Permitting Decisions - Variation

Our decision document recording our decision-making process

The Permit Number is:	EPR/BL9763IN/V005
The Applicant/Operator is:	Angus Energy Weald Basin No.3 Limited
The installation is located at:	Brockham Oilfield Feltons Farm Old School Lane Brockham Dorking Surrey RH3 7AU
Application consultation commenced on:	23/03/21
Application consultation ended on:	04/05/21
Draft decision consultation commenced on:	29/12/21
Draft Decision consultation ended on:	31/01/22

What this document is about

This is a decision document, which accompanies a variation and notice.

It explains how we have considered the Applicant's Application, and why we have included the specific conditions in the permit we are issuing to the Applicant. It is our record of our decision-making process, to show how we have taken into account all relevant factors in reaching our position. Unless the document explains otherwise, we have accepted the Applicant's proposals.

Our decision in this case has been reached following a programme of public consultation of the original application and later separately on the draft permit and a draft decision document. A summary of the responses received to our consultations and our consideration of them is set out in the Consultation Responses section at the end of this decision document.

Our decision

We have decided to grant the variation for Brockham Oilfield operated by Angus Energy Weald Basin No.3 Limited.

This variation is to add -

- A groundwater activity, as defined by the Groundwater Directive and Schedule 22 of the Environmental Permitting (England and Wales) Regulations 2016 as amended, for the re-injection of produced water resulting from the extraction of hydrocarbons from the Portland Sand Formation and Kimmeridge Clay Formation, and re-injection of imported produced water from other sites, into the Portland Sand Formation via well BRX3 (emission point W2) for production support.

The maximum daily discharge volume for re-injection via BRX3 (W2) is 24 m^3/day at a maximum rate of 1.3 litres per second.

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

Purpose of this document

This decision document provides a record of the decision-making process. It**:**

- highlights key issues in the determination;
- summarises the decision making process in the decision considerations section to show how the main relevant factors have been taken into account;
- summarises the engagement carried out because this is a site of high public interest; and
- shows how we have considered the consultation responses.

Unless the decision document specifies otherwise we have accepted the applicant's proposals.

Read the permitting decisions in conjunction with the environmental permit and the variation notice.

Key issues of the decision

Brief outline of the process

The site is located in the Weald Basin approximately 1km south west of Brockham and 2km east of Dorking in Surrey. The site is centred on National Grid Reference (NGR) TQ 18840 48672. The postcode for the site access is RH3 7AU.

There are 3 wells on the site. Two of these are production wells; one into the Kimmeridge Clay Formation and the other into the Portland Sand Formation. The third well at the site, BRX1, was drilled in 1987 and has since been plugged but contains a sidetrack into the Portland Sand Formation which is now referred to as BRX3.

BRX3 has previously been used for re-injection of produced water which was authorised as a Directly Associated Activity but this activity is now considered to be a groundwater activity.

The previous variation, EPR/BL9763IN/V004 (issued on 22/11/2018) included a request to add the groundwater activity to the permit. There was a lack of suitable information included in the Hydrogeological Risk Assessment[1] submitted as part of that application and we were unable to permit the groundwater activity at that time. We had concerns about the borehole integrity, infrastructure and procedures associated with the activity. In particular the HRA lacked suitable cement bond log data to confirm well integrity, and lacked site specific information to justify why groundwater monitoring was not being installed around the re-injection well. Therefore, the groundwater activity was not permitted in order to prevent any potential risk to groundwater occurring from the re-injection of produced water, at that time.

The subject of this variation is the addition of the groundwater activity.

Radioactive Substances

As part of this application the Applicant plans to re-inject produced water from BRX2 supplemented by produced water from other producing fields in the Weald Basin, in particular produced water from the Angus Energy operated Lidsey field.

The Applicant holds a standard rules permit (SR2014 No4) for handling NORM (naturally occurring radioactive materials) as a result of oil and gas production activities at Brockham Oilfield. The permit reference is EPR/RB3994DK/A001. Under this standard rules permit no produced water can be received at Brockham Oilfield from any other sites for re-injection into boreholes at Brockham Oilfield. In

[1] Hydrogeological Risk Assessment in Support of Re-Permit Application (SLR Ref: 422.07154.00001.01, Version No: Draft Rev 5 Issue, September 2018)

order to accept produced water imported from outside the installation boundary, the Applicant will need to apply for a bespoke Radioactive Substances Regulation (RSR) permit.

This requires a separate permit because radioactive substances activities are a separate regime to the Environmental Permitting (England and Wales) Regulations 2016 and therefore the activity cannot be consolidated into this permit.

Groundwater Activity

A groundwater activity, in general terms, is defined in Schedule 22 to the 2016 Regulations as meaning the discharge of a pollutant that results in the direct input of that pollutant to groundwater, or a discharge of a pollutant in circumstances that might lead to an indirect input of that pollutant to groundwater or any other discharge or activity that might lead to a direct or indirect input of a pollutant to groundwater.

The groundwater activity for this site is to re-inject produced water resulting from the extraction of hydrocarbons from both the Portland Sand Formation and the Kimmeridge Clay Foundation back into the Portland Sand Formation as specified under activity AR11 in Table S1.1 of Schedule 1 of the permit. The re-injection is via the well Brockham 3 (BRX3).

The discharge is a direct discharge to groundwater which is prohibited under the Water Framework Directive (WFD) except under certain exemptions. One of these exemptions is:

Groundwater activities for which a permit may be granted – Schedule 22, 8. (a), of the Environmental Permitting (England and Wales) Regulations 2016:

The injection of water containing substances resulting from the operations for exploration and extraction of hydrocarbons or mining activities, and injection of water for technical reasons, into geological formations from which hydrocarbons or other substances have been extracted.

This exemption can be found in Article 11(3)(j) WFD and also within paragraph 8(a) of Schedule 22 of the 2016 Regulations. We are satisfied that this re-injection activity meets the above exemption. A permit can only be granted in these circumstances provided it does not compromise the achievement of any of the environmental objectives relating to groundwater in Article 4 of the Water Framework Directive. We have given detailed consideration to the proposal and we are satisfied that none of the relevant environmental objectives set out in Article 4 of the Water Framework Directive will be compromised.

Re-injection at Brockham Oilfield

The Applicant submitted a 'Supplementary Hydrogeological Risk Assessment' (Supplementary HRA) as part of the application[2]. We reviewed the supplementary HRA against our information and conceptual understanding of the location. We issued a Schedule 5 Notice on 18/05/21 seeking additional information which included the following key issues:

- Evidence of current reservoir and formation pressures.
- Copies of all procedures referenced in the Supplementary HRA.
- Details regarding bottom hole pressure monitoring.
- A discussion and evaluation of the 2021 Cement Bond Log.
- Additional justification for the absence of groundwater monitoring.
- Additional information relating to surface water monitoring and discharge.
- Well cellar construction details.
- A series of clarifications in relation to accompanying procedures.

We received the Schedule 5 response on 22/06/21, which included a revised Supplementary HRA[3]. We sent a second Schedule 5 Notice on 19/07/21 seeking further clarifications in relation to:

- Proposals for reconciling the frequent well head pressure readings against monthly bottom hole pressure readings.
- A more detailed evaluation of the Cement Bond Log.
- The drainage plan and location of penstocks.

A response was received on 09/08/21. We are satisfied that both Schedule 5 Notices have been complied with, and that potential risks to groundwater have been identified and addressed through mitigation measures and controls specified in this consolidated permit. The Supplementary HRA, when read in conjunction with the HRA submitted as part of the previous variation, now addresses the concerns raised in the previous variation EPR/BL9763IN/V004.

We are satisfied that the Supplementary HRA has been completed in accordance with the Environment Agency's 'Groundwater risk assessment for your environmental permit guidance' and Onshore Oil and Gas Sector guidance and the potential risks to groundwater have been adequately identified and addressed.

The Supplementary HRA demonstrates the importance of well integrity and robust injection procedures and includes appendices for detailed procedures.

[2] Supplementary Hydrogeological Risk Assessment in Support of Permit Variation Application for a Groundwater Activity for the Injection of Process Waters (SLR Ref: 422.07154.00002), Version No: Issue Rev 6, August 2020
[3] Supplementary Hydrogeological Risk Assessment in Support of Permit Variation Application for a Groundwater Activity for the Injection of Process Waters (SLR Ref: 422.07154.00002), Version No: Issue Rev 7, June 2021

There is documentary evidence of pressure testing and evidence of sound well integrity.

The operator has procedures in place defining the duties, roles and responsibilities in relation to the monitoring of injection pressure to ensure the reservoir is not over-pressurised (procedures BRO-ANGPR-00003). The Operator has made a commitment to review the procedure at least annually or earlier if required.

Groundwater monitoring

We agree with the conclusions in the Supplementary HRA, that there is a negligible risk of pollution to groundwater from the re-injection of produced water into the Portland Sandstone formation. At the surface the site is located on the Weald Clay formation which is classed as Unproductive Strata which has low permeability and negligible significance for water supply or baseflow to rivers. Occasional sandstone and limestone horizons are present in the Weald Clay at approximately 100m below ground level as shown in the well construction logs. If sandstone and limestone horizons are present at shallower depths in the Weald Clay, these would not be considered a sensitive groundwater receptor. This is because the sandstone and limestone horizons are isolated and do not support groundwater abstraction or groundwater dependent features in the site area. The Supplementary HRA confirms that there are no licensed groundwater abstractions or private water supplies sourced from the Weald Clay within 2km of the site. We are satisfied that an intrusive investigation to inform the HRA on the ground conditions in the Weald Clay in the vicinity of the site is not required.

The Environment Agency is satisfied that groundwater monitoring is not required at the site because there is no significant risk to any known shallow groundwater receptors and sufficient mitigation measures and procedures are in place to prevent any potential impact on groundwater.

Decision considerations

Confidential information

A claim for commercial or industrial confidentiality has not been made.

Identifying confidential information

We have not identified information provided as part of the application that we consider to be confidential.

The decision was taken in accordance with our guidance on confidentiality.

Consultation

The consultation requirements were identified in accordance with the Environmental Permitting (England and Wales) Regulations (2016) and our public participation statement.

The application was publicised on the GOV.UK website from 23 March 2021 to 4 May 2021.

We consider this application to be of high public interest and so we extended the period of consultation with the public from four weeks to six weeks.

We consulted the following organisations:

- Local Authority – Environmental Health
- Health and Safety Executive (HSE)
- Fire and Rescue
- Director of Public Health
- Public Health England
- Mineral Planning Authority
- Oil and Gas Authority

Finally we have consulted on our draft decision from 29/12/21 to 31/01/22. A summary of the consultation responses and how we have taken into account all relevant representation can be found in the Consultation Responses section at the end of this decision document.

The regulated facility

We considered the extent and nature of the facility at the site in accordance with RGN2 ‘Understanding the meaning of regulated facility’.

The extent of the facility is defined in the site plan and in the permit. The activities are defined in table S1.1 of the permit.

The site

The operator has provided a plan which we consider to be satisfactory.

This shows the extent of the site of the facility.

The plan is included in the permit.

Waste management plan

The operator has provided a waste management plan which we consider is satisfactory.

Nature conservation, landscape, heritage and protected species and habitat designations

We have checked the location of the application to assess if it is within the screening distances we consider relevant for impacts on nature conservation, landscape, heritage and protected species and habitat designations. The application is within our screening distances for the following designation:

- Mole Gap to Reigate Escarpment Special Area of Conservation - 2.5km north of the site.

We have assessed the application and its potential to affect sites of nature conservation, landscape, heritage and protected species and habitat designations identified in the nature conservation screening report as part of the permitting process.

We consider that the application will not affect any site of nature conservation, landscape and heritage, and/or protected species or habitats identified.

There are no changes to point source emissions to air, sewer or water as a result of the variation.

We have not consulted Natural England.

The decision was taken in accordance with our guidance.

Environmental risk

We have reviewed the operator's assessment of the environmental risk from the facility.

The operator’s risk assessment is satisfactory.

Operating techniques

The operating techniques that the applicant must use are specified in table S1.2 in the environmental permit.

General operating techniques

We have reviewed the techniques used by the operator and compared these with the relevant guidance notes and we consider them to represent appropriate techniques for the facility.

Emission limits

Emissions limits have been added to table S3.2 for the discharge, W2, to groundwater as a result of activity AR11.

We have included these limits based on the information provided in the Supplementary HRA.

Monitoring

We have added the following monitoring parameters:

- rate and volume of produced water re-injected via W2 (BRX3)
- concentrations and volumes of chemicals added to the produced water prior to re-injection via W2 (BRX3).

We made these decisions in accordance with the requirements of our Onshore Oil and Gas Sector Guidance and the Groundwater Directive.

Based on the information in the application we are satisfied that the operator's techniques, personnel and equipment have either MCERTS certification or MCERTS accreditation as appropriate.

Reporting

We have added reporting in the permit for the following parameters:

- rate and volume of produced water re-injected via W2 (BRX3)
- concentrations and volumes of chemicals added to the produced water prior to re-injection via W2 (BRX3).

We made these decisions in accordance with the requirements of our Onshore Oil and Gas Sector Guidance and the Groundwater Directive.

Management system

We are not aware of any reason to consider that the operator will not have the management system to enable it to comply with the permit conditions.

The decision was taken in accordance with the guidance on operator competence and how to develop a management system for environmental permits.

We only review a summary of the management system during determination. The applicant submitted their full management system. We have therefore only reviewed the summary points.

A full review of the management system is undertaken during compliance checks.

Previous performance

We have assessed operator competence. There is no known reason to consider the applicant will not comply with the permit conditions.

Financial competence

There is no known reason to consider that the operator will not be financially able to comply with the permit conditions.

Financial provision

We are satisfied that the operator has made the necessary financial provision in accordance with the Environment Agency's guidance on financial provision.

Growth duty

We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit variation.

Paragraph 1.3 of the guidance says:

"The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation."

We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections.

We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.

Permitting Decisions - Variation

Our decision document recording our decision-making process

Consultation Responses

A) Advertising and consultation on the Application

The Application has been advertised and consulted upon in accordance with the Environment Agency's Public Participation Statement. The way in which this has been carried out along with the results of our consultation and how we have taken consultation responses into account in reaching our draft decision is summarised in this section. Copies of all consultation responses have been placed on the Environment Agency public register.

The application was publicised on the GOV.UK website from 23 March 2021 to 4 May 2021. We consider this application to be of high public interest and so we extended the period of consultation with the public from four weeks to six weeks. A full list of organisations we consulted is listed in the 'Consultations' section earlier in the Decision Document.

This section summarises the responses to consultation with other organisations and our notice on GOV.UK for the public and the way in which we have considered these in the determination process.

Responses from organisations listed in the consultation section

Response received from

Health and Safety Executive
Brief summary of issues raised
No objections.
Summary of actions taken or show how this has been covered
None needed.

Response received from
Public Health England
Brief summary of issues raised
PHE note that the HRA requires hydrogeological expertise and regulatory interpretation. They recognise that the Environment Agency will consider the hydrogeological risks and address any issues with well integrity and that produced water re-injection will be subject to appropriate controls to prevent pollution of groundwater. Additional points raised in relation to transportation off-site but PHE acknowledge this is a consideration of the planning permission rather than the environmental permit.
Summary of actions taken or show how this has been covered
We have reviewed the Supplementary HRA provided by the applicant, against our information and conceptual understanding of the location. We are satisfied that the well integrity and potential risks to groundwater have been adequately identified and addressed. See the key issues section of this decision document for more information.

Response received from
Surrey Fire and Rescue Service
Brief summary of issues raised
No objections raised in relation to the environmental permit. The Fire and Rescue Service highlighted the requirement for a responsible person to undertake an assessment of the risks from fire to the site.
Summary of actions taken or show how this has been covered
The changes as a result of this variation do not change the fire risk therefore we consider this concern not relevant to this existing variation application

Representations from local MPs, assembly members, councillors and parish/town community councils

Response received from
Brockham Parish Council
Brief summary of issues raised
The main concerns identified are: 1. The composition of the re-injection waste fluid having the potential to introduce pollution to groundwater. 2. The operator having a poor history of compliance with the permit conditions. 3. The need for assurance that the Operator has satisfactorily completed conditions set in the previous variation to reduce the impact on the environment.

4. Whether there are suitable procedures for monitoring and recording of re-injection to ensure that in the event of contamination of the water table or land, such contamination is detected early and remedial action undertaken immediately.
5. The potential for seismic activity as a result of re-injection.

Summary of actions taken or show how this has been covered

1. Produced water is derived from the extraction of oil from oil-bearing strata and as such would be expected to contain hazardous substances in the form of naturally formed dissolved hydrocarbons. The principle of re-injecting produced water for support of oil production activities is acceptable under the current regulatory regimes in the UK.

   Additive chemicals intrinsic to the extraction of oil will also be present in any re-injected produced water.

   We have reviewed the Supplementary HRA and are satisfied that the return of this produced water into oil-bearing strata will not result in any unpermitted discharges to other water-bearing strata.
2. We acknowledge historic issues in respect to operator competence. There are sufficient controls in the permit to both ensure the operator will operate in a competent manner, and also to allow us to take measures to bring them into compliance as and if required. The changes as part of this variation will update the activities permitted and help maintain future compliance.
3. There are a number of improvement conditions and a pre-operational condition set in the permit. As part of this variation we have marked any completed improvement conditions as such. Where pre-operational conditions are complete they have been removed from the permit.
4. The Environment Agency is satisfied that groundwater monitoring is not required at the site. This is because there is no significant risk to any known shallow groundwater receptors and sufficient mitigation measures and procedures are in place to prevent any potential impact on groundwater. See the key issues section of this decision document for more information.

5. The Environment Agency has not requested additional 2D or 3D seismic data. We are satisfied that sufficient information has been presented on the geology and hydrogeology in the HRA. We are satisfied that the information has been presented in accordance with the Environment Agency's Groundwater risk assessment for your environmental permit guidance and Onshore Oil and Gas Sector Guidance.

Response received from
County Councillor for Dorking Rural Division at Surrey: Helyn Clack
Brief summary of issues raised
The main concerns identified are: 1. Concern that waste should be dealt with at source and not transported for disposal elsewhere. 2. Concern about the potential for seismic activity as a result of re-injection. 3. Concern about increased flooding and that flooding containing toxic contaminants. 4. The operator has a poor history of compliance with the permit conditions.
Summary of actions taken or show how this has been covered
1. We are satisfied that the Operator's proposals are appropriate. Direct discharges to groundwater are prohibited under the Water Framework Directive except under certain exemptions. However, the principle of reinjecting produced water for support of oil production activities (rather than disposal) is acceptable under the current regulatory regimes in the UK. This is explained in more detail in the key issues, groundwater activity section of this decision document. 2. Seismicity linked to oil and gas operations is the remit of the Oil and Gas Authority (OGA). We are satisfied, however, that sufficient information has been presented on the geology and hydrogeology in the HRA in accordance with the Environment Agency's Groundwater risk assessment for your environmental permit guidance and Onshore Oil and Gas Sector Guidance. The permitted groundwater activity is to re-inject a maximum of 24m^3 of produced water per day into

the Portland Sand Formation for production support. This is a minor volume of produced water that will be re-injected over a period of 7 hours per day. Hydrocarbons and produced water will be extracted from the Portland Sand Formation and produced water will be re-injected at a pressure below the fracture pressure of the formation. The operating procedures specified in the HRA will ensure that there will be no over pressurisation of the reservoir.

3. We are satisfied that groundwater monitoring is not required at the site because there is no significant risk to any known shallow groundwater receptors and sufficient mitigation measures and procedures are in place to prevent any impact on groundwater. See the key issues section of this decision document for more information.
4. We acknowledge historic issues in respect to operator competence. There are sufficient controls in the permit to both ensure the operator will operate in a competent manner, and also to allow us to take measures to bring them into compliance as and if required. The changes as part of this variation will update the activities permitted and help ensure future compliance.

Representations from community groups and other organisations

Response received from
KEEP Kirdford and Wisborough ‘Green’
Brief summary of issues raised
We received a 26 page document which raised a number of concerns in numbered sections. The main concerns identified are: 1. The composition of the re-injection waste fluid has the potential to introduce pollution to groundwater. 2. Lack of information, detailed evaluation or baseline relating to the impacts of the drilling process and its associated activities to date on the area, habitats, air, water, soils and wildlife. 3. Comments relating to flowback fluids and their re-injection not being permissible.

4. The non-technical report is not available on the EA website.
5. Section 5 summarises national and international policies on mitigating climate change and challenges that this requires elimination of carbon-based fuels, stating that this proposal goes against that.
6. Section 6 raises concerns about the potential for seismic activity being increased and queries whether earthquakes in Oklahoma, USA are due to onshore oil and gas activities.
7. Sections 7 to 13 raise general objections in relation to NORM (naturally occurring radioactive materials) wastes. Concerns include production, presence and disposal of NORM wastes with reference to shale gas industry and hydraulic fracturing activities.
8. Concern about injection well integrity and the ability to withstand the re-injection of produced water.

Summary of actions taken or show how this has been covered

1. See our above response to Brockham Parish Council (Point 1.).
2. There are no changes proposed to the existing permitted drilling activity as part of this variation. As explained in the key issues section of this decision document we are satisfied that the Supplementary HRA demonstrates the importance of well integrity and includes robust re-injection procedures, and detailed monitoring procedures.
3. Flowback fluid is a product of hydraulic fracturing. No such activity has been applied for and so we consider this concern not relevant to the existing variation application.
4. The consultation section of this decision document sets out how we publicised the application. All application documents, including the non-technical summary, were available to view as part of that consultation.
5. This concern is not relevant to the application as no changes are proposed to the existing drilling activity.
6. Seismicity linked to oil and gas operations is the remit of the Oil and Gas Authority (OGA). Seismicity in the USA is not relevant to this variation application. We are satisfied that sufficient information has been presented on the geology and hydrogeology in the HRA in accordance with the Environment Agency's Groundwater risk assessment for your environmental permit guidance and Onshore Oil and Gas Sector Guidance.
7. NORM waste are routinely encountered in deeper geology associated with onshore oil production. NORM wastes are controlled through a separate permit as described in the key issues section of this decision document. Issues relating to

the shale gas industry and hydraulic fracturing are not relevant to this variation application as the permit is not for these activities.

8. As explained in the key issues section of this decision document we are satisfied that the Supplementary HRA demonstrates the importance of well integrity and includes robust re injection procedures, and detailed monitoring procedures.

Response received from
Brockham Oil Watch
Brief summary of issues raised
We received two submissions from Brockham Oil Watch, both of which included supporting documents and reports. The main concerns identified are: 1. Concern that a desk-based approach is not appropriate for an assessment of risk. 2. Concern about a lack of site-specific data on the near surface geology and hydrogeology including confirmation of whether there are interconnected sand lenses, based on the dips and strikes of more permeable strata. 3. Concern that groundwater monitoring should not be ruled out without intrusive investigation. 4. Concern about the chemical compatibility of produced water that will be received onto the site and a lack of information about testing for acceptance. 5. Concern about injection well integrity and the ability to withstand the re-injection of produced water. 6. Concern about the potential for seismic activity being increased and that fluid re-injection can trigger induced seismicity as the site is located 7km from a seismogenic zone near Newdigate, Surrey where there was a swarm of shallow earthquakes in 2018.

7. Concern that the application is for waste water disposal and to save money, rather than for supporting oil production at the site.
8. Concern that the Operator does not have planning permission for the importation of any waste fluids from other well sites.
9. The Operator has a poor history of compliance with the permit conditions and questionable operator competence.
10. There are discrepancies between the waste management plan and the supplementary HRA in terms of produced water source and detailed procedures.
11. Concern over the inadequacy of existing 2D seismic database, resolution of the 2D data and subsequent errors in interpretation of the geological structure.
12. Statements regarding regional groundwater flow and the Tunbridge Sand Formation and Ashdown Formation.
13. Concern that the re-injection depth is too shallow and there are inadequate geological barriers to upward flow of contaminated fluids. The response raises concern that the re-injection depth is unusually shallow at 625m below sea level and there are inadequate geological barriers to upward flow of contaminated fluids. The response also suggests that the throw of the southern field bounding fault is greater than the 15m of Purbeck Anhydrite and the Purbeck Anhydrite cannot act alone as a barrier to fluid migration.
14. Concerns about data omission or removal in Figure 2-1 of the Supplementary HRA.
15. Questions about scope values in reference to NORM and how this is measured and checked by the Environment Agency.

Summary of actions taken or show how this has been covered

1. We have reviewed the Supplementary HRA provided by the Applicant and compared this with our information and conceptual understanding of the location. We are satisfied that the assessment within the Supplementary HRA has been carried out in accordance with the Environment Agency's Groundwater risk assessment for your environmental permit guidance and Onshore Oil and Gas Sector guidance. We are satisfied that the potential risks to groundwater have been adequately identified and addressed.
2. We agree with the conclusions of the Supplementary HRA that there is negligible risk of pollution to groundwater from the re injection of produced water. See the key issues section on groundwater in this decision document for more information.

3. We are satisfied that groundwater monitoring is not required at the site because there is no significant risk to any known shallow groundwater receptors and sufficient mitigation measures and procedures are in place to prevent any impact on groundwater. See the key issues section of this decision document for more information.
4. The Water Acceptance and Unloading Procedure (BRO-ANGPR-O0004-3) referenced as an operating technique in the permit confirms that produced water imported onto site will be sampled and salinity measured with a conductivity monitor at an independent laboratory. The produced water sample will also be mixed with produced water from Brockham Oilfield to assess for any visual precipitation. It should also be noted the Operator is not able to accept produced water from other sites until a bespoke RSR permit has been issued.
5. As explained in the key issues section of this decision document, we are satisfied that the Supplementary HRA demonstrates the importance of well integrity and includes robust re-injection procedures, and detailed monitoring procedures.
6. Seismicity linked to oil and gas operations is the remit of the Oil and Gas Authority (OGA). We are satisfied that sufficient information has been presented on the geology and hydrogeology in the HRA in accordance with the Environment Agency's Groundwater risk assessment for your environmental permit guidance and Onshore Oil and Gas Sector Guidance. The permitted groundwater activity is to re-inject a maximum of 24m^3 per day of produced water into the Portland Sand Formation for production support. This is a minor volume of produced water that will be re-injected over a period of 7 hours per day. Hydrocarbons and produced water will be extracted from the Portland Sand Formation and produced water will be re-injected at a pressure below the fracture pressure of the formation. The operating procedures specified in the HRA will ensure that there will be no over pressurisation of the reservoir.
7. Direct discharges to groundwater are prohibited under the Water Framework Directive and Schedule 22 of the 2016 Regulations except under certain exemptions. This is explained in more detail in the key issues, groundwater activity section of this decision document. Injection of produced water is to support ongoing production and is not for disposal purposes.
8. Planning permission is outside the remit of the Environment Agency's permit determination. It should also be noted the operator is not able to accept produced water from other sites until a bespoke RSR permit has been issued.

9. We acknowledge historic issues in respect to operator competence. There are sufficient controls in the permit to both ensure the Operator will operate in a competent manner, and also to allow us to take measures to bring them into compliance as required. The changes as part of this variation will update the activities permitted and help ensure future compliance.
10. We are satisfied with the accuracy of the information provided in the Supplementary HRA. Regarding the Waste Management Plan, this is a working document that the operator updates during the lifetime of the permit. This is covered by condition 4.3.7 of the permit.
11. The Environment Agency has not requested additional 2D seismic data or 3D seismic data. We are satisfied that sufficient information has been presented on the geology and hydrogeology in the supplementary HRA in accordance with the Environment Agency's Groundwater risk assessment for your environmental permit guidance and Onshore Oil and Gas Sector Guidance.
12. The Upper Tunbridge Wells Sand and Ashdown Sand Formation are present at approximately 229m and 381m below ground level. The Upper Tunbridge Wells sand is overlain by 229m of impermeable Weald Clay which prevents the direct recharge of the Upper Tunbridge Wells sand from the surface at this location. There are no groundwater quality samples from the Upper Tunbridge Wells Sand and Ashdown Sand at this location and these formations are not used for water supply at this location. The Upper Tunbridge Wells sand outcrops 13.5km to the south east of the site, therefore groundwater in the Upper Tunbridge Wells at 229m below ground level is likely to have a long residence time and be of poorer quality. The Ashdown Sand Formation is also overlain by the impermeable Grinstead Clay and Wadhurst Clay. We are satisfied with the operator's interpretation that these formations are unlikely to contain potable groundwater and groundwater monitoring of these formations is not required.
13. The Portland Sand Formation is the producing oil reservoir. Produced water can be re-injected into formations from which hydrocarbons have been extracted to encourage further production of hydrocarbons under the exemption specified in paragraph 8 (a) of Schedule 22 to the Environmental Permitting Regulations 2016. The re-injection of produced water into geological formations from which hydrocarbons or other substances have been extracted is the best environmental option to minimise the exposure of the public to ionising radiation from the disposal of radioactive waste and is in accordance with the UK NORM Waste Strategy.

The Purbeck Anhydrite overlies the Portland Sand formation and acts as the reservoir seal trapping hydrocarbons in the geological structure. The field bounding fault to the south has downthrown the Purbeck Anhydrite against the Portland Sand which also acts to trap hydrocarbons. Overlying the Purbeck Anhydrite is the Purbeck Beds which consist of approximately 20m of impermeable claystone and mudstone with some interbedded limestone. If the field bounding fault throw is greater than 15m, impermeable claystone and mudstone would also be downthrown against the Portland Sand Formation and would continue to trap hydrocarbons and formation water in the reservoir.

The supplementary HRA confirms well construction for the BRX3 re-injection well and an evaluation of the Cement Bond Log results for the surface and intermediate sections of the re-injection well. We have reviewed the well construction and the evaluation of the Cement Bond Logs results and we are satisfied that the re-injection of produced water poses a negligible risk to groundwater in the Upper Tunbridge Wells Sand and the Ashdown Formation. In addition we are satisfied that the operating procedures set out in the HRA are sufficient to mitigate the risk to groundwater.

14. We have reviewed the supplementary HRA in detail and as part of our assessment sent the applicant two Schedule 5 Notices requesting further information. The Notices have been complied with and we are satisfied that sufficient information has been presented on the geology and hydrogeology in the supplementary HRA in accordance with the Environment Agency's Groundwater risk assessment for your environmental permit guidance and Onshore Oil and Gas Sector Guidance.
15. NORM wastes are routinely encountered in deeper geology associated with onshore oil production. NORM wastes are controlled through a separate permit as described in the key issues section of this decision document.

Response received from
Weald Action Group
Brief summary of issues raised
We received a 19 page document. The main concerns identified are: 1. General objections in relation to NORM wastes, namely the production, presence and disposal of NORM wastes.

2. Concern regarding the composition and contamination of flowback fluids and produced fluids along with inconsistent clarity and definition surrounding this area in monitoring and regulation.
3. Concern around acidising prior to re-injection.
4. Concern around the method of assessment of risk and environmental impact from re-injection.
5. General concerns about the assessment of fractures and faults and the potential for seismic activity to increase.
6. Concern about injection well integrity and the ability to withstand the re-injection of produced water.
7. General objections in relation to radioactive waste.
8. Concern about the impact of the activity on human health, specifically consideration of any carcinogenic volatile organic compounds or other toxic contaminants.
9. Concern about the Operator's competence and previous lack of planning permissions.
10. Concern about documents being missing from the application, specifically, injection rates/pressure, geo hazard assessment, seismic mitigation plans, fire prevention plan, training documents and emergency action plan.
11. Question raised about how often the facility will be inspected and concern about self-regulation by the operator?
12. General concerns raised in relation to radioactive substances in terms of their release, monitoring and communication of data to the public.
13. Concerns relating to the impact of the activity on drinking water standards.

Summary of actions taken or show how this has been covered

1. NORM wastes are routinely encountered in deeper geology associated with onshore oil production. NORM wastes are controlled through a separate permit as described in the key issues section of this decision document.
2. Flowback fluid is a product of hydraulic fracturing. No such activity has been applied for and so we consider this concern not relevant to the existing variation application. Produced water is derived from the extraction of oil from oil-bearing strata and as such would be expected to contain hazardous substances in the form of naturally formed dissolved hydrocarbons. The principle of re-injecting produced water for support of oil production activities is acceptable under the

current regulatory regimes in the UK. Additive chemicals intrinsic to the extraction of oil will also be present in any re-injected produced water.

We have reviewed the Supplementary HRA and are satisfied that the return of this produced water into oil-bearing strata will not result in any unpermitted discharges to other water-bearing strata.

We are satisfied that sufficient information has been presented on the geology and hydrogeology in the HRA in accordance with the Environment Agency's Groundwater risk assessment for your environmental permit guidance and Onshore Oil and Gas Sector Guidance.

3. The applicant has not applied to stimulate the formation with acid or undertake any acid treatment process. We consider this concern not relevant to the existing application.
4. Produced water is derived from the extraction of oil from oil-bearing strata and as such would be expected to contain hazardous substances in the form of naturally formed dissolved hydrocarbons. The principle of re-injecting produced water for support of oil production activities is acceptable under the current regulatory regimes in the UK.

   Additive chemicals intrinsic to the extraction of oil will also be present in any re-injected produced water.

   We have reviewed the Supplementary HRA and are satisfied with the return of this produced water into water-bearing strata.
5. See previous responses in the above tables regarding faults and seismic activity.
6. As explained in the key issues section of this decision document we are satisfied that the Supplementary HRA demonstrates the importance of well integrity and includes robust re-injection procedures, and detailed monitoring procedures.
7. NORM wastes are routinely encountered in deeper geology associated with onshore oil production. NORM wastes are controlled through a separate permit as described in the key issues section of this decision document.
8. Produced water is derived from the extraction of oil from oil-bearing strata and as such would be expected to contain hazardous substances in the form of naturally formed dissolved hydrocarbons. The principle of re-injecting produced water for support of oil production activities is acceptable under the current regulatory regimes in the UK.

   Additive chemicals intrinsic to the extraction of oil will also be present in any re-injected produced water.

We have reviewed the Supplementary HRA and are satisfied that the return of this produced water into oil-bearing strata will not result in any unpermitted discharges to other water-bearing strata and there will be no harm to human health.

9. See previous responses in the above tables regarding operator competency.
10. We assessed all documents submitted as part of the application and various requests for information. We are satisfied that the operator provided all required documentation in terms of injection rates/pressure and seismicity. Further information on these issues is provided in the above tables of responses.

    We are satisfied that the operator's management system and associated procedures will ensure appropriate staffing during operational hours.

    The operator has procedures in place in the event of accidents or emergencies, including fire. A fire prevention plan is not required for the addition of a groundwater activity to the permit.
11. The facility may be checked by the Environment Agency in two ways:
    a. an assessment - a desk-based check of whether the operator is complying with their permit, for example checking they're sending in required information.
    b. an inspection - where an officer visits the site

    Inspections can be planned ahead or be unannounced. Environment Agency staff will look around the site and ask questions. We may ask to see documents or talk to staff. The frequency of inspections depends on the type of site and whether there are any on-going compliance issues that require additional visits. In normal circumstances we would anticipate inspecting a site of this type at least twice a year.
12. NORM wastes are routinely encountered in deeper geology associated with onshore oil production. NORM wastes are controlled through a separate permit as described in the key issues section of this decision document.
13. See the responses in the above tables regarding our assessment of the impact on groundwater. We are satisfied with the operator's interpretation that these formations are unlikely to contain potable groundwater and groundwater monitoring of these formations is not required.

Representations from individual members of the public

A total of 175 responses were received from members of the public. Their comments are summarised below. Many responses overlapped in terms of content therefore we have only included comments below that are not already addressed above in our response to queries from statutory consultees, local MPs, assembly members, councillors, parish/town community councils and community groups/organisations.

Brief summary of issues raised	Summary of actions taken or show how this has been covered
Gas flaring	
Concerns raised about gas flaring	This concern is not relevant to the application as no changes are proposed to the existing permitted drilling activity and flare.
Sampling and monitoring	
Concern about how the Environment Agency will ensure the produced water samples are genuine and whether they will be collected by an independent agency.	The Water Acceptance and Unloading Procedure (BRO-ANGPR-O0004-3) referenced as an operating technique in the permit (Table S1.2) confirms that produced water to be imported onto site as well as produced water from Brockham will be sampled and salinity measured with a conductivity monitor at an independent laboratory. The produced water sample will also be mixed with produced water from Brockham to assess for any visual precipitation. It should also be noted the operator is not able to accept produced water from other sites until a bespoke RSR permit has been issued.
Environmental impact	

Concern about the impact on nearby watercourses.	Produced water is derived from the extraction of oil from oil-bearing strata and as such would be expected to contain hazardous substances in the form of naturally formed dissolved hydrocarbons. The principle of re-injecting produced water for support of oil production activities is acceptable under the current regulatory regimes in the UK. Additive chemicals intrinsic to the extraction of oil will also be present in any re-injected produced water. We have reviewed the Supplementary HRA and are satisfied that the return of this produced water into oil-bearing strata will not result in any unpermitted discharges to other water-bearing strata. As such we are satisfied there will be no significant impact on nearby surface watercourses.
Concern that the associated risks are too great to justify a declining production from an already depleted reservoir.	We have assessed the risk associated with the groundwater activity as described in more detail in the key issues section of this decision document. We are satisfied that the purpose of injection is to support production. A calculation on the amount of oil produced from the reservoir is a matter for the operator and is not relevant to our decision.
Concern about flooding from increased groundwater.	Re-injection takes place into a deep formation sealed by faults and a low permeability cap overlying the formation. There is no plausible pathway for the produced water to enter a shallower formation and exit at the surface.
Concern about local air quality given that many parts of Surrey are already breaching air quality targets.	There are no changes proposed that will have an impact on air emissions from the site. We consider this concern is not relevant to the application.

Concern about the presence of Red Kites in Surrey and the need to update the environmental impact assessment for the site.	There are no changes to point source emissions to air, sewer or surface water as a result of the variation. We consider that the application will not affect any site of nature conservation, landscape and heritage, and/or protected species or habitats identified. We therefore consider this concern is not relevant to the application.
Concern about the safe storage of fluids.	We have accepted the operator's assessment of risk and are satisfied that appropriate measures and procedures are in place to ensure that all liquids, including produced water and chemicals, will be stored in accordance with the necessary containment measures to ensure there is no risk to the environment.
Regulation and compliance	
Concern about the failure of regulation of the geological aspects of unconventional oil and gas sites with severe implications for environmental safety.	Unconventional oil and gas sites are those involving hydraulic fracturing of shale which is not occurring under this permit. This is therefore not relevant to this determination.
Concern about who would be responsible for remediating any contamination to groundwater.	Our approach to any environmental pollution incident involves investigation into the significance of the incident, identification of the source and consideration of the pathway. Any action taken depends on the outcome of such an investigation
Concern about the impact on biodiversity, including the food chain.	We are satisfied that groundwater monitoring is not required at the site because there is no significant risk to any known shallow groundwater receptors and sufficient mitigation measures and procedures are in place to prevent any impact on groundwater. See the key issues section of this decision document for more information.
Concern over the Environment Agency's finances and resources not being sufficient to effectively regulate the site.	Compliance activities will be undertaken by the Environment Agency area enforcement teams after the issue of the permit to ensure compliance with the

	permit conditions. Sufficient resources will be made available by the Environment Agency to comply with our regulatory requirements.
Amenity	
Concern about increased road traffic, especially as tankers having been seen arriving at the site yet the site is apparently not producing oil at the current time.	The planning authority determines whether the activity is an acceptable use of the land. It considers matters such as visual impact, traffic and access issues, which do not form part of our Environmental Permit decision making process. We consider the concern about increased traffic is outside of the remit of the Environment Agency. Regarding the presence of tankers at the site, this information has been passed to the relevant member of the regulated industry team.
Concern about increased noise pollution.	There is no increased risk of noise as a result of this variation. We consider this issue not relevant to the application.
The determination process	
Questions relating to whether this application has been assessed in detail, specifically has a “2018 report” been updated in 2021.	We assessed all documents submitted as part of the application and various requests for information. We are satisfied that the operator provided all required documentation for this type of application and that it was up to date.
No consultation documents have been supplied to those impacted, for example, a leaflet through the door.	The consultation section of this decision document sets out how we publicised the application. All application documents, including the non-technical summary, were available to view as part of that consultation. We are satisfied we have fulfilled our obligations in this regard. See the consultation section of this decision document for more information.
There was no cement bond log available for the re-injection activity.	The supplementary HRA confirms well construction for the BRX3 re-injection well and an evaluation of the Cement Bond Log results for the surface and intermediate sections of the re-injection well. We have reviewed the well construction and the

	evaluation of the Cement Bond Logs results and we are satisfied that the re-injection of produced water poses a negligible risk to groundwater in the Upper Tunbridge Wells Sand and the Ashdown Formation. In addition, we are satisfied that the operating procedures set out in the HRA are sufficient to mitigate the risk to groundwater.

B) Advertising and Consultation on the Draft Decision

This section reports on the outcome of the public consultation on our draft decision carried out between 29/12/21 and 31/01/22.

In some cases, the issues raised in the consultation were the same as those raised previously and already reported in section A and so have not been repeated in this section.

Also some of the consultation responses received were on matters which are outside the scope of the Environment Agency's powers under the Environmental Permitting Regulations. Our position on these matters is as described previously.

Representations from local MPs, assembly members, councillors and parish/town community councils

Response received from
Brockham Parish Council
Brief summary of issues raised
1. Concern about seismicity, specifically the need for seismic monitoring and a data logger. 2. Concern about the decision not to require groundwater monitoring. 3. Concern about the surface water discharge W1 into Tanner's Brook leading to contamination.

Summary of actions taken or show how this has been covered
1. We have addressed the risk of seismic activity in section A. The Oil and Gas Authority is responsible for managing risks in relation to seismic activity. 2. We have addressed this in section A. 3. The discharge to Tanners Brook is existing and not being changed as part of this variation. We have therefore not considered this comment further.

Representations from individual members of the public

A total of 4 responses were received from members of the public. In some cases, the issues raised in the consultation were the same as those raised previously and already reported in section A and so have not been repeated in this section.

Also some of the consultation responses received were on matters which are outside the scope of the Environment Agency's powers under the Environmental Permitting Regulations. Our position on these matters is as described previously.

Brief summary of issues raised	Summary of actions taken or show how this has been covered
Amenity	
Concern about an increase in traffic to the site resulting in near miss or injury.	The planning authority determines whether the activity is an acceptable use of the land. It considers matters such as visual impact, traffic and access issues, which do not form part of our Environmental Permit decision making process. We consider the concern about increased traffic is outside of the remit of the Environment Agency.
Response in favour of the proposal	

A single response was received in favour of the proposal expressing the view that the safest way to dispose of re-injection fluids is to inject where they originated underground rather than transporting them to an alternative site which may increase the environmental impact.	The re-injection of produced water will be for the support of oil production activities, which is acceptable under the current regulatory regime in the UK. Whilst some of the produced water will come from other sites operated by the permit-holder, it will be injected into the same geological formation from which hydrocarbons have been extracted.