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1. I have been involved in working with Environmental site remediation and clean-up of contaminant discharges into the Environment including spills for about thirty years of my career, since graduating as a Geoscientist in 1984. The range of my professional experience covers hydrogeology, water and waste water issues, landfill issues and chemical spills.
2. As a result of dealing with the practical consequences of these types of incidents, I am qualified to speak about the reasons that spills occur, the contamination problems that result, how spills should be contained, the costs of remediation, and other general issues relating to spills and contamination. I will be providing both fact and opinion evidence.
3. Given my background as a hydrogeologist I am able to apply that expertise to help understand the movement or flow of contaminants through geological structures. I have worked as a consultant providing expertise to the Ministry of Natural Resources on municipal servicing on the Oak Ridges Moraine and have been involved in various studies involving environmental investigations on the Oak Ridges Moraine. These studies involved efforts on my part to develop a measure of broad understanding of the patterns of distribution and flow of groundwater and surface water within and on the Moraine.
4. The groundwater flow patterns are enormously complex due to the variation in geological media. They can be outlined in simple terms but we have little understanding of site specific flow patterns in areas where groundwater monitoring is not undertaken in detail. The only way to fully understand the movement of water into and out of the Moraine is to undertake detailed hydrogeological studies. The geology controls how water moves through the structure. Many areas of the moraine lack detailed hydrogeological information..
5. An overall picture can be given in simple terms and I refer to one of my supporting documents, namely *The Citizens' Guide to the Oak Ridges Moraine*. A simple outline of the recharge/discharge process is provided there at pp 12-14. The Oak Ridges Moraine is made up of a variety of sediments including sand, gravel silts and clay,. These sediments are glacially-derived sediments. The sediments of the moraine vary in depth and in place exceed 300m. The Paleozoic bedrock beneath the moraine is made up of limestone, shale and sandstone much of which is fractured near the surface and influences the groundwater as well.

6. The Canadian Shield, for instance, is a very different geological formation. Here the surface sediment is thin and discontinuous and the rock underneath is much harder.

7. On the crest of the Moraine and many surrounding areas, water is absorbed rapidly into the porous upper layers flowing downward until it reaches the water table where it will flow laterally and vertically sometimes discharging out of side slopes of the moraine as surface water springs. Much is not known at present about all the flow patterns and links between water entering the Moraine and water emerging from it. Much is not known or fully understood about the particular permeable pathways that allow water flows within the moraine. In sum, my assessment would be that we cannot have an in depth understanding of particular areas of the Moraine without conducting proper in-depth hydrogeological studies involving monitoring wells and chemical testing. We cannot predict the actual impact of interference with the water entering or leaving the Moraine when we do not know all the details of how the water percolates through the Moraine itself.

8. We do know that water entering the Moraine at high points, around 300m above sea level, helps to provide pressure that drives water down into the underground aquifers and then out as the seeps and streams that appear at lower levels, (The level at Lake Ontario is about 75 m above sea level.) The water coming out of the Moraine flows fairly steadily all year round, even during droughts. It comes out quite cold, at around 8-10 degrees Centigrade in some areas.

9. The groundwater discharge from the Oak Ridges Moraine is thought to provide recharge for many of the streams, seeps and other water flows coming from the hills of the Moraine. Trout like cold water and that is why the groundwater discharge from the Oak Ridges Moraine is so suitable for trout. The temperature of the discharge waters operates to moderate the temperature of the streams flowing from the Moraine – making them warmer in winter and colder in summer.

10. There are major potential effects of building large structures on top of the Moraine: the first is an increase in the amount of land surface paved over, effectively covering the natural surface, preventing infiltration, and reducing the natural recharge to the aquifers. This can cause an impact on the hydrogeologic balance and put a strain on the aquifer yields and possible reduction in spring discharge quantity. Another potential impact is the possibility of contaminants entering the Moraine.

11. An increase of paving on the Moraine and construction can affect the footprints of seeps and streams if structures are built near to or impinge on discharge areas. Changing the patterns of water flow and discharge will, for instance, affect wetlands that depend on particular outflows of water. If structures are built in some lower locations on the Moraine, this will affect seeps and streams that form the headwaters of streams and rivers. It is difficult to claim that building a structure with a 60 foot cement base near to an outflow stream will not cause permanent and irreversible harm to the environment associated with that stream.

Similarly, excavating across seeps will change patterns of water discharge associated with that particular site.

12. The issue of hydrogeologic balance is not likely to be significant unless a situation arises in which water takings become larger than permitted or they continue for more than a short period. The Ministry of the Environment issued a limit on the amount of water to be removed in the Approval Notice of December 11, 2014 but appears to contemplate that water takings might continue for an unlimited period.

H - WATER TAKING ACTIVITIES

H1. The Company shall not take more than 50,000 litres of water on any day by any means during the construction, installation, use, operation, maintenance and retiring of the Facility.

13. If this level of takings continued for several days the effects could have an impact on water supplies at some locations at higher levels of the Moraine. In addition, the limitation while sensible does beg the question of who is to monitor the amount of water being pumped out, say during excavations along the low-lying Gray Road area. It needs to be recognized that a number of local wells are very shallow – some as shallow as 8 or 10 feet, yet they always give water. These wells demonstrate the pressure effect of the Moraine forcing water out through lower surfaces of the Moraine.

14. If water takings at lower levels were increased say by excavating into seeps or streams flowing out of the Moraine, or continued for more than a day or two, there would potentially be an unforeseen impact on certain higher level wells or outflows. Without the proper hydrogeological studies which have not been undertaken by the proponents, exact impacts are impossible to predict. More work is needed on the impact of interfering with low level outlets from the Moraine by this project in terms of effects elsewhere on the Moraine.

15. Spills and contamination issues are a serious and significant problem for the Moraine in relation to the Sumac Project. Contamination in the setting of the Moraine is a complex topic for reasons given above. In basic terms, we know and can see where water flows out of the Moraine but we do not know precisely where it got into the Moraine and how it travelled through it.

16. The City is extremely concerned about the potential for spills anywhere in the area. All cities now are extremely attentive to spill issues. But the possibility of spills represents an especially serious threat to the image of this municipality as a safe and attractive tourist area. We pride ourselves on our lakes and countryside so spills are of fundamental concern. In addition municipalities may be held accountable and ordered by the Ministry of the Environment to cleanup spills and remediate the environment as a result of the spill even if they are an innocent party and not the perpetrator of the spill. This can be costly and onerous for the municipality

17. We recently had a spill in the City of Kawartha Lakes from a domestic oil tank within a residential building. The effects from that were extremely serious. A relatively small spill in terms of litres, can contaminate very large amounts of water.

18. In terms of the proponent's duty to protect against spills on the Moraine, the Ministry of the Environment's approval of December 11, 2013, lists as a requirement under Item G3:

G3. The Company shall not store hazardous materials or conduct refuelling activities in any sensitive areas as identified in the Sumac Ridge Wind Farm Water Report and Environmental Impact Study, prepared by Natural Resource Solutions Inc., dated April 2012.

19. Two of the turbines are located on the Oak Ridges Moraine and within areas of high aquifer vulnerability and are therefore sensitive to construction and to contamination.

20. Turbine oil changes are required at least annually according to the manual (provided by the developer) for the turbine model concerned. What contaminants do the substances contain and how might any spill affect the Moraine and its water-bearing aquifers?

21. My own experience with dealing with spills suggests that spills can occur during construction phases or whenever heavy machinery is in use. Common sources of leaks include fuel or oil lines leaking or bursting on equipment such as trucks or other machinery. All equipment has the potential for leaks.

22. Refuelling trucks and/or other equipment is a serious issue for the proponent if not permitted in certain areas of the Moraine. Refuelling completely off the Moraine would be the only safe approach and would be the City of Kawartha Lakes' preferred solution.

23. What would the potential impact be for a serious spill? Would it have the capacity to contaminate a vulnerable part of the Moraine? First of all the porosity of the Moraine sediment means that spills would be absorbed promptly and directly. There would be little opportunity for the usual containment practices, such as placing of booms to prevent spread of contaminants and use of absorbent materials to soak up the spill. Liquids sink directly into the ground on the Moraine something akin to water spilt on sand on a beach. The only exceptions would be when the ground is frozen and snow or ice covered.

24. Where would a spill of contaminant flow say, for example, if a ground-based transformer at the foot of a turbine containing 500 litres of oil, was struck by lightning or damaged in some other way? We know some of the major outflows of water in the area of the project because they are visible, especially along the lower level of Gray Road. We do not know how many outflows there are because they have not been systematically mapped. We do not fully know the underground connections between aquifers near to the five turbine sites.

25. Contaminants could potentially reach nearby headwaters of river systems and other sensitive water features on the Moraine. It is essential from the perspective of the City of

Kawartha Lakes to consider the problems presented by a serious spill at any of the turbine sites.

26. Turbine 1 is located immediately next to a wetland area which is in the same area of the same farm. A stream flows beside the site for Turbine 1 and is marked on the proponent's maps; it connects the wetland as it flows north into a stream on the property that becomes a tributary of the Pigeon River.

27. That river in turn flows through the Pigeon River Conservation Area and through the town of Lindsay. There is an artesian well also on the property, south of the site for Turbine 1. This well fills from an underground spring or seep. The water is directed through a pipe to a trough previously used for drinking water for cattle.

28. Turbines 4 and 5, are in vulnerable aquifer recharge areas. Turbine 5 is located between two headwaters of the Fleetwood Creek complex, which flow downhill in an easterly direction through the nearby Fleetwood Creek Conservation Area.

29. Gray Road – the unopened road allowance - which, as stated, is at a lower altitude on the Moraine, contains many water features some of which include seeps, streams, and vernal pools. These water features have been minimized in the proponent's reports.

30. It should be pointed out that the water table at Gray Road is at surface level from Highway 35 along the first few hundred metres of the road allowance as far as the east end of the pond on the south side of the road allowance. The road is often water-logged. This situation makes the entire area susceptible to local spills and contamination because water is near the surface. It also means any contaminants emerging from the upper reaches of the Moraine would spread rapidly in this area.

RESPONSES TO SPILLS AND POTENTIAL CONTAMINATION

31. The normal response mechanism would be for the proponent to retain a private chemical clean-up company that would be called on to deal with any spill once discovered. The Ministry of the Environment would be involved if there was a need to enforce the requirement that the owner clean up the spill.

32. If that does not happen then the City of Kawartha Lakes could be called on to take action and take responsibility for the cleanup. The City knows, from past experience (as stated above) that this process can be enormously expensive.

33. There would need to be extremely strict protocols for any use of hazardous materials on the Moraine in the City's view. There would have to be special containment provisions for whatever hazardous materials were being transferred onto the Moraine and whatever exchanges of hazardous materials were permitted on the Moraine itself.

34. Condition G3 of the Ministry Approval of December 11, 2013 is not at all clear about what transfers of hazardous materials will or will not be permitted in relation to five turbines near to or on the Moraine.

35. In my view as a hydrogeologist, these issues should have been addressed in detail before the project was approved. Hydrogeological studies should have been carried out to assess whether the proposed locations are in fact suitable for oil carrying industrial structures and associated transformers as well as other infrastructure.

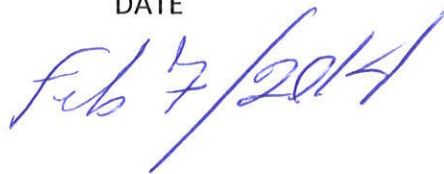
36. The approval appears to be premature given these issues.

SIGNED

DATE

A handwritten signature in blue ink, appearing to read 'DK', is written over the 'SIGNED' label.

David Kerr

A handwritten date 'Feb 7/2014' in blue ink is written over the 'DATE' label.