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MEMO

To: Marsha Spencer-Famous, Senior Planner, LURC
From: David P. Rocque, State Soil Scientist
Re: Kibby Expansion Wind Power Project
Date: January 29, 2010

After reviewing the subject application, I offer the following comments:

1. The 0.6 mile long *temporary skidder road for clearing* of the ridgeline. The soils where this skidder road will be constructed are cryic and have thixotrophic properties meaning that they rut easily. This activity is proposed to take place in late summer which is a good time to do so but care must still be taken to avoid rutting. Rutting can alter the natural hydrology and cause erosion and sedimentation. Will this activity be under the supervision of the land owner or TransCanada? I would like to see TransCanada supervise the clearing so that it is done appropriately.

2. *Acid Rock Testing and Mitigation Plan*: There are a number of issues I have with the proposed plan to deal with any acid rock that may be encountered.

    a. For temporary mitigation measures, *Neutralization* does not seem like a good option to me. It consists of placing a high pH material in drainage ditches (which may or may not exist in the blast area) immediately down gradient of the blast area. My concern is that there are likely to be fractures in the blasted rock that will allow acid water to move into the groundwater table. *Removal* would help regarding any blasted rock that is acid but you would still have the exposed faces of the blast area. *Isolation* seems to me to be the best option to protect groundwater and adjacent areas.

b. For permanent measures, I question all of the listed options. All three options can only be done if the acid rock is at least 10 feet above the groundwater table. In the mountains, the groundwater table (and/or bedrock) is generally very near the soil surface which would mean that only areas with over 10 feet of fill would be eligible for these measures. *Encapsulation* requires the use of a considerable amount of clay including 1% -3% slopes and they require an internal drain pipe in the cells to drain infiltration water. The clay will need to be imported and will be a challenge to stabilize. The infiltration pipe may allow acid water to escape. *Cut Slopes* require clay cover along with a more extensive cut face to create a slope that can be covered with clay. Shotcrete would be a better option than clay. Blasting could also cause the bedrock to fracture and allow up gradient groundwater to flow into the blast area unless sealed.

c. It is my opinion that any acid rock blasted should be disposed of somewhere else. Not in or on a protected and fragile natural resource (high mountain areas). And, any exposed acid rock faces should be isolated as permanently as possible.

Exhibit B-14 Soils and E&S and Stormwater

3. *Permanent Diversion Channels* (page 3-5): I am not sure what these are but if they are to be excavated into the soil deep enough to intercept the groundwater table, they will result in the alteration of the natural hydrology. Permanent diversions for surface runoff should be a shallow ditch or should be a constructed ridge so as to protect the groundwater table and only permanently divert runoff water.
4. *Silt fencing* and erosion control mix berms are discussed as being interchangeable. That is usually the case but not in the mountains. The mountains have unique hydrology and soils. In some instances, where the surface of the ground is quite irregular and very stony with organic duff on the stones, use of silt fence is actually counter-productive. In those cases, silt fence should not be an option. As was observed on the Kibby project, the ditching for silt fence along side one of the roads under construction created a channel through very stony soils that shallow groundwater became concentrated in. In fact, no temporary erosion control barrier may be needed in some areas. I suggest restricting silt fence to only those areas where it is appropriate and useful. It may be advisable to have a pre-construction meeting with the contractor, the 3PI and myself to make sure the contractors understand where to use and not to use silt fence. I understand this runs counter to what contractors are taught but mountains are not like the usual places they work.

5. What are *Isolated Seeps* (page 3-12)? How are they different from continual seeps? Will they be re-connected similar to continuous seeps?

6. *Cross culverts* are suggested as being installed within or *below stone bedding* (I presume of a rock sandwich). Culverts should be installed at least a couple of inches above the bottom of a rock sandwich (unless the culvert is to be installed in a concentrated flow area that is located in a wetland) so the rock transmits water to the other side until the volume becomes too great for it to handle. That is when the culvert should be utilized. It should act like an emergency spillway.

7. The use of *corduroy* is discussed on page 4-3. The discussion states it will be used in wetlands that are not anticipated to have standing or flowing water or saturated soils that are soft at the time of crossing. If the wetland is mineral soil, corduroy should not be needed unless the soils are soft. If the wetland is organic soil or has a thick organic layer on top, a timber mat would be more appropriate. Corduroy might be a good measure to use for crossing somewhat poorly drained soils or soils with oxyaquic conditions in the upper part when they are saturated. Corduroy should not be used in wetlands where the logs may become embedded and then have to be removed. This use seems to conflict with Wetlands on 4.2.2 where rock sandwiches are proposed to be used in wetland crossings and page 5.6 where corduroy will only be used as a last resort and then only in consultation with LURC, DEP and ACOE.

8. Page 4.2.2, Construction in Wetlands, *transmission lines* should take into consideration areas that are not wetlands but are still wet such as soils with oxyaquic conditions in the upper part, groundwater seeps etc. If such areas are not crossed properly, it can be difficult to re-connect the hydrology (as evidenced with the Kibby project transmission line). It is much better to cross them properly than to have to repair the hydrology later. I would like to see a discussion in the application of how such areas will be crossed such as only during the time of year that the ground is frozen, use of corduroy or log mats etc.

9. Page 7-2 again discusses *silt fence* as being allowed although E&S mix berms are preferred. This should be revised so it is not an always an equivalent alternative or even allowed. Sometimes, no temporary erosion control measure is needed, as stated above. Flexibility should be included so that only the correct measure is used and only where necessary (it should only be used where it will serve the purpose for which it is being installed). Otherwise it is a waste of time and money and may even be counter productive.

10. Page 8-1, Treatment of Concentrated Flow. This section allows for the use of *staked hay bales in swales*. I do not agree unless it is for a very short section of swale that is above the groundwater table (usually has no water in it). Rock or log check dams are much more effective and should be used. Mountains have more water to deal with than lower elevation areas making hay bale

check dams even less effective. Hay bale check dams are not the equivalent of log or rock check dams.

11. Page 9-2, *temporary seeding*, is a practice that is recommended for use in disturbed soil areas between April 16 and October 31 if the area has not been permanently stabilized within 30 days. Temporary seeding may be a good practice for lower elevation areas but not for the mountains. The seed can introduce invasive species and it does not recreate the natural vegetative community for the mountains. I would prefer to see hay mulch (tacked down), E&S blankets and/or erosion control mulch used.

12. Page 9-4, *permanent measures*. This section only includes a discussion of loam, seed and mulch for permanently stabilizing an area where the soil was disturbed. I do not believe that approach is appropriate for the higher elevation areas. I strongly recommend eliminating loam and seed and replacing it with erosion control mix which simulates the natural substrate much better and does not need to be maintained. The mountains do not have suitable topsoil for seeding so it would need to be brought in and then becomes a threat for sedimentation. E&S mulch is a much better option that does not need maintenance and will naturally re-vegetate. It is an acceptable permanent stabilization measure for lower elevation areas.

13. Page 10-2, table 8 (and 11-2), shows *temporary seeding* in uplands as being not required but allowed. This should not be an option for high elevation areas, as discussed above.

14. Page 10-3, (and table 9) indicates that *disturbed areas in wetlands* will be stabilized by *permanent seeding*. I do not agree with this practice. Wetlands should be repaired by replacing the top layers (muck and/or organic soil materials) that contain seeds, roots etc from native plants. If that is not possible for any reason or sufficient, I recommend using Erosion Control Mulch that could be mixed with some of the top layer material. This will more closely simulate the natural condition in the wetland and encourage native vegetation to re-colonize it.

15. Page 11-3 Timing of Restoration discusses *"finished grade, seed and mulch"*. It should also include the use of E&S mulch which does not need to be seeded and mulched and is the option to use in high elevation areas.

16. Page 12-1, *Supervision and Inspection*. Because of the uniqueness of high elevation areas (soils and hydrology), standard techniques are not always the best approach to construction. I understand the need for completing an application which includes what is anticipated to be used but would like the application to include the flexibility to allow for diverging from the construction plans, upon consultation with myself, the 3PI and the regulator. Lessons learned from the Kibby project included cases of where some

practices or measures were used when they were not needed or the best approach. When I questioned the contractor about the use of the practices, they would indicate that they knew the practices were not needed or the best approach to use but did so anyway because they were "specified on the plans". In order to achieve the ultimate goal of completing the project by balancing cost, practicality and environmental concerns, a site specific basis is often times the best approach, particularly in challenging areas (high mountains). Since construction in the mountains is new to all of us, we can not always anticipate the most appropriate approaches. Flexibility would help overcome that deficiency.

17. *Typical Road Section – Wet Areas*. This detail calls for 2"-3" stone in geogrid over filter fabric. I am not sure how well goegrid filled with stone would transmit water from one side of a road to the other. Unless I am mistaken, a standard rock sandwich would be more appropriate. It may be fine for small wet areas where there is no surficial hydrology connection.

18. Civil Details (construction drawings) – Some of the road cross-section details such as R/C2 (drawing C-2) show a significant cut on long slopes with a ditch at the upslope edge of the road. If the slope is long enough and has a large enough contributing watershed, even if the soil is shallow to bedrock (20" as shown on the soil map for R/C2) there will be a significant amount of groundwater intercepted in the ditch. In those cases, I would like to see a rock sandwich, under drain pipes outletting to a header pipe at the toe of a rock fill road or, at the minimum, cross-culverts used to re-connect the natural hydrology.

19. Many of the fill extensions are shown on the plan and profile sheets as being 3:1 or less steep. Such a gentle fill slope is not necessary if blasted rock is to be used as the primary fill material. A fill slope of 2:1 or steeper is acceptable when blasted rock is the primary fill material. A fill slope of 3:1 or less would be costly and will require the alteration of much more high mountain area than is needed. I am concerned that if the plan shows such shallow fill slopes the contractor will believe they are obligated to follow them and cause a more significant impact on the mountain than there should be (Tower T-1 is a good example). I therefore, recommend revising the plan to show a steeper fill slope and maybe including a note that fill slopes are not to exceed 2:1 unless otherwise specified.

20. There are a couple areas where it appears a rock sandwich and/or a culvert may be needed but are not shown on the plans. Sheet C-6, station 8+50+/- is one and sheet C-8, station 7+50 +/- is another. Sheet C-6 shows a plunge pool but no culvert near station 7+50. These can be confirmed by an on-site visit this summer. It also looks like a culvert is needed on sheet C-3, station 78+50.