



Pauline de Jong
Regulator
Office of the Regulator of Oil and Gas Operations
PO Box 1320, Yellowknife, NWT X1A 2L9

September 8, 2023

Dear Pauline de Jong:

Re: Information Update & Variance Request, North Liard Well Abandonment (ACW-2019-006-OBS-C-31A-WID1907) – Obsidian Energy

Well Background

The well was reported to have an H₂S concentration of 2% and CO₂ concentration of 18% from well file reports dated October 2, 2000.

Current Operations

We haven't yet encountered H₂S in the wellbore as we are monitoring on a daily basis and have circulated the wellbore over to fresh water.

We have however noticed significant corrosion on the 104 joints of 60.3 mm tubing that we have pulled from the wellbore. The tubing string was 184 joints, but the tubing parted at joint 104 due to the corrosion caused by CO₂ and H₂S embrittlement and sulfide stress cracking (shown in the Addendum).

On 9/7/2023 we attempted two fishing runs to retrieve the 84 joints of tubing still in the wellbore. The fish top is at 1026.5 m and we retrieved a piece of tubing that was 0.25 m in length. Our second attempt at fishing was not successful and we didn't retrieve any tubing.

On 9/8/2023 we attempted one fishing run to retrieve the entire tubing string with a washover assembly. We successfully got over the fish top and slowly and gently worked the wash pipe down over the tubing body. We noticed that we didn't have very much of a weight change and pulled to surface. We recovered a length of tubing that was ~4 m. The tubing recovered showed significant signs of H₂S embrittlement and stress cracking. We will make one more attempt to fish the string while we are waiting for a decision on this variance request.

Proposal for Variance

The top of the tubing is located at ~1030 m. The proposal would be to set a 244.5 mm cement retainer at ~1025 m (depending on casing collars). We would then sting into the retainer and pump a cement squeeze from that point that would cement off the entire wellbore including all of the Exshaw perforations and sit on top of the WR Plug that sits above the Fort Simpson formation. This top down cement approach will be the most effective in ensuring that the entire volume of casing (along with the tubing) will be filled with cement. The plan is to pump 31 m³ of cement.



Other factors that support this approach:

- There are no hydrocarbon bearing zones from the top of the Exshaw to surface
- Surface casing is set at 711 mKB and covers the base of groundwater at 600 m
 - The surface casing cement job had full cement returns to surface (11 m³)
- With the amount of H₂S embrittlement and Sulfide Stress Cracking seen, it is highly likely that this tubing string would continue to break off into smaller pieces and take an incredible amount of fishing runs to retrieve the entire string
- The water level in the Liard River has been consistently dropping due to the lack of rain. The longer that operations take on this well there is an increased risk for the Barge not to be able to cross the river and remove the equipment. Should this happen, the cost to Obsidian would be astronomical as we would have to wait until an ice bridge could be built to remove the equipment.
- The longer fishing operations continue, the safety exposure and operational risk increase. Obsidian believes this variance approach will safely and effectively abandon the wellbore

Calculations

Top of Fish = ~1030 m

Top of WR Plug = 1800 m

Distance between = 770 m

Casing Capacity of 244.5 mm (79.8 kg/m) = 0.036912 m³/m

Total Volume from WR Plug to Cement Retainer = 770 m x 0.036912 m³/m = **28.42 m³**

Volume of Cement to be left on top of Cement Retainer = 30 m x 0.036912 m³/m = **1.1 m³**

Total Cement Required = 28.42 m³ + 1.1 m³ = 29.52 m³

Hydrostatic Calculations to determine if Exshaw Perforations will hold a column of cement

The wellbore has been on a vacuum and the average volume of water pumped in the morning to fill the well is 2.5 m³

Hydrostatic Head of Water in Wellbore = 1697 m x 0.00981 m/s² x 1000 kg/m³ = 16,648 kPa

Depth of 2.5 m³ of fluid in the wellbore = 2.5 m³ / 0.036912 m³/m = 68 m

Hydrostatic head of fluid the formation can hold = (1697 – 68) x 0.00981 m/s² x 1000 kg/m³ = **15,980 kPa**

Hydrostatic Head of Cement at the Cement Retainer set at 1025 m

(1697 – 1025) = 672 m

672 m x 1775 kg/m³ x 0.00981 m/s² = **11,701 kPa**

Therefore, the formation can hold 15,980 kPa of fluid and the cement will exert a pressure of 11,701 kPa, which indicates the cement will stay in place once pumped through the retainer.



Addendum

This picture shows the sulfide stress cracking of the tubing pulled on 9/8/2023





This pictures shows the same tubing from another angle on 9/8/2023. The pipe is too brittle to be able to withstand the weight of the string to be brought to surface



This is the downhole diagram, post abandonmen



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Please take this recommendation into consideration and we look forward to hearing from you at your earliest convenience. However, after the fishing run in the afternoon of Sept. 8, we will not continue operations until hearing back from OROGO.

Regards,

Jeremy Sadleir

Jeremy Sadleir, P.L. (Eng.)
Completions Engineer