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NEWSLETTER

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AUGUST, 2008



AS WE SEE IT

A PERFECT RECIPE FOR DISASTER

With the recent landslide on the sea to sky highway the other day, and the coroners report released a couple of weeks ago concerning the fatal Blueridge landslide in North Vancouver in 2005, coupled with a case that we are currently working on, it only seems fitting that we give you our perspective on this topic for this month.

LANDSLIDES

A landslide is a general term used to describe the downwards movement of organic materials, soils, and rocks created by pressure of weight to the upper portion of an escarpment that results in a gravitational flow towards the bottom of that slope.

British Columbia in general is susceptible to this type of activity because of glacial sediments over the years and the natural elements that erode the land to cause this type of activity are very common. BC has lots of complex geology in its steep mountainous terrain giving choice view lots in developing municipalities which eat away at the natural vegetation in urban areas such as the Lower Mainland.

Three distinct physical events occur during a landslide; the initial slope failure, the subsequent transport, and the final deposition of the materials. This activity can be caused by one or some of the following.

- Undercutting of a slope by water causing erosion
- Human activity too close to the slope
- Shock or Vibration caused by mining, construction or nature
- Loading of additional weight to the upper portion of a slope

Landslides may result directly or indirectly from the activities of people by undercutting a slope or construction of structures, or additional materials placed on top of a slope. People are one of the major causes of slope instability by changing the landscape by clear cutting or benching when it is not necessary. Vegetation that is on that hillside is there to absorb moisture in the soil and strengthen the integrity of that hill itself with a complex root system that binds the slope together.

Most escarpments have a natural creep to them. They move with a gravitation pull towards the bottom which is a slow process of a fraction of an inch per year. This can be sped up to a rate of feet per second caused by the eco system being disturbed by human hands or nature itself in the form of waves, streams, rivers, rain, ice, or snow.

Populated areas and transportation routes in British Columbia are exposed to a great variety of landslides. Landslides not only cause property damage, injury and death, they also affect water supplies, fisheries, sewage disposal systems, forests, dams, and roadways for years after an event have occurred.

On the sea to sky highway from Vancouver to Squamish, it has been affected by 14 major slides since 1906, whereas 12 lives have been lost, 11 bridges destroyed, 4 homes demolished and a number of other structures totally lost.

BLUERIDGE LANDSLIDE

Commonly referred to as the Berkley-Riverside Escarpment Landslide, the BC Coroners Office found that the landslide was preventable in their report. It made recommendations to the provincial government to develop safety plans but it also cited that a study conducted in November of 1980 by Kohn Leonoff, after three separate slides occurred in December of 1979 that the slide in January of 2005 would have been preventable.

This report emphatically states the following conditions are very much in evident;

- At the top of the slope, fill had been placed to extend the some of the building lots
- At the bottom of the slope, the slope had been cut back to extend some of the building lots
- Erosion had occurred to the slope in places that was caused by heavy rainfalls, and moisture
- Homes were constructed near the crest at the top of the slope, and homes were constructed near the base of the slope well within the unstable zone
- Storm runoff is handled by open ditches at the base of the slope
- Minor groundwater or spring seepage zones are at various locations and elevations along the escarpment
- There was no major evidence of deep-seated movement to the hillside prior to the 1979 landslides

- There was no known activity to the slope prior to the upper and lower subdivisions being constructed
- Fills have been pushed over the crest of the natural slope to extend the lot area and is standing at a much steeper angle than the natural angle to the slope
- Development behind the crest of the slope has affected the natural run off routes

This report made the following recommendations to the slope

- Existing debris placed over the crest should be removed and no new debris be allowed to be placed there
- Vegetation should be controlled
- All storm drainage from residences should be connected to a storm sewer and not allowed to flow freely across the property to the slope
- Any existing abandoned septic tanks and systems should be removed and the cavity filled and compacted with non organic material
- All homes should have their drainpipes checked twice a year and maintained in a good working order
- No structures fill or other activities should take place within a recommended distance to the crest or each property.
- The Golder & Associates report dated February 16th, 1978 should be adhered to. This report stated
 - Existing ground streams should be controlled and redirect safely away from unstable areas
 - Flood control channels should be developed for heavy rains
 - All buildings should not encroach on the toe of the upper slope
 - All retaining walls and other structures should have proper drainage systems installed at their base

After the 2005 landslide, BGC Engineering was retained to provide a risk assessment of the situation which reiterated the history, and recommendations of the past as well as provide current conditions which generally have not changed.

Now let me step outside the box for a minute. As most of you think I am only a few years younger than the Dead Sea, so let's go back there. As a youngster just getting started in his adult world, I worked for a lumber company in Hamilton Ontario as a salesman. During these impressionable years, I can remember two contractors that stand out in my mind. Jim Johnson and Paul Paquette. Jim was a new home builder and Paul a restoration contractor and renovator. At that age they were my mentors in a way. One of them instilled upon me that at the top of a hillside, you do not construct anything from the edge inwards a distance that is within half the distance of the hillside. For example if the hillside is 250' vertically in height, stay away from the edge 125' and don't disturb anything. Simple - you bet. Does it work - I have no proof but I would have to say yes. There was another rule for building too close to the base of the hillside but I can't remember what it was. Now back to the business at hand.

The BGC report states "Where homes are constructed on or below sloping found, landslide risks cannot be eliminated, only managed in an informed and proactive manner."

So who's responsibility is it to manage and act in an proactive manner? The homeowner? The municipality? Who? Probably both although part of the risk is on private property. Maybe there should be a right of way along the crest and base of these hillsides in the unstable zone as well as the hillside itself that would allow trained professional inspectors at a municipal level to inspect these banks.

BENCHING

The process we see today is a relatively new, but benching really got its start back in the forties and fifties in the form of placing large steps of some degree into the embankment. Benching is a form of using the landscape as a retaining wall. The use of scrape tires brought this process to the forefront. Here's how.

A retaining wall is a wall built to keep a bank of sand or soil in its place. Although retaining walls are typically made of concrete, whole scrap tires were used as an alternative building material for retaining walls.

Traditionally to construct a retaining wall with whole tires, the tires are stacked vertically on top of each other. Adjacent tires are then clipped together horizontally and metal posts are driven vertically through the tire openings and anchored into the underlying earth as necessary to provide lateral support and prevent later displacement. Each layer of tires is filled with compacted earth backfill.

Today, these types of retaining walls are being replaced in North America with more traditional retaining walls because they can soon become an environmental hazard. They should never have been constructed where there is ground water run off in the spring, or springs emanating up from the ground or rivers and streams nearby.

Also, if they were used in a rural area in or near a grove of trees, toxic gases breathed in from a tire fire caused by a forest fire, can become deadly or even make one very ill.

In urban areas, most municipal bylaw ordinances have burning bylaws regarding open fire pits, which require the pit to be located away from any combustible material. Tires are combustible material. For example if the bylaw states 16 feet away, the pit must be 16 feet plus at least 7 feet additional for a total of 23 feet because the top row of tires will extend back into the bank at least 7 feet, thus making the fire pit only 9 feet away at maximum.

As a rule of thumb, tires that are stacked a certain number high (between 2 and 6) vertically should extend the same number horizontally into the bank and clipped together. This should be done on the first bottom row, then on the top row of each step.

For example, for a retaining wall 100 feet long and 10 feet tall (1,000 square feet), 600 tires could be used. The rate of placement would be 0.6 tires per square foot based upon a 4 foot tier step.

Thirty to Forty years ago, the average do it yourself building owner was allowed to construct this type of wall, as was so many contractors. Today, most municipalities ban this

type of retaining wall, and they are almost never recommended as a solution by any prudent engineer.

As you can see the combination of any or all of these conditions are a receipt for a disaster, the question is not "Will it happen?" the question is "When will it happen?" So let me ask you - Do you know what is in your backyard? and I don't mean figuratively.



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Every now and then, along comes an exceptional person, who has a sixth sense, they are artists. Watching Tana work, she is one of these people, as she will stop what she is doing, become oblivious to everyone around her as she communicates with the plants, rocks and earth transforming them into her canvas.



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