			
	3/6 5/6 7/6	CL	SANDY LEAN CLAY; stiff, moist, low plastic, light brown, 1 inch thick silty sand seam At 2 feet, coarse gravel and silty sands in drill cuttings		12	17
50 / 5	11/6 50/2		At 5 feet, clay is hard, weakly cemented, coarse gravel		>50	4
	20/0.5				>50	
			Auger and Sampler refusal on dense gravel/cobbles			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.
Since 1898

Test Boring: D-3

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

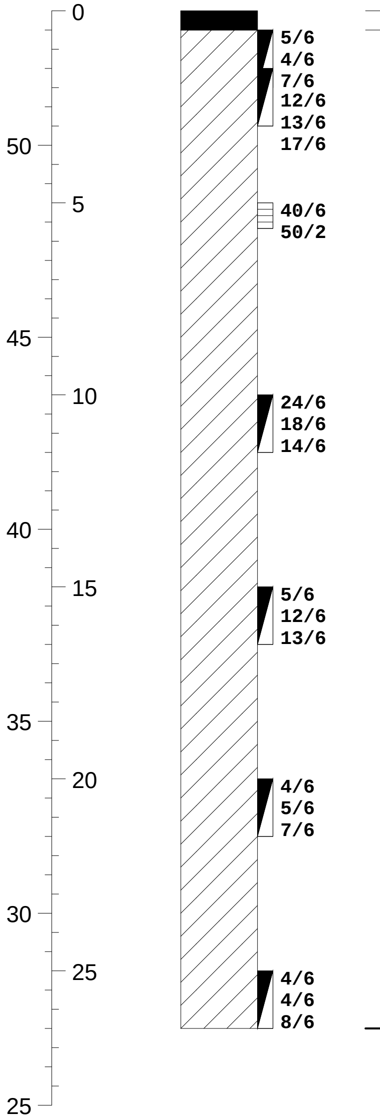
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/4/2019

Elevation: 53.5 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0	5/6 4/6 7/6	CL	AC = 6.5 AB = none SANDY LEAN CLAY; stiff, damp, low plasticity, light brown, some gravel		11	
	12/6 13/6 17/6		at 1.5 feet, hard		30	
5	40/6 50/2		6 inch thick layer corase grained black silty sand	DD= 114.9 pcf	>50	13
10	24/6 18/6 14/6		some coarse gravel present		32	
15	5/6 12/6 13/6		color is light brown to brown		25	
20	4/6 5/6 7/6		plasticity increase to moderate, less sand		12	
25	4/6 4/6 8/6		color changing to dark brown with depth		12	
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: D-4

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 3/4/2019

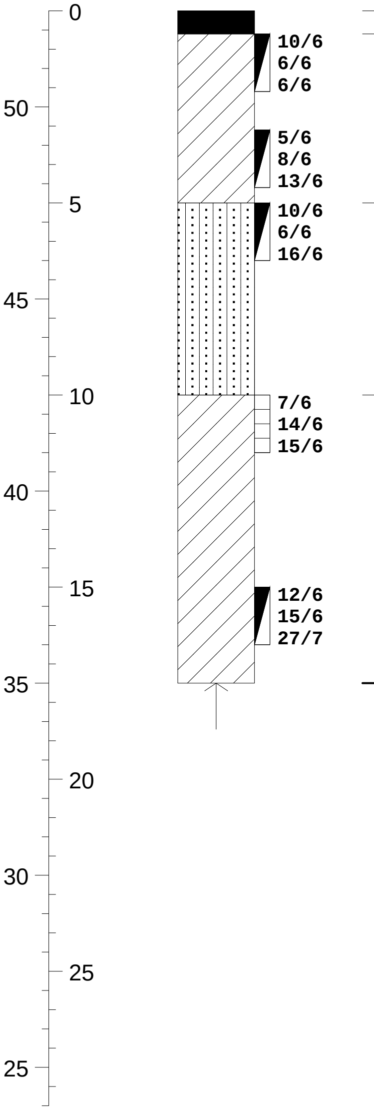
Drill Type: CME-75

Elevation: 52.5 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater
First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 7½ inches AB = none			
	10/6 6/6 6/6	CL	SANDY LEAN CLAY; stiff, moist, low plasticity, light brown, some fine and coarse gravel		12	
	5/6 8/6 13/6		at 2.5 feet, coarse gravel layer		24	
	10/6 6/6 16/6	SM	SILTY SAND; medium dense, damp, fine to medium grained, brown, with clay lumps and some coarse gravel		22	
	7/6 14/6 15/6	CL	SANDY LEAN CLAY; very stiff, moist, low plasticity, brown	DD= 99.5 pcf	29	23
	12/6 15/6 27/7		sand content increase, grading to coarse gravel		42	
			Auger Refusal on dense gravel / cobbles			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: D-5

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: VB

Drilled By: JC

Date: 2/26/2019

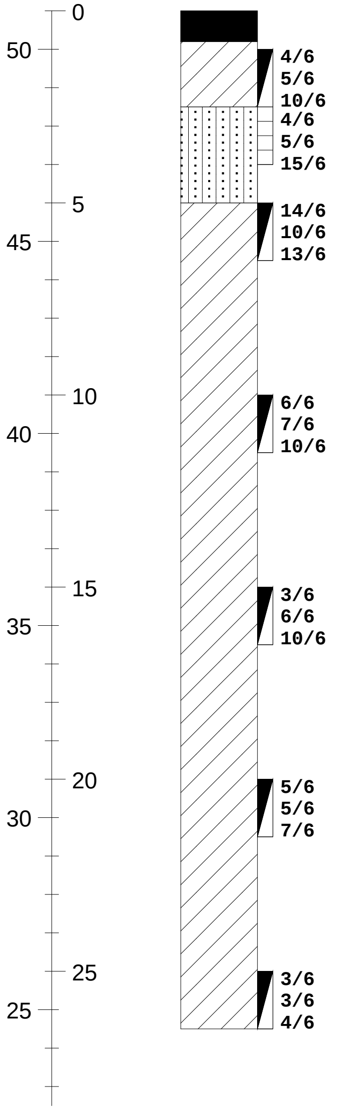
Drill Type: CME-75

Elevation: 51 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0			AC = 5 inches			
50	4/6 5/6 10/6	CL	AB = 5 inches SANDY LEAN CLAY; stiff, moist, low plasticity, gray at 1 foot, some black organics		16	18
	4/6 5/6 15/6	SM	SILTY SAND, medium dense, moist, medium grained, gray with clay lumps	DD= 98.3 pcf	20	18
5 45	14/6 10/6 13/6	CL	SANDY LEAN CLAY; very stiff, moist, moderate plasticity, medium brown		23	8
10 40	6/6 7/6 10/6				17	22
15 35	3/6 6/6 10/6				16	22
20 30	5/6 5/6 7/6		some gravel		12	16
25 25	3/6 3/6 4/6		slightly damp		7	20
			Bottom of Boring			

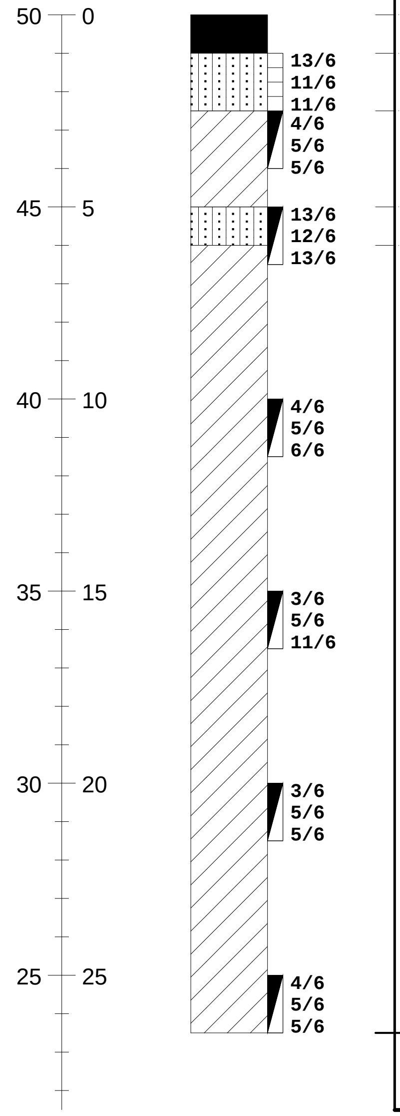
Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.
Since 1898

Test Boring: D-6

Project: Home Depot Store - Mission Valley - San Diego, CA
Project Number: D050R0.01
Drilled By: JC
Drill Type: CME-75
Auger Type: 6-5/8 inch hollow stem
Hammer Type: 140 pound auto trip
Logged By: JC
Date: 2/25/2019
Elevation: 50 feet AMSL
Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
50 / 0			AC = 6 inches AB = 5 inches			
	13/6 11/6 11/6	SM	SILTY SAND; medium dense, moist, fine to medium grained, light brown with iron oxide staining	DD= 95.7 pcf	22	5
	4/6 5/6 5/6	CL	SANDY LEAN CLAY; stiff, moist, slight to low plasticity, brown, iron oxide staining		10	30
45 / 5	13/6 12/6 13/6	SM	SILTY SAND; medium dense, moist, fine to medium grained, light brown to brown		25	31
		CL	SANDY LEAN CLAY; very stiff, moist, low plasticity, dark brown, iron oxide staining			
40 / 10	4/6 5/6 6/6				11	29
35 / 15	3/6 5/6 11/6		less plasticity		16	20
30 / 20	3/6 5/6 5/6		color is gray-brown		10	18
25 / 25	4/6 5/6 5/6		moderate plasticity		10	22
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Since 1898

Test Boring: D-7

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

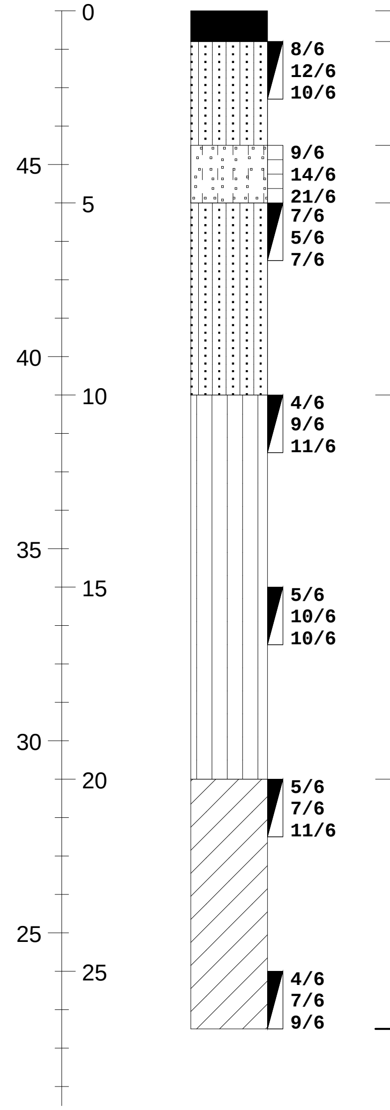
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 2/28/2019

Elevation: 49 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 6 inches AB = 3½ inches			
	8/6 12/6 10/6	SM	SILTY SAND; medium dense, moist, fine to medium grained, brown, trace of clay lumps		22	
	9/6 14/6 21/6	SP-SM	POORLY GRADED SAND with Silt; dense, very moist, fine to medium grained, brown		35	
	7/6 5/6 7/6	SM	SILTY SAND; medium dense, moist, fine to medium grained, brown with iron oxide stains		12	
	4/6 9/6 11/6	ML	SANDY SILT; very stiff, moist, non-plastic, dark brown		20	
	5/6 10/6 10/6		plasticity increase to slight		20	
	5/6 7/6 11/6	CL	SANDY LEAN CLAY; very stiff, moist, low to moderate plasticity, dark gray		18	
	4/6 7/6 9/6		color change to dark brown with iron oxide staining		16	
			Bottom of Boring			

Notes:

Figure Number

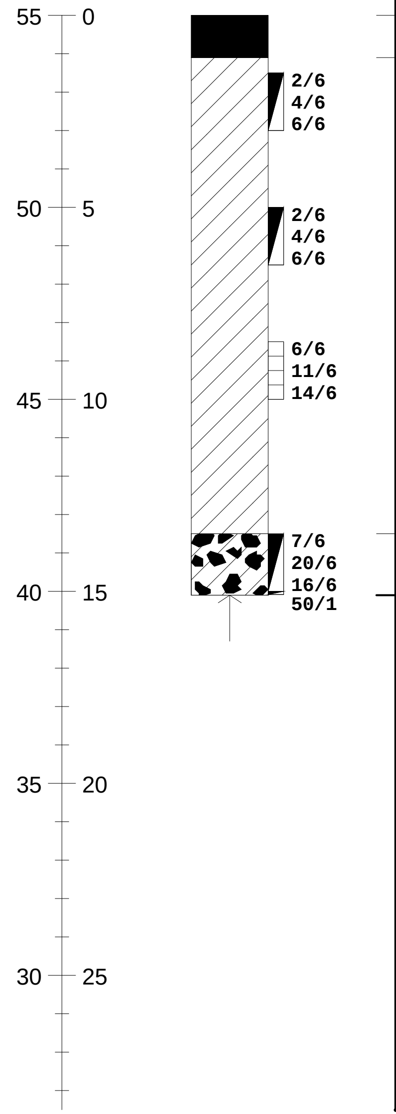
MOORE TWINING
ASSOCIATES, INC.

Test Boring: E-1

Project: Home Depot Store - Mission Valley - San Diego, CA
Project Number: D050R0.01
Drilled By: JC
Drill Type: CME-75
Auger Type: 6-5/8 inch hollow stem
Hammer Type: 140 pound auto trip

Logged By: VB
Date: 2/26/2019
Elevation: 55 feet AMSL
Depth to Groundwater First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet) — **SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA**



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
CL	AC = 10 inches AB = 3 inches SANDY LEAN CLAY; stiff, moist, moderate plasticity; medium brown		10	
	increase in sand fracion, also trace of gravel		10	19
		DD= 111.9 pcf	25	14
GC	CLAYEY GRAVEL; dense, moist, fine to coarse grained		36	5
	Auger and sampler refusal		>50	

Notes:

Figure Number

Test Boring: E-2

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JS

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

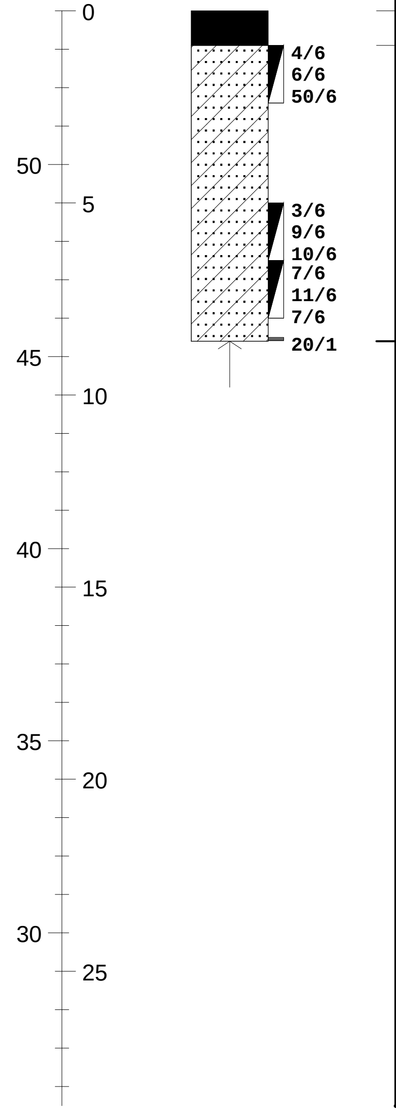
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 2/26/2019

Elevation: 54 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	AC = 7 inches			
	AB = 4 inches			
SC	CLAYEY SAND; loose, moist, fine to medium grained, olive		56	15
	At 2.5 feet, gravel fraction increase, hard drilling in very dense conditions		19	16
	At 5 feet, drilling effort reduced, medium dense, color change to light gray with medium gravels		18	16
	sampler refusal		>50	
	Drill refusal on very dense gravel/ cobbles			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: E-3

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 3/4/2019

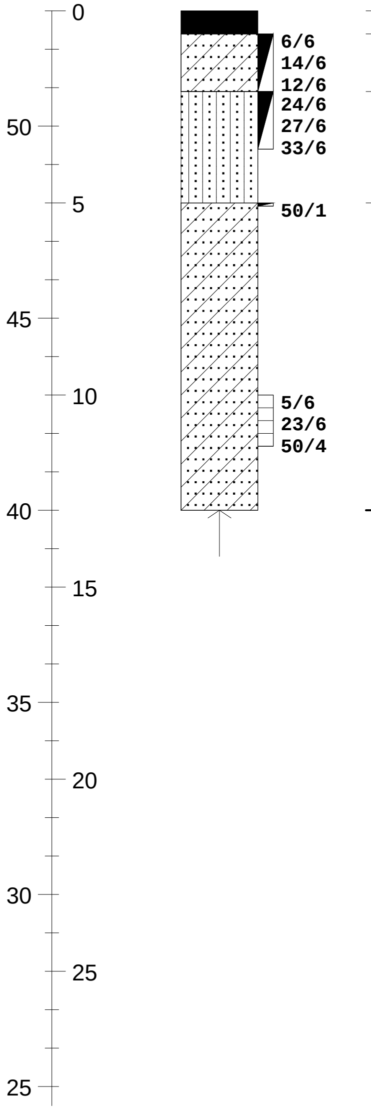
Drill Type: CME-75

Elevation: 53 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 7.2 inches AB = None			
	6/6 14/6 12/6	SC	CLAYEY SAND; medium dense, damp, fine to coarse grained, light brown, some gravels		26	
	24/6 27/6 33/6	SM	SILTY SAND with Gravel; very dense, damp, fine to coarse grained, light brown, some cementation		60	
	50/1	SC	CLAYEY SAND with Gravel; very dense, fine to coarse grained, brown		>50	
	5/6 23/6 50/4		some fine cobbles in cuttings	DD= 109.2 pcf	>50	17
			Auger Refusal in very dense cobbles/gravels			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: E-4

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

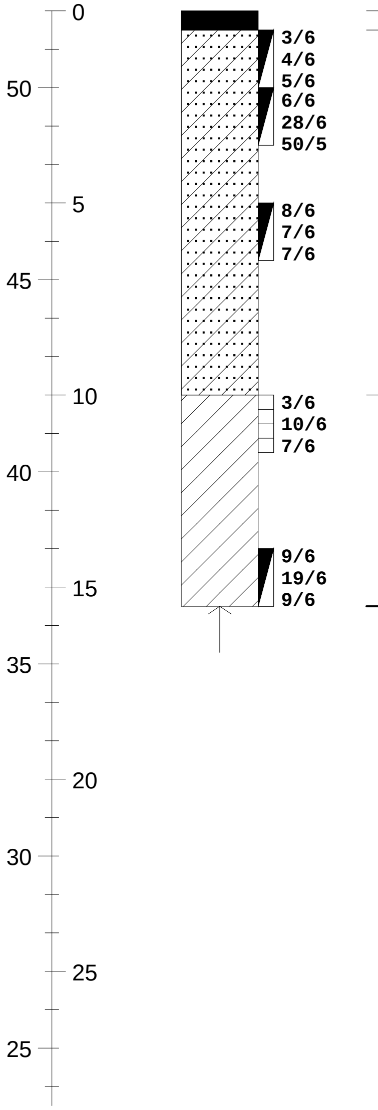
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/4/2019

Elevation: 52 feet AMSL

Depth to Groundwater
First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 5.5 inches AB = None			
		SC	CLAYEY SAND; loose, damp, fine to coarse grained, brown		9	
			At 2.5 feet, gravel content increase, very dense conditions		>50	
			interbedded Silty SAND layers, moist, light brown color, some fine gravel		14	
		CL	SANDY LEAN CLAY; stiff, moist, low plastic, fine sand, brown	DD= 102.4 pcf -200= 68% +4 = 0% LL = 35 PI = 15	17	22
			grading to Clayey SAND with gravel and cobbles, auger refusal at 14 feet		28	
			Auger refusal in cobble material			

Notes:

Figure Number

MOORE TWINING
ASSOCIATES, INC.
Since 1898

Test Boring: E-5

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: VB

Drilled By: JC

Date: 2/26/2019

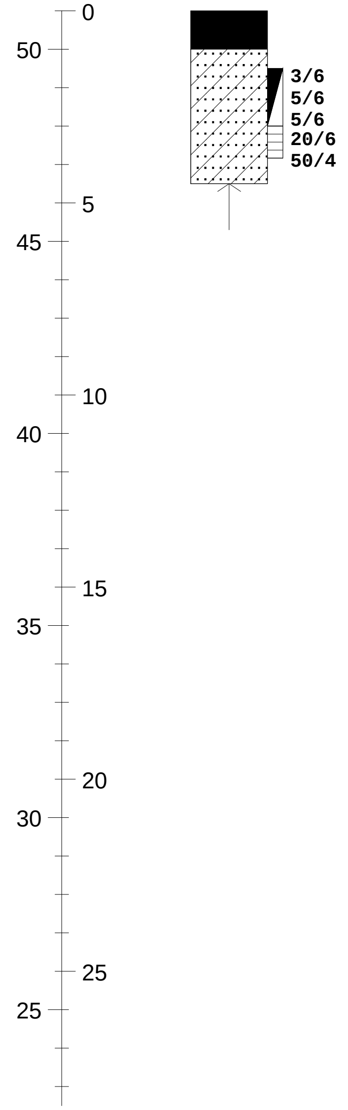
Drill Type: CME-75

Elevation: 51 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 6.5 inches			
			AB = 6 inches			
		SC	CLAYEY SAND; loose, moist, low plastic, light brown		10	17
			at 4 feet becoming very dense	DD= 89.9 pcf	>50	16
			Auger and Sample refusal			

Notes:

Figure Number

Test Boring: E-5B

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: VB

Drilled By: JC

Date: 2/26/2019

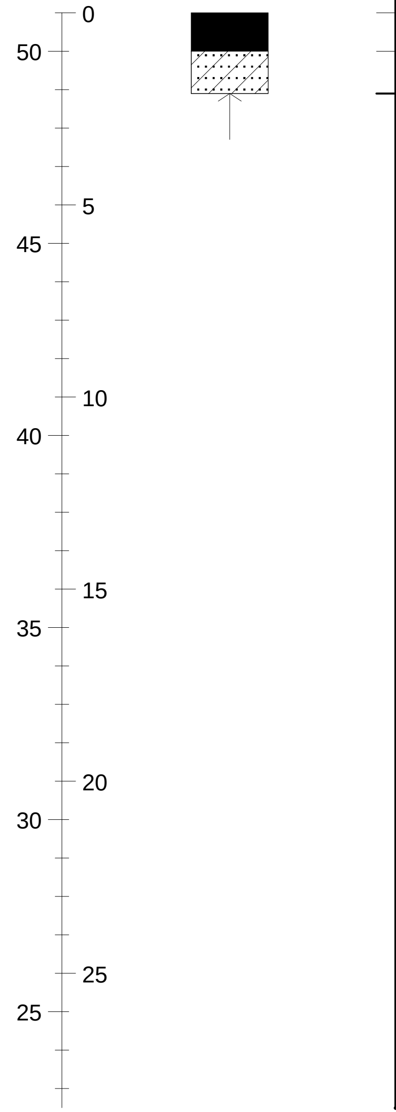
Drill Type: CME-75

Elevation: 51 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater
First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 6.5 inches			
			AB = 6 inches			
		SC	CLAYEY SAND; loose, moist, low plastic, light brown at 2 feet, drilling resistance difficult			
			Auger Refusal on Cobble material at 2 feet			

Notes: *boring located 5 feet east of E-5*

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: E-6

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 2/26/2019

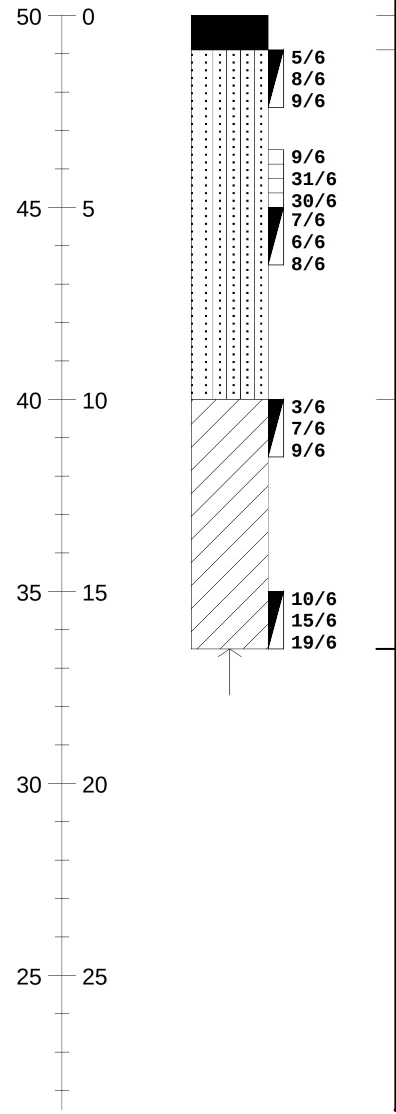
Drill Type: CME-75

Elevation: 50 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
50 / 0			AC = 7.5 inches AB = 3 inches			
	5/6 8/6 9/6 9/6 31/6 30/6 7/6 6/6 8/6	SM	SILTY SAND; medium dense, moist, fine to medium grained, light brown to brown, iron oxide staining at 4 feet, very dense conditions, cobbles in cuttings at 5 feet, less gravel and cobbles, 2 inch thick clay seam	RV = 63 -200= 22% +4 = 0% LL = NP DD = 96.6 pcf	17 61 14	8 10 3
40 / 10	3/6 7/6 9/6	CL	SANDY LEAN CLAY; very stiff, moist, low plasticity, gray-brown, iron oxide staining		16	16
35 / 15	10/6 15/6 19/6			No Recovery	34	
			Drilling refusal at 15.5 feet BSG on cobble material			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: E-7.3

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 9/17/2019

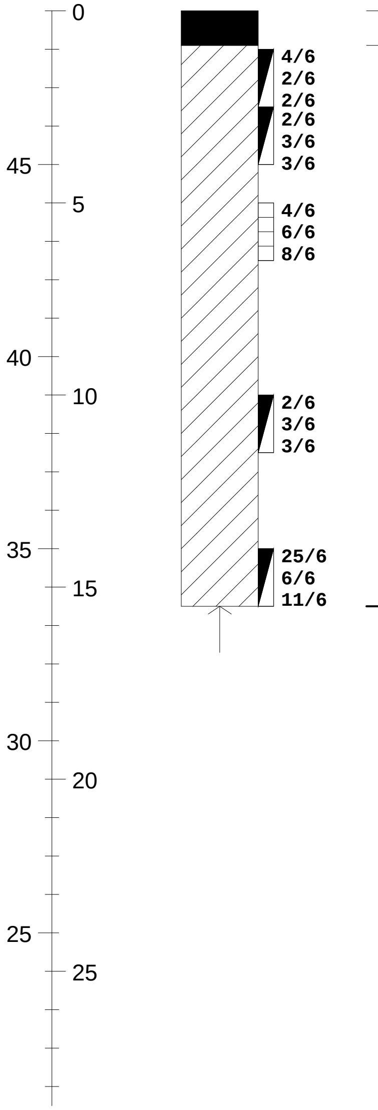
Drill Type: CME-75

Elevation: 49 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 5 inches AB = 5 inches			
	4/6 2/6 2/6	CL	SANDY LEAN CLAY; soft, moist, low to moderate plasticity, black, trace fine gravel		4	14
	2/6 3/6 3/6		At 3 feet, medium stiff		6	15
	4/6 6/6 8/6		at 5 feet, color change to dark brown, trace of coarse gravel	DD = 112.4 pcf	14	15
	2/6 3/6 3/6		increase in sand fraction		6	14
	25/6 6/6 11/6		coarse gravel and cobble materials present		17	
			Auger Refusal at 14.0 feet, sampler exteded to bottom of boring at 15½ feet.			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: E-7.3B

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JS

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

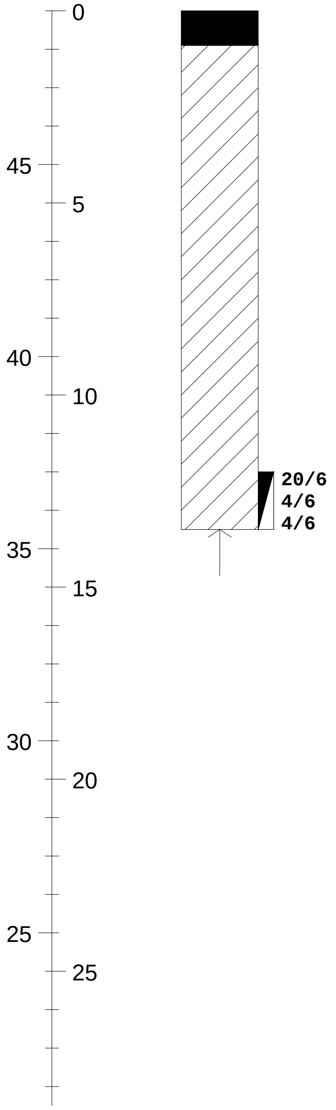
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 9/17/2019

Elevation: 49 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0			AC = 5 inches			
			AB = 5 inches			
		CL	SANDY LEAN CLAY; soft to medium stiff, moist, low to moderate plasticity, black, trace fine gravel			
	20/6 4/6 4/6		cobble and dense gravel encountered		8	
			Auger Refusal at 12.0 feet, sampler exteded to bottom of boring at 13½ feet.			

Notes: *Moved boring 3 feet east of E-7.3*

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: E-7.6

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 9/17/2019

Drill Type: CME-75

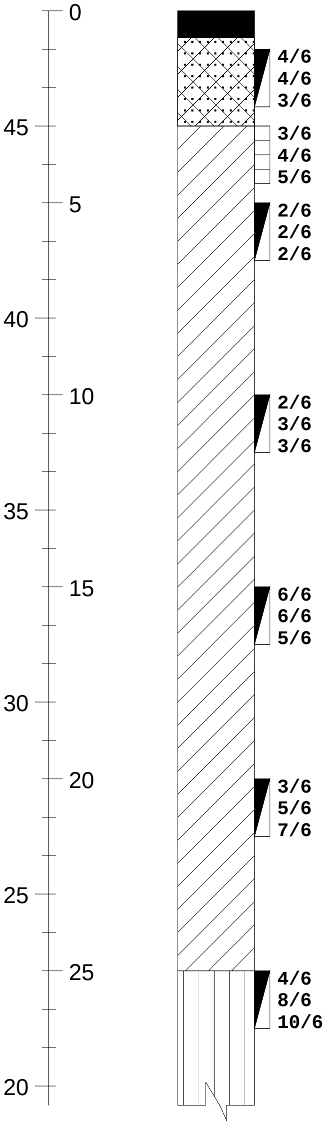
Elevation: 48 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

Depth to Groundwater First Encountered During Drilling: 30

ELEVATION/ DEPTH (feet) | **SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA**



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	AC = 3 inches AB = 5½ inches			
SC	FILL; CLAYEY SAND; loose, moist, fine sand to coarse gravel, intebedded Sandy Lean CLay and Silty Sand layers, brown and dark brown		7	8
CL		DD = 106.9 pcf	9	19
	NATIVE; SANDY LEAN CLAY; medium stiff, moist, low to moderate plasticity, dark brown, trace fine gravel at 5 feet, soft with increase in sand fraction		4	18
	at 10 feet, medium stiff, color is black		6	15
		no recovery	11	
	color is gray-brown, low plastic		12	18
ML	SANDY SILT; very stiff, moist, non-plastic, dark brown		18	18

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Since 1898

Test Boring: E-7.6

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JS

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

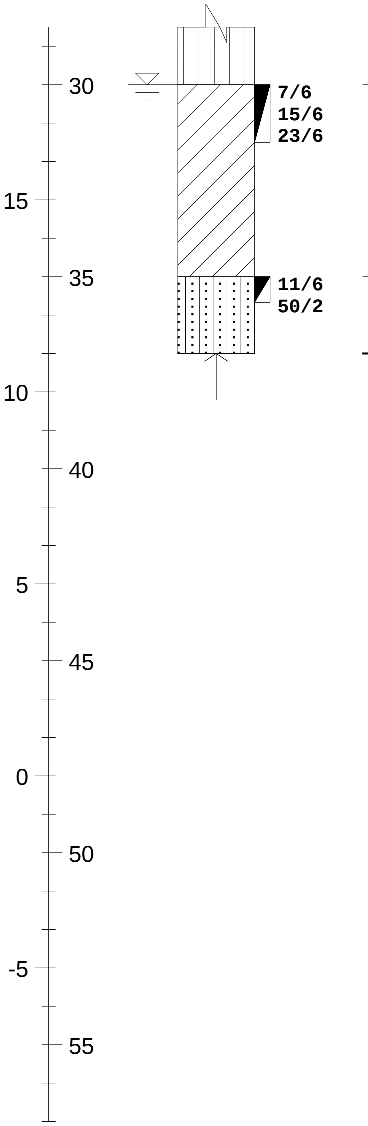
Logged By: JC

Date: 9/17/2019

Elevation: 48 feet AMSL

Depth to Groundwater First Encountered During Drilling: 30

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
30	7/6 15/6 23/6	CL	SANDY LEAN CLAY; hard, wet, low plasticity, brown	low recovery	38	26
35	11/6 50/2	SM	SILTY SAND, very dense, wet, fine to medium grained, brown		>50	23
			Auger refusal on cobble material, bottom of boring at 37 feet BSG			



Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: E-8

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 9/17/2019

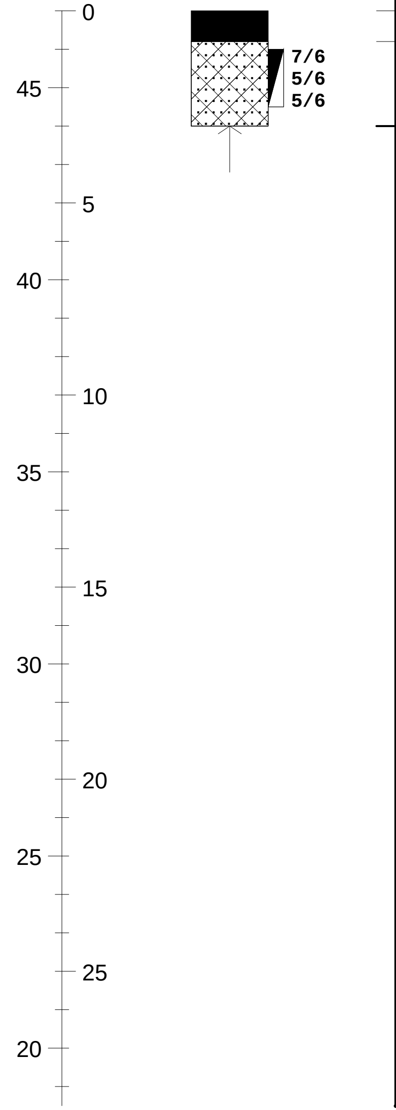
Drill Type: CME-75

Elevation: 47 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 3½ inches			
		SC	AB = 6 inches	Sand = 62.9% -#200 = 37.1% c = 200 PSF ø = 32° LL = 27 PI = 12	10	10
			FILL; CLAYEY SAND, loose, fine to medium grained, interbedded Silty Sand and Clayey Sand layers, brown to dark brown, trace fine gravel.			
			Auger Refusal on cobble material			

Notes:

Figure Number

Test Boring: E-8B

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 9/17/2019

Drill Type: CME-75

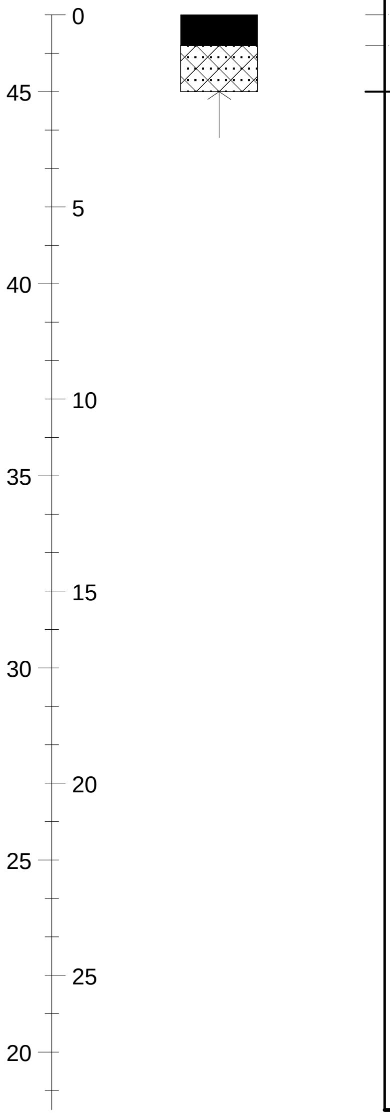
Elevation: 47 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 3½ inches			
		SC	AB = 6 inches			
			FILL; CLAYEY SAND, loose, fine to medium grained, interbedded Silty Sand and Clayey Sand layers, brown to dark brown, trace fine gravel			
			Auger refusal on large cobble, Bottom of Boring			



Notes: *boring moved 3 feet east of E-8*

Figure Number

Test Boring: F-1

Project: Home Depot Store - Mission Valley - San Diego, Ca

Project Number: D050R0.01

Logged By: VB

Drilled By: JC

Date: 2/26/2019

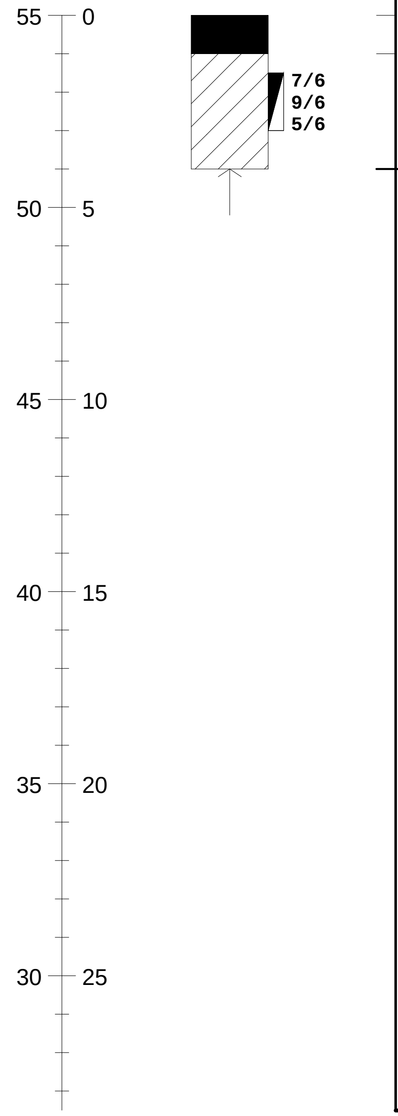
Drill Type: CME-75

Elevation: 55 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater
First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 6½ inches			
			AB = 5 inches			
		CL	SANDY LEAN CLAY; stiff, moist, moderate plasticity; brown		14	
			Auger refusal on dense gravel/ cobbles			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: F-1A

Project: Home Depot Store - Mission Valley - San Diego, Ca

Project Number: D050R0.01

Logged By: VB

Drilled By: JC

Date: 2/26/2019

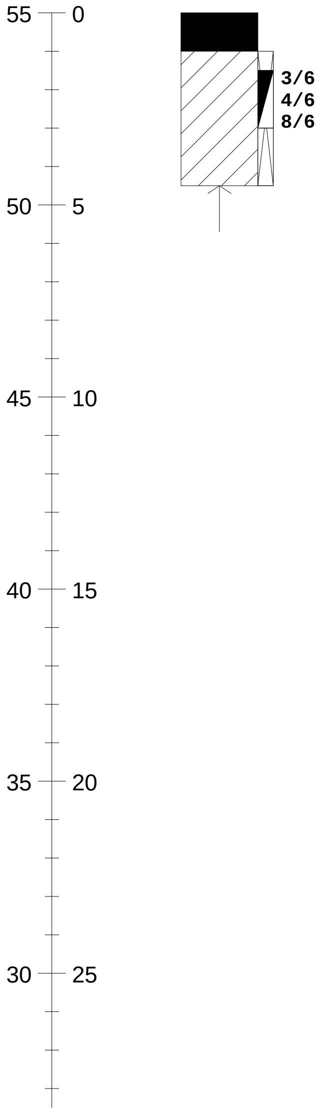
Drill Type: CME-75

Elevation: 55 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 6½ inches AB = 5 inches			
		CL	SANDY LEAN CLAY; stiff, moist, moderate plasticity, brown, some gravel	EI = 77	12	16
			Auger Refusal on dense gravels/ cobbles			

Notes: *5 feet north of F-1*

Figure Number

MOORE TWINING ASSOCIATES, INC.
Since 1898

Test Boring: F-2

Project: Home Depot Store - Mission Valley - San Diego, Ca

Project Number: D050R0.01

Drilled By: JS

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

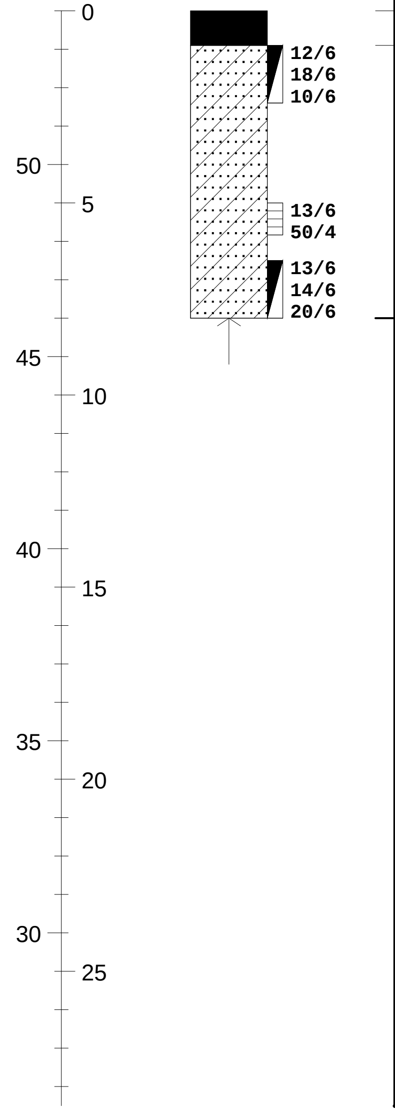
Logged By: JC

Date: 2/26/2019

Elevation: 54 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 7 inches AB = 4 inches			
	12/6 18/6 10/6	SC	CLAYEY SAND; medium dense, moist, fine to medium grained, olive, with iron oxide staining and trace of subangular gravel		28	14
	13/6 50/4			No Recovery	>50	
	13/6 14/6 20/6		Dense, light brown to brown, trace gravel auger refusal at 7 foot depth		34	8
			Bottom of Boring due to auger refusal at 7 feet on cobbles			



Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: F-3

Project: Home Depot Store - Mission Valley - San Diego, Ca

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

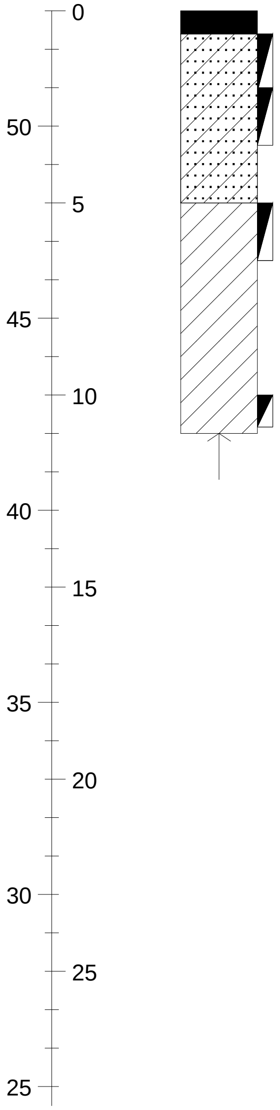
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/7/2019

Elevation: 53 feet AMSL

Depth to Groundwater
First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0			AC = 5 inches AB = 2 inches			
	12/6 13/6 9/6	SC	CLAYEY SAND; medium dense, damp, fine to coarse grained, light brown, some fine gravel		22	
	7/6 11/6 13/6		at 2 feet moisture increase		24	
5	6/6 10/6 6/6	CL	SANDY LEAN CLAY with Gravel; medium stiff, damp, low to medium plasticity, brown, fine to coarse gravel present		16	
10	5/6 50/4		sand and gravel content increasing		>50	
			Auger and Sampler refusal on cobbles			

Notes:

Figure Number

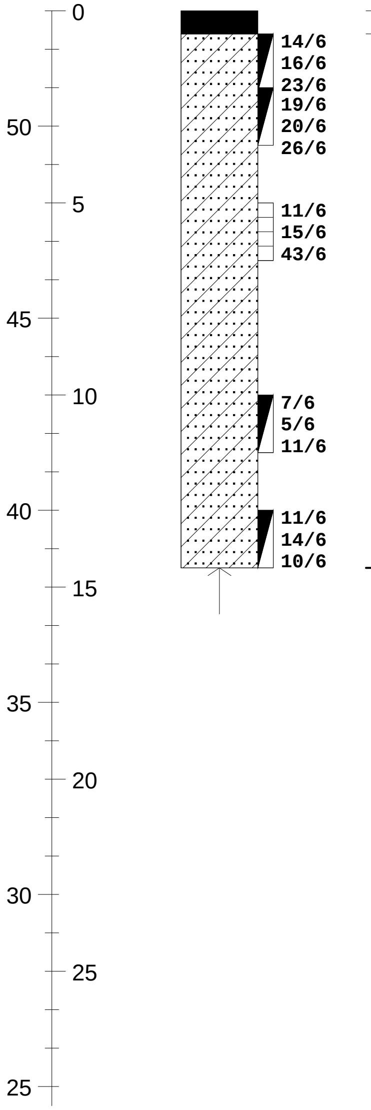
MOORE TWINING ASSOCIATES, INC.
Since 1898

Test Boring: F-4

Project: Home Depot Store - Mission Valley - San Diego, Ca
Project Number: D050R0.01
Drilled By: JC
Drill Type: CME-75
Auger Type: 6-5/8 inch hollow stem
Hammer Type: 140 pound auto trip

Logged By: JC
Date: 3/7/2019
Elevation: 53 feet AMSL
Depth to Groundwater First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet) | **SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA**



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	AC = 5-1/4 inches AB = 2 inches			
SC	CLAYEY SAND with Gravel; dense, slightly damp, fine sand to coarse grained gravel, brown to yellow brown , sub-angular 1½ inch gravel at 3 feet, 6 inch thick cemented layer	No Recovery	39 46 58	
	soils are medium dense, color is light brown		16	
	Auger refusal on cobble at 13 feet, sampler extended below encountered increased coarse gravel		24	
	Bottom of Boring due to Auger Refusal at 13 feet BSG			

Notes:

Figure Number

Test Boring: F-5

Project: Home Depot Store - Mission Valley - San Diego, Ca

Project Number: D050R0.01

Logged By: VB

Drilled By: JC

Date: 2/26/2019

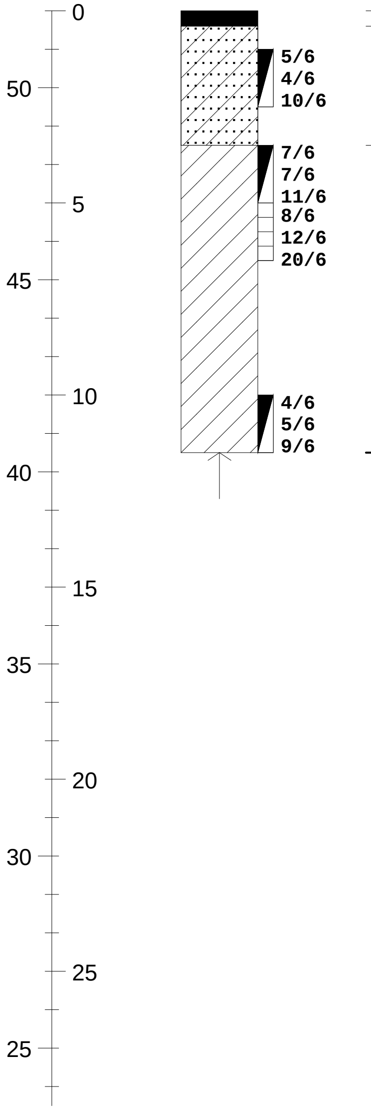
Drill Type: CME-75

Elevation: 52 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		SC	AC = 5 inches			
			AB = None		14	13
			CLAYEY SAND; medium dense, moist, fine to coarse grained, gray with some gravel			
		CL	SANDY LEAN CLAY; very stiff, moist, gray, with some gravel		18	13
				DD= 111.7 pcf	32	14
			Cobbles prevent drilling below 10 feet		14	15
			Bottom of Boring due to auger refusal on cobbles at 10 feet			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: F-6

Project: Home Depot Store - Mission Valley - San Diego, Ca

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

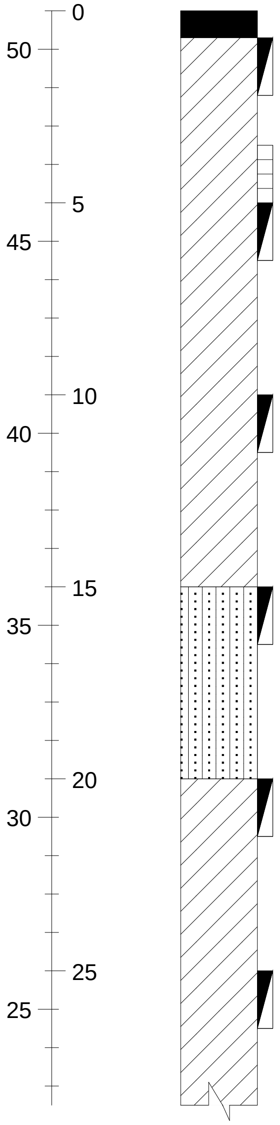
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/1/2019

Elevation: 51 feet AMSL

Depth to Groundwater
First Encountered During Drilling: 30 feet



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0			AC = 5 inches AB = 3 inches			
50	2/6 4/6 5/6	CL	SANDY LEAN CLAY; stiff, moist, low plasticity, gray-brown some iron oxide staining		9	
	35/6 22/6 19/6		at 3 feet, very stiff, color is brown to black		42	
5 / 45	12/6 10/6 10/6			No Recovery	20	
10 / 40	3/6 7/6 7/6		stiff, color is brown, 2 inch thick sandy silt seam		14	
15 / 35	9/6 25/6 20/6	SM	SILTY SAND; dense, moist, fine to medium grained, light brown to brown, some coarse sand, weakley cemented		45	
20 / 30	3/6 7/6 9/6	CL	SANDY LEAN CLAY; very stiff, moist, low to moderate plasticity, light gray-brown		16	
25 / 25	6/6 10/6 12/6		color is dark brown		22	

Notes:

Figure Number

Test Boring: F-6

Project: Home Depot Store - Mission Valley - San Diego, Ca

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

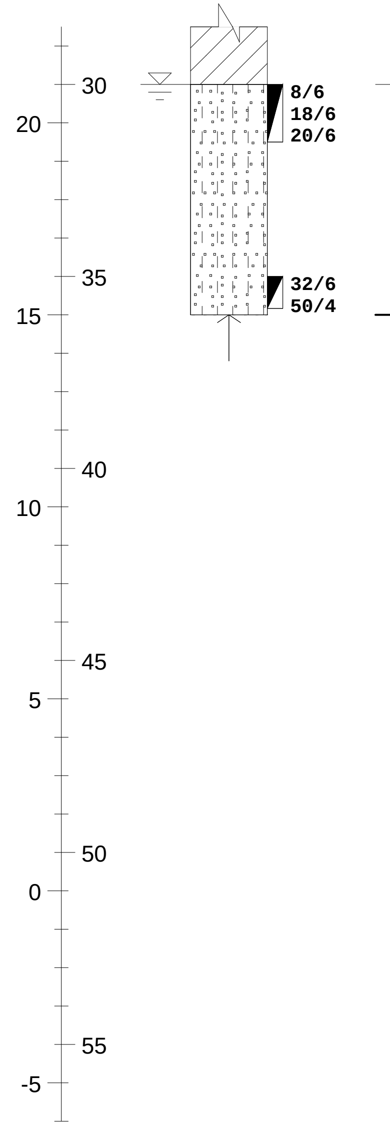
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/1/2019

Elevation: 51 feet AMSL

Depth to Groundwater
First Encountered During Drilling: 30 feet



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
30 20	8/6 18/6 20/6	SP-SM	POORLY GRADED SAND with Silt; dense, wet, fine to medium grained, brown		38	
35 15	32/6 50/4		Very dense		>50	
			Drilling and Sampler refusal			

Notes:

Figure Number

MOORE TWINING
ASSOCIATES, INC.

Test Boring: F-7A

Project: Home Depot Store - Mission Valley - San Diego, Ca

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 2/28/2019

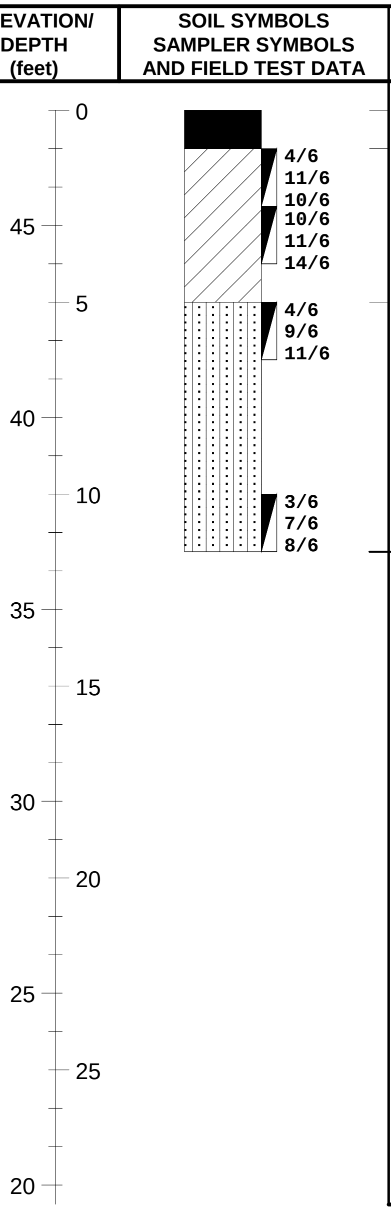
Drill Type: CME-75

Elevation: 48 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater
First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	AC = 7 inches AB = 5 inches			
CL	SANDY LEAN CLAY; very stiff, moist, low to moderate plasticity, dark brown, trace of gravel at 2.5 feet, color change to brown-black		21 25	
SM	SILTY SAND; medium dense, moist, fine to medium grained, brown		20	
	increse in silt content, slight increase in moisture		15	
	Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: F-7B

Project: Home Depot Store - Mission Valley - San Diego, Ca

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

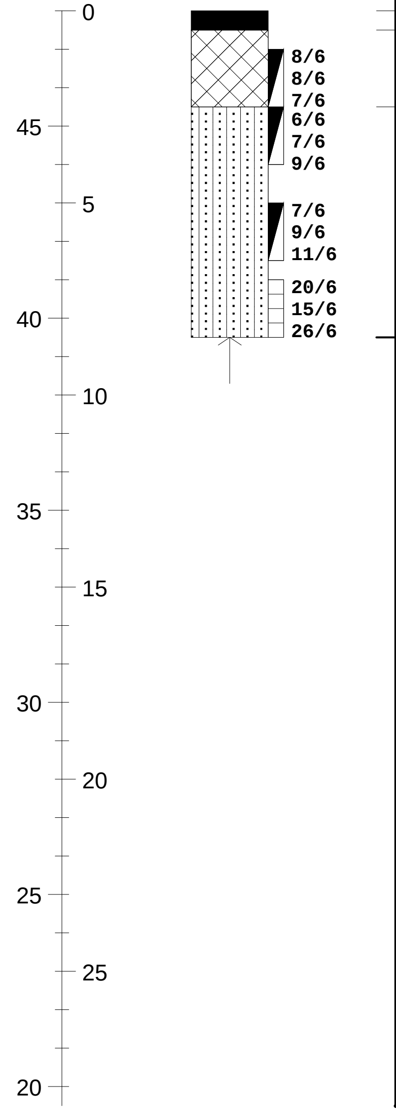
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 9/19/2019

Elevation: 48 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 5½ inches AB = 2 inhces			
	8/6 8/6 7/6	CL	FILL; SANDY LEAN CLAY; stiff, moist, non to moderate plasticity, interbedded Lean Clay and Sandy Silt layers, brown and red-brown, fine to corase angular gravel (broken rock fragments),		15	8
	6/6 7/6 9/6	SM	NATIVE; SILTY SAND; medium dense, moist, fine to medium grained, brown		16	10
	7/6 9/6 11/6				20	
	20/6 15/6 26/6			no recovery	40	
			Auger refusal at 7 feet on cobble materials, sampler extended to bottom of boring at 8½ feet BSG			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: F-7.3

Project: Home Depot Store - Mission Valley - San Diego, Ca

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

Logged By: JC

Date: 9/19/2019

Elevation: 47 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0		AC	AC = 6½ inches AB = 2 inhces 4 to 5 inch cobble under AB			
45	8/6 5/6 7/6	SC	CLAYEY SAND; medium dense, moist, fine to medium grained, dark brown		12	10
	16/6 26/6 21/6	SM	SILTY SAND; medium dense, moist, fine to medium grained, brown, trace of clay clumps	DD = 101.5 pcf	47	8
5 40	9/6 7/6 7/6	ML	SANDY SILT; stiff, moist, non-plastic, dark brown with iron oxide staining		14	22
10 35	6/6 7/6 8/6		at 10 feet decrease in sand fraction		15	17
15	6/6 6/6 5/6		color is gray, grading to Sandy Lean Clay		11	
30		CL	SANDY LEAN CLAY, stiff, moist, low to moderate plasticity, gray			
20 25	4/6 6/6 8/6				14	
25	9/6 13/6 15/6	ML	SANDY SILT; very stiff, moist, non-plastic, dark brown		28	
20			Bottom of Boring			

Notes:

Figure Number

Test Boring: F-8A

Project: Home Depot Store - Mission Valley - San Diego, Ca

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 2/28/2019

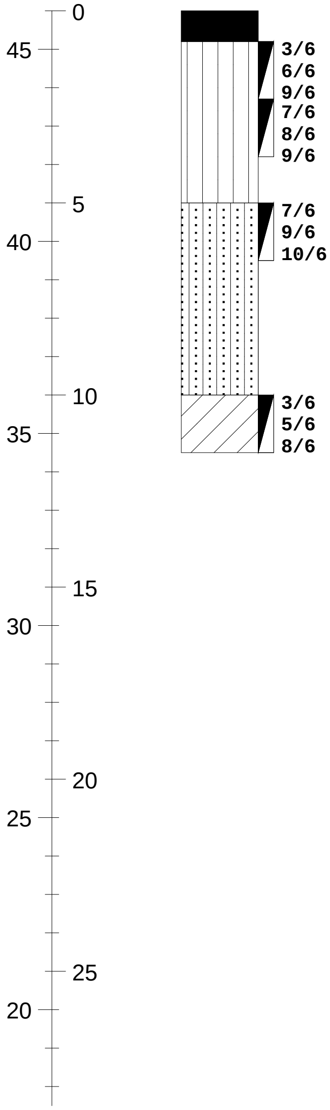
Drill Type: CME-75

Elevation: 46 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 7 inches AB = 2 inches			
	3/6 6/6 9/6 7/6 8/6 9/6	ML	SANDY SILT; stiff, moist, non-plastic, dark brown at 2.5 feet, very stiff, slight increase in sand		15 17	
	7/6 9/6 10/6	SM	SILTY SAND; medium dense, moist, fine to medium grained, brown		19	
	3/6 5/6 8/6	CL	SANDY LEAN CLAY; stiff, moist, low plasticity, dark brown		13	
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: F-8B

Project: Home Depot Store - Mission Valley - San Diego, Ca

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 9/19/2019

Drill Type: CME-75

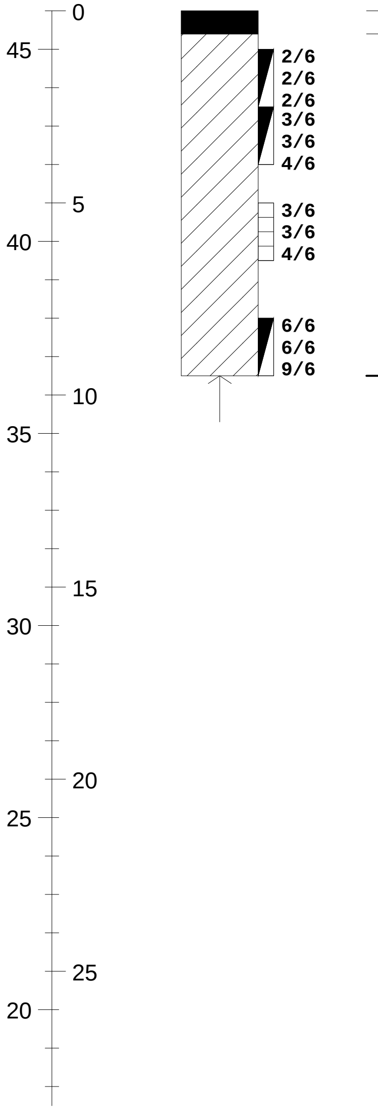
Elevation: 46 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater
First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		CL	AC = 5 inches AB = 2 inches SANDY LEAN CLAY; soft, moist, low to moderate plasticity, dark brown, trace of fine gravel		4	15
					7	17
				DD = 105.8 pcf	7	14
					15	
			Auger refusal at 8 feet, sampler penetration to bottom of boring at 9½ feet			



Notes: *Boring was drilled about 20 feet south of F-8A completed in February 2019*

Figure Number

Test Boring: G-1

Project: Home Depot Store- Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

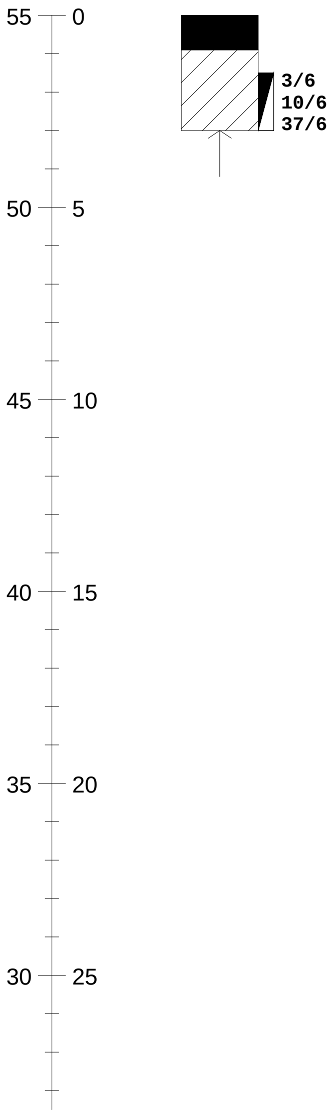
Hammer Type: 140 pound auto trip

Logged By: VB

Date: 2/26/2019

Elevation: 55 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 6 inches			
			AB = 5 inches			
	3/6 10/6 37/6	CL	SANDY LEAN CLAY w/ gravel; stiff, moderate plasticity, brown at 2.5 feet; grading to dense gravel		47	13
			Auger Refusal on dense gravel and cobbles			

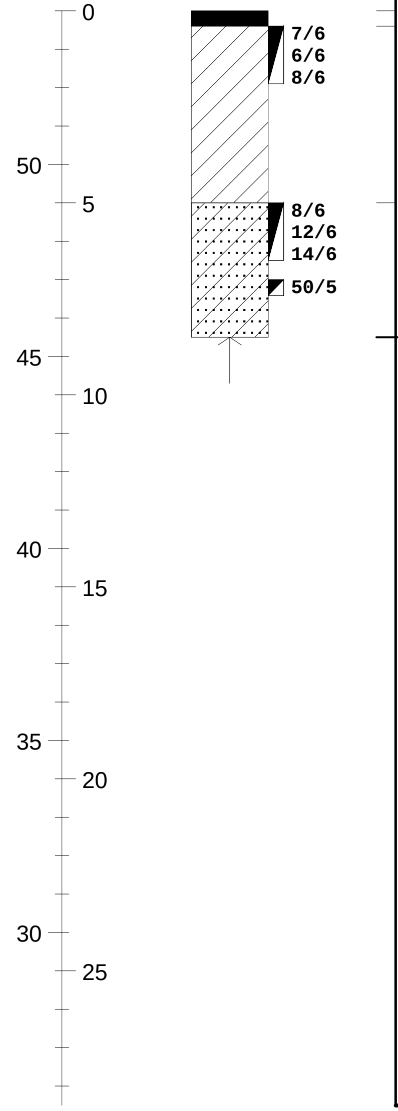
Notes:

Figure Number

Test Boring: G-2

Project: Home Depot Store- Mission Valley - San Diego, CA
Project Number: D050R0.01
Drilled By: JC
Drill Type: CME-75
Auger Type: 6-5/8 inch hollow stem
Hammer Type: 140 pound auto trip

Logged By: JC
Date: 3/7/2019
Elevation: 54 feet AMSL
Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 5-3/4 inches AB = 1 inch			
		CL	SANDY LEAN CLAY; stiff, damp, low ro moderate plasticity, light brown to yellow brown, trace gravel		14	
		SC	CLAYEY SAND with Gravel; medium dense, damp, fine grained sand and coarse gravel, light brown at 7 feet, grading to Clayey Gravel with Cobbles	Low Recovery	26 >50	
			Auger Refusal on cobbles			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: G-3

Project: Home Depot Store- Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 3/5/2019

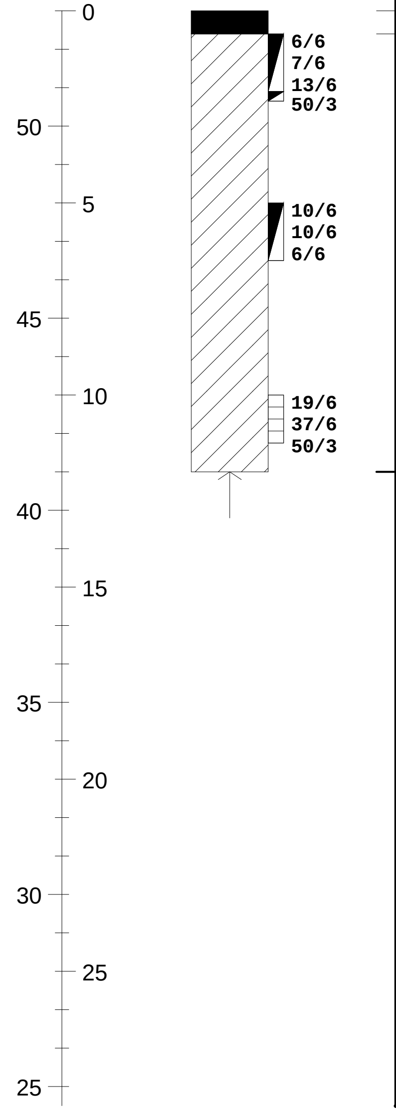
Drill Type: CME-75

Elevation: 53 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 7 inches AB = None			
		CL	SANDY LEAN CLAY; very stiff damp, low plastic, brown to light brown, some coarse subangular gravel		20	
			at 2 feet, less plastic, with very dense Silty Sand with gravel layer		>50	
			at 5 feet color is light brown		16	
			hard with coarse gravel (2 inch)	DD= 114.1 pcf	>50	13
			Auger refusal on gravel/cobbles			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: G-4

Project: Home Depot Store- Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 3/5/2019

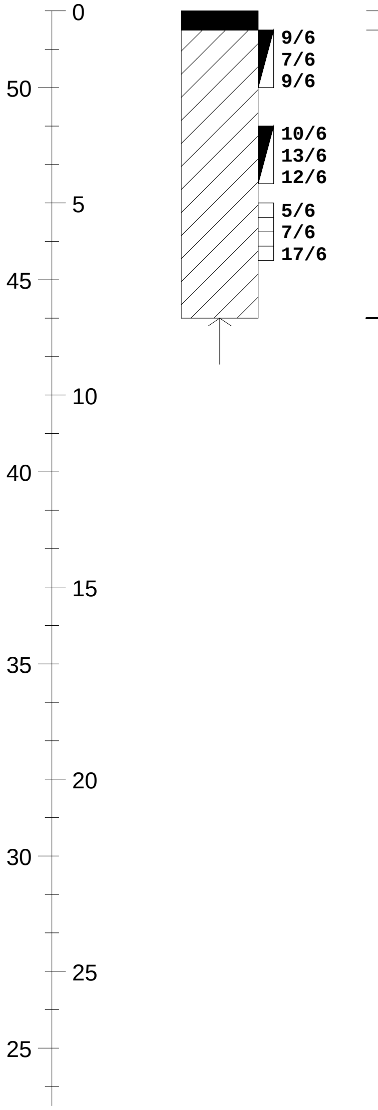
Drill Type: CME-75

Elevation: 52 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater
First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0	9/6 7/6 9/6	CL	AC = 6½ inches AB = None SANDY LEAN CLAY; very stiff, damp, low plasticity, light brown		16	
	10/6 13/6 12/6				25	
5	5/6 7/6 17/6		some fine gravel present	DD= 109.5 pcf	24	18
			Auger refusal on gravel/cobble			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC. Since 1898

Test Boring: G-5

Project: Home Depot Store- Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: VB

Drilled By: JC

Date: 2/26/2019

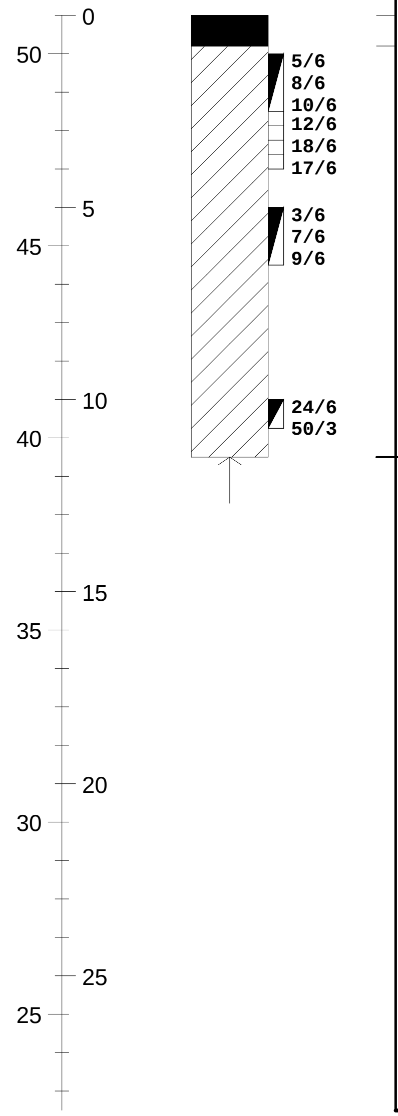
Drill Type: CME-75

Elevation: 51 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 10 inches			
	5/6 8/6 10/6	CL	AB = None		18	15
	12/6 18/6 17/6		SANDY LEAN CLAY; very stiff, moist, moderate plasticity, gray	DD= 111.5 pcf -200= 52% +4= 0% LL= 36 PI= 13	35	13
	3/6 7/6 9/6		low plasicity		16	13
	24/6 50/3		gravel fraction increasing		>50	8
			Auger Refusal			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: G-6

Project: Home Depot Store- Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

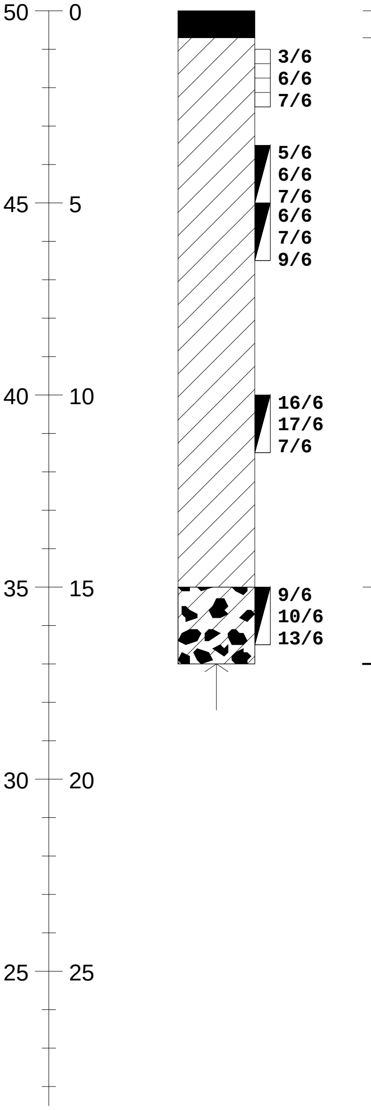
Hammer Type: 140 pound auto trip

Logged By: VB

Date: 2/27/2019

Elevation: 50 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
50 0			AC = 9 inches AB = None			
	3/6 6/6 7/6	CL	SANDY LEAN CLAY; stiff, moist, moderately plastic, gray	DD= 104.0 pcf -200= 52% LL = 36 PI = 13	13	18
	5/6 6/6 7/6				13	11
45 5	6/6 7/6 9/6				16	20
40 10	16/6 17/6 7/6				24	15
35 15	9/6 10/6 13/6	GC	CLAYEY GRAVEL; medium dense, moist, medium to coarse grained, subrounded		23	8
			Auger refusal on dense gravel/ cobble			
30 20						
25 25						

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.
Since 1898

Test Boring: G-7

Project: Home Depot Store- Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 9/19/2019

Drill Type: CME-75

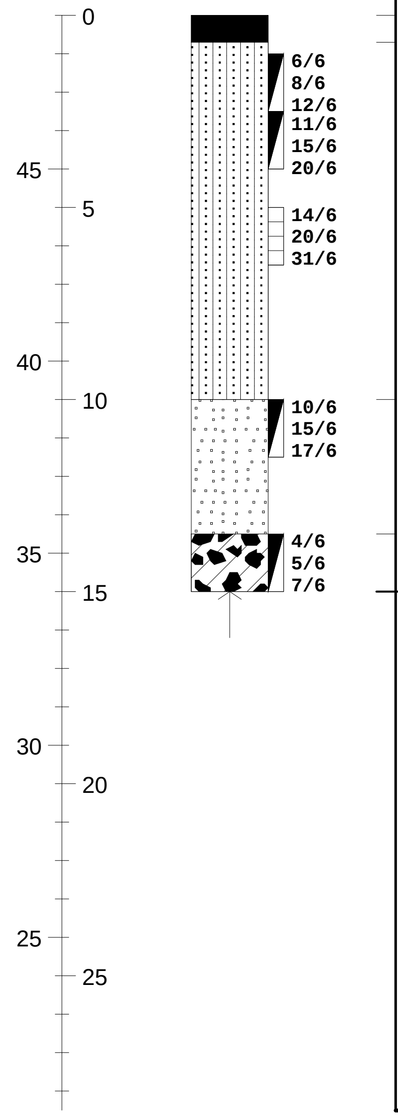
Elevation: 49 feet

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip

ELEVATION/ DEPTH (feet) | **SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA**



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
AC	AC = 6 inches			
SM	AB = 2½ inches SILTY SAND; medium dense, moist, fine to medium grained, brown		20	5
	at 2½ feet, dense		35	
	at 5 feet, decrese in silt fraction	DD= 107.6 psf	51	5
SP	POORLY GRADED SAND; dense, moist, fine to coarse, brown		32	
GC	SANDY LEAN CLAY with Gravel and Cobble; stiff, moist, low to moderate plasticity, brown with oxoide staining		12	
	Auger refusal at 13½ feet, sampler extended to bottom of boring at 15 feet BSG.			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: G-7.3

Project: Home Depot Store- Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 9/19/2019

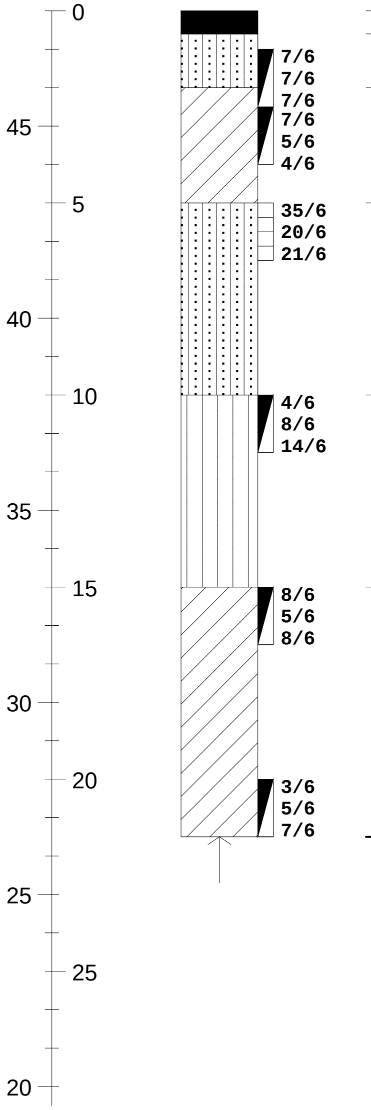
Drill Type: CME-75

Elevation: 48 feet

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		AC	AC = 5½ inches			
		SM	AB = 2 inches SITLY SAND; medium dense, moist, fine to medium grained, brown		14	8
		CL	SANDY LEAN CLAY; stiff, moist, low to moderate plasticity, brown		9	13
		SM	SILTY SAND; dense, moist, fine to medium grained, brown	DD = 98.3 pcf	41	5
		ML	SANDY SILT; very stiff, moist, non-plastic, dark brown		22	14
		CL	SANDY LEAN CLAY; stiff, moist, low to moderate plasticity, brown		13	
			decrease in sand fraction		12	
			Auger refusal on cobble at 21 feet, sampler extended to 21½ feet			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: G-7.6

Project: Home Depot Store- Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JS

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

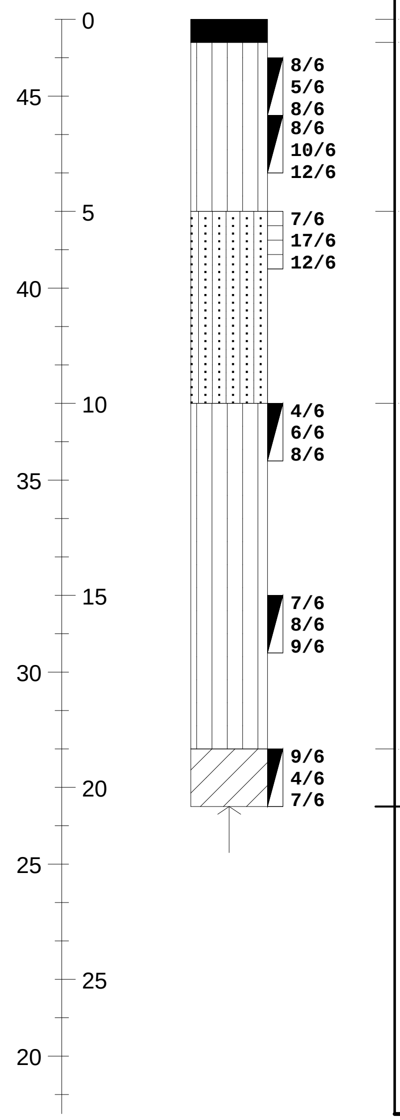
Logged By: JC

Date: 9/20/2019

Elevation: 47 feet

Depth to Groundwater
First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet) | **SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA**



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
ML	AC = 5-1/4 inches AB = 2 inches SANDY LEAN CLAY; stiff, moist, low plasticity, brown	Bulk Sample Sand = 31.6% -#200 = 68.4% LL = 30 PI = 12 Remold Shear ø = 19° c = 330 PSF DD = 107.6 pcf	13 22	18
SM	SILTY SAND; medium dense, moist, fine to medium grained, brown, trace gravel		38	8
ML	SANDY SILT; stiff, moist, slight plasticity, brown, cobbles encountered, hard drilling		14 17	23
CL	SANDY LEAN CLAY with gravel and cobble, stiff, moist, low to medium plasticity, brown		11	
	Auger refusal at 19 feet, sampler extended to bottom of boring at 20½ feet			

Notes:

Figure Number

MOORE TWINING
ASSOCIATES, INC.

Test Boring: G-8

Project: Home Depot Store- Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JS

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

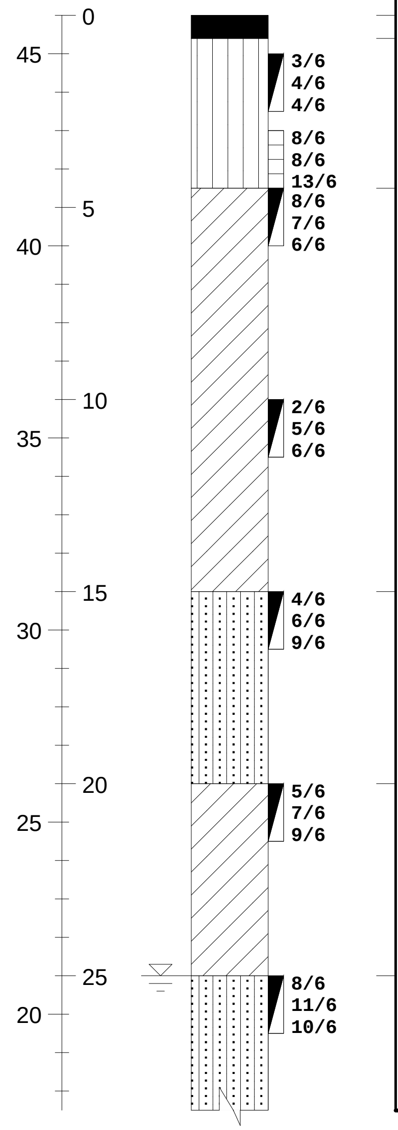
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 9/20/2019

Elevation: 46 feet

Depth to Groundwater
First Encountered During Drilling: 25



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0		AC	AC = 5 inches			
	3/6 4/6 4/6	ML	AB = 2 inches SANDY SILT; medium stiff, moist, slight plasticty, dark brown with iron oxide staining		8	21
	8/6 8/6 13/6			No Recovery	21	
5	8/6 7/6 6/6	CL	SANDY LEAN CLAY; stiff, moist, low to moderate plasticity, dark brown		13	
10	2/6 5/6 6/6		plasticty is low		11	27
15	4/6 6/6 9/6	SM	SILTY SAND; medium dense, moist, fine to medium grained, brown, 1 inch thick sandy lean clay lense		15	
20	5/6 7/6 9/6	CL	SANDY LEAN CLAY; very stiff, moist, low to moderate plasticity, brown at 22 feet, hard drilling in cobbles		16	
25	8/6 11/6 10/6	SM	SILTY SAND, medium dense, wet, fine to medium grained, dark brown		21	

Notes:

Figure Number

Test Boring: G-8

Project: Home Depot Store- Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JS

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

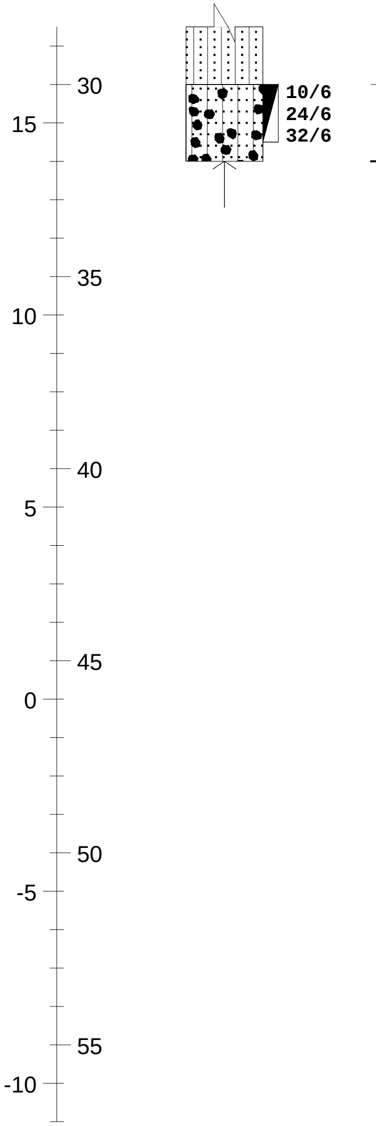
Logged By: JC

Date: 9/20/2019

Elevation: 46 feet

Depth to Groundwater First Encountered During Drilling: 25

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		GP-GM	POORLY GRADED GRAVEL with Sand and Silt; very dense, moist, wet, fine sand to medium gravel, dark brown		56	
			Auger refusal on dense cobble/ gravel at 32 feet			



Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: H-1

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

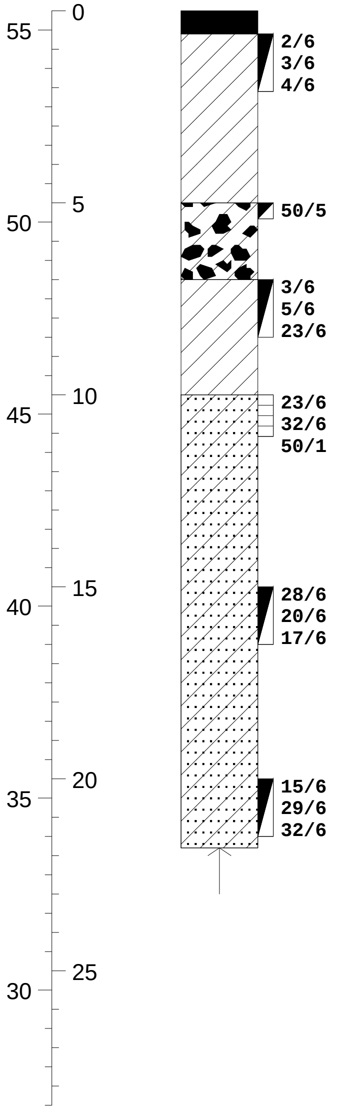
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/5/2019

Elevation: 55.5 feet AMSL

Depth to Groundwater
First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0 / 55	2/6 3/6 4/6	CL	AC = 7 inches AB = None SANDY LEAN CLAY; medium stiff, moist, low plastic, some gravel		7	
5 / 50	50/5	GC	CLAYEY GRAVEL; very dense, moist, medium to coarse grained, subrounded		>50	
	3/6 5/6 23/6	CL	SANDY LEAN CLAY; very stiff, moist, low to moderate plasticity, dark brown, trace angular gravel		28	
10 / 45	23/6 32/6 50/1	SC	CLAYEY SAND with Gravel; very dense, moist, medium sand to coarse gravel, dark brown	Low Recovery DD= 90.2 pcf	>50	2
15 / 40	28/6 20/6 17/6			No Recovery	37	
20 / 35	15/6 29/6 32/6		less fine grained material, Grading to Poorly Graded Sand with clay and gravel		61	
			Auger refusal on very dense gravel/cobble			
25 / 30						

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: H-2

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 3/7/2019

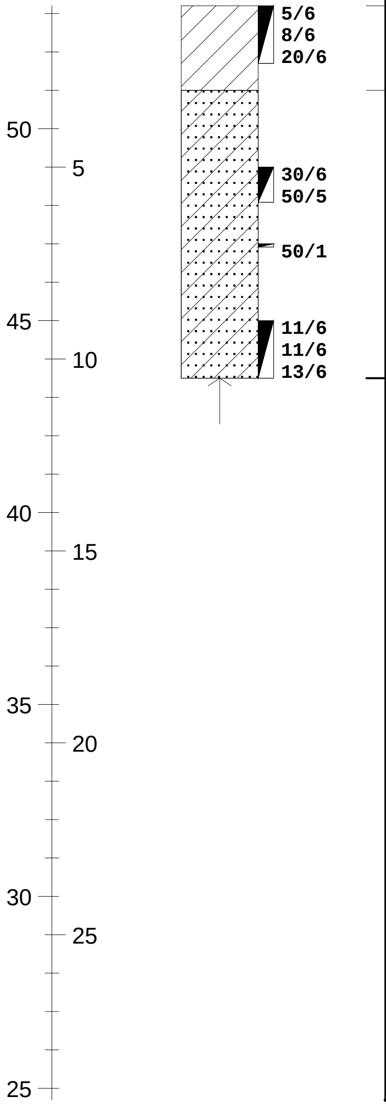
Drill Type: CME-75

Elevation: 54 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
CL	SANDY LEAN CLAY; very stiff, damp, low to moderate plasticity, brown, with trace of fine to coarse gravel		28	
SC	CLAYEY SAND with Gravel; very dense, damp, fine sand to coarse grained gravel, brown At 5 feet difficult drilling At 7 feet more fine gravel		>50	
	Grading to SANDY LEAN CLAY, Auger refusal at 9 feet on cobble		24	
	Bottom of Boring due to auger refusal at 9 feet.			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: H-3

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JS

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

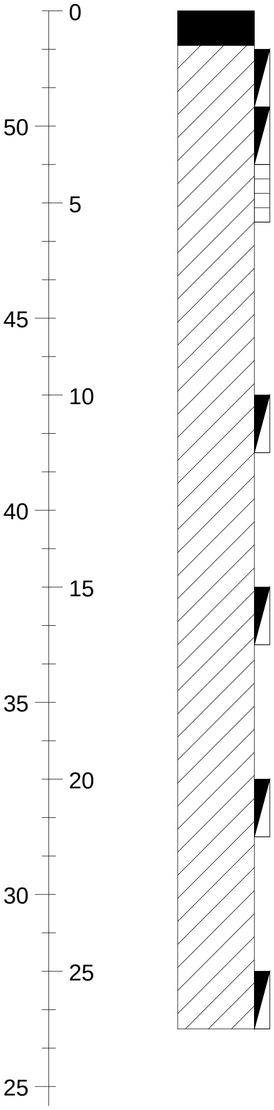
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 2/27/2019

Elevation: 53 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 7 inches AB = 4½ inches			
	14/6 11/6 6/6	CL	SANDY LEAN CLAY; very stiff, moist, low plasticity, brown, trace gravel		17	10
	5/6 15/6 19/6		at 2.5 feet, hard, iron oxide staining		34	14
	12/6 35/6 25/6		at 4 feet, increase in sand, decrease in plasticity	DD= 114.1 pcf	60	10
	6/6 7/6 10/6		very stiff, color is gray-brown		17	15
	5/6 8/6 8/6		low to moderate plasticity		16	17
	10/6 7/6 7/6		iron oxide staining		14	14
	3/6 4/6 6/6		less sand, color is dark brown-gray			24
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: H-4

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

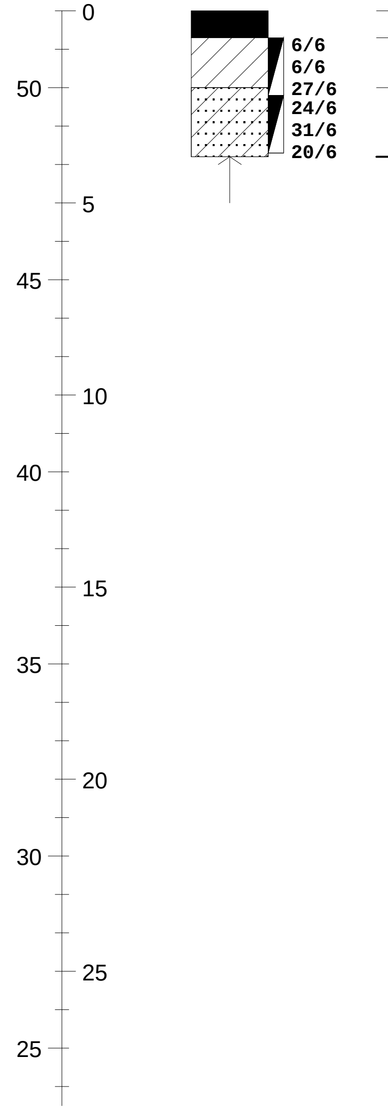
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/5/2019

Elevation: 52 feet AMSL

Depth to Groundwater
First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 5 inches AB = 2 inches			
		CL	SANDY LEAN CLAY; stiff, moist, low plastic, brown, coarse gravel in layer		33	
		SC	CLAYEY SAND with Gravel; very dense, moist, medium sand to coarse gravel, brown		51	
			Auger Refusal on cobbles (three locations)			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: H-5

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: VB

Drilled By: JC

Date: 2/27/2019

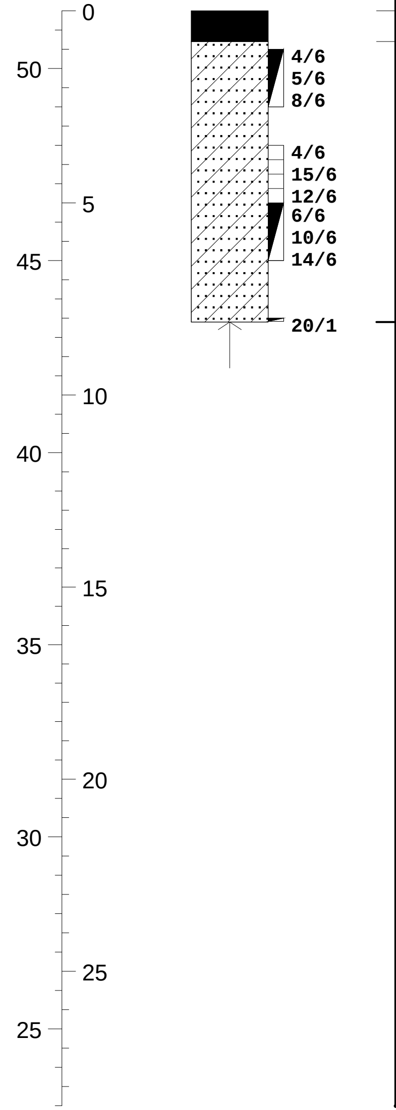
Drill Type: CME-75

Elevation: 51.5 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 9 inches			
			AB = None			
		SC	CLAYEY SAND; medium dense, moist, fine to medium grained, brown At 5 feet increase in clay fraction, some gravel	EI = 81	13	13
				DD= 110.5 pcf	27	13
			Auger and Sampler refusal			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.
Since 1898

Test Boring: H-6

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

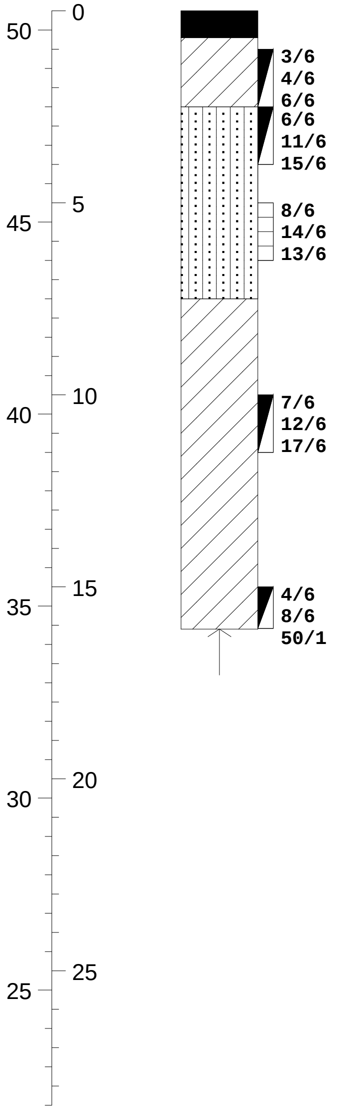
Hammer Type: 140 pound auto trip

Logged By: VB

Date: 2/27/2019

Elevation: 50.5 feet AMSL

Depth to Groundwater
First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 8 inches AB = None			
	3/6 4/6 6/6	CL	SANDY LEAN CLAY; medium stiff, moist, moderate plasticity, gray	LL = 36 PI = 12	10	15
	6/6 11/6 15/6	SM	SILTY SAND; medium dense, moist, fine to medium grained, light gray, with clay lumps		26	
	8/6 14/6 13/6			DD= 103.7 pcf -200 = 37.8	27	12
		CL	SANDY LEAN CLAY: very stiff, moist, moderate plasticity, gray			
	7/6 12/6 17/6				29	10
	4/6 8/6 50/1		gravel at 16 feet		>58	15
			Auger and sampler refusal on gravel/cobble			

Notes:

Figure Number

Test Boring: H-7A

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: VB

Drilled By: JC

Date: 2/27/2019

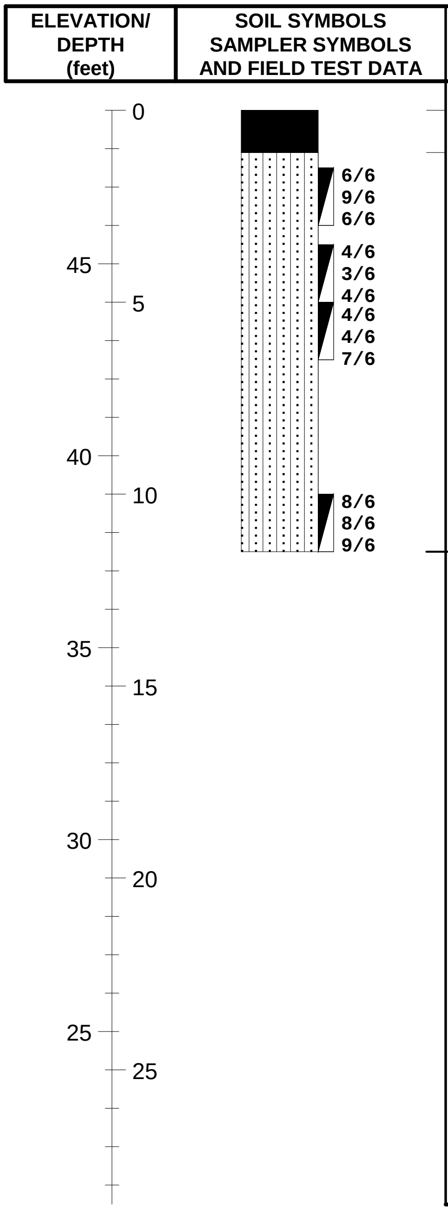
Drill Type: CME-75

Elevation: 49 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater
First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	AC = 7 inches			
	AB = 5 inches			
SM	SILTY SAND; medium dense, moist, fine to medium grained, light brown		15	8
	At 3.5 feet becoming loose		7	12
	At 6 feet becoming medium dense		11	13
	At 11 feet, grading to Sandy Lean Clay		17	20
	Bottom of Boring			

Notes:

Figure Number

Test Boring: H-7B

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 9/19/2019

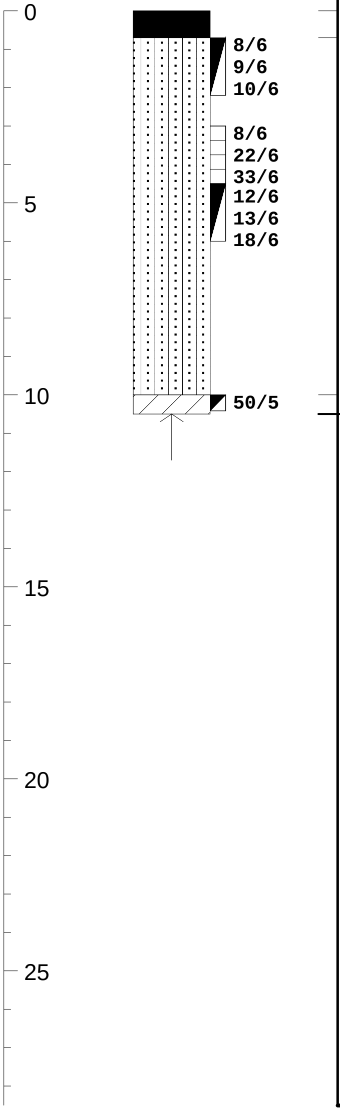
Drill Type: CME-75

Elevation: N/A

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0	8/6 9/6 10/6	AC SM	AC = 5.5 inches AB = 2.5 inches SILTY SAND; medium dense, moist, fine to medium grained, brown		19	6
	8/6 22/6 33/6		at 3 feet, dense with decrease in silt fraction	DD = 102.4 pcf	55	8
5	12/6 13/6 18/6				31	5
10	50/5	CL	Soils grading to SANDY LEAN CLAY low plasticity, dark-brown, iron oxide staining		>50	24
			Auger and Sampler refusal at 10.5 feet on cobble.			

Notes: *Boring drilled 20 feet west of boring H-7A completed in February 2019*

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: H-7.3

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 9/19/2019

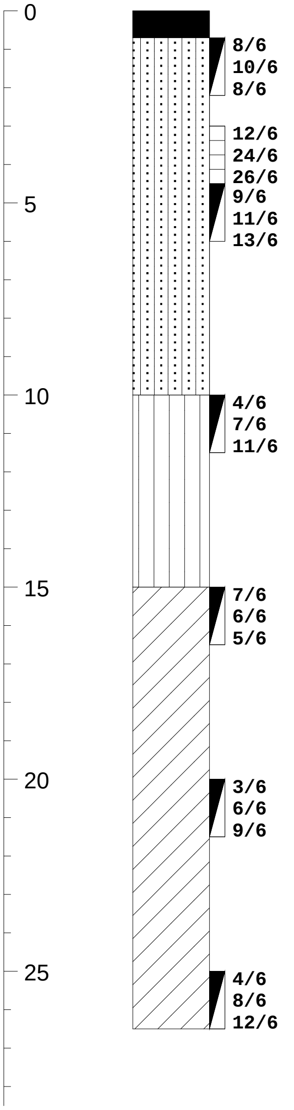
Drill Type: CME-75

Elevation: N/A

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater
First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0		AC	AC = 5.5 inches			
	8/6 10/6 8/6	SM	AB = 2.5 inches SILTY SAND; medium dense, moist, fine to medium grained, brown		18	4
	12/6 24/6 26/6			DD = 105.2 pcf	50	4
5	9/6 11/6 13/6				24	6
10	4/6 7/6 11/6	ML	SANDY SILT; very stiff, moist, non-plastic, dark-brown		18	16
15	7/6 6/6 5/6	CL	SANDY LEAN CLAY; stiff, moist, low plasticity, brown		11	
20	3/6 6/6 9/6		Low to medium, trace broken cobble fragments in sampler		15	
25	4/6 8/6 12/6		Very stiff, increase in sand fraction, dark-brown, iron oxide staining		20	
			Bottom of boring at 26.5 feet BSG			

Notes:

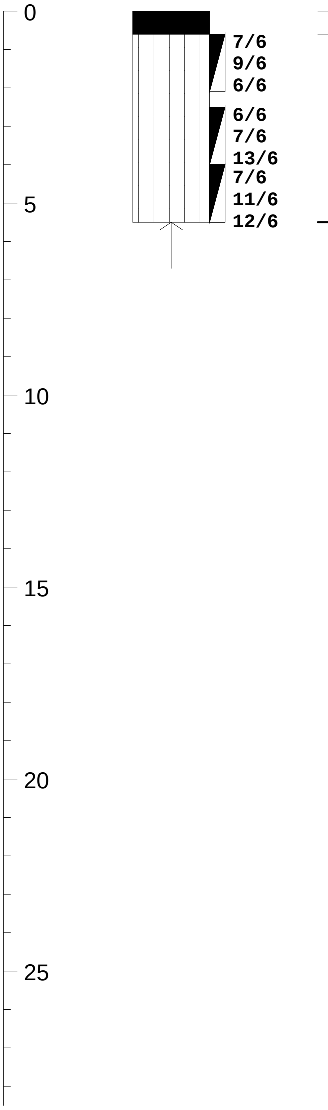
Figure Number

MOORE TWINING
ASSOCIATES, INC.

Test Boring: H-7.6

Project: Home Depot Store - Mission Valley - San Diego, CA
Project Number: D050R0.01
Drilled By: JS
Drill Type: CME-75
Auger Type: 6-5/8 inch hollow stem
Hammer Type: 140 pound auto trip

Logged By: JC
Date: 9/19/2019
Elevation: N/A
Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		AC	AC = 5.5 inches			
		ML	AB = 2.5 inches SANDY SILT; stiff, moist, non-plastic, brown Iron oxide staining Auger refusal at 4 feet, sampler extended to 5.5 feet to bottom of boring		15 20 23	11 12 13
			Bottom of boring at 5.5			

Notes: *This log represents the second boring attempt at this location. The intial attempt encountered auger refusal in cobbles at 0.6 feet BSG just below the pavement section*

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: H-8A

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: VB

Drilled By: JC

Date: 2/27/2019

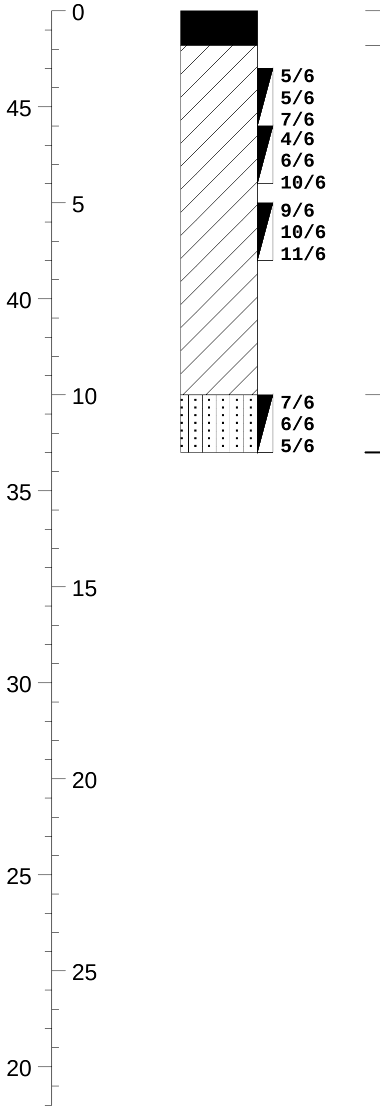
Drill Type: CME-75

Elevation: 47.5 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 8 inches AB = 3 inches			
		CL	SANDY LEAN CLAY; moist, stiff, moderate plasticity, brown	RV = 19 -200 = 55% +4 = 0%	12 16 21	17 23 13
		SM	SILTY SAND; medium dense, moist, fine to medium grained, brown		11	16
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.
Since 1898

Test Boring: H-8B

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JS

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

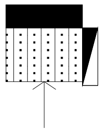
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 9/19/2019

Elevation: N/A

Depth to Groundwater
First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0	 10/6 7/6 7/6	AC	AC = 5.0 inches		14	23
		SM	AB = 2.5 inches			
			SILTY SAND; medium dense, moist, fine to medium grained, dark-brown, 3 inch thick seam of silt			
5			Auger refusal 2.0 feet			
10						
15						
20						
25						

Notes: *Boring drilled about 20 feet north of B-8A completed in February 2019*

Figure Number

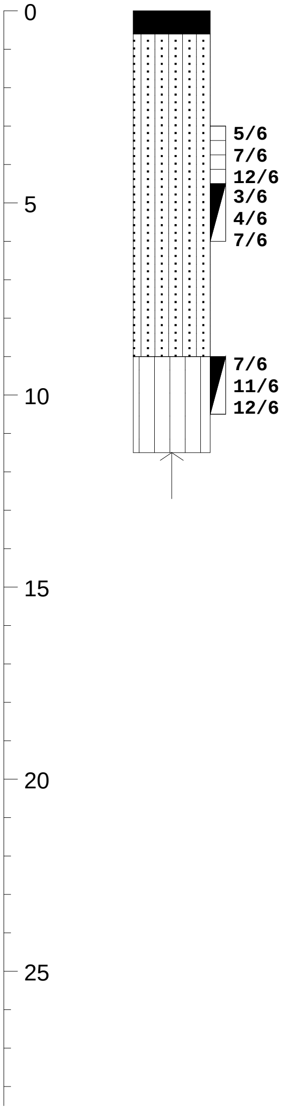
MOORE TWINING ASSOCIATES, INC.
Since 1898

Test Boring: H-8C

Project: Home Depot Store - Mission Valley - San Diego, CA
Project Number: D050R0.01
Drilled By: JS
Drill Type: CME-75
Auger Type: 6-5/8 inch hollow stem
Hammer Type: 140 pound auto trip

Logged By: JC
Date: 9/19/2019
Elevation: N/A
Depth to Groundwater First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet) | **SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA**



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
AC	AC = 5.0 inches			
SM	AB = 2.5 inches			
	SILTY SAND; moist, fine to medium grained, brown Medium dense	DD = 105.3 pcf	19	9
	Increase in silt fraction		11	12
ML	Auger refusal at 9.0 feet, sampler extended to 11.5 feet, at 9 feet grading to SANDY SILT; very stiff, moist, slight plasticity, brown		23	27
	Bottom of boring at 11.5 feet BSG			

Notes: *second attempt to drill boring about 5 feet west of H-8B*

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: I-1

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

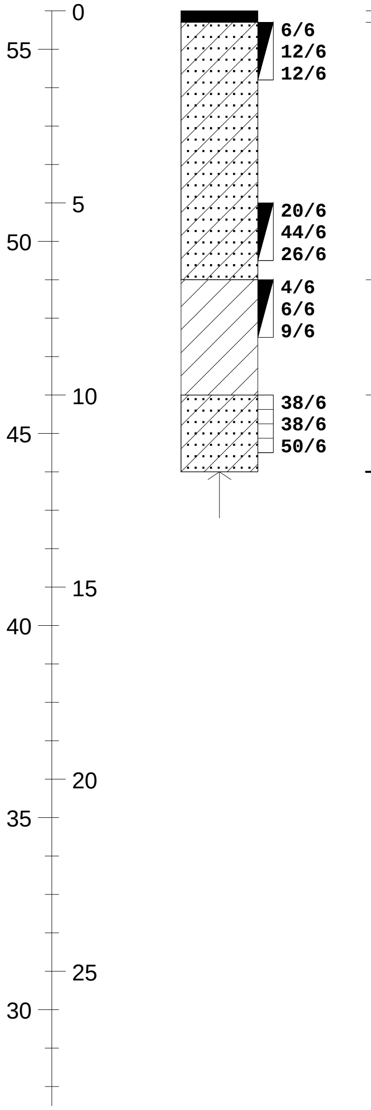
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/5/2019

Elevation: 56 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	6/6 12/6 12/6	SC	AC = 6-1/4 inch AB = none CLAYEY SAND; medium dense, damp, interbedded non-plastic zones (SM), fine to coarse grained, light brown, 2 inch subrounded gravel		24	9
	20/6 44/6 26/6			No Recovery	70	
	4/6 6/6 9/6	CL	SANDY LEAN CLAY with Gravel; very stiff, moist, low to moderate plasticity, dark brown to brown, with fine to coarse grained gravel		15	
	38/6 38/6 50/6	SC	CLAYEY SAND with Gravel; very dense, damp, fine sand to coarse gravel (up to 3-1/2 inches)	DD= 104.1 pcf	88	13
			Auger Refusal on cobbles and dense gravel			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: I-2

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

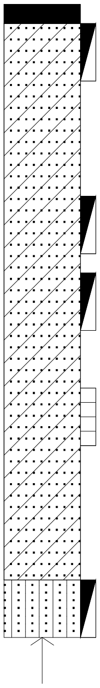
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/7/2019

Elevation: 55.5 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
55 / 0	10/6 13/6 23/6		AC = 6½ inches AB = None		36	
		SC	CLAYEY SAND with Gravel; dense, damp, fine to coarse grained, light brown, some Silty Sand zones			
50 / 5	3/6 6/6 10/6		at 5 feet medium dense, less gravel		16	
	8/6 12/6 13/6		clay fraction increased		25	
45 / 10	19/6 13/6 23/6		interbeded with Sandy Lean Clay layers,		36	
40 / 15	25/6 22/6 23/6	SM	SILTY SAND; dense, damp, fine to coarse grained, light brown to yellow brown, trace clay and fine gravel		45	
			Auger Refusal			
35 / 20						
30 / 25						

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: I-3

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 2/27/2019

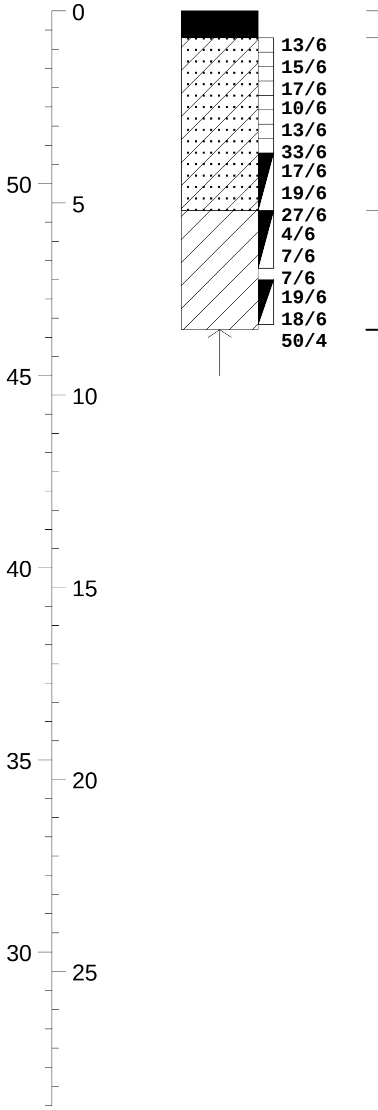
Drill Type: CME-75

Elevation: 54.5 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater
First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 5 inches AB = 3½ inches	No Recovery	32	
		SC	CLAYEY SAND; medium dense, moist, fine to medium grained, olive, trace subangular to subrounded gravel	DD= 110.9 pcf	46	12
			at 3.7 feet, increase in sand		46	8
		CL	SANDY LEAN CLAY; stiff, moist, low plasticity, dark brown		14	17
			gravel content increasing		>68	6
			Auger and Sampler Refusal on dense gravel/cobbles			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Since 1898

Test Boring: I-4

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 2/27/2019

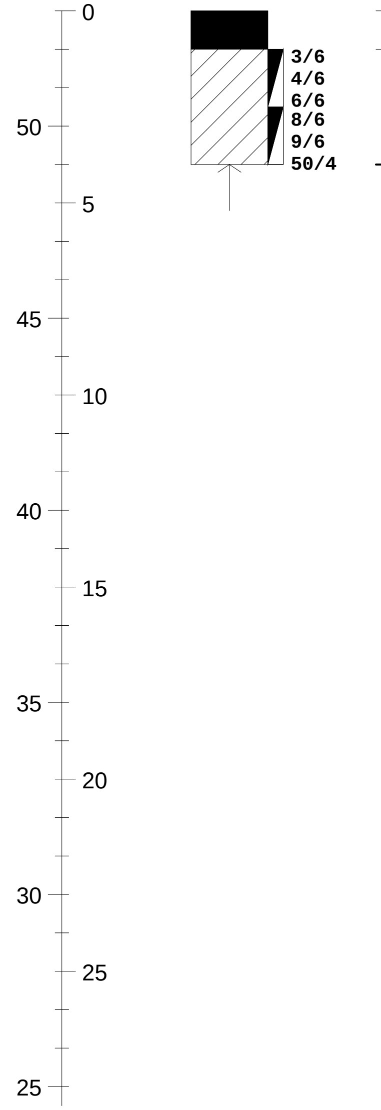
Drill Type: CME-75

Elevation: 53 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 7.5 inches AB = 4 inches			
	3/6 4/6 6/6	CL	SANDY LEAN CLAY; stiff, moist, low to moderate plasticity, dark brown, trace of gravel		10	15
	8/6 9/6 50/4		at 3 becomming hard, difficult drilling		>50	14
			Auger Refusal			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Since 1898

Test Boring: I-5

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

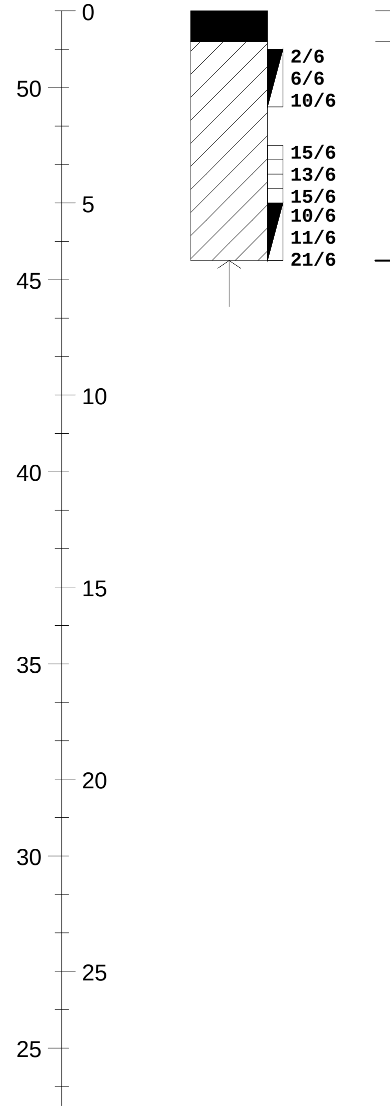
Hammer Type: 140 pound auto trip

Logged By: VB

Date: 2/27/2019

Elevation: 52 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0			AC = 9 inches			
	2/6 6/6 10/6	CL	AB = none SANDY LEAN CLAY; very stiff, moist, moderate plasticity; brown		16	14
	15/6 13/6 15/6			DD= 118.9 pcf	28	9
5	10/6 11/6 21/6		Grading to Clayey Gravel with Cobbles	No recovery	32	
			Auger Refusal on Cobbles			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: I-6

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: VB

Drilled By: JC

Date: 2/27/2019

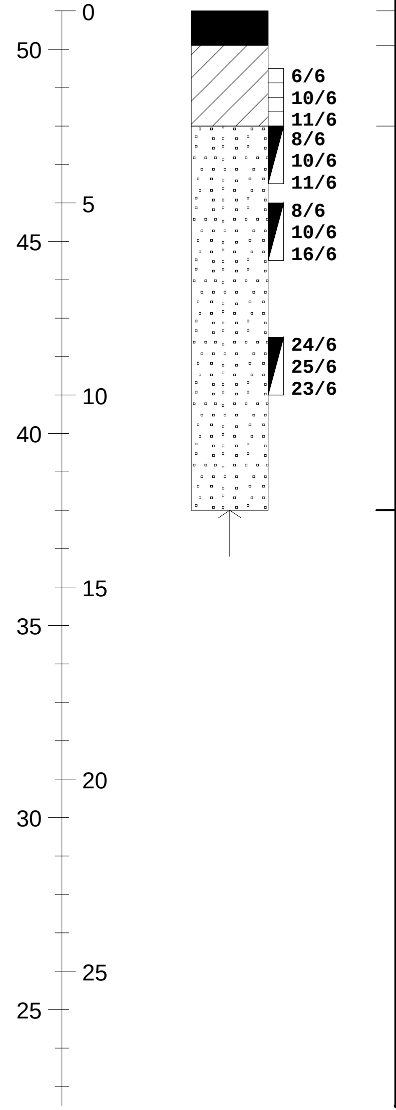
Drill Type: CME-75

Elevation: 51 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 3½ inches AB = 7 inches			
	6/6 10/6 11/6	CL	SANDY LEAN CLAY; very stiff, moist, low plasticity, light gray	DD= 106.2 pcf	21	14
	8/6 10/6 11/6	SP	POORLY GRADED SAND with Gravel and Cobble; medium dense, moist, medium grained sand to fine cobble		21	8
	8/6 10/6 16/6				26	
	24/6 25/6 23/6		Very dense		48	9
			Auger Refusal on dense gravel and cobble			

Notes:

Figure Number

Test Boring: I-7 A

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 9-19-19

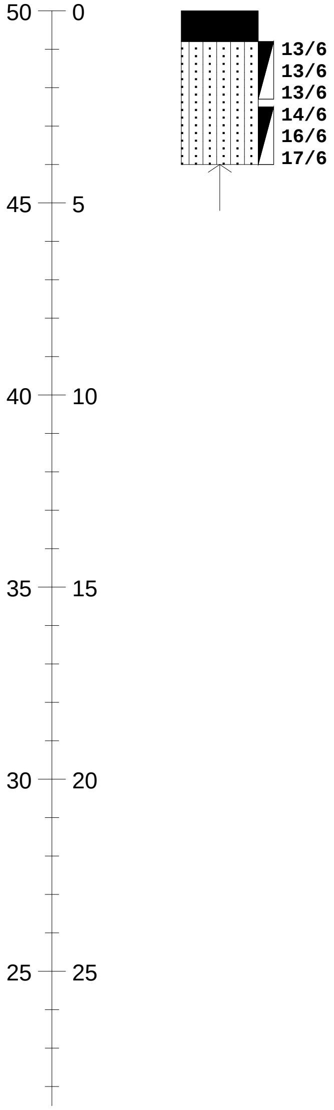
Drill Type: CME-75

Elevation: 50 feet

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

Depth to Groundwater
First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
50 / 0		AC	AC = 6 inches			
	13/6 13/6 13/6 14/6 16/6 17/6	SM	AB = 3 inches SILTY SAND; medium dense, moist, fine to medium grained, brown, trace clay Auger refusal at 1.0 foot, samplers extended to 4 feet to bottom of boring.		26 33	4 6
			Bottom of boring at 4.0 feet			

Notes:

Figure Number

Test Boring: I-7 B

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JS

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

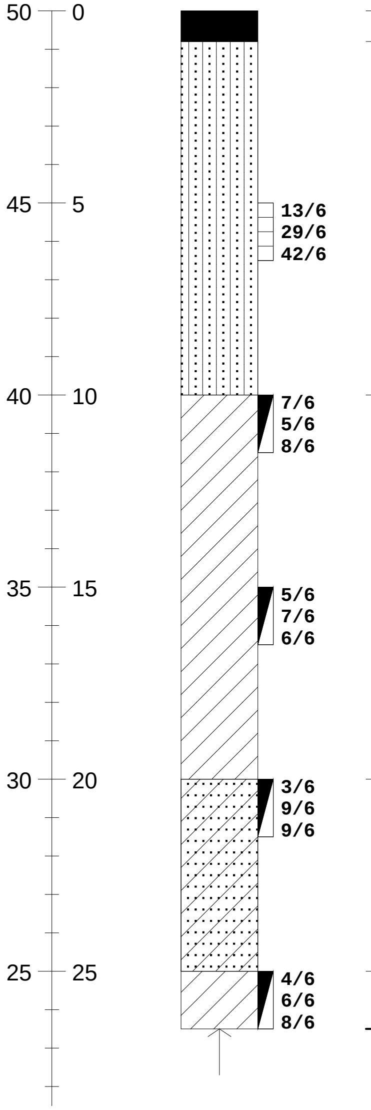
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 9-19-19

Elevation: 50 feet

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
50 / 0		AC SM	AC = 6.0 inches AB = 3.0 inches SILTY SAND; moist, fine to medium, brown			
45 / 5	13/6 29/6 42/6		Very dense	DD = 109.1 pcf	71	5
40 / 10	7/6 5/6 8/6	CL	SANDY LEAN CLAY; stiff, moist, low plasticity, dark-brown, with iron oxide staining	no sample recovery	13	
35 / 15	5/6 7/6 6/6		Gray-brown		13	
30 / 20	3/6 9/6 9/6	SC	CLAYEY SAND; medium dense, moist, fine to medium grained, dark-brown, iron oxide staining		18	
25 / 25	4/6 6/6 8/6	Cl	SANDY LEAN CLAY; stiff, moist, low to medium, gray		14	
			Bottom of boring			

Notes: *Boring moved 5 feet west of location I-7A*

Figure Number

Test Boring: I-7.3

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 9-19-19

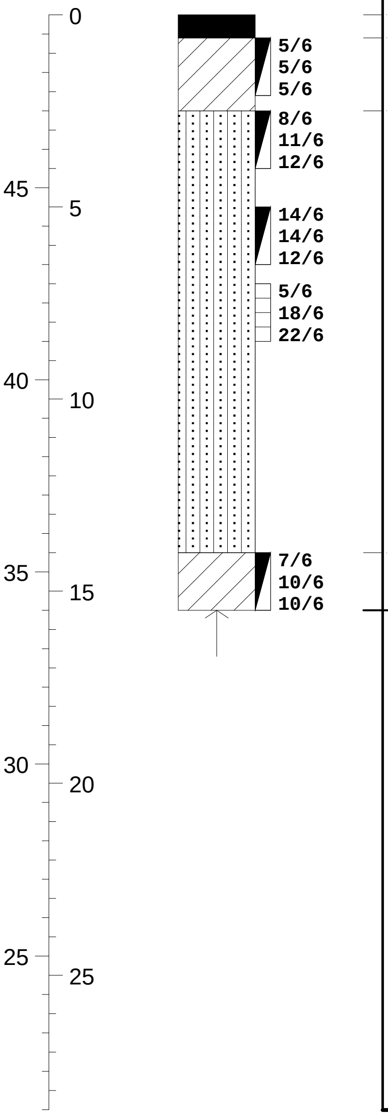
Drill Type: CME-75

Elevation: 49.5 feet

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater
First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0		AC	AC = 5.5 inches			
	5/6 5/6 5/6	CL	AB = 2.0 inches SANDY LEAN CLAY; stiff, moist, low to medium plasticity, dark-brown, trace fine gravel		10	26
	8/6 11/6 12/6	SM	SILTY SAND; medium dense, moist, fine to medium grained, brown		23	8
5	14/6 14/6 12/6				26	
	5/6 18/6 22/6		Light-brown, trace gravel	DD = 104.2 pcf	40	6
15	7/6 10/6 10/6	CL	Auger Refusal at 14 feet, sampler extended to 15.5 feet BSG, soils grading to SANDY LEAN CLAY; moist, low to medium plasticity, gray		20	
			Bottom of boring			

Notes: *This log represents the second boring attempt at this location. A previous boring encountered auger refusal in cobbles at 0.6 feet BSG just below the pavement section.*

Figure Number

Test Boring: I-7.6

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 9-19-19

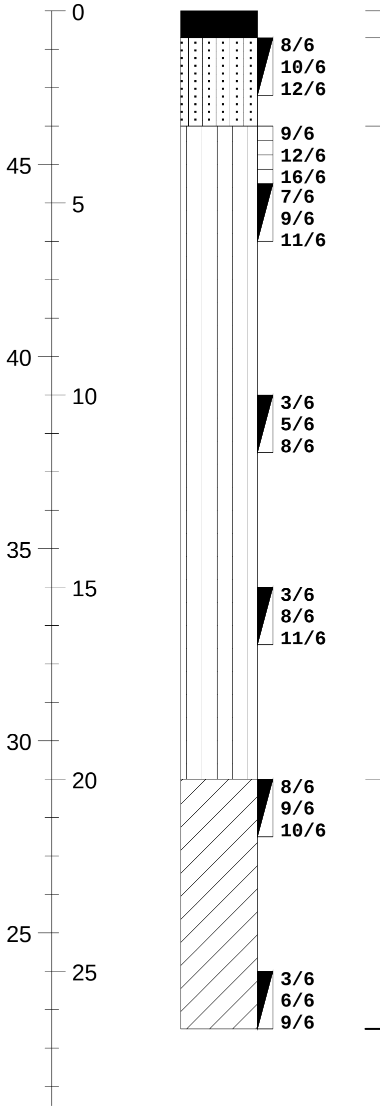
Drill Type: CME-75

Elevation: 49 feet

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater
First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		AC	AC = 6.5 inches			
	8/6 10/6 12/6	SM	AB = 2.0. inches SILTY SAND; medium dense, moist, fine to medium grained, brown		22	3
	9/6 12/6 16/6	ML	SILT; very stiff, moist, non-plastic, dark-brown, iron oxide staining, iron oxide staining, trace clay	DD = 102.1 pcf	28	25
	7/6 9/6 11/6		at 4.5 feet, sand fraction increase, color is brown		20	7
	3/6 5/6 8/6		Stiff, dark-brown		13	20
	3/6 8/6 11/6		Very stiff, increase in moisture		19	
	8/6 9/6 10/6	CL	SANDY LEAN CLAY; very stiff, moist, low to medium plasticity, brown		19	
	3/6 6/6 9/6		Stiff, iron oxide staining		15	
			Bottom of boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: I-8A

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 2/27/2019

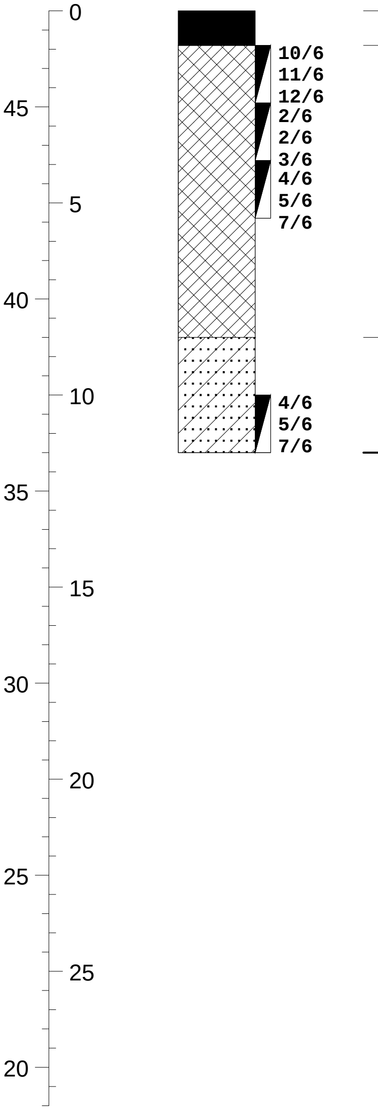
Drill Type: CME-75

Elevation: 47.5 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 6.5 inches AB = 4 inches			
		CL	FILL; SANDY LEAN CLAY; very stiff, moist, low to medium plasticity, dark brown, 2 inch thick silt seam at 2.3 feet, medium stiff, at 3.9 feet, 1 foot thick Silty Sand Layer		23 5 12	22 33 14
		SC	NATIVE; CLAYEY SAND; medium dense, moist, fine to coarse grained, brown less plastic		12	23
			Bottom of Boring			

Notes:

Figure Number

Test Boring: I-8B

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JS

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

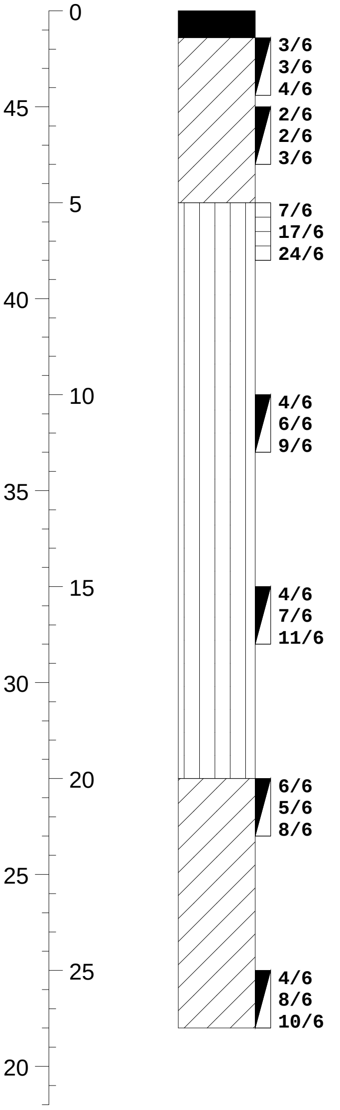
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 9-19-19

Elevation: 47.5 feet

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0		AC	AC = 6 inches			
	3/6 3/6 4/6	CL	AB = 2 inches SANDY LEAN CLAY; medium stiff, moist, low to medium plasticity, dark-brown		7	27
	2/6 2/6 3/6				5	41
5	7/6 17/6 24/6	ML	SANDY SILT; very stiff, moist, non-plastic, brown	DD = 104.2 pcf	41	11
10	4/6 6/6 9/6		Stiff		15	18
15	4/6 7/6 11/6		Very stiff		19	
20	6/6 5/6 8/6	CL	SANDY LEAN CLAY; stiff, moist, low plasticity, gray-brown, iron oxide staining		13	
25	4/6 8/6 10/6		Very stiff, dark-brown		18	
			Bottom of boring			

Notes: *Boring drilled about 10 feet north of I-8B*

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: J-1

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 3/5/2019

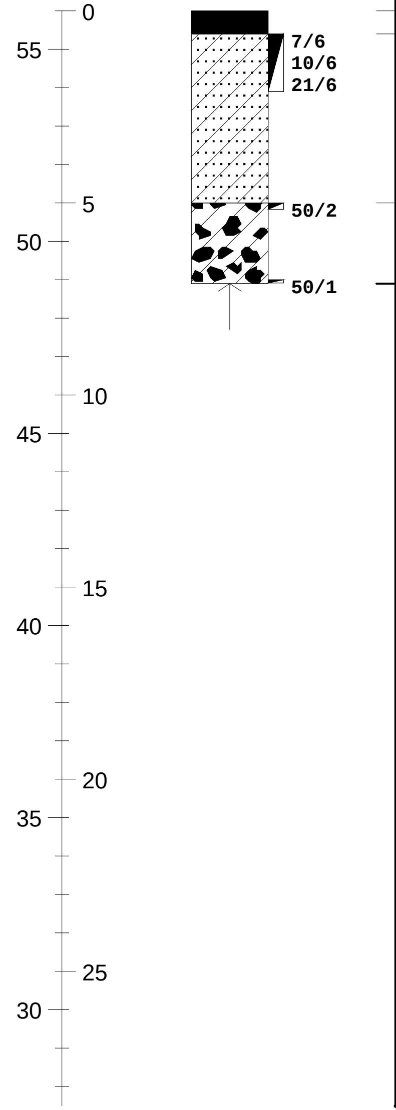
Drill Type: CME-75

Elevation: 56 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 8 inches AB = None			
	7/6 10/6 21/6	SC	CLAYEY SAND with Gravel; dense, damp, fine grained sand up to 1½ inch diameter gravel, dark brown		31	10
	50/2	GC	CLAYEY GRAVEL with Cobbles; very dense	No Recovery	>50	
	50/1		Auger Refusal on dense cobbles/ gravel	No Recovery	>50	

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: J-1A

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 3/5/2019

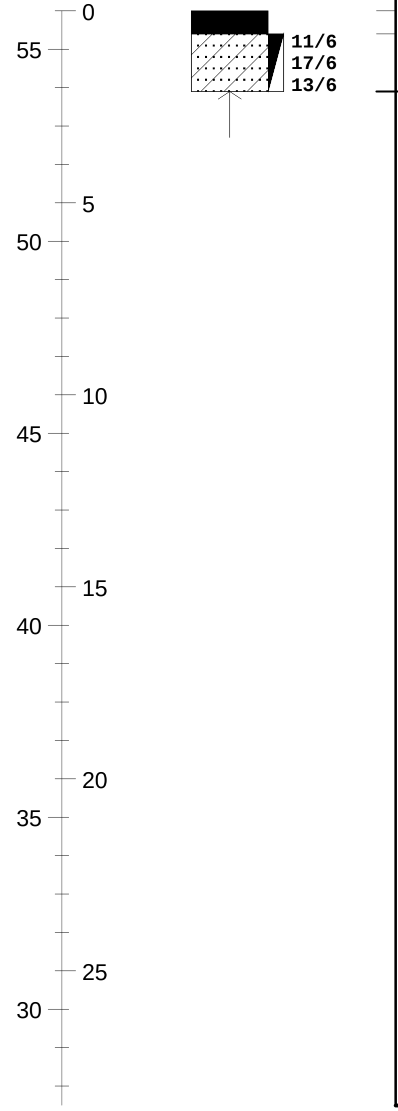
Drill Type: CME-75

Elevation: 56 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 8 inches AB = None			
		SC	CLAYEY SAND; medium dense, damp, fine grained, brown At 2 feet, Gravel and Cobble encountered		30	10
			Auger Refusal in Cobble/Gravel			

Notes: *3 feet west of J-1*

Figure Number

Test Boring: J-2

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JS

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

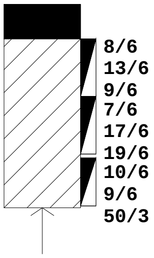
Hammer Type: 140 auto trip

Logged By: JC

Date: 2/27/2019

Elevation: 55 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
55 0			AC = 7 inches			
			AB = 3 inches			
	8/6 13/6 9/6	CL	SANDY LEAN CLAY with Gravel; very stiff, low plasticity, brown at 1.5 feet, hard drilling likely more cobble/gravel		22	12
	7/6 17/6 19/6		At 2.4 hard, color is light brown to brown		36	10
	10/6 9/6 50/3		at 4 feet, iron oxide staining Auger refusal on cobbles/gravel at 4.2 feet		>50	11
50 5			Sampler Refusal at 5.2 feet BSG			
45 10						
40 15						
35 20						
30 25						

Notes:

Figure Number

Test Boring: J-3

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JS

Logged By: JC

Date: 2/27/2019

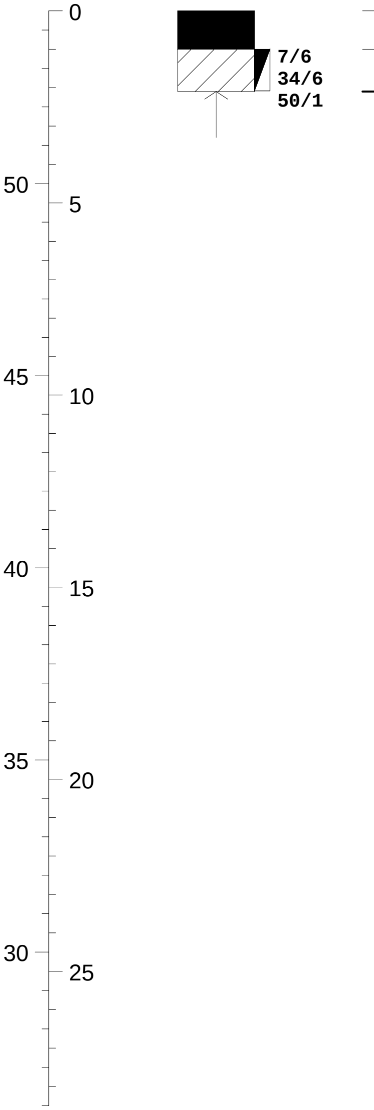
Drill Type: CME-75

Elevation: 54.5 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 auto trip

Depth to Groundwater
First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 7.5 inches			
	7/6 34/6 50/1		AB = 4 inches		>50	4
		CL	SANDY LEAN CLAY with Gravel, hard, moist, low plasticity, dark brown			
			Auger and sampler refusal on cobble/gravel			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: J-3A

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JS

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 auto trip

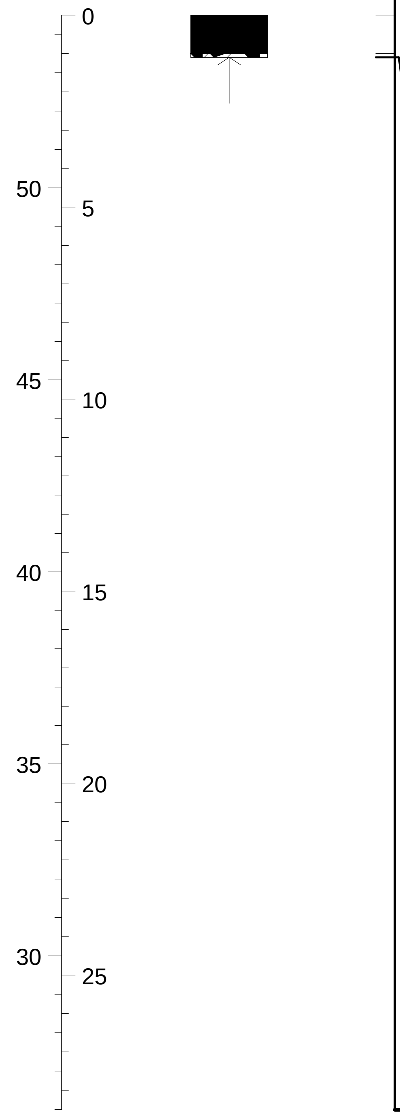
Logged By: JC

Date: 2/27/2019

Elevation: 54.5 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 7.5 inches			
			AB = 4 inches			
		GC	CLAYEY GRAVEL with Cobble; 7 inch diameter Cobble at 1 foot			
			Auger refusal on Cobble			



Notes: *Boring drilled 5 feet north of J-3*

Figure Number

Test Boring: J-4

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 3/6/2019

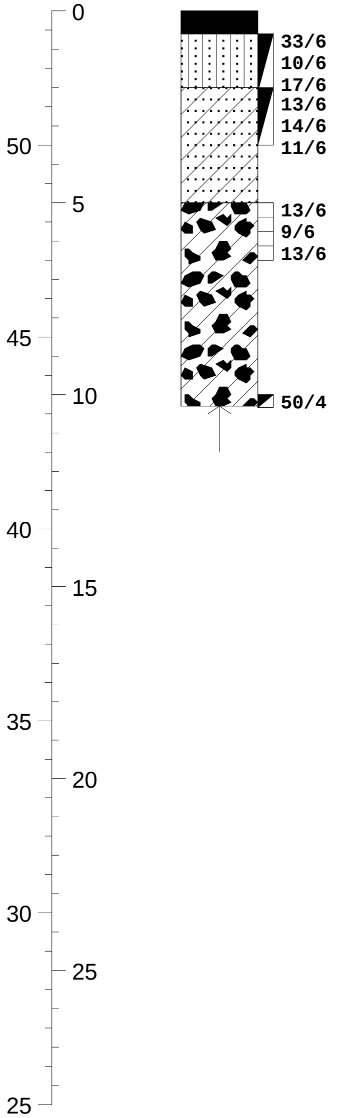
Drill Type: CME-75

Elevation: 53.5 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 7 inches AB = None			
		SM	SILTY SAND with Gravel; medium dense, damp, fine sand to medium sub-angualr gravel, light brown		27	
		SC	CLAYEY SAND with Gravel medium dense, damp, fine sand to medium gravel		25	
		GC	CLAYEY GRAVEL with Sand; medium dense, moist, fine sub-rounded grains, low plastic, light brown	DD= 108.6 pcf -200 = 36% +4 = 33% LL = 38 PI = 18	22	13
			at 10 feet, less clay and sand; Cobble fraction increasing		>50	
			Auger and Sampler refusal on very dense cobbles/gravel			

Notes:

Figure Number

Test Boring: J-5

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

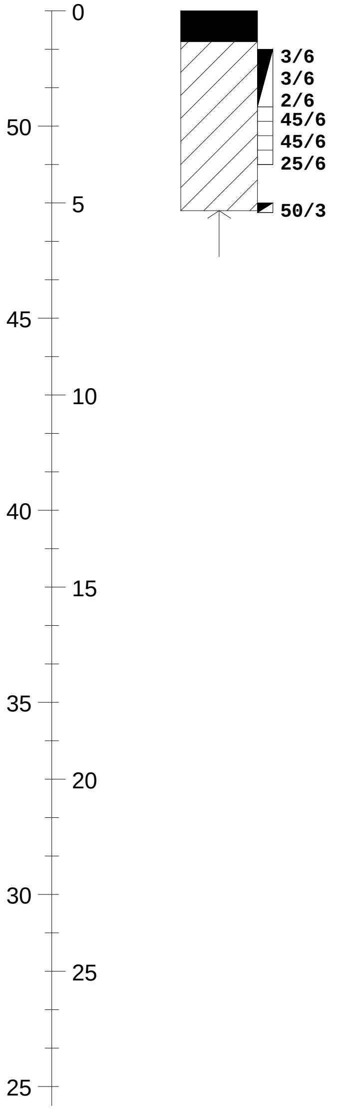
Hammer Type: 140 auto trip

Logged By: VB

Date: 2/27/2019

Elevation: 53 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 5 inches AB = 5 inches			
		CL	SANDY LEAN CLAY; medium stiff, moist, moderate plasticity; gray At 2.5 hard; increased drilling resistance	DD= 113.1 pcf	5 70	15 14
			Auger and Sampler refusal in gravel/cobbles		>50	10

Notes:

Figure Number

Test Boring: J-6

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: VB

Drilled By: JC

Date: 2/27/2019

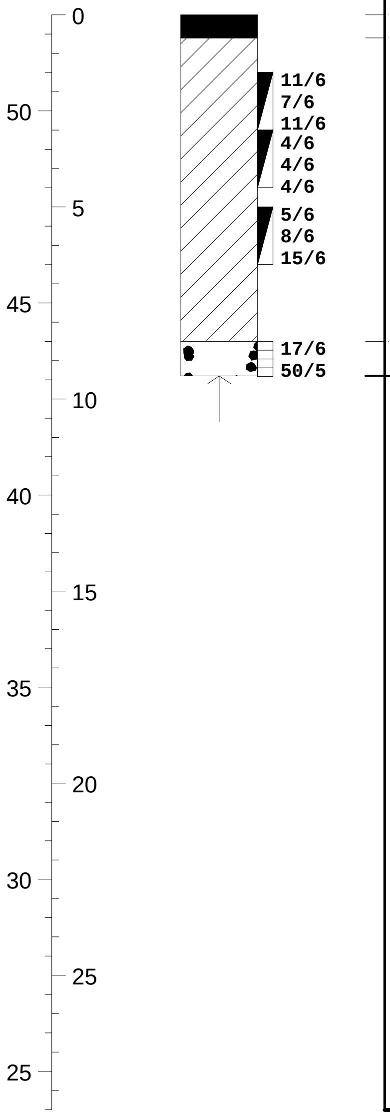
Drill Type: CME-75

Elevation: 52.5 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		CL	AC = 3 inches AB = 4 inches			
	11/6 7/6 11/6		SANDY LEAN CLAY with Gravel; stiff, moist, moderate plasticity, brown		18	11
	4/6 4/6 4/6		At 3 feet, increase in sand		8	19
	5/6 8/6 15/6		at 5 feet, less sand, more fine gravel		23	14
	17/6 50/5	GP	POORLY GRADED GRAVEL with Sand; very dense, damp, medium grained, subangular		>50	3
			Auger and Sampler Refusal in very dense gravel/cobble			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: J-7

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 2/27/2019

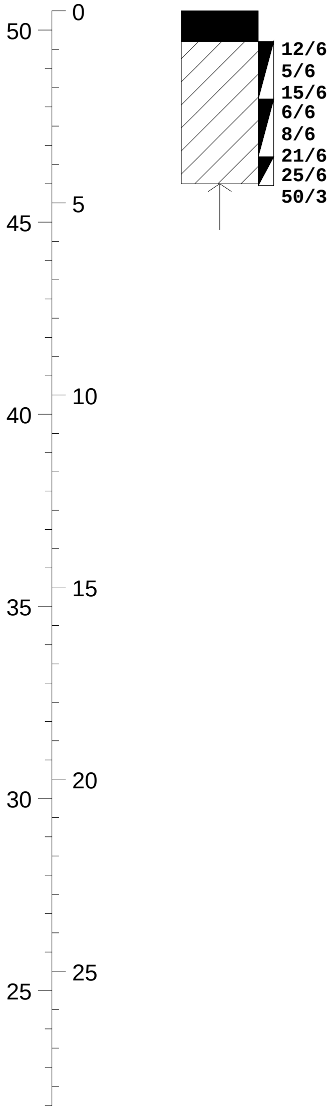
Drill Type: CME-75

Elevation: 50.5 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater
First Encountered During Drilling: N/E

Hammer Type: 140 auto trip



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	AC = 4.5 inches			
CL	AB = 5 inches		20	12
	SANDY LEAN CLAY; very stiff, moist, fine to medium grained, trace gravel	Minimal recovery	29	13
	at 1.5 feet, hard drilling, cobble in drill cuttings	No recovery	>50	
	at 2.3 feet, grading to Gravel			
	Auger and Sampler Refusal on gravel/cobble			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Since 1898

Test Boring: J-7.3

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 9-18-19

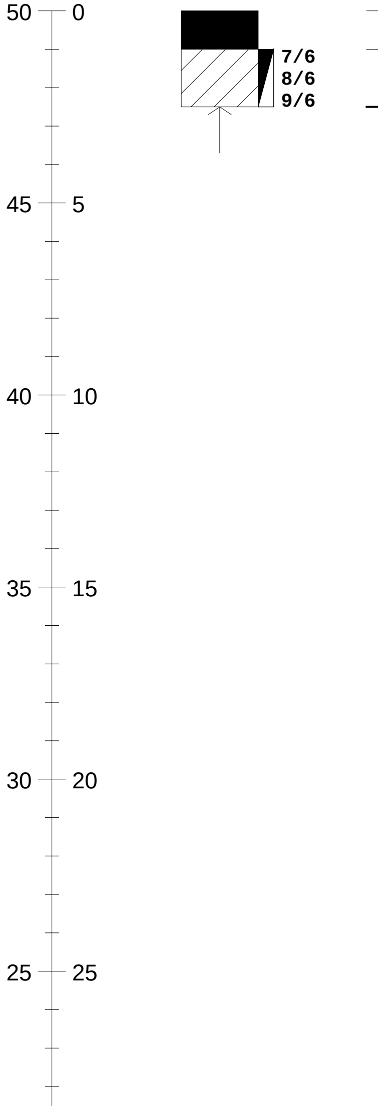
Drill Type: CME-75

Elevation: 50 feet

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
50 / 0		AC	AC = 5.5 inches AB = 3.0 inches			
	7/6 8/6 9/6	CL	SANDY LEAN CLAY; very stiff, moist, low plasticity, dark-brown		17	10
			Auger refusal at 2 feet BSG, Sample extended to Bottom of boring at 2½ feet			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: J-7.3B

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 9-18-19

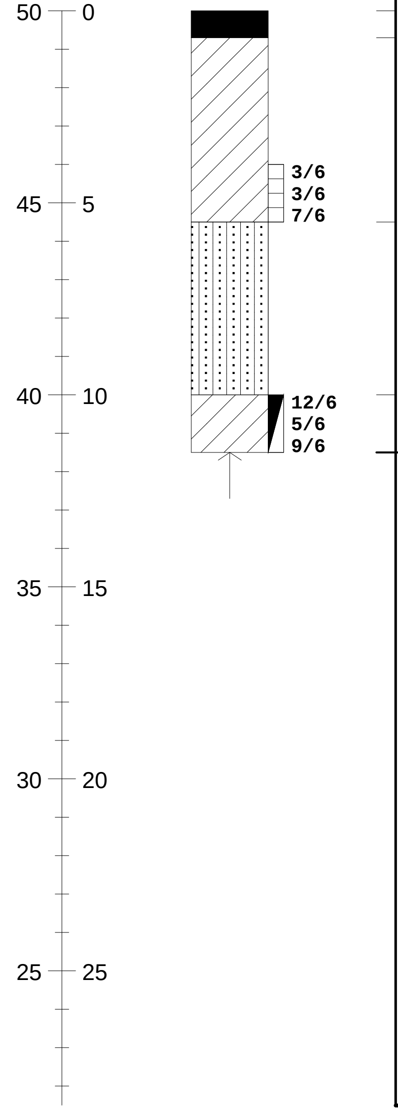
Drill Type: CME-75

Elevation: 50 feet

Auger Type: 6-5/8 inch hollow stem

Hammer Type: 140 pound auto trip

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		AC	AC = 5.5 inches			
		CL	AB = 3.0 inches SANDY LEAN CLAY; medium stiff, moist, low to medium plasticity, dark-brown	DD = 78.6 pcf	10	
		SM	SILTY SAND; medium dense, moist, fine to medium grained, brown			
		CL	SANDY LEAN CLAY; stiff, moist, low plasticity, brown Auger refusal at 11.0 feet, sampler extended to 11.5 feet BSG		14	22
			Bottom of boring			

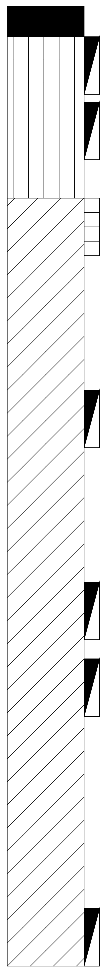
Notes: *Boring drilled 5 feet from boring J-7.3A location*

Figure Number

Test Boring: J-7.6

Project: Home Depot Store - Mission Valley - San Diego, CA
Project Number: D050R0.01
Drilled By: JS
Drill Type: CME-75
Auger Type: 6-5/8 inch hollow stem
Hammer Type: 140 auto trip

Logged By: JC
Date: 09/18/19
Elevation: 50 feet
Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
50 — 0		AC	AC = 6 inches			
	6/6 5/6 4/6	ML	AB = 3 inches SANDY SILT; stiff, moist, non-plastic, dark-brown		9	19
	5/6 4/6 4/6		Medium stiff, increase in moisture		8	28
45 — 5	4/6 8/6 12/6	CL	SANDY LEAN CLAY; stiff, moist, low to medium plasticity, dark-brown	DD = 98.1 pcf	20	28
40 — 10	3/6 5/6 7/6		Increase in sand fraction		12	25
35 — 15	4/6 5/6 9/6		SILTY SAND layer 6 inches thick at 15.5 feet, lean clay has increase sand fraction		14	
	5/6 6/6 6/6		Stiff, increase in sand fraction		12	
30 — 20						
	3/6 6/6 7/6		Low to medium plasticity		13	
25 — 25			Bottom of boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Since 1898

Test Boring: J-8

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JS

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

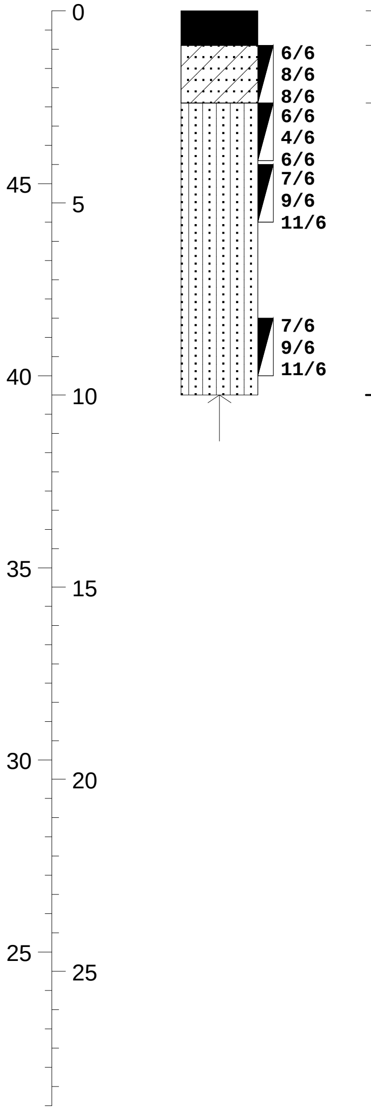
Hammer Type: 140 auto trip

Logged By: JC

Date: 2/27/2019

Elevation: 49.5 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0			AC = 6.5 inches AB = 4½ inches			
	6/6 8/6 8/6	SC	CLAYEY SANDY; medium dense, moist, fine to medium grained, low plastic, dark brown to black; 4 inch cobble in cuttings	RV = 22 -200 = 43% LL = 42 PI = 22	16	11
	6/6 4/6 6/6	SM	SILTY SAND; loose, moist, fine to medium grained, brown, 3 inch thick clay seam at 4 feet medium dense at 7.5 feet, hard drilling		10	10
45 / 5	7/6 9/6 11/6				20	5
40 / 10	7/6 9/6 11/6				20	13
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: J-8B

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 09/18/19

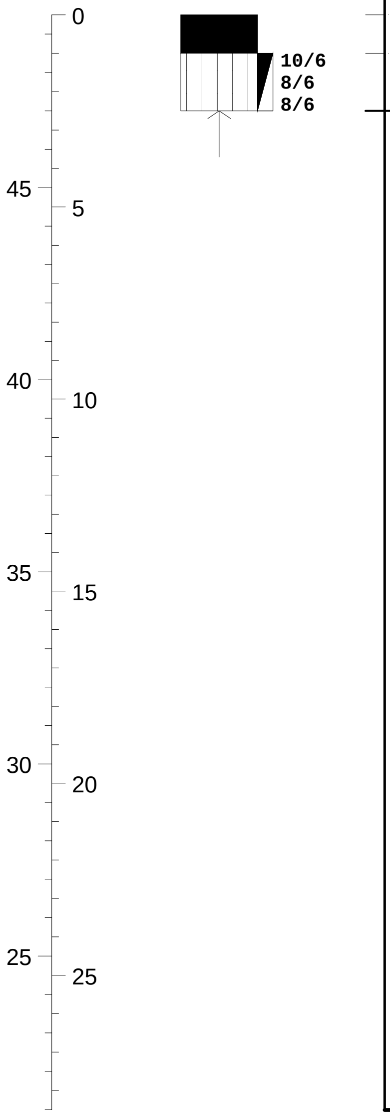
Drill Type: CME-75

Elevation: 49.5 feet

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		AC	AC = 6.0 inches			
		ML	AB = 3.5 inchs		16	8
			SANDY SILT; very stiff, moist, non-plastic, brown Auger refusal at 2 feet BSG, sampler extended to 2.5 feet			
			Bottom of Boring			

Notes: *Boring drilled 10 feet north of boring J-8 drilled in Feburary 2019. This boring is the second attempt at this locaiton after refusal on cobbles occurred at 0.7 feet BSG in the initial boring.*

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: K-7.6

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 09-18-19

Drill Type: CME-75

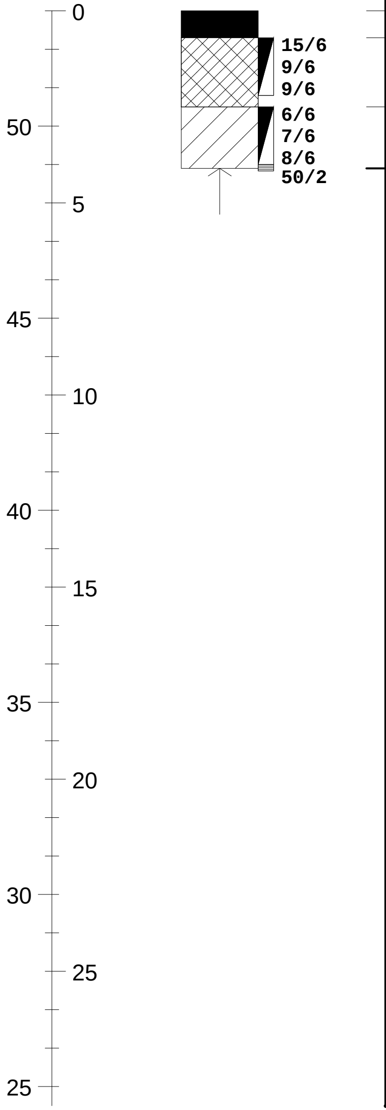
Elevation: 53 feet

Auger Type: 6-5/8 inch hollow stem augers

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 LB Auto Trip

ELEVATION/ DEPTH (feet) | **SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA**



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
AC	AC = 5 inches			
CL	AB = 3.5 inches FILL; SANDY LEAN CLAY; very stiff, moist, low to medium plasticity, brown, trace coarse gravel		18	10
CL	SANDY LEAN CLAY; stiff, low plasticity, trace fine gravel Hard drilling on gravels and cobbles Auger refusal at 4 feet BSG, sampler extended below auger refusal		15	17
		No Recovery	>50	
	Bottom of boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: K-8

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 09-18-19

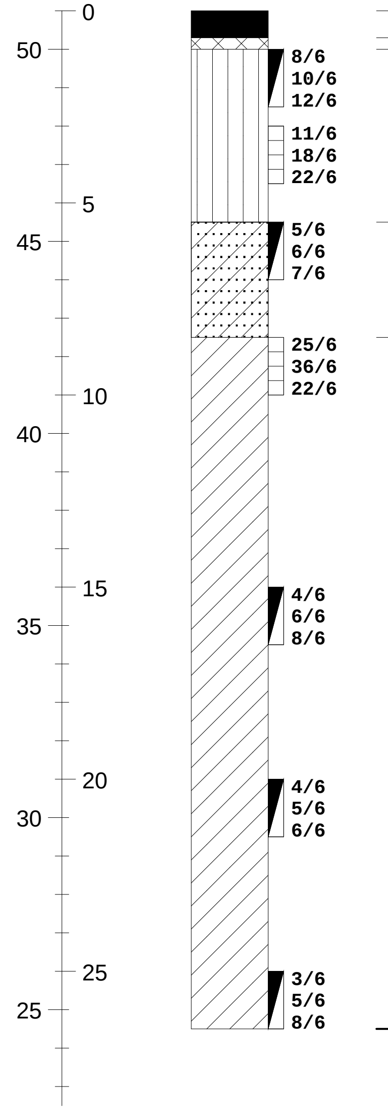
Drill Type: CME-75

Elevation: 51 feet

Auger Type: 6-5/8 inch hollow stem augers

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 LB Auto Trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		AC	AC = 5.8 inches			
	8/6 10/6 12/6	GM	AB = 3.0 inches		22	8
		ML	FILL; 4.5" X 3" cobble and coarse gravel under aggregate base			
	11/6 18/6 22/6		SANDY SILT; very stiff, moist, non-plastic, brown	DD = 89.4 pcf	40	4
	5/6 6/6 7/6	SC	CLAYEY SAND; medium dense, moist, fine to medium grained, brown		13	10
	25/6 36/6 22/6	CL	SANDY LEAN CLAY; hard, moist, low plasticity, dark-brown	No Recovery	58	
	4/6 6/6 8/6		Stiff, grading to non-plastic sandy silt		14	
	4/6 5/6 6/6		increase to low to medium plasticity		11	
	3/6 5/6 8/6		Iron oxide staining		13	
			Bottom of boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: L-8

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

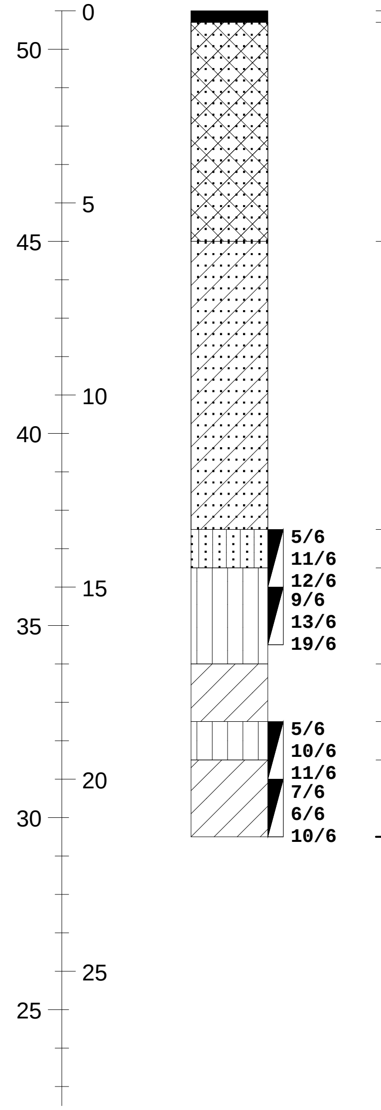
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/6/2019

Elevation: 51 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		SC	FILL; CLAYEY SAND with Gravel, very dense, moist, fine to coarse grained, brown at 3 feet color change to light brown			
		SC	NATIVE: CLAYEY SAND, moist, fine grained, brown			
	5/6 11/6 12/6	SM	SILTY SAND; medium dense, moist, fine to medium grained, brown		23	
	9/6 13/6 19/6	ML	SANDY SILT, very stiff, moist, non-plastic, dark brown at 15 feet, 1 inch thick clay seam		32	
		CL	SANDY LEAN CLAY with Gravel and Cobbles; low to medium plasticity, dark brown			
	5/6 10/6 11/6	ML	SANDY SILT; very stiff, moist, slight plasticity, dark brown		21	
	7/6 6/6 10/6	CL	SANDY LEAN CLAY; very stiff, moist, low plasticity, brown to dark brown		16	
			Bottom of Boring			

Notes: *deeper exploration boring drilled 8 feet south and 22 feet west of M-8A*

Figure Number

MOORE TWINING ASSOCIATES, INC.

Since 1898

Test Boring: M-8A

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

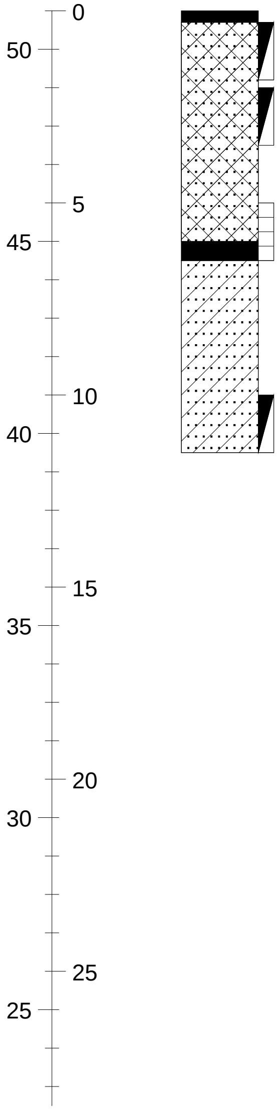
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/4/2019

Elevation: 51 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	5/6 13/6 31/6	SC	AC = 4½ inches AB = None		44	
	9/6 13/6 19/6		FILL; CLAYEY SAND with Gravel, very dense, moist, fine to coarse grained, brown		32	
	2/6 5/6 11/6		At 2 feet, less clay fraction, fine gravel, some slightly cemented soils at 3 feet	DD= 108.1 pcf	16	14
		SC	At 5 feet, more clay, no gravel, sand is fine grained			
			At 6 feet, 3 inch thick aged asphalt section			
	5/6 7/6 10/6		NATIVE: CLAYEY SAND; medium dense, moist, fine grained, brown		17	
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Since 1898

Test Boring: M-8B

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JS

Date: 9-18-19

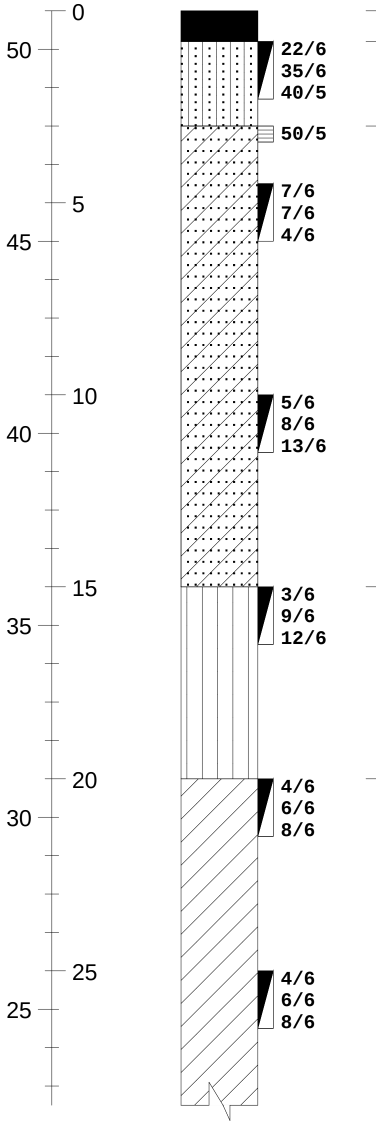
Drill Type: CME-75

Elevation: 51 Feet

Auger Type: 6-5/8 inch hollow stem augers

Depth to Groundwater First Encountered During Drilling: 30 feet

Hammer Type: 140 LB Auto Trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0		AC	AC = 5.5 inches AB = 4.5 inches			
	22/6 35/6 40/5	SM	SILTY SAND; very dense, moist, tan-brown, with fine gravel		75	20
	50/5	SC	CLAYEY SAND; very dense, moist, fine to medium grained, reddish-brown to brown, trace fine to coarse gravel		>50	13
5	7/6 7/6 4/6			No Recovery	11	
10	5/6 8/6 13/6			No Recovery	21	
15	3/6 9/6 12/6	ML	SANDY SILT; very stiff, moist, non-plastic, brown		21	19
20	4/6 6/6 8/6	CL	SANDY LEAN CLAY; stiff, moist, low plasticity, olive-brown		14	18
25	4/6 6/6 8/6		Low to medium plasticity, dark-brown		14	19

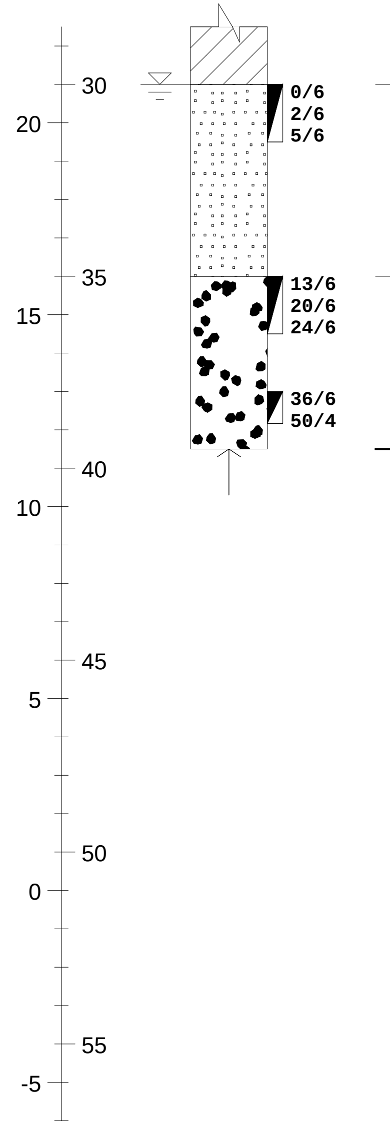
Notes: * - *flowing sands may have distubed sample*

Figure Number

Test Boring: M-8B

Project: Home Depot Store - Mission Valley - San Diego, CA
Project Number: D050R0.01
Drilled By: JS
Drill Type: CME-75
Auger Type: 6-5/8 inch hollow stem augers
Hammer Type: 140 LB Auto Trip

Logged By: JC
Date: 9-18-19
Elevation: 51 Feet
Depth to Groundwater
First Encountered During Drilling: 30 feet



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	0/6 2/6 5/6	SP	POORLY GRADED SAND; loose, wet, fine to coarse grained, brown	+4 = 3.7% Sand = 92.1% -#200 = 4.2%	7*	23
	13/6 20/6 24/6	GP	POORLY GRADED GRAVEL WITH SAND; dense, wet, fine to coarse grained, dark-brown		44	
	36/6 50/4		Auger refusal at 38 feet BSG, sampler extended to 39.5 feet BSG		>50	
			Bottom of boring			

Notes: ** - flowing sands may have distubed sample*

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: M-8C

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: SWK

Drilled By: MG - Pacific Drilling

Date: 12-27/2019

Drill Type: Marl Yeti M-10

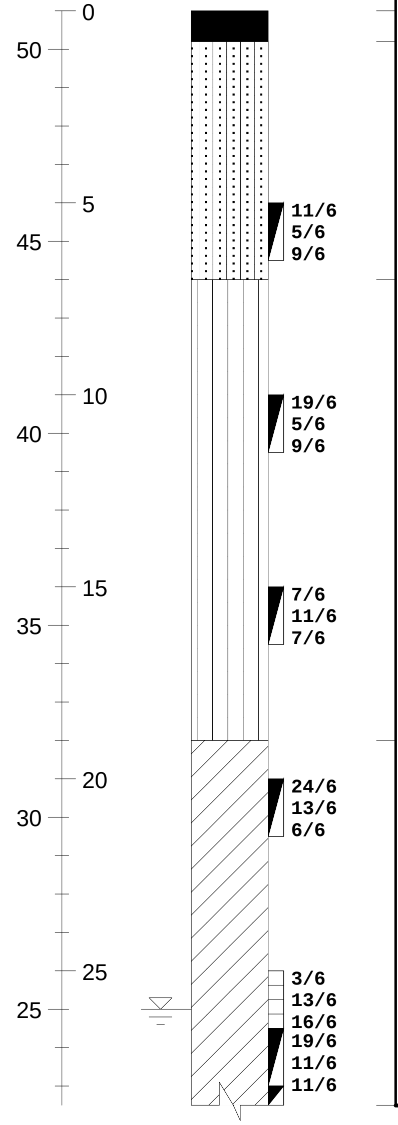
Elevation: 51 Feet

Auger Type: 6-5/8 inch hollow stem augers

Depth to Groundwater First Encountered During Drilling: 26 feet

Hammer Type: 140 LB Auto Trip

ELEVATION/ DEPTH (feet) | **SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA**



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
AC	AC= 6 inches			
SM	AB = 3 inches			
	SILTY SAND w gravel; medium dense, moist, fine to coarse grained, light gray tan			
	at 5 feet, no gravel, fine sand, slight plasticty, grading to Sandy Silt		15	
ML	SANDY SILT; stiff, moist, low non-plastic, gray-tan			
			14	
	some scattered gravel			
	interbedded plastic zones		18	
CL	SANDY LEAN CLAY; stiff, moist, low plastic, fine to medium grained, gray		18	
		No rings 10% recovery	29	
	Stiff clay, higher plasticity, less sand		22	
			37	

Notes: *Drilled 10 feet east of M-8B*

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: M-8C

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: MG - Pacific Drilling

Drill Type: Marl Yeti M-10

Auger Type: 6-5/8 inch hollow stem augers

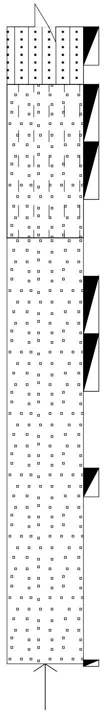
Hammer Type: 140 LB Auto Trip

Logged By: SWK

Date: 12-27/2019

Elevation: 51 Feet

Depth to Groundwater
First Encountered During Drilling: 26 feet



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	28/6 17/6 20/6	SM	grading to silty sand			
30 20	49/6 22/6 17/6	SP-SM	SILTY SAND; dense, wet, fine to emdium grained, w/ clay lenses, gray		35	
	8/6 6/6 12/6		POORLY GRADED SAND with silt and Gravel; dense to medium dense, wet, fine sand to coarse grained gravel, tan-gray		18	
35 15	4/6 5/6 5/6	SP	POORLY GRADED SAND w Gravel and Cobble; matrix is medium dense, wet, hard drilling, coarse gravel and/or cobble material mixed with sand		10	
	5/6 6/6 9/6				15	
40 10	49/6 50/3				>50	
			Less gravel/cobble at 43 feet, very hard drilling at 44 feet, near refusal 1 foot of advancement in 1/2 hour			
45 5	50/2		shattered rock in sampler Auger and sampler refusal on boulder sized material		>50	
50 0						
55 -5						

Notes: *Drilled 10 feet east of M-8B*

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: N-3

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 3/6/2019

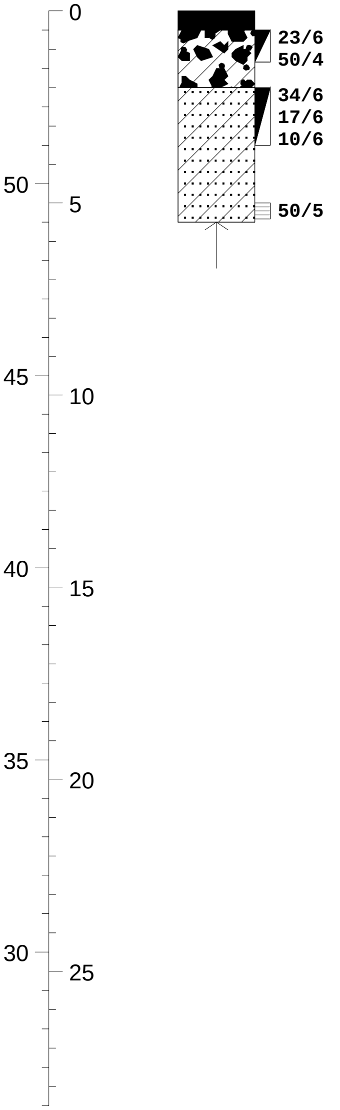
Drill Type: CME-75

Elevation: 54.5 Feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater
First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 5-3/4 inches AB = none			
	23/6 50/4	GW-GC	WELL GRADED GRAVEL with Sand and Clay; very dense, damp, fine sand to coarse gravel, light brown		>50	
	34/6 17/6 10/6	SC	CLAYEY SAND with Gravel; very dense, damp, fine sand to coarse gravel		27	
	50/5		At 5 feet, cobbles present	No Recovery	>50	
			Auger and sampler refusal on cobble			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC. Since 1898

Test Boring: N-3A

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

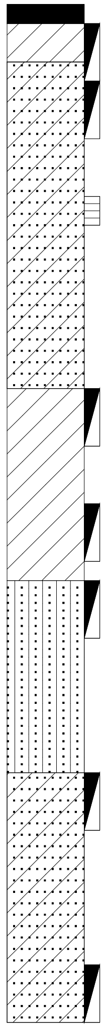
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/6/2019

Elevation: 54.5 Feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0	8/6 7/6 23/6	CL	AC = 5½ inches AB = none SANDY LEAN CLAY with Gravel; very stiff, moist, medium plasticity, light brown, with 1 inch gravel		30	13
	18/6 44/6 33/6	SC	CLAYEY SAND with Gravel; very dense, damp, fine to coarse grained, light brown		77	9
50 5	30/6 50/3		At 5 feet, color change to brown	DD= 90.6 pcf	>50	7
45 10	2/6 5/6 6/6	CL	SANDY LEAN CLAY with Gravel; medium stiff, moist, medium plasticity, brown, gravel is fine grained		11	
	13/6 9/6 13/6		at 13 feet, stiff, coarse gravel fraction increasing		22	
40 15	6/6 8/6 11/6	SM	SILTY SAND; medium dense, moist, fine grained, light brown		19	
35 20	4/6 4/6 7/6	SC	CLAYEY SAND; medium dense, moist, fine to medium grained, brown to light brown, trace fine gravel		11	
30 25	7/6 16/6 13/6				29	
			Bottom of Boring			

Notes: *second boring was located 5 feet east of N-3*

Figure Number

Test Boring: N-4

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

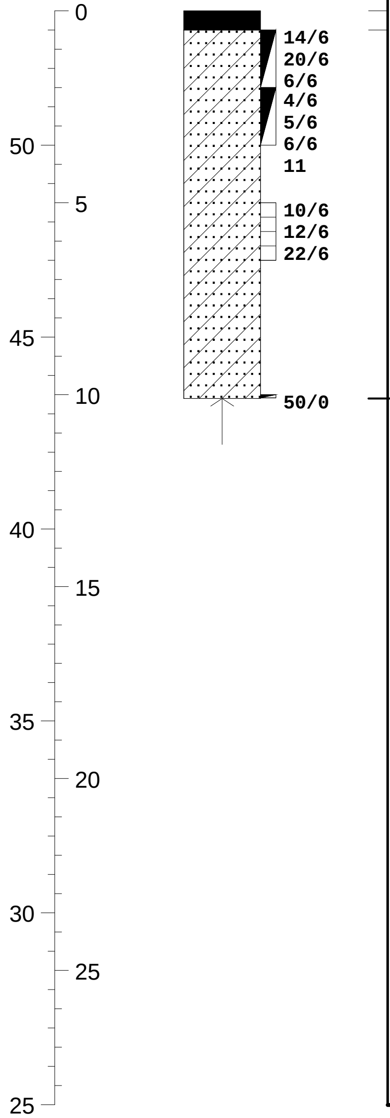
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/5/2019

Elevation: 53.5 Feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		SC	AC = 7 inches AB = None	Low recovery	26	
			CLAYEY SAND with Gravel; medium dense, fine grained sand to coarse gravel; light brown at 2 feet, fine gravel and increase in coarse grained sand		11	
			at 5 feet, gravel is coarse and sub-angular	DD= 103.2 pcf	34	16
			hard drilling, likley cobble	No Recovery	>50	
			Auger refusal on cobbles			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.
Since 1898

Test Boring: N-5

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

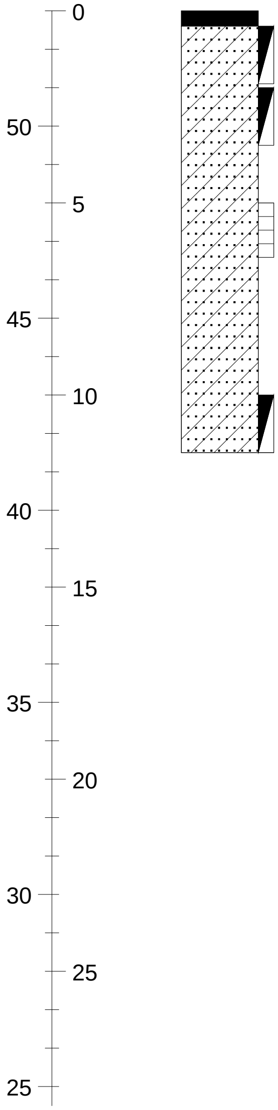
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/5/2019

Elevation: 53 Feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
			AC = 5-3/4 inches AB = None			
	2/6 3/6 5/6	SC	CLAYEY SAND; loose, moist, fine grained, light brown with tree roots at 2 feet, tree roots are finer, soils are medium dense		8	
	3/6 5/6 6/6				11	
	5/6 15/6 50/5		Increase in corase gravel, 2 inch sub-rounded	DD= 108.6 pcf	>50	18
	10/6 11/6 18/6				29	
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC. Since 1898

Test Boring: N-6

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 3/4/2019

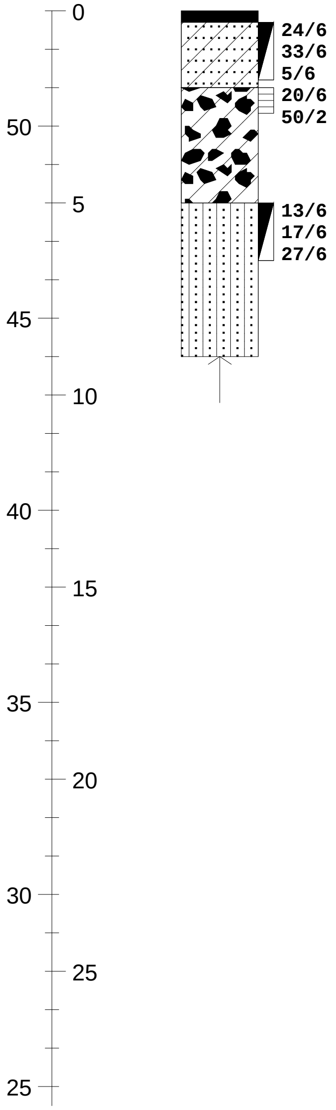
Drill Type: CME-75

Elevation: 53 Feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0			AC = 4 inches AB = none			
	24/6 33/6 5/6	SC	CLAYEY SAND with Gravel; dense, damp, fine grained sand to sub-angular coarse grained gravel, light brown		38	
	20/6 50/2	GC	CLAYEY GRAVEL with Sand; very dense, moist	DD= 113.4 pcf	>50	7
5	13/6 17/6 27/6	SM	SILTY SAND with Gravel; dense, damp, fine sand to coarse gravel, light brown, interbedded with Clayey Sand layers		44	
			Auger refusal on cobbles and gravel			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: N-7

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inch hollow stem

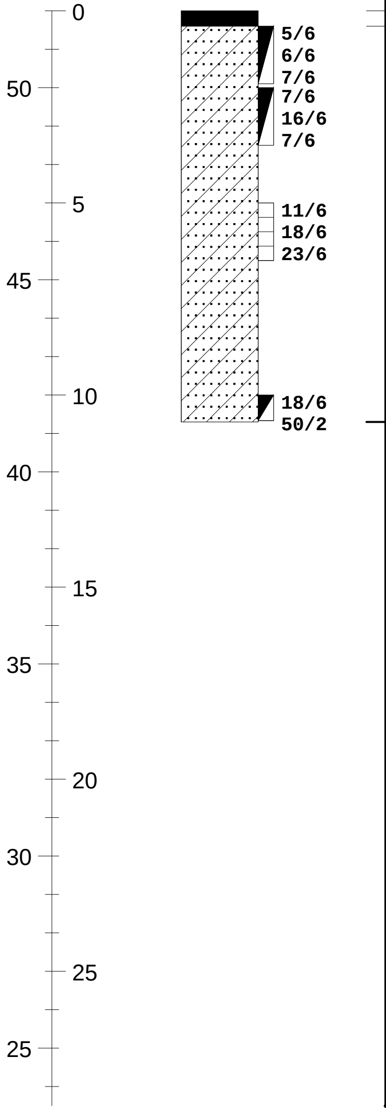
Hammer Type: 140 pound auto trip

Logged By: JC

Date: 3/2/2019

Elevation: 52 Feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0	5/6 6/6 7/6	SC	AC = 5 inches AB = none		13	
	7/6 16/6 7/6		CLAYEY SAND with Gravel; medium dense, damp, fine to medium grained, brown at 2 feet, no coarse gravel		23	
5	11/6 18/6 23/6		at 5 feet, color is brown mottled light brown with coarse gravel	DD= 106.4 pcf	41	9
10	18/6 50/2		Grading to GRAVEL, color is reddish brown		>50	
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: N-8

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 3/4/2019

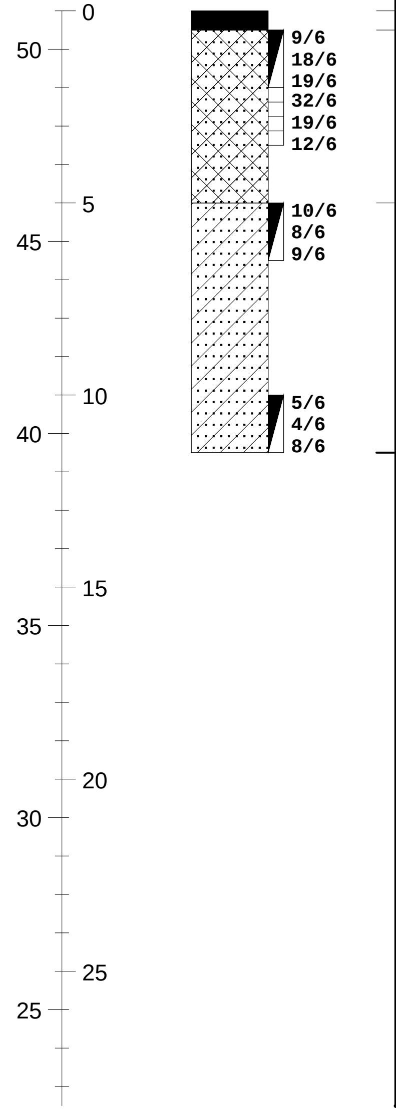
Drill Type: CME-75

Elevation: 51 feet AMSL

Auger Type: 6-5/8 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0 / 51	9/6 18/6 19/6 32/6 19/6 12/6	SC	AC = 6-3/4 inches AB = None FILL; CLAYEY SAND with Gravel; dense, damp, fine sand to coarse gravel, light brown, brick fragments	DD= 103.1 pcf	37 31	13
5 / 46	10/6 8/6 9/6	SC	NATIVE; CLAYEY SAND; medium dense, moist, fine grained, brown, trace gravel		17	
10 / 41	5/6 4/6 8/6		color is brown and light brown, trace coarse gravel, slightly cemented soils at 11 feet.		12	
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Since 1898

Test Boring: S-1

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: Pacific Drilling

Date: March 4, 2019

Drill Type: Fastre SPT

Elevation: 116 feet AMSL

Auger Type: 6 inch hollow stem

Depth to Groundwater
First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0 115	3/6 2/6 3/6	CL	FILL; SANDY LEAN CLAY; medium stiff, moist, low to moderate plasticity, brown and reddish brown, small wood debris at 2 feet, stiff, light brown, increase in wood debris		5	18
	6/6 10/6 13/6			DD= 107.8 pcf WD= 126.6 pcf -200= 49% ø = 18° C = 1,080 psf LL = 38 PI = 18	23	18
5 110	4/6 6/6 7/6	SC	FILL; CLAYEY SAND; stiff, moist, fine grained, low plastic, brown with some white calcification		13	15
10 105	9/6 12/6 15/6		less plastic to slight, some calcification, wood debris	DD= 91.7 pcf WD= 102.0 pcf	27	11
15 100	6/6 7/6 5/6	CL	NATIVE; SANDY LEAN CLAY; stiff, moist, low plasticity, brown, calcification, trace gravel		12	12
20 95	4/6 6/6 8/6		plasticity increase, 1 inch to ½ inch gravel		14	14
25 90	4/6 6/6 8/6	ML	SANDY SILT; stiff, moist, non-plastic, brown		14	16

Notes:

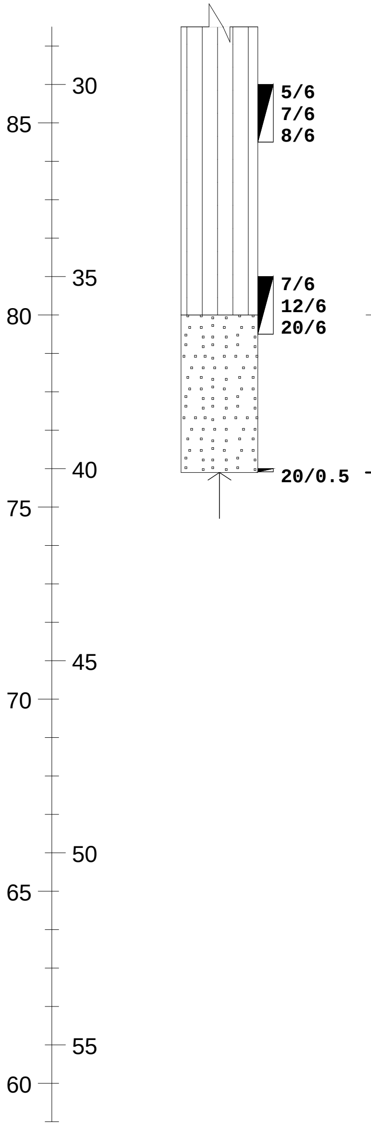
Figure Number

MOORE TWINING
ASSOCIATES, INC.

Test Boring: S-1

Project: Home Depot Store - Mission Valley - San Diego, CA
Project Number: D050R0.01
Drilled By: Pacific Drilling
Drill Type: Fastre SPT
Auger Type: 6 inch hollow stem
Hammer Type: 140 pound auto trip

Logged By: JC
Date: March 4, 2019
Elevation: 116 feet AMSL
Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	5/6 7/6 8/6		trace gravel and iron oxide staining		15	16
	7/6 12/6 20/6				32	15
		SP	POORLY GRADED SAND; dense, moist, fine to medium grained, light brown			
	20/0.5		Auger and Sampler Refusal due to suspected cobble		>50	

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: S-2

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: Pacific Drilling

Date: March 4, 2019

Drill Type: Fastre SPT

Elevation: 115 feet AMSL

Auger Type: 6 inch hollow stem

Hammer Type: 140 pound auto trip

Depth to Groundwater First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
115 — 0	2/6 3/6 5/6	CL	SANDY LEAN CLAY; medium stiff, moist, low to moderate plasticity, light brown, trace gravel, calcification		8	16
	8/6 10/6 7/6		at 2 feet, white weakly cemented calcification		17	9
110 — 5	12/6 16/6 16/6		Hard drilling at 6 feet	DD= 93.9 pcf WD= 101.3 pcf ø = 36° C = 50 psf	36	8
105 — 10	10/6 11/6 11/6				22	9
100 — 15	15/6 26/6 50/5.5		Hard, color change to dark brown, low plasticity	DD= 110.5 pcf WD= 118.4 pcf	>76	7
95 — 20	5/6 15/6 29/6		plasticity increase to moderate		44	12
90 — 25	6/6 6/6 8/6	ML	SANDY SILT; stiff, moist, non-plastic, dark brown		14	12
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: S-3

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: Pacific Drilling

Date: March 4, 2019

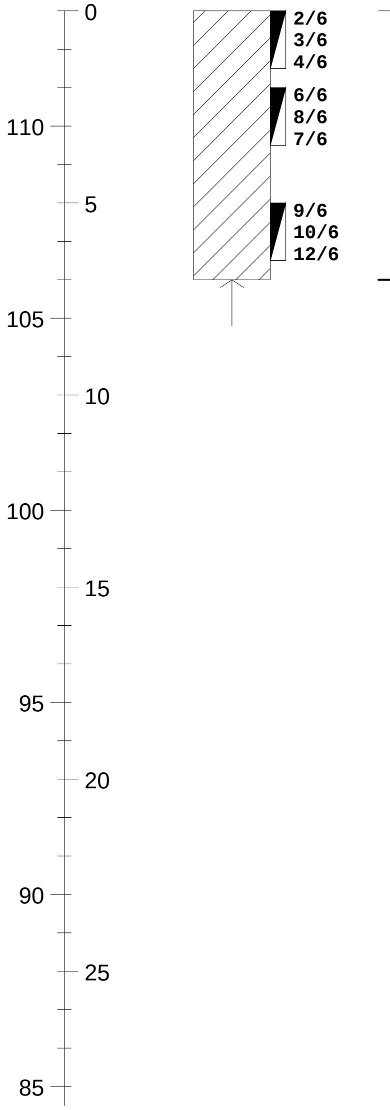
Drill Type: Fastre SPT

Elevation: 113 feet AMSL

Auger Type: 6 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
CL	SANDY LEAN CLAY; medium stiff, moist, low to moderate plasticity; dark brown, trace gravel		7	16
	Stiff at 2 feet, weakly cemented		15	8
		Low Recovery	22	14
	Hard drilling			
	Auger Refusal on Cobble			

Notes:

Figure Number

MOORE TWINING
ASSOCIATES, INC.
Since 1898

Test Boring: S-3A

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: Pacific Drilling

Drill Type: Fastre SPT

Auger Type: 6 inch hollow stem

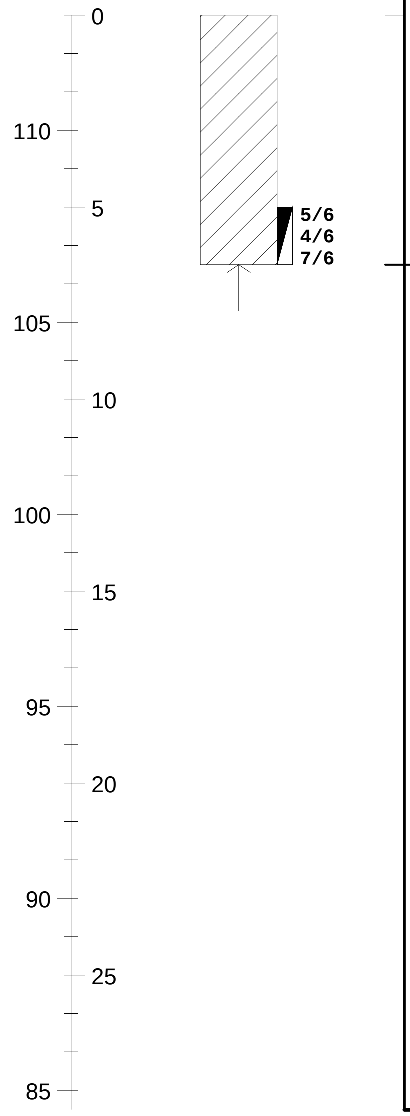
Hammer Type: 140 pound auto trip

Logged By: JC

Date: March 4, 2019

Elevation: 113 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0		CL	SANDY LEAN CLAY; medium stiff, moist, low to moderate plasticity; dark brown, trace gravel			
5	5/6 4/6 7/6		Hard drilling at 5.5 feet on a cobble Auger refusal on cobble at 6 feet		11	7
			Bottom of Boring (sample extended below auger)			

Notes: *Boring S-3A was drilled 3 feet southeast of S-3*

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: S-4

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: Pacific Drilling

Drill Type: Fastre SPT

Auger Type: 6 inch hollow stem

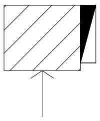
Hammer Type: 140 pound auto trip

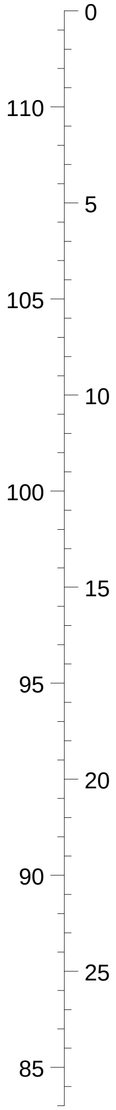
Logged By: JC

Date: March 4, 2019

Elevation: 112.5 feet AMSL

Depth to Groundwater
First Encountered During Drilling: N/E

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0	 4/6 12/6 16/6	CL	SANDY LEAN CLAY; very stiff, moist, low plasticity, reddish-brown to brown, trace gravel Hard drilling on cobbles at 1. 5 feet BSG		28	6
			Auger Refusal on Cobbles			



Notes:

Figure Number

MOORE TWINING
ASSOCIATES, INC.

Test Boring: S-4A

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: Pacific Drilling

Drill Type: Fastre SPT

Auger Type: 6 inch hollow stem

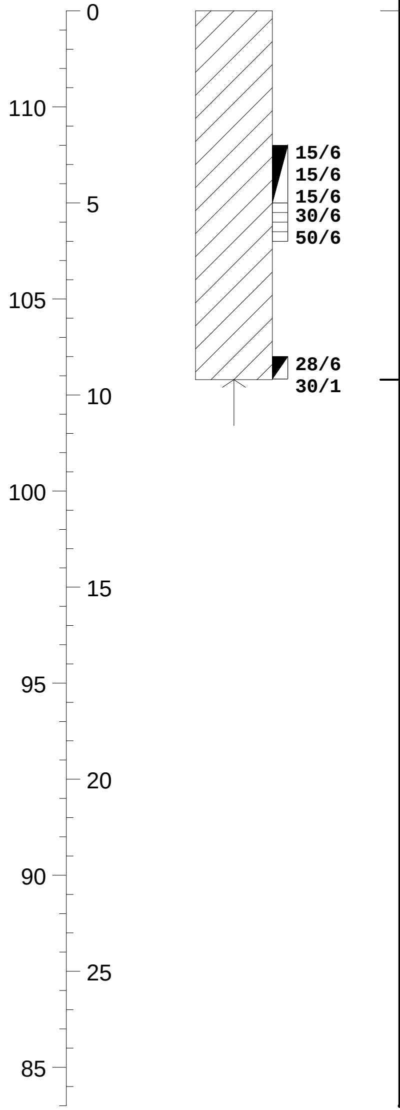
Hammer Type: 140 pound auto trip

Logged By: JC

Date: March 4, 2019

Elevation: 112.5 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0		CL	SANDY LEAN CLAY; medium stiff, moist, low to moderate plasticity; dark brown, trace gravel			
	15/6 15/6 15/6		very stiff, iron oxide staining, gravel increasing	minimal recovery	30	6
	30/6 50/6		Hard, color is brown, trace 1 to 1½ inch gravel	DD= 97.5 pcf WD= 109.2 pcf	>50	12
	28/6 30/1				>50	
			Auger and Sampler refusal on cobble			

Notes: *Boring S-4A was drilled 5 feet west of S-4*

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: S-5

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: Pacific Drilling

Date: March 5, 2019

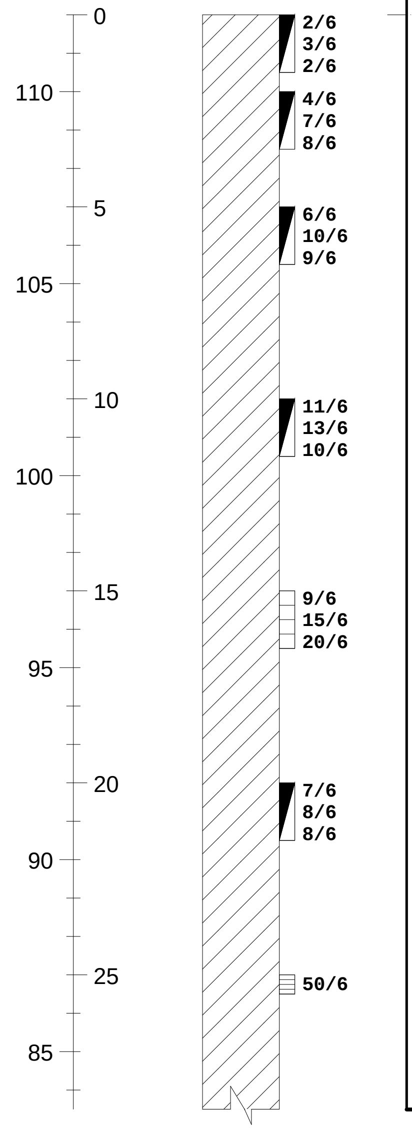
Drill Type: Fastre SPT

Elevation: 112 feet AMSL

Auger Type: 6 inch hollow stem

Hammer Type: 140 pound auto trip

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0	2/6 3/6 2/6	CL	SANDY LEAN CLAY; medium stiff, moist, low to medium plasticity, dark brown, trace gravel		5	18
110	4/6 7/6 8/6		At 2 feet, stiff, light brown, weak cementation		15	13
5	6/6 10/6 9/6		gravel present		19	14
10	11/6 13/6 10/6		color is light brown to dark brown		23	12
15	9/6 15/6 20/6		Hard, color is brown, decrease in plasticity	DD= 102.4 pcf WD= 117.2 pcf	35	15
20	7/6 8/6 8/6		Very stiff, low plasticity		16	13
25	50/6		Hard, color is dark brown, less moisture	No Recovery	>50	

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: S-5

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: Pacific Drilling

Date: March 5, 2019

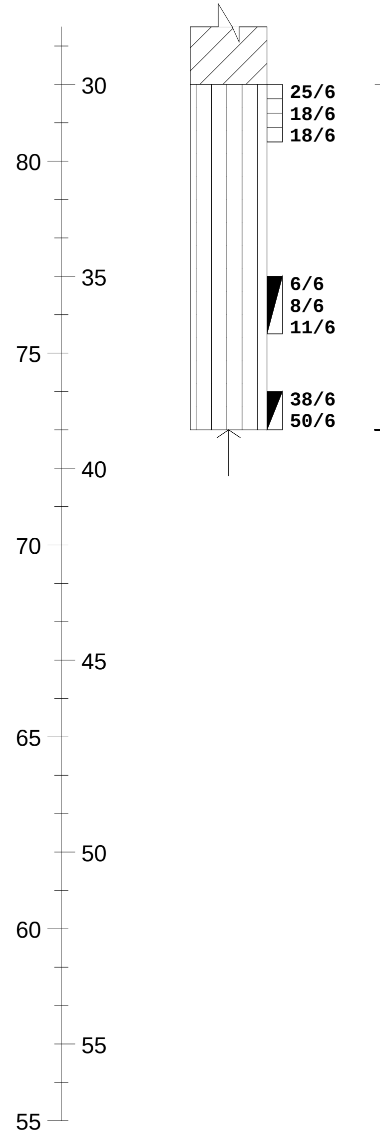
Drill Type: Fastre SPT

Elevation: 112 feet AMSL

Auger Type: 6 inch hollow stem

Hammer Type: 140 pound auto trip

Depth to Groundwater
First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
	25/6 18/6 18/6	ML	SILT with Sand; very stiff, moist, Low plasticity, brown	DD= 102.9 pcf WD= 115.5 pcf ø = 27° c = 310 psf -200= 71% +4 = 0% LL = 37 PI = 19	36	12
	6/6 8/6 11/6		very stiff, moist, low plasticity, light brown to brown		19	15
	38/6 50/6		Auger refusal on cobble		>50	6
			Sampler refusal			

Notes:

Figure Number

Test Boring: S-6

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: Pacific Drilling

Date: March 5, 2019

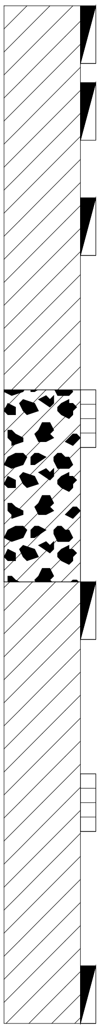
Drill Type: Fastre SPT

Elevation: 110.5 feet AMSL

Auger Type: 6 inch hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound auto trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
110 / 0	2/6 2/6 3/6	CL	SANDY LEAN CLAY; medium stiff, moist, low to moderate plasticity, dark brown, trace gravel		5	21
	5/6 6/6 7/6		at 2 feet, stiff, color is dark brown to black		13	13
105 / 5	5/6 5/6 10/6				15	16
100 / 10	8/6 13/6 15/6	GC	CLAYEY GRAVEL; very stiff, moist, black, coarse gravel (2 to 3 inch in cuttings) prevented full sample recovery	low recovery DD= 97.8 pcf WD= 110.6 pcf	28	13
95 / 15	4/6 7/6 7/6	CL	SANDY LEAN CLAY; stiff, moist, low plasticity, light brown		14	15
90 / 20	6/6 10/6 16/6		Very stiff, low to moderate plasticity, light brown to brown		26	12
85 / 25	5/6 5/6 5/6		color is light brown, decrease in plasticity to low/slight	DD= 107.5 pcf WD= 120.2 pcf	10	12
			Bottom of Boring			

Notes:

Figure Number

Test Boring: S-7

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: Pacific Drilling

Drill Type: Fastre SPT

Auger Type: 6 inch hollow stem

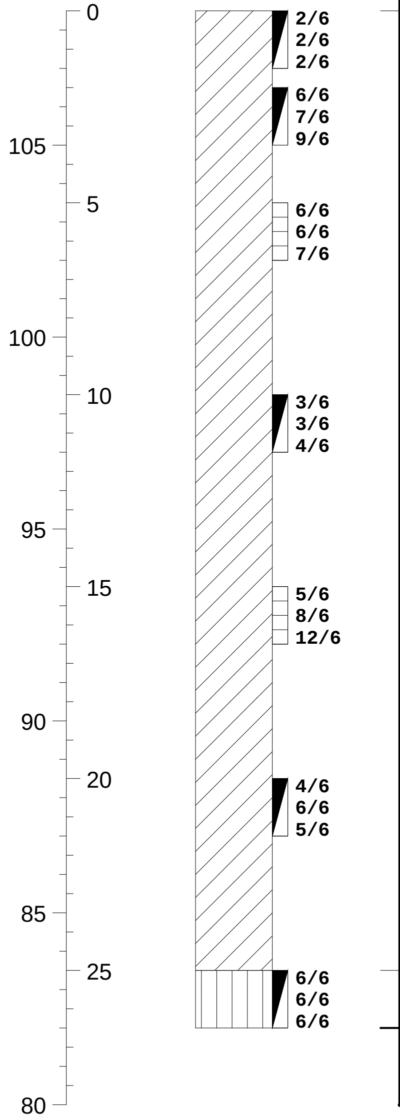
Hammer Type: 140 pound auto trip

Logged By: JC

Date: March 5, 2019

Elevation: 108.5 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0	2/6 2/6 2/6	CL	SANDY LEAN CLAY; soft, moist, low to moderate plasticity, dark-brown		4	22
	6/6 7/6 9/6		at 2 feet, very stiff, color is brown to dark brown		16	17
5	6/6 6/6 7/6		Color is light brown, calcification noted	DD= 98.8 pcf WD= 114.4 pcf ø = 32° C = 90 psf -200= 67% +4 = 0% LL = 42 PI = 21	13	16
10	3/6 3/6 4/6				7	16
15	5/6 8/6 12/6		Very stiff, color is light brown some calcification	DD= 105.1 pcf WD= 120.0 pcf	20	14
20	4/6 6/6 5/6		color is light orange, slight iron oxide staining		11	15
25	6/6 6/6 6/6	ML	SANDY SILT; stiff, moist, slightly plastic, light brown		12	12
			Bottom of Boring			

Notes:

Figure Number

MOORE TWINING
ASSOCIATES, INC.
Since 1898

Test Boring: S-8

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: Pacific Drilling

Drill Type: Fastre SPT

Auger Type: 6 inch hollow stem

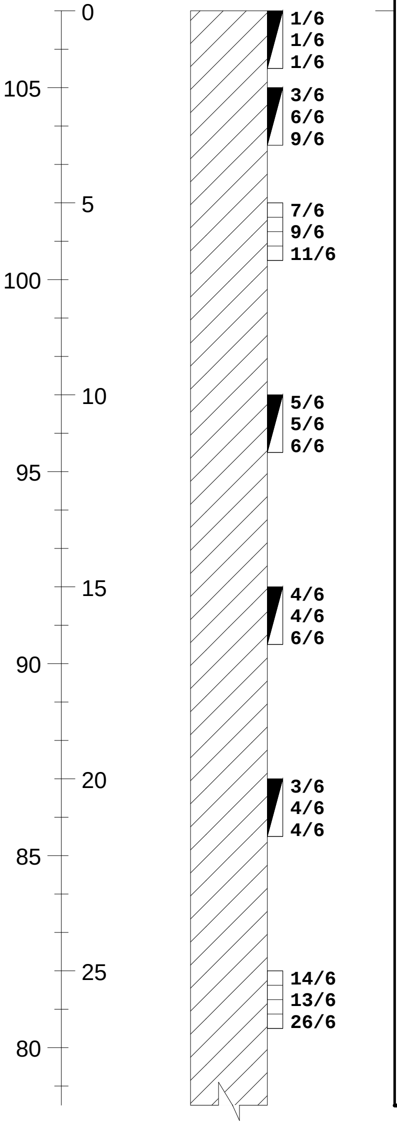
Hammer Type: 140 pound auto trip

Logged By: JC

Date: March 5, 2019

Elevation: 107 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
0	1/6 1/6 1/6	CL	SANDY LEAN CLAY; soft, moist, low to moderate plasticity, dark brown		2	19
105	3/6 6/6 9/6		at 2 feet, stiff, some red colored gravel, weak cementation,		15	17
5	7/6 9/6 11/6		at 5 feet, very stiff, brown to dark brown, cemented with some gravels	DD= 101.7 pcf WD= 115.6 pcf	20	14
10	5/6 5/6 6/6		stiff, low plasticity, light gray to brown		11	14
15	4/6 4/6 6/6				10	13
20	3/6 4/6 4/6		medium stiff		8	16
25	14/6 13/6 26/6		Hard, low plastic	DD= 96.6 pcf WD= 103.8 pcf	39	8

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.
Since 1898

Test Boring: S-8

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: Pacific Drilling

Drill Type: Fastre SPT

Auger Type: 6 inch hollow stem

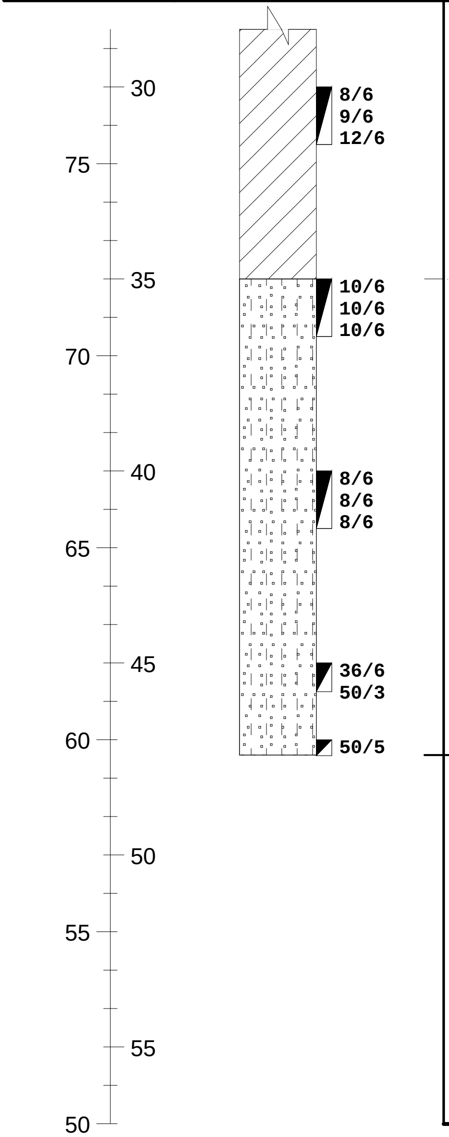
Hammer Type: 140 pound auto trip

Logged By: JC

Date: March 5, 2019

Elevation: 107 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
30	8/6 9/6 12/6		very stiff, color is light brown		21	20
35	10/6 10/6 10/6	SP-SM	POORLY GRADED SAND with Silt; medium dense, moist, fine to medium grained, light brown	-200= 7.2% +4 = 10%	20	2
40	8/6 8/6 8/6				16	2
45	36/6 50/3		with gravel, very dense, trace clay		>50	2
	50/5					
			Auger and sampler refusal in dense sands/gravel/cobbles			

Notes:

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: Perc - 1

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 3/12/2019

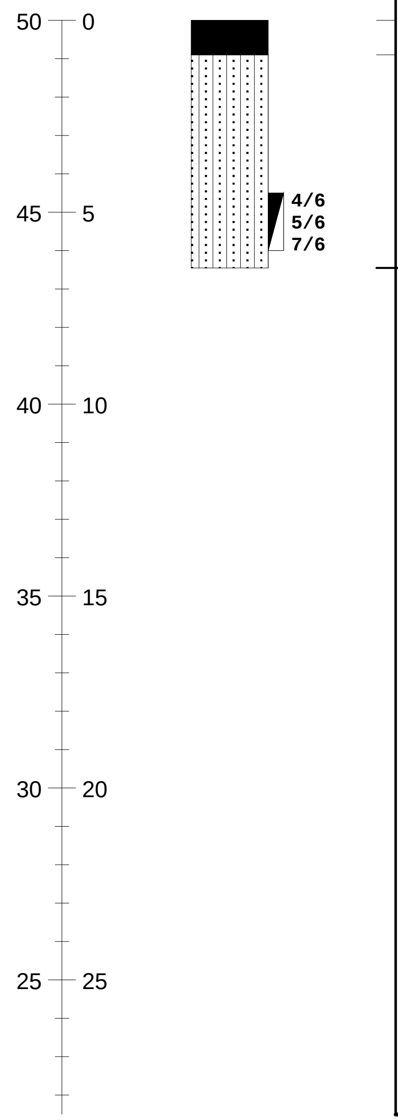
Drill Type: CME-75

Elevation: 50 feet AMSL

Auger Type: 6-5/8 inches hollow stem

Depth to Groundwater First Encountered During Drilling: N/E

Hammer Type: 140 pound Auto Trip



USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
SM	SILTY SAND; moist, brown			
	medium dense, moist, fine to medium grained, trace of coarse gravel		12	
	Bottom of Boring			

Notes: *Percolation test installed adjacent to L-8 location*

Figure Number

MOORE TWINING ASSOCIATES, INC.

Since 1898

Test Boring: Perc - 2

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Logged By: JC

Drilled By: JC

Date: 3/12/2019

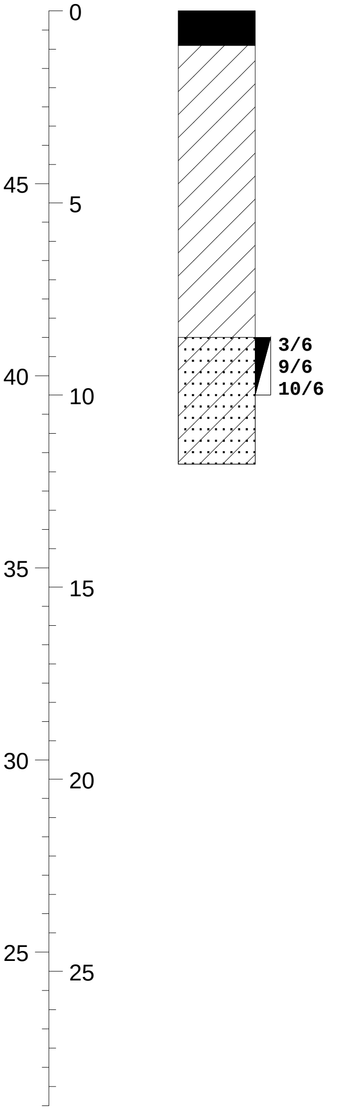
Drill Type: CME-75

Elevation: 49.5 feet AMSL

Auger Type: 6-5/8 inches hollow stem

Depth to Groundwater
First Encountered During Drilling: N/E

Hammer Type: 140 pound Auto Trip



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		CL	SANDY LEAN CLAY, very stiff, moist, dark brown, interbedded with Silty Sand layers			
	3/6 9/6 10/6	SC	CLAYEY SAND interbedded with Silty Sand layers; medium dense, moist, fine to coarse grained brown		19	
			Bottom of Boring			

Notes: *Percolation test installed adjacent to I-8 location*

Figure Number

MOORE TWINING ASSOCIATES, INC.

Test Boring: Perc - 3

Project: Home Depot Store - Mission Valley - San Diego, CA

Project Number: D050R0.01

Drilled By: JC

Drill Type: CME-75

Auger Type: 6-5/8 inches hollow stem

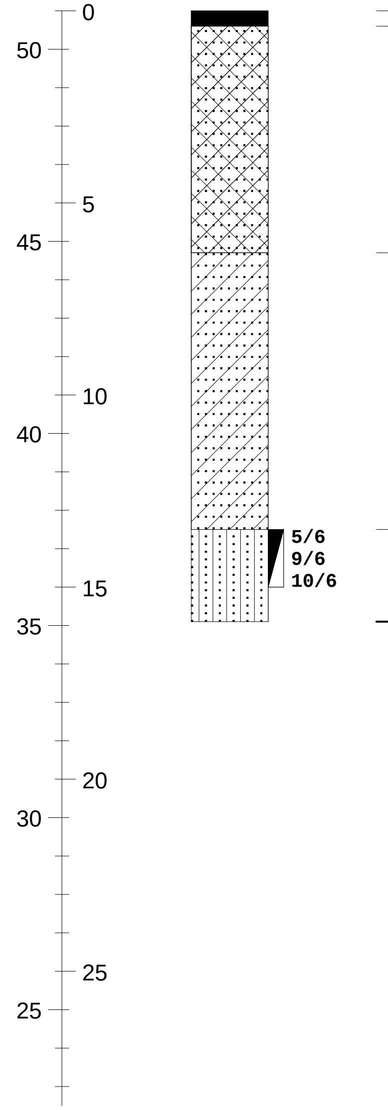
Hammer Type: 140 pound Auto Trip

Logged By: JC

Date: 3/12/2019

Elevation: 51 feet AMSL

Depth to Groundwater First Encountered During Drilling: N/E



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	N-Values blows/ft.	Moisture Content %
		SC	FILL; CLAYEY SAND with Gravel, brown			
		SC	NATIVE; CLAYEY SAND, moist, fine grained, brown			
	5/6 9/6 10/6	SM	SILTY SAND, medium dense, moist, fine grained, brown with some Sandy Silt zones	-200 = 43.6%	19	
			Bottom of Boring			

Notes: *Percolation test installed adjacent to M-8 location*

Figure Number

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
■	ASPHALTIC CONCRETE
▩	CLAYEY SAND FILL SOILS
▨	SC: Clayey sand
░	SM: Silty sand
▥	ML: Silt

Symbol	Description
▨	CL: LEAN CLAY
▓	GP-GM: Poorly graded gravel with silt
▓	GE-GC: Well graded gravel with clay
▓	GC: Clayey gravel
Misc. Symbols	
↑	Drill rejection

Notes:

1. Test borings in the building area were drilled from February 25 through March 12, 2019 using a CME 75 drill rig quipped with 6 inch O.D. hollow stem augers. Test borings on the upper slope bench were drilled using a Fastre SPT track mounted drill rig quipped with 6 inch O.D. hollow stem augers. Test Borings in the parking structure area were dirlled from September 17 through the September 20, 2019 using a CME 75 drill rig quipped with 6 inch O.D. hollow stem augers. ALso a single boring M-8C was drilled on December 26, 2019 using a Yeti M10 drill rig quipped with 8 inch O.D. hollow stem augers.

2. Groundwater was encountered in deeper boings during drilled and depths are indicated on the borings logs.

3. Boring locations were located with reference to the existing site features.

4. These logs are subject to the limitations, conclusions, and recommendations in this report.

5. The "N-value" reported for the California Modified Split Barrel Sampler is the uncorrected field blow count. This value shold not be interpreted as an SPT equivalent N-value.

6. Results of tests conducted on samples recovered are reported on the logs. Abbreviations used are:

   AMSL = Above mean sea level   RV = Ressistance Value
   O.D. = Outside diameter   WD = Wet Density (pcf)
   DD = Dry density (pcf)   +4 = Percent Retained on #4 sieve
   -#200 = Percent passing #200 sieve (%)   N/A = Not applicable
   N/E = None encountered   pcf = pounds per cubic foot
   psf = pounds per square foot   BSG = below site grade
   LL = Liquid Limit   PI = Plasticity Index
   C = Cohesion   ø = Angle of Internal Friction

KEY TO SYMBOLS

Symbol	Description
Soil Samplers	
◤	Standard penetration test
▤	California Modified split barrel ring sampler

APPENDIX C

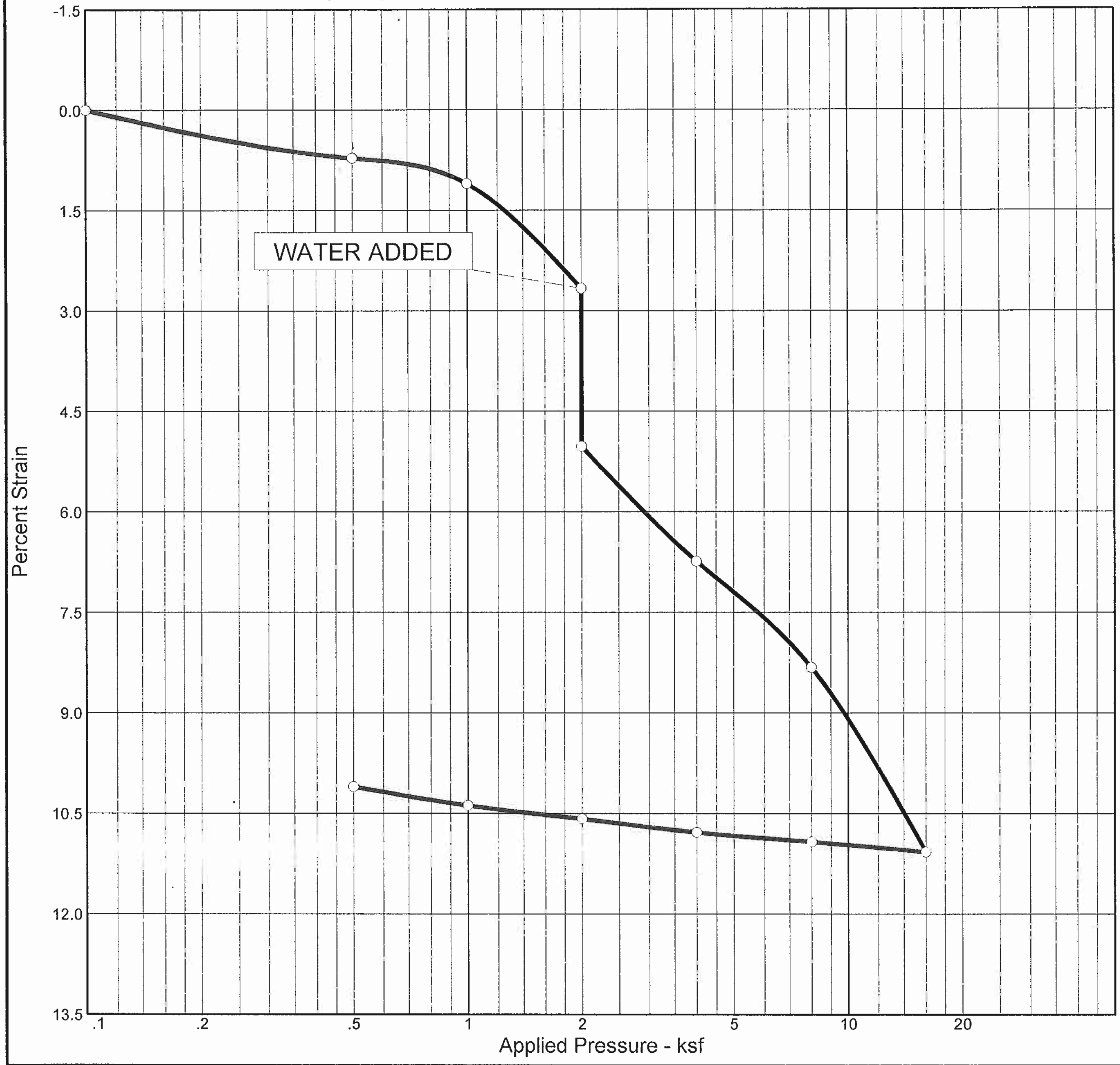
RESULTS OF LABORATORY TESTS

This appendix contains the individual results of the following tests. The results of the moisture content and dry density tests are included on the test boring logs in Appendix B. These data, along with the field observations, were used to prepare the final test boring logs in Appendix B.

These Included:	To Determine:
Moisture Content (ASTM D2216)	Moisture contents representative of field conditions at the time the sample was taken.
Dry Density (ASTM D2937)	Dry unit weight of sample representative of in-situ or in-place undisturbed condition.
Grain-Size Distribution (ASTM D422)	Size and distribution of soil particles, i.e., clay, silt, sand, and gravel.
Atterberg Limits (ASTM D4318)	Determines the moisture content at which the soil behaves as a viscous material (liquid limit) and the moisture content at which the soil reaches a plastic state.
Expansion Index (ASTM D4829)	Swell potential of soil with increases in moisture content.
Consolidation (ASTM D2435)	The amount and rate at which a soil sample compresses when loaded, and the influence of saturation on its behavior.
Direct Shear (ASTM D3080)	Soil shearing strength under varying loads and/or moisture conditions.

These Included:	To Determine:
Moisture-Density Relationship (ASTM D1557)	The optimum (best) moisture content for compacting soil and the maximum dry unit weight (density) for a given compactive effort.
R-Value (ASTM D2844)	The capacity of a subgrade or subbase to support a pavement section designed to carry a specified traffic load.
Sulfate Content (ASTM D4327)	Percentage of water-soluble sulfate as (SO4) in soil samples. Used as an indication of the relative degree of sulfate attack on concrete and for selecting the cement type.
Chloride Content (ASTM D4327)	Percentage of soluble chloride in soil. Used to evaluate the potential attack on encased reinforcing steel.
Resistivity (ASTM G187)	The potential of the soil to corrode metal.
pH (ASTM D4972)	The acidity or alkalinity of subgrade material.

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Clpse. %	e_o
Sat.	Moist.											
96.9 %	22.0 %	103.3			2.65		1.53	0.15	0.01		2.3	0.601

MATERIAL DESCRIPTION	USCS	AASHTO
Sandy lean clay	CL	

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

Source: **Sample No.:** E-4 **Elev./Depth:** 10-11.5'

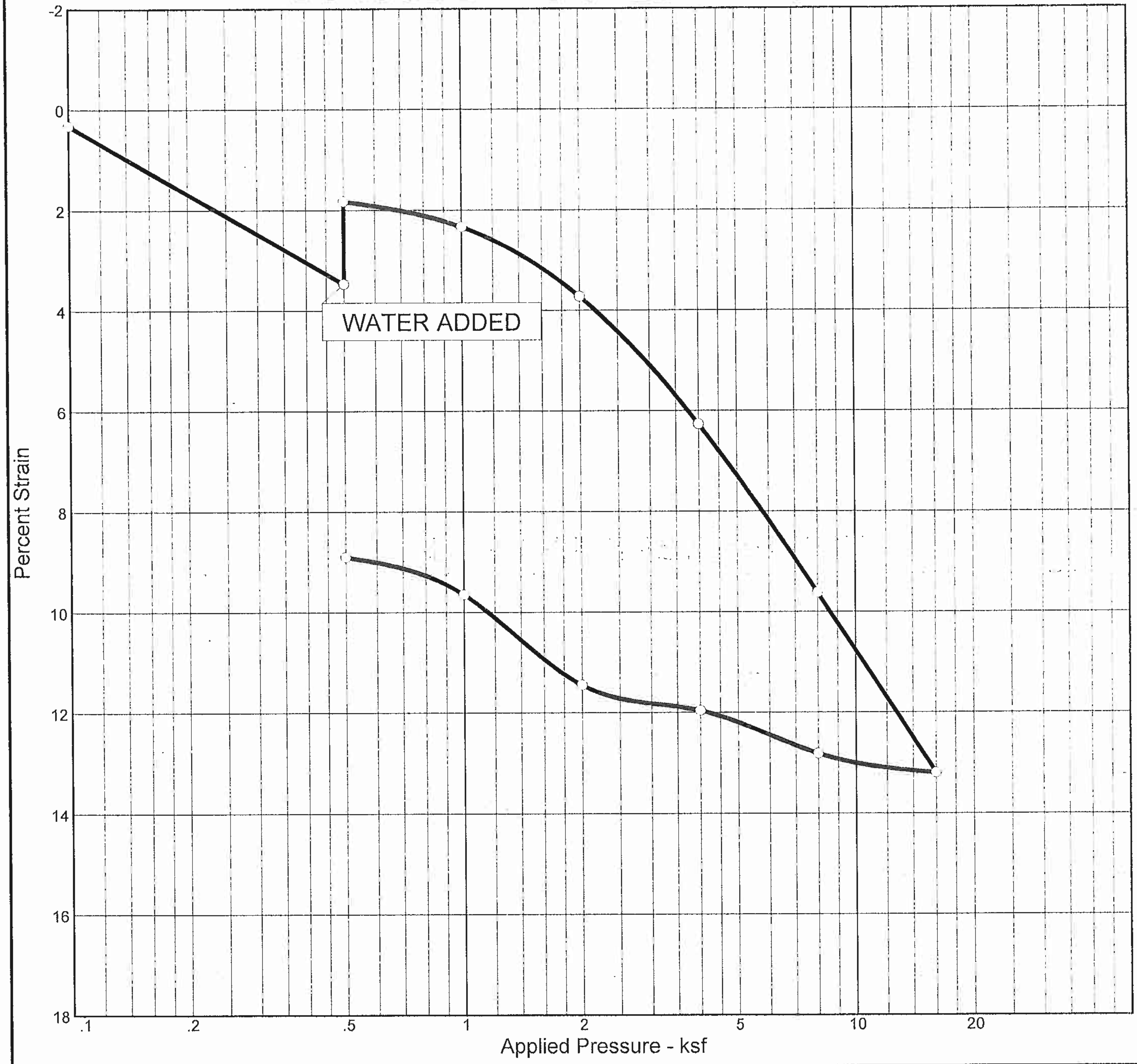
Remarks:

Moore Twining Associates, Inc.

Fresno, CA

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Swell %	e_o
Sat.	Moist.											
90.8 %	21.4 %	101.8			2.65		2.31	0.19	0.05	1.83	1.7	0.625

MATERIAL DESCRIPTION	USCS	AASHTO

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

Source: **Sample No.:** F-8 **Elev./Depth:** 5-6.5'

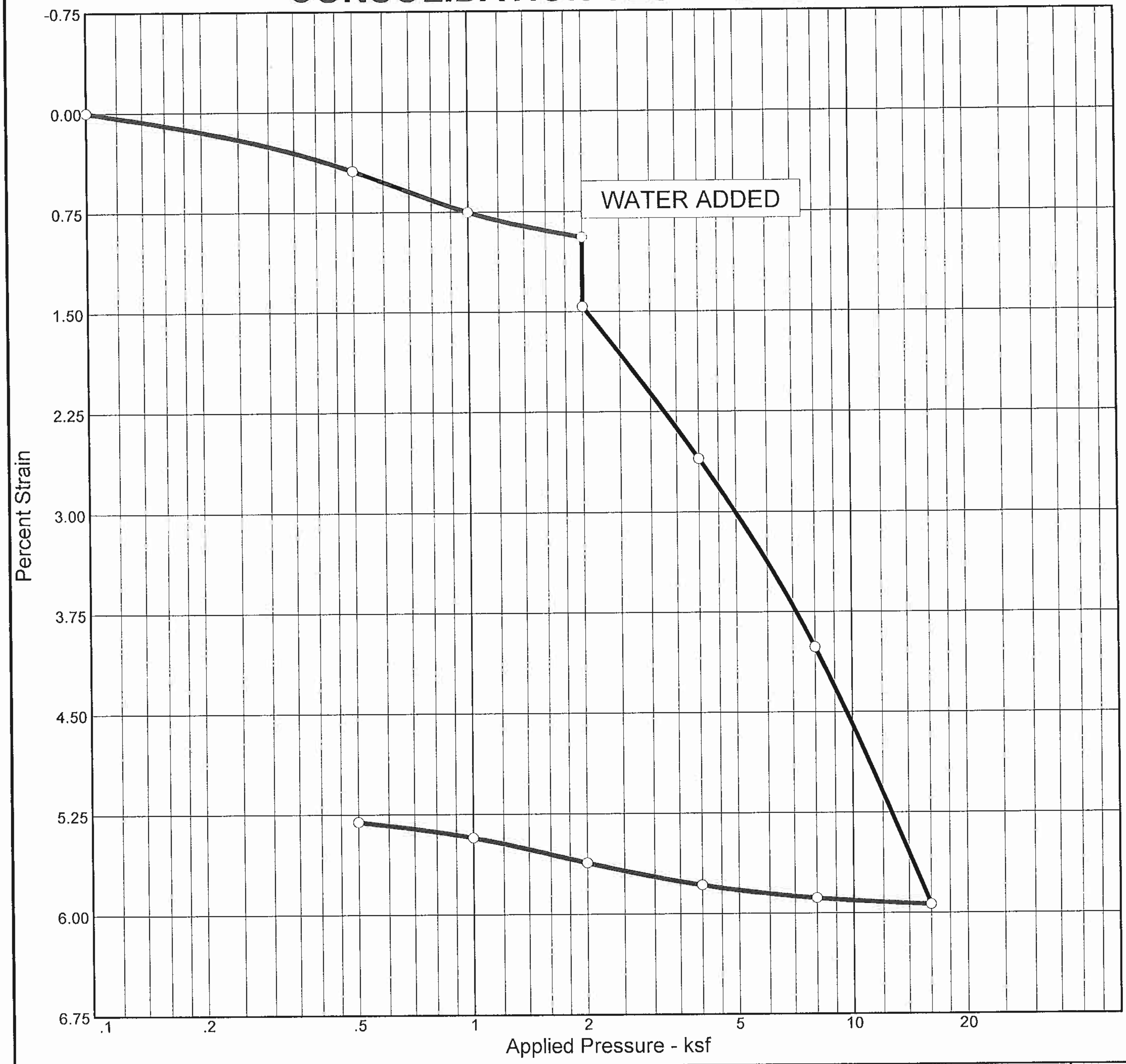
Moore Twining Associates, Inc.

Fresno, CA

Remarks:

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Clpse. %	e_o
Sat.	Moist.											
72.0 %	13.1 %	111.5	36	13	2.65		8.30	0.10	0.01		0.6	0.483

MATERIAL DESCRIPTION	USCS	AASHTO
Sandy lean clay	CL	

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

Source: **Sample No.:** G-5 **Elev./Depth:** 2.5-4'

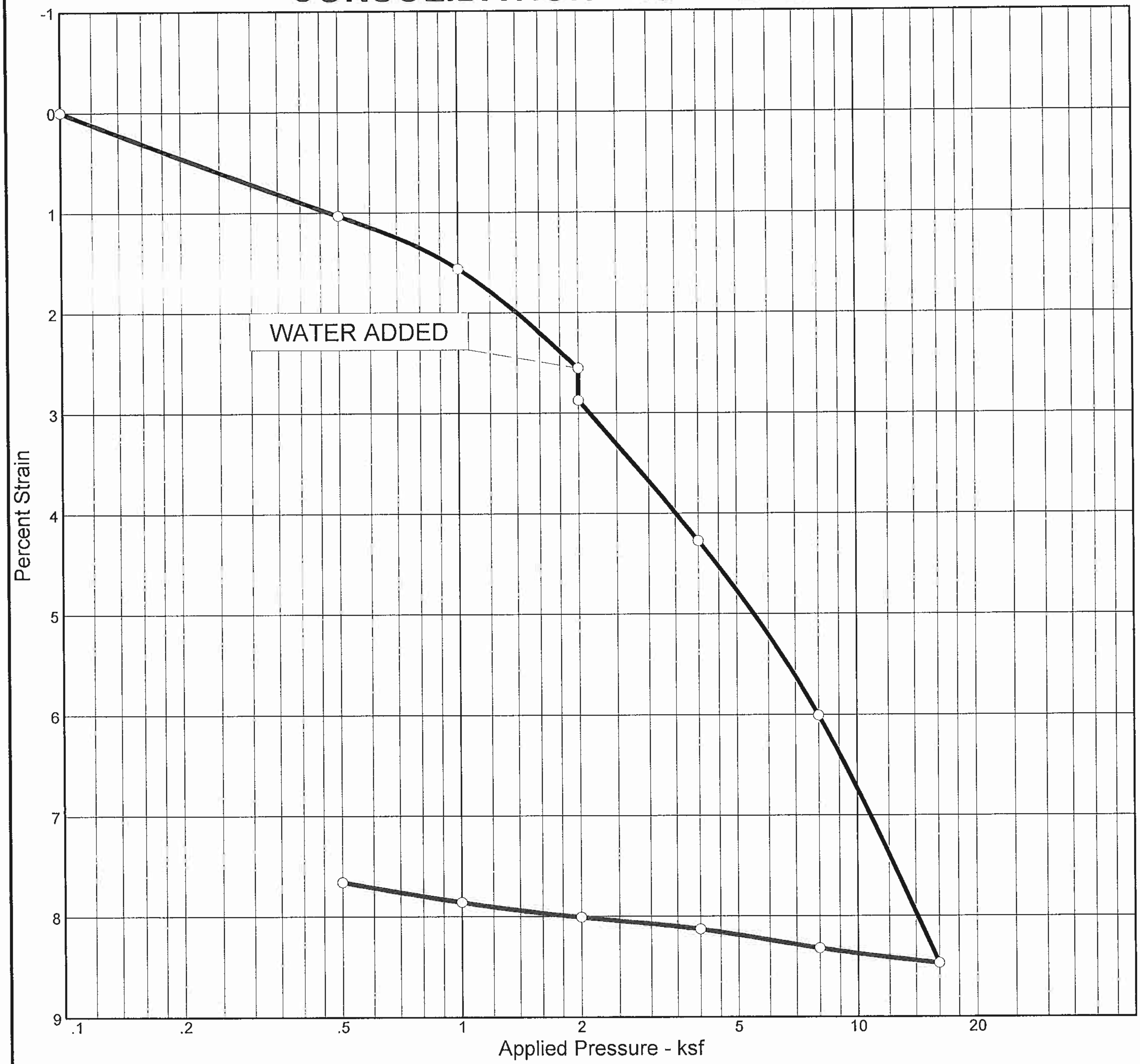
Moore Twining Associates, Inc.

Fresno, CA

Remarks:

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Clpse. %	e_o
Sat.	Moist.											
80.3 %	18.1 %	103.6	36	13	2.65		2.80	0.13	0.01		0.3	0.596

MATERIAL DESCRIPTION	USCS	AASHTO
Sandy lean clay	CL	

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

Source: **Sample No.:** G-6 **Elev./Depth:** 1-2.5'

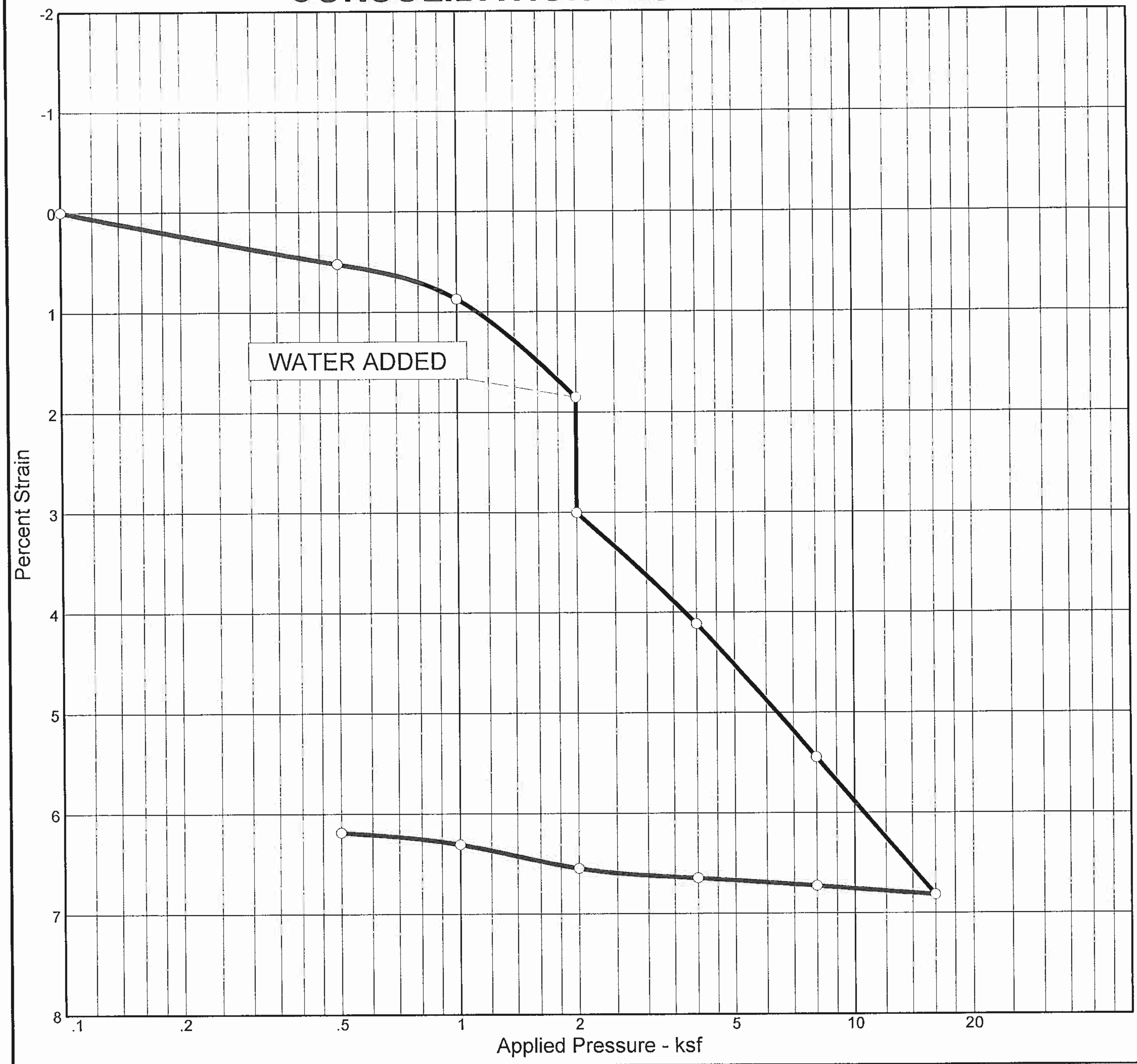
Moore Twining Associates, Inc.

Fresno, CA

Remarks:

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Clpse. %	e_o
Sat.	Moist.											
51.1 %	11.3 %	104.2			2.65		0.73	0.07	0.01		1.1	0.587

MATERIAL DESCRIPTION	USCS	AASHTO
Clayey sand	SC	

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

Source: **Sample No.:** H-6 **Elev./Depth:** 5-6.5'

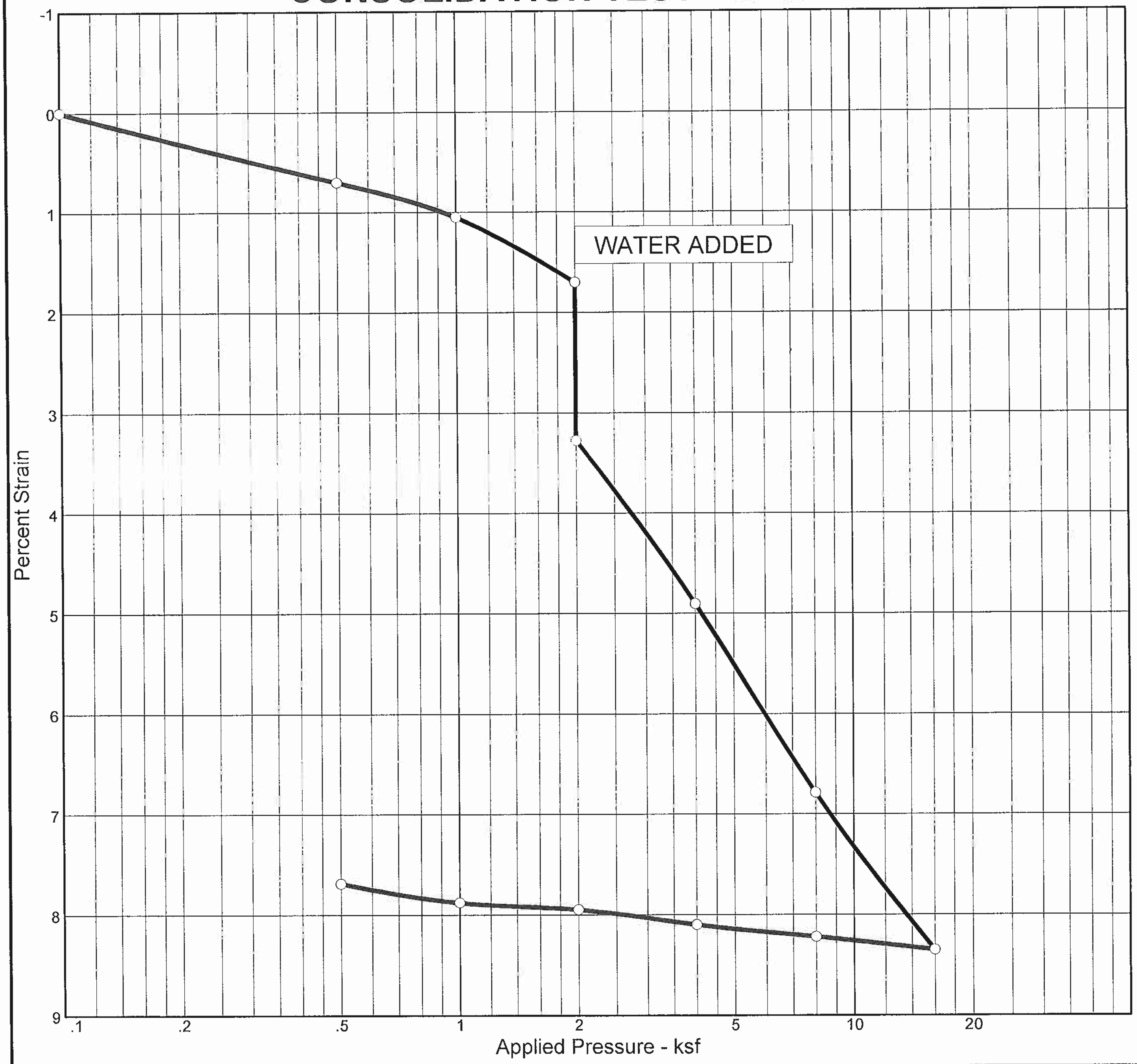
Moore Twining Associates, Inc.

Fresno, CA

Remarks:

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Clpse. %	e_o
Sat.	Moist.											
66.9 %	14.0 %	106.5			2.65		0.53	0.08	0.01		1.6	0.554

MATERIAL DESCRIPTION	USCS	AASHTO
Sandy lean clay	CL	

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

Source: **Sample No.:** I-6 **Elev./Depth:** 1.5-3'

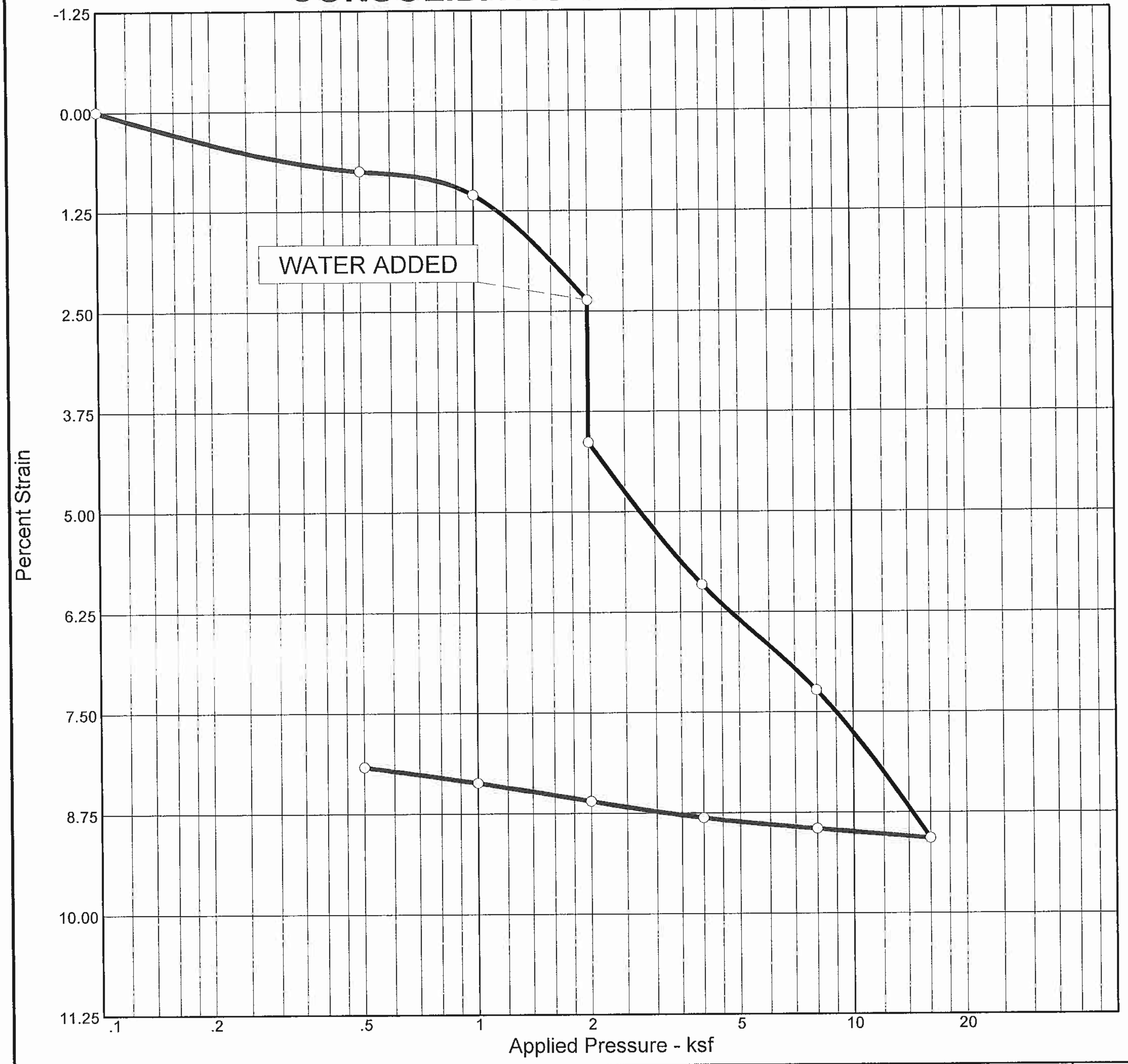
Moore Twining Associates, Inc.

Fresno, CA

Remarks:

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Clpse. %	e_o
Sat.	Moist.											
73.9 %	13.3 %	112.0			2.65		0.82	0.09	0.01		1.7	0.476

MATERIAL DESCRIPTION	USCS	AASHTO
Clayey gravel with sand	GC	

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

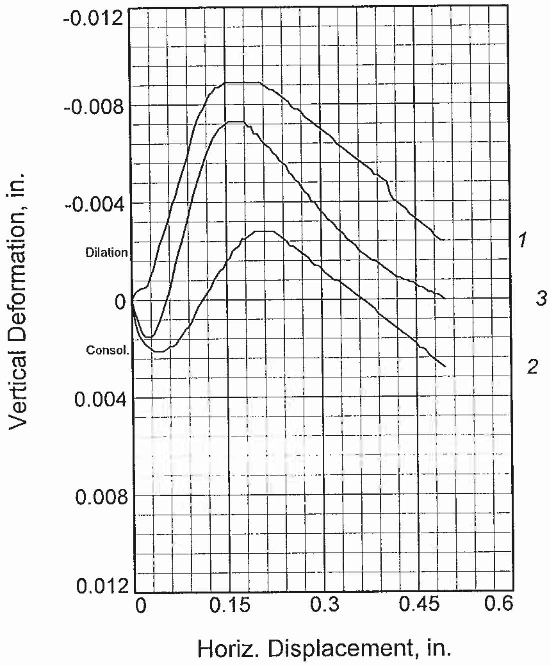
Source: **Sample No.:** J-4 **Elev./Depth:** 5-6.5'

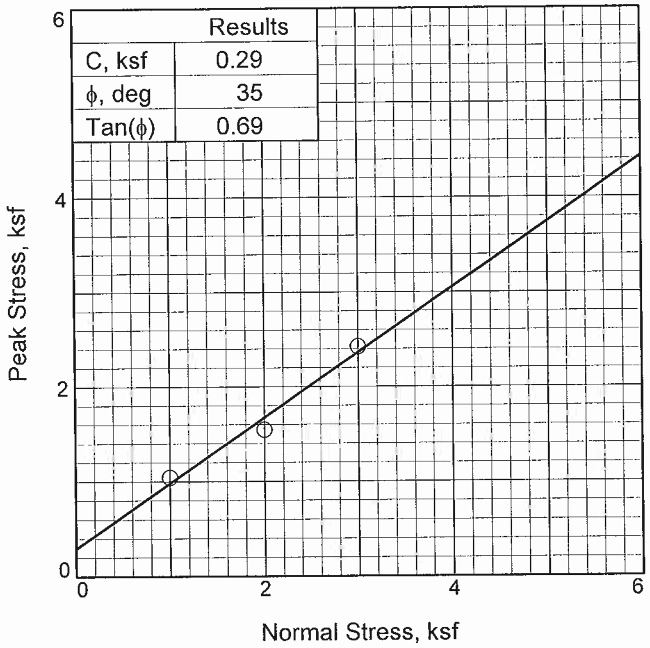
Remarks:

Moore Twining Associates, Inc.

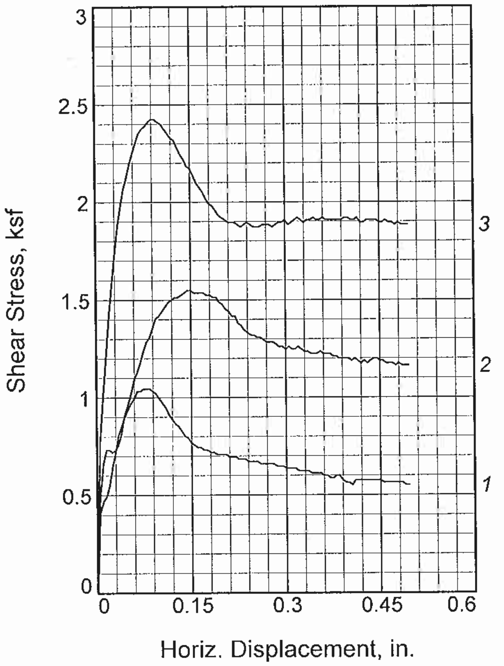
Fresno, CA

Figure





	Results
C, ksf	0.29
ϕ, deg	35
Tan(ϕ)	0.69



	Sample No.	1	2	3
Initial	Water Content, %	15.2	15.5	15.6
	Dry Density, pcf	103.8	103.9	104.0
	Saturation, %	67.9	69.4	69.8
	Void Ratio	0.5939	0.5927	0.5914
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	21.1	20.3	19.7
	Dry Density, pcf	105.6	106.1	106.8
	Saturation, %	98.5	96.3	95.0
	Void Ratio	0.5667	0.5592	0.5484
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.98	0.98	0.97
	Normal Stress, ksf	1.00	2.00	3.00
	Peak Stress, ksf	1.04	1.55	2.42
	Displacement, in.	0.08	0.14	0.09
	Ultimate Stress, ksf			
	Displacement, in.			
	Strain at peak, %	3.1	6.0	3.7

Sample Type:

Description: Sandy lean clay

Specific Gravity= 2.65

Remarks:

Figure ________

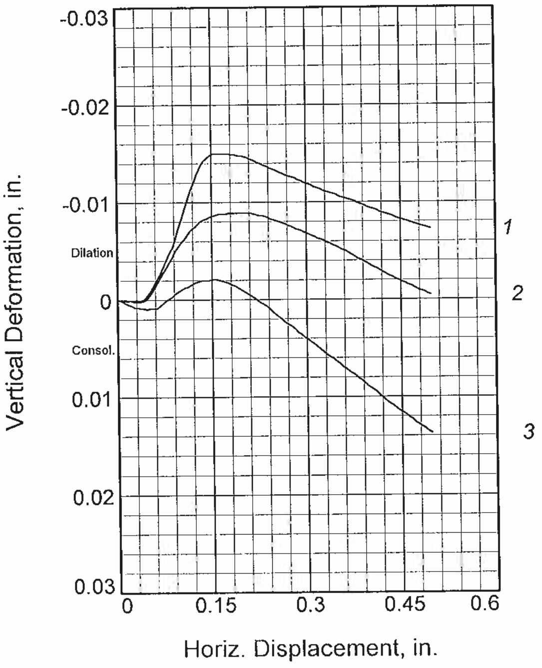
Client:

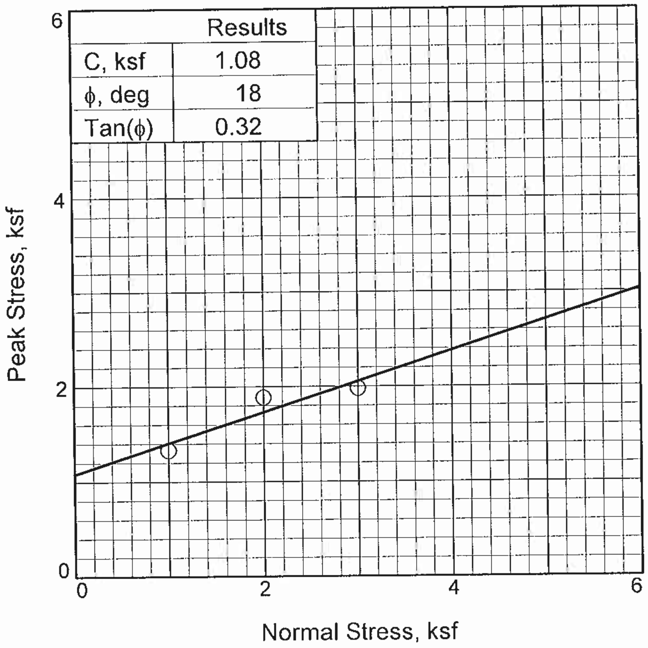
Project: Mission Valley - Home Depot

Sample Number: C-5 **Depth:** 5-6.5'

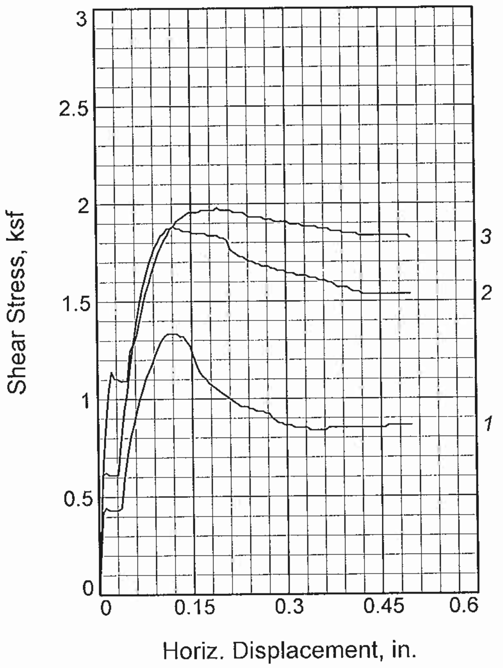
Proj. No.: D050R0.01 **Date Sampled:** 2/25/19

DIRECT SHEAR TEST REPORT
Moore Twining Associates, Inc.
Fresno, CA





	Results
C, ksf	1.08
ϕ, deg	18
Tan(ϕ)	0.32



	Sample No.	1	2	3
Initial	Water Content, %	17.3	17.3	17.4
	Dry Density, pcf	108.2	108.5	109.5
	Saturation, %	86.6	87.5	90.2
	Void Ratio	0.5290	0.5244	0.5105
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	18.6	17.9	17.2
	Dry Density, pcf	109.9	111.1	112.6
	Saturation, %	97.5	97.1	97.2
	Void Ratio	0.5052	0.4890	0.4695
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.98	0.98	0.97
Normal Stress, ksf		1.00	2.00	3.00
Peak Stress, ksf		1.33	1.88	1.98
Displacement, in.		0.11	0.12	0.19
Ultimate Stress, ksf				
Displacement, in.				
Strain at peak, %		4.6	5.0	7.9

Sample Type:

Description: Clayey sand (Fill)

Specific Gravity= 2.65

Remarks:

Figure ______

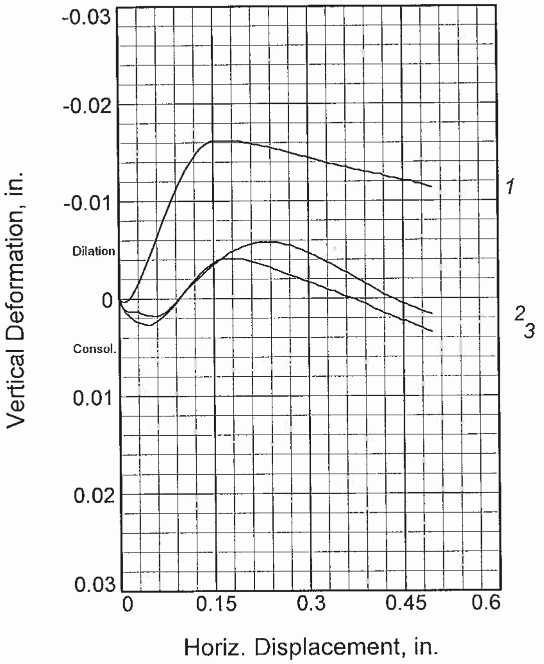
Client:

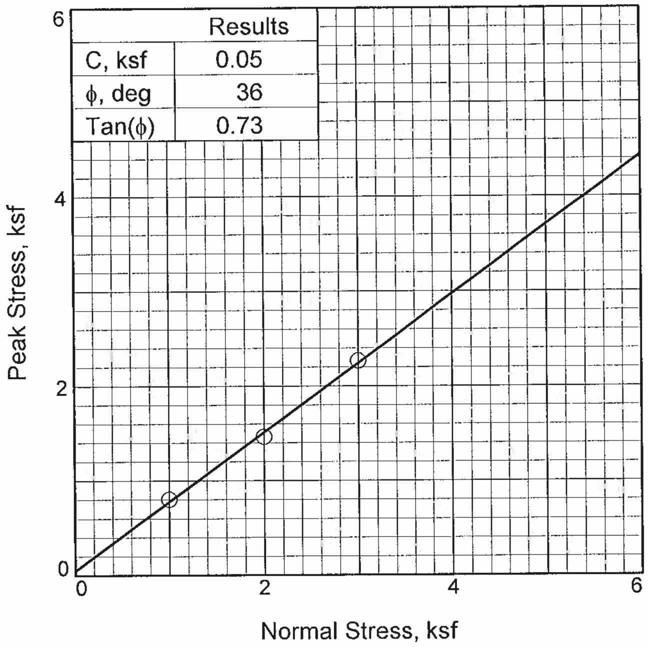
Project: Mission Valley - Home Depot

Sample Number: S-1 **Depth:** 2-3.5'

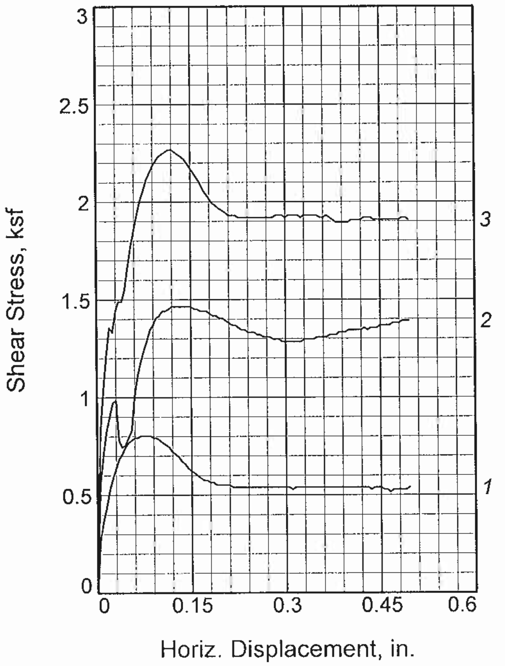
Proj. No.: D050R0.01 **Date Sampled:** 3/4/19

DIRECT SHEAR TEST REPORT
Moore Twining Associates, Inc.
Fresno, CA





	Results
C, ksf	0.05
ϕ, deg	36
Tan(ϕ)	0.73



	Sample No.	1	2	3
Initial	Water Content, %	7.8	7.7	7.7
	Dry Density, pcf	94.6	96.1	95.1
	Saturation, %	27.7	28.3	27.6
	Void Ratio	0.7494	0.7222	0.7387
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	26.6	24.8	25.2
	Dry Density, pcf	96.1	98.1	97.4
	Saturation, %	97.7	95.8	95.5
	Void Ratio	0.7219	0.6869	0.6982
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.98	0.98	0.98
	Normal Stress, ksf	1.00	2.00	3.00
	Peak Stress, ksf	0.80	1.46	2.27
	Displacement, in.	0.07	0.12	0.12
	Ultimate Stress, ksf			
	Displacement, in.			
	Strain at peak, %	2.9	5.0	4.8

Sample Type:

Description: Sandy lean clay

Specific Gravity= 2.65

Remarks:

Figure ________

Client:

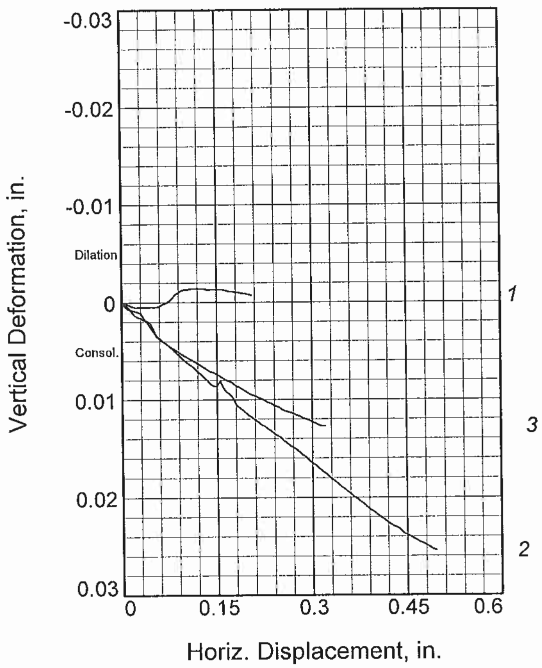
Project: Mission Valley - Home Depot

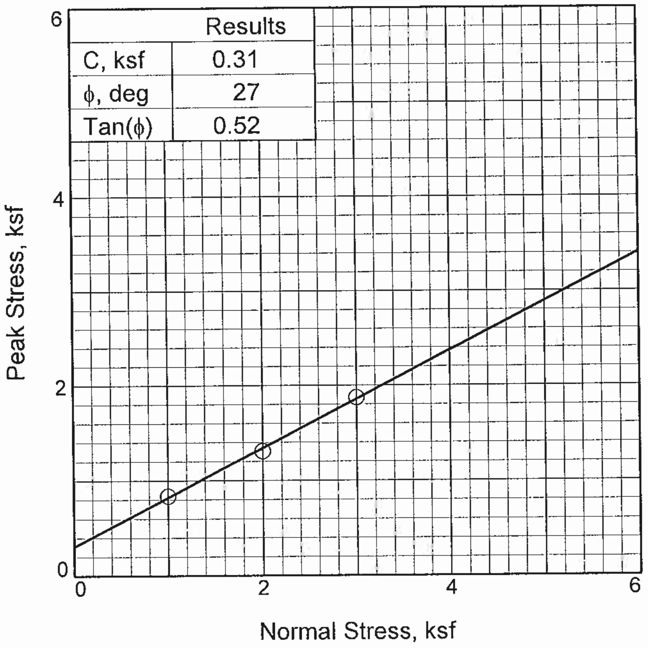
Sample Number: S-2 **Depth:** 5-6.5'

Proj. No.: D050R0.01 **Date Sampled:** 3/4/19

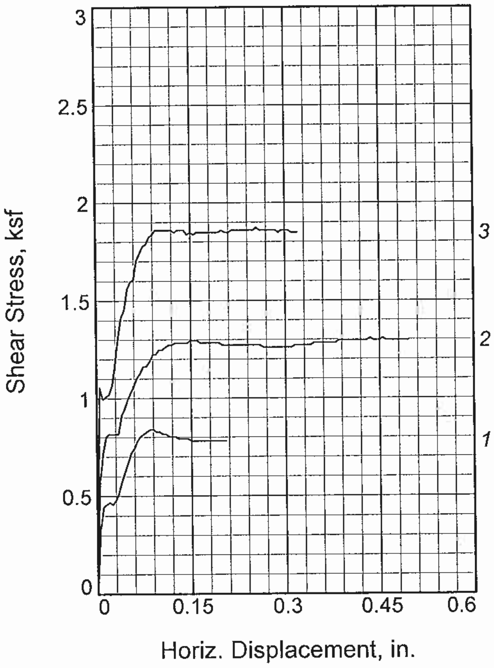
DIRECT SHEAR TEST REPORT

Moore Twining Associates, Inc.
Fresno, CA





	Results
C, ksf	0.31
ϕ, deg	27
Tan(ϕ)	0.52



	Sample No.	1	2	3
Initial	Water Content, %	14.0	14.2	14.3
	Dry Density, pcf	104.4	104.1	103.9
	Saturation, %	63.5	63.9	64.0
	Void Ratio	0.5850	0.5888	0.5927
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	20.6	20.3	19.9
	Dry Density, pcf	106.1	106.4	106.7
	Saturation, %	97.7	96.7	95.9
	Void Ratio	0.5594	0.5553	0.5503
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.98	0.98	0.97
	Normal Stress, ksf	1.00	2.00	3.00
	Peak Stress, ksf	0.84	1.31	1.87
	Displacement, in.	0.09	0.44	0.26
	Ultimate Stress, ksf			
	Displacement, in.			
	Strain at peak, %	3.5	18.0	10.6

Sample Type:
Description: Silt with sand

LL= 37 **PL=** 18 **PI=** 19
Specific Gravity= 2.65
Remarks:

Figure ________

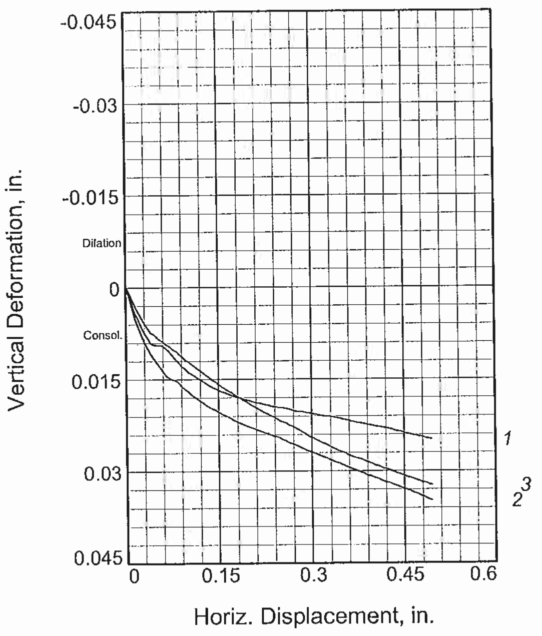
Client:

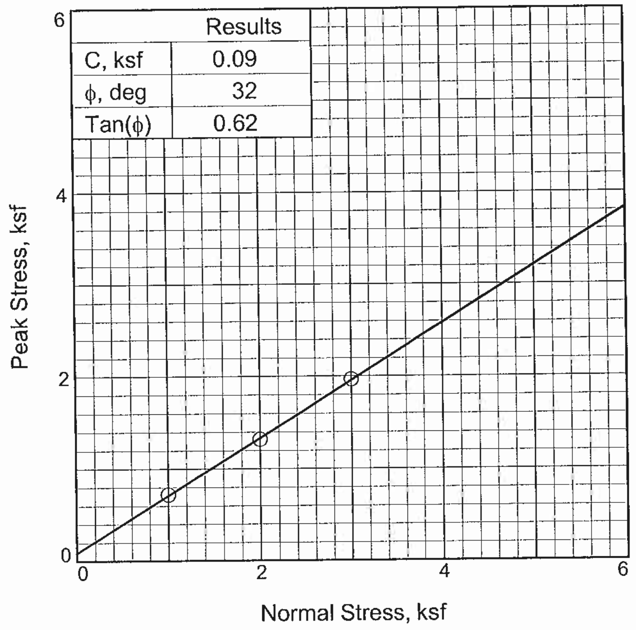
Project: Mission Valley - Home Depot

Sample Number: S-5 **Depth:** 30-31.5'

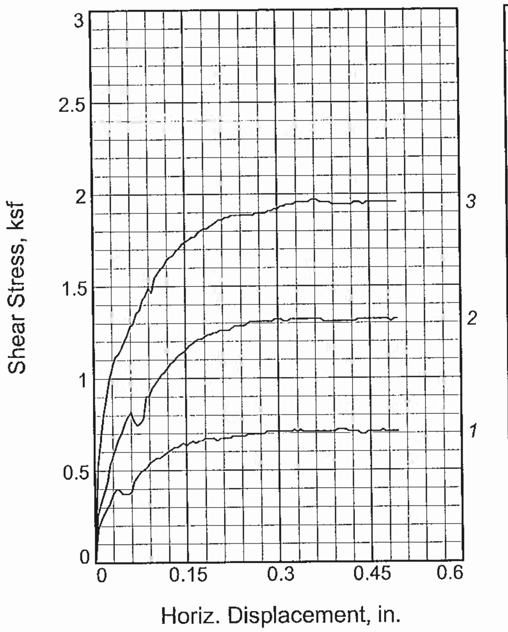
Proj. No.: D050R0.01 **Date Sampled:** 3/4/19

DIRECT SHEAR TEST REPORT
Moore Twining Associates, Inc.
Fresno, CA





	Results
C, ksf	0.09
ϕ, deg	32
Tan(ϕ)	0.62



	Sample No.	1	2	3
Initial	Water Content, %	15.5	15.6	15.5
	Dry Density, pcf	100.0	100.2	101.3
	Saturation, %	62.9	63.5	64.9
	Void Ratio	0.6549	0.6508	0.6332
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	22.4	22.4	22.4
	Dry Density, pcf	101.2	102.1	103.4
	Saturation, %	93.8	95.6	99.0
	Void Ratio	0.6340	0.6207	0.5992
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.99	0.98	0.98
	Normal Stress, ksf	1.00	2.00	3.00
	Peak Stress, ksf	0.72	1.32	1.97
	Displacement, in.	0.33	0.29	0.35
	Ultimate Stress, ksf			
	Displacement, in.			
	Strain at peak, %	13.5	12.2	14.7

Sample Type:

Description: Sandy lean clay

Specific Gravity= 2.65

Remarks:

Figure ________

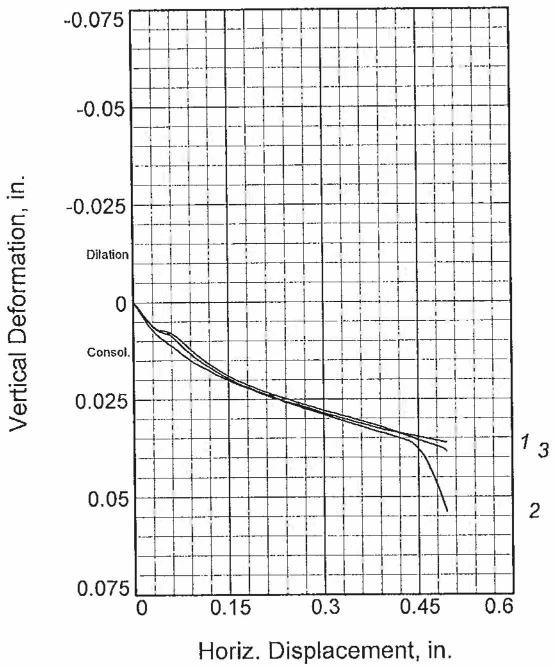
Client:

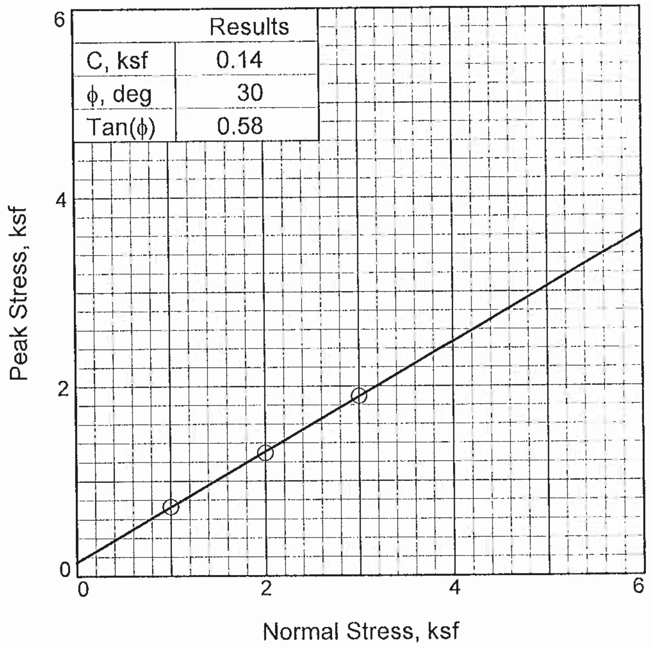
Project: Mission Valley - Home Depot

Sample Number: S-7 **Depth:** 5-6.5'

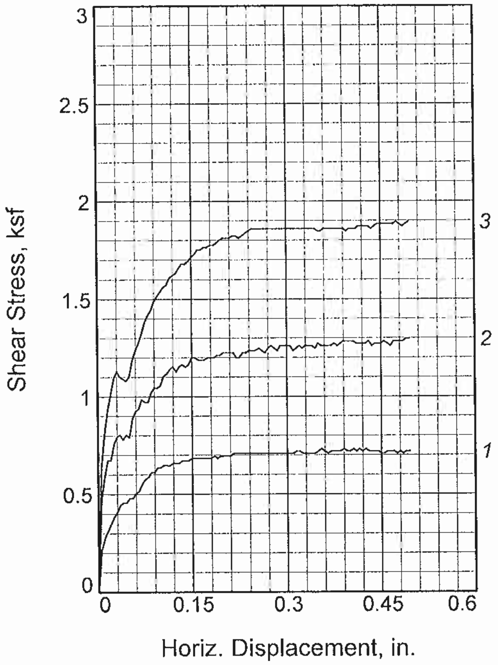
Proj. No.: D050R0.01 **Date Sampled:** 3/4/19

DIRECT SHEAR TEST REPORT
Moore Twining Associates, Inc.
Fresno, CA





	Results
C, ksf	0.14
ϕ, deg	30
Tan(ϕ)	0.58



	Sample No.	1	2	3
Initial	Water Content, %	2.6	7.0	8.8
	Dry Density, pcf	90.2	93.2	94.2
	Saturation, %	8.2	23.8	30.9
	Void Ratio	0.8332	0.7759	0.7571
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	26.5	23.2	21.7
	Dry Density, pcf	96.1	100.8	103.1
	Saturation, %	97.5	95.9	95.1
	Void Ratio	0.7208	0.6406	0.6051
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.94	0.92	0.91
	Normal Stress, ksf	1.00	2.00	3.00
	Peak Stress, ksf	0.73	1.30	1.90
	Displacement, in.	0.35	0.49	0.47
	Ultimate Stress, ksf			
	Displacement, in.			
	Strain at peak, %	14.7	20.3	19.7

Sample Type:

Description:

Specific Gravity= 2.65

Remarks:

Figure _______

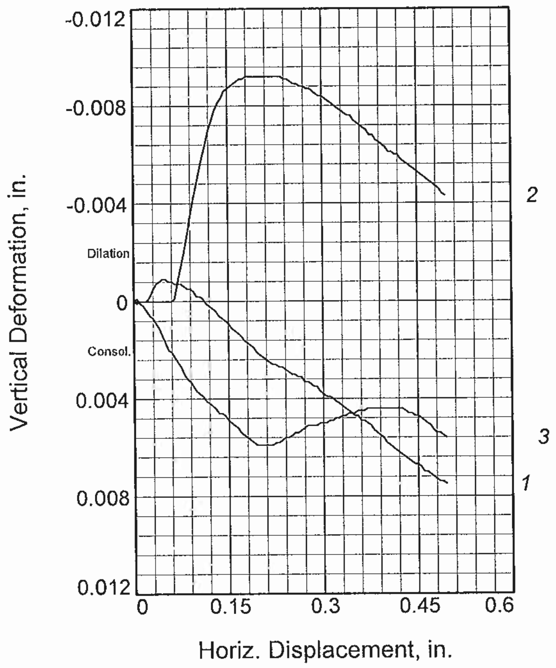
Client:

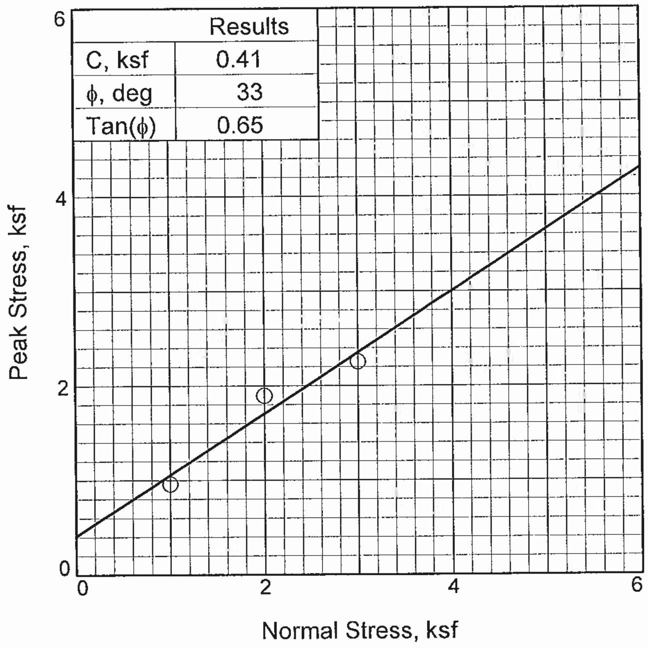
Project: Mission Valley - Home Depot

Sample Number: ES-1 **Depth:** 0.5-1'

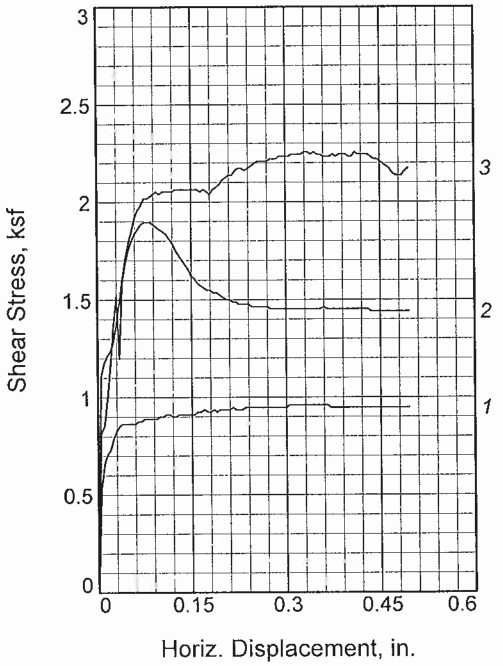
Proj. No.: D050R0.01 **Date Sampled:** 9/17/19

DIRECT SHEAR TEST REPORT
Moore Twining Associates, Inc.
Fresno, CA





	Results
C, ksf	0.41
ϕ, deg	33
Tan(ϕ)	0.65



	Sample No.	1	2	3
Initial	Water Content, %	8.4	8.3	8.1
	Dry Density, pcf	108.9	114.7	115.9
	Saturation, %	42.8	49.5	50.3
	Void Ratio	0.5197	0.4429	0.4271
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	18.2	14.6	13.8
	Dry Density, pcf	111.5	118.1	119.6
	Saturation, %	100.0	96.6	95.3
	Void Ratio	0.4835	0.4009	0.3827
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.98	0.97	0.97
	Normal Stress, ksf	1.00	2.00	3.00
	Peak Stress, ksf	0.96	1.90	2.26
	Displacement, in.	0.30	0.08	0.33
	Ultimate Stress, ksf			
	Displacement, in.			
	Strain at peak, %	12.6	3.1	13.7

Sample Type:

Description: Clayey sand

LL= 31 **PL=** 15 **PI=** 16

Specific Gravity= 2.65

Remarks: Remolded to 90% of the maximum dry density of 129.3 pcf and opt. moisture of 8.3%.

Figure ________

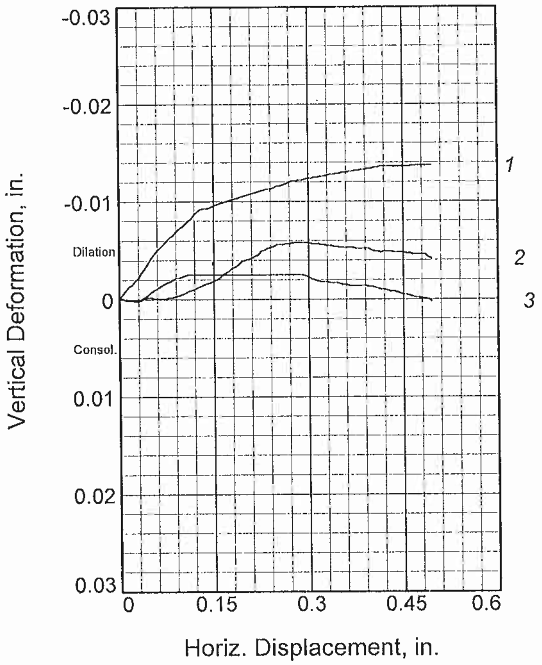
Client:

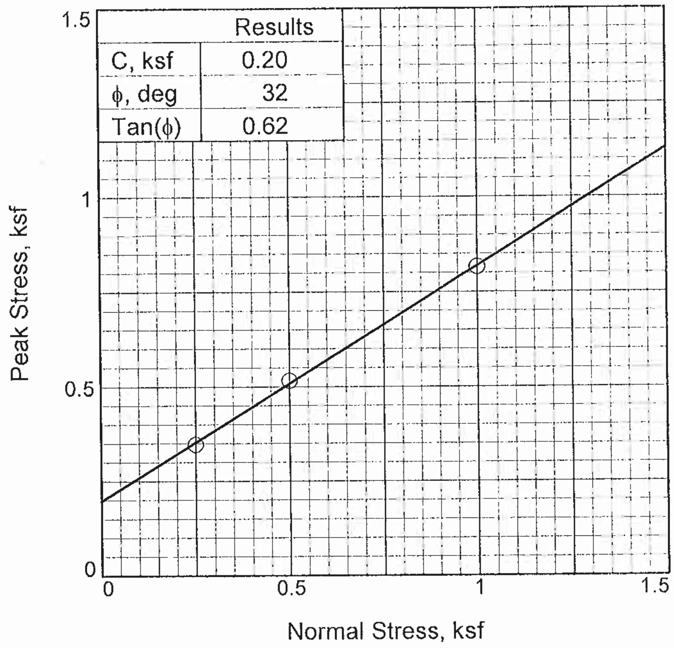
Project: Mission Valley - Home Depot

Sample Number: B-7 **Depth:** 0.8-5.0'

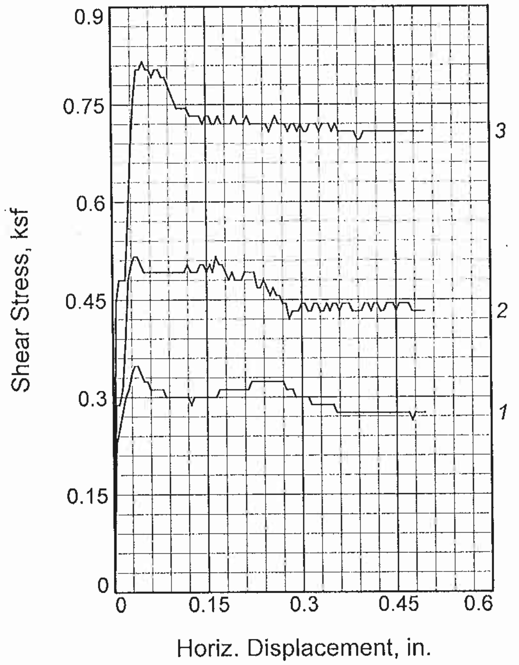
Proj. No.: D050R0.01 **Date Sampled:** 2/27/19

DIRECT SHEAR TEST REPORT
Moore Twining Associates, Inc.
Fresno, CA





	Results
C, ksf	0.20
ϕ, deg	32
Tan(ϕ)	0.62



	Sample No.	1	2	3
Initial	Water Content, %	7.6	6.1	7.4
	Dry Density, pcf	118.8	120.6	119.1
	Saturation, %	51.5	43.2	50.4
	Void Ratio	0.3922	0.3720	0.3893
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	14.1	13.0	13.3
	Dry Density, pcf	120.3	122.4	121.3
	Saturation, %	99.4	97.7	96.6
	Void Ratio	0.3746	0.3516	0.3638
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.99	0.99	0.98
	Normal Stress, ksf	0.25	0.50	1.00
	Peak Stress, ksf	0.35	0.52	0.82
	Displacement, in.	0.04	0.04	0.05
	Ultimate Stress, ksf			
	Displacement, in.			
	Strain at peak, %	1.4	1.4	2.1

Sample Type:

Description: Clayey sand

LL= 27 **PL=** 15 **PI=** 12

Specific Gravity= 2.65

Remarks: Shear points were remolded to 90% of the max. dry density of 132.2 & opt. moisture of 7.5%

Figure ________

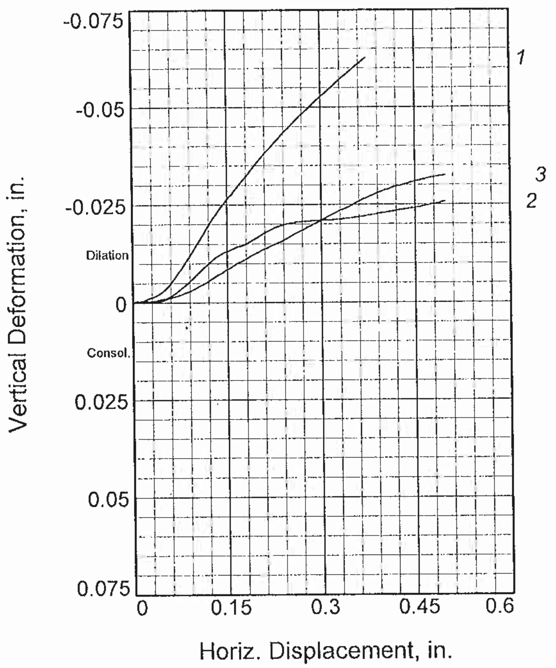
Client:

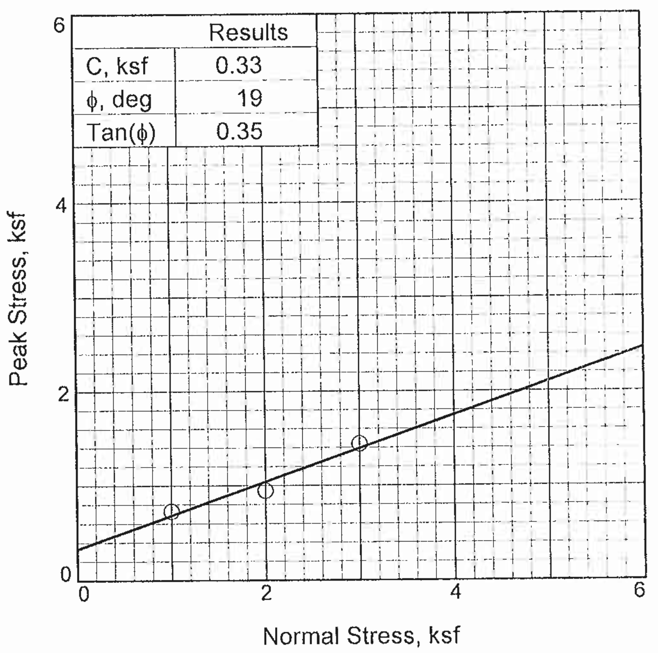
Project: Mission Valley - Home Depot

Sample Number: E-8 **Depth:** 1-3'

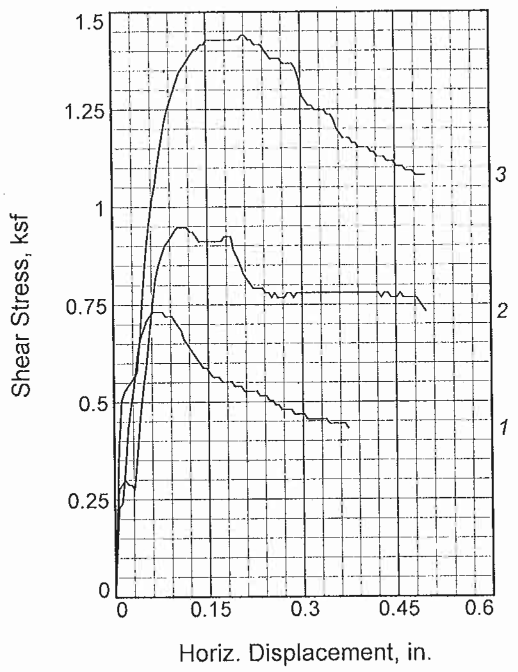
Proj. No.: D050R0.01 **Date Sampled:** 9/17/19

DIRECT SHEAR TEST REPORT
Moore Twining Associates, Inc.
Fresno, CA





	Results
C, ksf	0.33
ϕ, deg	19
Tan(ϕ)	0.35



	Sample No.	1	2	3
Initial	Water Content, %	12.5	11.9	12.0
	Dry Density, pcf	110.7	111.3	111.1
	Saturation, %	66.8	64.6	65.3
	Void Ratio	0.4946	0.4868	0.4890
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	16.8	15.5	14.7
	Dry Density, pcf	114.3	116.2	117.7
	Saturation, %	99.5	96.6	95.7
	Void Ratio	0.4480	0.4240	0.4058
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.97	0.96	0.94
	Normal Stress, ksf	1.00	2.00	3.00
	Peak Stress, ksf	0.73	0.95	1.44
	Displacement, in.	0.06	0.10	0.21
	Ultimate Stress, ksf			
	Displacement, in.			
	Strain at peak, %	2.6	4.2	8.6

Sample Type:

Description: Sandy lean clay

LL= 30 **PL=** 18 **PI=** 12

Specific Gravity= 2.65

Remarks: Shear point were remolded to 90 of the max. dry density of 124.8 pcf and opt. moisture of 10.8%.

Figure ________

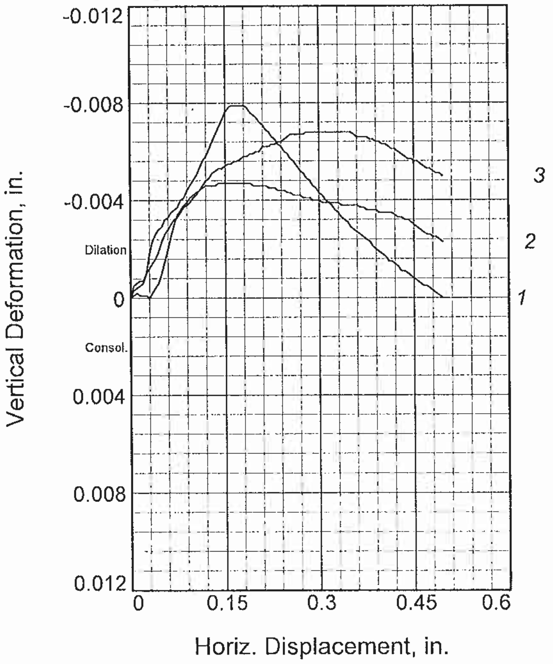
Client:

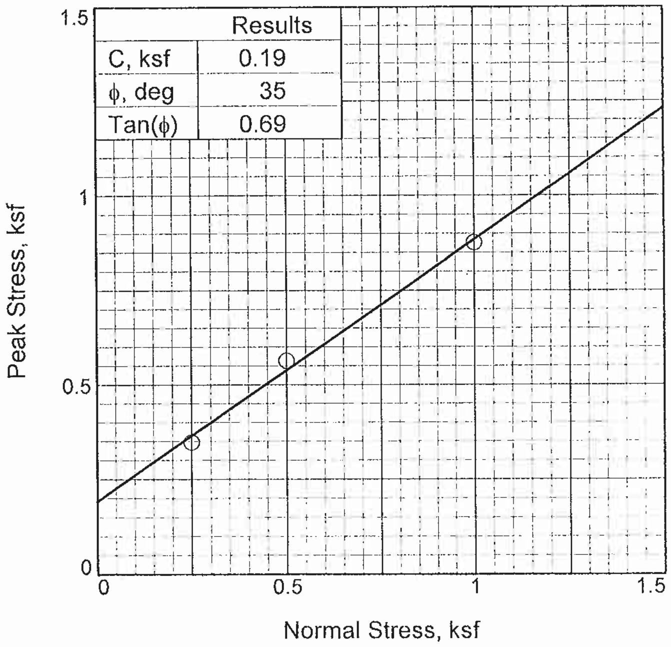
Project: Mission Valley - Home Depot

Sample Number: G-7.6 **Depth:** 1-5'

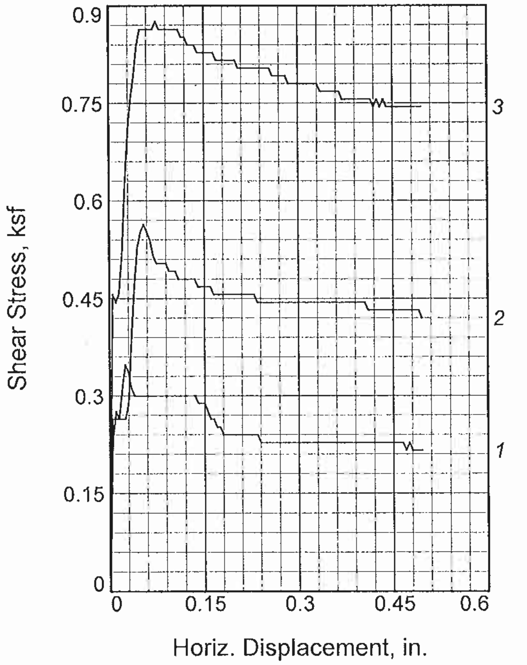
Proj. No.: D050R0.01 **Date Sampled:** 9/17/19

DIRECT SHEAR TEST REPORT
Moore Twining Associates, Inc.
Fresno, CA





	Results
C, ksf	0.19
ϕ, deg	35
Tan(ϕ)	0.69



	Sample No.	1	2	3
Initial	Water Content, %	12.5	10.1	9.3
	Dry Density, pcf	107.5	109.9	110.7
	Saturation, %	61.6	52.8	49.9
	Void Ratio	0.5385	0.5048	0.4946
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	17.7	15.9	15.2
	Dry Density, pcf	111.8	115.1	116.5
	Saturation, %	97.6	96.7	95.5
	Void Ratio	0.4803	0.4369	0.4206
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.96	0.95	0.95
	Normal Stress, ksf	0.25	0.50	1.00
	Peak Stress, ksf	0.35	0.56	0.88
	Displacement, in.	0.03	0.06	0.08
	Ultimate Stress, ksf			
	Displacement, in.			
	Strain at peak, %	1.0	2.3	3.1

Sample Type:

Description: Sandy lean clay

LL= 31 **PL=** 17 **PI=** 14

Specific Gravity= 2.65

Remarks: Shear points remolded to 90% of the max. dry density of 122.1 pcf and 10.1% opt. moisture.

Figure ______

Client:

Project: Mission Valley - Home Depot

Sample Number: Top Cut Slope (CST)

Proj. No.: D050R0.01 **Date Sampled:** 9/17/19

DIRECT SHEAR TEST REPORT
Moore Twining Associates, Inc.
Fresno, CA

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	66.2	33.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100.0		
1 in.	100.0		
3/4 in.	100.0		
1/2 in.	100.0		
3/8 in.	100.0		
#4	100.0		
#8	99.9		
#16	98.6		
#30	93.1		
#50	72.0		
#100	50.8		
#200	33.8		

* (no specification provided)

Material Description

Silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.441 D_{60}= 0.207 D_{50}= 0.146
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

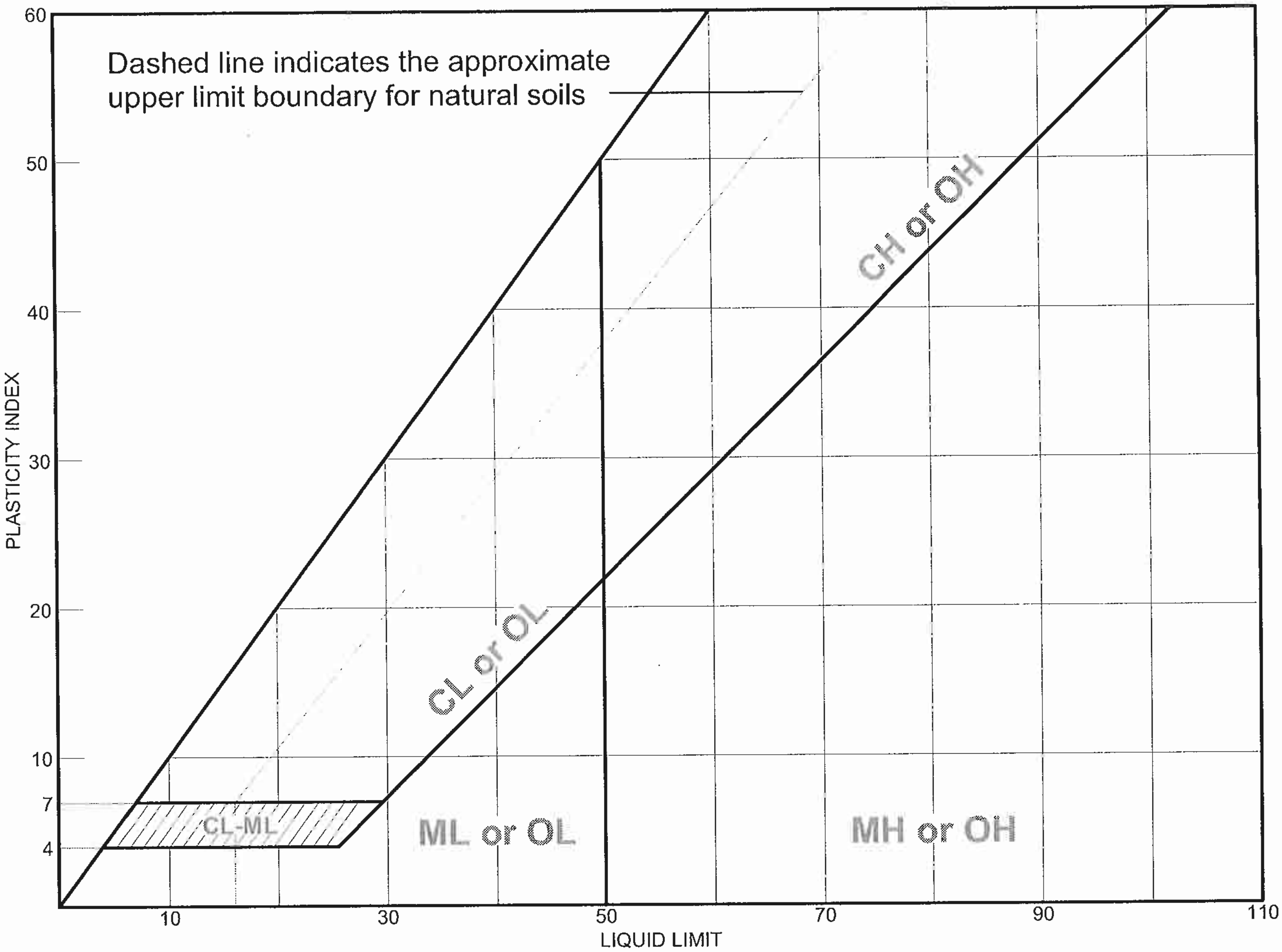
Sample No.: A-2 **Source of Sample:** **Date:**
Location: **Elev./Depth:** 10-11.5'

Moore Twining Associates, Inc.

Fresno, CA

Client:
Project: Mission Valley - Home Depot
Project No: D050R0.01 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand	NV	NP	NP	83.8	33.8	SM

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** A-2 **Elev./Depth:** 10-11.5'

Remarks:

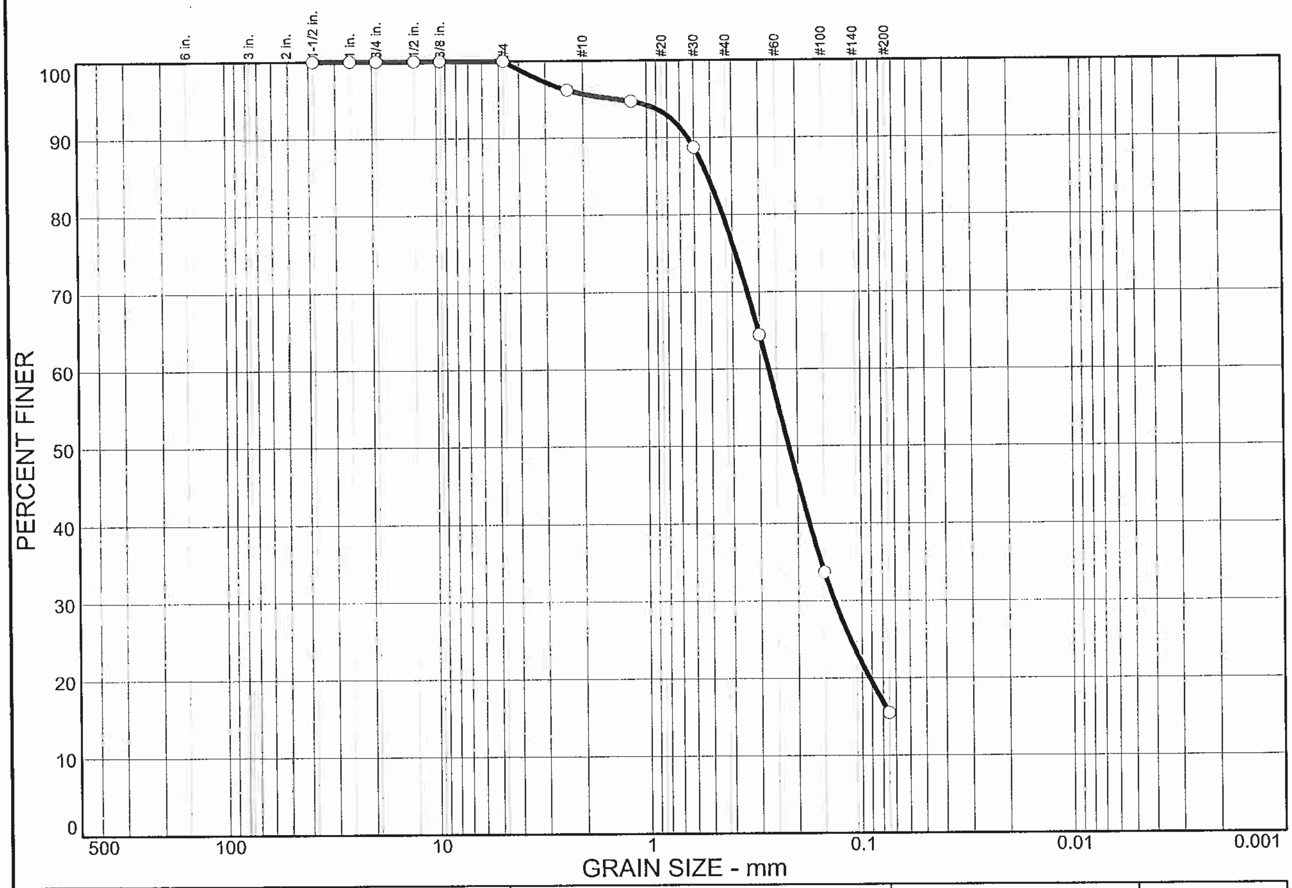
●

Moore Twining Associates, Inc.

Fresno, CA

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	84.5	15.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100.0		
1 in.	100.0		
3/4 in.	100.0		
1/2 in.	100.0		
3/8 in.	100.0		
#4	100.0		
#8	96.2		
#16	94.7		
#30	88.7		
#50	64.4		
#100	33.7		
#200	15.5		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.517 D_{60}= 0.273 D_{50}= 0.220
D_{30}= 0.135 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: A-2 **Source of Sample:** **Date:**
Location: **Elev./Depth:** 40-41.5'

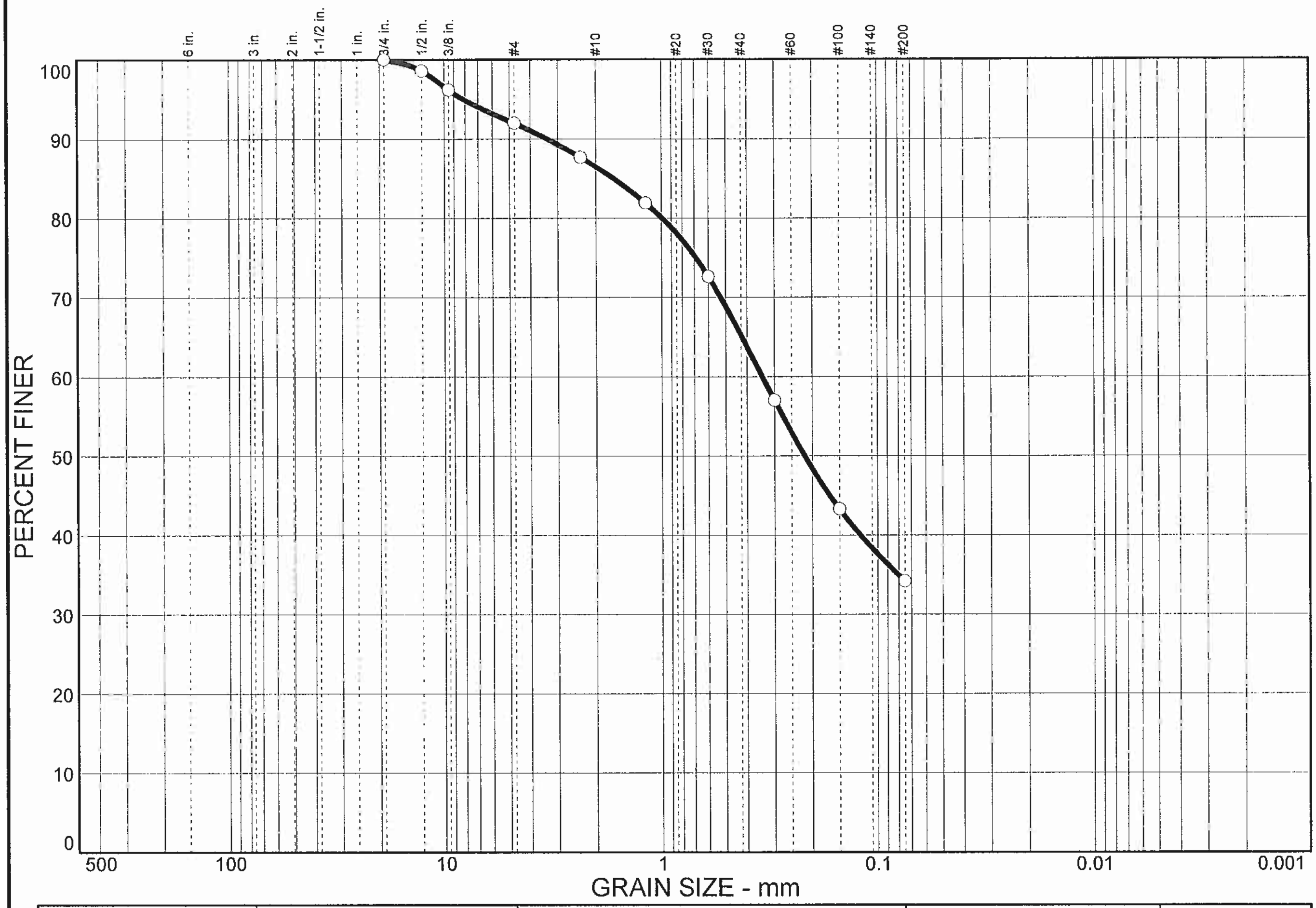
Moore Twining Associates, Inc.

Fresno, CA

Client:
Project: Mission Valley - Home Depot

Project No: D050R0.01 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	8.0	57.8	34.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	98.6		
3/8 in.	96.2		
#4	92.0		
#8	87.7		
#16	81.9		
#30	72.6		
#50	57.0		
#100	43.3		
#200	34.2		

* (no specification provided)

Material Description

Clayey sand

Atterberg Limits

PL= 15 LL= 31 PI= 16

Coefficients

D_{85}= 1.66 D_{60}= 0.341 D_{50}= 0.217

D_{30}= D_{15}= D_{10}=

C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Sample No.: B-7 **Source of Sample:** **Date:** 2/27/19

Location: **Elev./Depth:** 0.8-5.0'

Moore Twining Associates, Inc.

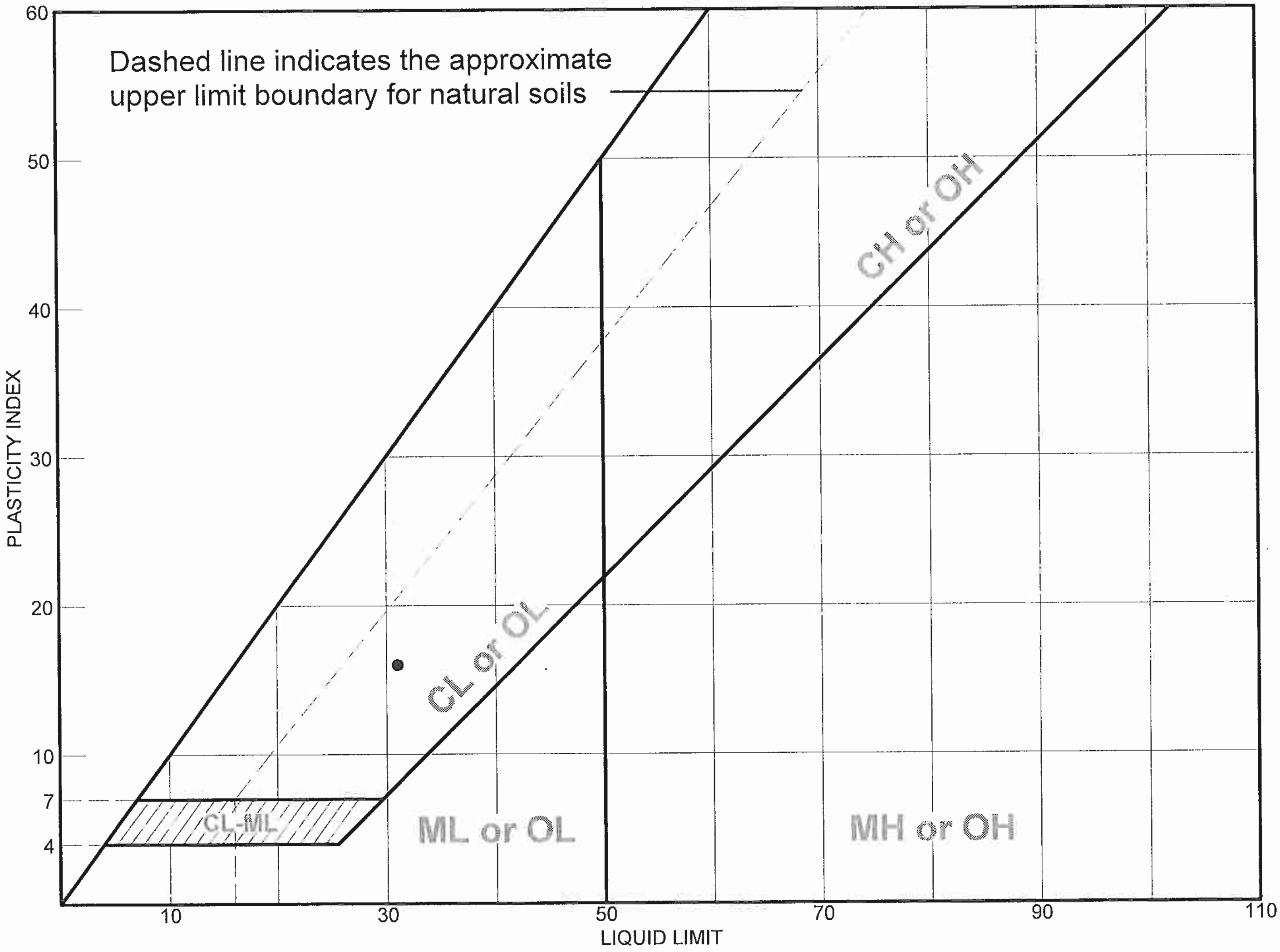
Fresno, CA

Client:

Project: Mission Valley - Home Depot

Project No: D050R0.01 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey sand	31	15	16	65.2	34.2	SC

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** B-7 **Elev./Depth:** 0.8-5.0'

Remarks:

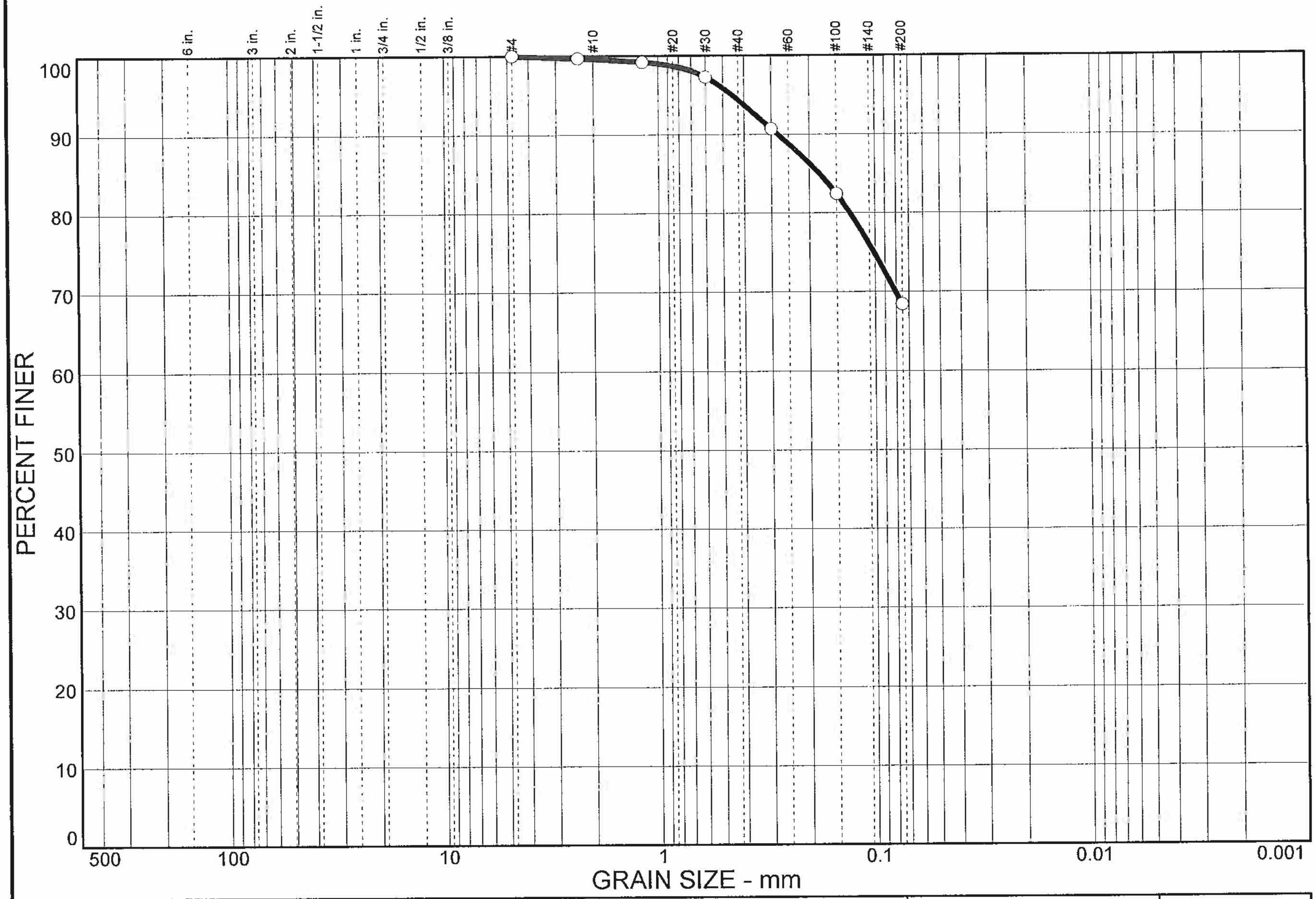
●

Moore Twining Associates, Inc.

Fresno, CA

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	31.6	68.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.7		
#16	99.2		
#30	97.3		
#50	90.7		
#100	82.4		
#200	68.4		

* (no specification provided)

Material Description

Sandy lean clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.180 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample No.: E-4
Location:

Source of Sample:

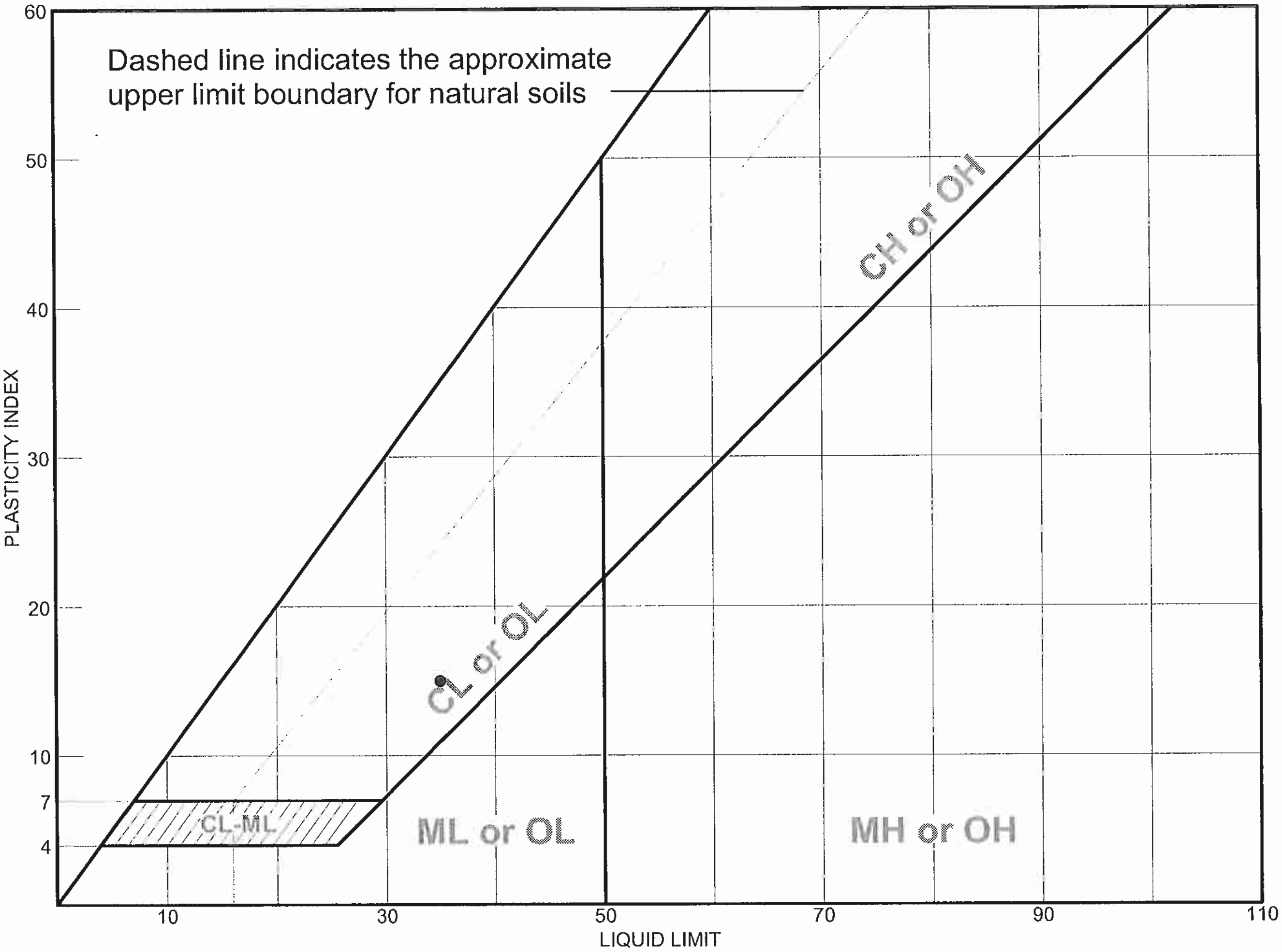
Date: 3/4/19
Elev./Depth: 10-11.5'

Moore Twining Associates, Inc.

Fresno, CA

Client:
Project: Mission Valley - Home Depot
Project No: D050R0.01
Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy lean clay	35	20	15	94.4	68.4	CL

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** E-4 **Elev./Depth:** 10-11.5'

Remarks:

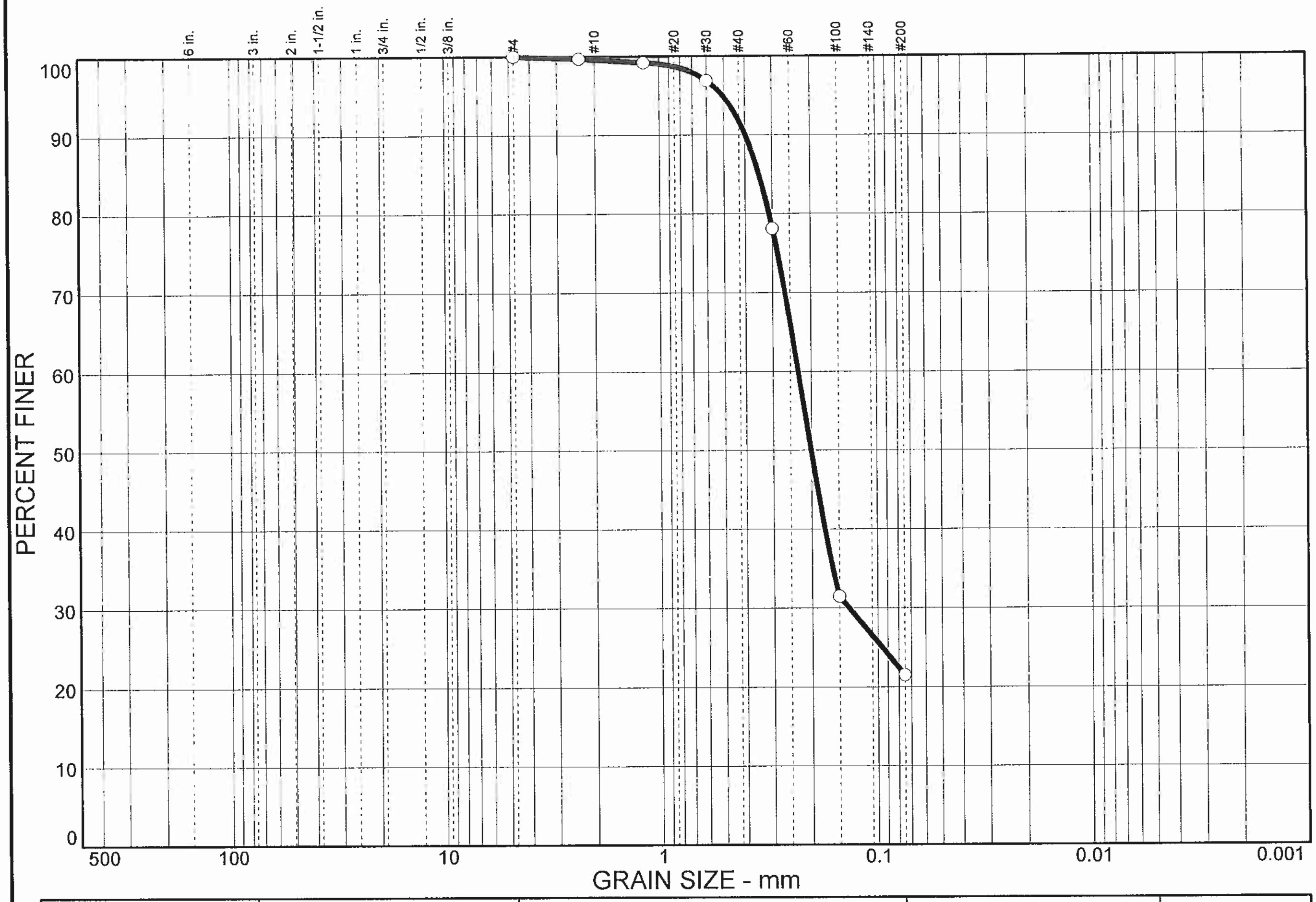
●

Moore Twining Associates, Inc.

Fresno, CA

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	78.5	21.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.7		
#16	99.2		
#30	96.9		
#50	78.1		
#100	31.5		
#200	21.5		

* (no specification provided)

Material Description

Silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.345 D_{60}= 0.230 D_{50}= 0.201

D_{30}= 0.135 D_{15}= D_{10}=

C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample No.: E-6 **Source of Sample:** **Date:** 2/25/19

Location: **Elev./Depth:** 0.9-5'

Moore Twining Associates, Inc.

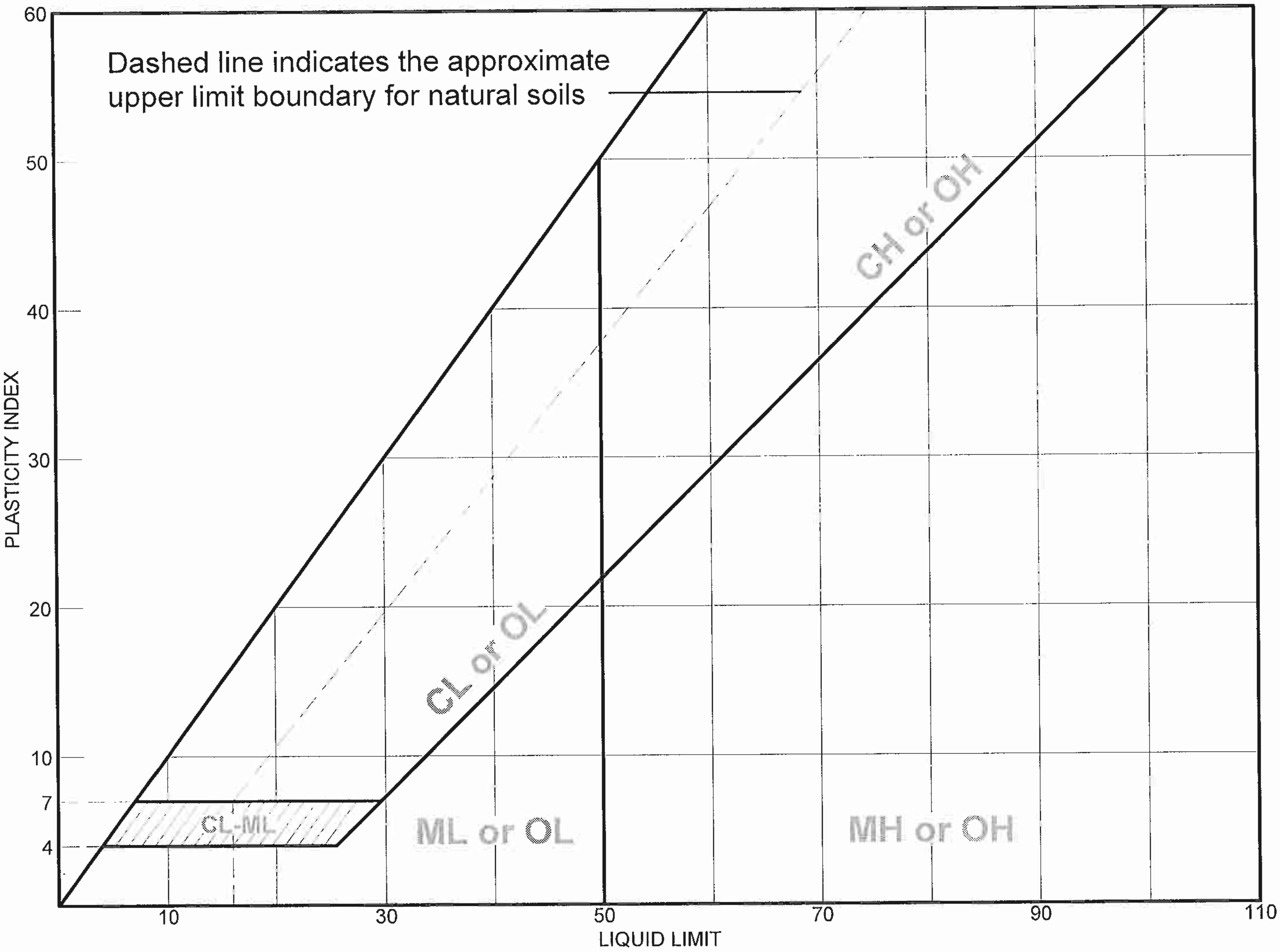
Fresno, CA

Client:

Project: Mission Valley - Home Depot

Project No: D050R0.01 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand	NV	NP	NP	91.7	21.5	SM

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** E-6 **Elev./Depth:** 0.9-5'

Remarks:

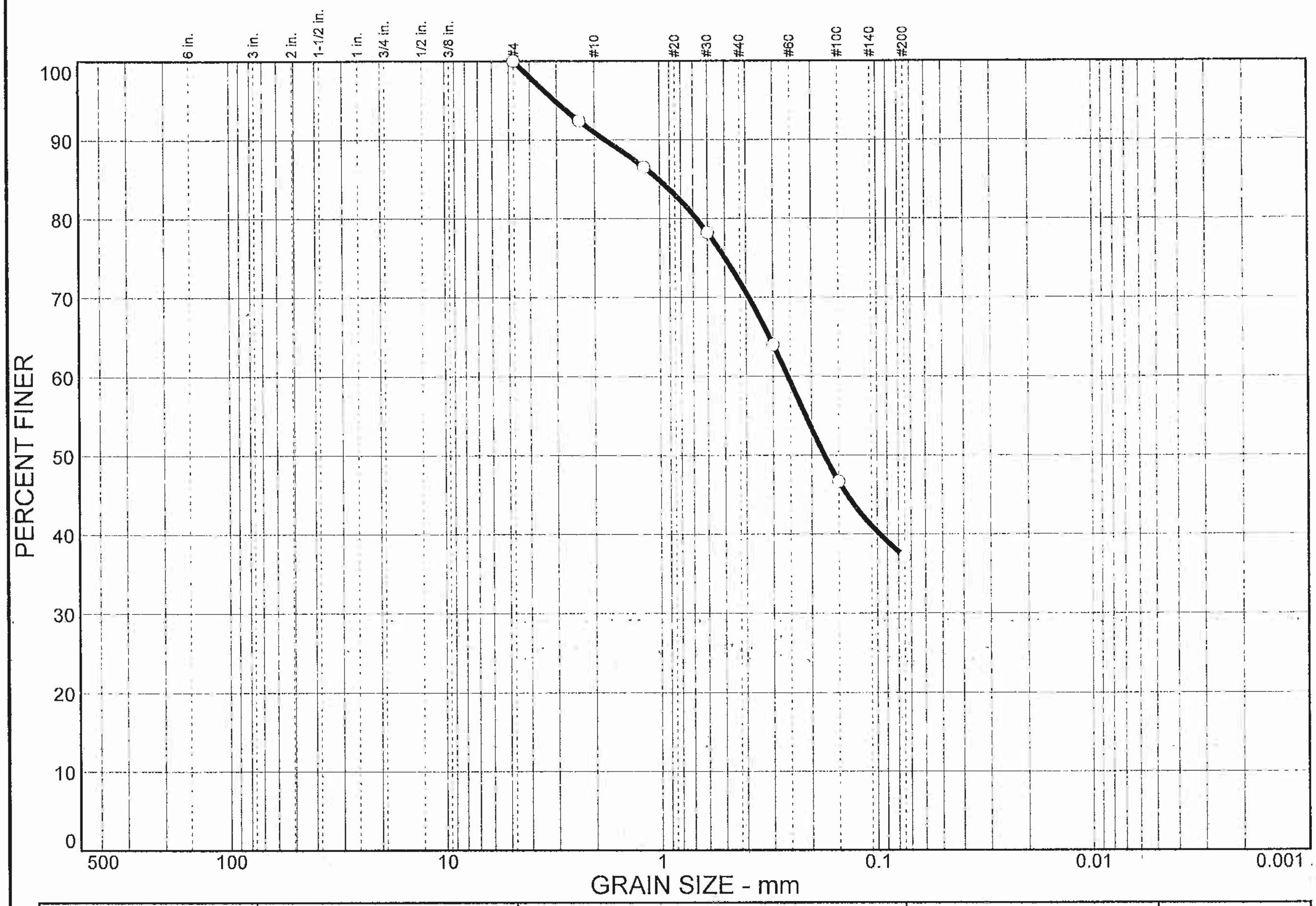
●

Moore Twining Associates, Inc.

Fresno, CA

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	62.9	37.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	92.4		
#16	86.5		
#30	78.2		
#50	64.0		
#100	46.7		
#200	37.1		

* (no specification provided)

Material Description

Clayey sand

Atterberg Limits

PL= 15 LL= 27 PI= 12

Coefficients

D_{85}= 1.01 D_{60}= 0.257 D_{50}= 0.174

D_{30}= D_{15}= D_{10}=

C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Sample No.: E-8 **Source of Sample:** **Date:** 9/17/19

Location: **Elev./Depth:** 1-3'

Moore Twining Associates, Inc.

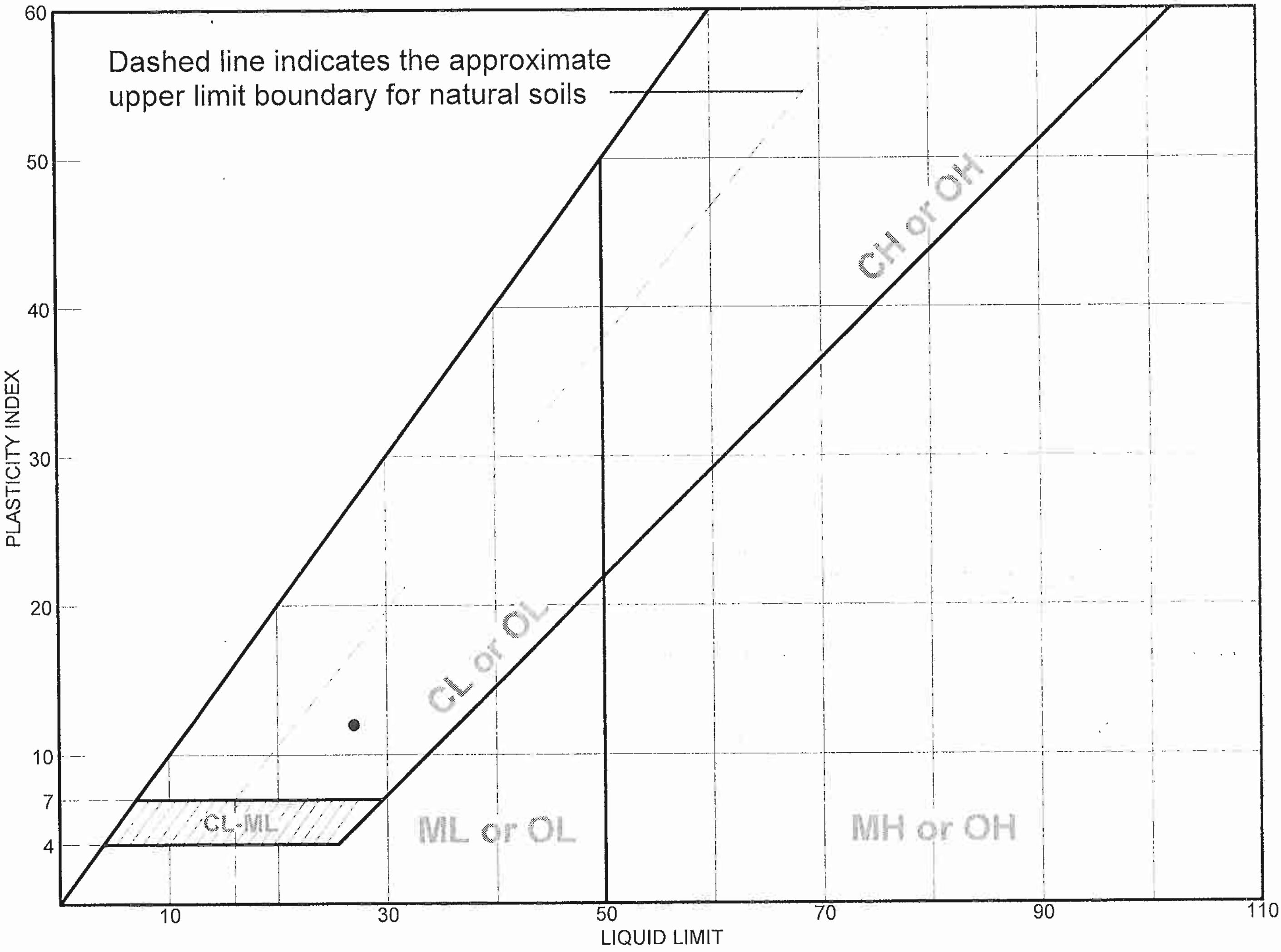
Fresno, CA

Client:

Project: Mission Valley - Home Depot

Project No: D050R0.01 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey sand	27	15	12	71.9	37.1	SC

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** E-8 **Elev./Depth:** 1-3'

Remarks:

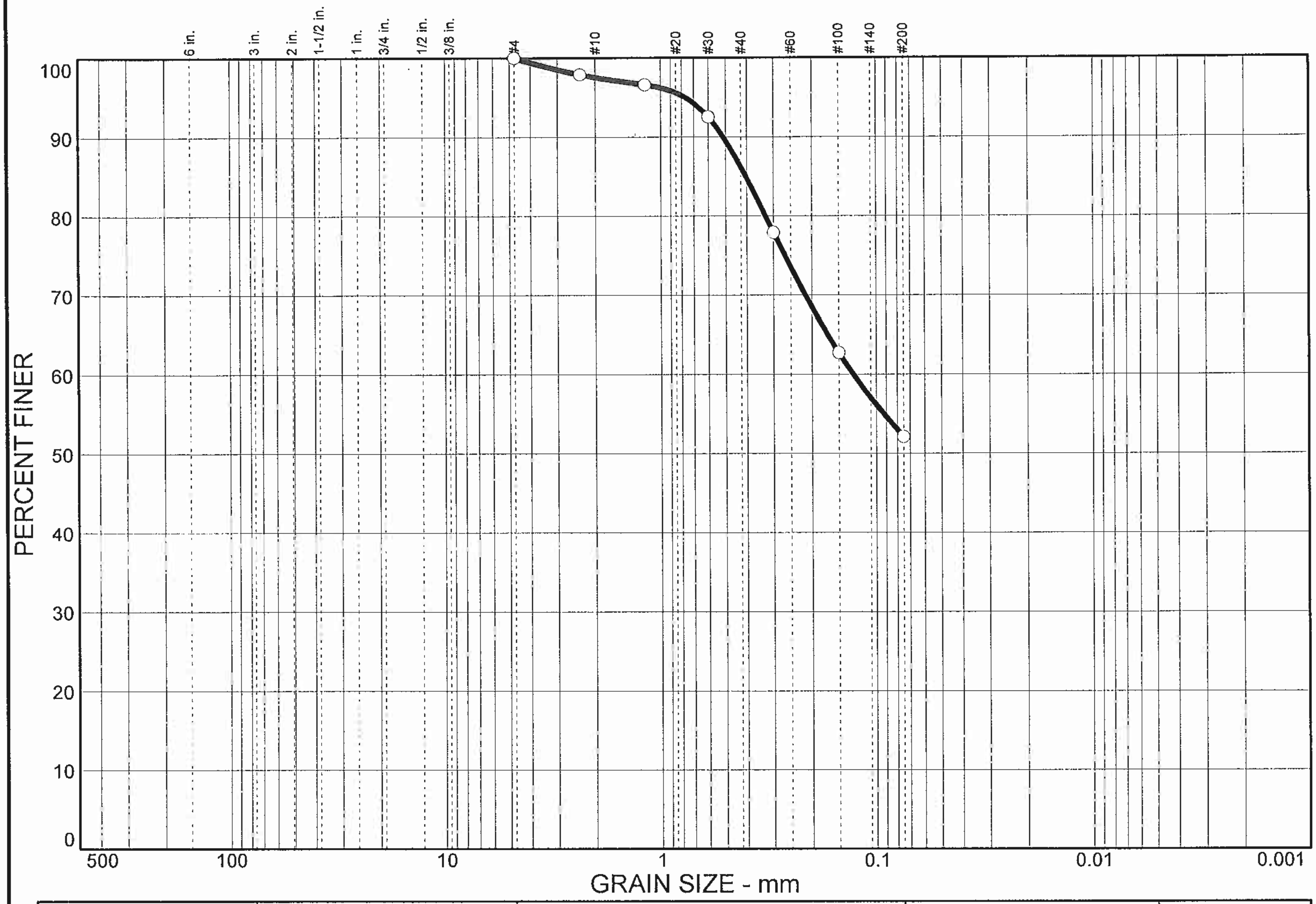
●

Moore Twining Associates, Inc.

Fresno, CA

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	47.9	52.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	97.9		
#16	96.6		
#30	92.5		
#50	77.9		
#100	62.7		
#200	52.1		

* (no specification provided)

Material Description

Sandy lean clay

Atterberg Limits

PL= 23
LL= 36
PI= 13

Coefficients

D_{85}= 0.404
D_{60}= 0.129
D_{50}=
D_{30}=
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= CL
AASHTO=

Remarks

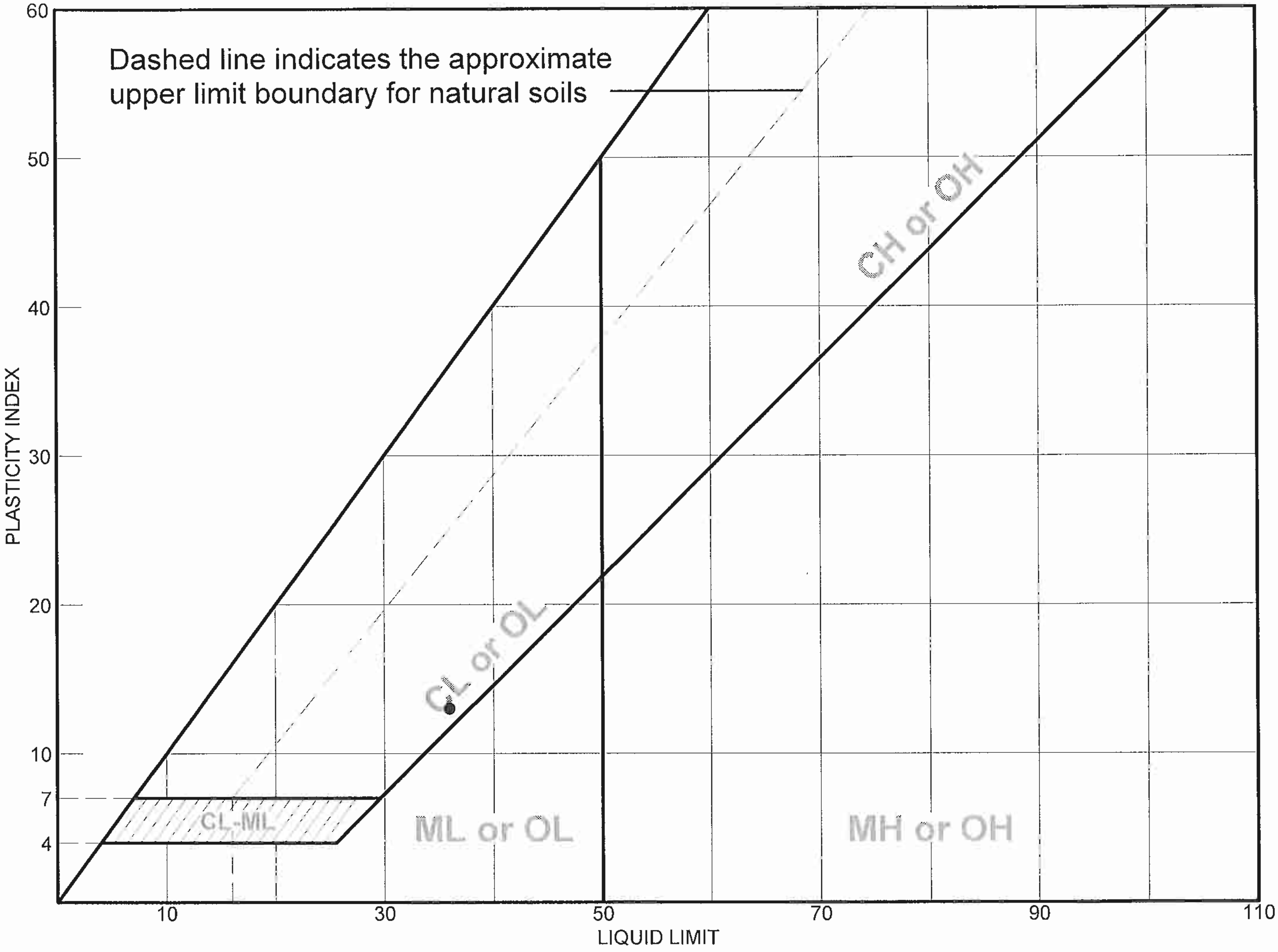
Sample No.: G-5
Source of Sample:
Date: 2/25/19
Location:
Elev./Depth: 2.5-4'

Moore Twining Associates, Inc.

Fresno, CA

Client:
Project: Mission Valley - Home Depot
Project No: D050R0.01
Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy lean clay	36	23	13	86.1	52.1	CL

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** G-5 **Elev./Depth:** 2.5-4'

Remarks:

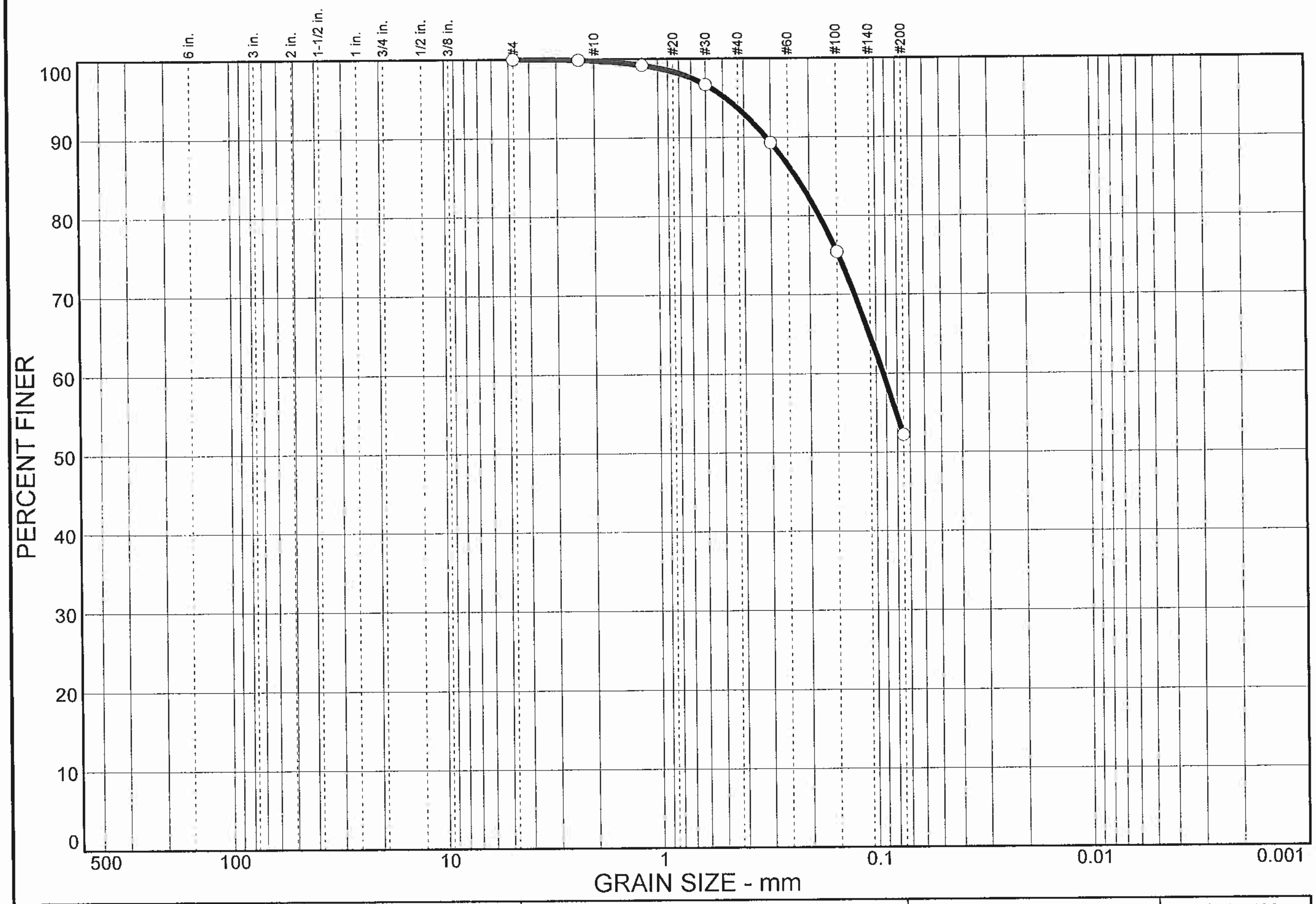
●

Moore Twining Associates, Inc.

Fresno, CA

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	47.8	52.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.9		
#16	99.2		
#30	96.7		
#50	89.3		
#100	75.4		
#200	52.2		

* (no specification provided)

Material Description

Sandy lean clay

Atterberg Limits

PL= 23 LL= 36 PI= 13

Coefficients

D_{85}= 0.230 D_{60}= 0.0930 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

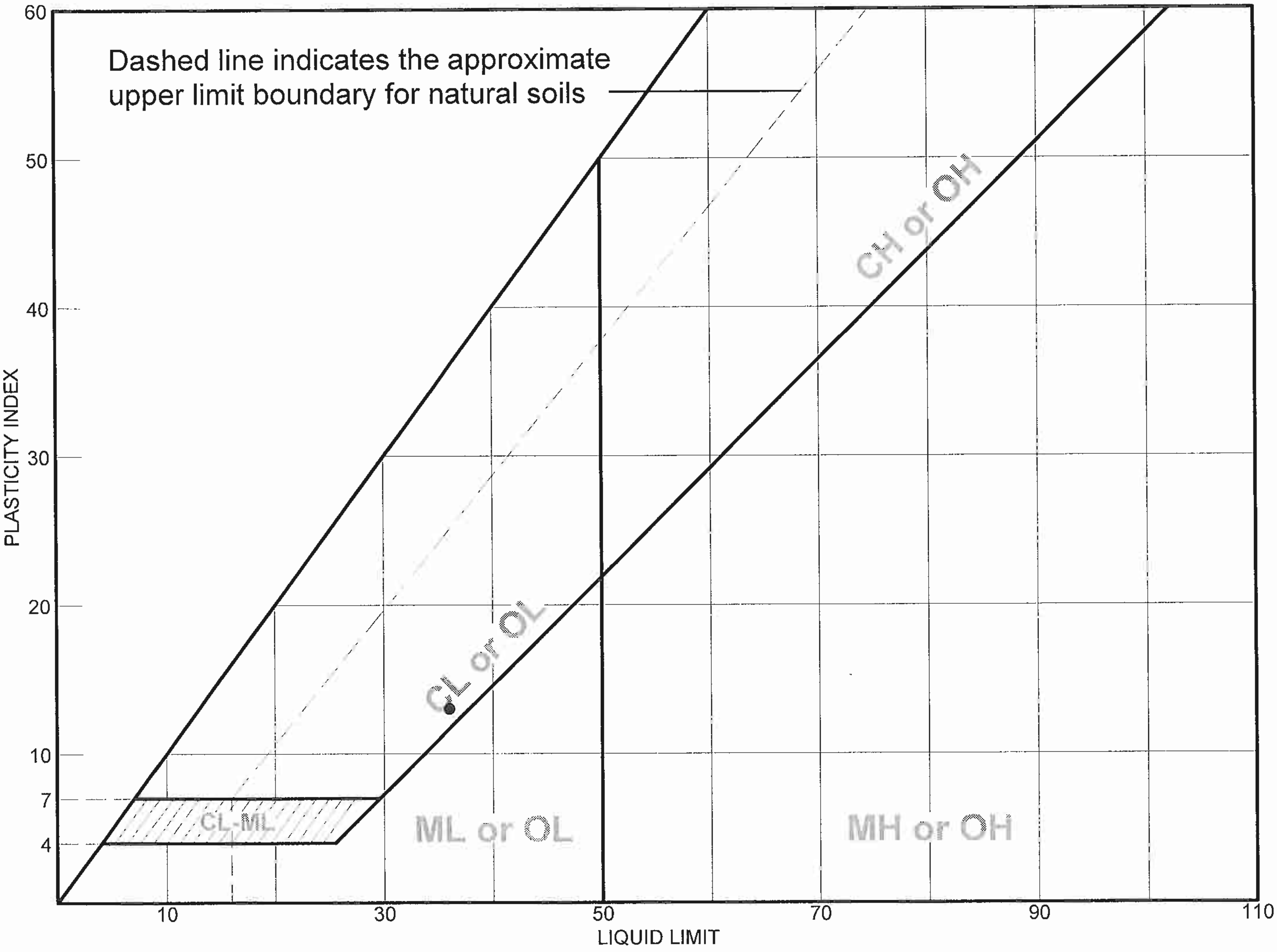
Sample No.: G-6 **Source of Sample:** **Date:** 2/25/19
Location: **Elev./Depth:** 1-2.5'

Moore Twining Associates, Inc.

Fresno, CA

Client:
Project: Mission Valley - Home Depot
Project No: D050R0.01 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy lean clay	36	23	13	93.7	52.2	CL

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** G-6 **Elev./Depth:** 1-2.5'

Remarks:

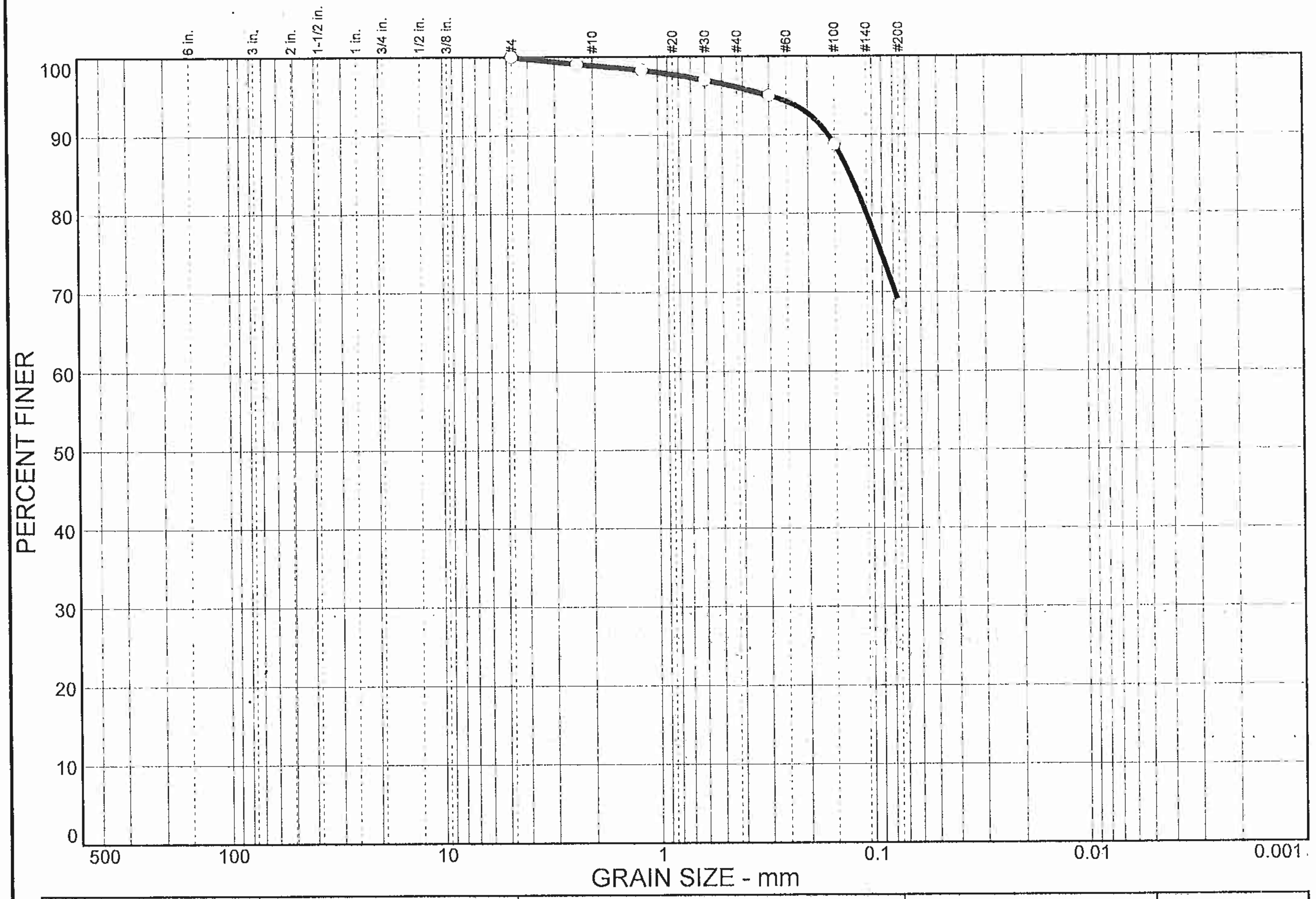
●

Moore Twining Associates, Inc.

Fresno, CA

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	31.6	68.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.1		
#16	98.3		
#30	97.0		
#50	95.0		
#100	88.8		
#200	68.4		

* (no specification provided)

Material Description

Sandy lean clay

Atterberg Limits

PL= 18 LL= 30 PI= 12

Coefficients

D_{85}= 0.127 D_{60}= D_{50}=

D_{30}= D_{15}= D_{10}=

C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample No.: G-7.6 **Source of Sample:** **Date:** 9/17/19

Location: **Elev./Depth:** 1-5'

Moore Twining Associates, Inc.

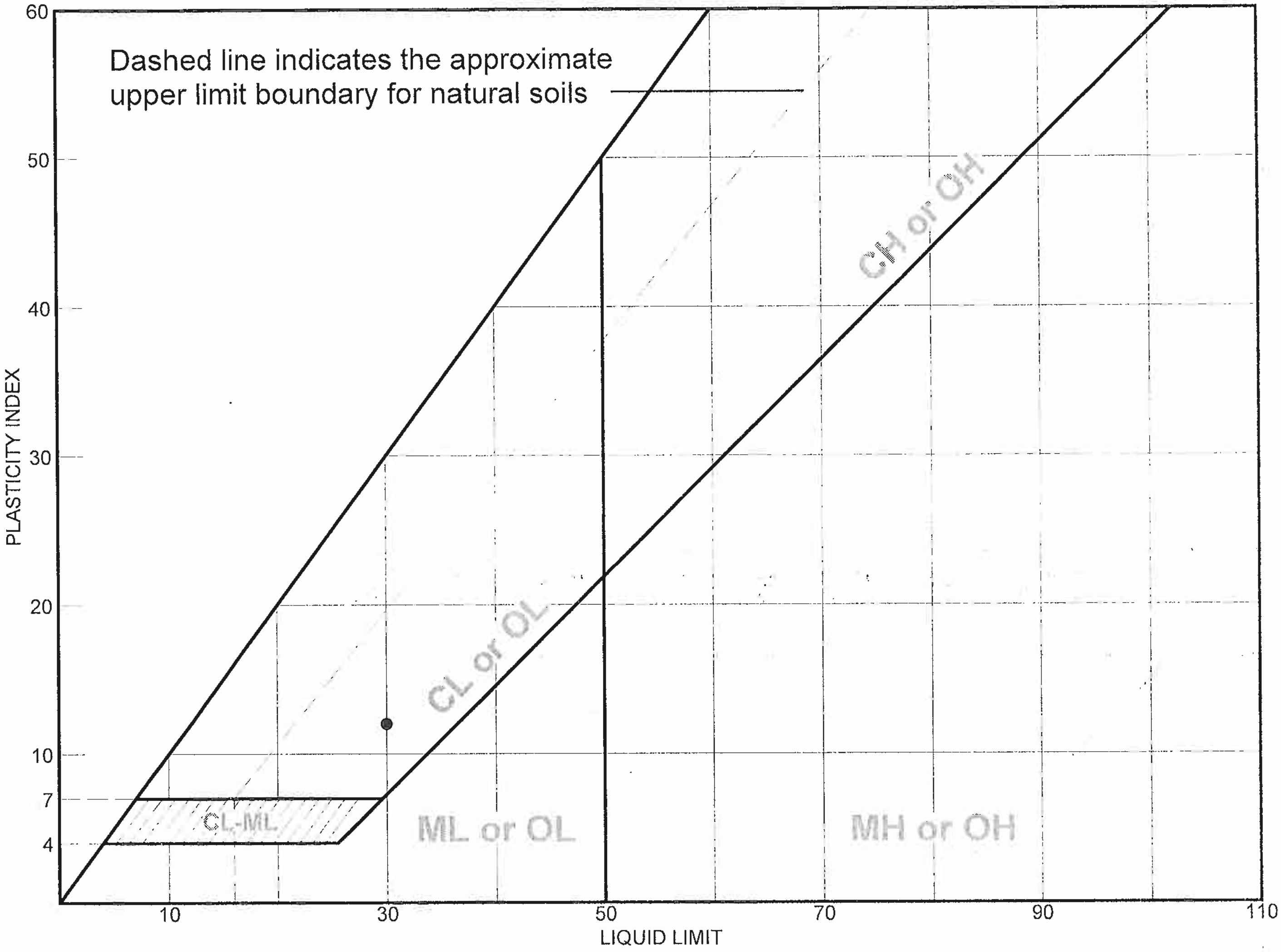
Fresno, CA

Client:

Project: Mission Valley - Home Depot

Project No: D050R0.01 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy lean clay	30	18	12	96.1	68.4	CL

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** G-7.6 **Elev./Depth:** 1-5'

Remarks:

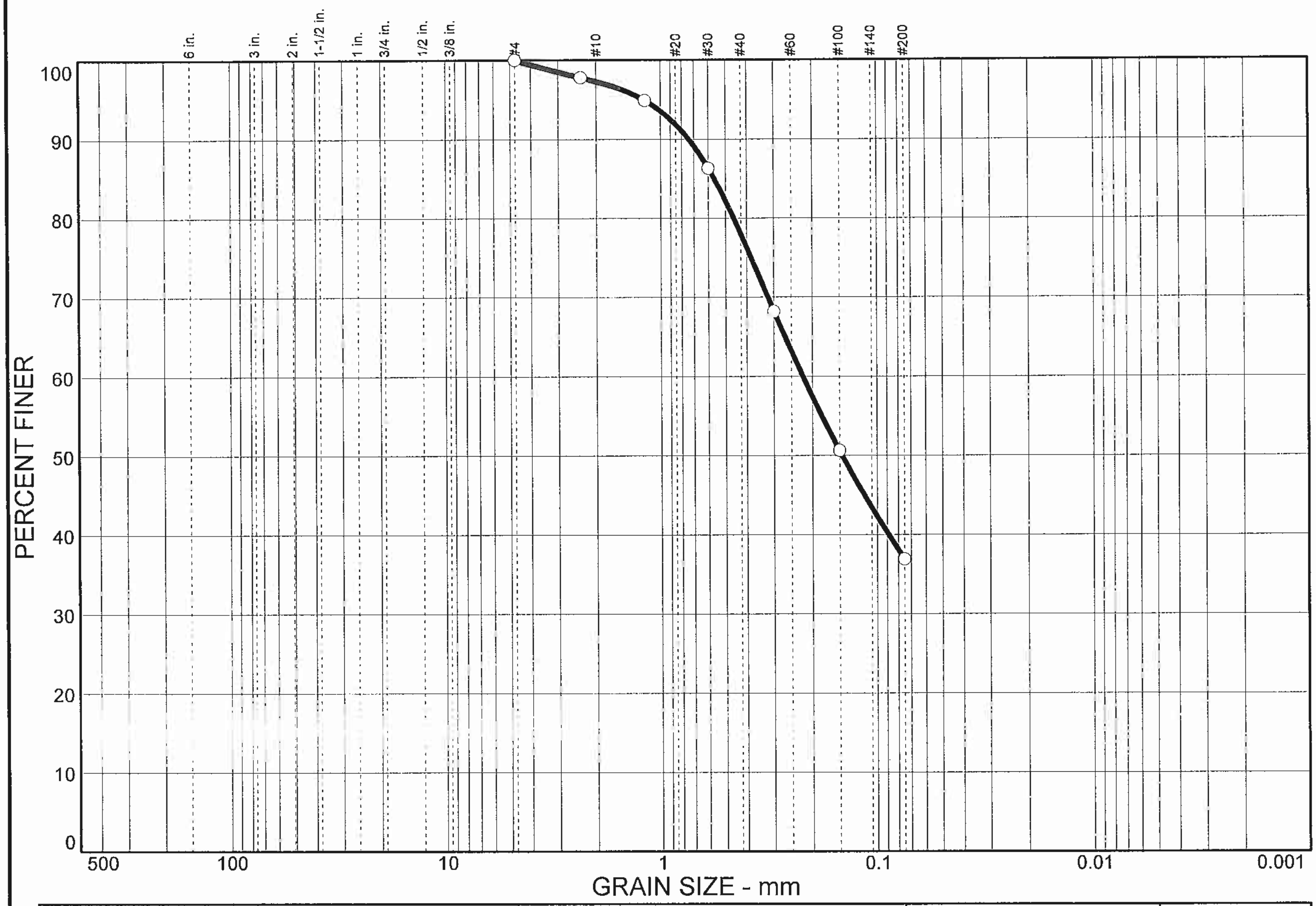
●

Moore Twining Associates, Inc.

Fresno, CA

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	63.1	36.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	97.8		
#16	94.9		
#30	86.3		
#50	68.2		
#100	50.6		
#200	36.9		

* (no specification provided)

Material Description

Clayey sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.564 D_{60}= 0.221 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

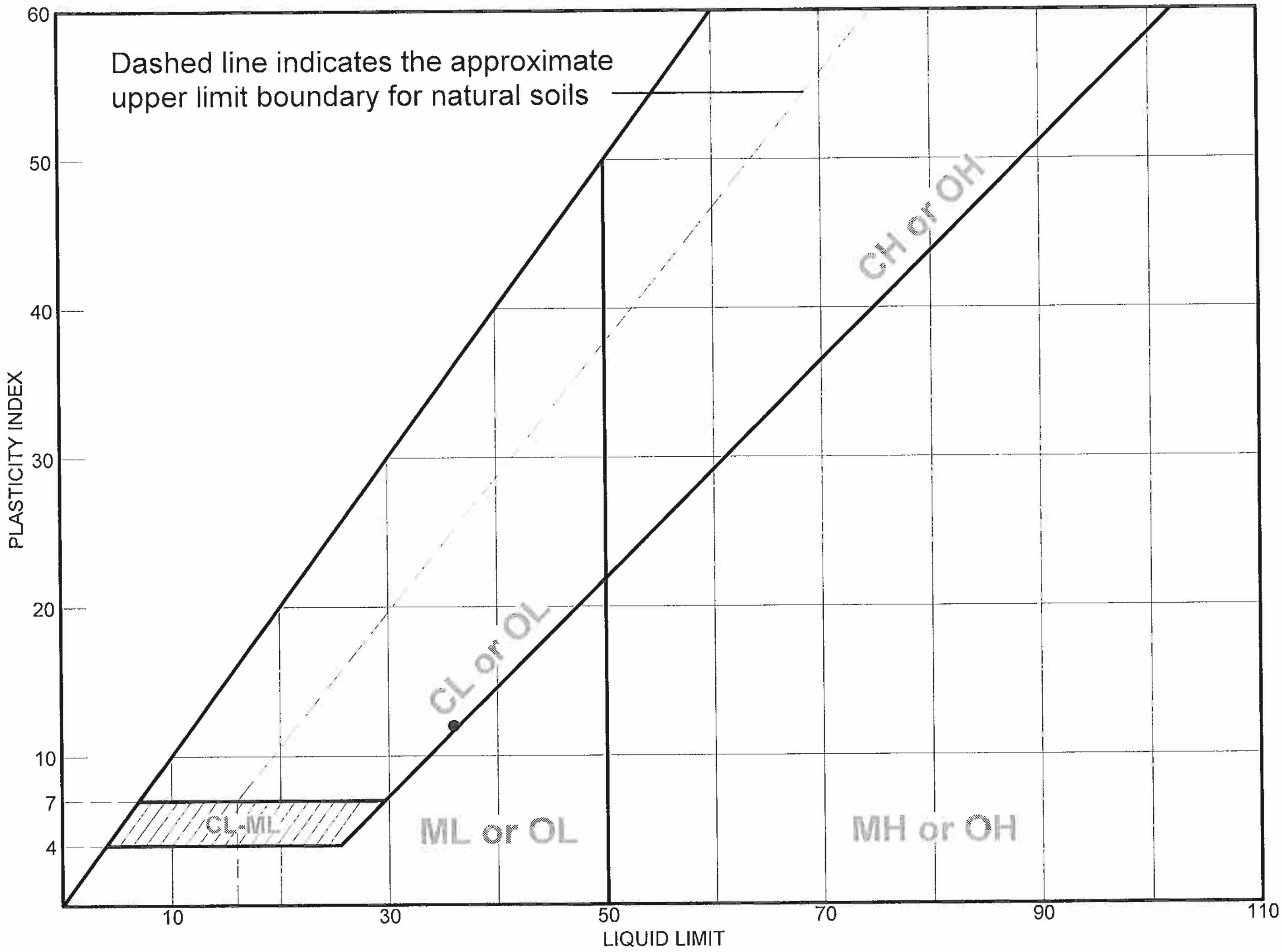
Remarks

Sample No.: H-6 **Source of Sample:** **Date:** 2/25/19
Location: **Elev./Depth:** 5-6.5'

Moore Twining Associates, Inc.
Fresno, CA

Client:
Project: Mission Valley - Home Depot
Project No: D050R0.01 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy lean clay	36	24	12			CL

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** H-6 **Elev./Depth:** 1-2.5'

Remarks:

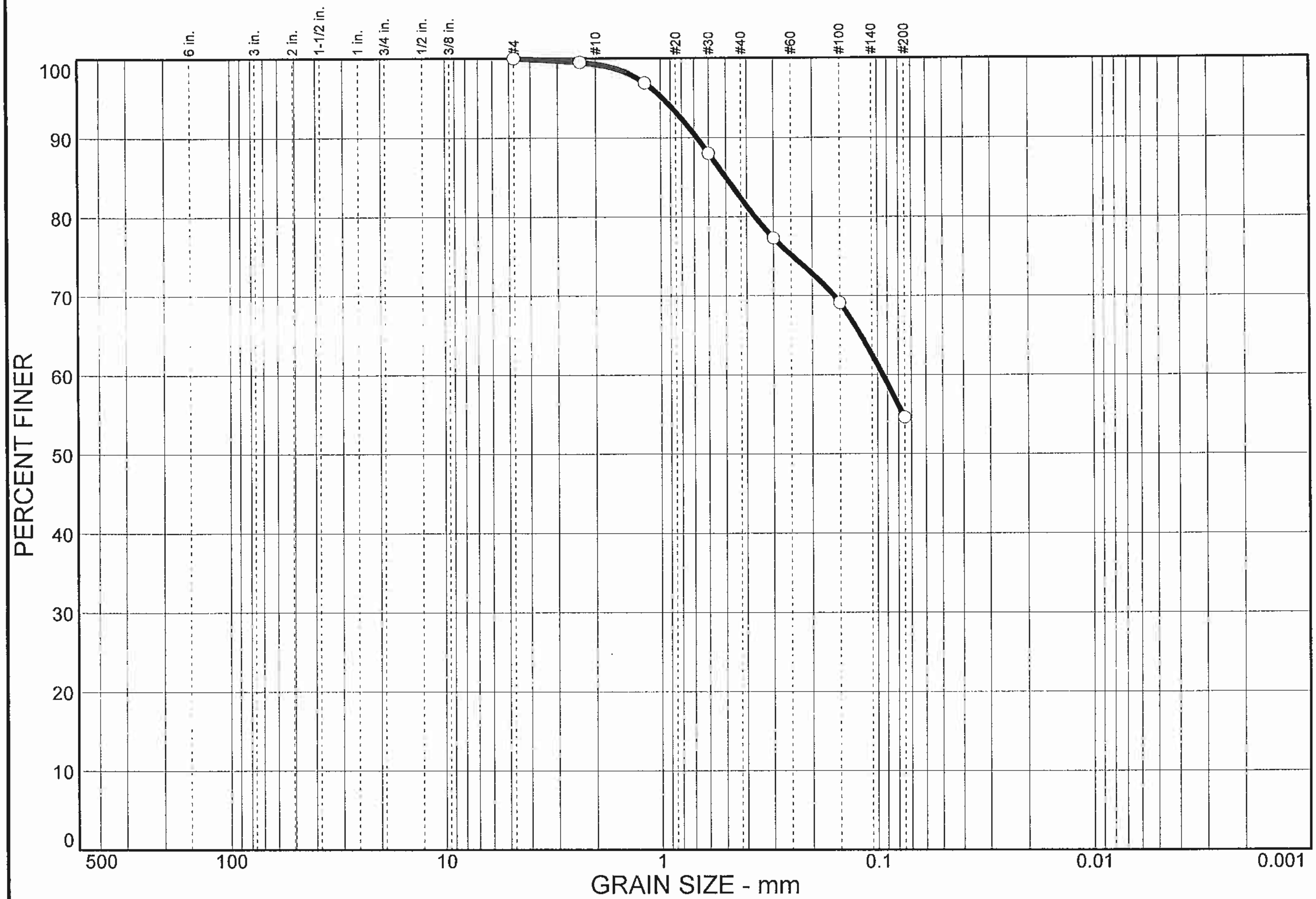
●

Moore Twining Associates, Inc.

Fresno, CA

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	45.4	54.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.5		
#16	96.9		
#30	88.0		
#50	77.3		
#100	69.1		
#200	54.6		

* (no specification provided)

Material Description

Sandy lean clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.500 D_{60}= 0.0945 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

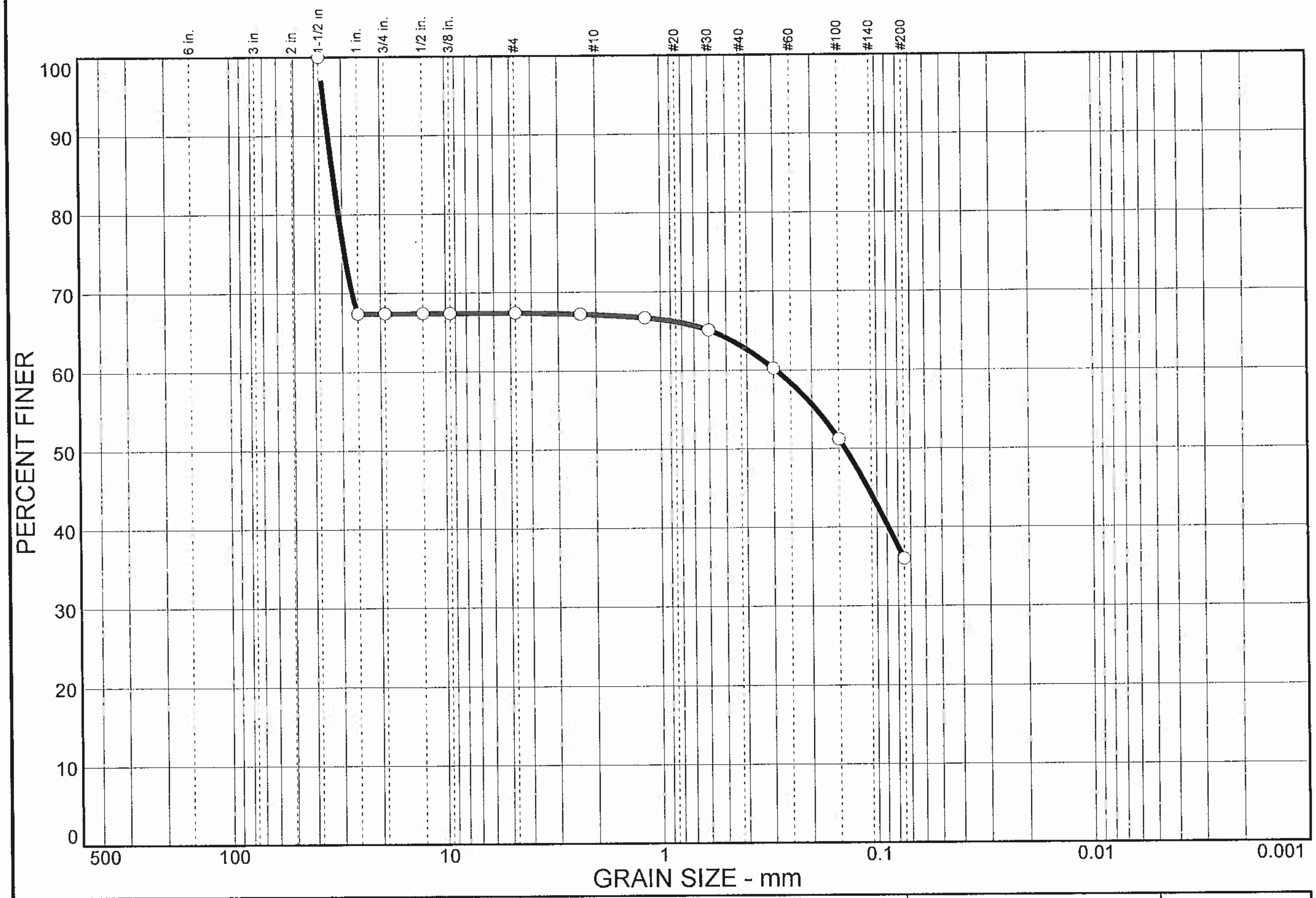
Sample No.: H-8 **Source of Sample:** **Date:** 2/25/19
Location: **Elev./Depth:** 1-5'

Moore Twining Associates, Inc.

Fresno, CA

Client:
Project: Mission Valley - Home Depot
Project No: D050R0.01 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	32.6	31.4	36.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100.0		
1 in.	67.4		
3/4 in.	67.4		
1/2 in.	67.4		
3/8 in.	67.4		
#4	67.4		
#8	67.2		
#16	66.7		
#30	65.1		
#50	60.2		
#100	51.2		
#200	36.0		

* (no specification provided)

Material Description

Clayey gravel with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 32.9 D_{60}= 0.294 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= GC AASHTO=

Remarks

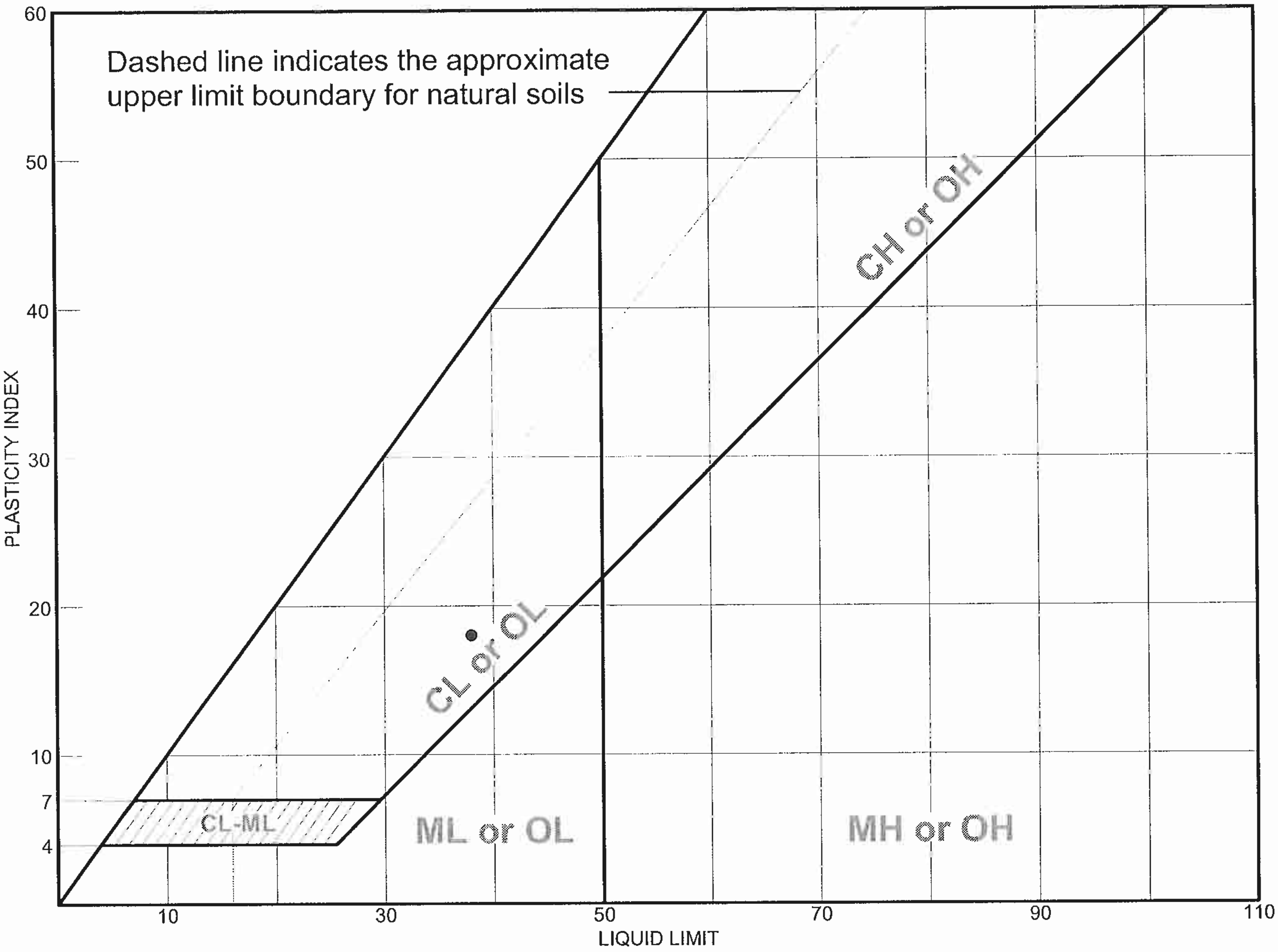
Sample No.: J-4 **Source of Sample:** **Date:** 3/4/19
Location: **Elev./Depth:** 5-6.5'

Moore Twining Associates, Inc.

Fresno, CA

Client:
Project: Mission Valley - Home Depot
Project No: D050R0.01 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey gravel with sand	38	20	18	63.1	36.0	GC

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** J-4 **Elev./Depth:** 5-6.5'

Remarks:

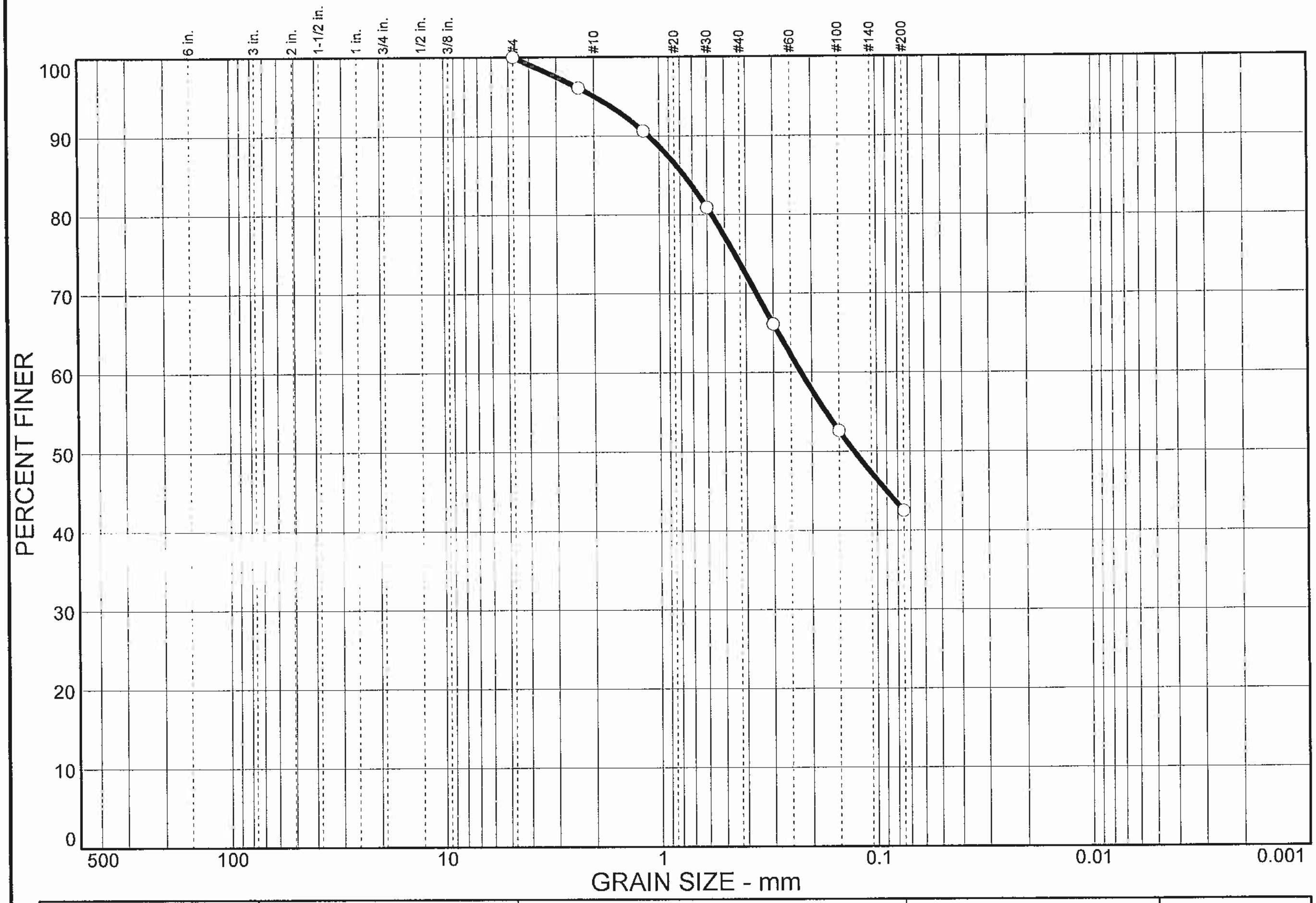
●

Moore Twining Associates, Inc.

Fresno, CA

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	57.5	42.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	96.1		
#16	90.6		
#30	80.9		
#50	66.1		
#100	52.6		
#200	42.5		

* (no specification provided)

Material Description

Clayey sand

Atterberg Limits

PL= 20
LL= 42
PI= 22

Coefficients

D_{85}= 0.764
D_{60}= 0.224
D_{50}= 0.128
D_{30}=
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= SC
AASHTO=

Remarks

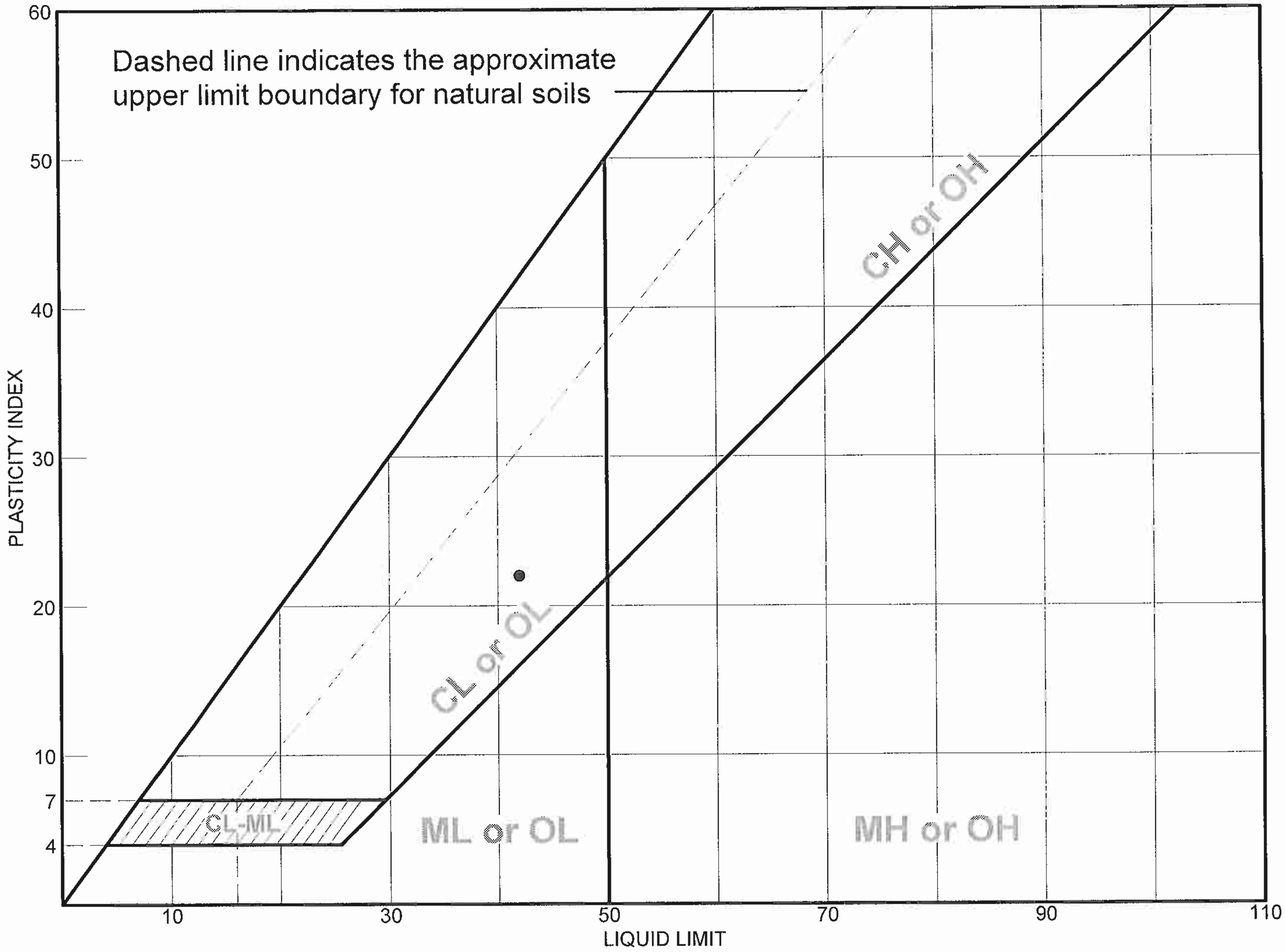
Sample No.: J-8
Source of Sample:
Date: 2/25/19
Location:
Elev./Depth: 0.9-5'

Moore Twining Associates, Inc.

Fresno, CA

Client:
Project: Mission Valley - Home Depot
Project No: D050R0.01
Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey sand	42	20	22	73.8	42.5	SC

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** J-8 **Elev./Depth:** 0.9-5'

Remarks:

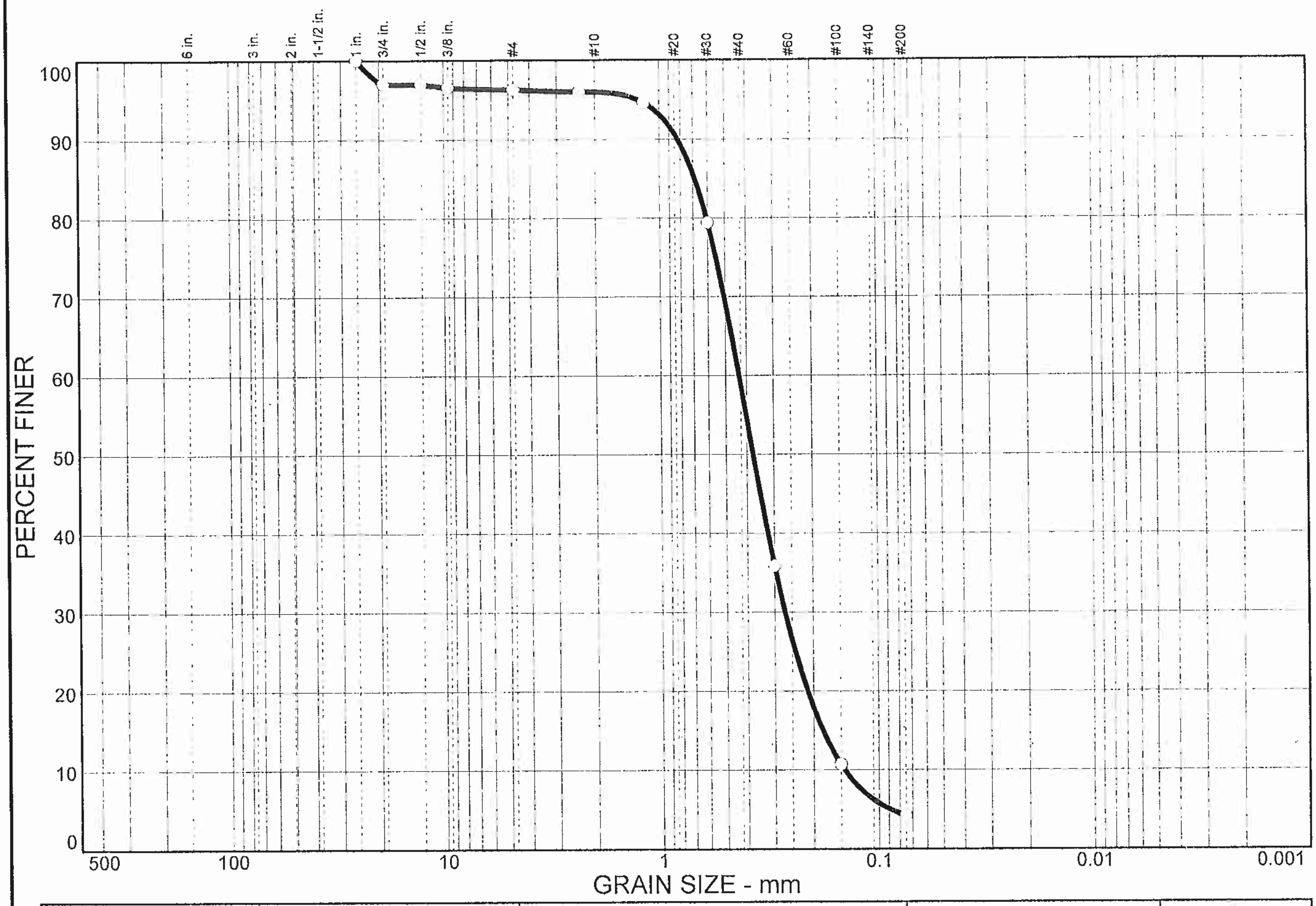
●

Moore Twining Associates, Inc.

Fresno, CA

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.7	92.1	4.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
3/4 in.	97.0		
1/2 in.	97.0		
3/8 in.	96.6		
#4	96.3		
#8	96.0		
#16	94.6		
#30	79.4		
#50	35.9		
#100	10.7		
#200	4.2		

* (no specification provided)

Material Description

Poorly graded sand

Atterberg Limits

PL=	LL=	PI=

Coefficients

D_{85}= 0.688	D_{60}= 0.434	D_{50}= 0.374
D_{30}= 0.269	D_{15}= 0.181	D_{10}= 0.144
C_u= 3.01	C_c= 1.16	

Classification

USCS= SP AASHTO=

Remarks

Sample No.: M-8 **Source of Sample:** **Date:** 9/17/19

Location: **Elev./Depth:** 30-31.5'

Moore Twining Associates, Inc.

Fresno, CA

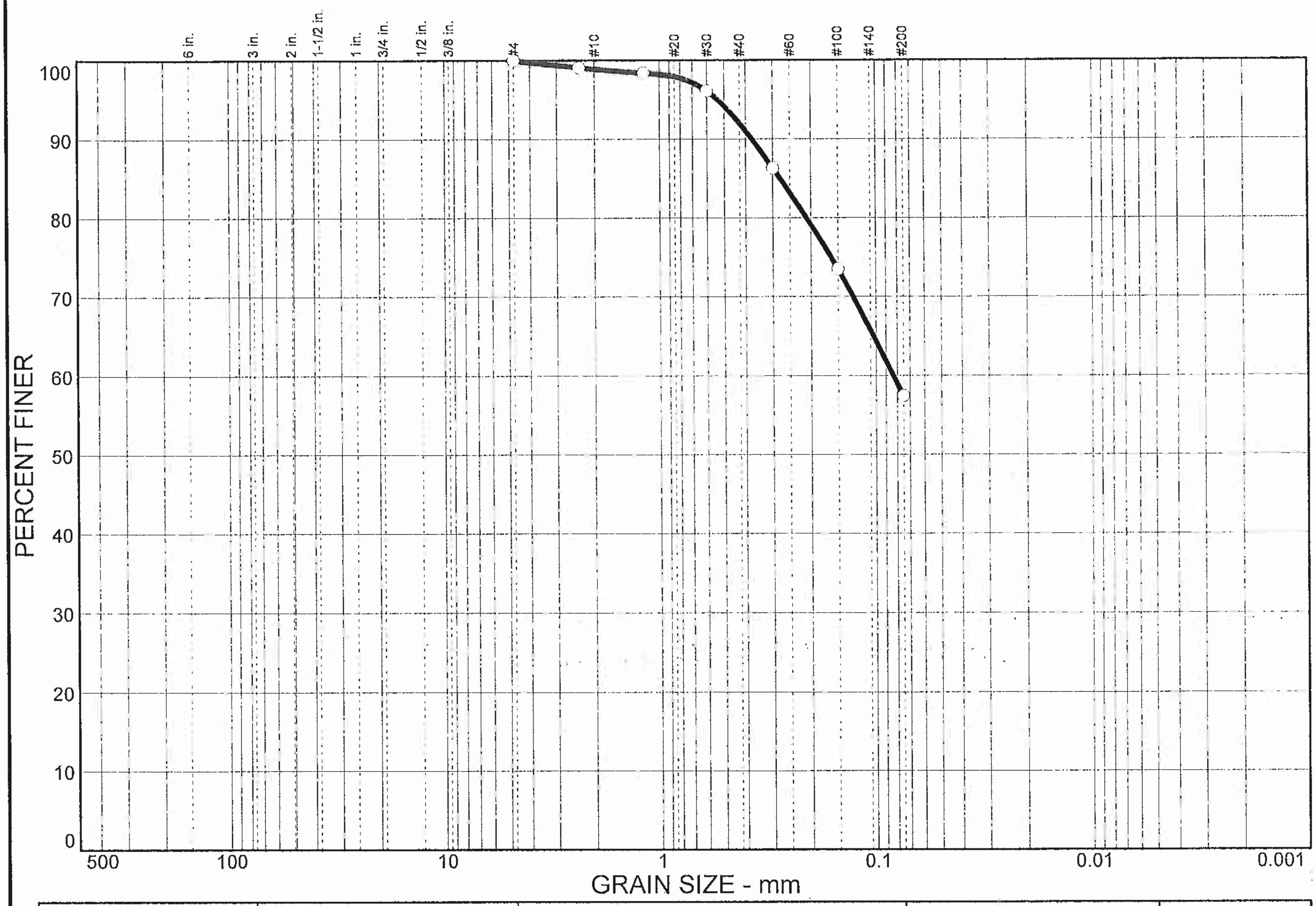
Client:

Project: Mission Valley - Home Depot

Project No: D050R0.01 **Figure**

8

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	42.6	57.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.1		
#16	98.4		
#30	96.1		
#50	86.3		
#100	73.5		
#200	57.4		

* (no specification provided)

Material Description

Sandy lean clay

Atterberg Limits

PL= 17 LL= PI=

Coefficients

D_{85}= 0.278 D_{60}= 0.0834 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

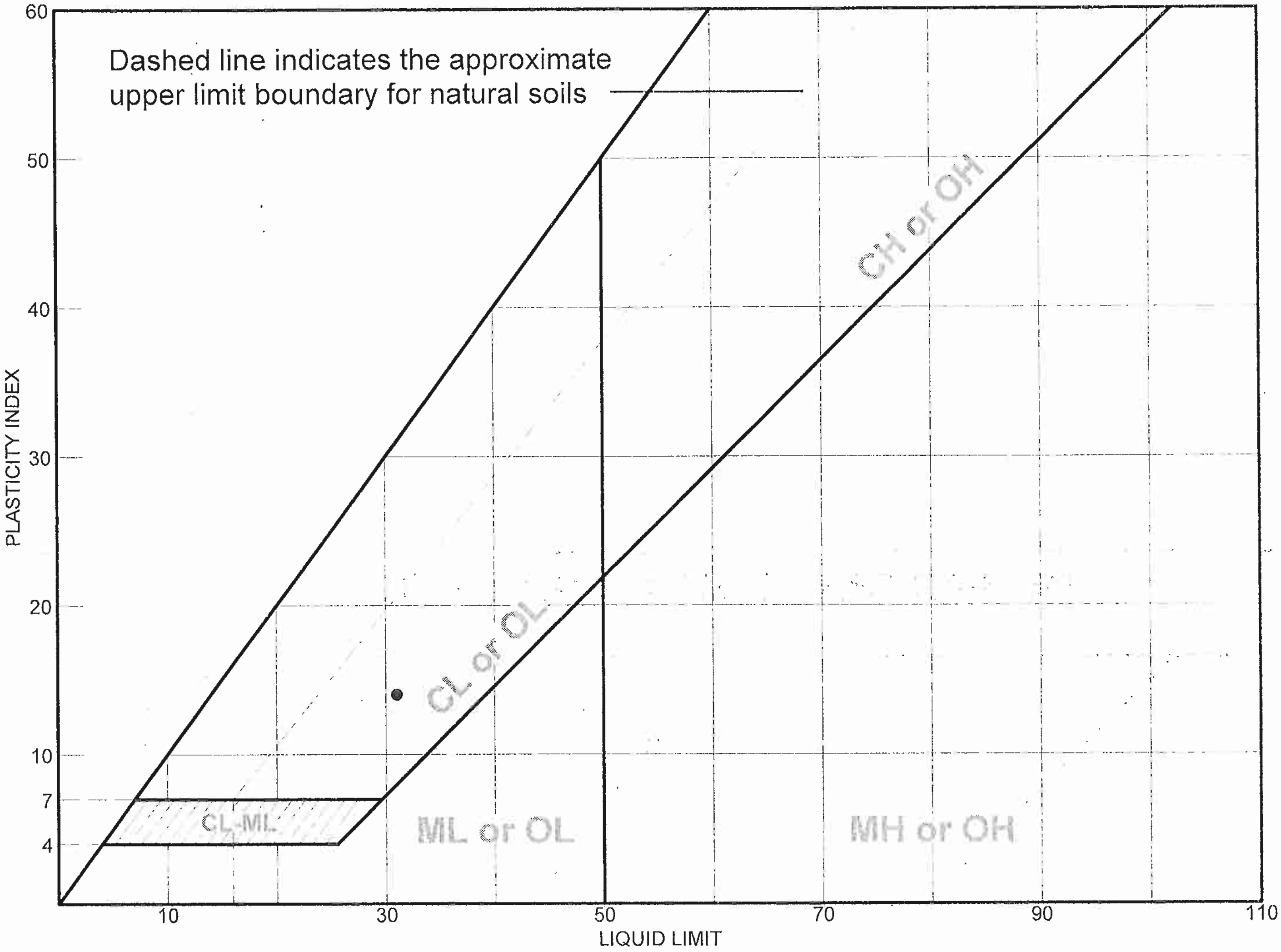
Sample No.: Top Cut Slope (CST) **Source of Sample:** **Date:** 9/17/19
Location: **Elev./Depth:**

Moore Twining Associates, Inc.

Fresno, CA

Client:
Project: Mission Valley - Home Depot
Project No: D050R0.01 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy lean clay	31	17	14	92.0	57.4	CL

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** Top Cut Slope (CST)

Remarks:

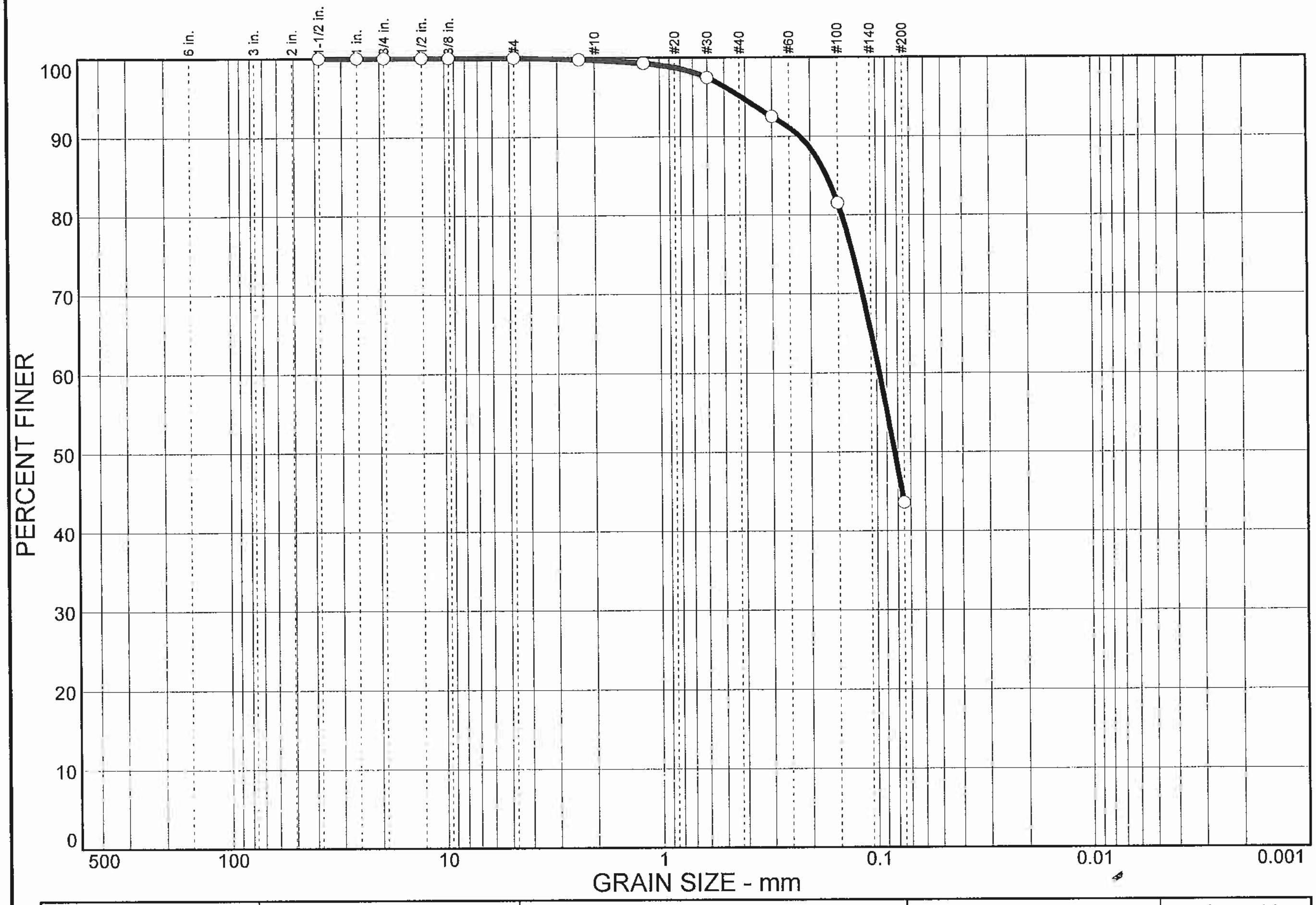
●

Moore Twining Associates, Inc.

Fresno, CA

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	56.4	43.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100.0		
1 in.	100.0		
3/4 in.	100.0		
1/2 in.	100.0		
3/8 in.	100.0		
#4	100.0		
#8	99.8		
#16	99.3		
#30	97.5		
#50	92.5		
#100	81.5		
#200	43.6		

* (no specification provided)

Material Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.168 D_{60}= 0.0972 D_{50}= 0.0828

D_{30}= D_{15}= D_{10}=

C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

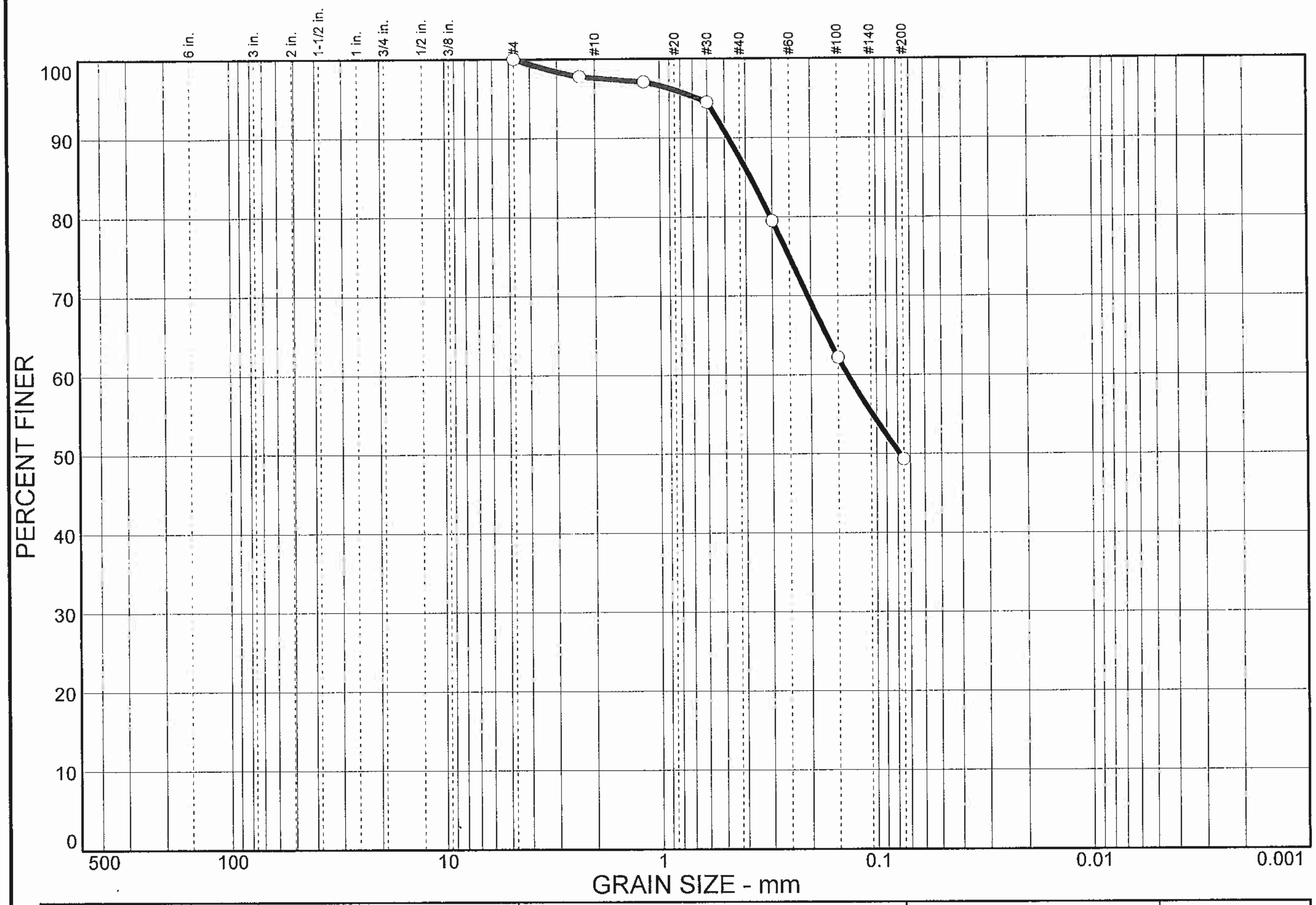
Sample No.: P-3
Source of Sample:
Date:
Location:
Elev./Depth: 13.5-15'

Moore Twining Associates, Inc.

Fresno, CA

Client:
Project: Mission Valley - Home Depot
Project No: D050R0.01
Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	50.7	49.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	97.8		
#16	97.1		
#30	94.5		
#50	79.5		
#100	62.2		
#200	49.3		

* (no specification provided)

Material Description

Clayey sand (Fill)

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.380 D_{60}= 0.135 D_{50}= 0.0782
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

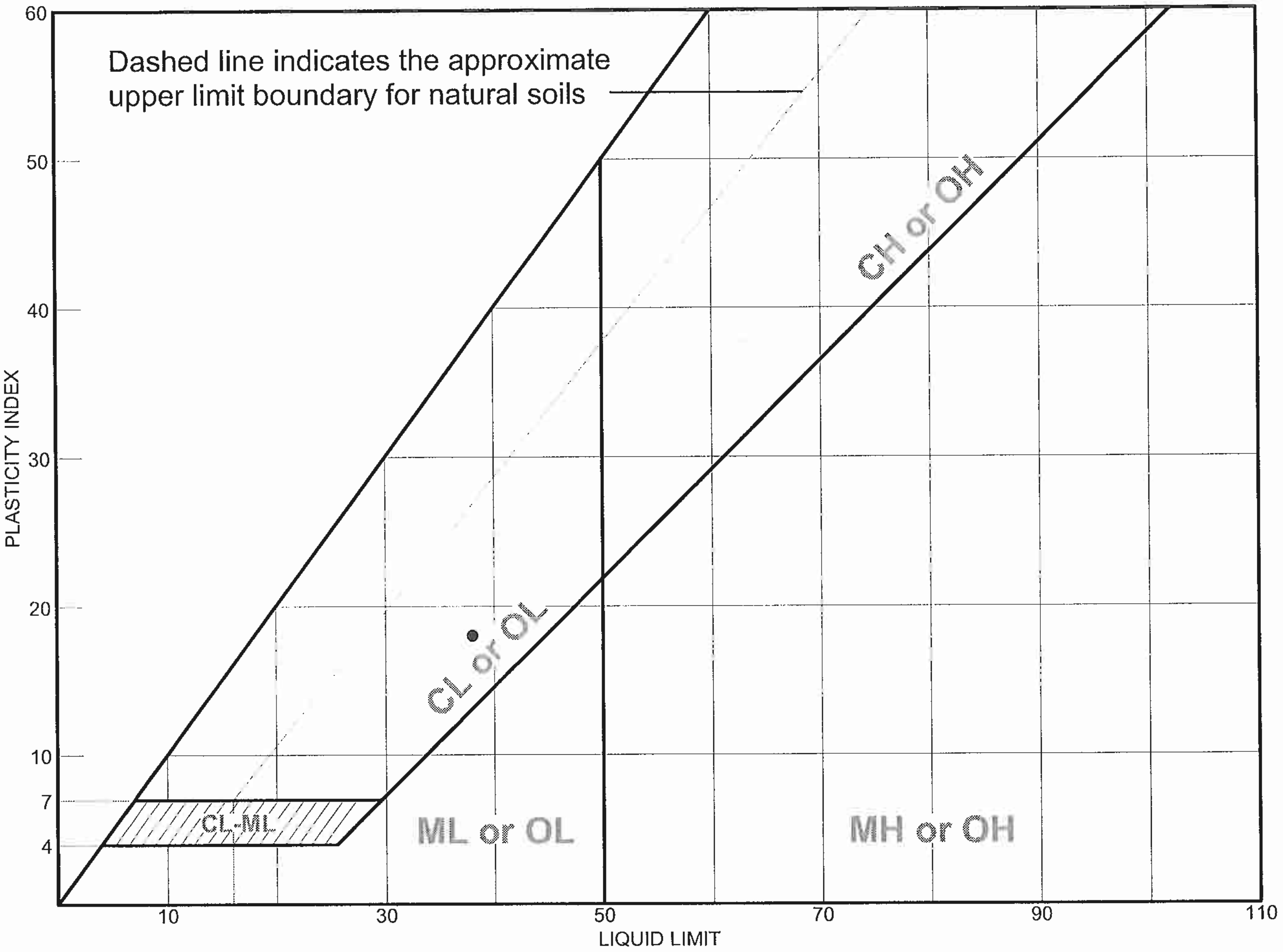
Sample No.: S-1 **Source of Sample:** **Date:** 3/4/19
Location: **Elev./Depth:** 2-3.5'

Moore Twining Associates, Inc.

Fresno, CA

Client:
Project: Mission Valley - Home Depot
Project No: D050R0.01 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey sand (Fill)	38	20	18	87.5	49.3	SC

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** S-1 **Elev./Depth:** 2-3.5'

Remarks:

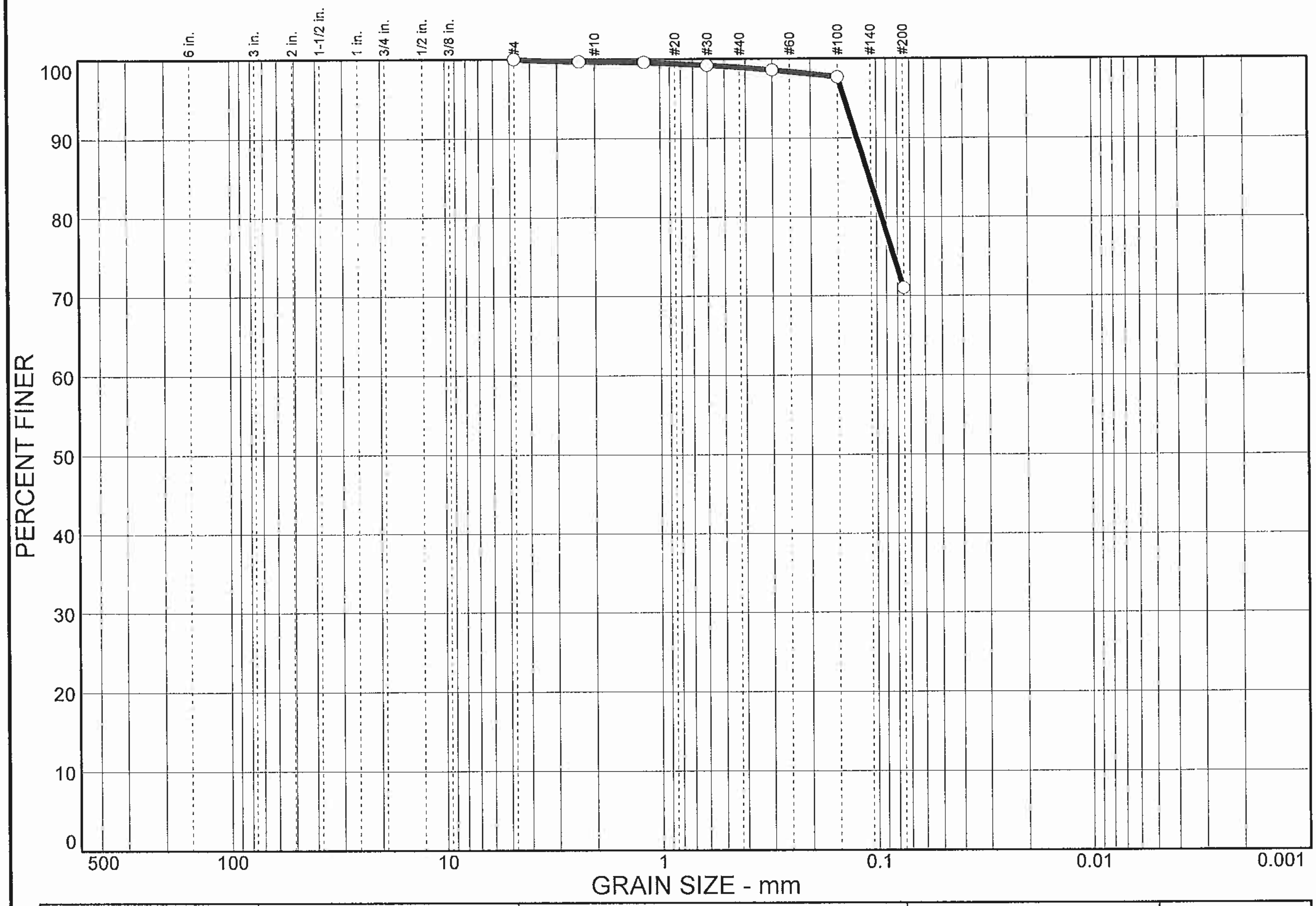
●

Moore Twining Associates, Inc.

Fresno, CA

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	29.0	71.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.7		
#16	99.6		
#30	99.2		
#50	98.6		
#100	97.7		
#200	71.0		

* (no specification provided)

Material Description

Silt with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.108 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

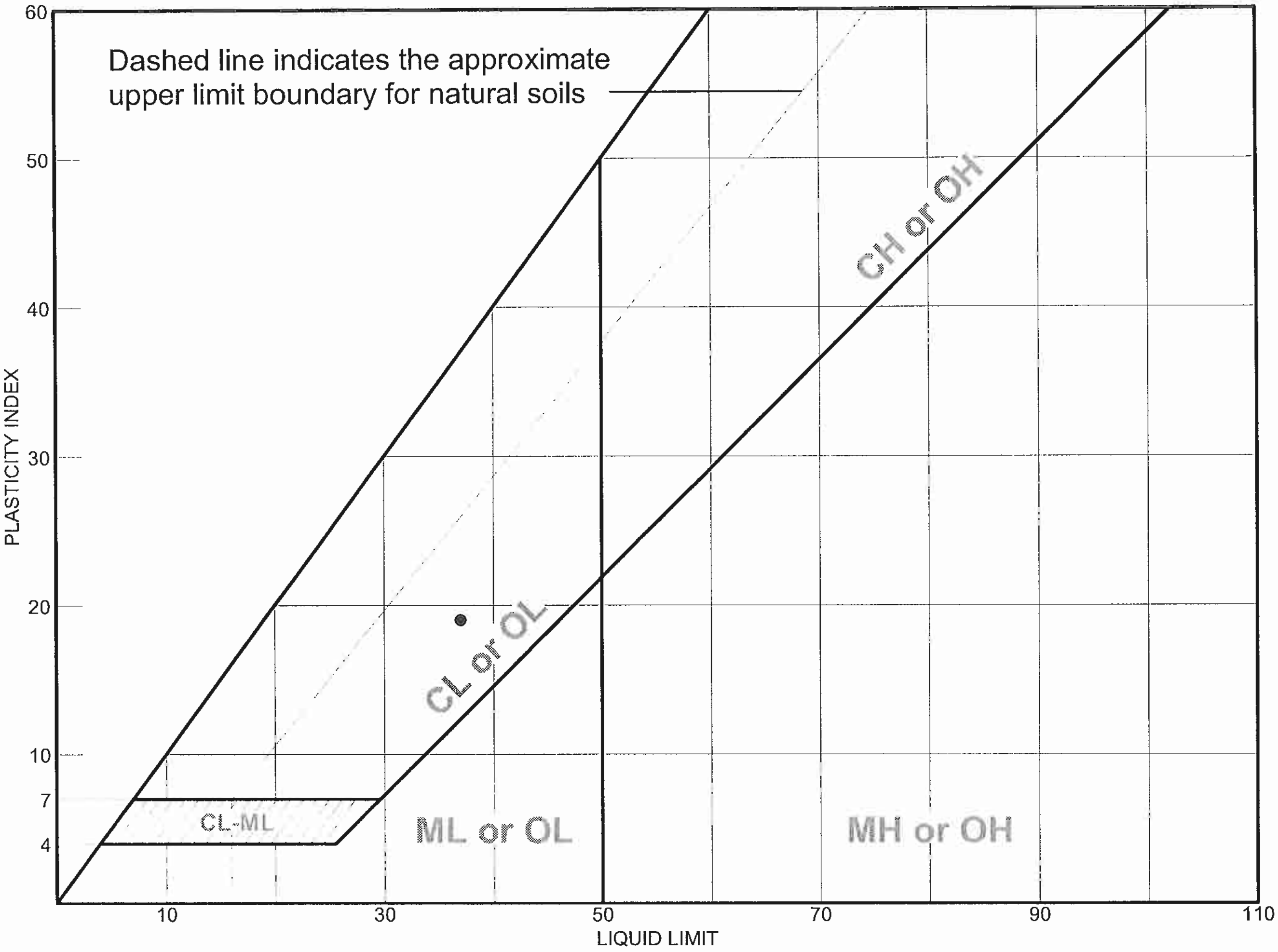
Sample No.: S-5
Location:
Source of Sample:
Date: 3/4/19
Elev./Depth: 30-31.5'

Moore Twining Associates, Inc.

Fresno, CA

Client:
Project: Mission Valley - Home Depot
Project No: D050R0.01
Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silt with sand	37	18	19	98.9	71.0	ML

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** S-5 **Elev./Depth:** 30-31.5'

Remarks:

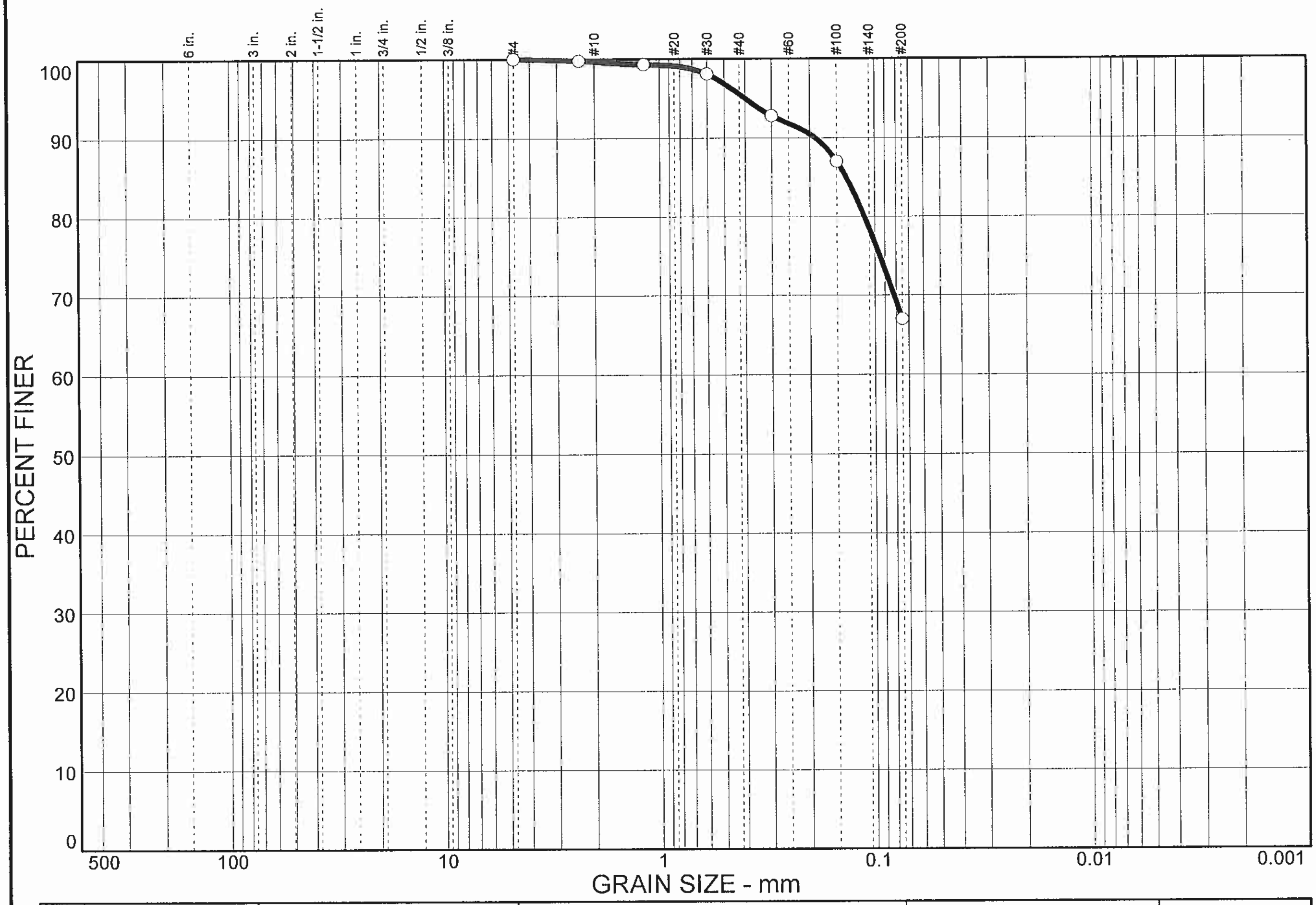
●

Moore Twining Associates, Inc.

Fresno, CA

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	33.0	67.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.8		
#16	99.3		
#30	98.1		
#50	92.8		
#100	87.0		
#200	67.0		

* (no specification provided)

Material Description

Sandy lean clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.136 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample No.: S-7
Location:

Source of Sample:

Date: 3/4/19
Elev./Depth: 5-6.5'

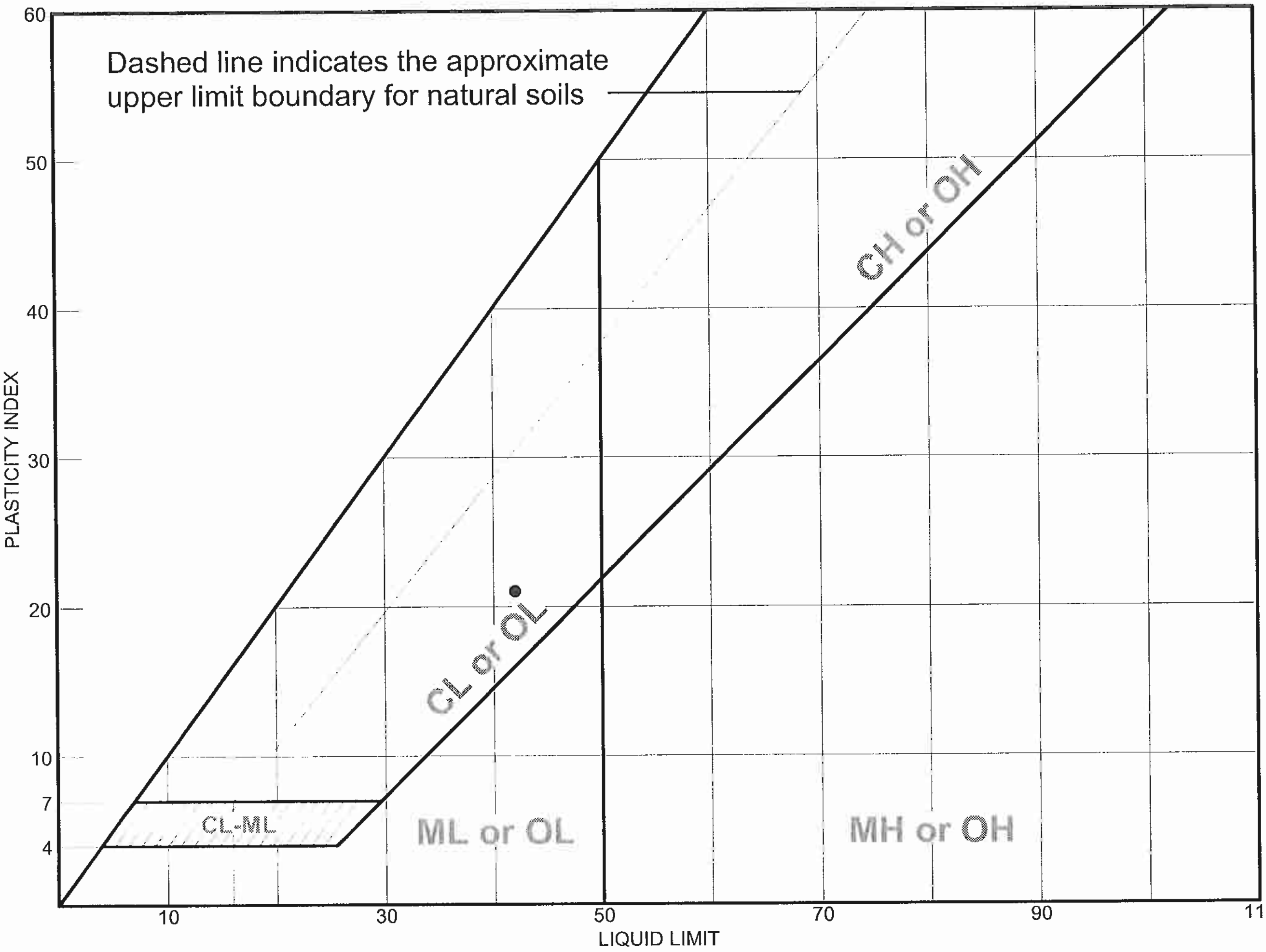
Moore Twining Associates, Inc.

Fresno, CA

Client:
Project: Mission Valley - Home Depot

Project No: D050R0.01 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy lean clay	42	21	21	95.5	67.0	CL

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** S-7 **Elev./Depth:** 5-6.5'

Remarks:

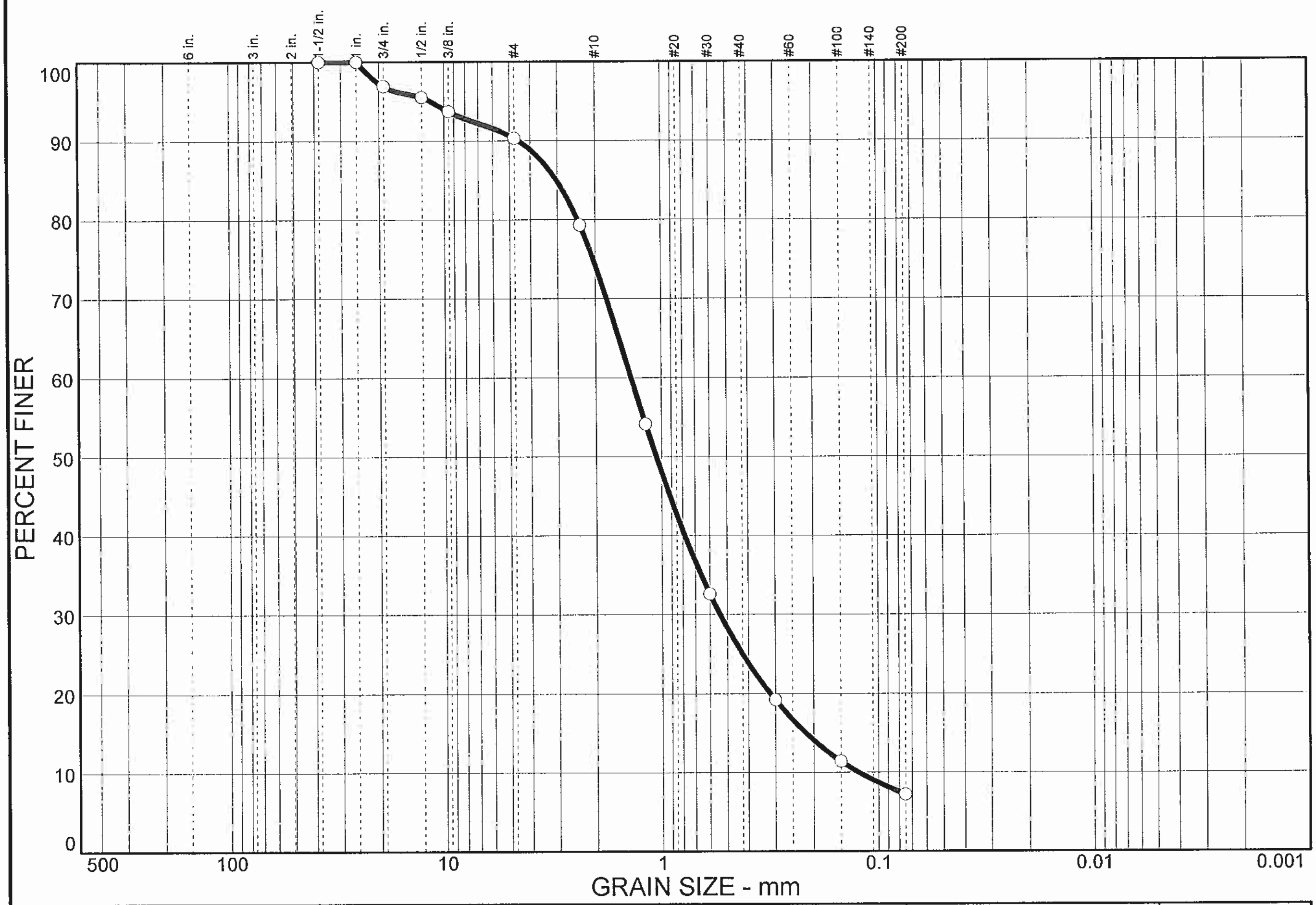
●

Moore Twining Associates, Inc.

Fresno, CA

Figure

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	9.7	83.1	7.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100.0		
1 in.	100.0		
3/4 in.	96.9		
1/2 in.	95.5		
3/8 in.	93.7		
#4	90.3		
#8	79.3		
#16	54.1		
#30	32.6		
#50	19.2		
#100	11.4		
#200	7.2		

* (no specification provided)

Material Description

Well-graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.03 D_{60}= 1.37 D_{50}= 1.06

D_{30}= 0.539 D_{15}= 0.217 D_{10}= 0.124

C_u= 11.10 C_c= 1.71

Classification

USCS= SW-SM AASHTO=

Remarks

Sample No.: S-8 **Source of Sample:** **Date:** 3/4/19

Location: **Elev./Depth:** 40-41.5'

Moore Twining Associates, Inc.

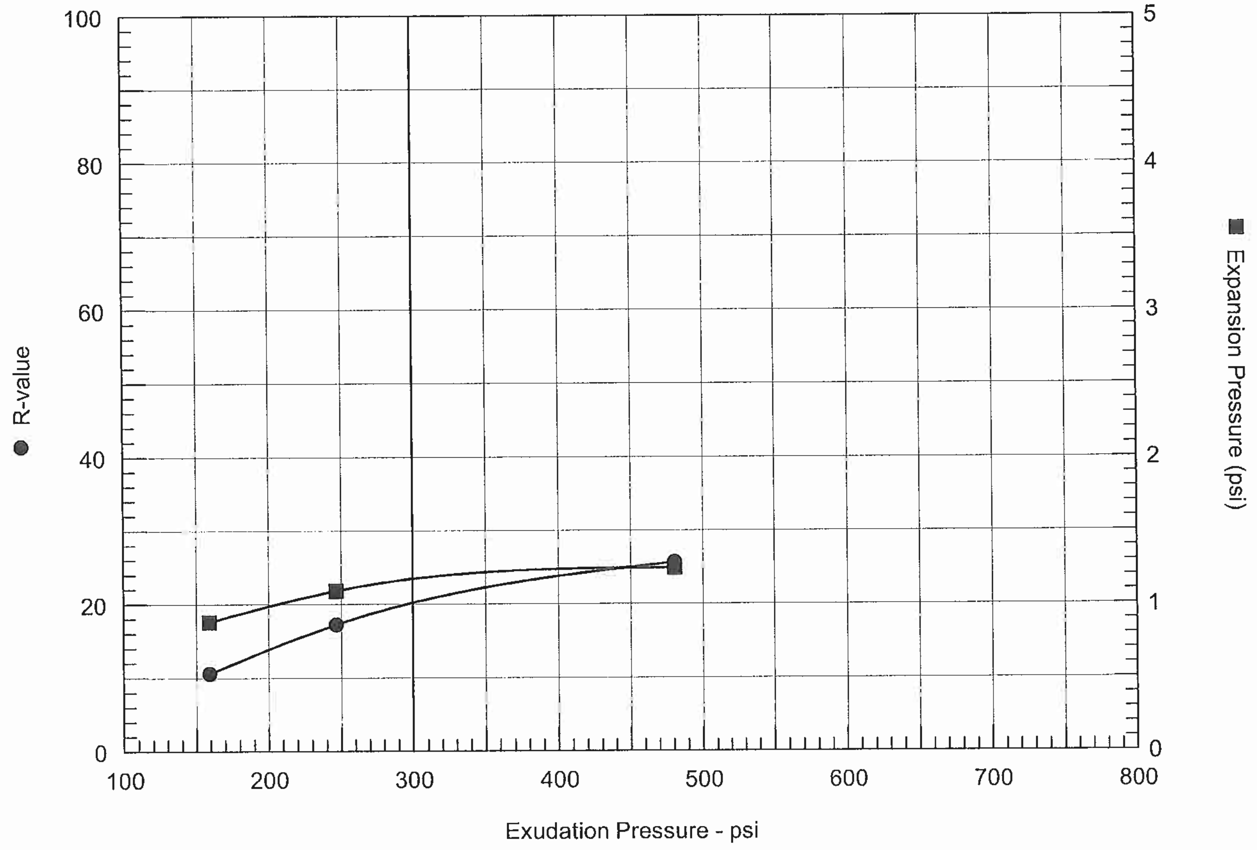
Fresno, CA

Client:

Project: Mission Valley - Home Depot

Project No: D050R0.01 **Figure**

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	150	113.8	14.3	1.24	91	2.56	481	25	26
2	100	112.2	15.3	1.09	107	2.59	247	16	17
3	50	111.5	16.4	0.88	123	2.62	159	10	11

Test Results	Material Description
R-value at 300 psi exudation pressure = 20 **Exp. pressure at 300 psi exudation pressure =** 1.17 psi	Sandy lean clay

Project No.: D050R0.01

Project: Mission Valley - Home Depot

Sample Number: A-2 **Depth:** 0-5'

Date: 4/17/2019

Tested by: TD

Checked by:

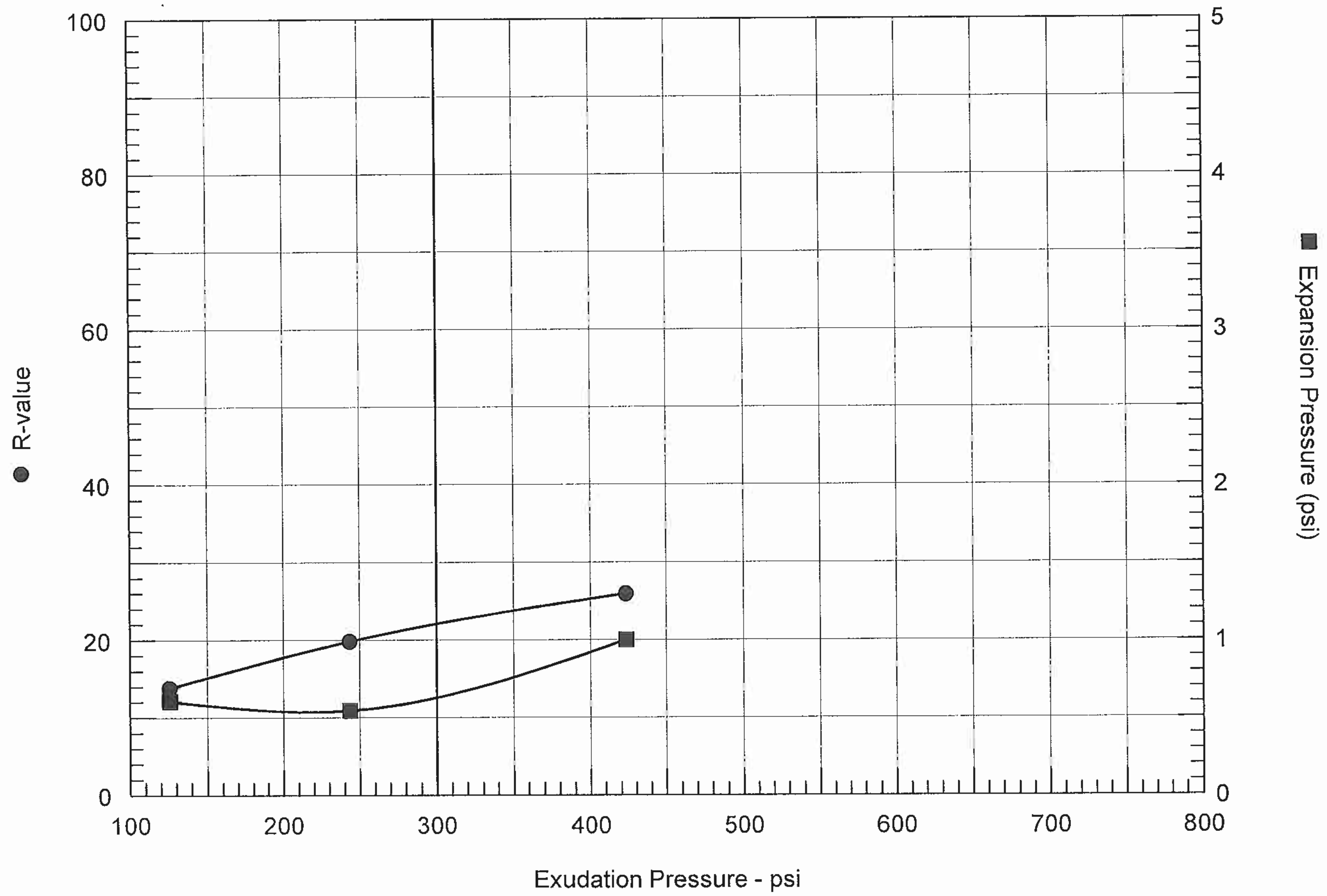
Remarks:

R-VALUE TEST REPORT

Moore Twining Associates, Inc.

Figure ______

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	100	115.3	15.3	0.55	101	2.61	244	18	20
2	50	113.7	16.3	0.61	113	2.63	126	13	14
3	150	116.7	14.3	1.00	89	2.57	423	25	26

Test Results

R-value at 300 psi exudation pressure = 22

Exp. pressure at 300 psi exudation pressure = 0.63 psi

Material Description

Sandy lean clay

Project No.: D050R0.01

Project: Mission Valley - Home Depot

Sample Number: D-1 **Depth:** 1.2-5'

Date: 4/11/2019

Tested by:

Checked by:

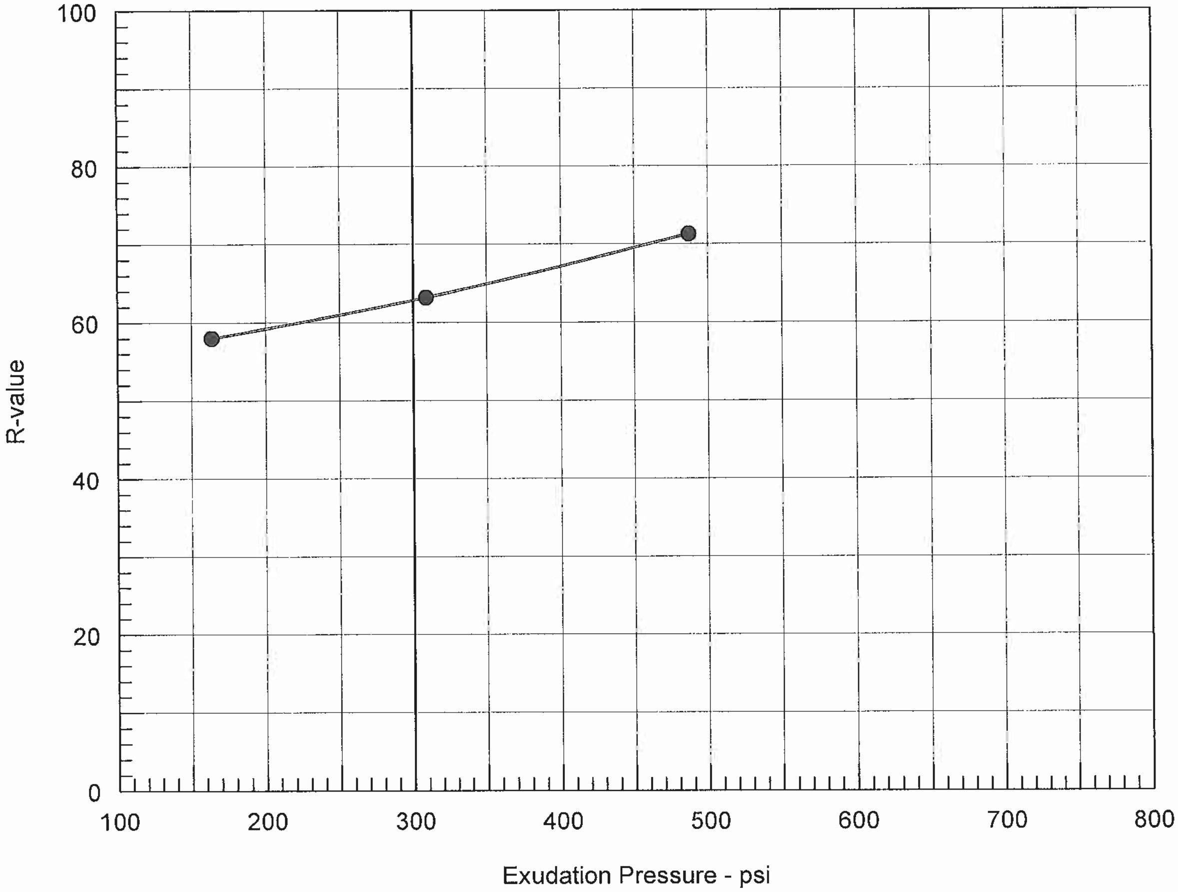
Remarks:

R-VALUE TEST REPORT

Moore Twining Associates, Inc.

Figure ______

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	300	123.6	9.5	0.00	27	2.51	487	71	71
2	250	120.8	11.0	0.00	36	2.56	309	62	63
3	250	121.0	11.9	0.00	41	2.56	164	56	58

Test Results	Material Description
R-value at 300 psi exudation pressure = 63	Silty sand

Project No.: D050R0.01

Project: Mission Valley - Home Depot

Sample Number: E-6 **Depth:** 0.9-5'

Date: 4/11/2019

Tested by:

Checked by:

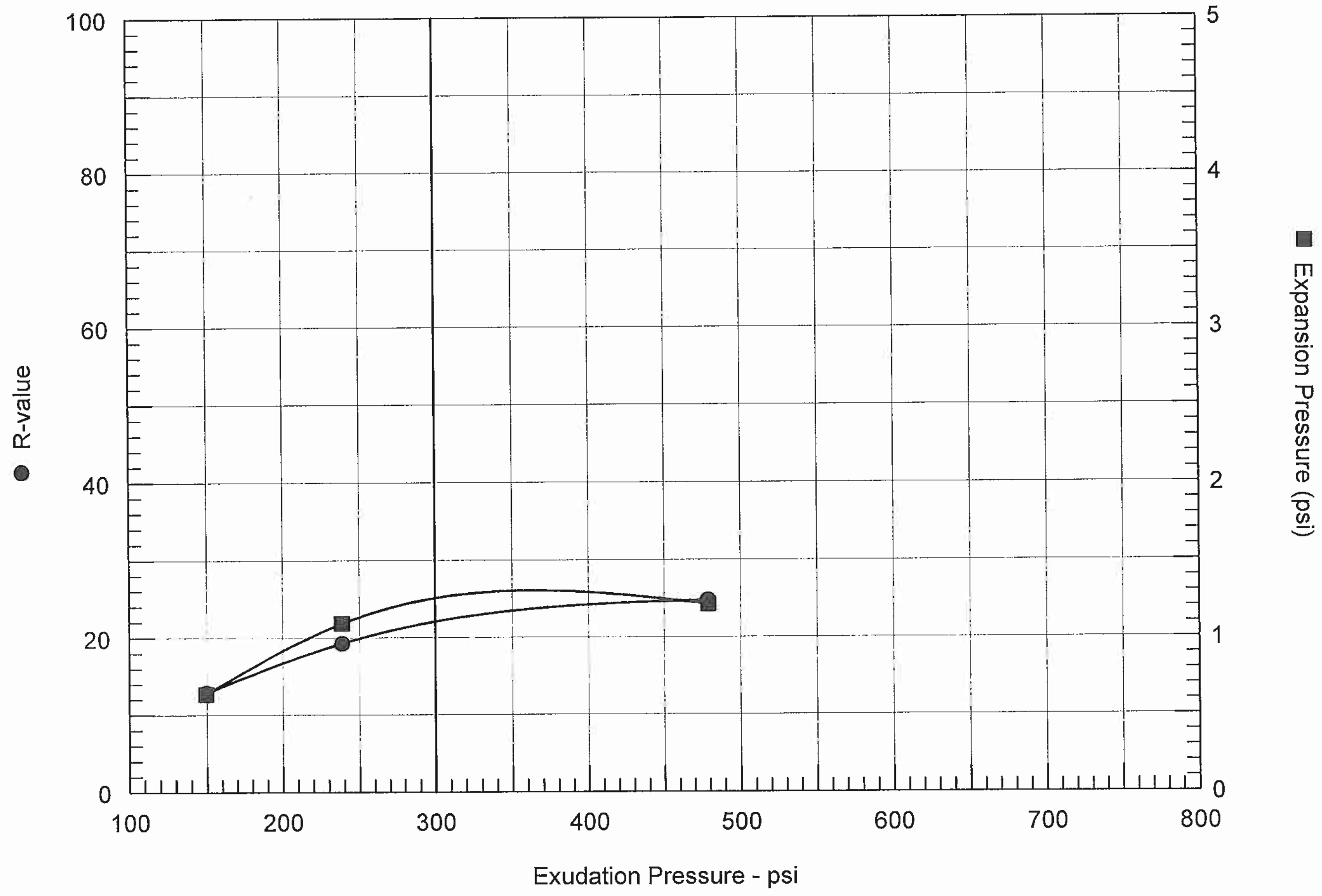
Remarks:

R-VALUE TEST REPORT

Moore Twining Associates, Inc.

Figure ______

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	100	116.7	13.0	1.21	92	2.58	479	23	25
2	100	115.0	14.0	1.09	101	2.61	239	18	19
3	50	113.1	15.5	0.64	116	2.65	150	12	13

Test Results	Material Description
R-value at 300 psi exudation pressure = 22 **Exp. pressure at 300 psi exudation pressure =** 1.26 psi	Clayey sand

Project No.: D050R0.01

Project: Mission Valley - Home Depot

Sample Number: J-8 **Depth:** 0.9-5'

Date: 4/11/2019

Tested by:

Checked by:

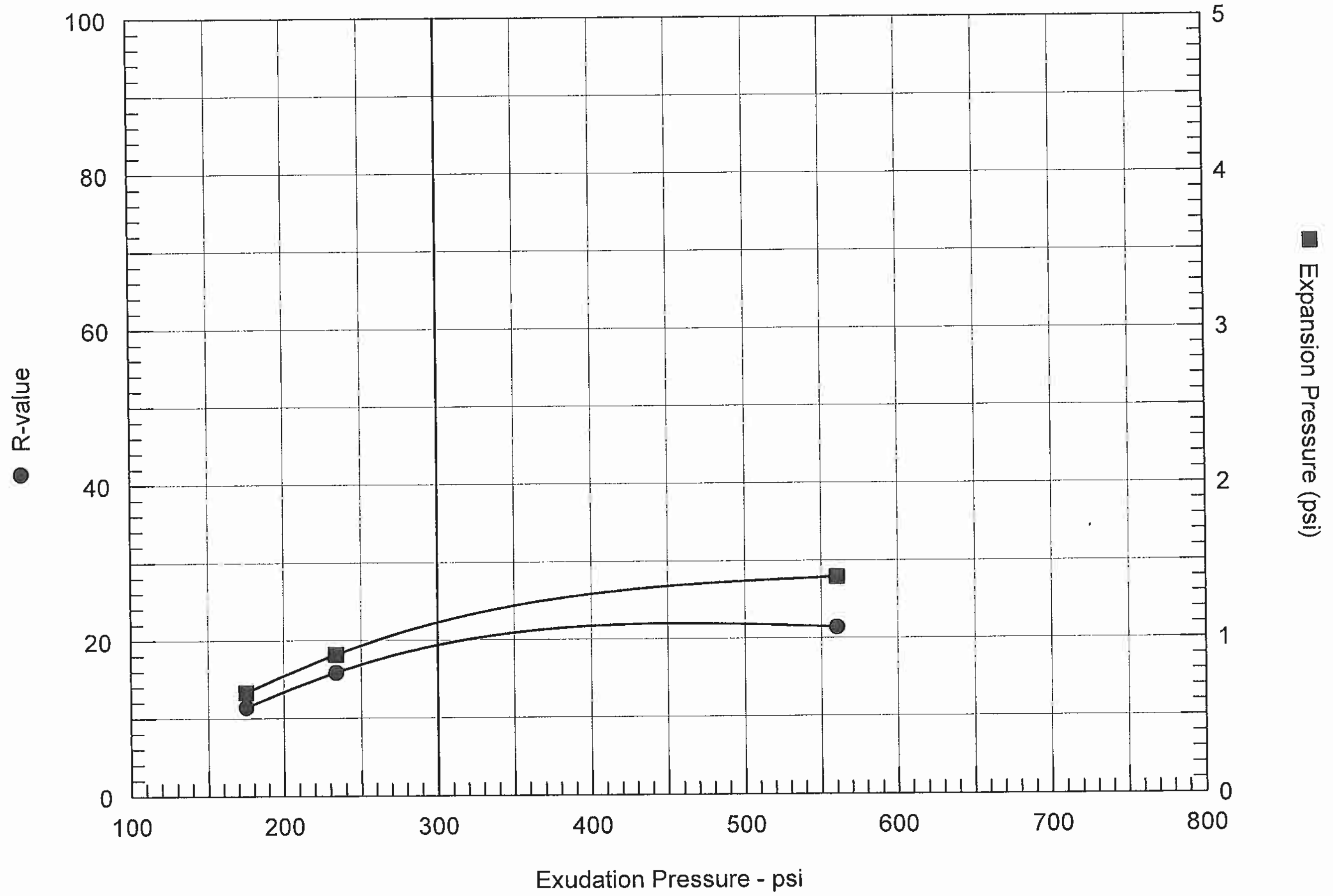
Remarks:

R-VALUE TEST REPORT

Moore Twining Associates, Inc.

Figure ______

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	200	116.7	11.8	1.39	100	2.60	560	20	21
2	100	116.0	13.7	0.91	111	2.62	234	15	16
3	50	115.8	15.2	0.67	120	2.63	175	11	11

Test Results	Material Description
R-value at 300 psi exudation pressure = 19 **Exp. pressure at 300 psi exudation pressure =** 1.11 psi	Sandy lean clay

Project No.: D050R0.01

Project: Mission Valley - Home Depot

Sample Number: H-8 **Depth:** 10-11.5'

Date: 4/11/2019

Tested by:

Checked by:

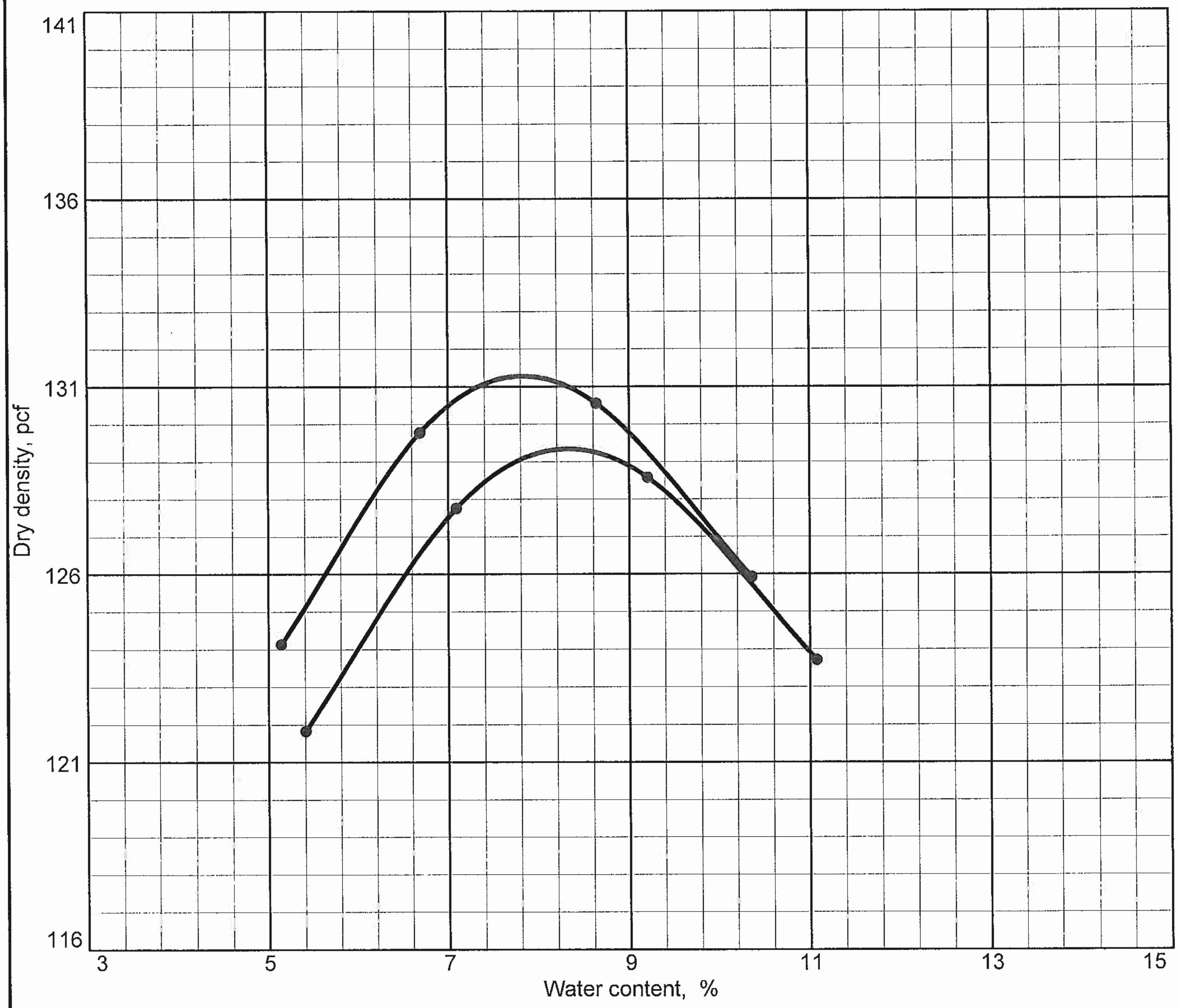
Remarks:

R-VALUE TEST REPORT

Moore Twining Associates, Inc.

Figure ______

COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method A Modified
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
0.8-5.0'	SC				31	16	8.0	34.2

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 131.3 pcf	129.3 pcf	Clayey sand
Optimum moisture = 7.8 %	8.3 %	

Project No. D050R0.01 **Client:**
Project: Mission Valley - Home Depot

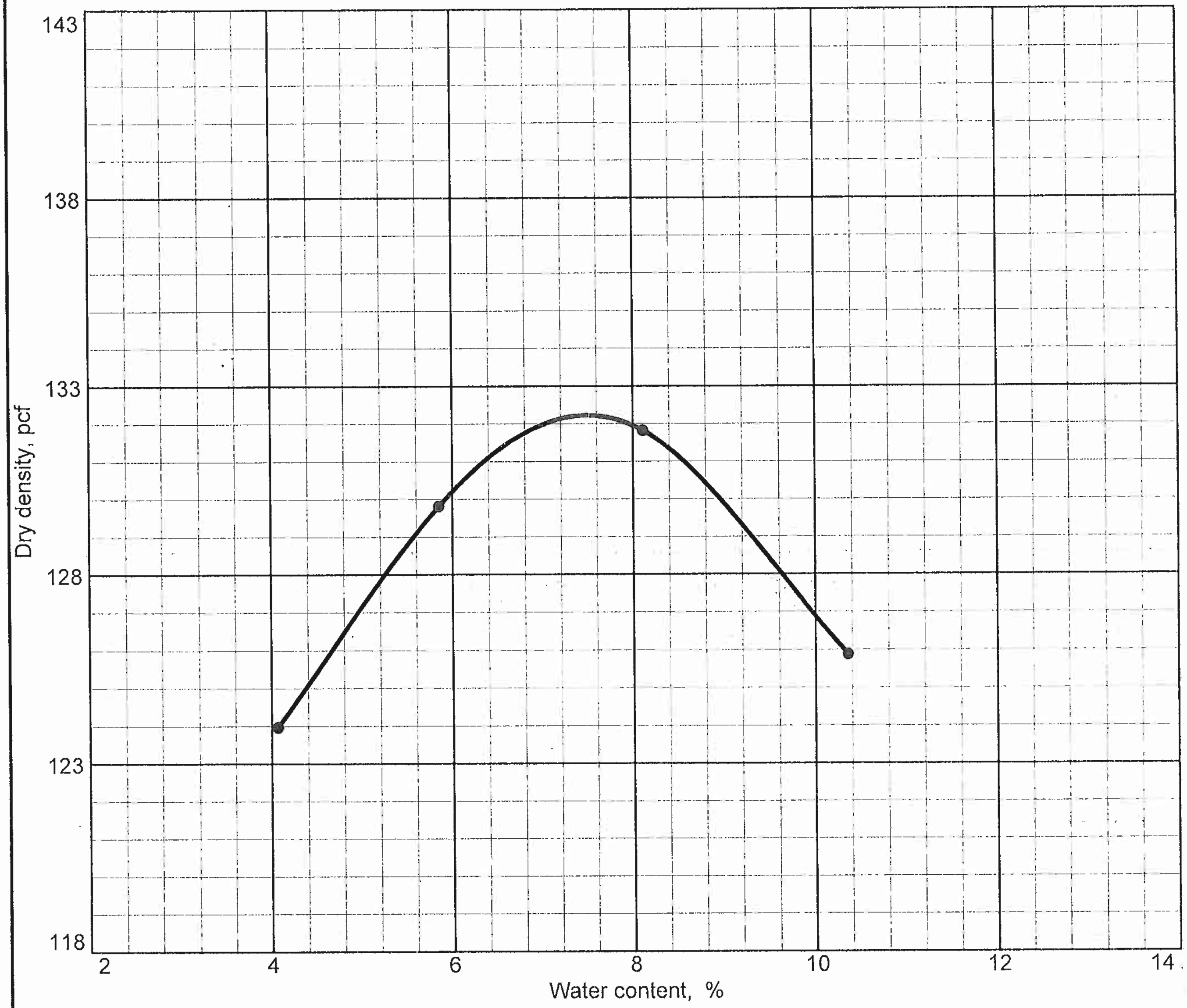
● **Source:** **Sample No.:** B-7 **Elev./Depth:** 0.8-5.0'

Remarks:

Moore Twining Associates, Inc.
Fresno, CA

Figure

COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
1-3'	SC				27	12	0.0	37.1

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 132.2 pcf Optimum moisture = 7.5 %	Clayey sand

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** E-8 **Elev./Depth:** 1-3'

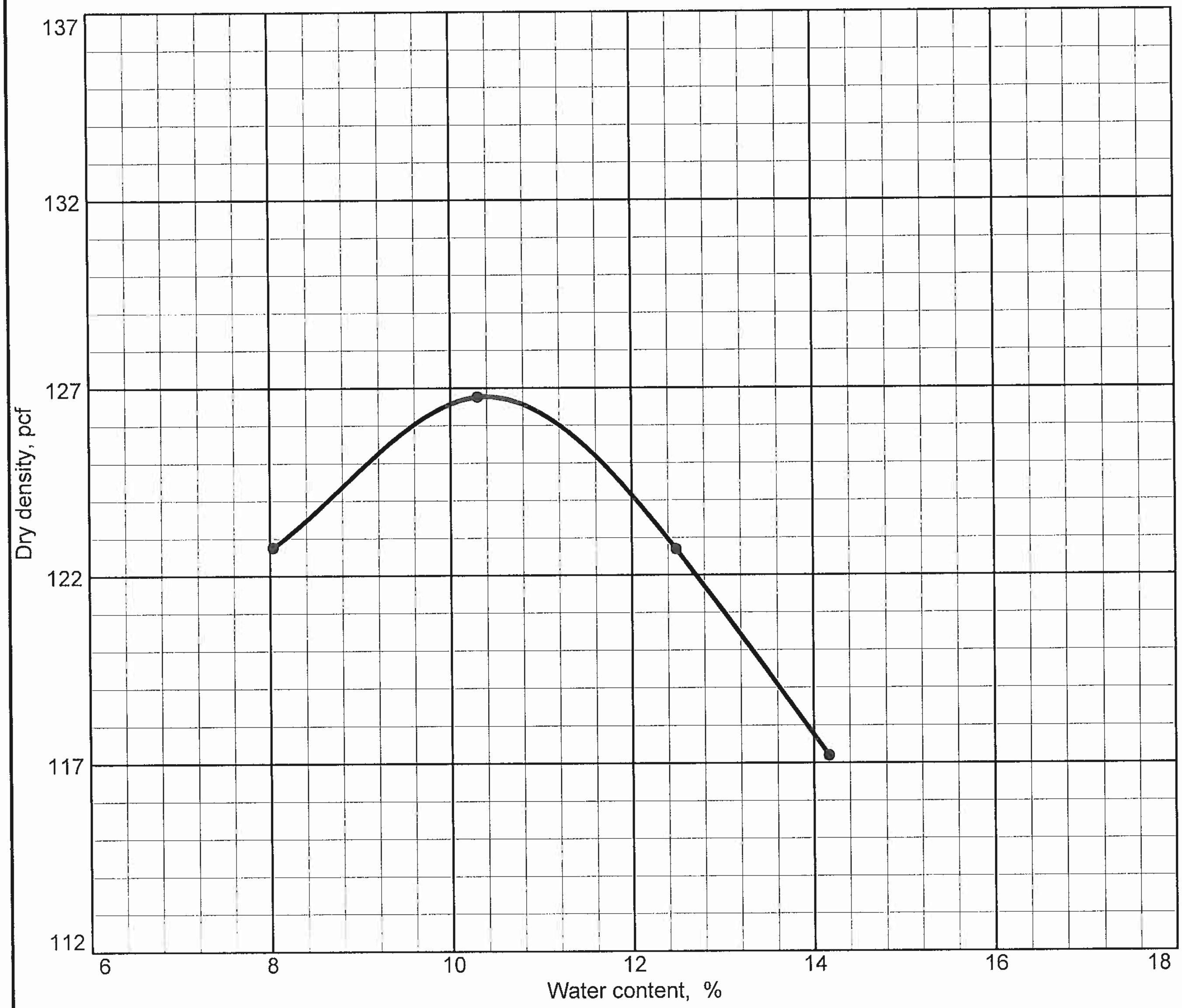
Moore Twining Associates, Inc.

Fresno, CA

Remarks:

Figure

COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
1-4.5'	CL							

TEST RESULTS

Maximum dry density = 126.8 pcf

Optimum moisture = 10.4 %

MATERIAL DESCRIPTION

Sandy lean clay

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** F-1A **Elev./Depth:** 1-4.5'

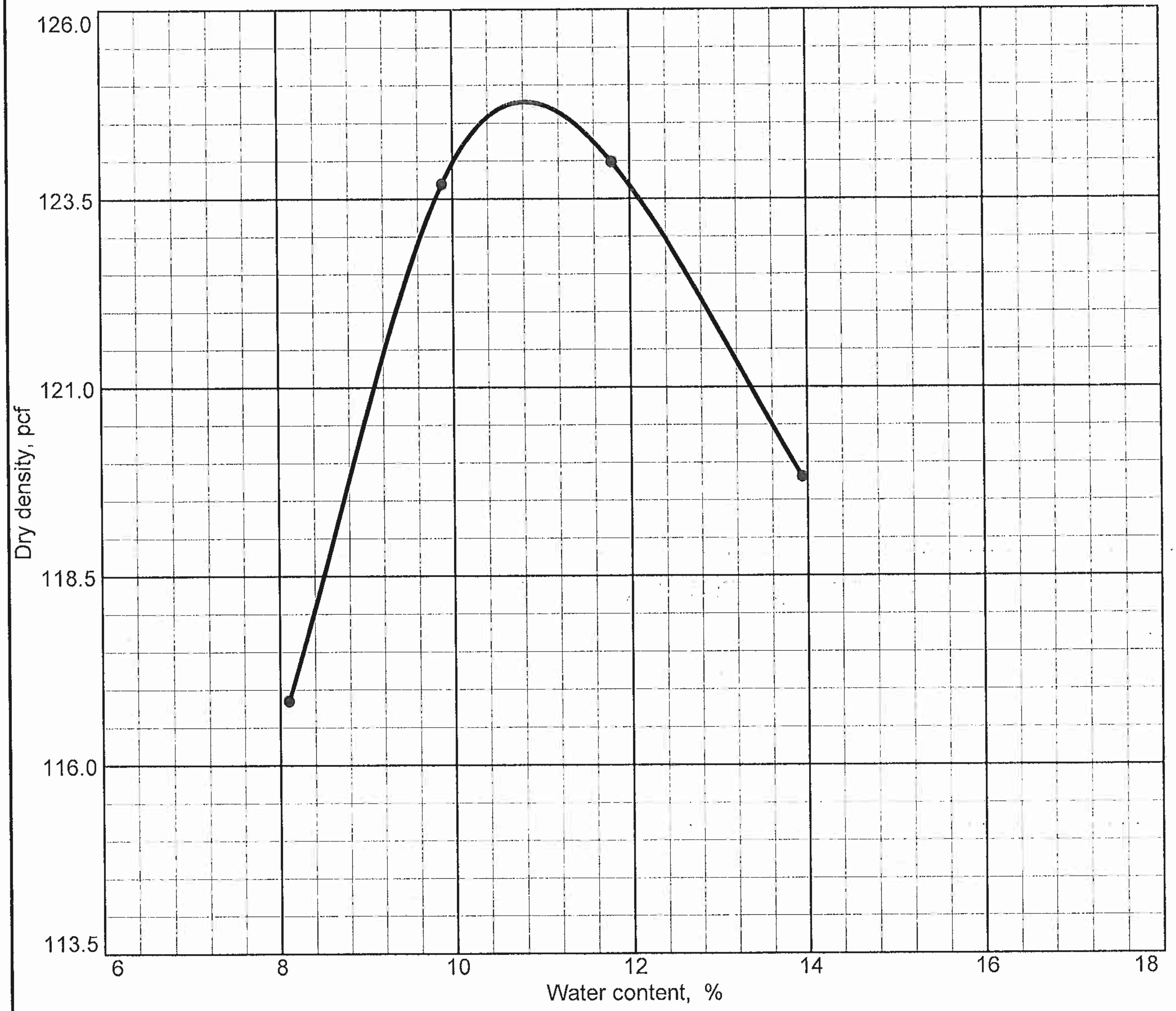
Moore Twining Associates, Inc.

Fresno, CA

Remarks:

Figure

COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
1-5'	CL				30	12		68.4

TEST RESULTS

Maximum dry density = 124.8 pcf

Optimum moisture = 10.8 %

MATERIAL DESCRIPTION

Sandy lean clay

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** G-7.6 **Elev./Depth:** 1-5'

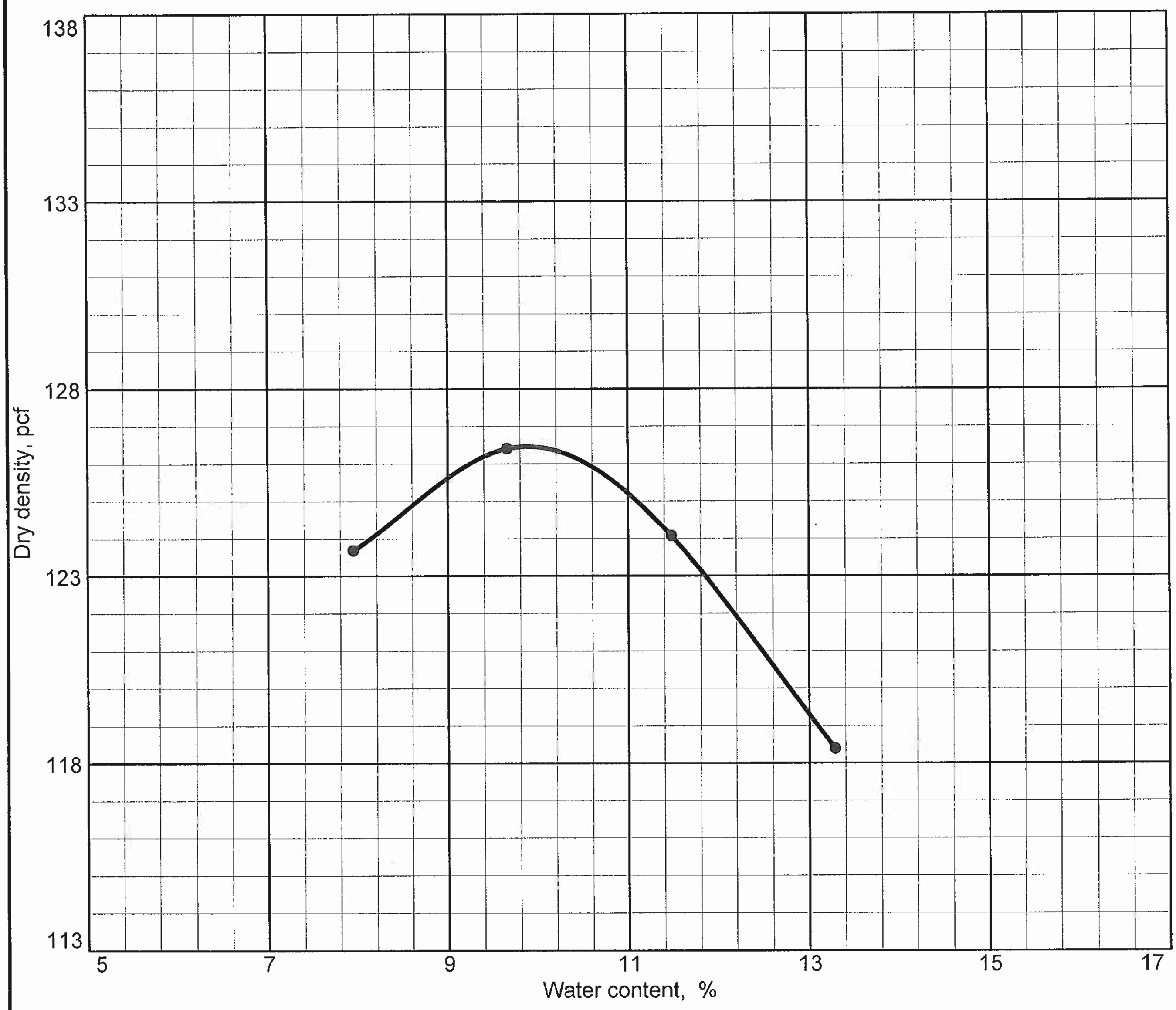
Moore Twining Associates, Inc.

Fresno, CA

Remarks:

Figure

COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
1-5'	SC							

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 126.5 pcf Optimum moisture = 9.9 %	Clayey sand

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** H-5 **Elev./Depth:** 1-5'

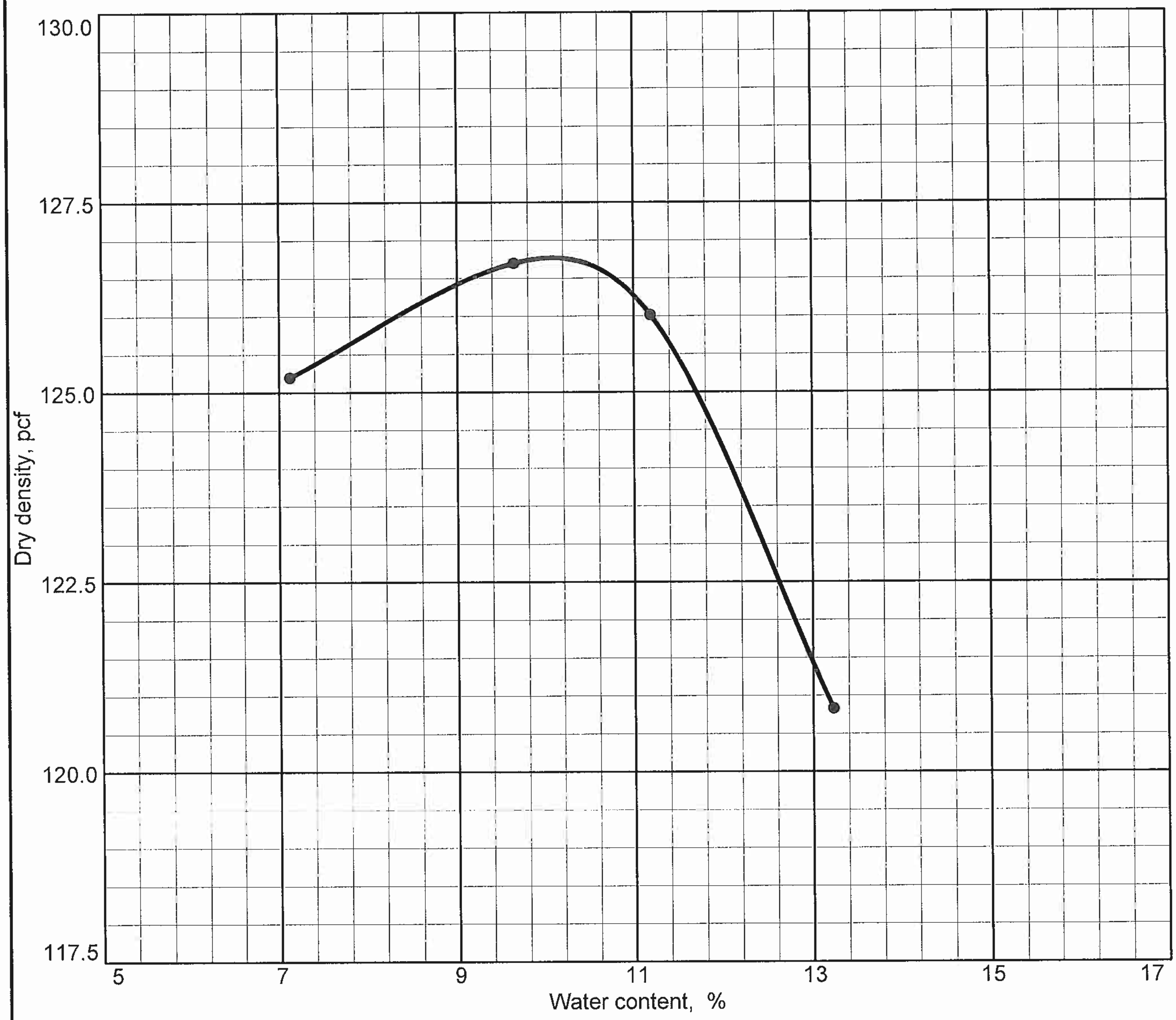
Moore Twining Associates, Inc.

Fresno, CA

Remarks:

Figure

COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
1-5'	CL						0.0	54.6

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 126.8 pcf Optimum moisture = 10.1 %	Sandy lean clay

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** H-8 **Elev./Depth:** 1-5'

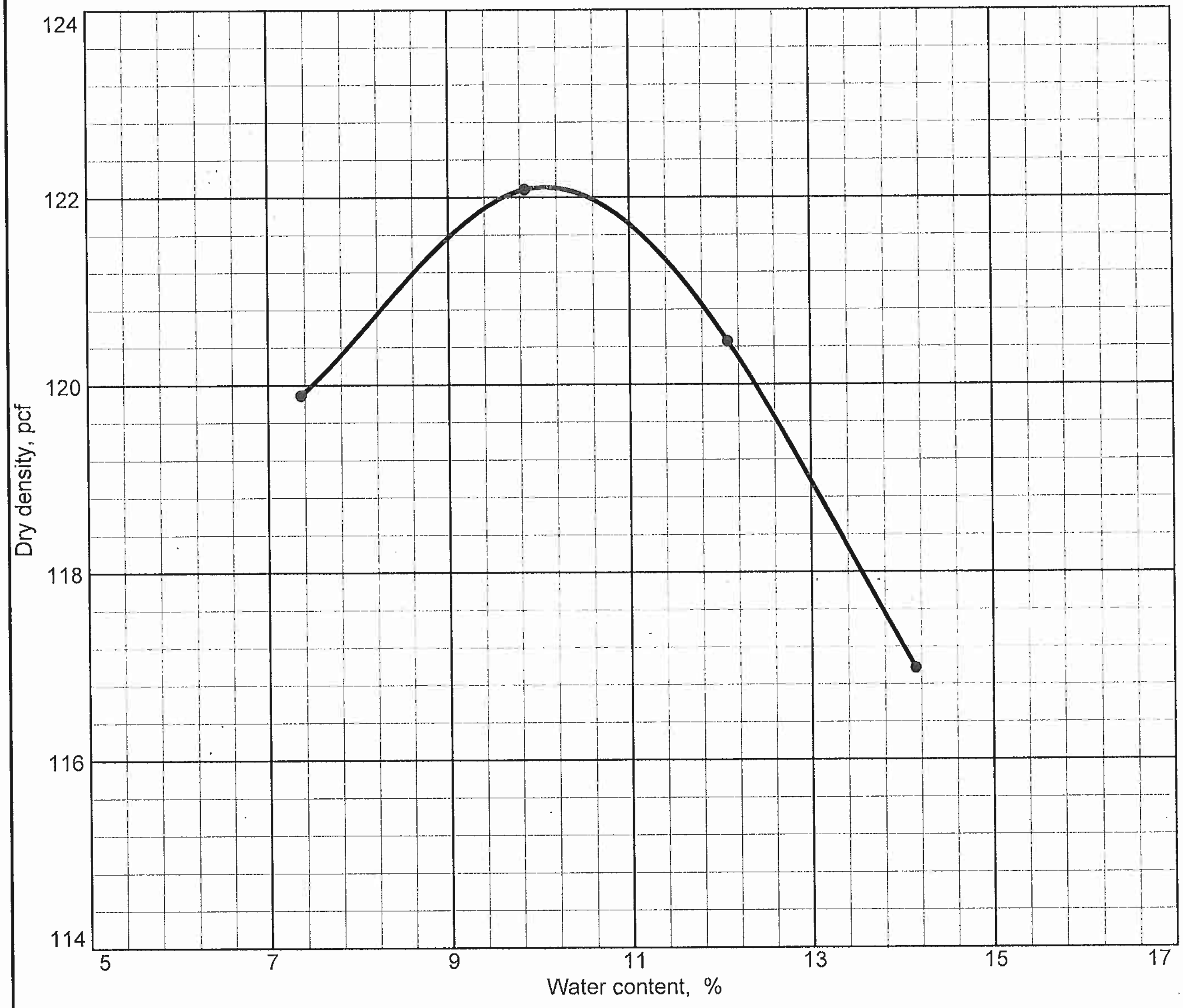
Remarks:

Moore Twining Associates, Inc.

Fresno, CA

Figure

COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	CL				31	14	0.0	57.4

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 122.1 pcf Optimum moisture = 10.1 %	Sandy lean clay

Project No. D050R0.01 **Client:**

Project: Mission Valley - Home Depot

● **Source:** **Sample No.:** Top Cut Slope (CST)

Moore Twining Associates, Inc.

Fresno, CA

Remarks:

Figure

MTA Since 1898 MOORE TWINING ASSOCIATES, INC.

EXPANSION INDEX TEST, ASTM D4829

MTA PROJECT NAME: Mission Valley - Home Depot
REPORT DATE: 2/29/19
TEST DATE: 3/25/2019

MTA PROJECT NO.: D050R0.01
SAMPLE I.D.: F-1A @ 1-4.5'
SAMPLED BY: VB / JC
SAMPLE DATE: 2/25/2019
TESTED BY: TD

MATERIALS DESCRIPTION: Sandy lean clay

% PASSING # 4 SIEVE 100

Initial Moisture Determination:

Pan + Wet Soil Wt., gm	250.0
Pan + Dry Soil Wt., gm	223.8
Pan Wt., gm	0.0
Initial % Moisture Content	11.7

Final Moisture Determination:

Wet Soil Wt., lbs	0.9198
Dry Soil Wt., lbs	0.7478
Final % Moisture Content	23.0

Initial Expansion Data:

Ring + Sample Wt., lbs	0.8353
Ring Wt., lbs	0.0000
Remolded Wt., lbs	0.8353
Remolded Wet Density, pcf	114.9
Remolded Dry Density, pcf	102.8

Final Expansion Data:

Ring + Sample Wt., lbs	0.9198
Ring Wt., lbs	0.0000
Remolded Wt., lbs	0.9198
Remolded Wet Density, pcf	117.5
Remolded Dry Density, pcf	95.5

Initial Volume	Final Volume
0.00727222	0.007829

Expansion Data:

Initial Gage Reading, in:	0.0500
Final Gage Reading, in:	0.1265
Expansion, in:	0.0765
Expansion Index	77

Comments: **Medium Expansion Potential**

Classification of Expansive Soils. (Table No.1 From ASTM D4829)

Expansion Index	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
>130	Very High

EXPANSION INDEX TEST, ASTM D4829

MTA PROJECT NAME: Mission Valley - Home Depot

REPORT DATE: 2/29/19
TEST DATE: 3/25/2019

MTA PROJECT NO.: D050R0.01
SAMPLE I.D.: H-5 @ 1-5'
SAMPLED BY: VB / JC
SAMPLE DATE: 2/25/2019
TESTED BY: TD

MATERIALS DESCRIPTION: Sandy lean clay

% PASSING # 4 SIEVE 100

Initial Moisture Determination:

Pan + Wet Soil Wt., gm	250.0
Pan + Dry Soil Wt., gm	224.2
Pan Wt., gm	0.0
Initial % Moisture Content	11.5

Final Moisture Determination:

Wet Soil Wt., lbs	0.9251
Dry Soil Wt., lbs	0.7539
Final % Moisture Content	22.7

Initial Expansion Data:

Ring + Sample Wt., lbs	0.8406
Ring Wt., lbs	0.0000
Remolded Wt., lbs	0.8406
Remolded Wet Density, pcf	115.6
Remolded Dry Density, pcf	103.7

Final Expansion Data:

Ring + Sample Wt., lbs	0.9251
Ring Wt., lbs	0.0000
Remolded Wt., lbs	0.9251
Remolded Wet Density, pcf	117.7
Remolded Dry Density, pcf	95.9

Initial Volume	Final Volume
0.00727222	0.007859

Expansion Data:

Initial Gage Reading, in:	0.0500
Final Gage Reading, in:	0.1307
Expansion, in:	0.0807
Expansion Index	81

Comments: **Medium Expansion Potential**

Classification of Expansive Soils. (Table No.1 From ASTM D4829)

Expansion Index	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
>130	Very High

Project Name: Mission Valley - Home Depot

Project Number: D050R0.01

Subject: Minimum Resistivity, ASTM G187
Material Description: Silty sand
Location: E-6 @ 0.9-5'

Report Date: 3/29/2019
Sample Date: 2/25/2019

Sampled By: VB / JC
Tested By: TD
Test Date: 3/27/2019

Laboratory Test Results, Minimum Resistivity - ASTM G187

Total Water Added, mls	Resistivity, Ohm-cm
50 mls	12,006
100 mls	10,005
150 mls	8,004
200 mls	5,336
250 mls	4,602
300 mls	4,869

Remarks: Min. Resistivity is 4,602 Ohm-cm

MOORE TWINING
ASSOCIATES, INC.
Since 1898

Project Name: Mission Valley - Home Depot
Project Number: D050R0.01
Subject: Minimum Resistivity, ASTM G187
Material Description: Sandy lean clay
Location: H-5 @ 1-5'

Report Date: 3/29/2019
Sample Date: 2/25/2019
Sampled By: VB / JC
Tested By: TD
Test Date: 3/27/2019

Laboratory Test Results, Minimum Resistivity - ASTM G187

Total Water Added, mls	Resistivity, Ohm-cm
50 mls	8,671
100 mls	6,670
150 mls	4,002
200 mls	2,268
250 mls	1,801
300 mls	1,868
350 mls	2,068

Remarks: Min. Resistivity is 1,801 Ohm-cm

MOORE TWINING
ASSOCIATES, INC.
Since 1898

Project Name: Mission Valley - Home Depot

Project Number: D050R0.01

Subject: Minimum Resistivity, ASTM G187
Material Description: Sandy lean clay
Location: D-1 @ 1.2-5'

Report Date: 3/29/2019
Sample Date: 2/25/2019

Sampled By: VB / JC
Tested By: TD
Test Date: 3/27/2019

Laboratory Test Results, Minimum Resistivity - ASTM G187

Total Water Added, mls	Resistivity, Ohm-cm
50 mls	8,004
100 mls	6,337
150 mls	4,736
200 mls	2,668
250 mls	2,201
300 mls	2,535

Remarks: Min. Resistivity is 2,201 Ohm-cm

MOORE TWINING
ASSOCIATES, INC.
California ELAP Certificate #1371

2527 Fresno Street
Fresno, CA 93721
(559) 268-7021 Phone
(559) 268-0740 Fax

March 15, 2019

Work Order #: **FC06030**

Scott Krauter
MTA Geotechnical Division
2527 Fresno Street
Fresno, CA 93721

RE: Soil Investigation in San Diego

Enclosed are the analytical results for samples received by our laboratory on **03/06/19** . For your reference, these analyses have been assigned laboratory work order number **FC06030**.

All analyses have been performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, Moore Twining Associates, Inc. (MTA) is not responsible for use of less than complete reports. Results apply only to samples analyzed.

If you have any questions, please feel free to contact us at the number listed above.

Sincerely,

Moore Twining Associates, Inc.

Susan Federico
Client Services Representative

MTA Geotechnical Division
2527 Fresno Street
Fresno CA, 93721

Project: Soil Investigation in San Diego
Project Number: D050R0.01
Project Manager: Scott Krauter

Reported:
03/15/2019

Analytical Report for the Following Samples

Sample ID	Notes	Laboratory ID	Matrix	Date Sampled	Date Received
D1@1.2-5		FC06030-01	Soil	03/06/19 00:00	03/06/19 14:00
E6@0.9-5		FC06030-02	Soil	03/06/19 00:00	03/06/19 14:00
H5@1-5		FC06030-03	Soil	03/06/19 00:00	03/06/19 14:00

MTA Geotechnical Division
2527 Fresno Street
Fresno CA, 93721

Project: Soil Investigation in San Diego
Project Number: D050R0.01
Project Manager: Scott Krauter

Reported:
03/15/2019

D1@1.2-5

FC06030-01 (Soil) Sampled: 03/06/19 00:00

Analyte	Flag	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method
Inorganics									
Chloride		**17**	6.0	mg/kg	3	B9C0616	03/06/19	03/07/19	ASTM D4327-84
Chloride		**0.0017**	0.00060	% by Weight	3	[CALC]	03/07/19	03/07/19	ASTM D4327-84
Sulfate as SO4		**0.0042**	0.00060	% by Weight	3	[CALC]	03/07/19	03/07/19	ASTM D4327-84
pH		**8.8**	0.10	pH Units	1	B9C0616	03/06/19	03/07/19	ASTM D4972-89 Mod
Sulfate as SO4		**42**	6.0	mg/kg	3	B9C0616	03/06/19	03/07/19	ASTM D4327

E6@0.9-5

FC06030-02 (Soil) Sampled: 03/06/19 00:00

Analyte	Flag	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method
Inorganics									
Chloride		ND	6.0	mg/kg	3	B9C0616	03/06/19	03/07/19	ASTM D4327-84
Chloride		ND	0.00060	% by Weight	3	[CALC]	03/07/19	03/07/19	ASTM D4327-84
Sulfate as SO4		**0.0021**	0.00060	% by Weight	3	[CALC]	03/07/19	03/07/19	ASTM D4327-84
pH		**8.5**	0.10	pH Units	1	B9C0616	03/06/19	03/07/19	ASTM D4972-89 Mod
Sulfate as SO4		**21**	6.0	mg/kg	3	B9C0616	03/06/19	03/07/19	ASTM D4327

H5@1-5

FC06030-03 (Soil) Sampled: 03/06/19 00:00

Analyte	Flag	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method
Inorganics									
Chloride		ND	6.0	mg/kg	3	B9C0616	03/06/19	03/07/19	ASTM D4327-84
Chloride		ND	0.00060	% by Weight	3	[CALC]	03/07/19	03/07/19	ASTM D4327-84
Sulfate as SO4		**0.0033**	0.00060	% by Weight	3	[CALC]	03/07/19	03/07/19	ASTM D4327-84
pH		**8.9**	0.10	pH Units	1	B9C0616	03/06/19	03/07/19	ASTM D4972-89 Mod
Sulfate as SO4		**33**	6.0	mg/kg	3	B9C0616	03/06/19	03/07/19	ASTM D4327

Notes and Definitions

DUP1	A high RPD was observed between a sample and this sample's duplicate.
µg/L	micrograms per liter (parts per billion concentration units)
mg/L	milligrams per liter (parts per million concentration units)
mg/kg	milligrams per kilogram (parts per million concentration units)
ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference

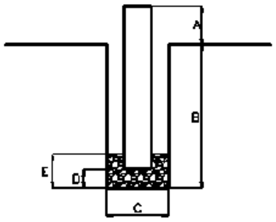
Analysis of pH, filtration, and residual chlorine is to take place immediately after sampling in the field. If the test was performed in the laboratory, the hold time was exceeded. **(for aqueous matrices only)**

APPENDIX D

RESULTS OF PERCOLATION TESTS

PERCOLATION TEST
No. P-1

Project: New Home Depot Store - Mission Valley **Project No.** D050R0.01
Location: San Diego **Test Date:** 3/13/2019
Boring Location J-8



A. Top of Pipe Above Ground	11 Inches
B. Depth of Hole	73 Inches
C. Diameter of Hole	8 Inches
D. Depth of Gravel Below Pipe	2 Inches
E. Total Gravel Layer Depth	30 Inches
F. Pipe Length	80 Inches
G. Pipe Diameter	2 Inches

Pre-saturated:	3/12/2019	to 32 inches from bottom at 2:45pm
Checked	3/13/2019	no water at 7:58 am

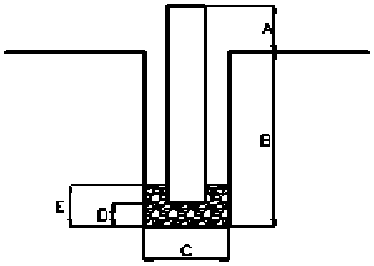
Gravel Correction Factor: 2.6

Trial	Date	Time	Depth To Water* (feet)	Time Interval (min)	Water Drop (inches)	Uncorrected, Unfactored Percolation Rate, (minutes per inch)	Unfactored Infiltration Rate, (Inches per hour)
1	3/13/2019	10:45:00	5.21				
	3/13/2019	11:15:00	5.63	30	5.04	15.2	0.4
2	3/13/2019	11:15:00	5.63				
	3/13/2019	11:47:00	5.81	32	2.16	37.9	0.2
3	3/13/2019	11:52:00	5.73				
	3/13/2019	12:02:00	5.78	10	0.6	42.7	0.2
4	3/13/2019	12:02:00	5.78				
	3/13/2019	12:12:00	5.87	10	1.08	23.7	0.3
5	3/13/2019	12:12:00	5.87				
	3/13/2019	12:24:00	5.95	12	0.96	32.0	0.2
6	3/13/2019	12:29:00	5.66				
	3/13/2019	12:39:00	5.71	10	0.6	42.7	0.2
7	3/13/2019	12:39:00	5.71				
	3/13/2019	12:49:00	5.76	10	0.6	42.7	0.2
8	3/13/2019	12:49:00	5.76				
	3/13/2019	12:59:00	5.80	10	0.48	53.3	0.1
9	3/13/2019	13:01:00	5.68				
	3/13/2019	13:31:00	5.80	30	1.44	53.3	0.1
10	3/13/2019	13:31:00	5.80				
	3/13/2019	14:01:00	5.91	30	1.32	58.2	0.1
11	3/13/2019	14:03:00	5.68				
	3/13/2019	14:33:00	5.81	30	1.56	49.2	0.1
12	3/13/2019	14:33:00	5.81				
	3/13/2019	15:03:00	5.94	30	1.56	49.2	0.2

* Depth to water measured from top of pipe

Project: New Home Depot Store - Mission Valley
Location: San Diego
Boring Location I-8

Project No. D050R0.01
Test Date: 3/13/2019



A. Top of Pipe Above Ground	23.5	Inches
B. Depth of Hole	123	Inches
C. Diameter of Hole	8	Inches
D. Depth of Gravel Below Pipe	2	Inches
E. Total Gravel Layer Depth	30	Inches
F. Pipe Length	144.5	Inches
G. Pipe Diameter	2	Inches

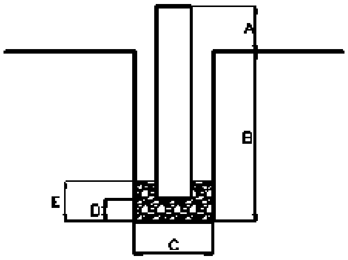
Pre-saturated:	3/12/2019	to 34 inches from bottom at 3:30pm
Checked	3/13/2019	no water at 7:54 am

Gravel Correction Factor: 2.6

Trial	Date	Time	Depth To Water* (feet)	Time Interval (min)	Water Drop (inches)	Uncorrected, Unfactored Percolation Rate, (minutes per inch)	Unfactored Infiltration Rate, (Inches per hour)
1	3/13/2019	8:09:00	11.06				
	3/13/2019	8:19:00	11.33	10.00	3.24	7.9	1.1
2	3/13/2019	8:19:00	11.33				
	3/13/2019	8:29:00	11.50	10.00	2.04	12.5	0.8
3	3/13/2019	8:29:00	11.50				
	3/13/2019	8:39:00	11.62	10.00	1.44	17.8	0.7
4	3/13/2019	9:06:00	11.07				
	3/13/2019	9:16:00	11.26	10.00	2.28	11.2	0.7
5	3/13/2019	9:26:00	11.07				
	3/13/2019	9:36:00	11.26	10.00	2.28	11.2	0.7
6	3/13/2019	9:38:00	11.02				
	3/13/2019	9:48:00	11.18	10.00	1.92	13.3	0.6
7	3/13/2019	10:00:00	11.05				
	3/13/2019	10:10:00	11.21	10.00	1.92	13.3	0.6
8	3/13/2019	10:14:00	11.04				
	3/13/2019	10:24:00	11.20	10.00	1.92	13.3	0.6
9	3/13/2019	10:27:00	11.04				
	3/13/2019	10:37:00	11.20	10.00	1.92	13.3	0.6
10	3/13/2019	10:50:00	11.04				
	3/13/2019	11:00:00	11.22	10.00	2.16	11.8	0.7
11	3/13/2019	11:03:00	11.04				
	3/13/2019	11:13:00	11.19	10.00	1.8	14.2	0.6
12	3/13/2019	11:27:00	10.99				
	3/13/2019	11:37:00	11.14	10.00	1.8	14.2	0.5

PERCOLATION TEST
No. P-3

Project: New Home Depot Store - Mission Valley
Project No. D050R0.01
Location: San Diego
Test Date: 3/13/2019
Boring Location K-8



A. Top of Pipe Above Ground	11	Inches
B. Depth of Hole	184	Inches
C. Diameter of Hole	8	Inches
D. Depth of Gravel Below Pipe	2	Inches
E. Total Gravel Layer Depth	31	Inches
F. Pipe Length	193	Inches
G. Pipe Diameter	2	Inches

Pre-saturated:	3/12/2019	to 35 inches from bottom at 4:05pm
Checked	3/13/2019	no water at 8:10 am

Gravel Correction Factor: 2.6

Trial	Date	Time	Depth To Water* (feet)	Time Interval (min)	Water Drop (inches)	Uncorrected, Unfactored Percolation Rate, (minutes per inch)	Unfactored Infiltration Rate, (Inches per hour)
1	3/13/2019	8:28:00	14.51				
	3/13/2019	8:38:00	14.75	10.00	2.88	8.9	0.6
2	3/13/2019	8:38:00	14.75				
	3/13/2019	8:48:00	14.89	10.00	1.68	15.2	0.4
3	3/13/2019	8:48:00	14.89				
	3/13/2019	8:58:00	15	10.00	1.32	19.4	0.3
4	3/13/2019	8:58:00	15				
	3/13/2019	9:08:00	15.22	10.00	2.64	9.7	0.8
5	3/13/2019	9:08:00	15.22				
	3/13/2019	9:18:00	15.31	10.00	1.08	23.7	0.4
6	3/13/2019	9:18:00	15.31				
	3/13/2019	9:28:00	15.38	10.00	0.84	30.5	0.3
7	3/13/2019	9:42:00	15.02				
	3/13/2019	9:52:00	15.14	10.00	1.44	17.8	0.4
8	3/13/2019	9:55:00	15.03				
	3/13/2019	10:05:00	15.14	10.00	1.32	19.4	0.4
9	3/13/2019	10:07:00	14.99				
	3/13/2019	10:17:00	15.1	10.00	1.32	19.4	0.4
10	3/13/2019	10:20:00	15.04				
	3/13/2019	10:30:00	15.15	10.00	1.32	19.4	0.4
11	3/13/2019	10:54:00	15.06				
	3/13/2019	11:04:00	15.17	10.00	1.32	19.4	0.4
12	3/13/2019	11:10:00	15.01				
	3/13/2019	11:20:00	15.12	10.00	1.32	19.4	0.4

APPENDIX E

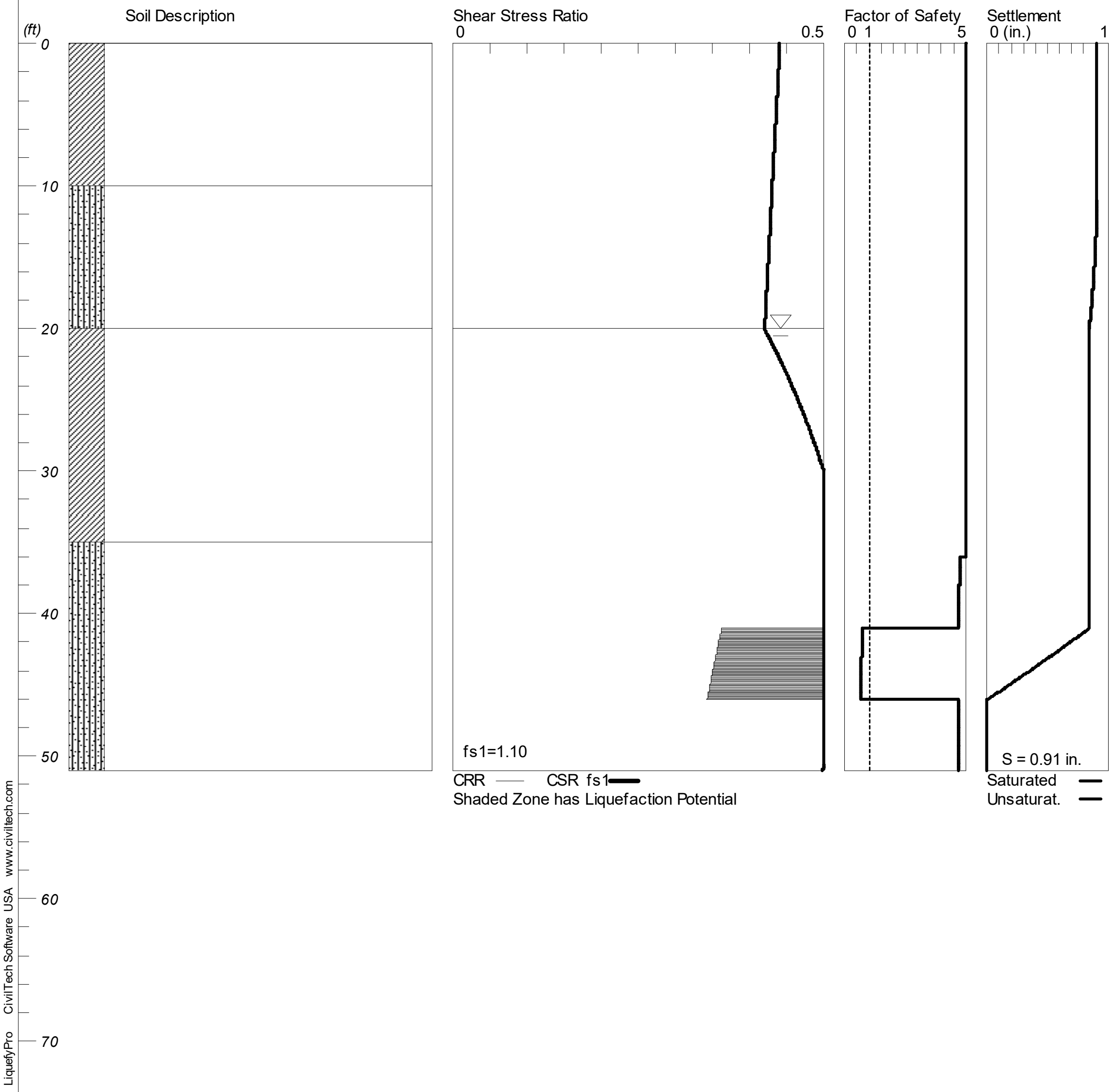
RESULTS OF LIQUEFACTION ANALYSIS

LIQUEFACTION ANALYSIS

Mission Valley Home Depot

Hole No.=A-2 Water Depth=20 ft Surface Elev.=54

Magnitude=6.89
Acceleration=0.617g



Moore Twining Associates, Inc. **1895 Camino del Rio S - San Diego**

Plate A-1

```
*******************************************************************************************************

                                   LIQUEFACTION ANALYSIS SUMMARY

                                   Copyright by CivilTech Software

                                     www.civiltechsoftware.com

    *******************************************************************************************************

        Font: Courier New, Regular, Size 8 is recommended for this report.

        Licensed to ,    1/8/2020 10:37:24 AM

        Input File Name: F:\ENG\Geotech\D050R0.01 - New Store - Mission Valley - San
Diego\Computations\Seismic Calcs\A-2 update to 7-16.liq

        Title:  Mission Valley Home Depot

        Subtitle:  1895 Camino del Rio S - San Diego

        Surface Elev.=54

        Hole No.=A-2

        Depth of Hole= 51.00 ft

        Water Table during Earthquake= 20.00 ft

        Water Table during In-Situ Testing= 29.50 ft

        Max. Acceleration= 0.62 g

        Earthquake Magnitude= 6.89

 Input Data:

        Surface Elev.=54

        Hole No.=A-2

        Depth of Hole=51.00 ft

        Water Table during Earthquake= 20.00 ft

        Water Table during In-Situ Testing= 29.50 ft

        Max. Acceleration=0.62 g

        Earthquake Magnitude=6.89

        No-Liquefiable Soils:   CL, OL are Non-Liq. Soil

        1. SPT or BPT Calculation.

        2. Settlement Analysis Method: Ishihara / Yoshimine

        3. Fines Correction for Liquefaction: Idriss/Seed

        4. Fine Correction for Settlement: During Liquefaction*

        5. Settlement Calculation in: All zones*

        6. Hammer Energy Ratio,                                  Ce = 1.4

        7. Borehole Diameter,                                        Cb= 1.15

        8. Sampling Method,                                          Cs= 1.2

        9. User request factor of safety (apply to CSR) ,   User= 1.1

           Plot one CSR curve (fs1=User)

        10. Use Curve Smoothing: No

        * Recommended Options
```

```
         In-Situ Test Data:
         Depth    SPT      gamma    Fines
         ft                pcf      %
         ____________________________________
         0.00     13.00    115.00   NoLiq
         6.00     10.00    115.00   NoLiq
         11.00    18.00    115.00   30.00
         16.00    16.00    115.00   30.00
         21.00    14.00    115.00   NoLiq
         26.00    61.00    115.00   NoLiq
         31.00    15.00    115.00   NoLiq
         36.00    24.00    115.00   15.00
         41.00    16.00    115.00   15.00
         46.00    50.00    115.00   15.00
         51.00    50.00    115.00   15.00
         ____________________________________

Output Results:
         Settlement of Saturated Sands=0.84 in.
         Settlement of Unsaturated Sands=0.07 in.
         Total Settlement of Saturated and Unsaturated Sands=0.91 in.
         Differential Settlement=0.455 to 0.600 in.

         Depth    CRRm     CSRfs    F.S.     S_sat.   S_dry    S_all
         ft                                  in.      in.      in.
         _______________________________________________________
         0.00     2.00     0.44     5.00     0.84     0.07     0.91
         1.00     2.00     0.44     5.00     0.84     0.07     0.91
         2.00     2.00     0.44     5.00     0.84     0.07     0.91
         3.00     2.00     0.44     5.00     0.84     0.07     0.91
         4.00     2.00     0.44     5.00     0.84     0.07     0.91
         5.00     2.00     0.44     5.00     0.84     0.07     0.91
         6.00     2.00     0.43     5.00     0.84     0.07     0.91
         7.00     2.00     0.43     5.00     0.84     0.07     0.91
         8.00     2.00     0.43     5.00     0.84     0.07     0.91
         9.00     2.00     0.43     5.00     0.84     0.07     0.91
         10.00    2.00     0.43     5.00     0.84     0.07     0.91
         11.00    2.48     0.43     5.00     0.84     0.07     0.91
         12.00    2.48     0.43     5.00     0.84     0.06     0.91
```

13.00	2.48	0.43	5.00	0.84	0.06	0.90
14.00	2.48	0.43	5.00	0.84	0.05	0.90
15.00	2.48	0.43	5.00	0.84	0.05	0.89
16.00	2.48	0.42	5.00	0.84	0.04	0.88
17.00	2.48	0.42	5.00	0.84	0.03	0.88
18.00	2.48	0.42	5.00	0.84	0.03	0.87
19.00	2.48	0.42	5.00	0.84	0.01	0.86
20.00	2.48	0.42	5.00	0.84	0.00	0.84
21.00	2.00	0.43	5.00	0.84	0.00	0.84
22.00	2.00	0.44	5.00	0.84	0.00	0.84
23.00	2.00	0.45	5.00	0.84	0.00	0.84
24.00	2.00	0.46	5.00	0.84	0.00	0.84
25.00	2.00	0.47	5.00	0.84	0.00	0.84
26.00	2.00	0.47	5.00	0.84	0.00	0.84
27.00	2.00	0.48	5.00	0.84	0.00	0.84
28.00	2.00	0.49	5.00	0.84	0.00	0.84
29.00	2.00	0.49	5.00	0.84	0.00	0.84
30.00	2.00	0.50	5.00	0.84	0.00	0.84
31.00	2.00	0.50	5.00	0.84	0.00	0.84
32.00	2.00	0.51	5.00	0.84	0.00	0.84
33.00	2.00	0.51	5.00	0.84	0.00	0.84
34.00	2.00	0.51	5.00	0.84	0.00	0.84
35.00	2.00	0.51	5.00	0.84	0.00	0.84
36.00	2.00	0.51	5.00	0.84	0.00	0.84
37.00	2.44	0.51	4.75	0.84	0.00	0.84
38.00	2.43	0.51	4.74	0.84	0.00	0.84
39.00	2.42	0.51	4.72	0.84	0.00	0.84
40.00	2.42	0.51	4.71	0.84	0.00	0.84
41.00	2.41	0.51	4.70	0.84	0.00	0.84
42.00	0.36	0.51	0.70*	0.69	0.00	0.69
43.00	0.35	0.51	0.69*	0.52	0.00	0.52
44.00	0.35	0.51	0.69*	0.36	0.00	0.36
45.00	0.35	0.51	0.68*	0.18	0.00	0.18
46.00	0.34	0.51	0.67*	0.01	0.00	0.01
47.00	2.38	0.51	4.69	0.00	0.00	0.00
48.00	2.37	0.51	4.69	0.00	0.00	0.00
49.00	2.37	0.50	4.70	0.00	0.00	0.00
50.00	2.36	0.50	4.71	0.00	0.00	0.00
51.00	2.35	0.50	4.72	0.00	0.00	0.00

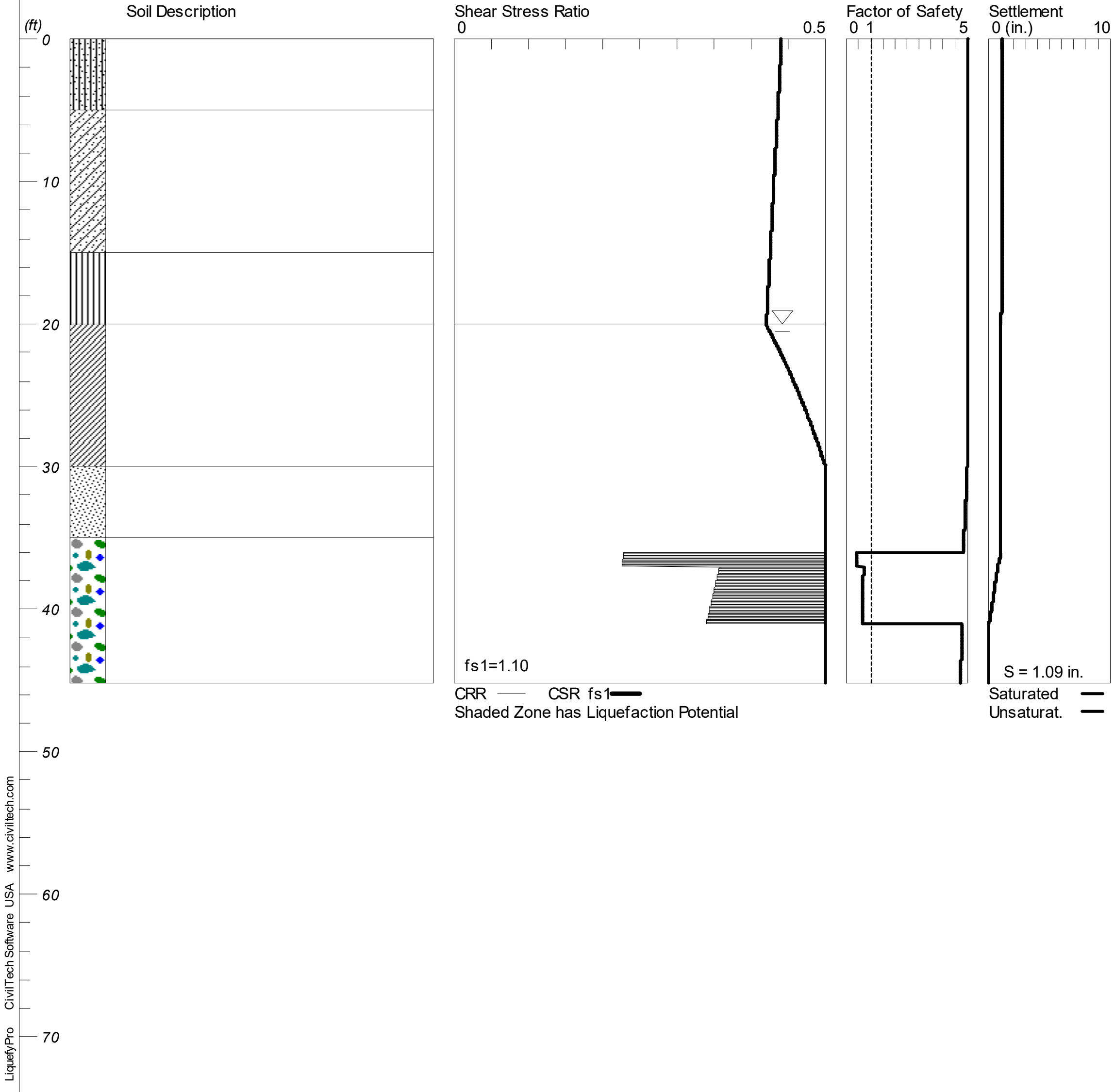
```
        _______________________________________________________

        * F.S.<1, Liquefaction Potential Zone

        (F.S. is limited to 5,    CRR is limited to 2,      CSR is limited to 2)


Units:  Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

        ____________________________________________________________________________________

1 atm (atmosphere) = 1 tsf (ton/ft2)

CRRm             Cyclic resistance ratio from soils

CSRsf            Cyclic stress ratio induced by a given earthquake (with user request factor of safety)

F.S.             Factor of Safety against liquefaction, F.S.=CRRm/CSRsf

S_sat            Settlement from saturated sands

S_dry            Settlement from Unsaturated Sands

S_all            Total Settlement from Saturated and Unsaturated Sands

NoLiq            No-Liquefy Soils
```

LIQUEFACTION ANALYSIS

Mission Valley Home Depot

Hole No.=M-8C Water Depth=20 ft Surface Elev.=51 ft

Magnitude=6.89
Acceleration=0.617g



Moore Twining Associates, Inc.

1895 Camino del Rio S - San Diego

Plate A-1

```
********************************************************************************************************

                                          LIQUEFACTION ANALYSIS SUMMARY

                                         Copyright by CivilTech Software

                                            www.civiltechsoftware.com

    ********************************************************************************************************

        Font: Courier New, Regular, Size 8 is recommended for this report.

        Licensed to ,    1/8/2020 11:31:36 AM

        Input File Name: F:\ENG\Geotech\D050R0.01 - New Store - Mission Valley - San
Diego\Computations\Seismic Calcs\M-8C.liq

        Title:  Mission Valley Home Depot

        Subtitle:  1895 Camino del Rio S - San Diego

        Surface Elev.=51 ft

        Hole No.=M-8C

        Depth of Hole= 45.20 ft

        Water Table during Earthquake= 20.00 ft

        Water Table during In-Situ Testing= 26.00 ft

        Max. Acceleration= 0.62 g

        Earthquake Magnitude= 6.89

 Input Data:

        Surface Elev.=51 ft

        Hole No.=M-8C

        Depth of Hole=45.20 ft

        Water Table during Earthquake= 20.00 ft

        Water Table during In-Situ Testing= 26.00 ft

        Max. Acceleration=0.62 g

        Earthquake Magnitude=6.89

        No-Liquefiable Soils:   CL, OL are Non-Liq. Soil

        1. SPT or BPT Calculation.

        2. Settlement Analysis Method: Ishihara / Yoshimine

        3. Fines Correction for Liquefaction: Idriss/Seed

        4. Fine Correction for Settlement: During Liquefaction*

        5. Settlement Calculation in: All zones*

        6. Hammer Energy Ratio,                                  Ce = 1.6

        7. Borehole Diameter,                                        Cb= 1.15

        8. Sampling Method,                                         Cs= 1.2

        9. User request factor of safety (apply to CSR) ,   User= 1.1

           Plot one CSR curve (fs1=User)

        10. Use Curve Smoothing: No

        * Recommended Options
```

```
         In-Situ Test Data:
         Depth    SPT      gamma    Fines
         ft                pcf      %
         ____________________________________
         0.00     15.00    115.00   30.00
         6.00     15.00    115.00   30.00
         11.00    14.00    115.00   60.00
         16.00    18.00    115.00   60.00
         21.00    18.00    115.00   NoLiq
         26.00    22.00    115.00   NoLiq
         28.00    37.00    115.00   NoLiq
         30.00    35.00    115.00   4.00
         33.00    18.00    115.00   4.00
         36.00    10.00    115.00   4.00
         37.00    15.00    115.00   4.00
         41.00    50.00    115.00   4.00
         45.00    50.00    115.00   4.00
         ____________________________________

Output Results:
         Settlement of Saturated Sands=1.01 in.
         Settlement of Unsaturated Sands=0.08 in.
         Total Settlement of Saturated and Unsaturated Sands=1.09 in.
         Differential Settlement=0.545 to 0.720 in.

         Depth    CRRm     CSRfs    F.S.     S_sat.   S_dry    S_all
         ft                                  in.      in.      in.
         ________________________________________________________
         0.00     2.48     0.44     5.00     1.01     0.08     1.09
         1.00     2.48     0.44     5.00     1.01     0.08     1.09
         2.00     2.48     0.44     5.00     1.01     0.08     1.09
         3.00     2.48     0.44     5.00     1.01     0.08     1.09
         4.00     2.48     0.44     5.00     1.01     0.08     1.09
         5.00     2.48     0.44     5.00     1.01     0.07     1.08
         6.00     2.48     0.43     5.00     1.01     0.07     1.08
         7.00     2.48     0.43     5.00     1.01     0.07     1.08
         8.00     2.48     0.43     5.00     1.01     0.07     1.08
         9.00     2.48     0.43     5.00     1.01     0.06     1.07
         10.00    2.48     0.43     5.00     1.01     0.06     1.07
```

```
        11.00   2.48    0.43    5.00    1.01    0.06    1.07
        12.00   2.48    0.43    5.00    1.01    0.05    1.06
        13.00   2.48    0.43    5.00    1.01    0.05    1.06
        14.00   2.48    0.43    5.00    1.01    0.04    1.05
        15.00   2.48    0.43    5.00    1.01    0.03    1.05
        16.00   2.48    0.42    5.00    1.01    0.03    1.04
        17.00   2.48    0.42    5.00    1.01    0.02    1.03
        18.00   2.48    0.42    5.00    1.01    0.02    1.03
        19.00   2.48    0.42    5.00    1.01    0.01    1.02
        20.00   2.48    0.42    5.00    1.01    0.00    1.01
        21.00   2.00    0.43    5.00    1.01    0.00    1.01
        22.00   2.00    0.44    5.00    1.01    0.00    1.01
        23.00   2.00    0.45    5.00    1.01    0.00    1.01
        24.00   2.00    0.46    5.00    1.01    0.00    1.01
        25.00   2.00    0.47    5.00    1.01    0.00    1.01
        26.00   2.00    0.47    5.00    1.01    0.00    1.01
        27.00   2.00    0.48    5.00    1.01    0.00    1.01
        28.00   2.00    0.49    5.00    1.01    0.00    1.01
        29.00   2.00    0.49    5.00    1.01    0.00    1.01
        30.00   2.00    0.50    5.00    1.01    0.00    1.01
        31.00   2.50    0.50    4.97    1.01    0.00    1.01
        32.00   2.49    0.51    4.93    1.01    0.00    1.01
        33.00   2.49    0.51    4.90    1.01    0.00    1.01
        34.00   2.48    0.51    4.87    1.01    0.00    1.01
        35.00   2.47    0.51    4.85    1.01    0.00    1.01
        36.00   2.47    0.51    4.82    1.01    0.00    1.01
        37.00   0.23    0.51    0.44*   0.73    0.00    0.73
        38.00   0.35    0.51    0.69*   0.55    0.00    0.55
        39.00   0.35    0.51    0.68*   0.37    0.00    0.37
        40.00   0.34    0.51    0.67*   0.19    0.00    0.19
        41.00   0.34    0.51    0.66*   0.01    0.00    0.01
        42.00   2.43    0.51    4.74    0.00    0.00    0.00
        43.00   2.42    0.51    4.74    0.00    0.00    0.00
        44.00   2.42    0.51    4.74    0.00    0.00    0.00
        45.00   2.41    0.51    4.73    0.00    0.00    0.00
```

---

* F.S.<1, Liquefaction Potential Zone

(F.S. is limited to 5,   CRR is limited to 2,   CSR is limited to 2)

Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

1 atm (atmosphere) = 1 tsf (ton/ft2)

CRRm	Cyclic resistance ratio from soils
CSRsf	Cyclic stress ratio induced by a given earthquake (with user request factor of safety)
F.S.	Factor of Safety against liquefaction, F.S.=CRRm/CSRsf
S_sat	Settlement from saturated sands
S_dry	Settlement from Unsaturated Sands
S_all	Total Settlement from Saturated and Unsaturated Sands
NoLiq	No-Liquefy Soils

GRL engineers, inc.

Dynamic
Measurements
and Analyses

Job No. 198075-2

Report on:
Energy Measurement for Dynamic Penetrometers – Standard Penetration Test Truck 75192H1 CME 75 Drill Rig Calibration
Lemoore, CA

Prepared for Moore Twining Associates, Inc.
By Camilo Alvarez, PE & Diego A. Campos

July 10, 2019

www.GRLengineers.com info@GRLengineers.com

GRL
Dynamic Measurements and Analyses
engineers, inc.

July 11, 2019

Allen Bushey
Moore Twining Associates, Inc

Re: Energy Measurement for Dynamic Penetrometers
Standard Penetration Test (SPT) on Truck 75192H1 CME 75 drill rig
Lemoore, CA. GRL Job No. 198075-2

Dear Mr. Allen Bushey:

This report transmits our findings from energy measurements and related data analysis conducted by GRL Engineers, Inc. (GRL) for your Truck 75192H1 mounted CME 75 drill rig located in Lemoore, CA. One automatic hammer and penetrometer system was monitored during Standard Penetration Test (SPT) of the test borehole. Dynamic testing summarized in this report was conducted on July 10, 2019.

The purpose in collecting the SPT energy measurements was to compute the energy transfer efficiency for a single SPT hammer. To meet this objective, an 8G Model, Pile Driving Analyzer® (PDA) utilizing the SPT Analyzer feature was used to acquire and process the dynamic test data. Additional information regarding the testing equipment and analytical procedures is provided in Appendix A.

Test Sequence

Using an instrumented AW-J rod for a Truck 75192H1 mounted CME 75 drill rig at test borehole, energy measurements were made at five sample depths for the drill rig. From BH1, the dynamic measurements were obtained from sample depths of 2.0, 5.0, 10.0, 15.0 and 20.0 ft. Each sample depth consisted of energy measurements of 18 inches of driving.

Energy Transfer Measurements

A Model 8G Pile Driving Analyzer was used to take measurements of strain and acceleration. The strain and acceleration signals were conditioned and converted to forces and velocities by the PDA. The PDA interprets the measured dynamic data according to the Case Method equations. Force and velocity records from the PDA were also viewed graphically on an LCD screen to evaluate data quality. All force and velocity records were also digitally stored for subsequent analysis.

The maximum energy transferred to the rod (EMX) was calculated by integrating both the force and velocity records over time as follows:

$$EMX = \int F(t)V(t)dt$$

Where: $F(t)$ = the force at time t
$V(t)$ = the velocity at time t

The energy transfer ratio or efficiency is computed by dividing EMX by the theoretical SPT hammer energy of 350 lb-ft (computed from the product of the hammer weight, assumed to be the standard 140 lbs, and the fall height, assumed to be 2.5 ft). The SPT N values can then be corrected for a nominal 60% transfer efficiency, $N_{60,}$ as follows:

$$N_{60} = (e_m / 60) N_m$$

Where: e_m = the measured transfer ratio (ETR)
N_m = the measured SPT "N" value

Conclusions

Table 1 in Appendix B presents a summary of the average transferred energy and the energy transfer ratio for the single drill rig at each sample depth calculated using the *EMX* equation. Included in Table 1 are also average values of the hammer operating rate, maximum impact force and maximum velocity of the rod. The overall performance, which represents the average of data from all sample depths for each rig/rod type is also shown. Complete data, including the maximum, minimum and standard deviation for each sampling depth, is included in Appendix B.

For the Truck 75192H1 mounted CME 75 drill rig-RIG 156, the average energy transfer ratio from individual sample depths ranged from 81.3 to 96.9%.

The average, overall transfer ratio (for all sampling depths weighted by N-values for each sample) were as follows:

SPT Rig (*Serial Number*)	Overall Transfer Efficiency	Hammer Operating Rate (BPM)
Truck 75192H1 CME 75 drill rig 156	**88.9%**	**40.4**

Presented N_{60} values, provided in the Table 1 in Appendix B, does not account for any required corrections such as those for overburden or sampling spoon.

We appreciate the opportunity to be of assistance to you. Please do not hesitate to contact us if you have any questions regarding this report, or if we may be of further service.

Respectfully,
GRL Engineers, Inc.

Registered Professional Engineer
Camilo A Alvarez
No. 67938
Exp. 6/30/21
Civil
State of California

Alvarez

Diego Campos

Camilo Alvarez, P.E.
Senior Engineer

Diego Campos, EIT
Engineer

APPENDIX A
AN INTRODUCTION INTO SPT DYNAMIC PILE TESTING

1. BACKGROUND

The Standard Penetration Test is frequently conducted as an in-situ assessment of soil strength. This test requires that a 140 lb weight is dropped 30 inches onto a drive rod at whose bottom a sampler is usually installed. The sampler is driven for 18 inches; the number of blows required for the last 12 inches of driving is the so-called N-value. The N-value may be used as a strength indicator for foundation design or as a means of assessing the liquefaction potential of soils.

Obviously, the SPT hammer efficiency is an important consideration when using the N-values for design purposes. Measurements have indicated that the energy in the drive rod is sometimes only 30% and and may reach 90% of the potential or rated energy of the SPT hammer (E-rated = 0.35 kip-ft or 0.475 kJ). The type of hammer used to drive the rod is the main reason for these variations. On the average, the energy in the drive rod is 60% of the standard rated energy.

Because of the variability of energy, methods based on N-values are considered unreliable. However, measurements during SPT testing using the Case Method can be done on a routine basis and these measurements yield the transferred energy values. With measured energy, EMX, known, an adjustment of the measured N-value, N_m, can be made as follows.

$$N_{60} = N_m \left[E_m / (0.6E_r)\right] \qquad (1)$$

Thus, if the measured energy value is equal to the normally expected transferred energy of 60% of E-rated then the adjusted and measured N-values are identical. On the other hand, if the measured energy is only 30% then the adjusted blow count will be reduced by 50%.

2. DYNAMIC TESTING AND ANALYSIS METHODS APPLIED TO SPT

The Case Method of dynamic pile testing, named after the Case Institute of Technology where it was developed between 1964 and 1975, requires that a substantial ram mass (e.g. a pile driving hammer) impacts the pile top such that the pile undergoes at least a small permanent set. Thus, the method is also referred to as a “High Strain Method”. The Case Method requires dynamic measurements on the pile or shaft under the ram impact and then a calculation of various quantities. Conveniently, for SPT applications, the measurements and analyses are done by a single piece of equipment: the SPT Analyzer. The Pile Driving Analyzer® (PDA) is also suitable to perform these measurements and data processing.

A related analysis method is the “Wave Equation Analysis” which calculates a relationship between bearing capacity, pile stresses, transferred energy and field blow count. The GRLWEAP™ program performs this analysis and provides a complete set of helpful information and input data. This program can be used very effectively to simulate the SPT driving process.

3. MEASUREMENTS

GRL uses equipment manufactured by Pile Dynamics, Inc. The system includes either an SPT-Analyzer™ (SPTA) or a Pile Driving Analyzer® (PDA), an instrumented rod section and two accelerometers. SPT energy testing is very closely related to and borrows procedures from dynamic pile testing. Those interested in the basis of the SPT energy testing method may obtain extensive literature on dynamic pile testing from GRL Engineers, Inc.

3.1 SPT Analyzer or Pile Driving Analyzer

The basis for the results calculated by the SPTA or PDA are strain and acceleration measured in an instrumented rod section. These signals are converted to rod top force, F(t), and rod top velocity, v(t). The SPTA or PDA conditions, calibrates and displays these signals and immediately computes average pile force and velocity thereby eliminating bending effects. The product of these two measurements is then integrated over time which yields the energy transferred to the instrumented section as a function of time (see Section 4.1).

For convenience and accuracy, strain measurements are usually taken on an instrumented section of SPT drive rod. Ideally, the section properties of the instrumented rod and those of the drive rod are the same, however, using subs, other sections can also be utilized.

For the instrumented section, PDI provides a force calibration in such a way that the output of the instrumented rod is directly calculated without the need for an accurate elastic modulus or cross sectional area of the rod section.

The acceleration measurements are often demanding in the SPT environment, because of high frequency and high acceleration motion components. An experienced measurement engineer, therefore, has to evaluate the quality of this data before final conclusions are drawn from the numerical results calculated by SPTA or PDA.

SPTA or PDA records are taken while the standard N-value is acquired in the conventional manner. This then allows a direct correlation between N-value and average transferred energy.

3.2 HPA

The SPT hammer’s ram velocity may be directly obtained using radar technology in the Hammer Performance Analyzer™. The impact velocity results can be automatically processed with a PC or recorded on a strip chart. HPA measurements yield a hammer kinetic energy, but not the energy transferred to the drive rod.

4 RECORD EVALUATION BY SPTA OR PDA

4.1 HAMMER PERFORMANCE

The PDA calculates the energy transferred to the pile top from:

$$E(t) = {}_{0}\int^{t} F(\tau)v(\tau)\, d\tau \qquad (2)$$

The maximum of the E(t) curve is often called **ENTHRU or EMX;** it is the most important quantity for an overall evaluation of the performance of a hammer and driving system. **EMX** allows for a classification of the hammer's performance when presented as, e_T, the rated transfer efficiency, also called energy transfer ratio (**ETR**) or global efficiency.

$$e_T = EMX/E_R \qquad (3)$$

where E_R is the hammer manufacturer’s rated energy value or 0.35 kip-ft (0.475 kJ) in the case of the SPT hammer.

Often in the SPT literature one finds also reference to the EF2 energy. This evaluation is based on assumed proportionality between force and velocity (see also Section 5):

$$v(t) = F(t) / Z \qquad (4)$$

where Z = EA/c is the pile impedance, E is the elastic modulus, A is the cross sectional area and c is the speed of the stress wave in the pile material..

Combining equations 2 and 4 leads to

$$EF(t) = {}_{0}\int^{t} F(\tau)^2 / Z\, d\tau \qquad (5)$$

The EF2 transferred energy value is the EF-value at the time t = 2L/c, where L is the drive rod length and c is the stress wave speed in steel (16,800 ft/s or 5,124 m/s). Since the force is easier to measure than both force and velocity, Equation 5 is preferred by some test engineers. However, the EF method is fraught with errors and certain correction factors have to be applied to make it approximately correct. Among the error sources are the following:

- Proportionality is often violated prior to time 2L/c. The proportionality between force and velocity in a downward traveling wave only holds if the wave does not encounter a disturbance prior to reflecting off the pile toe. Such disturbances include a change in cross sectional area, an open or loose splice or joint, or resistance along the shaft.
- Using only one force measurement precludes a data quality check based on the proportionality between force and velocity. Thus, a force measurement that is for some reason in error may not be detectable, which will lead to errors in the EF2 value. Data quality checks will be discussed further in Section 5.

The use if EF2 is therefore not recommended but it is often included in result presentations for the sake of completeness.

4.2 STRESSES

During SPT monitoring, it is also of interest to monitor compressive stresses at both the top of the drive rod and at its bottom.

At the pile top (location of sensors) the maximum compression stress averaged over the rod's cross section, **CSX**, is directly obtained from the measurements. Note that this stress value refers to the instrumented section. If the rod has a different cross sectional area then the stress in the rod will be different from CSX.

The SPTA or PDA can also calculate, in an approximate manner, the force at the rod bottom, **CFB**. To obtain the corresponding stress, this force value should be divided by the appropriate cross sectional area, e.g. by the rod area just above the sampler or by the sampler area itself. Of course, non-uniform stress components as they might occur at the sampler tip due to a sloping rock are not considered in this calculation.

5. DATA QUALITY CHECKS

Quality data is the first and foremost requirement for accurate dynamic testing results. It is therefore important that the measurement engineer performing SPTA or PDA tests has the experience necessary to recognize measurement problems and take appropriate corrective action should problems develop. Fortunately, dynamic pile testing allows for certain data quality checks because two independent measurements are taken that have to conform to the so-called proportionality relationship.

As long as there is only a wave traveling in one direction, as is the case during impact when only a downward traveling wave exists in the rod, force and velocity measured at its top are proportional

$$F = v\ Z \qquad (5)$$

where Z is again the pile impedance, Z = EA/c. This relationship can also be expressed in terms of stress

$$\sigma = F/A = v\ (E/c) \qquad (6)$$

or strain

$$\epsilon = \sigma/E = v\ /\ c \qquad (7)$$

This means that the early portion of strain times wave speed must be equal to the velocity unless the proportionality is affected by high friction near the pile top or by a pile cross sectional change not far below the sensors. Checking the proportionality is an excellent means of assuring meaningful measurements but is only truly meaningful for perfectly uniform rods. Open or loose splices, for example, will lead to a non-proportionality. For SPT rods it is fortunate that usually no soil resistance acts along the shaft and for that reason, proportionality can exist until the stress wave returns from sampler top or rod bottom unless connectors are not sufficiently tightened or have a significant mass.

Velocity data quality can also be checked by looking at the final displacement, DFN, which is calculated from the acceleration by double integration. If the calculated final displacement is much higher or lower than indicated by the N-value, the accelerometer attachment may be loose or the sensor may be faulty. If major drift in the velocity is observed, the EMX value may be in error, even though proportionality from impact to time 2L/c exists. In this case, it may be useful to evaluate the energy transferred to the drill rod at time 2L/c, which is calculated by the PDA or SPTA as the E2E quantity.

Appendix B

SPT Analyses Results

Summary of SPT Test Results

Project: CME 75 - RIG 156 - 75192H1, Test Date: 7/10/2019

FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows/Minute

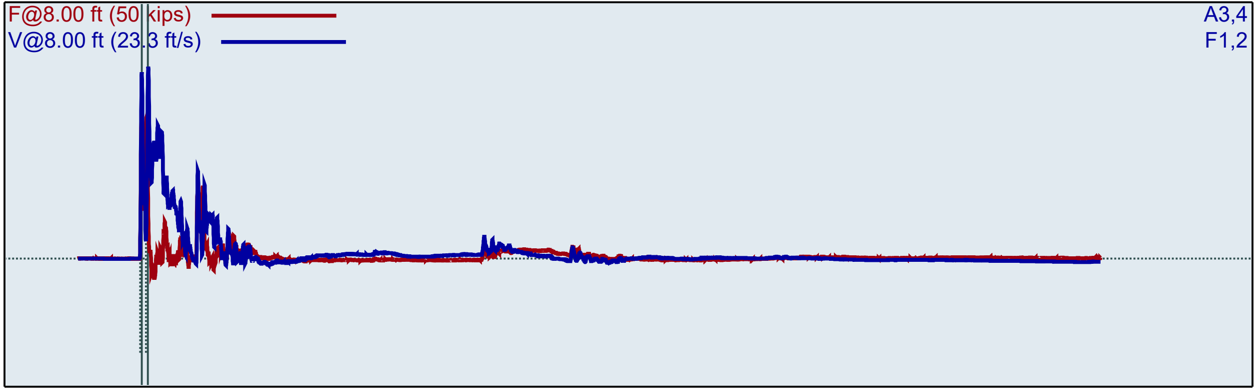
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

Instr. Length ft	Blows Applied /6"	**N Value**	**N60 Value**	Average FMX kips	Average VMX ft/s	Average BPM bpm	Average EFV ft-lb	Average ETR %
8.00	**4-6-8**	**14**	**20**	29	17.6	44.4	320	91.5
9.00	**3-3-3**	**6**	**8**	27	18.2	37.2	284	81.3
12.50	**1-3-7**	**10**	**14**	28	18.0	40.0	339	96.9
18.50	**3-1-10**	**11**	**16**	30	17.5	40.0	307	87.6
23.50	**2-8-13**	**21**	**31**	29	17.0	39.1	302	86.2
			Overall Average Values:	29	17.5	40.4	311	88.9
			Standard Deviation:	1	0.6	2.3	20	5.7
			Overall Maximum Value:	31	19.1	44.7	373	106.6
			Overall Minimum Value:	27	16.6	37.1	271	77.6

CME 75 - RIG 156 - 75192H1 At 2 feet
DC Test date: 7/10/2019

AR: 1.20 in^2 SP: 0.492 k/ft3
LE: 8.00 ft EM: 30000 ksi
WS: 16807.9 ft/s

Depth: (2.00 - 3.50 ft], displaying BN: 16



F1 : [217AWJ2] 214.53 PDICAL (1.03) FF6
F2 : [217AWJ1] 214 PDICAL (1.03) FF6

A3 (PR): [K4695] 378 mv/6.4v/5000g (0.97) VF6
A4 (PR): [K1388] 384 mv/6.4v/5000g (0.97) VF6

FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows/Minute

EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	BC /6"	FMX kips	VMX ft/s	BPM bpm	EFV ft-lb	ETR %
1	4	28	17.1	1.9	298	85.1
2	4	29	17.6	44.3	308	88.0
3	4	29	17.5	44.6	323	92.3
4	4	28	17.3	44.0	325	92.9
5	6	28	17.3	44.6	316	90.3
6	6	29	17.7	44.0	337	96.3
7	6	28	17.3	44.7	310	88.6
8	6	28	17.1	44.6	310	88.7
9	6	29	17.5	44.3	331	94.6
10	6	29	17.6	44.6	320	91.4
11	8	29	17.4	44.4	330	94.2
12	8	29	17.3	44.5	325	92.8
13	8	29	17.9	44.4	335	95.7
14	8	29	17.8	44.4	315	90.1
15	8	30	17.5	44.4	316	90.2
16	8	28	17.5	44.4	309	88.3
17	8	28	17.9	44.5	311	88.8
18	8	29	18.0	44.4	321	91.6
	Average	29	17.6	44.4	320	91.5
	Std Dev	1	0.3	0.2	9	2.6
	Maximum	30	18.0	44.7	337	96.3
	Minimum	28	17.1	44.0	309	88.3

N-value: 14

BN: 18 4-6-8

Sample Interval Time: 22.97 seconds.

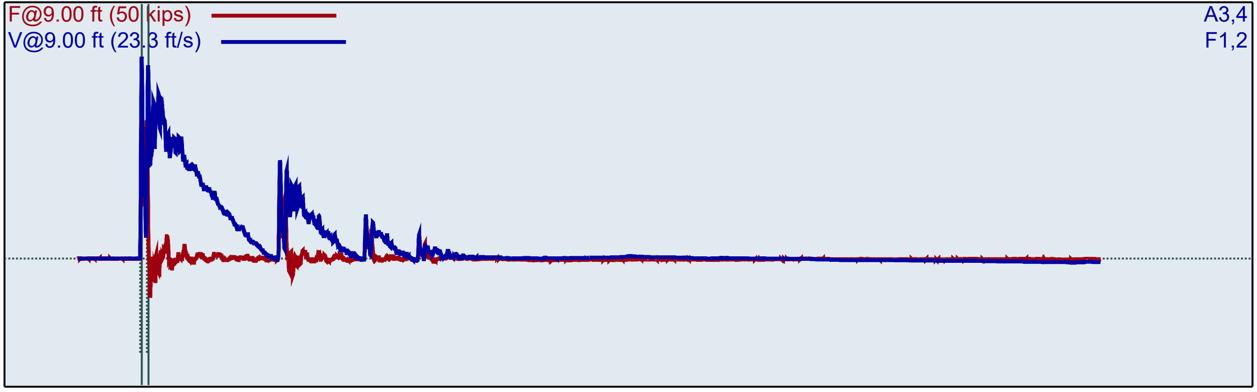
CME 75 - RIG 156 - 75192H1
DC

At 2 feet
Test date: 7/10/2019

AR: 1.20 in^2
LE: 9.00 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (5.00 - 6.50 ft], displaying BN: 25



F1 : [217AWJ2] 214.53 PDICAL (1) FF6
F2 : [217AWJ1] 214 PDICAL (1) FF6

A3 (PR): [K4695] 378 mv/6.4v/5000g (1) VF6
A4 (PR): [K1388] 384 mv/6.4v/5000g (1) VF6

BL#	BC /6"	FMX kips	VMX ft/s	BPM bpm	EFV ft-lb	ETR %
19	3	26	17.8	5.2	270	77.3
20	3	26	17.9	36.8	252	72.0
21	3	27	17.7	37.1	262	74.9
22	3	27	17.9	37.1	275	78.5
23	3	27	18.2	37.2	288	82.3
24	3	27	18.5	37.2	274	78.2
25	3	27	18.4	37.1	285	81.3
26	3	28	18.2	37.2	291	83.1
27	3	27	18.2	37.2	295	84.3
	Average	27	18.2	37.2	284	81.3
	Std Dev	0	0.2	0.1	8	2.3
	Maximum	28	18.5	37.2	295	84.3
	Minimum	27	17.9	37.1	274	78.2

N-value: 6

BN: 27 3-3-3

Sample Interval Time: 12.91 seconds.

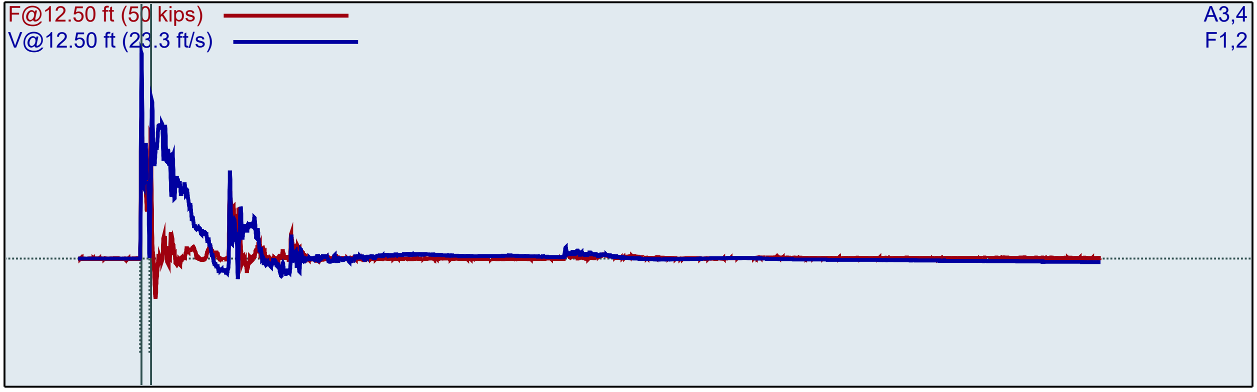
CME 75 - RIG 156 - 75192H1
DC

At 2 feet
Test date: 7/10/2019

AR: 1.20 in^2
LE: 12.50 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (10.00 - 11.50 ft], displaying BN: 36



F1 : [217AWJ2] 214.53 PDICAL (1) FF6
F2 : [217AWJ1] 214 PDICAL (1) FF6

A3 (PR): [K4695] 378 mv/6.4v/5000g (1) VF6
A4 (PR): [K1388] 384 mv/6.4v/5000g (1) VF6

BL#	BC /6"	FMX kips	VMX ft/s	BPM bpm	EFV ft-lb	ETR %
28	1	27	17.7	1.9	308	87.9
29	3	28	17.5	39.6	314	89.8
30	3	29	17.8	40.1	320	91.4
31	3	28	17.1	40.2	329	94.1
32	7	28	17.3	40.2	322	91.9
33	7	28	17.4	40.2	321	91.7
34	7	28	17.9	40.3	350	100.0
35	7	29	18.0	40.0	349	99.7
36	7	28	18.7	39.8	349	99.8
37	7	29	18.9	40.0	365	104.3
38	7	29	19.1	39.9	373	106.6
	Average	28	18.0	40.0	339	96.9
	Std Dev	0	0.7	0.2	20	5.6
	Maximum	29	19.1	40.3	373	106.6
	Minimum	28	17.1	39.6	314	89.8

N-value: 10

BN: 38 1-3-7

Sample Interval Time: 14.99 seconds.

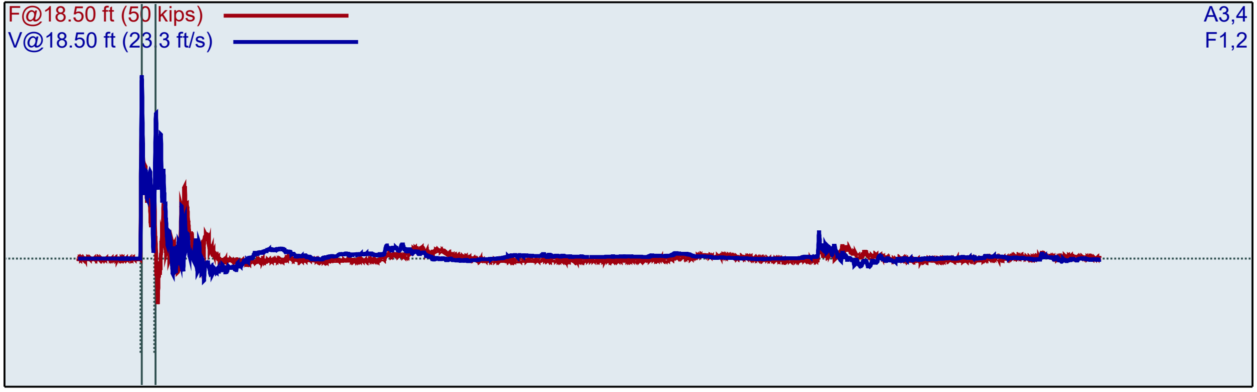
CME 75 - RIG 156 - 75192H1
DC

At 2 feet
Test date: 7/10/2019

AR: 1.20 in^2
LE: 18.50 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (15.00 - 16.50 ft], displaying BN: 50



F1 : [217AWJ2] 214.53 PDICAL (1) FF1
F2 : [217AWJ1] 214 PDICAL (1) FF1

A3 (PR): [K4695] 378 mv/6.4v/5000g (1) VF1
A4 (PR): [K1388] 384 mv/6.4v/5000g (1) VF1

BL#	BC /6"	FMX kips	VMX ft/s	BPM bpm	EFV ft-lb	ETR %
39	3	28	18.2	13.7	264	75.6
40	3	31	18.7	40.4	278	79.5
41	3	31	18.5	40.5	279	79.6
42	1	29	18.5	40.5	271	77.6
43	10	30	18.1	40.2	310	88.6
44	10	29	17.1	40.2	313	89.5
45	10	29	17.2	40.1	313	89.4
46	10	29	17.1	40.2	309	88.3
47	10	31	18.5	39.9	321	91.8
48	10	29	17.0	39.9	304	86.7
49	10	31	18.0	39.8	310	88.6
50	10	29	16.7	39.8	302	86.3
51	10	29	16.9	39.7	314	89.8
52	10	29	17.1	39.7	306	87.3
	Average	30	17.5	40.0	307	87.6
	Std Dev	1	0.6	0.2	12	3.5
	Maximum	31	18.5	40.5	321	91.8
	Minimum	29	16.7	39.7	271	77.6

N-value: 11

BN: 52 3-1-10

Sample Interval Time: 19.45 seconds.

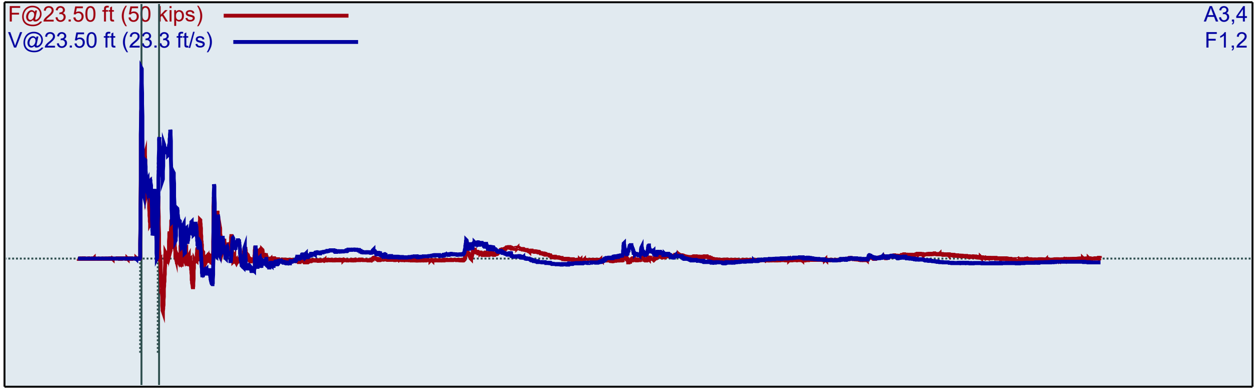
CME 75 - RIG 156 - 75192H1
DC

At 2 feet
Test date: 7/10/2019

AR: 1.20 in^2
LE: 23.50 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (20.00 - 21.50 ft], displaying BN: 73



F1 : [217AWJ2] 214.53 PDICAL (1) FF6
F2 : [217AWJ1] 214 PDICAL (1) FF6

A3 (PR): [K4695] 378 mv/6.4v/5000g (1) VF6
A4 (PR): [K1388] 384 mv/6.4v/5000g (1) VF6

BL#	BC /6"	FMX kips	VMX ft/s	BPM bpm	EFV ft-lb	ETR %
53	2	28	17.3	4.6	277	79.1
54	2	29	16.8	38.3	273	78.0
55	8	29	17.0	38.8	291	83.2
56	8	28	17.0	38.8	281	80.4
57	8	28	16.6	39.1	283	80.8
58	8	29	16.7	39.0	308	88.0
59	8	29	17.0	39.1	296	84.4
60	8	29	16.8	39.1	305	87.1
61	8	28	16.7	39.1	289	82.5
62	8	29	17.4	39.2	307	87.7
63	13	28	16.7	39.3	306	87.3
64	13	29	17.2	39.3	308	87.9
65	13	29	17.2	39.1	304	86.7
66	13	28	16.8	39.2	304	86.8
67	13	29	17.0	39.2	304	86.7
68	13	29	16.8	39.2	305	87.2
69	13	29	17.4	39.2	304	86.7
70	13	29	17.5	39.2	310	88.7
71	13	29	17.2	39.2	303	86.4
72	13	29	17.6	39.2	306	87.3
73	13	29	17.3	39.2	312	89.1
74	13	29	17.0	39.1	318	90.7
75	13	28	16.9	39.2	296	84.5
	Average	29	17.0	39.1	302	86.2
	Std Dev	0	0.3	0.1	9	2.6
	Maximum	29	17.6	39.3	318	90.7
	Minimum	28	16.6	38.8	281	80.4

N-value: 21

BN: 75 2-8-13

Sample Interval Time: 33.74 seconds.