

INFORMATION HANDOUT

Geotechnical Design Report for High Mast Light Pole Structures

Project No. 0713000149

Contract 07-297401

Memorandum

*Serious drought.
Help save water!*

To: MR. OSWALD ELIZONDO
DESIGN MANAGER
OFFICE OF TRAFFIC DESIGN
DISTRICT 7

Date: February 08, 2016

File: 07-LA-105/110
EA 07-297401
EFIS. 0713000149

Attention: Cesar Hernandez

From: DEPARTMENT OF TRANSPORTATION
Division of Engineering Services
METS-Geotechnical Service
Office of Geotechnical Design South

Subject: Geotechnical Design Report for High Mast Light Pole Structures

INTRODUCTION

The Office of Geotechnical Design – South (OGDS) has prepared this memorandum to provide geotechnical recommendations for the proposed high mast light pole structures at the interchange of State Routes 105 and 110 in Los Angeles County (Figure 1).

SCOPE OF WORK

The geotechnical work performed for this project includes:

- Review of geologic information, published historical groundwater levels, and As-Built LOTBs;
- Interpretation of subsurface geologic and groundwater conditions;
- Evaluate data obtained from above activities and perform engineering analyses; and
- Draft the report.

It should be noted that no subsurface exploration has been performed at the proposed light structure locations due to late request for the recommendations.

PROJECT DESCRIPTION

The proposed project consists of 8 high mast light pole structures. The information on the proposed structures provided by the District is summarized in Table 1.

Table 1 - Summary of the Proposed High Mast Light Pole Structures

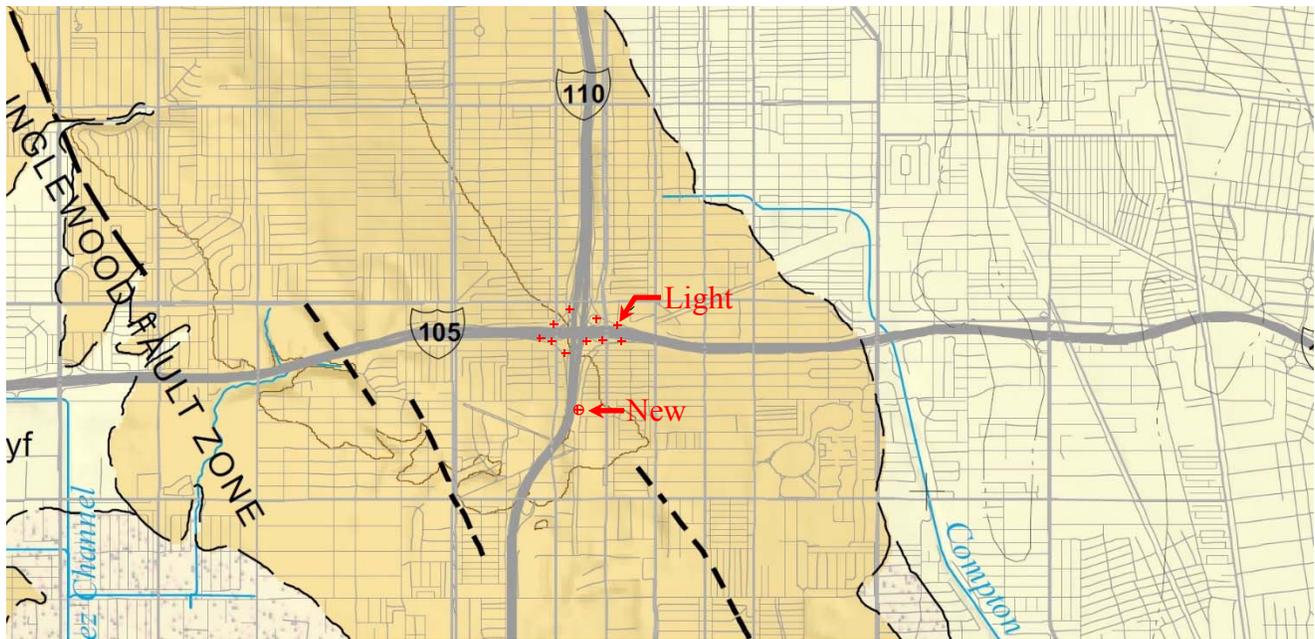
Pole Number	Pole Information and Existing Grade				Drilled Shaft		As-built LOTBs near the proposed pole locations Boring No. (Bridge No.)
	Light Pole Height (ft)	Latitude	Longitude	Approx. Ground Elevation at Top of Pole (ft)	Diameter (ft)	Length (ft)	
1	100	33°55'42.07"	118°17'04.71"	207	4	20	B-5 (53-2403G) B-11 (53-2682E)
3	160	33°55'45.05"	118°16'58.19"	178	6	25	B-1 (53-2402)
4	160	33°55'49.19"	118°16'53.30"	147	6	25	B-1 (53-2406F) B-2 (53-2683K)
6	160	33°55'47.05"	118°16'46.06"	157	6	25	B-4 (53-2676F) B-3 (53-2677F)
7	160	33°55'41.29"	118°16'42.63"	158	6	25	B-2 (53-2401R)
8	100	33°55'44.10"	118°16'35.60"	189	4	20	B-4 (53-2409) B-9 (53-2676F)
9	100	33°55'41.20"	118°16'34.49"	185	4	20	B-7 (53-2409) B-10 (53-2409)
10	120	33°55'37.86"	118°16'54.79"	179	5	20	B-3 (53-0981) B-1 (53-2403G)

SITE GEOLOGY AND SUBSURFACE CONDITIONS

Site Geology

For this report we have reviewed the Geologic Compilation of Quaternary Surficial Deposits in Southern California Onshore Portion of the Long Beach 30'X60' Quadrangle, by P.D. Roffers and T.L. Bedrossian (2010). The area is located in the Los Angeles Basin, which is an alluviated lowland or coastal plain, bounded on the north by the Santa Monica Mountains and Elysian, Repetto, and Puente Hills on the east and southeast by the Santa Ana Mountains and San Joaquin Hills.

The proposed locations for the Light Poles and Sign overly Quaternary Old Alluvial Valley Deposits which area composed of moderately consolidated, clay, silt, sand and gravel. Sediments have been deposited along stream valleys and alluvial flats of larger rivers.



Qyf

Young Alluvial Fan Deposits - unconsolidated to slightly consolidated, undissected to slightly dissected boulder, cobble, gravel, sand, and silt deposits issued from a confined valley or canyon

Qoa

Old Alluvial Valley Deposits - slightly to moderately consolidated, moderately dissected clay, silt, sand, and gravel along stream valleys and alluvial flats of larger rivers

Figure 2 Geologic Map of the Long Beach 30'X60' Quadrangle

Subsurface Conditions

Based on the relevant as-built LOTBs, the sites are underlain by silty SAND/SAND/sandy CLAY/clayey SILT materials. The apparent density of sandy materials are generally medium dense to very dense. The consistency of clayey materials are generally very stiff to hard.

GROUNDWATER

Based on As-Built LOTBs, groundwater was encountered at some borehole locations during previous subsurface explorations (Table 2).

Groundwater measurements are also available near the vicinity of the site from California Department of Water Resources. Based on the groundwater level measurements, groundwater depths varied from 113 feet (elevation -16 MSL) to 168 feet (elevation -69 MSL) between 4/23/1998 and 9/18/2015.

Based on the above information, a groundwater elevation of 108 feet above sea level is used for liquefaction analysis and seismic settlement estimate.

Table 2 - Measured Groundwater

Pole Number	Borehole Number (Bridge Number)	Top of Borehole Elevation (ft)	Ground Water Table Elevation (ft)	Ground Water Table below Ground Surface (ft)	Date Measured
1	B-5 (53-2403G) B-11 (53-2682E)	176.8 203.7	Not Encountered	--	--
3	B-1 (53-2402)	165.0	Not Encountered	--	--
4	B-1 (53-2406F) B-2 (53-2683K)	155.4 157.2	Not Encountered	--	--
6	B-4 (53-2676F) B-3 (53-2677F)	147.5 153.8	100.6 Not Encountered	46.9 --	07/17/1986
7	B-2 (53-2401R)	149.6	Not Encountered	--	--
8	B-4 (53-2409) B-9 (53-2676F)	140.4 140.3	98.4 Not Encountered	42.0 --	10/10/1985
9	B-7 (53-2409) B-10 (53-2409)	145.7 139.5	107.7 Not Encountered	38.0 --	10/10/1985
10	B-3 (53-0981) B-1 (53-2403G)	162.6 175.5	Not Encountered	--	--

It should be noted that groundwater table levels can fluctuate with seasonal change and other factors including local irrigation.

SEISMIC EVALUATION

The job site is not located within any California Geological Survey (CGS) designated Earthquake Fault Zone (EFZ). The job site is not considered prone to surface fault rupture hazard; therefore, the possibility of surface fault rupture hazard at this site is considered low.

LIQUEFACTION

Although groundwater table is assumed relatively shallow at the location, liquefaction potential is considered to be low because of relatively dense to very dense sandy and stiff to hard clayey materials at the site.

CORROSIVITY

Due to lack of soil samples for corrosion tests, foundation soil at the light pole locations should be assumed to be corrosive.

GEOTECHNICAL RECOMMENDATIONS

Soil Profile and Estimated Soil Strength Parameter

The engineering properties of subsurface material at the project site were correlated with blow counts obtained from relevant as-built LOTBs. Estimated soil engineering properties and generalized soil stratigraphy used for geotechnical analysis and design are summarized in Table 3.

Table 3 - Estimated soil engineering properties and generalized soil stratigraphy

Layer No.	Depth Below Ground Surface (ft)	Soil Type	Estimated Soil Engineering Parameters	Ground/Slope Condition at the Proposed Structures
Pole 1				
1	0 – 20	SM (Fill)	$\gamma = 120.0$ pcf $\phi = 34^\circ$	On the Slope
2	20 – 50	ML	$\gamma = 130.0$ pcf $C_u = 3.5$ ksf	
Pole 3				
1	0 – 15	SM (Fill)	$\gamma = 120.0$ pcf $\phi = 34^\circ$	At top of slope
2	15 – 30	CL/MH	$\gamma = 130.0$ pcf $C_u = 4.0$ ksf	
3	30 – 60	SM	$\gamma = 135.0$ pcf $\phi = 40^\circ$	

Pole 4				
1	0 – 30	CL/MH	$\gamma = 130.0$ pcf $C_u = 3.5$ ksf	Flat
2	30 – 50	SP/SM	$\gamma = 135.0$ pcf $\phi = 40^\circ$	
Pole 7				
1	0 – 20	SM	$\gamma = 120.0$ pcf $\phi = 35^\circ$	Flat
2	30 – 50	SP/SM	$\gamma = 135.0$ pcf $\phi = 40^\circ$	
Pole 6				
1	0 – 10	SM (Fill)	$\gamma = 120.0$ pcf $\phi = 34^\circ$	Flat
2	10 – 50	CL//CH/MH	$\gamma = 130.0$ pcf $C_u = 3.5$ ksf	
Poles 8 and 9				
1	0 – 40	SM (Fill)	$\gamma = 120.0$ pcf $\phi = 34^\circ$	On the slope
2	40 – 55	CL	$\gamma = 130.0$ pcf $C_u = 3.5$ ksf	
Pole 10				
1	0 – 30	CL	$\gamma = 130.0$ pcf $C_u = 4.0$ ksf	On the slope
2	30 – 60	SM	$\gamma = 135.0$ pcf $\phi = 40^\circ$	

Pile Analysis

Based on the provided loads, the proposed drilled shafts are analyzed using LPILE PLUS 5.0 computer software. Drilled shafts details and analysis results are summarized in table 4.

Table 4 – Foundation Recommendations for Light Poles

Pole Number	Light Pole Height (ft)	Pile Diameter (ft)	Pile Length (ft)	Axial Force (kips)	Bending Moment (kip-ft)	Shear (kip)	Estimated Max. pile-head deflection (in)
1	100	4.0	20	4.6	325.5	5.8	0.5
3	160	6.0	25	9.85	1035.3	12.2	0.5
4	160	6.0	25	9.85	1035.3	12.2	0.5
6	160	6.0	25	9.85	1035.3	12.2	0.5
7	160	6.0	25	9.85	1035.3	12.2	0.5
8	100	4.0	20	4.6	325.5	5.8	0.5
9	100	4.0	20	4.6	325.5	5.8	0.5
10	120	5.0	20	5.4	485.8	7.4	0.5

The proposed light pole foundations may be constructed using Drilled Shaft piles. The estimated maximum deflections of these pole foundations is about 0.5 inch at the top of foundation for poles.

Based on the result of analysis with the proposed pile lengths, the proposed foundation depth is sufficient to support the proposed light poles and sign structures.

CONSTRUCTION CONSIDERATIONS

Section 49-1.03 Expected Difficult Pile Installation.

Caving should be anticipated during excavation of the pile boring and during Drilled Shaft pile construction. Due to seasonal rainfall and fluctuating groundwater elevations, there is the high potential for groundwater to be encountered during the Drilled Shaft pile construction.

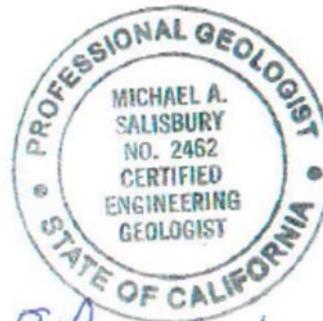
If you have any questions or comments, please contact Hung Po (Paul) Yang at (916) 227-4534 or Michael Salisbury at (916) 227-5392.

Prepared by:



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EXP: 2/28/2017
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