MOORE TWINING ASSOCIATES, INC.

MEMORANDUM

DATE: May 5, 2021

FROM: Read Andersen, RGE (Moore Twining Associates, Inc.)

TO: Mr. Chris Miller (Scannell Properties)

Subject: Preliminary Information from In-Progress Geotechnical Engineering Investigation for Proposed Distribution Center in Redding, California

Chris,

This memorandum was prepared to summarize findings from our in-progress geotechnical investigation for the proposed Distribution Center Warehouse in Redding, California. This information should be considered preliminary in nature. The final findings and recommendations will be included in our forthcoming geotechnical investigation report.

SITE DESCRIPTION AND ANTICIPATED CONSTRUCTION

It is our understanding the project encompasses two parcels identified as assessor's parcel numbers (APN) 054-200-002 (northern parcel) and 054-210-006 (southern parcel) with a total area of about 39.16 acres. The parcels are described herein as the northern parcel and the southern parcel.

Based on an aerial site plan overlay and information provided by the client, we understand an approximately 250,000 square foot Distribution Center warehouse structure is planned within the northern parcel at the subject site. The structure is anticipated to include concrete tilt up walls and a steel frame supported roof structure. A dock high condition is anticipated along some sides of the building for truck loading/unloading. The building area will generally be surrounded by pavements. The site plan provided depicts a trailer parking area to the south of the building and an employee parking area within the western portion of the site. Vehicular access to the property will be established by new driveways from the west side of the site from Airport Road. In addition to the Distribution Center building, a van maintenance garage structure is planned within the northeastern portion of the site.

Based on our experience with similar projects, the maximum column and wall loads are anticipated to be in ~100 kips and 4 kips per linear foot, respectively for the proposed warehouse.

The site is bounded to the north by a fence and commercially developed property beyond, to the west by Airport Road, to the south by an undeveloped lot with trees, seasonal vegetation and stockpiles of removed vegetation, and to the east by Old Oregon Trail.

PH: 559.268.7021
FX: 559.268.7126
2527 Fresno Street
Fresno, CA 93721

At the time of our field exploration between April 5 and April 8, 2021, the southern parcel was mostly cleared of manzanita brush but scattered mature trees remained. The ground surface was covered by seasonal grasses and tree/brush shavings and stockpiles. At the time of our field exploration, the northern parcel was mostly covered by manzanita brush and scattered trees with heights of up to about 50 to 65 feet. The manzanita brush was removed by an excavator during our time on site to make pathways to the proposed boring and test pit locations.

FIELD EXPLORATION

The field exploration was conducted between April 5 and April 8, 2021 and included seventeen (17) borings and five (5) test pits. One (1) boring was drilled within the footprint of the proposed van maintenance garage structure and encountered sampler refusal at a depth of about 19 feet. Eight (8) borings were drilled within the footprint of the proposed Distribution Center warehouse structure to depths ranging from 18.5 feet to 51.5 feet below site grade (BSG). Seven (7) of the eight (8) borings drilled within the footprint of the proposed Distribution Center warehouse structure encountered auger refusal at depths ranging from 18.5 to 27 feet BSG due to encountering soil with gravel and rock fragments. Two (2) test pits were also excavated within the footprint of the proposed Distribution Center warehouse structure to depths of about 6 to 6.5 feet BSG. Six (6) borings were drilled to depths of 10 feet BSG in proposed pavement areas, including two (2) borings in the area of the proposed Aviation Drive. Three (3) test pits were also excavated to depths of about 6 to 6.5 feet BSG in the proposed pavement areas. In addition, two (2) borings were drilled to depths of about 21.5 feet BSG in the western portion of the site.

SOIL AND GROUNDWATER ENCOUNTERED

The soils encountered generally consisted of lean clays, lean clays with sand or sandy lean clays with varying amounts of gravel extending to depths of about 2 feet BSG to as deep as about 23 feet BSG. These clay soils were underlain in some of the borings by interbedded layers of clayey sands, silty sands, sandy silts, and additional clay layers, all with varying amounts of gravel and rock fragments. The gravel content appeared to increase in the soils below depths of about 8.5 to 10 feet BSG. The test pits indicated that roots sometimes extended to depths of about 2 to 3 feet BSG.

Groundwater was encountered in boring B-10 at a depth of 36 feet BSG, and the groundwater depth was then measured to be at a depth of 32 feet BSG after drilling.

GEOTECHNICAL ENGINEERING RELATED DESIGN AND CONSTRUCTION CONSIDERATIONS

Based on our investigation, the site is considered geotechnically suitable for support of the proposed structure, when prepared in accordance with the recommendations of the forthcoming report. Various potential geotechnical engineering related design or construction constraints are described below based on the conditions encountering during this investigation and the results of laboratory testing.

EXPANSION INDEX TEST RESULTS

Expansion index tests indicated the near surface clay soils have a very low expansion potential based on expansion index values of 10, 10 and from samples collected and test from the areas of the proposed building footprints for the Distribution Center warehouse and proposed van maintenance garage. Thus, special conditions such as importing granular fill for placement below interior and exterior slabs-on-grade and Portland cement concrete pavements are not anticipated to be required to address expansive soil concerns. However, slabs-on-grade are recommended to be underlain by at least 6 inches of aggregate base for constructability purposes. Expansive soils encountered during grading should not be used within the upper 24 inches of the finished pad subgrade.

SITE CLEARING, STRIPPING AND ROOT REMOVAL

Most of the site is covered with a dense growth of tall manzanita brush and large trees. The test pits indicated that rootlets commonly extended to depths of about 1½ to 14 inches BSG, and larger roots from trees and manzanita brush extended to depths ranging from about 2½ to 3½ feet BSG. Root balls from the tall, mature trees may extend to depths ranging from about 3 to 5 feet BSG, or possibly deeper. Root removal and clearing of the site will be significant. As part of the site preparation, existing root systems and organics will need to be removed. Due to the extent of the root systems, equipment and procedures will need to be developed by the contractor to remove all roots in order to use the onsite soils as engineered fill.

SITE PREPARATION CONSIDERATIONS

Based on the findings of this investigation, it is anticipated that removals of about 2½ feet to 5 feet below site grades will be required to remove roots and root balls from the manzanita brush and tall, mature trees. Deeper removals may be necessary to remove soils which are disturbed from the tree removal. In addition to excavation for root removal, it is anticipated that engineered fill will need to be placed below the structure foundations to provide relatively uniform support and limit the potential for excessive differential settlement.

In addition, the surface soils were commonly considered very soft to soft with SPT N-values of 4 or less. The penetration test resistance increased below a depth of 3 feet. Due to the soft/weak surface soil condition, preparation of the subgrade soils will need to include removal and compaction of the near surface soils to establish subgrade support for improvements.

It should be noted that some of the near surface soils contained relatively high moisture contents. The average annual rainfall in the Redding area is high for California standards and the presence of clayey soils will create instability during the wet season. Accordingly, provisions should be provided for stabilization of subgrade soils for wet season construction.

PRELIMINARY ALLOWABLE FOUNDATION BEARING PRESSURE

Based on the soil conditions encountered, it is anticipated that the warehouse structure and van maintenance garage structure can be supported on conventional shallow spread and continuous foundations bearing on engineered fill soils. On a preliminary basis, it is anticipated that a maximum net allowable soil bearing pressure of 2,000 pounds per square foot or greater for dead-plus-live loads can be used for design. However, this value will need to be confirmed based on analyses.

2019 CBC SEISMIC FACTORS FOR DESIGN OF FOUNDATIONS

The following seismic factors were developed using online data obtained from the Ground Motion Parameter Calculator provided by the Structural Engineers Association of California website (https://seismicmaps.org/) based upon a Site Class D, a latitude of 40.528328 degrees and a longitude of -122.299785 degrees. The data provided in Table No. 1 below are based upon the procedures of Sections 1613.2.1 through 1613.2.4 of the 2019 California Building Code (CBC) and were not determined based upon a ground motion hazard analysis. The structural engineer should review the values in Table No. 1 and determine whether a ground motion hazard analysis is required for the project considering the seismic design category, structural details, and requirements of ASCE 7-16 (Section 11.4.8 and other applicable sections).

Table No. 1 Seismic Factors

Item	CBC Value
Maximum Considered Earthquake (geometric mean) peak ground acceleration adjusted for site effects (PGA_M)	0.538g
Mapped Maximum Considered Earthquake (geometric mean) peak ground acceleration (PGA)	0.481g
Site Class	D
Spectral Response At Short Period (0.2 Second), Ss	1.079
Spectral Response At 1-Second Period, S_1	0.432
Site Coefficient, Fa	1.068
Site Coefficient, Fv	See Note
Maximum considered earthquake spectral response acceleration for short period, S_{MS}	1.153
Maximum considered earthquake spectral response acceleration for 1 second, S_{M1}	See Note
Five percent damped design spectral response acceleration for short period, S_{DS}	0.768

Item	CBC Value
Five percent damped design spectral response acceleration at 1-second period, S_{D1}	See Note

Note: Requires ground motion hazard analysis per ASCE Section 21.2 (ASCE 7-16, Section 11.4.8), unless an Exception of Section 11.4.8 of ASCE 7-16 is applicable for the project design.

FAULT HAZARDS

The site is not located in an Alquist-Priolo Earthquake Fault Zone. The nearest known active fault is the Rocky Ledge fault, located about 43 miles northeast of the site. Therefore, the potential for fault rupture at the site is considered low.

LIQUEFACTION AND SEISMIC SETTLEMENT HAZARDS

Liquefaction and seismic settlement analyses were conducted based on soil properties revealed by boring B-10 which was drilled to a depth of 51.5 feet BSG. A Maximum Considered Earthquake (geometric mean) peak ground acceleration adjusted for site effects (PGA_M) of 0.538g was determined for the site using the Ground Motion Parameter Calculator provided by SEOAC and OSHPD (http://seismicmaps.org). A Maximum Considered Earthquake magnitude of 9.34 was applied in the analysis based on deaggregation analysis (United States Geological Survey deaggregation website, Dynamic Conterminous U.S. 2014, V4.2.0).

Based on the analysis, the potential for liquefaction is considered low and significant seismic settlements are not anticipated.

PRELIMINARY PAVEMENT DESIGN SECTIONS

The results of R-value testing conducted on sandy lean clay and lean clay with sand soils indicated R-values of 20, 39, 21 and 29. Based on the results of the testing, an R-value of 20 was used for the pavement thickness design.

The following preliminary asphalt concrete pavement sections are based on an R-value of 20, and traffic index values ranging from 5.0 to 11.0 for the pavements for onsite pavements associated with the Distribution Center warehouse facility. It should be noted that if pavements are constructed prior to the building construction, the traffic index value should account for construction traffic. The actual traffic index values applicable to the site should be determined by the project civil engineer.

Two-Layer Asphaltic Concrete Pavements

Traffic Index	AC thickness, inches	AB thickness, inches	Compacted Subgrade, inches
5.0	3.0	7.0	12
5.5	3.0	9.0	12
6.0	3.0	10.5	12
6.5	3.5	11.5	12
7.0	4.0	12.0	12
7.5	4.0	13.5	12
8.0	4.5	14.0	12
8.5	5.0	14.5	12
9.0	5.5	16.0	12
9.5	5.5	17.5	12
10.0	6.0	18.5	12
10.5	6.5	19.0	12
11.0	7.0	20.0	12

AC - Caltrans Type A Asphaltic Concrete compacted in accordance with our forthcoming report

AB - Class 2 aggregate base compacted to at least 95 percent relative compaction (ASTM D1557)

Subgrade - Minimum depth of subgrade soils prepared and compacted in accordance with the recommendations in the Site Preparation section of this report.

The following PCC pavement section thicknesses are based on a design k-value of 160 psi/in, a minimum aggregate base thickness of 6 inches and average daily truck traffic ranging from 0.5 trucks per day to 142 trucks per day. The design thicknesses were prepared based on the procedures outlined in the Portland Cement Association (PCA) document, "Thickness Design for Concrete Highway and Street Pavements," assuming the following: 1) minimum modulus of rupture of 500 psi for the concrete, 2) load transfer by aggregate interlock or dowels, 3) a

concrete shoulder, 4) a load safety factor of 1.1, and 5) truck loading consisting of 1 single axle load of 12 kips and two tandem axle loads of 34 kips each.

Portland Cement Concrete Pavement Section Thicknesses

ADTT (Trucks/day)	PCC thickness (inches)	Aggregate Base[1] (inches)	Compacted Subgrade[2] (inches)
0.5	5.5	6.0	12.0
1.9	6.0	6.0	12.0
7	6.5	6.0	12.0
21	6.5	6.0	12.0
58	7.0	6.0	12.0
142	8.0	6.0	12.0

1 - Caltrans Class 2 Aggregate Base compacted to at least 95 percent relative compaction (ASTM D-1557)

2 - Subgrade soils compacted to at least 95 percent relative compaction (ASTM D-1557)

INFILTRATION CHARACTERISTICS

Based on the clayey nature of the soils encountered at the site, the onsite soils are not considered agreeable with stormwater infiltration facilities.

END OF MEMORANDUM