



**Santa Rosa Office**  
1305 North Dutton Ave  
Santa Rosa, CA 95401  
P: 707-544-1072  
F: 707-544-1082

**Napa Office**  
1041 Jefferson St, Suite 4  
Napa, CA 94559  
P: 707-252-8105  
F: 707-544-1082

**Middletown Office**  
P.O. Box 852  
Middletown, CA 95461  
P: 707-987-4602  
F: 707-987-4603

April 24, 2017

Alameda Unified School District  
Attention: Robbie Lyng  
2060 Challenger Drive  
Alameda, CA 94501  
[rl yng@alameda.k12.ca.us](mailto:rl yng@alameda.k12.ca.us)

Geotechnical Peer Review  
Liquefaction Evaluation  
Donald D. Lum Elementary School Campus  
1801 Sandcreek Way  
Alameda, California

Project Number: 3523.01.06.1

As requested, this letter presents the results of our geotechnical peer review of a liquefaction evaluation report prepared by Miller Pacific Engineering Group (Miller Pacific) titled "Geotechnical Engineering Investigation, Evaluation of Liquefaction Risk and Liquefaction Induced Settlement Potential, Donald D. Lum Elementary School Campus," dated March 17, 2017. The school is located at 1801 Sandcreek Way in Alameda, California. This letter has been prepared in accordance with our Professional Services Agreement with Alameda Unified School District. The scope of RGH's services included reviewing the referenced report and performing an independent analysis of the data.

Miller Pacific performed seven Cone Penetration Tests (CPT's) at the elementary school campus to depths ranging from 49 to 70 feet. The CPT data was analyzed using the CPT Liquefaction Assessment software program CLiq (2007, ver. 1.7.6.49) and the procedures outlined by Idriss and Boulanger (2014). The design seismic conditions analyzed consisted of a magnitude 7.3 earthquake and a peak ground acceleration (PGA) of 0.52g. The latter of which corresponds to the  $PGA_M$  per ASCE 7-10 Section 11.8.3. Miller Pacific's analysis concluded that several granular soil layers between the ground surface and about 50 feet below the ground surface are susceptible to liquefaction. The report also concluded that liquefaction-induced settlement that ranged from 5 to 10 inches with differential settlement for a given building footprint estimated to be on the order 3 to 7 inches. Miller Pacific evaluated the liquefaction-induced settlement potential at the school for a seismic event producing a PGA of 0.28g, which reportedly corresponds to an expected return interval of approximately 90 to 100 years. That analysis concluded that the same granular layers were susceptible to liquefaction. This liquefaction resulted in settlement ranging from 4 to 8 inches with differential settlement estimated to be approximately 3 to 5 inches.

Our review confirmed that the design earthquake magnitude of 7.3 is within the range of values predicted for the Hayward fault. In addition, we confirmed the  $PGA_M$  of 0.52g is correct based on ASCE Standard 7-10. With this information, we analyzed the CPT data using CLiq, as we use the same software program as Miller Pacific for our CPT liquefaction analysis. In our analysis, we also used the procedures outlined by Idriss and Boulanger (2014). Our research found this to be the

most current publication regarding liquefaction analysis of CPT data. It also appears to update the most commonly used liquefaction analysis methods making it an appropriate analysis procedure. Our analysis found the same potential for liquefaction and calculated similar settlement to those in the Miller Pacific report. We also varied the groundwater level to see how it impacted the calculated settlement and found a difference ranging from about ½ to 1 inch.

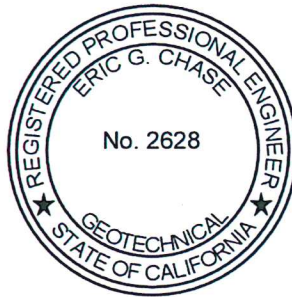
Based on the results of our review and analysis, RGH is in agreement with the results and conclusions regarding the potential for liquefaction and the resulting settlement presented in the Miller Pacific report.

We trust this provides the information you require at this time. Please call if you have questions.

Very truly yours,  
RGH Consultants



Eric G. Chase  
Senior Associate Engineer



cc:

[MarkQ@qka.com](mailto:MarkQ@qka.com)

[stlee@alameda.k12.ca.us](mailto:stlee@alameda.k12.ca.us)

[nicks@qka.com](mailto:nicks@qka.com)

EGC:TAW:ec:ejw  
Electronically submitted

s:\project files\3501-3750\3523\3523.01.06.1 geotech eng peer review-lum elem school liquefaction\peer review letter.doc

Attachment: References

### **REFERENCES**

American Society of Civil Engineers, 2010, Minimum Design Loads for Buildings and Other Structures, ASCE Standard ASCE/SEI 7-10.

Idriss, I.M. and Boulanger, R.W., 2014, CPT and SPT Based Liquefaction Triggering Procedures.