Jeffrey Weinstein
Assistant Superintendent of Business Services
Oxnard Union High School District
309 South K Street
Oxnard, CA 93030

March 27, 2020

Subject: **Engineering Geology and Seismology Review for**
Rio Mesa High School – Stadium Bleachers and Press Box
545 Central Avenue, Oxnard, CA
CGS Application No. 03-CGS4332

Dear Mr. Weinstein:

In accordance with your request and transmittal of documents received on February 27, 2020, the California Geological Survey has reviewed the engineering geology and seismology aspects of the consulting report prepared for Rio Mesa High School in Oxnard. It is our understanding that this project involves reconstruction of existing home stadium bleachers and press box. This review was performed in accordance with Title 24, California Code of Regulations, 2019 California Building Code (CBC) and followed CGS Note 48 guidelines. We reviewed the following report:

> **Engineering Geology and Geotechnical Engineering Report for Proposed Replacement Home Bleachers, Rio Mesa High School, 545 Central Avenue, Oxnard, Ventura County, California:** Earth Systems Pacific, 1731-A Walter Street, Ventura, California 93003; company Project No. 303280-002, report dated February 20, 2020, 24 pages, 5 appendices.

Based on our review, the consultants provide a thorough and well-documented assessment of engineering geology and seismology issues with respect to the proposed improvements. The principal concerns identified by the consultants are the potential for **strong ground shaking** and the presence of near-surface soils that may be **moderately corrosive to ferrous metal pipes.** The consultants recommend site-specific design spectral acceleration parameters of S_{DS} **= 1.334*g*** and S_{D1} **= 1.344*g***, which are considered reasonable. Their evaluation indicates surface-fault rupture, liquefaction, and deep-seated slope instability are not design concerns for the project.

In conclusion, ***the engineering geology and seismology issues at this site are adequately assessed in the referenced report, and no further information is requested***. If you have any further questions about this review letter, please contact the primary reviewer at (Jacqueline.Bott@conservation.ca.gov).

Respectfully submitted,

Jacqueline Bott
Engineering Geologist
PG 7459, CEG 2382

Concur:

Jennifer Thornburg
Senior Engineering Geologist
PG 5476, CEG 2240

Enclosures:

CGS Note 48 Checklist Review Comments
Keyed to: *Note 48 - Checklist for the Review of Engineering Geology and Seismology Reports for California Public Schools, Hospitals, and Essential Services Buildings (November 2019)*

Copies to:

Patrick Boales, *Certified Engineering Geologist*, and Anthony Mazzei, *Registered Geotechnical Engineer*
Earth Systems Pacific, 1731-A Walter Street, Ventura, CA 93003

Jay R. Tittle, *Architect*
Little Diversified Architectural Consulting, Inc., 1300 Dove Street, Suite 100, Newport Beach, CA 92660

Ted Beckwith, *Senior Structural Engineer*
Division of State Architect, 355 South Grand Avenue, Suite 2100, Los Angeles, CA 90071

Note 48 Checklist Review Comments

In the numbered paragraphs below, this review is keyed to the paragraph numbers of California Geological Survey Note 48 (November, 2019 edition), *Checklist for the Review of Engineering Geology and Seismology Reports for California Public Schools, Hospitals, and Essential Services Buildings.*

Project Location

1. Site Location Map, Street Address, County Name: Adequately addressed.
2. Plot Plan with Exploration Data with Building Footprint: Adequately addressed.
3. Site Coordinates: Adequately addressed. Latitude and Longitude provided in report: 34.2556°N, 119.1448°W

Engineering Geology/Site Characterization

4. Regional Geology and Regional Fault Maps: Marginally addressed. The consultants are requested to label relevant faults on the regional fault map.
5. Geologic Map of Site: Adequately addressed.
6. Geologic Hazard Zones: Adequately addressed. The consultants report the site is located within a Liquefaction Hazard Zone but not in a Seismically-induced Landslide Zone, as defined by the California Geological Survey. They also report the site is not located within any State-designated "Fault Rupture Hazard Zone" or any Ventura County "Fault Displacement Zones" in their General Plan Hazards Appendix (2013).
7. Subsurface Geology: Adequately addressed. The consultants report the site is underlain by alluvial deposits. In their two borings and 2 CPT soundings located at the bleacher site, they report encountering primarily clean sands with scattered gravel lenses to a maximum depth of 55 feet. The consultants report they did not encounter groundwater to the maximum depth of their subsurface investigations.
8. Geologic Cross Sections: Adequately addressed. CGS notes the USCS description of soils in boring logs does not match those on the cross section.
9. Geotechnical Testing of Representative Samples: Adequately addressed.
10. Consideration of Geology in Geotechnical Engineering Recommendations: Not applicable.
11. Conditional Geotechnical Topics: Not applicable.

Seismology & Calculation of Earthquake Ground Motion

12. Evaluation of Historic Seismicity: Adequately addressed.
13. Classify the Geologic Subgrade (Site Class): Adequately addressed. The consultants classify the site soil profile as Site Class D, Stiff Soil, based on average blow counts in boring B-1. This appears reasonable based on the data presented.
14. General Procedure Seismic Parameters: Adequately addressed. The consultants report the following parameters derived from a map-based analysis:
    S_S = 1.924 and S_1 = 0.719
    S_{DS} = 1.283 and (and S_{D1} = 0.815, for the purpose of calculating T_S)
    T_S = 0.64 second
15. Site-Specific Ground Motion Analysis: Adequately addressed. The consultants' deterministic and probabilistic MCE spectra appear reasonable based on comparison with results from the National Seismic Hazard Model (Petersen and others, 2014; Field and

others, 2013). The consultants report their site-specific seismic design parameters are: **S_{DS} = 1.334*g*** and **S_{D1} = 1.344*g***. Alternatively, S_a values presented in the penultimate column of the Spectral Response Values Table in Appendix D may be used with the equivalent lateral force procedure, per ASCE 21.4. The site-specific ground motion analysis presented appears to be reasonable and in accordance with ASCE 7-16.

16. Deaggregated Seismic Source Parameters: Adequately addressed.
17. Time-Histories of Earthquake Ground Motion: Not applicable.

Fault Rupture Hazard Evaluation

18. Active Faulting & Coseismic Deformation Across Site: Adequately addressed. The consultants consider the potential for fault rupture at the site is low. This conclusion appears reasonable based on the data presented.

Liquefaction/Seismic Settlement Analysis

19. Geologic Setting for Occurrence of Seismically Induced Liquefaction: Adequately addressed. The consultants report they ran cyclic mobility analyses to analyze the potential for liquefaction-induced settlement of the soil layers, based on historical high groundwater depth of 25 feet, the presence of relatively clean sands, in a dense to very dense state. The consultants account for the presence of gravels in some layers (labeled as “little” or “some” gravels in boring logs) by using the lowest blow count obtained for any 6-inch increment within the layer and doubling it. The data presented appear to support their approach.
20. Seismic Settlement Calculations: Adequately addressed. Based on a PGA_M of 0.94g, a magnitude M 7.2 event, and historical high groundwater at 25 feet, the consultants found all saturated layers have a factor of safety greater than 1.3 in boring B-1. However, on analysis of the CPT-2 sounding, two 1-foot thick layers were identified at depths greater than 35 feet, that had a factor of safety less than 1.3. They estimate a volumetric strain of 0.3 inch and estimate differential settlement of 0.15 inch at the ground surface. They conclude that liquefaction does not pose a hazard that would adversely affect the proposed project. Also the consultants estimate an additional 0.4 inches of potential dry seismic settlement. The data presented appear to support their estimates of settlement and their conclusions.
21. Other Liquefaction Effects: Adequately addressed.
22. Mitigation Options for Liquefaction: Not applicable.

Slope Stability Analysis

23. Geologic Setting for Occurrence of Landslides: Adequately addressed. The consultants report the site is relatively flat and neither landsliding nor rockfall pose a hazard to the site.
24. Determination of Static and Dynamic Strength Parameters: Not applicable.
25. Determination of Pseudo-Static Coefficient (Keq): Not applicable.
26. Identify Critical Slip Surfaces for Static and Dynamic Analyses: Not applicable.
27. Dynamic Site Conditions: Not applicable.
28. Mitigation Options/Other Slope Failure: Not applicable.

Other Geologic Hazards or Adverse Site Conditions

29. Expansive Soils: Adequately addressed. The consultants report the anticipated bearing soils lie in the “very low” expansion range, based on an expansion index of 0.

30. Corrosive/Reactive Geochemistry of the Geologic Subgrade: Adequately addressed. The consultants report the soils are in the “negligible” exposure class for sulfate exposure. The **resistivity measurements indicate the near-surface soils may be “moderately corrosive” to ferrous metal pipes.**
31. Conditional Geologic Assessment: Selected geologic hazards addressed by the consultant are listed below:
    C. Flooding: Adequately addressed. The consultants report the site is within a dam failure inundation zone for Lake Castaic, Pyramid Lake, Lake Piru, and Bouquet Canyon Dam.

Report Documentation

32. Geology, Seismology, and Geotechnical References: Adequately addressed.
33. Certified Engineering Geologist: Adequately addressed.
    Patrick Boales, Certified Engineering Geologist #1346
34. Registered Geotechnical Engineer: Adequately addressed.
    Anthony Mazzei, Registered Geotechnical Engineer #2823