

## TLS Report PNR1z

<b>Management System:</b>		HSE	<b>File Name:</b>	TLS_Trailing_Event_Final_report_04.11.2018_PNR1z	
<b>Approver:</b>		Senior Geoscientist	<b>Version No:</b>	1	
<b>Reviewer:</b>		HSE&P Manager, Frac Manager, Technical Director	<b>Date of Issue:</b>		
			<b>Proposed date of Review:</b>	n/a	
Version	Section	Revision Information		Date	Reviser
0.1	All	Draft Publication			Senior Geoscientist

*Documents are reviewed as per proposed review date, or sooner if a significant change to the operation has taken place, to ensure relevance to the systems and process that they define.*

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## Event Summary

After the injection operations of sleeve 35 for the hydraulic stimulation of PNR1z, a seismicity related traffic light system trailing event >0.5 threshold was exceeded. The seismic event had a local magnitude of 0.66 ML. The seismic event hypocenter shown in the map and x-section by the blue dot, was roughly 481 m from the injection point.

## Event Classification

Green Event	Amber Light	Red Light	Trailing Event (<=0.5ML)	Trailing Event (>0.5ML)
				<b>X</b>

## Event Details

Magnitude (ML)	Date	Time (24hr) BST	Last Sleeve Injection
<b>0.66</b>	<b>4/11/2018</b>	<b>16:24:06</b>	<b>35</b>

## Hypocenter Information

X [mEast] BNG	Y [mNorth] BNG	Z [mTVDGL]	Distance to Nearest Injection Point (m)
<b>336702</b>	<b>432904</b>	<b>2411</b>	<b>481</b>

## Error / Uncertainties

P Trace Quality	S Trace Quality	Trace Quality	Min Ellipsoid size (m)	Mid Ellipsoid size (m)	Max Ellipsoid size (m)
<b>0.84</b>	<b>0.45</b>	<b>0.36</b>	<b>192.9</b>	<b>231.2</b>	<b>597.6</b>

## Downhole Hypocenter Information

X [mEast] BNG	Y [mNorth] BNG	Z [mTVDGL]	Distance to Nearest Injection Point (m)
<b>336448</b>	<b>432740</b>	<b>2264</b>	<b>135.9</b>

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### Ground Motion & Well Integrity

Max PPV (mm/sec)	Average PPV (mm/sec)	Fit to GMPE (mm/sec)	Annular Pressure Change (psi)
0.42	0.11	0.3	0

### Injection Information

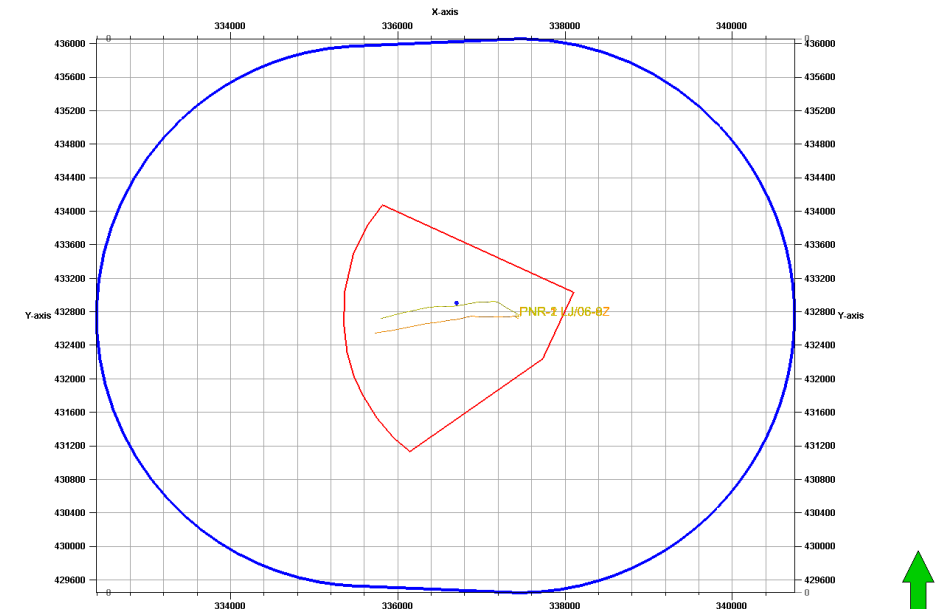
Sleeve	Fluid Volume Injected (m³)	Proppant Volume Injected (tonnes)	Average Rate (m³/min)	Max Treatment Pressure (surface) (bar)	Average Treatment Pressure (surface) (bar)
35	14.25	0	2.19	587	512

Stage (cumulative)	Fluid Volume Injected (m³) (cumulative)	Proppant Volume Injected (tonnes) (cumulative)	Flow Back (m³) (cumulative)
17	2482.05	146.4	297.45

### Forward Injection Schedule / Additional Mitigation

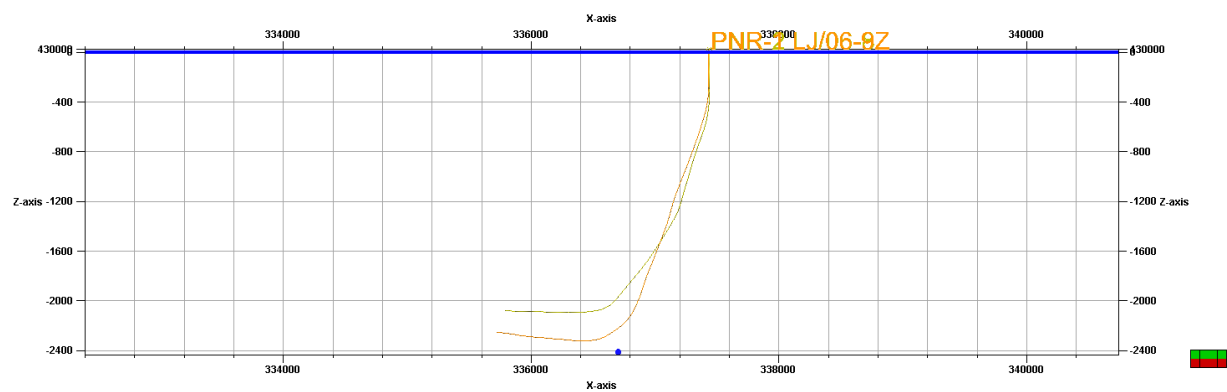
Waiting Time (hr) (<0.0ML)	Next Stage	Proposed Volume (m³)	Mini Frac	Additional Mitigation
-	-	-	Yes/no	

### Base Map

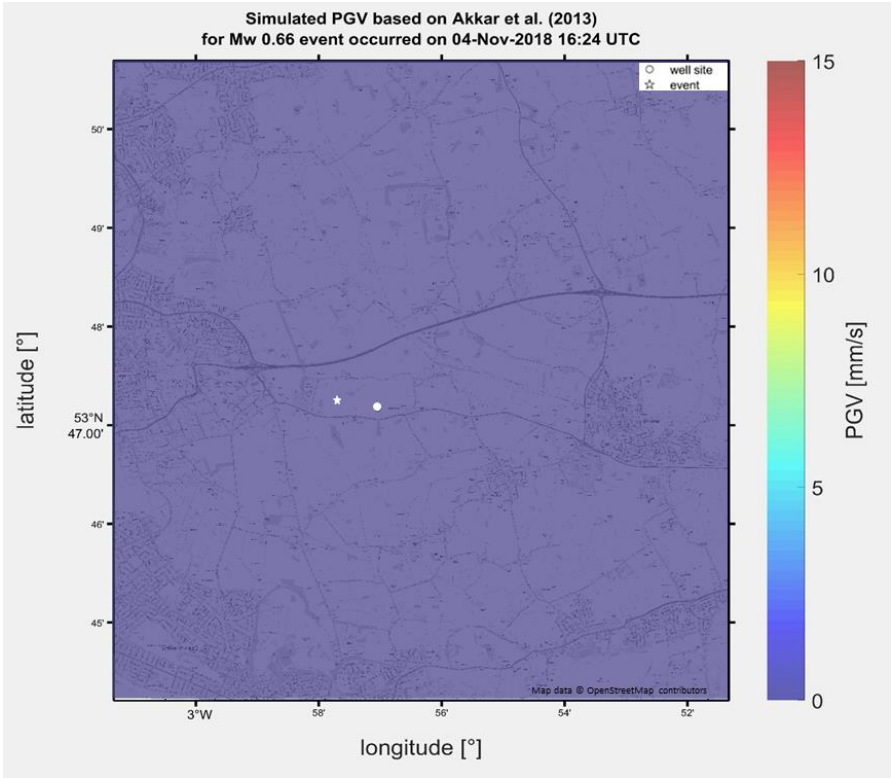


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Cross Section (From South)



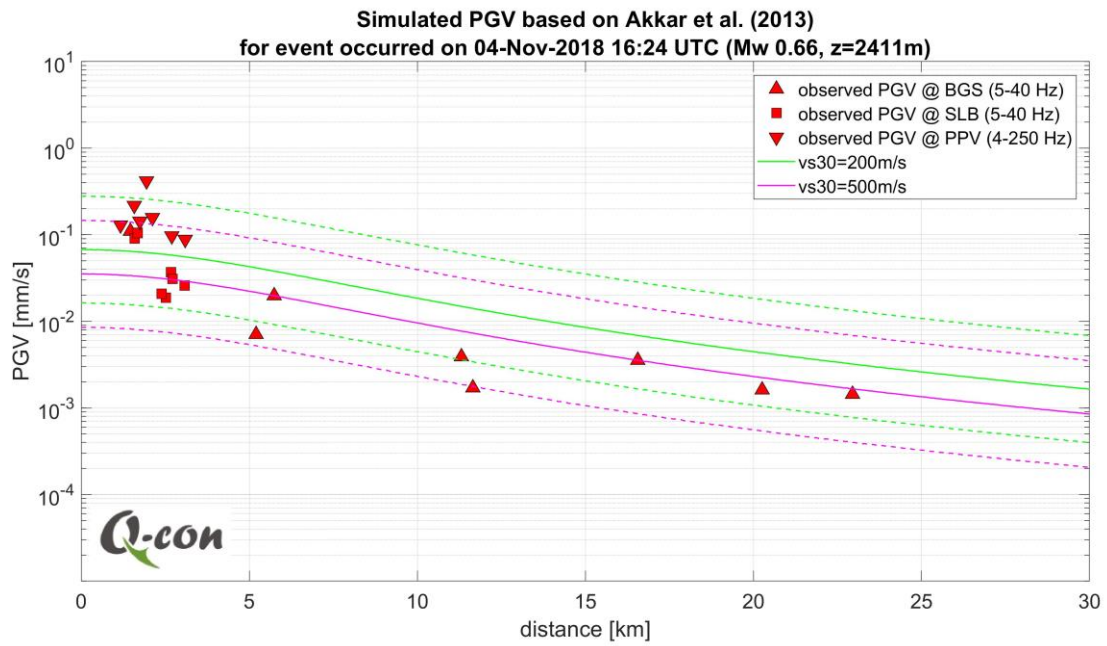
Shake Map



*The location of the sensor sites has been redacted on the basis of commercial confidentiality and public safety*

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## Attenuation Curve



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