

EPR/BB3001FT/V006 Schedule 5 No. 2 – 28/02/2025 Response

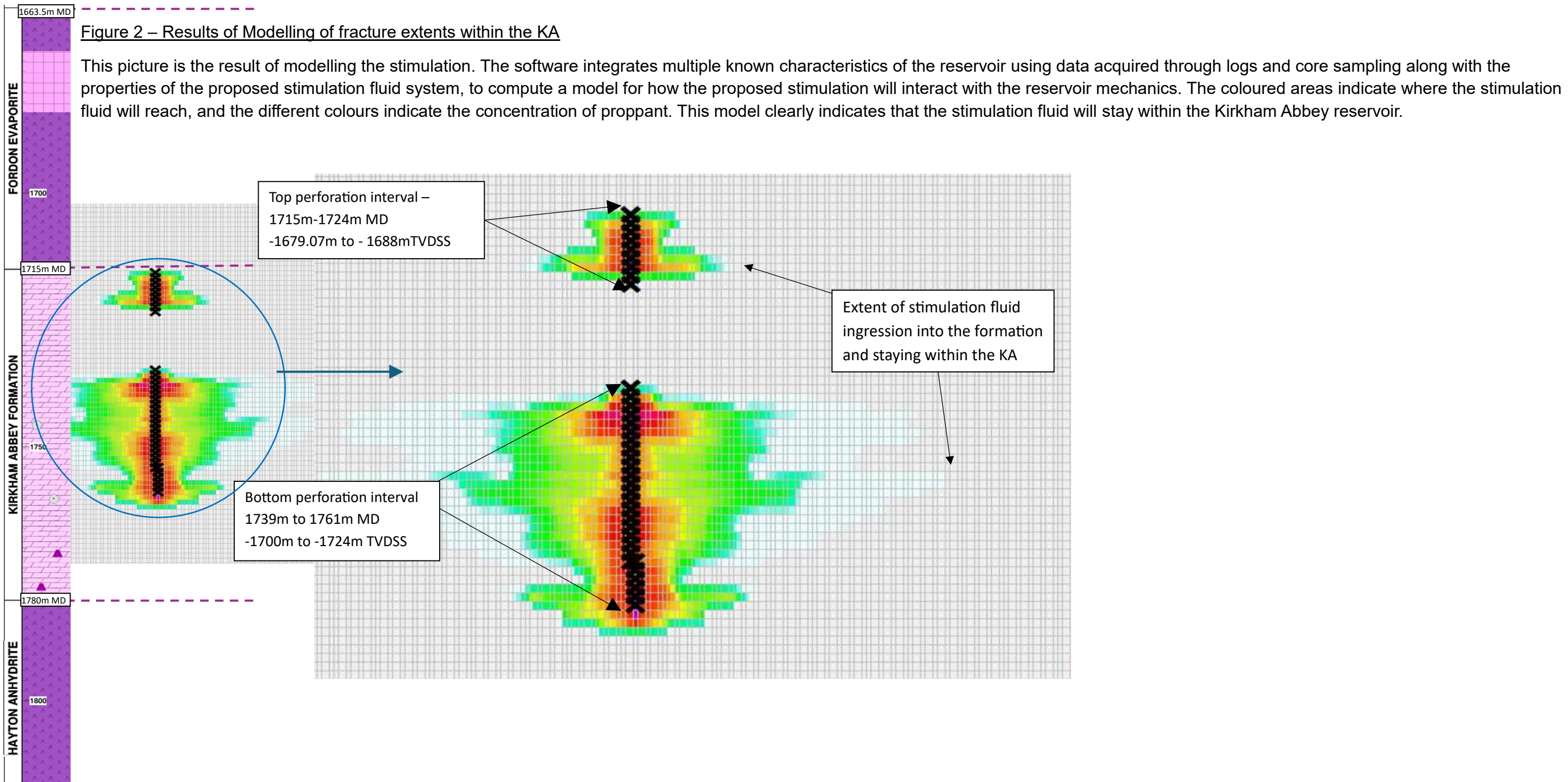
1	Provide a copy of the HFP (Hydraulic Fracture Plan). This is needed before the permit can be issued. Provide any comments given by the NSTA.	Reason: Supporting documents confirm the HFP has been submitted to both the NSTA and EA for approval with sign off. This is not correct and given the public interest on this, we request a copy ahead of the permit issued.	<p>The hydraulic fracture plan will be submitted independently from the permit variation application. It was agreed within the pre-application advice (email detailed RE: West Newton 'A' Well Site EPR/BB3001FT Pre-application response received on 24.05.2024 at 11.38 and excerpt shown in Figure 1) that the HFP can be provided as part of a pre-operational condition.</p> <p>Rathlin references the HFP in both the NTS and WMP but in each instance it is noted that an HFP will be submitted and stated specific elements will be included in it.</p> <p>Within the pre-app advice, the EA recognised that 'not all information is available to formalise at this stage.' Finalisation of specific details of the operation have yet to be agreed and will not be undertaken until confirmation has been received that a permit will be issued and the timeframe in which it will be agreed. More detailed information on the operation will be included in the HFP which will be submitted to both the NSTA and the EA in advance of the operation being conducted.</p>
2	The Agency accepts the response to Question 15 of the first Schedule 5. However, the answer provided to Question 18 in the first Schedule 5 does appear to directly oppose the justification for the use of acid, confirming acid stimulation as ineffective. Explain why acid-based materials are still justified within the wash and squeeze activity given their known negligible impact on the reservoir.	Reason: Greater explanation is needed to justify putting acid-based liquids in the environment if they are not going to add value.	<p>The documents submitted are 'live documents' and include for all operations on the site including drilling and completing new boreholes. The use of acid is to be used within 'Permian aged Carbonate formations' which include the Kirkham Abbey, Brotherton and the Caedby formations.</p> <p>It has been determined that the use of acid within the WNA-2 well has compounded any formation damage and has not improved permeability to the WNA-2 wellbore, therefore it requires a different method to bypass formation damage. However, it has not been determined that the use of acid under different circumstances would be detrimental to the formation permeability in other wells.</p>
3	Question 16 of the first Schedule 5 is only partially answered. For the wash/squeeze activity, confirm explicitly the volumes intended to be used, the exact depths and frequency of the acid wash activity. Explain and justify any variation to figures provided.	Reason: To be registered as a deminimis activity we need to know such specifics to include in the permits operating techniques. We appreciate there is a site and well specific aspect to the volume required for each well maintenance treatment, however we will need an indication of the maximum volume require per well maintenance treatment at each site. The Environment Agency will need this clarification so we can update the groundwater activity exclusion registrations for any well maintenance treatments where necessary.	<p>This activity is the same as the activity previously permitted, quantities and frequencies and receiving formations have not altered from the previously permitted deminimis activity.</p> <p>The quantity stipulated is 1m3 / 1m of perforated well. The total quantity would entirely depend upon the amount of reservoir to be acidised.</p>
4	Define which chemicals listed in the chemical inventory are to be used for which activity.	Reason: The Agency does not accept the response to Question 17. It is acknowledged that point 21 of the first Schedule 5 does make effort to answer this question, but we request it is made clearer, ideally the information tabulated for clarity. This level of detail is requested because of the nature of the operation and public scrutiny on chemicals being used. To reiterate from the first Schedule 5, it is unclear which chemical is being used for which activity. Justification for the use of hazardous chemicals over non-hazardous alternatives is needed for both activities. The Agency acknowledge the only additional product is the MO-IV Breaker and that all other products have previously been approved.	The Well Montage and Chemical Inventory now clearly denote both the activity and the formation in which the chemicals shall be used.
5	Confirm the location of the downhole location of the KAF with a NGR, or equivalent.	Reason: To specifically cite the location of the mining waste facility.	<p>Drawing ZG-WNAEXT-PROD-EPR-011 denotes the extent of the mining waste facility.</p> <p>The WNA penetrates the top of the KAF in the WNA-2 well at UTMX=519428m, UTM Y=439235m (OSGB36).</p>

6	<p>Question 10 of the first Schedule 5 has only been partially answered. Concerns remain around the factor of safety above and below the stimulation interval and the adjacent lithologies. Explain what measures are in place to ensure the stimulation activities do not extend beyond the KAF. Explain how these thicknesses have been calculated. What real time mitigation measures are in place during the stimulation activities should propagation into the evaporites occurs.</p>	<p>Reason: To re-affirm the distance between the stimulation zone and adjacent stratigraphic units across the 27/30m interval which the stimulation is proposed to take place; and to ensure the upper and lower lithologies are not at risk from any stimulation effects. Reassurance is needed to show the stimulation fractures will be isolated to only the Kirkham Abbey Formation.</p>	<p>The Kirkham Abbey (KA) is intersected in the WNA-2 well at 1715m MD rel KB (-1679m TVD SS). The KA 65.3m thick (TVD) with the Hayton Anhydrite lying immediately below the KA, the top of which is 1871m MD rel KB (-1744.3m TVD SS) in the WNA-2 well.</p> <p>The original plan was to conduct the stimulation over the lower set of open perforations from 1736m MD KB to 1761m MD KB (-1700m TVS SS to -1724m TVD SS)</p> <p>Modelling has been undertaken to show the predicted extent of the formation that the stimulation fluid will affect. The modelling includes for the stimulation being conducted over both sets of open perforations; the lower perforations from 1736m to 1761m MD (-1700m to -1724m TVDSS) and the upper perforations from 1715-1724m MD (-1679.07m to -1688mTVDSS).</p> <p>Based on the properties of the KA, the modelling results (shown in figure 2) demonstrate that the stimulation fluid will be contained within the formation, with no propagation beyond the KA formation.</p> <p>The KA is both porous and permeable, naturally fractured and brittle which is conducive to being stimulated by fluid to create fractures.</p> <p>Both above and below the KA are evaporites that exhibit very low permeability, are ductile and require high pressures to enter. These formations would NOT be classed as aquifers using the Water Framework Directive definition and therefore do not hold a 'body of groundwater'.</p> <p>The EPR Schedule 22 covers groundwater activities and describes both direct and indirect inputs in relation to groundwater. Therefore, any input to either the Fordon or the Hayton is not classed as a direct or indirect input to groundwater.</p> <p>However, the properties of these formations are important when assessing the potential for indirect input to groundwater.</p> <p>The Permian stratigraphic group of formations consists of mainly carbonate and evaporite strata. All carbonate formations have the potential to be classed as aquifers and must, therefore, have enough mitigation in place to prevent indirect discharge of pollutants. The evaporites would not be classed as aquifers.</p> <p>The Fordon is a sequence of anhydrite and halite (both evaporites) which directly overlies the KA. This sequence has an isopach of 50m TVD. The Hayton Anhydrite has an isopach of 164.5m and lies immediately below the KA.</p> <p>Both the Hayton Anhydrite and Fordon formations have very low porosities and permeabilities, and act in a ductile manner, they are classed as aquitards which provide very good seals for the carbonate formations and are not easily fractured. The presence of these strata is important in containing both the fractures and fluids within the KA and preventing migration to other groundwater bearing aquifers.</p> <p>Whilst Rathlin is unable to monitor fracture growth in real time, due to the low volumes of fluid involved in the proposed reservoir stimulation, the favourable geological environment and very short pumping times, it is considered extremely unlikely that any fluid would propagate beyond the KA to create an indirect input to other groundwater bearing formations.</p>
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7	Provide Chemical Inventory Data Sheets for Proprietary antifoam, Proprietary dispersants (Protekt 318), Tallowalkylamine ethoxylates and EGMBE, inclusive of CAS numbers.	Reason: These are confirmed as possible components for the acid wash.	<p>1. Proprietary Antifoam a. This is a chemical used within the following products: i. Protekt 7 Plus; and ii. Protekt 15 Plus.</p> <p>2. Proprietary dispersants (Protekt 318) a. This is a chemical used within the following products: i. Protekt 7 Plus; and ii. Protekt 15 Plus.</p> <p>3. Tallowalkylamine ethoxylates (CAS No. 68213-26-3) a. This is a chemical used within the following products: i. Protekt 7 Plus; and ii. Protekt 15 Plus.</p> <p>4. EGMBE a. EGMBE is SMS-01 detailed within the Chemical Inventory.</p> <p>These chemicals have previously been submitted within Chemical Inventory (08 Well Montage and Chemical Inventory Rev 3) as part of a permit variation which was approved by the Environment Agency (EPR/BB3001FT/V005 dated 23/08/2023).</p>
8	Provide the CAS number for the MO-IV BREAKER. Confirm what other components will be used with this product, specify quantities of each.	Reason: to allow for a robust assessment.	The CAS number has been provided by the manufacturer to the Environment Agency 17/01/2025.
9	Confirm the volume and frequency of the acid/alkali wash.	Reason: The Agency acknowledge this to be a diminimus activity but to complete the permit which the required metrics, this needs to be explicitly confirmed.	Please see explanation in response to Q3
10	Explain why the stimulation fluid contains hazardous properties that cannot be substituted for alternatives (e.g. non-hazardous alternatives).	Reason: The Agency acknowledges many of the products you are using as suitable, but formal justification for not using alternatives which are non-hazardous is needed for audibility purposes on the public register.	<p>As previously described in the response to Q18 on Schedule 5 no.1 of 12/12/2024, previous drilling and completion practices at WNA-2 have relied on the application of water-based fluids and additives. Through field operations, observations and laboratory studies, the application of water-based fluids has been shown to have a deleterious effect on the reservoir's ability to flow fluid to the wellbore.</p> <p>Rathlin has undertaken extensive technical research on the Kirkham Abbey reservoir's response to different fluids. This research has shown that the use of a hydrocarbon-based fluid would be less damaging to the reservoir than a water-based fluid at this location.</p> <p>The products detailed within this application are those which are compatible with a hydrocarbon-based fluid and are required to make up a suitable fluid system to undertake the proposed operation.</p>

Figure 1 – Pre-application Consultation Response

3. Confirm whether a Hydraulic Fracture Plan can be issued to the Environment Agency as a condition (i.e. when the 'Operator' is able to formalise the plan) on the basis, that enough information will be provided to satisfy the requirements for a groundwater activity variation.	Sufficient details are required within the HRA to enable an assessment of the proposals, however, it is recognised that not all information is available to formalise all details of the plan at this stage. Therefore, and in accordance with previous approaches, it would be acceptable to condition the requirement for a Hydraulic fracture plan. The details of the low volume fracking can be dealt within the fracture plan provided as a pre-operational condition as long as there are sufficient details in the HRA to make an assessment.
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General Comment

For clarity, the documents submitted in support of the application are 'working' documents which include for all operations currently proposed at the site.

This application to vary the permit is only for the additional inclusion of the reservoir stimulation within the WNA-2 well.

All other activities have already been included for and assessed in previous permits. This includes the area of the permit, the drilling testing and production of upto 8 wells and potential sidetracks with, all with the use of acid and other wellbore treatments.