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December 19, 2017

Mr. Nick Colella
Ministry of the Environment and Climate Change
Environmental Approvals Branch
135 St. Clair Avenue West
1st Floor
Toronto, ON, M4V 1P5
By email to: Nick.Colella@ontario.ca

Dear Mr. Colella,

Please find attached an addendum to the Ph.3A plan previously submitted to the MOECC. This addendum covers the vibration monitoring that will be implemented during the Commissioning phase of the North Kent Wind 1 facility (Project).

- Phase 3A: Operational Vibration Monitoring Program Instrumentation Design, North Kent 1 Project -- Addendum, Chatham-Kent, Ontario, dated December 14, 2017, and prepared by Storer J. Boone, Ph.D., P.Eng., Golder Associates Ltd.

As with previous vibration monitoring, this work plan has been developed by Golder Associates Ltd. on behalf of the Project and as part of Section H1 of the Renewable Energy Approval (REA) 5272-A9FHRL issued by the Ontario Ministry of the Environment and Climate Change (MOECC).

Yours sincerely,

North Kent Wind 1 LP

cc. Mohsen Keyvani, Director, Ministry of Environment and Climate Change
Jody Law, Pattern Energy
Joshua Vaidhyan, Samsung Renewable Energy

December 14, 2017

Project No. 1668031-1000-L04

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**PHASE 3A: OPERATIONAL VIBRATION MONITORING PROGRAM INSTRUMENTATION DESIGN
NORTH KENT WIND 1 PROJECT – ADDENDUM
CHATHAM-KENT, ONTARIO**

This letter summarizes the work plan that will be put in place for vibration monitoring during the Commissioning Phase for the North Kent 1 project (Project). Prior to Commercial Operation of the Project, each turbine that is erected will need to undergo inspections, testing, and turbine blade rotation to ensure that all equipment is working optimally without any malfunction, referred to as Commissioning.

Typical Commissioning procedures include the following steps:

- 1) test and commission all control systems for each wind turbine generator (WTG) without spinning blades;
- 2) subject to wind conditions, turbine blades are allowed to spin in order to perform brake and multi-range speed tests to ensure these features are fully functional and this testing is conducted over a period of about 1 hour; and
- 3) if step 2 is successful, the WTG will need to complete a “run test” for a continuous 72 hour period to ensure reliability of the system and after the 72 hour Run test, commissioning of the WTG is deemed complete.

Implementation of the Phase 2 vibration monitoring work plan is not appropriate for the commissioning phase of the Project for the following reasons:

- vibration magnitudes associated with turbine operations are expected to be smaller and of a more continuous nature as compared to the intermittent and transient vibrations associated with construction pile driving;
- pile driving was completed during normal construction work hours whereas commissioning will require longer periods of continuous turbine operation over night;
- water well pumps and nearby traffic influenced data from monitoring of local residential wells and these interferences would obscure information that might be associated with turbine operations;
- data collection at the residential wells was observed by personnel throughout construction in order to identify other site activities that could influence the data, continuous staffing ,on a 24 hours per day basis, is not



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reasonable for the commissioning period and could disrupt the quality of life for the well owners and residents during shift changes;

- weather conditions and continuous equipment security require additional protections for the instruments that may not be possible at the residential water wells that were used during Phase 2 vibration monitoring;
- power sources for the data loggers must be continuously available and, where solar power and remote systems are used, these add complexities to the on-site equipment that would otherwise be installed at the residences; and
- testing of the turbines is weather dependent, making scheduling of staff for simultaneous 24 hours per day operations highly problematic for monitoring multiple wells in multiple clusters.

Vibration monitoring will be completed during this commissioning period at the three mock wells, detailed within the previously submitted Phase 3A Work Plan. The mock wells will be installed using conventional water well drilling methods with a steel casing installed to and cemented into the top of the bedrock. Each mock well will be installed at a location along the turbine access road where property access and use is available. Further, the mock well will be installed from about 100 m to as much as 300 m from the nearby municipal roads, keeping them at a safe distance away from local and construction traffic/activity and within a quieter vibration environment so as to better capture vibration conditions that may be associated with the turbines. Based on site limitations the location of one mock well was further refined. The mock well for turbine T41 was relocated approximately 25 m closer to the turbine than initially planned to avoid site restrictions related to local topography, agricultural uses, buried power collection cables and access road areas. The locations of the others remain essentially unchanged from the locations originally planned. Finalized distances of mock wells to selected turbine sites are found in the chart below and the final locations will be surveyed and mapped within the Project coordinate system.

Turbine	Schematic Turbine to Mock Well Distance (m)	Schematic Mock Well to Road Distance (m)
T23	500	300
T41	125	125
T51	250	250
T42 Contingency	50	83

For short-term and long-term concerns as might be related to well interference complaints, the mock wells have been designed and will be installed to directly monitor the vibration environment in the rock, as compared to background data (already gathered), and to mimic conditions at domestic water wells in the Project area. For these reasons, the mock well data is of primary importance for directly addressing water well interference complaints. The three mock well systems will be used as the means for vibration data collection during the commissioning phase since these will offer better data as related to the distance-propagation of turbine-related vibrations that will be less likely to be influenced by near-turbine transient vibrations associated with on-going construction. Data will be collected by the data loggers at the mock wells on a continuous basis (24 hours per day) from Commissioning through to Operations. Data will be manually downloaded to Golder computers and the instrumentation systems will be inspected twice per week or more frequently as required by data storage and power systems require.

As noted in the Phase 3A work plan, instruments will be installed on the turbine foundations at turbines T23, T41, T42 and T51. Existing instruments also exist at the T42 site and will be supplemented as part of the Phase 3A instrumentation design for utilization during Commercial Operation of the Project. As part of the commissioning phase, the equipment currently installed and/or being installed on the turbine foundations over the next few months at T23, T41, T42, and T51 will not be used to collect vibration data since construction activity/traffic at these sites is on-going. Any data gathered from foundation-mounted systems and the subsurface monitoring systems at T42 that are in close proximity to the turbine, during the period from Commissioning prior to Commercial Operation, would result in the capture of data that will be adversely affected by construction traffic/activity. Therefore, these systems will not form part of the monitoring program during commissioning.

We trust that this information addresses the technical questions related to the timing and use of some of the instruments that form part of the long-term monitoring plan. If you have any other questions regarding the proposed work plan or require further clarification, please contact this office.

Yours truly,

GOLDER ASSOCIATES LTD.



Storer J. Boone, Ph.D., P.Eng.
Principal

SJB/MEB/cr

CC: J. Vaidhyan, Samsung
Jody Law, Pattern Energy

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