MAINE DEPARTMENT OF AGRICULTURE
FOOD AND RURAL RESOURCES
OFFICE OF THE STATE SOIL SCIENTIST
STATE HOUSE STATION # 28
AUGUSTA, MAINE 04333
PHONE: (207) 287-2666
E-MAIL: DAVID.ROCQUE@MAINE.GOV

MEMO

To: Donald Murphy, LURC Project Analyst
From: David P. Rocque, State Soil Scientist
Re: Proposed Bull Hill Wind Farm Project
Date: February 16, 2011

After reviewing the subject application, I offer the following comments. Most of these comments have been communicated to the James W. Sewall design engineers by phone. I called them to discuss a few questions and our conversation shifted to review comments.

1. **Erosion and Sediment Control Plan Narrative** – Volume I of the application includes a single paragraph discussing erosion and sediment control. Included in this paragraph is the statement **"The erosion and sediment control plan and attendant drawings are not intended to provide the exact location for placement of the erosion control measures, but rather provide the basis for their use as a "tool box" of control measures".** It is my opinion that the "tool box" approach is appropriate for hydrology measures in the mountains because the mountains have unique hydrology features that can not always be located in the field before construction begins. It is therefore, necessary to create a "tool box" of measures to be used when a particular, unexpected, hydrology feature is encountered. The same is not true however, for erosion and sediment control measures, and, in addition, the Bull Hill site is not a mountain and therefore does not include the unique hydrology features that require the use of a "tool box" of measures.

   The application does include drawings that have erosion and sediment control standard details and "general notes and construction specifications" as well as plans showing the location of a number erosion and sediment control measures. I recommend that the erosion and sediment control narrative strike the statement on using the "tool box" approach and it should be expanded to discuss the drawings and plans where erosion and sediment control measures can be found.

   The intent is to make it clear that erosion control methods should be evaluated and applied based on specific conditions, utilizing BMPs. More specific methods for erosion control have also been included in plan details.

2. **Standard Details** – Following are comments on the standard details sheets:

    a. **Erosion Control Mulch Berms** – According to the project engineer, the reason for the "tool box" approach for erosion control measures was to inform the reader that the erosion control mulch berms are not simply installed perpendicular to the slope, parallel to the road, but turn out occasionally. It was not intended to mean that the contractor could choose to replace any measure he/she wanted to with another one in any location. I suggest striking the "tool box" approach and include a standard detail showing the correct installation of erosion control mulch berms installed beside roads that are perpendicular to the contour and then put a note on the erosion control plans referring to the standard detail.

We have removed the words "tool box" from the narrative and clarified the details to reflect the proper installation and location of the erosion control mulch berms. Notations have been added to the plans to clarify.

    b. **Dewatering** – The detail plans include construction notes indicating that **"a high water table exists at several turbine pad locations. Contractor shall be responsible for properly dewatering excavations during construction".** The notes also state that **"contractor shall dispose of pumped water in appropriate manner to avoid concentrated flows from the site" and "methods of dewatering and sediment control devices shall be approved by Engineer and third party inspector at each location".** It is my opinion that the locations and designs for dewatering should be shown on the erosion control plans. They should be located on soils that have the ability to absorb the pumped water (not soils with a high groundwater table or that are shallow to bedrock) and away from any protected natural resource.

    Another note on dewatering, located beneath the standard detail for "dirtbag pumped silt control system" states **"Contractor shall provide appropriate sized dewatering control devices to accommodate dewatering activities"**. I would like to see more specific guidance provided to the contractor and third party inspector in the proper sizing of these devices.

    The standard detail for "dirtbag pumped silt control system" does not indicate if or how the infiltrative surface should be prepared before being used. That should be included in the detail. I believe using the natural ground surface, organic duff and roots, is superior to a graded surface. The graded surface destroys soil structure and greatly limits infiltrative capacity.

    The dewatering details and notes within the plans have been modified to reflect the Department's suggestions as agreed upon in our meeting with DEP and LURC on 4/11/11. See dewatering notes, dirtbag detail, and temporary sediment basin detail.

c. **Typical Road Details** – The typical road details show a deep cut on the upslope side and a fill on the downhill side. That detail is not very representative of the project site roads. Most of the roads are to be built on top of the existing ground surface with a few sections being a cut on both sides (perpendicular to the contour). If they were representative of the roads on the project site, they would need to be amended to show a rock sandwich because most of the soils on this site have a high seasonal ground water table. It would be more appropriate to show the typical condition road detail or to show several with all of the representative conditions expected to be encountered.

The original detail was shown exaggerated to illustrate in clear detail how to construct the road/crane path in both cut and fill locations. We have added an additional cross section detail that shows a roadway section with ditches on both sides. Notes have been added to details to discuss rip rap protection in ditches that may receive groundwater flows.

d. **Typical Stone Ditch Protection Detail** – This detail indicates that rip-rap will be used to line all ditches exceeding 8% slope, which is appropriate. It is also appropriate to line ditches with rip-rap on lesser slopes if the ditches are to be constructed below the groundwater table. This is typical of road cuts that are perpendicular to the slope. These ditches must carry water until they can outlet, which may be a considerable distance. Also, they will be hard to stabilize vegetatively due to prolonged wetness by groundwater. Rip-rap stabilization should go up the cut slope to the height of the seasonal groundwater table.

Notes have been added to the stone ditch detail for the contractor to continue stone ditch protection in ditch locations that follow eight percent slopes until they reach a protected outlet.

e. **Stone Bermed Level Lip Spreader** – the title of this detail seems to indicate that this detail may be for a soil core berm that is covered with stone (though that is not shown on the detail). I suggest just calling it a stone level spreader. The detail should also specify stone size since that is important in determining how well water is spread out after passing through the stone.

The title for this detail has been adjusted and the stone has been specified as requested. The stone listed for this detail does not meet the DEP chapter 500 standards, but as discussed in the meeting held on 4/11/11, this stone is recommended by the State Soil Scientist for these site conditions.

f. **Typical Ditch Cross Section** – This detail states “provide loam, seed and mulch or erosion control mix (mulch) on all disturbed soil areas”. Loam and seed with mulch and/or erosion control blankets is appropriate for all areas not needing rip-rap but erosion control mulch is not appropriate for the bottom of

the ditch. Concentrated flow there will wash the mulch away. Erosion control mesh should be included as an alternative for hay mulch and should be required for steeper cut slopes and those that are long.

This detail has been revised with a note included to prohibit erosion control mix in the bottom of ditches.

g. **Organic /Duff Waste Disposal Detail** – This detail indicates that all organic waste/duff will be disposed on along the downslope side of road fill extensions. That may be ok in some locations but may be a problem in others such as where there is a rock sandwich and where significant amounts of runoff water flow over the side of the road. I suggest the material simply be spread over the ground surface where it can decompose slowly. Even better, it could also be saved and mixed with soil from excavations to form topsoil equivalent, if allowed to age and decompose somewhat.

This detail has been removed from the plan set.

h. **Rock Sandwich Detail** – This detail needs to be revised as follows: The rock layer should extend upslope to cover all exposed soils that are below the seasonal groundwater table. Otherwise, these soils will seep and slump down over the sandwich material at the edge of the road. No filter fabric material should be used under the rock on the upslope side of the road. It is not needed because there will be no weight forcing the stone into the soil. Instead, I suggest a coarse gravel that is permeable enough to allow the seeping water into the rock layer. Filter fabric may not be permeable enough to accommodate the seep so it will be circumvented and cause a problem with the structure. On the downslope side of the road, the rock sandwich should be placed on the ground surface so that it out lets on top of the ground at the toe of fill, not subsurface as the detail indicates. It is impossible to reconnect the subsurface layers as they originally were. Therefore, it is best to let the rock sandwich outlet onto the ground surface where it can eventually seep into the ground.

The detail has been revised in accordance with the State Soil Scientist recommendations. Instead of coarse gravel, a very permeable geotextile is designed. The geotextile fabric specified has a flow rate of 145 gallons/minute/square foot. This permeability rate more than double what typical clean gravel will allow to flow through.

3. **Erosion and Sediment Control Plans** –
   a. **Cross Culverts** – Cross culverts shown on the erosion and sediment control plans do not indicate (by the after built contours) that upslope ditches on either side are supposed to drain into the culverts or where they outlet. Proposed contours of the ditches should be revised to indicate this. On the upslope side of the road, there should be a soil berm to prevent the ditch water

from flowing past the culvert inlet. On the downslope side, there should be a ditch turnout, directing upslope water to the buffer/filter strip.

A detail has been included in the plan set to show appropriate grading to direct ditch flow into the cross culverts.

b. **Road Cut Cross Culvert Buffers** – Most of the road cuts, at least the most lengthy and significant cuts, are perpendicular to the contour. That means that ditches are needed on both sides of the road. Much of the time, those ditches are well below the seasonal groundwater table meaning that they will carry significant amounts of groundwater as well as runoff water. The buffers that cross culverts in these cut areas outlet to should be designed to accommodate both expected runoff flows as well as groundwater flows. Otherwise, the buffers may be overwhelmed and not be effective.

The buffers to roadside ditches have been sized conservatively for this project. In locations where groundwater may occur, the ditches will receive rip rap. We anticipate that peak groundwater flows will not be coincidental with peak stormwater flows and buffers will be able to accommodate the additional longer periods of flow attributed to groundwater.

c. **Road Cut Cross Culverts** – Most of the road cuts that are perpendicular to the slope indicate cross culvert spacing to be several hundred feet apart. Due to the fact that these ditches are generally cut well below the seasonal groundwater table, there is likely to be a considerable amount of flowing water in them, particularly when the groundwater table is high during a precipitation event or snow melt. It is therefore recommended that every effort be made to provide additional cross drainage devices to reduce the volume of water discharged. These can be either cross culverts or "rock burritos" which are trenches with fabric wrapped rock that act similar to cross culverts. Rock burritos have an advantage in that they do not collapse, rust or heave but they can not accommodate the volume of water that a culvert does.

No additional culverts or rock burritos have been added to the plans. We have reviewed culvert spacing and with very limited exceptions, have maintained a typical maximum spacing of 400 feet between culverts to the best extent practicable while also meeting the Chapter 500 standards.

d. **Turbine Pads** – In many cases, turbine pads are to be installed in soils with a seasonal high groundwater table. A number of the pads require cuts in the upslope side of the hill and fill on the downhill side. The erosion and sediment control plan shows intercepted groundwater from the uphill cuts flowing around the pad site in constructed ditches before being outlet to buffer/filter strips. If possible, I would like to have a couple of rock burritos installed beneath the turbine pad sites, to carry intercepted groundwater where it will be discharged in a manner that will better reconnect the natural hydrology. The

manmade ditches can still be constructed but the rock burritos inlets should be installed at a slightly lower elevation so they take all of the groundwater they can. If the flow exceeds the capacity of the rock burritos, the excess will simply flow to the cross culvert and then to the buffer/filter field. This was done for the Kibby substation and has worked very well. The fill extension around the rock burrito outlets should be rip-rap so that it will act as a stone level spreader. The rock burrito should end where it encounters the rip-rap.

We believe this comment was addressed and agreed to be dismissed at the meeting. No additional action from the design team is necessary.

e. **SubStation** – I would like to see a couple of rock burritos installed below the substation site, similar to what was described above for the turbine pads and what was done at Kibby. The soils at this site are not mapped as being wet but shallow to bedrock soils typically have groundwater flow across the rock face in the spring, fall and after significant precipitation events. Over blasting the bedrock when preparing the site for installation is also an alternative. The resulting fractured rock/rubble will act in a similar manner to a rock sandwich, allowing groundwater to pass below the substation.

The substation is one of the few locations within the project limits where known ledge exists. We will be over blasting at the substation site to allow for infiltration.

Site Location of Development
TECHNICAL REVIEW MEMORANDUM
Bureau of Land and Water Quality

TO:	**Donald Murphy, Project Manager, LURC**
FROM:	**David A. Waddell -- Division of Watershed Management**
DATE:	**March 9, 2011**
RE:	**T16MD – Bull Hill Wind Project**

As per our phone conversation today, I have looked into the additional issues you have brought up and clarified some of my initial comments. I have addressed these below, and have revised and copied my adjusted original memo comments.

- Comment No. 1 - expanded.
- Comment No. 8 - has been corrected from an incomplete statement.
- Comment No. 14 - clarified and expanded.

New topics not in original memorandum:

- Provide a detail for the appropriate discharge of foundation and pit dewatering discharge.
  The dirtbag detail, temporary dewatering sediment basin, and dewatering notes have been modified on the detail sheets.
- Please provide or direct me to a maintenance plan that addresses the site specific long term maintenance measures for the stormwater structures constructed on site. Be sure to include ditches, buffers, level spreaders, culverts, rock sandwiches, and all other stormwater improvements.
  See the Stormwater Structure Maintenance Plan (Attachment A).
- Laydown areas are proposed for the project. These areas my be necessary during decommissioning or upgrades at a later date. After construction use these areas could be covered in a layer of erosion control mix with a minimum of 4 inches in thickness.
  Addressed in the "clean-up & final stabilization" notes – note 3 on page C-3.
- This review provided relies heavily on the contour information provided with the application. It is understood due to the nature of the project that during construction changes may be necessary to accommodate inaccuracies in the contour information, soils, or to accommodate infrastructure needs. Small changes in the locations of drainage / treatment structures to improve the treatment provided can be approved through the third party inspector. A cover letter outlining the changes should be submitted to the Commission for the project file at the end of construction. For changes that go beyond the scope above consider the following condition.
  Comment noted.

Proposed Condition: The applicant will retain the services of a professional engineer to provide "as-built" plans that detail any portions of the project that significantly deviate form the approved plans. Any changes in layout, grading, stormwater system, impervious

area, or other changes that affect the stormwater quality need to be located and addressed as to how these changes have been treated and meet the general standard. Significant changes in the proposed project may trigger the need for an amendment of the approved department order. This requirement is for the portion of the project constructed as common property. The applicant's agent will notify the department in writing within 14 days of final acceptance of the project to state that the project has been completed. Accompanying the engineer's notification must be updated project plan sheets (if necessary), a report on the changes in treatment and how they meet standard (if necessary), and a copy of the Notice of Termination (NOT) for the project.

Other typical Conditions:

Proposed Condition: Due to the level of disturbance, steep slopes, and its close proximity to on site water resources, an independent third party site inspector reviewing erosion and sedimentation control is suggested for this project. The applicant will retain the services of an approved site inspector to inspect the erosion and sedimentation controls on the site. Inspections shall consist of weekly visits to the site to inspect erosion and sedimentation controls from initial ground disturbance to final stabilization. If necessary, the inspecting engineer will interpret the erosion and sedimentation control plans and notes for the contractor. Once the site has reached final stabilization, the inspector will notify the department in writing within 14 days to state that the construction has been completed. Accompanying the engineer's notification must be a log of the engineer's inspections giving the date of each inspection, the time of each inspection, and the items inspected on each visit.

Proposed Condition: The applicant will retain the services of a professional engineer to inspect the construction and stabilization of the stone bermed level spreaders and ditch turnouts to be built on the site. Inspections shall consist of weekly visits to the site to inspect each level spreaders /turnout construction, stone berm material and placement, settling basin from initial ground disturbance to final stabilization of the level spreader. If necessary, the inspecting engineer will interpret the stone bermed level lip spreader's location and construction plan for the contractor. Once the stone bermed level lip spreaders are constructed and stabilized, the inspecting engineer will notify the department in writing within 14 days to state that the level lips have been completed. Accompanying the engineer's notification must be a log of the engineer's inspections giving the date of each inspection, the time of each inspection, the items inspected on each visit, and include any testing data or sieve analysis data of the berm media.

APPLICANT: First Wind – Blue Sky East
Application #: DP-4886
Town: T16MD
Engineer who prepared application: Stantec / Sewall Corp
Parcel Size:
Site Description:
Project description: 19 Wind Power turbines, Substation, O+M Building, Access Roads
Size of new impervious area: 24.24 acres
Size of new developed area: 25.44 acres
Watershed (waterbody): Narraguagus River, Narraguagus Lake, Spectacle Pond and Graham Lake
Watershed type: sensitive / threatened, most-at-risk lake, other

PLANS USED FOR REVIEW:

Pre-development: Plan Sheet C-701, "Pre Development Drainage Plan," dated 11/12/2010, revised 1/25/2011.
Post-development: Plan Sheet C-702, "Post Development Drainage Plan," dated 11/12/2010, revised 1/25/2011.
Erosion and Sediment Control Plans: Plan Sheets C-601 thru C-608, "Erosion Sedimentation Control Plan," dated 11/12/2010, revised 1/25/2011.
Note: Other plans may have been reviewed that are not noted here.

STORMWATER MANAGEMENT

The applicant is proposing a 19 turbine windfarm on Bull Hill and Heifer Hill in T16MD and called Bull Hill Wind Project. This project lies within the watersheds of Narraguagus River, Narraguagus Lake, Spectacle Pond and Graham Lake. This proposed project will create 25.44 acres of developed area and 24.24 acres of impervious area. This project has been required to meet the "Stormwater Law" rules and as such must meet the Basic, General, and Flooding Standards. Under the General Standards the applicant is applying the phosphorus methodology to address impacts to Narraguagus Lake and Spectacle Pond. As such, the applicant is required to use the Phosphorous Methodology outlined in "Phosphorous Control in Lake Watersheds: A Technical Guide to Evaluating New Development" to assess the development.
This project is being reviewed under the 2006 Stormwater Management rules and the design and sizing of the proposed BMPs for this project are based on the "Stormwater Management for Maine" January 2006.
Stormwater quality treatment will be achieved with numerous buffers.
Stormwater flooding mitigation will be achieved with disconnected impervious area and lengthening of flow paths.

The following comments need to be addressed:

ENGINEERING

1. In exhibit 11B the applicant has supplied a SPCC plan to address "house keeping" BMPs onsite. The plan appears to address only the conditions of construction. It is my understanding that a separate SPCC plan for Operations + Maintenance is

required also. Please submit this plan for review. Be sure this plan addresses any oil changes on the generator or "bus", and spills on the mostly porous foundation pads. For the construction SPCC plan, please address the storage and containment of materials related to construction (such as paint, solvents, grease, etc.) and disposal of construction debris. Consider including other housekeeping measures like dust suppression that are not typical for other sections of the application.
The applicant has previously provided a revised SPCC plan for construction and a SPCC plan for operations and maintenance will be provided within 6 months of operation.

2. Please reconcile the typical road cross section and the underground electric road cross section. It appears that the underground electric will be into the rock sandwich and other drainage details related to roads.
Notes have been added to the civil plans to direct contractor to reconstruct rock sandwiches if they are impacted by the installation of the underground electric. Notes have also been placed to instruct contractors to place underground electric beneath culverts were appropriate cover can not be achieved.

BASIC STANDARDS:

Note: *As always the applicant's erosion control plan is a good starting point for providing protection during construction. However, based on site and weather conditions during construction, additional erosion and sediment control measures may necessary to stop soil from leaving the site. In addition, other measures may be necessary for winter construction. All areas of instability and erosion must be repaired immediately during construction and need to be maintained until the site is fully stabilized or vegetation is established. Approval of this plan does not authorize discharges from the site.*

3. Erosion control notes call for top soil stock piles on site. Please provide locations of the stockpiles on the E+S location plan.
Stockpiles, as needed, will be located within the laydown areas.
4. Plan Sheet C-4 Silt Fence Detail: Notes do not limit silt fencing to ¼ acre of drainage for each 100 feet of fencing. The detail also does not require fencing be installed along the contour. Please correct.
See the revised details on sheet C-4. Additional notes have been added to detail to address
5. Lay down areas appear to need grading for this project. Though not included in the long term project impacts (as long as they are revegetated with in one year) these areas do need to be restored to their original contours. Please provide information on the protection of the natural area and removal of the lay down area fill as part of the E+S narrative.
The grading of the laydown areas will be determined by the contractors depending on what they will be using the area for. A note will be added to the plans directing the contractor to avoid grading in laydown areas in a way that promotes concentrated flows. The area will be allowed to revegetate once construction is complete.
6. It appears that all of the ditches for the project are stone lined. I was unable to find any detail for vegetated ditches or locations on the plans sheets. Stone check dams are intended to reduce scour of soil in the ditch line. This would only be necessary

if the ditch lines were to be vegetated. Where check dams are indicated on the plans the spacing is not correctly shown if the construction detail was applied.
See the revised stone ditch detail on C-4 indicates stone protection needed on all slopes greater than 8%. Plan check dam symbols only shown for illustrative purposes and should be installed per detail. Showing them spaced accurately on plan view would be too busy. We have added a note on the plans and detail to clarify.

7. It is typical for filter barriers such as silt fencing, hay bale barriers, and erosion control mix barriers to be installed along the contour. Without doing so, flow is directed to the lowest elevation in the line of barrier and may result in a blow out or overtopping of the barrier. On the E+S location plans the barriers are shown crossing contours through out. Please correct.
   Filter barriers shown on plan view are shown for illustrative purposes only. Notes have been added to plans and details to address comment.

GENERAL STANDARDS

General Comments:

8. The major watershed boundaries do not appear to actually reflect the actual contour information provided. Though not imperative for the portions of the project meeting the general standard, it is important for those areas draining to a great pond and using the phosphorous standard. These areas base their treatment threshold on the amount of acreage encumbered by the project. As such, a more accurate depiction of the drainage is important.
   The MeGIS watersheds were used for this project. We understand that the information may be off slightly from the aerial topographic information. We reviewed the phosphorus watersheds for accuracy and made any adjustments that were necessary.
9. The ditch lines does not show any diversions that divert flow into cross culverts. This could be done in a standard culvert crossing detail without showing it on the proposed contour plans. However without a detail it is assumed that flow in the ditchlines is not being directed into the cross culvert and continues down the fall line of the ditch.
   An additional detail has been added to the plan set to address this comment.
10. No culvert sizing schedule was found, nor was there any individual ID for culverts on the project except for road stationing. There were no inlet or outlet elevations shown.
    A culvert schedule was added to the detail sheets that included the stationing, culvert size and drainage area.
11. The road profiles did not include improvements like culverts or rock sandwiches. Also no information on culvert invert and outlet elevations was provided.
    This information was not added to the plans because of the typical accuracy of aerial survey it will likely be adjusted slightly in the field to better conform to actual field conditions.
12. Roadside buffers are shown as 35 feet (wooded) in width for a single lane of standard road way drainage and 55 feet (wooded) for two lanes of standard road way drainage. For this project the crane path is much greater in width than a standard road and as such to use the roadside buffers for a wider crane path will

need to increase. For crane path road side buffers, the buffer width would need to be increased from 35 feet (wooded) to 55 feet (wooded) for a single lane buffer width, and from 55 feet (wooded) to 80 feet (wooded) for a two lane buffer width.
Buffer sizing has been modified per meeting comments on the stormwater plans (600 series) to address this concern.

13. In general the level spreader buffers are shown with straight sides and do not follow the fall line of the contours or cross them perpendicularly. This results in the treatment areas not being the areas protected by the buffer plan. In some cases, like BL32 (Plan sheet C-604), the orientation does not result in acceptable treatment.
    Buffers have been adjusted on the stormwater plans (600 series) to address this comment.
14. Buffer areas to meet water quality purposed are restricted to either limited disturbance or no disturbance. These areas are typically protected by deed restrictions or agreements / easements and located in the field with signage to protect their integrity. Please address. It is assumed that the areas set aside as "phosphorous development area limits" are being used for their allocation. These areas will need to be restricted to General Forest Use due to the nature of the project. General forest use means that the land must be maintained in essentially forest cover with undisturbed soil, duff layer and ground cover vegetation, and understory vegetation. Timber may be harvested on a selective basis provided that no more than 40% of the volume is harvested within any 10 year period. If preferred, the standards for either limited disturbance or no disturbance buffers may be used as an alternative definition of general forest use. To limit disturbance of the duff layer winter harvesting in frozen conditions is considered more appropriate.
    See the attached buffer restrictions for stormwater buffers (Attachment B).
15. The calculations do not appear to take into consideration the existing impervious area that is being reused for this project.
    We did not take credit for the existing road in order to provide a more conservative analysis.

Details:

16. Plan Sheet C4: Add the level spreader berm material gradation specification to the detail
    Material gradation has been shown on the detail. See the revised detail on sheet C4.

Road Specific:

17. Turbine T4 is noted as "re-vegetation non-typical". Please address.
    Did not find the note. Revegetation of T4 will be the same as other turbines.
18. Plan sheet C-601: The treatment proposed at BL27 is diverted by the cross culvert at 1038+50. Flow is diverted to BL20. Please review treatment in this area.
    See the attached revised calculations (Attachment C) .
19. Turbine T2: an existing road crosses the turbine site in areas that are to be revegetated and through the buffer. Please account for the impact or remove.

The existing road will be scarified and allowed to revegetate. We have revised sheet C-601.

20. Plan sheet C-601, Buffer BL19: the level spreader is shown at contour elevation 560' and the inlet of the culvert is at elevation 556'. Please address.
    See revised sheet C-601. Culvert location has been adjusted.
21. Plan sheet C-601, Buffer BL20 / Buffer B1: Buffer BL20 is shown draining over B1. Buffer BL20 is called meadow but buffer B1 is forested. Please address.
    See the revised calculations.
22. Plan sheet C-100, Turbine T3: T3 is shown as being graded away from the proposed treatment buffer and into a diversion ditch that drains to an E+S level spreader. Please address.
    See the revised sheet C-601.
23. Plan sheet C-603: Road stationing is missing.
    See the revised sheet C-603. Stationing was inadvertently turned off; it has been turned on.
24. Plan sheet C-604, Buffer BL21 / BL2: Is buffer BL21 necessary? Would moving the culvert at Station 8+30 to station 6+50 allow for collection of the same area and treatment in BL2??
    We left this area as it was originally designed. If we moved the culvert, the ditch would be an extra 200 feet longer and we are trying to maintain a maximum of 400-500 feet of ditch before the water can outlet.
25. Plan sheet C-604, Road stationing NS19+20 to 22+10: This portion of road appears to drain to Spectacle Pond. Please review contour information and adjust treatment plans as necessary.
    See the revised calculations.
26. Plan Sheet C-604, Road Stationing NS 33+00 to 36+00: Treatment appears to be changed by the inclusion of the "rock sandwich" diverting flow away from Buffer BL32. Please adjust.
    See the revised sheet C-604. Buffers have been revised.
27. Plan Sheet C-601, Turbine T3 and T4: Both of these pads appear to drain to the Graham Lake Watershed. Please correct.
    See the revised calculations.
28. Spectacle Pond Water Quality Calculations for Linear Portion, page 1: NS Crane station starts at 15+75 and appears from Plan sheet C-604 to start at station 14+75. Please check impervious area calculation and treatment.
    See the revised calculations.
29. Plan Sheet C-601: Crane Path T1-4 Station 1002+00 TO 1005+00: Proposed layout conflict with existing road, consider removing and rehabilitation of existing road.
    As suggested, the existing road will be removed and the area revegetated.

O+M Building / Substation:

30. Plan sheet C2: A diversion ditch to the south of the substation pad that appears to need more work defining the ditches, outlets, and contours.
See the revised sheet C2. Ditches have been modified.

FLOODING STANDARDS

The applicant has provided a Hydro-cad model that shows the project's impact on the weighted curve number of each watershed and the subsequent impact to peak flows for these watersheds for the 2,10, and 25 year, 24 hour storm. The evidence shows that the weighted curve number for each sub watershed changes little. The model also indicates that there is a minor / "insignificant" increase in the peak flow for Spectacle Pond Watershed. In reviewing this portion of the model the assumptions of the sub-watershed boundaries to flow path length are inaccurate and result in an implied increase where one does not appear to exist when looking at the weighted curve number of the program. This change is well within model tolerances and does not take into consideration the redistribution of flows into the buffer areas that will lengthen the time of concentration for all of the watersheds. For this project the model indicates that the project meets the flooding standard requirement of maintaining the preconstruction peak flows for the 2, 10, and 25 year, 24 hour storm at the property boundary.
We reviewed the CN values and agree that there is no increase in peak flow for Spectacle Pond. We made conservative assumptions for this project, which meets the flooding standard for the 2, 10, and 25 year storm events.

MAINTENANCE:

NOTE: The applicant and contractor will be responsible for the maintenance of all proposed stormwater management structures, i.e. ponds, swales, culverts and discharge outlets during construction. Thereafter, each stormwater management structure should be cleaned and cleared of debris yearly at a minimum. Sweeping of all pavements is recommended on an annual basis. The DEP may request to inspect the site at a future date.

DESIGN REVIEW RESPONSIBILITY

This review only ensures that the proposed plan is meeting the minimum standards set by the department for erosion control management and for stormwater management. It does not guarantee that the design is appropriate for the level of work suggested and for the functionality of the facility.

REVIEW MEMORANDUM

March 21, 2011

To: Donald Murphy, Project Manager, Land Use Regulation Commission
From: John Hopeck, Ph.D., Division of Environmental Assessment
Re: Bull Hill Wind Project

1) It appears from the blast overpressure limit cited that the applicant does not intend to blast more than once per day. If the applicant intends to blast more often than once per day, or would like to have the option, I recommend that the applicant apply the standards for airblast levels found at 38 MRSA §490-Z)(14)(H). Records of individual blasts should generally include the information listed at 38 MRSA §490-Z)(14)(L), although blast records are not considered incomplete if missing only a social security number.

The contractor will likely blast more than once a day. The above referenced standards have been included in a revised Section 5B blasting plan (Attachment D).

2) The Spill Prevention, Control, and Countermeasures Plan submitted appears to address only construction; a full plan must be submitted to address storage and potential spills of petroleum and hazardous materials and other potential contaminants (including herbicides, paints, solvents, and similar products, excepting any used for purely custodial purposes) during operation. This plan must inventory all petroleum products and hazardous material stored and used on the site, describe storage locations and volumes, and must specifically address fuel storage and containment at the Operations and Maintenance building and procedures for changing oil in the turbines and related facilities, including the volumes and storage methods for any oil to be stored on the site during such oil changes. This operational plan should also describe vehicle maintenance, if any, planed to occur at the site. The plan or another document related to long-term operation should discuss planned use, if any, of herbicides at the site, and provide for no-herbicide setbacks from protected resources comparable to those for refueling and fuel storage. This project does not appear to include a separate powerline, so that use of herbicides and other potential contaminants for right-of-way maintenance is not an issue.

In addition to the other measures described in the construction SPCC plan, no overnight vehicle storage or parking, or any vehicle maintenance, should take place within 100 feet of a protected resource. The construction plan should also inventory potential contaminants other than fuel, and fuel storage procedures during construction, including estimated volumes and storage methods, should be described.

The applicant has previously provided a revised SPCC plan for construction. A SPCC plan for operations and maintenance will be provided within 6 months of operation of the facility.

3) The information submitted includes the location and design of a wastewater disposal system for the operation and maintenance building. There are no calculations for the design flow proposed, but the volume appears generally consistent with facilities of this type. The soil types are acceptable and sufficient

exploration was done in the area of the proposed system to demonstrate that separation from bedrock will be consistent with code requirements throughout the area. It is not clear if the location of the proposed disposal field would meet requirements under the Site Location Law for setbacks from downgradient property boundaries, but those are not applicable in this case.

The wastewater disposal system for the O&M Building was designed by a licensed site evaluator in accordance with the Subsurface Waste Water Disposal Rules.

4) It is noted in the archaeological survey that buildings may be removed from their present sites, whether as part of this project or at the same general time as this project; it is not clear if this removal is to occur as part of the proposed project. Any buildings moved or demolished as part of the project should be inspected carefully for hazardous materials, petroleum products, and other wastes such as asbestos-containing materials and mercury-containing materials. Any such materials should be disposed of properly, or handled in a manner to minimize risk to human health and the environment, if the structure is not to be demolished. Any stained soils or other evidence of petroleum contamination should be reported immediately.

Comment is noted, the buildings will be inspected for hazardous materials, petroleum, asbestos and mercury products prior to demolition or removal. An such materials will be handled and disposed of in accordance with regulatory requirements. Evidence of petroleum contamination will be promptly reported to DEPs Bureau of Remediation and Waste Management.

5) As noted in the application, the area of proposed construction is largely underlain by granite and other rocks of similar composition, so that the risk of encountering acid-generating rock is minimal. While no additional testing or other measures for assessment of this potential risk is required at this time, the applicant should be aware that unexpected rock types may be encountered, and the applicant should be able to recognize rocks with the potential for acid generation and respond properly in that event.

Comment noted.

Attachment A

Stormwater Structure Maintenance Plan

Bull Hill Stormwater Structure Maintenance Plan

The following outlines the maintenance that will be applied to the various permanent erosion control measures and other features that could experience erosion.

Ditches

Rip-rap lined ditches

- Inspect semi-annually.
- Remove sediment buildup, leaves, litter or other debris from the bottom and side slopes.
- Reposition stones to restore channel to original dimensions.

Vegetated Ditches

- Inspect the ditch lining monthly for slumping of the lining, downcutting of the ditches base, or undercutting of the banks.
- Repair any damage immediately.
- Mow or brush-cut annually only as necessary to prevent the establishment of woody vegetation.

Culverts

- Inspect for sediment buildup.
- Flush pipes and remove sediment at which time the depth of sediment at any location in the pipe exceeds three inches.

Rip-Rap Aprons, Level Spreaders, and Ditch Turnouts

- Inspect semi-annually or after severe storms for dislodged stones or slumping of the stone lining.
- Inspect and verify that top of stone is level (+/-1").
- Repair level lip to distribute flows uniformly across the buffer
- Reposition stones to restore the pools original dimensions and a uniform surface.
- Clean any accumulated sediments and debris from the plunge pool.
- Cut and remove any woody vegetation growing within the pool.

Vegetation

- Inspect vegetated areas each spring.
- Rework and re-stabilize sparsely re-vegetated areas that show evidence of soil erosion.

Stones Check Dams

Prior to establishment of permanent vegetation

- Inspect check dams after each storm event until permanent vegetation is established.
- Remove sediment buildup behind check dams.

After establishment of permanent vegetation

- Inspect for sediment build-up in void space between stones and dislodged stones.
- Remove sediment build-up.
- Stabilize disturbed areas.
- Replace check dam if sediment is filling void space.
- Replace dislodged stones.

Road Grading

- Grade the road as necessary to maintain the proposed roadway crown or super elevation and to prevent the creation of berms or ruts that may channelize flow.

Side slopes of gravel surfaces

- Inspect slopes for rill erosion due to concentrated flows.
- Stabilize eroded slopes with ECM or other approved BMP method.

Rock Sandwiches

- Inspect semi-annually or after severe storms for dislodged stones.
- Inspect for sediment buildup.
- Reposition stones to restore the rock sandwiches original dimensions.
- Clean any accumulated sediments and debris from the rock sandwich.
- Cut and remove any woody vegetation growing near the rock sandwich.

Buffers

- Inspect vegetated areas each spring.
- Rework and re-stabilize sparsely re-vegetated areas that show evidence of soil erosion.

Attachment B

Forested Buffer Restrictions

Bull Hill Forest Buffer Restrictions

Restrictions on Restricted Forest Buffer Area. Unless the owner of the Restricted Buffer Area obtains the prior written approval of the LURC, the Restricted Buffer Area must remain undeveloped during the existence of the project. To maintain the ability of the Restricted Buffer Area to filter and absorb stormwater, the use of the Restricted Buffer Area is hereinafter limited as follows:

a. No soil, loam, peat, sand, gravel, concrete, rock or other mineral substance, refuse, trash, vehicle bodies or parts, rubbish, debris, junk waste, pollutants or other fill material may be placed, stored or dumped on the Restricted Buffer Area, nor may the topography of the area be altered or manipulated in any way;

b. Any removal of trees or other vegetation within the Restricted Buffer Area must be limited to the following:

(i) No purposefully cleared openings may be created and an evenly distributed stand of trees and other vegetation must be maintained. An "evenly distributed stand of trees " is defined as maintaining a minimum rating score of 24 points in any 25 foot by 50 foot square (2500 square feet) area, as determined by the following rating scheme:

Diameter of tree at 4½ feet above ground level	Points
2 - 4 inches	1
4 - 8 inches	2
8 - 12 inches	4
>12 inches	8

Where existing trees and other vegetation result in a rating score less than 24 points, no trees may be cut or sprayed with biocides except for the normal maintenance of dead, windblown or damaged trees and for pruning of tree branches below a height of 12 feet provided two thirds of the tree's canopy is maintained;

(ii) No undergrowth, ground cover vegetation, leaf litter, organic duff layer or mineral soil may be disturbed except that one winding path, that is no wider than six feet and that does not provide a downhill channel for runoff, is allowed through the area; and

(iii) Harvesting is limited to 40 percent of wood volume in 10 years.

c. No building or other temporary or permanent structure may be constructed, placed or permitted to remain on the Restricted Buffer Area, except for a sign, utility pole or fence;

d. No trucks, cars, dirt bikes, ATVs, bulldozers, backhoes, or other motorized vehicles or mechanical equipment may be permitted on the Restricted Buffer Area; and

e. Any level lip spreader directing flow to the Restricted Buffer Area must be regularly inspected and adequately maintained to preserve the function of the level spreader.

Attachment C

Stormwater Calculations

Project Name	**Bull Hill**
Project Number	**74490E**
Date	4/15/2011
Done by	JAO

Pre & Post Development Summary

	Subcatchment Property Line	#	CN#
PRE	North	Spectacle Pond	70
POST	North	Spectacle Pond	70
	CHANGE		**0.00**
	Percent Increase		**0.00%**
PRE	East	Narraguagus River	70
POST	East	Narraguagus River	70
	CHANGE		**0.00**
	Percent Increase		**0.00%**
PRE	South	Narraguagus Lake	70
POST	South	Narraguagus Lake	70
	CHANGE		**0.00**
	Percent Increase		**0.00%**
PRE	West	Graham Lake	70
POST	West	Graham Lake	70
	CHANGE		**0.00**
	Percent Increase		**0.00%**

Project Name	**Bull Hill**	BA=Buffer Adjacent to Small Imp	RB=Roadside buffer
Project Number	**74490E**	BL=Buffer w/level spreader	DB=Detention basin
Date	4/15/2011	DT=Buffer w/ditch turnout	WP=Wet pond
Done by	JAO	USF=Underdrain Soil Filter	INF=Infiltration

QUALITY CALCULATIONS FOR NON LINEAR PORTION

Total NEW NONLIN impervious area for project=	103341	sf	=	2.37	acres
Total NEW NONLIN landscaped area for project=	33187	sf	=	0.76	acres
Total NEW NONLINEAR area of project=	136528	sf	=	3.13	acres

		NONLinear Area		
Subcatchment #	**BMP Type & #**	**Imp (sf)**	**Land (sf)**	**Description If Applicable**
1		68200	0	Substation
2	B27	11475	0	
3	B28	7610	6908	
4	BA	16056	7328	
	TOTAL	***103341***	***14236***	

SUMMARY FOR THE NONLINEAR PORTION OF THE PROJECT

IMP Area Required area to be treated (sf)=	98173.95		
Total NONLIN IMP Area Being Treated (sf)=	**103341**	***100.0%***	**>=95%**
DEVEL Area Required area to be treated (sf)=	109222.40		
Total NONLIN DEVEL Area Being Treated (sf)=	**117577**	***86.12%***	**>=80%**
NONLinear Area Not Being Treated (sf)=	18951		

Project Name	**Bull Hill**	BA=Buffer Adjacent to Small Imp	RB=Roadside buffer	BRS=Roadside Buffer with Rock Sandwich
Project Number	**74490E**	BL=Buffer w/level spreader	DB=Detention basin	
Date	4/15/2011	DT=Buffer w/ditch turnout	WP=Wet pond	
Done by	JAO	USF=Underdrain Soil Filter	INF=Infiltration	

QUALITY CALCULATIONS FOR LINEAR PORTION

Graham Lake (T16 MD)

Phosphorous Requirement

Watershed per acre phosphorus budget (Appendix C):	P	N/A	# P/acre/year	Total ac of devel. parcel:	TA		acres
Small Watershed Threshold (Appendix C)	SWT		acres	NWI wetland acreage:	WA		acres
Allowable increase in Town's share of annual phos (App C)	FC		lbs P/year	Steep slope acreage:	SA		acres
Area avail. For development (App C)	AAD		acres	Existing imp area (Pre 1980)	EIA_B		acres
Project acreage: A = TA - (WA + SA + EIA_B + EIA_A)	A		acres	Existing imp area (post 1980)	EIA_A		acres
A/AAD	R						

Project Phos Budget: PPB = P x A	**PPB**	**N/A**	**lbs P/year**
Project Phos Budget with small watershed adjustment:	**PPB**	**N/A**	**lbs P/year**

Total Post Development Phos Export (lbs P/yr)=	**0.0000**	<=	**N/A**	Access rd width(Const)=	24		Crane path width(Const)=	36
% of Project Treated for WS=	**76.99%**	>=	75%	Access rd width(Perm)=	24		Crane path width(Perm)=	36
Total Impervious Area for WS=	7.63	Acres		Turbine pad imp area(Perm)=	12350	sq ft	Met Tower Rd width=	12

Roadway Alignment or Turbine Site	Access Crane Turbine	Station to Station		% of area	BMP No. (or none)	SIDE OF RD T> RIGHT, LEFT BOTH	BMP cover Forest Meadow	Imp. Area (acres)	Treatment Factor	Export Coefficient	Pre-Treatment lbs P/Year	Post Treatment lbs P/year
T10	Turbine			100%	B10		Forest	0.2835	0.4			
NS	Crane	224	830	50%	BL1	RIGHT	Forest	0.2504	0.4			
NS	Crane	224	350	50%	B10	LEFT	Forest	0.0521	0.4			
NS	Crane	600	830	50%	BL21	LEFT	Forest	0.0950	0.4			
NS	Crane	830	1180	100%	BL2	BOTH	Forest	0.2893	0.4			
NS	Crane	1180	1300	100%	BL3	BOTH	Forest	0.0992	0.4			
NS	Crane	1300	1525	50%	B11	LEFT	Forest	0.0930	0.4			
NS	Crane	1300	1475	50%	BL3	RIGHT	Forest	0.0723	0.4			
T11	Turbine			100%	B11		Forest	0.2835	0.4			
T1-4	Crane	100150	100250	100%	NONE	BOTH		0.0826	1			
T1-4	Crane	100250	100550	50%	RB3	RIGHT	Forest	0.1240	0.4			
T1-4	Crane	100250	100650	50%	NONE	LEFT		0.1653	1			
T1-4	Crane	100650	101250	50%	RB4	LEFT	Forest	0.2479	0.4			
T1-4	Crane	100550	101025	50%	NONE	right		0.1963	1			
T1-4	Crane	101025	101100	50%	RB5	RIGHT	Forest	0.0310	0.4			

T1-4	Crane	101100	101600	50%	BL15	RIGHT	Forest	0.2066	0.4			
T1-4	Crane	101600	101850	100%	BL17	BOTH	Forest	0.2066	0.4			
T1-4	Crane	101850	102100	50%	B3	LEFT	Forest	0.1033	0.4			
T1-4	Crane	101850	102100	50%	RB12	RIGHT	Forest	0.1033	0.4			
T1-4	Crane	102100	102500	100%	BL18	BOTH	Forest	0.3306	0.4			
T1-4	Crane	102500	102850	50%	BL19	RIGHT	Forest	0.1446	0.4			
T1-4	Crane	102500	102750	50%	BL19	LEFT	Forest	0.1033	0.4			
T1-4	Crane	102850	103200	50%	NONE	RIGHT		0.1446	1			
T1-4	Crane	102750	103000	50%	B2	LEFT		0.1033	0.4			
T2	Turbine			100%	B2		Forest	0.2835	0.4			
T1-4	Crane	103200	103700	50%	RB6	RIGHT	Forest	0.2066	0.4			
T1-4	Crane	103000	103575	50%	NONE	LEFT		0.2376	1			
T1-4	Crane	103700	103850	50%	BL20	RIGHT	Forest	0.0620	0.4			
T1	Turbine			100%	B1		Forest	0.2835	0.4			
T1-4	Crane	103575	103700	50%	NONE	LEFT		0.0517	1			
T1-4	Crane	103850	104050	50%	BL27	LEFT	Forest	0.0826	0.4			
T1-4	Crane	104050	104235	50%	NONE	LEFT	Forest	0.0764	1			
T1-4	Crane	103850	104235	50%	B1	RIGHT	Forest	0.1591	0.4			
T5-6	Crane	500050	500450	100%	NONE	BOTH		0.3306	1			
T8	Turbine			50%	B8		Forest	0.1418	0.4			
T7	Crane	50000	50350	100%	BL8	BOTH	Forest	0.2893	0.4			
T7	Crane	50350	50500	50%	BL25	LEFT	Meadow	0.0620	0.4			
T7	Crane	50500	50900	50%	B7	LEFT	Forest	0.1653	0.4			
T7	Crane	50350	50900	50%	BL26	RIGHT	Forest	0.2273	0.4			
T7 STUB	Crane	100	250	100%	BL8	BOTH	Forest	0.1240	0.4			
T8-9 STUB A	Crane	200	300	100%	NONE	BOTH		0.0826	1			
T8-9 STUB B	Crane	200	300	100%	NONE	BOTH		0.0826	1			
MET TOWER 1	Met	0	250	100%	NONE	BOTH		0.0689	1			
MET TOWER 2	Met	0	195	100%	NONE	BOTH		0.0537	1			
Yellow Gate Rd	Improvements							0.1835	1			
T4	Turbine			100%	B4		Forest	0.2835	0.4			
T3	Turbine			100%	B3		Forest	0.2835	0.4			

Total Impervious **7.633** acres Total Pre Tx Phos **0.0000** lbs P/year Total Post Tx Phos **0.0000** lbs P/year

Project Name	**Bull Hill**	BA=Buffer Adjacent to Small Imp	RB=Roadside buffer	BRS=Roadside Buffer with Rock Sandwich
Project Number	**74490E**	BL=Buffer w/level spreader	DB=Detention basin	
Date	4/15/2011	DT=Buffer w/ditch turnout	WP=Wet pond	
Done by	JAO	USF=Underdrain Soil Filter	INF=Infiltration	

QUALITY CALCULATIONS FOR LINEAR PORTION

Narraguagus Lake (T16 MD)

Phosphorous Requirement

Watershed per acre phosphorus budget (Appendix C):	P	0.041	# P/acre/year	Total ac of devel. parcel:	TA	2.48	acres
Small Watershed Threshold (Appendix C)	SWT	54	acres	NWI wetland acreage:	WA		acres
Allowable increase in Town's share of annual phos (App C)	FC	8.78	lbs P/year	Steep slope acreage:	SA		acres
Area avail. For development (App C)	AAD	1075	acres	Existing imp area (Pre 1980)	EIA_B		acres
Project acreage: A = TA - (WA + SA + EIA_B + EIA_A)	A	2.48	acres	Existing imp area (post 1980)	EIA_A		acres
A/AAD	R	0.002					

Project Phos Budget: PPB = P x A	**PPB**	**0.102**	**lbs P/year**
Project Phos Budget with small watershed adjustment:	**PPB**	**N/A**	**lbs P/year**

Total Post Development Phos Export (lbs P/yr)=	**0.080**	<=	**0.102**	Access rd width(Const)=	24		Crane path width(Const)=	36
% of Project Treated for WS=	**100.00%**	>=	75%	Access rd width(Perm)=	24		Crane path width(Perm)=	36
Total Impervious Area for WS=	0.11	Acres		Turbine pad imp area(Perm)=	12350	sq ft	Met Tower Rd width=	12

Roadway Alignment or Turbine Site	Access Crane Turbine	Station to Station		% of area	BMP No. (or none)	SIDE OF RD Tx RIGHT, LEFT BOTH	BMP cover Forest or Meadow	Imp. Area (acres)	Treatment Factor	Export Coefficient	Pre-Treatment lbs P/Year	Post Treatment lbs P/year
MET TOWER 1	Met	250	667	100%	BL35	BOTH	Forest	0.1149	0.4	1.75	0.2010	0.0804

Total Impervious **0.115** acres Total Pre Tx Phos **0.2010** lbs P/year Total Post Tx Phos **0.0804** lbs P/year

Project Name	**Bull Hill**	BA=Buffer Adjacent to Small Imp	RB=Roadside buffer	BRS=Roadside Buffer with Rock Sandwich
Project Number	**74490E**	BL=Buffer w/level spreader	DB=Detention basin	
Date	4/15/2011	DT=Buffer w/ditch turnout	WP=Wet pond	
Done by	JAO	USF=Underdrain Soil Filter	INF=Infiltration	

QUALITY CALCULATIONS FOR LINEAR PORTION

Narraguagus River (T16 MD)

Phosphorous Requirement

Watershed per acre phosphorus budget (Appendix C):	P	N/A	# P/acre/year	Total ac of devel. parcel:	TA		acres
Small Watershed Threshold (Appendix C)	SWT		acres	NWI wetland acreage:	WA		acres
Allowable increase in Town's share of annual phos (App C)	FC		lbs P/year	Steep slope acreage:	SA		acres
Area avail. For development (App C)	AAD		acres	Existing imp area (Pre 1980)	EIA_B		acres
Project acreage: A = TA - (WA + SA + EIA_B + EIA_A)	A		acres	Existing imp area (post 1980)	EIA_A		acres
A/AAD	R						

Project Phos Budget: PPB = P x A	**PPB**	**N/A**	**lbs P/year**
Project Phos Budget with small watershed adjustment:	**PPB**	**N/A**	**lbs P/year**

Total Post Development Phos Export (lbs P/yr)=	**0.0000**	<=	**N/A**	Access rd width(Const)=	24		Crane path width(Const)=	36
% of Project Treated for WS=	**76.29%**	>=	75%	Access rd width(Perm)=	24		Crane path width(Perm)=	36
Total Impervious Area for WS=	13.38	Acres		Turbine pad imp area(Perm)=	12350	sq ft	Met Tower Rd width=	12

Roadway Alignment or Turbine Site	Access Crane Turbine	Station to Station		% of area	BMP No. (or none)	SIDE OF RD TX RIGHT, LEFT BOTH	BMP cover Forest Meadow	Imp. Area (acres)	Treatment Factor	Export Coefficient	Pre-Treatment lbs P/Year	Post Treatment lbs P/year
NS	Crane	1920	2210	100%	BL22	BOTH	Forest	0.2397	0.4			
NS	Crane	2210	2635	50%	BL5	RIGHT	Forest	0.1756	0.4			
NS	Crane	2210	2425	50%	B12	LEFT	Forest	0.0888	0.4			
NS	Crane	2425	2635	50%	BL5	LEFT	Forest	0.0868	0.4			
NS	Crane	2635	3000	50%	BL6	RIGHT	Forest	0.1508	0.4			
T12	Turbine			100%	B12		Forest	0.2835	0.4			
NS	Crane	2635	2975	50%	RB1	LEFT	Forest	0.1405	0.4			
T13	Turbine			50%	BL7		Forest	0.1418	0.4			
NS STUB 13	Crane	10000	10300	100%	BL7	BOTH	Forest	0.2479	0.4			
NS	Crane	2975	3000	50%	NONE	LEFT		0.0103	1			
NS	Crane	3000	3300	100%	NONE	BOTH		0.2479	1			
NS	Crane	3300	3610	50%	BL7	LEFT	Forest	0.1281	0.4			
NS	Crane	3300	3400	50%	NONE	RIGHT		0.0413	1			
NS	Crane	3400	3610	50%	BL7	RIGHT	Forest	0.0868	0.4			
NS	Crane	3610	4150	100%	BL7	BOTH	Forest	0.4463	0.4			
NS	Crane	4400	4725	100%	BL33	BOTH	Forest	0.2686	0.4			
NS	Crane	4725	5000	100%	BL9	BOTH	Forest	0.2273	0.4			
NS	Crane	5000	5200	100%	BL9	BOTH	Forest	0.1653	0.4			
NS	Crane	5200	5700	100%	BL10	BOTH	Forest	0.4132	0.4			
T16	Turbine			100%	B16		Forest	0.2835	0.4			
NS	Crane	5700	5950	50%	B16	LEFT		0.1033	0.4			
NS	Crane	5700	5950	50%	BL11	RIGHT	Forest	0.1033	0.4			

NS	Crane	5950	6200	100%	NONE	BOTH	Forest	0.2066	1			
NS	Crane	6200	6600	100%	NONE	BOTH		0.3306	1			
NS	Crane	6600	7350	50%	RB2	RIGHT	Forest	0.3099	0.4			
NS	Crane	6600	6850	50%	NONE	LEFT	Forest	0.1033	1			
NS	Crane	6850	7200	50%	BL12	LEFT	Forest	0.1446	0.4			
NS	Crane	7200	7500	50%	BL29	LEFT	Forest	0.1240	0.4			
NS	Crane	7350	7500	50%	BL29	RIGHT	Forest	0.0620	0.4			
T17	Turbine			100%	B17		Forest	0.2835	0.4			
T18	Turbine			100%	BL13		Forest	0.2835	0.4			
NS	Crane	7500	7700	50%	NONE	LEFT		0.0826	1			
NS	Crane	7700	8025	50%	BL13	LEFT	Forest	0.1343	0.4			
NS	Crane	7500	8025	50%	BL13	RIGHT	Forest	0.2169	0.4			
NS	Crane	8025	8425	50%	BL14	BOTH	Forest	0.1653	0.4			
NS	Crane	8425	8725	50%	BL36	LEFT	Forest	0.1240	0.4			
NS	Crane	8425	8800	50%	BL30	RIGHT	Forest	0.1550	0.4			
NS	Crane	8800	8815	50%	NONE	RIGHT		0.0062	1			
NS	Crane	8725	8815	50%	NONE	LEFT		0.0372	1			
T19	Turbine			100%	BL36		Forest	0.2835	0.4			
T1-4	Crane	101250	101600	50%	BL16	LEFT	Forest	0.1446	0.4			
T4	Turbine			100%	B4		Forest	0.2835	0.4			
T3	Turbine			100%	B3		Forest	0.2835	0.4			
T5-6	Crane	500450	500800	100%	NONE	BOTH		0.2893	1			
T5-6	Crane	500800	501025	50%	BL28	RIGHT	Forest	0.0930	0.4			
T5-6	Crane	500800	501025	50%	BL28	RIGHT	Forest	0.0930	0.4			
T5-6	Crane	501025	501400	50%	B5	RIGHT	Forest	0.1550	0.4			
T5	Turbine			100%	B5		Forest	0.2835	0.4			
T5-6	Crane	501025	502600	50%	NONE	LEFT		0.6508	1			
T5-6	Crane	501400	501550	50%	NONE	RIGHT		0.0620	1			
T5-6	Crane	501550	501800	50%	RB8	RIGHT	Forest	0.1033	0.4			
T5-6	Crane	501800	502525	50%	NONE	RIGHT		0.2996	1			
T5-6	Crane	502525	503100	50%	B6	RIGHT	Forest	0.2376	0.4			
T5-6	Crane	502600	503100	50%	BL23	LEFT	Forest	0.2066	0.4			
T6	Turbine			100%	B6		Forest	0.2835	0.4			
T8	Turbine			50%	B8		Forest	0.1418	0.4			
T8-9	Crane	100000	100275	50%	B8	LEFT	Forest	0.1136	0.4			
T8-9	Crane	100000	100175	50%	NONE	RIGHT		0.0723	1			
T8-9	Crane	100175	100400	50%	BL24	RIGHT	Forest	0.0930	0.4			
T8-9	Crane	100275	100400	50%	BL24	LEFT	Forest	0.0517	0.4			
T8-9	Crane	100400	100650	50%	BL24	LEFT	Forest	0.1033	0.4			
T8-9	Crane	100400	100650	50%	BL24	RIGHT	Forest	0.1033	0.4			
T8-9	Crane	100650	100850	50%	RB9	RIGHT	Forest	0.0826	0.4			
T8-9	Crane	100650	100850	50%	NONE	LEFT		0.0826	1			
T8-9	Crane	100850	101350	100%	BL31	BOTH	Forest	0.4132	0.4			
T8-9	Crane	101350	102240	50%	RB10	RIGHT	Forest	0.3678	0.4			
T8-9	Crane	101350	102570	50%	NONE	LEFT		0.5041	1			
T8-9	Crane	102240	102570	50%	NONE	RIGHT		0.1364	1			
T9	Turbine			100%	B9		Forest	0.2835	0.4			
MET TOWER 4	Met	0	70	50%	BL13	LEFT	Forest	0.0096	0.4			
MET TOWER 4	Met	0	70	50%	NONE	RIGHT		0.0096	1			
MET TOWER 4	Met	70	220	100%	BL34	BOTH	Forest	0.0413	0.4			
MET TOWER 4	Met	220	845	100%	RB11	BOTH	Forest	0.1722	0.4			

Total Impervious **13.38** acres Total Pre Tx Phos **0.0000** lbs P/year Total Post Tx Phos **0.0000** lbs P/year

Project Name	**Bull Hill**	BA=Buffer Adjacent to Small Imp	RB=Roadside buffer	BRS=Roadside Buffer with Rock Sandwich
Project Number	**74490E**	BL=Buffer w/level spreader	DB=Detention basin	
Date	4/15/2011	DT=Buffer w/ditch turnout	WP=Wet pond	
Done by	JAO	USF=Underdrain Soil Filter	INF=Infiltration	

QUALITY CALCULATIONS FOR LINEAR PORTION

Spectacle Pond (T16 MD)

Phosphorous Requirement

Watershed per acre phosphorus budget (Appendix C):	P	0.062	# P/acre/year	Total ac of devel. parcel:	TA	22.49	acres
Small Watershed Threshold (Appendix C)	SWT	24	acres	NWI wetland acreage:	WA		acres
Allowable increase in Town's share of annual phos (App C)	FC	6.08	lbs P/year	Steep slope acreage:	SA		acres
Area avail. For development (App C)	AAD	489	acres	Existing imp area (Pre 1980)	EIA_B		acres
Project acreage: A = TA - (WA + SA + EIA_B + EIA_A)	A	22.49	acres	Existing imp area (post 1980)	EIA_A		acres
A/AAD	R	0.046					

Project Phos Budget: PPB = P x A	**PPB**	**1.394**	**lbs P/year**
Project Phos Budget with small watershed adjustment:	**PPB**	**N/A**	**lbs P/year**

Total Post Development Phos Export (lbs P/yr)=	**1.372**	<=	**1.3944**	Access rd width(Const)=	24		Crane path width(Const)=	36
% of Project Treated for WS=	**N/A**	>=	75%	Access rd width(Perm)=	24		Crane path width(Perm)=	30
Total Impervious Area for WS=	1.48	Acres		Turbine pad imp area(Perm)=	12350	sq ft	Met Tower Rd width=	12

Roadway Alignment or Turbine Site	Access Crane Turbine	Station to Station		% of area	BMP No. (or none)	SIDE OF RD Tx RIGHT, LEFT BOTH	BMP cover Forest Meadow	Imp. Area (acres)	Treatment Factor	Export Coefficient	Pre-Treatment lbs P/Year	Post Treatment lbs P/year
T14	Turbine			100%	B14		Forest	0.2835	0.4	1.75	0.4962	0.1985
NS	Crane	4150	4250	50%	B14	LEFT	Forest	0.0344	0.4	1.75	0.0603	0.0241
NS	Crane	4150	4250	50%	NONE	RIGHT		0.0344	1	1.75	0.0603	0.0603
NS	Crane	4250	4400	100%	NONE	BOTH	Forest	0.1033	1	1.75	0.1808	0.1808
T15	Turbine			100%	B15		Forest	0.2835	0.4	1.75	0.4962	0.1985
NS	Crane	1475	1920	100%	BL4	BOTH	Forest	0.3065	0.3	1.75	0.5363	0.1609
T13	Turbine			50%	NONE			0.1418	1	1.75	0.2481	0.2481
MET TOWER 3	Met	0	335	100%	NONE	BOTH		0.0923	1	1.75	0.1615	0.1615
NS	Crane	1920	2210	100%	BL22	BOTH	Forest	0.1997	0.4	1.75	0.3495	0.1398

Total Impervious **1.479** acres Total Pre Tx Phos **2.589** lbs P/year Total Post Tx Phos **1.372** lbs P/year

Project Name **Bull Hill**
Project Number **74490E**
Date 4/15/2011
Done by JAO

BL=Buffer with a Level Lip Sprea L=Length
Imp=Impervious area W=Width
Land=Landscaped Area B=Buffer
C1=Loamy Sand or Sandy Loam C2=Silt Loam, Clay Loam or Silty Clay Loam

REQUIRED BUFFER FLOW PATH LENGTHS

~BUFFERS WITH LEVEL LIP SPREADERS~

0-8% Buffer Slope

Soils	Length of Flow Thru Buffer (ft)	Berm L for Forested Buffer(ft)		Berm L for Meadow Buffer(ft)	
		Per acre Imp	Per acre Land	Per acre Imp	Per acre Land
A	75	75	25	125	35
	100	65	20	75	25
	150	50	15	60	20
B	75	100	30	150	45
	100	80	25	100	30
	150	65	20	75	25
C1	75	125	35	150	45
	100	100	30	125	35
	150	75	25	100	30
C2	100	150	45	200	60
	150	100	30	150	45
D	150	150	45	200	60

9-15% Buffer Slope

Length of Flow Thru Buffer (ft)	Berm L for Forested Buffer(ft)		Berm L for Meadow Buffer(ft)	
	Per acre Imp	Per acre Land	Per acre Imp	Per acre Land
75	90	30	150	42
100	78	24	90	30
150	60	18	72	24
75	120	36	180	54
100	96	30	120	36
150	78	24	90	30
75	150	42	180	54
100	120	36	150	42
150	90	30	120	36
100	180	54	240	72
150	120	36	180	54
150	180	54	240	72

Graham Lake (TM)

BMP Type & #	Roadway Align. or Turbine Site	Imp (acres)	Buffer Type (forest/meadow)	Treatment Factor	Soil Type	Buffer Slope	Standard Buffer Length (ft) (from table)	L of Berm per ac. imp (from table)	Standard Berm Length (ft)	Adjusted Buffer Length (ft)
BL1	NS	0.2504	Forest	0.4	C	6.0%	100	150	38	100
BL2	NS	0.2893	Forest	0.4	C	6.5%	100	150	43	100
BL3	NS	0.1715	Forest	0.4	C	7.0%	150	100	17	150
BL15	T1-4	0.2066	Forest	0.4	C	3.5%	100	150	31	100
BL17	T1-4	0.2066	Forest	0.4	C	10.5%	150	120	25	150
BL18	T1-4	0.3306	Forest	0.4	C	6.5%	100	150	50	100
BL19	T1-4	0.2479	Forest	0.4	C	6.0%	100	150	37	100
BL20	T1-4	0.0620	Forest	0.4	C	6.0%	100	150	9	100
BL21	NS	0.0950	Forest	0.4	C	4.0%	100	150	14	100
BL25	T7	0.0620	Meadow	0.4	C	6.5%	100	200	12	100
BL26	T7	0.2273	Forest	0.4	C	4.0%	100	150	34	100
BL27	T1-4	0.0826	Forest	0.4	C	5.0%	100	150	12	100
BL8	T7	0.4132	Forest	0.4	C	4.0%	150	100	41	150
B3	T1-4	0.3868	Forest	0.4	C	5.0%	100	150	58	100

Spectacle Pond (TM)

							from table	from table		
BMP Type & #	Roadway Align. or Turbine Site	Imp (acres)	Buffer Type (forest/meadow)	Treatment Factor	Soil Type	Buffer Slope	Standard Buffer Length (ft)	L of Berm per ac. imp	Standard Berm Length (ft)	Adjusted Buffer Length (ft)
BL4	NS	0.3065	Forest	0.3	C	8%	100	150	46	133
BL22	NS	0.1997	Forest	0.4	C	6.0%	100	150	30	100

Narraguagus River (TM)

							from table	from table		
BMP Type & #	Roadway Align. or Turbine Site	Imp (acres)	Buffer Type (forest/meadow)	Treatment Factor	Soil Type	Buffer Slope	Standard Buffer Length (ft)	L of Berm per ac. imp	Standard Berm Length (ft)	Adjusted Buffer Length (ft)
BL5	NS	0.2624	Forest	0.4	C	10.0%	150	120	31	150
BL6	NS	0.1508	Forest	0.4	C	8.0%	100	150	23	100
BL7	T13	1.0508	Forest	0.4	C	6.5%	150	100	105	150
BL9	NS	0.3926	Forest	0.4	C	7.0%	100	150	59	100
BL10	NS	0.4132	Forest	0.4	C	4.0%	150	100	41	150
BL11	NS	0.1033	Forest	0.4	C	5.0%	100	150	15	100
BL12	NS	0.1446	Forest	0.4	C	4.0%	100	150	22	100
BL13	T18	0.6444	Forest	0.4	C	6.0%	150	100	64	150
BL14	NS	0.1653	Forest	0.4	C	9.0%	100	180	30	100
BL16	T1-4	0.1446	Forest	0.4	C	3.5%	100	150	22	100
BL23	T5-6	0.2066	Forest	0.4	C	3.5%	100	150	31	100
BL24	T8-9	0.3512	Forest	0.4	C	4.5%	100	150	53	100
BL28	T5-6	0.1860	Forest	0.4	C	17.5%	100	180	33	100
BL22	NS	0.2397	Forest	0.4	C	6.0%	100	150	36	100
BL29	NS	0.1860	Forest	0.4	C	6.0%	100	150	28	100
B27	Sub	0.2634	Forest	0.4	C	9.0%	100	180	47	100
B28	Sub	0.1747	Forest	0.4	C	4.0%	100	100	17	100
BL30	NS	0.1550	Forest	0.4	C	13.0%	100	180	28	100
BL31	T8-9	0.4132	Forest	0.4	C	4.0%	150	100	41	150
BL33	NS	0.2686	Forest	0.4	C	5.0%	100	150	40	100
BL34	MET TOWER 4	0.0413	Forest	0.4	C	4.5%	100	150	6	100
BL36	NS	0.4075	Forest	0.4	C	12.0%	150	120	49	150

Narraguagus Lake (TM)

							from table	from table		
BMP Type & #	Roadway Align. or Turbine Site	Imp (acres)	Buffer Type (forest/meadow)	Treatment Factor	Soil Type	Buffer Slope	Standard Buffer Length (ft)	L of Berm per ac. imp	Standard Berm Length (ft)	Adjusted Buffer Length (ft)
BL35	MET TOWER 1	0.1149	Forest	0.4	C	4%	100	240	28	100

Project Name	**Bull Hill**	RB=Roadside Buffer	L=Length
Project Number	**74490E**	Imp=Impervious area	W=Width
Date	4/15/2011	Land=Landscaped Area	B=Buffer
Done by	JAO		

REQUIRED BUFFER FLOW PATH LENGTHS

~BUFFER ADJACENT TO DOWN HILL SIDE OF ROAD~

# of Travel Ways to Buffer	Length of Flow Forest	Length of Flow Meadow
1	35	50
2	55	80

* Buffer slopes may not exceed 20%

** Buffers may not be located in a wetland

*** Roadside slopes may be included in a meadow buffer **if** the slope is less than 4:1 **and** if the soils allow infiltration

Graham Lake (TM)

BMP Type & #	Roadway Align. or Turbine Site	# of Travel Ways (1 or 2)	Buffer Type (Forest or Meadow)	Treatment Factor	Standard Buffer* Length (ft)	Adjusted Buffer Length (ft)
RB3	T1-4	1	Forest	0.40	55	55
RB4	T1-4	1	Forest	0.40	55	55
RB5	T1-4	1	Forest	0.40	55	55
RB6	T1-4	1	Forest	0.40	55	55
RB12	T1-4	1	Forest	0.40	55	55

Spectacle Pond (TM)

BMP Type & #	Roadway Align. or Turbine Site	# of Travel Ways (1 or 2)	Buffer Type (Forest or Meadow)	Treatment Factor	Standard Buffer* Length (ft)	Adjusted Buffer Length (ft)

Narraguagus River (TM)

BMP Type & #	Roadway Align. or Turbine Site	# of Travel Ways (1 or 2)	Buffer Type (Forest or Meadow)	Treatment Factor	Standard Buffer* Length (ft)	Adjusted Buffer Length (ft)
RB2	NS	1	Forest	0.40	55	55
RB8	T5-6	1	Forest	0.40	55	55
RB9	T8-9	1	Forest	0.40	55	55
RB10	T8-9	1	Forest	0.40	55	55
RB1	NS	1	Forest	0.40	55	55
RB11	MET TOWER 4	2	Forest	0.40	35	35

* Crane paths are considered a 2 way road, met towers are 1 for the calculations

Attachment D

Revised Section 5B Blasting Plan

It is anticipated that during construction, blasting will be required in some locations to break up bedrock ledge. This will enable road grades to accommodate oversized loads accessing the site and allow for construction of the turbine foundations and underground electrical collector lines. This blasting and other areas of excavation cuts will provide fill that can be used elsewhere on site for road, turbine pad, and turbine crane pad material. When designing the access road and crane path for this project, the project cut/fill balance attempted to minimize the net import or export of fill to or from the site. Any excess material will likely be utilized on-site. In addition, any waste concrete from tower foundations will also be used as fill in the turbine clearings.

Geotechnical investigations at each turbine site are currently under way, and therefore turbine foundation types have yet to be specified for this project. Preliminary indications suggest that the majority of turbine foundations will be a spread footing type of foundation.

BLASTING PLAN

General

Blasting operations shall follow all local, state and federal regulations related to transportation and use of explosives.

Pre-Blast Surveys/Notifications

Pre-blast surveys will be offered to all property owners within 2,000 foot radius of the blast site. Appropriate notices will be given and appointments arranged for those owners who desire a survey. Results of those surveys will be documented through video or still photographs and appropriate narration or written reports.

Property owners within 2,000 feet of the blast area will be provided a blasting schedule. The blasting schedule shall contain, at a minimum – (1) Name, address, and a telephone number of the operator, (2) Identification of the specific areas in which blasting will take place, (3) Dates and time periods when explosives are to be detonated, (4) Methods to be used to control access to the blasting areas, and (5) Type and patterns of audible warning and all-clear signals to be used before and after blasting.

Blast Monitoring

All blasts will be monitored by a representative who has been properly trained in the setup and use of seismic monitoring equipment. At least one seismograph will be in use at all times. Placement of monitoring equipment will be at the nearest structure to the blast site.

Sequence of Blasting

All blasting operations will be strictly coordinated with all appropriate parties including the Fire Department. Emphasis will be on the safe and efficient removal of the rock existing on this project without impact to surrounding structures. Blasts will be developed so as to create adequate relief which will minimize ground vibrations and offer the greatest protection possible to the surrounding structures.

Blasting Procedures

1. Blasting operations shall commence after 6:00 AM and cease before 6:00 PM, Monday through Friday.

2. Blasting cannot be conducted at times different from those announced in the blasting schedule except in emergency situations, such as electrical storms or public safety required unscheduled detonation.

3. Warning and all-clear signals of different character that are audible within a range of one-half mile from the point of the blast shall be given. All persons within the permit area shall be notified of the meaning of the signals through appropriate instructions and signs posted.

4. Access to blasting area shall be regulated to protect the public from the effects of blasting. Access to the blasting area shall be controlled to prevent unauthorized entry before each blast

and until the perimeter's authorized representative has determined that no unusual circumstances exist after the blast. Access to and travel in or through the area can then safely resume.

5. Areas in which charged holes are awaiting firing shall be guarded, barricaded and posted or flagged against unauthorized entry.

6. All blasts shall be made in the direction of the stress relieved face.

7. All stemming shall be minimum as specified using clean, dry 3/8" crushed stone.

8. Blasting mats shall be used as necessary to cover blasts.

Blasting Mats
Blasting mats and backfill will be used to control excessive amounts of rock movement and flyrock when blasting in close proximity to structures. Mats will be placed so as to protect all people, structures, and prevent flyrock from entering a protected natural resource on, or surrounding the blast site and property.

Blast Security and Warning Whistles
Each blast will be preceded by a security check of the affected area and then a series of warning whistles. Communications will be made with job site supervisors and local officials as required to ensure the safest possible operation. All personnel in the vicinity closest to the blast area will be warned. The warning whistles will follow the following sequence:

3 Whistles – 5 Minutes to Blast

2 Whistles – 1 Minute to Blast

1 Whistle – All Clear

The blast site will be examined by the blaster prior to the all clear signal to determine that it is safe to resume work. No blast will be fired until the area has been secured and determined safe.

Explosives
All explosives will be delivered to the job site on a daily basis. There will be no overnight storage. Only the amount of explosives required to perform the day's work will be brought to the site. All explosives will be stored in approved magazines when not in use.

Blasting Personnel
All blasting operations shall be conducted by experienced, trained and competent persons who understand the hazards involved. Persons working with explosive materials shall:

1. Have demonstrated a knowledge of, and willingness to comply with, safety and security requirements.

2. Be capable of using mature judgment in all situations.

3. Be of good physical condition and not addicted to intoxicants, narcotics, or other similar type of drugs.

4. The person(s) responsible for the explosives shall possess current knowledge of the local, State and Federal laws and regulations applicable to his work.

5. The person(s) responsible for the explosives shall have obtained a Certificate of Competency or a license as required by State law.

Licenses and Permits
Blasting operations to be performed by a blaster who is fully licensed and insured for the transportation, use, and handling of explosives. Blasting permits will be applied for as required from local authorities.

Blast Vibration
Blast vibration will be monitored at the blast site, typically at the structure(s) closest to the blast site. Vibration limits will closely follow limits described in the State Regulations. Blast designs will be modified as required to stay within the guidelines. Blasting operations will be modified accordingly when approaching buildings and utilities.

The standards found at 38 MRSA §490-Z)(14)(H) concerning airblast levels will be applied for this project.

Records of individual blasts will generally include the information listed at 38 MRSA §490-Z)(14)(L).