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1 Introduction

An operation specific risk assessment was conducted to evaluate shallow hazards presence and risk associated with choice of not drilling a pilot hole for appraisal well 31/7-2 S in license PL740. The meeting was held April 21st 2017. Representatives from *Faroe Petroleum* and the license partner *Point Resources* were present in the meeting together with representatives from Well Expertise, Odfjell Drilling (including Safety Delegate), Oceaneering and Schlumberger (see meeting participation list in the attachments).

1.1 Meeting Objective

The meeting objective was to assess the likelihood of encountering shallow hazards and to evaluate the associated consequences of encountering shallow gas in a 17 ½" hole versus a 9 7/8" pilot hole providing the mitigating measures put in place to manage the incident if shallow hazards should be present.

1.2 Background Data

Seismic data from the Brasse 2015 and Brasse Appraisal 2016 site survey results were presented, ref. /1/ and /2/, followed by a review of relevant offset wells for 31/7-2 S, ref. /3/ and NORSOK requirements relating to shallow gas, ref. /4/.

1.3 Risk Register and follow up

The risks that have been identified and discussed are captured and documented in the BRSE-FPNO-S-LA-0106 Brasse Appraisal 31/7/2 Risk Register and Action Log where they will be followed up. The Shallow hazards risk sheet is attached at the end of this report.

The "PL740 Brasse 31/7-2 – Shallow Gas Risk Assessment" presentation is stored on project place.

2 Risk Assessment Summary

Shallow gas in this well is considered to be in a range of zero to low probability.

Based on the outcome of this meeting, the plan going forward is to drill the 36" hole, land the conductor and then drill the 17 ½" hole, as opposed to drilling 36" hole, landing conductor and then drill 9 7/8" pilot hole and then opening up to 17 ½" hole.

2.1 Risks assessed

The subsurface risk of shallow gas at the well location and associated Major accident risk, if shallow gas is encountered along with water depth issues.

The main effects/consequences are assessed to be related to potential shallow gas incident/blow-out, lost time due to shallow gas incident, potential personnel injuries and impact on Faroe's reputation.

It also covers difficulties of killing a shallow gas incident in a 17 ½" hole compared with 9 7/8" hole and issues with winching the rig off location.

2.2 Mitigating Actions

Mitigating actions in place and/or to be put in place prior to spud are:

Probability reducing measures:

- Assessment of shallow site survey 2D seismic and the 3D seismic indicates no structural closure or anomaly at the 31 /7-2 well location
- No shallow gas experienced in Brasse exploration well 31/7-1 or in closest/relevant offset wells (within a radius of 15 km from Brasse 31/7-2)

Consequence reducing measures:

- Procedures and Decision tree are in place
- Shallow gas and winch off drills to be performed (as planned) prior to spud
- ROV at sea bottom for gas detection during drilling 17 ½" hole section
- BHA set-up for 17 ½" section optimized for gas detection
- Odfjell / Deepsea Bergen have winch-off experience from other wells (not shallow gas)
- Metocean data check during drilling 17 ½" hole section (Wind and wave direction)
- 1.5 x hole volume of 1.5sg kill mud available at rig down to 150 m below seabed - 1.5 x hole volume of 1.25 sg kill mud available down to TD.

- Gas tight cement and chemicals for placing 1x 50m plug with 200% excess available at rig during drilling of top hole
- Cement recipe for gas tight cement plug available at rig during drilling of top hole
- Cement filter unit available at rig during drilling of top hole

3 References

Ref. No.	Document
/1/	Fugro Survey Limited; Geophysical Site Survey and Habitat Assessment Brasse, Norwegian North Sea NCS 30/9 & 31/7. Date: 21.10.2015.
/2/	Fugro Survey Limited; 161109V1.1. Appraisal Well Site Survey Brasse, Norwegian North Sea NCS Blocks 30/9 and 31/7. Date: 30.01.2017.
/3/	Brasse 31/7-1 (A) Lessons Learned and 31/7-2 (A) Offset Review
/4/	NORSOK D-010 Well integrity in drilling and well operations. Rev. 4, Date: June 2013.

4 Attachmentments


4.1 Meeting Participation List

Meeting:	Shallow gas risk assessment
Date:	21.04.17



Name	Role	Company
Mike Simpson	Drilling Supt	Faroe
Ingrid Arfson	HSE	Force
Shij Seland	DSR	Faroe
Sine Gjose	HSE	Faroe / WE
Mart A. Brattbakk	Group HSE Manager	Faroe
Jonas Skulnes	Ass. Riggermaster	Odell
Jonas Ole Olsen	As Riggermaster	Odell
Kare Pedersen	Drilling ENG	Point Resources
STEIN TONNING	DRILLING MANAGER	FAROE
DAGFINN VEIBERG	Geophysicist	— — —
EINAR FRAMNES	WCU TEAM LEAD	— — —
Kjetil Ostvold	Drilling Engineer HVO / ASST DRILLER	— — —
OLAV SKADSHEIM	ODDELL	ODDELL DRILLING
Age Graskopf	Rov Pr. Manager	OCEANVEERING
SIGBJORN ØSTERHUS	HSE	— — —

4.2 Shallow Hazards Risk Log Sheet

PROJECT:		Brasse Appraisal 31/7-2		PROJECT ACCOUNTABLE		Stein Tønning		ASSESSMENT DATE:		21.04.17		<div></div>								
				RISK ASSESSMENT APPROVAL		Einar Framnes		LAST REVIEW & DATE:		21.04.17										
ACTIVITY:		Shallow gas risk assessment Based on Site survey 2D and Seismic 3D Shallow gas RA probability range: zero->low		RISK ASSESSMENT TEAM:		Faroe, Well Expertise, Point, Oceanering, Schlumberger & Odjell (incl VO), ref participants list		REVISION NO:		R.00										
						Pre-Mitigation								Post-Mitigation						
Reference to Category	Risk Id	Description of Risk/Aspect		Effect/ Consequence		Evaluation of uncertainty	Risk Grade	Manageability	Nominated to enterprise risk register?	Mitigating Actions (Key Control Mechanisms)		Action resp.	Mitigated Risk Grade	Change from last Review	Action Status	Due date dd.mm.yy	Comments / Records of assurance (Assurances of effectiveness of controls)			
Subsurface	1	Risk of shallow gas present at the well location due to: * Presence of structural closure that could trap shallow gas * Presence of anomalies on the seismic interpretation that could indicate presence of gas		* Potential shallow gas incident/blow-out * Lost time due to potential winch off and managing incident (worst case re-spud at new location) * Potential personnel injury while managing incident * Minor impact to reputation		Low uncertainty	B2	High	Yes	* shallow seismic from sitesurvey reviewed together with 3D seismic * 31/7-2 is an appraisal well drilled in a well known location/license to Faroe * No shallow gas reported encountered in any of the relevant offset wells - After drilling of the 31/7-1 exploration well in 2016, only wells located within 15 km of 31/7-2 S were considered as relevant for the the offset analysis. * No anomaly identified at the well location on site survey 2d seismic data or Faroe 3d seismic data. Closest anomaly is >100 m from surface location. * No structural closure identified at the well location on site survey 2d seismic data or Faroe 3d seismic data.		D.Veilberg	A2	—	Finalized	24.04.17	* Closest anomaly from the shallow seismic data is > 100 m away from the well location and represents a low probability gas risk * Hydro well 30/9-17 from 1995 (junked after encountering shallow gas) is not included in the offset analysis as it is located more than 17 km from the 31/7-2 S location, and outside the defined offset well area			
Major accident	2	Risk if encountering shallow gas in a 17 1/2" hole vs. a 9 7/8" hole		* More difficult to dynamically kill well in 17 1/2" hole * Increased flow rate * Lost time due to potential winch off and managing incident (worst case re-spud at new location) * Potential personnel injury while managing incident * Minor impact to reputation		Medium uncertainty	B2	High	No	* Shallow gas decision tree/action procedure in place and communicated to rig crew * Winch-off drill performed w. crew (incl. OIM & Stab-chief) prior to spud * Stand-off locations to be confirmed during the drills prior to drilling the top hole section * Winch direction and distance to be agreed prior to operation * Shallow gas drill performed prior to spud * ROV to monitor at seabed for gas - drilling of top hole section will only continue with working ROV sonar * 1.5 x hole volume of 1.5sg kill mud available at rig down to 150 m below seabed - 1.5 x hole volume of 1.25 sg kill mud available down to TD. * BHA set up to assist in detecting potential shallow gas zone * Gas tight cement and chemicals for placing 1x 50m plug with 200% excess available at rig during drilling of top hole * Cement recipe for gas tight cement plug available at rig during drilling of top hole * Cement filter unit available at rig during drilling of top hole * Odjell waiver for pumping cement through TDS to be prepared prior to drilling top hole		M.Simpson	A2	—	In Progress	Prior to spud	* Top hole section displaced to 1.25 sg MW at TD on well 3 1 - confirms kill mud weight ok * Recent experience on DSB with winch off location			
Major accident	3	Risk in case of a shallow gas blowout at the 31/7-2 well location (119 m MSL water depth) using the Deepsea Bergen		* Shallow gas at surface at well location. * Lost time due to potential winch off and managing incident (worst case re-spud at new location) * Potential personnel injury while managing		Medium uncertainty	B2	High	No	* Wind direction to be updated prior to operation * Winch direction and distance to be agreed prior to operation * Pull rig off location up wind using anchor winches		M.Simpson	A2	—	In Progress	Prior to spud	* Water depth at the location is 119 m MSL * Avg. wind and current at time of top hole drilling (May) at the 31/7-2 location are: - 7.2 m/s (predominantly north and south direction) - 0.5 knots heading north			