February 18, 2020

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Duke Realty
200 Spectrum Center Drive, Suite 1600
Irvine, California 92618

Attention: Mr. Adam Schmid
Development Services Manager

Project No.: **18G185-3**

Subject: **Geotechnical Report Update and Plan Review**
Proposed Warehouse
NEC Harvill Avenue and Rider Street
Riverside County (Perris Area), California

Reference: Geotechnical Investigation, Proposed Warehouse, NEC Harvill Avenue and Rider Street, Riverside County (Perris Area), California, prepared for Duke Realty, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 18G185-1, dated October 1, 2018.

Gentlemen:

In accordance with your request, we have prepared this letter to update the above-referenced geotechnical report relative to the currently proposed development. This report will serve to update the above-referenced geotechnical report to current standards and contains updated building code design parameters. Prior to the preparation of this report we have reviewed the referenced geotechnical investigation and a site plan for the subject project.

Current Site Conditions

The subject site is located at the northeast corner of Harvill Avenue and Rider Street in an unincorporated portion of Riverside County near Perris, California. The site is bounded to the north by a vacant lot, to the west by Harvill Avenue, to the south by Rider Street, and to the east by a railroad easement.

The subject site consists of two (2) parcels, totaling 14.4± acres in size. The southeastern area of the site was previously developed with seven (7) silos, hopper and elevator structures, various machinery associated with the silos, and one industrial building, approximately 4,500 ft^2 in size. However, all of the structures have recently been demolished. Two railroad spurs remain in the southeastern area of the site, extending to the southeastern corner of the site. A drainage course, approximately 6½± feet wide, extends from the northern portion of the previously developed area in the southeast portion of the site to Harvill Street. The remaining areas of the site are vacant and undeveloped. The ground surface cover in these areas consists of moderate to heavy native grass and weed growth. A soil stockpile is present in the northern portion of the site. The dimensions of the stockpile are about 10± feet in height and 280± feet long.

Detailed topographic information was obtained from the conceptual grading plan, prepared by Albert A. Webb Associates, dated October 16, 2019. Based on topographic information provided, the site topography ranges from 1503± feet mean sea level (msl) in the central-east area of the site to 1517± feet msl in the northern area of the site. The site topography slopes gently downward toward the east at a gradient of approximately 1± percent.

Previous Study

Southern California Geotechnical, Inc. (SCG) previously conducted a geotechnical investigation for the overall site. The results of the investigation are presented in the above-referenced report. As part of this investigation, a total of six (6) borings were advanced to depths of 20 to 50± feet below existing site grades.

Asphaltic concrete pavements were encountered at the ground surface at Boring No. B-4. The pavement section at B-4 consists of 3± inches of asphaltic concrete underlain by 3± inches of aggregate base.

Artificial fill soils were encountered beneath the pavements at Boring No. B-4, extending to depths of 5± feet below the existing site grades. The artificial fill soils generally consist of loose to medium dense silty fine to medium sands with trace clay content. The fill soils possess a disturbed appearance and artificial debris, including asphaltic concrete fragments, resulting in their classification as artificial fill.

Native alluvium was encountered beneath the artificial fill soils at Boring No. B-4, and at the ground surface at all of the remaining borings. The near surface alluvial soils within the upper 20 to 30± feet generally consist of loose to medium dense silty sands and clayey sands. However, most of the borings also encountered hard fine sandy clay layers and/or dense to very dense clayey sand layers within the upper 10± feet. Some of the alluvial soils within the upper 5 to 6± feet are porous. Some of the soils encountered throughout the upper 20± feet are weakly cemented.

The native alluvial soils encountered between depths of 32± feet and the maximum depth explored of 50± feet generally consist of medium dense to dense silty fine to medium sands with trace to little clay content. Some of the recovered samples possessed trace fine gravel content.

Free water was not encountered during the drilling of any of the borings. Based on the lack of any water within the borings, and the moisture contents of the recovered soil samples, the static groundwater table is considered to have existed at a depth in excess of 50± feet at the time of the subsurface exploration.

Based upon the conditions identified, SCG recommended that remedial grading be performed within the building pad area to remove an upper portion of the existing native soils and replace these as compacted structural fill. The building pad area was recommended to be overexcavated to a depth of at least 5 feet below existing grade and to a depth of at least 5 feet below proposed pad grade elevations, whichever is deeper. Additional overexcavation was recommended within the foundation influence zones to a depth of at least 3 feet below foundation bearing grades.

Conceptual Grading Plan Review

At the time of the referenced geotechnical investigation, the building was proposed as a 316,500± ft^2 structure. Dock-high doors were proposed along the east side of the building. The surrounding areas of the site were expected to be developed with asphaltic concrete pavements for automobile parking and drive areas, and Portland cement concrete (PCC) pavements in the truck traffic areas. Several landscape planters and concrete flatwork were expected to be included throughout the site.

Our office was provided with the most recent site plan for the project, identified as Duke Realty-Harvill & Rider Conceptual Grading Plan, prepared by Albert A. Webb Associates, dated October 16, 2019. Based on our review of this plan, the proposed development has not changed significantly since the time of the referenced geotechnical report. The proposed building will be a 310,995 ± ft^2 structure, surrounded by concrete pavements and landscape throughout the site. Cuts of less than 3± feet and fills of up to 5± feet will be necessary to achieve the new site grades. The referenced geotechnical investigation is considered applicable to the currently proposed development. No new subsurface exploration is considered warranted.

Updated Seismic Design Considerations

Seismic Design Parameters

The California Building Code (CBC) provides procedures for earthquake resistant structural design that include considerations for on-site soil conditions, occupancy, and the configuration of the structure including the structural system and height. The seismic design parameters presented below are based on the soil profile and the proximity of known faults with respect to the subject site.

The proposed development is expected to be designed in accordance with the requirements of the 2019 edition of the California Building Code (CBC). Other design consultants should verify the version of the code under which the proposed development will be submitted.

The 2019 CBC Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool, a web-based software application available at the website www.seismicmaps.org. This software application calculates seismic design parameters in accordance with several building code reference documents, ASCE 7-16, upon which the 2019 CBC is based. The application utilizes a database of risk-targeted maximum considered earthquake (MCE_R) site accelerations at 0.01-degree intervals for each of the code documents. The table below were created using data obtained from the application. The output generated from this program is included as Plate E-1 (2019 CBC) attached with this report. Based on this output, the following parameters may be utilized for the subject site:

The 2019 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped S_1 value greater than 0.2. However, Section 11.4.8 of ASCE 7-16 also indicates an exception to the requirement for a site-specific ground motion hazard analysis for certain structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section C11 of ASCE 7-16) indicates that "In general, this exception effectively limits the requirements for site-specific hazard analysis to

very tall and or flexible structures at Site Class D sites." **Based on our understanding of the proposed development, the seismic design parameters presented below were calculated assuming that the exception in Section 11.4.8 applies to the proposed structures at this site. However, the structural engineer should verify that this exception is applicable to the proposed structures.** Based on the exception, the spectral response accelerations presented below were calculated using the site coefficients (F_a and F_v) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2019 CBC.

2019 CBC SEISMIC DESIGN PARAMETERS

Parameter		Value
Mapped MCE_R Acceleration at 0.2 sec Period	S_S	1.500
Mapped MCE_R Acceleration at 1.0 sec Period	S_1	0.557
Site Class	---	D
Site Modified Spectral Acceleration at 0.2 sec Period	S_{MS}	1.500
Site Modified Spectral Acceleration at 1.0 sec Period	S_{M1}	0.971
Design Spectral Acceleration at 0.2 sec Period	S_{DS}	1.000
Design Spectral Acceleration at 1.0 sec Period	S_{D1}	0.647

It should be noted that the site coefficient F_v and the parameters S_{M1} and S_{D1} were not included in the SEAOC/OSHPD Seismic Design Maps Tool output for the 2019 CBC. We calculated these parameters-based on Table 1613.2.3(2) in Section 16.4.4 of the 2019 CBC using the value of S_1 obtained from the Seismic Design Maps Tool, assuming that a site-specific ground motion hazards analysis is not required for the proposed buildings at this site.

Further Plan Reviews

It is recommended that copies of the final grading plans, when they become available, be provided to our office for review. We also recommend that our office review any foundation plans for the proposed development, as they become available.

Geotechnical Report Update

This letter may serve as an update to the original geotechnical report. Provided that the updated recommendations contained within this letter are implemented, the previous geotechnical report is considered valid for the currently proposed development.

Closure

We sincerely appreciate the opportunity to be of continued service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,
SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Oscar Sandoval
Staff Engineer

Robert G. Trazo, GE 2655
Principal Engineer

Enclosures: Plate E-1 – Seismic Design Parameters

Distribution: (1) Addressee

OSHPD

Latitude, Longitude: 33.83134, -117.24802

Date	2/18/2020, 10:33:15 AM
Design Code Reference Document	ASCE7-16
Risk Category	III
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.5	MCE_R ground motion. (for 0.2 second period)
S_1	0.557	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.5	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.5	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.55	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.502	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.604	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.557	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.609	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.937	Mapped value of the risk coefficient at short periods
C_{R1}	0.916	Mapped value of the risk coefficient at a period of 1 s

SOURCE: SEAOC/OSHPD Seismic Design Maps Tool
<https://seismicmaps.org/>

SEISMIC DESIGN PARAMETERS - 2019 CBC

PROPOSED WAREHOUSE

RIVERSIDE COUNTY, CALIFORNIA

DRAWN: OS
CHKD: RGT

SCG PROJECT
18G185-3

PLATE E-1

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL