Utah Geological Survey

Project: Review of "Geologic hazard assessment of lot 1139, Timberlakes subdivision, Wasatch County, Utah."			Requesting Agency: Wasatch County
By: Francis X. Ashland	Date: 12-2-96	County: Wasatch	Job No: 96-45
USGS Quadrangle: Center Creek (1126)		Number of attachments: 1	

At the request of Robert Mathis, Wasatch County Planner, I reviewed a geologic report by Richard D. Poulson (1996) for lot 1139 in Timber Lakes Estates, Wasatch County, Utah. The lot is located on Aspen Road in section 10, T. 4 S., R. 6 E., Salt Lake Base Line and Meridian. The purpose of the review was to evaluate whether geologic hazards were adequately addressed prior to approval of a building permit to allow construction of a home on the lot. The scope of this review included a preliminary geotechnical-engineering slope-stability evaluation, review of geologic-hazards and soil-engineering literature (Holtz and Kovacs, 1981; Hylland and others, 1995) and aerial photographs (1987, 1:40,000 scale; 1962, 1:20,000 scale), but did not include a site visit.

The Poulson (1996) report discusses liquefaction, faults, earthquake ground shaking, landslides, and slope stability. In general, all of these issues are inadequately addressed. Regarding liquefaction, the report states that "no definitive clay layers were encountered, so liquefaction does not appear to be a problem...." This statement implies that clay layers are liquefiable, which generally they are not. Loose, saturated sands and silty sands are most susceptible to liquefaction (Holtz and Kovacs, 1981; Castro, 1987) during earthquake-induced ground shaking. The low liquefaction susceptibility of soils at the lot results not from the absence of clay layers but from the gradation (three out of four samples can be classified as poorly-graded gravels that have low liquefaction susceptibility) and relative density (no indication of liquefaction-susceptible loose soils) of the soils, and the absence of shallow ground water in at least the upper part of the lot (saturated conditions are necessary for liquefaction).

Presumably to address the potential for surface fault rupture, the Poulson (1996) report indicates the Strawberry fault is near the Timber Lakes area but the fault lacks evidence for Holocene movement. Hecker (1993) summarizes recent detailed work by the Bureau of Reclamation on the Strawberry fault which shows evidence for both latest Pleistocene and Holocene faulting and shows that the trace of the Strawberry fault does not cross the Timber Lakes area. Regarding ground shaking, the Poulson (1996) report states that "Utah...is classified as seismic zone 3 of the Uniform Building Code" (UBC). Although it is not correct that all of Utah is in seismic zone 3, much of northern and central Utah, including the Timber Lakes area, is in seismic zone 3, and Poulson correctly indicates that earthquake ground shaking is possible at the lot.

The Poulson (1996) report indicates no evidence of slumping or fractures related to landsliding on the lot. In addition, the report states that trees on the steep slopes in the northeast part of the lot "appeared to be...stationary" indicating no recent landsliding or soil creep. Poulson observed evidence for ground movement on nearby lots and the report states that "soils are moving," and also indicates an area of sloughing with unvegetated scarps on abutting lot 1138. The report indicates lot 1139 consists of a relatively flat portion in the southwest and a steeply sloping portion

in the northeast, and recommends a 25-foot building setback from the break-in-slope to reduce the risk from potential landslide hazards. The report, however, provides no basis for this recommendation. In a previous study for parts of the Timber Lakes area, EarthStore (1988) recommended that building setbacks be determined based on the intersection of an imaginary plane with a slope of three-horizontal-to-one-vertical (3H:1V) projected from the toe of the slope adjacent to Lake Creek. EarthStore's recommendation was based on their statistical analysis of assumed stable slopes in landslides in the Timber Lakes area.

The Poulson (1996) report also makes some general comments regarding soil strength that are related to foundation design, however the report does not recommend specific foundation designs and is not a geotechnical soil-foundation report. Foundation-design issues may be addressed by a qualified geotechnical engineer, as appropriate, prior to construction of a home on the lot.

Although the report inadequately addresses hazards at the site, only the landslide hazard requires additional work to define the buildable area. The Poulson (1996) report concludes that there is a "fairly large area" that is "suitable for building a home" in the flatter southwestern part of the lot, assuming that a 25-foot building setback from the break-in-slope is adequate to reduce the risk associated with landslide hazards. I believe the adequacy of the 25-foot building setback has not been demonstrated and, based on EarthStore's (1988) results, recommend a minimum setback based on a 3H:1V projection from the toe of the slope be used unless either the 25-foot building setback is shown to be more conservative or a proposed steeper slope can be shown to be stable by at least a preliminary geotechnical-engineering slope-stability analysis (see Hylland, 1996). Estimates of the buildable area may change once a setback line based on a 3H:1V projection or other stable slope angle has been determined. A summary regarding my evaluation of the adequacy of Poulson's slope-stability assessment is shown in attachment 1.

REFERENCES

Castro, Gonzalo, 1987, On the behavior of soils during earthquake-liquefaction, *reprinted from* Cakmak, A.S., editor, Soil dynamics and liquefaction: Elsevier, 36 p.

EarthStore, 1988, Geotechnical/engineering geology study - plats 19A, 19B, 20A, and 20 B, Timber Lakes development, located approximately seven miles east of Heber, Utah, in Wasatch County: Salt Lake City, unpublished consultant's report, 14 p.

Hecker, Suzanne, 1993, Quaternary tectonics of Utah with emphasis on earthquake-hazard characterization: Utah Geological Survey Bulletin 127, 157 p.

Holtz, R.D., and Kovacs, W.D., 1981, An introduction to geotechnical engineering: Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 733 p.

Hylland, M.D., editor, 1996, Guidelines for evaluating landslide hazards in Utah: Utah Geological Survey Circular 92, 16 p.

Hylland, M.D., Lowe, Mike, and Bishop, C.E., 1995, Engineering geologic map folio, western Wasatch County, Utah: Utah Geological Survey Open-File Report 319, 12 plates, scale 1:24,000.

Poulson, R.D., 1996, Geologic hazard assessment of lot 1139, Timberlakes subdivision, Wasatch County, Utah: Mapleton, Utah, unpublished consultant's report, 8 p.

Attachment 1
Job No. 96-45

CHECKLIST FOR THE REVIEW OF LANDSLIDE-HAZARD REPORTS

Report Author Richard D. Poulson Date Of Report October 21, 1996

Title Of Report Geologic hazard assessment of lot 1139, Timberlakes subdivision, Wasatch County, Utah

UGS File No. Technical Report 96-45 Requesting Agency Wasatch County Planning County Wasatch

USGS 7.5' Quad(s) (BLM No.) Center Creek (1126) Sec., T., R. Section 10, T.4 S., R. 6 E., SLB&M

Adequacy Codes: A = adequate; **N** = not necessary; **D** = additional data, analysis, or justification needed

SUBJECT[1]	Adequacy of report	COMMENTS (attach additional sheets if necessary)
1. List of reference materials used	D	some inaccuracies in report a result of out-of-date references
2. Vicinity map	A	
3. Site-planning map at suitable scale, showing:	D	report intended to identify buildable areas prior to development; needs a map showing buildable area at an appropriate scale
3a. proposed development	--	
3b. topography	--	
3c. geology	--	
3d. subsurface exploration and cross section locations	--	
3e. surface water	--	
3f. landslide features	--	
3g. hazard-reduction features	--	
4. Description of site conditions:	D	
4a. slopes	D	described briefly in text; no detailed slope map or profile to help determine building setback line provided
4b. slope materials	D	no engineering soil classification given; glacial deposits described as "glacial waste"
4c. subsurface planar features	N	
4d. surface/ground water	A	
4e. vegetation	A	
4f. suspected landslide features	N	none identified on lot
4g. surficial processes	N	
4h. other	N	

table continued

[1] *Refer to UGS Circular 92, "Guidelines for Evaluating Landslide Hazards in Utah" (1996, M.D. Hylland [editor]) for supplemental information.*

Attachment 1 (cont.)

Adequacy Codes: **A** = adequate; **N** = not necessary; **D** = additional data, analysis, or justification needed

SUBJECT	Adequacy of report	COMMENTS (attach additional sheets if necessary)
5. Description of existing landslides, including items in (4) above, and:	N	none identified on lot
5a. failed unit(s)	--	
5b. failure type(s)	--	
5c. scarp characteristics	--	
5d. age(s) of failure	--	
5e. cause(s) of failure	--	
6. Implications of nearby landslides	D	nearby landslides and "moving" soils indicate susceptibility of slope to shallow and deep-seated landsliding
7. Geotechnical-engineering evaluation:	N	not necessary unless a setback less than the 3H:1V projection is proposed
7a. subsurface materials/ground-water characterization	--	
7b. laboratory testing	--	
7c. profiles/cross sections	--	
7d. static slope-stability analysis	--	
7e. seismic slope-stability analysis	--	
• input ground motions	--	
• effects on shear strength and pore pressures	--	
• liquefaction potential	--	
7f. post-earthquake stability analysis	--	
8. Conclusions regarding hazard	D	potential for deep-seated slope failure affecting lot not addressed
9. Recommendations	D	adequacy of 25-foot building-setback recommendation undocumented

Additional comments:

Reviewed By Francis X. Ashland Date Reviewed November 15, 1996

UTAH GEOLOGICAL SURVEY
DOCUMENT ROUTING FORM

Program: Applied Geology

Title: Review of "Geologic Hazard Assessment of Lot 1139, ..."

Author(s): Francis X. Ashland

Recommended Publication Series: Technical Report

This document has been through the UGS document review process. The individuals who have reviewed the document are listed below. All review comments have been addressed by the author.

Inside Reviewers: _____

Outside Reviewers and Organization: _____

We believe this document is now ready for publication.

Author _____ Date 11-15-96

Project Manager/ _____ Date _____
Section Chief _____ Date _____

Document Review Coordinator _____ Date _____

Senior Geologist _____ Date 11/21/96

Please review this document and, if you concur with our recommendation, sign below and forward to the Editor.

UGS Technical Reviewer _____ Date 11/22/96

Deputy Director _____ Date 11/26/96

Director _____ Date 11-27-96

Location of Document Materials:

Paper copy of text: _____
Computer copy of text: _____
Illustration originals: _____
Mylar copy map/cross sections: _____
Colored copy map/cross sections: _____
Plate II materials: _____
Other: _____