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June 4, 2021
W.O. 9611

Conejo Recreation & Park District
403 W Hillcrest Drive
Thousand Oaks, California 91360

Attention: Mr. Andrew Mooney, Senior Park Planner

SUBJECT: Geotechnical Update and Change of Consultant Letter,
Conejo Creek Southwest Park, Paige Lane, North of Combes Avenue,
City of Thousand Oaks, California

Gentlemen:

Geolabs-Westlake Village has been requested to serve as the Geotechnical Consultant during construction of the subject project. We have accepted that role. In preparation for doing so, we have reviewed the geotechnical reports on the attached reference list. We understand those reports were used for project design. We concur with the geotechnical recommendations that are contained in the referenced reports, and will see that they are implemented during construction. Alternative criteria, if warranted, will be submitted for review.

In addition, we are presenting a geotechnical update report for the subject property. In order to perform the update, we have reviewed the referenced reports, current codes, and local practices. The interested reader may consult the referenced reports prepared by others for more thorough characterization of on-site soil conditions. Criteria presented in the referenced reports remain applicable to development of the site unless superseded herein.

PROPOSED PROJECT

Based on review of the plans provided, the proposed project will be to develop a new community park on the east and west sides of Paige Lane, north of Combes Avenue.

Construction of the park will include a "prefab" restroom building, basketball and play courts, turf fields, parking lot, stormwater runoff infiltration areas, walking trails, and other park facilities.

SEISMIC GROUND MOTION VALUES (MAPPED)

Seismic ground motion values in accordance with the methodology of ASCE Standard 7-16. Seismic ground motion values were determined using the U.S. Seismic Design Maps website (https://seismicmaps.org) provided by OSHPD and SEA. These seismic design maps present data for a maximum considered earthquake ground motion, defined by an earthquake with a 2 percent probability of exceedance within a 50-year return period (recurrence interval of 2475 years). Output from these analyses are provided in Appendix A and summarized herein.

Latitude: 34.1891º **Longitude: -118.8642º**	**Factor/Coefficient**	**Value**
Site Profile Type	Site Class	D – Default
Short-Period MCE at 0.2s	S_s	1.481
1.0s Period MCE	S_1	0.532
Site Coefficient	F_a	1.2
Site Coefficient	F_v	Null–see Section 11.4.8
Adjusted MCE Spectral Response Parameters	S_{ms} S_{m1}	1.777 Null–see Section 11.4.8
Design Spectral Acceleration Parameters	S_{DS} S_{D1}	1.185 Null–see Section 11.4.8
Long-Period Transition Period	T_L	8.0 sec
Peak Ground Acceleration	PGA_M	0.64

Structures on soil profiles designated as Site Class D with S_1 values greater than or equal to 0.2, need not use site-specific ground motion values provided the value of the seismic response coefficient C_S is determined in accordance with the procedures in ASCE 7-16 §12.8.1.1 (per exception 2 of §11.4.8). The following parameters are considered appropriate for use in determining C_S per exception 2.

Factor/Coefficient		**Value**	**ASCE 7-16 Equation**
Site amplification factor at 0.2 second	F_a=	1.20	
Site amplification factor at 1.0 second	F_v=	1.77	
Site-modified spectral acceleration value	S_{MS}=	1.777	(11.4-1)

Factor/Coefficient		Value	ASCE 7-16 Equation
Site-modified spectral acceleration value	S_{M1}=	0.941	(11.4-2)
Numeric seismic design value at 0.2 second SA	S_{DS}=	1.185	(11.4-3)
Numeric seismic design value at 1.0 second SA	S_{D1}=	0.627	(11.4-4)

If the designer uses the simplified lateral force analysis procedure, §12.14.8 allows F_a to be taken as 1.0 for rock sites, or 1.4 for soil sites, for development of S_{DS}. Also, the value of S_S can be capped at 1.5 for development of parameters in accordance with §11.4.4. Sites are permitted to be considered rock if the soil thickness is no greater than 10 feet below the footing.

DISCUSSION AND GEOTECHNICAL DESIGN CRITERIA

Presented herein is our geotechnical design and grading criteria for your consideration.

GRADING - ENGINEERED FILLS

In order to provide suitable support for the proposed improvements, the upper soils should be removed and recompacted in accordance with the grading design criteria provided below. Removal of existing improvements such as landscape, irrigation and drain lines, and other site improvements will disturb the graded surface; therefore, additional processing of the surface soils might be warranted. In areas to support improvements, any compressible undocumented fill that is encountered should be removed and replaced with compacted fill.

The following section provides discussion for the grading of the proposed improvements.

1. The on-site soils may be suitable for use as engineered fill. Any on-site or import materials that are to be used to support structures, paving or flatwork should be similar to the existing soils.

2. All vegetation, trash debris, or other deleterious material should be stripped from the area to be graded and wasted from the site.

3. Existing improvements within the area of new construction should be removed and wasted from the site.

4. Soils disturbed during demolition should be removed.

5. In building and development areas including the restroom building and areas to receive fill, the upper three feet of soils or 24 inches below the bottom of proposed footings, whichever is deeper, should be removed and recompacted. The removal area should extend at least 5 feet horizontally beyond proposed foundations and proposed improvement areas. In areas of pavement or hardscape, the depth of removal should be 24 inches or a minimum of 12 inches below subgrade elevation, whichever is deeper.

6. After removals are completed, areas to receive fill and/or backfill should be scarified a minimum of 12 inches, moisture conditioned, and compacted to at least 90% of the material's maximum dry density.

7. Fill materials should be placed in thin lifts, watered to near the material's optimum moisture content, and compacted to at least 90% of the material's maximum dry density.

8. All grading should comply with the grading specifications and requirements of the local governing agency.

COMPACTION STANDARDS

The on-site materials are suitable for use as engineered fill. All roots, organic matter, and other deleterious material should be hand-picked from the soils prior to their use as engineered fill. These materials should be moistened and/or air-dried to near optimum moisture content and compacted to at least 90% of their maximum density as determined using the Modified Proctor Test (ASTM D 1557). The density of earth materials is to be measured using the nuclear gauge (ASTM D6938) or sand cone (ASTM D1556) test methods. The frequency of field density tests should be at least one density test for every 1000 cubic yards of fill or each two vertical feet of fill.

UTILITY TRENCH BACKFILL

Backfill for utility trench excavations should be compacted to the appropriate relative compaction (see COMPACTION STANDARDS section). Where installed in sloping areas, the backfill should be properly keyed and benched.

EXPANSION POTENTIAL

Based on previous testing, soils at the site were found to be in the low expansive range (21-50 expansion index range). Foundation design criteria are based, in part, upon the expansive properties of the materials present near the finished pad grade.

Pre-saturation guidelines for expansive soils are presented in the City of Thousand Oaks Municipal Code Table 1809.7 – Minimum Footing and Slab Requirements. Based on Table 1809.7, the required pre-saturation is 3% over optimum moisture to a depth of 18" below lowest adjacent grade. The depth is intended to be measured from the adjacent pad grade. Pre-saturation of the foundation soils should be initiated well before concrete is scheduled to be placed. Care should be taken to see that the water has properly penetrated the soil. Last minute flooding is not a good practice. Excess water remaining in the target pre-saturation zone at the time of concrete placement will penetrate further into the soil, possibly causing additional expansion and uplift of the curing concrete.

A persistent difficulty in attaining the desired pre-saturation is the tendency to deeply saturate soil below footings when trying to achieve saturation of the soil beneath the floor slabs. Flooding of the footing trenches commonly results in the presence of compressible mud at the bottom of the footing trench. This practice should be avoided. Where such mud is present, it should be removed prior to concrete placement.

FOUNDATION SYSTEMS

Detailed plans are not available at this time; however, based on our understanding of the currently proposed development, a restroom and other appurtenant structures will be constructed at the site. For preliminary planning purposes, proposed structures should be supported on engineered compacted fill placed in accordance with the previous Grading section.

Conventional Shallow Foundations

Continuous or pad footings may be used to support the proposed structures. In order to achieve the capacities specified below, footings should be founded into the engineered fill in conformance with the table values, with concrete placed against in-place, undisturbed material. Foundation design criteria are based, in part, upon expansive properties of materials anticipated to be present near the finished pad grade.

The parameters provided in the following table are our minimum design values for the pertinent expansion range. Some of these values are empirical in nature. The foundation and slab designer should evaluate and design the foundations for the effects of expansive soils (CBC

§ 1805.8). The final foundation and slab-on-grade configuration should contain details that are not less than the values provided. Laboratory testing to verify the expansive properties of the near-pad-grade materials should be performed at the completion of rough grading.

FOUNDATION DESIGN PARAMETER	UNITS	DESIGN CRITERIA RECOMMENDATIONS	
		EI = 21 - 50	NOTES
Pre-Saturation depth	in	18	
Allowable Bearing Capacity (net) (FS>3)	psf	1500	1,2
Allowable Lateral Resistance (FS=1.5)	psf/ft	225	2,3
Maximum Allowable Lateral Resistance	psf	1500	2,3
Coefficient of Friction (FS=1.0)		0.35	
Minimum Embedment Below Adjacent Grade			
One-Story	in	12	
Two-Story	in	18	
Minimum Embedment into Supporting Earth Material and Below Adjacent Grade	in	15	4
Minimum Reinforcement		2 - #4, 1 near top and 1 near bottom	
SLAB-ON-GRADE DESIGN PARAMETER			
Minimum Concrete Thickness	in	4	
Minimum Reinforcement (On-Center-Each-Way)		#3 @ 18"	5
NOTES			
1) Bearing portions of all footings should be at least five feet (measured horizontally) from the face of adjacent descending slopes. All footings should bear at least three feet below an imaginary plane projected upward at 1.5:1 from the toe of locally over-steepened slopes. Pad footings should be at least 24 inches square. Continuous footings should be at least 12-inches wide for on-story and 15-inches wide for two-story construction.			
2) May be increased by 1/3 for short duration loading such as by wind or seismic forces.			
3) Decrease by 1/3 when combined with friction.			
4) Applies to exterior footings.			
5) For EI>50, dowel slab to exterior footing using #3 bars @ 24" on-center, bent 36" into slab.			

Slab-On-Grade Subgrade

Concrete slabs-on-grade may be used in this project. The design criteria for these slabs consider the subgrade soils to be engineered fill placed in accordance with the jurisdictional standards and the design criteria in this report. The material on-site is considered low expansive. Concrete slabs-on-grade should be a minimum 4 inches thick and reinforced with #3 rebar at 18 inches on center, each way, placed in the middle of the slab section.

Approximately four inches of sand should be placed across the slab subgrade. A vapor retarder should be placed on top of the sand in all areas where moisture penetration of the slab is undesirable. The vapor retarder should consist of a Class A (ASTM E1745), minimum 10 mil thick, polyolefin plastic. Concrete for the floor slab should be placed directly upon the vapor retarder. The vapor retarder should be placed in general conformance with ASTM E1643. The permeance (propensity to transmit water) and strength of vapor retarder, as well as the water/cement ratio, mix design and strength of the concrete, will influence a variety of things, including slab finishing, construction schedules, moisture released from the slab, and floor coverings. Project design and construction professionals should consider these factors when developing specifications for, and/or selecting materials for, the vapor retarder, concrete, and floor covering.

SETTLEMENT

For planning purposes, structural foundation designs for proposed structures should consider total settlement on the order of 1 inch with differential settlement on the order of ½ inch over a distance of 30 feet for static loading.

FACTORS OF SAFETY

The factor of safety for the allowable bearing pressure provided is greater than three. The allowable passive pressure provided is based upon a factor of safety of 1.5. The factor of safety for the sliding friction is one. The factor of safety for the active pressure is one.

With regard to retaining walls, the Uniform Building Code calls for a 1.5 factor of safety for both sliding and overturning. We defer to the Uniform Building Code and the project structural engineer on this matter.

CORROSION POTENTIAL

For structural elements, a site is considered to be corrosive if one or more of the following conditions exist for the representative soil samples taken at the site: Chloride concentration is 500 ppm or greater, sulfate concentration is 2000 ppm or greater, or the pH is 5.5 or less (Caltrans, 2015; GMED, 2013). For structural elements, the minimum resistivity of soil and/or water indicates the relative quantity of soluble salts present in the soil or water. In general, a minimum resistivity value for soil and/or water less than 1000 ohm-cm indicates the presence of high quantities of soluble salts and a higher propensity for corrosion.

Corrosion testing was not performed for the referenced investigation report. Prior to developing foundation designs for proposed site improvements, corrosion testing is recommended to determine these soil conditions.

PAVEMENT DESIGN

The project includes the construction of a parking lot and drive aisles. The referenced report included structural paving sections based on previous R-value testing of subgrade soils and various values for Traffic Index. The table presenting the various pavement sections is presented below. The minimum section for the City of Thousand Oaks is 3" AC / 6" AB.

ASSIGNED R-VALUE	RECOMMENDEDSTRUCTURAL SECTION
4	3" AC / 6" AB / S
5	3" AC / 6" AB / S
6	3" AC / 6" AB / S

AC = Asphaltic Concrete
AB = Aggregate Base
S = Compacted Subgrade (R~43)

Some earth materials at the site are classified as expansive. Based on standards of the governing agency, expansive soils require four or more inches of base under curbs, gutters, and sidewalks. Landscape watering should be kept to a minimum. Cutoff walls should be utilized if irrigation cannot be controlled.

At the completion of rough grading, underground conduit and infrastructure installation, spoils deposition, and general construction practices disturb the integrity of the subgrade. Therefore the upper 12 inches of the subgrade must be scarified, watered, and compacted to 95% of the materials' maximum dry density. The base should be compacted to a minimum of 95% of the materials' maximum dry density. If fills are required to reach the top of the subgrade they must be consistent with the 'R' values that were used in this report. All work and materials must comply with the latest applicable jurisdictional standards.

CONSTRUCTION MONITORING

Prior to finalizing construction plans, they should be submitted to this office for review. Additional recommendations may be provided at that time, if such are considered warranted.

Placement of all fill and backfill should be monitored by representatives of this office. This includes our observation of prepared bottoms prior to filling. All excavated slopes, both temporary and permanent, should be observed by a representative of this office. Supplemental recommendations may prove warranted based upon the materials exposed in the actual excavations.

Foundation excavations should be observed by representatives of this office to see if the recommended penetration of proper supporting strata has been achieved. Such observations should be made prior to placing concrete, steel, or forms. This office should be notified at least 24 hours prior to placing concrete, steel or forms.

The geotechnical engineer has prepared this report in accordance with generally accepted engineering practices at this time and location, and makes no other warranty as to the professional advice provided under the terms of the agreement and included in this report.

Thank you for this opportunity to be of service to you. Please do not hesitate to call if you have any questions regarding this report.

Respectfully submitted;

GEOLABS-WESTLAKE VILLAGE

Randal L. Wendt
G.E. 2341

REGISTERED PROFESSIONAL ENGINEER
RANDAL L. WENDT
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Enclosures: References ....Plate R
Seismic Ground Motion Values......................Appendix A

XC: (4) Addressee

REFERENCES

Independent Solutions, October 31, 2018, Addendum Geotechnical Letter, Additional Findings and Opinions, Proposed Park Improvements, Conejo Recreation and Park District, Conejo Creek Southwest Park, Paige Lane North of Combes Avenue, City of Thousand Oaks, California Project No. 18-3333-02.

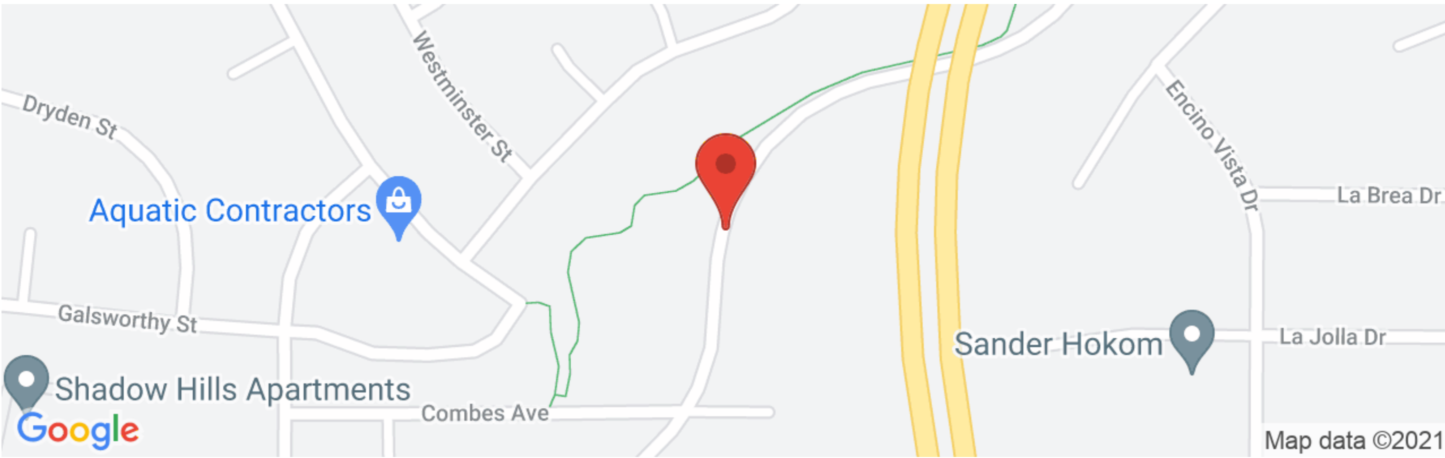
..., October 12, 2018, Limited Geotechnical Evaluation Report, Proposed Park Improvements, Conejo Recreation and Park District, Conejo Creek Southwest Park, Paige Lane North of Combes Avenue, City of Thousand Oaks, California Project No. 18-3333-01.

APPENDIX A
Seismic Ground Motion Values

June 4, 2021
W.O. 9611

CRPD - Conejo Creek Southwest Park

Latitude, Longitude: 34.1891, -118.8642



Date	6/3/2021, 10:57:15 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Default (See Section 11.4.3)

Type	Value	Description
S_S	1.481	MCE_R ground motion. (for 0.2 second period)
S_1	0.532	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.777	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.185	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1.2	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.533	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.64	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.481	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.616	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.532	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.585	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.533	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.916	Mapped value of the risk coefficient at short periods
C_{R1}	0.909	Mapped value of the risk coefficient at a period of 1 s

October 31, 2018

Project No.: 18-3333-02

Conejo Recreation and Park District
403 West Hillcrest Drive
Thousand Oaks, California 91360

Attn: Mr. Andrew Mooney

Subject: Addendum Geotechnical Letter, Additional Findings and Opinions, Proposed Park Improvements, Conejo Recreation and Park District, Conejo Creek Southwest Park, Paige Lane North of Combes Avenue, City of Thousand Oaks, California

Reference: California Department of Conservation, 2000, Seismic Hazard Zone Report for the Thousand Oaks 7.5-Minute Quadrangle, Ventura and Los Angeles Counties, California, Seismic Hazard Zone Report 042.

Independent Solutions, October 12, 2018, Limited Geotechnical Evaluation Report, Proposed Park Improvements, Conejo Recreation and Park District, Conejo Creek Southwest Park, Paige Lane North of Combes Avenue, City of Thousand Oaks, California, Project No. 18-3333-01.

The following additional findings and opinions is provided as input for the preparation of a Mitigated Negative Declaration for the proposed development. The additional findings and opinions were requested to address the liquefaction potential for the site.

Liquefaction

A detailed liquefaction evaluation for the site was not conducted as part of the scope of work for the referenced Limited Geotechnical Evaluation Report.

General

Liquefaction can occur when saturated loose granular soils are subjected to excessive ground vibrations. During liquefaction, excessive pore pressure increases cause these soils to lose strength. This may result in mobilization of the soil, causing total or differential settlements, lateral spreading, and/or surface manifestations such as loss of bearing capacity, artesian water flow, and sand boils.

Ground Water

Groundwater was not encountered in our recent limited subsurface exploration. Based on data presented in the *Seismic Hazard Report 042 for the Thousand Oaks 7.5-Minute Quadrangle, Ventura and Los Angeles Counties, California* (CDC 2000), the depth to historically high groundwater in the vicinity of the site is as shallow as 10 feet.

Liquefaction Potential

Based on our review of geotechnical data for the site, the site is within a liquefaction hazard zone, however, it is our opinion that the potential for liquefaction is low due to the clayey nature of the alluvial soils at the site (based on previous experience in the Conejo Creek Park and lab testing of near surface samples). In addition, based on the proposed development (park, paving, flatwork, playground equipment, prefab structure) and remedial grading recommended in the referenced report, settlement due to liquefaction at the site will have a limited effect on proposed site improvements.

All other previous recommendations from the referenced report remain applicable and should be incorporated into the design, construction and maintenance of proposed site improvements.

We appreciate this opportunity to be of service and should you have any questions, please do not hesitate to call us.

Sincerely,
Independent Solutions

Randal L. Wendt, GE 2341
Senior Geotechnical Engineer

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October 12, 2018 Project No.: 18-3333-10

Conejo Recreation and Park District
403 West Hillcrest Drive
Thousand Oaks, California 91360

Attn: Mr. Andrew Mooney

Subject: Limited Geotechnical Evaluation Report, Proposed Park Improvements, Conejo Recreation and Park District, Conejo Creek Southwest Park, Paige Lane North of Combes Avenue, City of Thousand Oaks, California

INTRODUCTION

This report contains a summary of our field and laboratory test program and geotechnical recommendations for proposed park improvements at the subject site. The site is an existing vacant field located on the north side of Combes Avenue and the east and west sides of Paige Lane in the City of Thousand Oaks. The site is trapezoidal shaped and extends north of Combes Avenue to where Paige Lane crosses underneath the Moorpark Freeway (23) at the northeast corner of the site and from the Moorpark Freeway on the east to a lined drainage channel on the west and northwest.

Site exploration was conducted on October 2, 2018 and included four shallow hand auger borings at the locations shown on the attached Boring Location Map (Figure 1). Subsurface conditions were observed in the borings and bulk soil samples were also obtained for laboratory analyses. The boring excavations were backfilled with on-site soils at the conclusion of our field exploration.

SUMMARY OF FIELD OBSERVATIONS / SUBSURFACE CONDITIONS

The vacant field contains numerous trees and seasonal weeds and grasses that have been tilled for weed abatement. There is also a walking trail which approximately parallels the alignment of the drainage channel on the west and northwest boundaries of the site. The upper 12 inches of soil were disturbed by the weed abatement. The underlying native soils consist of gray brown sandy clay in a dry and desiccated condition to a depth of approximately 12 inches. Below the desiccated zone, the soils are slightly moist to moist and medium stiff to stiff to a depth of 2 – 3 feet below the ground surface. These soils are also rocky and contained significant amounts of large gravel to cobble size fragments on the west side of Paige Lane. These surface soils are typically underlain by very fine sandy silty in a moist to stiff condition. Layers of gravel were encountered at some of the boring locations.

CONCLUSIONS AND RECOMMENDATIONS

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

- Based on the findings and results of the limited geotechnical evaluation, the site is considered suitable for the proposed construction from a geotechnical standpoint. The anticipated grading and building site will be safe from the potential hazards of land sliding, settlement or slippage. In addition, the anticipated grading and building construction will not affect the geologic stability of adjacent property.

- The site is considered suitable for the proposed construction with regard to support of the proposed

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structures and pavements, provided the recommendations contained in this report are followed.

We anticipate that minor cut and fill grading will be necessary to construct proposed park grades, prepare building pads, and prepare pavement subgrade for the proposed development. The following recommendations should be incorporated into the design, construction and maintenance of proposed park improvements.

Geotechnical Seismic Design

The Site may experience strong ground shaking from seismic events generated on regionally active faults. Seismic ground motion parameters were evaluated using a simplified code based approach and ground motion procedures for seismic design. The simplified code based approach follows the procedures in the 2013 California Building Code (CBC) based on ASCE/SEI 7-10 Section 11.4. The 2013 CBC is based on the 2012 IBC which references the Minimum Design Loads for Buildings and Other Structures (ASCE/SEI 7-10) as indicated under Effective use of the IBC/CBC on page ix of the 2013 CBC.

Seismic ground motion values are initially determined based on site class B (rock) conditions. The values are adjusted to obtain the maximum considered earthquake (MCE) spectral acceleration values for the site based on its site class of D. The seismic design parameters for the Site's coordinates (latitude 34.1891° North and longitude -118.8642° West) were obtained from the USGS web based spectral acceleration response maps and calculator:

<http://earthquake.usgs.gov/designmaps/us/application.php>

Seismic Parameters based on ASCE/SEI 7-10

CHAPTER 16 TABLE/FIGURE NO.	SEISMIC PARAMETER	VALUE PER CA BUILDING CODE
Figure 1613.5 (3)	Short Period Mapped Acceleration (S_s)	1.50g
Figure 1613.5 (4)	Long Period Mapped Acceleration (S_1)	0.60g
Table 1613.5.2	Site Class Definition	D
Table 1613.5.3 (1)	Site Coefficient (F_a)	1.0
Table 1613.5.3 (2)	Site Coefficient (F_v)	1.5
Equation 16-37	$S_{MS} = F_aS_s$	1.50g
Equation 16-38	$S_{M1} = F_vS_1$	0.90g
Equation 16-39	$S_{DS} = 2/3S_{MS}$	1.00g
Equation 16-40	$S_{D1} = 2/3S_{M1}$	0.60g

The purpose of the building code earthquake provisions is primarily to safeguard against major structural failures and loss of life, not to limit damage nor maintain function. Therefore, values provided in the building code should be considered minimum design values and should be used with the understanding site acceleration could be higher than addressed by code based parameters. Cracking of walls and possible structural damage should be anticipated in a significant seismic event.

Site Preparation and Grading

As discussed above, the proposed site development will include minor cut and fill grading and remedial grading to provide suitable building areas for the structure, parking and drive area subgrade and to provide suitable site drainage.

Grading and Earthwork

After stripping and removal of existing surface and subsurface improvements, all building and pavement areas and areas to receive fill should be over-excavated to a depth of at least 2' BGS.

The bottom of the over-excavation areas should be scarified to a depth of 8 inches, moisture conditioned to between optimum and three (3) percent above optimum moisture content and compacted as engineered fill to at least 90 percent of the maximum dry density as determined by ASTM Test Method D1557. It should be anticipated for this to be performed in all building and foundation areas and a minimum of 5 feet outside building areas where possible.

The moisture content and density of the compacted soils, footing excavations etc., should be maintained until the placement of concrete. If soft or unstable soils are encountered during excavation or compaction operations, the contractor shall perform remedial grading to achieve a stable subgrade condition. This may include the use of geotextile fabric and rock sections (or other means) to achieve stability at the base of excavation, prior to backfilling. All fills required to bring excavations to final grades should be placed as engineered fill. In addition, all native soils over-excavated should be compacted as engineered fill.

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

Vegetation and Debris Removal

Any vegetation, soils containing significant levels of organics, trash or construction debris on the property within the areas of development should be removed prior to the grading operations. Any existing utility or subsurface drainage systems present within the proposed development areas should be removed or abandoned per the approval of the project geotechnical consultant and the California Building Code.

Soil Removal

For planning purposes, we recommend that the removal be extended to a depth of 24" below the bottom of the proposed footings in building areas. For foundations on the existing or proposed ground level, we recommend a removal depth of 3 feet BGS or 24 inches below the bottom of proposed footings, whichever is deeper. In areas of pavement or hardscape, the depth of removal should be 24 inches BGS or a minimum of 12 inches below subgrade elevation, whichever is deeper.

Deeper removals may be necessary where heavy foundation loads are proposed. The structure loadings should be evaluated when available. The removals should be performed in all building and foundation areas and a minimum of 5 feet outside building areas where possible. Soil removals should be re-evaluated when foundation loading and proposed grading plans have been finalized.

The zone of over-excavation and compaction should extend a minimum of 5 feet beyond the exterior building lines where possible or laterally to the edge of the existing improvements which are to remain or property lines.

After the removals are completed as addressed above, the exposed soil should be observed by the project geotechnical consultant to evaluate if additional removals are needed. No fill soils should be placed until the geotechnical observation of removal areas is completed.

Preparation of Fill Area

After removals are performed as addressed above, all areas to receive fill should be processed before placing fill. Processing should consist of surface scarification to a minimum depth of 8 inches, moisture conditioning to slightly above the optimum moisture content, and recompaction to a minimum of 90% of the maximum dry density (90% relative compaction). Optimum moisture content and maximum dry density should be determined per ASTM D 1557.

Fill Placement

On-site materials obtained from excavations may be used as fill soils. Fill soils should be free of all deleterious materials including trash, debris, organic matter, and rocks larger than 6 inches. Fill soils should be placed in thin uniform lifts, brought to slightly above the optimum moisture content, and compacted to a minimum of 90% relative compaction. Sources of import fill if necessary should be approved by the project geotechnical consultant prior to transport of materials to the site.

Temporary Excavations

Temporary shallow excavations made in properly compacted fill or competent natural soils should stand with vertical sides. However, following Occupational Safety and Health Act (OSHA) requirements, vertical excavations deeper than 4 feet should be shored, or sloped.

During construction, the excavation and maintenance of safe and stable slope angles are the responsibility of the contractor. The contractor's work should conform to the requirements of OSHA and should consider the subsurface conditions and method of operation. Surcharge loads should be setback from the top of temporary excavations a horizontal distance equal to the depth of the excavation or 10 feet, whichever is more.

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

Temporary excavations should be constructed in accordance with CAL OSHA requirements. Temporary cut slopes should not be steeper than 1.5H:1V, and flatter if possible. If excavations cannot meet these criteria, the temporary excavations should be shored.

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

Slope gradient estimates provided in this report do not relieve the contractor of the responsibility for excavation safety. In the event that tension cracks or distress to the structure occurs, during or after excavation, the retail tenant should be notified immediately and the contractor should take appropriate actions to minimize further damage or injury.

Grading Standards

All aspects of grading including site preparation, grading and fill placement, keying, and benching should be per the current California Building Code or these recommendations, whichever is more stringent.

Soil Expansiveness

Expansion tests were performed on selected soil samples. Based on these test results, the soils at the site have low expansion potential (21-50 expansion index ranges). We recommend that preliminary designs consider the medium (21-50) range of expansive soils.

Expansive soils contain clay particles that change in volume (shrink or swell) due to a change in the soil moisture content. The amount of volume change depends upon: the soil swell potential; the availability of water; and the restraining pressure on the soil. Swelling occurs when clay soils become wet due to excessive water. Excessive water can be caused by poor surface drainage, over-irrigation of lawns and planters, and sprinkler or plumbing leaks.

Swelling clay soils can cause distress to construction (generally as uplift). Construction on expansive soil has an inherent risk that should be acknowledged and understood by the property owner. The geotechnical recommendations presented herein are intended to reduce the potential for expansive soil action. However, these recommendations are not intended, nor designed to provide complete and full mitigation of expansive soil conditions. If requested, additional recommendations beyond those herein can be provided to further reduce the risk of expansive soil action. A significant change in the internal soil moisture content can cause soil movement on the order of 1 to 2 inches, depending on the soil expansion range. Therefore, positive drainage should be consistently provided and maintained away from all structures and the drainage should not be changed creating an adverse drainage condition. Landscape watering should be held to a minimum. In addition, irrigation systems should be maintained and any sprinkler or plumbing leaks immediately repaired to avoid saturation of the building and hardscape subgrade soils.

Conventional Foundation Design

General

Foundations for the proposed structures should be supported entirely in certified compacted fill. When detailed foundation plans are prepared, they should be provided to this office for review. Certified compacted fill exposed in the foundation excavations should consist of materials with uniform characteristics regarding density and expansion. If non-uniform conditions are encountered revised foundation recommendations or remedial grading as directed by the project geotechnical consultant may be necessary.

Design Data

The proposed structures may be supported on continuous and isolated footings. The footings embedded in engineered compacted fill may be designed to impose an allowable bearing pressure of 2000 pounds per square foot (psf). These bearing pressures apply for dead plus live loads and may be increased by one-third when considering wind or seismic loads. Continuous and isolated footings should have minimum widths of 12 and 24 inches, respectively. The footings should be embedded a minimum of 18 inches below proposed grade or 18 inches into suitable bearing material, as measured from the lowest adjacent grade, interior or exterior. The above embedments are for footings embedded into materials having an expansion index of less than 90. Steel reinforcement should be per the structural engineer's recommendations, however, minimum continuous footing reinforcement should consist of 2 #4 bars in the top and bottom (total of 4 bars). Shallow footings adjacent to retaining walls should be included in the design of the walls or stepped down below a 2(h):1(v) plane projecting upward from the bottom of the retaining wall footings.

Lateral Resistance

Lateral forces exerted by retained soil or compacted fill may be resisted by passive soil pressure and friction. To develop full passive earth pressure, level ground consisting of engineered compacted fill should extend a distance of at least 3 times the footing depth in front of the footing. The passive soil pressure may be taken as an equivalent fluid pressure of 250 pcf, not to exceed 2500 psf where the footing is on level ground. Friction between the bottom of the footings and soil may be taken as 0.35. Passive resistance and friction may be combined with no reduction.

Settlement

Settlement of the footings embedded in certified compacted fill should be minimal, on the order of ½ to ¾ inch, depending upon the foundation loading and size. The settlements are anticipated to occur rapidly as the foundations are loaded. No long term settlement is anticipated for properly constructed foundations embedded in the recommended bearing materials.

Footing Excavation

All footings should be cut square and level and cleaned of all slough. Soil excavated from the footing trenches (including utility trenches) should not be spread over any areas of construction, unless properly compacted. The footing excavations should be observed by the project geotechnical consultant before placing reinforcing steel. Soils silted into the footing excavations during the pre-moistening operations should be removed to the required depth before casting the concrete. The footings should be cast as soon as possible to avoid deep desiccation of the footing subsoils.

Pre-moistening

Footing subsoils should be premoistened per the requirements of the project geotechnical consultant. For planning purposes, we recommend subgrade soils should be premoistened to a minimum of 3% over the optimum moisture content for a minimum depth of 24 inches. This office should observe pre-moistening of the subgrade before placement of sand base or concrete.

Conventional Slab on Grade

Subgrade Preparation

The subgrade for all slabs-on-grade should consist of engineered compacted fill for interior or exterior slabs. If disturbed during foundation and utility construction, the subgrade soils should be processed and compacted according to the recommendations of the previous Fill Placement and Compaction section before placement of any aggregate (sand) base. Any loose soils should be removed to firm in-place material, the exposed subgrade processed, and the material replaced as engineered compacted fill as described above.

Design Data

The concrete slabs-on-grade within the building interiors should be a minimum of 4 inches thick. Reinforcement should consist of a minimum of No. 3 bars at 24 inches on centers in both directions or per the structural engineer's design. The slab steel reinforcement should be extended into the foundations to within 3 inches of the footing bottom at 36 inches on center. The slab should be underlain by 4 inches of clean sand.

Concrete mixing, placement, finishing, and curing should be performed per the American Concrete Institute. Guide for Concrete Floor and Slab Construction (ACI 302.1R-04). The concrete slump for a Class 1 Floor is 5 inches in the ACI 302.1R-04 guide. Concrete slump in the Portland Concrete Association Design and Control of Concrete Mixtures bulletin is recommended at 4 inches for reinforced slabs. These published concrete slumps should be considered in the design of the concrete slabs-on-grade. Concrete shrinkage cracks could become excessive if water is added to the concrete above the allowable limit, and proper finishing and curing practices are not followed.

Concrete usually develops cracks. Concrete shrinkage and cracking could become excessive if water is added to the concrete above the allowable limit, or if proper placement, finishing and curing practices are not followed. Placement, finishing and curing should be performed in accordance with Portland Cement Association guidelines. Low slump concrete should be used; if a higher slump is needed for workability, a water reducing agent could be used instead of adding more water.

Premoistening

Slab subsoils should be premoistened per the requirements of the project geotechnical consultant. For planning purposes, we recommend subgrade soils should be premoistened to a minimum of 3% over the optimum moisture content for a minimum depth of 24 inches. This

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office should observe pre-moistening of the subgrade before placement of sand base or concrete.

Moisture Vapor Retarder Layer

An appropriate moisture vapor retarder layer should be installed and maintained below the slab to reduce moisture vapor transmission through the slab if specified. Ten-mil plastic sheeting, commonly used as a moisture vapor retarder layer, may not provide the desired reduction in moisture vapor transmission. Therefore, a retarder layer specifically manufactured per ASTM E 1745-97 *Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs* should be considered below the interior concrete slabs on-grade. The class of moisture vapor retarder layer should be strong enough to withstand abrasion during construction. The retarder should be installed per ASTM E1643-98(2005) *Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs*.

Perforations through the moisture vapor retarder such as at pipes, conduits, columns, grade beams, and wall footing penetrations should be sealed per the manufacturer's specifications or ASTM E1643-98(2005) *Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs*. Proper construction practices should be followed during construction of the slab on-grade. Repair and seal tears or punctures in the moisture barrier that may result from the construction process prior to concrete placement.

Minimizing shrinkage cracks in the slab-on-grade can further minimize moisture vapor emissions. A properly cured slab utilizing low-slump concrete will reduce the risk of shrinkage cracks in the slab as described herein.

The concrete contractor should be made aware of the moisture vapor retarder and required to protect the layer. Perforations made in the layer by the concrete contractor should be properly sealed prior to concrete placement. In addition, if the concrete is placed directly on top of the layer the concrete contractor should make the necessary changes in the concrete placement and curing. Placing the concrete directly on top of the moisture vapor retarder layer allows the layer to be observed for damage directly prior to concrete placement.

The grade of the project should be kept as high as practical and the interior slabs should be maintained as high as practical above the exterior grades. Drainage should be maintained away from the structures. Washing of the sidewalks adjacent the structures should be minimized and water should not be allowed to pond adjacent the structures. Provide proper drainage and elevation of ground adjacent the slab (that is the ground surface should be at least 6 inches below the wall plate). In addition, the landscaping should not be over watered resulting in excess moisture below the slab

The slabs should be tested for moisture content prior to the selection of the flooring and adhesives. Moisture in the slabs should not exceed the flooring manufacturer's specifications. The concrete surface should be sealed per the manufacturer's specifications if the moisture readings are excessive. It may be necessary to select floor coverings that are applicable to high moisture conditions.

Where cuts are made into the slab for future construction, the moisture vapor retarder layer should be repaired per the manufacturer's recommendation. Information regarding the need to repair the moisture vapor retarder layer and information on the selection of acceptable slab coverings should be conveyed to the project consultants.

Pavement Design

The asphaltic concrete pavement design formulas used were obtained from *The Flexible Pavement Design Guide for California Cities and Counties*. The asphalt concrete pavement designs shown below are based on a subgrade "R" Value of 43 based on recent testing and various traffic indices as indicated in the following table.

Assigned R-Value	Recommended Structural Section Asphalt Paving*
4	3" AC / 4" AB / S
5	3" AC / 5" AB / S
6	3" AC / 6" AB / S

*AC = Asphaltic Concrete

*AB = Aggregate Base

*S = Compacted Subgrade (R~43)

Subgrade Preparation

The subgrade soils within areas of proposed paving and beneath proposed curbs and gutters should be moistened to slightly above the optimum moisture content and compacted to a minimum of 90% of the laboratory standard prior to placing aggregate base or concrete.

Aggregate Base Preparation

The aggregate base and subbase (if utilized) materials within areas of proposed paving should be moistened to slightly above the optimum moisture content, placed in lifts no thicker than 6 inches and compacted to a minimum of 95% of the laboratory standard.

CLOSURE

This report was prepared under the direction of State registered geotechnical engineer. No warranty, express or implied, is made as to conclusions and professional advice included in this report. Independent Solutions disclaim responsibility and liability for problems that may occur if the recommendations presented in this report are not followed. We cannot attest to the presence of concealed adverse soil conditions nor can we anticipate changes in the soil conditions that can result from construction procedures.

The recommendations are based on interpretations of the subsurface conditions determined from the limited subsurface exploration program described herein. The interpretations may differ from actual subsurface conditions, which can vary horizontally and vertically across the site. This office should observe all aspects of field construction addressed in this report. Any person using this report for bidding or construction purposes should perform such independent investigations, as they deem necessary. The work should be performed per the current building code.

We appreciate the opportunity to submit this geotechnical report, and look forward to serving on your design team for the successful completion of this project. Please call if you have any questions regarding items presented in this report or desire any additional information.

Please call if you have questions regarding this report.

We appreciate this opportunity to be of service and should you have any questions, please do not hesitate to call us.

Sincerely,
Independent Solutions

Randal L. Wendt, GE 2341
Senior Geotechnical Engineer

Attachments:	Appendix A	Laboratory Results
	Figure 1	Boring Location Map

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Appendix A – Laboratory Results

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INTRODUCTION

Representative undisturbed soil samples and bulk samples were carefully packaged inthe field and sealed to prevent moisture loss. The samples were then transported to our office for examination and testing assignments. Laboratory tests were performed, by our laboratory and subcontracted laboratory (NV5) on selected representative samples to evaluate the physical properties of the soils affecting foundation design and construction procedures. Detailed descriptions of the laboratory tests are presented below under the appropriate test headings. Test results are presented in the figures that follow.

MAXIMUM DENSITY / OPTIMUM MOISTURE

Maximum density/optimum moisture tests (compaction characteristics) were performed on selected samples of the encountered materials. The tests were performed in general accordance with ASTM D 1557 test method. The results are as follows:

BORING NO.	DEPTH (FT)	SOIL DESC	MAX DENSITY (PCF)	OPTIMUM MOISTURE (%)
B-1 thru B-3	1'-3'	Gray Brown Sandy Clay	121.1	10.8

EXPANSION INDEX

Expansion index tests were performed on a bulk sample. The test was performed in accordance with ASTM 4289 to assess the expansion potential of on-site soils. The results of the test are summarized below:

BORING NO.	DEPTH (FT)	SOIL DESC	EXPANSION INDEX
B-1 thru B-3	1'-3'	Gray Brown Sandy Clay	32

ATTERBERG LIMITS

Liquid and plastic limits were determined for selected samples in accordance with ASTM 04318. Results of the Atterberg Limits test are summarized on below.

BORING NO.	DEPTH (FT)	SOIL CLASS	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)
B-1 thru B-3	1'-3'	Clay (CL)	28	18	10

R-VALUE

An "R" Value was conducted on a sample of the typical soil type encountered. The test was conducted under subcontract by Geo-Logic Associates in general accordance with the ASTM D2844/CTM 301. An "R" Value of 43 was determined for the sample tested. Test results are attached.

511 Central Ave.
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Conjeo Creek Southwest Park
Paige Lane, Thousand Oaks, CA

Project No.: 18-3333-10

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-02

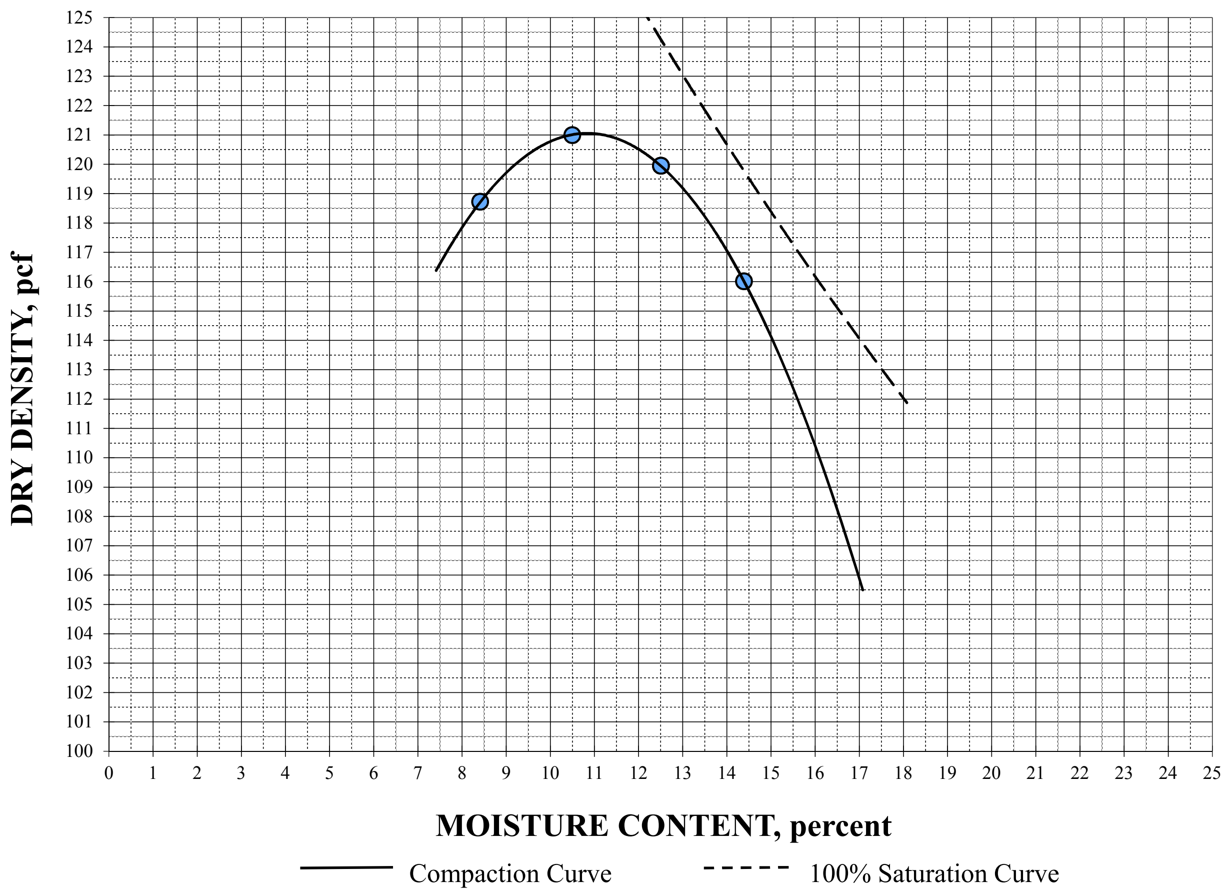
PROCEDURE USED: A
PREPARATION METHOD: Dry
RAMMER TYPE: Manual
SPECIFIC GRAVITY: 2.65 (assumed)

Date: October 4, 2018
Lab Number: 810021
Description: Dark Brown Silt with Sand (ML)

SIEVE DATA:

Sieve Size	% Retained
3/4"	0
3/8"	0
#4	0

MAXIMUM DRY DENSITY: 121.1 pcf
OPTIMUM MOISTURE: 10.8%



EXPANSION INDEX - UBC 18-2 & ASTM D 4829-88

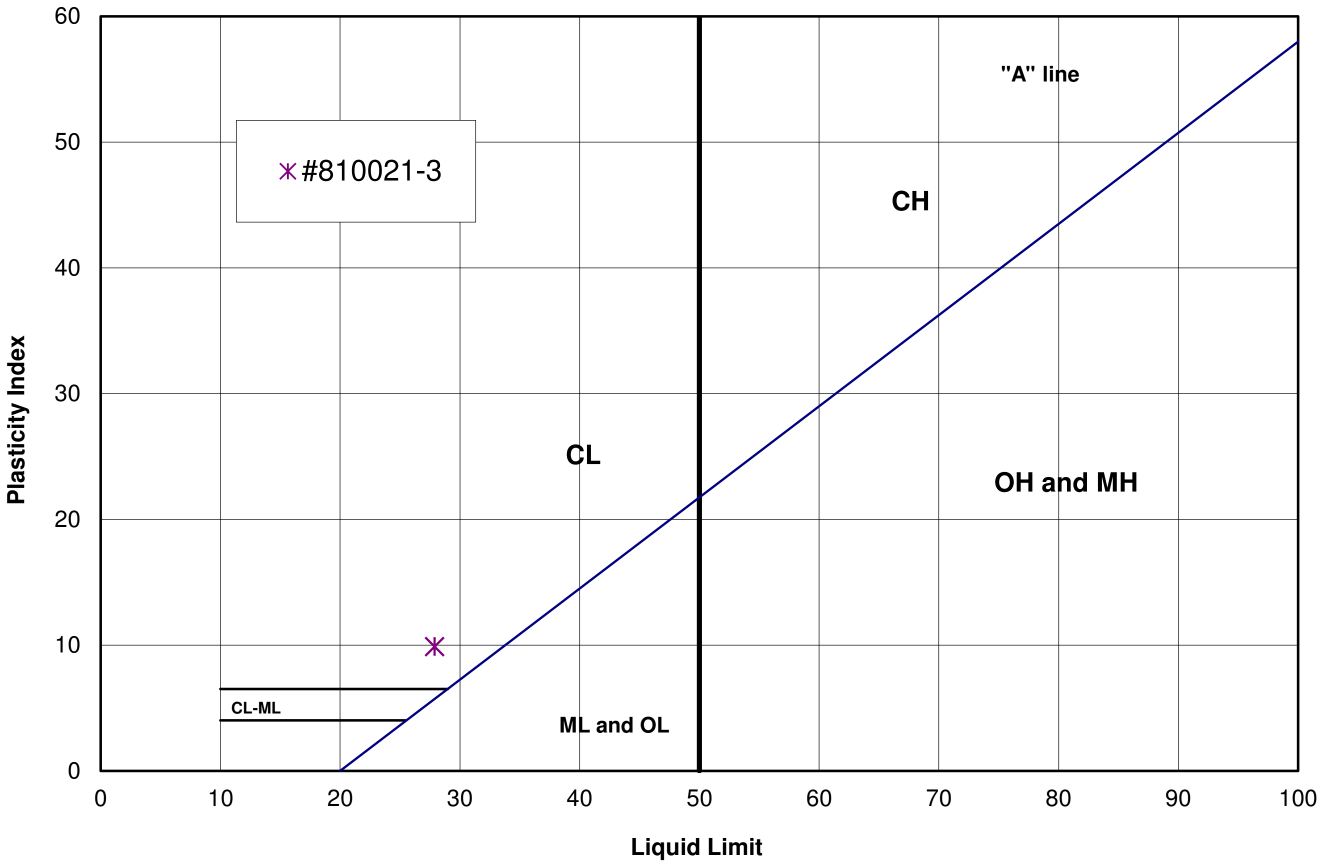
PROJECT Independent Solutions # 18-3333-10 JOB NO. SO17-1238

Sample	Lab ID 810021-2			By LD	Sample				By
Sta. No.					Sta. No.				
Soil Type	Brown, F.M.Clayey Sand				Soil Type				
Date	Time	Dial Reading	Wet+Tare	605	Date		Dial Reading	Wet+Tare	
10/8/2018	16:20	0.4111	Tare	218.1				Tare	
		H2O	Net Weight	386.9				Net Weight	
10/9/2018	10:00	0.3795	% Water	11				% Water	
			Dry Dens.	105.6				Dry Dens.	
			% Max					% Max	
			Wet+Tare	649.2				Wet+Tare	
			Tare	218.1				Tare	
			Net Weight	431.1				Net Weight	
INDEX	32	3.2%	% Water	23.7	**INDEX**			% Water	

Sample				By	Sample				By
Sta. No.					Sta. No.				
Soil Type					Soil Type				
Date		Dial Reading	Wet+Tare		Date		Dial Reading	Wet+Tare	
			Tare					Tare	
			Net Weight					Net Weight	
			% Water					% Water	
			Dry Dens.					Dry Dens.	
			% Max					% Max	
			Wet+Tare					Wet+Tare	
			Tare					Tare	
			Net Weight					Net Weight	
INDEX			% Water		**INDEX**			% Water	

Geo-Logic ASSOCIATES

PLASTICITY INDEX _ ASTM D4318



Sample	Depth	LL	PL	PI	USCS	Material Description
#810021-3		28	18	10	CL	

Job Name: Independent Solutions # 18-3333-10 Date: 10/9/18

Job No.: SO17-1238-00

Geo-Logic ASSOCIATES

'R' VALUE CA 301

Client: Independent Solutions
Date: 10/9/18
By: LD

Client's Job No.: 18-3333-10
Sample : Lab ID # 810021-4

GLA Reference: SO17-1238-00
Soil Type: Brown, Clayey Sand

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	**250**	**120**	**200**	
Initial Moisture Content	%	**6.2**	**6.2**	**6.2**	
Water Added	ml	**70**	**90**	**105**	
Moisture at Compaction	%	12.4	14.2	15.5	
Sample & Mold Weight	gms	**3188**	**3178**	**3141**	
Mold Weight	gms	**2104**	**2105**	**2101**	
Net Sample Weight	gms	1084	1073	1040	
Sample Height	in.	**2.448**	**2.51**	**2.46**	
Dry Density	pcf	119.4	113.5	110.9	
Pressure	lbs	**9400**	**4350**	**1990**	
Exudation Pressure	psi	748	346	158	
Expansion Dial	x 0.0001	**85**	**40**	**5**	
Expansion Pressure	psf	368	173	22	
Ph at 1000lbs	psi	**20**	**27**	**39**	
Ph at 2000lbs	psi	**40**	**58**	**83**	
Displacement	turns	**3.69**	**4.04**	**4.19**	
R' Value		67	52	36	
Corrected 'R' Value		**67**	**52**	**36**	

FINAL 'R' VALUE	
By Exudation Pressure (@ 300 psi):	**49**
By Epansion Pressure :	**43**
TI = 5	

Geo-Logic ASSOCIATES

Playground Perspective

KEY

1. Existing Tree(s) to Remain
2. Existing Multi-Use Path
3. Existing Conejo Creek Channel
4. Existing Utilities
5. Vegetated Swale with On-Site Retention
6. Porous Asphalt Parking Lot (1 ADA, 8 Standard Spaces)
7. Crosswalk
8. Porous Asphalt Pedestrian Path
9. Native Earth Equestrian Trail with Scored Concrete Crossing
10. Restroom - Single Occupancy with Drinking Fountain and Bottle Filling Station
11. Chumash Creek Themed Playground
12. Picnic Shade Structure
13. "Optional" Picnic Shade Structure
14. Backstop
15. Multi-Use Court
16. Sand Volleyball
17. Multi-Use Lawn
18. Fitness Node (6 Total)
19. Boardwalk
20. Vehicle Gate
21. Future Corral
22. Park Sign (Primary)
23. Park Sign (Secondary)
24. Picnic Area
25. Native/Drought Tolerant Landscape Planting
26. Bike Racks
27. Perimeter Fencing
28. Culvert

BORING LOCATION MAP
Figure 1

CRPD - Conejo Creek Southwest Park
Project No. 18-3333-10

EXPLANATION

● **Approximate Location of Hand Auger Boring**

0' 20' 40' 80' 120'
SCALE 1" = 40'
AUGUST 22, 2018

CONEJO CREEK SOUTHWEST PARK
CONCEPT PLAN
THOUSAND OAKS, CA.

Conejo Recreation & Park District

rrm design group