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Mr R Bennett
c/o West Cumbrian MRWS Partnership
Copeland Borough Council
The Copeland Centre
Catherine Street
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Dear Mr Bennett

OVERVIEW OF PROFESSOR DAVID SMYTHES REBUTTAL OF CoRWM'S VIEWS

As requested, I have undertaken a review of Professor Smythe's document "Why a deep nuclear waste repository should not be sited in Cumbria: a geological review". I have focused my review on the two key questions you asked, which are "In your opinion, to what extent is David Smythe expressing a view held by the wider geological community?" and "Which issues, if any, warrant further follow-up by the Partnership at this stage in the process?"

Starting with the first question, in terms of my own professional field of hydrogeology and contaminant transport geochemistry, I would contest the assertion by Professor Smythe that it is not possible to model adequately the complexity of groundwater flow and radionuclide transport in the geological sequences likely to be encountered within the West Cumbrian MRWS Partnership area. I prefer to use this description for the entire geographical area under consideration in this review (rather than "area", "region", West Cumbria" or any other term used to describe the geographical area of interest where a potential repository may be sited). I agree that the more complex the geology, the more uncertain the results of any modelling exercise. Our current understanding of the geology associated with the former Longlands Farm site indicates it is indeed complex (structurally, lithologically, geochemically and hydrogeologically). However, it is a considerable leap to go from this position to then suggest that the geological complexity of the "coastal strip of West Cumbria" is already sufficiently well understood to allow us to draw the conclusion that it should be rejected as being potentially suitable for a repository site. This statement has as much validity as the counter-claim that we currently have a sufficiently robust level of understanding in groundwater flow and flowpaths consistent with the safe disposal of intermediate-level nuclear waste. *I feel it is more Professor Smythe's personal opinion, and not the opinion of the wider geological community, that as a consequence of the MRWS*

Partnership area having complex geology and hydrogeology, the area should not be considered potentially suitable for a geological repository.

It is also true to say that a region with a lower hydraulic gradient would be *preferable,* but the current site selection process does not allow for much choice. Undertaking investigations in areas of low hydraulic gradients (i.e. Norfolk/The Wash) may be preferable but this is a political and not a scientific decision that lies outside the remit of the West Cumbrian MRWS Partnership.

I would like to try and derive a positive contribution to the current debate from what appears to be a rather negative document produced by Professor Smythe through looking at the second question you posed. I would agree, in general, with Professor Smythe that the MRWS Stage 4 technical criteria for the selection of areas for further investigation is lacking in detail. I believe it may be this uncertainty in the Stage 4 evaluation criteria that exacerbates the current disquiet as to whether or not the MRWS Partnership should proceed to Stage 4 and the fear that, irrespective of past events, the former Longlands Farm site will emerge on the potentially suitable site list at Stage 4, possibly at or near the top in terms of priority. It could be argued, as Professor Smythe does, that the original generic geological settings put forward by Chapman *et al.* in the 1980's could be used. However, the opportunity to evaluate potential sites in the UK, as a whole, against these ideal criteria was lost when Sellafield B and Dounreay were selected as the sites on which to undertake further work. Professor Smythe also cites the current/updated IAEA guidelines which, it should be noted, indicate *preferences* regarding geological complexity, not *requirements*. I believe it is the absence of any clear criteria against which the UK should evaluate potentially suitable sites at MRWS Stage 4 that leaves the discussion on the geological suitability of West Cumbria to host a repository open to a significant range of interpretations.

The original search process in the 1980's allowed for the selection of a site with as close to ideal geological and hydrogeological characteristics as possible. The current volunteerism process constrains selection to less than ideal sites. I would agree with Professor Smythe that the criteria set out in his Figure 2 are too vague, although I cannot agree with his subsequent highly personal derisory comments. It would be potentially very beneficial to the MRWS Partnership to follow-up with a request to the NDA to initiate a process by which specific criteria to be used at Stage 4 can be identified by the close of Stage 3. This might follow a similar methodology to that which derived the screening criteria for the BGS report.

It is a matter of some debate to suggest that the PRZ at the Longlands Farm site was selected by a scientifically irrational process. Since a large proportion of Professor Smythe's review focuses on the selection of the Sellafield B site, I feel it is necessary to acknowledge that it is true to say that the Sellafield B site is not/was not, *sensu stricto*, a Basement Under Sedimentary Cover (BUSC) scenario (as per the original prototype through the coastal plain of Maryland, USA). However, this does not mean it then ceases to be a potentially suitable repository host rock. The current selection process requires a review at Stage 4 (against clearly identified selection criteria) to determine its potential suitability. This may then provide the evidence (in particular from a structural geology perspective) to support Professor Smythe's claim that "the geology of this district is evidently unsuitable for considering a repository site".

I think Professor Smythe is wrong to refute the CoRWM statement. Based on Professor Smythe's own report, one area, first identified by the original BGS study for potential low-

and intermediate-level waste repository sites back in the 1980's, remains potentially suitable. Professor Smythe's figure 3 shows geological environments considered to have the potential for repository development. The area of the Solway Plain and Solway Firth is shown on this map under the heading "Areas of potentially suitable sedimentary formations". This is an area of thick Triassic and older rocks. Professor Smythe notes that the "general geological advice given to government by BGS has not subsequently been found by any later detailed investigation to be flawed". Professor Smythe highlights the potential wealth of oil industry seismic data within this region. Whilst there is a suggestion it may be structurally complex, this requires proper evaluation and is insufficient grounds to reject it. Professor Smythe considers this area is geologically unsuitable, and outlines his reasons in the paragraph preceeding section 4.5 on Page 9. The St Bees Evaporite Formation is dismissed as a consequence of its absence onshore in northern Allerdale. However, I understand from brief discussions with the BGS that the Mercia Mudstones within this area would also form part of the BGS's "potentially suitable sedimentary formations". Thus the conclusion must be that the Solway Plain within the West Cumbrian MRWS Partnership area remains, on geological evidence, an "area of potentially suitable sedimentary formations". This clearly supports CoRWM's position. The discussion by Professor Smythe on the Carboniferous Limestones in this region is largely irrelevant as it is stated in Table 5 of the BGS screening report that these are excluded between 200 and 500m below ground level, and subsequently that the isolation of any facility from exploitable water resources will be a major issue regarding the potential suitability of any proposed site.

Professor Smythe also reviews the geological potential of the Eskdale granite, which he dismisses on the grounds of a higher than desirable hydraulic gradient and its proximity to the Lake District Boundary Fault (LDBF). It should be noted that a number of radioactive waste research facilities were located in areas of high hydraulic gradient (for example, Grimsel in the Swiss Alps). Groundwater flow in hard rock systems is undeniably complex. It is probably insufficiently understood at present by the International hydrogeological community to permit its evaluation to the level necessary to satisfy the current UK regulatory agencies, particularly in consideration of its proximity to the LDBF. However, until it has been reviewed under the current evaluation process, it remains a potentially suitable repository host rock.

In conclusion, Professor Smythe fails to adequately refute CoRWM's position, and to some extent inadvertently even appears to support it. The issue of identifying suitable criteria for the selection of potentially suitable repository host rocks for implementation at Stage 4 should be followed-up by the West Cumbria MRWS Partnership.

Yours sincerely
for FWS Consultants Ltd

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