

**STATE OF NORTH DAKOTA
PUBLIC SERVICE COMMISSION**

**Meadowlark Wind I, LLC
New Frontier Wind Energy Project–McHenry County
Siting Application**

Case No. PU-11-69

**Staff Comments on April 17, 2018 Meadowlark Wind Late-Filed Exhibit 5
April 20, 2018**

Page 1 – Part 2 Composition of cement grade subgrade stabilization: The stabilization material contains nothing toxic or toxic forming. They indicate that it will be a 6% mixture by weight. Assuming that the stabilizing material will be incorporated 4” deep, which would mean that nearly 500 pounds would have to be applied per acre. It is not clear to what depth the material will be applied.

Part 2 - Testing and Stabilization Procedure: The instructions indicate to remove a ±4” layer of topsoil, add 6% stabilizer by weight, incorporate the stabilizer, and then compact the subgrade. Removing only 4” of topsoil would mean that the stabilizer would be added to the remaining in-situ topsoil and for the most part would not be in the subsoil. In the coal mining/reclamation world, this would be an unacceptable practice.

Calcium: A Central Regulator of Plant Growth and Development: This paper summarizes the role of calcium in plant growth and development. While calcium is essential for plant growth, it is important to note that calcium is a very common component of almost all North Dakota soils. (the light colored patches you see in a cultivated field usually are due to lime or calcium carbonate) I am not aware of any calcium deficiencies in ND. Most ND soils are alkaline in nature, primarily due to lime or calcium carbonate. Soils over much of the eastern US are acidic in nature and often require the addition of lime to make them more alkaline. There is no need to apply lime to ND soils since they are already alkaline. While mild alkalinity is good, strong alkalinity can be deleterious to plant growth.

Farm Show Article “Cement Dust Fertilizer Achieves Amazing Results”: What this article is referring to is the benefits of adding cement dust it a fertilzer blend and the resulting increase yields. Again, this article references case studies performed in Missouri, Illinois, and Louisana, all states with acidic soils that will benefit from the addition of lime.

1906 Soil Survey of the Cando Area: This publication cites the benefits of a lime soil. As previously noted, nearly all soils in ND are limey or alkaline and do not need additional lime. While many of the concepts in 112 year old publication are still valid today, a much more recent Soil Survey of Towner County has been published.

Soil Reclamation of Abandoned Mine Land by Revegetation: A Review: This paper goes over some basic soil handling and reclamation procedures. The most important take away for me is

on page 2.2.7 where it addresses the effects of stockpiling on soil microbial population. The report acknowledges an increase in anaerobic (not dependent on oxygen) bacteria and a decrease of aerobic bacteria (dependent of oxygen) in the stockpiled soil materials. However, the report indicates that once the soil is removed from the stockpile and reinstated (respread), aerobic microbial populations rapidly re-establish and are often times higher than the normal level. This is very consistent with what we see with stockpiled topsoil at the mines once it is respread.

Restoration and Revegetation Strategies for Degraded Mine Land for Sustainable Mine Closure:

This paper stresses the importance of topsoil salvage and respread in successful reclamation. The paper discusses that respread of topsoil onto a permanent surface is preferred to stockpiling and that rehandling of the soil material is discouraged.

My Observations:

- The cement based stabilization product should not be added to topsoil. The very reason we have the nice, dark black topsoil on the northern plains is because the lime (calcium carbonate) has been leached out the upper layer into the subsoil. Our in-situ topsoil has very little calcium carbonate in them; however, the in-situ subsoil is high in calcium carbonate. The recommended practice for adding the soil subgrade stabilization product (cement based) is to only remove 4" of topsoil and incorporate the cement into the remaining topsoil. The recommended practice is also to compact the subgrade surface. In this case, that would mean compacting the remaining in-situ topsoil. This would not be allowed in a mining situation.
- I do not think the cement stabilization material will "dissolve" or otherwise disappear in the short term. Think of concrete, even poor concrete, does not dissolve. It took mother nature thousands of years to move the calcium carbonate in the upper 12" of the soil profile to the lower soil profile. It does not dissolve, but rather it moves by translocation with time (e.g., hundreds of years)
- Direct respreading of soil materials is preferred to stockpiling of soil materials. Mines prefer not to stockpile because it is expensive as it requires a double handling of the material, requires additional areas for stockpiling and can increase soil compaction. However, there are times in the life of every mine when stockpiles are necessary. There are currently millions of cubic yards of topsoil and subsoil in stockpiles at the mines. It has long been known that stockpiling decreases the microbial activity of the stored topsoil. However, experience and research has shown that soil microbial levels quickly return to normal levels in relatively short periods of time (less than 2 years).
- We tend to discourage rehandling of soils at the mines to the extent possible. On occasion it is necessary to remove soils from an area that has been respread; however, the mines and we try to minimize the number of times this occurs. Each time the soil is handled, there is a small loss just due to removal inefficiencies and compaction. The Falkirk Mine feels that there is a 10% compaction loss in topsoil due to equipment handling and that there is a 1" interface loss due to removal inefficiencies. So if you removed 12" of topsoil and directly respread it, there would likely only be 10" of topsoil. Now if you removed it again, there conceivably would only be 8" available. That may

not be totally accurate as there is some “compaction rebound” in the reclaimed soils; but there is a real loss of material due to removal inefficiencies every time it rehandled. These losses are less in a stockpile as only the very base is affected by the removal inefficiencies but this losses are more likely when a respread area is stripped again.

In short, in a situation similar to this at the mines, we would require them to removal all the topsoil, stockpile it and then respread it on the area upon reclamation.

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