STATE OF VERMONT
PUBLIC SERVICE BOARD

Docket No. _____

Petition of UPC Vermont Wind, LLC for a Certificate of	)
Public Good pursuant to 30 V.S.A. section 248,	)
authorizing it to construct up to a 52 MW wind electric	)
generation facility, and associated transmission and	)
interconnection facilities, in Sheffield and Sutton, Vermont,	)
and operate the same.	)

PREFILED DIRECT TESTIMONY OF RALPH NELSON

ON BEHALF OF UPC VERMONT WIND, LLC

February 21, 2006

Summary:

Mr. Nelson provides information on site design, stormwater, soil erosion, and land impacts as they relate to the Sheffield Wind Farm's compliance with the water pollution, waste disposal, soil erosion, water supply, and traffic criteria under section 248(b)(5).

Q Please state your name and occupation.

Response: My name is Ralph D. Nelson, Jr., PE. I am currently an employee of Devine Tarbell and Associates (DTA). I work on civil engineering and permitting for various residential, commercial and industrial site design projects as a Senior Civil Engineer.

Q Please describe your qualifications and experience.

Response: Please refer to my resume, attached as ***Exhibit UPC-RN-1***. I was educated at Northeastern University, and received my BSCE in 1981. I am a registered professional engineer in the State of Vermont. I have 23 years of experience as a civil/structural, hydraulic engineer in the planning, licensing and permitting support on hydroelectric and heavy industrial projects. This experience includes project and lead engineering experiences on several wind projects.

DTA has been contracted by UPC Vermont Wind, LLC (UPC), to contribute to the design work at the Sheffield Wind Farm. To that end, I have familiarized myself with potential wind turbine components and Vermont's permitting processes.

Q Have you previously testified before the Public Service Board?

Response: No, I have not testified before the Vermont PSB.

Q What is the purpose of your testimony?

Response: I will testify about site design, stormwater, soil erosion, and land impacts as they relate to the Sheffield Wind Farm's compliance with the water pollution, waste disposal, soil erosion, water supply, and traffic criteria under section 248(b)(5).

Q Please summarize the investigations, analyses, planning, and engineering you conducted regarding the proposed Sheffield Wind Farm.

Response: DTA was responsible for the coordination of various subcontractors involved in the mapping of sensitive environmental resources including wetlands; rare, threatened and endangered species; and large mammal habitat, as well as the aerial photogrammetry used for the Project. DTA used this information, along with the construction and operation requirements provided by UPC, to prepare 20% design plans for the Project. I believe that this level of design is adequate to assess impacts discussed later in this testimony.

Q What was the objective of the design work that you performed?

Response: The objective was to design project roadways that will provide adequate site access for both construction and operation of the wind farm, as we avoided impacts to sensitive environmental resources within the project area. Further, as part of these preliminary design plans, we have considered various means to control and reduce the stormwater flows and the potential for erosion. As discussed below the exact details of stormwater and erosion control will be incorporated in the final design.

Q Please describe the components of DTA's work.

Response: DTA has prepared preliminary plans that show the turbine locations, the extent of clearing, the turbine foundations, the location of the substation required to connect to VELCO's 115 kV transmission line, and the local access roads that will be required for the installation and operation of this facility. These drawings were prepared based on the 2-ft contour aerial survey mapping of a "corridor" along the ridgelines and existing roads performed by Aerial Survey and Photo, Inc. of Norridgewock, Maine. See ***Exhibit UPC-RN-2***. Other design features, such as the location of the underground and overhead electrical collection system is being designed by others (see the prefiled direct testimony of Daniel Crocket).

In addition, DTA has prepared a framework of the erosion prevention and sediment controls that could be utilized for construction of this Project. This document is conceptual and not meant to be the final, site-specific plans that will need to be submitted to ANR as part of its permitting requirements. This conceptual plan is attached as ***Exhibit UPC-RN-3***. We have not proceeded with the final design level efforts at this time because the layout and construction aspects may change during the section 248 process.

Q Please describe the results of the iterative design process that has been undertaken.

Response: Developing the layout of this project is best viewed as having been a "living" design process. The original turbine locations were proposed by UPC based,

in part, on elevations and economics. One of the first iterations of the project layout included more than 35 wind turbines. We provided a project "envelope" encompassing all the anticipated impact areas for the project along with a 300-ft offset. This layout envelope was investigated by environmental and engineering experts retained by UPC. For a variety of reasons, including wetlands, habitat, visual, and engineering considerations, the number of turbines has been reduced from 35 to the current 26 and has resulted in the relocation of the turbines in many areas to minimize impacts to the extent practicable. This process has been on-going and the current proposal avoids and minimizes impacts to a very great extent and to the point where they do not cause an undue adverse impact to the environment. That being said, additional modifications may be considered, in consultation with ANR and through the 248 process, to further reduce impacts on bear-scarred beech trees and possibly on the Class 3 wetlands.

The resulting layout was designed to use the existing logging road network as much as feasible to minimize the impacts to wetlands, streams and wildlife habitat as much as practical. On the project plans and layouts provided as part of this permit application, the on-site roads are identified on the plans as those that will be upgraded for use and those to be constructed. The existing roads to the ridgelines were constructed to support logging operations, and the Project's proposed use is not dissimilar. Logging vehicles are very large and heavy. This is typically heavier on a per axial basis than the proposed wind project loads. In contrast, our proposed access vehicles require more grade and dimensional control for the roads due to the size of the cargo. Therefore, the upgrades on the existing access roads are

anticipated to include, in part, slight widening of the road surface in some areas, minor clearing of vegetation along the shoulder and overstory edges and repair/replacement or reinforcement of the culverts.

The proposed new access roads along the ridgelines and between turbines are designed based on the dimensional controls from construction vehicles, including the construction cranes and trucks. The construction of the proposed roads will included clearing of the vegetation, grubbing of the stumps and roots, removal of any topsoil and overburden, fill or removal of rock as needed to make the required maximum finish grade of 15% and the addition of cover material to allow movement of construction equipment. The final roads will be a nominal 16 feet wide. Those roads requiring construction crane passage will have additional 10 foot shoulders on both sides, creating a temporary construction width of 36 feet. Following the completion of construction these shoulders will be allowed to naturally re-vegetate.

The project considers two access points off of the local public road network. For the southern array access will be gained via an existing access road off of Hardscrabble Road. For the northern array access is via an existing logging road off of Dareios Road. Further discussion of the access routes is provided in the prefiled direct testimony of Cowan/Rowland/Vavrik.

In addition to the road network, I was responsible for assisting the UPC meteorologist in determining the final locations of the turbines along with the location of the substation and maintenance building. The substation was originally

located on the northern side of the access road depicted on the project layout. This substation was relocated twice to the south to avoid wetland impacts.

The maintenance building will serve as the office and warehouse for operation of the Project. The maintenance building's location is to be finalized following additional field work to delineate wetlands and other potential impacts. The two proposed on-site locations include: 1) at the edge of the existing gravel pit adjacent to the existing access road which runs from the substation to the northern array; and 2) further uphill on the existing access road for the northern array in an area of cutover land. In addition, off-site leased locations are being investigated by UPC. The final location of this building will be, in part, dictated by adequate soils for on-site septic disposal and avoiding habitat impacts. The maintenance building will have approximately 6,000 feet of cold storage and a heated office area. A water well will be installed to provide potable water for workers and for sanitary flows. An on-site septic disposal system will be designed and constructed. The water and wastewater systems will be designed in compliance with the local and the State of Vermont rules for such systems and good engineering practice.

Q Will the project cause undue water pollution, and will the project meet all applicable state regulations regarding stormwater and waste disposal?

Response: The project will not cause undue water pollution. The project will meet all applicable stormwater and waste disposal regulations.

The perceived *potential* water pollution sources include, but are not limited to, motorized equipment fuel or oil, hydraulic fluid, eroded soil and/or roadway materials, turbine lubricants or miscellaneous debris. Specifics will be elaborated upon prior to construction through the Vermont NPDES Construction General Permit's Notice of Intent but at this time I expect that the project will address the following element to protect water resources:

(1) Fuel storage or fueling equipment will be located a safe distance from wetland resources and surface waters;

(2) Prompt cleanup of any spills of fuel, motor oil, hydraulic fluid or cooling oil, and documentation of same. During the construction phase, the potential sources of groundwater contamination will be fuel, and hydraulic and lubricating oils used by the operation of vehicles and construction equipment. Spills of these substances from vehicles or equipment are typically small and of short duration and, when properly cleaned-up, should not pose any risk to water quality. The contractors and subcontractors that will access the project site will be trained in UPC's protocol for responding to, and preventing spills. The protocol will provide descriptive procedures for safe storage and handling of materials in order to prevent spills and, in the event of a spill, spill reporting procedures, emergency contact telephone numbers (including state and federal environmental agencies), and oil spill cleanup guidelines. In the event of a spill of oil or hazardous material, employees will be trained to promptly contain, report, and cleanup the spill in accordance with these procedures. In addition, as a standard

operation procedure, all operational vehicles are planned to carry an oil spill kit that contains material for conducting initial containment and cleanup of spills. Based on normal operations and the characteristics of a routine spill cleanup, there is no need for any ongoing groundwater monitoring.

Post-construction operation and maintenance of the wind turbines and substation will involve the use of common lubricants, hydraulic fluids, petroleum products, or other chemical products. These products are typically integral to the equipment used on site, such as in the nacelle, oil-filled transformers in the substation, capacitors, batteries, or other apparatus. Based on our understanding of the volumes of materials utilized in each turbine and/or typically stored within the maintenance building as part of the operations, only the transformer within the substation triggers the requirements of an SPCC plan. The SPCC plan will be developed within six months of beginning oil storage activities at the site. VELCO, who will own the transformer, will be responsible for developing and implementing the SPCC Plan.

(3) Secure containers for all chemicals and petroleum products on site. Storage of containerized chemical products used for maintenance on turbine and substation sites is limited and incidental, and will be contained in the operational and maintenance building, the substation's control house building (if necessary), or off-site. Examples of these products include lubricating oils, aerosol lubricants, non-chlorinated dielectric solvents, and pesticides (hornet or wasp spray). Bulk

quantities of petroleum products, pesticides, herbicides, fertilizer, or other products will not be stored on site;

(4) Erosion Prevention and Sediment Control, as discussed in more detail below.

(5) Class A Waters: Within the Passumpsic basin, the only Class A waters are those located above 2500 feet. There are no waters within the project area located above 2500 feet. Turbine T-3 is located at elevation 2522', but represents only one acre of temporary clearing and 0.1 acres of permanent impervious surfaces. Five stream crossings of Class B waters at lower elevations will be required, as shown on the site plans.

Q Please describe how stormwater will be addressed for the Project.

Response: Due to creation of more than one acre of impervious surface from the construction of the turbine foundations and the like, a permit from the State of Vermont's stormwater program for new development will be required.

I have reviewed the treatment standards contained in the Vermont Stormwater Manual and have met with representatives of this program on a number of occasions. All stormwater management aspects of this project will be designed for Water Quality, Recharge, Channel Protection, Overbank Flood and Extreme Storm conditions. Subject to further discussion with ANR, the preliminary design concepts are as follows:

(1) Water quality treatment will be designed to remove 80% of total suspended solids and 40% of total phosphorus load. The Water Quality Treatment Standard will be addressed during final design using combinations of stormwater credits, such as non-rooftop disconnection credits for discharge to a vegetated pervious area, the natural area conservation credit, the use of infiltration devices, and the use of water quality ponds where required.

(2) Channel Protection. The final design of the project will address the Channel Protection Treatment Standard through the combined use of stormwater ponds, stormwater wetlands, infiltration, filtering practices, and open channel practices. There may be areas of the project that qualify for the Channel Protection Treatment Standard waiver where post-development discharges are less than 2 cfs to qualifying drainages. Wherever possible, stormwater will be directed off the new impervious surfaces through sheet flow and across a vegetated buffer. Any concentrated flow will be frequently channeled beneath and away from the road, to both reduce the accumulating stormwater volume and to better maintain the existing hydrology. In addition, the nearer to wetland resources and other receiving waters, the more detailed the analysis will be for channel protection and flow attenuation. Even if the criteria for a waiver for Channel Protection are met, permanent controls of some nature will be provided.

(3) Groundwater Recharge Treatment is typically provided via an infiltration trench or surface sand filters, or dry swales or grass channels. Wherever possible, nonstructural groundwater recharge methods will be employed; examples include

sheet flow into stream buffer or open vegetated swales. The standard will be addressed during the final design, but it is anticipated that the standard will be met through the discharge of site runoff across permeable areas, rip-rapped slopes, or wood-chip covered areas.

(4) Overbank Flood Protection and Extreme Flood Protection will likely be provided by the same structures as those for channel protection. Initial analysis of the site hydrology shows that the peak flow values and runoff volumes for the 1-, 2-, 10-, and 100-year precipitation events from the site are not increased significantly, owing to the small increase in impervious area and the location of the new impervious at the uppermost portions of the basin. I anticipate that the new stream crossings will be designed to provide detention in order to reduce peak flow values, further reducing downstream peak flow values. The Flood Standards will be reviewed in the final design process. Vermont generally requires a downstream analysis for projects of more than 50 acres and where on-site impervious cover is greater than 25% or when deemed appropriate by the ANR. If required by ANR, the final design will incorporate a downstream analysis for the 10-year and 100-year event following the 10% rule.

Q Please describe how waste disposal and oil containment will be addressed for the Project.

Response: The operations and maintenance building sanitary flows will be treated via an on-site absorption system constructed consistent with Vermont's

requirements and best engineering practices. Facility solid waste is expected to be minimal, and would be collected and disposed similar to any dwelling in the town. No open burning of trash will be allowed. Heat to the building will be provided through a propane-fired or oil-fired hot air heating system. The only wastes that may require special handling would include lubricating oils and hydraulic fluids generated by the on-going maintenance of the wind turbines. All wastes generated by the operation of this facility will be collected, containerized, transported and disposed of in accordance with all applicable Vermont and Federal standards.

Fluid containment. The tower, foundation and nacelle structure would provide a measure of secondary containment. Given the lack of a watertight seal between the tower and nacelle, this containment is not complete. However, the majority of fluid released inside the nacelle would be contained inside this complex. Each nacelle is designed to contain any spills from the internal equipment. Therefore, the greatest exposure is during construction or component replacement. Oil stored on site during the construction efforts will be in approved containers, which will be 55-gallons or less. These containers will be stored in an area protected from the elements with adequate secondary containment to contain a spill of the largest container. Such containment will be sufficient to ensure the protection of the water supply, public health, and worker safety.

Q Will the project cause unreasonable soil erosion or reduction in the capacity of land to hold water so that a dangerous or unhealthy condition may result?

Response: The Project will not cause unreasonable soil erosion, nor reduce the land's water capacity so that a dangerous or unhealthy condition will result.

The project will be phased to limit the amount of open and exposed soils. Further, the amount of land cleared for this project has undergone the same iterative process as the location of roads and turbines in an effort to reduce the amount of clearing as much as possible. The current amount of cleared area for this project has been reduced to approximately 120 acres. Once the construction has been completed all construction staging/laydown areas and road shoulders will be allowed to naturally re-vegetate. This represents approximately 105 acres (or 87%) of the total 120 acres cleared for construction purposes. The remaining approximately 15.4 acres will remain permanently cleared and is considered to be the limit of new impervious surface.

As required under the NPDES Construction General Permit for construction activities that will disturb more than 5 acres of land, a project-specific Erosion Prevention and Sedimentation Control (EPSC) Plan is required. This plan will specify design elements required to stabilize erosion-prone soils and disturbed soils within the construction area of the project. Since the specific layout of the project may be modified as a result of the section 248 process, and due to on-going discussions with ANR on both erosion and stormwater issues, we are providing a number of sheets of typical erosion control practices that will likely be used for this

project. The detailed erosion control plan and permit will be prepared well in advance of construction. A conceptual erosion control plan is attached as ***Exhibit UPC-RN-3***, and EPSC drawings at ***Exhibit UPC-RN-2.*** Some of the general elements of the EPSC Plan are described here.

As part of our on-going development of the erosion control plans for this project, I have reviewed the *Vermont Handbook for Soil Erosion and Sediment Control on Construction Sites*. This site would not be considered a low-erosion potential environment, given the nature of the work to be performed and the setting, i.e., there will be locations with more than two acres disturbed at one time, there are stream crossings, and most notably the mountain slopes are frequently more than ten percent. I have thus considered the erosion potential of the situation in conceptualizing road designs for the Project.

Drawing C-101, sheet 4 of 5 of the preliminary project drawings ***(Exhibit UPC-RN-2)*** is an example plan and profile design drawing, which illustrates a challenging section of the proposed access road, where erosion potential exists. The access road is designed to provide construction and crane access from Turbine No. 7 downslope to Turbine No. 14. To accomplish this the proposed road reaches a maximum grade of 14.9 percent for over a quarter mile. The grading for this section of road features lengths of rock excavation and sections of fill.

Exposed cut and fill slopes depicted on this plan will require surface protection through the use of upslope diversion berms, rip-rap protection, and mulching and netting. Exposed rock cuts will not require protection, as they do not

present an erosion risk. The ditches along the roadway will be rip-rapped to resist the erosion forces of the concentrated runoff, and will have rock check dams to slow the water velocity and trap sediment. The ditches will flow to cross drainage culverts having stabilized inlets and outlets, which will convey the runoff under the road and re-distribute the runoff to adjacent natural vegetation.

Erosion controls will be implemented prior to construction-related soil disturbance activities being initiated within a specific area. In addition, stormwater controls will be implemented concurrently with the construction activities that require such measures (i.e., road construction). Where necessary, temporary controls will be constructed and maintained until the permanent controls are in place. At a minimum, specific techniques would include:

(1) Diversion Channels: There will be diversion channels, berms or dikes, installed outside the perimeter of cut areas to control runoff flowing into the excavation site. Since such cut areas will likely extend for substantial distances, there will be periodic stone or sodded channels (slope drains) to carry the water down the slope (where those cut slopes are not in bedrock), to the road ditch, through the road cross drainage and discharged through a stabilized outlet. Frequent road cross-drainage in steep terrain will reduce the water volume in the channels and help to maintain the mountainside hydrology.

(2) Undisturbed Buffer: Wherever possible, there will be an undisturbed buffer strip of vegetation of at least fifty feet down hill of all construction areas. As

this is not possible in some areas, additional measures will be employed to protect those Class 3 wetlands that are closer than 50 feet such as the use of silt fences and erosion control berms.

(3) Seed and Mulch: Disturbed soils will be mulched at the end of each day as necessary. The areas that have achieved finished graded slopes will be seeded and mulched within a week's time. Mulch could be: weed-free straw (placed loose on gentle slopes); an erosion control and re-vegetation mat (ECRM) that is stapled to slopes (swale bottoms, concentrated flow areas, long slopes with more rilling potential or slopes greater than 3:1 slope); or, the standard mulch incorporated into hydroseed mixes (small areas, gentle slopes). The mantra of mulching quickly and minimizing disturbance areas will be an important element on this site. During construction, the slopes will be routinely roughened to improve infiltration characteristics (typically, running a bulldozer up/down a slope). Also, the finished and seeded roadway segments will have interceptors, to reduce erosion until plants are established.

(4) Erosion Control Mix Berms: Erosion Control Mix Berms are an engineered mixture of shredded bark, grindings, composted bark, wood chip and soils, and have been used effectively as an alternative to silt fence. They would likely be preferred over silt fencing in less accessible locations, areas of shallow depth to bedrock, on steep slopes (where silt fence is an issue), and crossing swales (then, built like a check dam).

(5) Snow Fencing: Snow fencing will be placed along down gradient slopes, at least within one hundred feet of any Class 3 wetland resources. Where impacts to the Class 3 wetlands will be occurring during the construction activities, the limits of construction (hence impact) will be demarcated with additional snow fencing. Such fencing will serve not so much as an erosion control but more as a visual barrier for construction activities to prevent damage to wetlands.

(6) Silt Fence: Silt fence will also be installed at select locations to collect sediment. Silt fences may be used in combination with a hay bale buttress, as shown on the conceptual EPSC Plan drawings. I do not recommend the use of hay bales alone, as hay bales are frequently improperly installed.

(7) Downslope Dike: Downslope erosion control mix berms or dikes may be used as an alternative to silt fence on gentle slopes. Near wetland resources, downslope dikes may be used in conjunction with silt fences or other control devices. The berms could direct runoff away from wetlands; while the silt fence will serve as backup should the diversion dike become clogged during a significant rain event. The silt fence or additional snow fence will also serve as a visual cue for equipment to not disturb the dikes and other control devices. The dike could remain in place following construction to encourage infiltration of water.

(8) Stone Check Dams – Stone check dams will be used along the new road ditching to control ditch velocity and to trap sediment, as shown on the sample EPSCP detail sheet.

(9) Erosion Control/Stormwater Monitoring: Independent monitoring personnel will be employed as required in the stormwater/erosion control permit conditions, to observe, inspect and document control performance and maintenance/repair activities. All such erosion control measures will be inspected weekly and immediately following storm events of more than ½-inch rainfall as recorded at an on-site rain gage. The specifics of observation, inspection, record-keeping, maintenance and repair will also be in compliance with the specified permit conditions. I have provided a discussion of the independent monitoring and sample reporting forms in the conceptual EPSC Plan.

Q. Are there areas of the construction that will require special consideration when it comes to erosion prevention/sediment control and stormwater control?

Response: Areas of special consideration are wetlands, stockpiles, dust control, and sections of steep roadway.

Class 3 wetlands will be provided special protection in the form of additional silt fencing, erosion mix berms, erosion control barriers, and snow fencing beyond diversion dikes constructed uphill of the wetlands. These additional barriers will

provide effective control and containment of sediment so it does not enter the wetland areas.

Stockpiles require special consideration because these areas represent large piles of exposed, usually erodible materials where access is required on a frequent basis to allow construction to continue. Stockpiles will be sited on the most gentle of site gradients, as far away from wetland resources as is possible, in existing cleared areas if possible, and will be ringed with erosion control barriers.

Dust Control - We recommended that the project use water for dust control, dispersed from a water truck. The source of water would be the responsibility of the construction contractor. We understand that, historically, various surface water sources including the Passumpsic River, its tributaries and other local surface water sources have been used in addition to the Sheffield Municipal Well. The contractor will be responsible for any permitting involved with water withdrawal. Further, dust control will be required for concrete batching operations for the foundation construction. Again, we do not anticipate a concrete batch plant to be constructed within the project limits. The permitting of the concrete operations will also be the responsibility of the supplier.

Steep sections of new roadway will be more susceptible to erosion than areas with milder slope. The final design of these sections will address the velocity of the runoff and will present appropriately sized ditch rip-rap to resist the erosive forces of stormwater runoff. As I mentioned earlier, our goal is to redistribute runoff as frequently as practicable to preserve existing hydrology pattern and flows.

Q. Please provide a construction sequence and identify how erosion control and stormwater control will be implemented.

Response**:** The conceptual EPSC Plan (***Exhibit UPC-RN-3***) contains a sample discussion of the project construction sequencing. In form of a summary, the sequence, at its simplest, involves:

(1) Cut trees in the road and foundation construction areas; use temporary bridge crossings where necessary.

(2) Install erosion control barriers, such as silt fence and hay bales.

(3) Install diversion dikes and check dams and necessary temporary stormwater controls.

(4) Install and stabilize the culverts and stream crossings.

(5) Grub and stockpile loam, where feasible, from road and foundation construction. The accumulated loam will be reused, if possible, in the immediate vicinity of the stockpiled location; otherwise these materials will be transported off-site by the contractor unless a suitable on-site location is available.

(6) Excavate subsoils and rock; stabilize as necessary as work progresses.

(7) Build embankments to subgrade; stabilize as necessary as work progresses.

(8) Install rip-rap/trap rock on steep fill and cut slopes.

(9) Install finish layer of road materials on top of the embankments; complete permanent stormwater control structures.

(10) Install salvaged loam on embankments (as available); seed and mulch.

(11) Monitor site during turbine construction; finish clearing near turbines where blades reach toward the woods, but do not grub.

(12) Finish turbine assembly.

(13) Apply suitable topdress or wood chip to construction road shoulders; apply interceptor ditches, seed and mulch to stabilize. Finish stabilizing former stockpile areas.

(14) Continue monitoring site until suitably stabilized for the long-term operations.

Q Will there be sufficient water available for the reasonably foreseeable needs of the Project?

Response**:** There will be sufficient water available for foreseeable needs. First, water will be required for construction and compacting of soils and dust control. Based upon our experience, this water will be transported on-site by trucks provided by the contractor. The source of water has not been identified as of now. As discussed previously, off-site surface water sources will be utilized as a source. The contractor will be responsible for identifying and permitting, if necessary, a water withdrawal. Following construction the water demand of the project will be almost eliminated.

The proposed roads will only have heavy use during construction, when dust control will be used. During the remainder of the project life, the road use will be infrequent and a very low daily volume, and should not require further dust control.

Second, soils boring equipment used in the soils exploration program (necessary to acquire foundation design parameters) will require water, but it will be a small volume and is typically recycled during use.

Third, there will be the long-term staffing at the operations and maintenance building that will require potable water. This water demand would be analogous to a single family home.

Q Will the project cause unreasonable congestion or unsafe conditions on public roads?

Response: This question needs to be answered in terms of construction and operation/maintenance. In terms of construction, we are currently working with the Agency of Transportation to determine possible access points to the project. These are best described in the prefiled direct testimony of Cowan/Rowland/Vavrik. In terms of operation and maintenance, the project will employ on a full time basis between three and five personnel, representing 6-10 vehicle trips per day. These employees will require access to the project site, typically, during normal business hours and during periods of upset conditions. We do not feel that the personnel involved with the operation and maintenance will present an unreasonable congestion or make unsafe any public roads.

Q Have you relied on the work of any other experts concerning this project?

Response: I relied on the input from Art Gillman, the wetland expert retained by UPC and Jeff Wallin, wildlife biologist also retained by UPC. In addition, I received input from UPC on the typical wind turbine construction activities, and the desired locations of the wind turbines.

Q Describe your recommendations to UPC Vermont Wind regarding the design and siting of the project based upon the results of your investigations and analyses.

Response: To the extent that I have reasonably unfettered control of the micrositing of project roadways, my current recommendations have been incorporated and are represented on the "20-percent" design drawings. I have recommended:

(1) Road grade: Minimize grade severity wherever possible, to facilitate equipment movement and to reduce erosion potential. Maximum road grade for ridge top roads is 15%. Roads should ideally return to a 5% grade wherever an assembled crane is expected to make a turn, whether in transit along the ridge or to enter onto a dedicated crane pad.

(2) Road width: Ridge roads should have a width of thirty-six (36) feet for construction (consisting of a 16-foot main road width with two 10-foot shoulders to allow for crane transit); the width would be reduced through re-vegetation or the application of wood chip to a nominal width of approximately sixteen (16) feet. Access roads to the ridges will vary in width; generally, I

recommend a width of sixteen (16) feet, with re-vegetation at the widened road intersections, *e.g.*, intersection with the public way.

(3) Vegetation restoration: As noted above, roads that are constructed based upon the needs of construction-phase equipment should receive seed or wood chips over portions of that width. The road grade for its full width will be retained for potential maintenance/repair work such as replacing a damaged rotor and for eventual decommissioning, as necessary. However, it is unnecessary to maintain the full width as gravel, and so portions of the road width should be seeded and allowed to re-vegetate naturally.

(4) Turbine sites: Only the foundation site proper need be grubbed and thoroughly disturbed to create a crane pad and driveway. The approximate size of the crane pad is generally 40 ft by 100 feet. An additional area for the temporary laydown and storage of the turbine components is required, but the outlying areas, where only the blades of the rotor will project during assembly, can be cleared without grubbing stumps and roots, for the benefit of erosion control. Our design drawings submitted with this application show a "worse case" approach, where the entire turbine temporary laydown and assembly area is shown graded. In this way, the impacts in the final layout and construction plans will be less than submitted in the permit documents.

(5) Erosion control: Project temporary erosion controls must be consistent with Vermont ANR's requirements. UPC will coordinate with the general contractor, once selected, to ensure that the contractor understands all the aspects of the

EPSCP, is trained in the EPSCP requirements, commits to the provisions of the plan and the requirements of the State, and monitors progress of construction to ensure the successful implementation and protection of wetland and habitat resources. UPC and their consultants should work closely with ANR in the development of the EPSCP to incorporate State requirements during the development of the final plans.

(6) Stormwater control: Project stormwater controls should be implemented consistent with Vermont's current regulations. A thorough watershed evaluation should be conducted, to locate potential downstream issues, and to determine waiver applicability. Also, a clear maintenance plan should be established with commitments to ensure successful implementation and protection of wetland and habitat resources, abutting undisturbed property, and the public way.

(7) Transport issues. Once the turbine components are set, or at least the upper limits of shipping weights and dimension established, further consultation should proceed with VTAOT. In particular, VTAOT should be consulted on the proposed delivery route to evaluate the proposed loads on bridges and structures, and to prepare for public safety.

Q Does this conclude your testimony at this time?

Response: Yes, it does.