

**The problem of rock spoil
from a proposed underground
nuclear waste repository in
West Cumbria**

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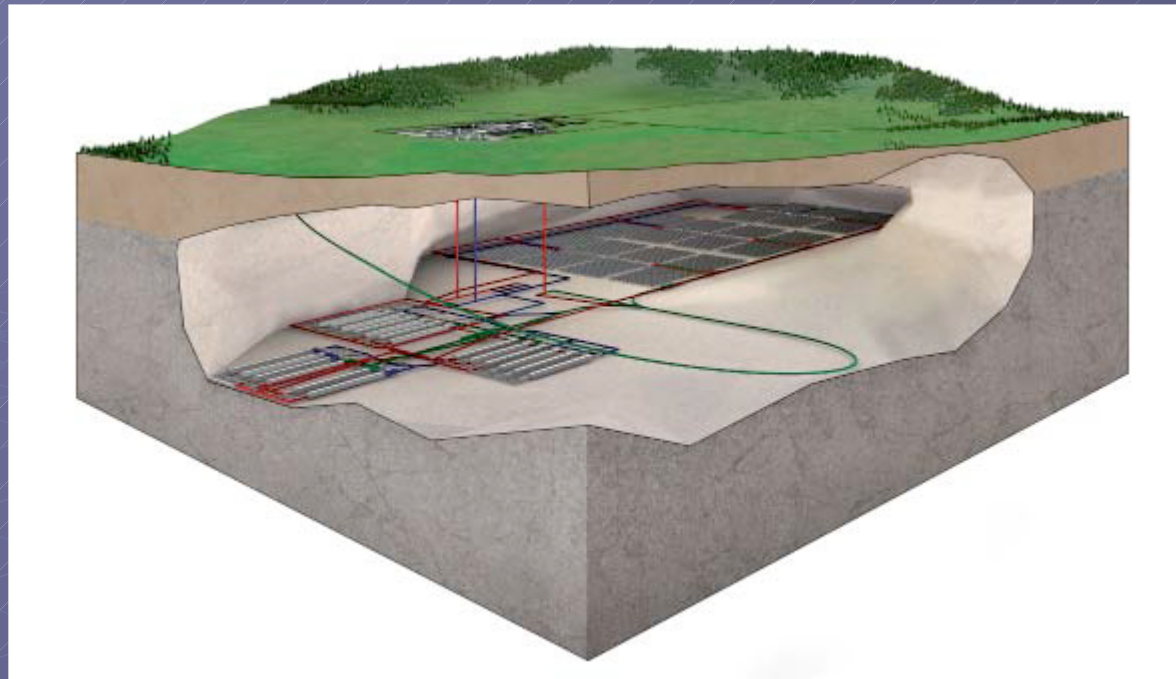
11 October 2011

A letter dated May 2011 from the Nuclear Decommissioning Authority (NDA) to Cumbria County Council states:

“all of the excavated rock spoil could be stored on the surface and then either re-used in construction and backfilling, or for landscaping and site restoration. Under this scenario there would be no requirement to transport rock spoil off-site. Under different scenarios ... there may be surplus rock spoil to be taken off-site. In such cases it is likely that bulk spoil transport would be by rail”.

This statement is completely misleading. In fact the NDA commissioned an environmental report (October 2010) in which precise figures are given.

The amounts are considerable, as this slideshow demonstrates.



This is a typical NDA image of what a repository is supposed to look like. It shows idealised green countryside and simple ideal geology (flat homogeneous layers).

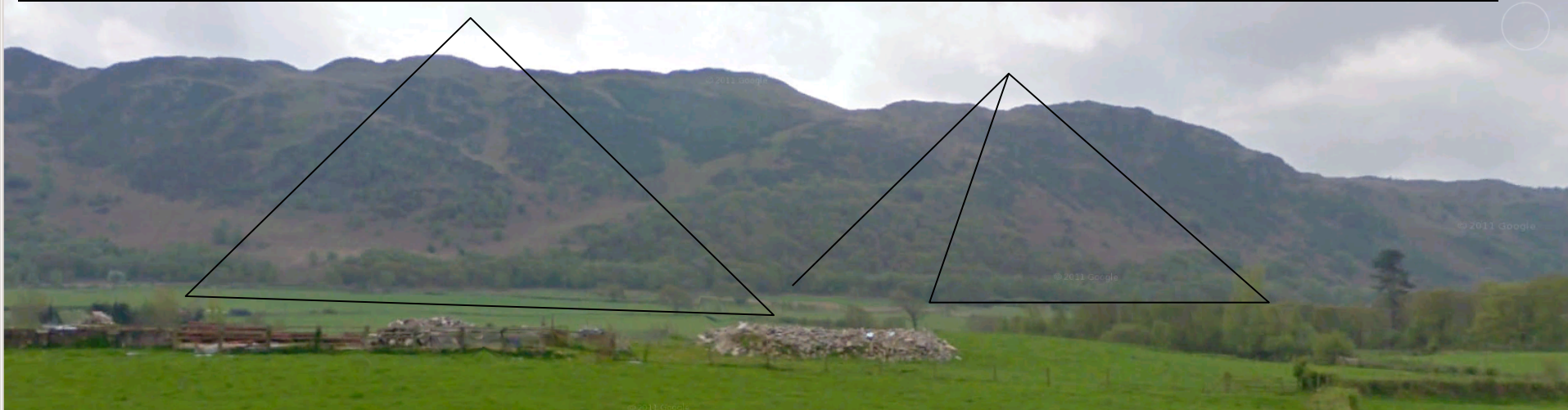
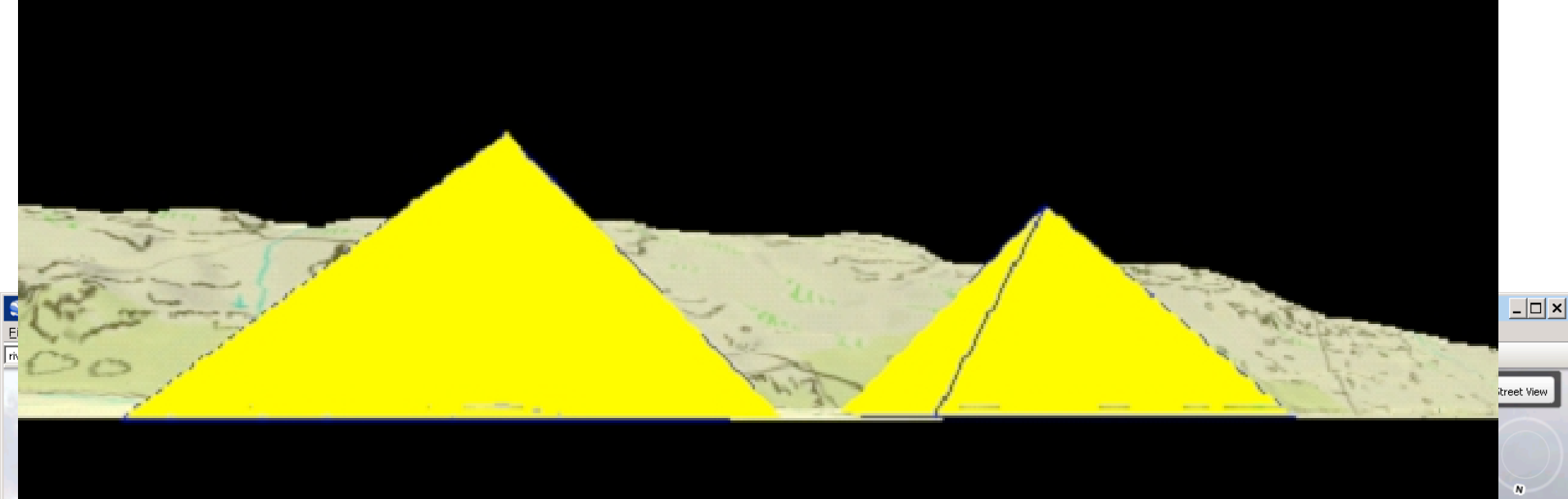
The picture omits the fact that the surface will be converted into an industrial zone spread over several square kilometres, and in existence for more than a century.

The idealised geology shown here has no resemblance to the actual geology of West Cumbria.



The Great Pyramid of Cheops (or Kheops) at Giza, Egypt, has a volume of 2,500,000 cu. m. It is 140 m high. A London Routemaster bus is shown at the foot for scale, as the people in the photo are too small to be seen clearly.

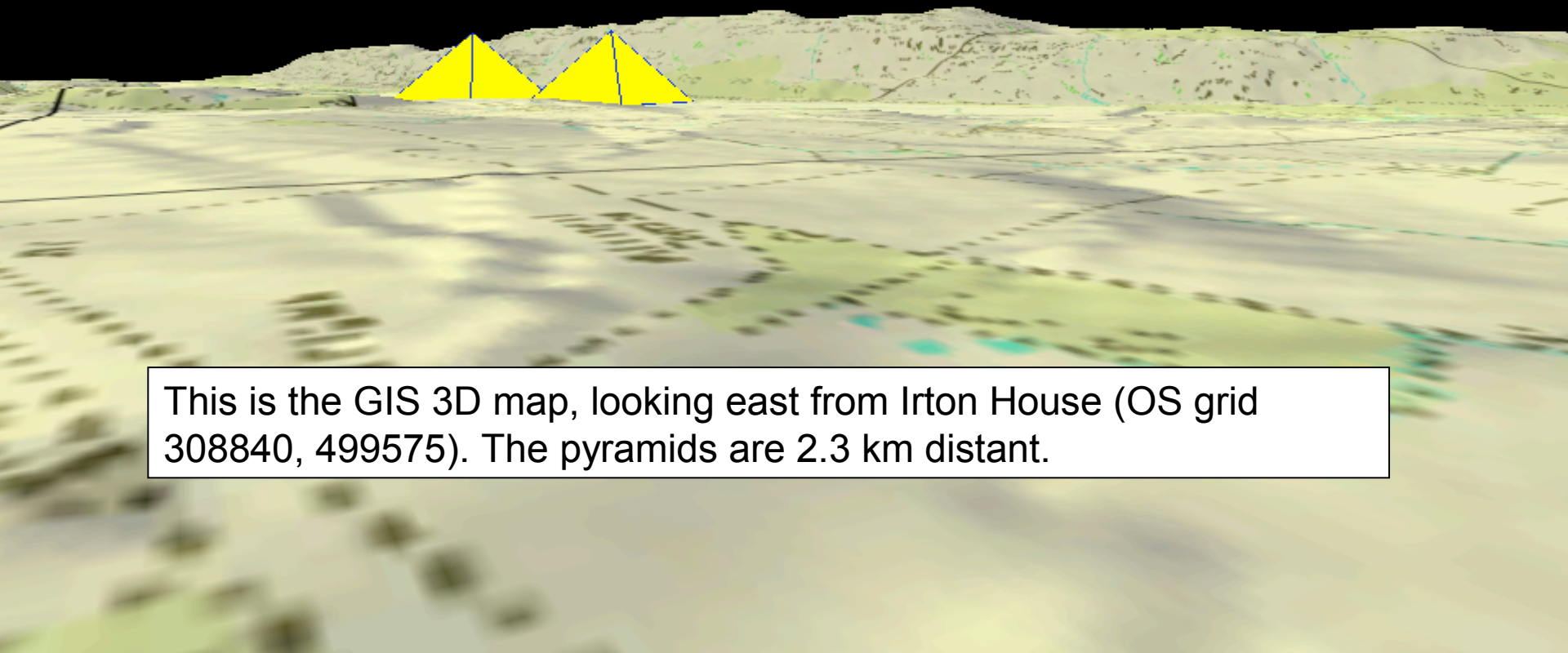
In the following slides I have visually modelled the effect of spoil heaps in West Cumbria, by assuming that they are built in the form of the Great Pyramid. Of course, they will not in fact be built to that shape, but rather in the form of low flat-topped mounds called *bunds*. But the pyramid has the smallest possible footprint that a stable mound of rubble and stone could occupy.



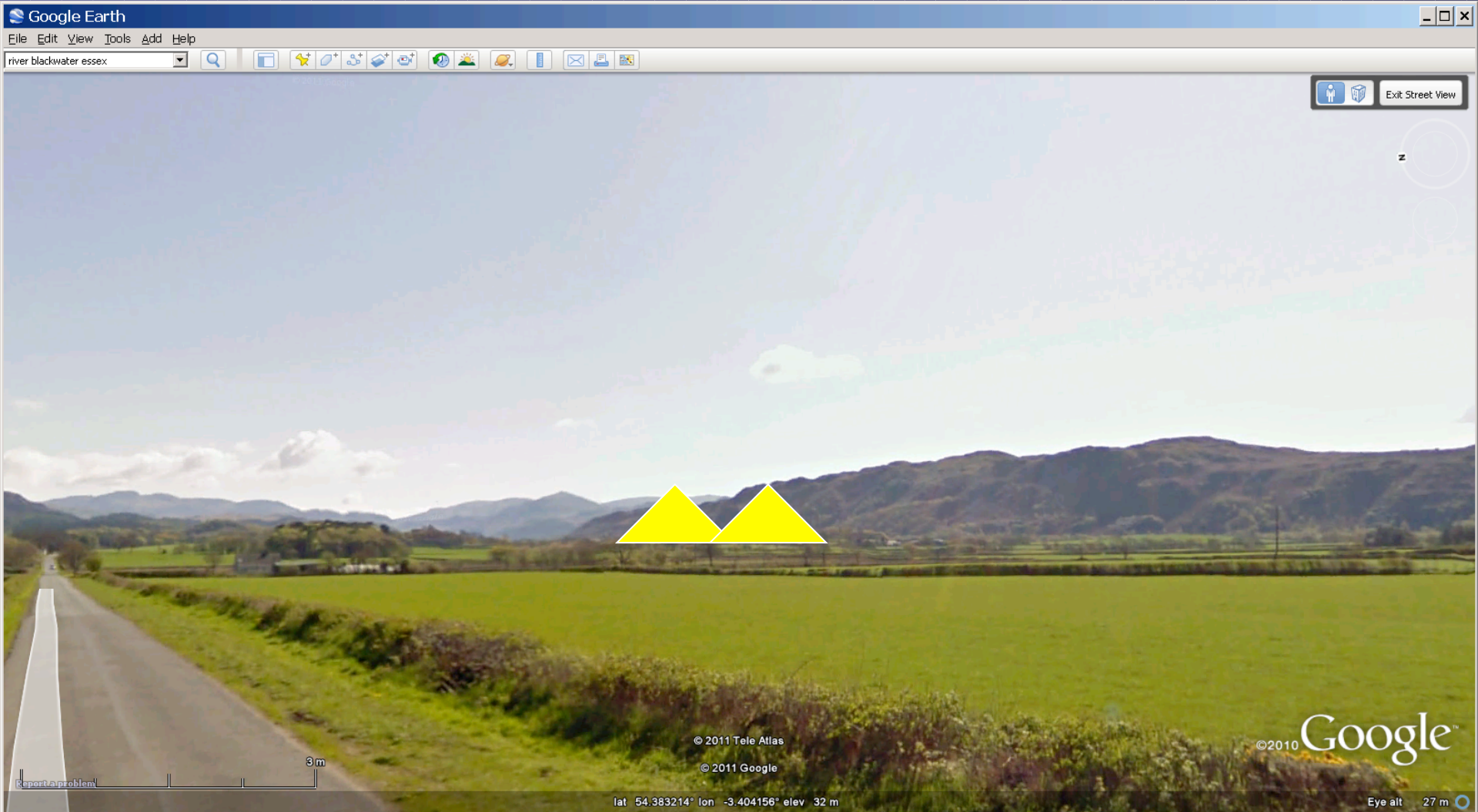
If a repository were to be excavated in the Eskdale granite, the site works might be in the Irt Valley. The spoil which has to be **stored for final use as backfill is equivalent to 2 pyramids**. The upper view is a 3D GIS view of the valley, on which I have superimposed the two 'backfill' pyramids. Both views are looking south from Sandbank.



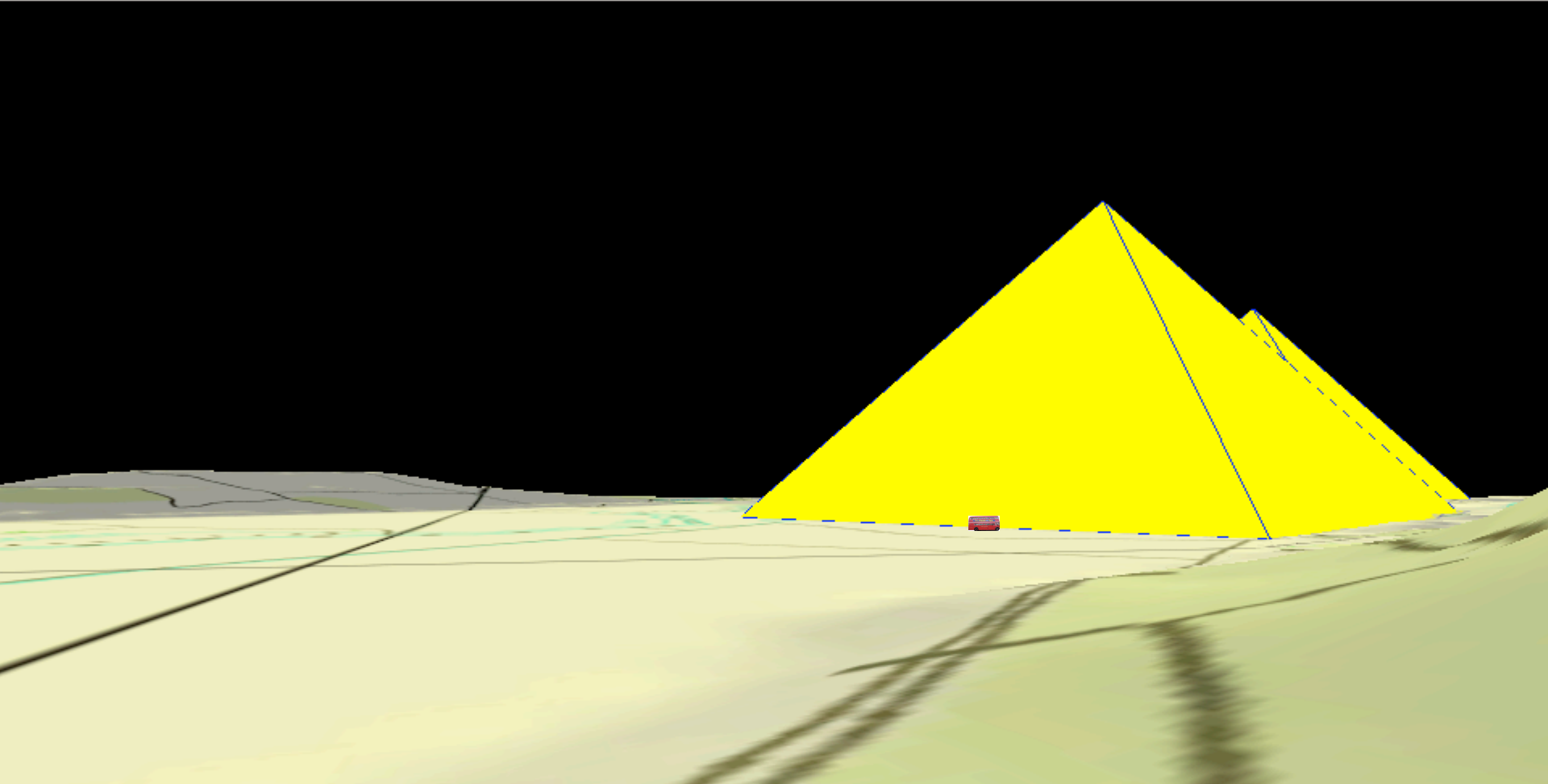
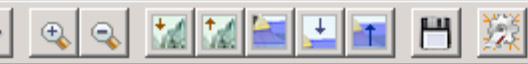
Muncaster Fell



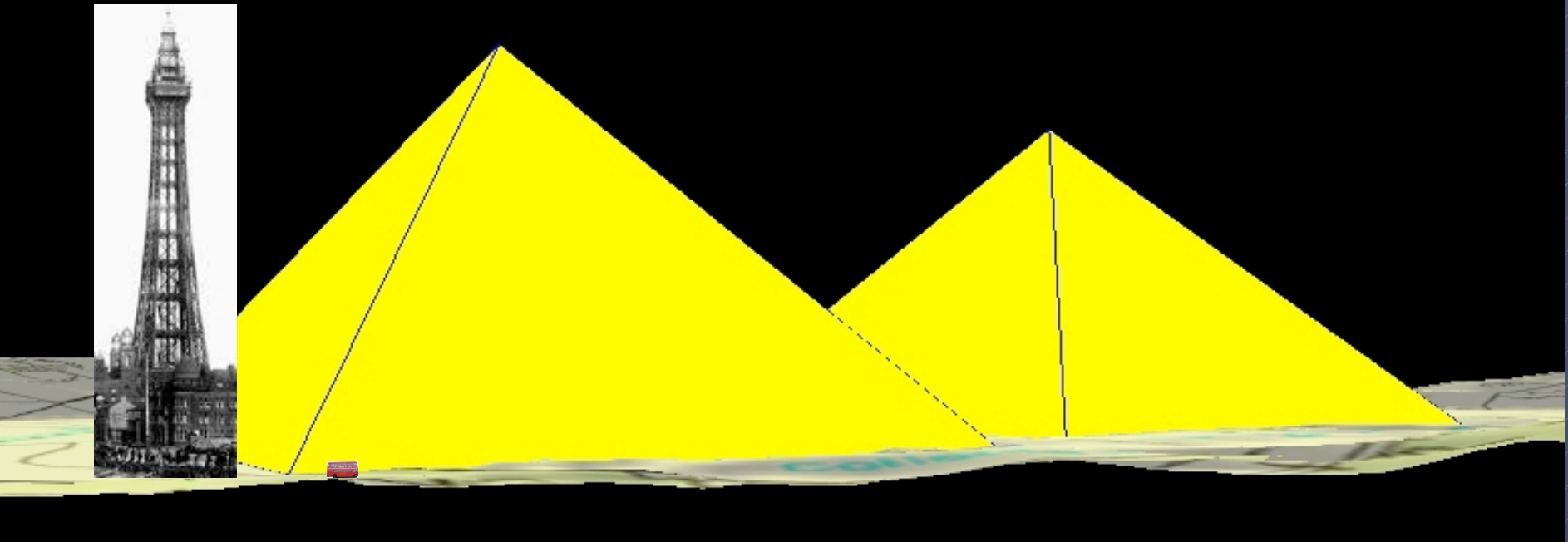
This is the GIS 3D map, looking east from Irton House (OS grid 308840, 499575). The pyramids are 2.3 km distant.



Google Street View looking east from Irton House, as in the previous graphic, and with the pyramids superimposed.



GIS 3D map, looking north-east from the Ravenglass & Eskdale railway line at the foot of Muncaster Fell.



The two pyramids seen from about 50 m uphill on Muncaster Fell to the south. They are 140 m high. The Blackpool Tower, shown for scale, is 158 m high. The Routemaster bus (4.4 m high) is also shown for scale near the nearest corner of the nearer pyramid.

The Eskdale problem

The previous slides illustrate the problem of how and where to store the 4.84 million cu. m. of spoil to be used for **backfill**. It will be around on the surface for about a century.

In addition we have 11 million cu. m. of **excess spoil**, not to be used for backfilling, which must either be stored permanently as bunds or taken away. **This volume is another 3½ pyramids-worth.**

Eskdale:

Transport off-site
of **excess spoil**

Granite spoil does have a commercial value as an aggregate. It would have to be shipped out by rail or road.

One possibility would be (compulsory) purchase of the **existing miniature railway line**, which originally served the haematite mines in the nineteenth century. This line could be re-upgraded to a modern gauge, and connects into the national rail network at Ravensglass.



Source: wiki

Ravenglass & Eskdale Railway

Eskdale:

Transport off-site
of **excess spoil**

(continued)



If removed by road, we have 18 million tonnes to shift. The capacity of a dumper truck on public roads is 44 tonnes, which means 407,000 loads.

This means 112 loads per day every day for (say) 10 years. Assuming an 8 hour day, the traffic out will be one truck every 4 minutes, plus an empty truck returning.

In comparison, the traffic frequency for the transport of radioactive waste to the repository during its lifetime (which the NDA letter quotes in detail) is insignificant – between 10 and 35 loads per week.

Pyramids or bunds?

So the NDA can 'solve' the problem of unused and commercially valuable **excess spoil** in Eskdale – ship it out by rail and/or road and sell it.

Of course, the two pyramids-worth of **backfill spoil** to be retained for up to a century will not actually be stored in pyramids. Realistically, it will be stored in flat-topped mounds called bunds.

If the bunds are 5 m high, we need 1 sq km to store the spoil. This is the same area as the Drigg low-level waste repository.

The problem with the coastal strip of West Cumbria, between Workington and Barrow, is that it is too narrow. Where is such an area to be found?

The Solway problem

A proposed repository sited in the Solway plain area would be excavated in so-called 'lower strength' rocks, such as the Mercia Mudstone.

In this case we have 15 million cu. m. of **excess spoil**, which cannot be used for backfilling, nor which has any commercial value. **This volume is 6 pyramids-worth, for which permanent storage must be found.**

Assuming bunds 5 m high, some 2.9 sq km of land would be needed – that is 2900 Ha, or 7400 acres.

Conclusion

I have demonstrated (elsewhere) that no possible underground repository site can be found within the area of Copeland and Allerdale district councils, that would be geologically safe.

In addition to the insurmountable geological problems, the NDA is misleading the elected officials and the general public of West Cumbria as to the scale of environmental blight to be caused, were such a repository to be excavated.

The MRWS:Cumbria partners need to ask some searching questions of the NDA; in particular, why the figures from the NDA's own environmental assessments, used herein, have not been presented in a more honest and transparent way.

Appendix Calculations

Source: 'Upper' inventory from:
Nuclear Decommissioning Authority 2010. *Geological Disposal: Generic Environmental and Sustainability Report for a Geological Disposal Facility Assessment Report October 2010.*

The 'upper' inventory includes Pu/U waste, but no new build waste.

Higher strength rocks: 3589000 m³ spoil is stored for backfill, 6640921 m³ excess is taken off-site. Density 2.7 tonnes m⁻³.

Lower strength rocks: 1177500 m³ spoil. Density 2.5 tonnes m⁻³.

Assumed spoil density is 2.0 tonne m⁻³, so solid rock spoil volumes are multiplied by 2.7/2.0 or 2.5/2.0 (higher and lower strength, respectively).

Mass calculated for granite transport is the solid rock volume multiplied by 2.7.