



Geotechnical Engineering Report

New Data Center – SFO069
Gilroy, Santa Clara County, California

September 16, 2020

Terracon Project No. ND205052

Prepared for:

Kimley-Horn & Associates, Inc.
Orange, California

Prepared by:

Terracon Consultants, Inc.
Concord, California



September 16, 2020

Kimley-Horn & Associates, Inc.
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Attn: Mr. Miles Johnson
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Re: Geotechnical Engineering Report
New Data Center – SFO069
Arroyo Circle and Gilman Road
Gilroy, Santa Clara County, California
Terracon Project No. ND205052

Dear Mr. Johnson:

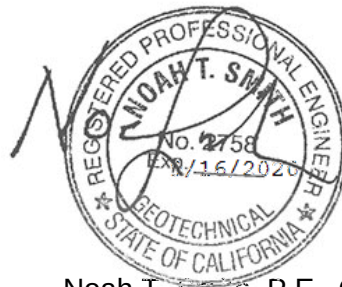
We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. PND205052 dated May 27, 2020. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, pavements, and floor slabs for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

A handwritten signature in black ink, appearing to read "Hoda", followed by a stylized flourish.

Hoda Alinasabbaboli, E.I.T.
Project Engineer



Noah T. Smith, P.E., G.E.
Principal

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Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the [GeoReport](#) logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
PHOTOGRAPHY LOG
SITE LOCATION AND EXPLORATION PLANS
EXPLORATION RESULTS
SUPPORTING INFORMATION

Note: Refer to each individual Attachment for a listing of contents.

REPORT SUMMARY

Topic ¹	Overview Statement ²
Project Description	The project site is currently undeveloped. The project will consist of the construction of a data center. We understand project will consist of two phases. The current phase one project includes the construction of one single-story data center building with a footprint of about 250,000 square feet (sf), an associated equipment yard, a security building with a footprint of about 2,500 sf, paved parking and drives, and bio-retention facilities. ■ Columns: 100 to 150 kips ■ Walls: 7 to 8 kips per linear foot (klf)
Geotechnical Characterization	Subgrade soils encountered in our borings and CPTs generally consisted of 7½ to 15 feet of medium to very stiff clay underlain by 14 to 27 feet of loose to dense sand with variable amounts of gravel. The sand was underlain by stiff to very stiff clay to the maximum depths explored of 50½ feet bgs in our borings and 83½ feet bgs in our CPTs. Groundwater was encountered in the borings at depths ranging from 15 to 22½ feet bgs and in the CPT soundings a depth of 24 feet bgs at the time they were performed.
Earthwork	Three to six feet of fill will be placed across the property to elevate the site above the design flood risk elevation. The near surface soils have moderate to high plasticity and are sensitive to moisture variation. The upper 18 inches of subgrade below soil supported floor slabs and exterior hardscapes should consist of chemically treated soil or Low Volume Change (LVC) structural fill. Grading should be conducted in accordance with the Earthwork section of this report.
Foundations	We estimate the placement of fill will trigger new settlement in excess of 3 inches depending on the final fill thickness. In order to mitigate the effects of the total and associated differential settlements on the proposed buildings from the fill placement, we have provided the following two options for foundation support for the proposed improvements. Option 1 – Shallow Foundations over Ground Improvement Option 2 – Deep Foundations consisting of either drilled piers or driven piles Recommendations for the design of each option are provided in the Foundations section of this report.
Retaining Structures	Building loading docks. Lateral Earth Pressures have been provided for use in design.
Pavements	Pavement sections are provided for both rigid and flexible pavements. Alternate pavement sections utilizing triaxial geogrid reinforcement or chemical treatment are provided.
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

1. If the reader is reviewing this report as a pdf, the topics above can be used to access the appropriate section of the report by simply clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Geotechnical Engineering Report
New Data Center – SFO069
Arroyo Circle and Gilman Road
Gilroy, Santa Clara County, California
Terracon Project No. ND205052
September 16, 2020

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed data center to be located at Arroyo Circle and Gilman Road in Gilroy, Santa Clara County, California. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- | | |
|--|------------------------------------|
| ■ Subsurface soil conditions | ■ Liquefaction Analysis |
| ■ Groundwater conditions | ■ Percolation testing results |
| ■ Site preparation and earthwork | ■ Pavement design and construction |
| ■ Seismic site classification per 2019 CBC | ■ Field electrical resistivity |
| ■ Foundation design and construction | ■ Thermal resistivity |
| ■ Floor slab design and construction | ■ Soil corrosivity |

The geotechnical engineering Scope of Services for this project included the advancement of seventeen test borings to depths ranging from approximately 13 to 51½ feet below existing site grades (bgs). Additionally, five Cone Penetration Test (CPT) soundings were advanced to depths varying from 61 and 83½ feet bgs. Four field electrical resistivity tests were performed on the site. Three percolation tests were also performed at depths ranging from 10 to 15 feet bgs.

Maps showing the site, boring/CPT and test locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and as separate graphs in the **Exploration Results** section.

SITE CONDITIONS

The following description of site conditions was derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

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Item	Description
Parcel Information	The project is located near Arroyo Circle and Gilman Road in Gilroy, Santa Clara County, California. 37.015505°N 121.556513°W (approximate) See Site Location
Existing Improvements	The site is currently undeveloped and has been used as an agricultural field. Stockpiles of soil 12 to 15 feet in height are located on the northern and southern ends of the site.
Current Ground Cover	Earthen, crops.
Existing Topography (from GoogleEarthPro)	The site is relatively flat with up to about 6 feet of relief across the property from the north down to the south.
Geology	Geologic maps, and preliminary exploration performed by others indicated subsurface conditions consisted of Holocene to Pleistocene age alluvial gravel, sand, and clay of valley areas. ¹ The subgrade soils encountered in our borings/CPTs were generally consistent with the mapped geology.

We also collected photographs at the time of our field exploration program. Representative photos are provided in our **Photography Log**.

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	The following documents were provided by Kimley-Horn to Terracon via email: ■ Request for Proposal Geotechnical Investigation, Dated May 20, 2020. ■ Geotechnical Desktop Review – Draft 3, ARUP, Job Number 271590-00, Dated November 22, 2019. ■ Geotechnical Considerations – Draft 3, ARUP, Job Number 271590-00, Dated November 22, 2019.

¹ Dibblee, T.W., and Minch, J.A., 2005, *Geologic map of the Gilroy quadrangle, Santa Clara County, California*: Dibblee Geological Foundation, Dibblee Foundation Map DF-169, scale 1:24,000

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Item	Description
Project Description	The project will consist of the construction of a data center. We understand project will consist of two phases. Phase one includes the construction of one data center building with an associated equipment yard, a security building, paved parking and drives, and bio-retention facilities. We understand the second building will be constructed in the future as part of phase two and subsequently was not included in the scope of work covered by this report.
Proposed Structures	The project includes a single-story data center building with a footprint of about 250,000 square feet (sf) and a security building with a footprint of about 2,500 sf.
Building Construction	We anticipate construction of data center building will consist of concrete and steel frame with a slab-on-grade floor and the security building will consist of wood frame with slab on grade floor.
Finished Floor Elevation (per 50% schematic drawings, dated 8/7/2020)	197.50
Maximum Loads (per HKS, Inc.)	■ Columns: 100 to 150 kips ■ Walls: 7 to 8 kips per linear foot (klf)
Grading	We understand the site will be elevated up 6 feet to raise the proposed improvements above the design flood risk elevation. We anticipate site grading may consist of minimal cuts up to 2 feet and fills up to 6 feet.
Free-Standing Retaining Walls	We anticipate retaining walls up to 4 feet in height may be required for construction of the loading docks. We have assumed retaining walls will consist of cantilevered concrete construction.
Pavements	Paved drives and parking will be constructed as part of development. We have assumed both rigid (concrete) and flexible (asphalt) pavement sections will be constructed. Anticipated traffic indices (TIs) are as follows: ■ Auto Parking Areas: TI = 5.0 ■ Auto Road: TI = 5.5 ■ Truck Parking Areas: TI = 6.0 ■ Truck Ramps and Roads: TI = 8.0 Average Daily Truck Traffic for rigid pavements ■ Car Parking and Access Lanes: ADTT = 1 (Category A) ■ Truck Parking Ramps and Roads: ADTT = 25 (Category B) ■ Dumpster Pads: Per Category C The pavement design period is 20 years.

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** section and the GeoModel can be found in the **Figures** section of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	Lean Clay	Medium to very stiff lean clay with variable amounts of sand.
2	Sand	Loose to dense sand with variable amounts of clay and gravel.
3	Gravel	Dense gravel with variable amounts of sand.

Practical refusal was encountered in CPT-1 and CPT-5 at depths of 83 and 83½ feet bgs. Refusal is defined as the depth below the ground surface at which a boring or CPT can no longer be advanced with the technique being used. Refusal is subjective and is based upon the type of equipment used. Additional borings, auger probes, test pits, or geophysical testing could be performed to obtain more specific subsurface information.

Groundwater Conditions

The boreholes were observed while drilling and after completion for the presence and level of groundwater. Pore pressure dissipation tests were also performed in the CPTs to help determine groundwater levels. The water levels observed in the boreholes and CPTs can be found on the boring/CPT logs in **Exploration Results** and are summarized below.

Boring/CPT Number	Approximate Depth to Groundwater while Drilling/Testing ¹ (feet)	Approximate Depth to Groundwater after Drilling ¹ (feet)
B1	22½	22½
B3	21	21
B5	15	15
CPT-1 through CPT-5	24	-

^{1.} Below ground surface

Since the borings were backfilled relatively soon after completion, the water levels summarized above for the borings are not stable groundwater levels. Due to the low permeability of soils encountered in the borings, a relatively long period may be necessary for a groundwater level to develop and stabilize in a borehole. Long term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in materials of this type.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the borings and CPTs were performed. Therefore, groundwater levels during construction or at other times in the life of the structures may be higher or lower than the levels indicated on the boring/CPT logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

GEOTECHNICAL OVERVIEW

The subject site has several geotechnical considerations that will affect the construction and performance of the proposed improvements that are discussed in this report. The primary geotechnical considerations that have been identified at the subject site that will affect development of the site are the following:

- Moderately to highly plastic clay considerations
- Excessive settlement considerations

Moderately to Highly Plastic Clay Considerations

As indicated in the **Geotechnical Characterization** section of this report, the near surface native soils primarily consist of medium to very stiff moderately high to high plasticity clay with variable amounts of sand which could become unstable with typical earthwork and construction traffic, especially after precipitation events. Effective drainage should be completed early in the construction sequence and maintained after construction to avoid potential issues. If possible, the grading should be performed during the warmer and drier times of the year. If grading is performed during the winter months or periods of normally high precipitation, an increased risk for possible undercutting and replacement of unstable subgrade will persist. Additional site preparation recommendations, including subgrade improvement and fill placement, are provided in the **Earthwork** section.

The native clay soils encountered in our borings/CPTs exhibit the potential for shrink-swell movements with changes in moisture content from seasonal or manmade conditions. Additional areas of localized moderately to highly plastic clays are likely present in the building areas where borings/CPTs were not performed. In order to help mitigate the effects of moderate to high volume

change clay, building floors that will consist of soil supported slabs-on-grade and exterior hardscapes should be underlain by at least 18 inches chemically treated soil or Low Volume Change (LVC) structural fill. If building floors will consist of structural floors spanning between foundation systems, floor slabs should be underlain by minimum 3-inch-thick void forms to help mitigate the effects of uplift pressures from the moderate to high volume change clays on the floor slabs.

Using chemically treated soil or LVC structural fill for additional support of soil supported slabs-on-grade as recommended in this report may not eliminate all future subgrade volume change and resultant slab movements. However, the procedures outlined herein should help to reduce the potential for subgrade volume change in the native clay soils. Details regarding chemically treated soil and LVC structural fill are provided in **Earthwork**. Even if these procedures are followed, some movement and cracking in the buildings should be anticipated. The severity of cracking and other (cosmetic) damage such as uneven floor slabs will likely increase if any modification of the site results in excessive wetting or drying of the expansive soils.

We anticipate the proposed improvements will be supported by **Deep Foundations**, or **Shallow Foundations** supported by subgrade soils mitigated with **Ground Improvement**. If **Ground Improvement** is performed, **Shallow Foundations** should have a minimum embedment of 24 inches below lowest adjacent grade.

Excessive Settlement Considerations

As indicated in the **Geotechnical Characterization** section of this report, the subgrade soils encountered in our borings and CPTs generally consisted of 7½ to 15 feet of medium to very stiff clay underlain by 14 to 27 feet of loose to dense sand with variable amounts of gravel. The sand was underlain by stiff to very stiff clay to the maximum depths explored of 50½ feet bgs in our borings and 83½ feet bgs in our CPTs. The subsurface clay soils are compressible. Laboratory testing indicated the upper clay layers were slightly over-consolidated while the CPT data indicated the clay layers below the sand with gravel are over-consolidated.

We understand site grades may be elevated up to 6 feet in some areas across the site to accommodate development and raise the site grades above the design flood risk elevation. Placement of the additional fill will trigger new consolidation settlement of the clay soils. We have anticipated 3 feet of fill will be required at the north end of the new data center building and 6 feet of fill will be required at the south end of the building. A settlement analysis was performed to estimate the anticipated settlement generated under the weight of the new fill at the north and south ends of the proposed data center as well as in the middle of the data center footprint. The analysis was performed using the results of laboratory testing, CPT data, and our experience. Surface clay thickness of 11, 14, and 15 feet were used in our calculations for the north, middle, and south locations of the data center building based on the soil lithology encountered in our borings and CPTs. The results of our settlement analysis are presented in the following table.

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Settlement from New Fill Placement		
Additional Fill Height (feet)	Fill Load (psf) ¹	Estimated Total Settlement ² (inches)
North End of Data Center Footprint		
1	120	$\frac{3}{4}$
2	240	$1\frac{1}{4}$
3	360	$1\frac{3}{4}$
4	480	$2\frac{1}{4}$
5	600	$2\frac{3}{4}$
6	720	$3\frac{1}{4}$
Middle of Data Center Footprint		
1	120	$\frac{3}{4}$
2	240	$1\frac{1}{4}$
3	360	$1\frac{3}{4}$
4	480	$2\frac{1}{4}$
5	600	$2\frac{3}{4}$
6	720	3
South End of Data Center Footprint		
1	120	$\frac{3}{4}$
2	240	$1\frac{1}{4}$
3	360	$1\frac{3}{4}$
4	480	$2\frac{1}{4}$
5	600	$2\frac{1}{2}$
6	720	$2\frac{3}{4}$

1. Based on a normal weight engineered fill having a unit weight of 120 pcf.

2. Does not include settlement due to liquefaction or structural loads.

Based on our analysis, we anticipate 70 to 80 percent of the settlement due to fill placement may occur in the upper clay layers above the sand with gravel. We also anticipate any settlement occurring in the sand with gravel layers due to fill placement will occur shortly after placement of the fill; however, the portion of settlement occurring in the upper clay soils could be prolonged over about 3 to 11 weeks for about 50 percent of the settlement to occur and 5 to 21 months for about 90 percent of the settlement to occur. These estimated times for settlement to occur in the upper clay soils could be reduced by about 50 to 75 percent if a granular drainage layer is placed between the native subgrade and proposed fill. We recommend the placement of the fill occur early in the construction process to allow for as much settlement to occur in the sand with gravel and lower clay layers as possible prior to construction of the improvements. These settlements due to fill placement could be

reduced by various **Ground Improvement** methods such as aggregate piers, auger cast columns, or drilled displacement columns.

In order to mitigate the effects of these total and associated differential settlements on the proposed buildings, the buildings should be supported by **Shallow Foundations** supported on subgrade mitigated by **Ground Improvement** methods, or by **Deep Foundations**. In addition, in areas not improved by **Ground Improvement** methods, the anticipated differential movement should be considered when planning development. Special design details and long-term maintenance should be considered for underground utility lines; site development such as hardscape, entrances, and pavements adjacent to structures supported by **Deep Foundations** or **Ground Improvement**; and site drainage.

The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

We understand the site will be elevated up 6 feet in order to raise the proposed improvements above the design flood plain. We anticipate site grading may consist of minimal cuts up to 2 feet and fills up to 6 feet. If greater fills are required, Terracon should be contacted to determine if additional earthwork recommendations are warranted, particularly with regard to potential ground settlement. Earthwork will include clearing and grubbing, fill placement, and excavations. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria as necessary to render the site in the state considered in our geotechnical engineering evaluation for foundations, floor slabs, and pavements.

Site Preparation

The proposed construction area is undeveloped and has been used for agricultural purposes. Prior to placing fill, existing vegetation and root mat, debris and any other deleterious material should be removed. Complete stripping of the topsoil should be performed in proposed building, hardscape, and parking/driveway areas.

Subgrade Preparation

After clearing, any required cuts should be made. The presence of a high volume of organic material due to the agricultural usage may warrant additional cuts or over-excavation at the time of grading operations.

Once cuts and over-excavation operations are completed, the resulting subgrade should be proof-rolled with an adequately loaded vehicle such as a fully loaded tandem axle dump truck. The proof-rolling should be performed under the direction of the Geotechnical Engineer. Areas

excessively deflecting under the proof-roll should be delineated and subsequently addressed by the Geotechnical Engineer. Such areas should either be removed or modified by stabilizing as noted in the following section **Soil Stabilization**. Excessively wet or dry material should either be removed, or moisture conditioned and recompacted. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction.

Over-excavated material may be stockpiled for use as structural fill provided it is cleaned of vegetation, debris, and any other deleterious material and meets the criteria for engineered fill specified in the **Fill Material Types** section of this report.

Once proof rolling has been performed, and prior to placing any fill, the subgrade soil should be scarified and compacted. The depth of scarification of subgrade soils and moisture conditioning of the subgrade is highly dependent on the time of year of construction and the site conditions that exist immediately prior to construction. If construction occurs during the winter or spring, when the subgrade soils are typically already in a moist condition, scarification and compaction may only be 12 inches. If construction occurs during the summer or fall when the subgrade soils have been allowed to dry out deeper, the depth of scarification and moisture conditioning may be as much as 18 inches. A representative from Terracon should be present to observe the exposed subgrade and specify the depth of scarification and moisture conditioning required.

Following scarification and compaction of the subgrade, any required fill may be placed and compacted in accordance with the **Fill Material Types** and **Fill Compaction Requirements** sections of this report.

Due to the moderate to high volume change soils present across the site, the near surface soils at finished grades could be chemically treated to create a stable working surface during construction, especially during the rainy season. For chemical treatment, the subgrade soils should be treated with a certain percentage of high calcium quicklime, usually 4.5 to 5.5 percent based on the dry unit weight of the soil. For estimating purposes, we recommend using 5 percent lime and a soil unit weight of 110 pounds per cubic foot. For a 12-inch and 18-inch treatment depth, this results in an estimated minimum spread rate of 5.5 and 8.3 pounds per square foot, respectively. The actual amount of lime to be used should be determined by Terracon and by laboratory testing at least three weeks prior to the start of grading operations. Lime treatment is typically performed after rough grading of the building pad and pavement areas is completed.

The moisture content and compaction of subgrade soils, and especially the lime treated soil sections, shall be maintained until foundation, slab, and pavement construction. Care should be taken to also prevent wetting or drying of the bearing materials during construction.

Soil Stabilization

Methods of subgrade improvement, as described below, could include scarification, moisture conditioning and recompaction, and removal of unstable materials and replacement with granular fill (with or without geosynthetics) and/or chemical treatment with lime and/or cement. The appropriate method of improvement, if required, would be dependent on factors such as schedule, weather, the size of the area to be stabilized, and the nature of the instability. More detailed recommendations can be provided during construction as the need for subgrade stabilization occurs. Performing site grading operations during warm seasons and dry periods would help to reduce the amount of subgrade stabilization required.

If the exposed subgrade is unstable during proof rolling operations, it could be stabilized using one of the methods outlined below.

- **Scarification and Compaction** – It may be feasible to scarify, dry, and compact the exposed soils. The success of this procedure would depend primarily upon favorable weather and sufficient time to dry the soils. Stable subgrades likely would not be achievable if the thickness of the unstable soil is greater than about 1 foot or if construction is performed during a period of wet or cool weather when drying is difficult.
- **Aggregate Base** – The use of Caltrans Class II aggregate base is the most common procedure to improve subgrade stability. Typical undercut depths would be expected to range from about 6 to 18 inches below finished subgrade elevation with this procedure. The use of high modulus geosynthetics (i.e., engineering fabric or geogrid) could also be considered after underground work such as utility construction is completed. Prior to placing the fabric or geogrid, we recommend that all below-grade construction, such as utility line installation, be completed to avoid damaging the fabric or geogrid. Equipment should not be operated above the fabric or geogrid until one full lift of aggregate base is placed above it. The maximum particle size of granular material placed over geotextile fabric or geogrid should meet the manufacturer's specifications.
- **Chemical Treatment** – Chemical treatment involves treating the unstable or pavement subgrade soils with a certain percentage of high calcium quicklime or Portland cement. Usually 4.5 to 5.5 percent based on the dry unit weight of the soil, for a depth of 12 to 18 inches. For estimating purposes, we recommend using 5 percent lime and a soil unit weight of 110 pounds per cubic foot. For 12-inch and 18-inch treatment depths, this results in an estimated minimum spread rate of 5.5 and 8.3 pounds per square foot lime/cement, respectively. The actual amount of lime/cement to be used should be determined by Terracon and by laboratory testing at least three weeks prior to the start of grading operations. Chemical treatment is performed after rough grading is completed.

Further evaluation of the need and recommendations for subgrade stabilization can be provided during construction as the geotechnical conditions are exposed.

Fill Material Types

Fill required to achieve design grade should be classified as structural fill and general fill. Structural fill is material used below, or within 5 feet of structures, pavements or constructed slopes. General fill is material used to achieve grade outside of these areas. Earthen materials used for structural and general fill should meet the following material property requirements:

Fill Type ¹	USCS Classification	Acceptable Location for Placement
Lean Clay/Clayey Sand	CL, SC (LL<40)	All structural and general fill locations and elevations, except as LVC material unless material explicitly meets LVC requirements.
Moderate Plasticity Material²	CL (50>LL≥40 or 30>PI≥25)	All general fill locations and elevations.
Well-graded Granular³	GM, GC, SM, SW	All structural and general fill locations and elevations.
Low Volume Change (LVC) Material⁴	CL, SC (LL<30 & PI<10) or Well-graded Granular Material ³	Within 1½ feet below bottom of floor elevations. All structural and general fill locations and elevations.
On-site Soils⁵	SW, SP	All structural and general fill locations and elevations.
	CL, SC	As noted above.
	GP	Should not be used as fill material.
	North and South Stockpiles	May be used as fill pending classification of soil types.

1. Compacted structural fill should consist of approved materials that are free of organic matter and debris. A sample of each material type should be submitted to Terracon for evaluation at least two weeks prior to grading.
2. Delineation of moderate to highly plastic clays should be performed in the field by a qualified geotechnical engineer or their representative and could require additional laboratory testing.
3. Caltrans Class II aggregate base may be used for this material.
4. Low plasticity cohesive soil or granular soil having low plasticity fines. Material should be approved by the geotechnical engineer.
5. This material should be removed and recompacted if used as a structural fill as described in section **Fill Compaction Requirements**. Existing fill soils to be re-used as structural or general fill should be processed to remove any vegetation or debris present in the material prior to re-use.

Fill Compaction Requirements

Structural and general fill should meet the following compaction requirements.

Item	Structural Fill	General Fill
Maximum Lift Thickness²	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used. 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used.	Same as Structural fill
Minimum Compaction Requirements^{1,3}	■ 95% of maximum: Upper 12 inches of subgrade in pavement areas, below floor slabs, for fill greater than 5 feet, for aggregate base, and chemically treated soil. ■ 90% of maximum: All other locations	90% of max.
Water Content Range¹	Low plasticity cohesive: +1% to +3% above optimum moisture content High plasticity cohesive: +2% to +4% above optimum moisture content Granular: -2% to +2% of optimum moisture content	As required to achieve min. compaction requirements ⁴

1. Maximum density and optimum water content as determined by the Modified Proctor test (ASTM D 1557).
2. Reduced lift thicknesses are recommended in confined areas (e.g., utility trenches, foundation excavations, and foundation backfill) and when hand-operated compaction equipment is used.
3. We recommend that all fill be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved. This procedure is intended for soils with 30 percent or less material larger than ¾ inch. Accordingly, we recommend full time proof roll observation be performed instead of moisture density testing for materials containing more than 30 percent aggregate retained on the ¾-inch sieve.
4. Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without the cohesionless fill material pumping when proof rolled.

Utility Trench Backfill

Due to the anticipated settlements associated with fill placement across the site, special design may be required for utilities at this site in areas not mitigated with **Ground Improvement**. Utility design should account for the anticipated settlements provide in **Geotechnical Overview**. It is recommended utilities and piping be designed with flexible connections and/or other means to accommodate such soil movement to preclude damage between areas mitigated and not mitigated with **Ground Improvement** or between non-mitigated areas and structures supported by **Deep Foundations**. Utility and drain lines designed for gravity flow should consider steeper

gradients to account for anticipated settlements, especially where such lines enter buildings supported by **Ground Improvement** methods or **Deep Foundations**.

All trench excavations should be made with sufficient working space to permit construction including backfill placement and compaction. If utility trenches are backfilled with relatively clean granular material, they should be capped with at least 18 inches of cementitious flowable fill or cohesive fill in non-pavement areas to reduce the infiltration and conveyance of surface water through the trench backfill. Attempts should also be made to limit the amount of fines migration into the clean granular material. Fines migration into clean granular fill may result in unanticipated localized settlements over a period of time. To help limit the amount of fines migration, Terracon recommends the use of a geotextile fabric that is designed to prevent fines migration in areas of contact between clean granular material and fine-grained soils. Terracon also recommends that clean granular fill be tracked or tamped in place where possible in order to limit the amount of future densification which may cause localized settlements over time.

Utility trenches are a common source of water infiltration and migration. Utility trenches penetrating beneath buildings should be effectively sealed to restrict water intrusion and flow through the trenches, which could migrate below the buildings. The trench should provide an effective trench plug that extends at least 5 feet from the face of the building exterior. The plug material should consist of cementitious flowable fill or low permeability clay. The trench plug material should be placed to surround the utility line. If used, the clay trench plug material should be placed and compacted to comply with the water content and compaction recommendations for structural fill stated previously in this report.

If chemical (lime) treatment of subgrade soils occurs before utility construction, Controlled Low Density Material (CLDM) or sand/cement slurry should be used as backfill material to cap utility trenches in all areas where trenches have cut through the treated subgrade. The thickness of the CLDM or slurry should be at least the thickness or depth of chemically treated subgrade. Such areas trenched through chemically treated soil should not be backfilled with aggregate base, native soil, or chemically treated soil.

Post construction trenching through geogrid in pavement areas may be accomplished with conventional trenching equipment. Repairs to the trenched section shall be accomplished using a full structural replacement of the displaced materials or with a repaired section that is identical to the original section. If the trench section is repaired to match the original, the trench backfill must be compacted to the same or higher density and the geogrid must be over-lapped a minimum 3-inches at the proper geogrid elevation.

Grading and Drainage

All grades must provide effective drainage away from the buildings during and after construction and should be maintained throughout the life of the structures. Water retained next to the

structures can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge into a site drainage system or at least 10 feet from the buildings.

Exposed ground should be sloped and maintained at a minimum 5 percent away from the buildings for at least 10 feet beyond the perimeter of the buildings. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After building construction and landscaping, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted as necessary as part of the structure's maintenance program. Where paving or flatwork abuts the structure a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Planters and bio-swales located within 10 feet of structures should be self-contained or lined with an impermeable membrane to prevent water from accessing buildings subgrade soils. Sprinkler mains and spray heads should be located a minimum of 5 feet away from the building lines.

Trees or other vegetation whose root systems have the ability to remove excessive moisture from the subgrade and foundation soils should not be planted next to the structures. Trees and shrubbery should be kept away from the exterior of the structures a distance at least equal to their expected mature height.

Implementation of adequate drainage for this project can affect the surrounding developments. Consequently, in addition to designing and constructing drainage for this project, the effects of site drainage should be taken into consideration for the planned structures on this property, the undeveloped portions of this property, and surrounding sites. Extra care should be taken to ensure irrigation and drainage from adjacent areas do not drain onto the project site or saturate the construction area.

Earthwork Construction Considerations

Excavations for the proposed structures are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of floor slabs, hardscapes, and pavements. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become desiccated, saturated, or disturbed, the affected material should be removed, or these materials should be scarified, moisture conditioned, and recompacted prior to floor slab, foundation or pavement construction.

We recommend the earthwork portion of this project be completed during extended periods of dry weather if possible. If earthwork is completed during the wet season (typically November through April) it may be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork operations may require additional mitigation measures beyond that which would be expected during the drier summer and fall months. This could include ground stabilization utilizing chemical treatment of the subgrade, diversion of surface runoff around exposed soils, and draining of ponded water on the site. Once subgrades are established, it may be necessary to protect the exposed subgrade soils from construction traffic.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, and/or state regulations. Stockpiles of soil, construction materials, and construction equipment should not be placed near trenches or excavations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Construction Observation and Testing

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of vegetation, debris, and topsoil, proofrolling, and mitigation of areas delineated by the proofroll to require mitigation.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 4,000 square feet in pavement areas. One density and water content test per lift should be performed for every 50 linear feet of compacted utility trench backfill.

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. If unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

FOUNDATIONS

We understand site grades may be elevated 3 to 6 feet in some areas across the site to accommodate development and raise the site grades above the design flood risk elevation. We estimate the placement of the fill will trigger new settlement on the order of 3 inches depending on the final fill thickness.

In order to mitigate the effects of the total and associated differential settlements on the proposed buildings from the fill placement, we have provided the following two options for foundation support for the proposed improvements.

Option 1 – Shallow Foundations over Ground Improvement:

The buildings may be supported by **Shallow Foundations** provided **Ground Improvement** is performed to mitigate the anticipated settlement from fill placement. For this option, **Ground Improvement** should be performed to stiffen the upper compressible clay layer. The upper clay layers extended to depths varying from 7½ to 15 feet bgs in our borings/CPTs. **Ground Improvement** could also extend deeper to help mitigate the potential liquefaction of the underlying sands if desired, especially at the southern end of the building where up to 1 inch of liquefaction settlement was estimated. All footings should extend at least 24 inches below lowest adjacent grade. The building floor slabs should be underlain by minimum 18 inches of chemically treated material or LVC structural fill to help mitigate the effects of moderate to high volume change clays.

Option 2 – Deep Foundations:

If Ground Improvement will not be performed, the proposed improvements should be supported by **Deep Foundations** to help protect the improvements against the estimated total and differential settlements generated by fill placement and **Liquefaction**. The **Deep Foundations** may consist of drilled piers or driven piles and should extend through the upper clay and potentially liquefiable sand layers and derive their support from the lower clay layers that were encountered beginning at depths of about 26 to 32 feet bgs. For this option, **Deep Foundations** will be required to account for a drag load imposed on the foundation from settlement due to fill placement and liquefaction and building floor slabs should be designed as structural slabs that span between foundation elements and rely on the foundations for support.

GROUND IMPROVEMENT

As a cost-effective alternative to supporting the improvements on **Deep Foundations**, ground improvement may be utilized to help mitigate the anticipated excessive settlement due to the consolidation of the upper clay layers. Ground improvement could also extend deeper to help

mitigate the potential liquefaction of the underlying sands if desired, especially at the southern end of the building where up to 1 inch of liquefaction settlement was estimated. Ground improvement methods such as aggregate piers, auger cast columns (ACC), and drilled displacement columns (DDC) are proprietary systems designed by licensed contractors who could provide further information regarding support options. Considering the various methods available for ground improvement, it is our opinion aggregate piers would be a suitable option for ground improvement at this site. Aggregate piers are often one of the most cost-effective methods for ground improvement and the spoils generated from installing aggregate piers would provide the added benefit of producing material that could be used as fill in raising the site to design elevations. However, if the Contractor or Structural Engineer have worked with a different ground improvement method that has proven successful to mitigate the hazards present at this site with similar subgrade soil conditions, Terracon could consider such options if desired.

Aggregate Piers

As a way to mitigate excessive settlement below the proposed improvements due to the placement of fill across the site and the presence of compressible clays, the upper clay layers could be improved with aggregate piers installed on a grid pattern. Ground improvement could also extend deeper to help mitigate the potential liquefaction of the underlying sands. This option would eliminate the need for **Deep Foundations**, and would allow for the use of **Shallow Foundations** over the aggregate pier-reinforced subgrade. Aggregate pier systems are typically installed after clearing and grubbing and prior to the beginning of fill construction. The aggregate pier system will serve to stiffen the compressible clay and may also serve as gravel conduits for the dissipation of pore-water pressure depending on the aggregate grading, thereby shortening the time required for consolidation settlements. Aggregate piers can also be used to densify potential liquefiable cohesionless soils.

Aggregate piers are typically constructed by advancing a drill or mandrel to design depths, then building a bottom bulb of clean, open-graded stone. The pier is built on top of the bottom bulb, using graded aggregate placed in thin lifts (12 to 24 inches compacted thickness). We anticipate piers would extend to depths varying from 8 to 32 feet at this site depending on the soils targeted for improvement. The result is a reinforced zone of soils directly under the foundations, which allows for the design and construction of foundations for relatively higher bearing pressures and with lower anticipated settlements.

A properly designed aggregate pier ground improvement system for this project should meet the following design criteria considering the anticipated fill placement and allowable bearing pressures provided in the **Shallow Foundations** section of this report:

Bearing Capacity Factor of Safety = 2.0

Global Stability (static) = 1.3

Global Stability (dynamic) = 1.1

Post-construction Settlement < ½-inch

Post-construction Differential Settlement < ¼ inch / 40 feet

Aggregate pier systems should be designed and constructed by a specialty ground improvement contractor. Since this would be specialty work, we recommend consideration of using a design-build process if this alternative is selected. The contractor should provide detailed design calculations sealed by a professional engineer licensed in the State of California.

SHALLOW FOUNDATIONS

If foundation support **Option 1** is utilized and the site has been prepared in accordance with the requirements noted in **Earthwork**, the improvements can be supported on shallow foundations. The following design parameters are applicable for shallow foundations.

Design Parameters – Compressive Loads

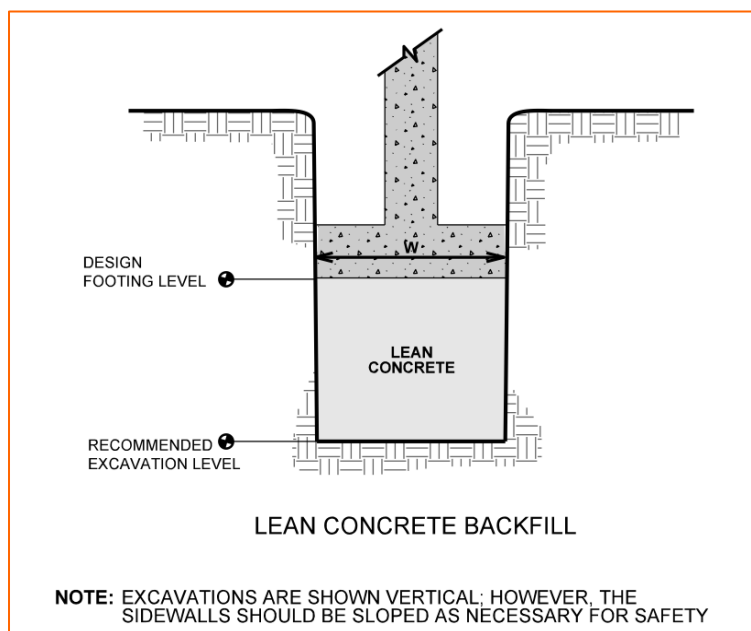
Item	Description
Maximum Net Allowable Bearing pressure ^{1, 2}	1,500 psf (assumes footings will bear in 3 to 6 feet of structural fill placed over native soils mitigated with ground improvement)
Required Bearing Stratum ³	Compacted structural fill
Minimum Footing Width	Columns: 24 inches Continuous: 18 inches
Maximum Footing Width	Columns: 120 inches Continuous: 72 inches
Passive Resistance ^{4, 8} (equivalent fluid pressure)	300 pcf
Coefficient of Sliding Friction ^{5, 8}	0.30
Minimum Embedment below Finished Grade ⁶	24 inches
Estimated Total Settlement from Structural Loads ²	Less than about 1½ inches
Estimated Differential Settlement ^{2, 7}	About 1/2 of total settlement

Item	Description
1.	The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. This bearing pressure can be increased by 1/3 for transient loads unless those loads have been factored to account for transient conditions. An appropriate factor of safety has been applied. Values assume that exterior grades are no steeper than 20% within 10 feet of structure.
2.	Values provided are for maximum loads noted in Project Description . <u>The settlement estimates are for static conditions and are inclusive of settlement due to fill placement, but do not include settlement associated with liquefaction.</u>
3.	Unsuitable or soft soils should be over-excavated and replaced per the recommendations presented in the Earthwork .
4.	Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted structural fill be placed against the vertical footing face.
5.	Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions.
6.	Embedment necessary to minimize the effects of seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.
7.	Differential settlements are as measured over a span of 40 feet.
8.	Passive pressure and sliding friction may be combined to resist sliding provided the passive pressure is reduced by 50 percent.

Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below.



To ensure foundations have adequate support, special care should be taken when footings are located adjacent to trenches. The bottom of such footings should be at least 1 foot below an imaginary plane with an inclination of 1.5 horizontal to 1.0 vertical extending upward from the nearest edge of adjacent trenches.

DEEP FOUNDATIONS

If foundation support **Option 2** is utilized, the proposed improvements may be supported by **Deep Foundations** consisting of either cast-in-place drilled piers or driven piles. Recommendations for the design and construction of drilled piers and driven piles based on the in-situ soil conditions are provided in the following paragraphs.

Drilled Pier Design Parameters

Drilled piers at the site should be designed for a minimum diameter of 24 inches and should extend at least 5 feet below the bottom of the sand layers. The bottom of the sand layers was encountered between 26 and 32 feet bgs in our borings/CPTs. The drilled piers should be designed as friction piers that derive support from the underlying lower clay layers. End bearing should not be used. Soil design parameters are provided below in the **Drilled Pier Design Summary** table for the design of the drilled pier foundations. The values presented for allowable side friction include a factor of safety. These criteria were developed from analysis of field data and our experience. Due to the variability in the thickness of the soil layers encountered in our borings/CPTs we have provided a table for the north, middle, and south locations of the building for use in design.

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Drilled Pier Design Summary ¹		
Approximate Depth Below Original Grade (feet)	Stratigraphy ²	Allowable Skin Friction (psf) ³
	Material	
North End of Building (B1, B2, CPT1, CPT2)		
0 to 11	Clay	0 ⁴
11 to 29	Sand with Gravel	795 ⁵
29 to 64	Clay	720
64 to 70	Clay	800
70 to 77	Clay	820
77 to 83	Sand	350
Middle of Building (B3, CPT3)		
0 to 14	Clay	0 ⁴
14 to 29	Sand with Gravel	845 ⁵
29 to 40	Clay	430
40 to 50	Clay	710
50 to 61	Clay	900
South End of Building (B4, B5, CPT4, CPT5)		
0 to 15	Clay	0 ⁴
15 to 30	Sand with Gravel	875 ⁵
30 to 83	Clay	685

1. Design capacities are dependent upon the method of installation, and quality control parameters. The values provided are estimates and should be verified when installation protocol have been finalized.
2. See **Geotechnical Characterization** for more details on stratigraphy.
3. Applicable for compressive loading only. Reduce to 2/3 of values shown for uplift loading. Effective weight of the pier can be added to uplift load capacity. Based on Federal Highway Administration (FHWA) method. The allowable skin friction capacity values are based on a factor of safety of 2.5.
4. Skin friction should be neglected for pier capacity in this layer due to down drag from consolidation of the upper clay layers and potential liquefaction in the sand layer.
5. Skin friction for this layer should be neglected for pier capacity in seismic design.

Tensile reinforcement should extend to the bottom of the pier if subjected to uplift loading. Buoyant unit weights of the soil and concrete should be used in the calculations below the highest anticipated groundwater elevation.

Due to consolidation of the upper clay layer and liquefaction of the sand layer, pier design should incorporate a static drag load of 60, 84, and 85 kips per pier for the north end, middle, and south end of the building respectively and a dynamic drag load of 149, 164, or 169 kips per pier for the north end, middle, and south end of the building respectively. The drag loads need not be combined in the pier design. The drag loads are based on a fill thickness of 3, 4½, and 6 feet at the north end, middle, and south end of the building respectively and the pier having a diameter of 24 inches. Terracon should be contacted to provide revised drag loads if different fill thicknesses will be placed or if drilled piers will have a diameter other than 24 inches. Static drag loads could be reduced or eliminated if fill is placed early in construction and settlement monitoring indicates settlement due to fill placement has ceased prior to foundation construction.

Drilled piers should have a minimum (center-to-center) spacing of three diameters. Closer spacing may require a reduction in axial load capacity. Axial capacity reduction can be determined by comparing the allowable axial capacity determined from the sum of individual piers in a group versus the capacity calculated using the perimeter and base of the pier group acting as a unit. The lesser of the two capacities should be used in design.

The pier foundation shall be designed to distribute the weight of the structure solely on the piers. Provided the pier is designed per the recommendations provided herein, we anticipate pier settlement to be less than ½ inch due to structural loads.

The structural capacity of the pier should be checked to assure it can safely accommodate the combined stresses induced by axial and lateral forces. The response of the drilled pier foundation to lateral loads is dependent upon the soil/structure interaction as well as the pier's diameter, length, stiffness and "fixed head" or "free head" condition.

Drilled Pier Lateral Loading

The following table lists input values for use in LPILE analyses. LPILE will estimate values of k_h and ϵ_{50} based on strength; however, non-default values of k_h should be used where provided. Since deflection or a service limit criterion will most likely control lateral capacity design, no safety/resistance factor is included with the parameters. Due to the variability in the soils encountered in our boring/CPTs we have provided three tables for use in design based on soil profiles encountered within the building footprint at the north, middle, and south locations of the building.

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North End of Building (B1, B2, CPT1, CPT2)- Lateral Load Analyses						
Estimated Engineering Properties of Soils						
Top Depth	Effective Unit Weight (pcf)	L-PILE/ GROUP Soil Type	Internal Angle of Friction (Degrees)	Cohesion (psf)	Coeff. of Static Subgrade Reaction K _s (pci)	ξ ₅₀
Bottom Depth						
0 ³	115	Stiff Clay without free water	--	2,000	--	0.006
3 ³			--	2,000	--	0.006
3	115	Stiff Clay without free water	--	3,600	--	0.005
14			--	3,600	--	0.005
14	120	Reese Sand	32	--	90	--
18			32	--	90	--
18	58	Liquefied Sand	--	--	--	--
32			--	--	--	--
32	53	Stiff Clay without free water	--	3,400	--	0.005
67			--	3,400	--	0.005
67	58	Stiff Clay without free water	--	9,000	--	0.004
73			--	9,000	--	0.004
73	58	Stiff Clay without free water		4,600		0.004
80				4,600		0.004
80	68	Reese Sand	38	--	125	--
86			38	--	125	--
Middle of Building (B3, CPT3) - Lateral Load Analyses						
Estimated Engineering Properties of Soils						
Top Depth	Effective Unit Weight (pcf)	L-PILE/ GROUP Soil Type	Internal Angle of Friction (Degrees)	Cohesion (psf)	Coeff. of Static Subgrade Reaction K _s (pci)	ξ ₅₀
Bottom Depth						
0 ³	115	Stiff Clay without free water	--	2,000	--	0.006
4.5			--	2,000	--	0.006
4.5	115	Stiff Clay without free water	--	4,200	--	0.006
18.5			--	4,200	--	0.006
18.5	120	Reese Sand	32	--	90	--
19.5			32	--	90	--
19.5	58	Liquefied Sand	--	--	--	--
33.5			--	--	--	--
33.5	53	Stiff Clay without free water	--	2,000	--	0.006
44.5			--	2,000	--	0.006
44.5	53		--	3,400	--	0.005

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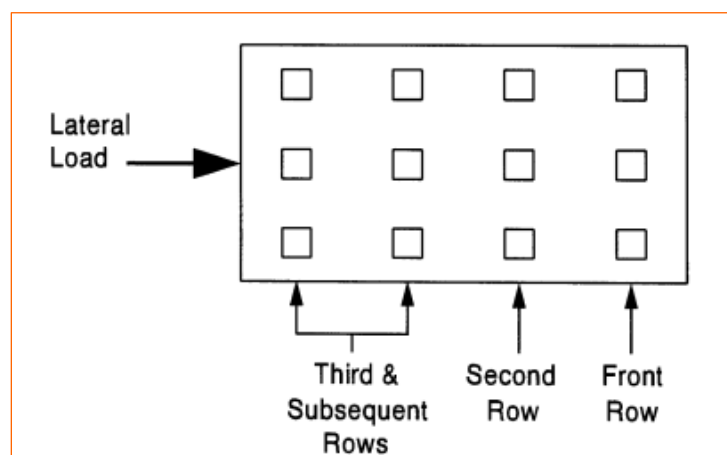
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54.5		Stiff Clay without	--	3,400	--	0.005
54.5	58	Stiff Clay without	--	6,000	--	0.004
65.5		free water	--	6,000	--	0.004

South End of Building (B4, B5, CPT4, CPT5) - Lateral Load Analyses						
Estimated Engineering Properties of Soils						
Top Depth	Effective Unit Weight (pcf)	L-PILE/ GROUP Soil Type	Internal Angle of Friction (Degrees)	Cohesion (psf)	Coeff. of Static Subgrade Reaction K_s (pci)	E_{50}
Bottom Depth						
0 ³	115	Stiff Clay without free water	--	2,000	--	0.006
6			--	2,000	--	0.006
6	115	Stiff Clay without free water	--	3,500	--	0.005
21			--	3,500	--	0.005
21	58	Liquefied Sand	--	--	--	--
36			--	--	--	--
36	53	Stiff Clay without free water	--	3,200	--	0.005
83			--	3,200	--	0.005

1. See **Subsurface Profile** in **Geotechnical Characterization** for more details on Stratigraphy.
2. Parameters assume groundwater is located at a depth deeper than 18, 19½, and 21 feet below the top of the proposed fill at the north end, middle, and south end of the building respectively.
3. Depth measured from the top of proposed fill. The upper 3 feet of the drilled pier should be neglected from design.

When piers are used in groups, the lateral capacities of the piers in the second, third, and subsequent rows of the group should be reduced as compared to the capacity of a single, independent pier. Guidance for applying p-multiplier factors to the p values in the p-y curves for each row of pier foundations within a pier group are as follows:



- Front row: $P_m = 0.8$;
- Second row: $P_m = 0.4$
- Third and subsequent row: $P_m = 0.3$.

For the case of a single row of piers supporting a laterally loaded grade beam, group action for lateral resistance of piers would need to be considered when spacing is less than three pier diameters (measured center-to-center). However, spacing closer than $3D$ (where D is the diameter of the pier) is not recommended, due to potential for the installation of a new pier disturbing an adjacent installed pier, likely resulting in axial capacity reduction.

The load capacities provided herein are based on the stresses induced in the supporting soil strata. The structural capacity of the piers should be checked to assure they can safely accommodate the combined stresses induced by axial and lateral forces. The response of the drilled pier foundations to lateral loads is dependent upon the soil/structure interaction as well as the pier's diameter, length, stiffness and "fixed head" or "free head" condition. The load-carrying capacity of piers may be increased by increasing the diameter and/or length.

Drilled Pier Construction Considerations

Groundwater was encountered in our borings/CPTs at depths varying from 15 to 24 feet bgs at the time our field exploration. Groundwater levels and seepage can and will fluctuate. Caving may occur during the drilling and construction of the proposed piers. To prevent collapse of the sidewalls and/or to control groundwater seepage, the use of temporary steel casing and/or slurry drilling procedures may be required for construction of the drilled pier foundation. Significant seepage could occur in case of the excavation penetrating water-bearing sandy soil. The drilled pier contractor and foundation design engineer should be informed of these risks.

The use of temporary steel casing and/or slurry drilling procedures should be anticipated at this site during drilled pier construction to prevent collapse of the sidewalls within sand seams and layers and control groundwater seepage. If casing is removed during concrete placement, care should be exercised to maintain concrete inside the casing at a sufficient level to resist earth and hydrostatic pressures present on a casing exterior. Water or loose soil should be removed from the bottom of the drilled pier prior to placement of the concrete.

Use of a telescoping casing arrangement can be considered to avoid handling long casing lengths. If possible, excess water should be evacuated from the casing to place concrete in the "dry".

Care should be taken to not disturb the sides and bottom of the excavation during construction. The bottom of the pier excavation should be free of loose material before concrete placement. Concrete should be placed as soon as possible after the foundation excavation is completed, to reduce potential disturbance of the bearing surface.

“Wet” piers should be constructed by slurry displacement techniques. In this process, the pier excavation is filled with approved polymer-based slurry to counter-balance the hydraulic forces below the water level and stabilize the wall of the pier. Concrete would then be placed using a tremie extending to within 6 inches of the pier base of the slurry-filled excavation. The tremie remains inserted several feet into the fresh concrete as it displaces the slurry upward and until placement is complete. The slurry should have a sand content no greater than 1 percent at the time concrete placement commences. The maximum unit weight of the slurry should be established in consultation with Terracon.

Concrete for “dry” drilled pier construction should have a slump of about 5 to 7 inches. Concrete should be directed into the pier utilizing a centering chute. Concrete for “wet” pier construction would require higher slump concrete.

While withdrawing casing, care should be exercised to maintain concrete inside the casing at a sufficient level to resist earth and hydrostatic pressures acting on the casing exterior. Arching of the concrete, loss of seal and other problems can occur during casing removal and result in contamination of the drilled pier. These conditions should be considered during the design and construction phases. Placement of loose soil backfill should not be permitted around the casing prior to removal.

Formation of mushrooms or enlargements at the top of the piers should be avoided during pier drilling. If a mushroom or enlargement develops at the top of a pier during drilling, a sono-tube should be placed at the pier top to help isolate the pier.

The drilled pier installation process should be performed under the direction of the Geotechnical Engineer. The Geotechnical Engineer should document the pier installation process including soil and groundwater conditions encountered, consistency with expected conditions, and details of the installed pier.

Driven Pile Design Parameters

Axial Loading: We anticipate driven pre-cast concrete piles could be used to support the proposed building at the site. Compressive axial loads on pile foundations are resisted by both side skin friction along the pile and by end bearing at the base of the pile, while uplift loads are resisted solely by side friction along the pile and by the weight of the pile. Driven piles should be spaced at least three pile widths apart (center-to-center) if side friction is used for compressive loads.

Lateral Loading: The proposed building will be subjected to lateral loading. The lateral resistance of a pile can be estimated using L-Pile analysis.

The lateral load design L-Pile input parameters and axial load design parameters are provided in the following sections. Due to the variability in the thickness of the soil layers encountered in our

borings/CPTs we have provided tables for the north, middle, and south locations of the building for use in design.

Driven Pile Axial Design Parameters

Axial Design	
Description	Value
Pile Type (assumed)	Pre-cast concrete pile
Pile Dimension (assumed)	16 inches square
<u>Minimum</u> Pile Embedment for Axial Design	5 feet below the bottom of the sand layers
Total Estimated Settlement	Less than ½ inch in addition to elastic shortening

The following tables can be used for design of pile axial and uplift capacities. Skin friction and end bearing values were calculated using CivilTech AllPile V7.21h software for a single 16-inch square pre-cast concrete pile. If a different pile type or diameter will be used, Terracon should be consulted to provide revised design parameters. The allowable axial and uplift capacities are based on a minimum factor of safety of 2.5 for skin friction and 3 for end bearing.

Driven Pre-Cast Concrete Pile Design Summary ^{1, 2}			
Approximate Depth (feet)	Stratigraphy ³	Skin Friction (psf) ⁴	End Bearing Pressure (ksf) ⁵
North End of Building (B1, B2, CPT1, CPT2)			
0 to 3	FILL	0 ⁶	0 ⁶
3 to 14	Clay	0 ⁶	0 ⁶
14 to 32	Sand with Gravel	500 ⁷	0
32 to 67	Clay	1,350	10
67 to 73	Clay	1,600	12
73 to 80	Clay	1,500	11
80 to 86	Sand	670	80
Middle of Building (B3, CPT3)			
0 to 4.5	FILL	0 ⁶	0 ⁶
4.5 to 18.5	Clay	0 ⁶	0 ⁶
18.5 to 33.5	Sand with Gravel	540 ⁷	0

Driven Pre-Cast Concrete Pile Design Summary ^{1, 2}			
Approximate Depth (feet)	Stratigraphy ³	Skin Friction (psf) ⁴	End Bearing Pressure (ksf) ⁵
33.5 to 44.5	Clay	795	6
44.5 to 54.5	Clay	1,350	10
54.5 to 65.5	Clay	1,600	12
South End of Building (B4, B5, CPT4, CPT5)			
0 to 6	FILL	0 ⁶	0 ⁶
6 to 21	Clay	0 ⁶	0 ⁶
21 to 36	Sand with Gravel	580 ⁷	0
36 to 83	Clay	1,275	9

1. Design capacities are dependent upon the method of installation, and quality control parameters. The values provided are estimates and should be verified when installation protocol have been finalized.
2. Design capacities can be increased by 33% for highly transient loads
3. See **Geotechnical Characterization** for more details on Stratigraphy
4. Applicable for compressive loading only. Reduce to 2/3 of values shown for uplift loading. Effective weight of pile can be added to uplift load capacity.
5. Piles should extend 5 feet into the bearing stratum for end bearing to be considered.
6. Skin friction and end bearing should be neglected for pile capacity in this layer due to down drag from consolidation of the upper clay layers and potential liquefaction in the sand layer.
7. Skin friction for this layer should be neglected for pile capacity in seismic design.

Due to consolidation of the upper clay layer and liquefaction of the sand layer, pile design should incorporate a static drag load of 98, 136, and 138 kips per pile for the north end, middle, and south end of the building respectively and a dynamic drag load of 144, 182, or 182 kips per pile for the north end, middle, and south end of the building respectively. The drag loads need not be combined in the pile design. The drag loads are based on a fill thickness of 3, 4½, and 6 feet at the north end, middle, and south end of the building respectively and the pile being a 16-inch square pile. Terracon should be contacted to provide revised drag loads if different fill thicknesses will be placed or if piles will have a different shape or dimension. Static drag loads could be reduced or eliminated if fill is placed early in construction and settlement monitoring indicates settlement due to fill placement has ceased prior to foundation construction. The project Structural Engineer should confirm combined drag and design loads do not exceed the structural capacity of the pile.

If desired, the drag loads could be reduced by the following methods:

- Pre-drilling oversized holes prior to pile driving and filling the resulting annular space with bentonite slurry.
- Providing a casing sleeve around the piles to separate the piles from direct contact with settling and liquefiable soils.
- Coating the piles with bitumen to allow slippage.

Driven Pile Lateral Loading Design Parameters

The lateral design of driven piles may utilize the LPILE input parameters provided in the ***Drilled Pier Lateral Loading Design Parameters*** section of this report.

Driven Pile Construction Considerations

Soils that are pre-drilled should not be relied on for lateral support. We recommend the bore hole be no larger in diameter than the smallest dimension of the pile.

The contractor should select a driving hammer and cushion combination which can install the selected piling without overstressing the pile material. The hammer should have a rated energy in foot-pounds at least equal to 15 percent of the design compressive load capacity in pounds. The contractor should submit the pile driving plan and the pile hammer-cushion combination to the engineer for evaluation of the driving stresses in advance of pile installation. During driving a maximum of 10 blows per inch is recommended to reduce the potential of damage to the piles.

If practical refusal is experienced above the design embedment elevation, the pile may be on an obstruction and a replacement pile should be driven adjacent to the original pile. If this occurs, the situation should be evaluated by Terracon during the pile driving operations. The contractor should be prepared to cut or splice piles, as necessary. Splicing of piles should be in accordance with specifications provided by the project Structural Engineer.

Pile driving conditions, hammer efficiency, and stress on the pile during driving could be better evaluated during installation using a Pile Driving Analyzer (PDA). A Terracon representative should observe pile driving operations. Each pile should be observed and checked for buckling, crimping and alignment in addition to recording penetration resistance, depth of embedment, and general pile driving operations.

Vibrations during pile driving can cause settlement of fill materials and can adversely affects improvements on adjacent sites. Potential settlement of the fill materials across the site following pile driving should be planned and accounted for. The condition of improvements on adjacent sites should be documented prior to pile installation and should be monitored during construction. Pile driving should be stopped, and Terracon contacted if movement or cracking of existing

improvements are observed. Monitoring vibration levels during pile driving should be considered. Although vibrations from pile driving may be below levels that will cause structural damage, they may be felt by occupants of the adjacent buildings.

Some ground heave may be experienced as a result of pile driving at each site. Therefore, it is recommended that the top elevations of the initial piles driven be surveyed. If any heave is noted after the driving of subsequent piles, the piles should be re-driven to their original top elevation. This problem can be particularly acute in pile groups.

The pile driving process should be performed under the direction of the Geotechnical Engineer. The Geotechnical Engineer should document the pile installation process including soil and groundwater conditions encountered, consistency with expected conditions, and details of the installed pile.

Indicator Piles

The subsurface profile across the site has significant variations. Geophysical testing could be utilized to help establish the subsurface soil profile between soil borings and CPTs. Variations in the required pile lengths should be anticipated and planned for. In order to help establish final pile driving criteria, we recommend installing indicator piles. The number of and locations of the indicator piles required will be dependent on the layout of the piles and the site conditions at the time of construction. Terracon should review the final foundation plans and recommend the locations and quantity of indicator piles. Indicator piles should be at least 5 feet longer than anticipated pile lengths to confirm field pile capacities. The indicator piles should be driven with the same equipment as planned for use during production pile driving. Indicator piles may be used as production piles provided the piles meet minimum lengths and no structural damage occurs to the pile during installation.

Pile load testing is recommended to further optimize the proposed pile foundation design. The contractor typically is responsible for the supplying the required equipment and materials and conducting the testing program. Pile load testing should be reviewed and monitored by Terracon and the project Structural Engineer.

SEISMIC CONSIDERATIONS

The 2019 California Building Code (CBC) Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool. This web-based software application calculates seismic design parameters in accordance with ASCE 7-16 and 2019 CBC. The 2019 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class F and Site Class D sites with a mapped S_1 value greater than or equal to 0.2.

However, Section 11.4.8 of ASCE 7-16 includes exceptions from such analysis for specific structures on Site Class F and D sites. Based on our understanding of the proposed structures, it is our assumption that the exception in Section 11.4.8 applies to the proposed structures. However, the structural engineer should verify the applicability of these exceptions. If it is determined a site-specific ground motion study is required, Terracon can prepare a supplemental scope of services to perform such study.

Based on this exception, the spectral response accelerations presented below were calculated using the site coefficients (F_a and F_v) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2019 CBC.

Description	Value
2019 California Building Code Site Classification (CBC) ¹	F ^{2,4}
Site Latitude	37.015505°N
Site Longitude	121.556513°W
S_s, Spectral Acceleration for a Short Period ³	1.593
S_1, Spectral Acceleration for a 1-Second Period ³	0.60
F_a, Site Coefficient ³	1.0
F_v, Site Coefficient (1-second period) ³	1.7
S_{DS}, Spectral Acceleration for a Short Period ³	1.062
S_{D1}, Spectral Acceleration for a 1-Second Period ³	0.68

1. Seismic site classification in general accordance with the 2019 California Building Code.

2. The 2019 California Building Code (CBC) requires a site soil profile determination extending a depth of 100 feet for seismic site classification. Five CPTs were extended to maximum depth ranging from 61 to 83½ feet bgs where practical refusal was encountered. This seismic site class assignment considers that similar dense soil continues below the maximum depth of the subsurface exploration. Additional exploration to greater depths could be considered to confirm the conditions below the current depth of exploration. Alternatively, a geophysical exploration could be utilized in order to attempt to justify a more favorable seismic site class.

3. These values were obtained using online seismic design maps and tools provided by the SEAOC/OSHPD (<https://seismicmaps.org/>).

4. This site qualifies as a site class F due to the presence of liquefiable soils. However, a site class D was used to develop the listed seismic design parameters due to the static in-situ soil conditions encountered in our Borings/CPTs. The proposed buildings may use the listed design parameters provided they have a period of 0.5s or less. Should the anticipated proposed buildings have a period greater than 0.5s, a site-specific ground motion analysis should be conducted to develop seismic design parameters. Terracon is qualified to perform such an analysis.

Typically, a site-specific ground motion study will generate less conservative coefficients and acceleration values which may reduce construction costs. We recommend consulting with a

structural engineer to evaluate the need for such study and its potential impact on construction costs. Terracon should be contacted if a site-specific ground motion study is desired.

Faulting and Estimated Ground Motions

The site is located in the San Francisco Bay Area of California, which is a relatively high seismicity region. The type and magnitude of seismic hazards affecting the site are dependent on the distance to causative faults, the intensity, and the magnitude of the seismic event. The following table indicates the distance of the fault zones and the associated maximum credible earthquake that can be produced by nearby seismic events, as calculated using the USGS Unified Hazard Tool. Segments of the San Andreas Fault, which is located approximately 13 kilometers from the site, are considered to have the most significant effect at the site from a design standpoint.

Characteristics and Estimated Earthquakes for Regional Faults			
Fault Name	Approximate Contribution (%)	Approximate Distance to Site (kilometers)	Maximum Credible Earthquake (MCE) Magnitude
San Andreas (Santa Cruz Mts) [5]: UC33brAvg_FM32	16.41	13.19	7.65
Calaveras (So) [5]: UC33brAvg_FM31	15.90	9.20	7.13
Calaveras (So) [5]: UC33brAvg_FM32	15.98	9.20	7.13
San Andreas (Santa Cruz Mts) [5]: UC33brAvg_FM31	15.90	9.20	7.13

Based on the ASCE 7-16 Standard, the peak ground acceleration (PGA_M) at the subject site is approximately 0.73g. Based on the USGS 2014 interactive deaggregations, the PGA at the subject site for a 2% probability of exceedance in 50 years (return period of 2475 years) is expected to be about 1.489g. The site is not located within an Alquist-Priolo Earthquake Fault Zone based on our review of the State Fault Hazard Maps.¹

LIQUEFACTION

Liquefaction is a mode of ground failure that results from the generation of high pore water pressures during earthquake ground shaking, causing loss of shear strength. Liquefaction is

¹ California Department of Conservation Division of Mines and Geology (CDMG), "Digital Images of Official Maps of Alquist-Priolo Earthquake Fault Zones of California, Southern Region", CDMG Compact Disc 2000-003, 2000.

typically a hazard where loose sandy soils or low plasticity fine grained soils exist below groundwater. The California Geologic Survey (CGS) has designated certain areas within California as potential liquefaction hazard zones. These are areas considered at a risk of liquefaction-related ground failure during a seismic event, based upon mapped surficial deposits and the presence of a relatively shallow water table. The project site and surrounding area is located within a Santa Clara County liquefaction hazard zone and is within an area designated as having high susceptibility to liquefaction. Therefore, a liquefaction analysis was performed to determine the liquefaction induced settlement.

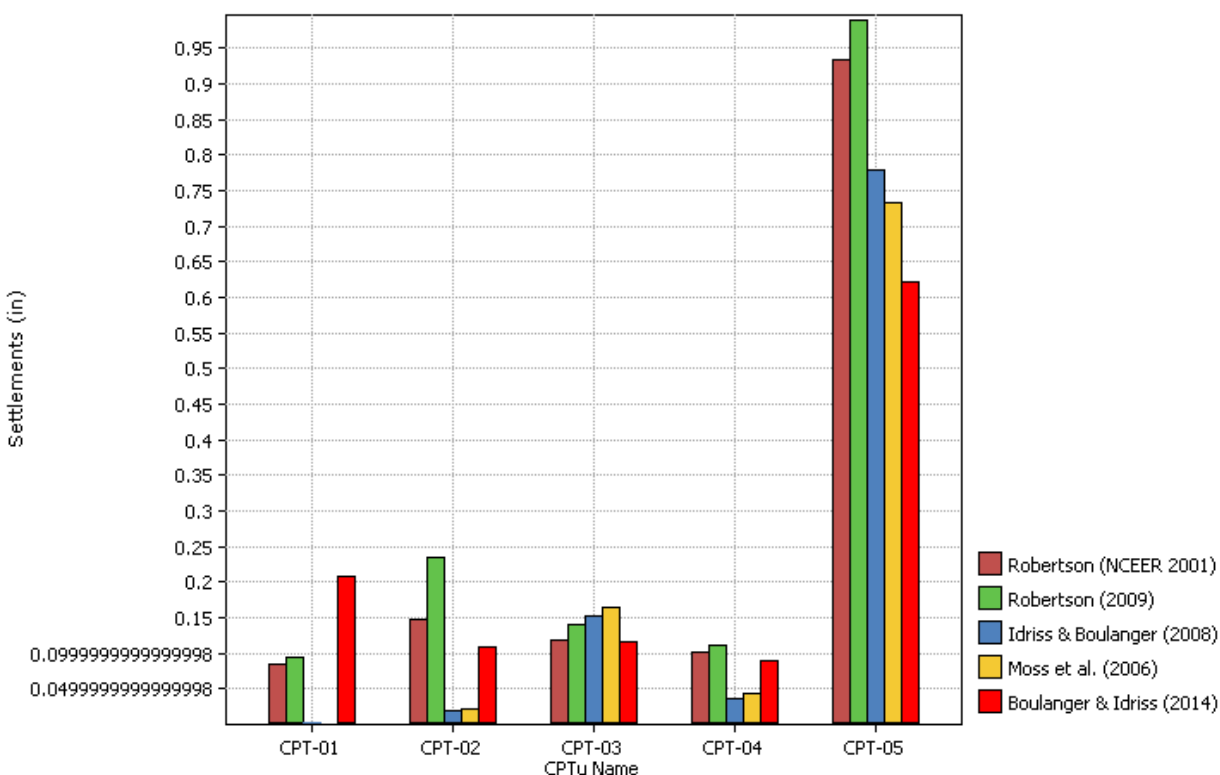
Our liquefaction hazard evaluation was performed in general compliance with the California Geological Survey (CGS) Special Publication 117A (2008); Southern California Earthquake Center "Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Liquefaction Hazards in California," 1999 report.

We performed a screening analysis to determine if there is a potential for liquefaction to occur at the site. We evaluated the soils encountered in our borings advanced to a maximum depth of approximately 50½ feet below the existing ground surface (bgs) and five cone penetration tests (CPTs) which were advanced to depths varying from 50 to 83½ feet bgs where practical refusal was encountered. We evaluated these soils based on soil classification, corrected SPT blow counts, water content, Atterberg limits, groundwater elevation, shear strength, peak ground acceleration, and CPT data. In our screening investigation we looked at the Atterberg limits for cohesive soils in the upper 50 feet of our soil borings. The Atterberg limits for these cohesive soils exhibited liquid limits ranging from 26 to 41 and plasticity indexes ranging from 8 to 20. We also calculated the ratio of the in-situ moisture content to the liquid limit. This data was then compared to the criteria by Idriss and Boulanger (2006) and Bray and Sancio (2006) for potential liquefaction or cyclic softening of fine-grained soils. These soils classify as "clay-like" and non-liquefiable by Idriss/Boulanger. Due to the plasticity index of the clays and the ratio of the in-situ moisture content to the liquid limit being less than 85% in these soils, we believe the soils have a low susceptibility to liquefaction by Bray/Sancio. It is our opinion the cohesive soils across the site are over-consolidated based on CPT and consolidation test data. However, based on the the presence of sand and gravel layers in our borings we determined that there is a potential for liquefaction to occur and further evaluation was warranted. We therefore performed a quantitative evaluation of the potential for liquefaction to occur and the effects if liquefaction were to occur on this project.

In performing our evaluation, we utilized data for the site obtained from the United States Geological Survey (USGS) website to determine the Peak Ground Acceleration (PGA_M) based on the ASCE 7-16 standard. The PGA_M was determined to be 0.73g based on the ASCE 7-16 criteria, while the PGA for the 2% exceedance in 50 years was determined to be 0.1.061g, as given using the USGS Unified Hazard Tool website based on the updated 2014 dynamic deaggregations. A mean magnitude of 7.26 for the project site was used. Based on groundwater

level data we encountered in our borings and CPTs and groundwater levels encountered in additional borings on nearby properties, a groundwater depth of 15 feet bgs was utilized in our analyses.

A liquefaction analyses was performed in general accordance with California Geologic Survey Special Publication 117. The liquefaction study utilized the software “CLiq” by GeoLogismiki Geotechnical Software. These analyses were based on the soil data obtained from the five CPT soundings supplemented by laboratory data performed on samples obtained from our borings. Analyses were performed on data obtained from CPT-01 through CPT-06. CPT calculations were assessed using the Robertson (NCEER 2001), Robertson (2009), Moss et al. (2006), Idriss & Boulanger (2008), and Boulanger & Idriss (2014) methods. A factor of safety of 1.3 was used against liquefaction. The liquefaction potential analyses were calculated from a depth of 15 to 60 feet bgs. A summary of the results of our analyses using the Robertson (2009) method has been attached to this report. The following table summarizes the vertical settlements calculated using the five noted methods.



Based on the analysis, liquefiable layers most susceptible to liquefaction were encountered between the depths of approximately 15 to 29 feet bgs across the site. Based on our review of the calculations by the various methods, the anticipated potential total liquefaction-induced settlement in the locations of CPT-01 through CPT-04 is less than about ¼ inch. However, a potential liquefaction settlement up to 1 inch was estimated at CPT-05 located at the southeast

end of the proposed building. The differential liquefaction-induced settlement may be about 1/2 to 2/3 the total settlement across the site. However, the differential settlement may be up to the amount of total settlement at the southeast end of the site.

Due to the cohesive nature and thickness of non-liquefiable soils across the surface of the site, we believe the probability for liquefaction to manifest at the surface is low.

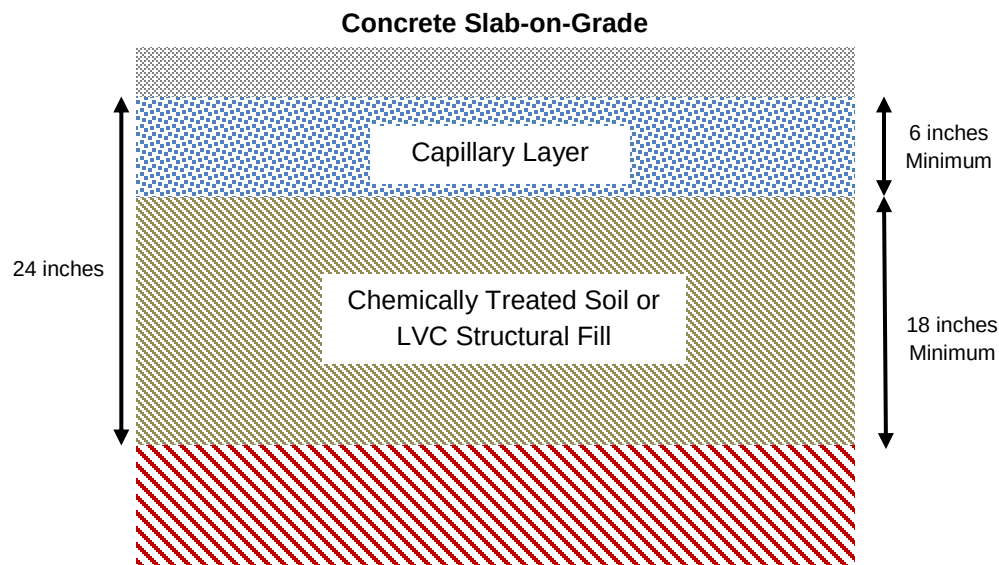
With regards to the potential for lateral spreading, we note that the site and surrounding area is relatively level. Given the relative flatness of the local topography and distance to nearby open faces deeper than 15 feet bgs, it is our opinion that the potential for lateral spreading to affect this site is low.

FLOOR SLABS

The surficial soils consist of moderately to highly plastic lean clay with variable amounts of sand exhibiting the potential for volume change with changes in moisture. Changes in water content could cause the subgrade soils to shrink and swell damaging the slabs. Special measures should be taken to protect the floor slabs from swelling pressures of the surficial clays.

If foundation **Option 2** is selected and the buildings are supported by **Deep Foundations**, building floor slabs should be designed as structural slabs that span between foundation elements and rely on the foundations for support. Such structural floor slabs should be underlain by minimum 3-inch-thick void forms to help mitigate the effects of uplift pressures from the moderate to high volume change clays on the floor slabs.

If foundation **Option 1** is selected and the buildings are supported by **Shallow Foundations** over soils mitigated by **Ground Improvement**, floor slabs may derive support from compacted subgrade soils. Building floor slabs that will consist of soil supported slabs-on-grade should be underlain by a minimum 18 inches chemically treated soil or Low Volume Change (LVC) structural fill. Using 18 inches of chemically treated soil or LVC structural fill as recommended in this report may not eliminate all future subgrade volume change and resultant slab movements. However, the procedures outlined herein should help to reduce the potential for subgrade volume change. Chemically treated soil and LVC structural fill should meet the specifications and be placed and compacted as recommended in **Earthwork** section of this report. Due to the potential for significant moisture fluctuations of subgrade material beneath slabs supported at-grade, the Geotechnical Engineer should evaluate the material within 12 inches of the bottom of the chemically treated soil or LVC structural fill immediately prior to placement of additional fill or slabs. Soils below the specified water contents within this zone should be moisture conditioned or replaced with structural fill as stated in our **Earthwork** section.



Design parameters for soil supported floor slabs assume the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structures.

Floor Slab Design Parameters

Item	Description
Floor Slab Support Course ¹	Minimum 6 inches of Caltrans Class II aggregate base.
Bearing Support ²	At least 18 inches of chemically treated soil or LVC material over firm native soil or compacted structural fill.
Estimated Modulus of Subgrade Reaction ³	$k_1 = 75 \text{ psi/in}$ $K_{(B \times B)} = K_1 \left(\frac{B + 1}{2B} \right)^2$ $K_{(B \times L)} = \frac{K_{(B \times B)} \left(1 + 0.5 * \left(\frac{B}{L} \right) \right)}{1.5}$ Where: k_1 = coefficient of subgrade reaction of foundations measuring 1 ft. x 1ft. $K_{(B \times B)}$ = coefficient of subgrade modulus for a square foundation having dimensions BxB.

Item	Description
	$K_{(B \times L)}$ = coefficient of subgrade modulus for a rectangular foundation having dimensions BxL.
1.	This material is in addition to the chemically treated or LVC material. May be omitted if LVC material consists of Caltrans Class II aggregate base.
2.	Floor slabs should be structurally independent of building foundations or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
3.	Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in Earthwork , and the floor slab support as noted in this table.
4.	

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or cracks should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

Floor Slab Construction Considerations

Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed, and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should approve the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

Exterior Hardscape

In order to help protect exterior hardscape against the swell pressure of moderately to highly plastic clays, we recommend the hardscapes be underlain by 18 inches of chemically treated soil or LVC structural fill.

Exterior hardscape, exterior architectural features, and utilities may experience some movement due to the volume change of the subgrade soils. To reduce the potential for damage caused by movement, we recommend:

- Minimizing moisture increases in the subgrade soils and backfill;
- Controlling moisture-density during placement of fill;
- Using designs which allow vertical movement between the exterior features and adjoining structural elements;
- Placing effective control joints on relatively close centers.
- Ensure clay subgrade soils are in a moist condition prior to slab construction.
- Reinforce exterior slabs and flatwork with a minimum No. 4 bars at 12 inches on center.

LATERAL EARTH PRESSURES

Design Parameters

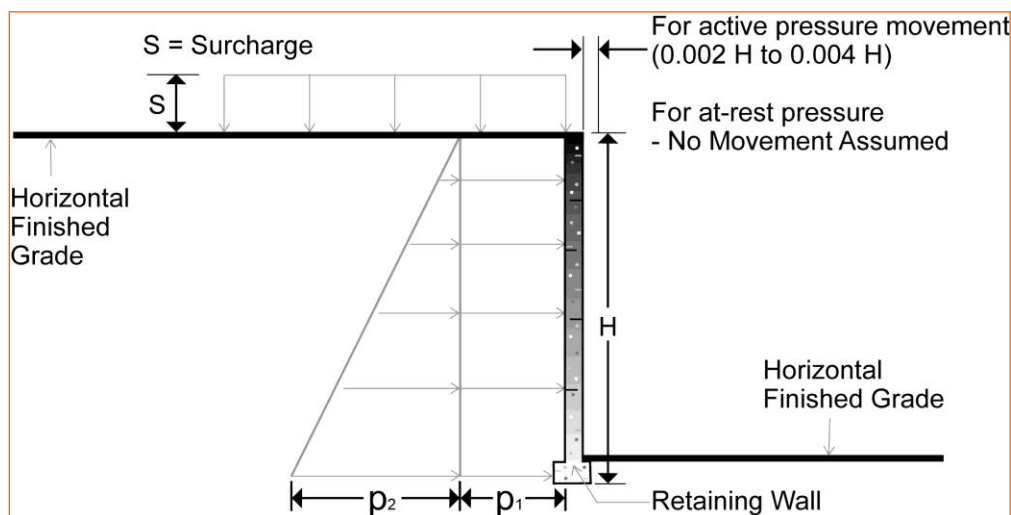
The retaining walls at this site may consist of cantilevered concrete retaining walls installed to facilitate construction of loading dock areas. The lateral earth pressure recommendations given in the following paragraphs are applicable to the design of retaining walls subject to slight rotation and rigid retaining or below grade walls, such as cantilever or gravity type concrete walls. These recommendations are not applicable to the design of modular block - geogrid reinforced backfill walls. Recommendations covering these types of wall systems are beyond the scope of services for this assignment. However, we would be pleased to develop recommendations for the design of such wall systems upon request.

Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown in the diagram below. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The “at-rest” condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).

Geotechnical Engineering Report

New Data Center – SFO069 ■ Gilroy, Santa Clara County, California

September 16, 2020 ■ Terracon Project No. ND205052



Lateral Earth Pressure Design Parameters				
Earth Pressure Condition ¹	Coefficient for Backfill Type ²	Surcharge Pressure ^{3, 4, 5} p_1 (psf)	Effective Fluid Pressures (psf) ^{2, 4, 5}	
			Unsaturated ⁶	Saturated ⁶
Active (K_a)	Structural granular fill - 0.31	$(0.31)S$	$(40)H$	$(80)H$
	On-site clay soils - 0.53	$(0.53)S$	$(65)H$	(95)
At-Rest (K_0)	Structural granular fill - 0.47	$(0.47)S$	$(55)H$	(90)
	On-site clay soils - 0.69	$(0.69)S$	$(85)H$	(105)
Passive (K_p)	Structural granular fill - 3.25	---	$(375)H'$	$(250)H'$
	On-site clay soils 1.89	---	$(225)H'$	$(175)H'$

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H , where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance.
2. Uniform, horizontal backfill, compacted to at least 90 percent of the ASTM D 1557 maximum dry density, rendering a maximum unit weight of 120 pcf.
3. Uniform surcharge, where S is surcharge pressure. The project structural engineer should provide any surcharge loading.
4. Loading from heavy compaction equipment is not included.
5. No safety factor is included in these values.
6. To achieve "Unsaturated" conditions, follow guidelines in **Retaining Wall Drainage** or **Subsurface Drainage for Below-Grade Walls** below. "Saturated" conditions are recommended when drainage behind walls is not incorporated into the design.

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of

the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively.

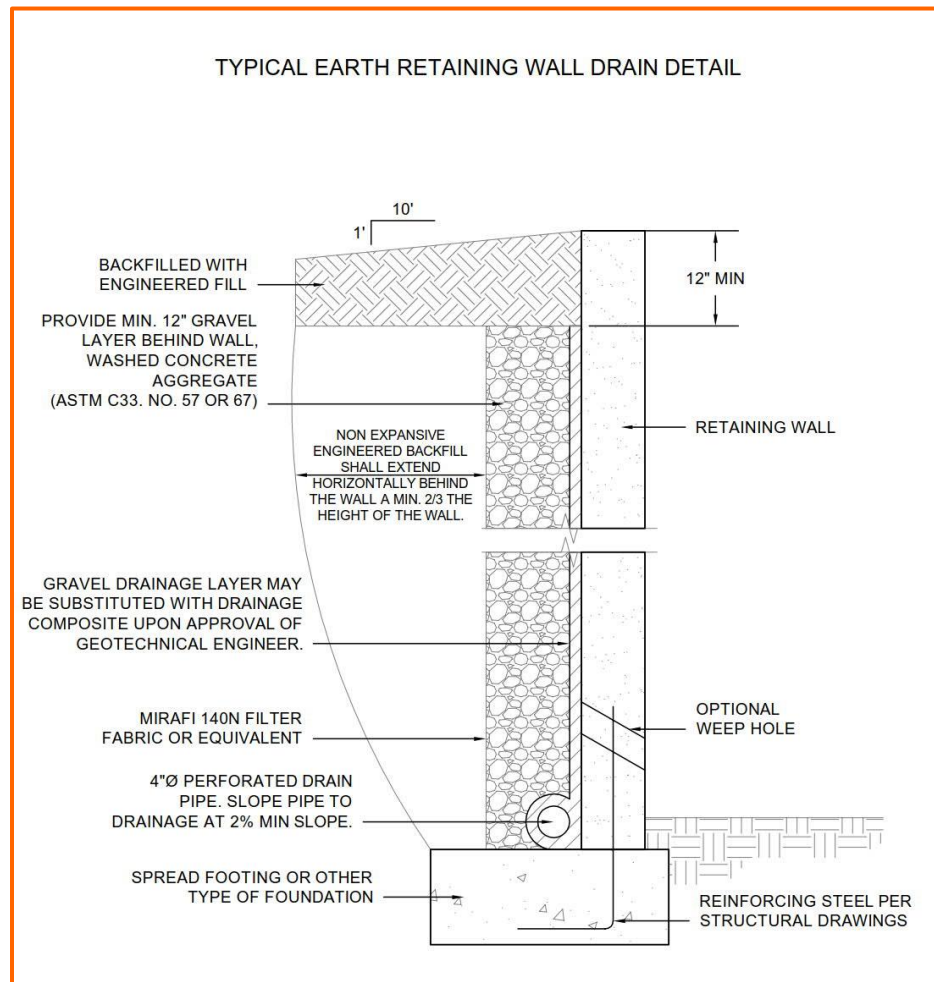
Total lateral earth pressure acting on retaining or below grade walls during a seismic event will likely include the active or at-rest static force and dynamic increment. The active dynamic increment should be applied to the wall as resultant force acting at $0.6H$ height from the base of the wall and the at-rest dynamic increment should be applied to the wall as resultant force acting at $0.63H$ height from the base of the wall. Such increments should be added to the static earth pressures. A dynamic lateral earth resultant force of $19H^2$ (in units of pounds per linear foot (plf)), where H (in units of feet) is the height of the soil behind the wall¹ should be used in design.

Heavy equipment should not operate within a distance closer than the exposed height of retaining or below grade walls to prevent lateral pressures more than those provided. Compaction of each lift adjacent to wall should be accomplished with hand-operated tampers for other lightweight compactors. Over-compaction may cause excessive lateral earth pressures which could result in wall movement.

Retaining Wall Drainage

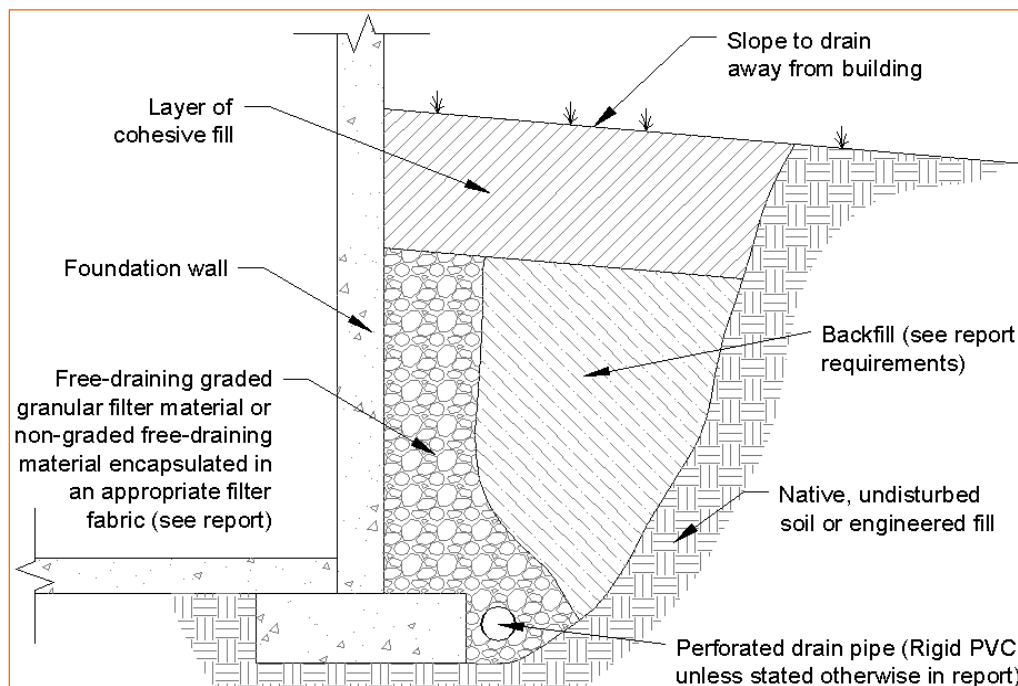
To control hydrostatic pressure behind retaining walls we recommend that a drain be installed at the bottom of the wall with a collection pipe leading to a reliable discharge. The drainage should consist of either a composite drain or a 12-inch thick free draining gravel blanket. Free draining gravel should consist of Caltrans Class II permeable material or $\frac{3}{4}$ inch clean gravel wrapped in Mirafi 140N filter fabric or equivalent. The drainage should extend from the bottom of the wall to within 12 inches of the top of the wall. The drainage should be capped with 12 inches of compacted cohesive soil. The collection pipe should be designed by the Civil Engineer but should be a minimum 4-inch diameter perforated Schedule 40 PVC or ABS drain pipe and should slope to an existing drainage system or to a positive gravity outlet. A typical earth retaining wall drain detail is illustrated on the following sketch.

¹ Seed & Whitman (1970)



Subsurface Drainage for Below-Grade Walls

A perforated rigid plastic drain line installed behind the base of walls and extends below adjacent grade is recommended to prevent hydrostatic loading on the walls. The invert of a drain line around a below-grade building area or exterior retaining wall should be placed near foundation bearing level. The drain line should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. The drain line should be surrounded by clean, free-draining granular material having less than 5% passing the No. 200 sieve, such as No. 57 aggregate. The free-draining aggregate should be encapsulated in a filter fabric. The granular fill should extend to within 12 inches of final grade, where it should be capped with compacted cohesive fill to reduce infiltration of surface water into the drain system.



As an alternative to free-draining granular fill, a pre-fabricated composite drain may be used. A pre-fabricated composite drain is a plastic drainage core which is covered with filter fabric to prevent soil intrusion and is fastened to the wall prior to placing backfill.

PAVEMENTS

General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the **Earthwork** section.

On most project sites, the site grading is accomplished relatively early in the construction phase. Fills are placed and compacted in a uniform manner. However, as construction proceeds, excavations are made into these areas, rainfall and surface water saturates some areas, heavy traffic from concrete trucks and other delivery vehicles disturbs the subgrade and many surface irregularities are filled in with loose soils to improve trafficability temporarily. As a result, the pavement subgrades, initially prepared early in the project, should be carefully evaluated as the time for pavement construction approaches.

We recommend the moisture content and density of the top 12 inches of the subgrade be evaluated and the pavement subgrades be proofrolled within two days prior to commencement of actual

paving operations. Areas not in compliance with the required ranges of moisture or density should be moisture conditioned and recompacted. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted fills.

After proof rolling and repairing deep subgrade deficiencies, the entire subgrade should be scarified and developed as recommended in the **Earthwork** section this report to provide a uniform subgrade for pavement construction. Areas that appear severely desiccated following site stripping may require further undercutting and moisture conditioning. If a significant precipitation event occurs after the evaluation or if the surface becomes disturbed, the subgrade should be reviewed by qualified personnel immediately prior to paving. The subgrade should be in its finished form at the time of the final review.

Support characteristics of subgrade for pavement design do not account for shrink/swell movements of an expansive clay subgrade, such as soils encountered on this project. Thus, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell related movement of the subgrade.

Pavement Design Parameters

Design of Asphaltic Concrete (AC) pavement sections were calculated using the Caltrans Highway Design Manual, latest edition, and a 20-year design life. Design of Portland Cement Concrete (PCC) pavement sections were designed using ACI 330R-08, "Guide for the Design and Construction of Concrete Parking Lots."

During the field investigation at the site, samples of the near surface soil were taken from borings P1 through P9. Two composite samples were tested in a Terracon laboratory to determine the Hveem Stabilometer Value (R-value). One composite sample from borings P2 through P4 and another composite sample from borings P5 through P7 were tested. The tests produced R-values of 7 and less than 5. A design R-Value of 5 was used to calculate the AC pavement thickness sections. A modulus of subgrade reaction of 50 pci was use for the PCC pavement designs.

Based on this relatively low R-value the conventional pavement sections will be relatively thick. The deeper pavement sections will require more off haul of material on site if the same grades are kept. As an alternative to conventional pavement sections, reinforcing the pavement sections with geogrid or chemical treatment of the subgrade soils may be performed to improve their physical support characteristics and reduce the pavement section.

Recommendations for conventional, geogrid reinforced, and chemically treated pavement sections are presented below. The recommendations are based on the subgrade being in a firm and unyielding condition.

Pavement Section Thicknesses

The following tables provide options for AC, AC with geogrid reinforcement, AC with chemical treatment and PCC Sections:

Asphaltic Concrete Design				
Layer	Thickness (inches)			
	Auto Parking Areas (TI=5.0 assumed) ³	Auto Road (TI=5.5 assumed) ³	Truck Parking Areas (TI=6.0 assumed) ³	Truck Ramps and Roads (TI=8.0 assumed) ³
AC ^{1, 2}	3.0	3.5	3.5	5.0
Aggregate Base ¹	10.0	11.0	13.0	18.0

1. All materials should meet the current Caltrans Highway Design Manual specifications
 - Asphaltic Base – Caltrans Class 2 aggregate base
2. A minimum 1.5-inch surface course should be used on ACC pavements.
3. The traffic index (TI) is a measure of traffic wheel loading frequency and intensity of anticipated traffic.

The following table provides options for AC pavement sections reinforced with geogrid. The sections were calculated using the Tensar SpectraPave4PRO-California software. The geogrid material shall be Tensar TriAx TX5 or an equivalent conforming to the physical properties in the 2015 Greenbook Standard Specifications, Multi-Axial Geogrid Table 213-5.2 (E) Type R2. The geogrid shall be placed directly on the subgrade below the aggregate base layer. Adjacent rolls of geogrid shall be overlapped a minimum of 1 foot. Soft subgrade conditions may require up to 3 feet of overlap at the discretion of the geotechnical engineer. The development of wrinkles in the geogrid shall be avoided. A minimum loose fill thickness of 6 inches is required prior to operation of tracked vehicles over the geogrid. When underlying substrate is trafficable with minimal rutting, rubber-tired equipment may pass over the geogrid reinforcement at slow speeds (less than 10 mph).

Reinforced pavement design procedures developed by grid producers rely on product specific field and laboratory research. In some cases, this research has tested pavement sections within a limited range of subgrade conditions and pavement thicknesses. Extrapolations are typically used for thicker pavement sections outside those parameters based on computer modeling. These methods represent the state of the practice but have not always been specifically verified by performance testing.

Asphaltic Concrete Design with Geogrid Reinforcement				
Layer	Thickness (inches)			
	Auto Parking Areas (TI=5.0 assumed) ³	Auto Road (TI=5.5 assumed) ³	Truck Parking Areas (TI=6.0 assumed) ³	Truck Ramps and Roads (TI=8.0 assumed) ³
AC ^{1, 2}	3.0	3.5	3.5	5.0
Aggregate Base ¹	5.0	6.0	8.0	11.0

1. All materials should meet the current Caltrans Highway Design Manual specifications
 - Asphaltic Base – Caltrans Class 2 aggregate base
2. A minimum 1.5-inch surface course should be used on ACC pavements.
3. The traffic index (TI) is a measure of traffic wheel loading frequency and intensity of anticipated traffic.

The following table provides options for AC pavement sections supported by chemically treated soil. Chemical treatment involves treating the pavement subgrade soils with a certain percentage of high calcium quicklime. Usually 3.5 to 5 percent based on the dry unit weight of the soil, for a depth of 12 inches. For estimating purposes, we recommend using 4.5 percent lime and a soil unit weight of 110 pounds per cubic foot. For a 12-inch treatment depth, this results in an estimated minimum spread rate of 5 pounds per square foot lime. The actual amount of lime to be used should be determined by Terracon and by laboratory testing at least three weeks prior to the start of grading operations. Chemical treatment is performed after rough grading of the pavement areas is completed.

Chemically Treated Subgrade Asphaltic Concrete Design				
Layer	Thickness (inches)			
	Auto Parking Areas (TI=5.0 assumed) ³	Auto Road (TI=5.5 assumed) ³	Truck Parking Areas (TI=6.0 assumed) ³	Truck Ramps and Roads (TI=8.0 assumed) ³
AC ^{1, 2}	3.0	3.5	3.5	5.0
Aggregate Base ¹	5.0	5.5	6.0	8.0
Chemically Treated Subgrade ^{1, 4}	12.0	12.0	12.0	12.0

1. All materials should meet the current Caltrans Highway Design Manual specifications
 - Asphaltic Base – Caltrans Class 2 aggregate base
2. A minimum 1.5-inch surface course should be used on ACC pavements.
3. The traffic index (TI) is a measure of traffic wheel loading frequency and intensity of anticipated traffic.
4. Chemically treated material shall have a minimum unconfined compressive strength of 300 psi.

Rigid PCC pavements will perform better than AC in areas where short-radii turning and braking are expected (i.e. entrance/exit aprons) due to better resistance to rutting and shoving. In addition, PCC pavement will perform better in areas subject to large or sustained loads. We recommend rigid pavement for the dumpster area to include the area where the trucks will pick up the dumpster. An adequate number of longitudinal and transverse control joints should be placed in the rigid pavement in accordance with ACI and/or AASHTO requirements. Expansion (isolation) joints must be full depth and should only be used to isolate fixed objects abutting or within the paved area.

All concrete for rigid pavements should have a minimum flexural strength of 550 psi, a minimum compressive strength of 4,500 psi. and be placed with a maximum slump of four inches. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. All joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer.

We recommend all PCC pavement details for joint spacing, joint reinforcement, and joint sealing be prepared in accordance with American Concrete Institute (ACI 330R and ACI 325R.9). PCC pavements should be provided with mechanically reinforced joints (doweled or keyed) in accordance with ACI 330R. Where practical, we recommend early-entry cutting of crack-control joints in PCC pavements. Cutting of the concrete in its “green” state typically reduces the potential for micro-cracking of the pavements prior to the crack control joints being formed, compared to cutting the joints after the concrete has fully set. Micro-cracking of pavements may lead to crack formation in locations other than the sawed joints, and/or reduction of fatigue life of the pavement.

Thickened edges should be used along outside edges of concrete pavements. Edge thickness should be at least 2 inches thicker than concrete pavement thickness and taper to the actual concrete pavement thickness 36 inches inward from the edge. Integral curbs may be used in lieu of thickened edges.

Portland Cement Concrete Design			
Layer	Thickness (inches)		
	Car Parking and Access Lanes ¹	Truck Parking ¹	Dumpster Pads ^{1,3}
PCC ²	5.0	6.5	7.5
Aggregate base ²	4.0	6.0	6.0

1. Car Parking and Access Lanes: ADTT = 1 truck per day
 Truck Parking: ADTT = 25 trucks per day
 Dumpster Pads: Per Category C

Portland Cement Concrete Design			
Layer	Thickness (inches)		
	Car Parking and Access Lanes ¹	Truck Parking ¹	Dumpster Pads ^{1,3}

2. All materials should meet the current Caltrans Highway Design Manual specifications.

3. The trash container pad should be large enough to support the container and the tipping axle of the collection truck.

As more specific traffic information becomes available for the project specific and project traffic indexes are determined, we should be contacted to reevaluate the pavement calculations.

Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

The pavement surfacing, and adjacent sidewalks should be sloped to provide rapid drainage of surface water. Water should not be allowed to pond on or adjacent to these grade-supported slabs, since this could saturate the subgrade and contribute to premature pavement or slab deterioration. In areas where pavement sections abut bioswales, curb should extend below the planned AB section to intercept water infiltration below the pavement section. Water migration in and out of the pavement sections may result in repeated shrinkage and swelling and increasing pavement section fatigue.

Pavement Maintenance

The pavement sections represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore, preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Maintenance consists of both localized maintenance (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Preventive maintenance is usually the priority when implementing a pavement maintenance program. Additional engineering observation is recommended to determine the type and extent of a cost-effective program. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2%.
- Subgrade and pavement surfaces should have a minimum 2% slope to promote proper surface drainage.
- Install below pavement drainage systems surrounding areas anticipated for frequent wetting.
- Install joint sealant and seal cracks immediately.
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils.
- Place compacted, low permeability backfill against the exterior side of curb and gutter.
- Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials.

PERCOLATION TESTING AND STORM WATER INFILTRATION

We performed three percolation tests within the proposed site development for use by the project civil engineers in the design on the storm water retention system. The proposed location and depth of the percolation tests were provided by Kimley-Horn. Three borings, Perc#1 through Perc#3, were drilled using a track-mounted drill rig to depths ranging from approximately 10 to 15 feet bgs. The approximate locations of the test holes are shown on the **Exploration Plan**.

After drilling the test holes, we placed approximately 2 inches of gravel in the bottom of the hole, then placed slotted PVC pipe in the hole, and filled the annular space around the pipe with gravel. The test holes were filled with water and left to saturate for a minimum 24 hours. We then filled the shallow holes with water to depths ranging from 4½ to 5¾ feet and measured the drop-in water surface over a period of approximately 2 hours, refilling the holes as necessary to maintain the desired head.

The measured percolation and infiltration rates are summarized below.

Perc Test #	Depth (ft)	Avg. Head (ft)	Perc. Rate (min/inch)	Perc. Rate (inch/hr)	Infiltration Rate (inch/hr)
Perc#1	15	4.3	0	0	0
Perc#2	12	5.7	0.76	78.7	3.36
Perc#3	10	5.4	17.8	3.38	0.05

Since we used test borings to perform percolation testing, we have used the Porchet formula (aka Inverse Borehole Formula) to calculate the test infiltration rate which takes into account sidewall area of the bore hole. Since our test was performed using clean water, the storm water runoff may likely contain materials such as silt, leaves, oil residues, and other matter that may reduce the percolation characteristics of the soil. We therefore recommend that a filtration system be implemented into the design and installed. An appropriate safety factor should be applied to the

measured infiltration rates by the designer for use in design and be based on the amount of filtration designed into the system, at a minimum a Safety Factor of 2 shall be utilized. The values above are clear water rates and do not have a safety factor applied. In addition, we recommend a regular maintenance program be implemented to monitor the storm drainage/filtration system prior to the beginning of each wet weather season.

We have provided the following considerations for the design and construction of the retention/detention facilities. Planned retention/detention facilities should be located no closer than 10 feet to structural site improvements.

The long-term infiltration rates will depend on many factors, and can be reduced if the following conditions are present:

- Groundwater table,
- Variability of site soils.
- Fine layering of soils, or
- Maintenance and pre-treatment (filtration) of the influent are not performed regularly

Given the fine-grained nature of the near surface clays encountered on this site and the slow infiltration rates measured in Perc#1 and Perc#3, it is our opinion that the native soils may not be very conducive for bioretention system design. We understand the site needs to handle the on-site storm water. Additional storage capacity of the proposed system may be needed.

Subsurface Soil Variation: Variations in subsurface soil conditions and the presence of fine layering can affect the infiltration rate of the receptor soils. As shown in the **Gemodel** section of this report, fine grained alluvial soils (clay) were encountered in our borings to depths ranging from 7½ to 15 feet bgs. The fine-grained soils were underlain by sands with variable amounts of clay and gravel. Due to variation in thickness of the upper surface fine grained soils, infiltration rates may vary across the site. Based on infiltration rate provided in table above, permeable soils were encountered in Perc#2. However, low permeability soils were encountered in Perc#1 and Perc#3.

Groundwater: Based on the measured depth to groundwater ranging from approximately 15 to 24 feet bgs in our borings/CPTs at the time of our field exploration, we anticipate that there should not be difficulty in maintaining adequate separation (greater than 5 feet) between the bottom of the system and groundwater with the bottom of an infiltration facility between 6 to 12 feet bgs

Construction Considerations: The infiltration rate of the receptor soils will be reduced in the event that fine sediment, organic materials, and/or oil residue are allowed to accumulate in the retention facilities. The use of a filtration system is highly recommended as well as a maintenance program.

Operation of heavy equipment during construction may densify the receptor soils below the infiltration facility. The soils exposed in the bottom of the infiltration facility should not be compacted and should remain in their native condition. This may require scarification of the soils prior to construction.

Maintenance of Facilities: Satisfactory long-term performance of an infiltration facility will require some degree of maintenance. Accumulations of sediment, organic materials, or other material that serve to reduce their permeability of the receptor soils should be removed from the filtration system on a regular basis so as not to enter the retention system. The filtration system shall have a rigorous maintenance program, debris from the filtration maintenance should be disposed of at an approved facility in accordance with applicable regulation.

FIELD ELECTRICAL RESISTIVITY

In-situ electrical resistivity testing was performed during our field explorations in general accordance with ASTM G57, utilizing the Wenner Four-Electrode Method. The test consisted of two mutually perpendicular arrays approximately oriented in the north-south and east-west directions. Within a test array, potential electrodes are created on a transverse line between the current electrodes. An equal “A” spacing between electrodes is maintained as listed in the table provided in the results. In-situ electrical resistivity measurements were taken at four test locations. Individual in-situ electrical resistivity values at various “A” spacings along each array are summarized in the table provided in the results. In addition, laboratory electrical resistivity tests were performed on bulk samples obtained from boring P1 through P5. The results of the laboratory testing, and report of field test results and approximate test locations are presented in **Exploration Results** of this report.

THERMAL RESISTIVITY

We understand that new underground utilities will be installed as part of part of the proposed data center construction. Terracon collected bulk samples in borings P1 through P4 for testing to be completed on each sample. Laboratory compaction characteristics testing was performed on the samples in accordance with ASTM D1557. In accordance with IEEE Standard 442-2017, thermal resistivity testing was performed on the samples at 95 percent relative compaction as determined by ASTM D1557. The test results are presented in **Exploration Results** section of this report.

We understand about 3 to 6 feet of fill will be placed across the site to raise grades above the flood plain. Thermal conductivity was performed on the native subsurface soils. Therefore, additional testing may be warranted following fill placement and rough grading to obtain final thermal conductivity values. Terracon can collect fill samples and perform additional thermal resistivity tests if desired.

CORROSIVITY

The table below lists the results of laboratory soluble sulfate, soluble chloride, electrical resistivity, and pH testing. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Corrosivity Test Results Summary						
Boring	Sample Depth (feet)	Soil Description	Soluble Sulfate (%)	Soluble Chloride (%)	Electrical Resistivity (Ω-cm)	pH
B6	1 to 2½	Lean Clay with Sand	0.0216	0.0073	1649	7.58
B7	1 to 2½	Lean Clay with Sand	0.0144	0.0063	1649	8.34

These test results are provided to assist in determining the type and degree of corrosion protection that may be required for the project. We recommend that a certified corrosion engineer determine the need for corrosion protection and design appropriate protective measures.

Resistivity

The resistivity values indicate the samples tested exhibit a high corrosive potential to buried metal pipes at borings B6 and B7. Evaluation of the test results is based upon the guidelines of J.F. Palmer, "Soil Resistivity Measurements and Analysis", Materials Performance, Volume 13, January 1974. The following table outlines the guidelines for soil resistivity for corrosion potential.

Corrosion Potential of Soil on Steel	
Soil Resistivity (ohm-cm)	Corrosion Potential
0 to 1,000	Very High
1,000 to 2,000	High
2,000 to 5,000	Moderate
> 5,000	Mild

Sulfates

The sulfate test results indicate that the soil from borings B6 and B7 at a depth of 1 to 2½ feet bgs classify as Class S0 according to Table 19.3.1.1 of ACI 318-14. This indicates that the sulfate severity is negligible when considering corrosion to concrete. Based on the sulfate content test results, ACI 318-14, Section 19.3 does not specify a required type of cement or a maximum water-cement ratio for concrete for sulfate Class S0. For further information, see ACI 318-14, Section 19.3.

Laboratory pH

Data suggests the soil pH should not be the dominant soil variable affecting soil corrosion if the soil has a pH in the 5 to 8 range. The pH of the sample tested from boring B6 was within the recommended range and therefore need not be considered when determining soil corrosion potential. The pH of the sample tested from boring B7 was above the recommended range and therefore should be considered when determining soil corrosion potential.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location

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of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing. This report should not be used after 3 years without written authorization from Terracon.

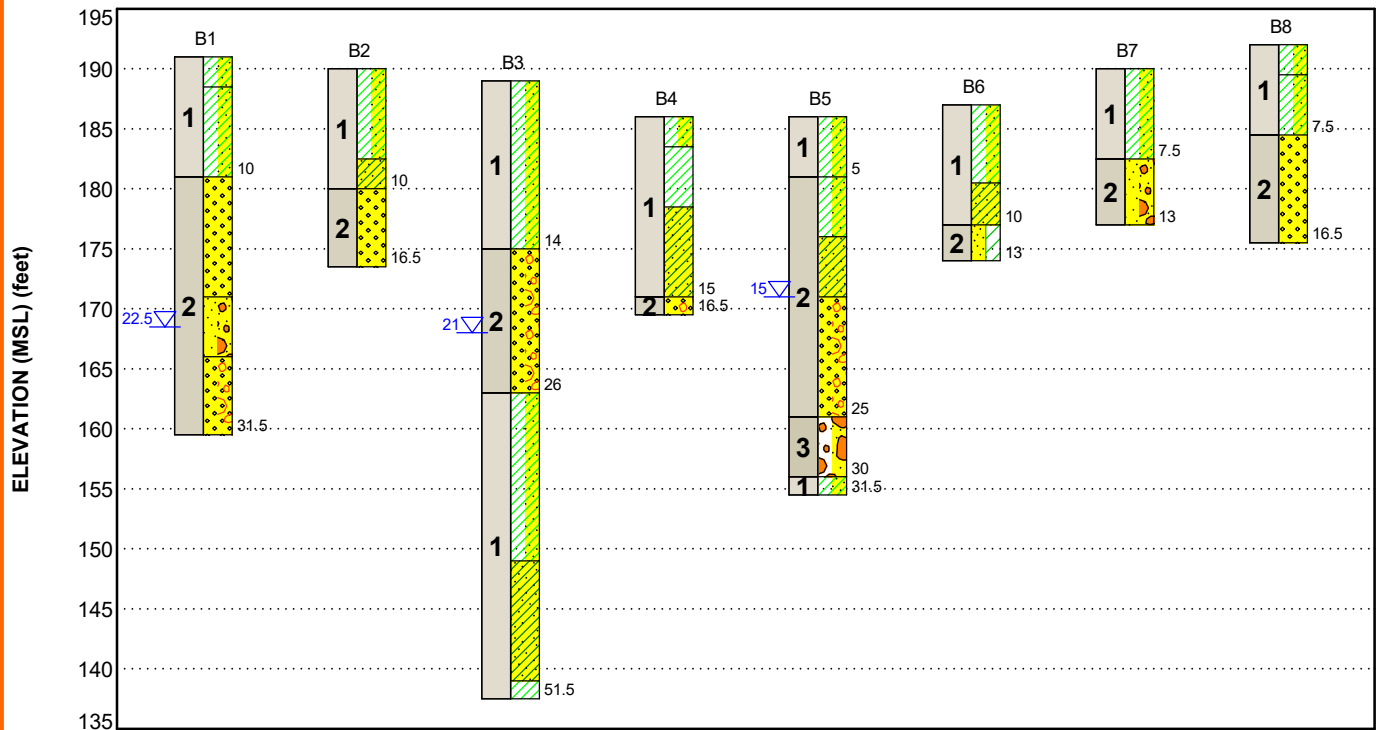
FIGURES

Contents:

GeoModel

GEOMODEL

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This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Lean Clay	Medium stiff to very stiff lean clay with variable amounts of sand.
2	Sand	Medium dense to dense sand with variable amounts of clay and gravel.
3	Gravel	Dense gravel with variable amounts of sand.

LEGEND

Lean Clay with Sand	Well-graded Sand with Gravel	Poorly-graded Gravel with Sand
Well-graded Sand	Sandy Lean Clay	Poorly-graded Sand with Clay
Poorly-graded Sand with Gravel	Lean Clay	

First Water Observation

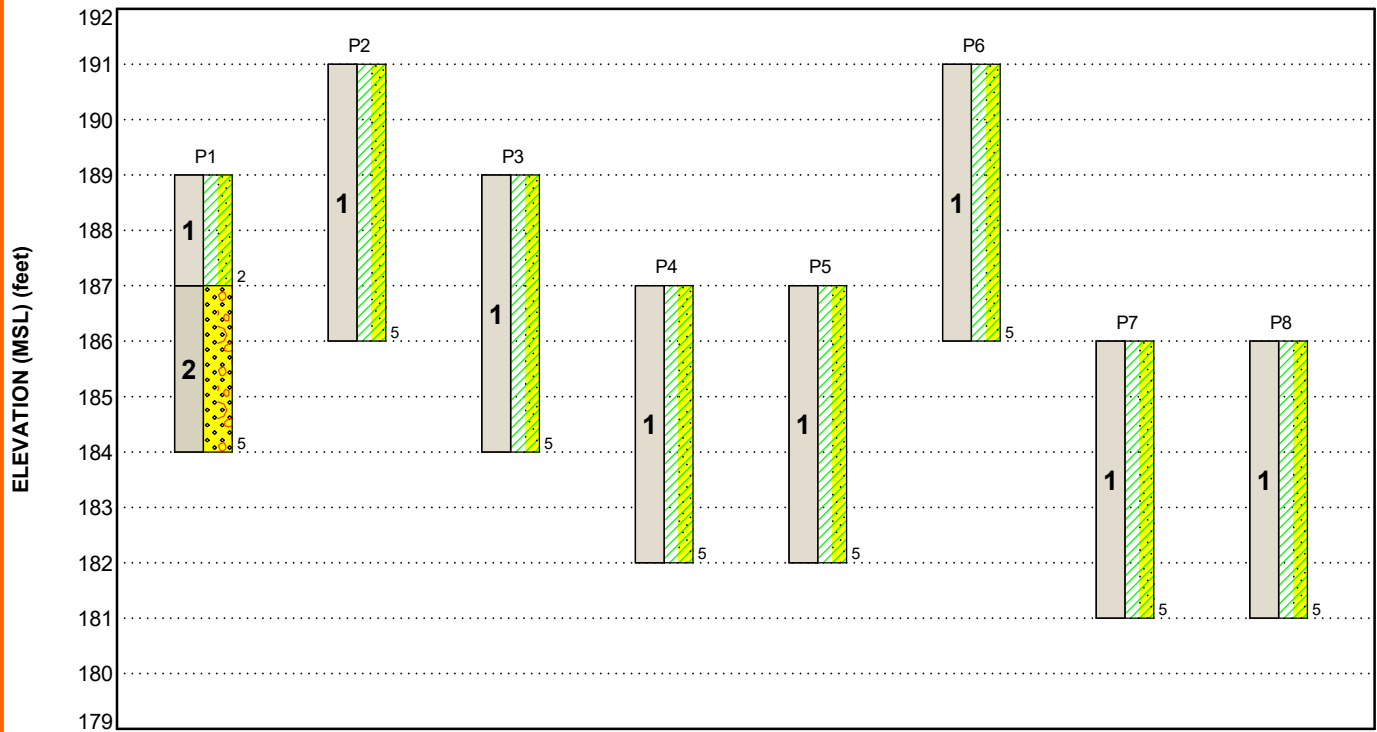
NOTES:

Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

GEOMODEL

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This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Lean Clay	Medium stiff to very stiff lean clay with variable amounts of sand.
2	Sand	Medium dense to dense sand with variable amounts of clay and gravel.
3	Gravel	Dense gravel with variable amounts of sand.

LEGEND

- Lean Clay with Sand
- Well-graded Sand with Gravel

First Water Observation

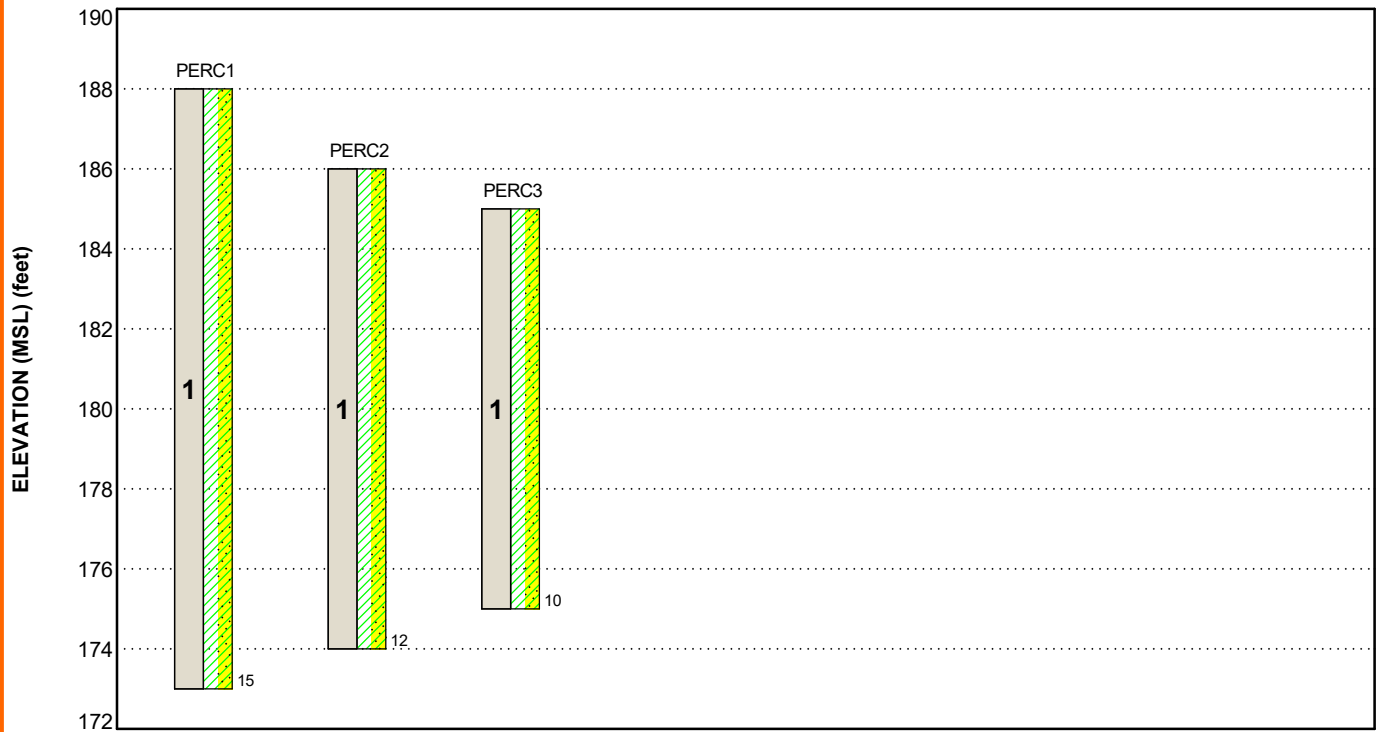
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This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Lean Clay	Medium stiff to very stiff lean clay with variable amounts of sand.
2	Sand	Medium dense to dense sand with variable amounts of clay and gravel.
3	Gravel	Dense gravel with variable amounts of sand.

LEGEND

 Lean Clay with Sand

 First Water Observation

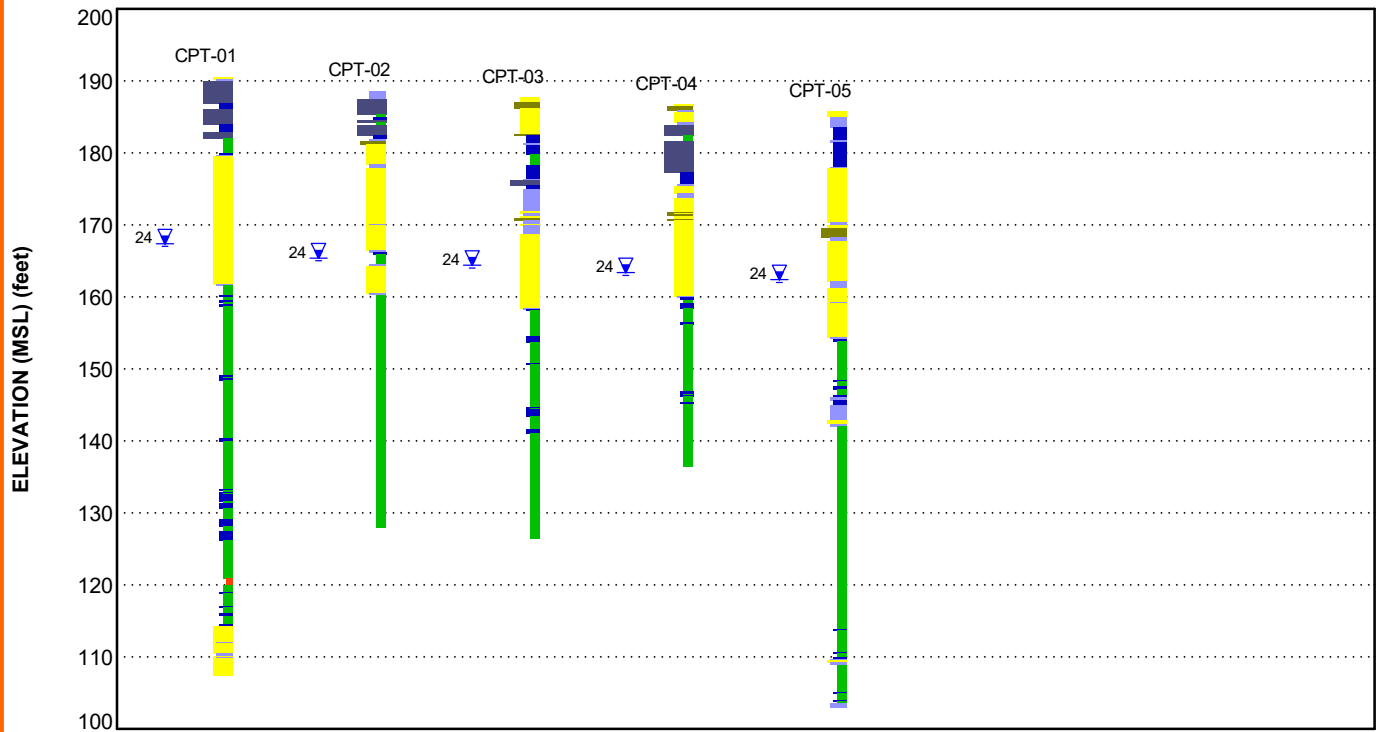
Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:

Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

GEOMODEL

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This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Lean Clay	Medium stiff to very stiff lean clay with variable amounts of sand.
2	Sand	Medium dense to dense sand with variable amounts of clay and gravel.
3	Gravel	Dense gravel with variable amounts of sand.

LEGEND

Soil Behavior Type (SBT)

 1 Sensitive, fine grained	 2 Organic soils - clay	 3 Clay - silty clay to clay
 4 Silt mixtures - clayey silt to silty clay	 5 Sand mixtures - silty sand to sandy silt	 6 Sands - clean sand to silty sand
 7 Gravelly sand to dense sand	 8 Very stiff sand to clayey sand	 9 Very stiff fine grained

 CPT Assumed Water Depth

 First Water Observation

NOTES:

Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings/CPTs	Boring Depth (feet)	Planned Location
1	51½	Planned building area
2	31½	Planned building area
3	16½	Planned building area
2	13	Planned equipment yard area
9	5	Planned parking and drives
2 CPT ¹	83 to 83½	Planned building area
3 CPT ¹	50 to 61½	Planned building area

1. Cone Penetration Test.

Boring/CPT Layout/Elevations: The boring/CPT layout was performed by Terracon. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±20 feet). Boring/CPT elevations were estimated using Google Earth Pro. If more precise boring/CPT locations and elevations are desired, we recommend the borings/CPTs locations be surveyed.

Subsurface Exploration Procedures: We advanced borings with a track-mounted drill rigs using continuous flight, hollow stem augers. One to four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. Additionally, a bulk sample was collected in upper 5 feet of borings P1 through P9. Soil sampling was performed using split-barrel sampling. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon or 2.5-inch outer diameter Modified California split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. Tube-lined, split-barrel sampling procedures are similar to standard split spoon sampling procedure; however, blow counts are not equivalent to the SPT blow counts. The values provided on our boring logs are uncorrected. Additionally, we observed and recorded groundwater levels during drilling and sampling. Per the requirements of the local health department and for safety purposes, all borings were backfilled with grout after their completion.

For the cone penetrometer testing, the CPT rig hydraulically pushes an instrumented cone through the soil while nearly continuous readings are recorded to a portable computer. The cone is equipped with electronic load cells to measure tip resistance and sleeve resistance and a pressure transducer to measure the generated ambient pore pressure. The face of the cone has an apex angle of 60° and an area of 15 cm². Digital Data representing the tip resistance, friction

resistance, pore water pressure, and probe inclination angle are recorded about every 2 centimeters while advancing through the ground at a rate between 1½ and 2½ centimeters per second. These measurements are correlated to various soil properties used for geotechnical design. No soil samples are gathered through this subsurface investigation technique. CPT testing was conducted in general accordance with ASTM D5778 “Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils.”

The sampling depths, penetration distances, and other sampling information were recorded on the field boring logs. The samples were placed in appropriate containers and taken to a Terracon soil laboratory for testing and classification by a geotechnical engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs include visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the geotechnical engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D1140 Standard Test Method for Determining the Amount of Material Finer than No. 200 Sieve by Soil Washing
- ASTM D2166/D2166M Standard Test Method for Unconfined Compressive Strength of Cohesive Soil
- ASTM D2435/D2435M Standard Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading
- ASTM G162 – 99 Standard Practice for Conducting and Evaluating Laboratory Corrosion Tests in Soils
- ASTM D2844 Standard Test Method for Resistance R-Value and Expansion Pressure of Compacted Soils

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September 16, 2020 ■ Terracon Project No. ND205052



The laboratory testing program often included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

Geotechnical Engineering Report

New Data Center – SFO069 ■ Gilroy, Santa Clara County, California

September 16, 2020 ■ Terracon Project No. ND205052



PHOTOGRAPHY LOG



Photo 1 – Approximately 5 feet southwest of boring B1 facing southwest



Photo 2 – Approximately 5 feet southwest of boring B1 facing northwest

Geotechnical Engineering Report

New Data Center – SFO069 ■ Gilroy, Santa Clara County, California

September 16, 2020 ■ Terracon Project No. ND205052



Photo 3 – Approximately 5 feet northeast of boring B1 facing northeast



Photo 4 – Approximately 5 feet east of boring B1 facing east

SITE LOCATION AND EXPLORATION PLANS

Contents:

Site Location Plan

Exploration Plan

Note: All attachments are one page unless noted above.

SITE LOCATION

New Data Center – SFO069 ■ Gilroy, Santa Clara County, California
September 16, 2020 ■ Terracon Project No. ND205052

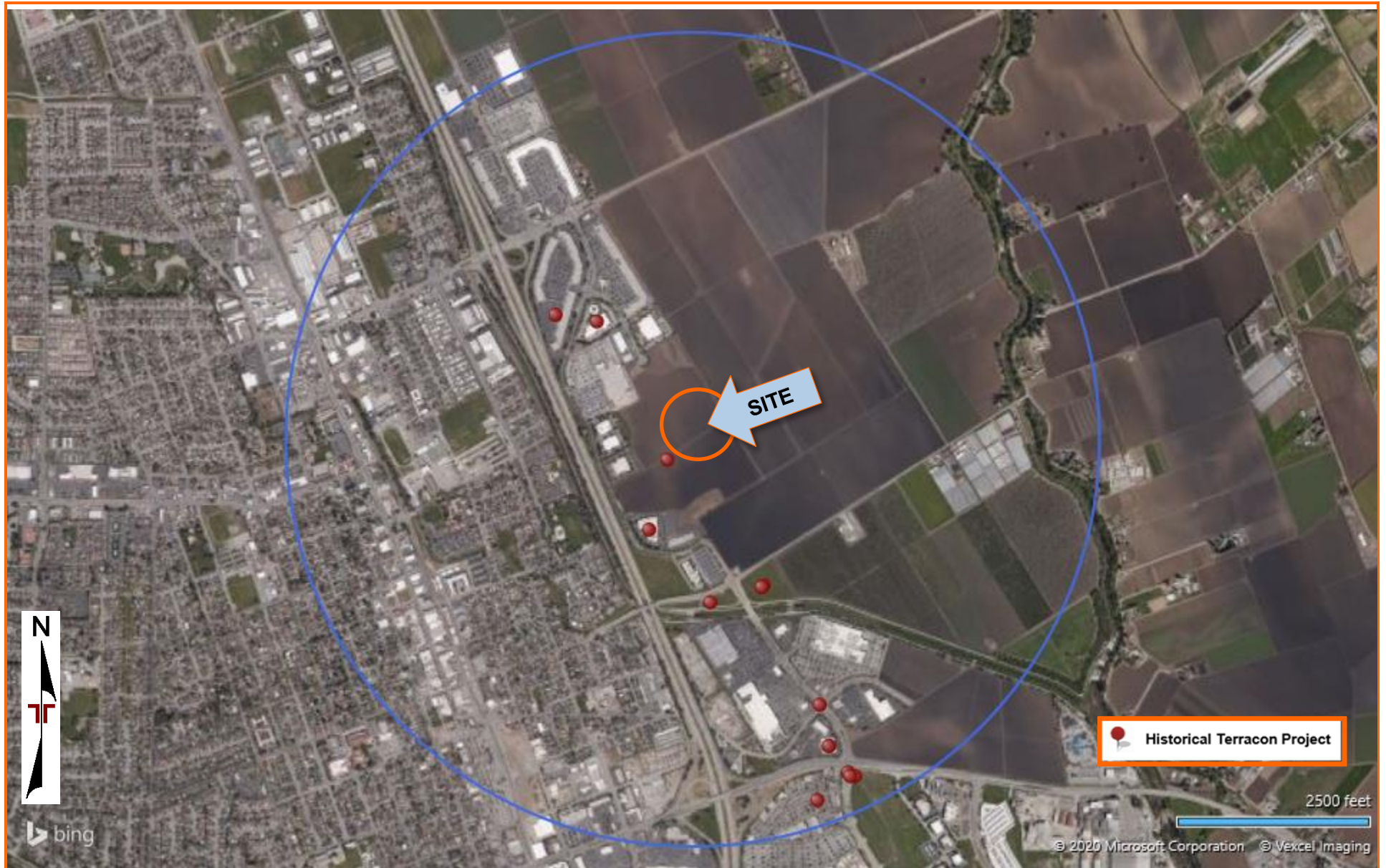
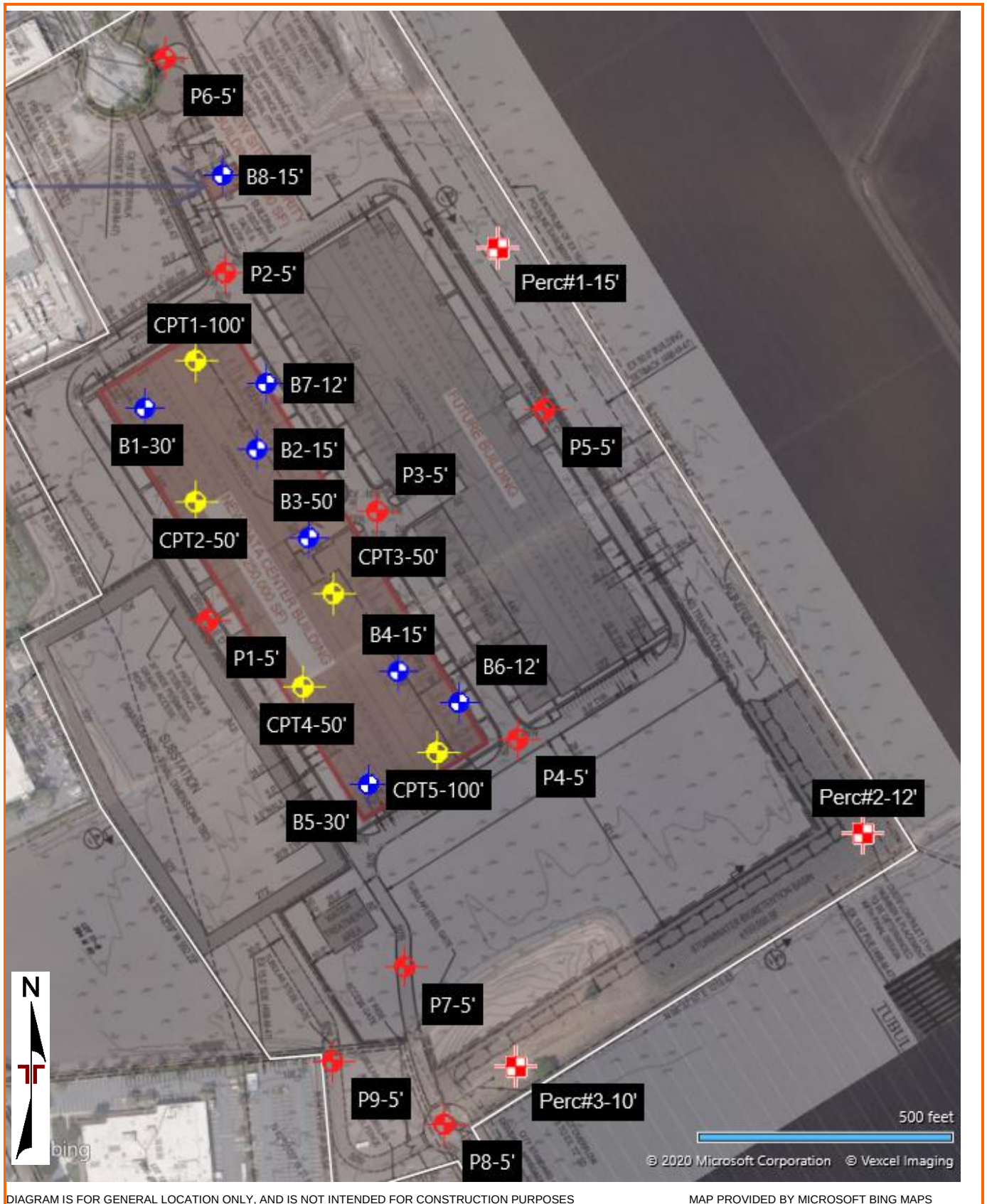


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN

New Data Center – SFO069 ■ Gilroy, Santa Clara County, California
September 16, 2020 ■ Terracon Project No. ND205052



EXPLORATION RESULTS

Contents:

Boring Logs (B1 through B8, P1 through P9)
CPT Logs (CPT-1 through CPT-5)
Field Electrical Resistivity
Lab Electrical Resistivity
Thermal Resistivity
Atterberg Limits
Unconfined Compressive Strength
Consolidation
Direct Shear
R-Value
Corrosivity
Moisture Density Relationship

Note: All attachments are one page unless noted above.

Page 1 of 2

**CLIENT: Kimley-Horn & Associates Inc
Orange, CA**

[illegible]

Hammer Type: Automatic

Project No.: ND205052

BORING LOG NO. B1

Page 2 of 2

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.0167° Longitude: -121.5598° Approximate Surface Elev.: 191 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2		WELL GRADED SAND WITH CLAY AND GRAVEL (SW) , fine to coarse grained, brown with black, medium dense to dense (<i>continued</i>) 31.5 159.5+/-	30			11-24-20 N=44		12			
		Boring Terminated at 31.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with cement-bentonite grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

 While drilling

Terracon
5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-05-2020

Boring Completed: 08-05-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

BORING LOG NO. B2

Page 1 of 1

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.0164° Longitude: -121.559° Approximate Surface Elev.: 190 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		LEAN CLAY WITH SAND (CL) , fine grained, brown to reddish brown, stiff 7.5 182.5+/-	5			6-8-11	4.5+ (HP)	17			
						5-6-9	4.5+ (HP)	16	101	26-16-10	74
						4-8-13	4.5+ (HP)	24	93		
						4-7-10	2.5 (HP)	18	98		
			10			9-18-20		11	96		
2		WELL GRADED SAND (SW) , fine to coarse grained, brown with red brown, medium dense, more gravel at 15 feet 10.0 180+/- 16.5 173.5+/-	15			16-21-21		8	111		
		Boring Terminated at 16.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.
Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-05-2020

Boring Completed: 08-05-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL ND205052 NEW DATA CENTER.GPJ TERRACON_DATATEMPLATE.GDT 9/16/20

BORING LOG NO. B3

Page 1 of 2

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.016° Longitude: -121.5587° Approximate Surface Elev.: 189 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		LEAN CLAY WITH SAND (CL) , fine grained, brown to reddish brown, medium stiff to stiff	14.0			4-5-8	4.0 (HP)	21			
						4-4-7	3.5 (HP)	19	97		
			5			4-9-13	3.5 (HP)	19	95		
						3-6-8	3.5 (HP)	24	98		
			10			3-6-8	3.5 (HP)	22	91	41-21-20	82
2		WELL GRADED SAND WITH GRAVEL (SW) , fine grained, brown to red brown, medium dense to dense	175+/-			9-19-17		9	106		
			20			13-21-33		12	104		9
			25			12-12-7 N=19		26	97		
1			26.0								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with cement-bentonite grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

While drilling

Terracon
5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-06-2020

Boring Completed: 08-06-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL ND205052 NEW DATA CENTER.GPJ TERRACON_DATATEMPLATE.GDT 9/16/20

BORING LOG NO. B3

Page 2 of 2

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.016° Longitude: -121.5587° Approximate Surface Elev.: 189 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		LEAN CLAY WITH SAND (CL) , fine grained, brown to light brown, stiff (<i>continued</i>) 40.0 149+/-	30			4-4-5 N=9	1.0 (HP)	21		26-18-8	77
		SANDY LEAN CLAY (CL) , fine to medium grained, brown to reddish brown, stiff 40 40	40			4-6-8 N=14		24			67
		LEAN CLAY (CL) , brown to red brown, very stiff 50.0 139+/-	45			6-7-9 N=16	2.25 (HP)	23			
		LEAN CLAY (CL) , brown to red brown, very stiff 51.5 137.5+/-	50			8-13-17 N=30	4.5+ (HP)	22			
		Boring Terminated at 51.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with cement-bentonite grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

 While drilling

Terracon
5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-06-2020

Boring Completed: 08-06-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

BORING LOG NO. B4

Page 1 of 1

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.0153° Longitude: -121.5581° Approximate Surface Elev.: 186 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		LEAN CLAY WITH SAND (CL) , fine grained, brown with black mottling, stiff 2.5 183.5+/-				3-4-5 N=9	4.5+ (HP)	21		38-18-20	74
		LEAN CLAY (CL) , trace silt and sand, fine grained, reddish brown, stiff 7.5 178.5+/-	5			3-4-7 N=11	4.5+ (HP)	25			
		SANDY LEAN CLAY (CL) , fine to medium grained, brown and red brown with black mottling, stiff 15.0 171+/-				4-5-8 N=13		23			
			10			4-6-8 N=14		23			
						4-6-8 N=14		24			
2		WELL GRADED SAND WITH GRAVEL (SW) , fine to coarse grained, brown with gray, medium dense 16.5 169.5+/-	15			12-9-9 N=18		11			
		Boring Terminated at 16.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-05-2020

Boring Completed: 08-05-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL ND205052 NEW DATA CENTER.GPJ TERRACON_DATATEMPLATE.GDT 9/16/20

BORING LOG NO. B5

Page 1 of 2

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.0147° Longitude: -121.5583° Approximate Surface Elev.: 186 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		LEAN CLAY WITH SAND (CL) , fine to medium grained, dark brown with brown red mottling, stiff 5.0 181+/-	5			4-6-8 4-5-7	3.5 (HP) 3.5 (HP)	21 20	94 93	36-18-18	79
		LEAN CLAY WITH SAND (CL) , fine to medium grained, brown with red brown and black mottling, stiff 10.0 176+/-	10			4-6-11 3-7-10	3.0 (HP) 3.5 (HP)	26 23	89 93		
		SANDY LEAN CLAY (CL) , fine to medium grained, light brown with red brown mottling, medium stiff 15.0 171+/-	15			4-4-6	1.5 (HP)	24	92		
2		WELL GRADED SAND WITH GRAVEL (SW) , fine to coarse grained, brown with black, medium dense to dense, Gravel increasing with depth 25.0 161+/-	25			14-22-17		9	116		
			20			13-15-23 N=38		11			
3		POORLY GRADED GRAVEL WITH SAND (GP) , fine to medium grained, brown with black, dense				7-19-16 N=35		12			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with cement-bentonite grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

At completion of drilling

Terracon

5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-05-2020

Boring Completed: 08-05-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL ND205052 NEW DATA CENTER.GPJ TERRACON_DATATEMPLATE.GDT 9/16/20

BORING LOG NO. B5

Page 2 of 2

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.0147° Longitude: -121.5583° Approximate Surface Elev.: 186 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
3		POORLY GRADED GRAVEL WITH SAND (GP) , fine to medium grained, brown with black, dense (<i>continued</i>) 30.0 156+/-	30								
1		LEAN CLAY WITH SAND (CL) , fine to medium grained, brown, very stiff 31.5 154.5+/-				7-9-13 N=22	2.5 (HP)	18			
		Boring Terminated at 31.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with cement-bentonite grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

At completion of drilling

Terracon
5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-05-2020

Boring Completed: 08-05-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

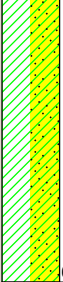
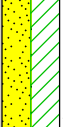
BORING LOG NO. B6

Page 1 of 1

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.0151° Longitude: -121.5577° Approximate Surface Elev.: 187 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		LEAN CLAY WITH SAND (CL) , fine to medium grained, brown with reddish brown, stiff 6.5 180.5+/-	5			4-5-7	4.0 (HP)	20			
						4-6-7	4.0 (HP)	19	95		
						5-9-13	4.5+ (HP)	20	104		
		SANDY LEAN CLAY (CL) , fine to medium grained, brown with reddish brown, stiff 10.0 177+/-	10			5-7-10	3.0 (HP)	23	95		
2		POORLY GRADED SAND WITH CLAY (SP) , some gravel, fine to medium grained, reddish brown, medium dense 13.0 174+/-				4-7-10		26	97		
						13-9-10 N=19		12			
Boring Terminated at 13 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-05-2020

Boring Completed: 08-05-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

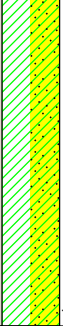
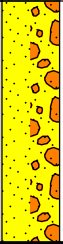
BORING LOG NO. B7

Page 1 of 1

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.0168° Longitude: -121.559° Approximate Surface Elev.: 190 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		LEAN CLAY WITH SAND (CL) , fine grained, brown with reddish brown, very stiff 7.5 182.5+/-	5			5-8-10 N=18		18			
						5-7-9 N=16		17			
						4-7-10 N=17		20			
2		POORLY GRADED SAND WITH GRAVEL (SP) , medium to coarse grained, brown with reddish brown, medium dense to dense 13.0 177+/-	10			3-13-19 N=32		11			
						8-10-10 N=20		7			
						11-13-16 N=29		8			
Boring Terminated at 13 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-06-2020

Boring Completed: 08-06-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL ND205052 NEW DATA CENTER.GPJ TERRACON_DATATEMPLATE.GDT 9/16/20

BORING LOG NO. B8

Page 1 of 1

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.018° Longitude: -121.5593° Approximate Surface Elev.: 192 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		LEAN CLAY WITH SAND (CL) , fine grained, brown with reddish brown, very stiff 2.5 189.5+/-				7-12-19	4.5+ (HP)	13	104	34-17-17	73
		LEAN CLAY WITH SAND (CL) , fine to medium grained, reddish brown to yellowish brown, very stiff 7.5 184.5+/-	5			7-10-15	4.5 (HP)	9	112		
						4-10-16		21	99		
2		WELL GRADED SAND (SW) , trace gravel, fine to coarse grained, brown with red brown, medium dense 16.5 175.5+/-	10			7-15-17		8	110		
			15			12-14-19		15	102		
						11-19-22		6	112		
		Boring Terminated at 16.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-06-2020

Boring Completed: 08-06-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL ND205052 NEW DATA CENTER.GPJ TERRACON_DATATEMPLATE.GDT 9/16/20

BORING LOG NO. P1

Page 1 of 1

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.0156° Longitude: -121.5593° Approximate Surface Elev.: 189 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		LEAN CLAY WITH SAND (CL) , fine grained, black, stiff 2.0 187+/-									
2		WELL GRADED SAND WITH CLAY AND GRAVEL (SW) , fine to coarse grained, brown with black, loose 5.0 184+/-				10-11-14		14			
		Boring Terminated at 5 Feet	5								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-06-2020

Boring Completed: 08-06-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

BORING LOG NO. P2

Page 1 of 1

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.0174° Longitude: -121.5592° Approximate Surface Elev.: 191 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		5.0 186+/-	5			4-6-10		18	104		
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-06-2020

Boring Completed: 08-06-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

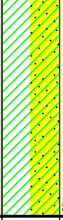
BORING LOG NO. P3

Page 1 of 1

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.0162° Longitude: -121.5582° Approximate Surface Elev.: 189 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		LEAN CLAY WITH SAND (CL) , fine grained, brown with reddish brown, stiff 5.0 184+/-	5	  		4-5-9		21	98		
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-05-2020

Boring Completed: 08-05-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

BORING LOG NO. P4

Page 1 of 1

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.0149° Longitude: -121.5573° Approximate Surface Elev.: 187 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		LEAN CLAY WITH SAND (CL) , fine grained, brown with reddish brown, medium stiff 5.0 182+/-	5	  		3-3-7		20	93		
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-05-2020

Boring Completed: 08-05-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

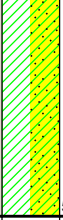
BORING LOG NO. P5

Page 1 of 1

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.0167° Longitude: -121.5571° Approximate Surface Elev.: 187 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		LEAN CLAY WITH SAND (CL) , brown and reddish brown, stiff 5.0 182+/-	5	  		4-7-11		23	93		
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-06-2020

Boring Completed: 08-06-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

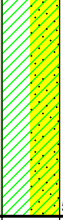
BORING LOG NO. P6

Page 1 of 1

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.0186° Longitude: -121.5596° Approximate Surface Elev.: 191 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		LEAN CLAY WITH SAND (CL) , brown to dark brown, stiff 5.0 186+/-	5	  		4-6-8		20	96		
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon

5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-06-2020

Boring Completed: 08-06-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

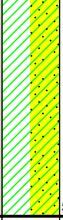
BORING LOG NO. P7

Page 1 of 1

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.0137° Longitude: -121.558° Approximate Surface Elev.: 186 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		LEAN CLAY WITH SAND (CL) , trace sand, brown with reddish brown, stiff 5.0 181+/-	5		  	3-5-8		21	98		
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-05-2020

Boring Completed: 08-05-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

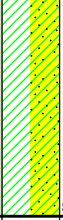
BORING LOG NO. P8

Page 1 of 1

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.0129° Longitude: -121.5578° Approximate Surface Elev.: 186 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		LEAN CLAY WITH SAND (CL) , brown to reddish brown, stiff 5.0 181+/-	5	  		4-6-10		14	108		
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-05-2020

Boring Completed: 08-05-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

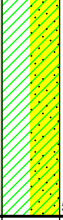
BORING LOG NO. P9

Page 1 of 1

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 37.0132° Longitude: -121.5585° Approximate Surface Elev.: 187 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		LEAN CLAY WITH SAND (CL) , brown, stiff 5.0 182+/-	5	  		4-6-9		18	95		
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Solid Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were obtained from Google Earth Pro

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
5075 Commercial Cir Ste E
Concord, CA

Boring Started: 08-05-2020

Boring Completed: 08-05-2020

Drill Rig: D-50

Driller: Terracon

Project No.: ND205052

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CPT LOG NO. CPT-01

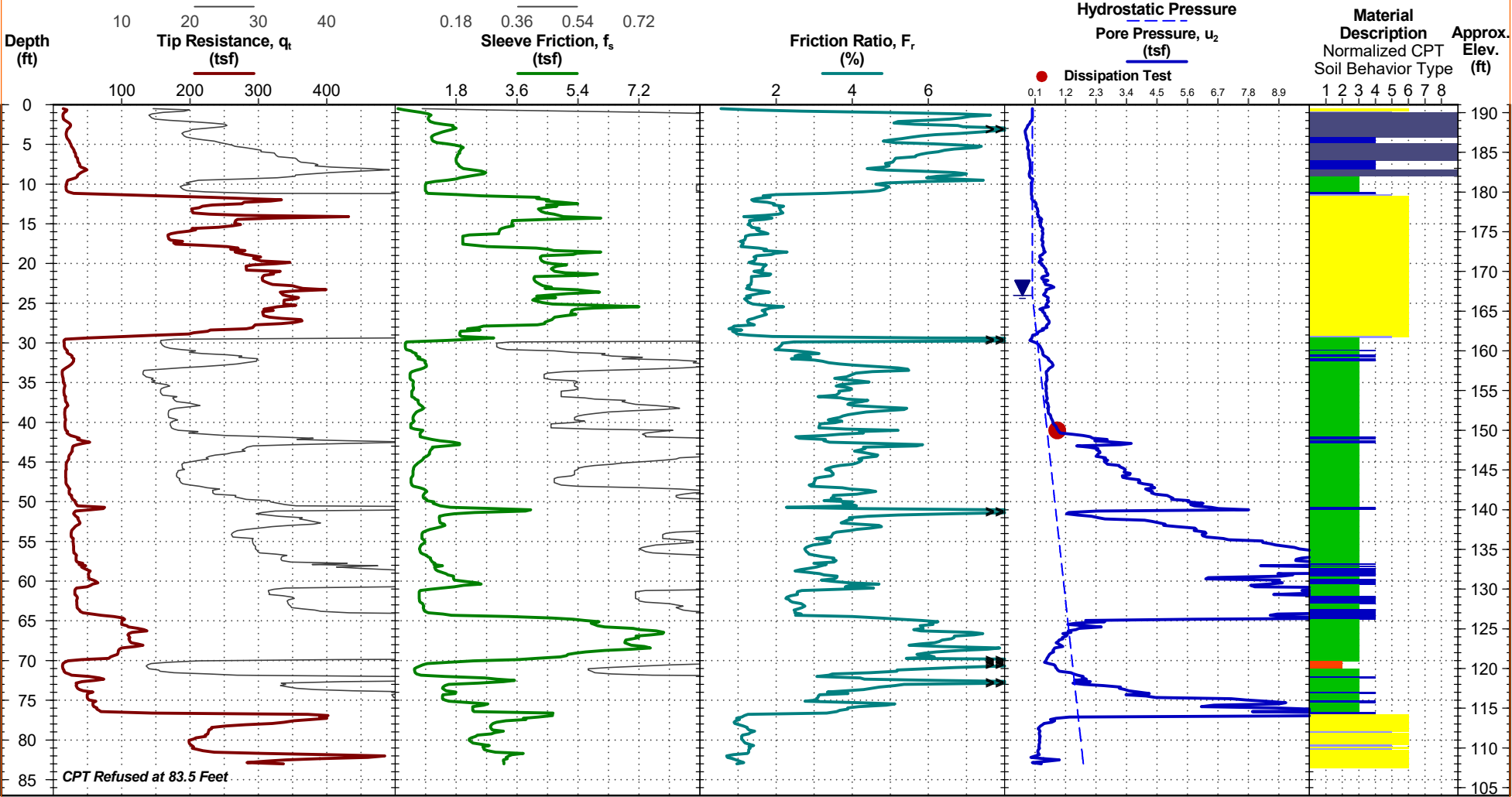
PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

TEST LOCATION: See [Exploration Plan](#)

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

Approx. Surface Elev: 191 ft +/-
Latitude: 37.01697144°
Longitude: -121.5594286°



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
Elevations were obtained from Google Earth Pro

Dead weight of rig used as reaction force.
CPT sensor calibration reports available upon request.

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravelly sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

WATER LEVEL OBSERVATION

24 ft measured water depth
(used in normalizations and correlations;
See [Supporting Information](#))

Probe no. DDG1496

Terracon
5075 Commercial Cir Ste E
Concord, CA

CPT Started: 8/12/2020

Rig: CPT

Project No.: ND205052

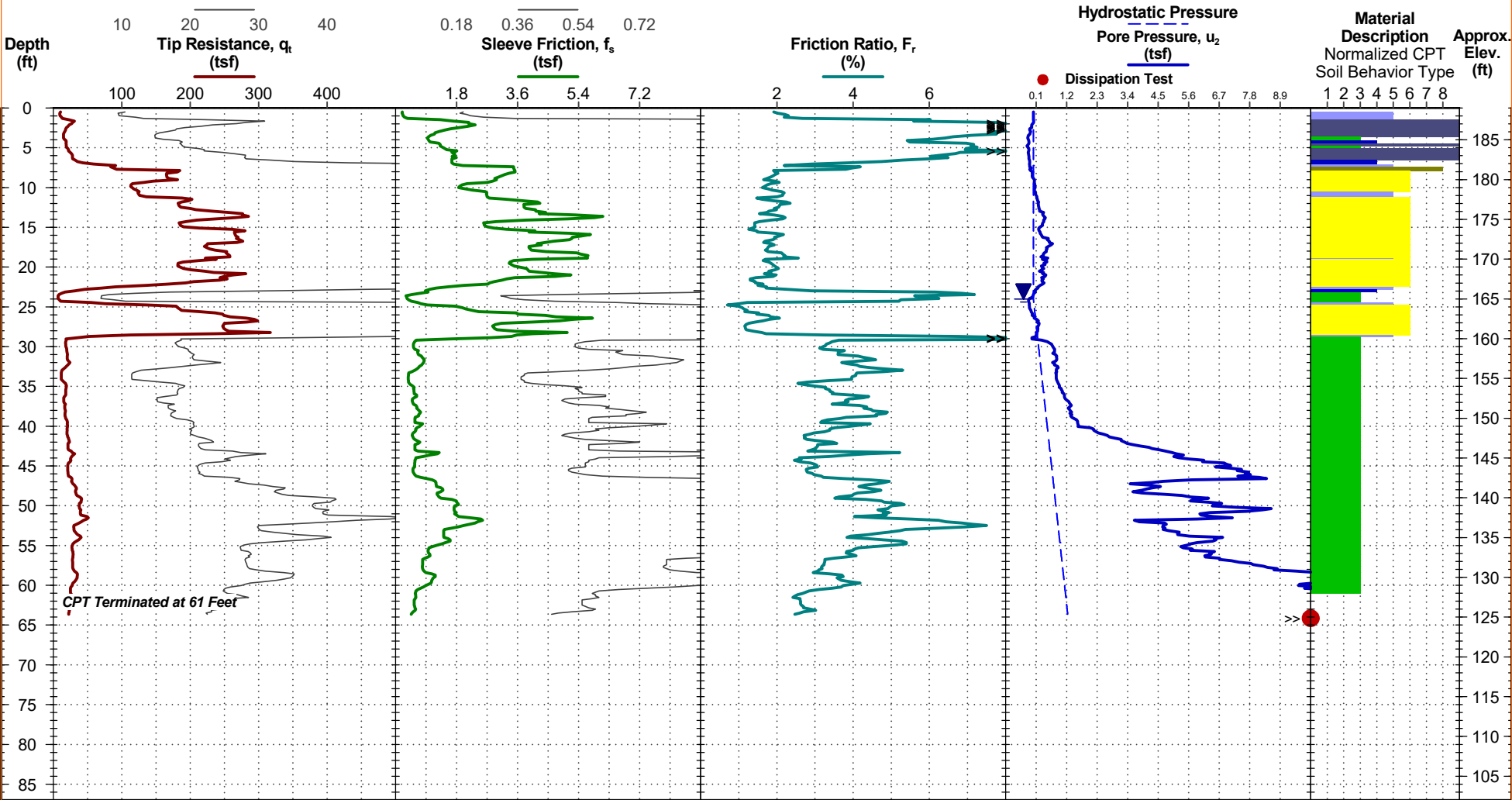
CPT Completed: 8/12/2020

Operator: Middle Earth

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT ND205052 NEW DATA CENTER.GPJ TERRACON.DATATEMPLATE.GDT 9/16/20

CPT LOG NO. CPT-02

PROJECT: New Data Center	CLIENT: Kimley-Horn & Associates Inc Orange, CA	TEST LOCATION: See Exploration Plan Approx. Surface Elev: 189 ft +/- Latitude: 37.01621094° Longitude: -121.5594286°
SITE: Arroyo Circle and Gilmore Road Gilroy, CA		



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
Elevations were obtained from Google Earth Pro

Dead weight of rig used as reaction force.
CPT sensor calibration reports available upon request.

WATER LEVEL OBSERVATION	Probe no. DDG1496	 5075 Commercial Cir Ste E Concord, CA	CPT Started: 8/12/2020	CPT Completed: 8/12/2020
24 ft measured water depth (used in normalizations and correlations; See Supporting Information)			Rig: CPT	Operator: Middle Earth
			Project No.: ND205052	

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT ND205052 NEW DATA CENTER.GPJ TERRACON.DATATEMPLATE.GDT 9/16/20

CPT LOG NO. CPT-03

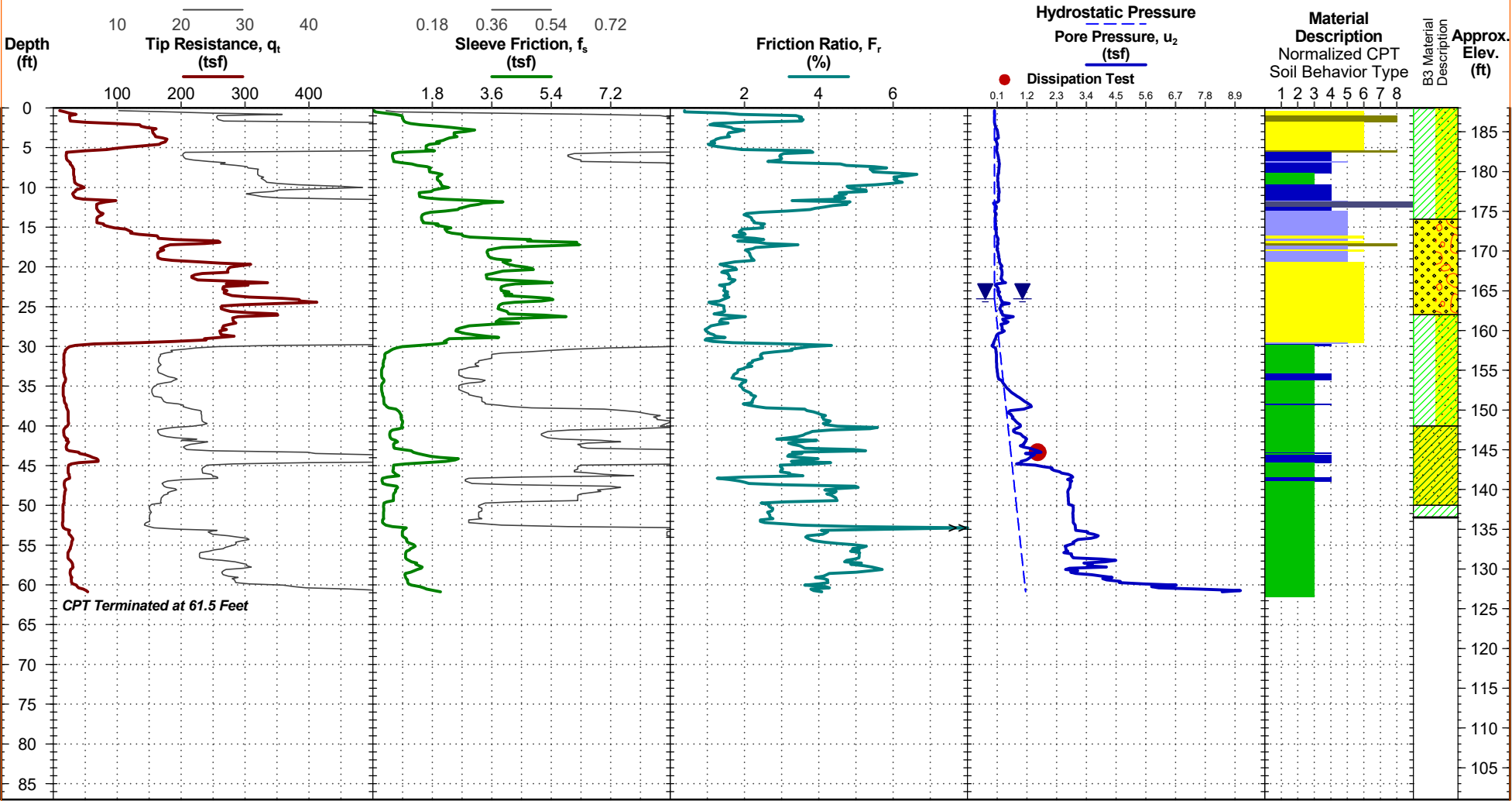
PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

TEST LOCATION: See [Exploration Plan](#)

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

Approx. Surface Elev: 188 ft +/- Adjacent Test: B3
Latitude: 37.01571662°
Longitude: -121.5585°



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Elevations were obtained from Google Earth Pro

See B3 for the adjacent test's full details.

Dead weight of rig used as reaction force.

CPT sensor calibration reports available upon request.

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravelly sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

WATER LEVEL OBSERVATION

24 ft measured water depth
(used in normalizations and correlations;
See [Supporting Information](#))

Probe no. DDG1496

Terracon
5075 Commercial Cir Ste E
Concord, CA

CPT Started: 8/12/2020

Rig: CPT

Project No.: ND205052

CPT Completed: 8/12/2020

Operator: Middle Earth

CPT LOG NO. CPT-04

Page 1 of 1

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

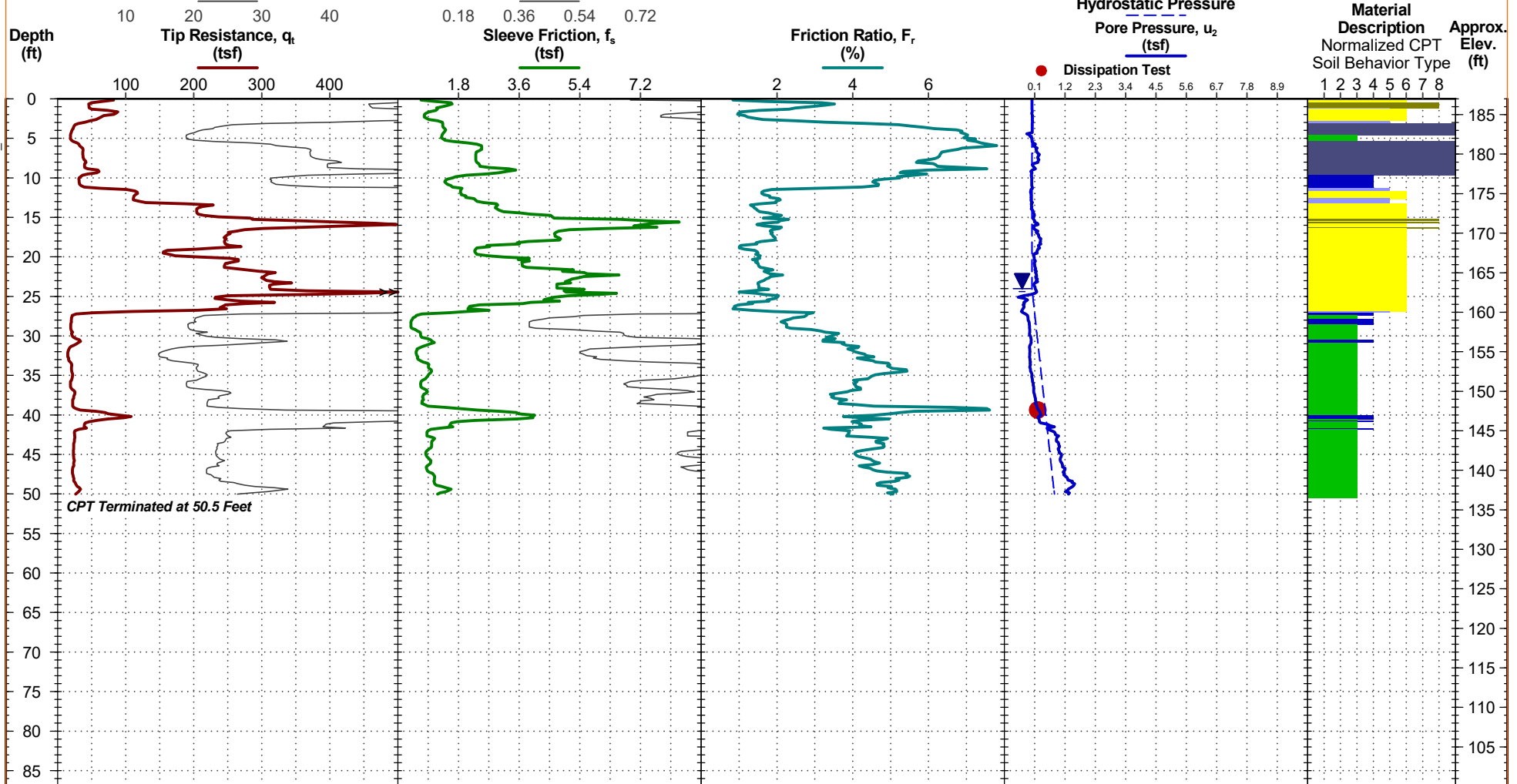
TEST LOCATION: See [Exploration Plan](#)

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

Approx. Surface Elev: 187 ft +/-

Latitude: 37.01521468°

Longitude: -121.5587047°



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Elevations were obtained from Google Earth Pro

Dead weight of rig used as reaction force.

CPT sensor calibration reports available upon request.

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravelly sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

WATER LEVEL OBSERVATION

24 ft measured water depth
(used in normalizations and correlations;
See [Supporting Information](#))

Probe no. DDG1496

Terracon
5075 Commercial Cir Ste E
Concord, CA

CPT Started: 8/12/2020

Rig: CPT

Project No.: ND205052

CPT Completed: 8/12/2020

Operator: Middle Earth

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THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT ND205052 NEW DATA CENTER.GPJ TERRACON.DATATEMPLATE.GDT 9/16/20

CPT LOG NO. CPT-05

PROJECT: New Data Center

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

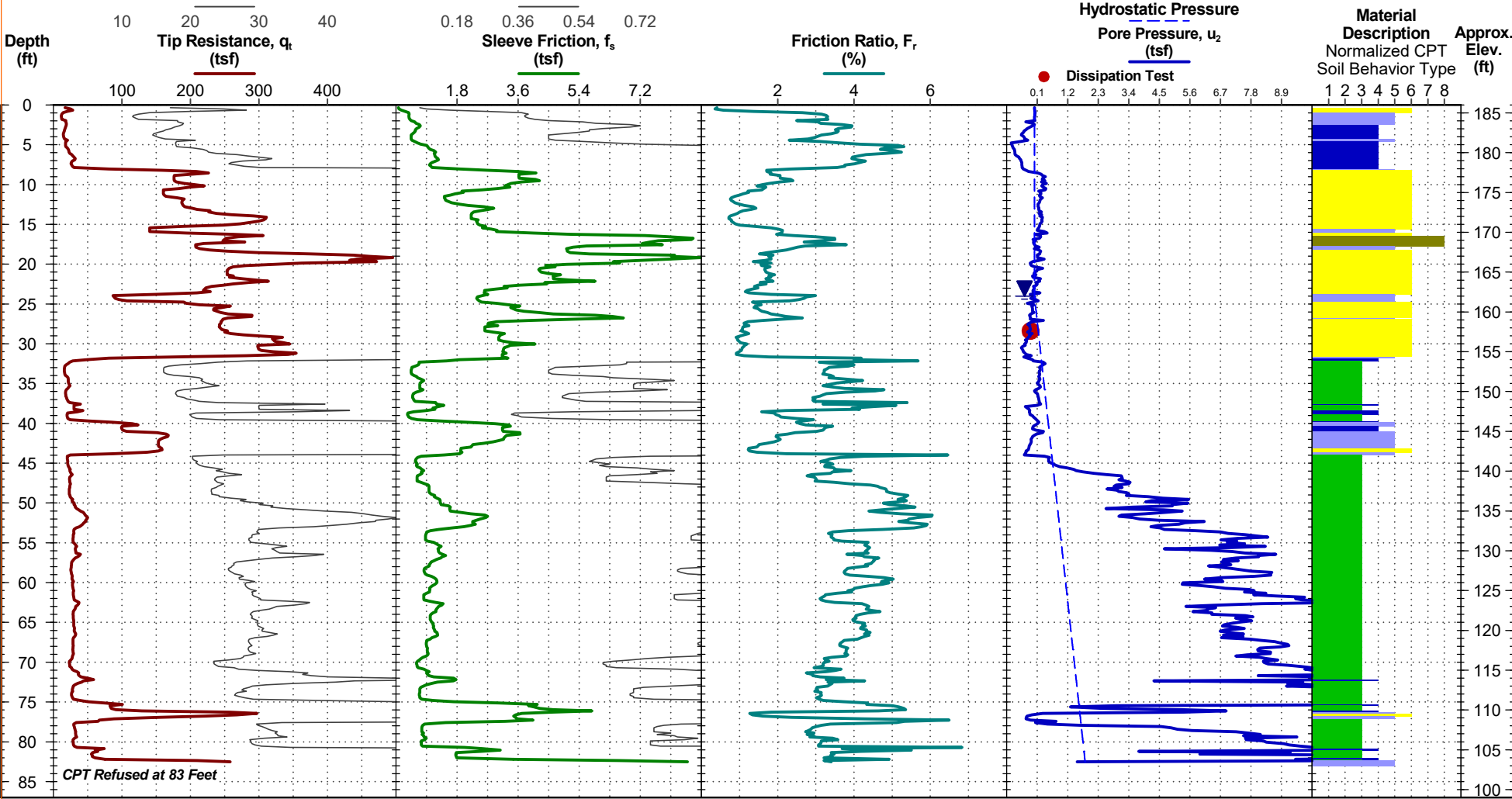
TEST LOCATION: See [Exploration Plan](#)

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

Approx. Surface Elev: 186 ft +/-

Latitude: 37.01486105°

Longitude: -121.5577999°



See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Elevations were obtained from Google Earth Pro

Dead weight of rig used as reaction force.

CPT sensor calibration reports available upon request.

- 1 Sensitive, fine grained
- 2 Organic soils - clay
- 3 Clay - silty clay to clay
- 4 Silt mixtures - clayey silt to silty clay
- 5 Sand mixtures - silty sand to sandy silt
- 6 Sands - clean sand to silty sand
- 7 Gravelly sand to dense sand
- 8 Very stiff sand to clayey sand
- 9 Very stiff fine grained

WATER LEVEL OBSERVATION

24 ft measured water depth
(used in normalizations and correlations;
See [Supporting Information](#))

Probe no. DDG1496

Terracon
5075 Commercial Cir Ste E
Concord, CA

CPT Started: 8/12/2020

Rig: CPT

Project No.: ND205052

CPT Completed: 8/12/2020

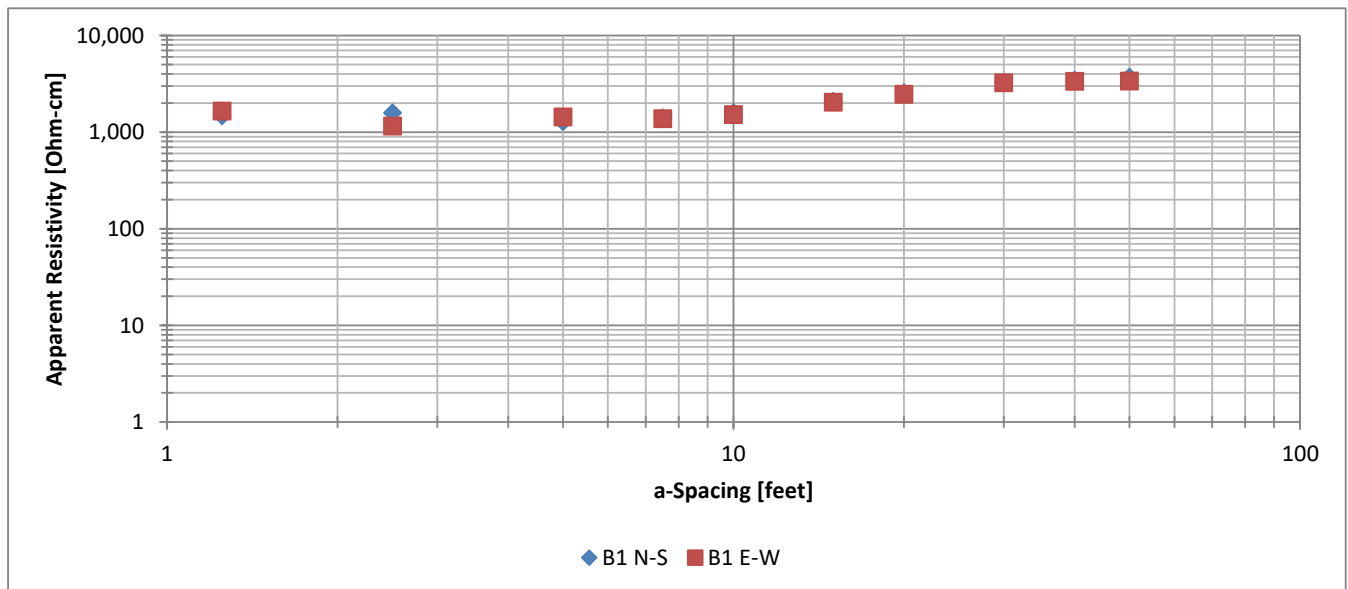
Operator: Middle Earth

Field Electrical Earth Resistivity Test Data

Project	New Data Center	Weather	85° F Clear and Sunny
Location	Arroyo Circle and Gilmore Rd. Gilroy, CA	Material Description	Tilled Agricultural Field
Project #	ND205052	Instrument	Mini Res Ultra
Test Date	7/28/2020	Tested By	E. McArthur

a-Spacing		B1 N-S	B1 N-S	B1 E-W	B1 E-W
		Measured Resistance	Apparent Resistivity	Measured Resistance	Apparent Resistivity
[feet]	[cm]	[Ohms]	[Ohms-cm]	[Ohms]	[Ohms-cm]
1.25	38.10	6.17	1,478	6.89	1,649
2.5	76.20	3.31	1,586	2.41	1,154
5	152.40	1.34	1,281	1.50	1,435
7.5	228.60	0.98	1,409	0.96	1,379
10	304.80	0.83	1,582	0.79	1,515
15	457.20	0.73	2,088	0.71	2,037
20	609.60	0.67	2,551	0.65	2,470
30	914.40	0.57	3,258	0.56	3,240
40	1219.20	0.45	3,447	0.44	3,363
50	1524.00	0.39	3,706	0.35	3,371

Readings taken in general accordance with ASTM G57.

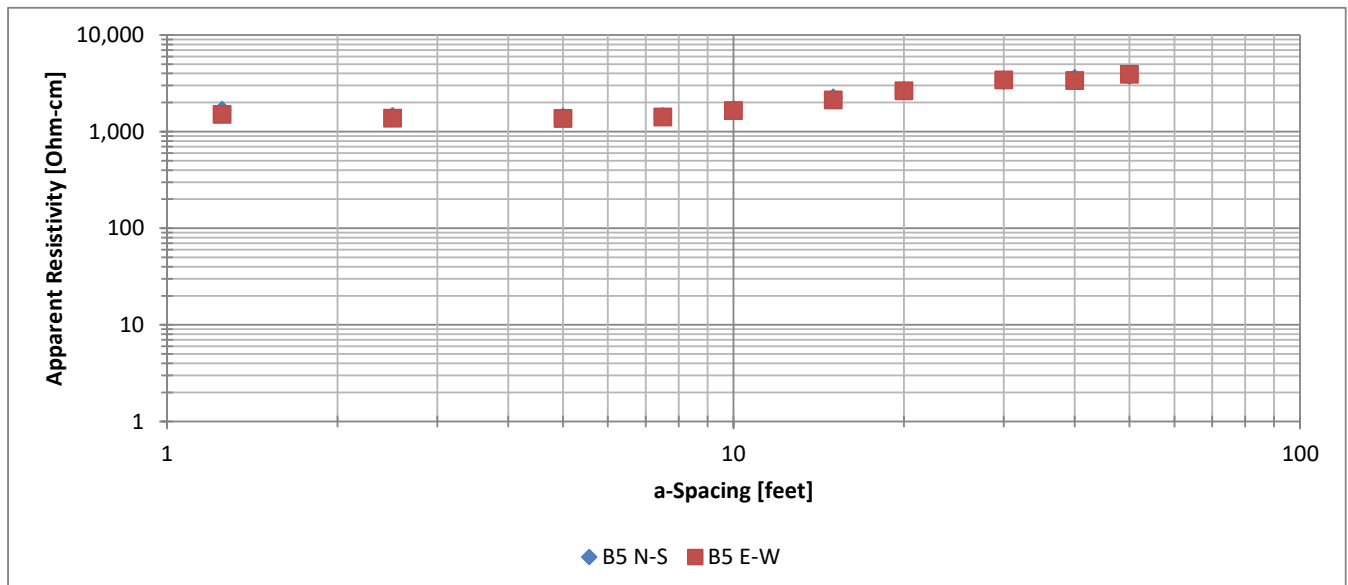


Field Electrical Earth Resistivity Test Data

Project	New Data Center	Weather	85° F Clear and Sunny
Location	Arroyo Circle and Gilmore Rd. Gilroy, CA	Material Description	Tilled Agricultural Field
Project #	ND205052	Instrument	Mini Res Ultra
Test Date	7/28/2020	Tested By	E. McArthur

a-Spacing		B5 N-S	B5 N-S	B5 E-W	B5 E-W
		Measured Resistance	Apparent Resistivity	Measured Resistance	Apparent Resistivity
[feet]	[cm]	[Ohms]	[Ohms-cm]	[Ohms]	[Ohms-cm]
1.25	38.10	6.99	1,673	6.33	1,516
2.5	76.20	3.01	1,443	2.89	1,384
5	152.40	1.49	1,422	1.44	1,376
7.5	228.60	1.00	1,438	0.99	1,418
10	304.80	0.88	1,693	0.87	1,658
15	457.20	0.78	2,238	0.74	2,137
20	609.60	0.70	2,674	0.69	2,651
30	914.40	0.59	3,395	0.60	3,436
40	1219.20	0.47	3,570	0.44	3,401
50	1524.00	0.40	3,821	0.41	3,916

Readings taken in general accordance with ASTM G57.

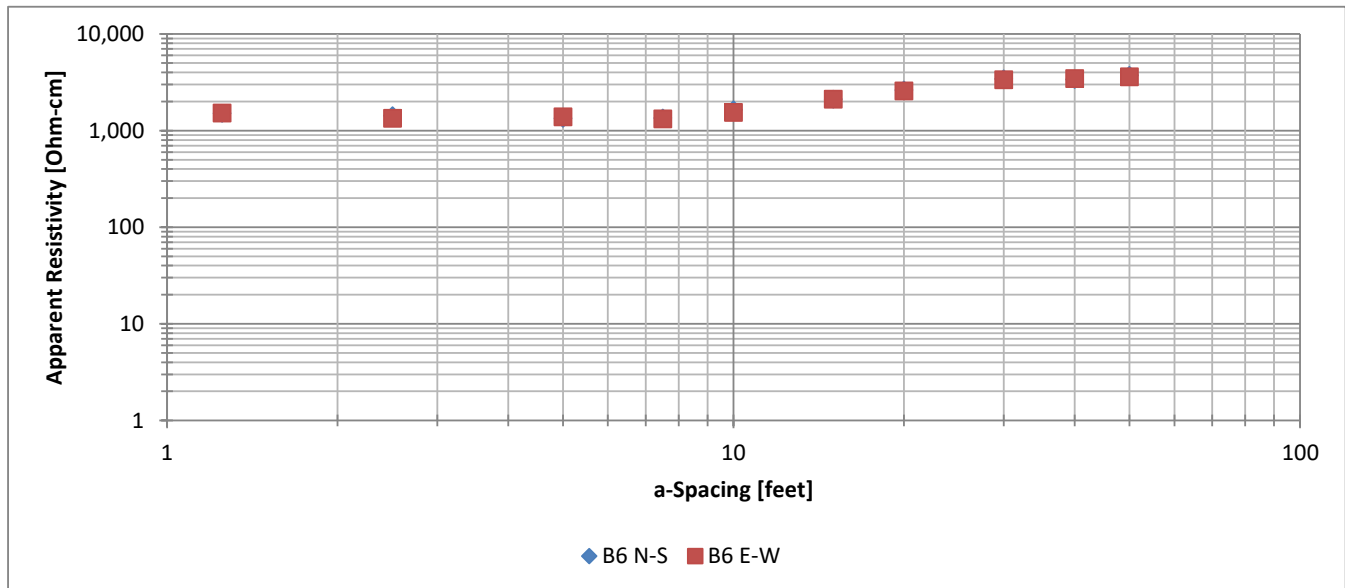


Field Electrical Earth Resistivity Test Data

Project	New Data Center	Weather	85° F Clear and Sunny
Location	Arroyo Circle and Gilmore Rd. Gilroy, CA	Material Description	Tilled Agricultural Field
Project #	ND205052	Instrument	Mini Res Ultra
Test Date	7/28/2020	Tested By	E. McArthur

a-Spacing		B6 N-S	B6 N-S	B6 E-W	B6 E-W
		Measured Resistance	Apparent Resistivity	Measured Resistance	Apparent Resistivity
[feet]	[cm]	[Ohms]	[Ohms-cm]	[Ohms]	[Ohms-cm]
1.25	38.10	6.29	1,505	6.33	1,516
2.5	76.20	2.99	1,430	2.80	1,340
5	152.40	1.40	1,342	1.45	1,389
7.5	228.60	0.94	1,350	0.92	1,323
10	304.80	0.86	1,639	0.81	1,545
15	457.20	0.74	2,114	0.73	2,109
20	609.60	0.69	2,635	0.67	2,578
30	914.40	0.60	3,430	0.58	3,355
40	1219.20	0.44	3,394	0.45	3,455
50	1524.00	0.39	3,725	0.38	3,610

Readings taken in general accordance with ASTM G57.

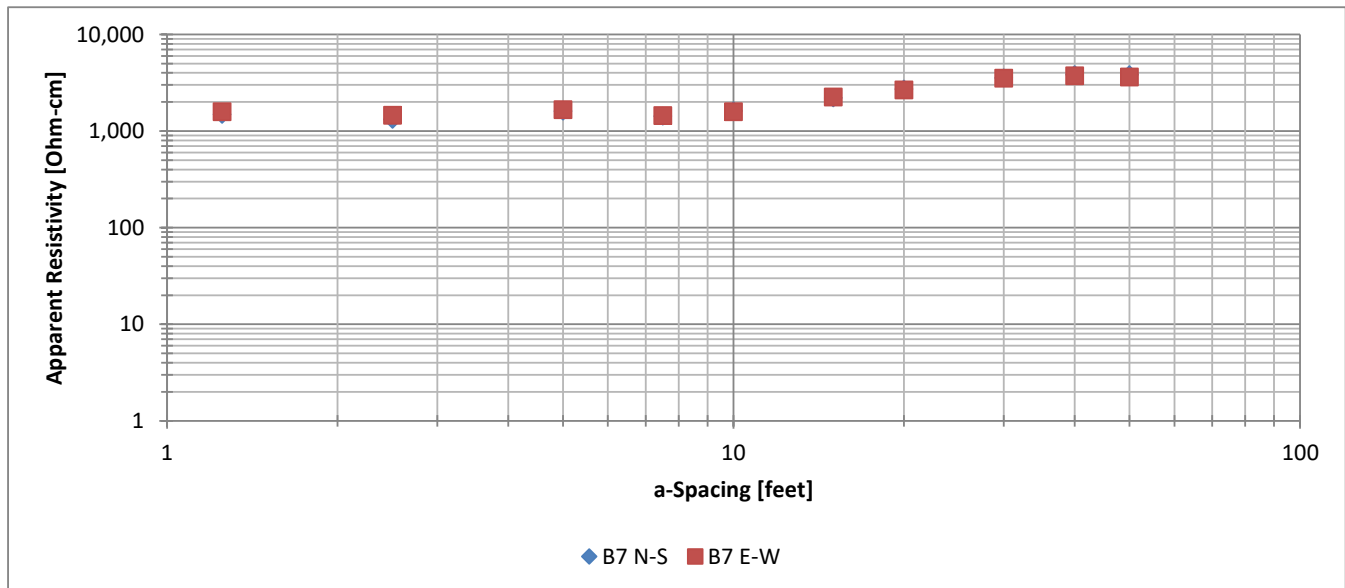


Field Electrical Earth Resistivity Test Data

Project	New Data Center	Weather	85° F Clear and Sunny
Location	Arroyo Circle and Gilmore Rd. Gilroy, CA	Material Description	Tilled Agricultural Field
Project #	ND205052	Instrument	Mini Res Ultra
Test Date	7/28/2020	Tested By	E. McArthur

a-Spacing		B7 N-S	B7 N-S	B7 E-W	B7 E-W
		Measured Resistance	Apparent Resistivity	Measured Resistance	Apparent Resistivity
[feet]	[cm]	[Ohms]	[Ohms-cm]	[Ohms]	[Ohms-cm]
1.25	38.10	6.22	1,490	6.66	1,594
2.5	76.20	2.77	1,327	3.05	1,462
5	152.40	1.68	1,611	1.74	1,670
7.5	228.60	1.00	1,429	1.01	1,446
10	304.80	0.85	1,620	0.83	1,591
15	457.20	0.77	2,218	0.79	2,255
20	609.60	0.71	2,719	0.70	2,677
30	914.40	0.62	3,568	0.62	3,533
40	1219.20	0.50	3,853	0.49	3,746
50	1524.00	0.40	3,849	0.38	3,648

Readings taken in general accordance with ASTM G57.



SOIL RESISTIVITY (ASTM G57)																			
Job Name:	New Data Center	Technician:	L. Wirkkala																
		Date:	8/27/2020																
Job Number:	ND205052	Soil Desc:	Dark Brown CL																
		Sample ID:	P-1																
<table><tr><td>Electrode Area (cm²)</td><td>6.55</td></tr><tr><td>L (cm)</td><td>6.43</td></tr><tr><td>Box Constant</td><td>1.02</td></tr><tr><td>Temperature (C)</td><td>23.0</td></tr><tr><td>Meter Reading (kΩ)</td><td>15.1</td></tr><tr><td>Meter Reading (Ω)</td><td>15070</td></tr><tr><td>Min Resistivity (Ω-cm)</td><td>14,794</td></tr><tr><td>Corrected Min Resistivity (Ω-cm)</td><td>17,896</td></tr></table>				Electrode Area (cm ²)	6.55	L (cm)	6.43	Box Constant	1.02	Temperature (C)	23.0	Meter Reading (kΩ)	15.1	Meter Reading (Ω)	15070	Min Resistivity (Ω-cm)	14,794	Corrected Min Resistivity (Ω-cm)	17,896
Electrode Area (cm ²)	6.55																		
L (cm)	6.43																		
Box Constant	1.02																		
Temperature (C)	23.0																		
Meter Reading (kΩ)	15.1																		
Meter Reading (Ω)	15070																		
Min Resistivity (Ω-cm)	14,794																		
Corrected Min Resistivity (Ω-cm)	17,896																		

SOIL RESISTIVITY (ASTM G57)

Job Name:	New Data Center	Technician:	L. Wirkkala	Date:	8/27/2020
Job Number:	ND205052	Soil Desc:	Dark Brown CL	Sample ID:	P-2

Electrode Area (cm ²)	6.55
L (cm)	6.43
Box Constant	1.02
Temperature (C)	22.8
Meter Reading (k Ω)	14.85
Meter Reading (Ω)	14850
Min Resistivity (Ω -cm)	14,578
Corrected Min Resistivity (Ω -cm)	17,560

SOIL RESISTIVITY (ASTM G57)																			
Job Name:	New Data Center	Technician:	L. Wirkkala																
		Date:	8/27/2020																
Job Number:	ND205052	Soil Desc:	Dark Brown CL																
		Sample ID:	P-3																
<table><tr><td>Electrode Area (cm²)</td><td>6.55</td></tr><tr><td>L (cm)</td><td>6.43</td></tr><tr><td>Box Constant</td><td>1.02</td></tr><tr><td>Temperature (C)</td><td>22.6</td></tr><tr><td>Meter Reading (kΩ)</td><td>11.07</td></tr><tr><td>Meter Reading (Ω)</td><td>11070</td></tr><tr><td>Min Resistivity (Ω-cm)</td><td>10,867</td></tr><tr><td>Corrected Min Resistivity (Ω-cm)</td><td>13,035</td></tr></table>				Electrode Area (cm ²)	6.55	L (cm)	6.43	Box Constant	1.02	Temperature (C)	22.6	Meter Reading (kΩ)	11.07	Meter Reading (Ω)	11070	Min Resistivity (Ω-cm)	10,867	Corrected Min Resistivity (Ω-cm)	13,035
Electrode Area (cm ²)	6.55																		
L (cm)	6.43																		
Box Constant	1.02																		
Temperature (C)	22.6																		
Meter Reading (kΩ)	11.07																		
Meter Reading (Ω)	11070																		
Min Resistivity (Ω-cm)	10,867																		
Corrected Min Resistivity (Ω-cm)	13,035																		

SOIL RESISTIVITY (ASTM G57)																			
Job Name:	New Data Center	Technician:	L. Wirkkala																
		Date:	8/27/2020																
Job Number:	ND205052	Soil Desc:	Dark Brown CH																
		Sample ID:	P-4																
<table><tr><td>Electrode Area (cm²)</td><td>6.55</td></tr><tr><td>L (cm)</td><td>6.43</td></tr><tr><td>Box Constant</td><td>1.02</td></tr><tr><td>Temperature (C)</td><td>23.1</td></tr><tr><td>Meter Reading (kΩ)</td><td>11.19</td></tr><tr><td>Meter Reading (Ω)</td><td>11190</td></tr><tr><td>Min Resistivity (Ω-cm)</td><td>10,985</td></tr><tr><td>Corrected Min Resistivity (Ω-cm)</td><td>13,316</td></tr></table>				Electrode Area (cm ²)	6.55	L (cm)	6.43	Box Constant	1.02	Temperature (C)	23.1	Meter Reading (kΩ)	11.19	Meter Reading (Ω)	11190	Min Resistivity (Ω-cm)	10,985	Corrected Min Resistivity (Ω-cm)	13,316
Electrode Area (cm ²)	6.55																		
L (cm)	6.43																		
Box Constant	1.02																		
Temperature (C)	23.1																		
Meter Reading (kΩ)	11.19																		
Meter Reading (Ω)	11190																		
Min Resistivity (Ω-cm)	10,985																		
Corrected Min Resistivity (Ω-cm)	13,316																		

SOIL RESISTIVITY (ASTM G57)

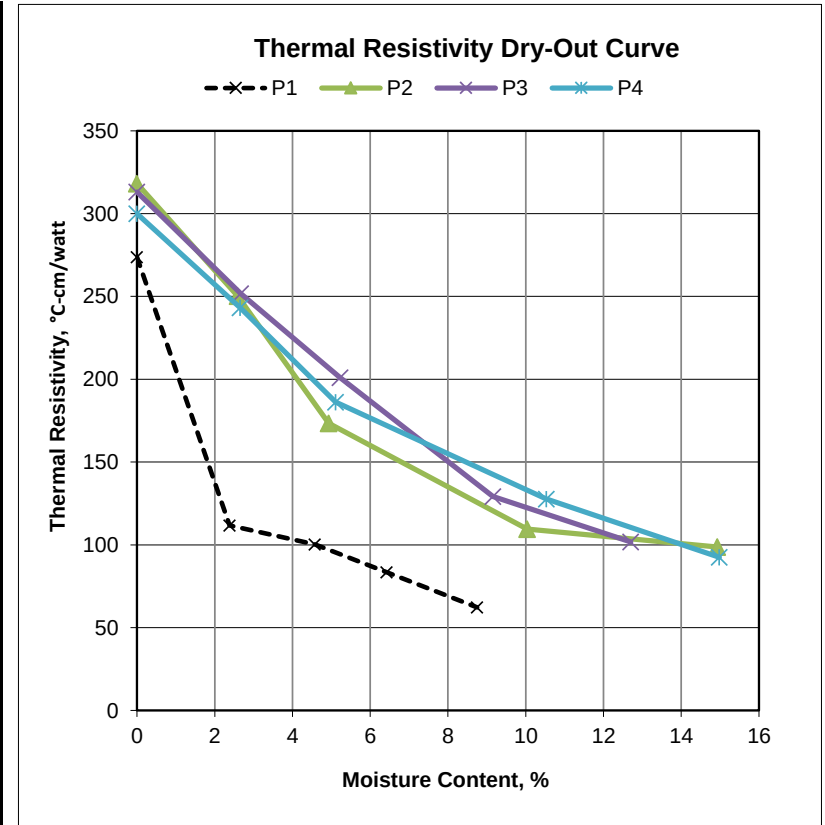
Job Name:	New Data Center	Technician:	L. Wirkkala	Date:	8/27/2020
Job Number:	ND205052	Soil Desc:	Dark Brown CL	Sample ID:	P-5

Electrode Area (cm ²)	6.55
L (cm)	6.43
Box Constant	1.02
Temperature (C)	23.6
Meter Reading (k Ω)	9.33
Meter Reading (Ω)	9330
Min Resistivity (Ω -cm)	9,159
Corrected Min Resistivity (Ω -cm)	11,219



Project Name: New Data Center
Project Number: ND205052

Sample ID	Soil Type	Proctor Method	Max. Dry Density (pcf)	Optimum Moisture Content (%)	Sample Compaction (%)	Thermal Resistivity Test Results		
						Moisture Content (%)	Thermal Resistivity (°C-cm/watt)	Temperature (°C)
P1	SW	ASTM D 1557-B	139.3	7.8	90	0.0	274	24.9
						2.4	112	24.4
						4.6	100	24.1
						6.4	83	23.7
						8.8	62	23.6
P2	CL	ASTM D 1557-B	118.8	13.2	90	0.0	318	23.6
						2.6	250	23.9
						4.9	173	25.4
						10.0	110	26.2
						14.9	99	23.3
P3	CL	ASTM D 1557-B	115.8	15.5	90	0.0	313	23.5
						2.7	252	26.9
						5.2	201	28.1
						9.2	129	27.8
						12.7	102	28.0
P4	CL	ASTM D 1557-B	117.5	14.5	90	0.0	300	28.7
						2.7	243	28.5
						5.1	186	27.9
						10.5	128	27.5
						15.0	93	27.7



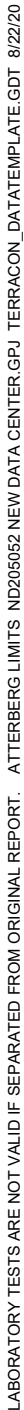
Date: 9/11/2020

Run By: D.Shuemaker

Reviewed By: BWP

Terracon

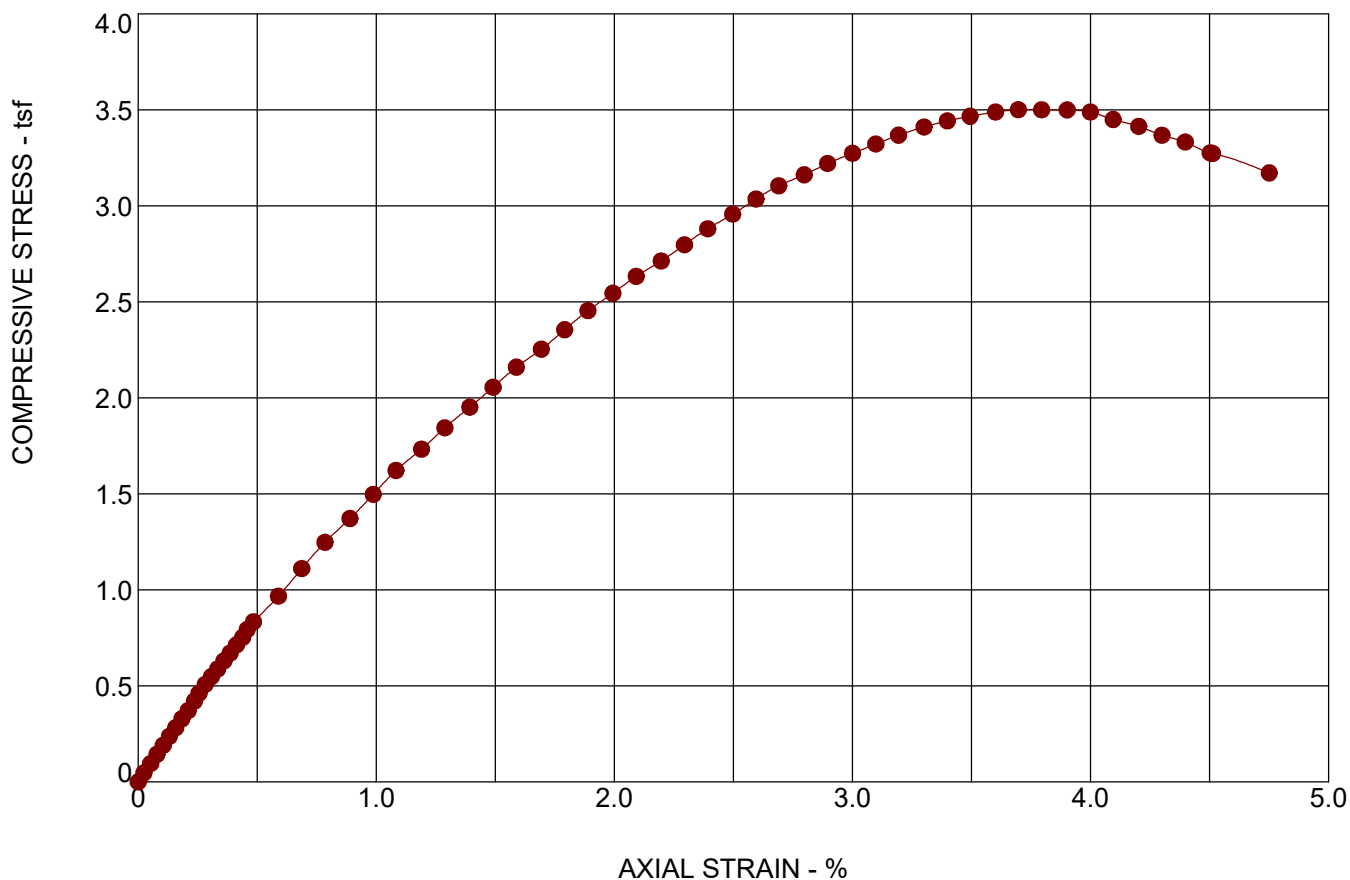
ASTM D4318



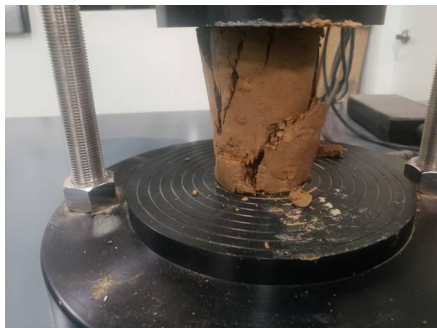
CLIENT: Kimley-Horn & Associates Inc
Orange, CA

UNCONFINED COMPRESSION TEST

ASTM D2166



SPECIMEN FAILURE PHOTOGRAPH



SPECIMEN TEST DATA

Moisture Content:	%	24
Dry Density:	pcf	110
Diameter:	in.	1.84
Height:	in.	4.19
Height / Diameter Ratio:		2.28
Calculated Saturation:	%	
Calculated Void Ratio:		
Assumed Specific Gravity:		
Failure Strain:	%	3.70
Unconfined Compressive Strength	(tsf)	3.50
Undrained Shear Strength:	(tsf)	1.75
Strain Rate:	in/min	
Remarks:		

SAMPLE TYPE: CARS

SAMPLE LOCATION: B5 @ 10 - 11.5 feet

DESCRIPTION:

LL

PL

PI

Percent < #200 Sieve

PROJECT: New Data Center

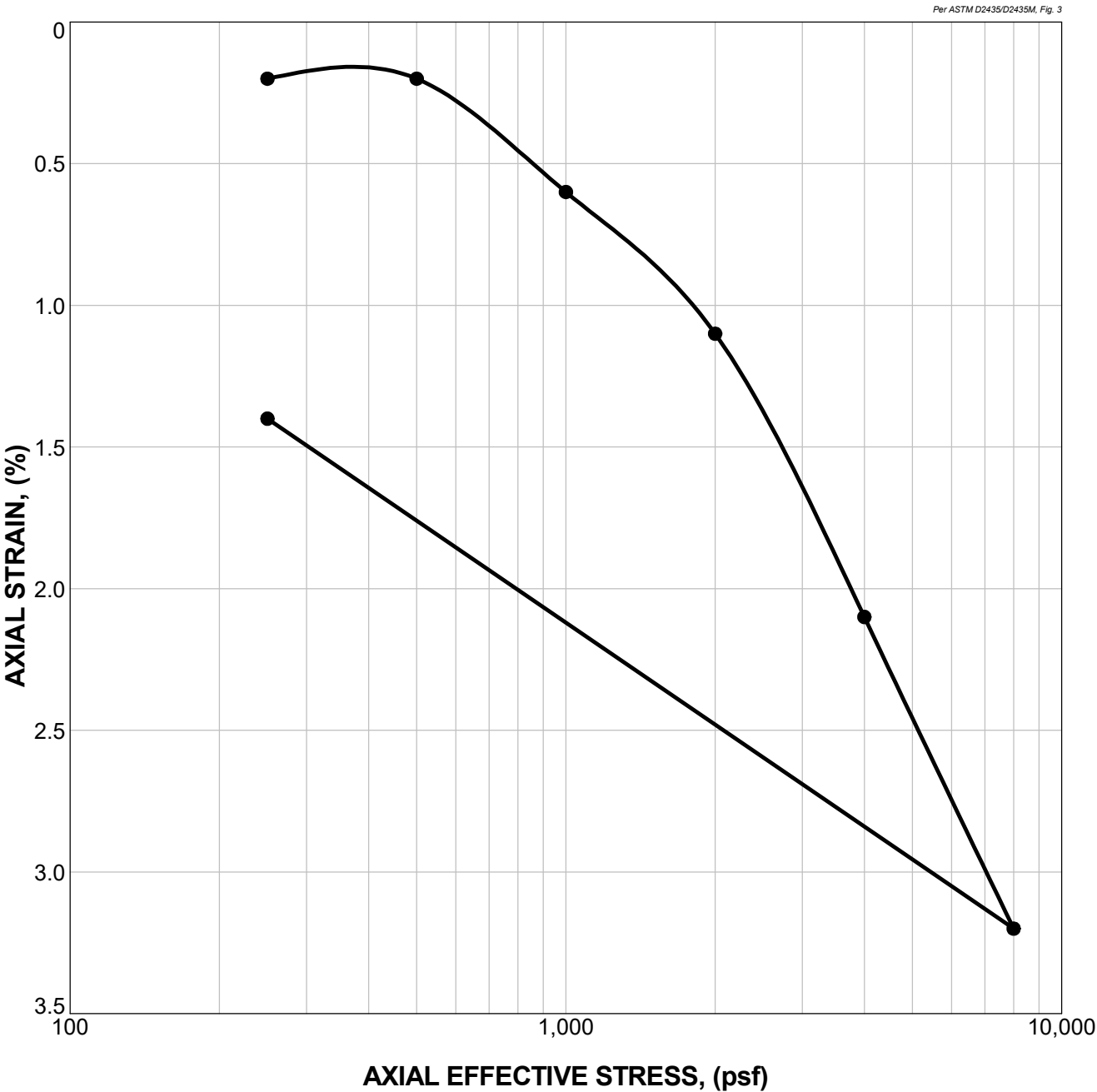
PROJECT NUMBER: ND205052

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

Terracon
5075 Commercial Cir Ste E
Concord, CA

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

CONSOLIDATION TEST (D2435)



Natural		Initial Dry Density (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P _c (psf)	C _c (% / log stress)	C _c (% / log stress)	Initial Void Ratio
Saturation	Moisture									
%	19.5 %									

MATERIAL DESCRIPTION									USCS	AASHTO
Lean Clay with sand									CL	

NOTES:

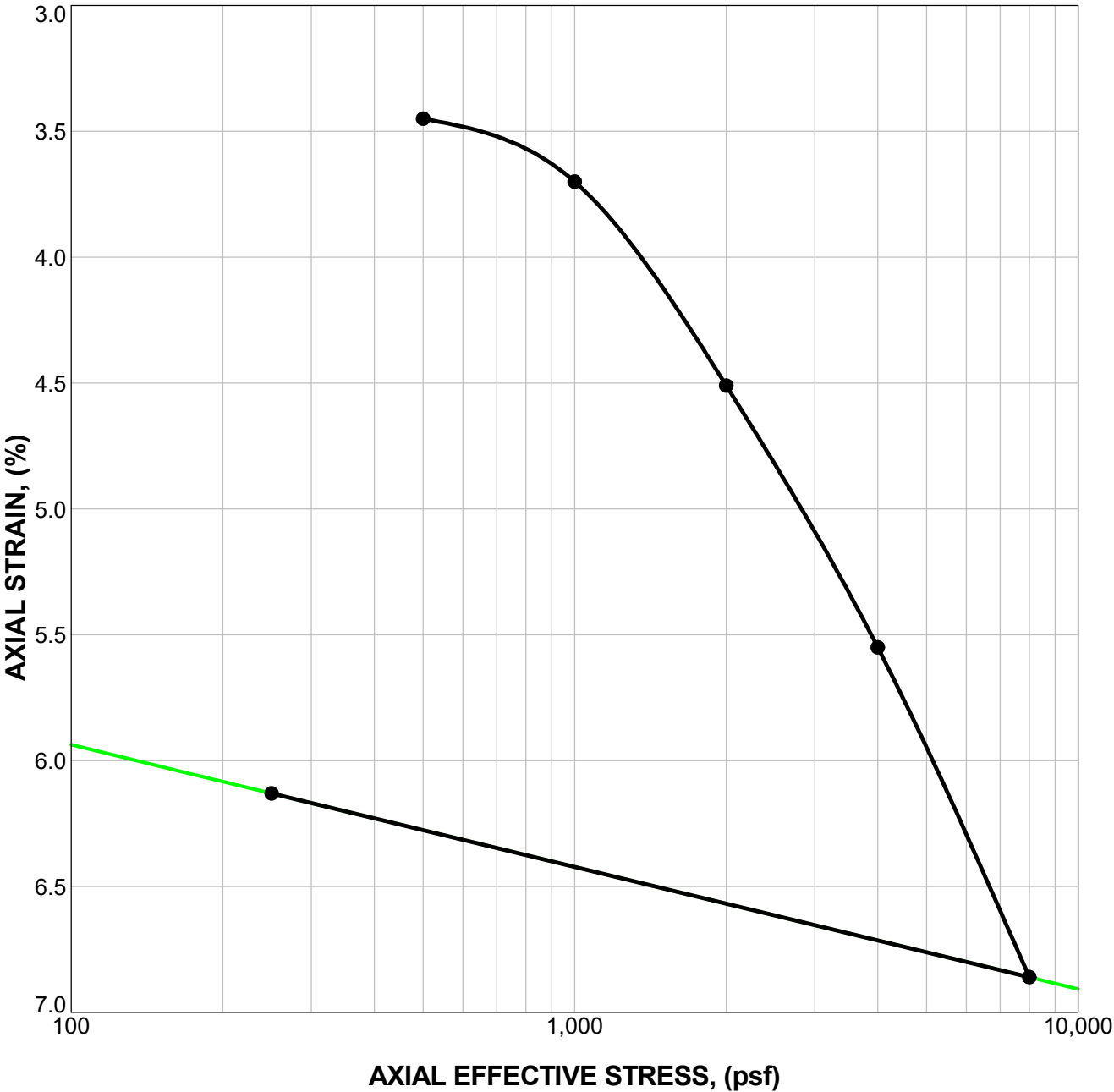
Borehole: B3 Depth: 5 ft Specimen #: 3

PROJECT: New Data Center	Terracon 5075 Commercial Cir Ste E Concord, CA	PROJECT NUMBER: ND205052
SITE: Arroyo Circle and Gilmore Road Gilroy, CA		CLIENT: Kimley-Horn & Associates Inc Orange, CA

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CONS_LOAD-DEF_PROP_STRESS-STRAIN ND205052 NEW DATA CENTER.GPJ TERRACON_DATATEMPLATE.GDT 9/1/20

CONSOLIDATION TEST (D2435)

Per ASTM D2435/D2435M, Fig. 3

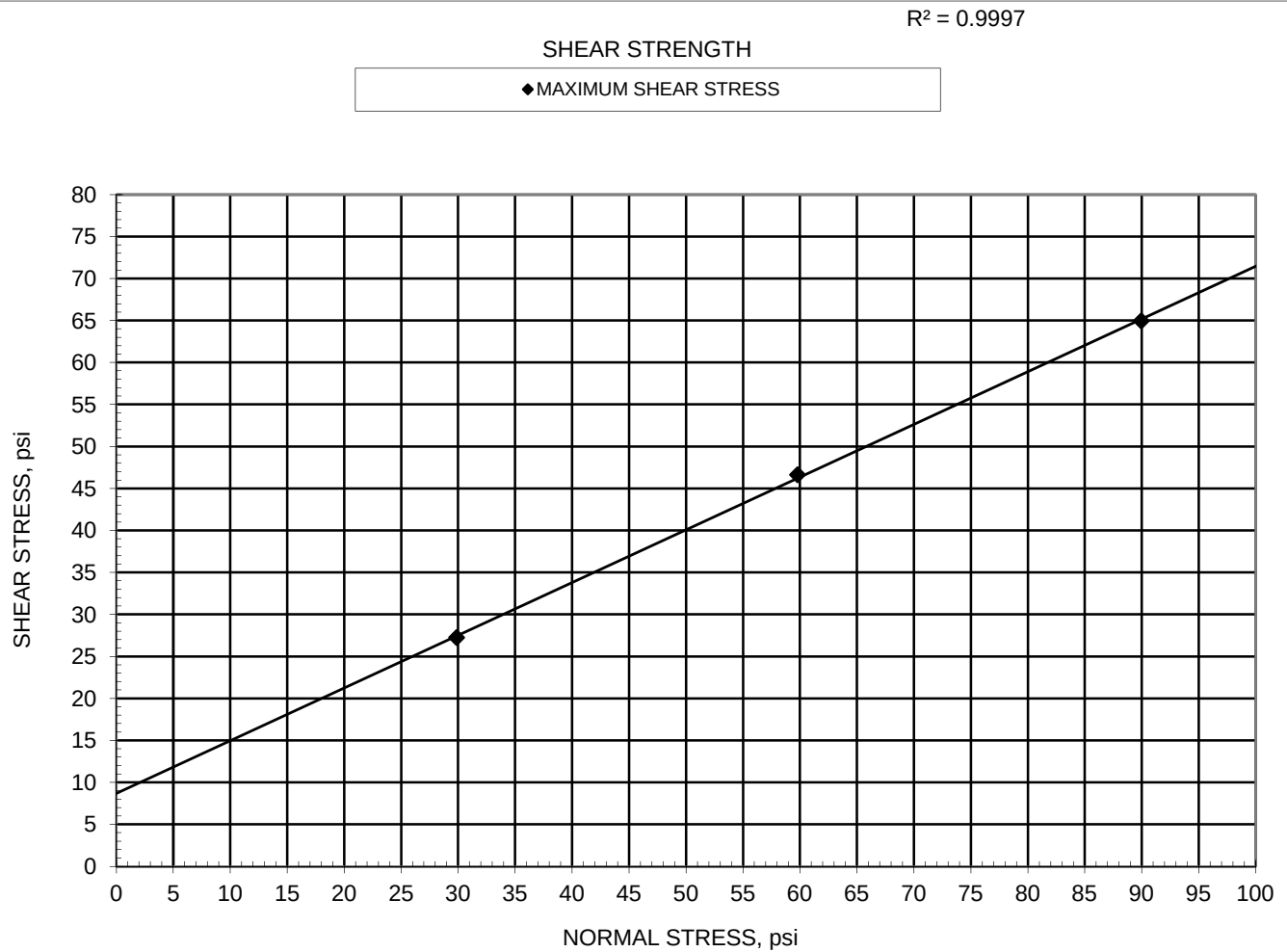


Natural		Initial Dry Density (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P _c (psf)	C _c (% / log stress)	C _c (% / log stress)	Initial Void Ratio
Saturation	Moisture									
%	18.4 %									
MATERIAL DESCRIPTION									USCS	AASHTO
Sandy Lean Clay									CL	
NOTES:										
Borehole: B5 Depth: 10 ft Specimen #: 5										
PROJECT: New Data Center						PROJECT NUMBER: ND205052				
SITE: Arroyo Circle and Gilmore Road Gilroy, CA						CLIENT: Kimley-Horn & Associates Inc Orange, CA				



LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CONS_LOAD-DEF_PROP_STRESS-STRAIN_ND205052_NEW DATA CENTER.GPJ TERRACON_DATATEMPLATE.GDT 9/11/20

**DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED DRAINED CONDITIONS
ASTM D3080**



		FRICITION ANGLE	COHESION	NORMAL	NORMAL	NORMAL
AT MAXIMUM SHEAR STRESS		32.1 deg	8.7 psi	STRESS, psi	STRESS, psi	STRESS, psi
				29.86	59.78	89.94
INITIAL AREA, mm2	2026.8	INITIAL MOISTURE, %		18.1	17.0	16.4
INITIAL LENGTH, mm	24.89	INITIAL DRY DENSITY, pcf		96.5	96.3	96.5
SPECIFIC GRAVITY	2.70	INITIAL SATURATION, %		65	61	59
SG TESTED		INITIAL VOID RATIO		0.75	0.75	0.75
SG ASSUMED	X	FINAL MOISTURE, %		19.4	19.2	18.8
LIQUID LIMIT		FINAL SATURATION, %		132	127	124
PLASTIC LIMIT		FINAL VOID RATIO		0.40	0.41	0.41
PLASTICITY INDEX		MAXIMUM SHEAR STRESS, psi		27.24	46.63	64.96
SAMPLE TYPE	RECOMPACTED	RATE OF LOADING, in/min		0.0050	0.0050	0.0050
DESCRIPTION	sand					

PROJECT NAME: New Data Center

BORING NO. B2

LOCATION: Gilroy, CA

SAMPLE NO. B2-5

JOB NO.: ND205052

DEPTH, feet 10 TO 11.5

DATE: 8/19/2020

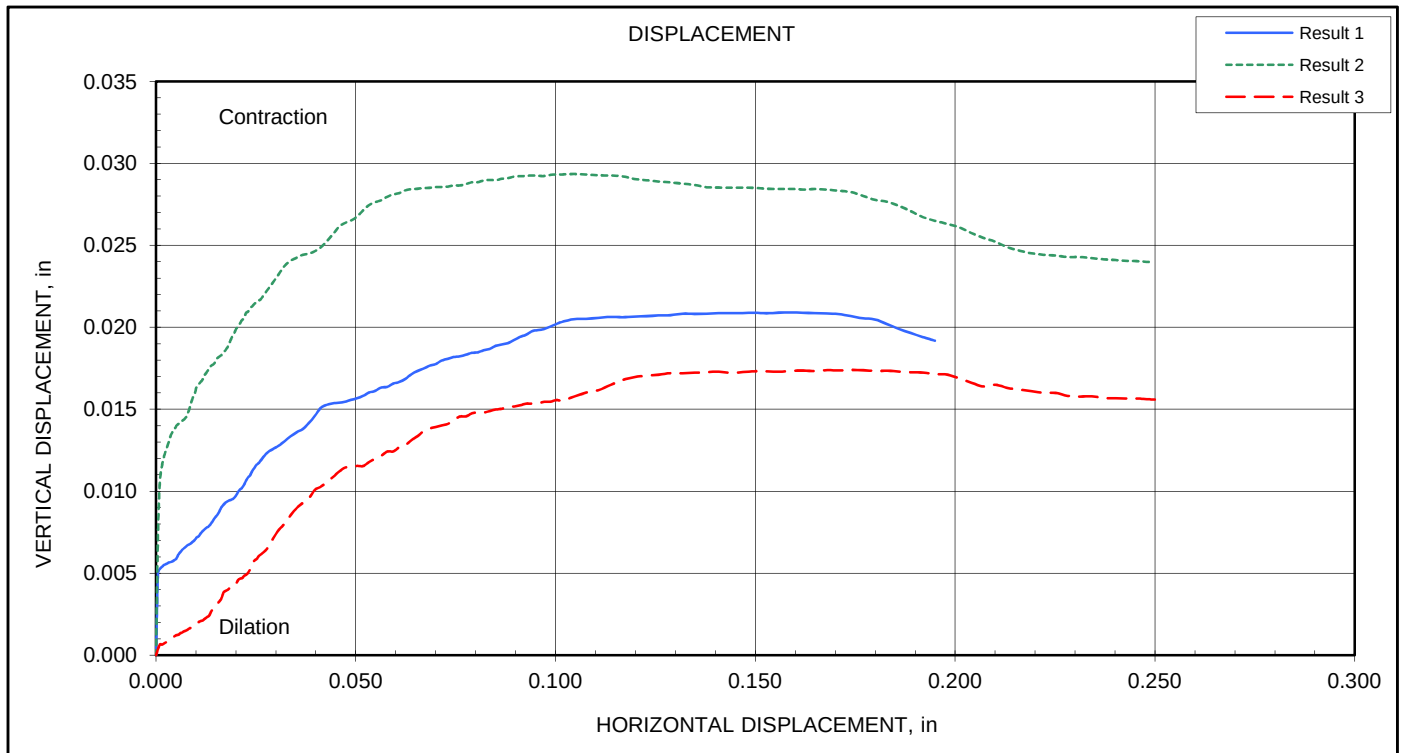
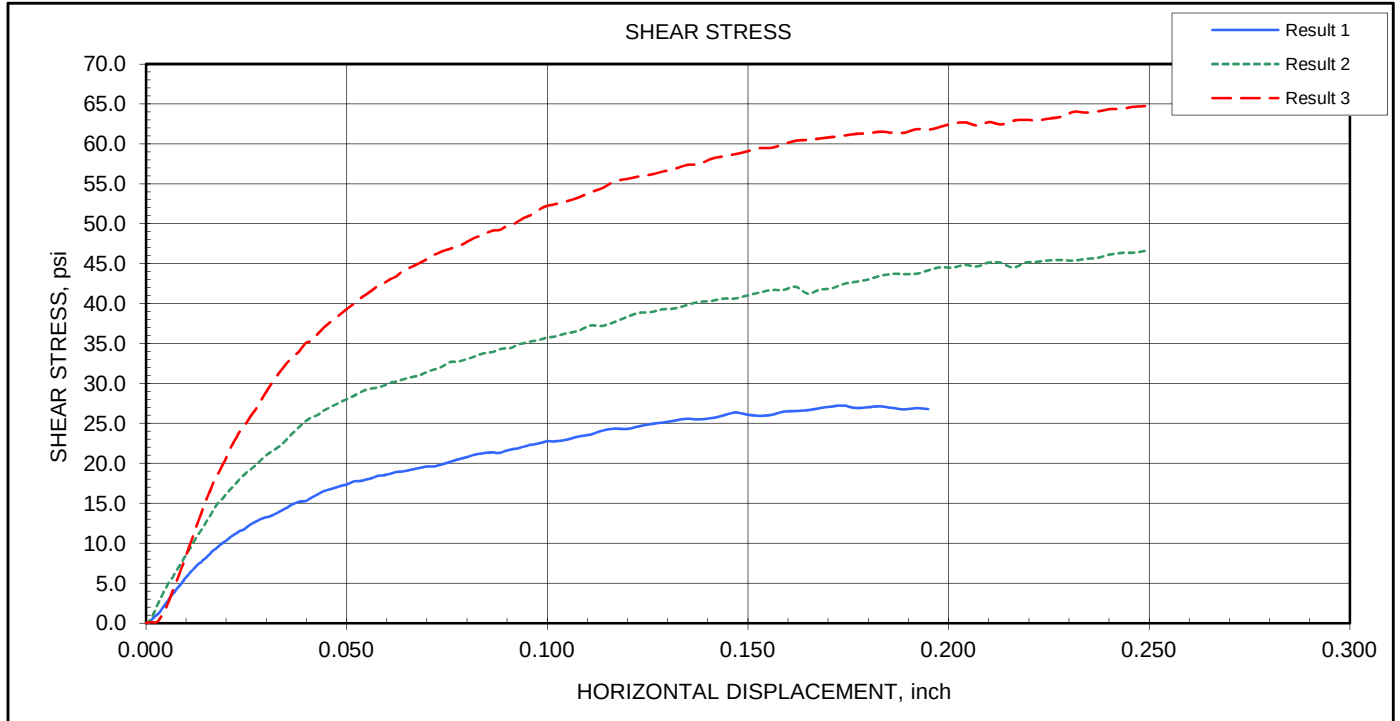
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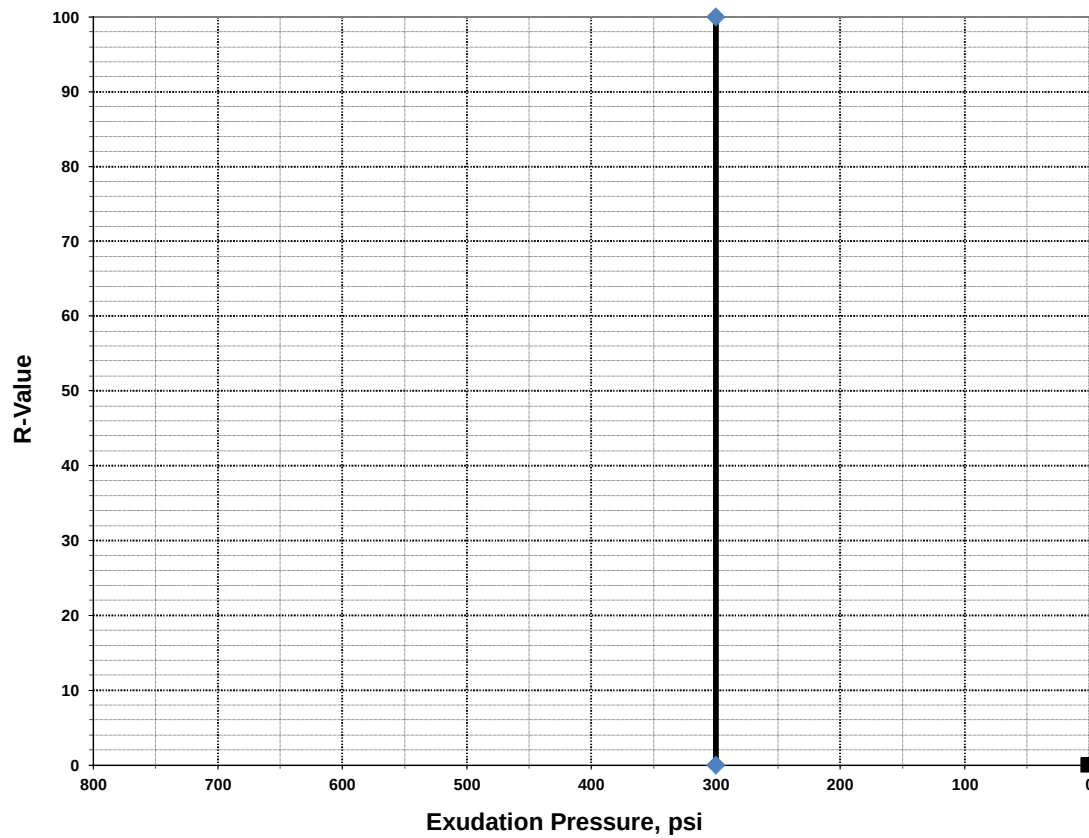
Terracon

New Data Center

ND205052
8/19/2020

BORING NO.	B2
SAMPLE NO.	B2-5
DEPTH, feet	10 TO 11.5

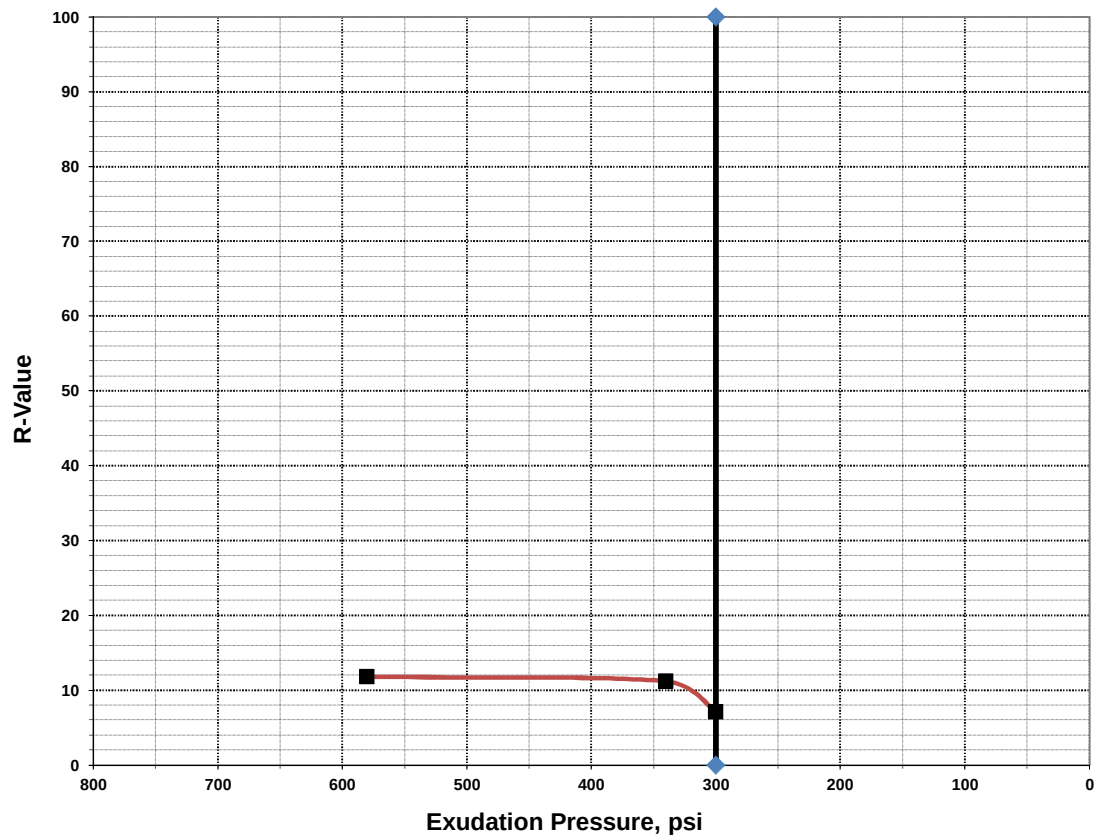




Specimen Identification	Compaction Pressure (psi)	R-Value at 300 psi	Material extruded from bottom of mold during exudation. Test aborted and R-Value reported as less than 5
P2,3&4	150.0	<5	

R-Value Test

Client: Kimley-Horn and Associates Inc., Orange, CA
Project: New Data Center
Site: Arroyo Circle and Gilmore Road, Gilroy, CA
Project No.: ND205052



Specimen Identification	Compaction Pressure (psi)	R-Value at 300 psi
P5,6,& 7	110.0	7

R-Value Test

Client: Kimley-Horn and Associates Inc., Orange, CA
Project: New Data Center
Site: Arroyo Circle and Gilmore Road, Gilroy, CA
Project No.: ND205052

Client

Kimley-Horn & Associates Inc
Orange, CA

Project

New Data Center

Sample Submitted By: Terracon (ND)

Date Received: 8/14/2020

Lab No.: 20-0910

Results of Corrosion Analysis

Sample Number	1	1
Sample Location	B-6	B-7
Sample Depth (ft.)	1.0-2.5	1.0-2.5
pH Analysis, ASTM G 51	7.58	8.34
Water Soluble Sulfate (SO ₄), ASTM C 1580 (mg/kg)	216	144
Sulfides, AWWA 4500-S D, (mg/kg)	Nil	Nil
Chlorides, ASTM D 512, (mg/kg)	73	63
Red-Ox, ASTM G 200, (mV)	+694	+692
Total Salts, AWWA 2540, (mg/kg)	581	1023
Resistivity (Saturated), ASTM G 57, (ohm-cm)	1649	1649

Analyzed By:



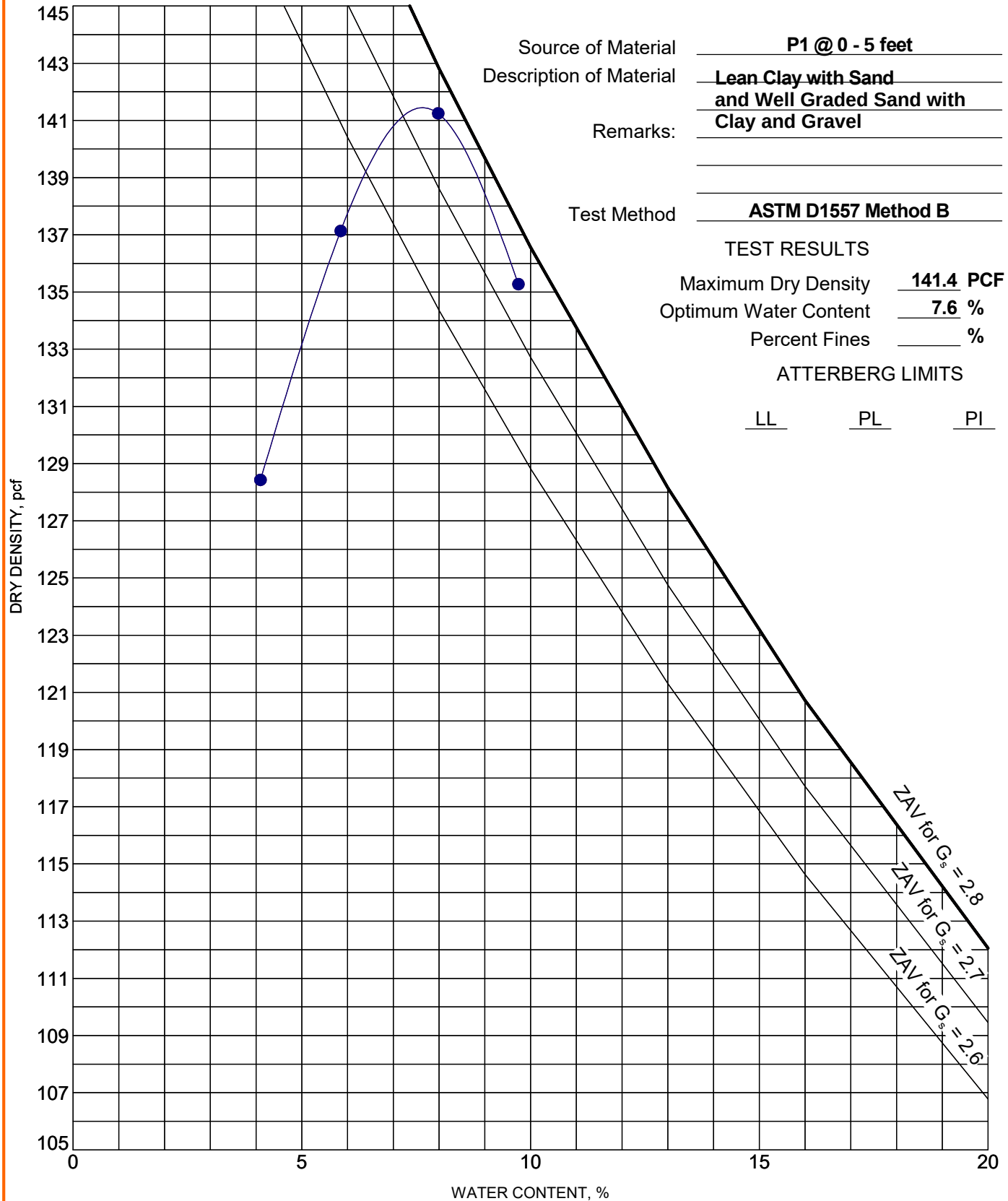
Trisha Campo
Chemist

The tests were performed in general accordance with applicable ASTM and AWWA test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. COMPACTION - V1 ND205052 NEW DATA CENTER.GPJ TERRACON.DATATEMPLATE.GDT 9/9/20



PROJECT: New Data Center

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

Terracon
5075 Commercial Cir Ste E
Concord, CA

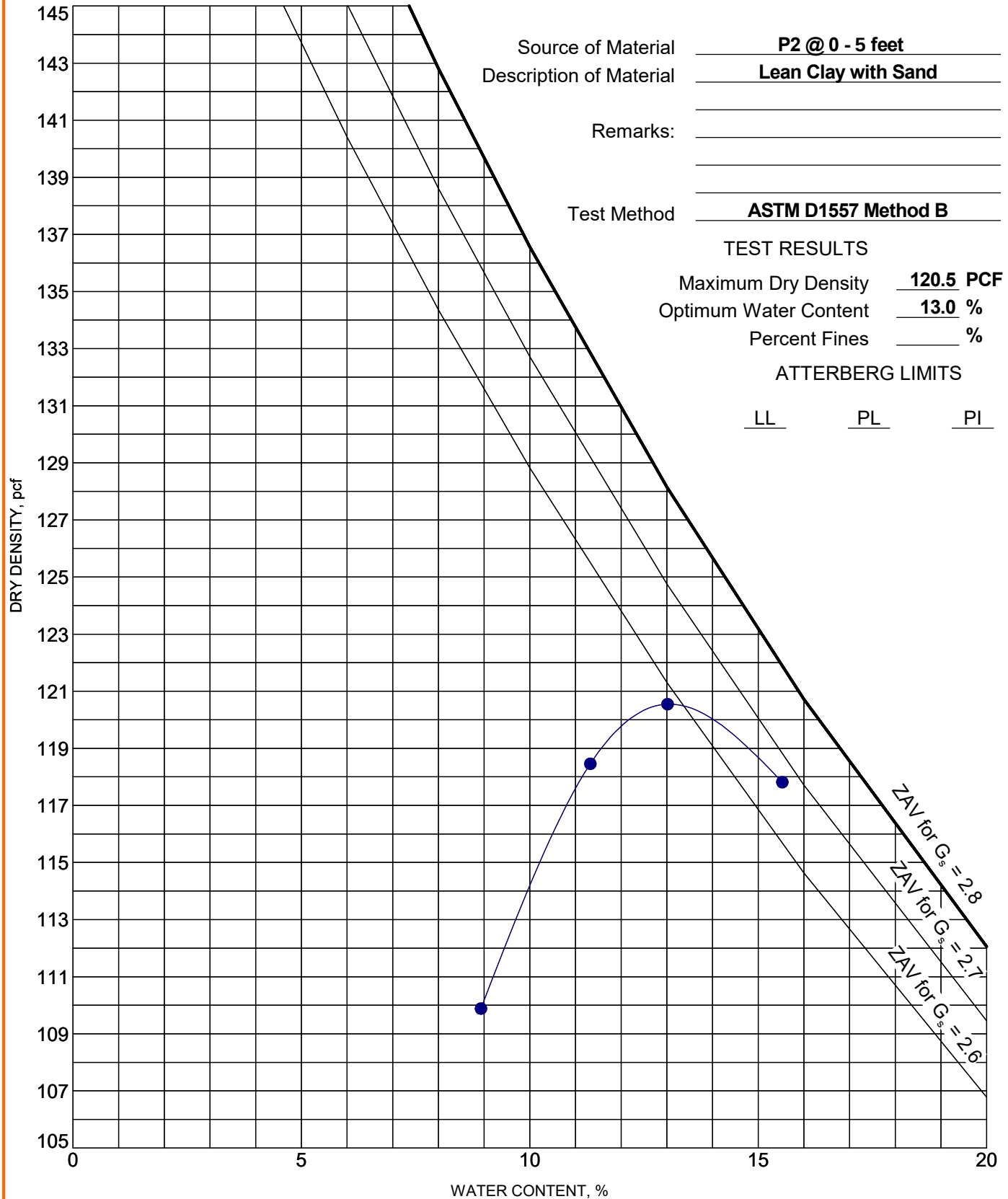
PROJECT NUMBER: ND205052

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. COMPACTION - V1 ND205052 NEW DATA CENTER.GPJ TERRACON.DATATEMPLATE.GDT 9/9/20



PROJECT: New Data Center

SITE: Arroyo Circle and Gilmore Road
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5075 Commercial Cir Ste E
Concord, CA

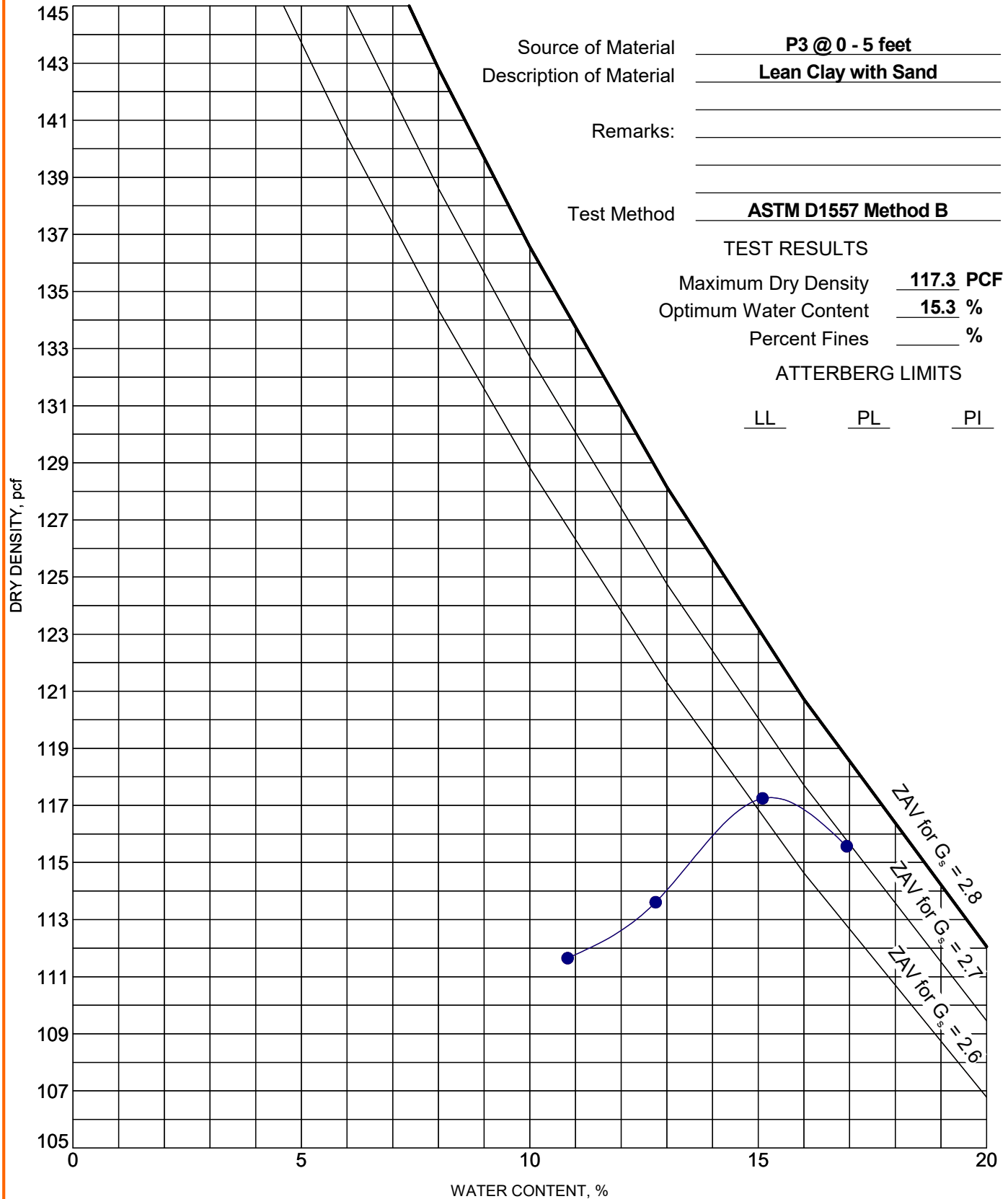
PROJECT NUMBER: ND205052

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. COMPACTION - V1 ND205052 NEW DATA CENTER.GPJ TERRACON.DATATEMPLATE.GDT 9/9/20



PROJECT: New Data Center

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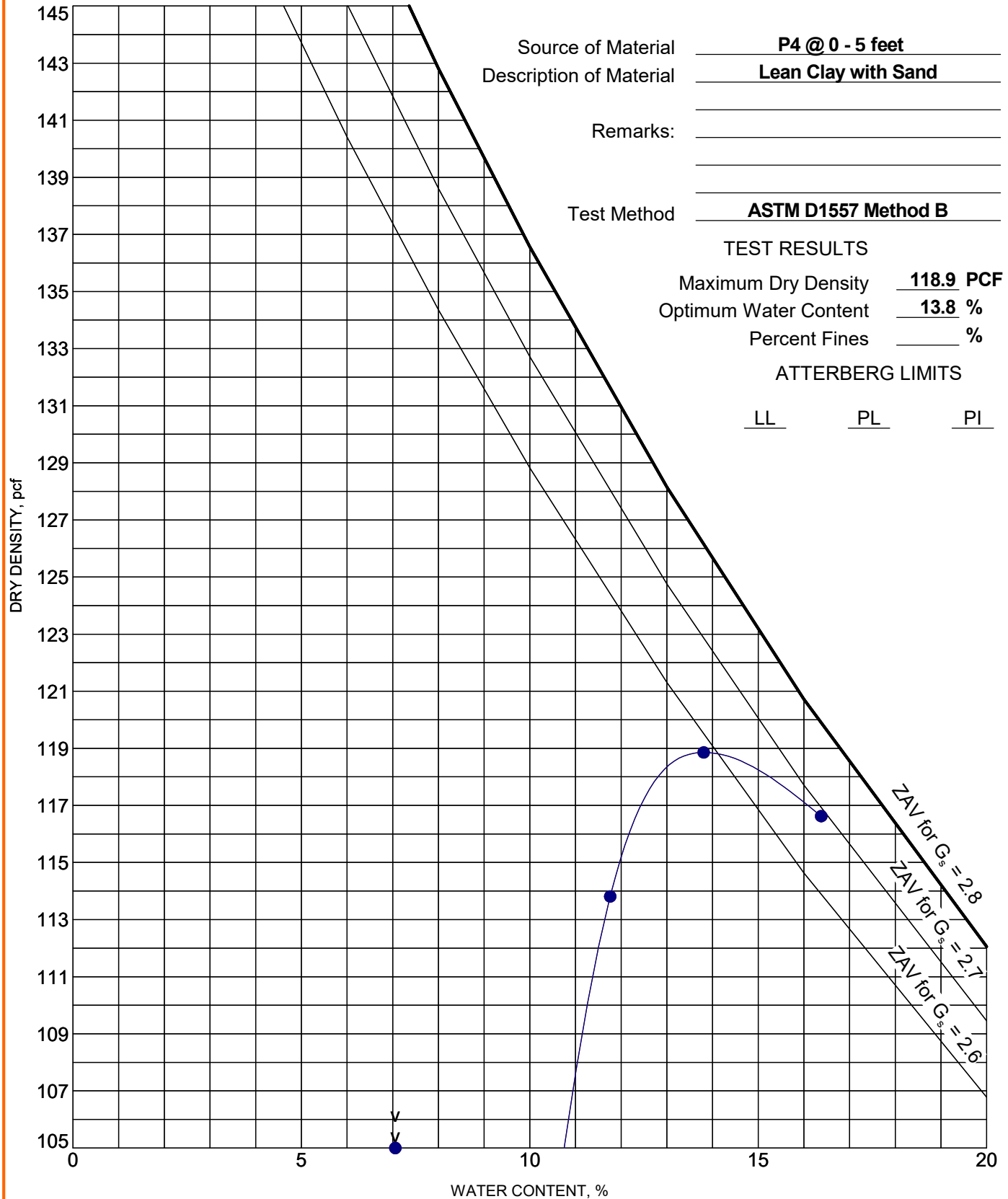
PROJECT NUMBER: ND205052

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. COMPACTION - V1 ND205052 NEW DATA CENTER.GPJ TERRACON.DATATEMPLATE.GDT 9/9/20



PROJECT: New Data Center

SITE: Arroyo Circle and Gilmore Road
Gilroy, CA

Terracon
5075 Commercial Cir Ste E
Concord, CA

PROJECT NUMBER: ND205052

CLIENT: Kimley-Horn & Associates Inc
Orange, CA

SUPPORTING INFORMATION

Contents:

General Notes

CPT General Notes

Unified Soil Classification System

Liquefaction Analysis

Note: All attachments are one page unless noted above.

SAMPLING	WATER LEVEL	FIELD TESTS
 Auger Cuttings  Grab Sample  Standard Penetration Test  Modified California Ring Sampler  Shelby Tube	 Water Initially Encountered  Water Level After a Specified Period of Time  Water Level After a Specified Period of Time  Cave In Encountered Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	N Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer UC Unconfined Compressive Strength (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See [Exploration and Testing Procedures](#) in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Ring Sampler Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength Qu, (tsf)	Standard Penetration or N-Value Blows/Ft.	Ring Sampler Blows/Ft.
Very Loose	0 - 3	0 - 6	Very Soft	less than 0.25	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	0.25 to 0.50	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium Stiff	0.50 to 1.00	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	1.00 to 2.00	8 - 15	10 - 18
Very Dense	> 50	> 99	Very Stiff	2.00 to 4.00	15 - 30	19 - 42
			Hard	> 4.00	> 30	> 42

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

CPT GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

New Data Center ■ Gilroy, CA

Terracon Project No. ND205052

DESCRIPTION OF GEOTECHNICAL CORRELATIONS

DESCRIPTION OF MEASUREMENTS AND CALIBRATIONS

To be reported per ASTM D5778:

Uncorrected Tip Resistance, q_c
Measured force acting on the cone divided by the cone's projected area

Corrected Tip Resistance, q_t
Cone resistance corrected for porewater and net area ratio effects
 $q_t = q_c + u_2(1 - a)$

Where a is the net area ratio, a lab calibration of the cone typically between 0.70 and 0.85

Pore Pressure, u

Pore pressure measured during penetration
 u_1 - sensor on the face of the cone
 u_2 - sensor on the shoulder (more common)

Sleeve Friction, f_s

Frictional force acting on the sleeve divided by its surface area

Normalized Friction Ratio, F_r

The ratio as a percentage of f_s to q_t , accounting for overburden pressure

To be reported per ASTM D7400, if collected:

Shear Wave Velocity, V_s

Measured in a Seismic CPT and provides direct measure of soil stiffness

Normalized Tip Resistance, Q_{tn}

$$Q_{tn} = ((q_t - \sigma_{v0})/P_a)(P_a/\sigma'_{v0})^n$$
$$n = 0.381(I_c) + 0.05(\sigma'_{v0}/P_a) - 0.15$$

Over Consolidation Ratio, OCR

$$OCR(1) = 0.25(Q_{tn})^{1.25}$$

$$OCR(2) = 0.33(Q_{tn})$$

Undrained Shear Strength, S_u

$$S_u = Q_{tn} \times \sigma'_{v0}/N_{kt}$$

N_{kt} is a soil-specific factor (shown on S_u plot)

Sensitivity, S_t

$$S_t = (q_t - \sigma_{v0}/N_{kt}) \times (1/f_s)$$

Effective Friction Angle, ϕ'

$$\phi'(1) = \tan^{-1}(0.373[\log(q_t/\sigma'_{v0}) + 0.29])$$

$$\phi'(2) = 17.6 + 11[\log(Q_{tn})]$$

Unit Weight, γ

$$\gamma = (0.27[\log(F_r)] + 0.36[\log(q_t/\text{atm})] + 1.236) \times \gamma_{\text{water}}$$

σ_{v0} is taken as the incremental sum of the unit weights

Small Strain Shear Modulus, G_0

$$G_0(1) = \rho V_s^2$$

$$G_0(2) = 0.015 \times 10^{(0.55I_c + 1.68)}(q_t - \sigma_{v0})$$

Soil Behavior Type Index, I_c

$$I_c = [(3.47 - \log(Q_{tn}))^2 + (\log(F_r) + 1.22)^2]^{0.5}$$

SPT N_{60}

$$N_{60} = (q_t/\text{atm}) / 10^{(1.1268 - 0.2817I_c)}$$

Elastic Modulus, E_s (assumes $q/q_{ultimate} \sim 0.3$, i.e. FS = 3)

$$E_s(1) = 2.6\psi G_0 \text{ where } \psi = 0.56 - 0.33\log Q_{tn, \text{clean sand}}$$

$$E_s(2) = G_0$$

$$E_s(3) = 0.015 \times 10^{(0.55I_c + 1.68)}(q_t - \sigma_{v0})$$

$$E_s(4) = 2.5q_t$$

Constrained Modulus, M

$$M = \alpha_M(q_t - \sigma_{v0})$$

For $I_c > 2.2$ (fine-grained soils)

$$\alpha_M = Q_{tn} \text{ with maximum of 14}$$

For $I_c < 2.2$ (coarse-grained soils)

$$\alpha_M = 0.0188 \times 10^{(0.55I_c + 1.68)}$$

Hydraulic Conductivity, k

$$\text{For } 1.0 < I_c < 3.27 \quad k = 10^{(0.952 - 3.04I_c)}$$

$$\text{For } 3.27 < I_c < 4.0 \quad k = 10^{(-4.52 - 1.37I_c)}$$

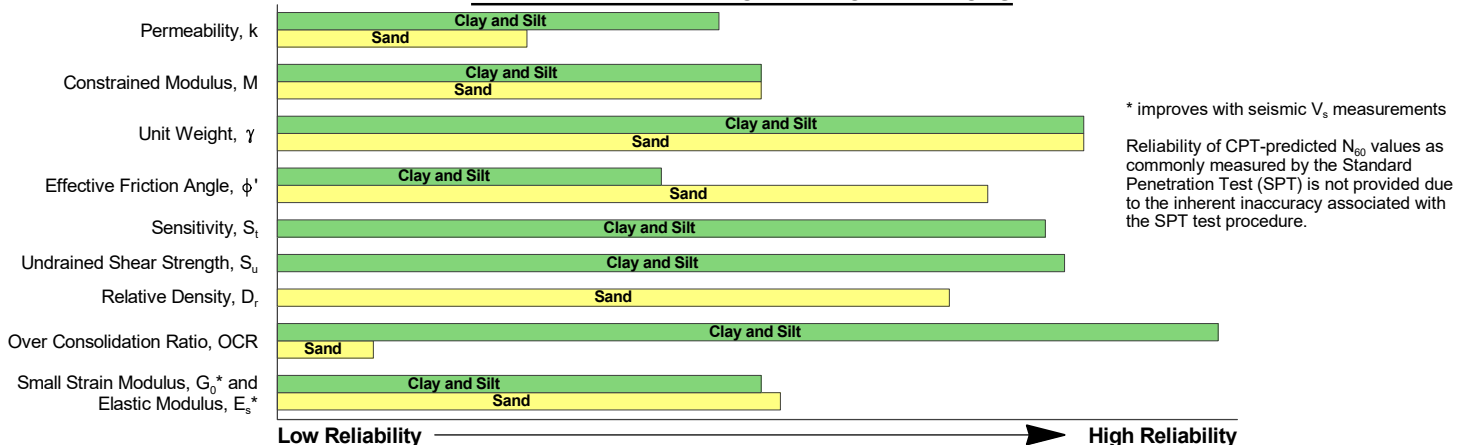
Relative Density, D_r

$$D_r = (Q_{tn} / 350)^{0.5} \times 100$$

REPORTED PARAMETERS

CPT logs as provided, at a minimum, report the data as required by ASTM D5778 and ASTM D7400 (if applicable). This minimum data include q_t , f_s , and u . Other correlated parameters may also be provided. These other correlated parameters are interpretations of the measured data based upon published and reliable references, but they do not necessarily represent the actual values that would be derived from direct testing to determine the various parameters. To this end, more than one correlation to a given parameter may be provided. The following chart illustrates estimates of reliability associated with correlated parameters based upon the literature referenced below.

RELATIVE RELIABILITY OF CPT CORRELATIONS



WATER LEVEL

The groundwater level at the CPT location is used to normalize the measurements for vertical overburden pressures and as a result influences the normalized soil behavior type classification and correlated soil parameters. The water level may either be "measured" or "estimated":

Measured - Depth to water directly measured in the field

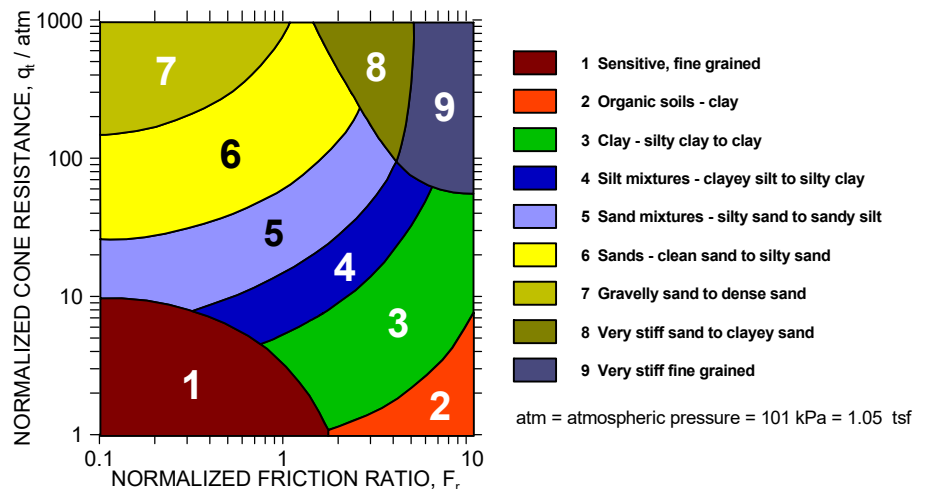
Estimated - Depth to water interpolated by the practitioner using pore pressure measurements in coarse grained soils and known site conditions

While groundwater levels displayed as "measured" more accurately represent site conditions at the time of testing than those "estimated," in either case the groundwater should be further defined prior to construction as groundwater level variations will occur over time.

CONE PENETRATION SOIL BEHAVIOR TYPE

The estimated stratigraphic profiles included in the CPT logs are based on relationships between corrected tip resistance (q_t), friction resistance (f_s), and porewater pressure (u_2). The normalized friction ratio (F_r) is used to classify the soil behavior type.

Typically, silts and clays have high F_r values and generate large excess penetration porewater pressures; sands have lower F_r 's and do not generate excess penetration porewater pressures. The adjacent graph (Robertson *et al.*) presents the soil behavior type correlation used for the logs. This normalized SBT chart, generally considered the most reliable, does not use pore pressure to determine SBT due to its lack of repeatability in onshore CPTs.



REFERENCES

- Kulhavy, F.H., Mayne, P.W., (1997). "Manual on Estimating Soil Properties for Foundation Design," Electric Power Research Institute, Palo Alto, CA.
- Mayne, P.W., (2013). "Geotechnical Site Exploration in the Year 2013," Georgia Institute of Technology, Atlanta, GA.
- Robertson, P.K., Cabal, K.L. (2012). "Guide to Cone Penetration Testing for Geotechnical Engineering," Signal Hill, CA.
- Schmertmann, J.H., (1970). "Static Cone to Compute Static Settlement over Sand," *Journal of the Soil Mechanics and Foundations Division*, 96(SM3), 1011-1043.

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A					Soil Classification	
					Group Symbol	Group Name ^B
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines ^C	Cu ≥ 4 and 1 ≤ Cc ≤ 3 ^E	GW	Well-graded gravel ^F	
			Cu < 4 and/or [Cc<1 or Cc>3.0] ^E	GP	Poorly graded gravel ^F	
		Gravels with Fines: More than 12% fines ^C	Fines classify as ML or MH	GM	Silty gravel ^{F, G, H}	
			Fines classify as CL or CH	GC	Clayey gravel ^{F, G, H}	
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines ^D	Cu ≥ 6 and 1 ≤ Cc ≤ 3 ^E	SW	Well-graded sand ^I	
			Cu < 6 and/or [Cc<1 or Cc>3.0] ^E	SP	Poorly graded sand ^I	
		Sands with Fines: More than 12% fines ^D	Fines classify as ML or MH	SM	Silty sand ^{G, H, I}	
			Fines classify as CL or CH	SC	Clayey sand ^{G, H, I}	
Fine-Grained Soils: 50% or more passes the No. 200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic:	PI > 7 and plots on or above “A”	CL	Lean clay ^{K, L, M}	
			PI < 4 or plots below “A” line ^J	ML	Silt ^{K, L, M}	
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay ^{K, L, M, N}
			Liquid limit - not dried		Organic silt ^{K, L, M, O}	
	Silts and Clays: Liquid limit 50 or more	Inorganic:	PI plots on or above “A” line	CH	Fat clay ^{K, L, M}	
			PI plots below “A” line	MH	Elastic Silt ^{K, L, M}	
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay ^{K, L, M, P}
			Liquid limit - not dried		Organic silt ^{K, L, M, Q}	
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat	

^A Based on the material passing the 3-inch (75-mm) sieve.

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^C Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

^D Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

$$^E Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

^F If soil contains $\geq 15\%$ sand, add "with sand" to group name.

^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^H If fines are organic, add "with organic fines" to group name.

^I If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.

^J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

^L If soil contains $\geq 30\%$ plus No. 200 predominantly sand, add "sandy" to group name.

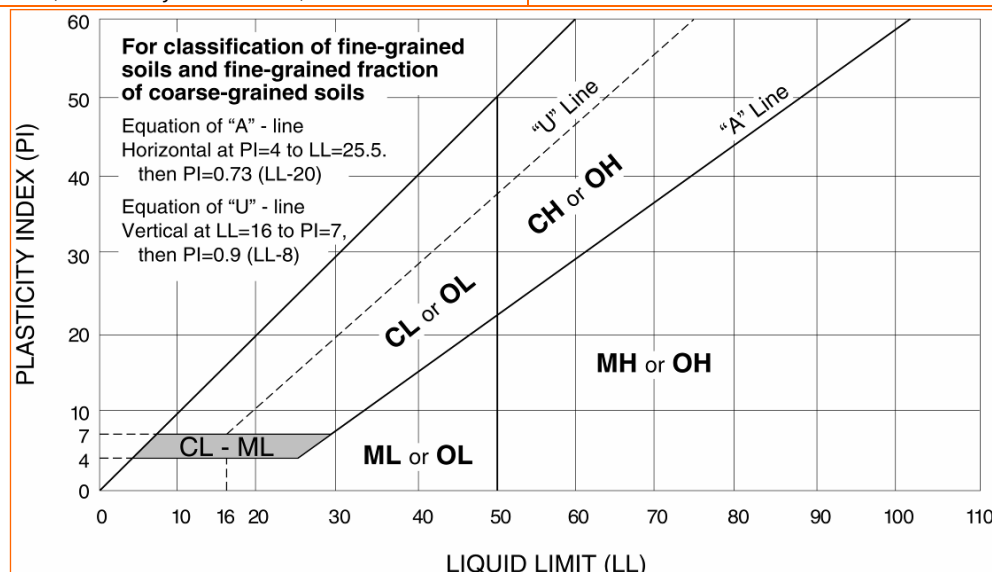
^M If soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

^N PI ≥ 4 and plots on or above "A" line.

^O PI < 4 or plots below "A" line.

^P PI plots on or above "A" line.

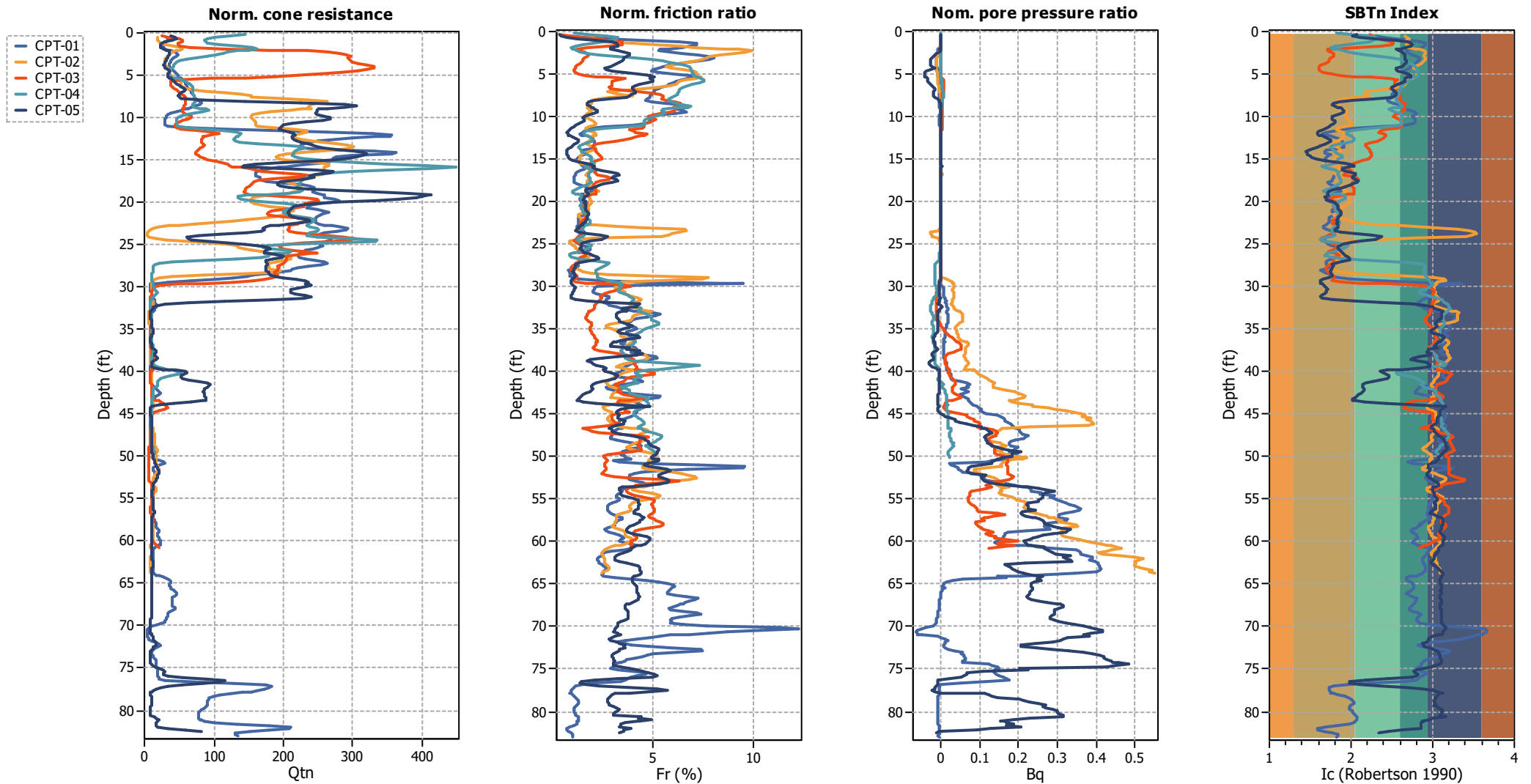
^Q PI plots below "A" line.





Project: New Data Center

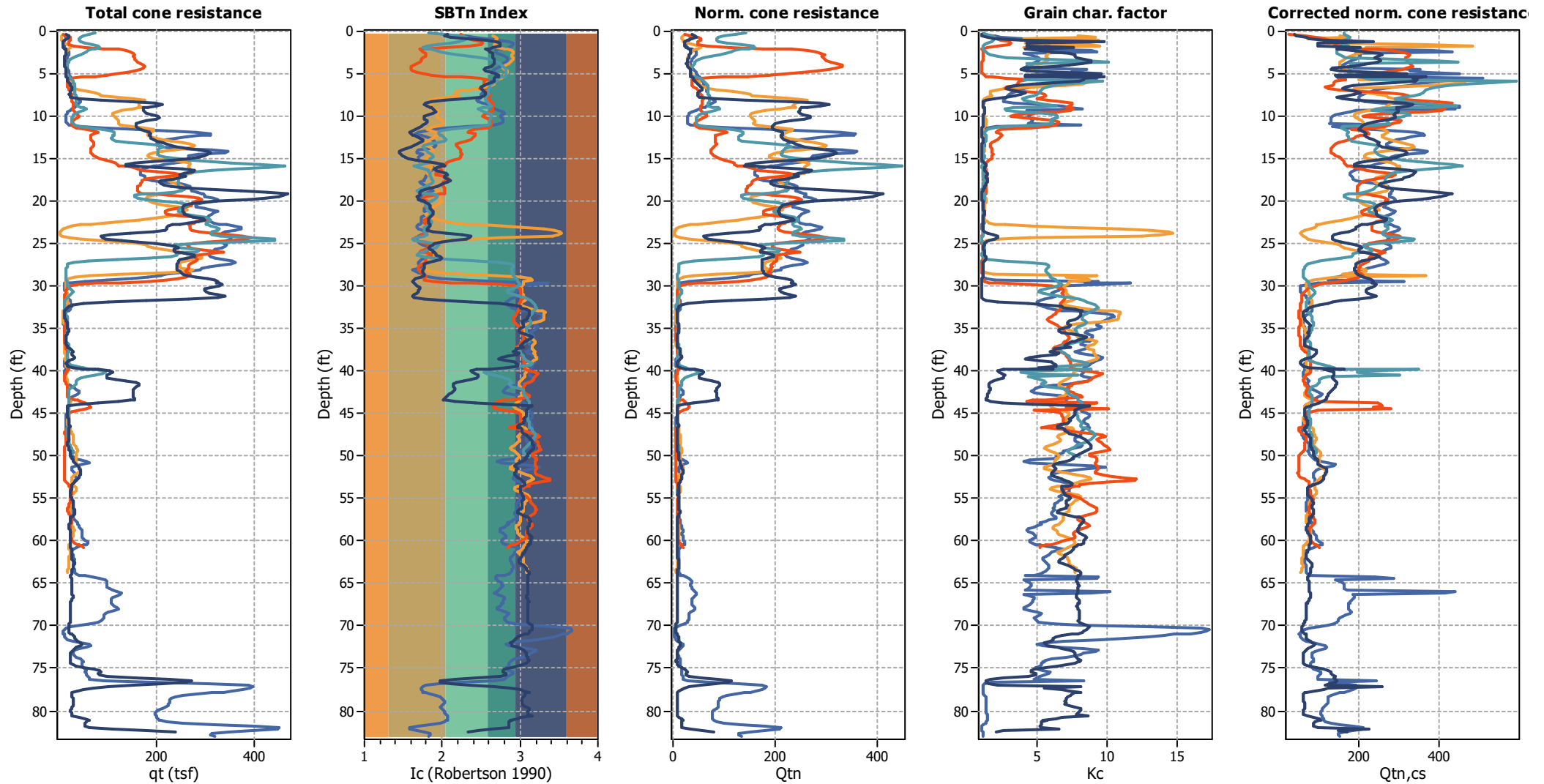
Overlay Normalized Plots





Project: New Data Center

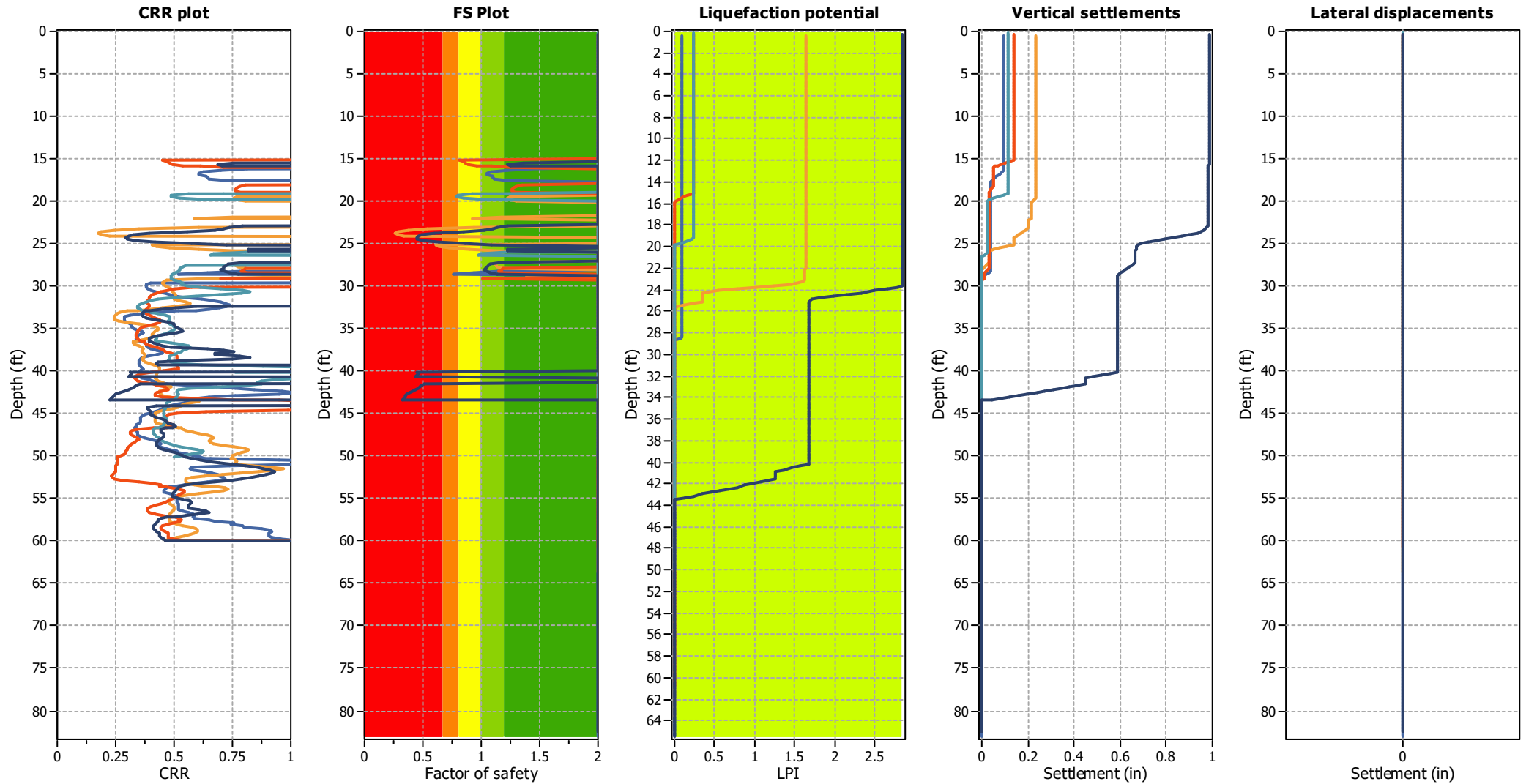
Overlay Intermediate Results





Project: New Data Center

Overlay Cyclic Liquefaction Plots





Project: New Data Center

Overlay Strength Loss Plots

