Brookfield

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May 1, 2015

c/o Mr. Martin Honigberg, Chairman
New Hampshire Site Evaluation Committee
21 South Fruit Street, Suite 10
Concord, NH 03301

Subject: Granite Reliable Power, LLC;
High Elevation Restoration Tree Survival Monitoring Protocol

Dear Site Evaluation Committee:

Pursuant to the Decision by the Site Evaluation Committee (SEC) Granting the Motion of Granite Reliable Power, LLC to Amend a Certificate of Site and Facility (the "Decision"), dated February 3, 2015, Granite Reliable Power (GRP) submits the attached High Elevation Restoration Tree Survival Monitoring Protocol (the "Protocol").

In its Decision, the SEC delegated the authority to monitor the road widening and crane assembly area construction and the execution of the approved Revised High Elevation Restoration Plan (the "Plan") to the New Hampshire Fish and Game Department (NHFG), and required that GRP be assisted by a qualified forester.

Since then, GRP has worked closely with both NHFG and Kevin Evans, a NHFG-recommended licensed forester whom GRP retained, to meet the Decision's condition requiring that a Protocol be prepared and submitted to NHFG and the SEC by May 4, 2015. On February 25, 2015, GRP met with them to develop the attached Protocol so that it addresses all the details of the approved Plan and the conditions set forth in the SEC's Decision. On March 13, 2015, GRP conducted a site visit for NHFG and Kevin Evans by snow cat, to gather enough information so that GRP and Mr. Evans could develop and timely submit the attached Protocol.

GRP also has made progress toward meeting the Decision's condition requiring GRP to evaluate and report as soon as possible whether sufficient indigenous topsoil or organic material will be available from the road widening or any on-site construction stockpiles, to be able to undertake additional plantings in the disturbed area. GRP has formulated a Methodology in the attached Protocol that details tree planting, plot selection, data collection, and analysis. In addition, GRP has begun selecting soil sites and evaluating the indigenous topsoil collected from those sites, but has been able to start doing so only recently because snow has covered the ground since the Decision was issued. There still remain several areas of the road still snow covered at this time and GRP plans to complete its evaluation as soon as the snow melts enough to allow Mr. Evans, GRP, and NHFG staff to access the site and to visually confirm the plot layout and indigenous soil availability. As soon as possible after that, GRP will report the results of that evaluation.

Further, the Decision requires GRP to undertake road widening-related construction, crane assembly area construction, and Plan implementation as soon as practicable in 2015. At this time, GRP has scheduled these activities to be completed in June 2015. If additional trees are needed due to mortalities during restoration efforts, additional trees will be ordered and planted in the fall 2015.

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If you have any questions or comments on the attached Protocol, please contact me at (207) 629-1872 or kyle.murphy@brookfieldrenewable.com.

Sincerely,

Kyle Murphy for

Kyle Murphy
Compliance Specialist

Attachment

Distribution: ***via email***

Todd Wynn, Tony Zarrella, Dennis Turcotte, Kevin Bernier; (GRP)
Richard Kristoff; (ACOE)
William Staats, Charles Bridges, John Kanter, Jillian Kilborn, Carol Henderson; (NHF&G)
John Warner, Maria Tur (F&WS)
Craig Rennie, NHDES

GRP File: 0001/1

Measuring Successful Tree Planting

An Amendment to the High Elevation Restoration Plan

for property managed by Granite Reliable Power

Millsfield, New Hampshire

A Report Submitted to

New Hampshire Fish and Game

and the

Site Evaluation Committee

Submitted by:
Kevin S. Evans
Professional Forester
N.H. License # 81
April 2015

Introduction

The Site Evaluation Committee decision granting the motion allowing Granite Reliable Power LLC to revise the High Elevation Restoration plan (HER) for its wind energy facility located on Mt. Kelsey concluded that the applicant's motion would be granted with the following conditions. The amendment states that with the assistance of a qualified forester the applicant shall prepare a protocol demonstrating how it will measure a 75 percent survival rate of trees planted for site restoration. This protocol shall include methods to analyze the factors that contribute to the success and failure to achieve 75 percent survival. The applicant will monitor tree survival for two years after planting is complete. At the end of each year the licensed forester will provide a report demonstrating the survival rate of the planted trees. In addition the SEC asked that Brookfield provide information regarding lessons learned in the process of implementing the HER which could be helpful in designing mitigation for future projects.

Purpose

This report will outline the measures to be taken to ensure successful tree planting and a protocol to measure success rate of seedlings planted.

Description of Site

The site is located on Mt. Kelsey, Millsfield New Hampshire. The elevation of the plantings will be between 2700 to 3470 feet. The soils are thin and rocky. The sites to be planted are areas that have been bulldozed for construction of the project. Some sites are near the towers themselves, while others are roadways that will be widened to 16 feet wide from the original construction widths or wider where necessary and other planting sites are on steep cut and fill banks to reduce erosion. The planting sites are to have topsoil placed on them from soil stock piled during the construction phase. These sites are exposed to direct sun and are subjected to wind and weather extremes.

Best Management Practices for site preparation and planting

Mountain top sites in Northern New Hampshire offer many challenges to successful tree plantings that will survive the conditions of shallow soil, harsh weather, short growing seasons, and general exposure on a disturbed site. The following are some critical Best Management Practices (BMPs) to help ensure a successful site preparation and planting scheme.

1. **Selecting Stock**: Containerized seedlings offer several advantages over bare root stock, including shorter cultivation time, extended planting season, and easier planting on rocky sites. Seedlings should also be procured from regions similar to the environment found on Mt. Kelsey.

2. **Site preparation**: Six to twelve inches of topsoil is recommended when planting tree seedlings. The single most limiting factor to seedling survival is soil being too compacted which will limit tree growth. Compacted soil reduces water infiltration and therefore reduces the availability of water for plant growth. Compacted soil also allows for sheet erosion that will dry the entire site out. Reclaimed soil moved to the site for planting must be left loose and un-compacted. When placing soil on level ground or gently sloping lands, soil placement should be carefully planned; once a pile is dumped in place, no more equipment should pass over it except for a final, light grading with a small dozer. Soil compaction is also limited when soil materials are dry, so reclaimed soil must be dry when applied. Mulch application is also critical in helping with moisture loss and preventing erosion.

3. **Planting:** Seedlings should be planted in late spring. The shorter the time period from nursery to planting on site is critical. Keep packed seedlings out of direct sun, and plant immediately after the seedlings are unpacked, preferably within 24 hours of receiving. (If not planting within 24 hours of receiving, place packaged seedlings under refrigeration at a temperature of 40-50 degrees Fahrenheit. If planting is delayed by a week or more, heel in the seedlings by spreading the roots out in a trench so that soil is in contact with all roots.) Planting crews should not pick up more seedlings then they can plant within a short period of time. Seedlings should be carried in a planting bag and not removed until planting hole is opened. Seedlings should be planted 1 inch deeper than their nursery soil. During planting the seedlings must be kept well watered. Exposing roots to hot sunlight and drying winds for as little as 3-5 minutes can cause seedling mortality. Avoid air pockets when planting; make sure seedlings are tamped in properly, as air spaces will cause roots to die.

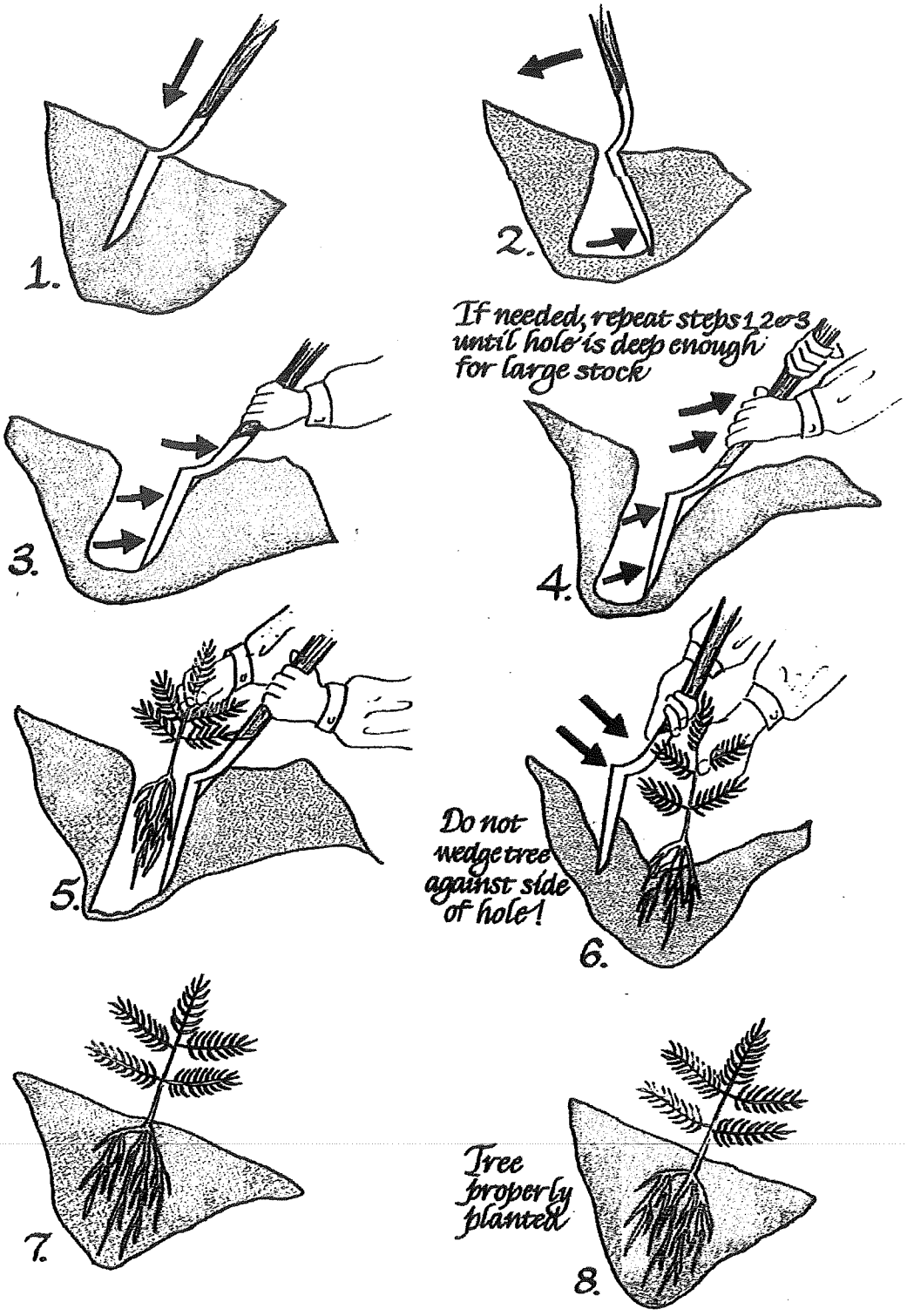
4. **Data to be recorded for each seedling:**

   - Source of growing stock, date of delivery to contractors, date of delivery to site
   - Date of planting, time of day, and by whom
   - Weather and planting conditions
   - Site conditions such as soil, mulch, and watering history

5. **Care after planting:** It is also recommended that the newly planted seedlings get plenty of water as they get established for the first few weeks. The watering should occur at any point when dry top soils are observed.

Steps in Shovel Planting

(Broken out on 4 sides)



Measuring survival of seedlings

The most simple and often used method to determine tree survivability is to create permanent circular plots of 43.5 square feet (one hundredth of an acre) for monitoring. However, the narrow width of these planting areas, the relative small acreage, and the steep slopes make this approach unsuitable for application at the Mt. Kelsey site. After considerable research we located a method that we believe is better suited for this site. It is called "the Ten-Tree-Row-Plot (TTRP)."

The method is to count 10 planted trees in a row and evaluate the survival of those 10 trees. Since the Granite site is planted on a 7 foot by 7 foot spacing, you can evaluate 10 trees in a space of 70 feet. The first tree is randomly located (planned before arriving at site) and the next tree (approximately 7 feet away) is evaluated. This is repeated until the 10 trees are evaluated. These plots can be accomplished on any slope and in any direction without a measuring bias (often introduced with circular plots on slopes). Assuming that the planting spacing has correctly accounted for slope, the person evaluating/monitoring must also be measuring the 7 foot spacing in the same way in order to determine the correct location of a planted seedling. These monitoring row plots are randomly spaced throughout the entire planting areas. Sixty two (62) rows must be established in order to satisfy statistical requirements of sampling.

In order to ensure strong statistical results, these 62 randomly placed TTRP samples have been calculated to result in a 95% confidence interval, within $\pm$ 5 % of population mean. In forestry applications of this nature, when sampling in homogenous forest stands (such as plantations) with uniform tree density the variation between sampling units will be small. The literature suggests that in forests, the Coefficient of Variation (CoV) from a number of trial cruises is between 8 and 25%. The Coefficient of Variation in this plantation however, is relatively small, as the seedlings are of only two species and are placed at a close spacing of 7 foot by 7 foot. Therefore in these calculations we will use 20% for the CoV to account for any variation at the site.

These 62 must be evenly distributed throughout all of the planting sites, Tiers 1-3 and roadways:

	Approximate area	**Number of trees planted or to be planted**	**Percentage of total trees planted**	**Number of TTRP samples needed**
Tier 1	1.49 acres	1323	20%	12
Tier 2	1.01 acres	894	13%	8
Tier 3	2.04 acres	1814	27%	17
Roadways	1.77 acres	1576	23%	14
Relocation areas	1.30 acres	1157	17%	11
Totals	***7.61***	***6764***	***100***	***62***

Setting up permanent plots

Establish 62 starting points for each of the TTRP randomly spaced throughout all planting areas, first on maps, then established in field, marked with a wire stake and flag with label indicating row plot number.

Determining starting points –

1. Each planted site needs to be numbered on High Elevation Restoration maps.
2. For each planted site, a random numbers table will be used to identify those specific sites within each category to be sampled. For example, for Tier 1, 12 random numbers will be selected.
3. Within each plot, another random number will be selected to determine which tree will be the starting point.

Flagging on stakes should be durable to last for duration of project and not be intrusive. Plots should be GPS located, but also marked with a bearing and distance from a nearby permanent structure such as large trees, rocks or a set stake. This second marking ensures a backup method for finding the starting point if the first reference point is lost. Random hubs (short grade stakes pounded into ground) will be needed if there are no permanent structures available. These will be placed as low to ground as possible for easy relocation but not necessarily noticeable from afar. All plots will be located on a map for future reference.

Data Collection and Analysis

Prior to site visit, recorded data for each seedling's planting history shall be reviewed.

- Source of growing stock, date of delivery to contractors, date of delivery to site
- Date of planting, and by whom
- Weather and planting conditions
- Site conditions such as soil, mulch, and watering history
- Location-which pad etc.

As each seedling is visited, the following data shall be collected:

- Mortality – dead or alive
- Site conditions and observations such as
  - wetness, dryness,
  - animal browsing,
  - site disturbances etc.
  - mark mortality location on reference map

Here are three measurements to decide whether a seedling is alive or dead:

1. How is the health of general foliage? – green is healthy, brown/red is not
2. How viable are the buds? – healthy buds are green and elastic
3. Scratch test – with thumbnail or knife, gently scratch a small spot of the bark of the trunk, and look for healthy greenish hue on underlying tissue. Dry, brittle, or brown indicates a dead cambium layer.

Data Analysis

A survival percentage will be calculated by adding all surviving trees together, dividing by the number of plots (62) times ten trees sampled per plot, times 100 to get Percent survival

Percent Survival = {(# of alive trees tallied) / (10 * # of TTRP measured)} * 100

Experimental design for pad plantings:

Because GRP is also interested in understanding future opportunities for successful site rehabilitation, the following is a series of planting trials proposed for the 8 pads remaining to be planted in summer of 2015. As discussed in the Planting section above, topsoil is the most important variable in seedling survival opportunity. Therefore these trials will compare topsoil and mulching schemes to determine which might result in better tree survival. Results of this trial will help to better inform future efforts for vegetative restoration at similar development projects.

At each pad site, trees will be planted using the same 7X7 spacing which has been the protocol on all other sites. Most of the sites will have the original required 4 inches of soil. Experimental planting sites will have varied amount of soil applied; final soil depth will be determined (TBD) during the spring soil evaluation. Additionally for each pair, a mulch treatment will also be tried, so that one pad planting will have tree chips or grindings applied as mulch; the other will have straw mulch. The treatments will be as consistent as possible in the placement of the same amount of mulch per site.

Pad number	**# of trees to be planted**	**Added top soil depth (inches)**	**Type of Mulch 2-3 inches**
8E	148	TBD	Straw
8W	31	TBD	Wood chips
9	155	4	Straw
10	76	4	Wood chips
11	218	4	Wood chips
12E	47	TBD	Straw
12W	135	TBD	Wood chips
13	201	4	Straw
14N	70	TBD	Straw
14S	139	TBD	Wood chips
15	105	4	Wood chips

Preparation of Annual Report:

The licensed forester will prepare an annual report at the end of each growing season commencing in 2016 to document the survival of planted trees and report on the effectiveness of the trial design planted plots. This report will be provided to Granite Reliable Power, Site Evaluation Committee, and to the New Hampshire Fish and Game Department.