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Nuclear waste disposal

Mainly UK: West Cumbria



The government and its agencies like the Nuclear Decommissioning Authority (NDA; successor to Nirex) are trying to airbrush out the history of the attempt to find a nuclear waste repository in West Cumbria. Documents and scientific papers which were formerly available on their websites have been removed; the Nirex documents have been transferred to the safe keeping of the British Geological Survey, where they may be 'consulted' at Keyworth, Nottinghamshire. But nothing remains online, not even an index of the documents and reports. One aim of this page is to rectify that omission.

The 1995-96 Sellafield Public Planning Inquiry

I have re-scanned the body of the [Inspector's Report](#), which is now in text-searchable pdf form. As it is 16 Mb in size, you might wish to download it in three separate parts ([A](#), [B](#) and [C](#)), or just read his [conclusions](#). His assessor was [Colin Knipe](#), an engineering geologist, and his [Assessor's Report](#) forms Appendix A to the Inspector's report. It was downloaded from the Johnson, Poole & Bloomer [website](#) as a series of rtf files, and converted to pdf. Appendix 2 (Appearances) and Appendix 3 (Documents and plans) are combined [here](#).

Here is what the Inspector said about the location of the proposed repository:

"... the Assessor's advice is that 2 principles of overriding value can be derived from his review of the geological, geomorphological & hydrogeological criteria. One principle is that
the location should be in a region of low hydraulic gradients, so that there should be slow-moving & long groundwater pathways:
and the other is that
the geology & hydrogeology of the site and its district should be sufficiently uncomplicated as to be readily characterisable & predictable." [Inspector's Report, para. 6A.60]

Neither of these two principles is respected anywhere in West Cumbria:

- which lies in a region of fast and high hydraulic gradients
- where the groundwater pathways are very short
- where the geology is complex and not readily characterisable or predictable.

There were three principal groups of objectors at the Inquiry - Cumbria County Council, Greenpeace and Friends of the Earth. Their evidence was compiled into a book:

*Radioactive waste disposal at Sellafield
site selection, geological and engineering problems*

Edited by [RS Haszeldine](#) and DK Smythe
University of Glasgow, 1996, ISBN 085261524-8

which is available for download [here](#). Copies of the original papers with full colour diagrams will be made available in due course; the book only had black-and-white scans of the diagrams. The Nirex submissions concerning the geology and hydrogeology will also be made available.

Two articles disproving Nirex's results on the supposed safety of a Sellafield-type site were published in the scientific literature by University of Glasgow researchers in [1995](#) and [1999](#). The full research is documented in the doctoral thesis of Chris McKeown, on open file. The work was based on Nirex's own detailed investigations at Longlands Farm. Among the many important conclusions of this work was that the host rocks chosen by Nirex were around **one thousand times too permeable** (i.e. allowing contaminated water to flow through them) for the site to be considered 'safe'.

Had Nirex's scientific and technical work not been challenged in this way, we would have been well on the way to the planned commissioning of an actual deep waste repository below Longlands Farm, planned for 2012 (see the [Inspector's Report](#), para. 3A.12). The Glasgow University work has never been refuted or even challenged in the peer-reviewed scientific literature.

David Oldroyd, a historian of science, has kindly granted me permission to put online the excellent chapter, [Nirex and the great denouement](#), from his memoir on the Lake district, *Earth, Water Ice and Fire: two hundred years of geological research in the English Lake District* (Geol. Soc. London, Memoir 25, 2002). He recounts the development of Nirex work at Sellafield, the geological arguments put forward pro- and anti-Nirex at the planning inquiry, and the subsequent events up to 2001. The extensive list of references for Oldroyd's memoir is [here](#). Oldroyd's book is currently (January 2011) on special offer from the [Geological Society of London](#), at £15 instead of £85 - a bargain for anyone interested in the geology of West Cumbria.

The DTI-DEFRA consultation exercise of 2007

The government called for responses to its consultation document [Managing Radioactive Waste Safely](#) in June 2007. In my [response](#) I noted that Nirex's belated attempt at transparency in recording the [history of UK site selection](#) was still disingenuous in 2005. It tries to obfuscate the fact that Sellafield-B (in effect, the Longlands Farm site) was never in the initial BGS list of 537 sites to be sieved. I also quote at length the Inspector of the 1995-96 Inquiry. His findings carry considerable legal weight, and are still pertinent today. The Inspector himself published a [letter](#) in *The Guardian* around the time of the 'consultation'. He says (28 June 2007):

"The relevant geology in west Cumbria is apparently now claimed to be "stable, although imperfect" ... the imperfection consists of simply **failing to meet the internationally agreed criteria** on the suitability of rocks for nuclear waste deposit. The site should be in a region of low groundwater flow, and **the geology should be readily characterisable and predictable** ... **The site is not suitable and investigations should be moved elsewhere.**"

The BGS report of October 2010

The British Geological Survey's report into the *Initial Geology Unsuitability Screening of West Cumbria* is in several parts - all pdfs: [Main report text](#), [Figs 3-14 \(excl Fig. 9\)](#), [Figure 9](#), and [Non-technical summary](#). Its remit was tightly constrained, to give the misleading impression that some parts of West Cumbria are to be considered suitable for nuclear waste disposal - after further site investigations, of course. At no point will the BGS be permitted to conclude that no part of West Cumbria is suitable; so, as a former BGS geophysicist myself, I am saying it for them. My slide show ***Why the whole of West Cumbria is unsuitable for a nuclear waste repository*** is [here](#) as a pdf.

[Here](#) is another slide show ***Why West Cumbria is not Switzerland***, in response to the almost facetious criticism of my views by a nuclear industry geologist to the effect that 'If a mountainous country like Switzerland can find a repository site, what's wrong with Cumbria?'

Geology and the Nuclear Decommissioning Authority

The BGS led the way internationally in the mid 1980s in defining six generic geological environments in the UK suitable for intermediate level waste (see [Chapman and others 1986](#)). This followed on from a [classic paper](#) published in the journal *Science* in 1981, which defined the concept of basement under sedimentary cover (BUSC). The BUSC concept was crucial at the Planning Inquiry, because Nirex had tried to argue that the coastal region of West Cumbria is a BUSC environment, but the Inspector rightly threw out that assertion.

So you might expect the the recent NDA document [Geological Disposal. Steps towards implementation](#) to provide at least an overview of the kinds of geological and hydrogeological regimes in Britain suitable for nuclear waste disposal, even if the document were to avoid discussion of specific regions and sites; but you will be disappointed. Although it purports to "*define a limited number of generic geological settings, encompassing typical, potentially suitable UK geologies*", it does no such thing. The geological content of the paper is essentially nil, as this [pdf](#) slideshow ***NDA geological analysis*** shows.

Government policy is regressing the science to the ideas of about 40 years ago - back to the era before the overall regional geological environment was considered, and finding a 'suitable host rock' for the repository was all that mattered. The NDA strategy now seems to be to avoid at all costs any generic regional classification, because it knows that West Cumbria does not conform to any of these scientific models. The BGS, incidentally, still adheres to the scientific concepts it helped to

develop, as this [pdf](#) from 2006 shows. But the BGS has not been asked (and will not be asked, in my view) to weigh up West Cumbria against other UK regions - something the Inquiry Inspector asked for; instead, the NDA pays for mediocre contractors' reports such as the [one](#) used to confirm its current 'implementation' policy.

A note on international guidelines

The geological disposal of nuclear waste is governed by national regulations, by EU treaties (e.g. Euratom), legislation and guidance, and by international indicative guidelines from the International Atomic Energy Authority (IAEA). In 1994 the IAEA published [Siting of Geological Disposal Facilities](#), which is due to be superseded by an update labelled DS 334, but this has not yet taken place. The Joint Research Centre of the European Commission has recently published [Geological Disposal: Steps Towards Implementation](#). This re-states the essential requirements of the geology and hydrogeology:

“Fundamental criteria include, for instance, long geological stability, low hydraulic gradients and permeabilities, low geochemical and other potentials, etc. In other words, a geological system is sought out that exhibits in its natural state a low potential for change and very slow rates of change.”

The Inquiry Inspector made frequent reference to the 1994 IAEA paper, which was referred to in the Inquiry documents as GOV/507. His comments based around it are still valid, since it remains the current guidance. The paper itself is rather abstract, as it is meant for general worldwide application; it is easier to read the Inspector's words on it, in the real-world context of a proposed repository in West Cumbria. For example, the guidance document does not mention marine discharges explicitly. In contrast, the Inspector pointed out that the UK site selection process had *"some predisposition towards maritime settings"* which seemed to be *"contrary to international law"*, and, of course, that Sellafield was one such site. He concluded that there would have to be *"exceptional justification for locating a repository near the sea"*. Law obviously takes precedence over 'guidance', and different countries have different local conditions - for example, international maritime law need not concern the Swiss.

As I understand it, the international guidelines are a general framework for individual countries to use in developing their own disposal strategies. So in the UK case, the generic geological environments developed by the BGS in the 1980s, and mentioned above, still apply. They cannot simply be discarded.

In preparation

The [Nirex site selection process](#) analysed in detail; here for now is the [complete list](#) of 537 UK sites identified in 1988, leading to the choice of Sellafield. The sites were confidential till 2005; they can be found on the [NDA website](#), but only on a county-by-county search. To cut a long story short, both 'Sellafield' sites should have been eliminated early on in the sieving process, and one of the finalists, [Stanford, Norfolk](#), should have been declared the best site on the criteria employed at that time. That does imply that it is the best site now.

David Smythe 2011

This article was last updated on 28-Jan-11

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