



May 4, 2016

Mr. Jared Andersen
Weber County Engineering Division
2380 Washington Blvd., Suite 240
Ogden, UT 84401

Subject: Geologic Review No. 1
KEO Homestead Subdivision
Approximately 5600 East Highway 39
Huntsville, Utah
SWC Section 24, Township 6N, Range 1E
Weber County Parcel No: 20-015-0010
SA Project No: 15-183

Report: GSH Summary Report, Geological Study, Proposed Single-Lot KEO Homestead Subdivision, Approximately 5600 East Highway 39, Weber County, Utah (GSH Job No. 1675-02n-15), dated April 11, 2016, prepared for Mr. David Orchard, 2248 Oneida Street, Salt Lake City, Utah, prepared by GSH Geotechnical, Inc., 1596 West 2650 South, Ogden, Utah 84401.

Geologic Submittal Status: **INCOMPLETE SUBMITTAL**

Dear Mr. Andersen,

At your request, SA reviewed the above referenced April 11, 2016, GSH report. The purpose of the GSH investigation was not clearly stated in the April 11, 2016, GSH report. The purpose of the GSH investigation appears to be to document geologic conditions at the property.

The April 11, 2016, GSH report indicates (page 1), proposed development of the 21.3 acre parcel will consist of the construction of a single-family residential dwelling, a detached garage, a paved vehicle turnaround area, an on-site septic system, and a water well.

GSH' scope of work included:

1. Geological mapping, comprised of:
 - a. Reviews of previous mapping and literature pertaining to site geology including Sorensen and Crittenden (1979), Bryant (1988), Coogan and King (2001) and King, et al. (2008);
 - b. Analysis of stereoscopic aerial photography;
 - c. Analysis of 1.0 meter digital NAIP and HRO imagery;
 - d. Analysis of 2.0 meter LiDAR imagery;
 - e. Subsurface exploration (two trenches), and;
 - f. Preparation of the April 11, 2016, GSH report.

The purpose of SA's review is to evaluate whether or not the GSH report adequately addresses geologic conditions at the site, consistent with concerns for public health, safety, and welfare; reasonable professional standards-of-care, and; the minimum standards stipulated in Part II, Title 104, Chapter 27 (Weber County, 2016a), and Part II, Title 108, Chapter 14 (Weber County, 2016b) of the Weber County Code of Ordinances.

SA's scope-of-work included review of pertinent geologic reports and maps, aerial photographs, and the Weber County Code of Ordinances (Weber County, 2016a; 2016b). SA visited the site on January 26, and February 2, 2016 to observe general site conditions and trench exposures.

GSH Geologic Conclusions

GSH primary geologic conclusions follow:

1. Based upon our geological studies herein, we believe that the proposed KEO Subdivision is suitable for development as discussed in Section 1 of this report. The Homesite Area is generally covered with an approximately 10-foot thick mantle of

Colluvial deposits (Qc) that is potentially susceptible to slope creep processes, but does not appear to be exposed to deep-seated landslide movement.

2. No evidence or indications of deep-seated landslide movement was observed in the two trenches.
3. The site appears to be underlain by Norwood Formation deposits and colluvial and expansive vertisol soils were observed in the excavations made for this study. Areas where these soils are present should be evaluated prior to the placement of structural loads. Further study of the expansive potential of the near surface soils will be included as part of our concurrent geotechnical study.
4. Due to the "moderate" radon potential for the site, radon testing of the home following construction is recommended.
5. Test pits and trenches were excavated in the vicinity of the proposed home or garage structure areas. The backfill soils for these explorations is likely unsuitable for bearing structures. The trench/test pit backfill soils within the structure locations must be removed and replaced with compacted structural fill meeting the requirements of the lot specific geotechnical study. Due to the potential for unsuitable soils at the site, observation of the home excavation during construction is required.

SA Recommendations

Based on concerns for public health, safety, and welfare; reasonable professional standards-of-care, and; the minimum standards stipulated in the Weber County Code of Ordinances (Weber County, 2016a; 2016b), *SA recommends Weber County not consider the April 11, 2016, GSH report in conformance with the Weber County Code of Ordinances (Weber County, 2016a; 2016b) for the following:*

1. *Geologic Mapping:* The April 3, 2016 GSH report states GSH's geological mapping was comprised of:
 - a. Reviews of previous mapping and literature pertaining to site geology .
 - b. Analysis of stereoscopic aerial photography.

- c. Analysis of 1.0 meter digital NAIP and HRO imagery.
- d. Analysis of 2.0 meter LiDAR imagery.
- e. Subsurface exploration (two trenches).

GSH did not perform field mapping to confirm their imagery analyses. It is a long established standard-of-practice to perform actual field mapping when preparing a geologic map (i.e., walking the entire parcel and adjacent properties to field verify imagery analyses and actually observe and describe rock exposures) (Compton 1961, 1962; USBR, 1998).

2. *Trench Exposures and Trench Logging:* On January 26, and February 3, 2016, on behalf of Weber County, SA and Taylor Geotechnical (TG) performed geologic and geotechnical field reviews (SA, 2016). During January 26, 2016, field review SA and TG were not able to adequately evaluate the nature of the deposits exposed in two GSH trenches due to:
- a. The relatively shallow depth of the trenches, and;
 - b. Trench walls had not been cleaned.

SA and TG suggested GSH consider deepening the trenches and cleaning debris and backhoe smear from one or both of the trench walls.

- a. Logging the trench, and;
- b. Scheduling a second field review.

It is a long established standard-of-practice to clean debris and backhoe smear from at least one of the trench walls, otherwise the geologic units cannot be observed (McCalpin 2009; Salt Lake County, 2002; Draper City, 2007; Morgan County, 2010).

At the February 3, 2016, field review, parts of both trenches had been deepened to a depth of about 10 to 12 feet below existing ground surface, however, the trench walls had not been adequately cleaned for the field review.

During the February 3, 2016, field review, SA and TG cleaned the smear from parts of the trench walls and observed:

- a. Undulating geologic contacts;
- b. Shears, dipping downslope, that appeared to be related to mass movement, and;
- c. Geologic units containing chaotically oriented volcanic ash-rich material and clay pods which, based on our experience, is characteristic of landslide-debris deposits.

SA and TG discussed the situation with GSH, and indicated:

- a. The trench walls had not been properly cleaned and until the trench walls are properly cleaned, a definitive conclusion on whether or not the site is underlain by landslide deposits cannot be formulated.
- b. SA and TG observations strongly suggested the Property is indeed underlain by landslide deposits and unless proven otherwise.

Based on the requirements of the Weber County Geologic Hazard Ordinance (Weber County, 2007), and the well-established prevailing standards-of-practice, *SA recommends Weber County also not accept the April 11, 2016, GSH report until GSH provides adequate responses to the following items:*

1. *Radon:* On page 12 of the April 13, 2016, GSH geologic report, GSH states:

The radon-hazard potential for site location is mapped as "Moderate" by the UGS (Solomon, 1996).

SA recommends Weber County request GSH provide:

- a. The definition for "Moderate" radon-hazard potential and consider the classification in regards to the USEPA action levels for radon mitigation (USEPA, 2016).
- b. A citation for Solomon (1996).

2. *Radon*: On page 13 of the April 13, 2016, GSH geologic report, GSH states:

“Due to the ‘moderate’ radon potential for the site, radon testing of the home following construction is recommended.”

Should the applicant deem it appropriate to mitigate for radon, *SA recommends Weber County discuss with the applicant a radon mitigation system installed during new construction which is significantly more cost-effective than retro-fitting an existing structure for a radon mitigation system.*

3. *Soils*: The April 11, 2016, GSH report discussed pedogenic (soil) horizons observed at the property (see pages 8 and 9). Consistent with long-established, geologic standards-of-practice (Birkeland, 1991, 1999; Shlemon, 1985), it is appropriate to document soil-stratigraphic by providing at least one, representative, standard soil-profile measurement and description. *SA recommends Weber County request GSH provide least one, representative, standard soil-profile measurement and description, particularly if soil development is being used for estimating age and/or genesis geologic units.*

SA Comments

1. Based on GSH geological data presented to date, it is SA’s opinion GSH has not adequately shown the proposed KEO Subdivision is suitable for the proposed development.
2. It is SA’s opinion the conclusions in the April 11, 2016, GSH report are not supported by adequate data and misrepresent geologic conditions.
3. Page 4 of the April 11, 2016, GSH report, GSH states:

“Because parts of the KEO Subdivision are mapped by the UGS geologists (King, et al, 2008) as upon or within mapped Quaternary landslide deposits (Qms and Qmc) or sensitive Tertiary age Norwood Formation (Tn) rocks (King, et al., 2008), Weber County Geological Consultant, Mr. David Simon requested that a more detailed geological mapping of the site using

currently available LiDAR data/imagery be performed before selecting test pit and/or boring locations for final work plan implementation. The County, following Mr. Simon's recommendation, has requested GSH to prepare geological mapping of the KEO Subdivision vicinity to better ascertain the geological conditions of the site prior to the acceptance test pit and/or boring locations for the subdivision work plan and evaluation."

SA refutes the preceding GSH accusations. SA, TG, and Weber County did not direct or imply that GSH prepare and submit "... a preliminary reconnaissance level geological study of the site ..." (see SA, 2015).

Closure

Comments and recommendations in this review are based on data presented in the referenced Consultant's report. SA accordingly provides no warranty that the data in the Consultant's report or any other referenced reports are correct or accurate.

SA has not performed an independent site evaluation. Comments and recommendations presented herein are provided to aid Weber County in reducing risks from geologic hazards and to protect public health, safety, and welfare. There is no other warranty, either express or implied.

All services performed by SA for this review were provided for the exclusive use and benefit of Weber County; no other person or entity may or is entitled to use or rely upon any of the information or reports generated by SA as a result of this review.

SA would be pleased to meet with Weber County and/or the Consultant, at a mutually convenient time, to discuss any of the issues presented herein.

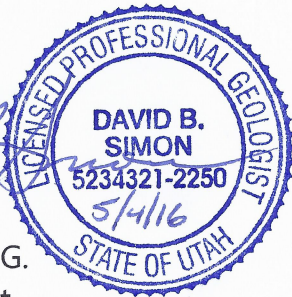
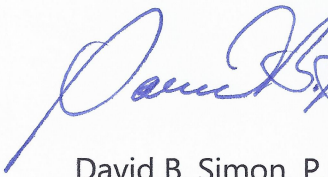
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Should you have any questions, please feel free to contact the undersigned. The opportunity to be of service to Weber County is appreciated.

Very truly yours,

SA



David B. Simon, P.G.
Principal Geologist

DBS/AOT

Distribution: 1/addressee
1/Ben Hatfield, Weber County
1/Alan Taylor, TG

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