

## **V-2.0 TRANSMISSION CORRIDOR ROUTING SELECTION PROCESS**

TransCanada considered several transmission line alternatives to connect the proposed Kibby Substation to the existing regional electric transmission grid. Evaluation and selection of the transmission route was made based on total route length, proximity to sensitive resources, accessibility, property ownership, and anticipated cost of construction. TransCanada studied the route selected by the earlier Kenetech project, and identified several other options for connection into the existing electrical transmission system. Extension of a transmission line corridor into Canada was also considered because of proximity of the Kibby Wind Power Project site to the U.S. national border with Canada.

TransCanada used a phased approach, by identifying the nearest existing substations and transmission lines, evaluating potential corridors to these, selecting the most appropriate endpoint, comparing possible routes to the selected endpoint, and choosing the best route based on the combination of relevant factors. TransCanada considered five possible endpoints:

- Lac Megantic in Canada northwest of the Kibby site;
- Rumford Substation to the south;
- Harris Substation to the east;
- Lake Moxie to the east between Harris and Wyman Substations; and
- Stratton Substation (similar to the endpoint chosen by Kenetech) to the south.

The first two endpoints were eliminated early in the evaluation process, and the remaining three were compared in detail. The selected endpoint was then evaluated and refined to minimize impacts to the environment, adjacent landowners, and the community.

### **V-2.1 Initial Identification of Possible Substation Endpoints**

#### ***V-2.1.1 Lac Megantic***

Although the market for the Kibby Wind Power Project is the United States, and in particular, New England, interconnection could be made at Lac Megantic, Canada, with return of the electricity to the United States via an existing HydroQuebec transmission line terminating in Ayer, Massachusetts. This potential interconnection option was examined early in the project.

The direct distance from the Kibby Wind Power Project site to the Lac Megantic Substation is approximately 23 miles (37 kilometers [km]). Depending upon the route selected (typically routing follows existing features such as roadways or rail corridors to the extent feasible), the actual transmission distance could be significantly greater.

There were a number of factors that eliminated this option from further consideration. From an environmental and engineering impact perspective, the general characteristics (for example, terrain and wetland presence) of this route appeared similar to other areas surrounding the project. Given that the route would generally need to be through undeveloped areas, potential impacts and issues associated with resources encountered would be similar on a per-mile basis to other potential routing corridors. In addition, significant regulatory issues would be associated with pursuing this interconnection option. A Presidential Permit would be required from the U.S. Department of Energy for a facility proposed to cross the U.S./Canadian border. The Presidential Permit process is a federal review that typically requires a full National Environmental Policy Act (NEPA) Environmental Impact Statement, which would be in addition to the comprehensive and lengthy review process required by LURC. Permits would also be required from the Canadian government, depending upon the specific impact potential of a potential corridor.

The purpose of the Kibby Wind Power Project is to utilize a premier wind resource to respond to New England's growing demand for clean, renewable and sustainable energy. Given this purpose, and the above factors, it was determined that an interconnection point with the ISO-NE electrical system within Maine would be preferred for the project. No further examination of this route was undertaken.

#### ***V-2.1.2 Rumford Substation***

One option for connection with the ISO-NE system considered and eliminated was Rumford Substation. Rumford is located approximately 72.5 miles (116.7 km) south of the Kibby Wind Power Project site, but is connected to an existing 34.5 kV collector line that extends within approximately 21.5 miles (34.6 km) of the site, along Route 16. The 34.5 kV line would not be suitable, both because it is privately owned and because the project requires a larger capacity (115 kV) transmission line. Therefore, in order to interconnect at the Rumford Substation, approximately 21.5 miles (34.6 km) of 115 kV line would be required to reach the existing 34.5 kV corridor, and an additional 50.9 miles (81.9 km) of 115 kV transmission line would need to be installed parallel to the existing line. Given the distance and the terrain and wetland characteristics along the existing 34.5 kV corridor, this potential option was eliminated from further consideration.

#### ***V-2.1.3 Harris Substation***

Harris Substation is approximately 53 miles (86.1 km) due east of the proposed Kibby Substation (Figure V-2-1), and was considered as a potential interconnection point. TransCanada mapped a potential route from the proposed Kibby Substation to Harris Substation that follows existing roads and other corridors to the extent possible. This route was carried forward for further investigation.

The Kibby-Harris Route extends north from the proposed Kibby Substation along Gold Brook Road for approximately 9.5 miles (15.3 km) until it meets Spencer Road at Appleton Corners (also known as Appleton Road/Hardscrabble Road). The route then turns due east and parallels



Spencer Road for approximately 26.2 miles (42.2 km). The route avoids Parlin Pond by turning south along Route 201. After approximately 6.3 miles (10.1 km) the route turns due east again, just beyond the intersection of Route 201 and Capital Road, and follows an existing 34.5 kV electric transmission line ROW along the southern town line of Johnson Mountain Township and then the southern town line of Chase Stream Township. Directly after Mud Pond and just before Dead Stream Pond, the Kibby-Harris Route veers away from the town line to the northeast, following the existing 34.5 kV ROW until it meets with Harris Substation on the southern banks of Indian Pond. The total length of the Kibby-Harris Route is approximately 53 miles (86.1 km) from Kibby Substation to Harris Substation.

#### **V-2.1.4 Lake Moxie Substation**

The existing transmission line between Harris and Wyman Substations east of the Kibby Wind Power Project site passes through Lake Moxie (shown in Figure V-2-1). A terminus at Lake Moxie, approximately 58.7 miles (94.5 km) from the Kibby Substation, was determined to be appropriate for consideration. This location would require construction of a new substation capable of meeting project requirements. TransCanada mapped a potential route from the proposed Kibby Substation to Lake Moxie that follows existing roads and other corridors to the extent possible. This route was carried forward for further investigation.

From the proposed Kibby Substation, the Kibby-Lake Moxie Route would require construction of a new ROW heading southeast, parallel to and between Kibby Range and Kibby Stream. North of Antler Hill and Farm Hill the route turns east, and proceeds to bend alternately north and south as it winds its way east to avoid steep grades (King and Bartlett Mountain and Little King Ridge to the north) and major waterbodies. Nonetheless, the Kibby-Lake Moxie Route unavoidably crosses or is adjacent to many wetlands and waterbodies. Portions of the easterly route parallel existing roads, including a long stretch of Lower Enchanted Road to its terminus at Route 201. The eastern option to the south crosses over Route 201, turns south towards The Forks, and then heads east again crossing the Kennebec River near The Forks, above the confluence with the Dead River. The route then runs parallel to the town line between Moxie Gore and The Forks. It bears to the southeast for a short stretch along Lake Moxie Road where it finally meets with the existing 115 kV utility ROW. For the purposes of the alternatives analysis, TransCanada assumed that a two-breaker substation would be installed at this location for the intertie. The Kibby-Lake Moxie Route as proposed would be approximately 38.6 miles [62.1 km] in length from the Kibby Substation to the existing 115 kV line ROW in Lake Moxie. A little less than half of this distance would parallel existing roads.

#### **V-2.1.5 Stratton/Bigelow Substation**

The endpoint chosen by the former Kenetech project was Stratton Substation to the south. Kenetech mapped and compared seven alternative routes to Stratton Substation (Kenetech's alternatives analysis is provided in Appendix 2-G of this application). In considering potential routing alternatives, TransCanada assessed the previously identified routes in order to select an appropriate option for further consideration.

### **V-2.1.5.1      *TransCanada Assessment of Kenetech Routes***

The Kenetech LURC application (submitted in 1995) described the evaluation of seven routes for its proposed transmission line from the site to Stratton Substation. Each of the seven Kenetech routes (Figure V-2-2) proceeded south and then east of the project site to connect with the existing Stratton Substation. TransCanada reviewed the seven routes using updated information to confirm the validity of the Kenetech findings, and examine the relative merits of the routes.

Kenetech first identified the beginning and end points of the route, which were the proposed substation located south of Kibby Stream in Kibby Township (in a generally similar location to the currently proposed Kibby Substation) and the connection with the existing 115 kV line at Stratton Substation, respectively. Next, Kenetech identified significant natural resource and cultural constraints through literature review, map analysis, and initial site visits. Kenetech's areas of concern included:

- Little Jim Pond, Jim Pond, and the extensive wetlands associated with the Northwest Inlet;
- Flagstaff Lake and its regulated buffer zone;
- Kibby Range;
- The North Branch of the Dead River;
- Route 27 (major transportation route with residential and commercial development);
- Tea Pond;
- The village of Eustis and development surrounding Jim Pond and Porter Nadeau Roads;
- Wetlands around Reed Pond, Reed Brook, and Trout Brook;
- The Eustis Ridge picnic area with open views to the east toward Flagstaff Lake;
- Cathedral Pines;
- Mapped protected natural resources.

Kenetech mapped seven alternative routes for the transmission line, as shown in Figure V-2-2, and compared them for equivalency. Kenetech developed preliminary design information, reviewed aerial photographs for environmental feature differences, and examined land ownership along each route. The most promising routes avoided residential areas and public viewscapes. The original set of seven routes was reduced to three alternatives. Kenetech conducted field inspections for each of these, and considered cost, design and resource factors such as access, number of angles, subsurface conditions, topography, spans to avoid environmental impacts, and route changes to avoid impacts.









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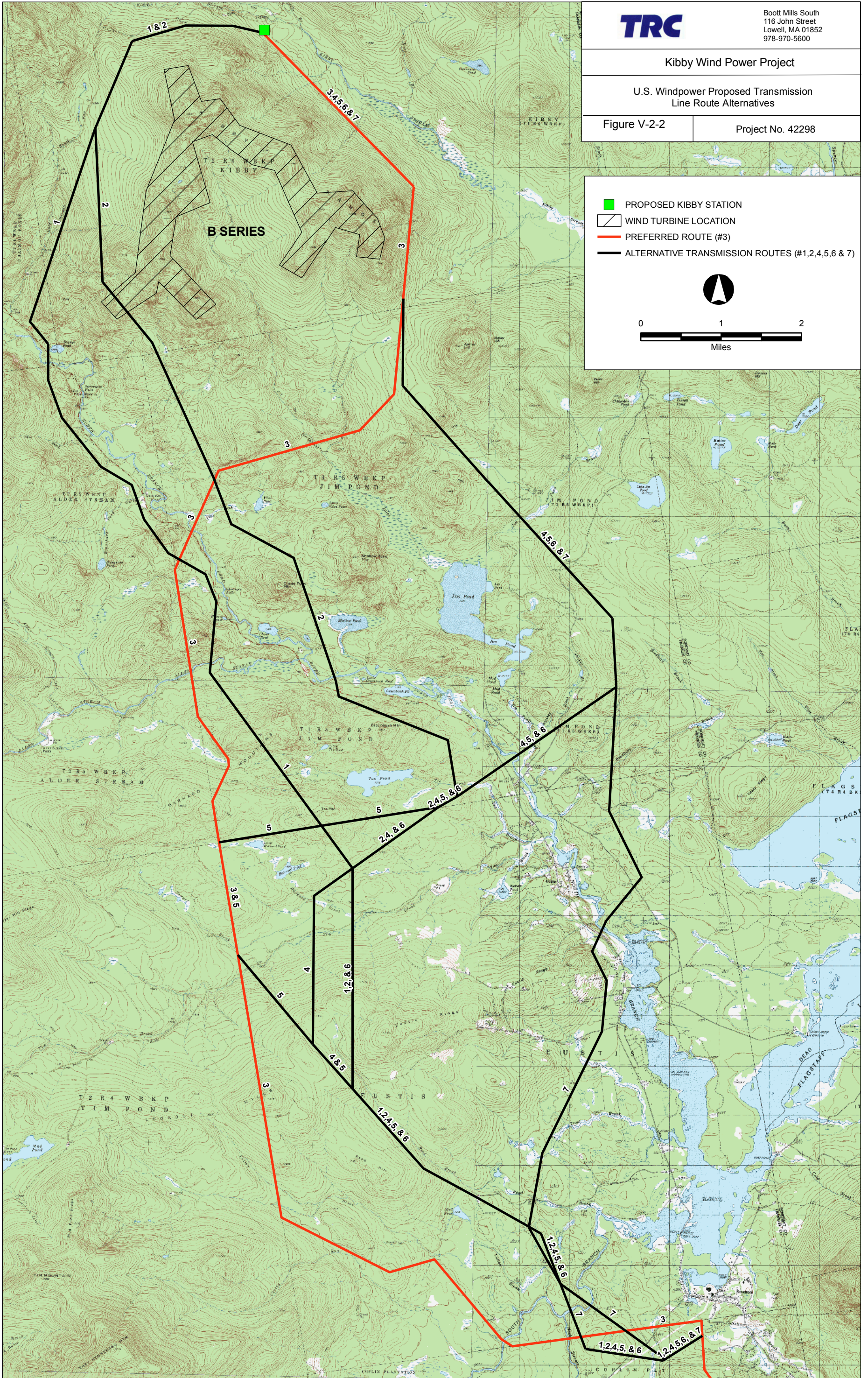
### Kibby Wind Power Project

U.S. Windpower Proposed Transmission  
Line Route Alternatives

Figure V-2-2

Project No. 42298

-  PROPOSED KIBBY STATION
-  WIND TURBINE LOCATION
-  PREFERRED ROUTE (#3)
-  ALTERNATIVE TRANSMISSION ROUTES (#1,2,4,5,6 & 7)





Kenetech chose their Route #3 for the following reasons:

- Avoids the entire Jim Pond and King & Bartlett Road areas completely;
- Results in no structures in waterway buffers and only one pole structure in a wetland;<sup>1</sup>
- Maximizes use of existing road networks;
- Avoids visually sensitive areas;
- Avoids all residential, commercial and significant recreation areas;
- Minimizes the number of landowners impacted; and
- Avoids high value stands and offers minimal interference with traditional land uses.

TransCanada examined the Kenetech routes in order to update as much as possible, using secondary data, the Kenetech route selection. TransCanada compared each route using the most recent USGS mapping, the DeLorme Maine Atlas and Gazetteer, aerial photography when available, and National Wetland Inventory (NWI) mapping. Kenetech Route #3 appears to cross fewer wetlands; is shorter in length and, therefore, less costly to construct; and avoids more scenic and recreational areas than most of the other alternatives considered by Kenetech. Kenetech Route #3 was confirmed as the most appropriate route considered by Kenetech.

#### ***V-2.1.5.2 Routing from Stratton Substation to Bigelow Substation***

Although the Kenetech route connected at Stratton Substation, the Kibby Wind Power Project requires an interconnection at Bigelow Substation due to changes in use of the lines since the time the Kenetech project was under consideration. Instead of turning into the Stratton Substation upon reaching the town of Stratton, a route was considered that avoids the town and turns south-southeast towards Hedgehog Hill. A route was identified that would parallel the existing Boralex 115 kV ROW which leads from the Stratton Substation to the Bigelow Substation.

#### ***V-2.1.5.3 Route 27 Alternative to Stratton Substation***

In addition to the Kenetech routing, TransCanada investigated whether a route to the Stratton Substation paralleling Route 27 would be advantageous or feasible. A transmission line paralleling Route 27 would be somewhat more direct, but more important, it would require far less intrusion on the landscape by following an existing cleared linear feature. However, the following issues removed this option from further consideration:

- Parallel occupancy of a road shoulder is typically only allowed by a utility;

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<sup>1</sup> Note that the current project design may or may not be able to achieve this level of wetland avoidance, as wetland definitions have changed over time.

- Route 27 is a state designated scenic highway and it is, therefore, less likely that an overhead transmission line would be permitted along its length;
- Areas of development are generally clustered along Route 27, making a transmission line located along that road more visible;
- Route 27 passes near Flagstaff Lake, a significant recreational area, again increasing its visibility;
- If an underground line were to be considered in order to address issues associated with visibility, costs would be in the range of five to ten times that for an aboveground line, depending on installation method (i.e., direct bury versus duct bank); and
- The transmission line length along this corridor would be 26.5 miles (42.7 km) from the proposed Kibby Substation to the Bigelow Substation (as compared to 27.6 miles [44.4 km] for the Preferred Route), not a significant decrease in length when compared to potential issues and costs.

#### **V-2.1.5.4 Kibby-Bigelow Route**

From the Kibby Substation the Kibby-Bigelow Route (as shown on Figure V-2-1) heads southeast parallel to and just south of Kibby Stream and Wahl Road. After approximately 1.7 miles (2.7 km), the route turns south for approximately 2.6 miles (4.2 km) and passes through the saddle between the eastern end of Kibby Range and Antler Hill. The route then turns southwest to avoid the large wetland area associated with the Northwest Inlet and Jim Pond, crossing the Northwest Inlet stream at its narrowest point. After approximately 2.4 miles (3.9 km) the route veers further southwest for 1.4 miles (2.3 km) and crosses the North Branch of the Dead River as well as Route 27 approximately 1 mile (1.6 km) north of Shadagee Falls. The route then bends south for 1.7 miles (2.7 km) and parallels the town line between Jim Pond and Alder Stream Townships. In order to avoid a large wetland at the base of the low lying Barnard Mountains the route bends southeast and then back southwest before continuing south again for 5.3 more miles (8.5 km) along the town line between Eustis and Tim Pond Townships. Through this stretch the Kibby-Bigelow Route crosses Sawyer Brook, Tim Pond Brook, Tim Pond Road and Lutton Brook. The route then turns southeast and crosses Cherry Run Brook and the South Branch of the Dead River before turning east along the Eustis and Coplin Plantation town line. After following the town line for approximately 2.5 miles (4.0 km) the route approaches Stratton.

From the Stratton area, the route parallels the existing Boralex 115 kV ROW which leads to the Bigelow Substation. The Stratton-Bigelow extension would require the construction of 5.9 miles (9.5 km) of transmission line parallel to the existing ROW; together with the proposed Kibby-Stratton route, this yields a total route length of 27.7 miles (44.4 km).



## V-2.2 Comparison of Kibby-Harris, Kibby-Lake Moxie and Kibby-Bigelow Routes

TransCanada conducted a detailed comparison of the three candidate routes (as shown in Figure V-2-1) with respect to engineering, environmental considerations, and community issues. Table V-2-1 presents a direct comparison of the three routes evaluated, and is followed by a narrative discussion of these and related factors.

**Table V-2-1. Alternative Route Comparison**

Study Factors	Harris	Lake Moxie	Bigelow
<i>Route Length (Miles)</i>			
New clearing ROW	0	19.3	21.7
New ROW Parallel to roads	43.2	18.0	0
Parallel to existing ROW	9.4	21.4	5.9
Total route length	52.6	58.7	27.6
<i>Natural Resource Issues</i>			
<i>Wetland Crossings<sup>2</sup></i>			
Lacustrine system	2	0	0
Riverine system	0	3	2
Palustrine system	69	32	37
<i>Waterbody Crossings</i>			
Perennial streams	50	15	15
Intermittent streams	5	0	7
<i>Community Issues</i>			
Potential impact to sensitive visual receptors	- Maine Public Reserve Land 1+ mile (1.6 km) north of Spencer Road associated with Attean Mountain and Pond  - No. 5 Bog north of route	- Route runs approximately 5 miles (8.1 km) north of Flagstaff Lake	- Crosses Route 27  - Enters Stratton just south of Flagstaff Lake
Potential impact to recreational activities	- Campsites along Gold Brook Road and Spencer Road  - Crosses north of commercial rafting	- Campsites along Lower Enchanted Stream  - Campsites near Kennebec River	- Crosses North (near canoe trip route) and South Branch of Dead River  - Existing ROW crosses Appalachian

<sup>2</sup> Based upon review of secondary data sources only. Field work would only be conducted for the selected route.

**Table V-2-1. Alternative Route Comparison**

Study Factors	Harris	Lake Moxie	Bigelow
	put-in	- Crosses Kennebec River reach used by commercial rafting trips and as a canoe route	Trail - Existing ROW runs parallel to Maine Public Reserve Land
<i>Logistics</i>			
Engineering feasibility	Feasible	Feasible	Feasible
Accessibility	Least accessible	Most accessible	Accessibility limited along the Kibby to Stratton segment
Ease of maintenance	Similar terrain and design; accessibility will be key to ease of maintenance	Similar terrain and design; accessibility will be key to ease of maintenance	Similar terrain and design; accessibility will be key to ease of maintenance
No. of parcels/no. of landowners	22/9	26/11	19/8
Percent of ownership type	94% forest management 5% private landowner 1% public lands	93% forest management 8% private landowner 1% utility company	85% forest management 12% public lands (in forest use) 3% utility company
Cost for installation	\$34.8 million	\$38.8 million	\$18.2 million

Based on a review of the information presented above, the Kibby-Bigelow Route is the preferred route for the project interconnection with the regional transmission system. The prior licensing of the “new” portion of this route by Kenetech, although some years ago, is further evidence that this route meets the applicable regulatory criteria and will not have an undue impact on the environmental and communities. TransCanada determined that the Kibby-Bigelow Route is the apparent best route alternative based on the factors of minimization of impact to sensitive community and natural resources, land ownership and accessibility, length of route, and anticipated cost of construction.

**V-2.3 Route 27 Crossing Alternatives to Access Bigelow Substation**

The existing Boralex right-of-way is 150 feet (45.7 m) wide. South of the Boralex ROW an option exists for a 75-foot (22.9 m) ROW for an unrelated project. TransCanada proposes to occupy a 125 foot (38.1 m) right-of-way just south of that 75-foot (22.9 m) easement. The goal in locating adjacent to existing easements is to minimize the need for new clearing and to be

consistent with the priority of co-locating transmission elements where possible. If at some future time it is possible to adjust the project right-of-way to be closer to the existing corridor, TransCanada will work to make the new footprint as small as possible. Overhead and underground Route 27 crossing options have been identified.

An overhead routing option is illustrated in Figure V-2-3. Under this scenario, overhead lines would shift to the northern side of the Boralex right-of-way and cross Route 27 from a point just north of the Appalachian Trail property. Appropriate tree screening will be placed along the road edge, consistent with the screening in place within the Boralex right-of-way. From that point, the proposed corridor would remain along the north of the existing right-of-way, then turn to continue paralleling the existing right-of-way to the east. Where the corridor would cross the Appalachian Trail tree screening would be utilized, as is the case for the existing overhead line, to shield users of the Appalachian Trail from views of the cleared corridor. The proposed corridor would continue along the eastern side of the existing Boralex right-of-way to access Bigelow Substation.

Figure V-2-4 illustrates an underground crossing option, which would also involve overhead transmission lines within a 125 foot (38.1 m) corridor extending to the south of the existing right-of-way and optioned easement to a point just prior to Route 27. The transmission line would cross to the eastern side of Route 27 in an underground duct back, then extend underground along Route 27 to a point of access into Bigelow Substation.




Concept 1 has been selected, due to the following advantages:

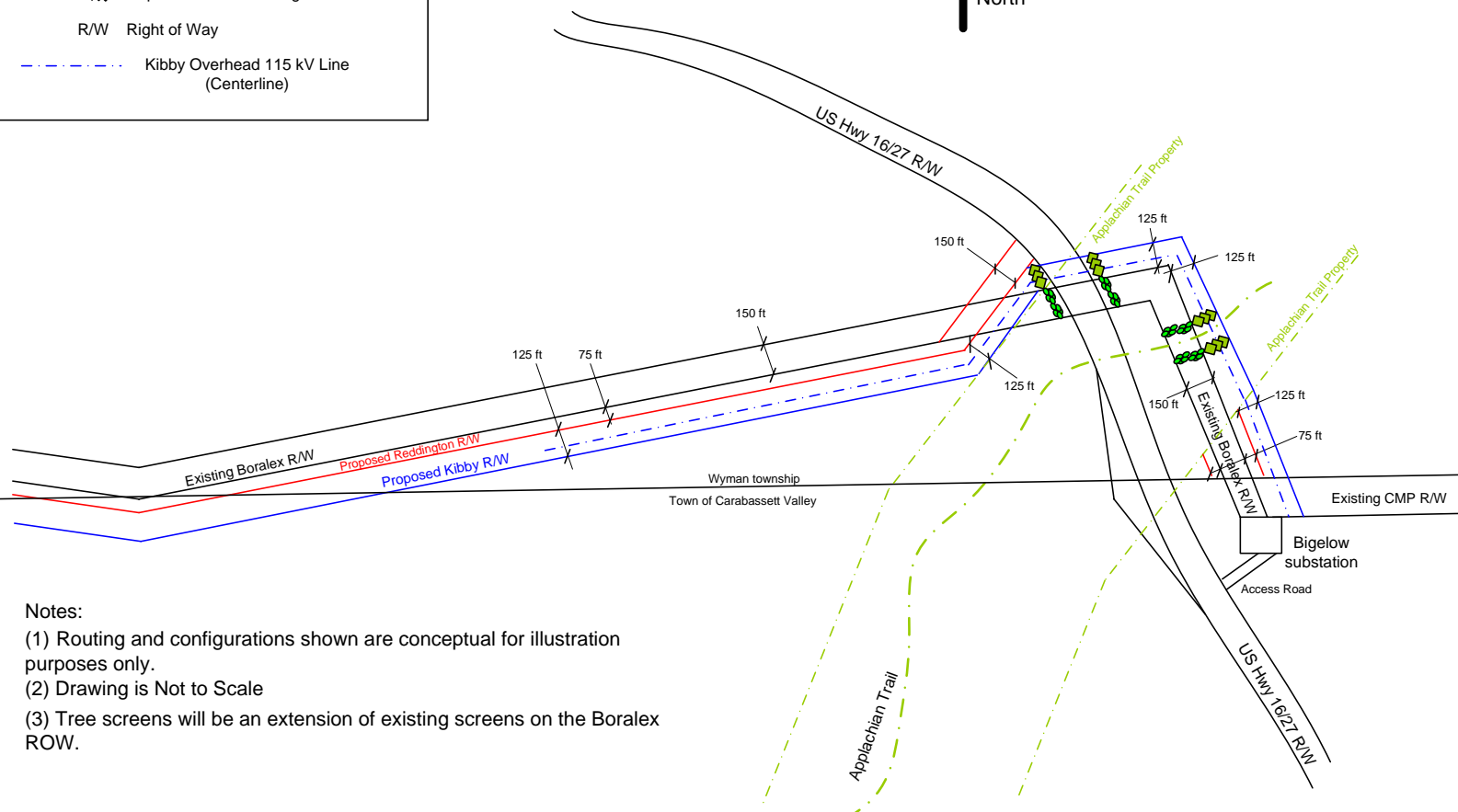
- It requires traffic and safety management only for stringing the lines across Route 27;
- It allows for greater flexibility on seasonal timing of construction;
- It results in minimal disturbance to existing grade surfaces; and
- It results in a significant cost advantage over directionally drilled alternatives, which would cost approximately \$2 million dollars more to install.

Although an aboveground alternative has some increased visual effect, it was considered to be only slightly incremental to the existing aboveground Boralex line. Design measures will be incorporated, such as tree screening, to reduce visibility from both Route 27 and the Appalachian Trail. Coordination will occur with the National Park Service to implement appropriate regulatory review for crossing of the Appalachian Trail in this location. The proposed ROW location, proximate to the Appalachian Trail's crossing of Route 27, is considered to have minimal potential to affect recreational experiences in the area. The 115 kV transmission line presented in this application, therefore, includes this concept for the final entry into Bigelow Substation.




**Legend**








-  Existing Tree Screening
-  Proposed Tree Screening
- R/W Right of Way
-  Kibby Overhead 115 kV Line (Centerline)

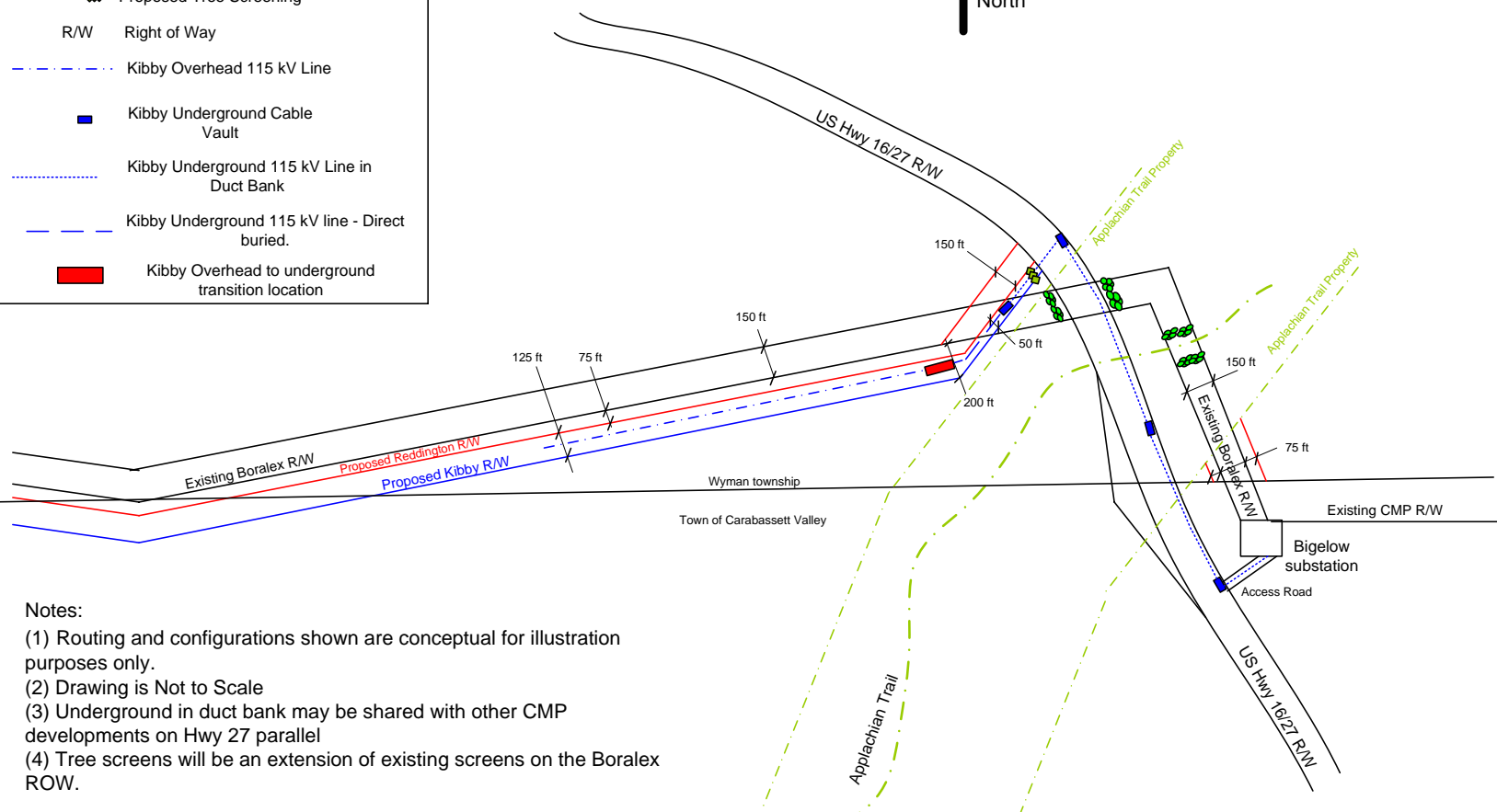


- (1) Routing and configurations shown are conceptual for illustration purposes only.
- (2) Drawing is Not to Scale
- (3) Tree screens will be an extension of existing screens on the Boralex ROW.

<b>Kibby Wind Power Project #1</b>	
 <p><b>TransCanada</b> <i>In business to deliver™</i></p>	Overhead Routing Option
Figure v-2-3	

**Legend**

-  Existing Tree Screening
-  Proposed Tree Screening
- R/W Right of Way
-  Kibby Overhead 115 kV Line
-  Kibby Underground Cable Vault
-  Kibby Underground 115 kV Line in Duct Bank
-  Kibby Underground 115 kV line - Direct buried.
-  Kibby Overhead to underground transition location



**Notes:**

- (1) Routing and configurations shown are conceptual for illustration purposes only.
- (2) Drawing is Not to Scale
- (3) Underground in duct bank may be shared with other CMP developments on Hwy 27 parallel
- (4) Tree screens will be an extension of existing screens on the Boralex ROW.

**Kibby Wind Power Project #3**



Underground Routing Option

Figure v-2-4