Appendix E Soils Investigation Report

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John R. Byerly
INCORPORATED

SOILS INVESTIGATION

CHRIST'S CHURCH OF THE VALLEY

AUDITORIUM BUILDING

RANCHO CUCAMONGA, CALIFORNIA

WLC ARCHITECTS, INC.

GEOTECHNICAL ENGINEERS • TESTING AND INSPECTION
2257 South Lilac Ave., Bloomington, CA 92316-2903
Bloomington (909) 877-1324 Riverside (909) 783-1910 Fax (909) 877-5210

John R. Byerly
INCORPORATED

SOILS INVESTIGATION

MARCH 8, 2018

CHRIST'S CHURCH OF THE VALLEY
AUDITORIUM BUILDING
7576 ETIWANDA AVENUE
RANCHO CUCAMONGA, CALIFORNIA

CLIENT:
WLC ARCHITECTS, INC.
8163 ROCHESTER AVENUE, SUITE 100
RANCHO CUCAMONGA, CALIFORNIA 91730-0729
ATTENTION: JIM DICAMILLO

RPT. NO.: 4867-a
FILE NO.: S-14033

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INTRODUCTION

During January of 2017, an investigation of the soil conditions underlying the proposed auditorium building was conducted by this firm. The purpose of our investigation was to evaluate the surface and subsurface conditions at the site with respect to safe and economical foundation types, vertical and lateral bearing values, liquefaction and seismic settlement potential, support of concrete slabs-on-grade, asphalt concrete pavement for drive and parking areas, and site preparation. Included in the recommendations are the seismic design parameters as required by the 2016 edition of the California Building Code and the American Society of Civil Engineers (ASCE) Standard 7-10. The seismic information is presented in the "Seismic Design Parameters" section of this report. Percolation testing to assist in the establishment of design infiltration rates for a chamber storm water disposal system was also performed. Our soils investigation, together with our conclusions and recommendations, is discussed in detail in the following report.

This report has been prepared for the exclusive use of WLC Architects, Inc. and their consultants for specific application to the project described herein. Should the project be modified, the conclusions and recommendations presented in this report should be reviewed by the geotechnical engineer. Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, express or implied.

PROJECT DESCRIPTION

We understand that the auditorium building will be a two-story structure with a footprint area of 26,000 square feet. The building will be a mixture of concrete masonry unit (CMU) and steel framed construction. A new parking lot will be developed west of the new building. Also planned is an underground chamber system for storm water disposal to be located within the new parking lot. The building site appears to be at the approximate desired grade, and no significant additional cuts or fills are anticipated. The configuration of the proposed development is illustrated on Enclosure 1.

SITE CONDITIONS

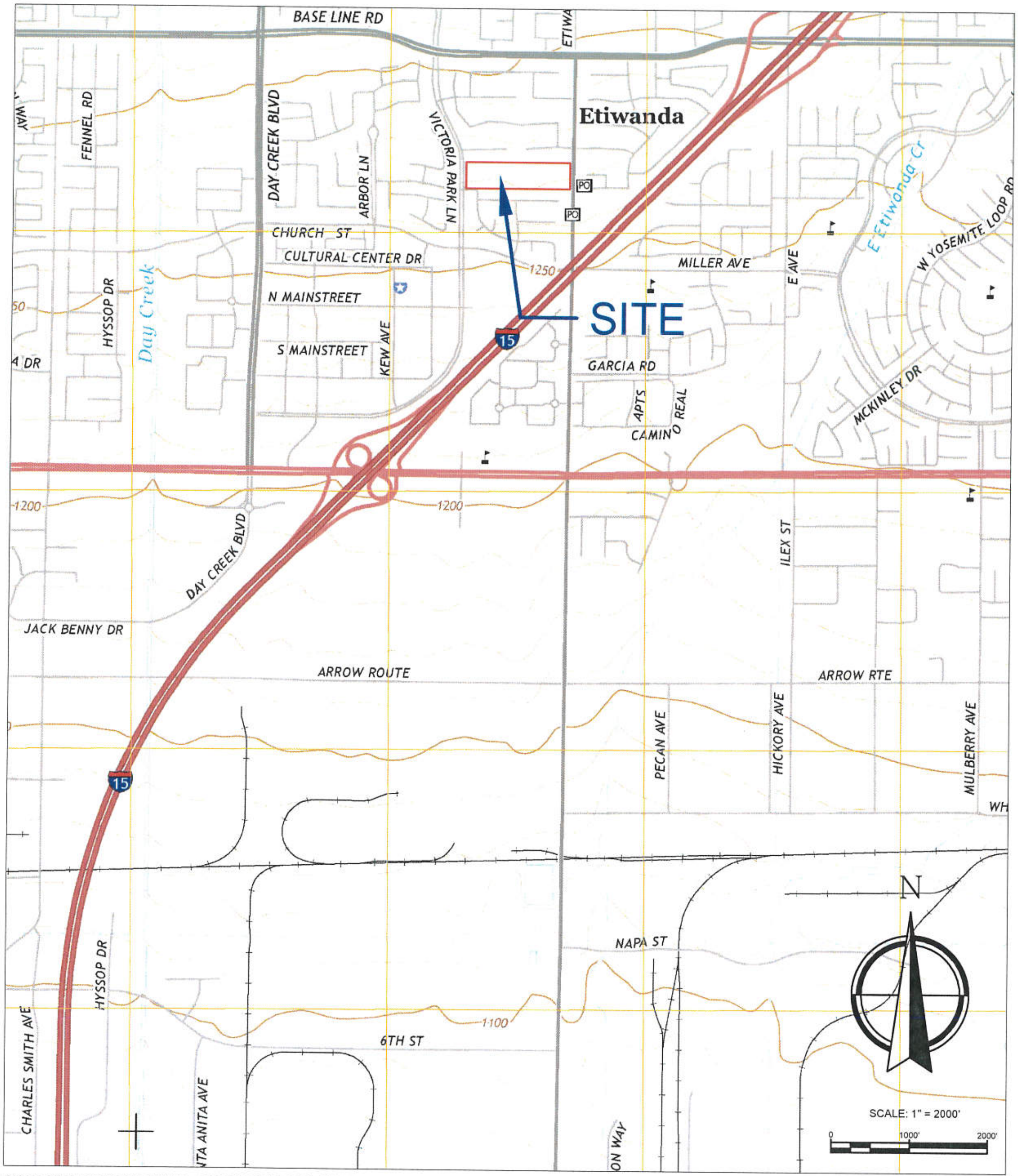
The existing Christ's Church of the Valley campus is located on the west side of Etiwanda Avenue, north of Candlewood Street, in the City of Rancho Cucamonga. An Index Map showing the general vicinity of the site is presented on the following page. The coordinates of the site are latitude 34.116788° N and longitude of 117.526707° W, utilizing the North American Datum (NAD) from 1983. The area topography is generally flat, and slopes gently downward to the south. The new building is to be constructed within an existing parking lot that will be demolished and removed with parking to be relocated directly to the west. Adjacent properties are occupied by single-family residences.

FIELD AND LABORATORY INVESTIGATION

The soils underlying the proposed building area were explored by five test borings drilled with a truck-mounted flight-auger to depths up to 46.5 feet below the existing ground surface. Two additional borings were drilled in the area of the proposed chamber storm water disposal system. The approximate locations of the explorations are indicated on Enclosure 1. The soils encountered were examined and visually classified by our field engineer. A summary of the soil classifications appears as Enclosure 2. The exploration logs show subsurface conditions at the dates and locations indicated and may not be representative of other locations and times. The stratification lines presented on the logs represent the approximate boundaries between soil types, and the transitions may be gradual. Bulk and relatively undisturbed samples were obtained at selected levels within the explorations and returned to our laboratory for testing and evaluation.

Percolation tests were performed in each of the two borings in the area of the chamber storm water disposal system. Two inches of gravel was placed in the bottom of the borings. Water was introduced into the borings and allowed to soak and condition the soil overnight prior to testing. The following day, water was reintroduced into the borings to bring the water surface to 12 inches above the bottom of the borings. At time intervals, the depth to the water surface was measured. Additional water was then introduced into the borings. The test continued until steady state conditions were attained. The percolation test data are presented on Enclosure 6.

INDEX MAP



SOURCE DOCUMENTS: USGS GUASTI QUADRANGLE, CALIFORNIA, 7.5 MINUTE SERIES, 2015

TOWNSHIP AND RANGE: SECTION 5, T1S, R6W

LATITUDE: 34.116788° N

LONGITUDE: 117.526707° W

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Included in our laboratory testing were moisture/density determinations on all undisturbed samples. Optimum moisture content/maximum dry density relationships were established for typical soil types so that the relative compaction of the subsoils could be determined. Consolidation testing was performed to evaluate soil compressibility. The moisture/density data are presented on the test boring logs, Enclosure 2. The results of the maximum density tests appear on Enclosure 3. Consolidation test results are summarized on Enclosure 4. Gradation, sand equivalent, and "R" value testing was performed on likely subgrade soil for pavement design purposes. The subgrade soil test results appear in Enclosure 5. Chemical testing, comprised of pH, soluble sulfate, chloride, redox potential, and resistivity testing, was also performed. The chemical test results are presented in the "Chemical Test Results" section of this report.

SOIL CONDITIONS

The explorations encountered up to 5 feet of medium dense artificial fill classified as silty sand. The natural soil underlying the fill consisted of medium dense to dense silty sand. Ground water was not encountered in our explorations. The depths of artificial fill encountered in each boring are tabulated below.

Test Boring No.	Depth of Artificial Fill (ft)
1	0.0
2	0.0
3	5.0
4	5.0
5	5.0

The soils underlying the site are granular and non-plastic, and are considered to exhibit very low expansion potential in accordance with ASTM D 4829 "Standard Test Method for Expansion Index of Soils."

LIQUEFACTION AND DYNAMIC SETTLEMENT

Liquefaction is a phenomenon that occurs when a soil undergoes a transformation from a solid state to a liquefied condition due to the effects of increased pore-water pressure. Loose saturated soils with particle sizes in the medium sand to silt range are particularly susceptible to liquefaction when subjected to seismic ground shaking. Affected soils lose all strength during liquefaction, and foundation failure can occur.

Free ground water was not encountered in our explorations. The depth to ground water in this area is known to be more than 200 feet. Due to the great depth to historic high ground water, we conclude that the potential for liquefaction is low. Loose soil present on the site will be recompacted during site grading. We also conclude that the potential for seismically induced settlement is low.

CONCLUSIONS

The existing artificial fill is non-uniform and undocumented, and should be removed and recompacted. To assure uniform foundation support, the natural soil should be overexcavated and recompacted such that all footings will bear on compacted fill. With the site prepared as recommended, the buildings can be safely supported by shallow spread and wall footings. Detailed recommendations are presented below.

RECOMMENDATIONS

FOUNDATION DESIGN

For the site prepared as recommended, the proposed auditorium building may be founded on conventional continuous and isolated footings. Footings should be at least 18 inches deep below the lowest final adjacent grade, and should be designed for a maximum safe soil bearing pressure of 2,500 pounds per square foot for dead plus live loads. The allowable bearing value may be increased by one-third for wind and seismic loading. Footings should bear on compacted fill as recommended below under "Site Preparation."

For footings designed and constructed as recommended, we estimate maximum settlement of less than 1 inch, with a maximum angular distortion of less than 1:720.

SEISMIC DESIGN PARAMETERS

To assist the structural engineer in the selection of seismic coefficients to be incorporated into the design of the structures, we have reviewed the 2016 edition of the California Building Code and the ASCE Standard 7-10. The various coefficients and factors are provided in the following table:

Factor or Coefficient	***Value***
Latitude	34.116788° N
Longitude	117.526707° W
Mapped S_S	1.577g
Mapped S_1	0.600g
F_a	1.000
F_v	1.500
S_{MS}	1.577g
S_{M1}	0.900g
S_{DS}	1.052g
S_{D1}	0.600g
PGA	0.590g
T_L	12 seconds
Site Class	D

RETAINING WALLS AND LATERAL LOADING

Retaining walls with horizontal backfill surfaces should be designed for an active earth pressure of 35 pounds per square foot per foot of depth, exclusive of surcharge loads.

Resistance to lateral loads will be provided by passive earth pressure and basal friction. For footings bearing against compacted fill, passive earth pressure may be considered to develop at a rate of 275 pounds per square foot per foot of depth. Basal friction may be computed at 0.4 times the normal dead load. The resistance from basal friction and passive earth pressure may be combined directly without reduction. The allowable lateral resistance may be increased by one-third for wind and seismic loading.

SLABS-ON-GRADE

Concrete slab-on-grade design recommendations are listed below. The slab-on-grade recommendations assume underlying utility trench backfills and pad subgrade soils have been densified to a relative compaction of at least 90 percent (ASTM D 1557).

1. It is our opinion that the recommended compacted fill soils should provide adequate support for concrete slabs-on-grade without the use of a gravel base. The final pad surface should be rolled to provide a smooth, dense surface upon which to place the concrete.

2. The lightly loaded slab-on-grade floors should be at least 4 inches thick.

3. Slabs to receive moisture-sensitive floor coverings should be underlain with a moisture vapor retardant membrane, such as 10-mil Stego Wrap or equivalent. The moisture vapor retardant membrane should conform to ASTM E 1745 (Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs). The moisture vapor retardant membrane should be lapped into the footing excavation to provide full coverage of the subgrade soils. Punctures and/or holes cut for plumbing should be taped to minimize moisture emissions through the membrane. The project superintendent and/or a representative of the geotechnical engineer should inspect the placement of the moisture vapor retardant membrane prior to covering. Installation of the moisture vapor retardant membrane should be performed in accordance with ASTM E 1643 (Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs).

4. A 2-inch layer of clean sand (SE>30, no more than 7 percent passing the No. 200 sieve) should be placed over the moisture vapor retardant membrane to promote uniform setting of the concrete. Concrete should be placed on the sand blanket when the sand is damp. Excess moisture should not be allowed to accumulate within the sand blanket prior to concrete placement. At the time of concrete placement, the moisture content of the sand blanket above the moisture vapor retardant membrane should not exceed 2 percent below the optimum moisture content.

5. In lieu of placing the sand blanket described above and to further minimize future moisture vapor emissions through the slabs-on-grade, the slab concrete may be placed directly on the moisture vapor retardant membrane. Placing concrete directly on the moisture vapor retardant membrane will increase shrinkage and curling forces and make finishing more difficult. To accommodate these concerns, the structural engineer should provide appropriate mix design criteria for concrete placed directly on the moisture vapor retardant membrane.

6. We recommend a maximum water-cement ratio of 0.50 for all building slab concrete. Architectural or structural considerations may require the utilization of a lower water-cement ratio. Where slab concrete is placed directly on the moisture vapor retardant membrane without the presence of an intervening layer of absorptive sand, a lower maximum water-cement ratio may be needed.

7. Preparation of the concrete floor slabs should conform to ASTM F 710 (Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring) and the manufacturer's recommendations. Moisture vapor emission tests should be performed to verify acceptable moisture emission rates prior to flooring installation.

SITE PREPARATION

We assume that the site will be prepared in accordance with the California Building Code or the current City of Rancho Cucamonga requirements. The recommendations presented below are to establish additional grading criteria. These recommendations should be considered preliminary and are subject to modification or expansion based on a geotechnical review of the project foundation and grading plans.

- The ground surface in areas to be graded should be stripped of significant organic matter and debris. Significant roots from removed trees should be grubbed from the soil. Existing asphalt concrete pavement and associated curbs should be removed. The removed asphalt concrete should be removed from the site. Alternatively, the removed asphalt concrete can be ground to particles no larger than 3 inches in greatest dimension, mixed with on-site soil, and placed as fill under the building and pavement areas, or at a depth of at least 3 feet in landscape areas. Buried obstructions should be removed, and the debris hauled from the site. All cavities created during site clearing should be cleaned of loose and disturbed soil, shaped to provide access for construction equipment, and backfilled with fill placed and compacted as described below.

- The existing artificial fill should be removed from all improvement areas. The exposed natural soil should be overexcavated to a depth of at least 24 inches below the bottom of the footings. The soil exposed in the bottom of the overexcavation should be evaluated by the representative of the geotechnical engineer. Where the natural soil exposed in the bottom of the overexcavation exhibits a relative compaction of less than 85 percent (ASTM D 15577), the natural soil should be further overexcavated until natural soil exhibiting a relative compaction of at least 85 percent is encountered. The soil exposed in the approved overexcavation bottom should be scarified to a depth of at least 12 inches; the scarified soil should be moisture conditioned to near the optimum moisture content, and compacted to a relative compaction of at least 90 percent (ASTM D 1557).

- All other surfaces to receive fill should be scarified to a minimum depth of 12 inches, moistened to near the optimum moisture content, and densified to a minimum relative compaction of 90 percent (ASTM D 1557

- The on-site soils should provide adequate quality fill material provided they are free from organic matter and other deleterious materials, and are at acceptable moisture contents. Import fill should be inorganic, granular soil free from rocks or lumps greater than 6 inches in maximum dimension and should exhibit a very low expansion potential (expansion index less than 21), negligible sulfate content (less than 1,000 ppm soluble sulfate by weight), and low corrosion potential. Prior to bringing import fill to the site, the contractor should obtain certification to verify that the proposed import meets the State of California Department of Toxic Substance Control (DTSC) environmental standards. Proposed import should be sampled at the source and tested by this firm for expansion index, soluble sulfate content, and corrosion potential.

- All fill should be placed in 8-inch or less lifts, moisture conditioned to near the optimum moisture content, and densified to a minimum relative compaction of 90 percent (ASTM D 1557).

- Cut and fill slopes should be constructed no steeper than 2H:1V. Fill slopes should be overfilled and then cut back to expose fully compacted fill.

- The surface of the site should be graded to provide positive drainage away from the structures. Drainage should be directed to established swales and then to appropriate drainage structures to minimize the possibility of erosion. Water should not be allowed to pond adjacent to footings.

SHRINKAGE AND SUBSIDENCE

Volume change in going from cut to fill conditions is anticipated where near-surface grading will occur. Assuming the fill will be compacted to an average relative compaction of 93 percent, an average cut-fill shrinkage of 10 to 15 percent is estimated for excavation of the silty sand soil. Subsidence in the range of 0.10 to 0.15 feet should be expected during preparation of the natural ground to receive fill.

CHEMICAL TEST RESULTS

The chemical test results from a sample taken from Boring 3 at a depth of 0 to 3 feet are shown on the following table:

Analysis	Result	Units
Saturated Resistivity	9800	ohm-cm
Chloride	ND (Not Detected)	ppm
Sulfate	40	ppm
pH	7.3	pH units
Redox Potential	198	mV

The soil tested exhibited negligible soluble sulfate content; therefore, sulfate-resistant concrete will not be required for this project. In addition, the results of the corrosivity testing indicate that the soil tested is not detrimentally corrosive to ferrous-metal pipes.

ASPHALT CONCRETE PAVEMENT

The likely subgrade soil exhibits good stability under traffic loading conditions. The pavement sections presented in the following table are recommended for preliminary design.

Location	**TI**	**"R" Value**	**Thickness (Inches)** **Asphalt Concrete**	**Aggregate Base**
Parking areas for conventional passenger cars and light trucks	5.0	59	2.5	4.0
Driveway areas	6.0	59	3.0	4.0

The foregoing pavement sections assume that utility trench backfill below all proposed pavement areas will be compacted to at least 90 percent relative compaction. Aggregate base should conform to the Caltrans Standard Specifications requirements for Class 2 aggregate base, or to the Greenbook requirements for crushed miscellaneous base. Aggregate base should be densified to at least 95 percent relative compaction (ASTM D 1557).

INFILTRATION RATES

Testing in Borings P-1 and P-2 yielded infiltration rates shown below. Conversion of percolation rates to infiltration rates was performed using the Porchet method to accommodate the influence of test hole sidewall area. The percolation rate conversion equation is presented below.

$$I_t = \frac{\Delta H\ (60\ \text{min./hr.})\ r}{\Delta t\ (r+2\ H_{avg})}$$

Where: I_t = *tested infiltration rate (in./hr.)*

Δt = *time interval (min.)*

r = *test hole radius (in.)*

ΔH = *change in height over the time interval (in.)*

H_{avg} = *average head height over the time interval (in.)*

The converted percolation rates are presented in the following table.

Percolation Number	**Depth of Test (feet)**	**Converted Percolation Rate (inch per hour)**
P-1	10.2	1.24
P-2	9.9	1.63

A safety factor has not been applied to these design values. The depths of percolation testing performed during this investigation correspond to the anticipated depths representative of the bottom elevation of the proposed chamber storm water disposal system. We recommend the chamber storm water disposal system be designed for an infiltration rate of 1.24 inches per hour.

FOUNDATION AND GRADING PLAN REVIEW

The project foundation and grading plans should be reviewed by the geotechnical engineer. Additional recommendations may be required at that time.

CONSTRUCTION OBSERVATIONS

All grading operations, including the preparation of the natural ground surface, should be observed and compaction tests performed by this firm. No fill should be placed on any prepared surface until that surface has been evaluated by the representative of the geotechnical engineer. All footing excavations should be observed by the representative of the geotechnical engineer prior to placement of forms or reinforcing steel.

The conclusions and recommendations presented in this report are based upon the field and laboratory investigation described herein and represent our best engineering judgment. Should conditions be encountered in the field that appear different from those described in this report, we should be contacted immediately in order that appropriate recommendations might be prepared.

Respectfully submitted,

JOHN R. BYERLY, INC.

REGISTERED PROFESSIONAL ENGINEER
JOHN R. BYERLY
No. GE000179
Exp. Date 6-30-19
GEOTECHNICAL
STATE OF CALIFORNIA

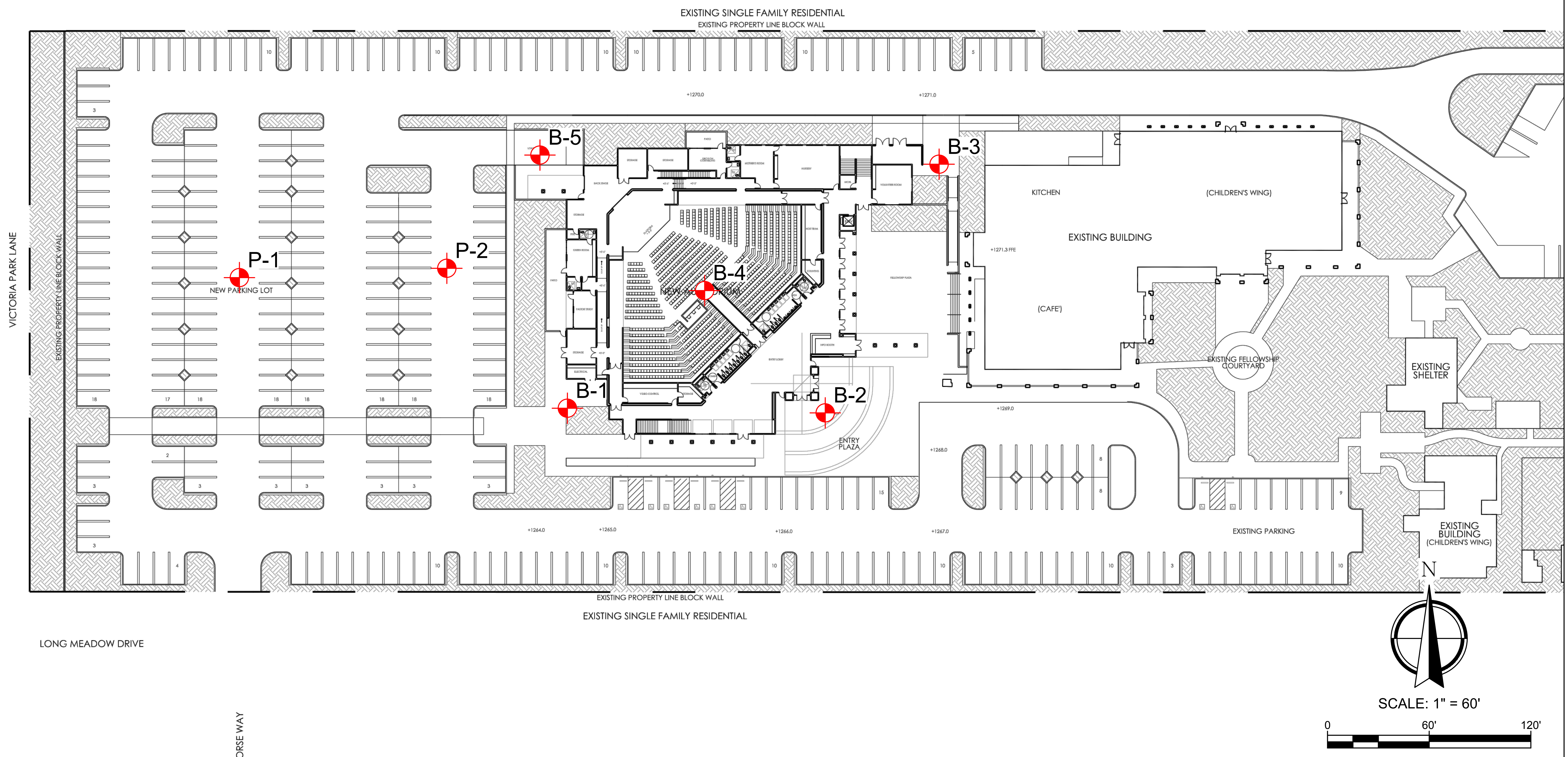
John R. Byerly, Geotechnical Engineer
President

JRB:jet

Enclosures:
(1) Plot Plan
(2) Exploration Logs
(3) Maximum Density Determinations
(4) Consolidation Test Results
(5) Subgrade Soil Test Data
(6) Percolation Test Data

LEGEND

⌖ APPROX. BORING LOCATION



SOURCE DOCUMENT: WLC ARCHITECTS, INC., 14 NOVEMBER 2017

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SOILS INVESTIGATION

CHRIST'S CHURCH OF THE VALLEY
7576 ETIWANDA AVENUE
RANCHO CUCAMONGA, CALIFORNIA

Enclosure 1
Rpt. No.: 4867-a
File No.: S-14033

Boring 1

Boring Date: 1/02/18
Surface Elevation:
Drilling Method: Truck-Mounted Flight-Auger

Std. Pen. "N" Value	Blows/Ft.	Dry Density (PCF)	Moisture Content (%)	Rel. Compaction (%)	Water Table
	6	101	6.6	78	GWT not encountered
	14	111	9.1	86	
	18	110	7.8	85	
	24	110	10.0	85	
	55	110	3.1	87	
	86	119	3.6	88	
	55	117	7.4	87	
	100	---	4.0	---	

Depth: 0, 5, 10, 15, 20, 25, 30, 35

3.0 inches of asphalt concrete over 5.0 inches of aggregate base

SM Yellow-brown silty fine to coarse sand, damp and loose

SM Yellow-brown silty fine to medium sand with a trace of gravel, moist and medium dense

SM Gray-brown fine to coarse sand with silt, slighty damp and dense

SM Brown silty fine to coarse sand with gravel, slightly damp and dense

Total Depth at 26.0 Feet
No Free Ground Water Encountered

LOG OF BORING

John R. Byerly, Inc.

Christ's Church of the Valley
Rancho Cucamonga, CA

Enclosure 2, Page 1
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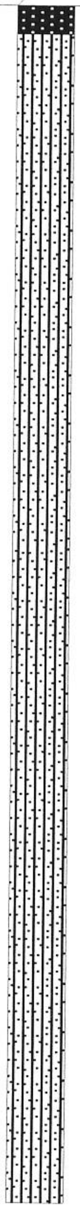
Boring 2

Boring Date: 1/02/18
Surface Elevation:
Drilling Method: Truck-Mounted Flight-Auger

Depth	Std. Pen. "N" Value	Blows/Ft.	Dry Density (PCF)	Moisture Content (%)	Rel. Compaction (%)	Water Table
0						GWT not encountered
		16	108	6.3	84	
		23	110	6.2	85	
5		55	118	8.7	91	
		29	110	9.1	85	
10		32	111	13.5	86	
15		55	120	5.7	93	
20		100	109	9.2	84	
25		55	112	9.9	86	
30		150	---	---	---	
35						



SM

3.0 inches of asphalt concrete over 6.0 inches of aggregate base

Yellow-brown silty fine to medium sand, damp and medium dense

- becoming dense

Total Depth at 31.0 Feet
No Free Ground Water Encountered

LOG OF BORING

John R. Byerly, Inc.

Christ's Church of the Valley
Rancho Cucamonga, CA

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File No.: S-14033

Boring 3

Boring Date: 1/02/18
Surface Elevation:
Drilling Method: Truck-Mounted Flight-Auger

Depth	Std. Pen. "N" Value	Blows/Ft.	Dry Density (PCF)	Moisture Content (%)	Rel. Compaction (%)	Water Table
0						GWT not encountered
		28	116	7.1	86	
		16	116	11.2	86	
5		27	116	14.8	86	
		26	113	15.2	87	
10		18	108	12.7	84	
15		47	121	8.6	90	
20		75	117	4.4	87	
25		86	118	4.5	87	
30						
35						

	3.0 inches of asphalt concrete over 4.0 inches of aggregate base
SM	Dark gray-brown silty fine to coarse sand with gravel, damp and medium dense (FILL)
SM	Brown silty fine to coarse sand with gravel, moist and medium dense (FILL)
SM	Brown silty fine to medium sand, moist and medium dense (ORIGINAL GROUND)
SM	Yellow-brown silty fine to coarse sand, moist and dense

Total Depth at 26.0 Feet
No Free Ground Water Encountered

LOG OF BORING

John R. Byerly, Inc.

Christ's Church of the Valley
Rancho Cucamonga, CA

Enclosure 2, Page 3
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Boring 4

Boring Date: 1/02/18
Surface Elevation:
Drilling Method: Truck-Mounted Flight-Auger

Std. Pen. "N" Value	Blows/Ft.	Dry Density (PCF)	Moisture Content (%)	Rel. Compaction (%)	Water Table
	13	106	4.8	82	GWT not encountered
	16	107	8.7	82	
	29	111	11.6	87	
	60	117	5.2	87	
	86	---	2.4	---	
	49	109	6.7	84	
	75	---	4.0	---	
	75	112	3.6	87	
	60	---	6.3	---	

2.5 inches of asphalt concrete over 6.0 inches of aggregate base

SM Yellow-brown silty fine to medium sand with gravel, damp and medium dense (FILL)

SM Yellow-brown silty fine to medium sand, moist and medium dense (ORIGINAL GROUND)

SM Yellow-brown silty fine to coarse sand with gravel, damp and dense

SM Gray-brown silty fine to coarse sand, slightly damp and dense

SM Yellow-brown silty fine sand with gravel, damp and medium dense

SM Yellow-brown silty fine to medium sand, damp and dense

Total Depth at 31.0 Feet
No Free Ground Water Encountered

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LOG OF BORING

John R. Byerly, Inc.

Christ's Church of the Valley
Rancho Cucamonga, CA

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File No.: S-14033

Boring 5

Boring Date: 1/02/18
Surface Elevation:
Drilling Method: Truck-Mounted Flight-Auger

Depth	Std. Pen. "N" Value	Blows/Ft.	Dry Density (PCF)	Moisture Content (%)	Rel. Compaction (%)	Water Table
0						GWT not encountered
		25	109	7.0	81	
		17	107	10.9	83	
		27	118	7.2	87	
	14					
10		33	114	3.9	84	
	28					
		55	114	4.3	84	
	36					
20		55	120	4.6	89	
	40					
		120	---	3.7	---	
	65					
30		120	---	---	---	
	52					
	52					
40	42					
	43					
50						
60						
70						

SM 2.0 inches of asphalt concrete over 5.0 inches of aggregate base

SM Gray-brown silty fine to coarse sand with gravel, damp and medium dense (FILL)

SM Yellow-brown silty fine to medium sand, moist and medium dense (FILL)

Yellow-brown silty fine to coarse sand, damp and medium dense (ORIGINAL GROUND)

SM Brown silty fine sand, damp and medium dense

SM Brown silty fine to coarse sand with gravel, moist and medium dense

Total Depth at 46.5 Feet
Refusal on Dense Soil
No Free Ground Water Encountered

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LOG OF BORING

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Christ's Church of the Valley
Rancho Cucamonga, CA

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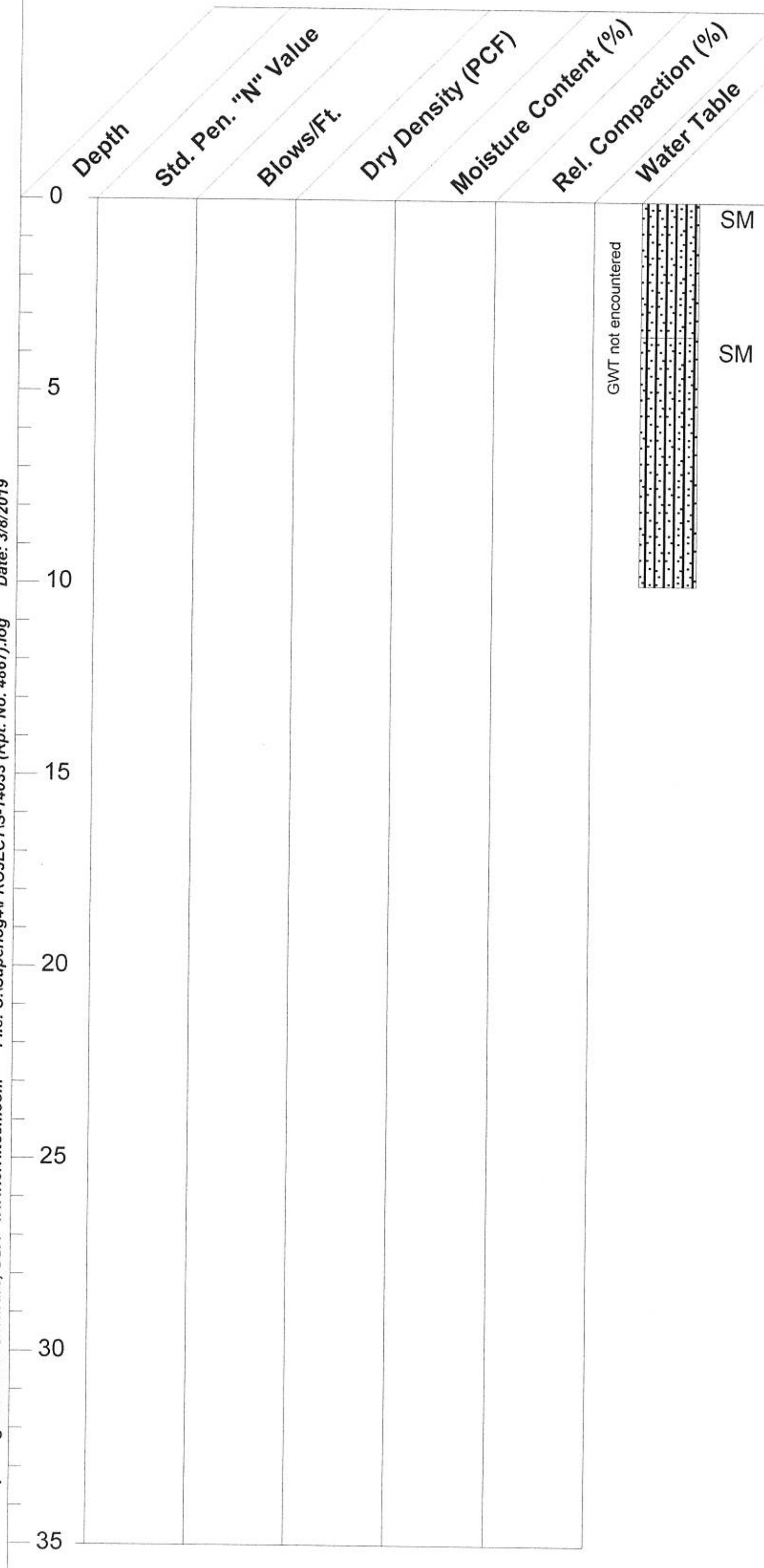
Test Pit 1

Boring Date: 1/02/18
Surface Elevation:
Drilling Method: Truck-Mounted Flight-Auger



Gray-brown silty fine to coase sand, dry and medium dense

Yellow-brown silty fine to coarse sand, damp and medium dense

Total Depth at 10.0 Feet
No Free Ground Water Encountered

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\S-14033 (Rpt. No. 4867).log Date: 3/8/2019

LOG OF BORING

John R. Byerly, Inc.

Christ's Church of the Valley
Rancho Cucamonga, CA

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File No.: S-14033

Test Pit 2

Boring Date: 1/02/18
Surface Elevation:
Drilling Method: Truck-Mounted Flight-Auger

Depth	Std. Pen. "N" Value	Blows/Ft.	Dry Density (PCF)	Moisture Content (%)	Rel. Compaction (%)	Water Table		
0						GWT not encountered	SM	Gray-brown silty fine to coarse sand, dry and medium dense
							SM	Yellow-brown silty fine to coarse sand, damp and medium dense
5								
10								Total Depth at 10.0 Feet No Free Ground Water Encountered
15								
20								
25								
30								
35								

LOG OF BORING

John R. Byerly, Inc.

Christ's Church of the Valley
Rancho Cucamonga, CA

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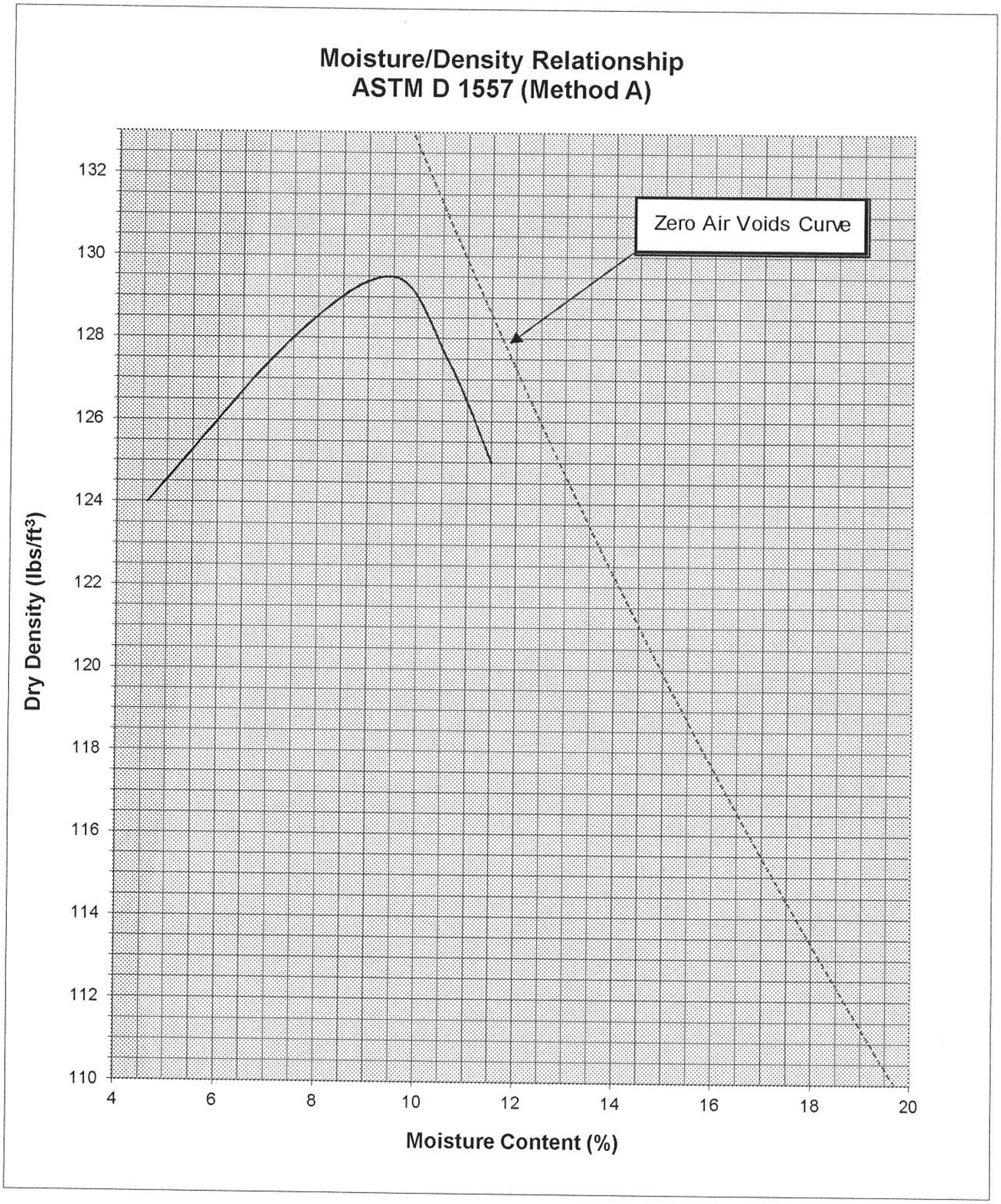

Boring No.	B-1
Depth (ft.)	0-10'
Optimum Moisture (%)	9.5
Maximum Dry Density (pcf)	129.5
Soil Classification	Yellow-brown silty fine to medium sand with a trace of gravel (SM)

Christ's Church of the Valley
Auditorium Building

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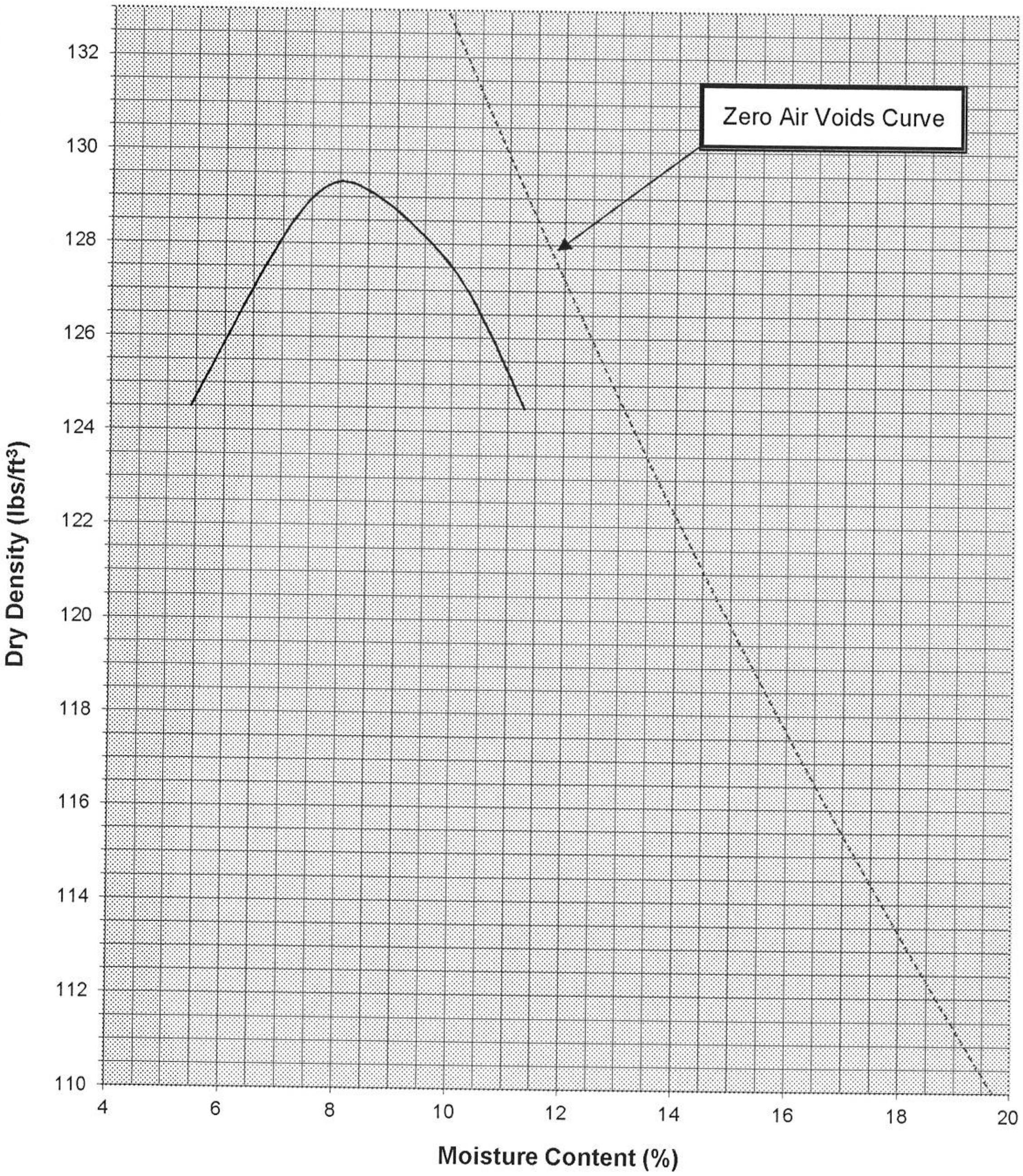
Moisture/Density Relationship
ASTM D 1557 (Method A)



Boring No.	B-1
Depth (ft.)	10-20'
Optimum Moisture (%)	8.2
Maximum Dry Density (pcf)	129.3
Soil Classification	Brown silty fine to coarse sand with gravel (SM)

Christ's Church of the Valley
Auditorium Building

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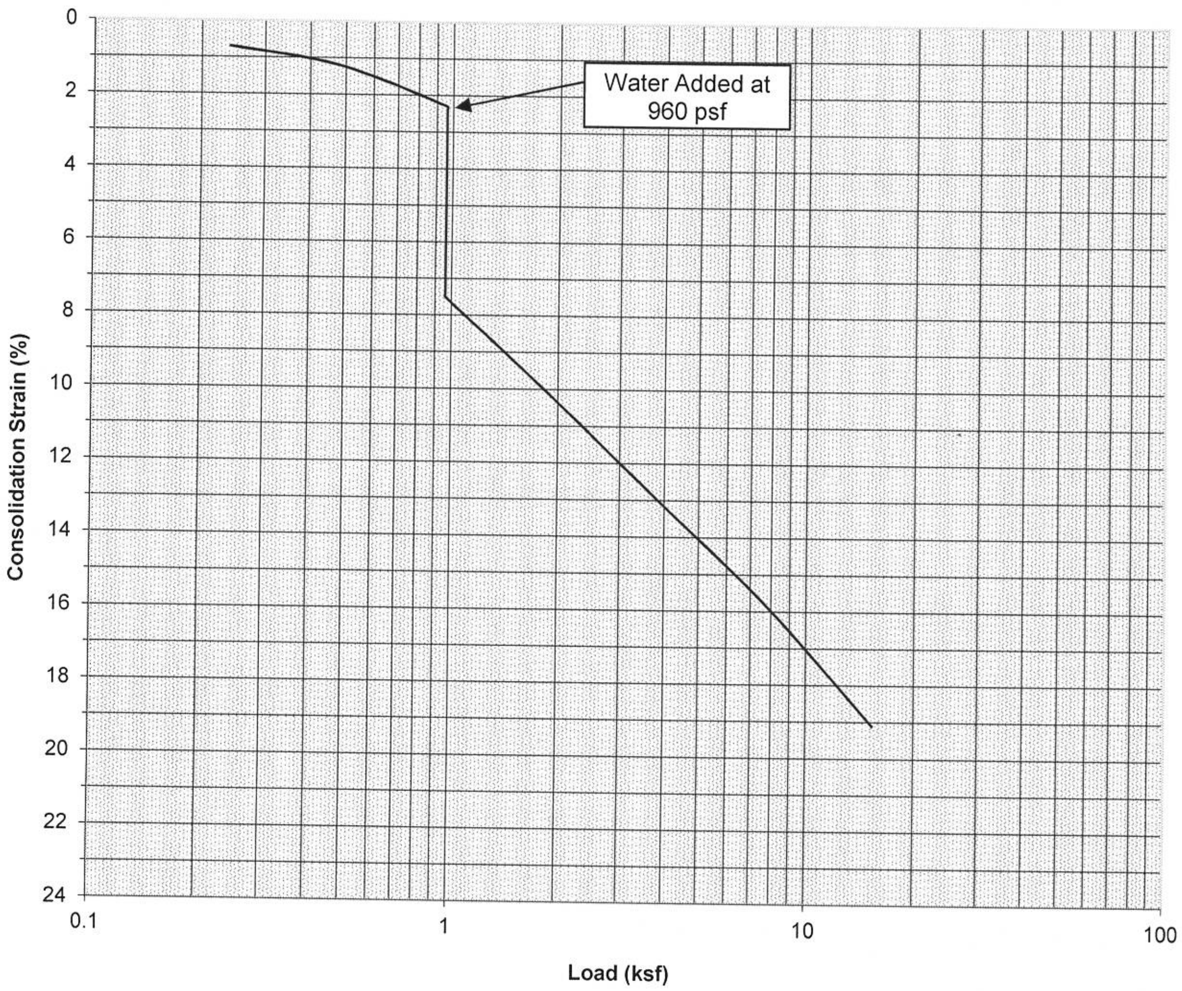
John R. Byerly
INCORPORATED

Consolidation Test Results



Classification: SM

Boring Number:	B-1
Depth (ft)	3.5
Specimen Diameter (in)	2.4
Specimen Thickness (in)	1.0

Initial Moisture Content (%)	9.1
Final Moisture Content (%)	18.2
Initial Dry Density (pcf)	111

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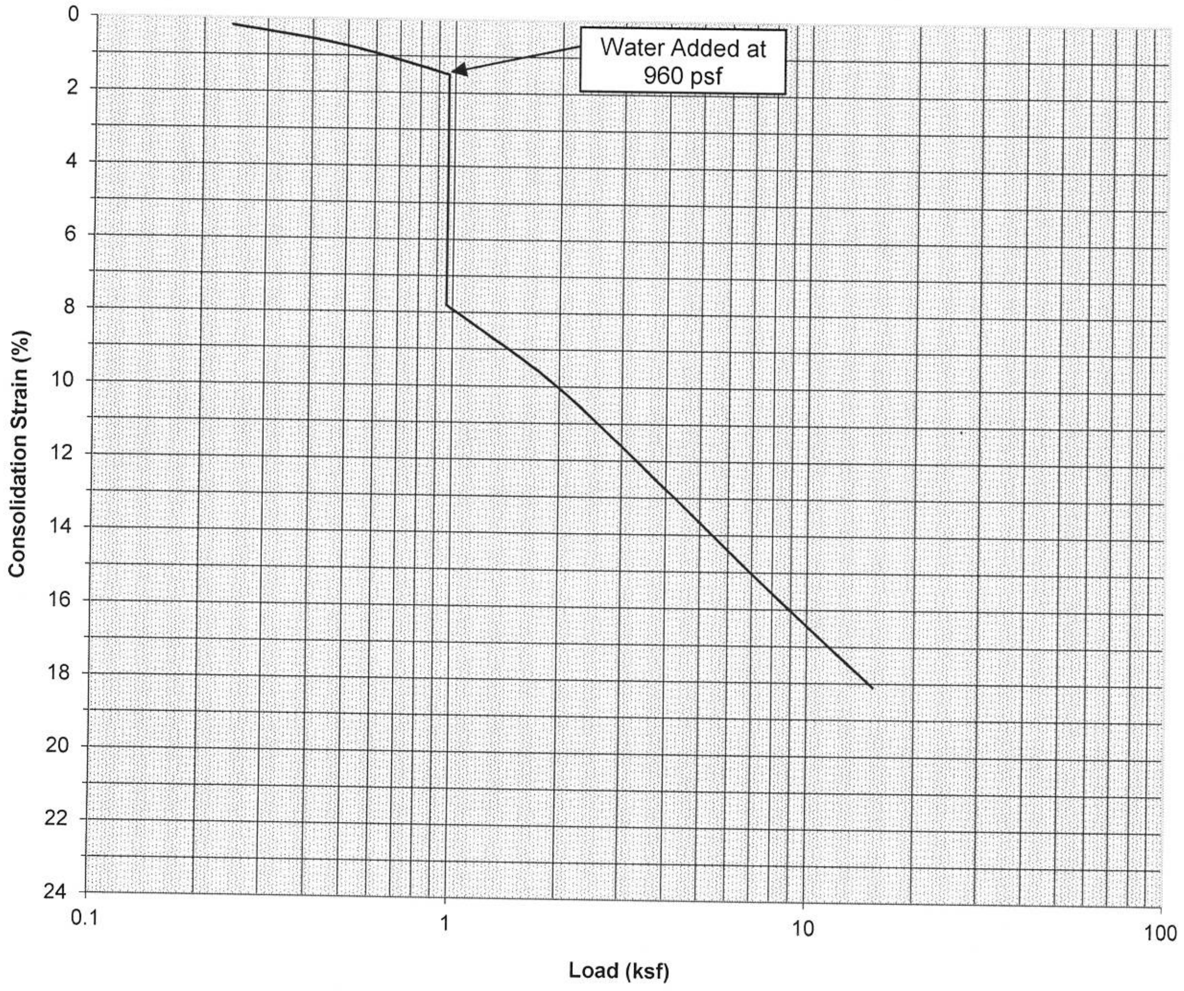
Consolidation Test Results



Classification: SM

Boring Number:	B-4
Depth (ft)	3.5
Specimen Diameter (in)	2.4
Specimen Thickness (in)	1.0

Initial Moisture Content (%)	8.7
Final Moisture Content (%)	17.0
Initial Dry Density (pcf)	107

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RESULTS OF SUBGRADE SOIL TESTS

California Department of Transportation Test Methods 202, 217, & 301
ASTM Designations C136 and D2419

PROJECT: Christ's Church of the Valley

		Percent Passing Sieve Size:														
Sample No.	**Location**	**3"**	**2½"**	**2"**	**1½"**	**1"**	**3/4"**	**1/2"**	**3/8"**	**No. 4**	**No. 8**	**No. 16**	**No. 30**	**No. 50**	**No. 100**	**No. 200**	**Sand Equiv.**
1	B-4 at 0-10'					100	98	97	95	92	88	84	71	64	46	29	20

STABILOMETER "R" VALUE

Sample No.		1	
Moisture Content (%)	9.7	10.6	11.5
Dry Density (lbs./cu. ft.)	123.5	122.8	122.3
Exudation Pressure (psi)	412	282	171
Expansion Pressure (psf)	0.000	0.000	0.000
"R" Value	71	57	43
"R" Value at 300 PSI Exudation		59	

Enclosure 5
Rpt. No.: 4867-a
File No.: S-14033

JOHN R. BYERLY, INC.

PERCOLATION TEST DATA SHEET

Job: Christ's Church of the Valley – Auditorium Building
Date: 1/3/18
By: JEJ
Remarks: __________

Bor. No. P-1 Dia. (in.) 8
Depth of Test: 60 inches

Time Read	Read. (in)	Rate* (in/hr)
5:48	107.00	2.76
6:13	113.25	
6:14	107.00	2.35
6:39	112.50	
6:40	107.00	1.74
7:10	112.00	
7:11	107.00	1.63
7:41	111.75	
7:42	107.00	1.53
8:12	111.50	
8:13	107.00	1.43
8:43	111.25	
8:44	107.00	1.33
9:14	111.00	
9:15	107.00	1.24
9:45	110.75	
9:46	107.00	1.24
10:16	110.75	
10:17	107.00	1.24
10:47	110.75	

Bor. No. P-2 Dia. (in.) 8
Depth of Test: 47 inches

Time Read	Read. (in)	Rate* (in/hr)
5:46	110.00	3.20
6:11	117.00	
6:12	110.00	2.48
6:37	115.75	
6:38	110.00	1.96
7:08	115.50	
7:09	110.00	1.85
7:39	115.25	
7:40	110.00	1.85
8:10	115.25	
8:11	110.00	1.74
8:41	115.00	
8:42	110.00	1.74
9:12	115.00	
9:13	110.00	1.63
9:43	114.75	
9:44	110.00	1.63
10:14	114.75	
10:15	110.00	1.63
10:45	114.75	

* Rate has been corrected for contribution of boring sidewall

Enclosure 6
Rpt. No.: 4867-a
File No.: S-14033