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Geotechnical Report

E&P Technology Way – Buildings A & B Use Permits
(P22-00307 / P22-00308)
Planning Commission Hearing Date November 20, 2024

GEOTECHNICAL INVESTIGATION
TWO DISTRIBUTION BUILDINGS
Technology Way Easterly of Morris Court
Napa, California

File No. 192-352

Raney Geotechnical Inc

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September 30, 2021

Panattoni Development Company, Inc
Attention: Abbie Wertheim
8775 Folsom Boulevard
Suite 200
Sacramento, CA 95826

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INTRODUCTION

In accordance with your request and our proposal letter of August 18, 2021, we have performed a Geotechnical Investigation for use in the design and construction of two distribution buildings fronting on Technology Way easterly of Morris Court. This report presents the results of our investigation. The westerly building will be of about 160,000 square feet in plan and the easterly one of about 65,000 square feet in plan. In preparing this study, we have considered two nearby studies performed by our firm within about the last decade.[1][2]

The locations of our exploratory borings performed for this study are shown relative to the proposed buildings over an aerial photo base on Plate 1, *Plot Plan.* Logs of the borings are presented on Plate 2 through 12, *Log of Boring, Borings A through G and 1 -4,* respectively. The results of moisture, density and unconfined strength testing performed on relatively undisturbed samples obtained from the borings are presented on the logs at the depth of each sample tested. The nomenclature used to describe the soils on the Boring Logs is defined on Plate 13, *Unified Soil Classification System.* The results of testing performed to assess soil plasticity are presented on Plate 14, *Atterberg Limit Data.* The results of testing performed to assess the organic content of selected samples of the more organic soils encountered on the property are presented on Plate 15, *Organic Content Data.* Data

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[1] Raney Geotechnical, Inc; "Geotechnical Investigation, Metropolitan Warehouse, Alexis Court, Airport Road and Airport Boulevard, Napa, California"; January 7, 2011; File No. 3574-001.

[2] Raney Geotechnical, Inc; "Geotechnical Investigation, Technology Way Warehouse, Technology Way and Airpark Road, Napa, California"; June 28, 2013; File No. 3574-002.

generated for use in assessment nt of soil liquefaction potential are presented on Plate 16, *Grain Size Data.* Pavement subgrade property data are presented on Plate 17, *Resistance Value Data.*

PROPOSED CONSTRUCTION

As indicated, the proposed construction consists of two distribution buildings, the westerly one of about 160,000 square feet and the easterly one of 65,000 square feet. The larger building will have about 24 recessed dock doors and two at-grade doors, and the smaller one 24 recessed dock doors and six at grade doors. Building clear height is expected to be 28 to 30 feet. Owing to the buildings' proximity to the West Napa Fault about one mile west of the composite site, we would expect relatively thick tilt panels giving rise to a perimeter line load on the order of 5,500 pounds per lineal foot, largely dead load. The widest internal column grid spacing would appear to be on the order of 50- by 60-feet, giving rise to a maximum spot load on the order of about 75 kips, dead plus live. There will be three entries off the street and accessing the westerly building, one off Technology Way and two off Morris Court, and two entries to the easterly building off Technology Way. Assuming one delivery per recessed dock door per operating day by a fully loaded semi, the traffic index (TI) for total traffic to each building would be nearly 8.0.

SITE CONDITIONS

SURFACE

The composite property, that is the ground that will support both buildings is made up of three parcels. The largest is an approximate 13-acre parcel which will sustain the westerly building and is defined by Morris Court on the west, Sheehy Creek on the north, Technology Way on the south, and the westerly most of the two parcels that will support the easterly building on the east. The easterly building will overlie two parcels totaling nearly seven acres. The composite of the two easterly parcels also fronts on Technology Way and is defined on the north by Sheehy Creek; there is an existing tilt-up concrete building to the east (240 West Gateway). Elevations on the property which will support the westerly building generally slope downward to the north toward Sheehy Creek; the high point of this property would appear to be about +35 feet near the intersection of Technology Way and Morris Court. The slope to the north from the high point near the intersection would appear to be at a configuration on the order of one on ten, whereas the remainder of the property slopes comparatively gently and has an average elevation on the order of about +25 feet. Elevations on the property which will support the easterly building (the two easterly parcels) generally slope downward reasonably uniformly to the west from the parking lot of the building addressed as 240 Gateway at about Elevation +35 feet, to about Elevation +26 feet at a point about 100 feet westerly of the proposed easterly building; the average natural ground elevation within the footprint area of the proposed easterly building is about +30 feet.

Ground surfaces on both the westerly and easterly properties are covered with low, dry volunteer grasses. We noted a monitoring well on the westerly property and situated at about the northeasterly corner of the proposed westerly building site. We also noted that there is fill on both properties, which is most significant on the easterly portion of the easterly property. The approximate location of the pre-existing trace of Sheehy Creek, which according to Gogle Earth® imagery was moved to its present location within the interval between the summers of 2003 and 2004, crosses the property as shown approximately on Plate 1. The backfill of the pre-existing creek trace is discussed in the next section.

SUBSURFACE

It should be recognized that eight of the 11 borings drilled on the composite property were located over the pre-existing creek trace in order to assess the quality of the creek backfill. In locating borings over the former creek trace we considered historic aerial photography, and by virtue of the composition of the creek fill materials we engaged, it is apparent that our exploratory location methodology was appropriate. The depths of fill engaged in the creek-specific borings ranged from 5.3 to 19 feet, likely reflecting the locations of our explorations relative to the centerline of the trace; the quality of the creek backfill appears to be good. The immediate surface of the creek backfill soils consists of a foot or less of silt which is typically underlain by a six- to 20-foot-thick dark, high plasticity clay stratum, although the dark heavy clays also appear at the surface locally, and also are interlayered with leaner, lighter-colored silty clays and silty sands locally. Within areas outside the pre-existing creek trace, it would appear that the native soil profile consists of two to four feet of locally loose but generally medium dense silt at ground surfaces, underlain by comparatively thin strata of dark heavy clay soils, which are locally interrupted by lighter, leaner silty clays and clayey silts. At depths of six to seven feet within the native soils, silty clays of stiff to very stiff consistency were engaged; these soils were found to extend to depths of nearly 20 feet. Below about 20 feet the native soils consist of a complex sequence of silty sand, sandy silt, silty clay, and even fine gravel locally, which appear to extend beyond our maximum 50-depth of our exploration; consistencies of the soils in this lowermost interval generally are stiff to hard/dense.

GROUNDWATER

Free groundwater was encountered in nine of the 11 borings drilled for this study. Measured depths ranged from, as little as eight feet, to 17.5 feet, although no water was engaged in either the 20-foot-deep Boring 3 or the 15-foot-deep Boring 4. Nearly three feet of artesian pressure was measured in Boring B where the free groundwater is confined by dark heavy clay backfill materials. In the face of the current drought condition, we would expect "typical" groundwater levels to be several feet higher during more so "normal" rainy season weather. The higher levels we measured appear to have occurred at a location where we were directly (or nearly so) over the pre-existing creek trace. In as much as both building pads will be raised significantly, we would not expect groundwater/dock foundation construction conflict, unless the work were undertaken during very wet weather and high stage conditions on Sheehy Creek.

EXPANSIVE SOILS

As indicated above, the plasticity of the uppermost native clays is quite high. These near surface clays are capable of exerting high to very high expansion pressures on slabs, flatwork, pavements and foundations with variations in moisture content. As with other projects in this setting, soil expansion potential will be addressed by chemical treatment.

BEARING CAPACITY

The uppermost native soils exhibit generally favorable consistency, strength and compressibility properties. Furthermore, significant fill material will be required to achieve pad grades in almost all pad areas, such that most at grade foundations will be based in fill, although the area of the easterly portion of the easterly building, and most of the dock foundations will not.

SOIL CHEMISTRY

The chemical testing was performed in conjunction with our referenced studies, as well as in conjunction with the consideration a property you plan to borrow from on the southeasterly corner of South Kelly and Devlin Roads.[3] These test data all would indicate that the dark heavy clay soils present on the composite site and in significant portions of the indicated borrow site have a low to neutral pH, low resistivity, and are low sulfate, and moderate chloride concentration. Based upon these data, ACI 318 would indicate an exposure class of S0. Furthermore, conventional Type II portland cement should be suitable for use, and the indicated clays should not be corrosive to properly covered reinforcement. We also would expect the site soils to be corrosive to unprotected iron.

SEISMIC DESIGN

In design using the Equivalent Lateral Force or Modal Response Spectrum Analysis procedures of the 2019 CBC/ASCE 7-16, the parameters in Table I on the next page should be used. With Site Class D and a Mapped Spectral Response Acceleration S_1 equal to or greater than 0.2g, the Seismic

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[3] Raney Geotechnical, Inc; "Geotechnical Investigation Update, Napa Airport Corporate Center, Buildings "A" and "B", South Kelly and Devlin Roads, American Canyon, California"; March 17, 2015; File No. 192-313.

Response Coefficient C_S used to scale base shear must be increased as indicated below, otherwise, a site-specific ground motion hazard analysis is required.

When using the Equivalent Lateral Force or Modal Response Spectrum Analysis procedures, the calculated maximum value of C_S (Equation 12.8-2) should be used for structures with fundamental periods of up to $1.5*(S_{D1}/S_{DS})$ =0.756 If either building has a greater period, the calculated limitations on values of C_S (Equations 12.8-3 and 12.8-4) should be increased by 50 percent.

TABLE I
2019 CBC/ASCE 7-16 SEISMIC DESIGN PARAMETERS

Period (seconds)	Mapped Spectral Response Accelerations	Site Class	Site Coefficients	Maximum Considered Earthquake Spectral Response Accelerations	Design Spectral Response Accelerations
0.2	S_S 2.131g	D	F_a 1.2	S_{MS} 2.557g	S_{DS} 1.705g
1.0	S_1 0.758g		F_v 1.7	S_{M1} 1.289g*	S_{D1} 0.859g*

* To be used only for calculation of T_s

LIQUEFACTION POTENTIAL

Liquefaction analyses were performed using CivilTech software and the soil profile data at Boring E, a 50-foot-deep boring located near the center of the proposed westerly building. We assumed a ground motion with a two percent chance of being exceeded in 50 years and attributable to 6.8 moment magnitude earthquake event. No liquefaction settlement was determined, although we note that relatively thin strata of predominately granular soils of moderate density are locally present below free groundwater. Based upon this, and the proximity of the site to the West Napa Fault, we estimate that modest (less than about one-half inch) total liquefaction settlement could be experienced locally. The results of the liquefaction analyses performed on the profile at Boring E are presented as Figure 1 in the next page.

RECOMMENDATIONS

EARTHWORK

Site clearance should begin with the removal of any rubble and rubbish. Underground pipes and conduit within two feet of original or final grades also should be removed; deep excavations for the removal of buried items should be dished out so as to expose firm undisturbed soils as identified by our representatives. Backfill of all such excavations should be in accordance with the recommendations of this report. If so designated, the decommissioning of the existing monitoring well should be performed in accordance with County standards. Based upon the condition of the volunteer vegetation on ground surfaces at this time, site preparation should include a thorough disc and cross-disc effort sufficient to uniformly incorporate existing dry organic matter into the upper eight inches of the profile. The extent of new actively growing vegetation on the composite site should be reviewed by our representatives immediately prior to earthwork construction to confirm the suitability of the above site preparation procedure. Within areas designated to receive fill (almost the entire site) and support buildings or pavements, or the limited areas to be left at existing grades, the disc soils should be moisture conditioned to an over-optimum state (at least three percent over in the case of the dark heavy clays) and recompacted in place to a least degree of relative compaction of 90 percent in accordance with the ASTM D1557 procedure. Engineered fill should be placed in maximum eight-inch loose lifts, moisture conditioned to an over optimum condition (at least three percent over in the case of the dark heavy clays) and compacted to a least degree of relative compaction of 90 percent.

Excavations for undergrounds and recessed dock areas should be performed to the lines and grades shown on the project drawings. On-site soils are suitable for use as engineered fill, provided the soils do not contain significant vegetable matter, rubble, rubbish, or other undesirable substances. The dark, heavy clay soils indicated to be present both on the site and within the presently designated borrow source, however, should be excluded from use as recessed wall backfill. Imported soils from other than the South Kelly/Devlin Road should be tested and approved by our firm prior to importation to the site.

The upper 15 inches of the building pads and the areas five feet beyond, as well as any other flatwork areas should be chemically treated to reduce soil expansion and provide for a durable working surface. Swelling of the soils from the untreated to treated state should be expected. For purposes of estimating an average dry unit weight of the site soils, and of the initially indicated borrow soils, we suggest use of an average dry unit weight of 105 pounds per cubic foot, and chemical concentrations of three percent lime and five percent cement. This is expected to require spread rates of 4.0 pounds of lime and 6.5 pounds of cement per square foot of treated area for the recommended 15-inches of treatment. These relatively high estimated spread rates are attributable to the organic concentrations within the dark heavy clay soils (see Plate 15). Actual treatment levels may be expected to vary depending upon the composition of the soils designated for treatment, and hopefully will be lesser than those suggested above for use in estimating. Final location-specific assessment of treatment concentrations, and type could perhaps eliminate the need for treatment with both lime and cement within some areas; this final assessment of treatment type and method will be made following rough grading which should enable determination of finished pad composition.

The lime/soil mixtures should be brought to over-optimum moisture, thoroughly mixed, lightly compacted to seal the surface, and allowed to cure for a minimum of 16 hours but no more than three days. The cured lime treated soils should then be treated with portland cement. Final shaping and compaction of cement treated soils should be completed within three hours of the placement of the cement. A minimum degree of relative compaction of treated soils of 92 percent of the maximum dry density determined by the ASTM D1557 procedure should be provided. Treatment should conform to the applicable provisions of the Caltrans Standard Specifications. The treated soils should be kept moist for a period of at least three days following treatment as recommended in Section 24 of the Caltrans Standard Specifications.

The upper eight inches of untreated pavement subgrades, if any, should be compacted to at least 90 percent of the ASTM D1557 maximum dry density, regardless of whether the final grade is achieved by cutting, filling, or left at existing grade. Permanent excavation and embankment slopes should not exceed an inclination of one vertical on two and one-half horizontal. A representative of this firm should be present during grading and chemical treatment to test and observe the work.

FOUNDATIONS

The proposed buildings may be supported on conventional continuous and isolated spread foundations based within the recompacted native oils and fill materials prepared as recommended above. A least depth of foundation confinement of 24 inches should be provided relative to pad grades. In the case of recessed dock area foundations, the confinement depth may be reduced to 18 inches relative to adjacent dock pavement subgrade level. Foundations based as recommended may be designed for maximum allowable bearing pressures of 2,400 pounds per square foot (psf) for dead plus live load and 3,200 psf for total load, including the effect of either seismic or wind forces. A least perimeter foundation width of 33 inches should be provided. The weight of foundation concrete below grade may be neglected in sizing computations. All bearing surfaces should be free of slough and water, and should be approved by our firm prior to the placement of foundation concrete. In the event that groundwater is engaged in any of the dock foundations, recommendations for the remedial stabilization of these areas should be developed by our firm at the time of construction. We would expect this remediation to consist of the forcing of granular materials into the foundation subgrades, or similar.

Resistance to lateral forces may be calculated using either friction or passive earth pressure but not both, except as recommended in this paragraph. The coefficient of friction acting between structural foundation or pedestal bases and the native soils may be assumed to be 0.27. Passive resistance acting against appropriate faces of spread foundations and/or pedestals/stems may be considered equal to the stress exerted by a fluid weighing 325 pounds per cubic foot. A combination of both friction and passive earth pressure may be used, provided that the larger mode of resistance is reduced by 50 percent. The recommended friction and passive earth pressure values have been modified by appropriate factors of safety and may be applied directly in design calculations.

Foundations for trash enclosures or similar "lightly loaded" construction associated with the buildings also may be supported in the fill materials and uppermost native soils, although owing to soil expansion potential, a least depth of foundation confinement of 24 inches should be provided. These foundations may be sized using the allowable bearing pressures recommended above for the buildings. A least "lightly loaded" foundation width of 12 inches should be provided.

Foundation excavations should be clean, free of loose and/or soft material, and observed by our representatives prior to concrete placement. A indicated above, some remedial stabilization may be required locally in the case of recessed dock foundations.

We would expect settlement of building foundations designed as recommended to be less than one inch.

SLAB-ON-GRADE

Floor slabs may be supported upon the chemically treated building pads prepared as recommend above. In as much as the slab likely will be required to support a truck crane during panel erection, will be subject to forklift traffic in everyday use, and the soils below the treated sections will be highly expansive, at least locally, a minimum six-inch-thick slab is recommended, together with least slab reinforcing consisting of No.3 bars on 16-inch centers in both directions, and a maximum control joint spacing of 15 feet. Construction control joints should contain dowels or other equivalent proprietary load transfer mechanism in accordance with Portland Cement Association (PCA) guidelines. We recommend a least slab concrete unconfined strength of 4,000 psi at 28 days. Depending upon the forklift size and traffic, a thicker slab may be required, although a six-inch thick slab should be sufficient for forklifts up to 4,000-pound capacity. Racking post loads also may require increased slab thickness. In any case, slab edges should be thickened by 20 percent at drive through doors and anywhere that heavy materials/equipment will be stored within five feet of a free edge. In assessing slab thickness, a modulus of subgrade reaction of 150 pounds per inch cubed may be used for the treated pads. In warehouse portions of the slab, where minor moisture vapor penetration through the slab can be tolerated, a minimum three-inch layer of AB should be placed beneath the slabs as a leveling course, and to promote slab curing. The AB should be moist but not overly wet just prior to slab concrete placement. In order to prevent free water about exterior of the building from contacting the AB beneath the slab, the AB should be removed, and the slab edge thickened and placed directly on the treated pad for a minimum eight-inch width about warehouse portions of the building perimeter.

In office areas of both buildings, or other areas that are designated to receive floor coverings, and moisture cannot be tolerated, slab concrete, including portions within the closure strip, should be placed directly on a durable proprietary membrane such as Stego® 15 mil material. The membrane should be underlain by a minimum of three inches of AB which should be continuous beneath the closure strip and cut tight around plumbing stands, and any other penetrations. The seams of the membrane also should be taped. Laterally migrating moisture from building perimeters or from warehouse areas without a membrane should be cutoff for a distance of at least eight inches by removing the AB, suppressing the membrane to the treated pad within this interval and placement of a thickened perimeter slab edge directly on the suppressed membrane. Even with the above recommended procedures, impervious floor coverings installed using water-based flooring adhesives may blister and de-bond due to moisture vapor condensation beneath the coverings. If there are specific concerns regarding moisture vapor condensation beneath floor coverings, consideration could be given to use of a concrete sealant.

DOCK WALLS/EARTH RETAINING

Retaining walls alongside docks could be subject to both earth pressure and traffic surcharge loads. In as much as these walls must remain fixed, we recommend use of an at-rest equivalent fluid earth pressure of 55 pounds per cubic foot (pcf) in design, in addition to an appropriate traffic surcharge load. Similarly, the at-rest earth pressure condition also will be imposed on the recessed portions of dock walls. Because of the highly expansive nature of both the dark native and imported clays, these soils should be excluded from use behind the recessed portions of dock panels and retaining walls. Consideration should be given to the use of select granular material such as three-quarter inch crushed rock for purposes of recessed wall backfill.

PAVEMENTS

The pavement subgrade properties of the surface and dark heavy clay soils, which are likely to make up significant portions of pavement subgrades, are poor. Resistance value five was measured for these soils and was used in the Caltrans Design Method for Flexible Pavements together with TI's that can be related to design life and wheel loads. PCA design methods have been used in the case of rigid pavements. It is common practice to use an assumed useful pavement life of 20 years when applying the indicated design methods, and we have done so in the case of the subject buildings.

The Asphalt Institute has suggested that a TI of 4.5 may be reasonably representative of automobile parking lot wheel loads. Areas subject to channelized automobile traffic only probably should be designed for a traffic index of 5.0, and areas subject to weekly waste removal truck traffic only probably should be TI of 5.5 to 6.0. The TI's considered appropriate for use within areas of the pavement subject to one-fourth total truck traffic, one-half total truck traffic and total truck traffic give rise to TI's of 6.5, 7.0 and nearly 8.0. Alternative asphalt and portland cement concrete pavement sections for TI's of 4.5, 5.0, 6.0, 6.5 7.0 and 8.0 are presented in Table II on the next page.

The recommended alternative sections include options with chemically stabilized bases. Chemical treatment of pavement subgrades should prove cost efficient, although it is not possible to determine the exact means of treatment prior to achieving finished pavement subgrade levels. Treatment costs may be estimated using the methods suggested for the building pads. We can provide additional pavement sections and consider other traffic load cases upon request. Decisions regarding pavement sections should be made on the basis of economics and the desired level of future maintenance.

TABLE II
PAVEMENT SECTION ALTERNATIVES

Design Traffic Index	Type B Asphalt Concrete (inches)	Portland Cement Concrete (inches)	Class 2 Aggregate Base (inches)	Chemically Stabilized Base (inches)
4.5	2.5	--	9.0	--
	3.0	--	7.0	--
	2.5	--	3.0	12
5.0	3.0	--	9.5	--
	3.0	--	3.0	12
	--	5.80	3.0	12
6.0	3.0	--	13.5	--
	3.0	--	3.0	12
	--	6.15	3.0	12
6.5	3.0	--	15,5	--
	3.0	--	3.0	12
	--	6.4	3.0	12
7.5	4.0	--	17. 5	--
	3.5	--	5.0	12
	--	6.65	3.0	12
8.0	4.0	--	19.0	--
	4.0	--	6.0	12
	--	6.85	3.0	12

Untreated pavement subgrades should be prepared as recommended in the *Earthwork* section of this report. The recommended concrete pavements assume un-reinforced sections composed of concrete with a minimum unconfined strength of 4,000 psi at 28 days. We would suggest maximum control joint spacing of 12 feet in concrete pavements. Construction joints should contain dowels consisting of 14-inch-long No. 6 bars in the case of approximate six-inch-thick pavements, and 14-inch-long No. 7 bars in the case of approximate seven-inch-thick pavements, all on 12-inch centers. Equivalent proprietary joinery systems also may be used. Concrete pavements joining asphalt concrete pavements and free concrete edges should be tapered to 1.2 times the recommended thickness within five feet of free edges.

LIMITATIONS

This report necessarily assumes uniform variation of soils between our borings and sample points. Our recommendations are based upon this assumed uniformity and the information provided regarding the proposed construction. If unusual conditions are encountered during construction, the contractor or his representative should notify this firm immediately so that alternate written recommendations can be developed.

This report is applicable only to the proposed construction, as described herein, and should not be utilized for design or construction on any other site.

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The following Plates are attached and complete this report:

Plate 1 - Plot Plan
Plate 2 - Log of Boring, Boring A
Plate 3 - Log of Boring, Boring B
Plate 4 - Log of Boring, Boring C
Plate 5 - Log of Boring, Boring D
Plate 6 - Log of Boring, Boring E
Plate 7 - Log of Boring, Boring F
Plate 8 - Log of Boring, Boring G
Plate 9 - Log of Boring, Boring 1
Plate 10- Log of Boring, Boring 2
Plate 11- Log of Boring, Boring 3
Plate 12- Log of Boring, Boring 4
Plate 13- Unified Soil Classification System
Plate 14- Atterberg Limit Data
Plate 15- Organic Content Data
Plate 16- Grain Size Data
Plate 17- Resistance Value Data

Very truly yours,

RANEY GEOTECHNICAL, INC

REGISTERED PROFESSIONAL ENGINEER
JOHN M. RANEY
No. 708
Exp. 12/31/21
GEOTECHNICAL
STATE OF CALIFORNIA

9/30/21.

John M. Raney
Geotechnical Engineer No.708

Addressee
Bryan Bonino

PROJECT NUMBER: 192-352

NOTES:

1. BORING AND SAMPLING LOCATIONS SHOWN ARE APPROXIMATE.
2. PREPARED FROM A SITE PLAN BY RMW AND A 10/21/20 GOOGLE EARTH IMAGE.

KEY:

⊕ A	BORING LOCATION AND NUMBER
▭ S1	SURFACE SAMPLING LOCATION AND NUMBER

PLOT PLAN

Raney Geotechnical Inc

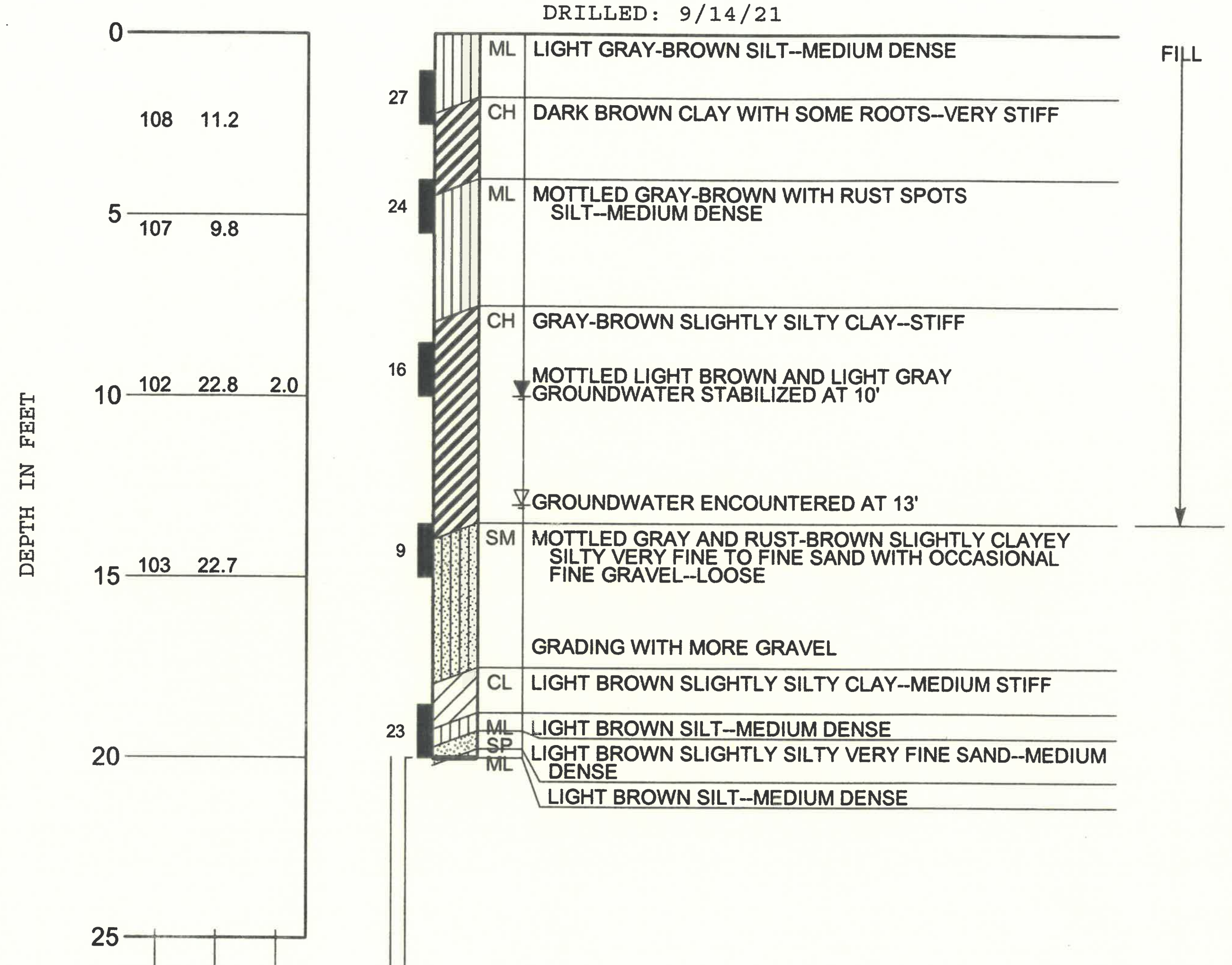
PLATE 1

PROJECT NUMBER: 192-352
PLATE NUMBER: 2

DRAWN BY: TL
DATE: 9/9/21

BORING A

DRILLED: 9/14/21



NOTES:

1. THE BORING LOG DEPICTS SUBSURFACE CONDITIONS ONLY AT THE BORING LOCATION AND TIME DESIGNATED.
2. NOMENCLATURE USED TO DESCRIBE SOILS DEFINED ON PLATE 13.
3. UNDISTURBED SAMPLE OBTAINED WITH 2" I.D. MODIFIED CALIFORNIA SAMPLER.
4. SAMPLER PENETRATION RESISTANCE IN BLOWS PER FOOT OR FRACTION THEREOF; 140-POUND HAMMER, 30" DROP.
5. FREE GROUNDWATER ENCOUNTERED IN BORINGS UNLESS OTHERWISE NOTED.

Raney Geotechnical Inc

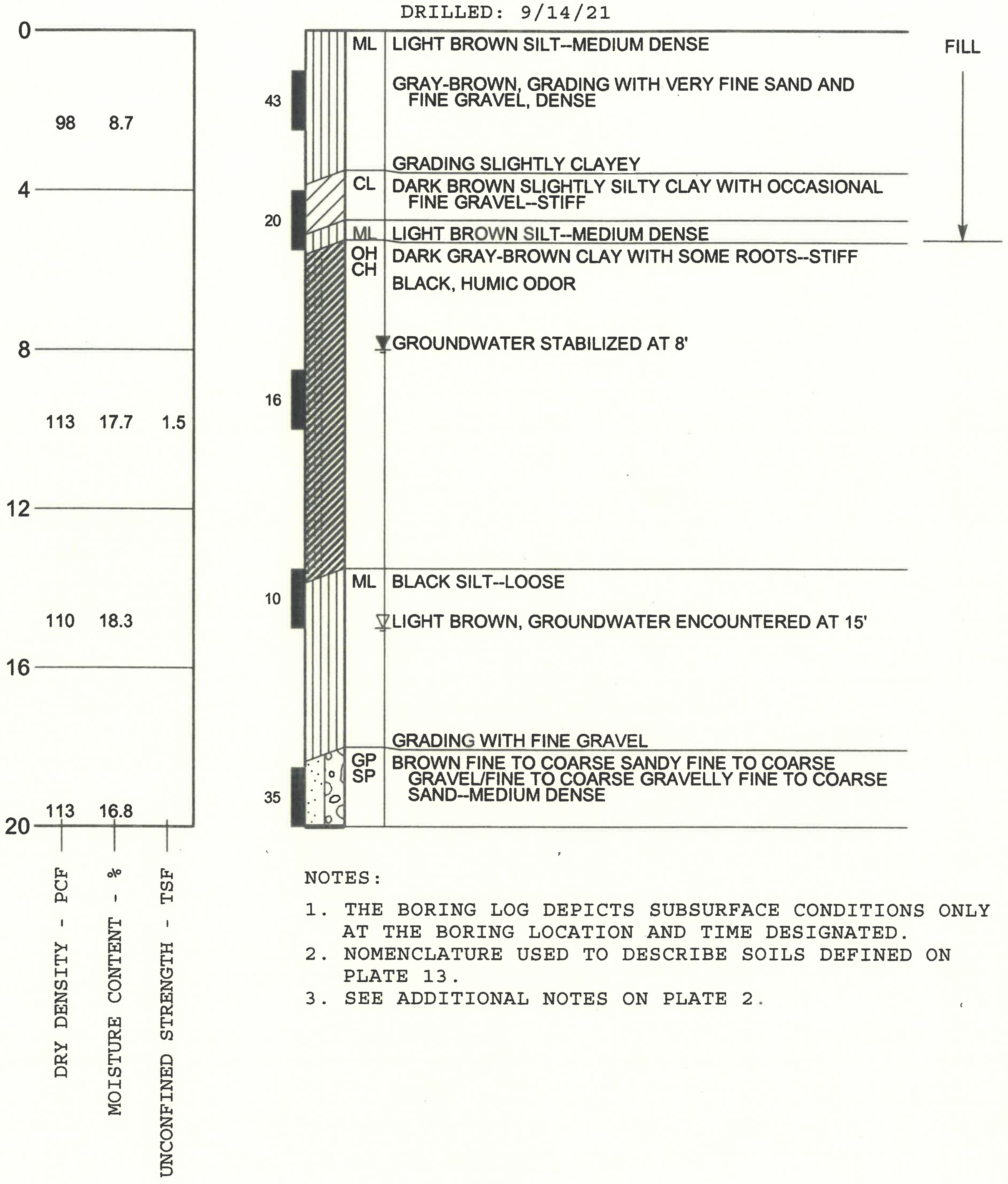
LOG OF BORING

PROJECT NUMBER: 192-352
PLATE NUMBER: 3

DRAWN BY: TL
DATE: 9/17/21

BORING B

DRILLED: 9/14/21



ML LIGHT BROWN SILT--MEDIUM DENSE

GRAY-BROWN, GRADING WITH VERY FINE SAND AND FINE GRAVEL, DENSE

GRADING SLIGHTLY CLAYEY

CL DARK BROWN SLIGHTLY SILTY CLAY WITH OCCASIONAL FINE GRAVEL--STIFF

ML LIGHT BROWN SILT--MEDIUM DENSE

OH CH DARK GRAY-BROWN CLAY WITH SOME ROOTS--STIFF

BLACK, HUMIC ODOR

GROUNDWATER STABILIZED AT 8'

ML BLACK SILT--LOOSE

LIGHT BROWN, GROUNDWATER ENCOUNTERED AT 15'

GRADING WITH FINE GRAVEL

GP SP BROWN FINE TO COARSE SANDY FINE TO COARSE GRAVEL/FINE TO COARSE GRAVELLY FINE TO COARSE SAND--MEDIUM DENSE

NOTES:

1. THE BORING LOG DEPICTS SUBSURFACE CONDITIONS ONLY AT THE BORING LOCATION AND TIME DESIGNATED.
2. NOMENCLATURE USED TO DESCRIBE SOILS DEFINED ON PLATE 13.
3. SEE ADDITIONAL NOTES ON PLATE 2.

Raney Geotechnical Inc

LOG OF BORING

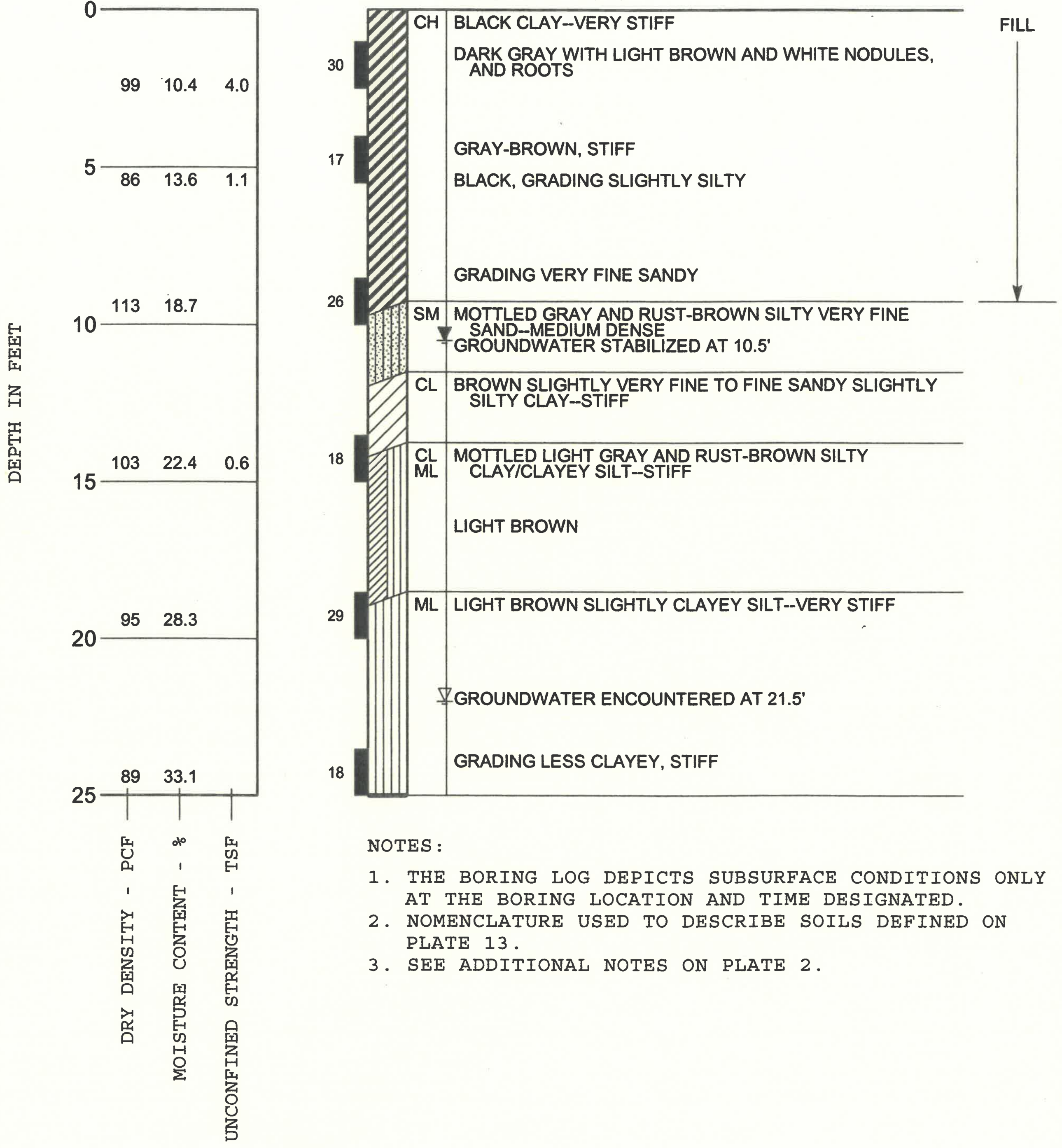
PLATE 3

PROJECT NUMBER: 192-352
PLATE NUMBER: 4

DRAWN BY: TL
DATE: 9/9/21

BORING C

DRILLED: 9/7/21



BLACK CLAY--VERY STIFF

DARK GRAY WITH LIGHT BROWN AND WHITE NODULES, AND ROOTS

GRAY-BROWN, STIFF

BLACK, GRADING SLIGHTLY SILTY

GRADING VERY FINE SANDY

MOTTLED GRAY AND RUST-BROWN SILTY VERY FINE SAND--MEDIUM DENSE

GROUNDWATER STABILIZED AT 10.5'

BROWN SLIGHTLY VERY FINE TO FINE SANDY SLIGHTLY SILTY CLAY--STIFF

MOTTLED LIGHT GRAY AND RUST-BROWN SILTY CLAY/CLAYEY SILT--STIFF

LIGHT BROWN

LIGHT BROWN SLIGHTLY CLAYEY SILT--VERY STIFF

GROUNDWATER ENCOUNTERED AT 21.5'

GRADING LESS CLAYEY, STIFF

NOTES:

1. THE BORING LOG DEPICTS SUBSURFACE CONDITIONS ONLY AT THE BORING LOCATION AND TIME DESIGNATED.
2. NOMENCLATURE USED TO DESCRIBE SOILS DEFINED ON PLATE 13.
3. SEE ADDITIONAL NOTES ON PLATE 2.

Raney Geotechnical Inc

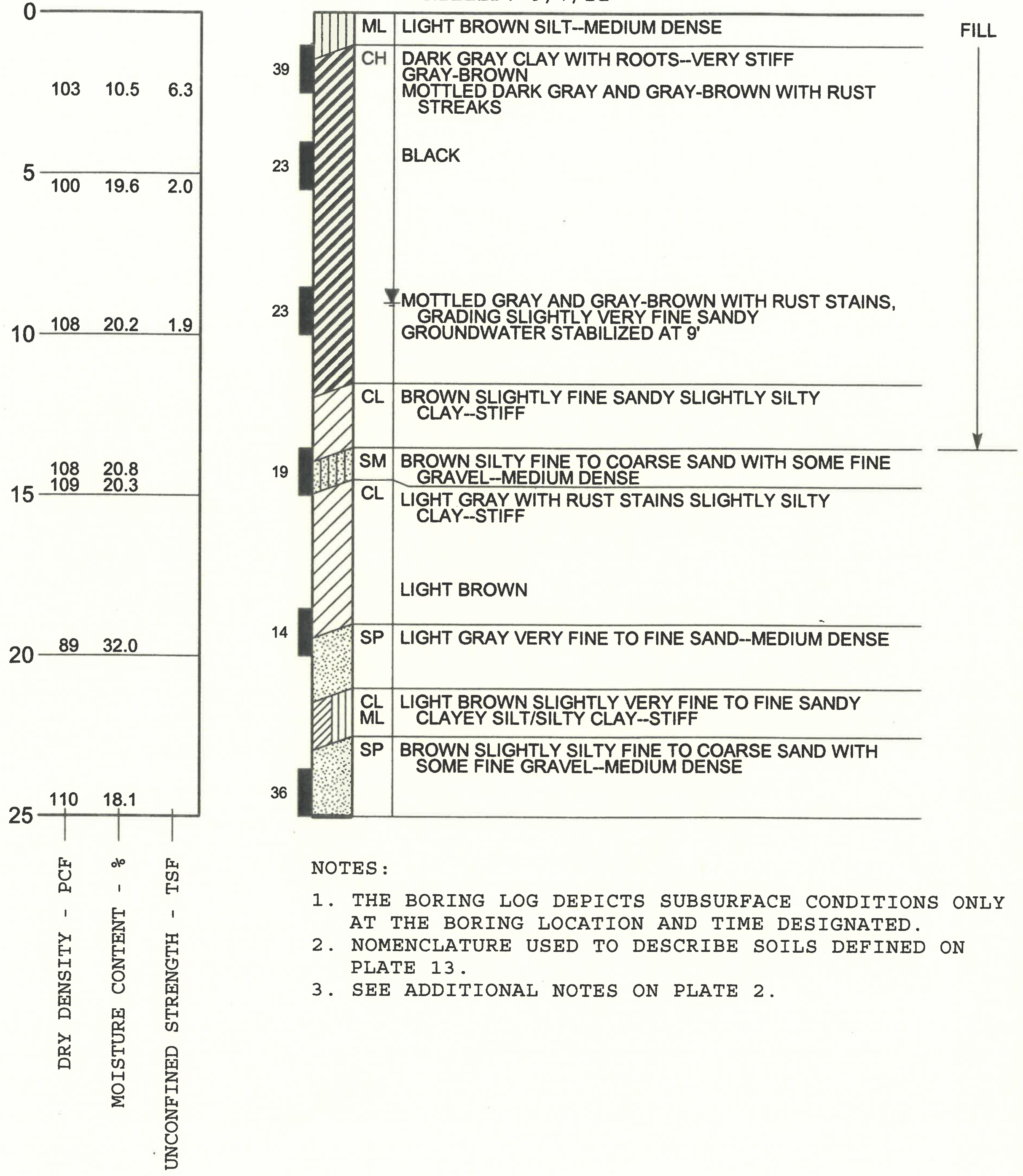
LOG OF BORING

PROJECT NUMBER: 192-352
PLATE NUMBER: 5

DRAWN BY: TL
DATE: 9/9/21

BORING D

DRILLED: 9/7/21



NOTES:

1. THE BORING LOG DEPICTS SUBSURFACE CONDITIONS ONLY AT THE BORING LOCATION AND TIME DESIGNATED.
2. NOMENCLATURE USED TO DESCRIBE SOILS DEFINED ON PLATE 13.
3. SEE ADDITIONAL NOTES ON PLATE 2.

LOG OF BORING

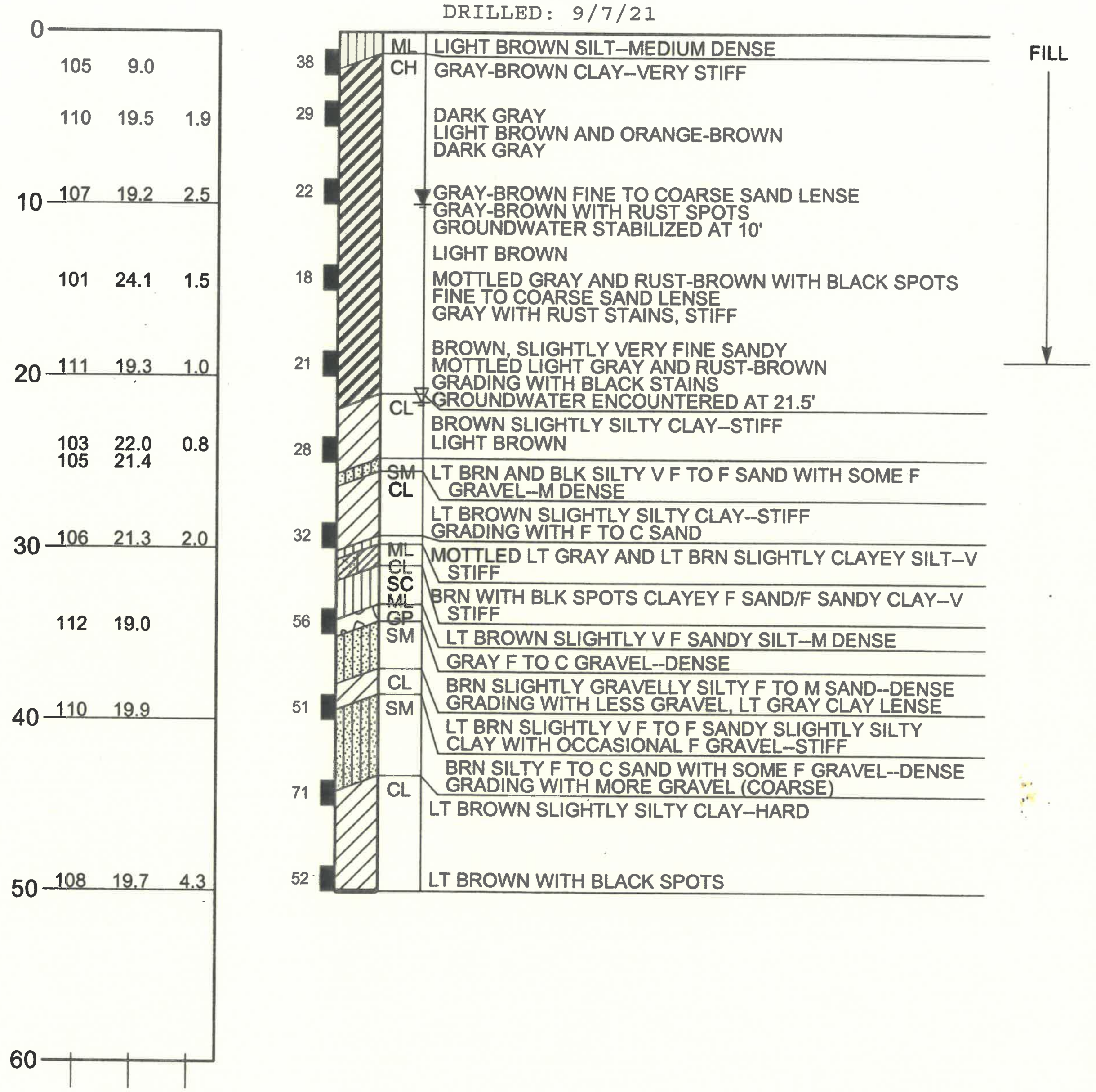
Raney Geotechnical Inc

PROJECT NUMBER: 192-352
PLATE NUMBER: 6

DRAWN BY: TL
DATE: 9/9/21

BORING E

DRILLED: 9/7/21



LIGHT BROWN SILT--MEDIUM DENSE
GRAY-BROWN CLAY--VERY STIFF
DARK GRAY
LIGHT BROWN AND ORANGE-BROWN
DARK GRAY
GRAY-BROWN FINE TO COARSE SAND LENSE
GRAY-BROWN WITH RUST SPOTS
GROUNDWATER STABILIZED AT 10'
LIGHT BROWN
MOTTLED GRAY AND RUST-BROWN WITH BLACK SPOTS
FINE TO COARSE SAND LENSE
GRAY WITH RUST STAINS, STIFF
BROWN, SLIGHTLY VERY FINE SANDY
MOTTLED LIGHT GRAY AND RUST-BROWN
GRADING WITH BLACK STAINS
GROUNDWATER ENCOUNTERED AT 21.5'
BROWN SLIGHTLY SILTY CLAY--STIFF
LIGHT BROWN
LT BRN AND BLK SILTY V F TO F SAND WITH SOME F GRAVEL--M DENSE
LT BROWN SLIGHTLY SILTY CLAY--STIFF
GRADING WITH F TO C SAND
MOTTLED LT GRAY AND LT BRN SLIGHTLY CLAYEY SILT--V STIFF
BRN WITH BLK SPOTS CLAYEY F SAND/F SANDY CLAY--V STIFF
LT BROWN SLIGHTLY V F SANDY SILT--M DENSE
GRAY F TO C GRAVEL--DENSE
BRN SLIGHTLY GRAVELLY SILTY F TO M SAND--DENSE
GRADING WITH LESS GRAVEL, LT GRAY CLAY LENSE
LT BRN SLIGHTLY V F TO F SANDY SLIGHTLY SILTY CLAY WITH OCCASIONAL F GRAVEL--STIFF
BRN SILTY F TO C SAND WITH SOME F GRAVEL--DENSE
GRADING WITH MORE GRAVEL (COARSE)
LT BROWN SLIGHTLY SILTY CLAY--HARD
LT BROWN WITH BLACK SPOTS

DRY DENSITY - PCF	MOISTURE CONTENT - %	UNCONFINED STRENGTH - TSF
105	9.0	
110	19.5	1.9
107	19.2	2.5
101	24.1	1.5
111	19.3	1.0
103	22.0	0.8
105	21.4	
106	21.3	2.0
112	19.0	
110	19.9	
108	19.7	4.3

NOTES:

1. THE BORING LOG DEPICTS SUBSURFACE CONDITIONS ONLY AT THE BORING LOCATION AND TIME DESIGNATED.
2. NOMENCLATURE USED TO DESCRIBE SOILS DEFINED ON PLATE 13.
3. SEE ADDITIONAL NOTES ON PLATE 2.

LOG OF BORING

Raney Geotechnical Inc

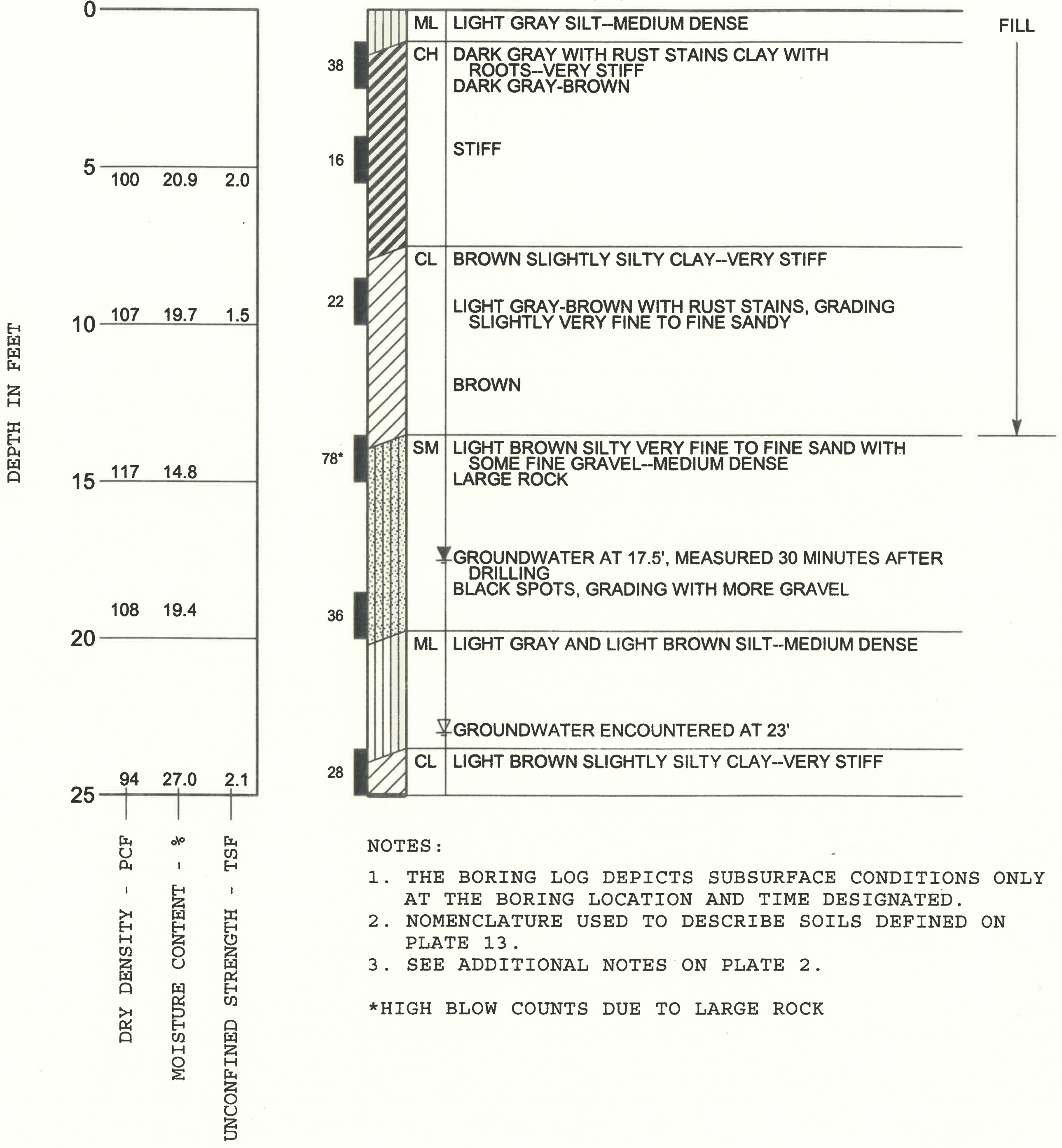
PLATE 6

PROJECT NUMBER: 192-352
PLATE NUMBER: 7

DRAWN BY: TL
DATE: 9/9/21

BORING F

DRILLED: 9/7/21



ML LIGHT GRAY SILT--MEDIUM DENSE

CH DARK GRAY WITH RUST STAINS CLAY WITH ROOTS--VERY STIFF
DARK GRAY-BROWN

STIFF

CL BROWN SLIGHTLY SILTY CLAY--VERY STIFF

LIGHT GRAY-BROWN WITH RUST STAINS, GRADING SLIGHTLY VERY FINE TO FINE SANDY

BROWN

SM LIGHT BROWN SILTY VERY FINE TO FINE SAND WITH SOME FINE GRAVEL--MEDIUM DENSE
LARGE ROCK

GROUNDWATER AT 17.5', MEASURED 30 MINUTES AFTER DRILLING
BLACK SPOTS, GRADING WITH MORE GRAVEL

ML LIGHT GRAY AND LIGHT BROWN SILT--MEDIUM DENSE

GROUNDWATER ENCOUNTERED AT 23'

CL LIGHT BROWN SLIGHTLY SILTY CLAY--VERY STIFF

NOTES:

1. THE BORING LOG DEPICTS SUBSURFACE CONDITIONS ONLY AT THE BORING LOCATION AND TIME DESIGNATED.
2. NOMENCLATURE USED TO DESCRIBE SOILS DEFINED ON PLATE 13.
3. SEE ADDITIONAL NOTES ON PLATE 2.

*HIGH BLOW COUNTS DUE TO LARGE ROCK

LOG OF BORING

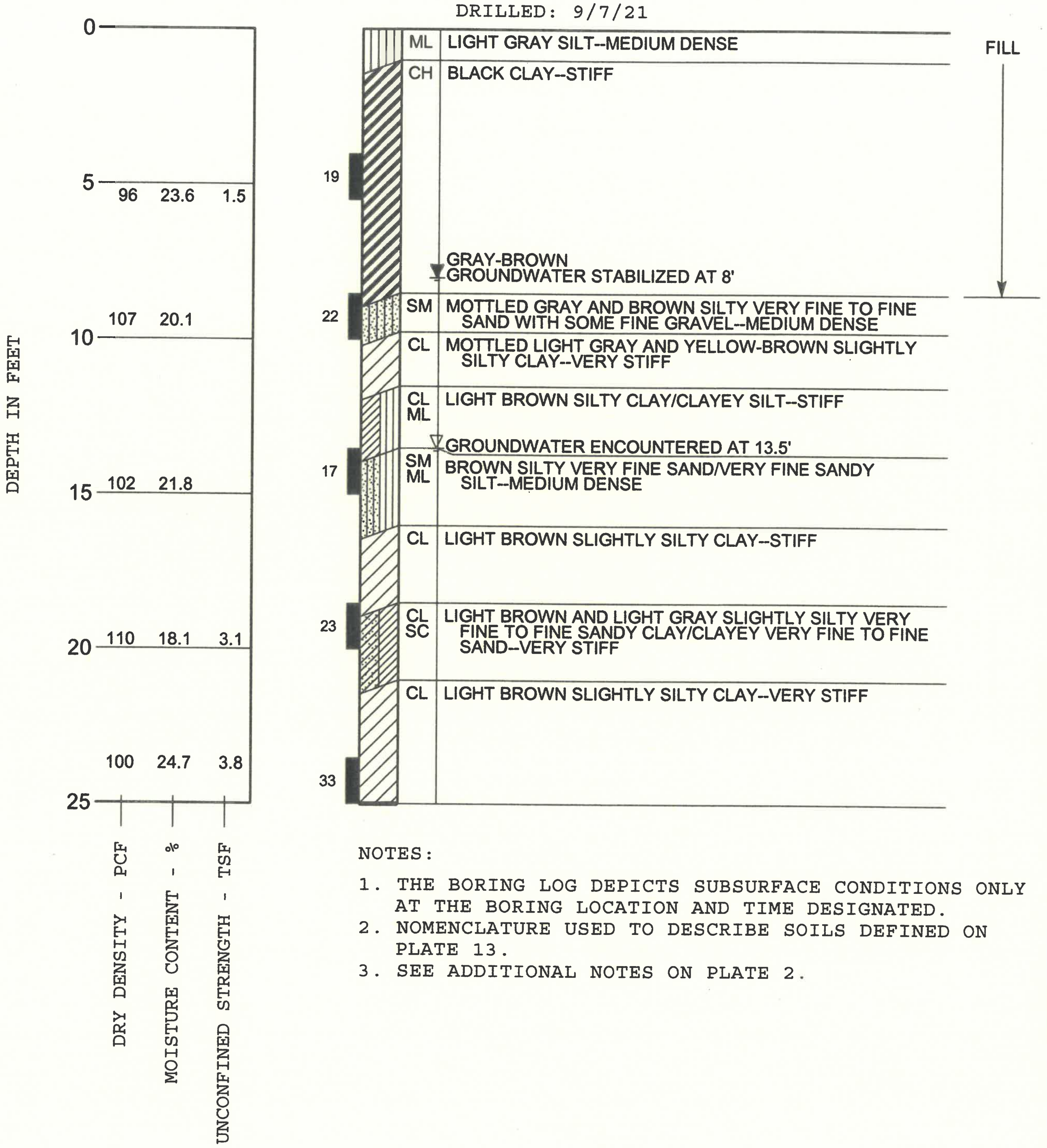
Raney Geotechnical Inc

PROJECT NUMBER: 192-352
PLATE NUMBER: 8

DRAWN BY: TL
DATE: 9/9/21

BORING G

DRILLED: 9/7/21



NOTES:

1. THE BORING LOG DEPICTS SUBSURFACE CONDITIONS ONLY AT THE BORING LOCATION AND TIME DESIGNATED.
2. NOMENCLATURE USED TO DESCRIBE SOILS DEFINED ON PLATE 13.
3. SEE ADDITIONAL NOTES ON PLATE 2.

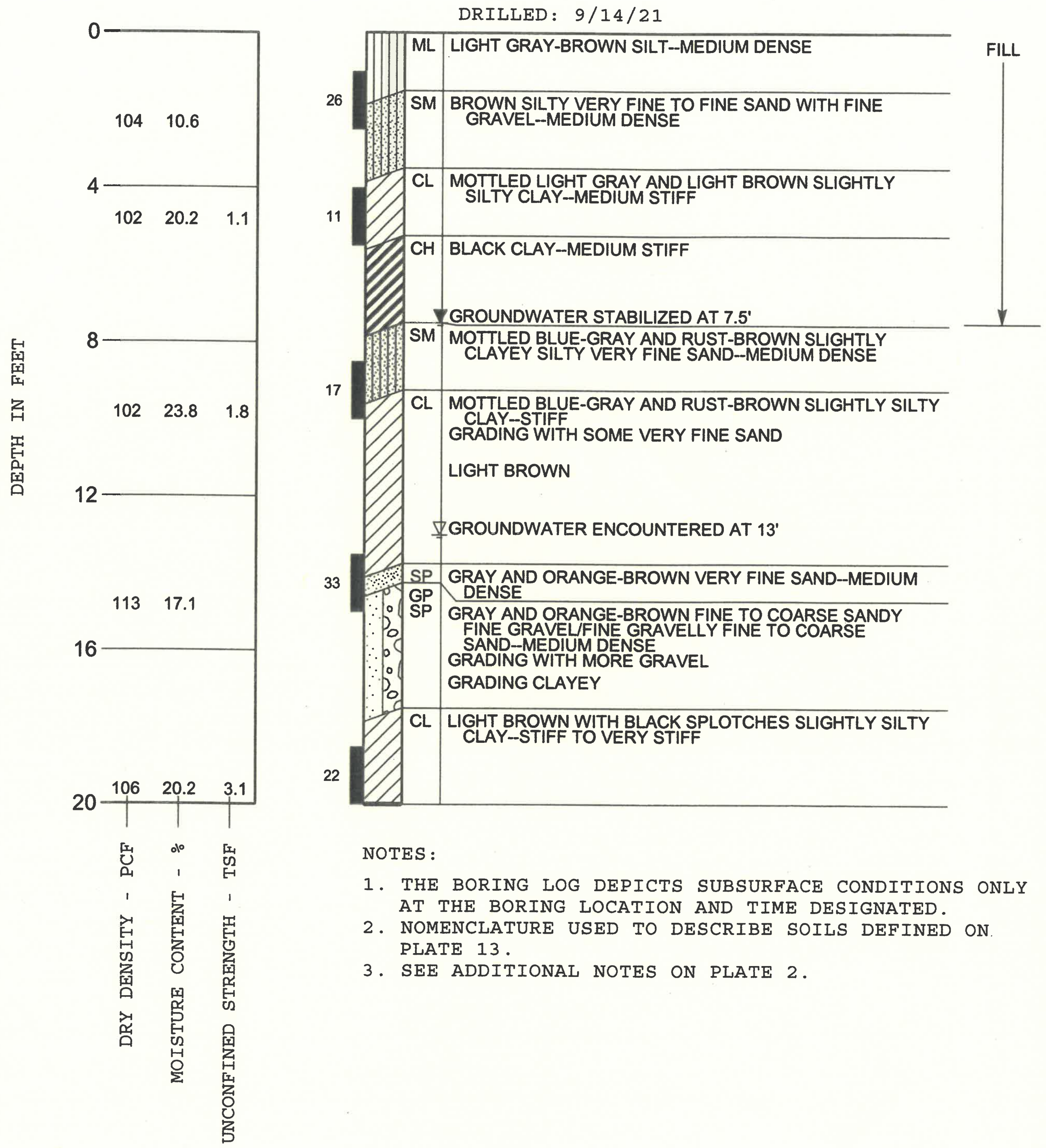
Raney Geotechnical Inc

LOG OF BORING

PROJECT NUMBER: 192-352
PLATE NUMBER: 9
DRAWN BY: TL
DATE: 9/17/21

BORING 1

DRILLED: 9/14/21



NOTES:

1. THE BORING LOG DEPICTS SUBSURFACE CONDITIONS ONLY AT THE BORING LOCATION AND TIME DESIGNATED.
2. NOMENCLATURE USED TO DESCRIBE SOILS DEFINED ON PLATE 13.
3. SEE ADDITIONAL NOTES ON PLATE 2.

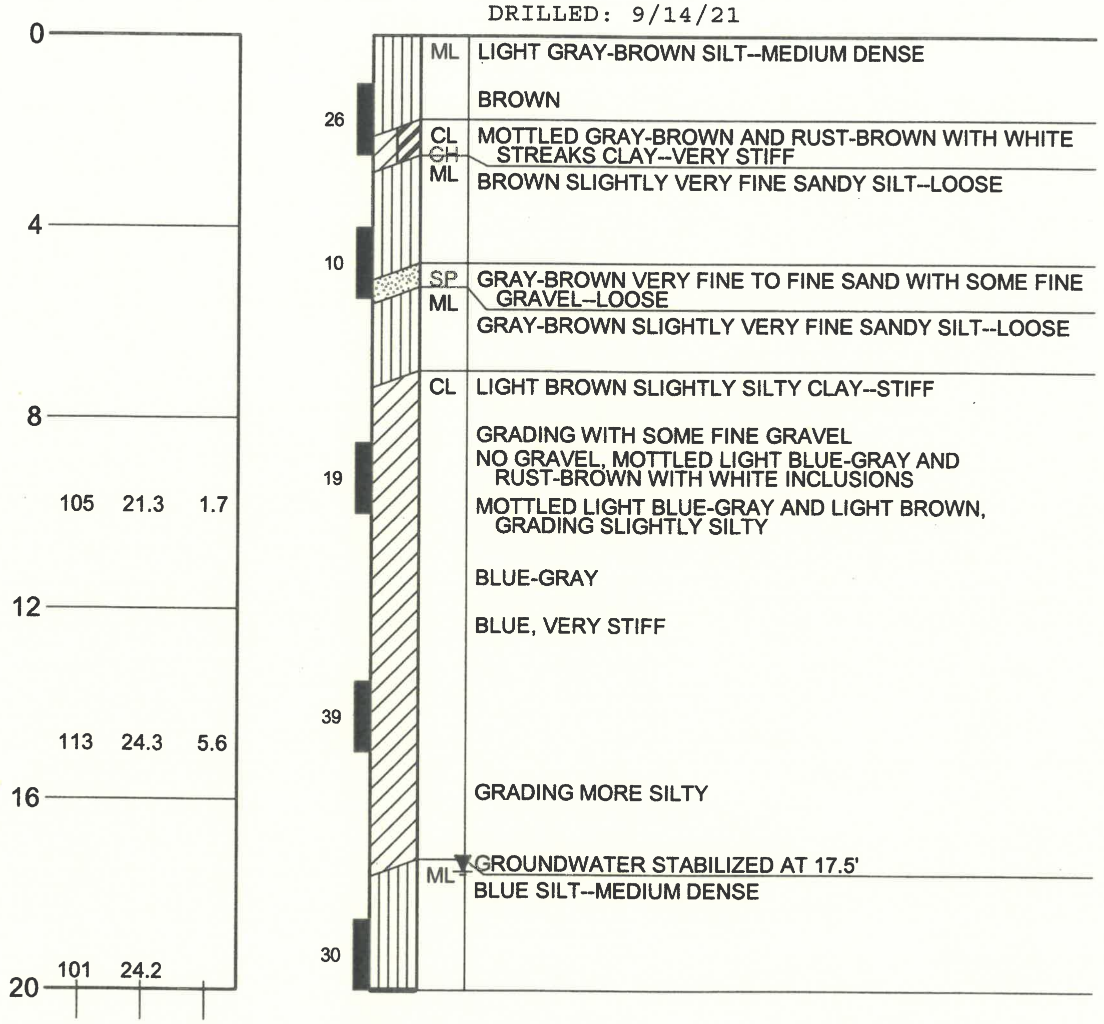
LOG OF BORING

Raney Geotechnical Inc

PROJECT NUMBER: 192-352
PLATE NUMBER: 10
DRAWN BY: TL
DATE: 9/17/21

BORING 2

DRILLED: 9/14/21



NOTES:

1. THE BORING LOG DEPICTS SUBSURFACE CONDITIONS ONLY AT THE BORING LOCATION AND TIME DESIGNATED.
2. NOMENCLATURE USED TO DESCRIBE SOILS DEFINED ON PLATE 13.
3. SEE ADDITIONAL NOTES ON PLATE 2.
4. FREE GROUNDWATER NOT ENCOUNTERED DURING DRILLING. STABILIZED GROUNDWATER MEASURED 1.25 HOURS AFTER DRILLING.

LOG OF BORING

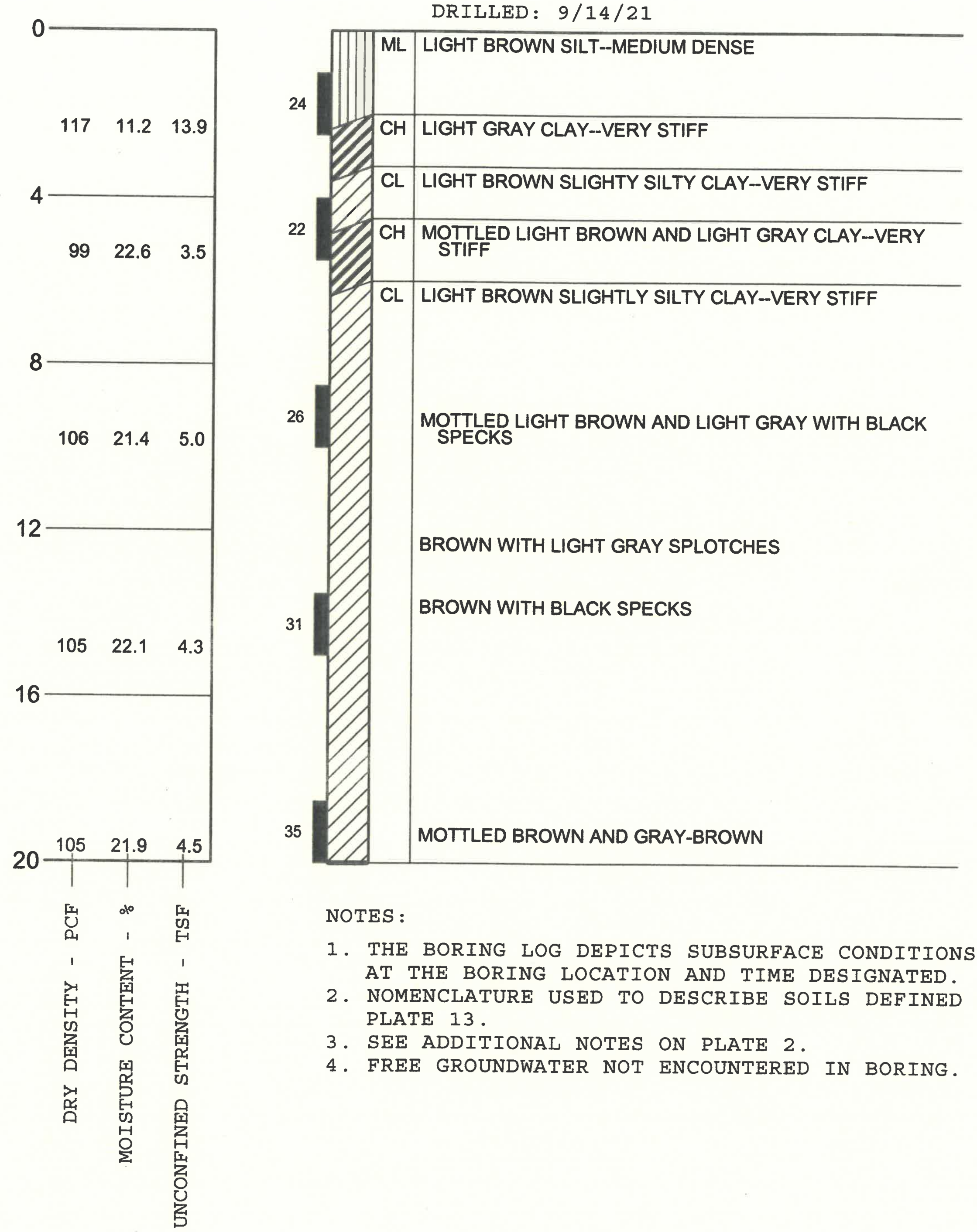
Raney Geotechnical Inc

PROJECT NUMBER: 192-352
PLATE NUMBER: 11

DRAWN BY: TL
DATE: 9/17/21

BORING 3

DRILLED: 9/14/21



ML	LIGHT BROWN SILT--MEDIUM DENSE
CH	LIGHT GRAY CLAY--VERY STIFF
CL	LIGHT BROWN SLIGHTY SILTY CLAY--VERY STIFF
CH	MOTTLED LIGHT BROWN AND LIGHT GRAY CLAY--VERY STIFF
CL	LIGHT BROWN SLIGHTLY SILTY CLAY--VERY STIFF
	MOTTLED LIGHT BROWN AND LIGHT GRAY WITH BLACK SPECKS
	BROWN WITH LIGHT GRAY SPLOTCHES
	BROWN WITH BLACK SPECKS
	MOTTLED BROWN AND GRAY-BROWN

NOTES:

1. THE BORING LOG DEPICTS SUBSURFACE CONDITIONS ONLY AT THE BORING LOCATION AND TIME DESIGNATED.
2. NOMENCLATURE USED TO DESCRIBE SOILS DEFINED ON PLATE 13.
3. SEE ADDITIONAL NOTES ON PLATE 2.
4. FREE GROUNDWATER NOT ENCOUNTERED IN BORING.

LOG OF BORING

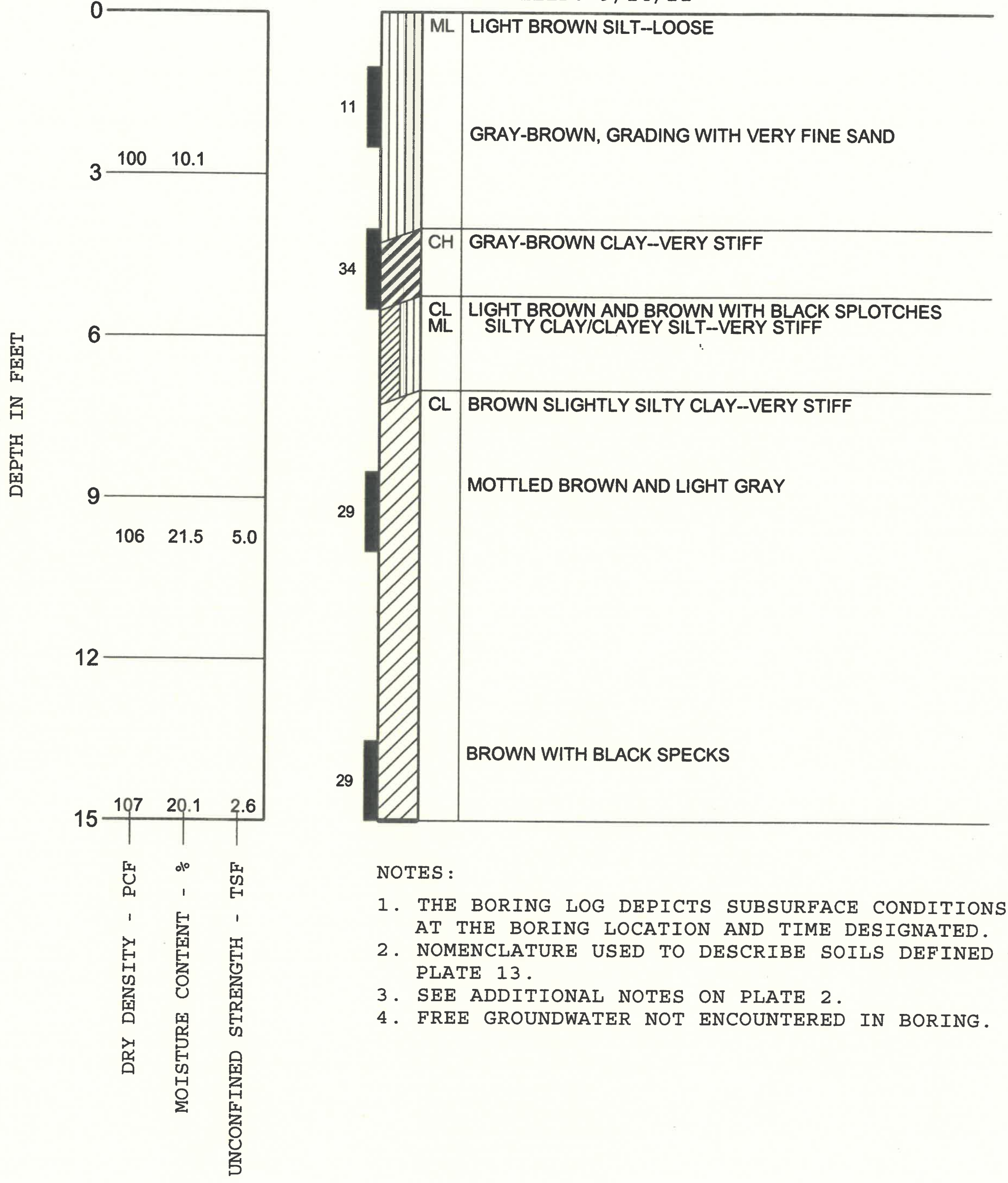
Raney Geotechnical Inc

PROJECT NUMBER: 192-352
PLATE NUMBER: 12

DRAWN BY: TL
DATE: 9/17/21

BORING 4

DRILLED: 9/14/21



NOTES:

1. THE BORING LOG DEPICTS SUBSURFACE CONDITIONS ONLY AT THE BORING LOCATION AND TIME DESIGNATED.
2. NOMENCLATURE USED TO DESCRIBE SOILS DEFINED ON PLATE 13.
3. SEE ADDITIONAL NOTES ON PLATE 2.
4. FREE GROUNDWATER NOT ENCOUNTERED IN BORING.

LOG OF BORING

Raney Geotechnical Inc

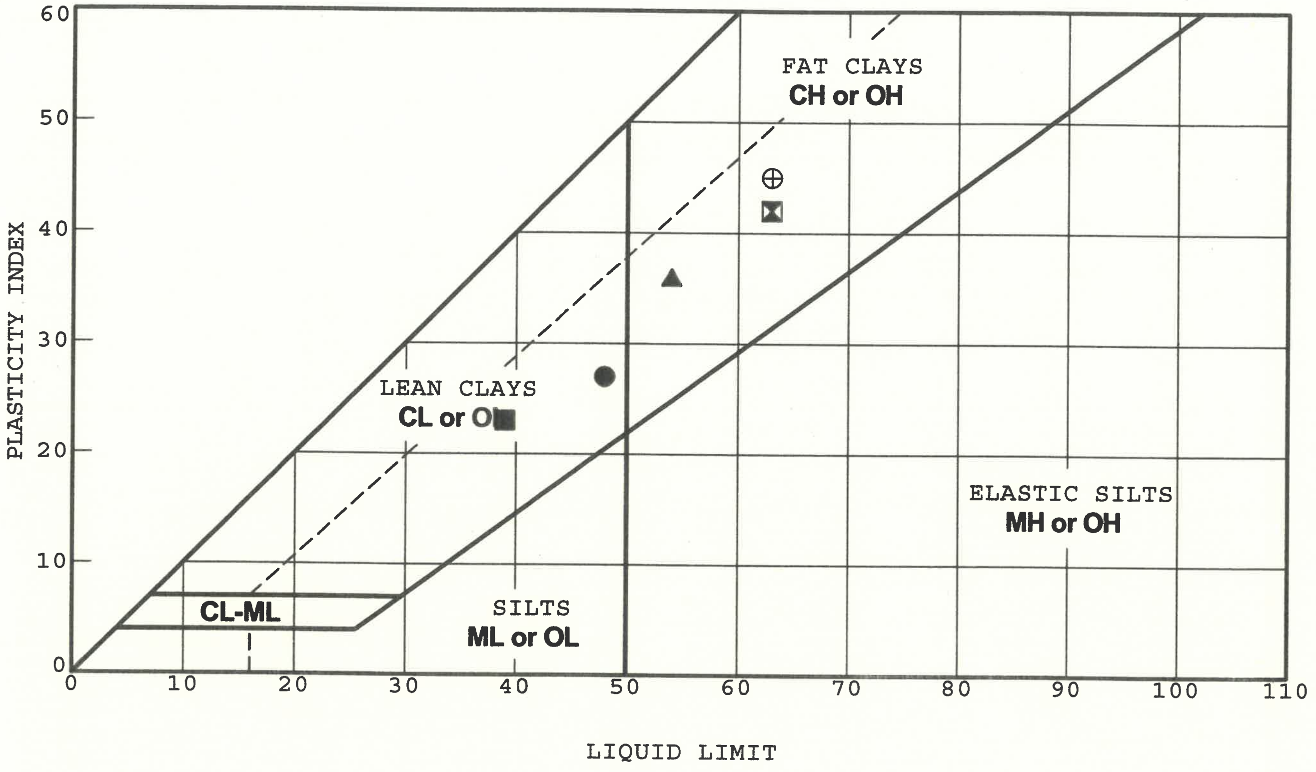
PROJECT NUMBER: 192-352
PLATE NUMBER: 13

GRAPH	SYMBOL	DESCRIPTION	MAJOR DIVISIONS		
▨	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES	CLEAN GRAVELS WITH LESS THAN 5% FINES	GRAVEL AND GRAVELLY SOILS	COARSE GRAINED SOILS MORE THAN 50% LARGER THAN NO. 200 SIEVE
▨	GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES			
▨	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	GRAVELS WITH MORE THAN 12% FINES	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	
▨	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES			
▨	SW	WELL GRADED SANDS, GRAVELLY SANDS	CLEAN SANDS WITH LESS THAN 5% FINES	SANDS AND SANDY SOILS	
▨	SP	POORLY GRADED SANDS, GRAVELLY SANDS			
▨	SM	SILTY SANDS, SAND-SILT MIXTURES	SANDS WITH MORE THAN 12% FINES	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	
▨	SC	CLAYEY SANDS, SAND-CLAY MIXTURES			
▨	ML	INORGANIC SILTS, ROCK FLOUR, OR CLAYEY SILTS WITH SLIGHT PLASTICITY	LIQUID LIMIT LESS THAN 50	SILTS AND CLAYS	FINE GRAINED SOILS MORE THAN 50% SMALLER THAN NO. 200 SIEVE
▨	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS			
▨	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY			
▨	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTS, ELASTIC SILTS	LIQUID LIMIT GREATER THAN 50	SILTS AND CLAYS	
▨	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS			
▨	OH	ORGANIC CLAYS AND ORGANIC SILTS OF MEDIUM TO HIGH PLASTICITY			
▨	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENT	HIGHLY ORGANIC SOILS		

UNIFIED SOIL CLASSIFICATION SYSTEM

Raney Geotechnical Inc

PROJECT NUMBER: 192-352
PLATE NUMBER: 14



CLASSIFICATION TEST RESULTS						
SYMBOL	SAMPLE LOCATION	DEPTH FEET	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	SOIL CLASSIFICATION
●	BORING 2	2.0	48	21	27	CL
⊠	BORING 3	4.5	63	21	42	CH
▲	BORING A	9.5	54	18	36	CH
⊕	BORING B	9.0	63	18	45	OH
■	BORING C	4.5	39	16	23	CL

ATTERBERG LIMIT DATA

Raney Geotechnical Inc

Project Number: 192-352

ORGANIC CONTENT
ASTM D2974

Sample Location	Sample Depth (ft)	Moisture Content (%)	Ash Content (%)	Organic Content (%)
B-3II	9	21.8	96.4	3.6
D-2II	4.5	16.8	96.4	3.6

ORGANIC CONTENT DATA

Raney Geotechnical Inc

Project Number: 192-352

Sieve Analysis
No. 200 Sieve Only

Sample Number	Sample Depth (ft)	% Passing No. 200 Sieve
E-8I	34.5	17
E-9I	39.5	17

GRAIN SIZE DATA

Raney Geotechnical Inc

Project Number: 192-352

RESISTANCE VALUE TEST
CALIFORNIA TEST METHOD 301G

SAMPLE LOCATION: SAMPLE S2
DEPTH: 0.5-1.5’
MATERIAL DESCRIPTION: LIGHT GRAY CLAY

TEST NUMBER	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	EXUDATION PRESSURE (PSI)	EXPANSION PRESSURE (PSF)	RESISTANCE VALUE
1	99.8	22.8	264	0	4
2	109.1	18.5	480	0	8
3	112.8	16.3	674	39	22

Resistance value at 300 psi exudation pressure = 4

RESISTANCE VALUE DATA

Raney Geotechnical Inc