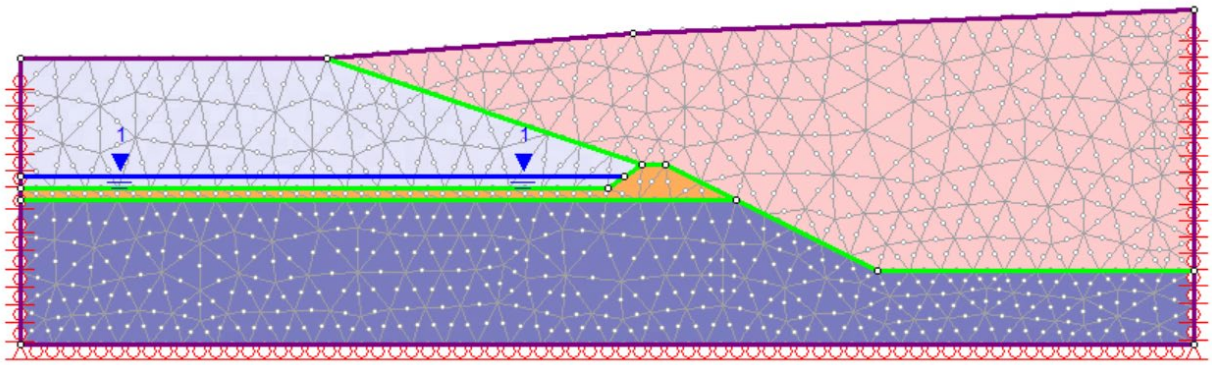
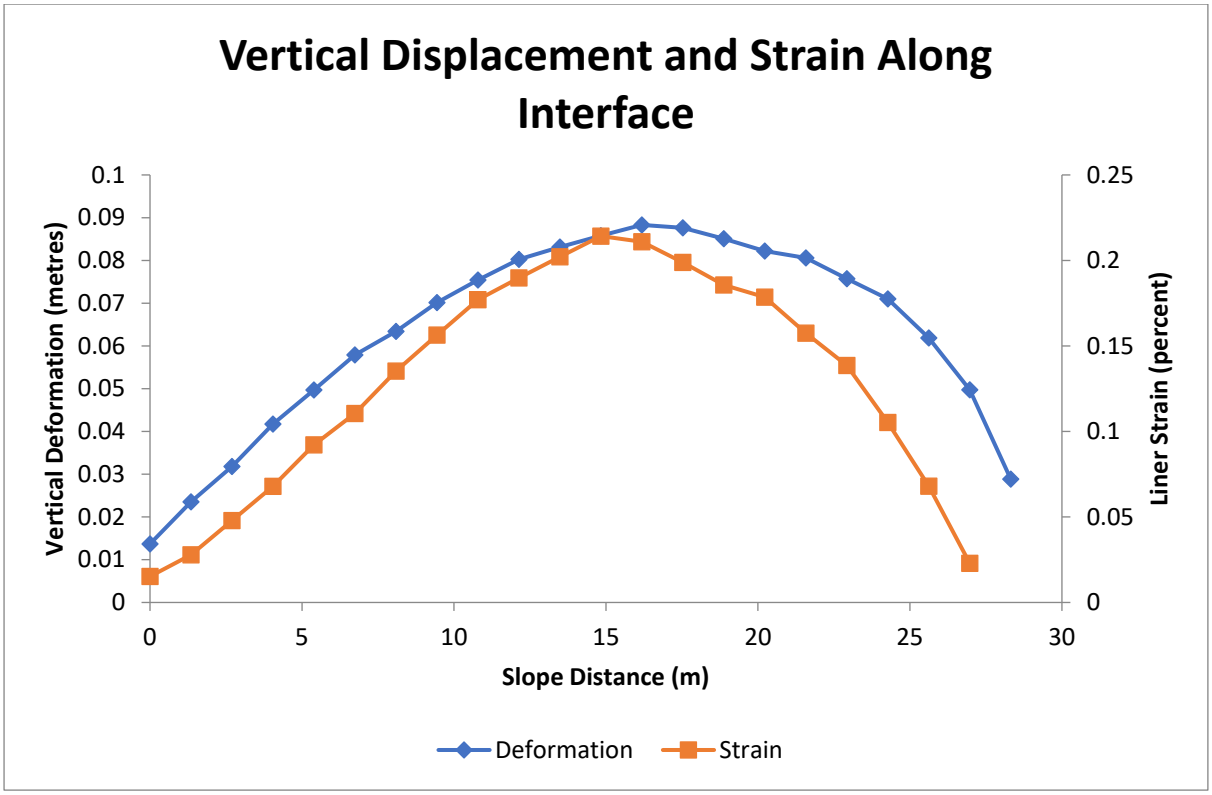
Response to NRW Comments on Review of Cell 8 Basal Lining Design and CQA Plan

1. *What will be the final thicknesses of new waste deposited in the eastern piggy-back area over Cell 13? Is the increased loading significant enough to warrant modelling the extent of re-activation of settlement of the Cell 13 waste to investigate the degree of deformation of the Cell 13 capping membrane? The results of the modelling may require the use of a support layer, such as geogrid reinforcement.*

The final thickness of waste over the Cell 13 piggy-back will vary but is up to 13metres. The diagram below is a snapshot of the FE model made to examine this issue and it shows how the new wastes (pink) increase in thickness toward the edge of Cell 13 as the Cell 13 wastes decrease in thickness. The consequence of this loading event has been explored in a simple FE model, the results of which are shown on the graph beneath.



The graph plots the FE results along the interface between Cell 13 and Cell 8 to show how the current Cell 13 capping membrane and the proposed overlying Pozidrain drainage geocomposite will settle and stretch due to the imposed stresses caused by the overlying wastes. The output shows the displacement and also the strain in the plane of the liners.



The conclusion of the assessment is that the strain in the liner elements will be acceptably small (note that the in-plane strains are expressed as percentages not decimal fractions) without the need for geogrid reinforcement. This is the same approach that has been used on previous cells where new wastes have piggy-backed onto old wastes.

2. *Similarly, to the above, because the piggy-back is a side slope should the Cell 13/Cell 8 boundary be checked for interface stability?*

This is not the first time at Withyhedge that wastes have been placed against and overlapping Cell 13. The 3 Valley Cells were placed with the same geometry as this proposal but the wastes were thicker and the loads greater. At the time a stability risk assessment was carried out to support the Permit Variation application to authorise the piggy-backing. The SRA showed that the proposed piggy-back was stable and did not compromise or threaten the liners at the interface. Even without the passive wedge developed by the infilling of wastes into the rock void below the interface between the Cell 8 and Cell 13 wastes (see scaled section above) a simple infinite slope stability assessment reveals that the 1:3 side slope to Cell 13 is stable with the capping membrane and the geocomposite layers. Accordingly, as this approach has been used successfully for three previous cells where the thickness of wastes were greater, and as the width of the cell is large compared with the slope length it is concluded that there is no need to revisit the interface stability.

3. *The groundwater contours for the southern and south-eastern sidewalls fall steeply and parallel to the slope topography to the valley feature. This may indicate the thin clayey weathered-rock soils are confining the groundwater to some extent. Seepages are apparent from exposed bedrock towards the base of the slope and the surface water ditch in the valley feature. If the groundwater is able to find seepage pathways, particularly on the southern and south-eastern slopes where excavation into rock with the removal of the lower-permeability cover soils is proposed, is there a risk groundwater building up directly beneath*

the liner components after construction and fail the >1m above groundwater permit requirement?

The levels shown at Formation are significantly above the groundwater levels established by monitoring the numerous boreholes in this area over several years, as shown on the design drawings. It is also noted that this part of the site had all of the soils stripped in 2018 leaving the terraced quarry profile cut into bedrock. It is not therefore considered likely that in this area confinement beneath a low permeability confining layer is responsible for the relatively steep gradient. The extent of the excavation compared with the Cell 8 boundary (shown in yellow on the aerial photograph below) reveals that clay confinement is not an issue at this Cell (though it could become so for future cells). Accordingly, Geotechnology is satisfied that the groundwater is not confined by an overlying layer but it has been noted that groundwater levels vary and such variation may be a result of focussed flows in certain fractures.

It is advised that after the excavation earthworks are completed a walkover survey is carried out to inspect for seepages. Should any seepages be found construction should stop at this stage and mitigation measures carried out before continuing with construction of the cell. This may require the over-excavation of bedrock by a minimum of 1m and the replacement with a low permeability soils layer. Proposals for dealing with groundwater seepages should be in place prior to construction starting.

It is agreed that the formation needs to be carefully examined to look for localised seepages. Such a feature was found unexpectedly on Cell 7 and was remediated by interception and diverting the source. The base of the excavations will be examined and in the event that groundwater is found that could compromise the 1m unsaturated zone requirement (or generally affect the construction works in any way) construction will pause until a permanent and effective means of dealing with the water is devised. Under such circumstances NRW will be contacted with proposals for remedial works (ie constituting a design change under the CQA procedure requiring further submissions to be made).

4. *1.6.2 of the Specification: Although it is proposed to use the same manufacturers for the construction materials as previous cells, cylinder tests and interface shear test should still be carried out as they are checking the manufacturer's specification and new batches of the materials will be used for this cell.*

Noted. Cylinder and Interface Shear Tests will be undertaken on the batches of materials used during construction. These will be reported in the CQA Validation Rerport.

5. *1.6.3: a new AEGB soil source acceptability report should be carried out for new sources of material other than the previously tested and approved on-site source of Head Deposits that only occur in the lagoons area.*

When the documents were drafted it was unclear whether sufficient existing approved site won clay that has been used on previous cells was available. Now that the donor site has been examined carefully we can confirm that there will be no other source proposed for Cell 8. This is likely to change in future and it is expected that a source characterisation report will be produced over the winter period when alternative sources are considered. However, for Cell 8 only the currently approved site won source will be used for AEGB materials.

6. *1.6.4: Photographs of the decommissioning of borehole BH20R should be included in the CQA Validation Report.*

Noted. A section in the CQA Validation Report will cover the decommissioning and will include photographs and grout records.

7. *During the part removal of capping soils from the Cell 13 area provision should be made to make repairs to the capping membrane where damage is found or caused by the works.*

Noted. Materials for such repairs are already on site to remediate the cap after installation of the Cell 13 additional sump and target pad. Soils stripping will be carried out by machines sat on the full thickness layer removing soils prior to installation of the geocomposite layer. The CQA inspector will examine the area and if any defects are identified these will be remediated in accordance with the CQA procedures and reported in the CQA Validation Report.

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