Hi Dan,

As the Chief Administrative Officer for the Mohawks of the Bay of Quinte this email has been provided to you for distribution to Chief and Council.

The Ministry of the Environment and Climate Change seeks the support and concurrence of the Chief and Council with respect to the summary below and the recommended actions/suggestions of our hydrogeologist that will be requested of Union Gas with respect to the continuation of the pipeline drilling project along Highway 49 that has impacted Territorial properties. The following notes provide a summary of the MOECC involvement in the discharge of drilling mud and slurry onto a private residence on Tyendinaga Mohawk Territory.

The MOECC feels that the suggested actions as outlined below are necessary to ensure that all reasonable precautions/steps are taken to reduce the likelihood of additional environmental impact occurring from the completion of the drilling operation.

SUMMARY:

In response to a request on October 9, 2105 from Todd Kring, Senior Projects Manager, Mohawks of the Bay of Quinte arrangements were made for MOECC (Jon Morrish, Senior Environmental Officer) to attend the site of a drilling mud slurry spill. Officer Morrish attended at 13 Gussy Road on October 9, 2105 and made recommendations on the cleanup and potential monitoring of local private water wells.

On October 13, 2015, staff of the Ministry of the Environment and Climate Change attended the Union Gas pipeline construction project to the review the extent of the impacts from a spill of slurry water from the pipeline construction. On site for the MOECC were Greg Faaren, Technical Support Supervisor; Dan Joyner, Senior Environmental Officer; and Warren Lusk, Hydrogeologist.

The following is the report of Warren Lusk (italized):

We attended 13 Gussys Lane in the Tyendinaga Mohawk Territory and at a directional drill location on the west side of Highway 49 on the south shore of the Bay of Quinte in the City of Prince Edward County.

During our on-site assessment at 13 Gussys Lane (owned by Ms. Sandra Green), I met Mr. Pete Brant of the Mohawks of the Bay of Quinte, Mr. Michael Blackburn of Union Gas, Ms. Angie Ducharme of Stantec and Mr. Tom Green. At the directional drill location, I met Mr. Dennis Bush of Michels Drilling and Mr. Dale Watton of Link-Line.

Based on the information provided by Mr. Blackburn, Mr. Bush and Mr. Green and my observations, I determined the following:

- *Michels Drilling was in the process of drilling an approximately 25.4 to 30.5 centimetre (10 to 12 inch) diameter directional drilled hole (tunnel) for about 1.3 kilometres starting at the south shore of the Bay of Quinte in Prince Edward County, below the Bay of Quinte and ending on the north shore of the Bay of Quinte on the Highway 49 right of way through the Tyendinaga Mohawk Territory. The purpose of the tunnel is to install a pipeline for Union Gas.*

- *The drilling process used a tricone drill bit attached to 8 to 10 metre long drill rods. The drill rods are attached to a drive head on a stationary direction drill rotary drill rig. The drive head rotated the drill rods and bit. The drill bit crushed the bedrock and created the drill hole. Petroleum based lubricants and grease were used in attaching the threads of the drill rods.*

- *During drilling, Michels Drilling mixed about 4,000 gallons of drilling mud (bentonite and water slurry) near the drill rig. Michels Drilling pumped the drilling mud through the drill rig's rods*

and drill bit at about 400 gallons per minute. The drill mud cooled the bit, collected the drill cuttings, and flowed (or circulated) around the outside of the drill rods in the hole back to the mud tank at the drill rig site location.

- *Initially, Michels Drilling drilled the Union Gas hole on an angle to a depth of about 56 metres below the ground surface. Michels Drilling continued drilling the hole underneath the Bay of Quinte at a depth of about 56 metres below the ground surface. It was assumed that drilling at 56 metres below the ground surface would help to reduce the risk of encountering groundwater and highly fractured limestone bedrock. Groundwater was not encountered during the drilling process.*

- *During the week of October 4, 2015 and after drilling about 1 kilometre, the drill machine's drill bit went off course by about 3.2 metres. Micheals Drilling removed the drill rods and drill bit (tripped out) and then proceeded to seal the end portion of the hole with a cement and bentonite (manufactured swelling clay) plug.*

- *Michels Drilling tripped in the hole with drilling tools and began re-drilling the plugged portion of the hole. Michels Drilling adjusted the drilling to steer the drill bit back on course. After drilling about 900 metres, the drilling mud stopped circulating back to the drill rig site. The loss of drilling mud was an indicator that the drilling mud discharged into an open fractured area in the bedrock.*

- *Michels Drilling attempted to place a mixture of additives including saw dust, fibers and other mud products to attempt to seal and plug the fractured zone in the bedrock (this plug is typically called a "pill"). The attempt appeared to initially work; however, more drilling mud was lost in the hole.*

- *After four attempts of placing “pills” in the Union Gas hole and losing about 1,500 gallons of drilling mud per attempt, Michels Drilling stopped drilling and was notified of a discharge of drilling mud on Mr. Sandra Green's property at 13 Gussys Lane.*

- *When drilling stopped, the drill bit was about 150 to 200 metres from the Green residence at 13 Gussys Lane and located about 50 metres below the ground surface.*

- *Apparently, 179 cubic metres (or 179,000 litres) of drilling mud and “pill” additives were discharged into the Union Gas hole and the fractures in the bedrock.*

- *The drilling mud began discharging out of a location about 0.3 metres south of the Green residence near the end of week of October 4, 2015 and just before drilling stopped.*

- *Apparently, 120 cubic metres (or 120,000 litres) of drill mud was collected using “daylighting” (hydrovac) equipment by Union Gas agents on the Green property.*

- *By the late morning of October 13, 2015, Mr. Tom Green approached Union Gas representatives. Mr. Tom Green reported that Mr. Green's father, Peter Green, originally owned the residence at 13 Gussys Lane. Mr. Tom Green informed Union Gas of two abandoned wells on the Green property that were never plugged or sealed. The abandoned wells were apparently drilled by Chalk Well Drilling about 40 years ago.*

- *Mr. Green reported that one of the abandoned wells was located at the location of the drilling mud discharge on the Green property and was drilled to a depth of about 55 metres (180 feet below the ground surface). The second abandoned well was located about 15 metres south of the Sandy Green residence. The wells were abandoned due to insufficient water.*

- *By the late morning of October 13, 2015, Union Gas representatives removed drilling mud and a concrete cover exposing the abandoned drilled well reported by Mr. Green. Union Gas*

representatives managed to place a tape measure with a weighted end to about 17 metres below the ground surface. The drilling mud in the hole stopped the weighted end of the tape measure from moving further down into the well.

- *During the afternoon of October 13, 2015, I observed a small 10 centimetre deep by about 0.6 metre square concrete well pit. At the bottom of the well pit I observed a 15.9 centimetre (6.25 inch) diameter hole and steel casing, typical of a drilled well. After Union Gas representatives "daylighted" the drilling mud in the top of the drilled well, I observed drilling mud coming up the hole and discharging onto the ground surface at a slow rate (about less than a litre per minute). (See attached photos showing the Green abandoned well after the drilling mud was removed from the well and when the drilling mud was flowing out of the abandoned well onto the ground surface).*

- *Due to a lack of groundwater with depth or mineralized groundwater, area residents use shallow water supply wells or use surface water from shore wells along the Bay of Quinte.*

Based on the information provided by Ms. Ducharme of Stantec, Stantec has been assessing area wells near the site. Based on the information provided by Ms. Ducharme, Stantec has not yet identified any contaminants of concern in the water wells including total dissolved solids and elevated turbidity. However, more sampling is being conducted.

As water supply wells are shallow and the lack of drilling mud observed in water supply wells, I suspect that the drilling mud that is located in deep open bedrock fractures may not be connected to the shallow groundwater used by area wells. However, further assessments by Stantec will be necessary to verify my suspicion.

Based on my observations and the information provided by the parties,

- *Michels Drilling encountered a fracture zone in the bedrock during the drilling of the Union Gas hole (tunnel) about 150 to 200 metres from the Green residence.*

- *Michels Drilling discharged drilling mud through the drill rods and drill bit under a high velocity (400 gallons per minute) into the hole. The drilling mud would have quickly moved through an open fracture network in the bedrock at about 50 to 56 metres below the ground surface.*

- *The Sandy Green abandoned wells were apparently drilled to about the same depth as the depth of Union Gas hole (tunnel) constructed by Michels Drilling. At least one of the Green abandoned wells, located about 0.3 metres from the Green residence, was not plugged and sealed.*

- *The drilling mud in the open bedrock fractures encountered the abandoned well near the Green residence that was not plugged and sealed.*

- *Since the drilling mud was discharging at a high velocity (400 gallons per minute), the force of the drilling mud pushed upward though the open hole of the abandoned well and discharged onto the ground surface of the Green property.*

- *Since the drilling operation has stopped, the drilling fluid should stop flowing from the Green abandoned well in the short term.*

Suggestions

It is my understanding that Stantec, Union Gas' geoscience consultant, is conducting water quality sampling on nearby wells that are located near the Union Gas hole (tunnel) for contaminants of concern,

including total suspended solids and the other chemical parameters of the bentonite and the "pill" (additives that made up the plugs).

For your consideration, prior to the commencement of any drilling, Union Gas and its consultants should provide you with a groundwater report that shows all sample interpretations and other observations and an interpretation of all water quality sample determinations from area wells compared to the contaminants of concern in the drilling mud and the "pill" additives. The groundwater report should also provide conclusions and any recommendations including temporary bottled water supplies and any well remediation.

For your consideration, prior to the commencement of any drilling, Union Gas and its consultants should develop an action plan for your review and approval:

- *to identify any other abandoned wells near the Union Gas hole (or tunnel) that remains to be drilled by Michels Drilling and to determine what material was used to plug the abandon holes and the depth of the holes,*

- *to remove all permeable or low strength material from the abandoned wells, video the identified abandoned wells with a down the hole camera and properly seal the identified abandoned wells with a high strength material (e.g., cement with a density of no less than 1 kilograms per litre) to help prevent the holes from acting as a pathway for drilling mud from the Michels Drilling operation,*

- *to identify any other discharge of drilling mud near the Union Gas hole (or tunnel) that remains to be drilled by Michels Drilling,*

- *to drill the remaining of the Union Gas hole (tunnel) in a method that will not cause an adverse effect to the natural environment including the discharge of drill cuttings to any abandoned or in use well, and*

- *to identify how Union Gas and its agents will implement the recommendations in the groundwater report prepared by Union Gas and its consultants.*

The MOECC requires Union Gas to undertake all reasonable steps to ensure that additional drilling fluids are not lost during the completion of the drilling. This is a requirement of the Permit to Take Water issued for the project. It is the MOECC intent to provide assistance to federal and provincial agencies and to the Mohawks of the Bay of Quinte in this matter. The Ministry has been in touch with Health Canada, Aboriginal Affairs and Northern Development Canada, Environment Canada and the Provincial Ministry of Transportation and it was recommended that the MOECC contact MBQ's Chief and Council.

Please advise whether the Chief and Council would like to discuss or meet regarding this information and pending request to Union Gas. The attachments have been provided to the MOECC by Union Gas.

Sincerely,

Dan Joyner
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