From:
To: Site C Submissions BCUC:EX
Cc:
Subject: Submission from Dr. Gilles Wendling, P.Eng. - Site C - Costs related to Groundwater
Date: Wednesday, August 30, 2017 10:57:17 AM
Attachments: 16 01 08 Press release - groundwater report - Final.pdf
ATT00001.htm

To BC Utilities Commission,

I am writing this letter to express my concerns regarding the potential failure of the Site C dam, and the potentially very large costs associated with groundwater related issues.

I have completed a thorough review of the technical documents produced for the design of the dam, focusing particularly on groundwater, on behalf of Treaty 8 Tribal Association and the Nun wa dee Stewardship Society.

The conclusions of my study were the following:

- The amount and distribution of groundwater level and quality data - especially along the south bank and up the tributaries of the Peace River - is insufficient to adequately characterize the hydrogeology of the 83 km long study area and to evaluate the effects of the filling of the reservoir on the groundwater regime.

- The groundwater regime is not sufficiently described, especially near the dam site; maps describing the piezometric contours (i.e., water table) pre and post construction for each hydrogeological unit are needed, especially near the dam site. They have not been produced.

- Post-construction downstream effects on groundwater near the dam has not been assessed, in particular the larger lateral groundwater flows and pressure expected to be generated by the high hydraulic gradients resulting from the build-up of the reservoir.

- The cumulative effect of Oil and Gas well fracking and reservoir filling on the long-term modification of the regional groundwater regime has not been assessed.

- The risks on dam stability resulting from fracking induced seismicity should be reassessed.

- A more thorough assessment on the impact on groundwater quality should be completed.

A press release was issued January 12, 2016 (copy attached).

I would like to highlight in particular the following point. Through the completed review, I was very surprised by the lack of study of the groundwater, and in particular the absence of characterisation of the groundwater regime (i.e., Where is the groundwater? In which direction is it moving? How fast? etc.). I was extremely surprised to find out that the dam was being built without characterising and understanding the presence and movement of the groundwater before, during and post construction. This lack of understanding was acknowledged by Jun Yin, Regional Hydrogeologist for the BC Ministry of Forest, Lands, Natural Resources and Operation (FLNRO) during a presentation in the presence of Pieter Bekker, manager,

Water Allocation and Utility Regulation, Water Management Branch (FLNRO) on January 6, 2016, in Fort Saint John, BC.

Why is it a serious concern? Because you DON'T STOP groundwater when you build a dam. On the contrary, you give more strength to the groundwater. Groundwater will keep flowing under the dam, around the dam, through the banks on both side of the valley, even at great distances following permeable pathways. And **many dam failures have resulted from the rupture of the foundation or abutments due to excessive groundwater pressure**.

Therefore, I am concerned the poorly defined hydrogeologic conditions could:

1. be the source of ground instability that may lead to catastrophic failure of the dam; or

2. result in significant modification of the design or adaptive and remediation measures that could create a financial burden to BC taxpayers.

I am very concerned that the approach BC Hydro is taking to address groundwater related issues consists of dealing with the problem when it is encountered, in a very unprepared and reactive approach. Unfortunately, this could result in extremely large costs and delays, if impermeable walls have to be grouted, unstable banks have to be stabilized, etc. In addition, such mitigative measures will require long-term monitoring. This will be associated with both capital and long-term operational costs.

All the costs for works dealing with groundwater related issues should be accounted for. They could range from the millions to the hundreds of millions dollars.

Thank you for taking my concerns into consideration. I will be pleased to share my findings and am available for discussing these issues further, should you have any questions.

Yours truly,

Gilles Wendling, Ph.D., P.Eng.

President, GW Solutions Inc.

PRESS RELEASE - Prophet River First Nation, Saulteau First Nations and West Moberly First Nations

First Nations Present Scientific Evidence on Impacts to Groundwater from Site C Dam

FORT ST. JOHN, BC, January 12, 2016 – Prophet River First Nation, Saulteau First Nations and West Moberly First Nations provide new scientific evidence on the potential impact to groundwater from the proposed Site C dam. The First Nations retained an expert in hydrogeology, Dr. Gilles Wendling, to review groundwater data provided by BC Hydro.

"My research", Dr. Wendling stated, "uncovered significant data gaps in the characterization of groundwater around the dam site". His analysis found the following:

1. There is not enough information on current groundwater flows in the area and how those flows will change when the dam is built, and the subsurface conditions are very complex.
2. There are significant concerns about the interaction between increased groundwater pressures from the dam and the extensive oil and gas activity in the region, including the re-injection of liquid wastes into the ground. Changes to groundwater flows could cause liquid waste to mix with groundwater.
3. The increased frequency and severity of earthquakes in the region due to hydraulic fracturing, or "fracking", could pose a risk to dam safety that has not been accounted for by BC Hydro, and could further affect the integrity of oil and gas wells, including the liquid waste disposal wells.

Dr. Wendling's report was prepared for the consultation process between the First Nations and the provincial government about the main water licence for the Site C dam and reservoir. A written hearing process on the proposed licence recently concluded, and the First Nations met last week with government officials to present the new research and other concerns.

"We view this new information about groundwater impacts as highly significant," said Chief Roland Willson of the West Moberly First Nations, "and it seems clear that BC Hydro should have done this research at a much earlier stage. We have asked the provincial government to go back to BC Hydro for more information on groundwater conditions before making their decision on the water licence."

The water licence is one of many authorizations still required for the Site C dam. BC Hydro has already begun site preparation activities, including clearing timber and constructing temporary roads and bridges in the area of the proposed dam. The First Nations' legal challenges are expected to continue for at least the next several months.

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