

KENT HILLS 3: KENT HILLS WIND FARM EXPANSION PHASE 3

Appendix J Visual Impact Assessment

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Appendix J Visual Impact Assessment

Visual Impact Assessment – Kent Hills 3 Wind Project

Date: September 12, 2017

Re: Visual Impact Assessment for the Kent Hills 3 Project

1.0 Introduction and Project Background

Due to the importance of assessing the potential effect to the area's visual aesthetics, a Visual Impact Assessment was completed for the Kent Hills 3 Project (the Project), also incorporating the existing turbines from the Kent Hills 1 and Kent Hills 2 Project phases, known collectively as the Kent Hills Wind Farm. The visual analysis conducted for the Kent Hills Wind Farm uses techniques that illustrate potential visual impacts and are generally based on the planning approach and graphic communication techniques, as demonstrated in "Guidelines for Landscape and Visual Impact Assessment" (3rd Edition, The Landscape Institute, Institute of Environmental Management and Assessment 2013).

The approach to conducting this visual assessment involved the creation of Zone of Visual Influence (ZVI) maps of the landscape and photomontage simulations from selected vantage points in and around the regional study area (RSA).

2.0 Zone of Visual Influence (ZVI)

The results presented in this section are based on the cumulative impact on the Zone of Visual Influence (ZVI) from the addition of the Kent Hills 3 Project consisting of nine additional turbine locations under consideration (5 preferred, 4 alternate) to be appended to the existing 50 wind turbines already in operation at the Kent Hills Wind Farm. When constructed, the proposed Kent Hills 3 Project will consist of five Vestas V126-3.45 megawatt (MW) turbines having a 117 m hub-height.

The Project area can be described as having very little residential development being situated on a Crown land plateau. Results from the previous ZVI assessments completed for the Kent Hills 1 and Kent Hills 2 Wind Farms suggest that turbine observation *"is quite visually contained. The hills in the surrounding area serve to limit views of the wind farm in the 10 to 15 km range. Beyond approximately 20 km, views of the wind farm open up in the Moncton-to-Petitcodiac corridor and*

the eastern side of the Bay of Fundy, but from these large distances the wind turbines are not a dominant feature on the landscape.”

2.1 ZVI Modeling

ZVI is based on line-of-sight between gridded viewpoints and the various wind turbines that comprise the wind farm. The model relies on information from digital elevation models (DEM) and turbine locations to generate a ZVI map. ZVI maps use color coding to categorize the number of turbines visible from a given viewpoint. If the highest observable part of any turbine can be seen then the count is one, and if the highest observable part of all the turbines can be seen then the count is 59, which consist of 50 from existing turbines and 9 for the KH3 turbines under consideration (note that only 5 of the 9 proposed locations will be constructed).

Two models were run using different study boundaries to represent the two visibility ranges of a wind turbine.

1. The first study boundary was a 15 x 15 km area around the wind farm center. The model is run using the blade tip as the highest observable part of the turbine (up to 125 m height for the existing KH1 and KH2 turbines; and up to 180 m height for the proposed KH3 turbines). It is recognized that from within this distance, the average person’s eye would recognize a turbine blade.
2. The second study boundary was a 35 x 35 km area around the wind farm center. The model is run using the turbine nacelle as the highest observable turbine part (at 80 m height for the existing KH1 and KH2 turbines; and 117 m height for the proposed KH3 turbines) From within this distance, the average person’s eye would recognize the tower of a wind turbine but from a distance greater than 15 km would not recognize a turbine blade.

The ZVI was simulated using the WindPro version 3.1.617 software. The simulation is considered “worst case”, as it does not consider obstacles such as trees or other vegetation, and buildings or structures. It also assumes that weather conditions are conducive to the visibility of the turbines within the study area.

As the height contours are the only obstruction to view, the accuracy of the DEM is an important consideration for the ZVI model. In this case, the DEM accuracy used within the first 15 km is 2 m while the remaining is based on the standard 10-m contour lines. The calculation grid is 50 x 50 meters, and the receptor or viewer height is 1.5 m above grade to be representative of average human vision.

2.2 ZVI Results

The results of each ZVI map from each of the two zone simulation scenarios are provided in Figure 1 and Figure 2, respectively.

Figure 1 shows the results of the first zone of visual influence modeled as per scenario 1. For that area, the number of visible turbines including blade tips could be described as highly visually constrained as a great number of turbines could be seen only at viewpoints with similar elevation as the Project itself – mainly on top of surrounding hills. For a majority of visual receptors in this range, less than 15 turbines could theoretically be observed. For those visible turbines within the 3 km range, they would take less than 5 degrees of the of the vertical field of view.

Figure 2 shows the results of the second visual influence modeled as per scenario 2. For that area, the number of visible turbines could be described as low since the hills in the surrounding area serve to limit views of the wind farm beyond the 10 km range. Beyond approximately 20 km, views of the wind farm open up in the Moncton-to-Petitcodiac corridor and the eastern side of the Bay of Fundy, but from these large distances the wind turbines are not a dominant feature on the landscape. For the Kent Hills Wind Farm collectively, it is estimated that beyond the 5 km range, visible turbines would take less than 1 degree of the of the vertical field of view.

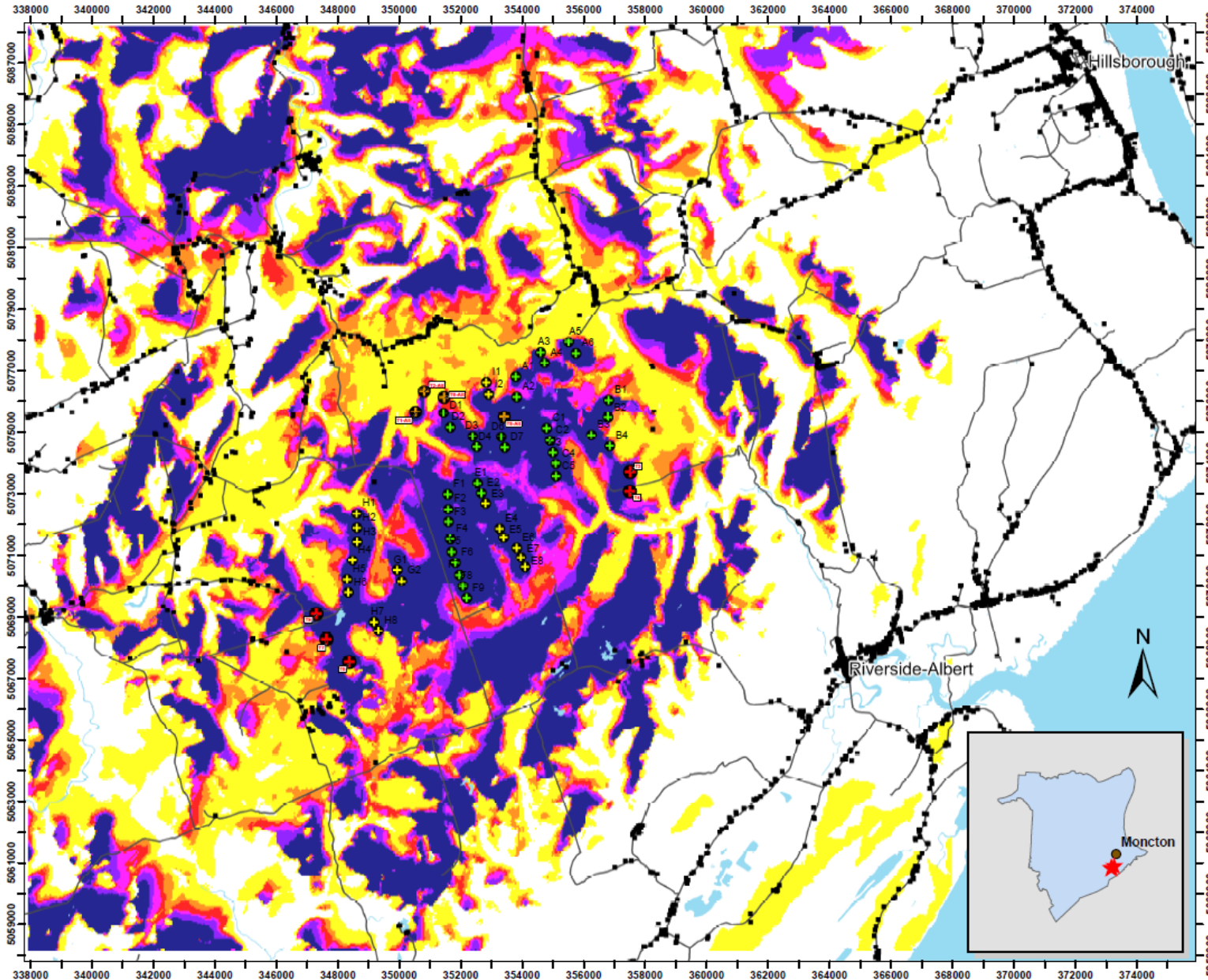
2.3 ZVI Conclusion

There are two main factors to keep in mind while interpreting the ZVI results:

1. ZVI maps represent where wind turbines may be seen theoretically – that is, they may not actually be visible in a real-life situation due to various reasons such as vegetation or weather conditions affecting visibility or localized screening which is not represented by the DEM accuracy; and
2. ZVI maps indicate potential visibility only, that is, the areas in which there may be a line of sight. They do not convey the nature or magnitude of visual impacts. For example, whether visibility will result in positive or negative effects and whether these will be significant or not.

As per the results presented herein, the cumulative impact of adding the Kent Hills 3 Project - a five turbine expansion - to the existing Kent Hills Wind Farm is considered to be low. Its geographical location on higher ground mostly surrounded by forested hills contains the visual impact to surrounding hills with similar elevations. Populated areas tend to be in valleys or lower elevations with the effect of masking most turbines by nearby hills. Beyond the 10 km range, it is generally agreed that turbines in sight of view take only less than one degree of the vertical field of view.

Figure 1 – ZVI at 15 km including blades



Legend

- Kent Hills Phase 3 - Preferred 5
- Kent Hills Phase 3 - Alternate
- Kent Hills Phase 1
- Kent Hills Phase 2
- Dwellings
- Roads
- Waterbody

ZVI @ 15km with blades

Number of visible turbines

1 - 15
15 - 23
23 - 30
30 - 37
37 - 44
44 - 59

0 1/4 1 2 3 4 km's

TransAlta™

Kent Hills 3 Wind

**Zone of Visual Influence
15 km including Blades**

Date: August 21th, 2017
 Projection: UTM Zone 20, NAD83
 Source: NTDB 1:50,000, GeoNB, ESRI, Province of New Brunswick, Carvec and TransAlta
 Created By: TransAlta - Simon Belanger
 Scale: 1:120,000

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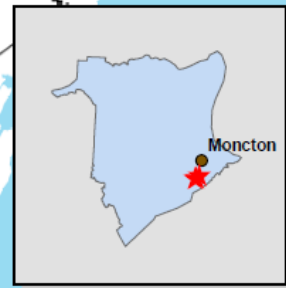
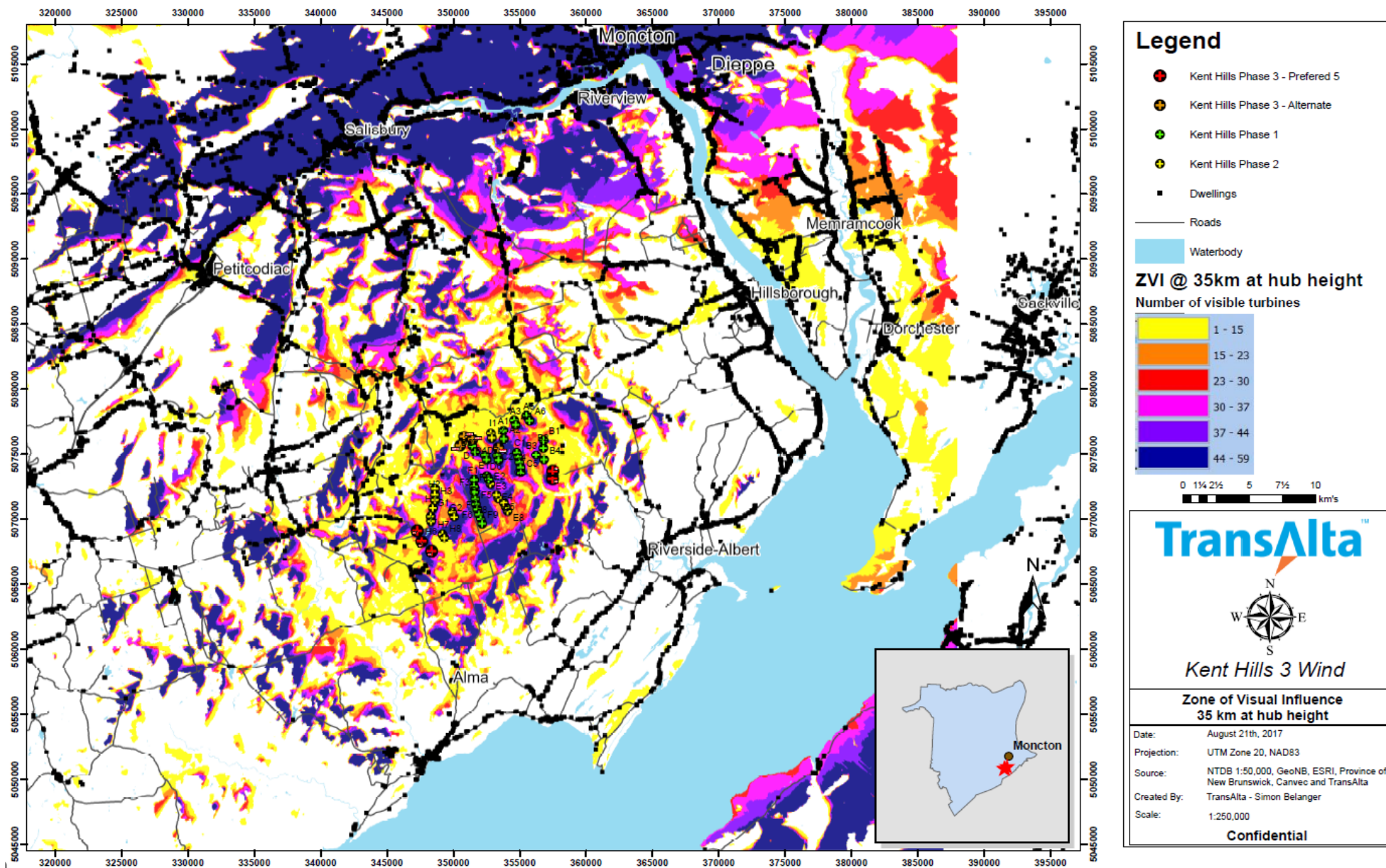


Figure 2 – ZVI at 35 km at hub height



3.0 Photomontage

A viewshed analysis was completed to support the overall visual impact assessment for the Kent Hills 3 Project. Visualizations (photomontage or computer-altered photographs) were used to illustrate the anticipated change to characteristic landscapes within the Regional Study Area (RSA) resulting from the installation of the Project.

The objective is to create images that are highly accurate and representative of the visual landscape as a result of the proposed wind farm expansion. The visual impact assessment included nine additional turbine locations under consideration (5 preferred, 4 alternate) to be appended to the existing 50 wind turbines operating at Kent Hills 1 and Kent Hills 2.

Photographs were selected to provide the viewer with characteristic views of the existing landscape where the additional proposed turbine locations could be observed.

3.1 Photomontage Modeling

In November 2016, May 2017 and August 2017, site reconnaissance was conducted to take representative photographs of existing visual conditions, and to identify key public viewpoints appropriate for simulation. Potential viewpoints were identified from known landmarks and simulations were developed from those photographs.

For each viewpoint, a camera was mounted on a leveled tripod at 1.5 m above grade and focused on located turbines. The camera was set at equivalent of 35 mm SLR 50 mm focal length. A GPS reading was then taken at the base of the tripod and, when applicable, at two objects in the field of view to be used as control points. As an example, when existing turbines from Kent Hills 1 and Kent Hills 2 were visible in the field of view, they were used to fix the photograph location and angle of view. A compass reading was taken in direction of the center view to set the pan angle. Other parameters such as the picture timestamp and weather conditions were also considered to increase the accurateness of the.

Photomontages were simulated using the WindPro version 3.1.617 software. The simulation relies on viewpoint and control point locations, turbine locations and the DEMs (height contours). Photographs were imported and the control points were aligned to the corresponding objects in the photograph. A wire frame of the surrounding topography was created and overlaid on the photograph to synchronize with the camera settings. The software then renders images of the turbines onto the photographs per their spatial reference and DEM data. Lastly, the rendered visible turbines are adjusted to be representative of the natural weather conditions, light and oriented toward the direction of the prevailing winds.

3.2 Photomontage Results

A selection of 11 representative views and photomontages where Project turbine(s) could be visible from the viewpoint are listed in Table 1 and presented in Figure 1. Various viewpoints were abandoned due to existing obstacles (trees, buildings, hills, etc.) for which no expansion turbines were in sight of view. The 11 photomontage visualizations that have been produced for this assessment are presented in Appendix A.

Table 1. Kent Hills 3 Photomontage Viewpoints

ID	Location	Direction
Viewpoint 1	Junction of Prosser Brook Road and main access road	SW
Viewpoint 2	Prosser Brook area	SE
Viewpoint 3	Hayward Road	SE
Viewpoint 4	Hayward Road	SE
Viewpoint 5	Prosser Brook area	SSE
Viewpoint 6	Prosser Brook west area	SE
Viewpoint 7	New Ireland Road	NE
Viewpoint 8	Ferndale Road	SE
Viewpoint 9	Blackwood Lake Road	NE
Viewpoint 10	Hayward Pinnacle Summit	NNE
Viewpoint 11	Hayward Pinnacle Summit	SW

In Viewpoints 1 to 6, the Project will mostly affect the visual landscape along Prosser Brook Road and Hayward Road where the three alternate turbine locations [T1Alt, T2-Alt, T6-Alt] would be prominent for nearby residents. For some of those residences, a few existing turbines from Kent Hills 1 and Kent Hills 2 phases are already visible and can be observed on the original photographs. The impact on the landscape could be qualified as medium as the size of the proposed turbines become a significant part of the field of view for the observer. However, these viewpoints are already being partially impacted by pre-existing wind turbines. No concerns were raised on the cumulative impact of these viewpoints during the Open House. Nonetheless, TransAlta is aware of the sensitivity for this potential visual impact and ranked these proposed turbine locations as ‘alternate’ with medium-low risk of being selected for construction.

In Viewpoint 7 to 9, the Kent Hills 3 expansion will slightly affect the landscape for those road and cabin users on New Ireland Road, Ferndale Road and Blackwood Lake Road. Land users in this area mostly consist of snowmobilers, ATV’s, hikers and local residents accessing their nearby leased lands or cabins. Turbines observed from these viewpoints [T3, T4, T5, T7, T9] are the five preferred turbine locations currently selected for construction since they present a minimal impact on the landscape and are considered to blend with the existing turbines already seen from these locations. No concerns were raised on the cumulative impact of these viewpoints during the Open House held on June 20, 2017.

For the Hayward Pinnacle summit, a meeting with the Dobson Trail Association and Fundy Hiking Trail Association suggested the visual impact from the Project might be considered high for hikers visiting this landmark. Thus, two photographs (i.e viewpoints) were taken from the summit to evaluate the visual impact of the Project from this location. The results of the photomontages suggest a relatively medium-high impact based on the relatively short distance of the turbines to Hayward Pinnacle, but being somewhat reduced due to views currently being obstructed by existing trees and topography (Figure 3). Nonetheless, TransAlta has considered the potential sensitivities associated with visual impacts from the Project at Hayward Pinnacle and has ranked these proposed turbine locations (T1 Alt, T2 Alt) as alternate sites with medium-low risk of being selected for construction.

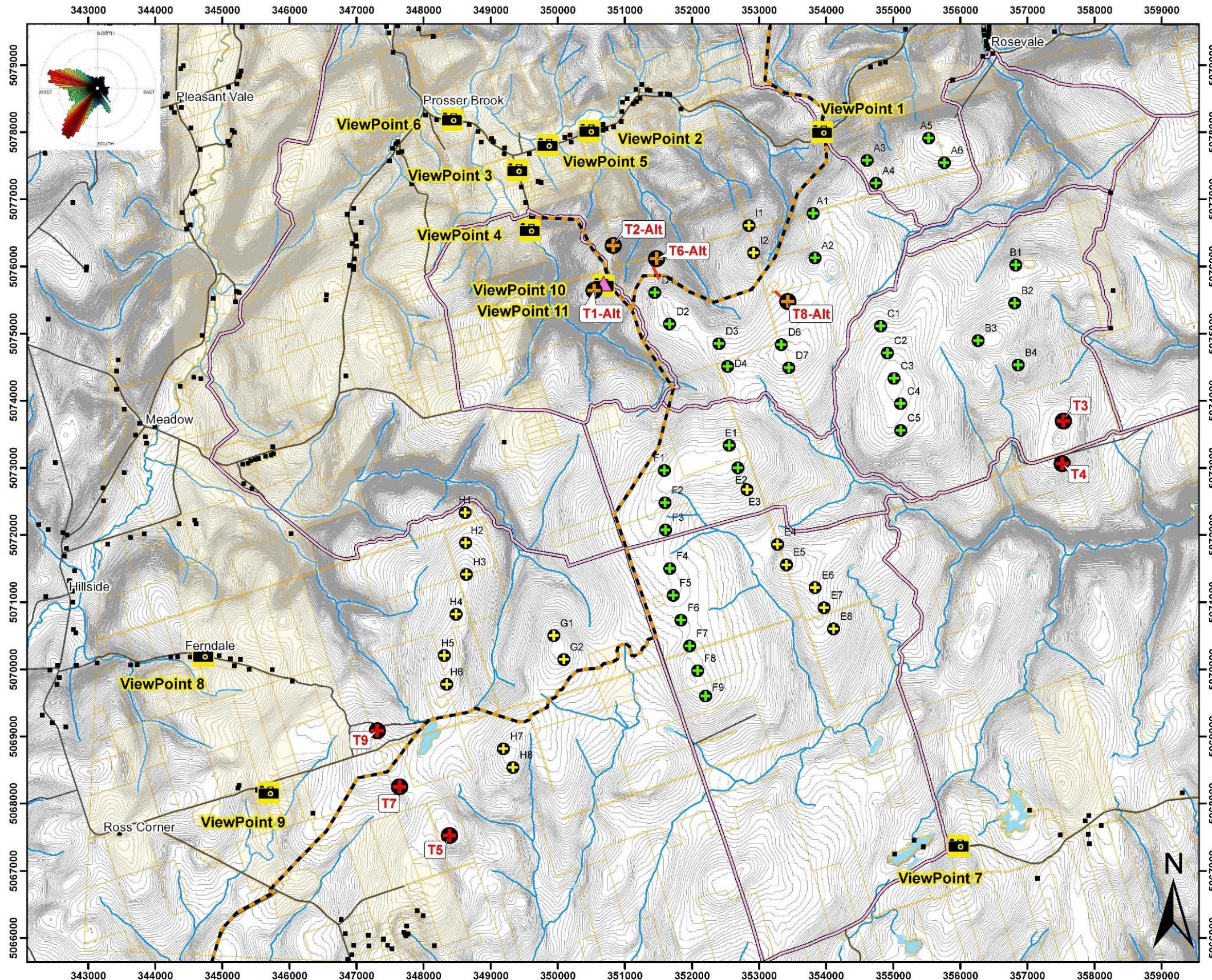
The visual impact assessment for the Kent Hills 3 Project also demonstrated that the 50 turbines assessed in the Kent Hills 1 and Kent Hills 2 photo simulations were quite accurate compared to the existing conditions today, having no instances where the installed turbines were more visible in the simulation compared to what was presented to the public during the initial public consultation period in 2007/2009. To date, no complaints have been filed regarding visual impacts related to the existing Kent Hills wind farm.

3.3 Photomontage Conclusion

As per the results presented herein, the cumulative impact of adding the Kent Hills 3 Project - a five turbine expansion - to the existing Kent Hills Wind Farm is low considering the most likely selection of turbine locations T3, T4, T5, T7 & T9. The cumulative impact could be considered medium if any of the proposed Kent Hills 3 Project alternate turbine locations were inevitably selected for construction.

The proposed Project has been planned and designed to minimize visual impacts to scenic resources within the RSA. TransAlta has made provisions for fitting the wind turbines, collection lines, access roads, and ancillary facilities harmoniously into the existing natural environment and believes that there will be no unreasonable interference with existing scenic or aesthetic uses. Its geographical location on higher ground mostly surrounded by forested hills contained the visual impact to surrounding hills with similar elevations. Most roads and dwellings in the area are in valleys and the steep sides of the plateau block views of all but the nearest turbines. At most vantage points in the area, only a few turbines (if any) are visible at any one time due to this effect and the screening effects of vegetation along the roads.

APPENDIX A



Legend

- Kent Hills Phase 3 - Preferred 5
- Kent Hills Phase 3 - Alternate
- Kent Hills Phase 1
- Kent Hills Phase 2
- Hayward Pinnacle
- Viewpoints
- Dwellings
- Dobson Trail
- NBFSC Trails - 2016-2017
- Roads
- Property Lines
- Private Lands
- Waterbody
- Drainages
- Contours 2m

0 0.375 0.75 1.5 2.25 3 km's

Kent Hills 3 Wind

Photomontages - ViewPoints

Date: September 7th, 2017
 Projection: UTM Zone 20, NAD83
 Source: NTDB 1:50,000, GeoNB, ESRI, Province of New Brunswick, Canvec and TransAlta
 Created By: TransAlta - Simon Belanger
 Scale: 1:55,000

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Figure 3 – Viewpoints of the Kent Hills 3 Project

Viewpoint 1: Prosser Brook Rd, looking toward SW



Original



Simulation

Viewpoint 2: Prosser Brook area, looking toward SE

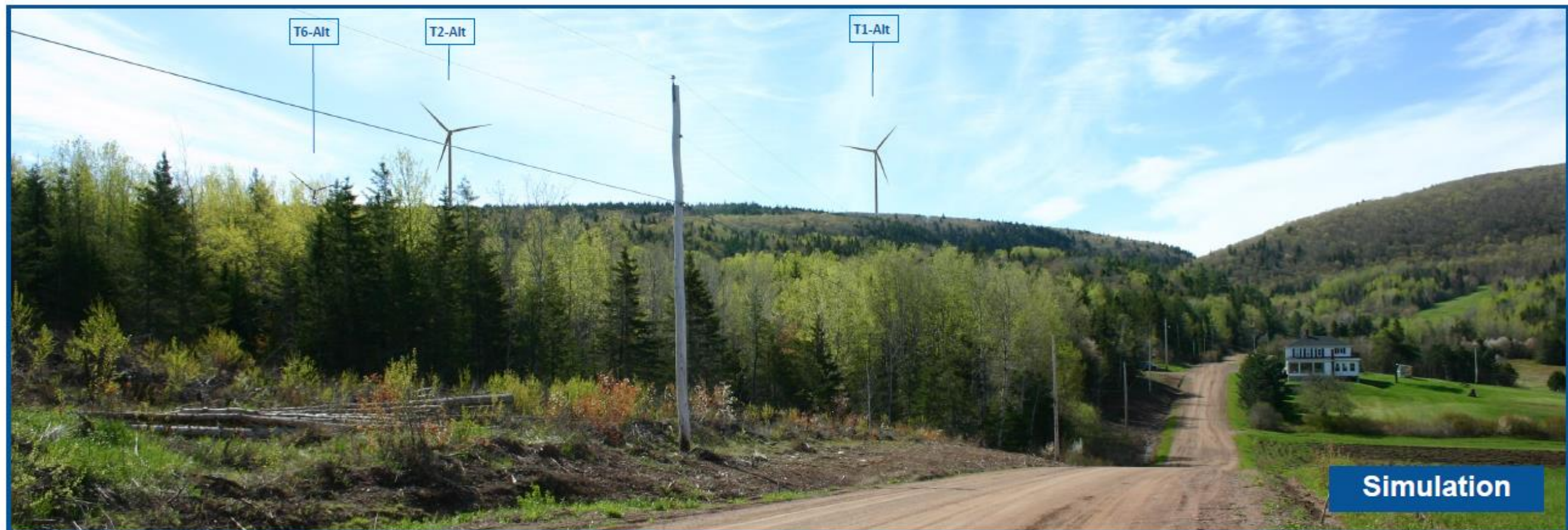


Original



Simulation

Viewpoint 3: Hayward Rd, looking toward SE



Viewpoint 4: Hayward Rd, looking toward SE



Original



Simulation

Viewpoint 5: Prosser Brook area, looking toward SSE



Viewpoint 6: Prosser Brook west area, looking toward SE



Viewpoint 7: New Ireland Rd - Highest point, looking toward NE



Original



Simulation

Viewpoint 8: Ferndale Rd, looking toward SE



Viewpoint 9: Blackwood Lake Rd, looking toward NE

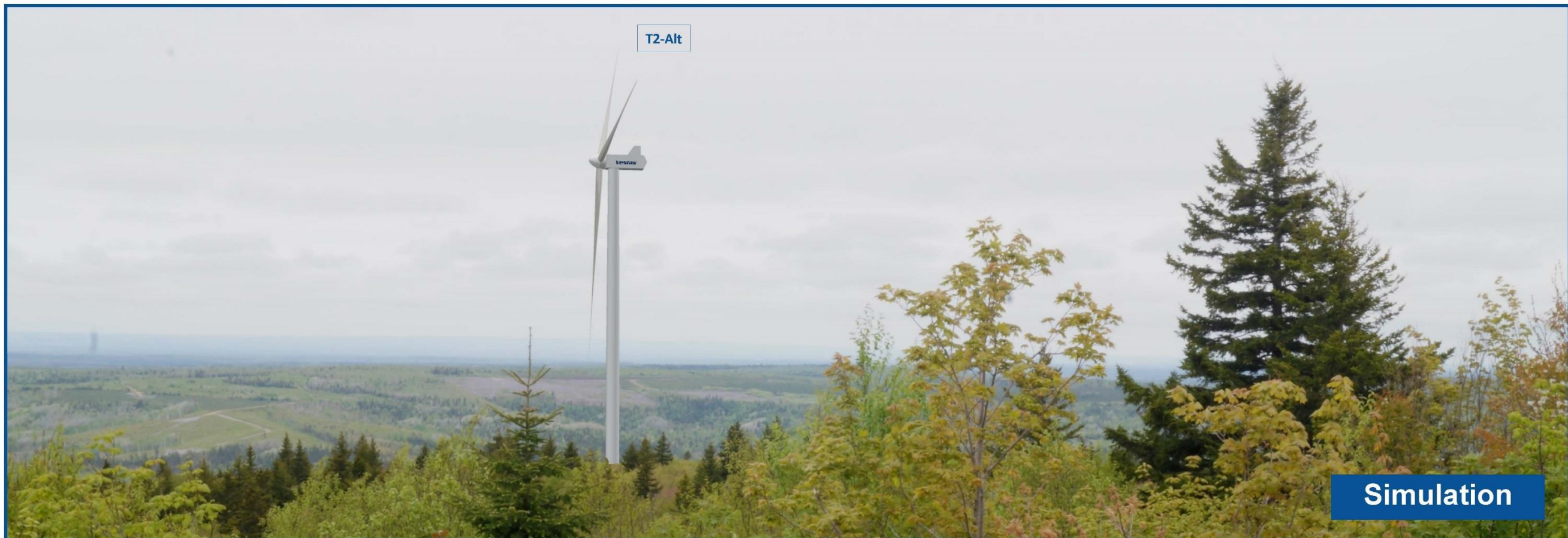


Original



Simulation

Viewpoint 10: Hayward Pinnacle - Summit, looking toward Moncton [NNE]



Viewpoint 11: Hayward Pinnacle - Summit, looking toward SW

