

MEMO



TO: Gary Tomlinson, MOE Senior Environmental Officer

FROM: Darin Burr, Dillon Consulting Limited.

DATE: July 4, 2014

SUBJECT: Response to Ontario Ministry of the Environment (MOE) June 30, 2014 information request regarding Dufferin Wind Power Transmission Line Pole Impact Assessment/Mitigation Measures

OUR FILE: 13-8287

CC: Robb Phiri, Construction Manager, Longyuan Power
David Restivo, Environmental Monitoring Project Manager, Dillon Consulting Limited.
Don McKinnon, Project Manager, Dillon Consulting Limited.
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This memorandum provides our response to MOE questions provided via email on June 30, 2014 to Dillon Consulting Limited (Dillon) regarding Surface Water/Groundwater Interaction at Transmission Line Pole Locations for the Dufferin Wind Farm project. As discussed in our June 16, 2014 and June 20, 2014 technical memorandum, it is our opinion that the risks of the transmission line power poles acting as preferential pathways for surface water to enter into the subsurface and impact local aquifers is very low; however, additional mitigation actions are being put forward by Dufferin Wind Power on a voluntary basis to provide further risk reduction and to address the Ministry's concerns.

Our responses to the Ministry's June 30, 2014 email questions related to this issue are presented below:

MOE Question 1): Submit the complete methodology referenced in the 20 June, 2014 Memorandum authored by Darin Burr of Dillon Consulting for sealing the various utility pole bases identified in the 16 and 20 June, 2014 Dillon Memorandums

Response: In addition to the construction methodologies detailed in Dillon's June 20, 2014 memorandum, a surface seal made of low permeability material will be applied to transmission pole foundations that are located in areas of concern (as identified further below). Although the risk of surface water migrating into the aquifer via the transmission pole foundation and impacting the aquifer is deemed very low, the application of a surface seal, where required, will provide additional mitigative protection.

The seal will be constructed of commercially supplied bentonite clay which is commonly used in the water well and environmental industry. Bentonite is a swelling clay that after hydration forms a semi-solid flexible seal that has a very low permeability (10^{-8} cm/s). The swelling properties of the bentonite will form a tight seal between the clay and surrounding materials (e.g., pole, casing, ground, etc.).

The methodology for installation of the surface seal is as follows:

For new pole installations:

- 1) The interior space between the outer steel casing and the pole (for poles not using caisson construction) will be filled with bentonite clay to a depth of 18" (0.45 m) as measured from the top lip of the steel casing.
- 2) The exterior space between the steel casing and the surrounding native soil will be filled with bentonite clay to a depth of 24" (0.61 m) as measured from the top lip of the steel casing. The width of the bentonite clay seal extending outward from the exterior of the steel casing will be a minimum of 6" (0.15 m).
- 3) Following placement, the bentonite clay will be hydrated.
- 4) Once installation of the seal has been completed, the space between the top lip of the steel casing and the ground surface above it (typically 6" (0.15 m)) will then be covered with native backfill material. In addition, backfill material, including clay material that has been excavated from the pole foundation borehole, will be mounded around the pole foundation and sloped away from the pole to allow positive surface water drainage.
- 5) For poles located in areas of ponded water/wetlands, the steel casing will extend above the anticipated high water level. For these situations, the thickness of the bentonite clay seal on the exterior of the casing will be a minimum of 24" (0.61 m) installed below ground surface. A 18" (0.45 m) thick clay seal will also be installed within the interior of the casing.

For existing pole installations:

- 1) Native soils will be excavated around the pole and temporarily stored on site.
- 2) The interior material between the outer steel casing and the pole (for poles not using caisson construction) will be excavated and then filled with bentonite clay to a depth of 18" (0.45 m) as measured from the top lip of the steel casing.
- 2) The exterior material between the steel casing and the surrounding native soil will be excavated and then filled with bentonite clay to a depth of 24" (0.61 m) as measured from the top lip of the steel casing. The width of the bentonite clay seal extending outward from the exterior of the steel casing will be a minimum of 6" (0.15 m).
- 3) Following placement, the bentonite clay will be hydrated.
- 4) Once installation of the seal has been completed, the space between the top lip of the steel casing and the ground surface above it (typically 6" (0.15 m)) will then be covered with native backfill material. In addition, backfill material, including clay material that has been excavated from the pole foundation borehole, will be mounded around the pole foundation and sloped away from the pole to allow positive surface water drainage. Excavated aggregate will be reused at other pole locations.

The recommended bentonite seal thickness of 18" (0.45 m) in the interior of the casing, and 24" (0.61 m) on the exterior of the casing is based on balancing environmental protection requirements and the structural integrity and safety of the pole foundations. With respect to environmental protection requirements, the depth is deemed adequate to ensure sealing of the annular space during drier summer months and be resistant to short-circuiting from shallow animal burrowing or other soil disturbance/erosion. Soil placed on top of the bentonite and mounded over the pole foundation will provide further protection, by limiting drying of the seal, as well as directing runoff water away from the base of the pole foundations. With respect to the structural integrity and safety of the pole foundations, Dufferin Wind Power has indicated to Dillon that 18" (0.45 m) of bentonite seal within the interior of the casing and 24" (0.61 m) of bentonite seal exterior to the casing will not compromise the structural

integrity of the foundation design. Dufferin Wind Power has stated that a deeper seal may affect the structural stability of the foundation which is not acceptable.

MOE Question 2): Submit a list of Dufferin Wind utility pole locations where the sealing identified in Item 1 above is proposed to occur

Response: Dufferin Wind Power proposes to seal all poles north of Highway 89 and to seal those poles (including new poles, and ones previously installed) south of Highway 89 that are in areas of concern where flooding may occur (e.g., near wetlands/surface water), and where the top of the overburden/bedrock aquifers used for potable water sources are within 2.5 m of the base of the pole foundation. Based on a review of available Water Well Records for wells within 500 m of the transmission line alignment south of Shelburne, the depth of the bedrock aquifer that is used by the vast majority of private wells ranges from 9.8 m to 50.3 m (averaging ~24 m). Nevertheless, based on the MOE Water Well Records, there are isolated areas where the overburden is used as a potable water supply. Pole foundations located within 150 m of these areas where the base of the foundation is <2.5 m from the top of an overburden aquifer used for potable purposes will also be constructed with a surface seal.

An inventory of pole locations south of Highway 89 is currently being completed and a summary of pole locations identified for sealing will be provided as soon as possible.

MOE Question 3): Submit a justification for not sealing any Dufferin Wind utility pole locations identified in Item 2 above;

Response: The justification for not sealing pole foundations that are omitted in Item 2 above is as follows:

- 1) Steel poles involving caisson foundations. With respect to the larger caissons used to support the transmission line's steel poles, the interior of the caisson is filled to 6" (0.15 m) above ground with concrete, and therefore no pathway for surface water migration into the subsurface from the interior of the caisson exists. As a result, the application of an interior surface seal is not deemed required for this situation. The outer sides of the steel caisson will be sealed with 24" (0.61 m) of bentonite seal.
- 2) Poles south of Highway 89 in non-sensitive areas. These poles include locations where no surface water features are present and in areas where there is at least 2.5 m of lower permeability material (clays, silt/clay or clay till) separating the base of the foundation (depth ranging from 6 to 9 m) with the top of the potable water aquifer used by wells within 150 m of the pole location. The 2.5 m value is based on the minimum depth of annular seal required in a bored well where the water producing horizons are shallow (O.Reg. 903, Section 14.2 (2).2.)

MOE Question 4): Submit a work plan\schedule for the work identified in Items 1 and 2 above to be started and completed.

Response:

North of Highway 89

Dufferin Wind will install seals on all pole installations north of Highway 89. To date, 104 of the 216 power poles that will be located north of Highway 89 have been installed. Dufferin Wind will commence to retrofit seals on these previously installed power poles starting July 8, 2014 and expects to be complete with this retrofit seal work by September 15, 2014.

*Technical Memorandum
Dufferin Wind Farm Project Transmission Pole Impact Assessment*

South of Highway 89

Dufferin Wind will install seals on all pole installations south of Highway 89 as per the standards outlined above. To date, 132 of the 174 power poles that will be located south of Highway 89 have been installed. Dufferin Wind will commence to retrofit seals on a select number of these previously installed power poles starting July 8th, 2014 and expects to be complete with this retrofit seal work by September 15, 2014. Dufferin Wind will work with the MOE to identify those power pole locations south of Highway 89 that require seals.

Respectfully submitted,



Darin Burr, M.Sc., P.Ge.
Dillon Consulting Limited

