



Permit (EPR/AB3101MW)
Monitoring Suspension Period; Supporting Evidence
HSE-Permit-INS-PNR-020

November 2019

Version 2.0

1.0 Purpose

This report provides justification for the reduction in environmental monitoring at Preston New Road exploration site. A supporting environmental risk assessment is provided separately in document PNR-ERA-002 to assess the suspension phase.

2.0 Activities on Site

During the suspension phase there will be no drilling, hydraulic fracturing or well testing undertaken. All extractive waste associated with the drilling and hydraulic fracturing phases have been removed from site. The site and wells will be suspended in accordance with Borehole Sites Operational Regulations 1996 and the offshore installations and wells (design and construction etc.) regulations 1996. During the suspension phase Cuadrilla will undertake analysis of the well test data.

Surface activity onsite will be minimal, however it will include scheduled maintenance visits to monitor the wellheads, undertake general site inspections and remove or discharge ditch water. This will involve a low number of vehicle and personnel movements.

There will be a small generator which will be used as required to provide power to the site cabin and the surface water treatment plant. Foul effluent from the site facilities will be managed by tanker collection and offsite disposal.

After a period of approximately 3-6 months of well suspension, Cuadrilla will remove pressure monitoring equipment from PNR 2 wellbore. This operation will be short in duration (2-3 days), and assessed as a low risk operation to the environment. The operation will involve the use of a slick line unit to remove the gauges.

There will be no liquids stored on site that have the potential to cause pollution to land or water with the exception of a small volume of diesel fuel for powering the generator. This will be stored in secure containment with either a double skin or secondary containment. The pads tertiary site wide impermeable membrane will remain in situ.

3.0 Environmental Controls

3.1 Sub Surface

In accordance with HSE legislation and the Installation permit pre-operational condition, PO5, Cuadrilla conducted well integrity tests for each wellbore during the wellbore construction. Both wells have been inspected and reviewed by the relevant regulatory bodies with acceptable integrity results.

Post drilling and completion works, the Hydraulic Fracturing Plan for PNR1z and PNR2 required the reporting of well integrity damage or loss to the regulators. Cuadrilla can confirm, and as reported during the hydraulic fracturing of both wells, there has been no loss or damage to well integrity. Cuadrilla will continue to monitor the annulus pressure of both wells during suspension periods and report deviations in data to the regulator as per schedule 5 of EPR AB3101MW.

Cuadrilla can also confirm that fracture growth remained within the sub surface red line boundary during hydraulic fracturing. Continued microseismic monitoring post hydraulic fracturing did not identify activity or upward migration of fluids beyond the sub surface red line boundary.

For the well suspension phase there is a legal requirement to have a minimum of two barriers preventing the uncontrolled release of fluids from the wellbore.

PNR1z will remain suspended with a sub-surface plug and wellhead acting as a double barrier.

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PNR2 will remain suspended for several months while pressure monitoring of the reservoir continues. The wellhead upper master valve and lower valve will provide two barriers of prevention. Once pressure monitoring is completed and the gauges removed, two barriers will remain for the future suspension period.

The environmental risk assessment has concluded that the well integrity and the barriers described above will prevent formation fluids from migrating into groundwater or to the atmosphere.

3.2 Surface

A site wide impermeable membrane was installed during site construction in accordance with Construction Quality Assurance (CQA) standards. Modifications to the membrane have taken place in accordance with CQA standards and inspected by the Environment Agency. There has been no reported damage or areas identified where the membrane integrity has been compromised.

Surface water from the site has been collected in the drainage ditch surrounding site. The vast majority of water collected in the drainage ditch has been removed from site via tankers. Discharges from site have been via an onsite treatment plant to remove contaminants and tested to ensure it meets relevant environmental standards. Cuadrilla has conducted several batch discharges from the drainage ditch into Carr Bridge brook during 2019. Surface water monitoring data collected downstream of the discharge point in the Carr Bridge Brook has been analysed and submitted to the Environment Agency. There has been no impact on water quality due to these discharges.

The environmental risk assessment has concluded that the barriers and controls will prevent the migration of contaminants into sub-surface soils and groundwater and the uncontrolled release of site effluent into Carr Bridge Brook during the well suspension phase.

3.3 Data

As required by the permit, Cuadrilla has reported groundwater, surface water and air quality data to the Environment Agency. The data is available in the public domain via a variety of sources including Cuadrilla's EPortal and the Environment Agency public register.

In January 2019 Cuadrilla submitted information to the Environment Agency to support a permit variation which concluded that:

Based on the detailed summary of the environmental monitoring results collected in and around the Preston New Road over an extended period site presented above it is apparent that the site has undertaken its proposed activities, including those perceived as higher risk (such as well drilling and hydraulic fracturing) without causing a discernible adverse impact on the surrounding water and air environment.

Cuadrilla has continued to review the data set for groundwater, surface water and air quality before and throughout operations. The review post January 2019, did not identify any discernible adverse impact on the surrounding water and air environment.

4.0 Proposed Monitoring

In accordance with condition 3.5 and 3.5.1 of permit EPR/AB3101MW/V005:

The operator shall, unless otherwise agreed in writing by the Environment Agency, undertake the monitoring specified in the following tables in schedule 3 to this permit:

(a) point source emissions specified in tables S3.1 and S3.2;

(b) surface water or groundwater monitoring specified in table S3.5;



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(c) process monitoring specified in S3.6;

(d) ambient air specified in S3.7

Cuadrilla has requested that the Environment Agency agree in writing the following monitoring requirements for Preston New Road site during the well suspension period. It is proposed that this new monitoring programme should commence from the 6th January 2020. During the remainder of November and December 2019, monitoring will continue as per the permit and Environmental Management and Monitoring Plan (EMMP) requirements.

Table 1: Proposed Environmental Monitoring

Parameter	Locations	Frequency	Parameter	Standards	Reporting to Environment Agency
Groundwater	x4 boreholes A1-A4	Quarterly	<ul style="list-style-type: none"> • Dissolved methane • Chloride • Barium • Strontium • Potassium • Cadmium • Sodium • Calcium • Zinc 	As per permit	Quarterly
Surface Water	Surface water monitoring point B4 at SD 36840 33023 B2 at SD 37738 33034	Quarterly	<ul style="list-style-type: none"> • Barium • Cadmium • Chromium Total • Copper • Lead • Mercury • Nickel • pH • Zinc 	As per permit	Quarterly
Fugitive Methane	Wellheads	4 monthly	Methane	As per EMMP	Within 28 days of LDAR deployment.

4.1.1 Groundwater

The proposed groundwater monitoring regime is designed to provide surveillance of methane levels and chemistry to reflect key components of flowback and produced water. As the dominant natural gas compound, identified during the well test of PNR1 and PNR2, methane is a credible but highly unlikely source of contaminant into groundwater from the wellbores. Changes in groundwater chemistry or methane levels could be an indication of a change in well integrity. Formation fluid cannot upwardly migrate due to a lack of pathway and formation pressure to generate an upward force to overcome the hydrostatic head within the wellbore and surrounding formation, however a basic suite of monitoring will continue to verify the groundwater quality.

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The comprehensive data collected before and during operations will provide a reference against which new data collected on a quarterly basis will be reviewed. In the event of significant changes in methane or chemical concentrations compared with previous data sets, Cuadrilla will communicate the data to the Environment Agency in accordance with the permit and conduct further sampling and analysis between quarterly monitoring periods.

The quarterly frequency will account for seasonal variations and provide surveillance of methane and chemistry during the suspension period where the well is not designed to flow fluids to the surface.

4.1.2 Surface Water

A comprehensive review of surface water data was conducted as part of the application for the 2018/2019 permit variation. The review of data and conclusion from the Environment Agency was to grant the discharge of site surface water from the site drainage ditch. The discharge has been commissioned and Cuadrilla has conducted several batch discharges from the drainage ditch into Carr Bridge brook during 2019. There have been no reported changes in water quality since Cuadrilla commenced this operation.

Given the limited operational surface activity that will take place during the well suspension period and the barriers and controls, the risk to surface water from continued batch discharges during this period is low. A review of the environmental risk assessment for surface water discharge has been undertaken which supports the proposal that the monitoring parameters for surface water during the well suspension period should reflect the site surface water discharge parameters at the confluence of Carr Bridge Brook (location B4) and upstream of the site, location B2, to account for external influences on monitoring point B4. The proposed monitoring regime is designed to continue surveillance of Carr Bridge water quality on a quarterly basis accounting for seasonal variations.

Location points B1, B3, B5, B6 (ponds) are not hydraulically linked to the site. With the reduced operational activity at site and the absence of a pathway to these receptors, the proposed suspension period monitoring regime will not monitor these surface water locations.

4.2 Air Quality

A review of the environmental risk assessment has identified limited sources of gaseous emissions from site during well suspension, confined to a small generator and a small number of vehicle movements. The proposed air quality monitoring regime during well suspension reflects the low risk associated with the reduced site operations and sources of emissions.

It is proposed to continue a Leak Detection and Repair (LDAR) monitoring programme targeting the wellheads on a 4 monthly basis. Before the removal of the continuous and passive air quality monitoring stations, a leak detection test of both PNR 1z and PNR2 well heads will be conducted to start the 4 monthly routine. This is scheduled to start from December 2019. Monitoring the only potential source of fugitive methane will enable future repairs to be targeted in the unlikely scenario that the wellheads leak. To date, LDAR monitoring of both well heads have not identified any leaks of the wellheads.

4.3 Removal of Equipment

Ambient air monitoring equipment will be removed from site on the 6th January 2020 because the wellheads will be monitored at source via the LDAR programme. As there will be no process source emissions and only very limited gaseous emissions from the generator and vehicle movements during well suspension, it is proposed that the TDL 500, ambient gas sentinel, Aqmesh, Dustrac and weather station are removed. The four passive air quality monitoring stations and associated equipment will also be removed from site.

GasClams will be removed from the headworks as dissolved methane is being sampled as part of the quarterly groundwater sampling suite. Headspace bag sampling will also be suspended. To date there

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have been no elevations within the GasClam data, headspace data or laboratory data for dissolved methane which has been attributed to operations.

5.0 Notification

Cuadrilla will notify the Environment Agency approximately 1 month before the start of new operations or changes to the site environmental risk profile, for example opening the up the well, well intervention works or use of surface equipment linked to the wellhead (excluding the retrieval of pressure gauges using slick line).

The change in operational profile will require environmental monitoring in accordance with the prevailing permit conditions and environmental risks at the time of those operations. Cuadrilla will set up and monitor at least 4 weeks prior to the start of changes to the operational profile.