

## **Impact of soil conditions on development costs & land value**

### **Questions**

#### **Q1. It is very difficult to value land. WHY?**

Establishing the value of land is very challenging because there are so many factors that influence the value of land such as:

Soil conditions

Excavation and foundation costs

Complex zoning and building regulations

Location (Not being discussed)

The next flash cards illustrate using examples, factors that influence land value.

#### **Q2. Soil conditions can have major impact on foundation and construction costs.**

##### **Examples on the flip side.**

Soil conditions vary widely and depend on the location. Some examples are;

Rock and shale. Costly to excavate

Expandable clay. Increases the excavation and foundation costs

Collapsible soil and sand

Organic or spongy soil

Peat moss

Sink holes

Water and drainage problems

Sites near water often require costly pilings

At one point during the due diligence the developer will have a soil test done by a Geoscientist.

#### **Q3. How are soil tests done?**

Various soils test are conducted on-site and laboratory analysis carries out to decide the quality of soil for building construction purposes which help the architect and structural engineers design the building.

On-site drilling using a drilling rig, as shown in the photo, is a standard method for carrying out a soil test.



A soil test is carried out before the design of a condominium building with underground parking.

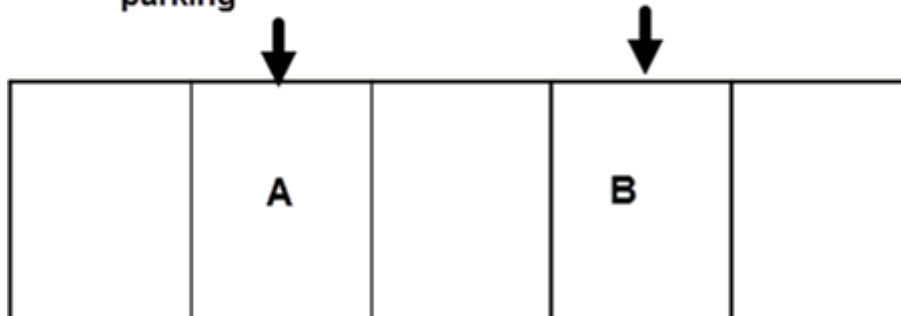
A wonderful location.

**Q4.**

**Site A sold recently for \$200 PSF. The developer proposes to build a 3 floor office building with underground parking**

**Another developer wants to acquire site B to also build a similar three floor office building to site A**

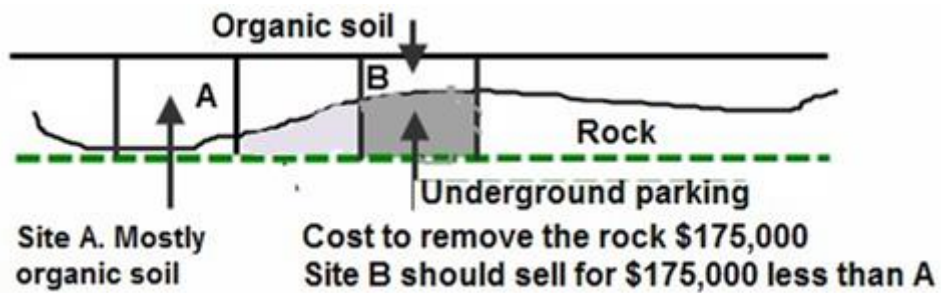
**How much will site B sell for?**



The temptation is to say that site B will sell for the same price as site A which is \$200 per sq. ft because they are comparable's.

Soil conditions that influence construction cost can vary from one site to another. For site A the excavation for the underground parking is easy because of the organic soil, which is easy to remove.

Site B has some organic soil but is mostly rock which will cost \$175,000 to remove to create the underground parking. This means that site B should sell for \$175,000 less than site A



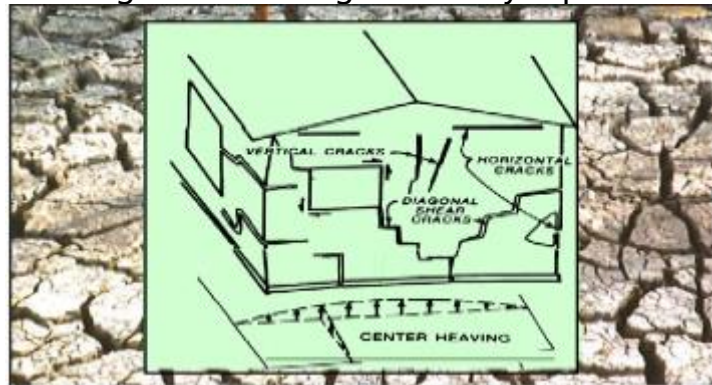
**Q5. What is expandable clay?**

Expandable clay is a nasty clay that expands when wet, and shrinks when dry, and can cause considerable damage to a building.

Expandable clay can be found in most areas of North America. Dealing with expandable clay when developing a building can be very costly and lowers the land value.

**Q6. On the flip side are some examples of the damage to buildings created by expandable clay.**

Example of damage to a building created by expandable clay



**Q7. What are some of the ways architects and engineers use to deal with expandable clay to prevent building damage?**

Techniques for dealing with expandable clay

Remove and replace the expandable soil with stable fill  
Keep water away from the building  
Slope the soil away from the building  
Install a waterproof apron or moisture barrier around the building  
Use pilings to support the structure  
Design flexibility into the structure (See examples below)  
Separate paved areas and slabs from the main structure

**Q8. What is organic soil?**

Organic soils are unstable soils that consist of soil and decayed organic material such as buried trees and branches and, in some cases, buried construction debris such as lumber and drywall scrapes, etc.

Buildings cannot be constructed on organics soils because the weight of the building would cause the structure to settle unevenly, causing damage to the building.

Organic material has to be removed and replaced with stable, compacted fill, and pilings may be required to support the building, which increases the construction cost and lowers the land value.

**Q9. For examples of organic soils see the flip side**

**Examples of organic soil, buried materials, and rubbish**



**Q10. What are sink holes, and how do sink holes develop?**

Sink holes are hidden cavities in the ground that occur naturally or are man-made, and can range in size from minor cavities to vary large and dangerous pits. Sink holes can occur anywhere in North America. Costly to deal with and lowers land value.

Man-made changes to the natural water patterns through drainage and pumping systems and dams can create sink holes.

. A landowner may clear the land by removing trees or tree stumps and then burying the stumps and branches on the site along with other rubbish, which decays and create sinkholes.

**Q11. When I first got involved in development, I was looking for an industrial site to develop an industrial building. I found a large site where the price per acre seemed cheap compared to similar sites elsewhere.**

**Why was the price per acre so cheap?**

When I told the senior partner he replied: That's on river road where:

- a) A large amount of fill has to be bought in to bring the ground level with the road
- b) The organic soil and peat moss has to be removed and replaced with compacted fill
- c) Expensive pilings have to be used to support the foundation and structure

The cost to develop this industrial site is very high hence the low price per acre. Not such a great deal after all.

**Q12. Building on unstable soil may require pilings driven into the ground to support the foundation and building.**

**Pile driving is a costly and time-consuming process that lowers the land value.**



**Q13. What is “Pre-loading”?**

Site Preloading

If the land is soft and spongy and needs to be compacted, the site is pre-loaded with sand to compact the soil. This is common for sites near the ocean or waterways.

The sand may sit on the site for several years before being removed. A preloaded site is worth a lot more than a non-preloaded site.

**Q14. What is dynamic compaction?**

Dynamic compaction increases the density of the soil by dropping a heavyweight at regular interval intervals over the site to compact the soil.

**Q15. How does the developer reduce the risks associated with soil conditions on construction costs, development profit, and land value?**

When making the offer for the land, the developer will make to offer subject to:

Carrying out a soil test by a specified date

The seller to allow access to the site to carry out the soil test.

The developer may reduce the offering price if the soil test indicates that developing the land is more costly than anticipated because of the soil conditions.

**Q16. True case**

**Can the impact of soil conditions on construction costs kill a project?**

It looks like the “Geoscientists” and “Engineers”

A client had an accepted offer to by a site which had the building permit for a three storey apartment building.

The profit determined by the development analysis suggested it was acceptable but a bit low.

My question was “Has there been a soils test done?”

Answer. The soil test is being carried out.

Result. The soil test indicated that to develop the site required pilings at a cost of \$525,000 which killed the deal.

It’s very important for a developer to make an offer subject to a soils test.

**Q17. It looks like the “Geoscientist” and “Engineers” didn’t get it right.**

**If you don't get it right ???**

