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In particular, homeowners with property in the vicinity of the area described in the document should not rely on the document to evaluate any risk of damage to their property, but should retain the services of their own independent consultants.

Copper Canyon Lane Retaining Wall

April 17, 2017

April, 2015 *Dry Year*

April, 2017 *Wet Year*

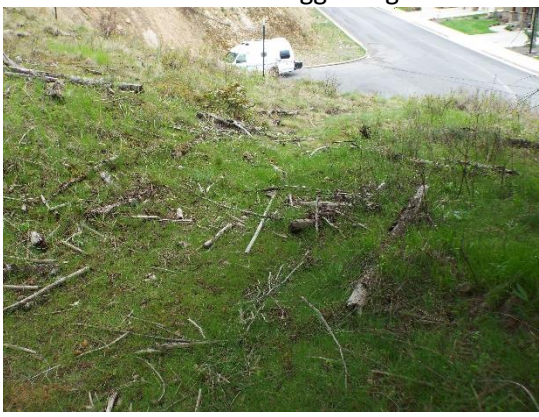
Encountered Conditions

The cul-d-sac is cut into a timbered hillside with a cut slope inclined approximately 1½ horizontal to 1 vertical, the base of which is retained by a Redi-Rock wall. The blocks appear to be of a size that require geogrid reinforcement, as opposed to deeper blocks that do not (41-inch deep gravity wall blocks).

The soils appear to be fine-grained, comprising silts and sands with shear angles nearly equal to the slope angle.

2015 Water was noted seeping from one point through the base of the wall. The slope above the wall appeared relatively stable.

2017 Muddy water was noted seeping through much of the base of the wall. Most of the wall was wet suggesting that water had been running over the top.



Portions of the crest have broken away and are beginning to slide on to the wall.

It appears that mud had been removed from the pavement.

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Above the crest, a small drainage swale channels surface runoff and snowmelt over the cut slope.

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The wall appeared to be plumb and true with no signs of distress to suggests imminent failure.

Copper Canyon Lane Retaining Wall

April 17, 2017

Conclusions

Cause

The cut slope had established itself at its repose angle with a Safety Factor near 1.0.
In this wet season of a wet year, the weight of water increased driving forces and reduced soil strength which upset the tenuous balance, resulting in small arcuate failures at the crest.

What to Expect

A massive failure does not appear imminent.
The integrity of wall is based upon the amount and length of geogrid reinforcing in the backfill.
Although the design and construction of the wall is unknown to us, the fact that it is holding well in very wet conditions suggests that it is adequate and not likely to fail.
While free ground water behind a wall can triple the loads on the wall, seepage through the wall is apparently preventing excessive build-up of hydrostatic pressures.
The failed material from the crest of the cut can be expected to slide downslope and over the wall.

Recommendations

Permanent repair would require 1) either raising the wall or stabilizing the cut slope and 2) improving surface and subsurface drainage. This can be done by in one or more of several ways:

- **Raising the Wall.** Increasing the wall height would involve a complete rebuild. As the wall loads are proportional to the square of the height, longer geogrid reinforcing would be required from bottom to top.

- **Grading.** The upper portion of the cut slope slope could be graded back to a safe angle. This could be done with a backhoe from the top. If no property is available for this, soil nailing could be used to stabilize the existing slope above the wall. The slumped soil may need to be removed as the soil may be too loose to nail in-place.

- **Surface Drain.** The existing drainage swale could be redirected to the culvert to the north.

- **Subdrain.** Assuming the wall is rebuilt in order to raise it, a gravel drainage blanket could be installed behind the wall and the intercepted water piped to the culvert to the north.

We anticipated that the most prudent option might be to regrade the top and accept the need for continued maintenance, though the decision depends on the HOA's preferences related to expected performance, maintenance costs, and cost of a reliable repair.