Testing the Texada "goop"—a summary

March 18, 2008

Tests performed

Testing of the once mysterious Texada "goop", or gravel as it is officially known, has now reached a point where we have a good idea of what it is, and why it has the properties that make it is such a nuisance. The tests that have been performed by various people and groups on Gabriola are as follows:

1. A simplified but pertinent sieve test (Randy Young). This measured the amount of fine material—"fines" as they are called—in the goop. Fines comprise silt and clay.

2. A reflected-light assessment of its mineral content, together with a few standard hand-sample tests for hardness and so on (Nick Doe).

Information obtained this way is limited, but much better than none—geologists require a thin-section they can examine with polarizing light before they can make accurate determinations of the minerals present. Identifying the minerals gives guidance as to the geological origin of the material; and determines, without further testing, a whole range of the chemical and physical properties of the material, which in turn enables an assessment to be made of its suitability for road surfacing. It is not possible to identify clay minerals with a light microscope, you have to use X-rays, and that also has not been done.

3. Chemical analyses of the water in potholes. (Nick Doe) These included both cations (mostly metals like calcium, sodium, etc.) and anions (mostly non-metals like chlorine, carbon, etc.). The importance of these tests is that not only are chemicals leaching from the goop identified, but so are those already existing on the road surface, for example sodium chloride (salt).

4. An analysis of acid-extractable elements, cations only (Residents and Ratepayers Assoc.). Acid extraction is a way of assessing what could potentially leach out of the material in the long term, and of providing information useful in the identification of minerals. This test is most commonly used to look for industrial contamination in soil. The limitation of the test is that it does not identifying anions; possibly exaggerates contamination of groundwater by leaching out elements that are chemical stable in water; and, if hydrofluoric acid is not used, as it wasn't for this test, gives no indication of silicate and aluminosilicate composition, which is what many non-carbonate minerals are.

5. An analysis of water-extractable elements, cations only (Islands Trust). This identifies what is actually being leached out of the material and what will eventually enter groundwater aquifers. The only caution needed to be exercised in the reading of the results of such a test is that concentrations in goop-saturated water will be higher, perhaps much higher, than those in the aquifer because the aquifer contains water from other (unpolluted) sources.

Test results summary

The goop is a mix of clay plus silt- and sand-sized clasts, mostly sand sized. The clay component is estimated to be about 22% by weight of the total, although laboratory-standard filtration methods were not used to establish this. If accurate, this is too high.

The non-clay component contains carbonate and carbonaceous clasts plus a smaller number of clasts made up of common igneous minerals of various kinds, felsic and mafic.

The carbonate component (20% of the non-clay material including coatings only) consists of clasts of calcite, plus a greater number of clasts that appear to be granodiorite that have been heavily coated with carbonate, mainly calcite, but with some magnesite or dolomite.

The material contains some arsenic, but not in worrying amounts. Test 4 showed the arsenic content, when the material is judged as a rock, was about five times greater than the worldwide average for sandstone, but half that for shale. Test 5 showed an arsenic content is water saturated with goop to be slightly above the Canadian standard for potable water, but this will be quickly diluted as the runoff makes its way into aquifers. The bedrock of Gabriola also contains arsenic.

Clay and carbonates form the basis of hydraulic cement, which is what so many people object to. The material has a high aluminum content, which might also be contributing to the observed cementing property. The clay has not been identified, but may be montmorillonite, possibly as a component of bentonite. Like all clays, montmorillonite is rich in silica.

The cement on vehicles is creating sealed pockets of moisture, which, if it has a high salt content as it will if the vehicle has been driven on salted roads, will harbour pockets of corrosion. Sealing of moisture containing bacteria might also account for reported skin problems on pets, although this has not been substantiated.

Although sodium chloride is not used for de-icing on unpaved roads on Gabriola, calcium chloride, and possibly magnesium chloride, has been used for dust control. The presence of these chemicals has been detected in pothole water, Test 3. Dust control chemicals are deliquescent or hydroscopic and so will hinder or prevent the clay drying out.

Test 3 revealed that the pothole water has a high magnesium content. Scales of magnesium silicate are a common industrial hot-water problem and may be what is in the coatings that are difficult to remove in car braking systems. The origin of the magnesium might be the goop itself (in the carbonate coating, or from the clay by cation exchange), or from earlier applications of magnesium chloride.

Conclusions

There are sound technical explanations for many of the complaints being made by the public about this material. Claims that it is toxic however have not been substantiated, particularly when bearing in mind that Gabriola bedrock is itself nor entirely innocent.

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