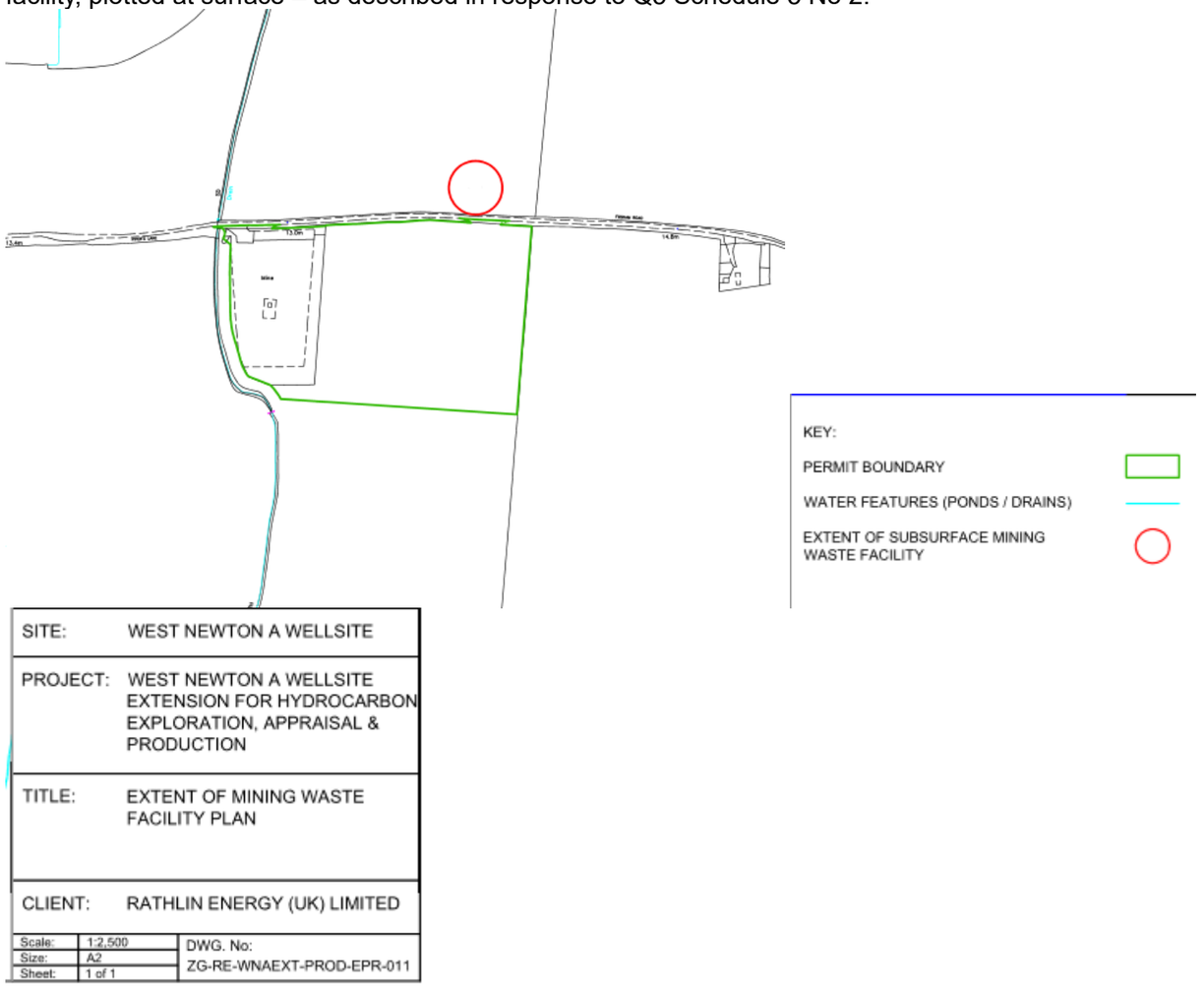
EPR/BB3001FT/V006 Schedule 5 No. 3 – 11/04/2025 Response

	Question	Reason	Response
1	Provide a plan showing the lateral extent of the mining waste facility down hole location, plotted at surface	To show the location of the mining waste facility	Drawing ZG-RE-WNAEXT—PROD-EPR-011 defines the extent of the lateral extent of the downhole waste facility, plotted at surface – as described in response to Q5 Schedule 5 No 2. 
2	Figure 2 in the second Schedule 5 defines two stimulation zones; an upper and a lower zone. The original application and the subsequent two Schedule 5's only discuss one stimulation zone between 1736-1761m MD BRT. Explain why a shallower stimulation zone has now been introduced to the application. Explain why this wasn't discussed in Question 10 of the first Schedule 5, when	It is unclear from the primary application that two zones of stimulation are required. Clear, robust, and defined understanding of the proposed activities is needed so an accurate assessment can be made.	Figure 2 in the second Schedule 5 defines two stimulation zones; an upper and a lower zone. The original application and the subsequent two Schedule 5's only discuss one stimulation zone between 1736-1761m MD BRT. Explain why a shallower stimulation zone has now been introduced to the application. A shallower stimulation zone has been discussed within the schedule 5 response because the WNA-2 well currently has two sets of open perforations within the KA reservoir section (1715-1724 m MD and 1736-1761 m MD). The original modelling had only accounted for the perforation zone 1736-1761m MD. A review of the engineering programme concluded that cementing off the upper perforations, in order to isolate only the lower perforations for the stimulation, would add unnecessary operational steps to the programme.

	concerns were raised over the factor of safety to the upper and lower lithologies; which confirms the proposed area to undertake the reservoir stimulation is 1736-1761m MD BRT leaving 20.6, TVD below the bottom of the perforations to the Hayton Anhydrite. Explain why the discussion on the inversion profile on the resistivity curve provided in the first Schedule 5 also only highlights one zone for the intended stimulation. If this shallower stimulation is now required, all supporting documents will need to be revised to include this. Explanations are also needed to explain why there is a dispersion plume below the deeper stimulation zone in Figure 2 and not in the shallower zone and equally why vertical dispersion does not occur above both intended zones, with due regard to vertical dispersion above the shallower stimulation being immediately adjacent to the Fordon Evaporite.		Explain why this wasn't discussed in Question 10 of the first Schedule 5, when concerns were raised over the factor of safety to the upper and lower lithologies; which confirms the proposed area to undertake the reservoir stimulation is 1736-1761m MD BRT leaving 20.6, TVD below the bottom of the perforations to the Hayton Anhydrite. Additional reservoir stimulation modelling had not been completed. It concluded that leaving the upper perforations open would not increase the likelihood of the stimulation fluids extending beyond the Kirkham Abbey reservoir section. The additional reservoir stimulation modelling (shown in figure 2 of Schedule 5 no. 2) of the fracture height and half-length indicates that the stimulation fluids will remain within the KA formation. Explain why the discussion on the invasion profile on the resistivity curve provided in the first Schedule 5 also only highlights one zone for the intended stimulation. As noted, the additional reservoir stimulation modelling work, which considers leaving both sets of perfs open, had not been concluded. The results from the additional modelling demonstrate that the formations above (Fordon Evaporite) and below (Hayton Anhydrite), or other groundwater bearing formations beyond the Kirkham Abbey will not be at risk from any stimulation effects. The stimulation will be isolated to the Kirkham Abbey formation. If this shallower stimulation is now required, all supporting documents will need to be revised to include this. The original application and supporting documents don't mention a discreet zone, only a stimulation within the Kirkham Abbey formation. Only the response to Schedule 5 No 1 specified the depth of the perforations to flow the stimulation fluid through. Explanations are also needed to explain why there is a dispersion plume below the deeper stimulation zone in Figure 2 and not in the shallower zone and equally why vertical dispersion does not occur above both intended zones, with due regard to vertical dispersion above the shallower stimulation being immediately adjacent to the Fordon Evaporite. The dispersion of the stimulation fluid will naturally follow zones of higher porosity and permeability. There is a small (<5m) dispersion plume below the deeper stimulation zone (1736-1761 m MD) because the KA below the lower perforations is still porous and still has matrix permeability. That porosity and permeability gradually diminishes with depth towards the underlying Hayton. The lower most portion of the Kirkham Abbey has lower effective porosity and permeability and the underlying Hayton Anhydrite has no effective porosity and permeability. There is no dispersion of stimulation fluid between the shallower (1715-1724 m MD) and deeper (1736-1761 m MD) stimulation zones because there is a very abrupt lithology change from porous and permeable dolomite to tight, dense (2.84 – 2.85 g/cc grain density) dolomitic mudstone that exhibits both anhydrite and halite cementation. The stimulation fluids will not extend into the section of Kirkham Abbey reservoir between the 2 perforated intervals. The overlying Fordon Evaporite is an anhydrite with no effective porosity or permeability to allow the stimulation fluids to extend into that formation. There is an abrupt lithologic change (tight ductile anhydrite (Fordon) to porous, brittle dolomite (KA), at the Fordon/KA interface, at 1715m MD, which prevents upward dispersion.

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<td>3</td>
<td>The answer to Question 7 of the second Schedule 5 is only answered in part. We require confirmation of all CAS numbers for those components, inclusive of the antifoam and dispersants. If these are a combination of chemicals, then a breakdown of constituents is needed, each with a CAS number. We acknowledge the comment that they have previously been approved, but every application needs to be considered as a standalone set of documents to avoid risks associated with inaccurately referencing other files assumed to be correct.</td>
<td>These are confirmed as possible components for the acid wash and need to be assessed.</td>
<td>As discussed, the chemicals ‘Proprietary antifoam, Proprietary Dispersants (Protek 318) and Tallowalkylamine are all components within the products Protekt 7 and Protekt 15. Protekt 318, and its sub-components, is included as its own product.

EGMBE is detailed as product SMS-01 within the chemical inventory and the SDS submitted with the response to Schedule 5 number 2.

SDS are not available for these sub-chemicals but have all been previously approved. The chemicals noted are to be used within the well treatments which are determined to be de minimus volume.

Protekt 7 was included in the chemical inventory for the WNA permit variation of 2021 which was issued permit EPR/BB3001FT/V005. The final chemical inventory noted on the permit is that which was sent in response to a Schedule 5 on 18/11/2022 resulting in ‘Well Montage and Chemical Inventory Rev 3.

The decision document for this permit variation noted that the chemicals in the chemical inventory had been assessed even though a groundwater activity had not been included. (Page 4 under ‘Risk to Groundwater’).

Protekt 15 was included in the chemical inventory for the variation application for WNB in May 2020 which was issued as EPR/DB3503HL/V002 on 04/05/2021. The use of the chemical at the WNA site was approved by CAR PP3833VA/0396849 on 01/04/2021.

Protekt 318 was approved via CAR form PP3833VA/0403341</td>
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<td>4</td>
<td>Confirm which chemicals previously obtained for Halliburton have been removed from the operations use and provide an updated inventory on replacement products, inclusive of all MSDS requirements, including CAS numbers for parent chemicals and CAS numbers for any sub-divisions, percentage quantities and total volumes.</td>
<td>To be clear on which chemicals will be used in the groundwater activity and whether or not they are hazardous or non-hazardous and whether any technical assessment is needed to affirm use or whether they have already had prior assessment.</td>
<td>The following products have been removed from the chemical inventory; MO-IV Breaker, MO-85M Gelling Agent & MO-86M Gelling Agent.
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<tr><th>Product Name</th><th>UN No</th><th>Transport Class</th><th>Hazardous Chemical Composition (SDS Section 3)</th><th>Weight %</th><th>CAS Number</th><th>Product Hazard Statements</th><th>Results of PBT/vPvB Assessment</th><th>Comments</th></tr>
<tr><td colspan="9">Reservoir Stimulation - Proppant Carrier Products (Halliburton Products)</td></tr>
<tr><td>MO-IV BREAKER</td><td>N/A</td><td>N/A</td><td>This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200). The product contains no substances which at their given concentration, are considered to be hazardous to health.</td><td>100</td><td>N/A</td><td>N/A</td><td>Persistance : No information available.
Bioaccumulation: No information available.
Toxicity: The environmental impact of this product has not been fully investigated.</td><td></td></tr>
<tr><td>MO-85M Gelling Agent</td><td>3265</td><td>8</td><td>Alkyl Esters</td><td>60-100</td><td>Proprietary</td><td>H314, H318</td><td>Persistance : No information available.
Bioaccumulation: No information available.
Toxicity: No information available.</td><td></td></tr>
<tr><td rowspan="5">MO-86M Gelling Agent</td><td rowspan="5">2922</td><td rowspan="5">8</td><td>Ferric Sulfate</td><td>30-60</td><td>10028-22-5</td><td>H302, H315, H318</td><td rowspan="5">Persistance : Partial information available.
Bioaccumulation: Partial information available.
Toxicity: Partial information available.</td><td rowspan="5"></td></tr>
<tr><td>Ethanolamine</td><td>5-10</td><td>Proprietary</td><td>H226, H302, H312, H314, H318, H331, H335, H402</td></tr>
<tr><td>Dibutylaminoethganol</td><td>5-10</td><td>102-81-2</td><td>H227, H302, H312, H314, H318, H335, H402</td></tr>
<tr><td>n-Polyethoxylated oleyl amine</td><td>1-5</td><td>26635-93-8</td><td>H302, H315, H318, H400</td></tr>
<tr><td>Ethoxylated alkyl amines</td><td>1-5</td><td>Proprietary</td><td>H302, H315, H318, H401, H411</td></tr>
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Rev 5 of the well montage and chemical inventory supplied with the response to Schedule 5 number 2 supplied with this response with all of the CAS numbers for the chemicals within the stimulation fluid and sub-divisions included.

For clarity, the total volume of stimulation fluid will not change from the volumes proposed in the application.</td>
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