



TRANSMISSION VEGETATION MANAGEMENT PLAN



Revised June 2007

**Vermont Electric Power Company, Inc.
Transmission Vegetation
Management Plan**

I. Introduction

Vermont Electric Power Company (VELCO) is responsible for maintaining the integrity and reliability of over 688 miles of high voltage electric transmission lines, which includes managing vegetation on nearly 12,000 acres of rights of way. This system of transmission line rights of way extends throughout the State of Vermont and portions of New Hampshire.

VELCO recognizes its responsibility to maintain its rights of way in the manner that most appropriately balances avoiding unreasonable risk of harm to the environment, neighbors, occupants, workers, and users of the land on which or adjacent to which its rights of way lie, promoting the reliability of the VELCO transmission system, and minimizing the expense of vegetation management over the long term.

It is the policy of VELCO to manage the vegetation growing on its transmission line rights of way in accordance with this Transmission Vegetation Management Plan (TVMP) and all other applicable rules and regulations.

The TVMP will be written, implemented and updated every four years following a complete cycle of the transmission system by VELCO's Supervisor of Right of Way Management. This person shall be adequately trained in Utility Vegetation Management. The Supervisor of Right of Way Management shall meet the following requirements:

1. Possess an Associate or Bachelor's degree in Arboriculture, Forestry, or other related Environmental Degree.
2. Have at least five years experience in Utility Vegetation Management

3. Maintain International Society of Arboriculture Certified Arborist Certification.
4. Maintain International Society of Arboriculture Certified Arborist Utility Specialist Certification.
5. Maintain Vermont Pesticide Applicator Certification

II. **Goals and Objectives**

The goal of this TVMP is to establish a steady, dependable rhythm of annual vegetation management that is sustainable year after year. In order to accomplish this goal, VELCO utilizes a system of vegetation management that manages plant communities in which compatible and incompatible vegetation are identified, action thresholds are considered, control methods are evaluated, and selected control (s) are implemented to achieve a specific objective. Choice of control methods is based on safety, environmental impact, effectiveness, site characteristics, security, and economics. This system of vegetation management is called Integrated Vegetation Management.¹

The reason for Integrated Vegetation Management is to promote sustainable plant communities that are compatible with the intended use of the site, and discourage incompatible plants that may pose concerns, including safety, security, access, fire hazard, electric service reliability, emergency restoration, visibility, line of sight requirements, regulatory compliance, environmental, or other specific concerns.² The objectives of VELCO's TVMP are listed below as well as how those objectives will be met.

¹ American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (Integrated Vegetation Management a. Electric Utility Vegetation Management, ANSI A300 (Part 7)-2006 IVM (American National Standards Institute, Inc.) p. 58

² American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (Integrated Vegetation Management a. Electric Utility Vegetation Management, ANSI A300 (Part 7)-2006 IVM (American National Standards Institute, Inc.) p. 57

A. Safety

VELCO's primary concern is safety when it comes to vegetation management. The safety concern is for the landowners, neighbors, occupants, workers, and users of the land on which or adjacent to which its rights of way lie. When vegetation comes in contact with or grows close enough to the conductors (wires) there is risk of electrical arcing. This can cause injury, wide spread power outages, and potential fires. Bulk Transmission System interruptions can lead to loss of electricity to thousands of Vermonters. This can cause safety concerns including but not limited to national security, heating of homes, as well as loss of electricity to hospitals, schools, traffic lights, etc. Therefore, minimum clearances from vegetation and the conductors must be met to mitigate these safety concerns.

B. Reliability Standards

VTTRANSCO also must maintain vegetation to ensure the reliability of the Transmission System. It is vital to the operation the New England grid and Vermont's local transmission network that VELCO's TVMP does not allow tree caused unscheduled outages on its transmission line system. As a bulk transmission system operator, VELCO's vegetation management practices are designed to conform to the Transmission Vegetation Management Program reliability standards recently adopted by the North American Electric Reliability Council ("NERC") as Standard FAC-003-1, ISO – NE OP #3 Vegetation Management Standard and to the American National Standards Institute ("ANSI") Standard A300 – Standard Practices for Tree Shrub and Other Woody Plant Maintenance (Integrated Vegetation Management - Electric Utility Rights-of-Way). The NERC Vegetation Management reliability standard was adopted after the blackout of August 14, 2003; one of the initiating events was contact between a transmission line and vegetation below the line. The ANSI standard is considered a utility best management practice.

Properly maintained vegetation on a right of way allows for easier access, longer lines of sight, and improved visibility of structures, all of which aids in reducing restoration time in the event of a service interruption.

C. Environmental Impact

VELCO's TVMP strives to have an approach to vegetation management that has the least amount of impact on the environment. VELCO takes many aspects into consideration when prescribing various vegetation management techniques. Those aspects include streams, wetlands, wildlife habitat, plant bio-diversity, soil erosion, rare, threatened and endangered species, and rare or uncommon natural areas all which will be discussed below in more detail.

D. Economics

VELCO's TVMP strives to have an approach to vegetation management that has the least cost to Vermont's rate payers as possible while being effective at mitigating vegetation caused interruptions and outages. Various vegetation management strategies and techniques as well as various vegetation management cycle intervals can have an impact to the cost of maintaining the electric system. VELCO considers these economic factors when making vegetation management decisions.

E. Enhance Wildlife Habitat

VELCO's TVMP strives to have an approach to vegetation management that enhances wildlife habitat. VELCO understands that properly maintained rights of way result in improved wildlife habitat for numerous plant and animal species, including songbirds and rare plants. General observations on VELCO rights-of-way indicate a noticeable bio-diversity that provides very favorable

habitat for many wildlife species. Right of way corridors that promote low growing desirable vegetation that is maintained in a stable early successional habitat that is disappearing throughout Vermont as farms are abandoned and developed. By managing for early successional habitat, the right of way develops into a stable habitat type that promotes wildlife habitat improvement.

There have been many studies on this subject that VELCO references when making vegetation management decisions. The most well known is a continuing research project initiated by Purdue University professors Dr. William Byrnes and Dr. William Bramble. This study has been directed on a transmission line right-of-way in Pennsylvania over the last 50 years. The project concentrated on the vegetation on utility rights-of-ways and the relationship to the habitat of wildlife. The research documented the effects that many different vegetation management techniques have on food and cover for whitetail deer, cottontail rabbit, ruffed grouse, wild turkey, songbirds and other small mammals and birds. The conclusions of this study has documented that Integrated Vegetation Management on rights-of-way is extremely beneficial to wildlife.

VELCO also conducts its own wildlife habitat assessments with the goal of gaining information in order to make sound vegetation management recommendations and to better understand its role in wildlife habitat management along its rights of way. This assessment is conducted once during a cycle inventory along a ten mile stretch of right of way.

Wildlife travel lanes are maintained on VELCO rights of way in appropriate locations to promote the movement of white tailed deer and other wildlife across the right of way corridor. In general, the management objectives are to favor vegetation that can support

snow (softwoods) and thereby keep the snow depth on the ground shallow enough for deer to move about easily and conceal wildlife as they cross through wildlife travel lanes.

Specific vegetation management practices in wildlife crossings shall include:

1. Selective removal of trees favoring crown closure.
2. Removing cut material or cutting up small enough so as not to interfere with animal movement in the travel lane.
3. Promoting compatible species of trees and shrubs.
4. Favoring the continued growth and reproduction of coniferous vegetation with canopies that intercept snow.
5. Avoid use of mechanical methods during bird nesting season.

Stream crossings are also of particular concern for wildlife that requires special management objectives. The objective of stream crossing management is to favor vegetation that will shade the stream, control erosion, and promote bank stability. Wildlife also use stream crossing as wildlife crossings and are managed as such.

Specific vegetation management practices in stream crossings shall include:

1. Selective removal of trees favoring crown closure to provide shade to the stream.
2. Removing cut material or cutting up small enough so as not to interfere with animal movement in the travel lane.
3. Favoring the continued growth and reproduction of compatible vegetation with canopies that provide shade to the stream.
4. Avoid use of mechanical methods that may cause soil compaction or rutting to the greatest extent possible.

5. Leave all stumps in place so that root mat maintains bank stability.
6. Remove all slash and debris from the stream.

VELCO is actively involved with many wildlife partnerships such as the National Wild Turkey Federation, The Ruffed Grouse Society, Wildlife Management Institute, and Vermont Institute of Natural Sciences.

VELCO also has partnered with Vermont Fish and Wildlife, Vermont Forests, Parks, and Recreation and U.S. Fish and Wildlife to further improve wildlife habitat and seeks input from them when considering vegetation management policy changes.

F. Wetland Impacts

VELCO's TVMP strives to have approach to vegetation management that has the least amount of impact to wetlands. VELCO will work with the Vermont Agency of Natural Resources to develop best management practices with the goal to have the least amount of impact to wetlands while still meeting the goals and objectives of the TVMP. Vegetation management activities will be conducted in accordance with *Vermont Wetland Rules*. The routine repair and maintenance of utility poles and lines in a manner which minimizes adverse impacts and is in accordance with a plan approved by the Secretary of the Agency of Natural Resources is an allowed use as defined by the Wetland Rules 6.2 (h).³

A study was conducted in Massachusetts in 1989 concerning the use of right of way management techniques, including the use of herbicides to control undesirable vegetation in wetlands. The study concluded that there is no significant impact to wetlands from vegetation management techniques. Mechanical treatments result in relatively higher impacts than selective herbicide use.

Mechanical techniques had a significantly higher impact on the cover value of herbaceous vegetation than herbicide techniques. Wildlife habitat values were rated low for mechanical techniques and medium for herbicide techniques. Residues from petroleum products such as bar and chain oil or hydraulic fluid were found in the leaf litter on mechanically treated sites. No herbicide residues were found on herbicide treated sites.⁴ Many wetland species are low growing and are desirable species. By removing the undesirable species the desirable species can out compete undesirable species which reduces need for additional vegetation management during subsequent cycles.

G. Rare, Threatened, and Endangered Species Impacts

VELCO's TVMP strives to have an approach to vegetation management that has the least amount of impact to rare, threatened, and endangered species as possible. VELCO will work with the Vermont Agency of Natural Resources to map the rare, threatened and endangered species and develop best management practices to have the least amount of impact possible while meeting the goals and objectives of the TVMP. Right of way corridors promote low growing desirable vegetation that is maintained in a stable early successional habitat. By managing for early successional habitat, the right of way develops into a stable habitat type that promotes many rare, threatened and endangered species.

H. Rare and Uncommon Natural Areas Impacts

VELCO's TVMP strives to have an approach to vegetation management that has the least amount of impact to rare and uncommon natural areas. VELCO will work with the Vermont

³ Vermont Wetland Rules, Water Resources Board, Effective January 1, 2002.

Agency of Natural Resources to map the rare and uncommon natural areas and develop best management practices to have the least amount of impact possible while meeting the goals and objectives of the TVMP.

I. Invasive Species Control

Invasive exotic species of plants are also of concern. In areas where the invasive exotic species are being controlled off the rights-of-way by a landowner, VELCO will work with the landowner to control the invasive exotic species on the right-of-way as well. These invasive exotic species may include but are not limited to: glossy and common buckthorn, oriental bittersweet, Japanese knotweed, phragmites or common reed, and several species of honeysuckle.

J. Public Lands

VELCO's TVMP strives to have an approach to vegetation management that has a positive impact to public lands such as State of Vermont Wildlife Management Areas, State Forests and Parks, Green Mountain National Forests and many municipal forests and parks. VELCO will work with various agencies to develop vegetation management strategies to meet the objectives of the TVMP and the goals of the site.

K. Maintain Access

VELCO's TVMP strives to have an approach to vegetation management that maintains access along the right of way corridor to allow for crews to be able to safely and efficiently traverse the right of way for emergency and routine maintenance. Vegetation will be maintained in an herbaceous state in access roads.

⁴ Study of the Impacts of Vegetation Management Techniques on Wetlands for Utility Rights-of-Way in the Commonwealth of Massachusetts, Environmental Consultants, Inc., June 1989, p ES-6

L. Aesthetics

VELCO endeavors to establish aesthetically pleasing rights of way and effective road screens where feasible. This will be accomplished by promoting low growing compatible vegetation to the greatest extent possible to ensure normal vegetation management cycle intervals. Incompatible tall growing species will not be allowed to grow in road screens and the continued growth and reproduction of compatible vegetation will be favored.

M. Erosion Control

Erosion control is a concern when vegetation is completely removed. Promoting stable plant communities on the right of way allows strong, healthy root-mat conditions that are effective in stabilizing soil and controlling erosion. This vegetation management program encourages compatible plants such as: ferns and grasses, sweet-fern, blueberries, blackberries, raspberries, dogwood and other low-growing shrubs as well as a variety of wild flowers. In areas where there are compatible species, erosion control is typically less of a concern due to the fact that most plant species are not removed. In areas where incompatible species dominate the right of way, erosion controls maybe more of a concern. In these areas the strong root-mat conditions of the incompatible species are typically effective in controlling erosion until either compatible species begin to grow in or incompatible species re-sprout.

Erosion along stream banks is of particular concern when removing vegetation near streams to avoid siltation of the stream. VELCO will encourage compatible vegetation to grow along stream banks. If incompatible species dominate the species composition of a stream crossing removing all vegetation during one cycle will be avoided, if

possible. If removing all vegetation can not be avoided appropriate erosion control methods would be used.

Upon completion of culvert and/or access road repair, the work area is seeded with a erosion control mix and then mulch is usually applied to keep the seeds moist and in place depending upon the circumstances (size of area, soil conditions, slope, etc.). There are two publications that are used as reference for this kind of work:

1. Wetlands Rules & Regulations – what they mean to your logging operation in Vermont. Provided by the University of Vermont Extension Service.
2. VELCO Environmental Guidance Manual. Provided by the VELCO Environmental Team.
3. Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont. Provided by the VT Department of Forest, Parks and Recreation.

N. Public Outreach and Education

VELCO understands that for a vegetation management program to be successful the plan needs to involve and educate the public and all stakeholders in the vegetation management plan, techniques implemented, and the status of the program used by VELCO. VELCO will accomplish this through public outreach with various partners and affiliations including:

1. National Arbor Day Foundation – Tree Line USA
2. United States Environmental Protection Agency – Pesticide Environmental Stewardship Partnership
3. Vermont Urban and Community Forestry Council
4. National Wild Turkey Federation – Energy for Wildlife
5. Utility Arborists Association

6. International Society of Arboriculture

O. Investigate New Technology

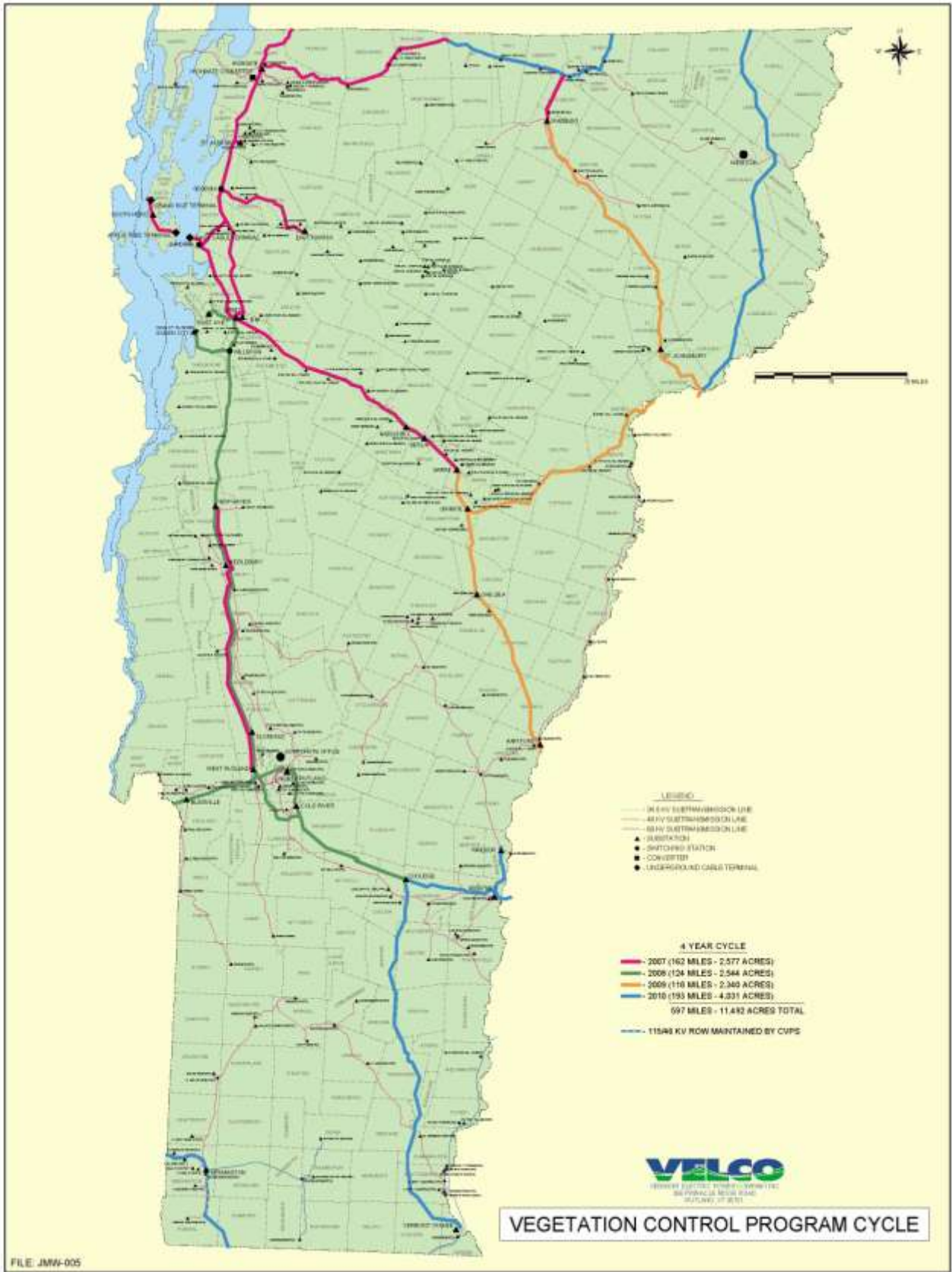
VELCO's TVMP strives to have an approach to vegetation management that investigates new technologies and evaluates them for their ability to meet the goals and objectives of the TVMP.

III. Integrated Vegetation Management Program

VELCO utilizes a system of vegetation management that manages plant communities in which compatible and incompatible vegetation are identified, action thresholds are considered, control methods are evaluated, and selected control (s) are implemented to achieve a specific objective. Choice of control methods is based on effectiveness, environmental impact, site characteristics, safety, security, and economics. This system of vegetation management is called Integrated Vegetation Management.⁵

A four year vegetation management cycle has been established as an action threshold. This vegetation management cycle has been time tested since 1980 and is based engineering design of the line, the growth rate potential of the vegetation, and required minimum vegetation to conductor clearances. The following map shows the vegetation management cycle.

⁵ American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (Integrated Vegetation Management a. Electric Utility Vegetation Management, ANSI A300 (Part 7)-2006 IVM (American National Standards Institute, Inc.) p. 58



The primary factors in determining the compatible and incompatible species of vegetation is the engineering design of the line, the growth rate potential of the vegetation, and required minimum vegetation to conductor clearances. This is determined by species composition, exposure to sunlight, soil quality and type, and available soil moisture. The diagram on page 16 shows the various required clearances used in determining the standard 12 foot maximum safe tree height. The right of way must be maintained with compatible vegetation that doesn't mature at heights greater than 12 feet in height and grows very slowly. All incompatible species must and will be removed because they have the potential to exceed the safe tree height in the four year cycle interval.

NERC adopted Transmission Vegetation Management Standard FAC-003-1 became effective April 7, 2006. The standard requires that the Transmission Owner, in the TVMP, shall identify and document clearances of vegetation to conductors at the time of vegetation management and to prevent flashover between vegetation and conductors.⁶

NERC Standard FAC-003-01 R1.2.1 Clearance 1 is the minimum clearance required at the time of vegetation management.⁷ NERC FAC-003-01 R1.2.2 Clearance 2 is the minimum distance from vegetation to conductor at maximum sag to prevent flashover.⁸

⁶ NERC Standard FAC-003-1 -- Transmission Vegetation Management Program, B. Requirements, R1.2, p.1.

⁷ NERC Standard FAC-003-1 -- Transmission Vegetation Management Program, B. Requirements, R1.2.1, p.1.

⁸ NERC Standard FAC-003-1 -- Transmission Vegetation Management Program, B. Requirements, R1.2.2, p.1.

Nominal Line Voltage	Maximum System Voltage	Maximum Line to Ground Voltage	NESC 232.C.1		Minimum Clearance Between Ground and Conductors (Note 2)	Maximum Tree Height at Time of Maintenance	NERC FAC-003-1 R1.2.1	NERC FAC-003-1 R1.2.2
			Table 232-1 (Sections 2-4)	232.C.1.A (voltages exceeding 22kV)			Clearance 1 (Minimum Clearance between vegetation and conductors at time of maintenance) (Note 2)	Clearance 2 (Minimum Clearance between vegetation and conductors to prevent flashover) (Note 3)
kV	kV	kV	ft	ft	ft	ft	ft	ft
115	120.75 kV	69.72	18.5	1.6	20.1	12	8.1	4
230	241.5 ft	139.43	18.5	3.9	22.4	12	10.4	6
345	362 kV	209.15	18.5	6.24	24.75	12	12.75	10
450 DC	472.5	472.5	18.5	15	33.5	12	21.5	15

Note 1: Maximum line voltage based on 1.05%

Note 2: Clearances between ground and conductors shall be based on maximum operating limits, as defined by VELCO line ratings program.

Note 3: Clearance 2, Minimum Clearance between Vegetation and Conductors, will be defined by either NERC (IEEE 516) or ISO-NE Operating Procedure #3, whichever is greater.

If the Clearance 1 can not be obtained at the time of vegetation management the mitigation steps below will be implemented to achieve sufficient clearances for the protection of the transmission facilities. If the vegetation is an imminent threat or not in compliance with Clearance 2 the threat shall be immediately communicated the condition to the VELCO control room at (802) 770-6261 so that appropriate action can be taken until the threat is relieved.

1. The condition will be immediately reported to the Supervisor of Right of Way Management.
2. The Supervisor of Right of Way Management will review easement documents and enforce legal vegetation management rights per easement language.
3. If easement language does not allow proper clearances to be met the Supervisor of Right of way Management with work with VELCO's Legal department to obtain appropriate easement rights for vegetation management.

Compatible Vegetation

The Wire Zone is described as the area directly under the conductors and 15 feet outside of the conductors on each side of directly underneath the conductors. This area varies due to different construction types and structure cross arm lengths. The Border Zone is described as the area outside of the wire zone on both sides of the Wire Zone that extend out to the edge or cleared width of the right of way.

The main concern in maintaining vegetation in the wire zone is to ensure vegetation does not grow tall enough to grow into the wires; wires do not sag into the vegetation during heavy load conditions, or ensure that a combination of both does not occur. This area is managed for vegetation that **does not** mature at heights greater than 12 feet. If a compatible species exceeds the 12 foot height restriction it is removed. Below is a list of example compatible vegetation for the wire zone area:

Wire Zone Compatible Vegetation⁹

American Elder	Black Chokeberry
Red Chokeberry	Bearberry
Japanese Barberry*	Common Barberry
Buttonbush	Leather Leaf
Sweet Pepper Bush	Sweet Fern
Silky Dogwood	Gray Dogwood
Round Leaf Dogwood	Red Osier Dogwood
American Hazelnut	Beaked Hazelnut
Bush Honeysuckle	Autumn Olive*
Huckleberries	Inkberry
Winterberry	Arrowwood
Common Juniper	Creeping Juniper
Sheep Laurel	Mountain Laurel
Common Privet	Spicebush
Honeysuckles*	Sweet Gale
Northern Bayberry	Mountain Holly
Virginia Creeper	Ninebark
Beach-plum	Pinkster-flower Azalea
Swamp Azalea	Shining Sumac
Gooseberries	Roses
Multiflora Rose*	Northern Blackberry
Northern Dewberry	Running Blackberry
Red Raspberry	Black Raspberry
Black Elderberry	Red Elderberry

⁹ Northeastern Shrub and Short Tree Identification: A guide for Right of Way Vegetation Management, Ballard, Benjamin; Whittier, Heather; Nowak, Christopher, Eastwood Litho Syracuse ,NY, 2004.

Green Briar
Meadowsweet
Snowberry
Low bush Blueberry
Cranberry
Maple-leaf Viburnum
Northern Wild Raisin
Thimble Berry

Bull Briar
Steeplebush
American Yew
High bush Blueberry
Deerberry
Witch-hobble
High bush Cranberry

* Denotes species that are known to have invasive characteristics in Vermont.¹⁰

The main concern for maintaining the vegetation in the border zone is to ensure that vegetation does not grow tall enough to fall into the conductors, grow into the conductors or blow into the conductors during wind events. This area is managed for vegetation that **does not normally** mature at heights greater than 12 feet. If the vegetation exceeds the 12 foot maximum safe tree height restriction it is removed. The main factors in allowing the taller species is for aesthetics and wildlife habitat concerns, however all requires minimum clearances as described above must be met. The taller species may be allowed in areas of aesthetic concerns, wildlife crossings, stream crossings, and other environmentally sensitive areas. Below is a list of example compatible vegetation for the border zone area:

Border Zone Compatible Vegetation¹¹

Speckled Alder
Serviceberry
Blue Beech
Eastern Red Cedar
Flowering Dogwood
Witch-hazel
Mountain Maple
Common Apples
Common Pears
Common Buckthorn*
Smooth Sumac
Pussy Willow
Shining Willow
American Mountain Ash
Crab Apples

Common Alder
American Hornbeam
White Cedar
Alternate-leaf Dogwood
Hawthorns
American Holly
Prickly Ash
Choke Cherry
Scrub Oak
Glossy Buckthorn*
Staghorn Sumac
Diamond Willow
Purple Willows
Striped Maple

* Denotes species that are known to have invasive characteristics in Vermont.¹²

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¹¹ Northeastern Shrub and Short Tree Identification: A guide for Right of Way Vegetation Management, Ballard, Benjamin; Whittier, Heather; Nowak, Christopher, Eastwood Litho Syracuse ,NY, 2004.

¹²

Incompatible Vegetation

Incompatible Vegetation is vegetation that exceeds a mature height of 12 feet. These species typically grow very fast, especially at early stages of their life cycles. The fast growing nature of these species is often emphasized when they exceed the height of the compatible species canopy and receive full sunlight. Many of these species also re-sprout very quickly. Due to these factors these incompatible plants are removed in both the wire zone and border zone. Below is a list of example incompatible vegetation.

Incompatible Vegetation

<u>Common Name</u>	<u>Scientific Name</u>	<u>Mature Height</u>
<i>Ash, White, Green</i>	Fraxinus	40-80'
<i>Aspen, Quaking, Big Tooth</i>	Populus	50-80'
<i>Basswood, Lindens</i>	Tilia	60-80'
<i>Beech, American</i>	Fagus	70-80'
<i>Birch, Black, Yellow, White, Grey</i>	Betula	50-70'
<i>Boxelder</i>	Acer	50-70'
<i>Butternut</i>	Juglands	40-60'
<i>Catalpa</i>	Catalpa	90-120'
<i>Cherry, Black, Pin, Fire</i>	Prunus	30-60'
<i>Cottonwood</i>	Populus	80-100'
<i>Elm, American, Slippery</i>	Ulmus	60-90'
<i>European Larch</i>	Larix	40-80'
<i>Fir, Balsam</i>	Abies	40-60'
<i>Hemlock</i>	Tsuga	60-80'
<i>Hickory, Shagbark, Bitternut</i>	Carya	70-80'
<i>Hop Hornbeam</i>	Ostrya	30-50'
<i>Maple, Red, Sugar, Norway, Silver</i>	Acer	60-90'
<i>Oak, Black, Red, Chestnut, White</i>	Quercus	60-80'
<i>Pine, White, Red, Scotch</i>	Pinus	70-100'
<i>Sycamore</i>	Plantanus	80-100'
<i>Spruce, Red, White, Black, Norway</i>	Picea	60-80'
<i>Yellow Poplar, Tulip tree</i>	Liriodendron	70-90'
<i>Willow, Weeping, Crack, Black</i>	Salix	30-40'

IV. Methods of Vegetation Control

VELCO will maintain its rights of way in the manner that most appropriately balances avoiding unreasonable risk of harm to the environment, workers, neighbors, occupants, and users of the land on

which or adjacent to which its rights of way lie, promoting the reliability of the VELCO transmission system, and minimize expenses over the long term. The overall strategy is implementing the vegetation management technique that best meets the goals and objectives of the TVMP.

The methods of vegetation control are Manual, Mechanical, Biological and Chemical. Each method has various types of tools and applications.

A. Manual Methods

1. Chainsaws
2. Brush saws

Manual methods are used frequently in areas where Chemical methods are restricted by regulation or landowners and where non chemical alternatives are favored.

Advantages of Manual methods are:

1. Can be employed year round
2. Generally accepted by the public
3. Selective as only incompatible species are removed

Disadvantages of Manual methods are:

1. Loss of plant bio-diversity as generally promotes monocultures of incompatible plant species.
2. Most incompatible species re-sprout increasing stem densities therefore only gaining short term control.
3. More exposure to personal injuries as chainsaws can be hazardous to operate.
4. Increase in illegal dumping due to increased brush density and decreased lines of sight.
5. Reduced wildlife habitat due to incompatible monocultures of vegetation that develop cyclic rather than stable plant communities.

6. Increase in petroleum product pollution from bar and chain oil which does not break down quickly and is prone to leaching.
7. Manual methods are labor intensive and more costly than other methods.

B. Mechanical Methods

1. Mowing of brush with specialized equipment for cutting and grinding brush

Mechanical methods are also used in areas where Chemical methods are restricted by regulation or landowners and non chemical alternatives are favored.

Advantages of Mechanical methods are:

1. Can be employed year round with the exception of deep snow cover or extreme cold temperatures
2. Generally accepted by the public

Disadvantages of Mechanical methods are:

1. Loss of plant bio-diversity as generally promotes monocultures of incompatible plant species.
2. Non-selective as compatible as well incompatible species are removed
3. Most incompatible species re-sprout increasing stem densities therefore only gaining short term control.
4. More exposure to personal injuries from flying debris can be hazardous to operators, bystanders and the public.
5. Due to the need for heavy equipment there is potential for soil compaction and rutting that can lead to soil erosion problems.
6. Increase in illegal dumping due to increased brush density and decreased lines of sight.

7. Reduced wildlife habitat due to incompatible monocultures of vegetation that develop cyclic rather than stable plant communities.
8. Risk for petroleum product pollution from hydraulic oil leaks and spills which do not break down quickly and are prone to leaching.
9. Mechanical methods require heavy equipment and are typically more costly than other methods.

C. Biological Methods

1. Encourage land to be converted to a higher use such as lawns, agricultural fields or pastures.
2. Plant low-growing brush and/or allelopathic plants.
3. Grub, seed and mulch the right of way.
4. Introduce vegetation eating insects.
5. Introduce wood decaying fungus.
6. Burn the right-of-way.

Biological methods are used in limited locations. The most common is converting right of way to a higher use. Planting in the right of way is difficult because of existing root mass. Grubbing of stumps and preparing the soil to be suitable for planting which is expensive is the main limiting factor of this method. The introduction of vegetation eating insects, wood decaying fungus and burning the right of way may prove to be very risky due to the high probability of those methods leaving the right of way onto adjacent lands.

Advantages of Biological Control Methods are:

1. Generally accepted by the public.
2. Typically longer term than manual or mechanical methods however tree seedlings will eventually seed back into the right way if not maintained.

Disadvantages of Biological methods are:

1. Loss of plant bio-diversity as generally promotes monocultures.
2. Typically cost prohibitive.
3. Due to need for heavy equipment there is potential for soil compaction and rutting that can lead to soil erosion problems.
4. High probability of those methods leaving the right of way onto adjacent lands.

D. Chemical Methods

1. Low Volume Foliar Application
2. Low Volume Basal Application
3. Cut Stump Treatment
4. High Volume Foliar Application
5. Aerial Application

VELCO currently employs Low Volume Foliar, Low Volume Basal, and Cut Stump herbicide application methods. The application method is selected depending on site characteristics such as stem densities, environmental concerns, aesthetic concerns, and landowner preferences.

Advantages of Chemical Control Methods

1. Safest vegetation management method for vegetation management workers.
2. Only long term vegetation management method.
3. Hand held applications allow species selectivity.
4. Highly Regulated.
5. Promotes bio-diversity among plants and wildlife.
6. Products used bio-degrade quickly.
7. Products used are not prone to leaching.
8. Only method that reduces stem densities of undesirable plant species reducing future management costs.

9. Stable plant communities lead to long term aesthetic improvement.
10. Stable plant communities improve wildlife habitat.
11. Only feasible control method for invasive species.

Disadvantages of Chemical Control Methods

1. Generally less acceptable to the public.
2. Limited window of opportunity for application.
3. Requires additional training of workers.
4. Applications limited to annual permit requirements.
5. Short term aesthetic concerns.

Each application method is explained in detail below:

1. Low Volume Foliar

Low Volume Foliar is an application herbicide application method where the herbicide application is made directly to the foliage of the incompatible species of vegetation. This application is very selective as there is little to no runoff and in low densities of incompatible species can be used as a spot type treatment. This application is typically made from a back pack sprayer following full leaf out which is typically the middle to the end of June until leaf coloration which is usually the first of October. This application is 90-95% effective of controlling the incompatible species in one application.

2. Low Volume Basal

Low Volume Basal applications are made to the stems of individual trees. The application is made to the complete circumference of lower 6-18 inches of the tree depending on the diameter. This application can be made during the growing or dormant season with the exception of frozen ground or snow cover using a back pack sprayer and low volume wand or hand spray bottle. The application is very selective as only stems of

undesirable vegetation are treated. This application is 85-90 % effective of controlling the incompatible species in one application.

3. Cut Stump Treatment

Cut Stump Treatments are made directly to stumps of undesirable trees following manual treatments and sometimes following mechanical treatments. This application can also be made during the growing or dormant season with the exception of frozen ground or snow cover using a back pack sprayer and low volume wand. The application is very selective as only stumps of undesirable vegetation are treated. This application is 85-90 % effective of controlling the incompatible species in one application.

4. High Volume Foliar

High Volume Foliar is an herbicide application method where the herbicide application is made directly to the foliage of the incompatible species of vegetation. This application can be selective in low densities of incompatible species when used as a spot type treatment. This application is typically made from a piece of equipment with a mounted tank following full leaf out which is typically the middle to the end of June until leaf coloration which is usually the first of October. This application is 90-95% effective of controlling the incompatible species in one application. This application is typically used on high density undesirable vegetation. VELCO has used an IVM program for many years and has low stem densities, therefore does not typically employ this application method. However, this may be the method of choice to reclaim areas where herbicides have not been used in the past or when new lines are constructed to lower stem densities prior to employing other application techniques.

5. Aerial Herbicide Applications

Aerial Herbicide applications are herbicide applications made from helicopters or fixed wing aircraft to the foliage of vegetation. **VELCO does not utilize this method.**

VELCO has conscientiously assessed all of the significant benefits and risks of the use of herbicides and their alternatives in the maintenance of its rights of way. Consequently, VELCO has concluded that it will best fulfill its responsibilities as a public utility by utilizing the limited and selective use of herbicides as described in this plan.

VELCO shall not use herbicides for right of way vegetation management unless it is:

- (1) registered for general use by the U.S. Environmental Agency (under authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), EPA must classify all pesticide products for either "**general**" or "**restricted**" use),
- (2) Approved for use by the Vermont Agency of Agriculture,
- (3) Determined by the Company's experience, or the experience of others, to be effective for purposes for which it is used.

General use pesticides, as defined by the EPA, are those that will not cause unreasonable adverse effects to the user or the environment when used in accordance with the label instructions. Under FIFRA, "unreasonable adverse effects on the environment" means any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide.

Restricted use pesticides are those which may cause adverse effects to the applicator or the environment unless applied by persons who have been specifically trained in their use. VELCO does not use any EPA restricted use herbicides.

The following describes VELCO's specific methods of herbicide use.

- a. Herbicides shall be applied only by manual methods that target individual plants or compact clusters of plants. **Aerial or broadcast applications of herbicides shall not be utilized for right of way vegetation management.**
- b. Herbicides shall be applied in strict accordance with the instructions of the manufacturer and the requirements of any state or federal agency having jurisdiction, provided that, if VELCO's experience, or generally accepted practices within the industry, indicate the need for more restrictive application, then such greater restrictions shall be observed.
- c. Herbicides shall be applied only by applicators trained as required by FIFRA or, if FIFRA has no training requirements for the particular herbicide, then the applicator shall be trained by, or according to the direction of and to the satisfaction of VELCO's Supervisor of Right of Way Management.
- d. Herbicides shall be applied in accordance with the products label directions to be effective for the purposes for which they are used.
- e. The requirements and limitations of this policy shall apply both to VELCO personnel and to any outside contractor engaged to perform right of way vegetation management.

Prohibition on use of herbicides

- a. Herbicides shall not be used in violation of any applicable law or regulation.
- b. Herbicides shall not be used at locations where or during times when they may pose a greater than normal risk of off-target dispersion (e.g. rain, snow, frozen ground, adjacent to streams or gardens, or in more than moderate wind).
- c. Herbicides shall not be used in easements within the property of any landowner who has, pursuant to the procedures of Vermont Public Service Board Rule No. 3.640, requested that they not be used.

- d. Herbicides shall not be used at any location where the Supervisor of Right of Way Management or his or her designee has determined that non-chemical measures would be substantially as effective, substantially as safe to applicators, and not substantially more costly than chemical means of vegetation management.

Regulatory Herbicide Use Instructions

Specific instructions for the use of herbicides in Vermont are listed in the Revised Regulation for Control of Pesticides In Accordance With 6 V.S.A. Chapter 87. These regulations are administered through the Vermont Agency of Agriculture, Plant Industry Division. A request for a permit to apply herbicides on rights of way must be submitted to the Agency of Agriculture annually.

The application is reviewed by the Vermont Pesticide Advisory Council and they make recommendations to the Commissioner of Agriculture regarding the approval of the permit. The Agency of Agriculture conducts field inspections on programs having approved permits to ensure compliance with regulations, according to labeling instructions and permit conditions.

The following is required to be on site and available to the herbicide application crews prior to and during herbicide application operations:

1. Vermont Agency of Agriculture issued permit and permit application (including all herbicide labels and MSDS sheets).
2. At least one crew member that is a Vermont Agency of Agriculture Certified Pesticide Applicator.
3. A VELCO line map showing details such as: county lines, town boundaries, property ownership, water supplies, wetlands, access routes, environmental concerns and any special data available or gathered over the years (property owner requests, etc.).

4. Required personal protective equipment in accordance with herbicide labels.
5. Drinking water and wash water.
6. VELCO Vegetation Management Policies and Procedures Manual
7. Spill Kit (including spill response instructions), shovel, absorbent material and container.
8. Herbicide Spill Response Instructions

VELCO and its contactors shall conduct annual training on herbicide use for all members of the herbicide application crews prior to beginning the vegetation control program.

Miscellaneous

- a. Any person who requests that herbicides not be used on right-of-way located on land that he or she owns or occupies shall be informed of the provisions of Vermont Public Service Board Rule No. 3.640.
- b. The Supervisor of Right of Way Management or a person designated by the Supervisor of Right of Way Management shall be responsible for acquiring and maintaining a high level of expertise in all relevant subjects related to the use of herbicides for right of way vegetation management, including, but not limited to the effectiveness, benefits and risks of all herbicides used by or considered for use by the company or its contractors, regulatory requirements concerning such use, and the need for and techniques of the training of personnel in the application, transport, and storage of herbicides.
- c. The Supervisor of Right of Way Management will maintain current and sufficiently comprehensive files on all herbicides that it uses. The files shall cover such subjects as toxicities, effectiveness, regulatory developments, environmental and health effects, cost-effectiveness, industry practices, etc.

In summary Manual, Mechanical, and Biological methods are effective but are typically short term, more expensive, and have more impact on the environment than the selective use of Chemical methods.

V. DANGER TREES

VELCO also needs to remove trees outside of the cleared right of way area as needed to ensure that the TVMP meets the goals and objectives of the plan. Typically easements allow for the removal of trees outside of the easement area that VELCO deems may have an impact to the safe and reliable operation of the line. Trees that are tall enough or are capable of growing tall enough over the next four year cycle are evaluated based on the criteria listed below. Danger trees that are deemed to be removed are marked and added to the vegetation cycle inventory for removal. If a tree does not pose a concern it will not be cut and will reevaluated during subsequent vegetation cycle inventories and patrols.

If a tree is determined to be an imminent threat it is called a **threat tree** and necessary actions are taken to have it removed immediately.

DANGER TREE EVALUATION CRITERIA

Species

- Failure rates of tree species
- Tensile strengths of wood
- Longevity
- Rooting characteristics

Growth Patterns

- Phototropism-tree growing towards sunlight
- Lean

Location

- Slope
- Shallow soils
- Wet soils
- Stream banks
- Erosion

Structural Defects

- Poorly attached leaders / crotches with included bark
- Multi stems – co-dominate leaders
- Rubbing leaders or rubbing other trees

Disease / Insect damage

- Defects caused by disease or insects

Decay – caused from

- Storm damage
- Mechanical damage
- Disease
- Frost cracks
- Sun scald

VI. WIDENING OF THE RIGHT OF WAY

VELCO also needs to periodically widen the edges of the right of way.

Trees growing along the edges seek sunlight in the right of way and either bend out towards the sunlight or grow all their branches on the right of way side of the tree. This establishes an aesthetically pleasing condition of a feathered edge. However, tree seedlings can become established under these branches and encroach the easement. This encroachment needs to be removed to ensure the goals and objectives of the TVMP are met. This is reviewed as part of the vegetation cycle inventory and completed as needed during each vegetation management cycle.

VII. IMPLEMENTATION OF INTEGRATED VEGETATION MANAGEMENT

In keeping with an integrated vegetation management approach to vegetation management prior to each management cycle an inventory of vegetation conditions shall be completed. The inventory will record information regarding incompatible species heights and densities, if control is required the method of control is prescribed, danger trees are listed, whether the right of way has encroached and needs to be widened, and restrictions that may affect the vegetation management that is prescribed.

The inventory is developed into the work scope for a request for proposal for vegetation management services from qualified vegetation management contractors. Contracts are developed for each line or line segment that includes a work scope, pricing, schedule of performance, general conditions, key personnel, and special conditions.

Following the award of the work to a specific contractor, and the approval of an herbicide use permit, a meeting is held with the contractor. The purpose of this meeting is to discuss the details of the permit application and the approved permit issued by the Department of Agriculture.

In the meeting, requirements of the following are discussed:

1. Agreement for Vegetation Management Services
2. Permit Application
3. Herbicide Use Permit Issued

Additionally, the following issues are reviewed in detail:

1. Community Water Supplies-Locations/Water Supply Division
2. Wetlands/Water Quality Division & National Wetlands Inventory Maps
3. Significant Habitat Maps/VT Fish & Wildlife Department
4. Selective Areas (buffers & wildlife crossings)
5. VELCO's line maps/Reviewed with Field Foreman of crew.

In accordance with VELCO's request for proposal, the contractor conducts an annual training session which includes topics such as chainsaw safety, herbicide use safety and applications, safe driving techniques, good public relations habits, tree & shrub identification and various logistical matters.

VIII. INSPECTION STANDARDS

Growth rates of vegetation vary due to species, soil, site conditions and climate conditions. It is therefore required that each line be periodically patrolled for the specific purpose of detecting locations where minimum clearances are being approached.

A. Frequency

1. An aerial or foot patrol shall be performed at least once a year to determine where vegetation is not in compliance with the standard

clearances. If an aerial patrol is utilized, it shall be followed, where necessary, by a foot patrol.

2. An aerial or foot patrol may be preformed following a weather event that has the potential to cause changes in vegetation conditions such as heavy wet snows, ice accumulations, or high wind events.
3. An aerial or foot patrol may be preformed prior to line maintenance work that may put more than normal reliability requirements on a particular line or group of lines.

B. Nature of Patrol

1. All vegetation conditions that might immediately affect the operation or maintenance of the lines shall be observed and recorded.
2. The following list is representative of observations to make:
 - a. Heights of vegetation in the transmission corridor.
 - b. Clearance of road crossing screens, wildlife crossings, stream crossings, and other environmental buffers.
 - c. Vegetation which is not in compliance with standard clearances.
 - d. Any evidence of vegetation-conductor contact or burning caused by contact.
 - e. Trees which because of their condition are an imminent threat to the lines and may be deemed a threat tree.
 - f. Trees which because of their condition may be deemed a danger tree and need further evaluation prior to the next vegetation management cycle.
 - g. Encroachment of trees along the edge of the right of way that may pose a threat to the reliability of the line prior to the next vegetation management cycle.

C. Action Following Patrols

When vegetation is determined to be an imminent threat to the reliability of the line the condition shall be immediately communicated to the VELCO control room (1-802-770-6261). Actions to avoid unscheduled interruption of service will be taken as needed by the control room. Vegetation found not to be in compliance with the standards but not an imminent threat shall

be reported to the Supervisor of Right of Management and action shall be initiated within a reasonable time frame to obtain clearance to maintain standard clearances until the next cycle or at least the minimum conductor-to-vegetation clearance standard until standard clearances can be obtained.

IX. GUIDANCE, CONTROL, & EVALUATION OF CONTRACTORS

VELCO Vegetation Management Policies and Procedures Manual has been developed as a guide for vegetation management contractors. VELCO expects the vegetation management contractors to train its field personnel (supervisors & technicians) in the concepts of this TVMP and the VELCO Vegetation Management Policies and Procedures Manual.

VELCO's Right of Way Management staff will inspect the contract field crews on a frequent basis to monitor activities and insure compliance with this vegetation management plan and all related regulations and safety standards. It is the responsibility of VELCO's Right of Way Management staff and the vegetation management contractor's supervisors to evaluate the quality of performance of the contract field crews.

The elements of an evaluation are as follows:

1. Compliance with all safety regulations.
2. Clear understanding of what is expected.
3. Good work production.
4. Good work quality.
5. Good public relations with property owners and the general public.
6. Dependability.
7. Good communication with VELCO inspector.
8. Maintenance of daily records/herbicide data, time sheets, etc.
9. Maintenance of equipment in good and safe condition.

To accomplish this evaluation the field representative must:

1. Make frequent visits to the active job sites and observe activities.
2. Look ahead to preview upcoming work and communicate with crew foreman so plans can be made in a timely manner.
3. Review work previously done to evaluate effectiveness and quality and to determine whether or not plans were understood and followed.

As a result of this process, compliments and/or comments can be given to the crew. Adjustments can be made to improve or correct work activities if and where necessary.

VELCO will insist that its contractors apply current techniques and are in compliance with all State and Federal Laws and Regulations and the principles of the TVMP and VELCO Vegetation Management Policies and Procedures Manual. These principles have the primary purpose of assuring the continuous safe and reliable operation of the New England grid and Vermont's local transmission network.