Christchurch
EARTHQUAKE RESPONSE

March 2011

Liquefaction
Frequently asked questions

How does liquefaction work?

Liquefaction happens in loose silt and sand that is below the water table.

- It does not happen in clay soil.
- It does not happen in peat because it is made of plant materials. There may be sand or silt layers above or below the peat that can liquefy.
- It is uncommon in gravelly soils.
- Dry soil does not liquefy.
- The severity of liquefaction depends on the strength of ground shaking and the length of time the ground shook.

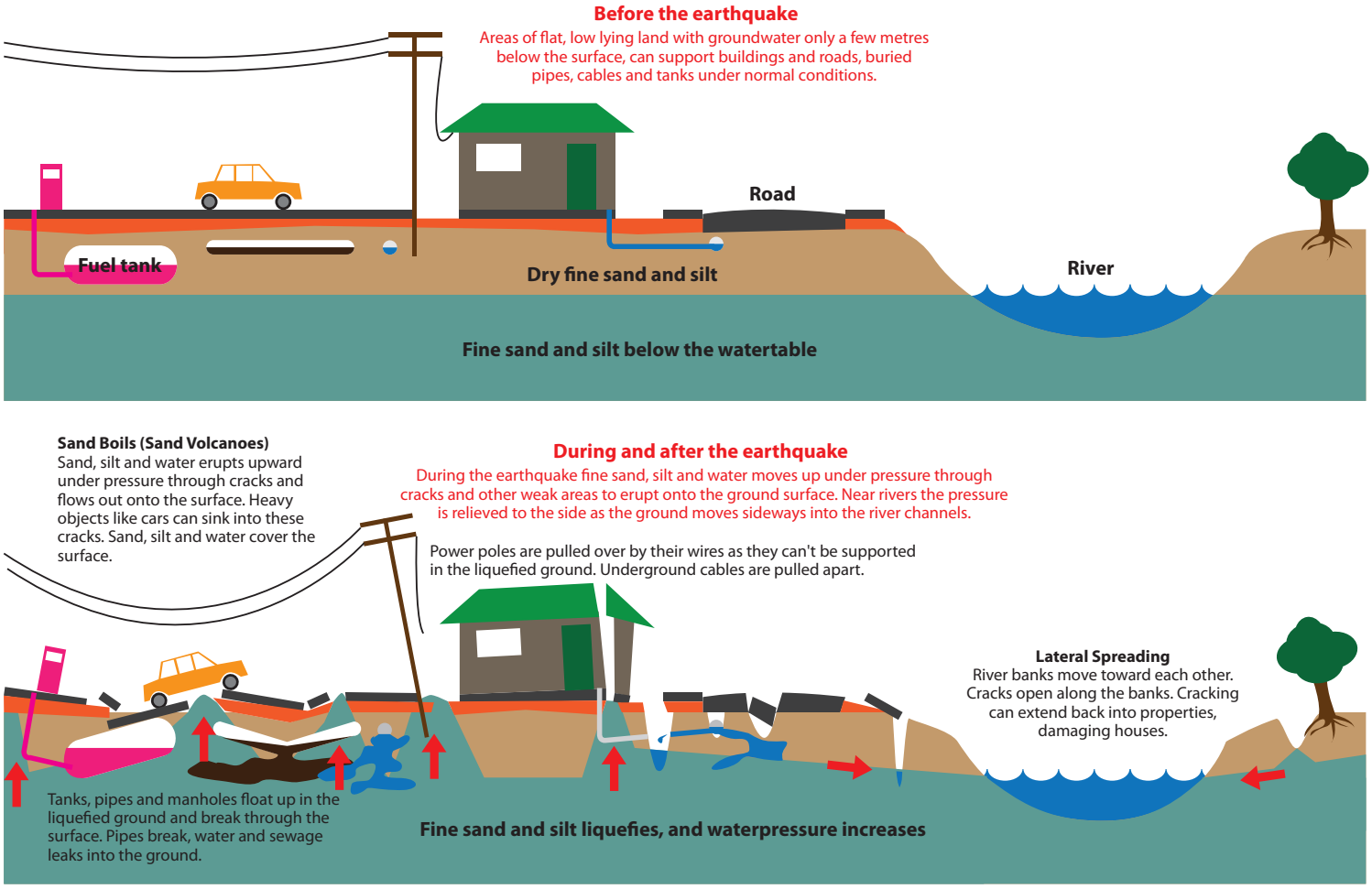
How does liquefaction happen?

1. Sand and silt grains try to compact during an earthquake.
2. This compresses spaces which are filled with water.
3. The water pushes back and pressure builds up in the water until the silt and sand grains "float" in the water.
4. When that happens the soil behaves like a liquid. The soil can't support the weight of what is above the ground (e.g. a building, or car).
5. Pressurised water is forced up to the ground surface through the easiest way it can find e.g. cracks or crevasses in the ground or concrete.

Are all cracks in the ground, beside streams or estuaries, earthquake faults?

No. During an earthquake liquefied soil can move sideways towards streams or estuaries creating cracks in the ground beside streams or estuaries. The cracks only go down a few metres. This is called lateral spreading.

Liquefaction and its effects



Credit:: The Institution of Professional Engineers of New Zealand

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Why was there so much liquefaction in Christchurch with this earthquake, but very little in Kaiapoi and Selwyn?

The difference is because:

- The magnitude of this earthquake was smaller than the 4 September earthquake, so the strongest ground shaking happened across a smaller area.
- The epicentre was much closer to Christchurch, so the ground shaking in Christchurch was much greater than in September.
- By the time the earthquake waves got to Kaiapoi and rural Selwyn district in this earthquake, there wasn't enough energy left in the waves for major liquefaction to happen again.

A comparison:

After the September Earthquake: Christchurch City Council removed 54,000 tonnes of silt from areas affected by liquefaction.

As a result of the 22 February 2011 earthquake: Christchurch City Council has removed 322,000 tonnes of silt as of Thursday 10 March.

How much has the ground sunk?

After the September earthquake ground levels in most places affected by liquefaction appeared to have sunk by up to 10 centimetres.

Because so much more silt and sand has come to the ground surface in the 22 February earthquake, the ground in some places is likely to have sunk by more than that. Surveying work is being done to determine how much it has sunk by.

Does liquefaction leave big holes underneath the ground?

Generally, no. The ground surface sinks to fill in the spaces left by the silt and sand that has come to the ground surface.

But there may be holes that you can't see where high pressure water pipes have burst and scoured out sand and silt under the ground, or where lateral spreading has happened under asphalt or lawn.

There may be hollows in the ground surface after liquefaction that you can see.

In areas affected by severe liquefaction you should be careful for the first 2-3 weeks after the earthquake until the soil is fully stable again.

How stable is the soil now?

After 2-3 weeks the soil is almost back to the same condition or strength as before the earthquake. A small amount of subsidence may happen over the next couple of months.

Liquefaction can happen in the same place more than once if the soil is not treated.

Should I fill in holes left in my backyard after liquefaction?

Yes and inspect your property for any hollows or dips in the ground to make sure you don't step into them by accident.

Take photos of your property before you fill in any holes to show the Earthquake Commission engineer when they come to visit.

Will the Earthquake Commission come to inspect the damage to the land?

Yes, but it will take many months to get to everyone's property. Please be patient.

Please take photos of any major land damage, before you tidy it up, to show the EQC engineer. Also remember to tell the engineer if you have had silt or sand on your property after the earthquake that has since been removed.

Damage to houses will be looked at as a separate process.

For more information go to http://www.ipenz.org.nz/ipenz/forms/pdfs/ChChFactSheets-Liquefaction.pdf

This factsheet incorporates information from the Liquefaction factsheet compiled by the Institute of Professional Engineers of New Zealand.

More information:

www.canterburyearthquake.org.nz
http://twitter.com/ChristchurchCC
Christchurch City Council: (03) 941 8999
Canterbury Business Recovery Group 0800 505 096

Earthquake Government Helpline: 0800 779 997
Earthquake Commission (EQC): 0800 326 243
Orion (electricity): (03) 363 9898
Housing NZ Emergency Assistance: 0800 435 700