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23 February 2020

Dear Sirs,

GEOTECHNICAL COMMENT AND QUERIES
NETWORK RAIL PROPOSALS FOR THE CLIFF SECTION FROM PARSONS TUNNEL TO TEIGNMOUTH

As geotechnical experts in cliff stability and stabilisation, we would like to provide our comments on the proposed South West Resilience Programme, as it affects the cliff section between Parsons Tunnel and Teignmouth.

While we accept that improvements to the railway are likely to be required due to climate change and sea level rise, our main concern is that the current proposals for the cliff stabilisation works are not appropriate.

The current proposal is to stabilise the cliffs with massive reinforced earth buttresses. These buttresses in turn require the railway line and associated sea defence works to be pushed seaward. We have reviewed a number of documents which support your proposal, and our comments are restricted to the limited detail that they provide. From this information, the current proposal cannot be supported. We request that in the spirit of openness, all documents are made available, not just selected highlights, some of which could be considered misleading to members of the public who are being consulted.

Our main concerns/ questions are as follows:

i. It is not clear why further action is required at this point. Can you clarify the level of instability currently being experienced along the different cliff sections and how does this compare to the historic record of instability which must be present since Brunel constructed the railway?

ii. Why were previous stabilisation works undertaken in recent years unsuccessful?

iii. The railway line now protects the cliffs from attrition and undercutting due to wave action, and thus cliff instability can only arise due to changes in groundwater pressures within the slopes and surface weathering. Instability to date appears to be mostly shallow unravelling of the weathered surface of the cliff face. Therefore, our questions in this regard are:

   - The proposed buttress design that has been put forward is described as being required to address gross instability. Can you clarify what changes you expect to occur in the cliff to result in this gross instability?

   - What evidence is there for active deep-seated landslides along this section of cliff that require support from the proposed reinforced earth buttress?

   - In one report you provide an output from a limit equilibrium stability analysis model. This suggests that a section of the cliff should have already been subject to gross large-scale cliff failure but this clearly has not occurred. Your ground model is therefore wrong. As any geotechnical engineer experienced in large scale slope stabilisation knows, these models have many limitations in their use for analysis of such large natural slopes. Can you explain the discrepancy between what is actually occurring and the results of your stability analysis?

iv. A risk profile is provided for sections of the cliff. This hazard assessment appears to be directed at the effect to the line, and not the geotechnical likelihood of failure. Can you provide more details of this assessment and the likelihood of failure along each cliff section?

v. The proposed buttress could potentially block natural and existing slope drainage systems and also induce loads on the lower section of the cliff and railway. Groundwater levels could increase in the slope, not reduce. The massive increase in loading from the large structures could result in slope failures (and potentially reactivate deeper seated historic landslides) that could affect the railway line and new sea defence structure. Have you undertaken any assessments in this regard?

vi. Can you provide any precedence for similar massive earth buttresses being used to stabilise large cliffs next to railway lines? These methods are not used in countries that have railways in mountainous terrains.

vii. At the consultation events members of the NR team have stressed that the proposed design is required to manage a compound wedge failure. However, part of the compound wedge failure is too high upslope to be stabilised by the buttress. Most slopes have multiple mechanisms of potential instability and in our opinion, there is nothing unique in the geological conditions along this section of railway which warrants the buttress solution being proposed.

viii. Repeated reference is made to your Experts who have produced this slope design. Having been given the title of Expert they must be nationally recognised geotechnical engineers in "large scale slope assessment and stabilisation", not just qualified geologists or geotechnical engineers *per se.* Can you clarify what experience these engineers have in large scale slope assessment and stabilisation, as this has not been made clear?

ix. You provide a series of historic photographs of failures to railway lines which includes the historic Folkestone Warren failure (Chalk over Gault Clay). None of those failures bear any resemblance to the geological conditions along the subject cliff section and this sort of presentation is therefore misleading particularly to non-ground engineering professionals.

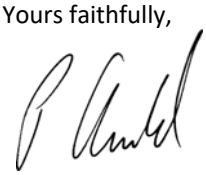
x. A key element which civil engineers are expected to consider in their design, is the sustainability and impact to the environment. The proposed works clearly require extensive quarrying operations (where will the stone be sourced from?), sea transportation of aggregates and armour stone (how many ship movements?), dredging, extensive use of plastics in the buttress reinforcement, and finally earth and construction works using heavy diesel-powered plant. This project will have a massive carbon footprint. Can you therefore please explain what assessments have been made to justify the carbon footprint of the works?

xi. We are aware that any sea defences that interrupt sediment flows have consequences. No model, however advanced, can entirely capture these dynamic processes or fully predict the potential implications. There are so many examples where ill-placed sea defences resulted in increased erosion in unexpected areas or siltation of others. Can you inform us of the scenarios and level of risk (likelihood and consequence) assigned in your risk register to these adverse effects, which could include loss of the remaining beach at Teignmouth, silting of the harbour entrance, siltation of the fishing grounds, accelerated erosion of cliff sections elsewhere etc.., so that those affected are clearly informed of the potential implications of your works?

It is our opinion that the information provided by Network Rail is insufficient to provide confidence that the proposed works will not only have a significant effect on the landscape and environment, but also do not provide sufficient confidence that the slope stability has been adequately or appropriately assessed. We believe that, while any large coastal cliff will be subject to localised instability from time to time, potential instability can be best addressed by localised cliff stabilisation with line protection by fences, rock traps and canopy shields, without recourse to measures that appear grossly disproportionate to the instability risk.

Given the public cost of these works and the environmental implications, we therefore request that a review of your proposals is carried out by an independent body, and that final design is subject to a full public enquiry.

Yours faithfully,



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