REPORT OF

GEOTECHNICAL INVESTIGATION

PROPOSED 9-UNIT APARTMENT BUILDING

17534-17540 SHERMAN WAY

VAN NUYS, CALIFORNIA

FOR:

SHAHE BOYADJIAN

PROJECT NO. 19-AE-834

APRIL 22, 2019

ageengineering@yahoo.com

A.G.E. ENGINEERING
Geotechnical Engineering and Foundation Design

April 22, 2019 19-AE-834

Shahe Boyadjian
17662 Mahoney Place
Granada Hills, CA 91344

Gentlemen:

It is our pleasure to submit this Geotechnical Investigation Report for the proposed 9-unit apartment building with street level parking to be constructed at 17534-17540 Sherman Way, Van Nuys, California. As we discussed, prior to the completion of this report, the results of our preliminary investigation indicate that the proposed site is satisfactory for the planned development from a geotechnical engineering standpoint. After proper site preparation, a foundation system consisting of conventional spread and isolated footings may be used to support the proposed buildings.

Investigation of the project site included drilling of two 52-foot deep exploratory test borings. The materials encountered at the location of the exploratory test borings, to the depth explored, were consisted of fill soils overlaying natural deposits of sandy silt, clayey silt, and relatively clean sand soils. The depths of fill soils, at the locations of our exploratory test boring, were determined to be about two feet. The site was occupied by residential buildings and garages. We anticipate encountering approximately two feet of fill underneath the existing buildings to be demolished to allow for the construction of the proposed residential units.

During the course of the site grading, the existing surficial fill soils along with any disturbed soils generated from demolition of the existing structures should be excavated and recompacted for new fill, grade slabs and foundation support. The ground surface of the site was relatively level.

The proposed project will consist of the construction of 9-unit apartment building. The first floor will be used for parking, second and third floors will be the residential units. The subject site is rectangular in shape and covers an area of about 16,700 square feet. It is bordered on north by Sherman Way, to the east by an apartment building, to the south by an alley, and to the west by Caldus Avenue and single family homes beyond. The footings and grade slab of the proposed structures will be established near the existing grades. The proposed buildings will be typical wood frame construction.

The proposed building will have 7 feet setback from west, 15 feet setback from north, 6 feet setback from east and 15 feet setback from south property lines.

The site is located within an area identified as having a potential for liquefaction defined by the State of California per the Seismic Hazard Mapping Act of 1990. We have performed a site–specific liquefaction analysis. Based on our investigation and analysis the potential for the liquefaction to adversely affect the proposed structure is considered low.

A detailed analysis of the data collected during the course of our investigation, additional recommendations, and conclusions pertaining to this site are included in this report.

Thank you for the opportunity to serve you on this project. If you have any questions regarding this report please do not hesitate to call the undersigned.

Respectfully submitted,

Zaven Abrahamian
Civil Engineer
RCE 41672

ZA/aa

Dist: (3) Addressee

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GEOTECHNICAL INVESTIGATION

PROPOSED 9-UNIT APARTMENT BUILDING

17534-17540 SHERMAN WAY

VAN NUYS, CALIFORNIA

INTRODUCTION

This report summarizes the findings of our geotechnical engineering exploration performed on the subject property. The purpose of the exploration was to evaluate the subsurface materials, discuss the engineering properties of the earth materials underlying the property, investigate the soil conditions, and provide soil engineering recommendations and evaluate the feasibility of construction of the proposed apartment building with street level parking.

The field exploration included the drilling of two 52-foot deep exploratory test borings. From this test boring, soils samples were obtained for laboratory testing to determine geotechnical engineering properties of the underlying earth materials. Based on the results of these laboratory tests, recommendations have been provided for design and construction of foundations, grade slabs and grading.

The approximate locations of our exploratory test borings are shown in relation to the site boundaries in the enclosed Site Plan; Drawing No. 1.

Appendix A describes our drilling and sampling procedures. Profiles of the materials encountered at the locations of our exploratory test borings are presented in Figures A-1 and A-2. The Uniform Soil Classification System Chart, a guide to these figures is included as Figure A-3.

Appendix B describes our laboratory testing procedures. The results of direct shear and consolidation tests are performed on selected samples presented in Figures B-1 and B-2.

PROJECT CONSIDERATIONS

The proposed project will consist of the construction of an apartment building with street level parking. The footings and grade slab of the proposed structures will be established near the existing grade. The proposed buildings will be typical wood frame construction.

The structural loads will be transmitted to the footings and then to the subgrade mainly through exterior and interior continuous footings. However, some interior columns may also occur.

Actual structural loads exerted on the isolated and continuous footings are not available at this time. It is anticipated that concentrated column loads will not exceed 100 kips and continuous footings loads will be approximately 10 kips per lineal foot.

PROPOSED GRADING

Prior to placement of compacted fill soils, the site shall be cleared of all vegetation, existing fill, loose top soil, debris, and any other deleterious materials. The site existing fill soils may be used in the compacted fill areas under engineering observations and testing, provided that these materials are free from organic materials and rocks larger than six inches in diameter. Import soils may be required if proposed finished grades are established above the existing grades. The limits of compaction area should extend a minimum of 5 feet beyond the proposed building lines.

ENGINEERING ANALYSIS

Based on the results of laboratory tests, our recommendations have been provided for design and construction of foundations, grade slabs, grading and liquefaction analysis.

SURFACE CONDITIONS

The subject site is located at 17534-17540 Sherman Way, Van Nuys, California. The site is occupied by residential buildings and garages. The ground surface of the site is relatively level. The subject site is rectangular in shape and covers an area of about 16,700 square feet.

SUBSURFACE CONDITIONS

The data gathered from our test borings were sufficiently consistent. The materials encountered at the location of the exploratory test boring, to the depth explored (52-foot deep), were consisted of fill soils overlaying natural deposits of sandy silt, clayey silt, and relatively clean sand soils. The depths of fill soils, at the locations of our exploratory test pits, were determined to be about two feet. We anticipate encountering approximately two feet of fill underneath the existing buildings to be demolished to allow for the construction of the proposed apartment building.

The native materials encountered at the locations of our exploratory test borings were found to be firm, sandy silt native soils. The results of our laboratory testing indicated that the native soils have moderate strength and are low to moderately compressible.

No water was encountered at the locations of our exploratory test borings, to the depth explored.

The site upper soils have low expansion potential.

CONCLUSION AND RECOMMENDATIONS

GENERAL FINDINGS

Based on our field investigation and laboratory testing of soils samples, the proposed development is feasible from a geotechnical engineering standpoint. The

foundation design and construction plans should take into account the appropriate soils engineering features of the site. No ground water was encountered during the course of the drilling of the exploratory test borings, to the depth explored. The foundation soils were found to be firm, sandy silt soils. Existing fill soils along with any disturbed soils generated from demolition of the existing building should be excavated and properly recompacted for new fill, structural foundations, and grade slabs support.

SITE PREPARATION

The existing surficial fill and disturbed soils generated from demolition of the existing buildings should be stripped until sandy silt native soils are exposed. Prior to placing any controlled compacted fill, the Soils Engineer should observe the excavation bottoms. These bottoms should be scarified to a depth of 6-8 inches and compacted near optimum moisture content to at least 90 percent of the maximum dry density as determined by ASTM designation D 1557-12 compaction method.

The excavated upper fill soils could be used in the compacted fill areas, provided that these materials are free from organic materials and rocks larger than six inches in diameter. Import soils will be required if the proposed finished grades are established above the existing grades. Fill import soils should be non-expansive and sandy in nature. A 40-pound sample of each import soils should be submitted to the soil engineer for approval prior to use in compacted fill areas. Fill soils, approved by the Soil Engineer should be placed in loose layers not exceeding 6-8 inches, brought to near optimum moisture content and compacted to at least 90 percent of the maximum laboratory dry density as determined by ASTM Designation D 1557-12 compaction method.

In-place density tests should be made by the Soil Engineer during site grading to assist the contractor in obtaining the required degree of compaction and the proper moisture content. Where compaction of less than 90 percent is indicated, additional compactive effort should be made with adjustment of the moisture content or layer thickness, as necessary, until at least 90 percent compaction is obtained.

FOUNDATIONS

Bearing Value

Conventional, continuous and spread (isolated) footings foundation systems on silty sand native and/or properly compacted fill soils should provide adequate support for the proposed structures. Continuous and isolated footings should be placed at a minimum depth of 30 inches below lowest adjacent finished grades or 30 inches into site native and/or properly compacted fill soils. Continuous footings should be a minimum of 12 inches wide and square footings should be at least 24 inches wide. All continuous footings should be reinforced with at least four #4 steel bars; two shall be placed near the top and two placed near the bottom of the footings. Footings should be cleaned of all loose soils. The recommended bearing value for properly designed and constructed continuous and isolated footings are 1,700 and 1,900 pounds per square foot, respectively. These values could be increased by a rate of 400 and 120 pounds per square foot for each additional foot of footing depth and width, to a maximum value of 3,500 pounds per square foot. These bearing values are for the total of dead and frequently

applied live loads. These values may be increased by 1/3 for short duration loadings, which includes the effects of wind or seismic forces.

SETTLEMENT

Total settlement of the isolated footings, under the assumed maximum concentrated loads of 100 kips is expected to be approximately 5/8 of one inch. Continuous footings, with loads of about 10 kips per lineal foot are expected to settle approximately 3/8 of one inch. Maximum differential settlements are expected to be less than 1/4 of an inch. The major portion of the settlements will occur during construction.

LATERAL DESIGN

Lateral resistance force at the base of the footings and underlying native soils may be assumed to be the product of the dead load forces and a coefficient of friction of 0.30.

Passive pressure acting on the face of the footings may also be used to resist later forces. A passive pressure of 350 pounds per square foot at the top of the footing and increasing at a rate of 250 pounds per square foot per foot of depth to a maximum value of 4,500 pounds per square foot may be used for footings poured against native and/or properly compacted fill soils. When combining passive and friction for lateral resistance, one value should be reduced by one-third.

GRADE SLABS

Grade slabs could be supported on the finished grades which consist of sandy silt native and/or properly compacted fill soils. The site upper soils have medium expansion potential.

Grade slab should be a minimum of 5 inches thick and minimum reinforcing should consist of No. 4 rebar with center to center distance of at least 12 inches at both direction and having adequate clearance with the slab sub-grade. The slab sub-grade should consist of at least 12 inches of sandy soils with expansion index of less than 20.

In the areas where floor coverings are sensitive to dampness, vapor barrier should be placed. This normally consists of a 10-mil visqueen covered with 2 inches of sand.

LIQUEFACTION POTENTIAL

Liquefaction potential is greatest where the ground water level is shallow, loose and fine sands occur within a depth of about 50 feet or less. According to open-File Report 97-15, Seismic Hazard Evaluation of the Van Nuys 7.5-Minute Quadrangle, Los Angeles County, California, by the California Department of Conservation, Division of Mines and Geology, the historic high ground water level, at the location of the subject project is at a depth of about 30 feet below grade.

According to the California Division of Mines and Geology (1998), the subject site is located within an area identified as having a potential for liquefaction.

Liquefaction potential analysis was performed based on historic high groundwater level, 30 feet, State peak ground acceleration of 0.66g and 0.44g (2/3 of 0.66g), Design Earthquake Magnitude of 6.65, In-Situ Standard Penetration Test. Based on our liquefaction analysis, it is our opinion that chance of the liquefaction to adversely affect the proposed structure is considered low.

Liquefaction is a process which occurs when saturated sediments are subjected to repeated strain reversals during a seismic event. The strain reversals cause an increase in pore water pressure such that the internal pore pressure approaches the overburden pressure and the shear strength approaches a low residual value. Liquefied soils are subject to flow, consolidation, or excess strain. Liquefaction typically occurs in loose to medium dense sand and silty sand soils below the groundwater table. Predominately fine-grained soils, such as silts, and clay, are less susceptible to liquefaction.

Starting in January 2012, the Department of Building and Safety, Grading Division requires that all liquefaction evaluations conform to the requirements in the latest version of CGS Special Publication 117 (SP 117A), Guidelines for Evaluating and Mitigating Seismic Hazards in California (1803.7.2, 1803.5.12). The so-called "Chinese Criteria" is no longer accepted as an indicator of the potential for liquefaction.

Based on Guidelines for Evaluating and Mitigating Seismic Hazards in California 2008, Special Publication 117 and 117A, if clayey soil materials are encountered during site exploration, those materials may considered non-liquefiable, with the following conditions: Percent finer than 0.005 mm less than 15 percent, Liquid Limit less than 35

and Water Content greater than 0.9 x Liquid Limit. In addition based on Special Publication 117A which states "Although soils having plasticity index (PI) greater than 7 have generally been expected to behave like clays (Boulanger and Idriss, 2006), Bray and Sancio (2006) found loose soils with a PI<12 and moisture content>85% of the liquid limit are susceptible to liquefaction". Moreover, sensitive soils having PI>18 can undergo severe strength loss.

Based on the above requirements and our laboratory analysis and in accordance with the screening procedures referenced in SP 117A (i.e., Bray and Sancio, 2006, and Boulanger and Idriss, 2006, referenced papers), it is our opinion that the potential for liquefaction to adversely affect the proposed structure is considered low (See attached laboratory test results).

SEISMIC DESIGN

Based on the ASCE 70-10 Standard, the following seismic design parameters are provided.

Site Class = D

Mapped 0.2 Second Spectral Response Acceleration, S_S= 1.808g

Mapped one Second Spectral Response Acceleration, S_1=0.602g

Site Coefficient Fa = 1.00

Site Coefficient Fv = 1.50

Maximum Design Spectral Response Acceleration for short period, S_{MS} = 1.808g

Maximum Design Spectral Response Acceleration for one-second period, S_{M1} = 0.904g

5% Design Spectral Response Acceleration for short period, S_{DS} = 1.206g

5% Design Spectral Response Acceleration for one-second period, S_{D1} = 0.602g

Strong ground shaking can be expeeted here and at most localities in the greater Los Angelcs area from earthquakes that originates on any of the many active faults that cross Southern California.

Based on the State of California Seismic Hazard Maps, the subject site is locatcd within a liquefaction hazard zone. Based upon the liquefaction analysis, liquefaction should not pose any significant hazard to thc proposed development. Based upon the liquefaction analysis, liquefaction induced settlement is estimated to be (0.29) inch and differential settlement of (0.190) inch. Based upon the liquefaction analysis, the settlement is not anticipated to be detrimental to the proposed development.

OBSERVATION DURING CONSTRUCTION

The presented recommendations in this report assume that all structural foundations will be established on firm sandy silt native and/or properly compacted fill soils. All footing excavations should be observed by a representative of this office before reinforcing is placed. It is essential to assure that footing excavations are established in the recommended bearing materials and are free of disturbed soils.

Site grading work should be conducted under observation and testing by a representative of this firm. Please notify this office at least 24 hours before any observation work is required.

The recommendations included in this report are based on data derived during the course of our geotechnical investigation. Based on our future observation of the project development this office may find it necessary to modify some of its recommendations.

CLOSURE

The findings and recommendations presented in this report are based on our professional engineering experience and judgment combined with our field investigation and laboratory testing results. The report was prepared in accordance with generally accepted engineering principles and practice. No warranty, either express or implied, is made or intended in connection with this report or by furnishing this report or by any other oral or written agreement. Any liability in connection herewith shall not exceed the fee for this report.

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EMPIRICAL PREDICTION OF
EARTHQUAKE-INDUCED LIQUEFACTION POTENTIAL

JOB NUMBER: 19-AE-834 DATE: 04-26-2019

JOB NAME: ShermanBoring1

SOIL-PROFILE NAME: SHERMANW.LDW

BORING GROUNDWATER DEPTH: 60.00 ft

CALCULATION GROUNDWATER DEPTH: 30.00 ft

DESIGN EARTHQUAKE MAGNITUDE: 6.65 Mw

SITE PEAK GROUND ACCELERATION: 0.660 g

BOREHOLE DIAMETER CORRECTION FACTOR: 1.00

SAMPLER SIZE CORRECTION FACTOR: 1.00

N60 HAMMER CORRECTION FACTOR: 1.00

MAGNITUDE SCALING FACTOR METHOD: Idriss (1997, in press)

Magnitude Scaling Factor: 1.360

rd-CORRECTION METHOD: Seed (1985)

FIELD SPT N-VALUES ARE CORRECTED FOR THE LENGTH OF THE DRIVE RODS.

Rod Stick-Up Above Ground: 3.0 ft

CN NORMALIZATION FACTOR: 1.044 tsf

MINIMUM CN VALUE: 0.6

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EMPIRICAL PREDICTION OF
EARTHQUAKE-INDUCED LIQUEFACTION POTENTIAL

JOB NUMBER: 19-AE-834 DATE: 04-26-2019

JOB NAME: ShermanBoring1

SOIL-PROFILE NAME: SHERMANW.LDW

BORING GROUNDWATER DEPTH: 60.00 ft

CALCULATION GROUNDWATER DEPTH: 30.00 ft

DESIGN EARTHQUAKE MAGNITUDE: 6.65 Mw

SITE PEAK GROUND ACCELERATION: 0.440 g

BOREHOLE DIAMETER CORRECTION FACTOR: 1.00

SAMPLER SIZE CORRECTION FACTOR: 1.00

N60 HAMMER CORRECTION FACTOR: 1.00

MAGNITUDE SCALING FACTOR METHOD: Idriss (1997, in press)

Magnitude Scaling Factor: 1.360

rd-CORRECTION METHOD: Seed (1985)

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SOIL NO.	CALC. DEPTH (ft)	TOTAL STRESS (tsf)	EFF. STRESS (tsf)	FIELD N (B/ft)	FC DELTA N1_60	C N	CORR. (N1)60 (B/ft)	LIQUE. RESIST RATIO	r d	INDUC. STRESS RATIO	LIQUE. SAFETY FACTOR
1	0.25	0.014	0.014	32	9.95	*	*	*	*	*	**
1	0.75	0.042	0.042	32	9.95	*	*	*	*	*	**
1	1.25	0.071	0.071	32	9.95	*	*	*	*	*	**
1	1.75	0.099	0.099	32	9.95	*	*	*	*	*	**
1	2.25	0.127	0.127	32	9.95	*	*	*	*	*	**
1	2.75	0.155	0.155	32	9.95	*	*	*	*	*	**
1	3.25	0.184	0.184	32	9.95	*	*	*	*	*	**
1	3.75	0.212	0.212	32	9.95	*	*	*	*	*	**
1	4.25	0.240	0.240	32	9.95	*	*	*	*	*	**
1	4.75	0.268	0.268	32	9.95	*	*	*	*	*	**
1	5.25	0.297	0.297	32	9.95	*	*	*	*	*	**
1	5.75	0.325	0.325	32	9.95	*	*	*	*	*	**
1	6.25	0.353	0.353	32	9.95	*	*	*	*	*	**
1	6.75	0.381	0.381	32	9.95	*	*	*	*	*	**
1	7.25	0.410	0.410	32	9.95	*	*	*	*	*	**
1	7.75	0.438	0.438	32	9.95	*	*	*	*	*	**
1	8.25	0.466	0.466	32	9.95	*	*	*	*	*	**
1	8.75	0.494	0.494	32	9.95	*	*	*	*	*	**
1	9.25	0.523	0.523	32	9.95	*	*	*	*	*	**
1	9.75	0.551	0.551	32	9.95	*	*	*	*	*	**
1	10.25	0.579	0.579	32	9.95	*	*	*	*	*	**
1	10.75	0.607	0.607	32	9.95	*	*	*	*	*	**
1	11.25	0.636	0.636	32	9.95	*	*	*	*	*	**
1	11.75	0.664	0.664	32	9.95	*	*	*	*	*	**
1	12.25	0.692	0.692	32	9.95	*	*	*	*	*	**
1	12.75	0.720	0.720	32	9.95	*	*	*	*	*	**
1	13.25	0.749	0.749	32	9.95	*	*	*	*	*	**
1	13.75	0.777	0.777	32	9.95	*	*	*	*	*	**
1	14.25	0.805	0.805	32	9.95	*	*	*	*	*	**
1	14.75	0.833	0.833	32	9.95	*	*	*	*	*	**
1	15.25	0.862	0.862	32	9.95	*	*	*	*	*	**
1	15.75	0.890	0.890	32	9.95	*	*	*	*	*	**
1	16.25	0.918	0.918	32	9.95	*	*	*	*	*	**
1	16.75	0.946	0.946	32	9.95	*	*	*	*	*	**
1	17.25	0.975	0.975	32	9.95	*	*	*	*	*	**
1	17.75	1.003	1.003	32	9.95	*	*	*	*	*	**
1	18.25	1.031	1.031	32	9.95	*	*	*	*	*	**
1	18.75	1.059	1.059	32	9.95	*	*	*	*	*	**
1	19.25	1.088	1.088	32	9.95	*	*	*	*	*	**
1	19.75	1.116	1.116	32	9.95	*	*	*	*	*	**
1	20.25	1.144	1.144	32	9.95	*	*	*	*	*	**
1	20.75	1.172	1.172	32	9.95	*	*	*	*	*	**
1	21.25	1.201	1.201	32	9.95	*	*	*	*	*	**

File Name: SHERMANW.OUT

SOIL	CALC. DEPTH	TOTAL STRESS	EFF. STRESS	FIELD N	FC DELTA	C	CORR. (N1)60	LIQUE. RESIST	r	INDUC. STRESS	LIQUE. SAFETY

4	44.25	2.550	2.105	64	0.05	0.654	41.9	Infin	0.812	0.281	NonLiq
4	44.75	2.582	2.121	64	0.05	0.654	41.9	Infin	0.807	0.281	NonLiq
5	45.25	2.613	2.137	70	0.05	0.614	43.0	Infin	0.802	0.280	NonLiq
5	45.75	2.645	2.153	70	0.05	0.614	43.0	Infin	0.797	0.280	NonLiq
5	46.25	2.676	2.169	70	0.05	0.614	43.0	Infin	0.792	0.279	NonLiq
5	46.75	2.708	2.185	70	0.05	0.614	43.0	Infin	0.787	0.279	NonLiq
5	47.25	2.739	2.201	70	0.05	0.614	43.0	Infin	0.782	0.278	NonLiq
5	47.75	2.771	2.217	70	0.05	0.614	43.0	Infin	0.776	0.278	NonLiq
5	48.25	2.802	2.233	70	0.05	0.614	43.0	Infin	0.771	0.277	NonLiq
5	48.75	2.834	2.249	70	0.05	0.614	43.0	Infin	0.766	0.276	NonLiq
5	49.25	2.865	2.265	70	0.05	0.614	43.0	Infin	0.761	0.275	NonLiq
5	49.75	2.897	2.281	70	0.05	0.614	43.0	Infin	0.756	0.275	NonLiq

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EMPIRICAL PREDICTION OF
EARTHQUAKE-INDUCED LIQUEFACTION POTENTIAL

JOB NUMBER: 19-AE-834 DATE: 04-26-2019

JOB NAME: ShermanBoring2

SOIL-PROFILE NAME: SHERMAN.LDW

BORING GROUNDWATER DEPTH: 60.00 ft

CALCULATION GROUNDWATER DEPTH: 30.00 ft

DESIGN EARTHQUAKE MAGNITUDE: 6.65 Mw

SITE PEAK GROUND ACCELERATION: 0.660 g

BOREHOLE DIAMETER CORRECTION FACTOR: 1.00

SAMPLER SIZE CORRECTION FACTOR: 1.00

N60 HAMMER CORRECTION FACTOR: 1.00

MAGNITUDE SCALING FACTOR METHOD: Idriss (1997, in press)

Magnitude Scaling Factor: 1.360

rd-CORRECTION METHOD: Seed (1985)

FIELD SPT N-VALUES ARE CORRECTED FOR THE LENGTH OF THE DRIVE RODS.

Rod Stick-Up Above Ground: 3.0 ft

CN NORMALIZATION FACTOR: 1.044 tsf

MINIMUM CN VALUE: 0.6

SOIL NO.	CALC. DEPTH (ft)	TOTAL STRESS (tsf)	EFF. STRESS (tsf)	FIELD N (B/ft)	FC DELTA N1_60	C N	CORR. (N1)60 (B/ft)	LIQUE. RESIST RATIO	r d	INDUC. STRESS RATIO	LIQUE. SAFETY FACTOR
1	0.25	0.015	0.015	31	4.14	*	*	*	*	*	**
1	0.75	0.044	0.044	31	4.14	*	*	*	*	*	**
1	1.25	0.073	0.073	31	4.14	*	*	*	*	*	**
1	1.75	0.102	0.102	31	4.14	*	*	*	*	*	**
1	2.25	0.131	0.131	31	4.14	*	*	*	*	*	**
1	2.75	0.160	0.160	31	4.14	*	*	*	*	*	**
1	3.25	0.189	0.189	31	4.14	*	*	*	*	*	**
1	3.75	0.218	0.218	31	4.14	*	*	*	*	*	**
1	4.25	0.247	0.247	31	4.14	*	*	*	*	*	**
1	4.75	0.276	0.276	31	4.14	*	*	*	*	*	**
1	5.25	0.305	0.305	31	4.14	*	*	*	*	*	**
1	5.75	0.334	0.334	31	4.14	*	*	*	*	*	**
1	6.25	0.363	0.363	31	4.14	*	*	*	*	*	**
1	6.75	0.392	0.392	31	4.14	*	*	*	*	*	**
1	7.25	0.421	0.421	31	4.14	*	*	*	*	*	**
1	7.75	0.450	0.450	31	4.14	*	*	*	*	*	**
1	8.25	0.479	0.479	31	4.14	*	*	*	*	*	**
1	8.75	0.508	0.508	31	4.14	*	*	*	*	*	**
1	9.25	0.537	0.537	31	4.14	*	*	*	*	*	**
1	9.75	0.566	0.566	31	4.14	*	*	*	*	*	**
1	10.25	0.595	0.595	31	4.14	*	*	*	*	*	**
1	10.75	0.623	0.623	31	4.14	*	*	*	*	*	**
1	11.25	0.652	0.652	31	4.14	*	*	*	*	*	**
1	11.75	0.681	0.681	31	4.14	*	*	*	*	*	**
1	12.25	0.710	0.710	31	4.14	*	*	*	*	*	**
1	12.75	0.739	0.739	31	4.14	*	*	*	*	*	**
1	13.25	0.768	0.768	31	4.14	*	*	*	*	*	**
1	13.75	0.797	0.797	31	4.14	*	*	*	*	*	**
1	14.25	0.826	0.826	31	4.14	*	*	*	*	*	**
1	14.75	0.855	0.855	31	4.14	*	*	*	*	*	**
1	15.25	0.884	0.884	31	4.14	*	*	*	*	*	**
1	15.75	0.913	0.913	31	4.14	*	*	*	*	*	**
1	16.25	0.942	0.942	31	4.14	*	*	*	*	*	**
1	16.75	0.971	0.971	31	4.14	*	*	*	*	*	**
1	17.25	1.000	1.000	31	4.14	*	*	*	*	*	**
1	17.75	1.029	1.029	31	4.14	*	*	*	*	*	**
1	18.25	1.058	1.058	31	4.14	*	*	*	*	*	**
1	18.75	1.087	1.087	31	4.14	*	*	*	*	*	**
1	19.25	1.116	1.116	31	4.14	*	*	*	*	*	**
1	19.75	1.145	1.145	31	4.14	*	*	*	*	*	**
1	20.25	1.174	1.174	31	4.14	*	*	*	*	*	**
1	20.75	1.203	1.203	31	4.14	*	*	*	*	*	**
1	21.25	1.232	1.232	31	4.14	*	*	*	*	*	**

SOIL	CALC. DEPTH	TOTAL STRESS	EFF. STRESS	FIELD N	FC DELTA	C	CORR. (N1)60	LIQUE. RESIST	r	INDUC. STRESS	LIQUE. SAFETY

NO.	(ft)	(tsf)	(tsf)	(B/ft)	N1_60	N	(B/ft)	RATIO	d	RATIO	FACTOR
1	21.75	1.261	1.261	31	4.14	*	*	*	*	*	**
1	22.25	1.290	1.290	31	4.14	*	*	*	*	*	**
1	22.75	1.319	1.319	31	4.14	*	*	*	*	*	**
1	23.25	1.348	1.348	31	4.14	*	*	*	*	*	**
1	23.75	1.377	1.377	31	4.14	*	*	*	*	*	**
1	24.25	1.406	1.406	31	4.14	*	*	*	*	*	**
1	24.75	1.435	1.435	31	4.14	*	*	*	*	*	**
1	25.25	1.464	1.464	31	4.14	*	*	*	*	*	**
1	25.75	1.493	1.493	31	4.14	*	*	*	*	*	**
1	26.25	1.522	1.522	31	4.14	*	*	*	*	*	**
1	26.75	1.551	1.551	31	4.14	*	*	*	*	*	**
1	27.25	1.580	1.580	31	4.14	*	*	*	*	*	**
2	27.75	1.610	1.610	35	3.78	*	*	*	*	*	**
2	28.25	1.640	1.640	35	3.78	*	*	*	*	*	**
2	28.75	1.669	1.669	35	3.78	*	*	*	*	*	**
2	29.25	1.699	1.699	35	3.78	*	*	*	*	*	**
2	29.75	1.729	1.729	35	3.78	*	*	*	*	*	**
2	30.25	1.759	1.751	35	3.78	0.764	30.5	Infin	0.920	0.396	NonLiq
2	30.75	1.788	1.765	35	3.78	0.764	30.5	Infin	0.917	0.399	NonLiq
2	31.25	1.818	1.779	35	3.78	0.764	30.5	Infin	0.914	0.401	NonLiq
2	31.75	1.848	1.793	35	3.78	0.764	30.5	Infin	0.912	0.403	NonLiq
2	32.25	1.878	1.807	35	3.78	0.764	30.5	Infin	0.909	0.405	NonLiq
3	32.75	1.907	1.822	51	0.05	0.712	36.4	Infin	0.906	0.407	NonLiq
3	33.25	1.937	1.836	51	0.05	0.712	36.4	Infin	0.903	0.409	NonLiq
3	33.75	1.967	1.850	51	0.05	0.712	36.4	Infin	0.899	0.410	NonLiq
3	34.25	1.997	1.865	51	0.05	0.712	36.4	Infin	0.896	0.412	NonLiq
3	34.75	2.027	1.879	51	0.05	0.712	36.4	Infin	0.893	0.413	NonLiq
3	35.25	2.057	1.894	51	0.05	0.712	36.4	Infin	0.889	0.415	NonLiq
3	35.75	2.087	1.908	51	0.05	0.712	36.4	Infin	0.886	0.416	NonLiq
3	36.25	2.117	1.922	51	0.05	0.712	36.4	Infin	0.882	0.417	NonLiq
3	36.75	2.147	1.937	51	0.05	0.712	36.4	Infin	0.878	0.418	NonLiq
3	37.25	2.177	1.951	51	0.05	0.712	36.4	Infin	0.874	0.419	NonLiq
4	37.75	2.208	1.966	58	0.45	0.665	39.0	Infin	0.871	0.419	NonLiq
4	38.25	2.239	1.982	58	0.45	0.665	39.0	Infin	0.866	0.420	NonLiq
4	38.75	2.270	1.997	58	0.45	0.665	39.0	Infin	0.862	0.421	NonLiq
4	39.25	2.301	2.012	58	0.45	0.665	39.0	Infin	0.858	0.421	NonLiq
4	39.75	2.332	2.028	58	0.45	0.665	39.0	Infin	0.854	0.421	NonLiq
4	40.25	2.363	2.043	58	0.45	0.665	39.0	Infin	0.849	0.421	NonLiq
4	40.75	2.394	2.059	58	0.45	0.665	39.0	Infin	0.845	0.422	NonLiq
4	41.25	2.425	2.074	58	0.45	0.665	39.0	Infin	0.840	0.422	NonLiq
4	41.75	2.456	2.089	58	0.45	0.665	39.0	Infin	0.836	0.421	NonLiq
4	42.25	2.487	2.105	58	0.45	0.665	39.0	Infin	0.831	0.421	NonLiq
5	42.75	2.518	2.120	100	1.07	0.615	62.5	Infin	0.826	0.421	NonLiq
5	43.25	2.549	2.135	100	1.07	0.615	62.5	Infin	0.822	0.421	NonLiq

NCEER [1997] Method

LIQUEFACTION ANALYSIS SUMMARY

File Name: SHERMAN.OUT

SOIL NO.	CALC. DEPTH (ft)	TOTAL STRESS (tsf)	EFF. STRESS (tsf)	FIELD N (B/ft)	FC DELTA N1_60	C N	CORR. (N1)60 (B/ft)	LIQUE. RESIST RATIO	r d	INDUC. STRESS RATIO	LIQUE. SAFETY FACTOR
5	43.75	2.579	2.150	100	1.07	0.615	62.5	Infin	0.817	0.420	NonLiq

5	44.25	2.610	2.166	100	1.07	0.615	62.5	Infin	0.812	0.420	NonLiq
5	44.75	2.641	2.181	100	1.07	0.615	62.5	Infin	0.807	0.419	NonLiq
5	45.25	2.672	2.196	100	1.07	0.615	62.5	Infin	0.802	0.418	NonLiq
5	45.75	2.702	2.211	100	1.07	0.615	62.5	Infin	0.797	0.418	NonLiq
5	46.25	2.733	2.226	100	1.07	0.615	62.5	Infin	0.792	0.417	NonLiq
5	46.75	2.764	2.241	100	1.07	0.615	62.5	Infin	0.787	0.416	NonLiq
5	47.25	2.795	2.256	100	1.07	0.615	62.5	Infin	0.782	0.415	NonLiq
6	47.75	2.826	2.272	120	0.37	0.600	72.4	Infin	0.776	0.414	NonLiq
6	48.25	2.857	2.287	120	0.37	0.600	72.4	Infin	0.771	0.413	NonLiq
6	48.75	2.888	2.303	120	0.37	0.600	72.4	Infin	0.766	0.412	NonLiq
6	49.25	2.919	2.319	120	0.37	0.600	72.4	Infin	0.761	0.411	NonLiq
6	49.75	2.951	2.334	120	0.37	0.600	72.4	Infin	0.756	0.410	NonLiq

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*                           *
*      L I Q U E F Y 2      *
*                           *
*       Version 1.50        *
*                           *
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EMPIRICAL PREDICTION OF
EARTHQUAKE-INDUCED LIQUEFACTION POTENTIAL

JOB NUMBER: 19-AE-834 DATE: 04-26-2019

JOB NAME: ShermanBoring2

SOIL-PROFILE NAME: SHERMAN.LDW

BORING GROUNDWATER DEPTH: 60.00 ft

CALCULATION GROUNDWATER DEPTH: 30.00 ft

DESIGN EARTHQUAKE MAGNITUDE: 6.65 Mw

SITE PEAK GROUND ACCELERATION: 0.440 g

BOREHOLE DIAMETER CORRECTION FACTOR: 1.00

SAMPLER SIZE CORRECTION FACTOR: 1.00

N60 HAMMER CORRECTION FACTOR: 1.00

MAGNITUDE SCALING FACTOR METHOD: Idriss (1997, in press)

Magnitude Scaling Factor: 1.360

rd-CORRECTION METHOD: Seed (1985)

FIELD SPT N-VALUES ARE CORRECTED FOR THE LENGTH OF THE DRIVE RODS.

Rod Stick-Up Above Ground: 3.0 ft

CN NORMALIZATION FACTOR: 1.044 tsf

MINIMUM CN VALUE: 0.6

SOIL NO.	CALC. DEPTH (ft)	TOTAL STRESS (tsf)	EFF. STRESS (tsf)	FIELD N (B/ft)	FC DELTA N1_60	C N	CORR. (N1)60 (B/ft)	LIQUE. RESIST RATIO	r d	INDUC. STRESS RATIO	LIQUE. SAFETY FACTOR
1	0.25	0.015	0.015	31	4.14	*	*	*	*	*	**
1	0.75	0.044	0.044	31	4.14	*	*	*	*	*	**
1	1.25	0.073	0.073	31	4.14	*	*	*	*	*	**
1	1.75	0.102	0.102	31	4.14	*	*	*	*	*	**
1	2.25	0.131	0.131	31	4.14	*	*	*	*	*	**
1	2.75	0.160	0.160	31	4.14	*	*	*	*	*	**
1	3.25	0.189	0.189	31	4.14	*	*	*	*	*	**
1	3.75	0.218	0.218	31	4.14	*	*	*	*	*	**
1	4.25	0.247	0.247	31	4.14	*	*	*	*	*	**
1	4.75	0.276	0.276	31	4.14	*	*	*	*	*	**
1	5.25	0.305	0.305	31	4.14	*	*	*	*	*	**
1	5.75	0.334	0.334	31	4.14	*	*	*	*	*	**
1	6.25	0.363	0.363	31	4.14	*	*	*	*	*	**
1	6.75	0.392	0.392	31	4.14	*	*	*	*	*	**
1	7.25	0.421	0.421	31	4.14	*	*	*	*	*	**
1	7.75	0.450	0.450	31	4.14	*	*	*	*	*	**
1	8.25	0.479	0.479	31	4.14	*	*	*	*	*	**
1	8.75	0.508	0.508	31	4.14	*	*	*	*	*	**
1	9.25	0.537	0.537	31	4.14	*	*	*	*	*	**
1	9.75	0.566	0.566	31	4.14	*	*	*	*	*	**
1	10.25	0.595	0.595	31	4.14	*	*	*	*	*	**
1	10.75	0.623	0.623	31	4.14	*	*	*	*	*	**
1	11.25	0.652	0.652	31	4.14	*	*	*	*	*	**
1	11.75	0.681	0.681	31	4.14	*	*	*	*	*	**
1	12.25	0.710	0.710	31	4.14	*	*	*	*	*	**
1	12.75	0.739	0.739	31	4.14	*	*	*	*	*	**
1	13.25	0.768	0.768	31	4.14	*	*	*	*	*	**
1	13.75	0.797	0.797	31	4.14	*	*	*	*	*	**
1	14.25	0.826	0.826	31	4.14	*	*	*	*	*	**
1	14.75	0.855	0.855	31	4.14	*	*	*	*	*	**
1	15.25	0.884	0.884	31	4.14	*	*	*	*	*	**
1	15.75	0.913	0.913	31	4.14	*	*	*	*	*	**
1	16.25	0.942	0.942	31	4.14	*	*	*	*	*	**
1	16.75	0.971	0.971	31	4.14	*	*	*	*	*	**
1	17.25	1.000	1.000	31	4.14	*	*	*	*	*	**
1	17.75	1.029	1.029	31	4.14	*	*	*	*	*	**
1	18.25	1.058	1.058	31	4.14	*	*	*	*	*	**
1	18.75	1.087	1.087	31	4.14	*	*	*	*	*	**
1	19.25	1.116	1.116	31	4.14	*	*	*	*	*	**
1	19.75	1.145	1.145	31	4.14	*	*	*	*	*	**
1	20.25	1.174	1.174	31	4.14	*	*	*	*	*	**
1	20.75	1.203	1.203	31	4.14	*	*	*	*	*	**
1	21.25	1.232	1.232	31	4.14	*	*	*	*	*	**

NCEER [1997] Method

LIQUEFACTION ANALYSIS SUMMARY

File Name: SHERMAN.OUT

SOIL	CALC. DEPTH	TOTAL STRESS	EFF. STRESS	FIELD N	FC DELTA	C	CORR. (N1)60	LIQUE. RESIST	r	INDUC. STRESS	LIQUE. SAFETY

NO.	(ft)	(tsf)	(tsf)	(B/ft)	N1_60	N	(B/ft)	RATIO	d	RATIO	FACTOR
1	21.75	1.261	1.261	31	4.14	*	*	*	*	*	**
1	22.25	1.290	1.290	31	4.14	*	*	*	*	*	**
1	22.75	1.319	1.319	31	4.14	*	*	*	*	*	**
1	23.25	1.348	1.348	31	4.14	*	*	*	*	*	**
1	23.75	1.377	1.377	31	4.14	*	*	*	*	*	**
1	24.25	1.406	1.406	31	4.14	*	*	*	*	*	**
1	24.75	1.435	1.435	31	4.14	*	*	*	*	*	**
1	25.25	1.464	1.464	31	4.14	*	*	*	*	*	**
1	25.75	1.493	1.493	31	4.14	*	*	*	*	*	**
1	26.25	1.522	1.522	31	4.14	*	*	*	*	*	**
1	26.75	1.551	1.551	31	4.14	*	*	*	*	*	**
1	27.25	1.580	1.580	31	4.14	*	*	*	*	*	**
2	27.75	1.610	1.610	35	3.78	*	*	*	*	*	**
2	28.25	1.640	1.640	35	3.78	*	*	*	*	*	**
2	28.75	1.669	1.669	35	3.78	*	*	*	*	*	**
2	29.25	1.699	1.699	35	3.78	*	*	*	*	*	**
2	29.75	1.729	1.729	35	3.78	*	*	*	*	*	**
2	30.25	1.759	1.751	35	3.78	0.764	30.5	Infin	0.920	0.264	NonLiq
2	30.75	1.788	1.765	35	3.78	0.764	30.5	Infin	0.917	0.266	NonLiq
2	31.25	1.818	1.779	35	3.78	0.764	30.5	Infin	0.914	0.267	NonLiq
2	31.75	1.848	1.793	35	3.78	0.764	30.5	Infin	0.912	0.269	NonLiq
2	32.25	1.878	1.807	35	3.78	0.764	30.5	Infin	0.909	0.270	NonLiq
3	32.75	1.907	1.822	51	0.05	0.712	36.4	Infin	0.906	0.271	NonLiq
3	33.25	1.937	1.836	51	0.05	0.712	36.4	Infin	0.903	0.272	NonLiq
3	33.75	1.967	1.850	51	0.05	0.712	36.4	Infin	0.899	0.274	NonLiq
3	34.25	1.997	1.865	51	0.05	0.712	36.4	Infin	0.896	0.275	NonLiq
3	34.75	2.027	1.879	51	0.05	0.712	36.4	Infin	0.893	0.275	NonLiq
3	35.25	2.057	1.894	51	0.05	0.712	36.4	Infin	0.889	0.276	NonLiq
3	35.75	2.087	1.908	51	0.05	0.712	36.4	Infin	0.886	0.277	NonLiq
3	36.25	2.117	1.922	51	0.05	0.712	36.4	Infin	0.882	0.278	NonLiq
3	36.75	2.147	1.937	51	0.05	0.712	36.4	Infin	0.878	0.279	NonLiq
3	37.25	2.177	1.951	51	0.05	0.712	36.4	Infin	0.874	0.279	NonLiq
4	37.75	2.208	1.966	58	0.45	0.665	39.0	Infin	0.871	0.280	NonLiq
4	38.25	2.239	1.982	58	0.45	0.665	39.0	Infin	0.866	0.280	NonLiq
4	38.75	2.270	1.997	58	0.45	0.665	39.0	Infin	0.862	0.280	NonLiq
4	39.25	2.301	2.012	58	0.45	0.665	39.0	Infin	0.858	0.281	NonLiq
4	39.75	2.332	2.028	58	0.45	0.665	39.0	Infin	0.854	0.281	NonLiq
4	40.25	2.363	2.043	58	0.45	0.665	39.0	Infin	0.849	0.281	NonLiq
4	40.75	2.394	2.059	58	0.45	0.665	39.0	Infin	0.845	0.281	NonLiq
4	41.25	2.425	2.074	58	0.45	0.665	39.0	Infin	0.840	0.281	NonLiq
4	41.75	2.456	2.089	58	0.45	0.665	39.0	Infin	0.836	0.281	NonLiq
4	42.25	2.487	2.105	58	0.45	0.665	39.0	Infin	0.831	0.281	NonLiq
5	42.75	2.518	2.120	100	1.07	0.615	62.5	Infin	0.826	0.281	NonLiq
5	43.25	2.549	2.135	100	1.07	0.615	62.5	Infin	0.822	0.280	NonLiq

File Name: SHERMAN.OUT

SOIL NO.	CALC. DEPTH (ft)	TOTAL STRESS (tsf)	EFF. STRESS (tsf)	FIELD N (B/ft)	FC DELTA N1_60	C N	CORR. (N1)60 (B/ft)	LIQUE. RESIST RATIO	r d	INDUC. STRESS RATIO	LIQUE. SAFETY FACTOR
5	43.75	2.579	2.150	100	1.07	0.615	62.5	Infin	0.817	0.280	NonLiq

60.0

27.5	31.0	1	116.0	16	0.560	26.25
32.5	35.0	1	119.0	15	0.590	30.75
37.5	51.0	1	120.0	4	0.260	35.25
42.5	58.0	1	124.0	7	0.330	40.25
47.5	100.0	1	123.0	8	0.250	46.75
50.0	120.0	1	125.0	6	0.210	49.25

60

27.5	29.66	26.93	1	116.0	16.0	0.560	26.25	9999.00
32.5	30.53	28.09	1	119.0	15.0	0.590	30.75	9999.00
37.5	36.37	36.33	1	120.0	4.0	0.260	35.25	9999.00
42.5	39.00	39.18	1	124.0	7.0	0.330	40.25	9999.00
47.5	62.53	62.25	1	123.0	8.0	0.250	46.75	9999.00
50.0	72.37	72.39	1	125.0	6.0	0.210	49.25	9999.00

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LIQUEFACTION ANALYSIS SUMMARY

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Input File Name: UNTITLED
Title:
Subtitle:

Surface Elev.=
Hole No.=2
Depth of Hole= 50.00 ft
Water Table during Earthquake= 60.00 ft
Water Table during In-Situ Testing= 30.00 ft
Max. Acceleration= 0.66 g
Earthquake Magnitude= 6.65

Input Data:
Surface Elev.=
Hole No.=2
Depth of Hole=50.00 ft
Water Table during Earthquake= 60.00 ft
Water Table during In-Situ Testing= 30.00 ft
Max. Acceleration=0.66 g
Earthquake Magnitude=6.65
No-Liquefiable Soils: CL, OL are Non-Liq. Soil

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Ishihara / Yoshimine
3. Fines Correction for Liquefaction: Idriss/Seed
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1
7. Borehole Diameter, Cb= 1
8. Sampling Method, Cs= 1
9. User request factor of safety (apply to CSR) , User= 1
   Plot two CSR (fs1=1, fs2=User)
10. Use Curve Smoothing: Yes*

* Recommended Options

In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
27.50	31.00	116.00	-1.00
32.50	35.00	119.00	-1.00
37.50	51.00	120.00	-1.00
42.50	58.00	124.00	-1.00
47.50	100.00	123.00	-1.00
50.00	120.00	125.00	-1.00

Output Results:

Settlement of Saturated Sands=0.00 in.
Settlement of Unsaturated Sands=0.29 in.
Total Settlement of Saturated and Unsaturated Sands=0.29 in.
Differential Settlement=0.144 to 0.190 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
27.50	0.40	0.40	1.00*	0.00	0.29	0.29
27.55	0.40	0.40	1.00*	0.00	0.29	0.29
27.60	0.40	0.40	1.00*	0.00	0.29	0.29
27.65	0.40	0.40	1.00*	0.00	0.28	0.28
27.70	0.40	0.40	1.00*	0.00	0.28	0.28
27.75	0.40	0.40	1.00*	0.00	0.28	0.28
27.80	0.40	0.40	1.00*	0.00	0.28	0.28
27.85	0.40	0.40	1.00*	0.00	0.28	0.28
27.90	0.40	0.40	1.00*	0.00	0.28	0.28
27.95	0.40	0.40	1.00*	0.00	0.28	0.28
28.00	0.40	0.40	1.00*	0.00	0.27	0.27
28.05	0.40	0.40	1.00*	0.00	0.27	0.27
28.10	0.40	0.40	1.00*	0.00	0.27	0.27
28.15	0.40	0.40	1.00*	0.00	0.27	0.27
28.20	0.40	0.40	1.00*	0.00	0.27	0.27
28.25	0.40	0.40	1.00*	0.00	0.27	0.27
28.30	0.40	0.40	1.00*	0.00	0.27	0.27
28.35	0.40	0.40	1.00*	0.00	0.27	0.27
28.40	0.40	0.40	1.00*	0.00	0.26	0.26
28.45	0.40	0.40	1.00*	0.00	0.26	0.26
28.50	0.40	0.40	1.00*	0.00	0.26	0.26
28.55	0.40	0.40	1.00*	0.00	0.26	0.26
28.60	0.40	0.40	1.00*	0.00	0.26	0.26
28.65	0.40	0.40	1.00*	0.00	0.26	0.26
28.70	0.40	0.40	1.00*	0.00	0.26	0.26
28.75	0.40	0.40	1.00*	0.00	0.26	0.26
28.80	0.40	0.40	1.00*	0.00	0.25	0.25

28.85	0.40	0.40	1.00*	0.00	0.25	0.25
28.90	0.40	0.40	1.00*	0.00	0.25	0.25
28.95	0.40	0.40	1.00*	0.00	0.25	0.25
29.00	0.40	0.40	1.00*	0.00	0.25	0.25
29.05	0.40	0.40	1.00*	0.00	0.25	0.25
29.10	0.40	0.40	1.00*	0.00	0.25	0.25
29.15	0.40	0.40	1.00*	0.00	0.24	0.24
29.20	0.40	0.40	1.00*	0.00	0.24	0.24
29.25	0.40	0.40	1.00*	0.00	0.24	0.24
29.30	0.40	0.40	1.00*	0.00	0.24	0.24
29.35	0.40	0.40	1.00*	0.00	0.24	0.24
29.40	0.40	0.40	1.00*	0.00	0.24	0.24
29.45	0.40	0.40	1.00*	0.00	0.24	0.24
29.50	0.40	0.40	1.00*	0.00	0.24	0.24
29.55	0.40	0.40	1.00*	0.00	0.23	0.23
29.60	0.40	0.40	1.00*	0.00	0.23	0.23
29.65	0.40	0.40	1.00*	0.00	0.23	0.23
29.70	0.40	0.40	1.00*	0.00	0.23	0.23
29.75	0.40	0.40	1.00*	0.00	0.23	0.23
29.80	0.40	0.40	1.00*	0.00	0.23	0.23
29.85	0.40	0.40	1.00*	0.00	0.23	0.23
29.90	0.40	0.40	1.00*	0.00	0.22	0.22
29.95	0.40	0.40	1.00*	0.00	0.22	0.22
30.00	0.40	0.40	1.00*	0.00	0.22	0.22
30.05	0.40	0.40	1.00*	0.00	0.22	0.22
30.10	0.40	0.40	1.00*	0.00	0.22	0.22
30.15	0.40	0.40	1.00*	0.00	0.22	0.22
30.20	0.40	0.40	1.00*	0.00	0.22	0.22
30.25	0.40	0.40	1.00*	0.00	0.22	0.22
30.30	0.40	0.40	1.00*	0.00	0.21	0.21
30.35	0.40	0.40	1.00*	0.00	0.21	0.21
30.40	0.40	0.40	1.00*	0.00	0.21	0.21
30.45	0.40	0.40	1.00*	0.00	0.21	0.21
30.50	0.40	0.40	1.00*	0.00	0.21	0.21
30.55	0.40	0.40	1.00*	0.00	0.21	0.21
30.60	0.40	0.40	1.00*	0.00	0.21	0.21
30.65	0.40	0.40	1.00*	0.00	0.20	0.20
30.70	0.40	0.40	1.00*	0.00	0.20	0.20
30.75	0.40	0.40	1.00*	0.00	0.20	0.20
30.80	0.40	0.40	1.00*	0.00	0.20	0.20
30.85	0.40	0.40	1.00*	0.00	0.20	0.20
30.90	0.40	0.40	1.00*	0.00	0.20	0.20
30.95	0.40	0.40	1.00*	0.00	0.20	0.20
31.00	0.40	0.40	1.00*	0.00	0.20	0.20
31.05	0.40	0.40	1.00*	0.00	0.19	0.19
31.10	0.40	0.40	1.00*	0.00	0.19	0.19
31.15	0.39	0.39	1.00*	0.00	0.19	0.19
31.20	0.39	0.39	1.00*	0.00	0.19	0.19

31.25	0.39	0.39	1.00*	0.00	0.19	0.19
31.30	0.39	0.39	1.00*	0.00	0.19	0.19
31.35	0.39	0.39	1.00*	0.00	0.19	0.19
31.40	0.39	0.39	1.00*	0.00	0.19	0.19
31.45	0.39	0.39	1.00*	0.00	0.18	0.18
31.50	0.39	0.39	1.00*	0.00	0.18	0.18
31.55	0.39	0.39	1.00*	0.00	0.18	0.18
31.60	0.39	0.39	1.00*	0.00	0.18	0.18
31.65	0.39	0.39	1.00*	0.00	0.18	0.18
31.70	0.39	0.39	1.00*	0.00	0.18	0.18
31.75	0.39	0.39	1.00*	0.00	0.18	0.18
31.80	0.39	0.39	1.00*	0.00	0.18	0.18
31.85	0.39	0.39	1.00*	0.00	0.17	0.17
31.90	0.39	0.39	1.00*	0.00	0.17	0.17
31.95	0.39	0.39	1.00*	0.00	0.17	0.17
32.00	0.39	0.39	1.00*	0.00	0.17	0.17
32.05	0.39	0.39	1.00*	0.00	0.17	0.17
32.10	0.39	0.39	1.00*	0.00	0.17	0.17
32.15	0.39	0.39	1.00*	0.00	0.17	0.17
32.20	0.39	0.39	1.00*	0.00	0.17	0.17
32.25	0.39	0.39	1.00*	0.00	0.16	0.16
32.30	0.39	0.39	1.00*	0.00	0.16	0.16
32.35	0.39	0.39	1.00*	0.00	0.16	0.16
32.40	0.39	0.39	1.00*	0.00	0.16	0.16
32.45	0.39	0.39	1.00*	0.00	0.16	0.16
32.50	0.39	0.39	1.00*	0.00	0.16	0.16
32.55	0.39	0.39	1.00*	0.00	0.16	0.16
32.60	0.39	0.39	1.00*	0.00	0.16	0.16
32.65	0.39	0.39	1.00*	0.00	0.15	0.15
32.70	0.39	0.39	1.00*	0.00	0.15	0.15
32.75	0.39	0.39	1.00*	0.00	0.15	0.15
32.80	0.39	0.39	1.00*	0.00	0.15	0.15
32.85	0.39	0.39	1.00*	0.00	0.15	0.15
32.90	0.39	0.39	1.00*	0.00	0.15	0.15
32.95	0.39	0.39	1.00*	0.00	0.15	0.15
33.00	0.39	0.39	1.00*	0.00	0.15	0.15
33.05	0.39	0.39	1.00*	0.00	0.15	0.15
33.10	0.39	0.39	1.00*	0.00	0.14	0.14
33.15	0.39	0.39	1.00*	0.00	0.14	0.14
33.20	0.39	0.39	1.00*	0.00	0.14	0.14
33.25	0.39	0.39	1.00*	0.00	0.14	0.14
33.30	0.39	0.39	1.00*	0.00	0.14	0.14
33.35	0.39	0.39	1.00*	0.00	0.14	0.14
33.40	0.39	0.39	1.00*	0.00	0.14	0.14
33.45	0.39	0.39	1.00*	0.00	0.14	0.14
33.50	0.39	0.39	1.00*	0.00	0.14	0.14
33.55	0.39	0.39	1.00*	0.00	0.13	0.13
33.60	0.39	0.39	1.00*	0.00	0.13	0.13

33.65	0.39	0.39	1.00*	0.00	0.13	0.13
33.70	0.39	0.39	1.00*	0.00	0.13	0.13
33.75	0.39	0.39	1.00*	0.00	0.13	0.13
33.80	0.39	0.39	1.00*	0.00	0.13	0.13
33.85	0.39	0.39	1.00*	0.00	0.13	0.13
33.90	0.39	0.39	1.00*	0.00	0.13	0.13
33.95	0.39	0.39	1.00*	0.00	0.13	0.13
34.00	0.38	0.38	1.00*	0.00	0.13	0.13
34.05	0.38	0.38	1.00*	0.00	0.13	0.13
34.10	0.38	0.38	1.00*	0.00	0.12	0.12
34.15	0.38	0.38	1.00*	0.00	0.12	0.12
34.20	0.38	0.38	1.00*	0.00	0.12	0.12
34.25	0.38	0.38	1.00*	0.00	0.12	0.12
34.30	0.38	0.38	1.00*	0.00	0.12	0.12
34.35	0.38	0.38	1.00*	0.00	0.12	0.12
34.40	0.38	0.38	1.00*	0.00	0.12	0.12
34.45	0.38	0.38	1.00*	0.00	0.12	0.12
34.50	0.38	0.38	1.00*	0.00	0.12	0.12
34.55	0.38	0.38	1.00*	0.00	0.12	0.12
34.60	0.38	0.38	1.00*	0.00	0.12	0.12
34.65	0.38	0.38	1.00*	0.00	0.11	0.11
34.70	0.38	0.38	1.00*	0.00	0.11	0.11
34.75	0.38	0.38	1.00*	0.00	0.11	0.11
34.80	0.38	0.38	1.00*	0.00	0.11	0.11
34.85	0.38	0.38	1.00*	0.00	0.11	0.11
34.90	0.38	0.38	1.00*	0.00	0.11	0.11
34.95	0.38	0.38	1.00*	0.00	0.11	0.11
35.00	0.38	0.38	1.00*	0.00	0.11	0.11
35.05	0.38	0.38	1.00*	0.00	0.11	0.11
35.10	0.38	0.38	1.00*	0.00	0.11	0.11
35.15	0.38	0.38	1.00*	0.00	0.11	0.11
35.20	0.38	0.38	1.00*	0.00	0.11	0.11
35.25	0.38	0.38	1.00*	0.00	0.11	0.11
35.30	0.38	0.38	1.00*	0.00	0.11	0.11
35.35	0.38	0.38	1.00*	0.00	0.10	0.10
35.40	0.38	0.38	1.00*	0.00	0.10	0.10
35.45	0.38	0.38	1.00*	0.00	0.10	0.10
35.50	0.38	0.38	1.00*	0.00	0.10	0.10
35.55	0.38	0.38	1.00*	0.00	0.10	0.10
35.60	0.38	0.38	1.00*	0.00	0.10	0.10
35.65	0.38	0.38	1.00*	0.00	0.10	0.10
35.70	0.38	0.38	1.00*	0.00	0.10	0.10
35.75	0.38	0.38	1.00*	0.00	0.10	0.10
35.80	0.38	0.38	1.00*	0.00	0.10	0.10
35.85	0.38	0.38	1.00*	0.00	0.10	0.10
35.90	0.38	0.38	1.00*	0.00	0.10	0.10
35.95	0.38	0.38	1.00*	0.00	0.10	0.10
36.00	0.38	0.38	1.00*	0.00	0.10	0.10

36.05	0.38	0.38	1.00*	0.00	0.10	0.10
36.10	0.38	0.38	1.00*	0.00	0.09	0.09
36.15	0.38	0.38	1.00*	0.00	0.09	0.09
36.20	0.38	0.38	1.00*	0.00	0.09	0.09
36.25	0.38	0.38	1.00*	0.00	0.09	0.09
36.30	0.38	0.38	1.00*	0.00	0.09	0.09
36.35	0.38	0.38	1.00*	0.00	0.09	0.09
36.40	0.38	0.38	1.00*	0.00	0.09	0.09
36.45	0.38	0.38	1.00*	0.00	0.09	0.09
36.50	0.38	0.38	1.00*	0.00	0.09	0.09
36.55	0.38	0.38	1.00*	0.00	0.09	0.09
36.60	0.38	0.38	1.00*	0.00	0.09	0.09
36.65	0.38	0.38	1.00*	0.00	0.09	0.09
36.70	0.38	0.38	1.00*	0.00	0.09	0.09
36.75	0.38	0.38	1.00*	0.00	0.09	0.09
36.80	0.38	0.38	1.00*	0.00	0.09	0.09
36.85	0.37	0.37	1.00*	0.00	0.09	0.09
36.90	0.37	0.37	1.00*	0.00	0.09	0.09
36.95	0.37	0.37	1.00*	0.00	0.08	0.08
37.00	0.37	0.37	1.00*	0.00	0.08	0.08
37.05	0.37	0.37	1.00*	0.00	0.08	0.08
37.10	0.37	0.37	1.00*	0.00	0.08	0.08
37.15	0.37	0.37	1.00*	0.00	0.08	0.08
37.20	0.37	0.37	1.00*	0.00	0.08	0.08
37.25	0.37	0.37	1.00*	0.00	0.08	0.08
37.30	0.37	0.37	1.00*	0.00	0.08	0.08
37.35	0.37	0.37	1.00*	0.00	0.08	0.08
37.40	0.37	0.37	1.00*	0.00	0.08	0.08
37.45	0.37	0.37	1.00*	0.00	0.08	0.08
37.50	0.37	0.37	1.00*	0.00	0.08	0.08
37.55	0.37	0.37	1.00*	0.00	0.08	0.08
37.60	0.37	0.37	1.00*	0.00	0.08	0.08
37.65	0.37	0.37	1.00*	0.00	0.08	0.08
37.70	0.37	0.37	1.00*	0.00	0.08	0.08
37.75	0.37	0.37	1.00*	0.00	0.08	0.08
37.80	0.37	0.37	1.00*	0.00	0.08	0.08
37.85	0.37	0.37	1.00*	0.00	0.08	0.08
37.90	0.37	0.37	1.00*	0.00	0.08	0.08
37.95	0.37	0.37	1.00*	0.00	0.07	0.07
38.00	0.37	0.37	1.00*	0.00	0.07	0.07
38.05	0.37	0.37	1.00*	0.00	0.07	0.07
38.10	0.37	0.37	1.00*	0.00	0.07	0.07
38.15	0.37	0.37	1.00*	0.00	0.07	0.07
38.20	0.37	0.37	1.00*	0.00	0.07	0.07
38.25	0.37	0.37	1.00*	0.00	0.07	0.07
38.30	0.37	0.37	1.00*	0.00	0.07	0.07
38.35	0.37	0.37	1.00*	0.00	0.07	0.07
38.40	0.37	0.37	1.00*	0.00	0.07	0.07

38.45	0.37	0.37	1.00*	0.00	0.07	0.07
38.50	0.37	0.37	1.00*	0.00	0.07	0.07
38.55	0.37	0.37	1.00*	0.00	0.07	0.07
38.60	0.37	0.37	1.00*	0.00	0.07	0.07
38.65	0.37	0.37	1.00*	0.00	0.07	0.07
38.70	0.37	0.37	1.00*	0.00	0.07	0.07
38.75	0.37	0.37	1.00*	0.00	0.07	0.07
38.80	0.37	0.37	1.00*	0.00	0.07	0.07
38.85	0.37	0.37	1.00*	0.00	0.07	0.07
38.90	0.37	0.37	1.00*	0.00	0.07	0.07
38.95	0.37	0.37	1.00*	0.00	0.07	0.07
39.00	0.37	0.37	1.00*	0.00	0.07	0.07
39.05	0.37	0.37	1.00*	0.00	0.07	0.07
39.10	0.37	0.37	1.00*	0.00	0.06	0.06
39.15	0.37	0.37	1.00*	0.00	0.06	0.06
39.20	0.37	0.37	1.00*	0.00	0.06	0.06
39.25	0.37	0.37	1.00*	0.00	0.06	0.06
39.30	0.37	0.37	1.00*	0.00	0.06	0.06
39.35	0.37	0.37	1.00*	0.00	0.06	0.06
39.40	0.37	0.37	1.00*	0.00	0.06	0.06
39.45	0.37	0.37	1.00*	0.00	0.06	0.06
39.50	0.37	0.37	1.00*	0.00	0.06	0.06
39.55	0.37	0.37	1.00*	0.00	0.06	0.06
39.60	0.37	0.37	1.00*	0.00	0.06	0.06
39.65	0.37	0.37	1.00*	0.00	0.06	0.06
39.70	0.37	0.37	1.00*	0.00	0.06	0.06
39.75	0.36	0.36	1.00*	0.00	0.06	0.06
39.80	0.36	0.36	1.00*	0.00	0.06	0.06
39.85	0.36	0.36	1.00*	0.00	0.06	0.06
39.90	0.36	0.36	1.00*	0.00	0.06	0.06
39.95	0.36	0.36	1.00*	0.00	0.06	0.06
40.00	0.36	0.36	1.00*	0.00	0.06	0.06
40.05	0.36	0.36	1.00*	0.00	0.06	0.06
40.10	0.36	0.36	1.00*	0.00	0.06	0.06
40.15	0.36	0.36	1.00*	0.00	0.06	0.06
40.20	0.36	0.36	1.00*	0.00	0.06	0.06
40.25	0.36	0.36	1.00*	0.00	0.06	0.06
40.30	0.36	0.36	1.00*	0.00	0.06	0.06
40.35	0.36	0.36	1.00*	0.00	0.05	0.05
40.40	0.36	0.36	1.00*	0.00	0.05	0.05
40.45	0.36	0.36	1.00*	0.00	0.05	0.05
40.50	0.36	0.36	1.00*	0.00	0.05	0.05
40.55	0.36	0.36	1.00*	0.00	0.05	0.05
40.60	0.36	0.36	1.00*	0.00	0.05	0.05
40.65	0.36	0.36	1.00*	0.00	0.05	0.05
40.70	0.36	0.36	1.00*	0.00	0.05	0.05
40.75	0.36	0.36	1.00*	0.00	0.05	0.05
40.80	0.36	0.36	1.00*	0.00	0.05	0.05

40.85	0.36	0.36	1.00*	0.00	0.05	0.05
40.90	0.36	0.36	1.00*	0.00	0.05	0.05
40.95	0.36	0.36	1.00*	0.00	0.05	0.05
41.00	0.36	0.36	1.00*	0.00	0.05	0.05
41.05	0.36	0.36	1.00*	0.00	0.05	0.05
41.10	0.36	0.36	1.00*	0.00	0.05	0.05
41.15	0.36	0.36	1.00*	0.00	0.05	0.05
41.20	0.36	0.36	1.00*	0.00	0.05	0.05
41.25	0.36	0.36	1.00*	0.00	0.05	0.05
41.30	0.36	0.36	1.00*	0.00	0.05	0.05
41.35	0.36	0.36	1.00*	0.00	0.05	0.05
41.40	0.36	0.36	1.00*	0.00	0.05	0.05
41.45	0.36	0.36	1.00*	0.00	0.05	0.05
41.50	0.36	0.36	1.00*	0.00	0.05	0.05
41.55	0.36	0.36	1.00*	0.00	0.05	0.05
41.60	0.36	0.36	1.00*	0.00	0.05	0.05
41.65	0.36	0.36	1.00*	0.00	0.05	0.05
41.70	0.36	0.36	1.00*	0.00	0.04	0.04
41.75	0.36	0.36	1.00*	0.00	0.04	0.04
41.80	0.36	0.36	1.00*	0.00	0.04	0.04
41.85	0.36	0.36	1.00*	0.00	0.04	0.04
41.90	0.36	0.36	1.00*	0.00	0.04	0.04
41.95	0.36	0.36	1.00*	0.00	0.04	0.04
42.00	0.36	0.36	1.00*	0.00	0.04	0.04
42.05	0.36	0.36	1.00*	0.00	0.04	0.04
42.10	0.36	0.36	1.00*	0.00	0.04	0.04
42.15	0.36	0.36	1.00*	0.00	0.04	0.04
42.20	0.36	0.36	1.00*	0.00	0.04	0.04
42.25	0.36	0.36	1.00*	0.00	0.04	0.04
42.30	0.36	0.36	1.00*	0.00	0.04	0.04
42.35	0.36	0.36	1.00*	0.00	0.04	0.04
42.40	0.36	0.36	1.00*	0.00	0.04	0.04
42.45	0.36	0.36	1.00*	0.00	0.04	0.04
42.50	0.36	0.36	1.00*	0.00	0.04	0.04
42.55	0.36	0.36	1.00*	0.00	0.04	0.04
42.60	0.35	0.35	1.00*	0.00	0.04	0.04
42.65	0.35	0.35	1.00*	0.00	0.04	0.04
42.70	0.35	0.35	1.00*	0.00	0.04	0.04
42.75	0.35	0.35	1.00*	0.00	0.04	0.04
42.80	0.35	0.35	1.00*	0.00	0.04	0.04
42.85	0.35	0.35	1.00*	0.00	0.04	0.04
42.90	0.35	0.35	1.00*	0.00	0.04	0.04
42.95	0.35	0.35	1.00*	0.00	0.04	0.04
43.00	0.35	0.35	1.00*	0.00	0.04	0.04
43.05	0.35	0.35	1.00*	0.00	0.04	0.04
43.10	0.35	0.35	1.00*	0.00	0.03	0.03
43.15	0.35	0.35	1.00*	0.00	0.03	0.03
43.20	0.35	0.35	1.00*	0.00	0.03	0.03

43.25	0.35	0.35	1.00*	0.00	0.03	0.03
43.30	0.35	0.35	1.00*	0.00	0.03	0.03
43.35	0.35	0.35	1.00*	0.00	0.03	0.03
43.40	0.35	0.35	1.00*	0.00	0.03	0.03
43.45	0.35	0.35	1.00*	0.00	0.03	0.03
43.50	0.35	0.35	1.00*	0.00	0.03	0.03
43.55	0.35	0.35	1.00*	0.00	0.03	0.03
43.60	0.35	0.35	1.00*	0.00	0.03	0.03
43.65	0.35	0.35	1.00*	0.00	0.03	0.03
43.70	0.35	0.35	1.00*	0.00	0.03	0.03
43.75	0.35	0.35	1.00*	0.00	0.03	0.03
43.80	0.35	0.35	1.00*	0.00	0.03	0.03
43.85	0.35	0.35	1.00*	0.00	0.03	0.03
43.90	0.35	0.35	1.00*	0.00	0.03	0.03
43.95	0.35	0.35	1.00*	0.00	0.03	0.03
44.00	0.35	0.35	1.00*	0.00	0.03	0.03
44.05	0.35	0.35	1.00*	0.00	0.03	0.03
44.10	0.35	0.35	1.00*	0.00	0.03	0.03
44.15	0.35	0.35	1.00*	0.00	0.03	0.03
44.20	0.35	0.35	1.00*	0.00	0.03	0.03
44.25	0.35	0.35	1.00*	0.00	0.03	0.03
44.30	0.35	0.35	1.00*	0.00	0.03	0.03
44.35	0.35	0.35	1.00*	0.00	0.03	0.03
44.40	0.35	0.35	1.00*	0.00	0.03	0.03
44.45	0.35	0.35	1.00*	0.00	0.03	0.03
44.50	0.35	0.35	1.00*	0.00	0.03	0.03
44.55	0.35	0.35	1.00*	0.00	0.03	0.03
44.60	0.35	0.35	1.00*	0.00	0.03	0.03
44.65	0.35	0.35	1.00*	0.00	0.03	0.03
44.70	0.35	0.35	1.00*	0.00	0.02	0.02
44.75	0.35	0.35	1.00*	0.00	0.02	0.02
44.80	0.35	0.35	1.00*	0.00	0.02	0.02
44.85	0.35	0.35	1.00*	0.00	0.02	0.02
44.90	0.35	0.35	1.00*	0.00	0.02	0.02
44.95	0.35	0.35	1.00*	0.00	0.02	0.02
45.00	0.35	0.35	1.00*	0.00	0.02	0.02
45.05	0.35	0.35	1.00*	0.00	0.02	0.02
45.10	0.35	0.35	1.00*	0.00	0.02	0.02
45.15	0.35	0.35	1.00*	0.00	0.02	0.02
45.20	0.35	0.35	1.00*	0.00	0.02	0.02
45.25	0.35	0.35	1.00*	0.00	0.02	0.02
45.30	0.35	0.35	1.00*	0.00	0.02	0.02
45.35	0.35	0.35	1.00*	0.00	0.02	0.02
45.40	0.35	0.35	1.00*	0.00	0.02	0.02
45.45	0.34	0.34	1.00*	0.00	0.02	0.02
45.50	0.34	0.34	1.00*	0.00	0.02	0.02
45.55	0.34	0.34	1.00*	0.00	0.02	0.02
45.60	0.34	0.34	1.00*	0.00	0.02	0.02

45.65	0.34	0.34	1.00*	0.00	0.02	0.02
45.70	0.34	0.34	1.00*	0.00	0.02	0.02
45.75	0.34	0.34	1.00*	0.00	0.02	0.02
45.80	0.34	0.34	1.00*	0.00	0.02	0.02
45.85	0.34	0.34	1.00*	0.00	0.02	0.02
45.90	0.34	0.34	1.00*	0.00	0.02	0.02
45.95	0.34	0.34	1.00*	0.00	0.02	0.02
46.00	0.34	0.34	1.00*	0.00	0.02	0.02
46.05	0.34	0.34	1.00*	0.00	0.02	0.02
46.10	0.34	0.34	1.00*	0.00	0.02	0.02
46.15	0.34	0.34	1.00*	0.00	0.02	0.02
46.20	0.34	0.34	1.00*	0.00	0.02	0.02
46.25	0.34	0.34	1.00*	0.00	0.02	0.02
46.30	0.34	0.34	1.00*	0.00	0.02	0.02
46.35	0.34	0.34	1.00*	0.00	0.02	0.02
46.40	0.34	0.34	1.00*	0.00	0.02	0.02
46.45	0.34	0.34	1.00*	0.00	0.02	0.02
46.50	0.34	0.34	1.00*	0.00	0.02	0.02
46.55	0.34	0.34	1.00*	0.00	0.02	0.02
46.60	0.34	0.34	1.00*	0.00	0.01	0.01
46.65	0.34	0.34	1.00*	0.00	0.01	0.01
46.70	0.34	0.34	1.00*	0.00	0.01	0.01
46.75	0.34	0.34	1.00*	0.00	0.01	0.01
46.80	0.34	0.34	1.00*	0.00	0.01	0.01
46.85	0.34	0.34	1.00*	0.00	0.01	0.01
46.90	0.34	0.34	1.00*	0.00	0.01	0.01
46.95	0.34	0.34	1.00*	0.00	0.01	0.01
47.00	0.34	0.34	1.00*	0.00	0.01	0.01
47.05	0.34	0.34	1.00*	0.00	0.01	0.01
47.10	0.34	0.34	1.00*	0.00	0.01	0.01
47.15	0.34	0.34	1.00*	0.00	0.01	0.01
47.20	0.34	0.34	1.00*	0.00	0.01	0.01
47.25	0.34	0.34	1.00*	0.00	0.01	0.01
47.30	0.34	0.34	1.00*	0.00	0.01	0.01
47.35	0.34	0.34	1.00*	0.00	0.01	0.01
47.40	0.34	0.34	1.00*	0.00	0.01	0.01
47.45	0.34	0.34	1.00*	0.00	0.01	0.01
47.50	0.34	0.34	1.00*	0.00	0.01	0.01
47.55	0.34	0.34	1.00*	0.00	0.01	0.01
47.60	0.34	0.34	1.00*	0.00	0.01	0.01
47.65	0.34	0.34	1.00*	0.00	0.01	0.01
47.70	0.34	0.34	1.00*	0.00	0.01	0.01
47.75	0.34	0.34	1.00*	0.00	0.01	0.01
47.80	0.34	0.34	1.00*	0.00	0.01	0.01
47.85	0.34	0.34	1.00*	0.00	0.01	0.01
47.90	0.34	0.34	1.00*	0.00	0.01	0.01
47.95	0.34	0.34	1.00*	0.00	0.01	0.01
48.00	0.34	0.34	1.00*	0.00	0.01	0.01

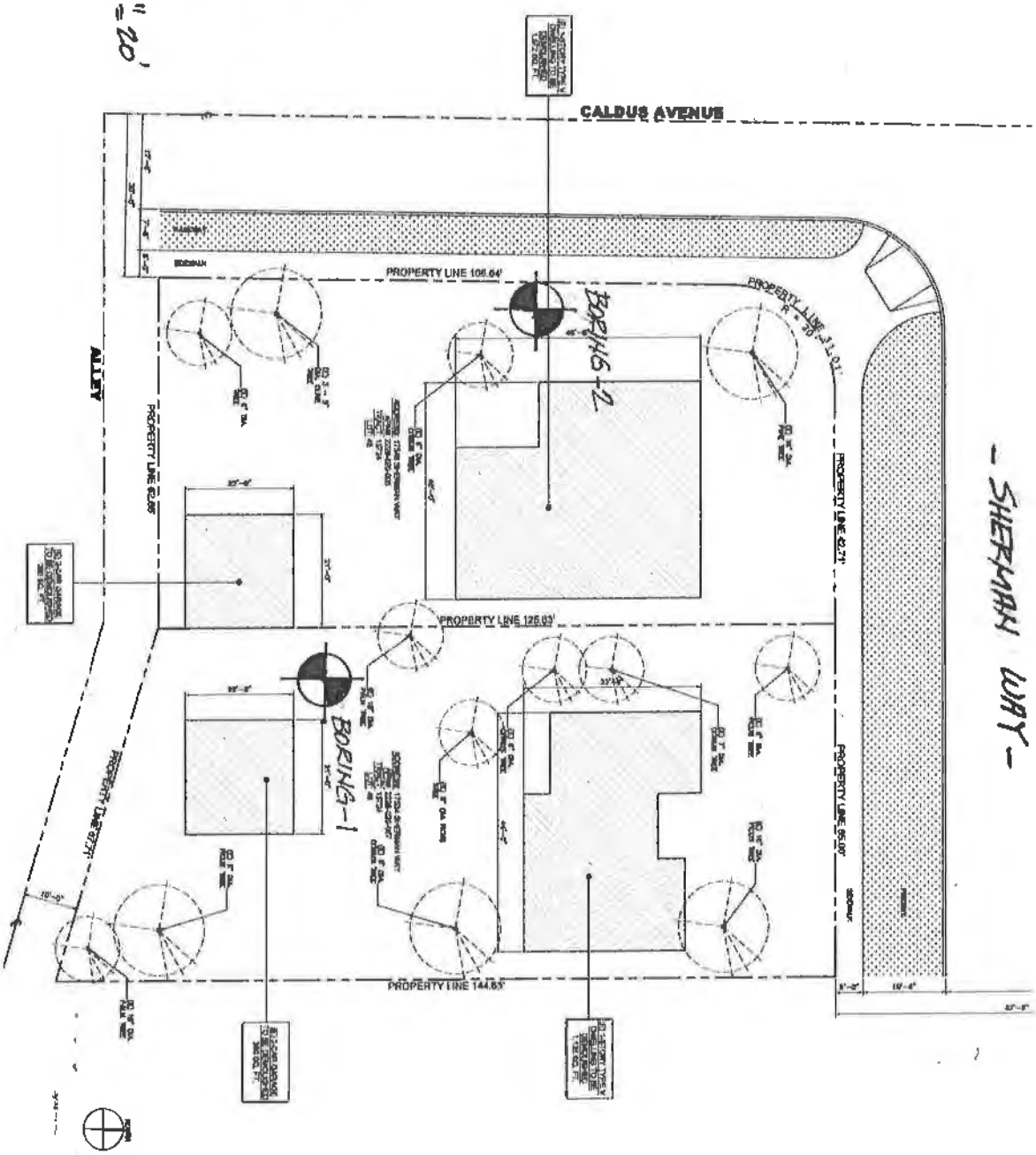
48.05	0.34	0.34	1.00*	0.00	0.01	0.01
48.10	0.34	0.34	1.00*	0.00	0.01	0.01
48.15	0.34	0.34	1.00*	0.00	0.01	0.01
48.20	0.34	0.34	1.00*	0.00	0.01	0.01
48.25	0.34	0.34	1.00*	0.00	0.01	0.01
48.30	0.34	0.34	1.00*	0.00	0.01	0.01
48.35	0.33	0.33	1.00*	0.00	0.01	0.01
48.40	0.33	0.33	1.00*	0.00	0.01	0.01
48.45	0.33	0.33	1.00*	0.00	0.01	0.01
48.50	0.33	0.33	1.00*	0.00	0.01	0.01
48.55	0.33	0.33	1.00*	0.00	0.01	0.01
48.60	0.33	0.33	1.00*	0.00	0.01	0.01
48.65	0.33	0.33	1.00*	0.00	0.01	0.01
48.70	0.33	0.33	1.00*	0.00	0.01	0.01
48.75	0.33	0.33	1.00*	0.00	0.01	0.01
48.80	0.33	0.33	1.00*	0.00	0.00	0.00
48.85	0.33	0.33	1.00*	0.00	0.00	0.00
48.90	0.33	0.33	1.00*	0.00	0.00	0.00
48.95	0.33	0.33	1.00*	0.00	0.00	0.00
49.00	0.33	0.33	1.00*	0.00	0.00	0.00
49.05	0.33	0.33	1.00*	0.00	0.00	0.00
49.10	0.33	0.33	1.00*	0.00	0.00	0.00
49.15	0.33	0.33	1.00*	0.00	0.00	0.00
49.20	0.33	0.33	1.00*	0.00	0.00	0.00
49.25	0.33	0.33	1.00*	0.00	0.00	0.00
49.30	0.33	0.33	1.00*	0.00	0.00	0.00
49.35	0.33	0.33	1.00*	0.00	0.00	0.00
49.40	0.33	0.33	1.00*	0.00	0.00	0.00
49.45	0.33	0.33	1.00*	0.00	0.00	0.00
49.50	0.33	0.33	1.00*	0.00	0.00	0.00
49.55	0.33	0.33	1.00*	0.00	0.00	0.00
49.60	0.33	0.33	1.00*	0.00	0.00	0.00
49.65	0.33	0.33	1.00*	0.00	0.00	0.00
49.70	0.33	0.33	1.00*	0.00	0.00	0.00
49.75	0.33	0.33	1.00*	0.00	0.00	0.00
49.80	0.33	0.33	1.00*	0.00	0.00	0.00
49.85	0.33	0.33	1.00*	0.00	0.00	0.00
49.90	0.33	0.33	1.00*	0.00	0.00	0.00
49.95	0.33	0.33	1.00*	0.00	0.00	0.00
50.00	0.33	0.33	1.00*	0.00	0.00	0.00

* F.S.<1, Liquefaction Potential Zone
(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

1 atm (atmosphere) = 1 tsf (ton/ft2)

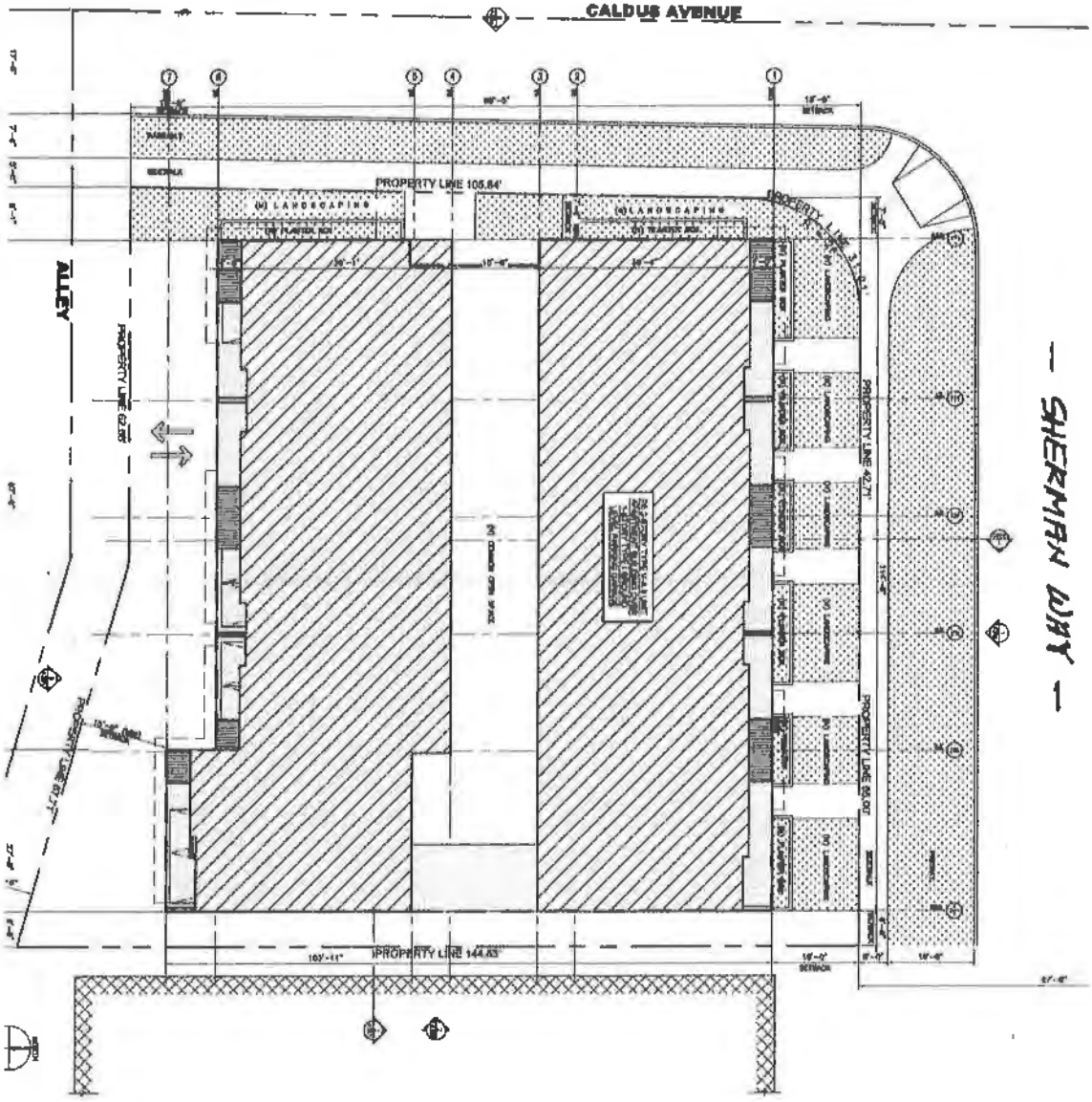
CRRm	Cyclic resistance ratio from soils
CSRsf	Cyclic stress ratio induced by a given earthquake (with user request factor of safety)
F.S.	Factor of Safety against liquefaction, F.S.=CRRm/CSRsf
S_sat	Settlement from saturated sands
S_dry	Settlement from Unsaturated Sands
S_all	Total Settlement from Saturated and Unsaturated Sands
NoLiq	No-Liquefy Soils



A.G.E. ENGINEERING
Geotechnical Engineering and Foundation Design

SITE PLAN - EXISTING		
17534-17540 SHERMAN WAY, VAN NUYS, CA.		
For: BOYADJIAN	DATE: 4-22-19	PROJECT NO. 19-AE-834
		DRAWING NO. 1

SCALE: 1" = 20'



A.G.E. ENGINEERING
Geotechnical Engineering and Foundation Design

COMMON OPEN SPACE

SECOND FLOOR

BALCONY

SITE PLAN - PROPOSED		
17534 - 17540 SHERMAN WAY, VAN NUYS, CA.		
For: BOYADJIAN	DATE: 4-22-19	PROJECT NO. 19-AE-034
		DRAWING NO. 1A

The following Figures and Appendices are attached and complete this report:

Site Plan - Drawing No. 1

Appendix A - Method of Field Exploration

Figures A-1 and A-2

Appendix B - Methods of Laboratory Testing

Figures B-1 and B-2

Respectfully submitted,

Zaven Abrahamian
Civil Engineer
RCE 41672

ZA/aa

Dist: (3) Addressee

APPENDIX A

METHOD OF FIELD EXPLORATION

Two exploratory test borings were drilled to a depth of 52 feet below the existing ground surface. The test borings were logged by our field personnel and classified by visual examination. Representative undisturbed and bulk samples of the subsurface soils were obtained and returned to the laboratory for subsequent testing. The approximate locations of the test borings are shown on the enclosed Site Plan. Exploratory Test Borings were drilled with an 8-inch hollow stem drilling rig.

A description of soils encountered at test borings was recorded during the field work and are presented in Figures A-1 and A-2 within this Appendix. These figures also show the number and approximate depths of each of the recovered soils samples.

Relatively undisturbed samples of representative soils were obtained at frequent intervals in the test boring. The samples were obtained by driving a thin walled steel sampler with successive drops of a 140-pound hammer free falling a vertical distance of about 30 inches. The number of blows required for one foot of sampler penetration was recorded at the time of the field investigation and are shown on the log of exploratory test boring. The relatively undisturbed soil samples were retained in 2.5 inches in diameter and 1.0 inch in height brass rings. Standard Penetration test, which consist of counting the number of hammer blows (140 pound hammer free falling 30 inches) required to drive a standard sampler (called a split spoon) to a depth of 12 inches, were performed

during the course of the drilling of the 52' deep borings and the number of the blows were recorded and are shown on the log of the exploratory test borings.

Field investigation for this project was performed on April 6, 2019. The exploratory test borings were backfilled following examination, logging and sampling.

A.G.E. ENGINEERING

Log of Boring No. 1

DATE DRILLED: 4/6/19 **GROUND ELEVATION:**

Depth In Feet	Sample No.	Dry Density (pcf)	Field Moisture (% Dry Weight)	Blows Per Foot	Material Type	Material Symbol	Material Description
1					Sand (SM)		Fill: Moderately compact, moist ↓ brown, silty sand
2					Silt (ML)		Firm, moist, brown, fine sandy
3							
4	1	103	10	11			
5					(ML)		Grades to grayish brown, clayey
6							
7	2	101	20.4	17	(ML)		Grades to increase in moisture
8							
9							
10	3	106	12.7	24	(ML)		Grades to stiff, light brown, clayey
11							
12							

LOG OF EXPLORATORY BORING

JOB NAME: 17534-17540 Sherman Way, Van Nuys, CA **JOB NO: 19-AE-834**

FIGURE No.: A-1

A.G.E. ENGINEERING

Log of Boring No. 1

DATE DRILLED: 04/6/19 **GROUND ELEVATION:**

Depth In Feet	Sample No.	Dry Density (pcf)	Field Moisture (% Dry Weight)	Blows Per Foot	Material Type	Material Symbol	Material Description
12					Silt (ML)		
13							
14							
	4	108	14.1	42	(ML)		Grades to very stiff, brown
15							
16							
17							
18							
19							
					(ML)		Grades to light brown
20	5	107	9.8	15/SPT			
21							
22							
23							

LOG OF EXPLORATORY BORING

JOB NAME: 17534-17540 Sherman Way, Van Nuys, CA **JOB NO: 19-AE-834**

FIGURE No.: A-1

A.G.E. ENGINEERING

Log of Boring No. 1

DATE DRILLED: 04/6/19 **GROUND ELEVATION:**

Depth In Feet	Sample No.	Dry Density (pcf)	Field Moisture (% Dry Weight)	Blows Per Foot	Material Type	Material Symbol	Material Description
23							
24							
25							
	6	111	11.1	19/SPT	(ML)		Grades to hard
26							
27							
28							
29							
30							
	7	113	11.5	32/SPT	(ML)		Grades to light brown, slightly clayey
31							
32							
33							
34							

LOG OF EXPLORATORY BORING

JOB NAME: 17534-17540 Sherman Way, Van Nuys, CA **JOB NO: 19-AE-834**

FIGURE No.: A-1

A.G.E. ENGINEERING

Log of Boring No. 1

DATE DRILLED: 04/6/19 **GROUND ELEVATION:**

Depth In Feet	Sample No.	Dry Density (pcf)	Field Moisture (% Dry Weight)	Blows Per Foot	Material Type	Material Symbol	Material Description
35							
	8	116	8.8	35/SPT	(ML)		Grades to light yellowish brown,
36							fine sandy
37							
38							
					Sand		Dense, moist, yellowish brown,
39	9	118	7.9	39/SPT	(SM/SP)		fine to medium grained, slightly
							silty
40							
	10	118	8.2	43/SPT	Sand		Grades to very dense, fine to
41					(SP)		coarse grained, trace of fines
							slightly gravelly
42							
43							
44							
45							
	11	127	5.8	64/SPT	(SP)		Grades to light brown, fine to
46							medium grained

LOG OF EXPLORATORY BORING

JOB NAME: 17534-17540 Sherman Way, Van Nuys, CA **JOB NO: 19-AE-834**

FIGURE No.: A-1

A.G.E. ENGINEERING

Log of Boring No. 1

DATE DRILLED: 04/6/19 **GROUND ELEVATION:**

Depth In Feet	Sample No.	Dry Density (pcf)	Field Moisture (% Dry Weight)	Blows Per Foot	Material Type	Material Symbol	Material Description
47					Sand (SP)		
48							
49							
50							
	12	126	6.2	70/SPT	(SP)		Grades to yellowish brown fine to corase grained
51							
52							End of boring at 52' No Water
53							
54							
55							
56							
57							
58							

LOG OF EXPLORATORY BORING

JOB NAME: 17534-17540 Sherman Way, Van Nuys, CA **JOB NO: 19-AE-834**

FIGURE No.: A-1

A.G.E. ENGINEERING

Log of Boring No. 2

DATE DRILLED: 4/6/19 **GROUND ELEVATION:**

Depth In Feet	Sample No.	Dry Density (pcf)	Field Moisture (% Dry Weight)	Blows Per Foot	Material Type	Material Symbol	Material Description
1	1	111	8.2	30	Silt (ML)		Firm, moist, dark brown, fine sandy
2							
3							
4							
5	2	102	15.1	10	(ML)		Grades to less sandy, brown
6							
7							
8							
9	3	105	17.9	11	(ML)		Grades to increase in moisture
10							
11							
12							

LOG OF EXPLORATORY BORING

JOB NAME: 17534-17540 Sherman Way, Van Nuys, CA **JOB NO: 19-AE-834**

FIGURE No.: A-2

A.G.E. ENGINEERING

Log of Boring No. 2

DATE DRILLED: 04/16/19 **GROUND ELEVATION:**

Depth In Feet	Sample No.	Dry Density (pcf)	Field Moisture (% Dry Weight)	Blows Per Foot	Material Type	Material Symbol	Material Description
12					Silt (ML)		Grades to stiff, light brown, increase in moisture, clayey
13							
	4	107	11.2	35			
14							
15							
16							
17							
18	5	108	9.2	19/SPT	(ML)		Grades to light brown
19							
20							
21							
22					(ML)		
							Grades to light brown
23	6	112	7.2	21/SPT			

LOG OF EXPLORATORY BORING

JOB NAME: 17534-17540 Sherman Way, Van Nuys, CA **JOB NO: 19-AE-834**

FIGURE No.: A-2

A.G.E. ENGINEERING

Log of Boring No. 2

DATE DRILLED: 04/6/19 **GROUND ELEVATION:**

Depth In Feet	Sample No.	Dry Density (pcf)	Field Moisture (% Dry Weight)	Blows Per Foot	Material Type	Material Symbol	Material Description
23							
24							
25							
26							
27							
28	7	116	10.6	31/SPT	(ML)		Grades to hard, brown, increase in moisture
29							
30							
31							
32							
33	8	119	11.5	35/SPT	(ML)		Grades to yellowish brown, fine sandy
34							

LOG OF EXPLORATORY BORING

JOB NAME: 17534-17540 Sherman Way, Van Nuys, CA **JOB NO: 19-AE-834**

FIGURE No.: A-2

A.G.E. ENGINEERING

Log of Boring No. 2

DATE DRILLED: 04/6/19 **GROUND ELEVATION:**

Depth In Feet	Sample No.	Dry Density (pcf)	Field Moisture (% Dry Weight)	Blows Per Foot	Material Type	Material Symbol	Material Description
35	9	121	8.1	49/SPT	Sand (SM/SP)		Dense, moist, yellowish brown, fine grained, slightly silty
36							
37							
38	10	120	7.3	51/SPT	(SM/SP)		Grades to fine to medium grained
39							
40							
41							
42							
43	11	124	7.2	58/SPT	(SP)		Grades to very hard, grayish brown, fine to coarse grained
44							
45							
46							

LOG OF EXPLORATORY BORING

JOB NAME: 17534-17540 Sherman Way, Van Nuys, CA **JOB NO: 19-AE-834**

FIGURE No.: A-2

A.G.E. ENGINEERING

Log of Boring No. 2

DATE DRILLED: 04/6/19 **GROUND ELEVATION:**

Depth In Feet	Sample No.	Dry Density (pcf)	Field Moisture (% Dry Weight)	Blows Per Foot	Material Type	Material Symbol	Material Description
47					(SP)		Grades to yellowish brown, fine to corase grained
48	12	123	6.6	100 SPT			
49							
50							
	12	125	8.1	120 SPT	(SP)		
51							
52							End of boring at 52' No Water
53							
54							
55							
56							
57							
58							

LOG OF EXPLORATORY BORING

JOB NAME: 17534-17540 Sherman Way, Van Nuys, CA **JOB NO: 19-AE-834**

FIGURE No.: A-2

APPENDIX B

LABORATORY TESTING PROCEDURES

Moisture - Density

The field moisture content and dry density are determined for each of the undisturbed soil samples, and the results are shown in the log of the exploratory test borings. The moisture-density information provides a gross picture of the soil consistency between borings. The dry density is determined in pounds per cubic foot and the field moisture content is determined as a percentage of the dry density. The tests were performed using ASTM D-2216-98 Laboratory Determination of water content Test Method.

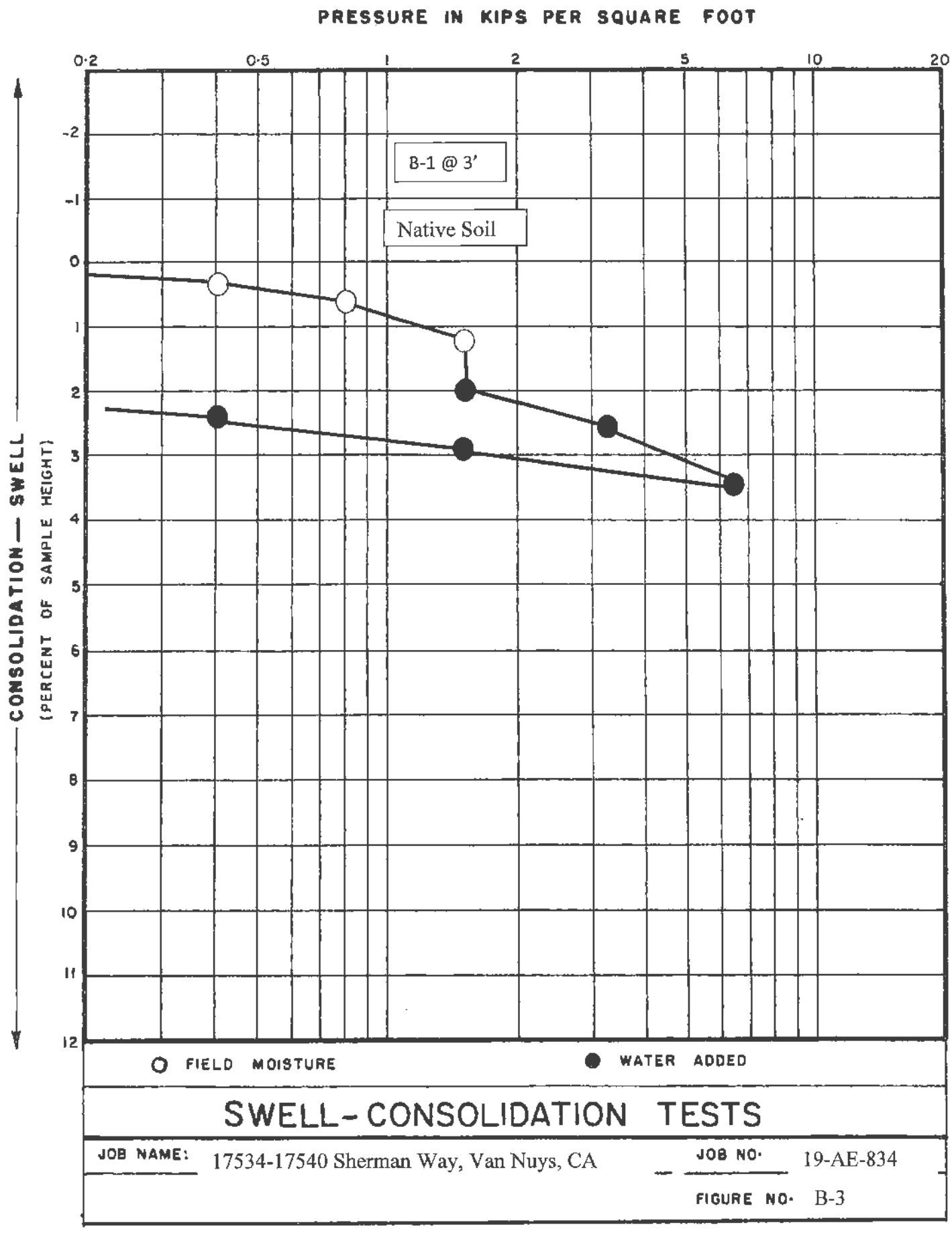
Shear Tests

Shear tests were performed on selected undisturbed soil samples, under varying normal stresses, in order to determine the shear strength parameters, cohesion and angle of internal friction. Shear tests are performed in the direct shear machine at a constant rate of strain. The results of these tests are presented in Figure B-1. For the proposed project, a rate of 0.005 was selected. The tests were performed using ASTM D-3080-04 Laboratory Direct Shear Test Method.

Consolidation Tests

Consolidation tests were performed on selected undisturbed soil samples taken at and below the foundation level. The consolidation apparatus is designed to receive the undisturbed soil sample in an one- inch high ring. Loads are applied in several increments, in geometric progression, to a maximum value of 6,400 lbs. per square foot. The resulting deformations are recorded at selected time intervals.

Porous stones are placed at the top and bottom of each specimen to permit free flow of water into or from the specimen during the test. The test results are shown in Figure B-2. The tests were performed using ASTM D-2435-03 Laboratory Consolidation Test Method.

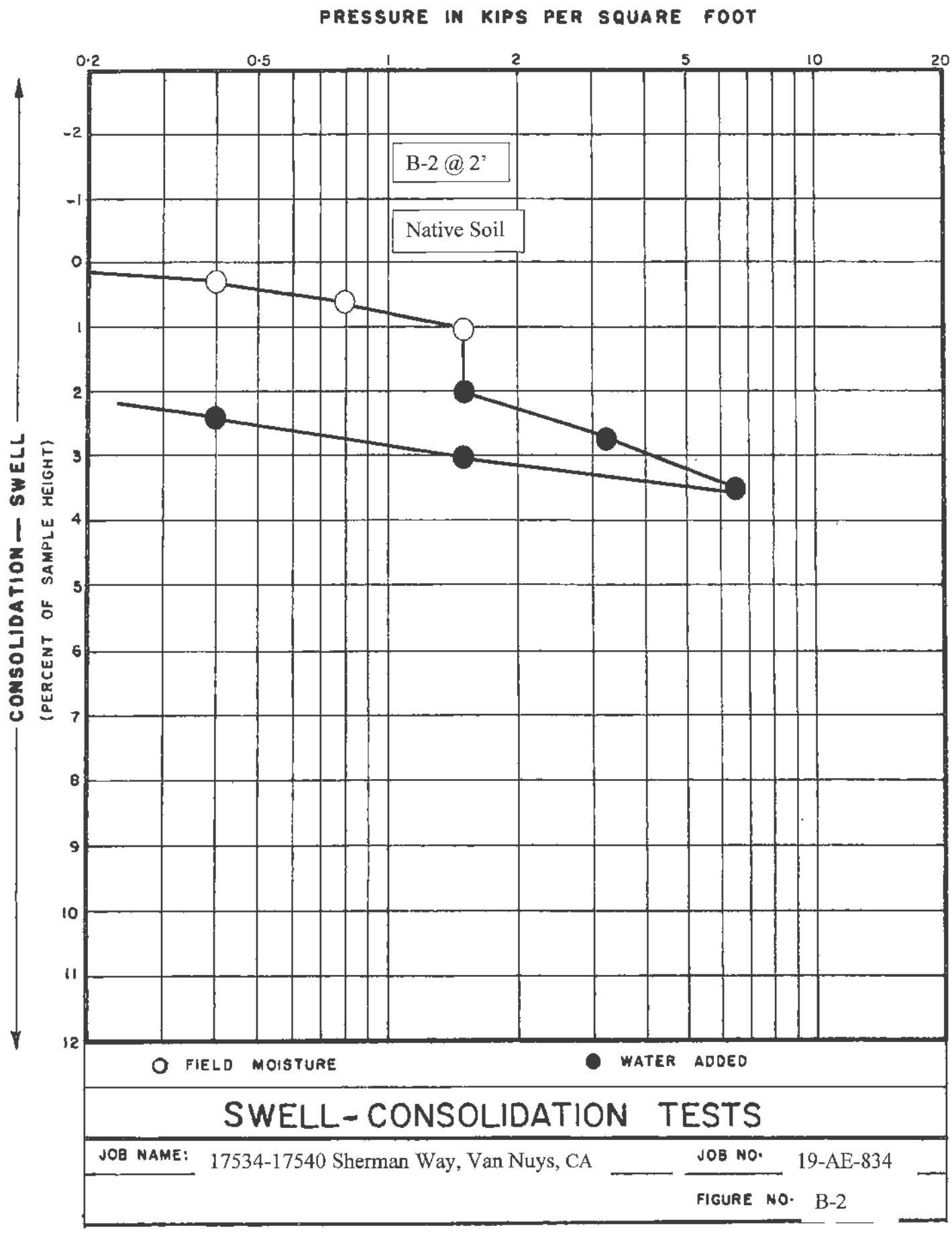


SWELL-CONSOLIDATION TESTS

JOB NAME: 17534-17540 Sherman Way, Van Nuys, CA

JOB NO. 19-AE-834

FIGURE NO. B-3

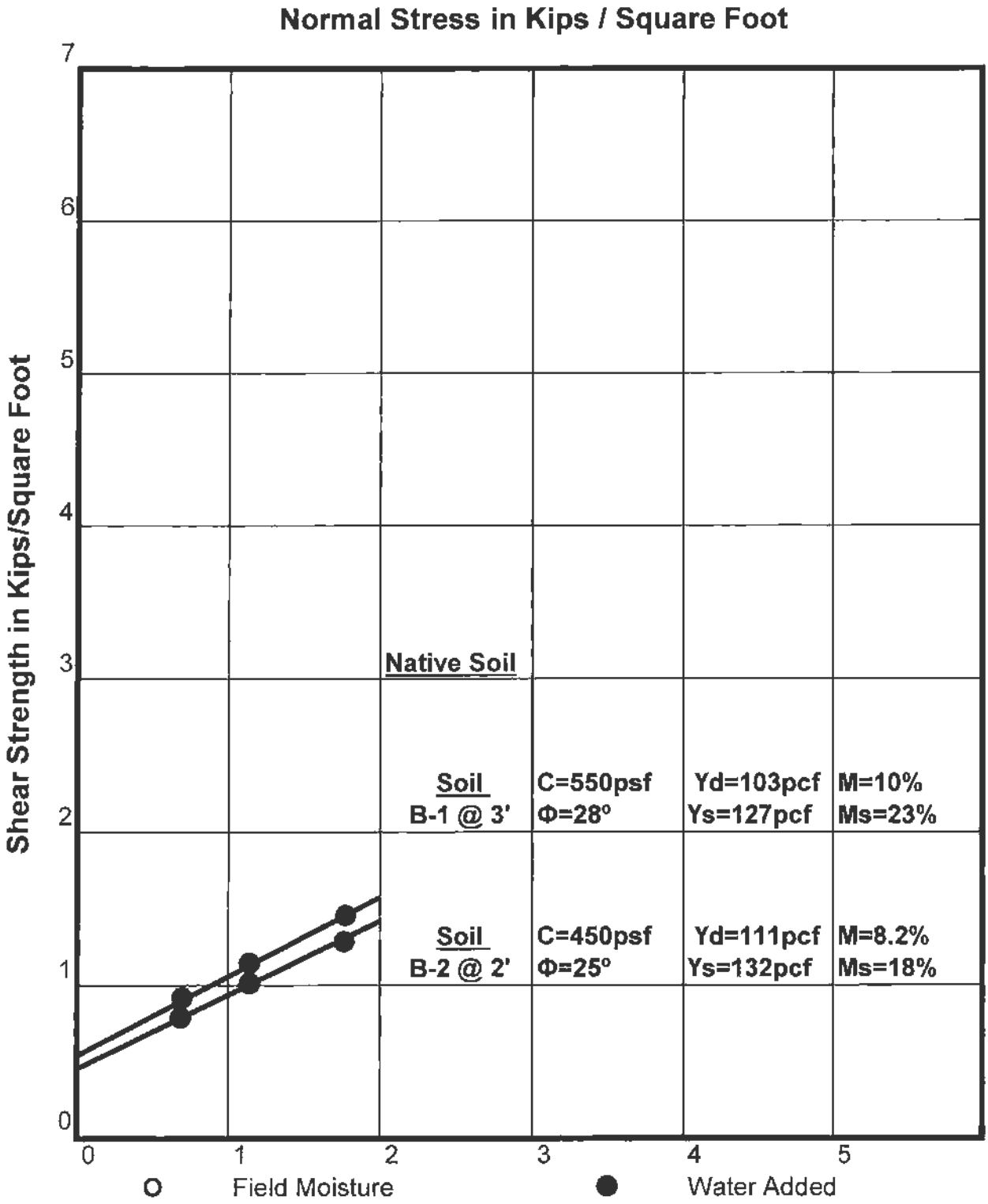


SWELL-CONSOLIDATION TESTS

JOB NAME: 17534-17540 Sherman Way, Van Nuys, CA JOB NO. 19-AE-834

FIGURE NO. B-2

A.G.E. Engineering

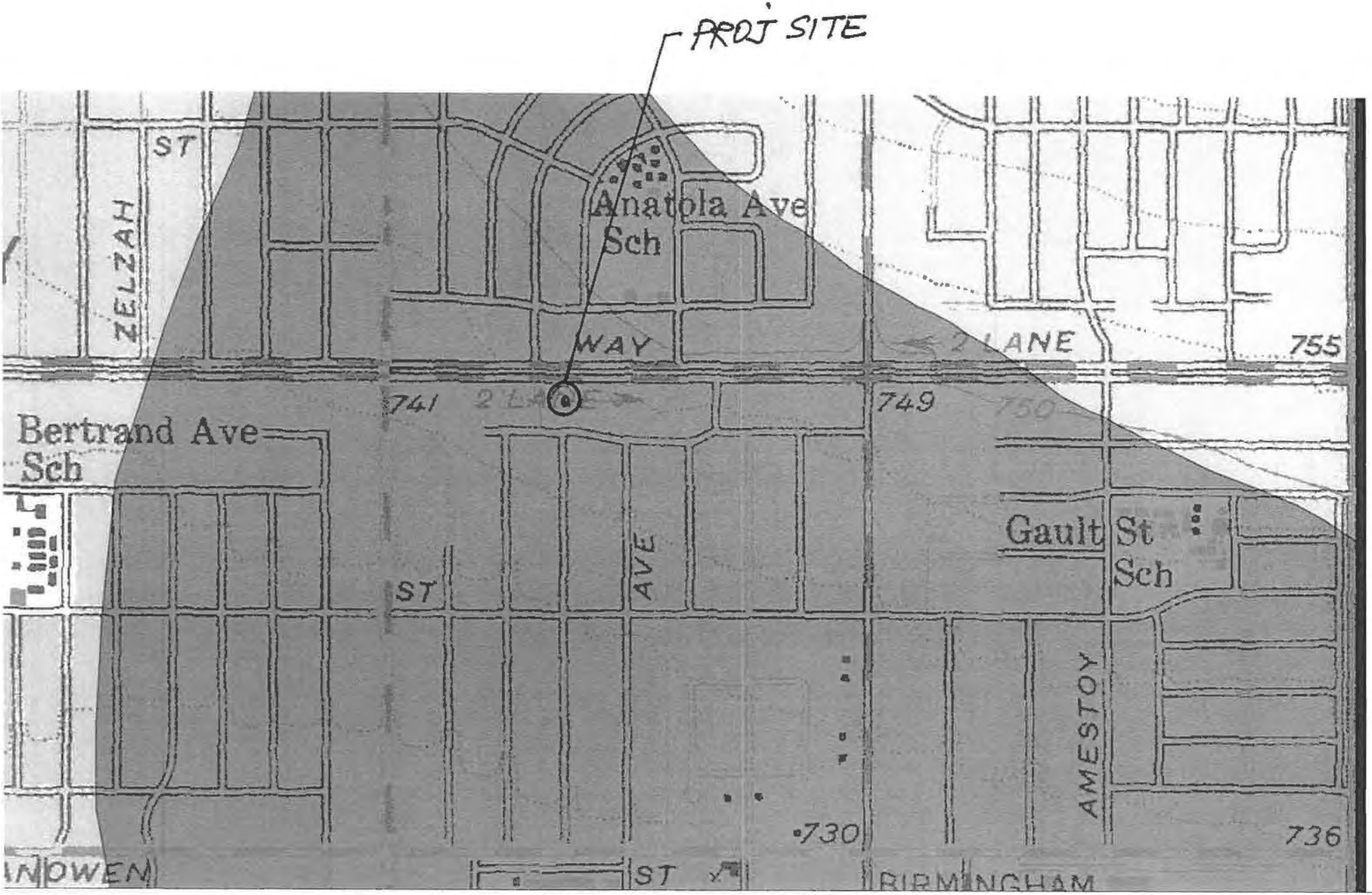


Project Name: 17534-17540 Sherman Way, Van Nuys, CA

DIRECT SHEAR TESTS

Project No.: 19-AE-834

Figure No. B-1


PROJ SITE
ST
ZELZAH
Anatola Ave
Sch
WAY
LANE
755
741
749
750
Bertrand Ave
Sch
Gault St
Sch
ST
AVE
AMESTOY
730
736
OWEN
ST
BIRMINGHAM

OSHPD

17534-17540 Sherman Way, Van Nuys, CA

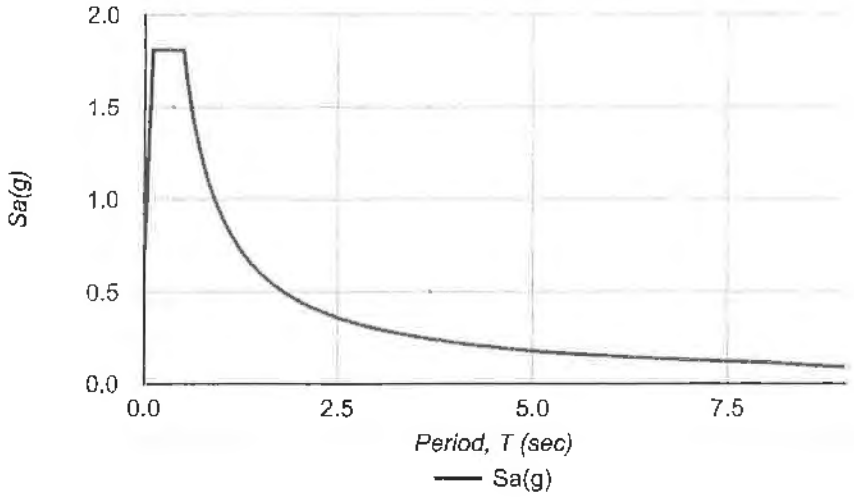
Latitude, Longitude: 34.20111, -118.5154

Date	4/21/2019, 9:25:48 PM
Design Code Reference Document	ASCE7-10
Risk Category	II
Site Class	D - Stiff Soil

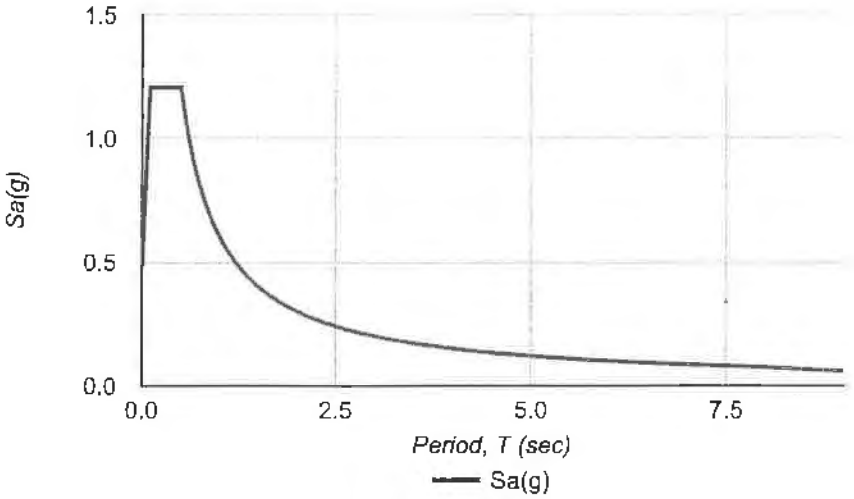
Type	Value	Description
S_S	1.808	MCE_R ground motion. (for 0.2 second period)
S_1	0.602	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.808	Site-modified spectral acceleration value
S_{M1}	0.904	Site-modified spectral acceleration value
S_{DS}	1.206	Numeric seismic design value at 0.2 second SA
S_{D1}	0.602	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	1.5	Site amplification factor at 1.0 second
PGA	0.665	MCE_G peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	0.665	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	2.085	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.025	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.808	Factored deterministic acceleration value. (0.2 second)
S1RT	0.737	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.709	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.602	Factored deterministic acceleration value. (1.0 second)
PGAd	0.665	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	1.029	Mapped value of the risk coefficient at short periods
C_{R1}	1.039	Mapped value of the risk coefficient at a period of 1 s

MCER Response Spectrum



Design Response Spectrum



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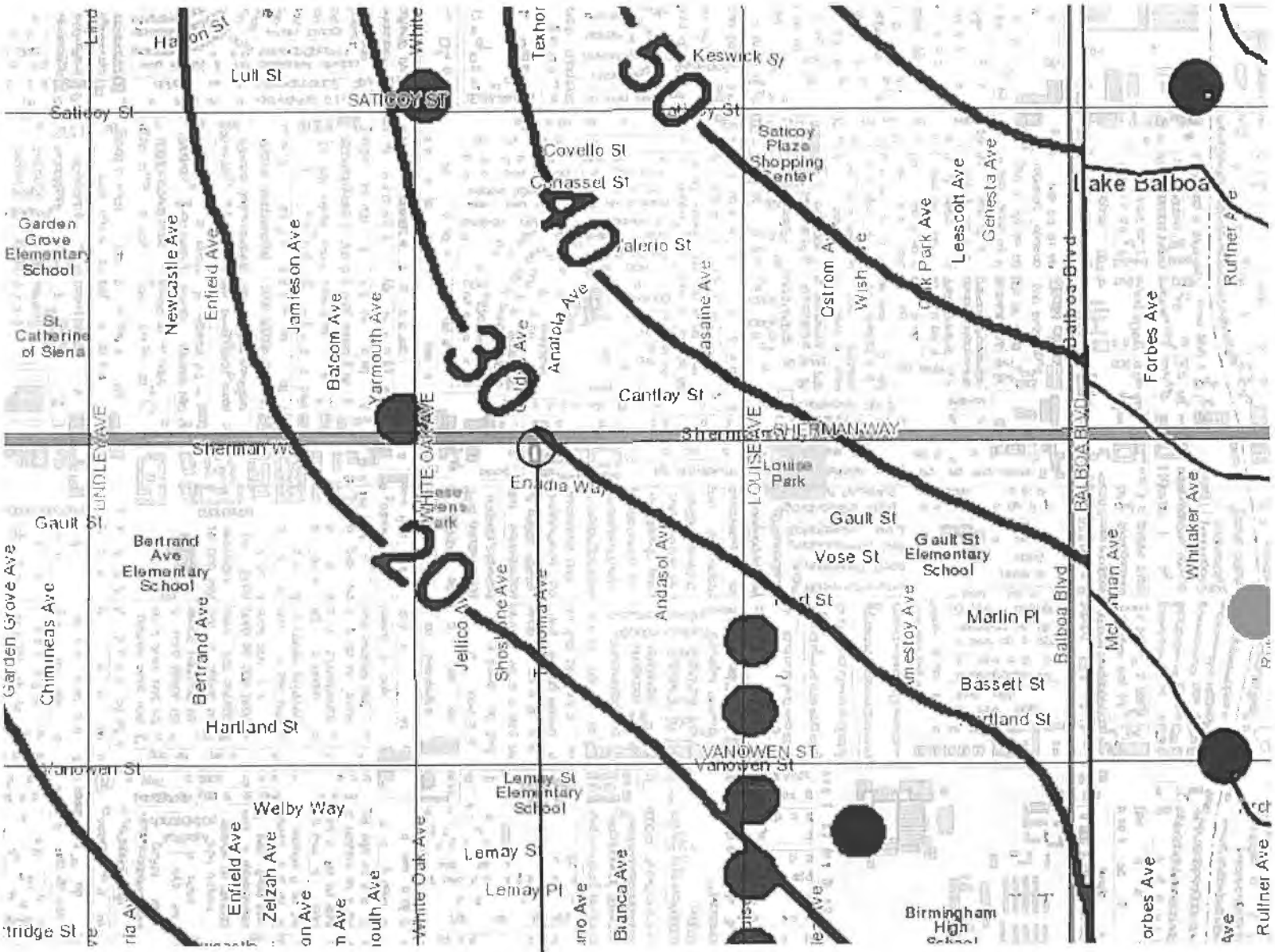
50
40
30
20
Lull St
SATICOY ST
Saticoy St
Keswick St
Covello St
Cohassel St
Saticoy Plaza Shopping Center
Lake Balboa
Garden Grove Elementary School
St. Catherine of Siena
Valerio St
Newcastle Ave
Enfield Ave
Jamieson Ave
Balcom Ave
Yarmouth Ave
Anatola Ave
Lasaine Ave
Ostrom Ave
Wilbur Ave
Lesco Park Ave
Genesta Ave
Balboa Blvd
Forbes Ave
Rullner Ave
Cantlay St
SHERMAN WAY
Sherman Way
LINDLEY AVE
WHITE OAK AVE
Louise Park
LOUISE AVE
BALBOA BLVD
Whitaker Ave
Gault St
Bertrand Ave Elementary School
Bertrand Ave
Garden Grove Ave
Chimineas Ave
Jellico Ave
Shoshone Ave
Andasol Ave
Vose St
Gault St Elementary School
Melvinian Ave
Marlin Pl
Balboa Blvd
Hartland St
Bassett St
VANOWEN ST
Vanowen St
Lemay St Elementary School
Welby Way
Enfield Ave
Zelzah Ave
White Oak Ave
Lemay St
Lemay Pl
Bianca Ave
Birmingham High
Rullner Ave

PROJ SITE