

December 21, 2016

GRP File: 0001|01

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 Update**

Dear Site Evaluation Committee:

I am writing to update the Site Evaluation Committee (the "Committee") regarding Granite Reliable Power, LLC's ("GRP") Tree Survival Monitoring set forth in the Committee's Decision Granting GRP's Motion to Amend a Certificate of Site and Facility dated February 3, 2015 (the "Decision").

As described in the September 25, 2015 filing to the Committee, GRP completed the road widening and the tree plantings during the summer/fall of 2015. Under oversight of the New Hampshire Fish and Game ("NHFG"), licensed forester Mr. Kevin Evans was retained by GRP and assisted in the development and implementation of the High Elevation Restoration (HER) Tree Survival Monitoring for 2016.

Winter conditions during the 2015 -2016 year resulted in below average snow pack for the region causing additional stress on the trees. The summer of 2016 was also considered a year of significant drought in the region. Despite these difficult conditions, tree survival for the HER attained 79% for year 1 of the survival monitoring.

Please find the attached report submitted by Kevin Evans detailing the methods and results for Year 1 of the Tree Survival Monitoring of the Granite HER. The second and final monitoring report will be submitted by GRP to NHFG and the Committee by December 30, 2017.

If you have any questions or comments, please contact me at (207) 458-5861 or kyle.murphy@brookfieldrenewable.com.

Sincerely,

Kyle Murphy for

Kelly Maloney
Licensing and Compliance Manager

Attachment

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Evaluation of Success of Tree Planting:
An Interim Report
for property managed by Granite Reliable Power

Evaluation of Success of Tree Planting: An Interim Report

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
November 2016

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.

In April 2015, a plan for Measuring Successful Tree Planting was adopted by Granite Reliable Power to ensure successful tree planting to the required 75 % rate of success.

Purpose

This report is the follow-up to that plan, reporting site visits, evaluation, and analysis through November 2016. The final report will be submitted in November 2017 to fulfill the 2-year tree survival monitoring requirement.

Description of Site

The site is located on Mt. Kelsey, Millsfield New Hampshire, with planting sites between 2700 to 3470 feet of elevation. The soils are thin and rocky. The sites were bulldozed for construction of the project. Some sites are near the towers themselves, while others are roadways that were widened to 16 feet 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 were intended to have topsoil placed on them from soil stock piled during the construction phase. These sites are exposed to direct sun and are subject 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 planting with the conditions of shallow soil, harsh weather, short growing seasons, and general exposure on a disturbed site. The following Best Management Practices (BMPs) were recommended in April 2015: to help ensure successful site preparation and planting scheme.

1. **Selecting Stock:** Use containerized seedlings 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, and reclaimed soil moved to the site for planting must be left loose and un-compacted, equipment passing over must be minimized and reclaimed soil must be dry when applied. Mulch should also be applied to prevent moisture loss and 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. Seedlings should be carried in a planting bag until hole is ready, and planted 1 inch deeper than their nursery soil. During planting the seedlings must be kept well-watered.
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:** The newly planted seedlings get plenty of water as they get established.

Site Evaluations

Site evaluations were performed on two separate occasions, to make sure the Best Management Practices (BMPs) that were recommended in the April 2015 plan were being followed. The first site visit took place on July 31st 2015 and was to check on placement of soil on the pads, excavation of the road widening areas (to make sure soil and bark were being separated), and to evaluate the soil depth. The important part of spreading soil on pads was to get the correct depth, that the machine not be treading the soil too much and that it be completed in dry conditions. Inspection also included making sure the correct mulch was used for the specific site.

The following are some pictures from this site evaluation.



Figure 1: Pad 10: soil spread with excavator (to decrease soil compaction), Dump truck placing soil on pad area delineated with paint. Excavator operator is spreading to specified soil depth for specific pad depths. Machine was then used to tread site once for soil stabilization.



Figure 2: Soil depths were checked at random points on all Pads. They were also coordinated with having wood chips or Jute Mat. This is a 4-inch soil depth with wood chips.



Figure 3: Layout of soil placement on Pads



Figure 4: Layout of soil placement on Pads



Figure 5: Pad area ready for planting, with correct soil depth and woodchips



Figure 6: Pad 13- Ready for planting with 4 inches of soil, straw and Jute erosion cloth

In consultation with New Hampshire Fish and Game the site was then approved as ready to plant. As the summer progressed the soil moisture became too low to plant (following BMP's) Brookfield was informed (July 31, 2015) to delay planting until soil moisture conditions improved. As soon as this occurred Brookfield was informed that planting could be completed (August 8, 2015). A site visit was made to the site after planting (October 27 2015).



Figure 7: Newly planted seedlings on Pad October 27, 2015



Figure 8: Trees planted on roadway showing 7 foot by 7-foot spacing



Figure 9: Newly planted seedlings on Pad 15.

Measuring survival of seedlings

As described in the April 2015 Measuring Successful Tree Planting an Amendment to the High Elevation Restoration Plan, the Ten-Tree-Row-Plot Method was used to determine tree survivability. It was planned to visit sixty-two randomly placed sample plots.

Field monitoring of tree survivability

Determining starting points on map –

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

Flagging was used to mark all starting trees in the row plots, plot number, type of plot and date, were indicated on the flagging.

Site map with all plot locations was used to locate all plots and starting points. Upon first site visit it was determined that some of the sites designated as being planted were absent of trees. It was then determined that all sites should be inspected to determine where plots should be located. A revised plot map was then made to determine that enough plots could be placed in specific areas to come up with a statistically significant number of points to determine survivability. Second and third site visits were made to measure the new plot locations.

At each plot start trees were selected, flagged and then counted in a row with a designation of being alive or dead. If a tree was called dead, it was checked using the 3 measurements to determine if it was alive or dead as described in the April 2015 plan.



Figure 10: Flagging on Start tree for row plot. Start tree numbers were calculated as a random number selected from the number of trees in that planting area. Roadway plots had a two random numbers selected for each plot and was counted from start, then second start tree was counted from last tree in row plot.



Figure 11: Live tree



Figure 12: Dead tree. All dead trees, if in question were tested using the Scratch test to make sure they were dead.

Data Analysis

Information taken at each plot is included on the data sheet.

Overall survival percentage was calculated by adding all surviving trees together (460), dividing by the number of plots (58) times ten trees (580) sampled per plot, times 100 to get Percent survival.

$$\begin{aligned}\text{Overall percent survival} &= \{(\# \text{ of alive trees tallied}) / (10 * \# \text{ of TTRP measured})\} * 100 \\ &= \{460/(10*58)\} * 100 \\ &= 460/580 \\ &= 79\%\end{aligned}$$

Survival by site:

Site	Percentage Survival
Tier 1	63%
Tier 2	74%
Tier 3	77%
Roadways	86%

Experimental design for pad plantings:

Part of the design of this planting was to learn from the different soil depths, materials used and observations from the site. These are preliminary observations from being on the site over the last 2 years. It should be noted that the final analysis may differ.

Animal damage - seems to be minimal with some rabbit, moose and deer browsing. Moose and deer browsing occurred on larger trees planted and had no effect on survival.

Effects of wind and snow - It was observed that some trees were listing toward the east from high winds. The pads show more signs of wind damage than the roadways and plantings alongside of road, which are more sheltered. Also the winter of 2015-16 was a low snow year; usually smaller trees would have been protected from deeper snow.

Size of seedlings - It looks as though larger planting stock survived much better. The taller 2-3-foot-tall seedlings did well on the pad sites. There was no noticeable difference between spruce and fir, but seems that spruce is coming in areas naturally.

Green mesh - After 5+ years and the moving of soil around, green erosion mesh can still be found. It doesn't breakdown readily and is a potential hazard to wildlife; for future planting projects another product should be considered.

TREE SURVIVAL INSPECTION

SAMPLING LOCATION: _____

SOURCE OF GROWING STOCK: _____

PLANTING CONTRACTOR: _____

DATE SEEDLINGS DELIVERED TO CONTRACTOR: _____

DATE SEEDLINGS DELIVERED TO SITE: _____

DATE OF PLANTING: _____ WEATHER & CONDITIONS: _____

SITE CONDITIONS: SOIL DEPTH _____

TYPE OF MULCH _____

WATERING HISTORY _____

RANDOM TREE #: _____

Plot tree	Dead or Alive	Wet or Dry	Animal Browsing	Comments
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Inspected by: _____

Date: _____



Figure 13: Green erosion mesh. This was picked up from soil removed from roadside, and was then still in the soil on pads after re soiling the pads.

At this point depth of soil and type of erosion material doesn't seem to be a factor in tree survival. There was a slight difference in soil depth, as time goes on this will become more of a factor as the tree roots try to establish themselves. The soil under the sites is compact from equipment working the site and as the trees grow they will need to penetrate that soil to survive and the deeper topsoil will allow them to survive for a longer period and get a firmer grip before they need to spread out. So far the jute erosion control fabric and woodchips seem to have no difference with survival. Grass seems to start quicker on jute sites and will allow for good stabilization and a surface that might help natural regeneration establish itself. The problem with woodchips is it does stop erosion but it also inhibits natural regeneration. Photos show areas that have woodchips with nothing else growing. Jute erosion areas with tufts of grass growing. Dirty rock also seems to allow for natural regeneration much better than the woodchips. The soil mixed in with the rock give the trees something to get established on.

Pad number	# of trees to be planted	Added top soil depth (inches)	Type of Mulch 2-3 inches
8E	148	6	Straw
8W	31	6	Wood chips
9	155	4	Straw
10	76	4	Wood chips
11	218	4	Wood chips
12E	47	10	Straw
12W	135	10	Wood chips
13	201	4	Straw
14N	70	12	Straw
14S	139	12	Wood chips
15	105	4	Wood chips



Figure 14: Jute Erosion mesh. After one growing season grass is already establishing itself



Figure 15: Woodchips 5 years after. Grass having trouble getting established, no natural seedlings.



Figure 16: Dirty rock showing signs of recovery where area with woodchips still devoid of any vegetation



Figure 17: Dirty rock starting to grow vegetation



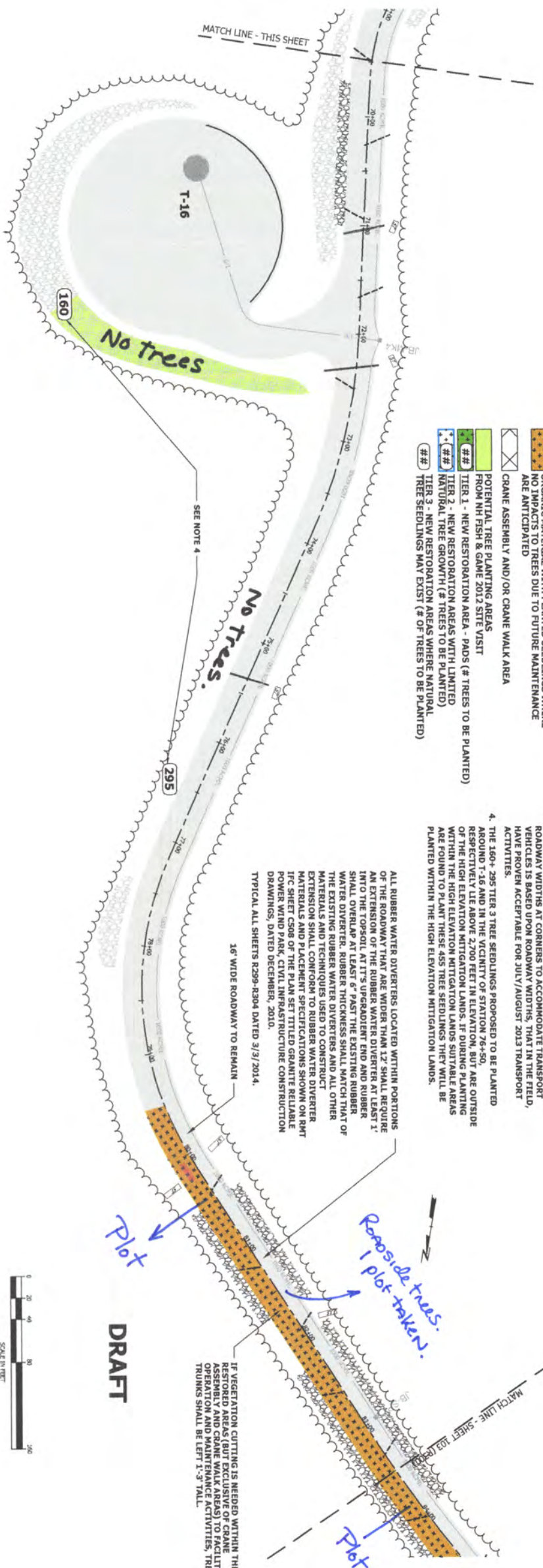
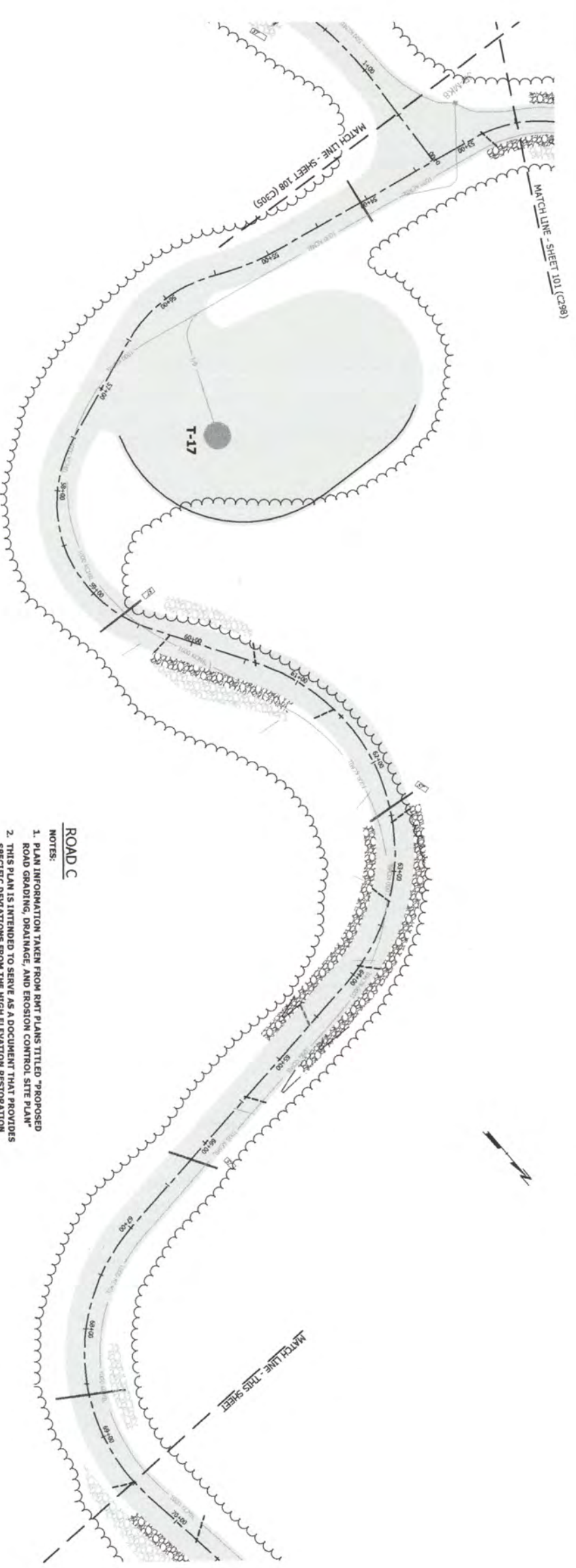
Figure 18: Protection from wind and dryness are critical in tree seedling mortality.

Conclusions

This interim report provides important data and observations only 15 months after tree seedlings were planted on the Granite Reliable site in Millsfield , New Hampshire. Extreme site conditions and necessary construction methodology both make it a challenging place for successful seedling establishment and long term growth. The final report due in 2017 will provide more important data to understand and document successful methodologies for tree planting to ensure survivability in high elevation sites in northern New Hampshire.

High Elevation Restoration

Site Maps



LEGEND

- EXISTING ROADWAY TO REMAIN
- ORGANIC MATERIAL WITH PLANTED SEEDLINGS WHERE ARE ANTICIPATED
- POTENTIAL TREE PLANTING AREAS FROM NH FISH & GAME 2012 SITE VISIT
- TIER 1 - NEW RESTORATION AREA - PADS (# TREES TO BE PLANTED)
- TIER 2 - NEW RESTORATION AREAS WITH LIMITED NATURAL TREE GROWTH (# TREES TO BE PLANTED)
- TIER 3 - NEW RESTORATION AREAS WHERE NATURAL TREE SEEDLINGS MAY EXIST (# OF TREES TO BE PLANTED)
- CRANE ASSEMBLY AND/OR CRANE WALK AREA

ROAD C

NOTES:

1. PLAN INFORMATION TAKEN FROM RMT PLANS TITLED "PROPOSED ROAD GRADING, DRAINAGE, AND EROSION CONTROL SITE PLAN"
2. THIS PLAN IS INTENDED TO SERVE AS A DOCUMENT THAT PROVIDES SPECIFIC DEVIATIONS FROM THE HIGH ELEVATION RESTORATION PLAN PREVIOUSLY APPROVED BY NH FISH AND GAME FOR GRANITE RELIABLE POWER'S COOS COUNTY WIND PARK PROJECT. THIS PLAN WAS DEVELOPED IN COORDINATION WITH STAFFS OF NH FISH AND GAME, THE APPALACHIAN MOUNTAIN CLUB, THE NH NATURAL HERITAGE BUREAU, AND NHDES, AND IS INTENDED TO MODIFY THE LOCATIONS OF RESTORATION FEATURES SPECIFIED ON SHEET C559 OF THE ISSUED FOR CONSTRUCTION PLAN SET PREPARED BY RMT OF MADISON WISCONSIN.
3. REDUCED WIDTHS OF TOPSOIL COVERAGE TO ALLOW WIDENED ROADWAY WIDTHS AT CORNERS TO ACCOMMODATE TRANSPORT VEHICLES IS BASED UPON ROADWAY WIDTHS, THAT IN THE FIELD, HAVE PROVEN ACCEPTABLE FOR JULY/AUGUST 2013 TRANSPORT ACTIVITIES.
4. THE 160+ 295 TIER 3 TREE SEEDLINGS PROPOSED TO BE PLANTED AROUND T-16 AND IN THE VICINITY OF STATION 76+50, RESPECTIVELY LIE ABOVE 2,700 FEET IN ELEVATION, BUT ARE OUTSIDE OF THE HIGH ELEVATION MITIGATION LANDS. IF DURING PLANTING WITHIN THE HIGH ELEVATION MITIGATION LANDS SUITABLE AREAS ARE FOUND TO PLANT THESE 455 TREE SEEDLINGS THEY WILL BE PLANTED WITHIN THE HIGH ELEVATION MITIGATION LANDS.

ALL RUBBER WATER DIVERTERS LOCATED WITHIN PORTIONS OF THE ROADWAY THAT ARE WIDER THAN 12' SHALL REQUIRE AN EXTENSION OF THE RUBBER WATER DIVERTER AT LEAST 1' INTO THE TOPSOIL AT ITS UPGRADIENT END AND RUBBER SHALL OVERLAP AT LEAST 6" PAST THE EXISTING RUBBER WATER DIVERTER. RUBBER THICKNESS SHALL MATCH THAT OF THE EXISTING RUBBER WATER DIVERTERS AND ALL OTHER MATERIALS AND TECHNIQUES USED TO CONSTRUCT EXTENSION SHALL CONFORM TO RUBBER WATER DIVERTER MATERIALS AND PLACEMENT SPECIFICATIONS SHOWN ON RMT PROJECT SHEET C508 OF THE PLAN SET TITLED GRANITE RELIABLE POWER WIND PARK, CIVIL/STRUCTURE CONSTRUCTION DRAWINGS, DATED DECEMBER, 2010.

16' WIDE ROADWAY TO REMAIN

SEE NOTE 4

IF VEGETATION CUTTINGS IS NEEDED WITHIN THE RESTORED AND GAME WALK AREAS TO FACILITATE OPERATION AND MAINTENANCE ACTIVITIES, TREE TRUNKS SHALL BE LEFT 1'-3' TALL.

DRAFT



GRANITE RELIABLE POWER WIND PARK		COOS COUNTY, NEW HAMPSHIRE	
PROPOSED ROAD GRADING, DRAINAGE, AND EROSION CONTROL SITE PLAN			
SCALE:	PROJ. NO.:	PERMIT SHEET NO.:	RMT SHEET NO.:
AS SHOWN	00121.10	102	C299



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HIGH ELEVATION RESTORATION PLANS AMMENDMENT PLAN SHEETS

R299
3/3/2014



DRAFT

- LEGEND**
- EXISTING ROADWAY TO REMAIN
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**HIGH ELEVATION RESTORATION PLANS
AMMENDMENT PLAN SHEETS**

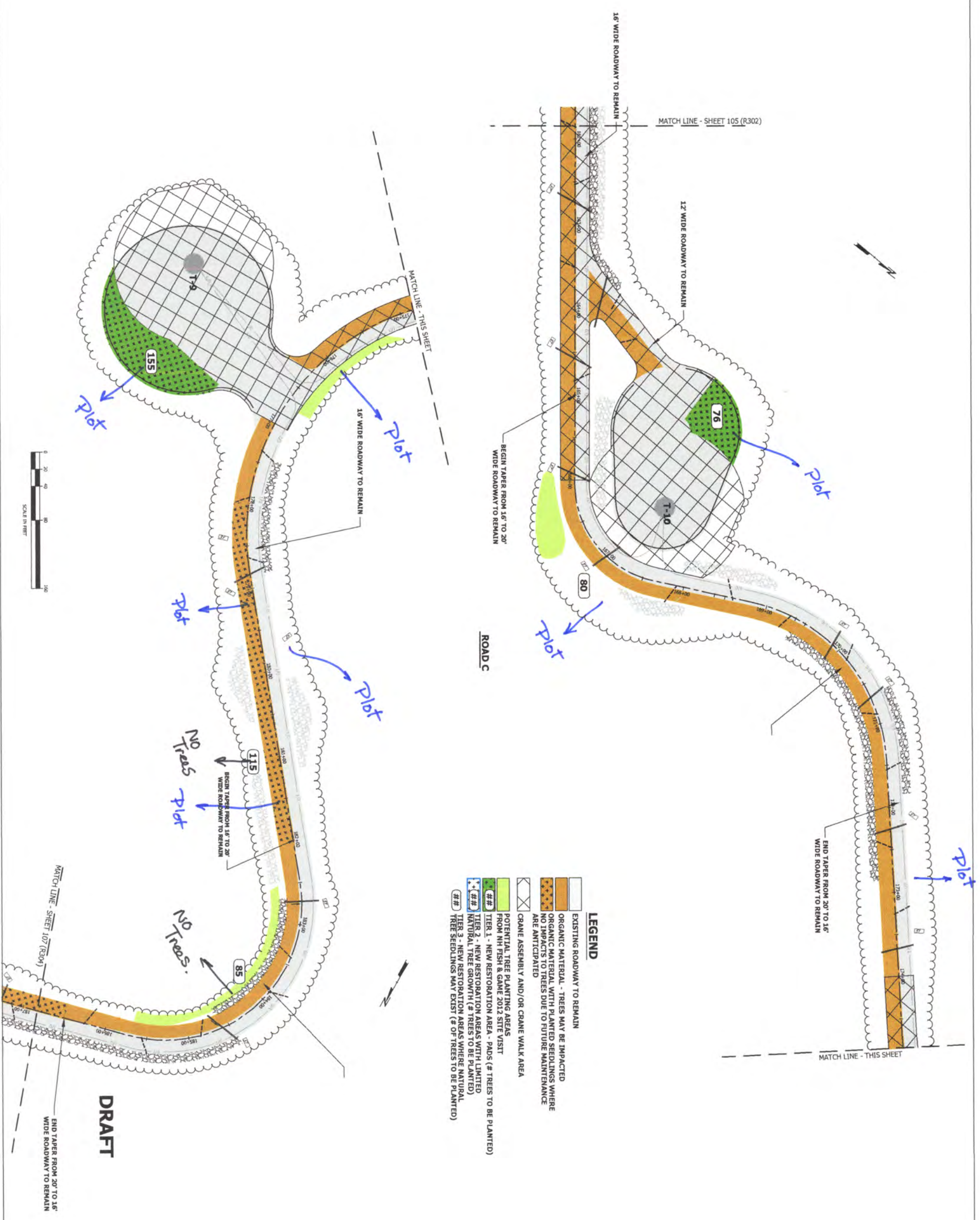
R301
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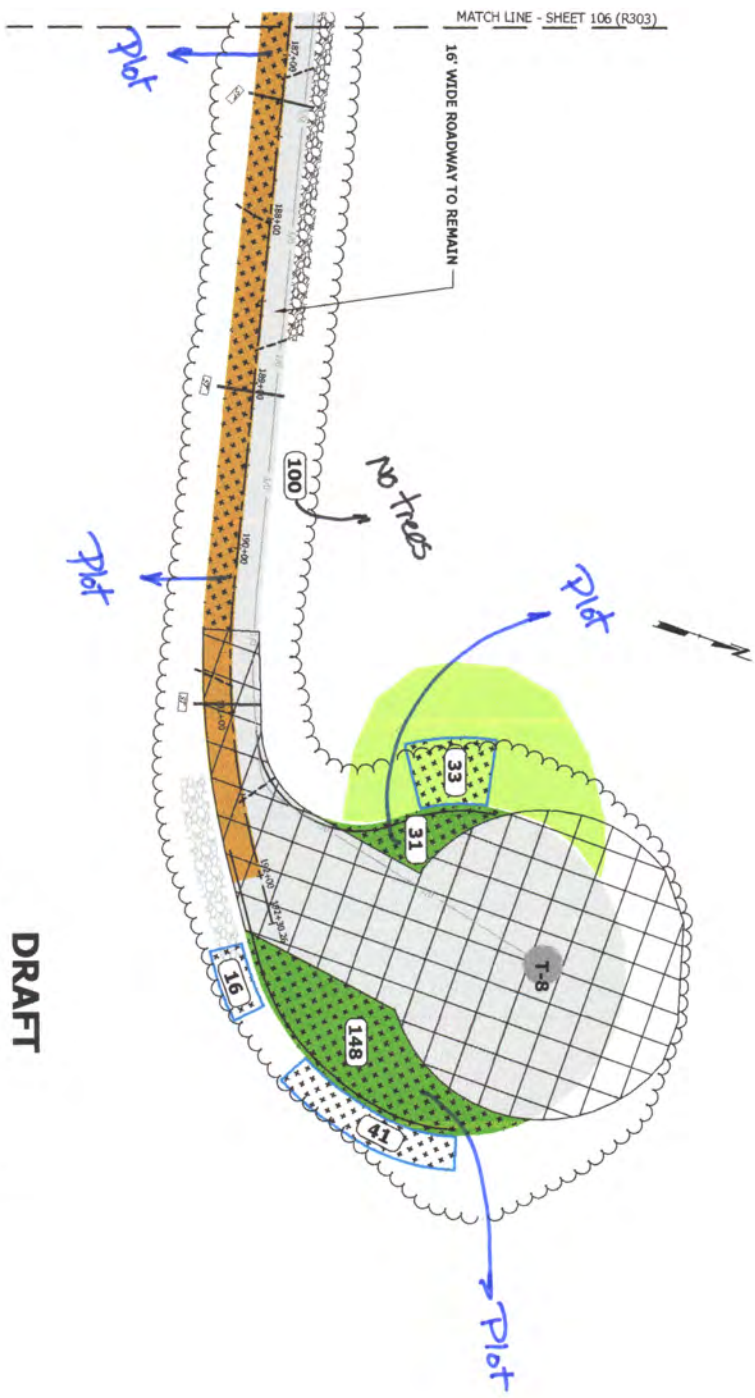
GRANITE RELIABLE POWER WIND PARK		COOS COUNTY, NEW HAMPSHIRE	
PROPOSED ROAD GRADING, DRAINAGE, AND EROSION CONTROL SITE PLAN			
SCALE:	AS SHOWN	PROJECT NO.:	104
DATE:	06/12/10	DRAWN BY:	104
		CHECKED BY:	C301



- LEGEND**
- EXISTING ROADWAY TO REMAIN
 - ORGANIC MATERIAL - TREES MAY BE IMPACTED
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DRAFT



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ROAD C

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GRANITE RELIABLE POWER WIND PARK COOS COUNTY, NEW HAMPSHIRE
PROPOSED ROAD GRADING, DRAINAGE, AND EROSION CONTROL SITE PLAN

SCALE:	PROJ. NO.	PERMIT SHEET NO.	RMP SHEET NO.
AS SHOWN	0612110	107	C304

HIGH ELEVATION RESTORATION PLANS AMMENDMENT PLAN SHEETS

R304
3/3/2014