Linda Owens Jackson
Chief Facilities Officer
Compton Community College District
1111 E. Artesia Boulevard
Compton, California 90221

August 29, 2023

Subject: **Second Engineering Geology and Seismology Review for Compton College – New Student Residential Housing Facility 1111 East Artesia Boulevard, Compton, California CGS Application No. 03-CGS5902**

Dear Ms. Owens Jackson:

In accordance with your request and transmittal of additional documents received on July 18, 2023, the California Geological Survey (CGS) has reviewed the engineering geology and seismology aspects of the consulting reports prepared for the subject project at Compton College in Los Angeles County. It is our understanding that this project involves the construction of a new three-story student residential housing facility. This review was performed in accordance with Title 24, California Code of Regulations, 2022 California Building Code (CBC) and followed CGS Note 48 guidelines. We reviewed the following reports for this additional review of the project:

California Geological Survey (CGS) Response Letter, Compton College – New Student Residential Housing Facility, 1111 East Artesia Boulevard, Compton, California: Universal Engineering Sciences LLC, 16 Technology Dr., Suite 139, Irvine, CA 92618; company Project No. 4230.2200060.0000, report dated July 14, 2023, 5 pages, 3 appendices (including the following ground improvement design package).

Compton Community College, Proposed Student Housing, Ground Improvement Design – Deep Soil Mixing: Keller North America Inc., 17461 Derian Avenue, Suite 106, Irvine, California 92614; design submittal package dated July 7, 2023 (Rev 01), 11 pages, 6 appendices (including Shop Drawings Sheets KNA-1, KNA-2, & KNA-3 dated July 10, 2023).

In addition, we previously reviewed the following reports:

Geotechnical Engineering Report, Proposed Student Housing, 1111 E Artesia Blvd, Compton, California 90221: Universal Engineering Sciences LLC, 16 Technology Dr., Suite 139, Irvine, CA 92618; company Project No. 4230.2200060.0000, report dated April 14, 2023, 25 pages, 8 figures, 6 tables, 8 appendices (including the following ground improvement design package).

Compton Community College, Proposed Student Housing, Ground Improvement Design-Deep Soil Mixing (DSM): Keller North America Inc., 17461 Derian Avenue, Suite

106, Irvine, California 92614; design submittal package dated April 7, 2023, 11 pages, 5 appendices (including Shop Drawings Sheets KNA-1 and KNA-2 dated March 13, 2023).

CGS previously submitted our findings regarding this project in a review letter dated June 8, 2023, in which the consultants were requested to consider all potentially controlling faults in their site-specific ground motion hazard analysis, assess the potential for surface manifestation of liquefaction, and provide additional evaluation of the proposed Deep Soil Mixing (DSM) ground improvement design.

Discussion of Calculation of Earthquake Ground Motion

Based on this second review, the consultants have provided an updated site-specific ground motion hazard analysis. The consultants report that their site-specific ground motion hazard analysis now considers the Compton and Puente Hills thrust faults. However, in the updated deterministic analysis spreadsheet, the consultants appear to combine the controlling magnitude associated with the Compton Thrust Fault with input parameters associated with the Newport Inglewood Fault Zone. The consultants are reminded that deterministic (MCE_R) ground motions should be taken as **the largest acceleration at each period considering all characteristic earthquakes on known active faults individually** within the region. In this instance however, this error does not appear to impact the ground motion analysis results. The consultants report their site-specific seismic design parameters are: **S_{DS} = 1.255g** and **S_{D1} = 1.091g**. Alternatively, S_a values presented in column "Site Specific Design Spectral Acceleration (g)" in the site-specific ground motion table page of Appendix B may be used with the equivalent lateral force procedure, per ASCE 7, Section 21.4. The site-specific ground motion analysis presented appears to be reasonable and in accordance with ASCE 7-16.

The consultants also report that **if the previously provided map-based parameters are to be used for design, the parameter S_{M1} is to be increased by 50%**. They note that this increase is to be applied for all applications of S_{M1} in accordance with the Item 1 exception in ASCE 7-16 Supplement 3, Section 11.4.8.

Discussion of Mitigation of Liquefaction

In our previous review letter, we requested the consultants to explicitly address the potential for surface manifestation of liquefaction to occur at the site and affect the project. In their response, the consultants report that the proposed DSM ground improvement is anticipated to reduce the potential of surface liquefaction manifestations within the building footprint and five feet laterally. This appears reasonable based on the information provided and the design and plans for the ground improvement are discussed further below.

Discussion of Ground Improvement Design and Plans

As discussed in our previous review letter, the consultants recommend that **liquefaction and seismic settlement should be mitigated by means of ground improvement achieved by deep soil mixing (DSM)**. They provided a design package and plans for a DSM system drafted by a specialty design-build contractor, Keller North America (KNA). The KNA design package includes their independent analysis of CPT data from the consultants' explorations along with design calculations and shop drawings for the DSM system. CGS noted that not all of the referenced information was provided in the KNA design package and requested KNA to provide additional analysis and discussion to demonstrate the designed DSM system will provide

adequate mitigation of the hazards and satisfaction of the reported design criteria for the improved soils.

In response to our comments, KNA has revised their design package for the proposed DSM system and has provided copies of their independent analysis of the data. The revised KNA design package includes their independent analysis of CPT data obtained from all six (6) CPTs performed at the site along with design calculations and shop drawings for the DSM system. KNA reports **the DSM system is designed to reduce total static settlement to maximum of 1-inch, total seismic settlement to maximum of 1-inch, and combined differential settlement to maximum of 1-inch over a 13.9-foot span**. KNA has also provided additional sensitivity analysis and discussion of analysis settings to address the influence of applying a "transition zone" exclusion function in their CPT-based calculations of liquefaction triggering potential and a depth-weighting factor in their analysis of liquefaction-induced settlement. Based on our review of the sensitivity analysis, it appears the potential seismic settlement of the improved soils has been reasonably estimated and CGS finds the results analysis adequate to inform the design of the ground improvement system.

Based on this second review, we understand that KNA has revised the planned DSM installation depth from 20 to 25 feet in a portion of the building footprint. The provided copy of their geotechnical analysis and design calculations appear to support their plans for installation of **grids of 3-foot diameter DSM columns with a minimum overlap of 0.5-foot and extending to depths of 20 to 25 feet below the ground surface**. The contractors' design is based on a **design average unconfined compressive strength (UCS) of 150 psi for the DSM columns and layout of columns that supports all foundations and provides an average area replacement ratio (ARR) of 30% within the building footprint** to satisfy the reported performance objectives and design criteria. The final acceptance criteria for the DSM ground improvement system provided by KNA on their shop drawings include reasonable and appropriate **requirements for coring of a minimum of 2% of installed DSM columns** with minimum recovery of 85% and determination of laboratory UCS strength test results.

Altogether and based on the information provided, the contractors' geotechnical analysis, design, and plans for the proposed system of DSM ground improvement appear to be reasonable and appropriate for the reported site conditions and appear to adequately address the engineering geologic and seismic hazards to be mitigated as part of the project. Therefore, **no further information is requested by CGS at this time**. However, CGS notes that the Division of the State Architect (DSA) may provide separate review comments and/or request additional information regarding bid set plans and specifications for the ground improvement that should be addressed by the design team.

The geotechnical consultants should be engaged to provide monitoring of the DSM ground improvement program, including all DSM installation, verification testing, and required special inspections, under their authority as the Geotechnical Engineer of Record (GEOR) for the project. **After completion of the recommended and accepted final ground improvement program, the consultants should provide a comprehensive final report for CGS review**. The report should document their observations, testing, and analysis, including the data collected to satisfy the specified acceptance criteria. The report should include (at minimum):

- All DSM installation logs/records, field testing records, as-built plan and record of installed DSM elements, and daily field reports from both contractor and consultants' field representative(s).
- All equipment calibration reports, QA/QC data and records of DSM installation data.

- All DSM coring logs, any downhole televiewer logs, and laboratory test results, including summary and calculations of the UCS values of the DSM materials.
- Any other pertinent data gathered and/or observations made during the performance of the ground improvement program that are considered in assessing the satisfaction of the design objectives.
- Discussion and conclusion(s) regarding satisfaction of the DSM design and performance requirements for the project.

Conclusion

Based on the discussion above, the consultants have addressed our earlier concerns regarding earthquake ground motion, surface manifestation of liquefaction, and ground improvement design. The consultants have now provided a thorough evaluation of engineering geology and seismology issues with respect to the proposed improvements.

In conclusion, *the engineering geology and seismology issues of this site are adequately assessed in the referenced reports.* ***The project is provisionally accepted***, as we request additional documentation from the consultants following the completion of the ground improvement program, as discussed above. The consultants are reminded that all supplemental documents should include CGS application number, and should be uploaded directly to CGS at this link: https://www.conservation.ca.gov/cgs/upload-school. If you have any further questions about this review letter, please contact the primary reviewer at Justin.LaForge@conservation.ca.gov.

Respectfully submitted,

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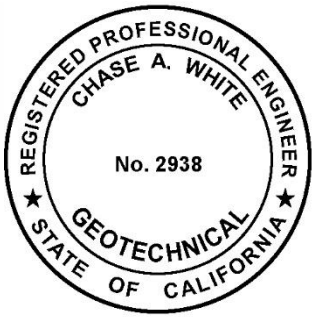

Concur:

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