Massachusetts Electric Company
d/b/a
National Grid

Winter Storm 2008 Report

Book 5 of 5

February 23, 2009

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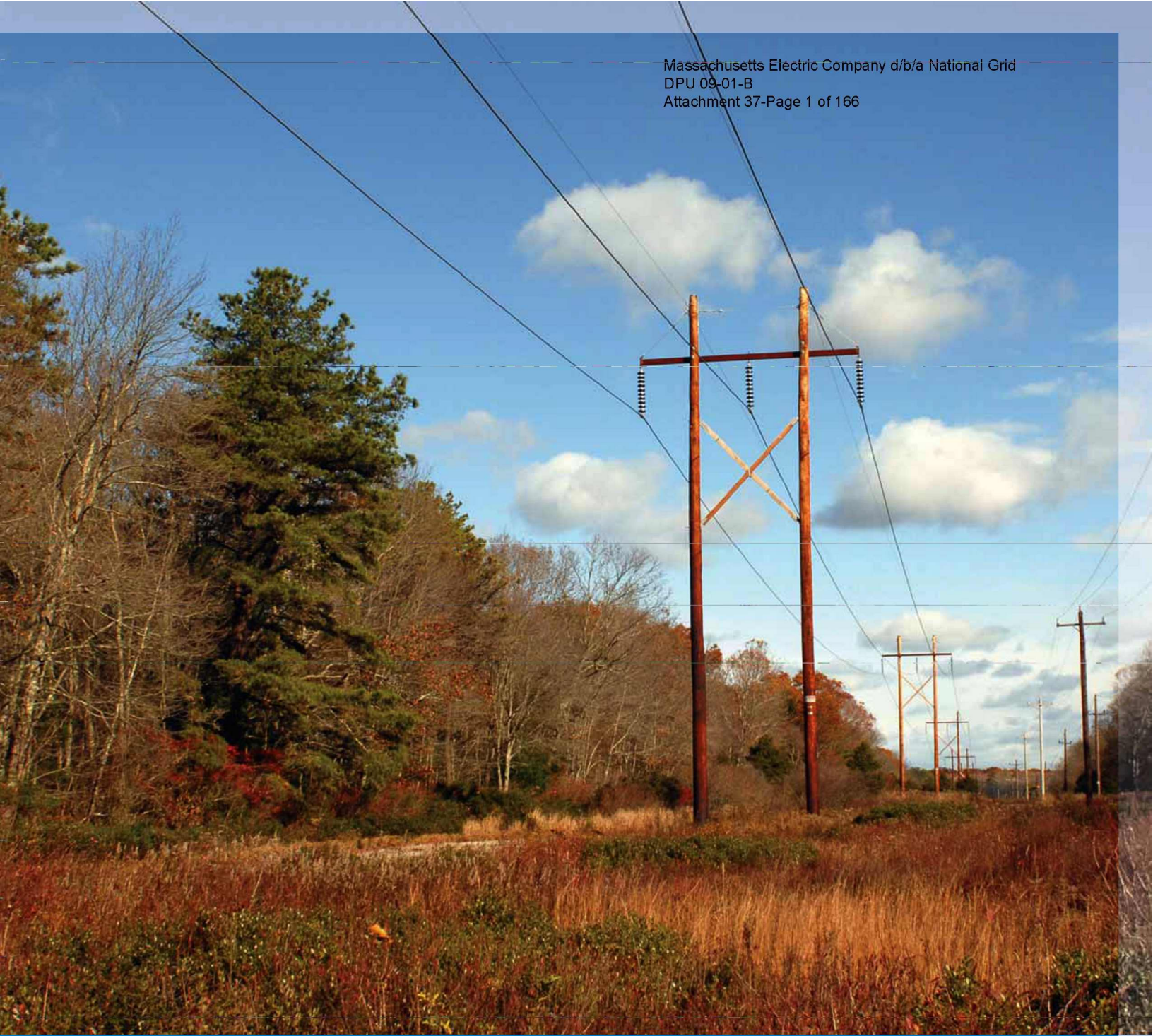
Submitted by:

nationalgrid



Transmission Forestry

2008 Right-of-Way Yearly Operational Plan

nationalgrid

Prepared and Submitted by National Grid

2008 Right-of-Way Yearly Operational Plan

The core functions of National Grid's U.S. transmission business have achieved ISO 14001 registration of their Environmental Management System.

nationalgrid

SUMMARY

The purpose of this Yearly Operational Plan (YOP) is to outline the National Grid companies (hereafter referred to as "Companies") 2008 program for managing vegetation with herbicides on rights-of-way in compliance with 333 CMR 11.00, regulations administered by the Massachusetts Department of Agricultural Resources (DAR). Rights-of-way proposed for treatment in 2008 and the municipalities through which they pass, are listed in Appendix 1.

National Grid's use of herbicides for vegetation management is done within the context of an Integrated Pest Management (IPM) program. In right-of-way management the pest is tall growing vegetation, primarily trees. Biological control is a component of our IPM program.

Biological control is achieved by promoting the establishment of plant communities that resist invasion of rights-of-way by tree species. Judicious and selective use of herbicides to control tall growing trees, allows low-growing shrubs, grasses, ferns, and herbaceous plants to become established and resist invasion by tree species.

Herbicides are applied by trained, licensed applicators using hand-held equipment. Applicators walk to each target plant and apply the minimal effective amount of herbicide.

Sections of right-of-way devoid of trees: areas where non-target, low-growing shrubs, ferns, and grasses make up the vegetative cover; wet areas where high water table prevents trees from growing; and areas where land use prevents establishment, trees are not treated with herbicides.

Our IPM program also utilizes alternative control methods including: hand cutting, mowing, and land use which prevents the establishment of trees.

National Grid uses only herbicides and application methods recommended for use in sensitive areas, as per 333 CMR 11.04(1)(d), on the full length and width of all rights-of-way to be treated. Sensitive areas are defined in 333 CMR 11.02 (Appendix 5). As of December 1999, the herbicides Accord Concentrate, Arsenal, Escort, and Krenite S have been recommended and will be the only herbicides used. Application rates and mixes are presented on page 4.

Sensitive areas: methods to identify them, and no-herbicide and conditional-herbicide use zones are illustrated in Appendix 4.

National Grid employs three in-house professional foresters to supervise the implementation of this YOP. The Companies retain independent, professional, experienced contractors to perform the treatment applications.

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I. INTRODUCTION

The purpose of this Yearly Operational Plan (YOP) is to outline the National Grid companies* (hereafter referred to as National Grid) 2008 program for managing vegetation with herbicides on rights-of-way in compliance with 333 CMR 11.00. This YOP is designed to complement National Grid's five-year Vegetation Management Plan (VMP) as approved by the Massachusetts Department of Agricultural Resources (DAR). Copies of the VMP and this YOP are available upon request.

The purpose of 333 CMR 11.00, Rights of Way Management, is to promote the implementation of Integrated Pest Management (IPM) techniques and to establish standards, requirements and procedures necessary to minimize the risk of unreasonable adverse effects on human health and the environment associated with the use of herbicides to manage vegetation on rights-of-way. These regulations establish procedures which guarantee ample opportunity for public and municipal agency review and input.

A YOP must be submitted to the Department of Agricultural Resources every year herbicides are intended for use. The YOP provides details for the vegetation management program for the year.

Upon receipt of this YOP, the DAR publishes a notice in the Environmental Monitor. The Companies will provide a web site address for a copy of the YOP, notification, copies of location maps and Environmental Monitor notice will be sent to the Chief Elected municipal official, the Conservation Commission, the Board of Health, and water departments for each city or town in which herbicide treatment is proposed.

DAR allows a 45 day comment period on the proposed YOP beginning with the publication of the notice in the Environmental Monitor and receipt of the notification and Environmental Monitor notice by each municipality.

Public notification of herbicide application is made separately at least 21 days in advance of the treatment. Notice is made to DAR, the Chief Elected official, the Conservation Commission, the Board of Health, and water department of each municipality where right-of-way treatment will be carried out.

Any comments on this YOP should be directed to the contact person listed on page 7.

* National Grid companies that manage rights-of-way in Massachusetts are Massachusetts Electric Company, New England Power Company, and New England Hydro Transmission Electric Company.

II. RIGHTS-OF-WAY PROPOSED FOR TREATMENTS IN 2006

Rights-of-way proposed for vegetation management treatments with herbicides in 2008, and the municipalities through which they pass, are listed in Appendix 1. Rights-of-way listed to facilitate "touch up" on segments treated in 2007 are listed in Appendix 6.

III. INTEGRATED PEST MANAGEMENT OF RIGHTS-OF-WAYS

National Grid's use of herbicides for vegetation management is done within the context of an Integrated Pest Management (IPM) program. In right-of-way management the pest is tall growing vegetation, primarily trees. Our program recognizes and considers all of the concepts identified in the IPM definition: reducing reliance on chemical pesticides, applying pesticides selectively, timing applications, using biological control measures, avoiding fixed application schedules, protecting non-target organisms, and protecting environmentally sensitive sites.

Biological control is achieved by promoting the establishment of plant communities that resist invasion of rights-of-way by tree species. Judicious and selective use of herbicides primarily to control tall growing trees, allows low-growing shrubs, grasses, ferns and herbaceous plants to become established and resist invasion by tree species. Herbicides are also used, to a lesser extent, to ensure access to structures for maintenance and to control noxious plants. See section VI.

Herbicides are applied by trained, licensed applicators using hand-held equipment. Applicators walk to each target plant and apply the minimal effective amount of herbicide. Typically 10% and in the most extreme case up to 50% of the vegetative cover is sprayed.

Sections of right-of-way devoid of trees: areas where non-target, low-growing, shrubs, ferns and grasses make up the vegetative cover; wet areas where high water table prevents trees from growing; and areas where land use prevents establishment of trees are not treated with herbicides.

Our IPM program also utilizes alternative control methods including: hand cutting, mowing, and alternative land use of rights-of-way. Non-sprouting conifers; White Pine, Hemlock, Cedar, Spruce and Larch taller than 1-2 feet are hand-cut and no herbicides applied to the stumps. Pitch Pine stumps will sprout and are treated with

herbicides. All conifers less than this height are not treated. Hand cutting and/or mowing are also used where there are prohibitions on herbicide use. These include sensitive areas and their associated buffer zones (see Appendix 4) around public and private wells; surface water supplies; lakes, ponds, and streams; inhabited areas such as homes, schools, and parks; and agricultural areas including crops, orchards, pastures, and Christmas tree plantations. Mowing and/or hand-cutting are also used in areas where easement and/or landowner agreements preclude herbicide applications.

Alternative land uses include: parking lots, golf courses, parks, driveways, roadways, crops, pastures, gardens and lawns.

IV. VEGETATION MANAGEMENT CONTROL METHODS USING HERBICIDES

Tall growing hardwood trees are the primary target for application of herbicides. Hardwoods over 12 feet tall are hand-cut and the stumps treated with herbicide. Hardwoods under 12 feet tall and certain woody plant species that present a safety problem, see Section VI., are sprayed with herbicides using either foliar or basal application methods. As mentioned above, Pitch Pine is the only conifer species treated with herbicides.

The table on page 4 outlines vegetation management control methods, herbicides, tank mixes, and estimated application rates proposed for use on rights-of-way to be treated in 2008.

Specific herbicides prescribed for use on a right-of-way within a particular municipality will be listed in the notification letter mailed to each municipality prior to treatments.

The Companies use only herbicides and application methods recommended for use in sensitive areas, as per 333 CMR 11.04(1)(d), on the full length and width of all rights-of-way to be treated. Sensitive areas are defined in 333 CMR 11.02 (see Appendix 5). In addition, the Companies use herbicides and application methods in wetlands as per the Department of Food and Agriculture Decision, dated October 12, 1995, concerning the wetland impact study conducted pursuant to 333 CMR 11.04(4)(c)(2). As of June 19, 1990, the herbicides Accord, Arsenal, Escort and Krenite "S" have been recommended and will be the only herbicides used on company rights-of-way.

Vegetation Management Control Methods, Herbicides Tank Mixes and Estimated Application Rates

Control Method	Herbicide(s)/ Adjuvant(s)	Active Ingredient	Tank Mix [1]	Estimated Application Rate (Formulation per acre) [2]
Foliar Treatment: Low Volume Foliar	Accord Concentrate [3] or Glypro	Glyphosate	2% - 5%	10 - 32 ounces
	Krenite S [3]	Fosamine Amonium	10% - 15%	1 - 3 quarts
	Escort [3]	Metsulfuron Methyl	1 oz./50 gal.	0.04 - 0.12 ounces
	Arsenal [4]	Imazapyr	0.125% - 0.25%	1.0 - 3.0 ounces
	Adjuvant [5]	---	Per label	---
	Low-drift [6]	---	Per label	---
Cut Stump Treatment:	Accord Concentrate or Glypro	Glyphosate	50%	2 - 24 ounces
	Accord Concentrate or Glypro	Glyphosate	50%	2 - 24 ounces
	Arsenal [7]	Imazapyr	6%	0.25 to 3 ounces
Basal Treatment	Garlon 4 Or Garlon 4 Ultra [8]	Triclopyr	20% – 25%	12 – 96 ounces
Hand Cutting:	None	---	---	---
Mowing:	None	---	---	---

[1] This is the ratio or amount of herbicide formulation diluted into the carrier. Water is used as the carrier for foliar or cut stump mixes. The carrier for basal mixes is listed above. The higher tank mix rates are used when the herbicide is mixed alone, when resistant target species are present, during the early or late part of the treatment season or during periods when the vegetation is stressed by drought.

[2] These estimates are derived from calculations of the average amount of undiluted herbicide formulation applied on representative rights-of-way over the pst 10 years.

[3] Accord Concentrate, Glypro or Krenite are most often applied in combination with Escort or Arsenal at the lower tank mix rates.

[4] Arsenal will be applied in combination with Accord Concentrate, Glypor or Krenite and Escort at the lower tank mix rates. Arsenal will not be applied on the same right-of-way in 2 consecutive years.

[5] Adjuvants are additives designed to help or improve herbicide effectiveness. In this case, adjuvants are natural oils or other compounds that may enhance herbicide activity by increasing penetration on the leaf cuticle or stem by causing the solution to spread better on the target plant surface and/or by helping to stick the solution to the target. One of several products are selected.

[6] Low-drift agents are adjuvants designed to increase spray droplet size and minimize off target movement of the herbicide solution. Low-drift agents are separated from other adjuvants because they are never included in basic herbicide formulations used by the Companies and are a very important component of the herbicide solution. All low-drift agents are not compatible with all herbicide solutions. Different low-drift agents are mixed at different rates and may be increased based on wind conditions. For this reason, specific tank mix rates are not given. One of several products are selected.

[7] Arsenal will be applied in combination with Accord Concentrate or Glypro to the cut-surface. Arsenal will not be applied on the same right-of-way in 2 consecutive years.

8 Garlon 4 or Garlon 4 Ultra mixed with mineral based basal oil. Garlon 4 Ultra will not be used in Sensitive Areas unless it receives DAR approval for Sensitive Area use.

V. CONTRACTORS THAT WILL PERFORM HERBICIDE TREATMENTS

The following vegetation management contractors will perform herbicide applications on the Companies' rights-of-way.

Vegetation Control Service, Inc.
2342 Main Street
Athol, MA 01331
(978) 249-5348

The Davey Tree Expert Company
PO Box 1825
New London, NH 03257-2264
(603) 526-4122

Asplundh Tree Expert Company
15 Pleasant Harbour Rd.
Plymouth, MA 02360
(508) 326-4127

Lewis Tree Service, Inc
300 Lucius Gordon Drive
West Henrietta, NY 14586
(585)-436-3208

Specific contractors retained for treatments on rights-of-way within a particular municipality will be listed in the notification letter mailed to each municipality prior to treatments.

VI. IDENTIFICATION OF TARGET VEGETATION

All tree species, except conifers less than one to two feet tall, within the cleared width of the right-of-way will be removed or controlled during the treatment operation. Tree species are identified as woody plants that mature at heights exceeding fifteen feet. These trees must be removed because they are capable of growing tall enough to grow into or fall onto the lines. In rare isolated instances, such as in steep ravines and on severe slopes, the electric lines are high enough off the ground so that mature trees will not interfere with the operation of the line. In these instances, trees will be left. Trees that need to be removed will be identified visually by trained treatment crews and include, but are not limited to, species such as maples, oaks, ash, cherries, birches, poplar, willow and pines.

All woody vegetation (trees, shrubs, vines) on or encroaching upon existing roads or pathways or immediately adjacent to line structures or equipment will be treated. If no access along the right-of-way exists, a pathway will be created and maintained in a suitable location by treating all woody vegetation within the selected route. Woody vegetation must be treated in these areas to ensure access to and along the right-of-way and line structures for safe and efficient inspection, maintenance, and repair operations. Woody plant species to be controlled include tree species previously identified plus shrub and vine species. Examples of shrub and vine species include, but are not limited to, viburnums, mountain laurel, alder, winterberry, bush honeysuckle, grape vines, buckthorn, virginia creeper and bittersweet.

Certain woody plant species that pose a safety problem will be removed whenever practical. These are plants that have heavy thorn growth or dermal toxicity and may create a hazardous environment to people working on or traversing the right-of-way. Examples of these plant species include, but are not limited to, poison ivy, multiflora rose, greenbriar, and hawthorne.

Desirable plant species that provide biological control include, but are not limited to: sweet fern, sheep laurel, mountain laurel, rhododendron, common juniper, highbush and lowbush blueberry, huckleberry, privet, shadbush, sumac, chokeberry, spirea, viburnums, dogwoods, azaleas, mountain holly, sweet pepperbush, buttonbush, and ferns, grasses, sedges, and other herbaceous species.

VII. INDIVIDUALS SUPERVISING THE YOP

National Grid employs three in-house professional foresters to supervise the implementation of the VMP and YOP.

All three have professional degrees in forestry, and extensive experience in utility vegetation management operations. National Grid retains independent, professional, experienced contractors to perform the treatment applications.
Overall supervision of the YOP on Companies' rights-of-way will be performed by:

Thomas E. Sullivan
Manager, Transmission Forestry
National Grid
25 Research Drive
Westborough, MA 01582
(508) 389-9086

The Transmission Forestry Manager is ultimately responsible for the preparation and implementation of this YOP including: work scheduling, prescription of herbicides and general application methods for each right-of-way, procurement of necessary permits, municipal notifications, contractor selection, provision of technical expertise and liaison between the Companies and landowners, local and state officials, or other interested parties, and ensuring overall compliance with the VMP and this YOP.

Coordination of the YOP on Companies' rights-of-way will be performed by Company and Contract Foresters. The Forester is responsible for: field level implementation of this YOP, coordinating and observing the daily activities of the treatment crews, providing liaison between the Companies and landowners, local officials or other interested parties, and ensuring compliance with the VMP and this YOP. National Grid's Foresters responsible for right-of-way segments are identified below with address and telephone number.

John P. Cookson
National Grid
407 Miracle Mile
Lebanon, NH 23776 (603)-443-4276

Eric Gemborys
National Grid
25 Research Dr
Westborough, MA 01582
(508)-389-4136

Michael V. Sikora, Jr.
National Grid
25 Research Dr
Westborough, MA 01582 (508) 389-9087

VIII. METHODS TO DESIGNATE SENSITIVE AREAS ON RIGHTS-OF-WAY

Sensitive areas are identified as public ground water supplies, public surface water supplies, private drinking water supplies, surface waters, wetlands, inhabited areas, agricultural areas, and road crossings.

Sensitive areas: methods to identify them, and no-herbicide and conditional-herbicide use zones are illustrated in Appendix 4.

For the purpose of identification, sensitive areas can be separated into two categories: areas not readily identifiable in the field and areas that are readily identifiable in the field.

Sensitive areas not readily identifiable in the field include public ground water supplies, public surface water supplies and private wells. The method utilized to identify these sensitive areas will be as follows:

1) Consult the appropriate reference materials and sources (Data Sheets and YOP maps) to determine the precise location of these areas.
2) Place the boundaries of these sensitive areas on United States Geological Survey (USGS) topographic maps (YOP maps).
3) Within the required municipal right-of-way treatment notification letter, mail copies of the appropriate sections of these marked up YOP maps to each municipality and solicit confirmation and input regarding the accuracy of these public and private water supply locations.
4) The treatment crew will deploy a cutting crew or point person in advance of the main herbicide application operation to locate and flag the boundaries of these sensitive areas and the appropriate buffer zones. These crews will also identify any private wells that are not shown on these maps and add new private wells to the list and survey forms for inclusion on YOP maps.

Sensitive areas readily identifiable in the field include surface waters, wetlands, inhabited areas, and agricultural areas. The method utilized to identify these sensitive areas will be as follows:

1) Consult USGS topographic (YOP) maps, and company Data Sheets to locate any of these sensitive areas.
2) The treatment crew will deploy a cutting crew or point person in advance of the main herbicide application operation to locate and flag boundaries of these sensitive areas or the appropriate buffer zone. These crews or persons will additionally identify any new sensitive areas that are not shown on these maps. New sensitive areas will be incorporated into Data Sheets and YOP maps.

IX. PROCEDURES AND LOCATIONS FOR HANDLING, MIXING, AND LOADING HERBICIDE CONCENTRATES

National Grid retains independent contractors to accomplish all aspects of handling, mixing, and loading herbicide concentrates. As a contractual term, contractors are required to comply with all applicable laws, regulations, and rules pertaining to handling, mixing, and loading herbicide concentrates.

The majority of the handling, mixing, and loading of herbicide concentrates is done at the contractor's base location. If it is necessary to handle, mix, or load herbicide concentrates at any other location, the contractor is required to comply with herbicide label directions and existing regulations regarding setbacks from sensitive areas and safety precautions.

No handling, mixing, or loading of herbicide concentrates will be done within the buffer zones adjacent to any drinking water supplies or surface waters, nor within 100 feet of any other sensitive area. All water to be used to mix herbicide solutions will be secured from a faucet or open bodies of water, that are not drinking water supplies. If pumps are used they must be equipped with anti-siphoning devices. Pumps and hoses used for water will not be used to pump or mix herbicides

X. HERBICIDE FACT SHEETS

The appropriate Herbicide Fact Sheets are attached in Appendix 7. These Fact Sheets have been developed and/or approved by the Massachusetts Department of Agricultural Resources.

XI. HERBICIDE LABELS

Herbicide Labels provided by the herbicide manufacturer are attached in Appendix 8.

XII. MAP(S) LOCATING THE RIGHTS-OF-WAY AND SENSITIVE AREAS NOT READILY IDENTIFIABLE IN THE FIELD

The appropriate YOP map(s) locating the rights-of-way and sensitive areas not readily identifiable in the field within each specific municipality notified will be sent to the appropriate municipal official.

The D.E.P. Water Supply Maps, which are the primary reference available to identify the locations of public groundwater supplies, public surface water supplies, and established primary recharge areas, do not contain the locations of all of these sensitive areas. National Grid has contacted water departments in many of these municipalities to assist in the preparation of these maps.

To insure that all of the applicable sensitive areas are identified on the Companies maps, National Grid is requesting municipal verification of areas currently mapped and identification of any areas not mapped. This request is highlighted in the cover letter of the notification mailed to each municipality prior to any herbicide treatments

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XIII. EMERGENCY CONTACTS

Herbicide Label:

Herbicide Material Safety Data Sheet:

Herbicide manufacturer:

- Dow AgroSciences (800) 992-5994
- Dupont (800) 441-3637 (Medical Emergencies)
- Monsanto (314) 694-4000
- BASF (800) 832-4357

Local police and/or fire department

Massachusetts Pesticide Bureau: (617) 626-1781

Massachusetts Poison Control Center: (800) 682-9211

Massachusetts Department of Environmental Protection:

(617) 556-1133 (to report spills)
(888) 304-1133

Or

Framingham State Police Office

508-820-2121 (after hours)

Chemtrec: (800) 424-9300

Additional Information:

Pesticide Hotline: (800) 858-7378

NPIC.orst.edu
6:30 a.m. - 4:30 p.m. Pacific time

Appendix 1

Rights-of-Way Proposed for Treatment in 2008

Line Number	Short Description	Town
303	Brayton Point to Rehoboth/Norton T/L	Somerset Swansea Rehoboth Dighton
339	Tewksbury Sub. to Haverhill St., N. Reading	Tewksbury Andover Wilmington North Reading
339	STR #102 to Golden Hills Sub.	North Reading Lynnfield Wakefield Saugus Melrose
339 Cedar Swamp	Haverhill St. to STRUC #102	North Reading
357	Millbury #3 to Milford/Medway T/L	Millbury Sutton Grafton Upton Milford
394	King Street Sub. to New Hampshire S/L	Groveland West Newbury Merrimack Amesbury
E205W, E	Massachusetts S/L to Connecticut River	Rowe Heath Colrain Shelburn Greenfield Gill
E205E	Connecticut River to Barre Sub.	Erving Wendell New Salem Petersham Barre

Line Number	Short Description	Town
G-133 Tap	Methuen Jct to New Hampshire State Line	Methuen
I135/J136	New Hampshire S/L to Fitchburg Switch	Winchendon Ashburnham Westminster Fitchburg
J136 TAP	East Winchendon Tap	Winchendon
F158/Q169	Golden Hills to Marshall Street, Revere	Saugus Revere
F158	Marshall Street to Everett Sub.	Revere Malden Everett
H160/N166	Northboro Road Sub. to Hudson T/L	Southboro Marlboro
O167	Everett Sub. to Mystic Terminal	Everett
P168	Mystic Terminal to Revere Sub.	Everett (Chelsea) Revere
Q169	Marshall Street to A179 ROW	Saugus Revere Lynn
A179	Revere Sub. to Lynnway Station	Revere Saugus Lynn
E183/F184	303 ROW to Mink Street Sub.	Somerset Swansea Seekonk
E183	Mink Street Sub. to Rhode Island S/L	Seekonk
F184	Mink Street Sub. to Read Street Sub.	Seekonk Attleboro

Line Number	Short Description	Town
S197	#4 Station to Bear Swamp	Shelburne Buckland Charlemont Colrain Heath Rowe
502-509	Mid Weymouth Tap	Weymouth
502-508	East Weymouth Tap	Weymouth
536-537 TAP	East Holbrook Tap	
D4	Massachusetts S/L to #4 Station	Bernardston Leyden Colrain Shelburne
E5/F6	Connecticut River to Ware Sub.	Sunderland Leverett Shutesbury Pelham Belchertown Ware
E5/F6	Ware Sub. to Meadow Street Sub.	Ware West Brookfield North Brookfield East Brookfield Spencer
B69	Windsor Dam to Belchertown Sub.	Belchertown
W123/V173	Carpenter Hill Sub. to Snow Street Sub.	Charlton Southbridge
1819	Florence Junction to Mount Tom	Northampton Easthampton

Line Number	Short Description	Town
E20/F19/G18/C2	Bridgewater Sub. to DuPont Sub. to Auburn St.	Bridgewater West Bridgewater Brockton Whitman
V5/U6/S8	Williams Street (Taunton) to Bridgewater Sub.	Taunton Raynham Bridgewater
NEES Supply	NEES Supply	Westboro
2284	Franklin Sub. to Plainville Sub.	Franklin Wrentham Plainville
2285	South Wrentham Sub. to Wrentham Sub.	Wrentham
9L4	(Sewage Plant Tap)	Seekonk
8T34	West Andover Sub. to Merrimack River	Andover
Liquid Carbonic	Liquid Carbonic Tap	Tewksbury
2366-67	Georgetown Sub. to East Boxford Sub. to I-95	Georgetown Boxford
2377-96	Merrimack T/L to Amesbury Sub.	Amesbury
2383/84	Meadowbrook Sub to Billerica Sub &NE Nuc	
13 Tap	Raytheon to IRS	Andover
59L1	Gillette Tap	Andover

Line Number	Short Description	Town
2391	Commercial Street Lynn to Denver Street Sub.	Lynn Saugus
12	E5/F6 ROW to Quaboag Rubber	North Brookfield
1259-01	Grove Street to Candice Street	Clinton
1259-02	Grove Street to Lancaster	Clinton
11 Feeder	King Street Sub. to Damon Road	Northampton
9-W2	1819 ROW to Route 66	Northampton
2	Easthampton to West Street Sub.	Northampton
4	West Street Sub. to Florence Junction	Northampton
5 & 15	King Street Sub. to Easthampton T/L	Northampton Easthampton
5	Brown Street Sub. to Adams Sub.	Adams North Adams
7 & 8	Brown Street Sub. to Williamstown Sub.	North Adams Williamstown

Appendix 2

List of Municipalities for Notification in 2008

Adams
Amesbury
Andover
Ashburnham
Attleboro
Barre
Belchertown
Bernardston
Boxford
Bridgewater
Brockton
Buckland
Charlemont
Charlton
Clinton
Colrain
Dighton
East Brookfield
Easthampton
Erving
Everett
Fitchburg
Franklin
Georgetown
Gill
Grafton
Greenfield
Groveland
Heath
Leverett
Leyden
Lynn
Lynnfield
Malden
Marlborough
Melrose
Merrimac
Methuen
Milford
Millbury
New Salem
North Adams
Northampton
North Brookfield
North Reading
Pelham
Petersham
Plainville
Raynham
Rehoboth
Revere
Rowe
Saugus
Seekonk
Shelburne
Shutesbury
Somerset
Southborough
Southbridge
Spencer
Sunderland
Sutton
Swansea
Taunton
Tewksbury
Upton
Wakefield
Ware
Wendell
Wenham
Westborough
West Bridgewater
West Brookfield
Westminster
West Newbury
Weymouth
Williamstown
Wilmington
Winchendon
Whitman
Wrentham

Appendix 3

List of Identified Private Wells

001243	PRW	SAUGUS		40 JUNIPER ST	90 FT
001243	PRW	LYNNFIELD		17 NEW MEADOW RD	OO FT
001243	PRW	WAKEFIELD	CZARNIAWSKI	416 SALEM ST	01 FT
001261	PRW	SOUTH GRAFTON	HORSEY	1 FITZPATRICK RD	42 FT
001261	PRW	UPTON	DRAINVILLE	123 FOWLER ST	50 FT
001261	PRW	UPTON	DAVISON	99 FOWLER ST	105 FT
001261	PRW	GRAFTON	WELL	95 KEITH HILL RD	49 FT
001261	PRW	GRAFTON	THERRIEN	48 BRIGHAM HILL RD	52 FT
001261	PRW	GRAFTON	THERRIEN	48 BRIGHAM HILL RD	47 FT
001261	PRW	GRAFTON	BAKER	280 UPTON ST	85 FT
001261	PRW	GRAFTON	THERRIEN	48 BRIGHAM HILL RD	59 FT
001261	PRW	GRAFTON	BAKER	281 UPTON ST	124 FT
001261	PRW	GRAFTON	WALSH	41 LELAND ST	64 FT
001261	PRW	GRAFTON	CHANDLER	55 LELAND ST	28 FT
001261	PRW	UPTON	JOHNSON	96 MECHANIC ST	50 FT
001261	PRW	UPTON	ADAMS	2 GORE RD	70 FT
001261	PRW	UPTON	SPENCE	35 CIDERMILL LN	120 FT
001261	PRW	UPTON	MINICH	43 CIDERMILL LN	0 FT
001261	PRW	UPTON	KEENE	36 CIDERMILL LN	97 FT
001261	PRW	UPTON	HOUNAMS	40 CIDERMILL LN	58 FT
001261	PRW	UPTON	GENTILE	120 ELM ST	79 FT
001261	PRW	UPTON	JOHNSON	72 RESERVOIR RD	77 FT
001261	PRW	UPTON	SHANLEY	37 RESERVOIR RD	106 FT
001261	PRW	MILFORD	HUNTLEY	1 PINE ISLAND RD	0 FT
001261	PRW	MILFORD	WALKER	51 CAMP ST	0 FT
001261	PRW	MILFORD	BELLUCCI	54 CAMP ST	87 FT
001261	PRW	MILFORD	FLATLEY	10 EBEN ST	0 FT
001261	PRW	GRAFTON	BAKER	280 UPTON ST	100
001261	PRW	GRAFTON	BAKER	281 UPTON ST	100
001277	PRW	GROVELAND	DUNN	207 KING ST	00 FT
001277	PRW	GROVELAND		204 KING ST	68 FT
001277	PRW	GROVELAND	MULLER	2 ROCKYWOODS RD	100 FT
001277	PRW	GROVELAND		194 KING ST	52 FT
001277	PRW	GROVELAND		2 HOLLY LANE	90 FT
001277	PRW	W NEWBURY	TERRILL	14 SAWMILL BROOK RD	50 FT
001277	PRW	MERRIMAC		10 SKUNK RD	45 FT
001277	PRW	MERRIMAC	FREEMAN	6 SKUNK RD	60 FT
001277	PRW	MERRIMAC	HARMONY	7 SKUNK RD	20 FT
001277	PRW	MERRIMAC		37 MIDDLE RD	10 FT
001277	PRW	W NEWBURY	CAURROSO	20 MIDDLE ST	30 FT
001277	PRW	W NEWBURY	CONNER	109 GEORGETOWN RD	100 FT
001277	PRW	W NEWBURY	LEARY	105 GEORGETOWN RD	50 FT
001277	PRW	W NEWBURY	NATIONAL GRID	103 GEORGETOWN RD	00 FT
001277	PRW	W NEWBURY	DURKIN	35 ASH ST	20 FT
001277	PRW	W NEWBURY	KELLY	28 ASH ST	00 FT
001277	PRW	W NEWBURY	DONOUGH	BACHELOR ST	00 FT
001277	PRW	W NEWBURY	POORE	85 BACHELOR ST	50 FT
001333	PRW	WENDELL	DOUGHTY	230 NEW SALEM RD	35 FT
001333	PRW	NEW SALEM	WILBUR	323 WENDELL RD	60 FT
001333	PRW	PETERSHAM	STUART	27 OLD HARDWICK RD	75 FT
001333	PRW	BARRE	GRAVES	686 DANA RD	100 FT
001333	PRW	ERVING		17 LAURAL LN	10

001333	PRW	ERVING		13 LAURAL LN	10
001333	PRW	ERVING		11 LAURAL LN	10
001333	PRW	WENDELL		69 MORMAN HOLLOW RI	50
001333	PRW	NEW SALEM	MYDELL	220 NORTH MAIN	50
001455	PRW	ASHBURNHAM	SINGERE	322 WINCHENDON RD	75 FT
001455	PRW	WINCHENDON		448 ROUTE 202	10 FT
001455	PRW	WINCHENDON	JAMESON	385 ROUTE 202	30 FT
001455	PRW	WINCHENDON		116 MONOMONAC RD	20 FT
001455	PRW	WINCHENDON		146 MONOMONAC RD	20 FT
001455	PRW	WINCHENDON	MAY	145 MONOMONAC RD	00 FT
001455	PRW	WINCHENDON	SAFFORD	525 LAKEVIEW DR	45 FT
001455	PRW	WESTMINSTER		90 BRAG HILL RD	50
001455	PRW	ASHBURNAM	SACKS	20 CHESHIRE POND	60
001455	PRW	ASHBURNAM		24 CHESHIRE POND	50
001455	PRW	WINCHENDON	MAY	145 W MANOMANOC	90
001455	PRW	WINCHENDON	ARSENAULT	146 W MANOMANOC	10
001581	PRW	SWANSEA		271 PEARSE RD	100 FT
001585	PRW	SEEKONK		111 GREENWOOD AVE	10
001585	PRW	SEEKONK	PROVOST	303 WOODWARD AVE	150
001585	PRW	SEEKONK	KINGSTON	313 WOODWARD AVE	100
001585	PRW	ATTLEBORO	NEWLY BUILT	MORSE AVE	300
001585	PRW	ATTLEBORO	HOLBROOK	MORSE AVE	300
001589	PRW	COLRAIN	SMITHERS	51 DWIGHT CROSSING R	200FT
001589	PRW	HEATH		186 COLRAIN STAGE RD	0 FT
001589	PRW	HEATH		186 COLRAIN STAGE RD	0 FT
001589	PRW	HEATH		166A COLRAIN STAGE R	90 FT
001589	PRW	HEATH	MOTT	14 CHIPPEWA	100 FT
001589	PRW	HEATH	ROYER	15 LEDGES RD	90 FT
001589	PRW	HEATH	CHURCHHILL	8 EAST MAIN ST	100 FT
001589	PRW	HEATH	MCKINSEY	4 EAST MAIN ST	0 FT
001592	PRW	WEYMOUTH	SUPREME OIL COMP/	572 EAST ST	35
001592	PRW	WEYMOUTH	SNYDER	30 CAMP ST	40
001592	PRW	WEYMOUTH	SNYDER	20 CAMP ST	60
001623	PRW	LEYDEN	ALLIS	323 WEST LEYDEN RD	50 FT
001623	PRW	COLRAIN	SKY	326 WEST LEYDEN RD	00 FT
001623	PRW	COLRAIN		62 ADAMSVILLE RD	00 FT
001623	PRW	COLRAIN		337 MAIN RD/RT112	100
001623	PRW	COLRAIN		337 MAIN RD/RT112	20
001623	PRW	COLRAIN		337 MAIN RD/RT112	0
001623	PRW	COLRAIN	SHARP	45 FOUNDRY VILLAGE	10
001623	PRW	COLRAIN	SHARP	45 FOUNDRY VILLAGE	10
001629	PRW	WARE	SULLIVAN	45 OLD GILBERVILLE RD	100 FT
001629	PRW	WARE	SLATTERY	54 OLD GILBERVILLE RD	100 FT
001629	PRW	WARE	LAGRANT	152 OSBORNE RD	75 FT
001629	PRW	WARE	NEVUE	150 OSBORNE RD	20 FT
001629	PRW	WARE	TETREAULT	5 OLD POOR FARM RD	115 FT
001629	PRW	WARE	CEMBURA	14 OLD POOR FARM RD	50 FT
001629	PRW	WARE	ADAMS	6 KING GEORGE DR	70 FT
001629	PRW	WARE	WITT	151 GREENWICH PLAINS	140 FT
001629	PRW	WARE	WITT	153 GREENWICH PLAINS	150 FT
001629	PRW	WARE	ROBIDOUX	155 GREENWICH PLAINS	100 FT
001629	PRW	WARE	ONEAL	158 GREENWICH PLAINS	40 FT

001629	PRW	PELHAM	SMITH	266 AMHEREST RD	115 FT
001629	PRW	PELHAM	LEVEAUU	264 AMHEREST RD	25 FT
001629	PRW	PELHAM	CUPHONE	224 N. VALLEY RD	34 FT
001629	PRW	PELHAM	BETJEMANN	112 BUFFAN RD	87 FT
001629	PRW	LEVERETT	KOSLOSKI	71 CUSHMAN RD	0 FT
001629	PRW	LEVERETT	TRUEHEART	64 CUSHMAN RD	85 FT
001629	PRW	LEVERETT	STEVE	96 DEPOT RD	0 FT
001629	PRW	DEERFIELD	SMITH	314 GREENFIELD RD	88 FT
001629	PRW	WARE	ESKET	141 FISHERDICK RD	100+
001629	PRW	PELHAM	LABON	264 AMHERST RD	25
001629	PRW	PELHAM	CUPHONE	224 NORTH VALLEY RD	25
001629	PRW	LEVERETT	STEVE	96 DEPOT RD	5
001629	PRW	SUNDERLAND	WARNER	23 GUNN MTN RD OFF M	100+
001629	PRW	SUNDERLAND	VIGNONE	130 MONTAGUE-RT 47	100+
001631	PRW	SPENCER	GODIN	121 SMITHVILLE RD	100 FT
001631	PRW	SPENCER	GODIN	121 SMITHVILLE RD	95 FT
001631	PRW	SPENCER	ANGUS	124 SMITHVILLE RD	95 FT
001631	PRW	SPENCER	PETERS-JANE	125 SMITHVILLE RD	71 FT
001631	PRW	N. BROOKFIELD	BARNEY	81 SHORE RD	25 FT
001631	PRW	N. BROOKFIELD	LECH	60 SHORE RD	51 FT
001631	PRW	N. BROOKFIELD	BARD	55 GREEN RD	110 FT
001631	PRW	N. BROOKFIELD	HUARD	47 FULLAM HILL RD	46 FT
001631	PRW	N. BROOKFIELD	WORTHINGTON	46 FULLAM HILL RD	25 FT
001631	PRW	N. BROOKFIELD	CARPENTER	87 SMITH-HANSON	180 FT
001631	PRW	W.BROOKFIELD	WAHL	102 HUNT RD	80 FT
001631	PRW	W.BROOKFIELD	KARIUKI	141 WIGWAM	180 FT
001631	PRW	W.BROOKFIELD	SARAMITH	147 WIGWAM	40 FT
001631	PRW	W. BROOKFIELD	KADY	189 NEW BRAINTREE RD	60 FT
001631	PRW	W. BROOKFIELD	BARRETT	129 BIRCH HILL RD	117 FT
001631	PRW	W. BROOKFIELD	HENNESSY	83 SHEA RD	30 FT
001631	PRW	FISKDALE	CARON	290 CLARK RD	60 FT
001631	PRW	W. BROOKFIELD	STANIKMAS	30 RAGGED HILL RD	200 FT
001631	PRW	W. BROOKFIELD	SILVERBERY	22 RAGGED HILL RD	100 FT
001631	PRW	W. BROOKFIELD	DURELL	81 JOHN GILBERT RD	100 FT
001631	PRW	W. BROOKFIELD	SITTERLY	74 JOHN GILBERT RD	90 FT
001631	PRW	W. BROOKFIELD	ALLARD	PO BOX 848	35 FT
001631	PRW	ASHFORD,CT	MERCER	60 SELES RD	28 FT
001631	PRW	W. BROOKFIELD	PULTA	191 PIERCE RD	80 FT
001631	PRW	W. BROOKFIELD	DENDOR	185 PIERCE RD	5 FT
001631	PRW	NORTHBROOKFIELD	WORTHINGTON	46 FULLAM HILL RD	20
001631	PRW	WEST BROOKFIELD	HENNESSY	83 SHEA RD	30
001631	PRW	WEST BROOKFIELD		191 PIERCE RD	100
001631	PRW	WEST BROOKFIELD		185 PIERCE RD	25
001631	PRW	WEST BROOKFIELD		185 PIERCE RD	25
001634	PRW	BELCHERTOWN	CAREY	114 BLUE MEADOW RD	20 FT
001634	PRW	BELCHERTOWN		108 BLUE MEADOW RD	10 FT
001634	PRW	BELCHERTOWN		90 BLUE MEADOW RD	40 FT
001634	PRW	BELCHERTOWN	PINCIAK	102 BLUE MEADOW RD	18 FT
001634	PRW	BELCHERTOWN	BOCK	14 EDELCY DR	15 FT
001634	PRW	BELCHERTOWN		47 JENSEN RD	115 F
001634	PRW	BELCHERTOWN	RITTER	37 JENSEN RD	100 FT
004011	PRW	BROCKTON		105 EDSON ST	25 FT

004011	PRW	BROCKTON	SPILLANE	274 CARL AVE	80 FT
004011	PRW	BROCKTON		262 CARL AVE	95 FT

Appendix 4

Sensitive Areas

Illustration of Areas and Buffer Zones

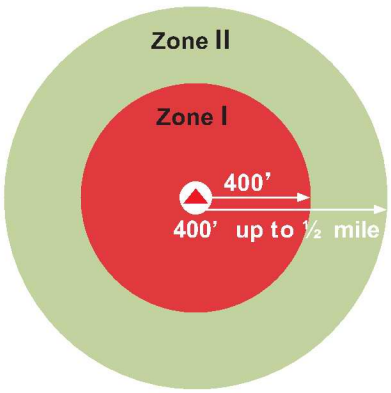
Vegetation Control Strategies in Sensitive Areas
2008

Required by 333 CMR 11.00 and/or approved Vegetation Management Program and Yearly Operational Plan.

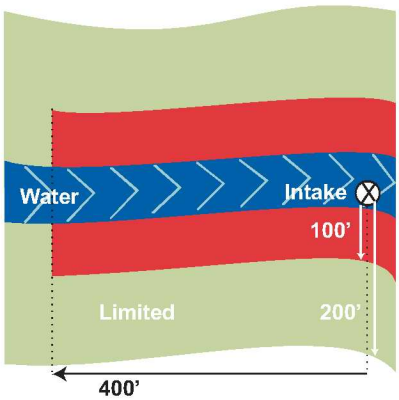
Sensitive areas not readily identified in the field:

- Mapped on electronic USGS Topographic Maps.
- Contractor will be provided electronic and hard copy of maps with which to flag the boundaries of no-herbicide zones within the right-of-way (ROW) prior to herbicide application.

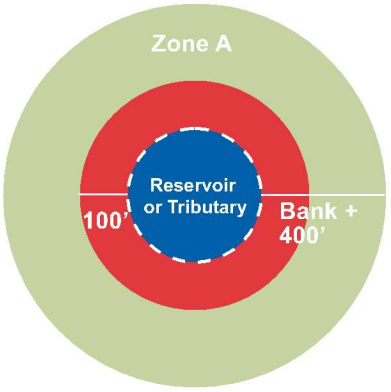
Public Ground Water Supply Well Zone I



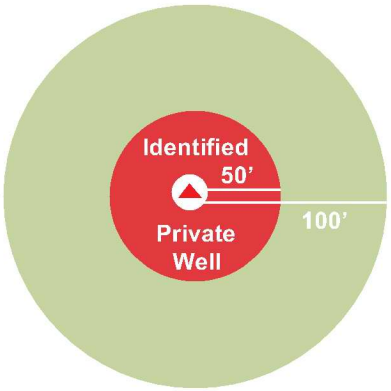
Drinking Water Intake Class B



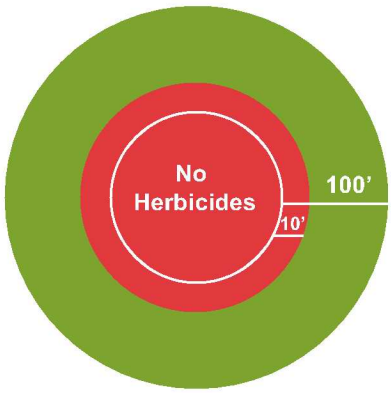
Public Surface Water Source Class A



Identified Private Drinking Water Well



Certified Vernal Pool



Sensitive areas readily identifiable in the field:

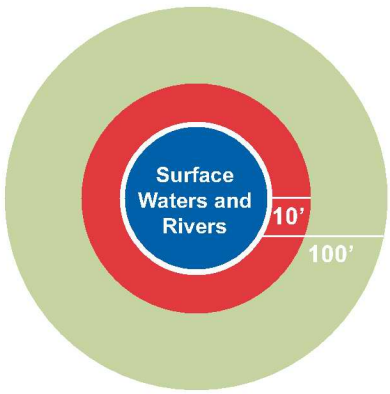
- Consult USGS Topographic Maps
- Contractor will be provided electronic and hard copy of maps with which to flag the boundaries of no-herbicide zones within the right-of-way (ROW) prior to herbicide application.
- Contractor will mark additional areas not found on maps

Wetlands

Defined by Chapter 131, Section 40

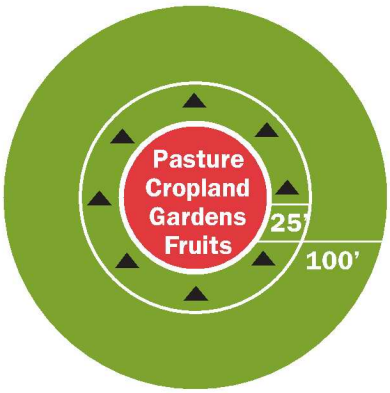
Surface Waters and Rivers

All surface water and water over wetlands. Mean high water for rivers.

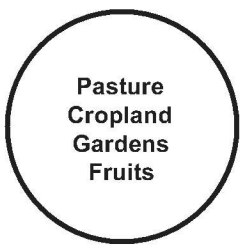


Agricultural Areas

Active - Growing Season



Inactive



No Restrictions

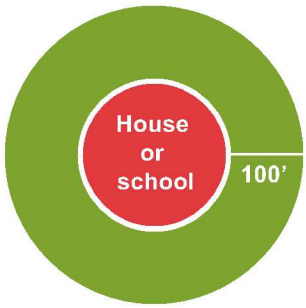
Massachusetts Electric Company d/b/a National Grid
DPU 09-01-B
Attachment 37-Page 32 of 166

Sensitive areas readily identifiable in the field: *continued*

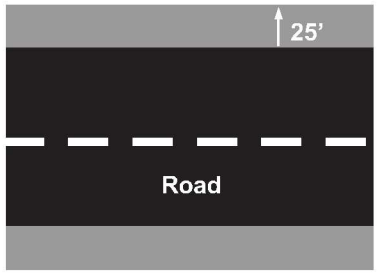
- Consult USGS Topographic Maps
- Contractor will be provided electronic and hard copy of maps with which to flag the boundaries of no-herbicide zones within the right-of-way (ROW) prior to herbicide application.
- Contractor will mark additional areas not found on maps

Inhabited Areas

Where people live, work, or gather



Road Crossings



Foliar spray of resprout permitted. National Grid policy

KEY

= No Herbicide Use

= Water

= Public Ground Water Supply Well or Private Well

= Limited Herbicide Use

1.) Herbicide recommended for use in sensitive area: per (333 CMR 11.04(1)(d)).

2.) Cut stump, basal and low pressure foliar.

3.) 24 months elapsed since previous treatment.
12 months elapsed since previous treatment.

4.) No herbicides applied to conifer species and carriers reviewed by DAR and DEP.

5.) Cut stump only.

6.) Cut stump and basal treatments. (Foliar application to resprouts is permitted.) No other conditions.

Appendix 5

333 CMR 11.00

333 CMR 11.00: RIGHTS OF WAY MANAGEMENT

Section

11.01: Purpose
11.02: Definitions
11.03: General Provisions
11.04: Sensitive Area Restrictions
11.05: Vegetation Management Plan (VMP)
11.06: Yearly Operational Plan (YOP)
11.07: Public Notification
11.08: Notice of Modification and Revocation
11.09: Right-of-appeal
11.10: Penalties
11.11: Rights-of-way Advisory Panel

11.01: Purpose

The purpose of 333 CMR 11.00 is to establish a statewide and uniform regulatory process which will minimize the uses of, and potential impacts from herbicides in rights-of-way on human health and the environment while allowing for the benefits to public safety provided by the selective use of herbicides. Specific goals of 333 CMR 11.00 are to:

(1) Ensure that an Integrated Pest Management (IPM) approach to vegetation management is utilized on all rights-of-way covered by 333 CMR 11.00.

(2) Establish standards, requirements and procedures necessary to prevent unreasonable risks to humans or the environment, taking into account the economic, social and environmental costs and benefits of the use of any pesticide.

(3) Ensure ample opportunity for public and municipal agency input on potential impacts of herbicide application to rights-of-way in environmentally sensitive areas.

(4) Establish a mechanism for public and municipal review of rights-of-way maintenance plans.

11.02: Definitions

For the purposes of 333 CMR 11.00, unless the context clearly requires otherwise, the following definitions shall apply:

Agricultural Area includes, but is not limited to, actively cultivated gardens, greenhouses, orchards, fields, pastures, and other areas under cultivation or agricultural management.

Applicant, any person representing any federal, state or local government or agency, utility, railroad or pipeline, that intends to maintain a right-of-way in the Commonwealth by application of herbicides.

Associated Surface Water Body, as identified on the most current available maps prepared by the Department of Environmental Protection, any body of water that is hydrologically connected to a Class A surface water source.

Ballast, the coarse gravel or crushed rock on which the ties, tracks and switching, signaling and communication devices of a railroad are laid.

Broadcast, any non-selective herbicide application technique which results in application to all vegetation within a target area.

Certified Vernal Pool, a confined basin depression, certified and mapped by NHESP pursuant to the provisions of 310 CMR 10.57(2)(a)5. and 6., which, at least in most years, holds water for a minimum of two continuous months during the spring and/or summer, and which is free of adult fish populations.

11.02: continued

Certified Vernal Pool Habitat, that vernal pool habitat which has been certified and mapped by NHESP pursuant to the provisions of 310 CMR 10.57(2)(a)5. and 6. or, in the event that such habitat has not been mapped, the area extending 100 feet horizontally outward from the boundary of any Certified Vernal Pool.

Class A Waters, waters which are designated as a source of public water supply, as defined in 314 CMR 4.05(3)(a).

Class B Drinking Water Intakes, intakes to Class B waters suitable as sources of public water supply with appropriate treatment, as defined at 314 CMR 4.05(3)(b) and as identified on the most current available maps prepared by the Department of Environmental Protection.

Department, the Department of Agricultural Resources.

FIFRA, the Federal Insecticide, Fungicide and Rodenticide Act, Public Law 92-516.

Foliar Treatment, any technique which applies herbicide to leaves of target vegetation.

Inhabited Area, any area where people generally live, work or gather, including, but not limited to, any residence, school, hospital, park or recreational facility.

Interim Wellhead Protection Area (IWPA), for public water systems using wells or well fields that lack a Department of Environmental Protection-approved Zone II, an interim wellhead protection area, as that term is defined in the Massachusetts drinking water regulations, 310 CMR 22.02, and as identified on the most current available maps prepared by the Department of Environmental Protection, shall apply. Generally, this is a ½- mile radius for sources whose approved pumping rate is 100,000 gallons per day or greater. For smaller sources, the radius in feet is determined by multiplying the approved pumping rate in gallons per minute by 32 and adding 400.

Limited Application Waiver, a waiver from the requirements of 333 CMR 11.05 and 11.06, granted at the Department's sole discretion pursuant to 333 CMR 11.03(14), when the reason for the application is emergency public health or safety or when the application is for one time only.

Limited Spray Area, any area that is both within a Right-of-Way and within:

(a) any Zone II or IWPA;
(b) a distance of between 100 feet and 400 feet of any Class A Surface Water Source;
(c) a distance of between ten and 200 feet of any tributary or associated surface water body where the tributary or associated surface water body runs outside the Zone A for the Class A surface water source;
(d) a lateral distance of between 100 and 200 feet for 400 feet upstream, on both sides of the river, of a Class B Drinking Water Intake;
(e) a distance of between 50 and 100 feet of any identified Private Well;
(f) a distance of between 10 and 100 feet of any Wetlands or Water Over Wetlands;
(g) a distance of between ten feet from the mean annual high water line of any river and the outer boundary of the Riverfront Area;
(h) a distance of between ten feet from any Certified Vernal Pool and the outer boundary of any Certified Vernal Pool Habitat; and
(i) a distance of 100 feet of any Agricultural or Inhabited Area.

Low Pressure, pressure under 60 pounds per square inch (psi).

Maps, United States Geological Survey maps of scale 1:25,000 or other maps, as determined by the Department, which are of such accuracy and scale to provide sufficient detail so that sensitive areas can be delineated.

NHESP, the Natural Heritage and Endangered Species Program within the Massachusetts Division of Fisheries and Wildlife.

11.02: continued

No-spray Area, any area that is both within a Right-of-Way and within:

(a) any Zone I;
(b) 100 feet of any Class A Surface Water Source;
(c) 100 feet of any tributary or associated surface water body where the tributary or associated surface water body runs within 400 feet of a Class A surface water source;
(d) ten feet of any tributary or associated surface water body where the tributary or associated surface water body is at a distance greater than 400 feet from a Class A surface water source;
(e) a lateral distance of 100 feet for 400 feet upstream, on both sides of the river, of a Class B Drinking Water Intake;
(f) 50 feet of any identified Private Well;
(g) ten feet of any Wetlands or Water Over Wetlands;
(h) ten feet of the mean annual high-water line of any river; and
(i) ten feet of any Certified Vernal Pool.

Person, an individual, association, partnership, corporation, company, business organization, trust, estate, the Commonwealth or its political subdivisions, administrative agencies, public or quasi-public corporation or body, or any other legal entity or its legal representatives, agent or assignee, or a group of persons.

Person Aggrieved, any person who, because of an act or failure to act by the Department may suffer an injury in fact which is different either in kind or magnitude from that suffered by the general public and which is within the scope of the interests identified in 333 CMR 11.00. Such person must specify in writing sufficient facts to allow the Department to determine whether or not the person is in fact aggrieved.

Private Well, any private drinking water supply identified by the local Board of Health, the well owner or the Department of Agricultural Resources.

Private Well Registry, a registry of private wells located within 100 feet of a right-of-way which is maintained by the Department of Agricultural Resources. Homeowners must notify the Department by completing a registration form which is available directly from the Department or online at the Department website.

Public Water Supplier, as defined at 310 CMR 22.02(1), any person who owns or operates a public water supply system.

Public Ground Water Source, a source of water for a Public Water Supply System, as that term is defined in the Massachusetts drinking water regulations at 310 CMR 22.02.

Right(s)-of-way (ROW), any roadway, or thoroughfare on which public passage is made and any corridor of land over which facilities such as railroads, powerlines, pipelines, conduits, channels or communication lines or bicycle paths are located.

Rights-of-way Advisory Panel, a panel established to advise the Department on issues relating to 333 CMR 11.00 and to fulfill specific functions as detailed within 333 CMR 11.05 and 11.11.

River, a river as defined at 310 CMR 10.04 and as identified on the most current available maps prepared by the Department of Environmental Protection.

Riverfront Area, a riverfront area as defined at 310 CMR 10.58(2) and as identified on the most current available maps prepared by the Department of Environmental Protection. In general, this term shall mean the area between the mean annual high-water line of a perennially flowing river and a parallel line 200 feet away.

Selective Application, any application of herbicides, in such a manner that the delivery to the target vegetation is optimized and delivery to non-target vegetation and the environment is minimized.

11.02: continued

Sensitive Areas, as defined in 333 CMR 11.04, any areas within Rights-of-Way, including No-Spray and Limited-Spray Areas, in which public health, environmental or agricultural concerns warrant special protection to further minimize risks of unreasonable adverse effects.

State-listed Species, any species on the Massachusetts list of Endangered, Threatened, and Special Concern Species as described in the Massachusetts Endangered Species Act (M.G.L c. 131A; 321 CMR 10.02).

State-listed Species Habitat, the Estimated Habitats of Rare Wildlife (310 CMR 10.59 and 10.37) and the Priority Habitats for State-listed Species (321 CMR 10.02) as shown on the most recent edition of the Massachusetts Natural Heritage Atlas prepared by NHESP.

Stem Treatment, any technique including, but not limited to, stump, basal, stem, injection, banding, frill, or girdle and any other technique which delivers herbicide at low pressure to the stump, base or stem of the target vegetation.

Surface Water Source, any lake, pond, reservoir, river, stream or impoundment designated as a public water supply in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00, as identified on the most current available maps prepared by the Department of Environmental Protection.

Target Vegetation, any plant species which has the potential to interfere with the operation and safety of the right-of-way.

Touch-up Application, any limited application of herbicides following an initial treatment, which is necessary to achieve the desired vegetation control.

Tributary, as identified on the most current available maps prepared by the Department of Environmental Protection, any body of running, or intermittently running, water which moves in a definite channel, naturally or artificially created, in the ground due to a hydraulic gradient, and which ultimately flows into a Class A surface water source, as defined in 314 CMR 4.05(3)(a).

Vegetation Management Plan (VMP), a long term management plan for the applicant's right-of-way system which describes the intended program for vegetation control over a five year period.

Vernal Pool, *see* Certified Vernal Pool.

Water Over Wetlands, the ocean or any estuary, lake or pond as defined at 310 CMR 10.04.

Wetlands, any of the following areas as defined in 310 CMR 10.02(1)(a), (b), (c) and (f):

(a)

Any bank,		the ocean
any freshwater wetland,		any estuary
any coastal wetland,		any creek
any beach,	bordering	any river
any dune,	on	any stream
any flat		any pond
any marsh,		or any lake
or any swamp;		

(b) Land under any of the water bodies listed in 333 CMR 11.02: Wetlands(a); and

(c) Land subject to tidal action.

11.02: continued

Wetlands Determination, a written determination of the boundaries of Wetlands and boundaries of areas within 100 feet of Wetlands in accordance with the regulations of the Department of Environmental Protection (DEP) at 310 CMR 10.05(3)(a)1. and 2. 310 CMR 10.03(6)(b) requires applicants not eligible for a public utility exemption to submit these determinations with their VMPs if they will apply herbicides within 100 feet of wetlands and will not submit a Notice of Intent under M.G.L. c. 131, § 40, the Wetlands Protection Act. In order to obtain a Wetlands Determination, the applicant should submit a request to the conservation commission on maps of a scale that will enable the conservation commission or Department of Environmental Protection to find and delineate the boundaries of Wetlands and buffer zones within the vicinity of the right-of-way herbicide management area. To be considered "valid", the Wetlands Determination should be made no sooner than six months immediately prior to the submission of the Vegetation Management Plan. The Wetlands Determination shall cover the period of the Vegetation Management Plan only and shall expire at the end of the five year period of that Vegetation Management Plan.

Yearly Operational Plan (YOP), the yearly operational plan which describes the detailed vegetation management operation for the calendar year consistent with the terms of the long term Vegetation Management Plan.

Zone A, as identified on the most current available maps prepared by the Department of Environmental Protection, the protective land area for a Surface Water Source, Class A water source, Tributary, or Associated Surface Water Body defined in 310 CMR 22.02 as:

(a) the land area between the Class A surface water source and the upper boundary of the bank;

(b) the land area within a 400 foot lateral distance from the upper boundary of the bank of a Class A surface water source, as defined in 314 CMR 4.05(3)(a); and

(c) the land area within a 200 foot lateral distance from the upper boundary of the bank of a Tributary or Associated Surface Water Body.

Zone I, as identified on the most current available maps prepared by the Department of Environmental Protection and as defined at 310 CMR 22.02, the protective radius required around a public water supply well or wellfield. For public water system wells with approved yields of 100,000 gallons per day (gpd) or greater, the protective radius is 400 feet. Tubular wellfields require a 250 foot protective radius. Protective radii for all other public water system wells are determined by the following equation: Zone I radius in feet = (150 x log of pumping rate in gpd) –350.

Zone II, as identified on the most current available maps prepared by the Department of Environmental Protection and as defined at 310 CMR 22.02, the aquifer recharge area for a public water supply well or wellfield.

11.03: General Provisions

(1) No person shall use an herbicide for the purpose of clearing or maintaining a right-of-way unless appropriately certified by the Department, or licensed by the Department and working under the on-site supervision of an appropriately certified applicator.

(2) No person shall use an herbicide for the purpose of clearing or maintaining a right-of-way except in accordance with a Vegetation Management Plan (VMP) and a Yearly Operational Plan (YOP) as approved by the Department. The YOP shall be available at the work site at all times during herbicide applications and be made available to the Department and municipal officials including the Conservation Commission and Board of Health upon reasonable request.

(3) No person shall handle, mix or load an herbicide concentrate on a right-of- way within 100 feet of a sensitive area.

(4) The perimeter of any sensitive areas which are not readily identifiable on the ROW shall be identified with a clearly visible marker system, consistent with the VMP, prior to any herbicide application.

11.03: continued

(5) No foliar application of herbicides shall be used to control vegetation greater than 12 feet in height except for side trimming.

(6) No herbicide shall be applied when the wind velocity is such that there is a high propensity to drift off target and/or during measurable precipitation, and no person shall apply herbicides in such a manner that results in drift into any No-spray Area.

(7) No person shall apply herbicides by aircraft for the purpose of clearing or maintaining a right-of-way.

(8) No touch-up applications shall be carried out except under the following conditions:
(a) Touch-up applications must occur within 12 months of the initial application.
(b) All applicable public notification procedures of M.G.L. c. 132B, § 6B, as outlined in 333 CMR 11.07(1) and (3), are followed.
(c) No more than 10% of the initially identified target vegetation on the applicant's right-of-way in any municipality may be treated and the total amount of herbicide applied in any one year shall not exceed the limits specified by the label or Yearly Operational Plan.
(d) The Department may impose such additional restrictions or conditions on the use of herbicides as it deems necessary to protect public health and the environment.

(9) The Department will maintain mailing lists of individuals and groups desiring to obtain notices on various aspects of the Program.

(10) No person shall apply any herbicide identified as a Potential Ground Water Contaminant pursuant to 333 CMR 12.00 to a right-of-way.

(11) No person shall use an herbicide for the purpose of clearing or maintaining a right-of-way unless that person has obtained the most current available map of public ground water sources from the Department of Environmental Protection.

(12) No person shall use an herbicide for the purpose of clearing or maintaining a right-of-way unless that person has done one or more of the following:
(a) obtained a current list of identified Private Wells within 100 feet of the right-of-way from the Board of Health, or
(b) obtained a current list of all private wells, within 100 feet of the right of way from the Department of Agricultural Resources private well registry; or
(c) followed an alternative Private Well identification method outlined in an approved YOP.

(13) The applicator shall provide any employee of any state agency, or authority as defined in M.G.L. c. 3, § 39, when such employee is, within a right-of-way, using pesticides, supervising the use of pesticides, or present during the use of pesticides, with personal protective equipment and clothing. Applicators should note that other federal or state laws or regulations pertaining to pesticide applications may require this personal protective equipment to include protections according to Material Safety Data Sheets (MSDS's), the product label, and any other supporting technical data supplied by the manufacturer.

(14) Notwithstanding the provisions of 333 CMR 11.03(2) or other provisions of 333 CMR 11.00, the Department may, at its sole discretion, issue Limited Application Waivers to applicants wishing to apply herbicides to clear or maintain rights-of-way without VMPs or YOPs, but only under the following conditions:
(a) The applicant must demonstrate either:
1. that the application will not occur more than once in a five-year period unless a VMP and a YOP are prepared and all other requirements of 333 CMR 11.00 are met; or
2. that the application is necessary to protect public health or safety.
(b) The applicant must still adhere to all public notification requirements established at 333 CMR 11.07(1) and (3).
(c) The applicant must provide the Department with a letter establishing the concurrence of the chief elected official or board of selectmen of the municipality where the application is to be made.

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11.03: continued

(d) The applicant may only use herbicides on the Department's "Herbicides Recommended for Use in Sensitive Areas List."
(e) If the application could impact Wetlands, the Department recommends that the applicant send a copy of its application for a Limited Application Waiver to the Department of Environmental Protection's Division of Wetlands and Waterways no less than 21 days before the proposed application.
(f) It should be noted that, with certain exceptions for public utilities, wetlands regulations at 310 CMR 10.03(6)(b) currently require Wetlands Determinations prior to any application within 100 feet of a Wetland.

Limited Application Waivers shall be issued solely at the Department's discretion, and the Department may impose such additional restrictions or conditions on the use of herbicides as it deems necessary to protect public health and the environment.

11.04: Sensitive Area Restrictions

(1) General. In any sensitive area:
(a) No more than the minimum labeled rate of herbicide for the appropriate site, pest, and application method shall be applied.
(b) Herbicides shall only be applied selectively by low pressure, using foliar techniques or basal or cut-stump applications, or other method approved for use by the Department.
(c) No person shall apply herbicides for the purpose of clearing or maintaining a right-of-way in such a manner that results in drift to any area within ten feet of standing or flowing water in a wetland; or area within 400 feet of a public drinking water supply well; or area within 100 feet of any Class A surface water used as a public water supply; or area within 50 feet of a Private Well.
(d) Only herbicides specified by the Department as acceptable for use in sensitive areas pursuant to the Cooperative Agreement executed between the Department of Agricultural Resources and the Department of Environmental Protection on July 1 and 2, 1987, or future amendments thereto, shall be used in sensitive areas. Applicants proposing to use an herbicide which has been registered for use on rights-of-way but has not yet been evaluated pursuant to the provisions of the Cooperative Agreement may request that such herbicides be evaluated pursuant to said provisions. For an herbicide that has been evaluated pursuant to the provisions of the Cooperative Agreement, applicants proposing to use such herbicide in a manner inconsistent with the terms and conditions of use imposed in the guidelines may request a modification or waiver of such terms or conditions. A request for such modification or waiver shall provide a detailed rationale for use, with all relevant data including but not limited to environmental fate, efficacy and human health effects of the proposed herbicide. Such herbicides and/or uses shall be subject to the evaluation standards adopted by the Departments of Agricultural Resources and Environmental Protection in the Cooperative Agreement.
Commentary. Applicants not eligible for the public utilities exemption from the Wetlands Protection Act outlined at 310 CMR 10.03(6)(a), who wish to apply pesticides registered for use in Massachusetts to rights-of-way, may choose to apply herbicides determined to be suitable for use in sensitive areas in accordance with the provisions of the Cooperative Agreement mentioned above or, alternatively, such applicants may proceed pursuant to the provisions of 310 CMR 10.00 as authorized by M.G.L. c. 131, § 40.
(e) The Department may impose such additional restrictions or conditions on the use of herbicides within or adjacent to sensitive areas as it determines necessary to protect human health or the environment. Such changes may be proposed by a municipal agency or individual during the public comment period.
(f) In the event of a question or dispute as to which setback applies to a sensitive area, the most restrictive setback shall apply.

(2) Water Supplies.
(a) Public Ground Water Sources.
1. No herbicides shall be applied within a Zone I.
2. No herbicides shall be applied within a Zone II or IWPA unless:

11.04: continued

a. A minimum of 24 months has elapsed since the last application to the site; and

b. Herbicides are applied selectively by low pressure, using foliar techniques or basal or cut-stump applications.

(b) Class A Public Surface Water Sources, Associated Surface Water Bodies, Tributaries and Class B Drinking Water Intakes.

1. No herbicides shall be applied within 100 feet of any Class A public surface water source.

2. No herbicides shall be applied within 100 feet of any tributary or associated surface water body located within the Zone A of a Class A public surface water source, or within ten feet of any tributary or associated surface water body located outside of the Zone A of the Class A public surface water source.

3. No herbicides shall be applied within a lateral distance of 100 feet for 400 feet upstream of any Class B Drinking Water Intake.

4. No herbicides shall be applied within a distance of between 100 feet from any Class A surface water source and the outer boundary of any Zone A, or within a distance of between ten feet and the outer boundary of the Zone A for any tributary or associated surface water body located outside of the Zone A of a Class A surface water source, or within a lateral distance of between 100 and 200 feet for 400 feet upstream of a Class B Drinking Water Intake, unless:

a. A minimum of 24 months has elapsed since the last application to the site; and

b. Herbicides are applied selectively by low pressure, using foliar techniques or basal or cut-stump applications.

(c) Private Wells.

1. No herbicides shall be applied within 50 feet of an identified Private Well.

2. No herbicides shall be applied within a distance of between 50 feet and 100 feet of an identified Private Well, unless:

a. A minimum of 24 months has elapsed since the last application to the site; and

b. Herbicides are applied selectively by low pressure, using foliar techniques or basal or cut-stump applications.

(3) State-listed Species Habitat.

(a) Any person proposing to apply an herbicide within any State-listed Species Habitat who does not have a current Yearly Operational Plan approved in writing by the Division of Fisheries and Wildlife pursuant to 321 CMR 10.14(12), shall submit all necessary materials required for review pursuant to 321 CMR 10.18.

(b) The management of vegetation within existing utility rights-of-way shall be exempt from the requirements of 321 CMR 10.18 through 10.23, provided that the management is carried out in accordance with a Yearly Operational Plan approved in writing by the Division of Fisheries and Wildlife, pursuant to 321 CMR 10.14(12).

(c) No person shall apply an herbicide within State-listed Species Habitat unless the application is approved by the Division of Fisheries and Wildlife pursuant to 333 CMR 11.04(3)(a) and (3)(b), and such approval is submitted to the Department.

(4) Wetlands, Waters Over Wetlands, Riverfront Areas, and Certified Vernal Pools.

(a) No herbicide shall be applied on or within ten feet of a Wetland or Water Over a Wetland, within ten feet of the mean annual high-water line of any River, or within ten feet of any Certified Vernal Pool.

(b) No herbicide shall be applied on or within a distance of between ten feet and 100 feet of any Wetland or Water Over a Wetland, within a distance of ten feet from the mean annual high-water line of any River and the outer boundary of any Riverfront Area, or within a distance of ten feet from any Certified Vernal Pool and the outer boundary of any Certified Vernal Pool Habitat unless:

1. A minimum of 12 months has elapsed since the last application to the site; and

2. Herbicides are applied selectively by low pressure, using foliar techniques or basal or cut-stump applications.

(c) Notwithstanding 333 CMR 11.04(4)(a) and (b), public utilities providing electric, gas, water, telephone, telegraph and other telecommunication services (and other applicants, if consistent with all relevant provisions of the Massachusetts Wetlands Protection Act and its regulations in effect at the time of application) may apply herbicides on or within ten feet of a Wetland in accordance with the following conditions:

11.04: continued

1. Submission of a study, the design of which is subject to prior approval by the Departments of Agricultural Resources and Environmental Protection, evaluating impacts of the proposed vegetation management program utilizing herbicides on or within ten feet of Wetlands, and comparing those impacts to those which would result if only non-chemical control methods were used in these areas. The study must detail vegetation management practices and use patterns specific to those used by the type of entity submitting the study; and

2. A finding by the Department, after consultation with the Rights-of-way Advisory Panel, that the proposed vegetation management program utilizing herbicides on or within ten feet of Wetlands will result in less impacts to the Wetlands than mechanical control.

3. Notwithstanding the above, no herbicides shall be applied on or within ten feet of any standing or flowing water in a Wetland.

(5) Inhabited and Agricultural Areas. No foliar herbicide shall be applied within 100 feet of any Inhabited Area or any Agricultural Area unless:

(a) A minimum of 12 months has elapsed since the last application to the site; and

(b) Herbicides are applied selectively by low pressure, using foliar techniques or basal or cut-stump applications.

11.05: Vegetation Management Plan (VMP)

(1) General.

(a) Unless otherwise specified by the Department, all VMPs should be submitted by the applicant no later than September 1st prior to the calendar year of the proposed first year of maintenance. All approved VMPs shall be effective for a five year period unless otherwise modified, or revoked by the Department.

(b) The VMP shall be presented on forms and/or format approved by the Department.

(2) Requirements. The VMP shall include, but not be limited to, the following:

(a) General statement of goals and objectives of the VMP.

(b) Identification of target vegetation.

(c) Intended methods of vegetation management and rationale for use, including vegetation control techniques, equipment proposed for use, timing of applications and alternative control procedures.

(d) Discussion of justification for proposed herbicide applications, including a description of the alternative control methods considered and the reasons that they were rejected.

(e) Methods, references and sources for identifying sensitive areas and control strategies proposed for sensitive areas. Applicants should note that the Department of Environmental Protection regulations at 310 CMR 10.03(6)(b) require Wetlands Determinations for applicants that are not eligible for a public utility exemption.

(f) Operational guidelines for applicators relative to herbicide use.

(g) Identification and qualifications of individuals developing and submitting a plan.

(h) A detailed description of the IPM Program, showing how it will minimize the amount and frequency of herbicide application.

(i) Description of alternative land use provisions or agreements that may be established with individuals, state, federal or municipal agencies that would minimize the need for herbicides, including the rationale for accepting or denying any reasonable request made by any individual.

(j) Description of a remedial plan to address spills and related accidents.

(k) For state agencies and authorities as defined in M.G.L. c. 3, § 39, a description of the applicant's policy to eliminate or, if necessary, reduce the use of pesticides for any vegetation management purpose along roadways, and a demonstration that, for the proposed application, the costs of non-chemical vegetation control significantly outweigh the benefits.

(3) Public Notice, Review and Comment.

(a) Upon receipt of the proposed VMP, the Department shall schedule and hold appropriate regional public hearings affording all interested parties the opportunity to comment, both at the hearings and in writing to the Department, on the proposed plan.

11.05: continued

(b) At least 21 days prior to the public hearings, the Department shall publish notice of the hearings in the Environmental Monitor and regionally located newspapers, and send notice to municipalities covered by the plan and to the appropriate mailing list. The notice will include locations where copies of the VMP can be reviewed.
(c) The public shall have no less than 45 days, starting from publication of the *Environmental Monitor* notice, to comment upon proposed VMPs, unless the Department extends the comment period for good cause.
(d) Wherever a chief elected official, Board of Health or Conservation Commission in a municipality covered by the proposed VMP requests a copy of the proposed plan, the applicant shall, at least 21 days prior to the end of the public comment period, respond to this request. The response must either include a copy of the proposed VMP, or an Internet address where the VMP may be viewed and a note that a hard copy will be provided promptly upon further request.

(4) Disposition of VMP.
(a) 25 copies of the proposed VMP shall be submitted to the Department. The Department shall distribute copies of the proposed VMP to each member of the Rights-of-way Advisory Panel. The Department may, at its sole discretion, allow electronic presentation of the VMP in *lieu* of some or all of the 25 copies that would otherwise be submitted pursuant to 333 CMR 11.05(4).
(b) Within 30 days of the end of the public comment period unless extended for good cause, the Rights-of-way Advisory Panel shall review the VMPs and recommend in writing to the Department approval, denial or modification of each VMP; if necessary, the Advisory Panel may request additional information from the applicant.
(c) Within 21 days of the end of the Rights-of-way Advisory Panel review period, unless extended by the Department for good cause, the Department will notify the applicant and the Advisory Panel in writing one of the following:
1. request for additional information or modification;
2. denial of VMP; or
3. approval of VMP.

(d) The VMP may be modified, withdrawn or amended by the applicant through a written request sent by certified mail to the Department.
(e) Resubmission of a denied VMP, updating of a VMP, or a significant amendment to an approved VMP shall be processed according to 333 CMR 11.05.
(f) The applicant must send a copy of the approved VMP, or an Internet address where the VMP may be viewed and a note that a hard copy will be provided promptly upon further request, to the chief elected official, Board of Health, and Conservation Commission in each municipality covered by the plan.

(5) Time for Action. Non-action by the Department on a VMP within the time specified in 333 CMR 11.05 does not constitute approval of the submitted plan. In the event that the Department fails to notify the applicant of a decision within the time specified in 333 CMR 11.05(4)and upon written request from the applicant, the Commissioner must issue a finding within ten days of receipt stating the reason for the delay and providing an estimated completion date.

11.06: Yearly Operational Plan (YOP)

(1) General.
(a) The applicant is responsible for the accuracy and completeness of all information submitted with the YOP. The YOP shall be consistent with the objectives of the VMP and shall describe the intended operational program for that calendar year.
(b) The YOP shall be presented on forms and in a format approved by the Department.

(2) Requirements. The YOP shall include but not be limited to the following:
(a) Maps locating the rights-of-way and sensitive areas not readily identifiable in the field;
(b) Herbicides proposed including Environmental Protection Agency (EPA) Registration numbers, application rates, carriers and adjuvants;
(c) Herbicide application techniques and alternative control procedures proposed.
(d) The name, address and phone number of the company which will perform any herbicide

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11.06: continued

(e) Identification of target vegetation;
(f) The name, address and phone number of the individual representing the YOP applicant;
(g) Description of methods used to flag or otherwise designate sensitive areas on the right-of-way;
(h) Herbicide Fact Sheets as approved by the Department; and
(i) Procedures and locations for handling, mixing and loading of herbicide concentrates.

(3) Public Notice, Review and Comment.
(a) Upon submittal of the YOP for approval, the Department will publish a notice in the *Environmental Monitor*. Said notice shall be provided by the applicant and shall include the information on the municipalities through which the rights-of-way pass, a brief description of the intended program, and the procedure for public review and comment. The Department shall send notification of the publication to the applicant and the appropriate mailing list.
(b) Upon submittal of the YOP to the Department, the applicant shall provide by certified mail under separate cover to the Board of Health, Conservation Commission, chief elected municipal official, and where applicable, the Massachusetts Water Resources Authority and Massachusetts Department of Conservation and Recreation, a copy of the proposed YOP (or an Internet address where the proposed YOP may be viewed and a note that a hard copy will be provided promptly upon request) and the *Environmental Monitor* notice for the municipality or municipalities in which the herbicide treatment is proposed. Community water suppliers shall receive electronic information or a one page notification by mail which provides details about where to receive more information. The applicant shall maintain copies of the packet sent to municipalities and certified mail receipts. The applicant shall make copies of the packet, certified mail receipts, and any further correspondence regarding hard copies of YOPs in *lieu* of Internet viewing, available to the Department upon request.
(c) The Department shall allow a 45-day comment period on proposed YOPs, unless extended for good cause, commencing with the publication of the notice in the *Environmental Monitor* and receipt of the proposed YOP and *Environmental Monitor* notice by each municipality.
(d) The Department may approve, deny or modify YOPs after the 45-day comment period has expired.

(4) Disposition of YOP.
(a) The applicant shall submit the YOP to the Department at least 90 days prior to the proposed commencement of application to allow completion of the comment and review period.
(b) The Department shall review the YOP to ensure that the YOP is consistent with the approved VMP. Any inconsistencies or deficiencies will be noted by the Department and returned with the YOP to the applicant.
(c) Where practical, the Department shall approve or deny the YOP within 90 days of receipt. The Department will provide notice of the decision to the applicant, municipal agencies and commentators in writing.
(d) The approved YOP in conjunction with the VMP shall govern the application of herbicide for a period not to exceed 12 months in accordance with other laws and regulations of the State and Federal governments and impose such conditions as necessary to minimize the risk of adverse effects on human health and the environment.

(5) Time for Action. Non-action by the Department on a YOP within the time specified in 333 CMR 11.06(4) does not constitute approval of the submitted plan. In the event that the Department fails to notify the applicant of a decision within the time specified and upon a written request from the applicant, the Commissioner must issue a finding within ten days of receipt stating the reason for the delay and providing an estimated completion date.

11.07: Public Notification

(1) At least 21 days in advance of application of herbicide to a right-of-way in any city or town, the applicant shall notify the Department, the board of health, and the local public water supplier and, by registered mail, the Mayor, City Manager or Chairman of the Board of Selectman, and the conservation commission in the municipality where the right-of-way lies. The notice shall include the following information: the approximate dates on which such herbicide application shall commence and conclude, provided however, that said application shall not commence more than ten days before nor conclude more than ten days after said approximate dates; the method and locations of application; a Department-approved Herbicide Fact Sheet on the active ingredient(s) of the herbicide(s) used; the EPA registration number(s) for the herbicide(s) used; the name, title, business address and phone number of the certified commercial applicator or licensed applicator, or the contractor, employer or employees responsible for carrying out the application. Where specific information required for this notice is already contained in the current YOP that is on file with the local official, the applicant may incorporate the appropriate pages of the YOP by reference in its notice to that official, indicating that these pages are also directly available from the applicant upon request.

(2) This public notice may run concurrently with the public notice and comment period in 333 CMR 11.06(3), provided that the notice is distributed at least 21 days prior to the herbicide application, and that, prior to the herbicide application, the public notice and comment period has closed and the Department has granted YOP approval without modifications. When the Department's final approval requires modifications or application dates are selected after YOP approval, separate notice under 333 CMR 11.07(1) is required.

(3) At least 48 hours prior to the application referred to in 333 CMR 11.07(1), the applicant must publish a conspicuous notice in at least one newspaper of general circulation in the city or town where the right-of-way lies. The notice must appear in the local section of the newspaper and measure at least four by five inches in size. The notice shall contain the following information: the method and locations of pesticide application; the approximate dates on which the pesticide application shall commence and conclude, provided that the applications shall not commence more than ten days before nor conclude ten days after said approximate dates; a list of potential pesticides to be used; a description of the purpose of the application; and the name, title, business address and phone number of a designated contact person representing the applicant from whom any citizen may request further information. The notice should apply only to the calendar year in which the notice is published. Upon request the notice must be made available to the Department.

11.08: Notice of Modification and Revocation

(1) The Department may suspend approval of any VMP or YOP, by written notice to the applicant and applicator, halting the application of herbicide to that right-of-way of the YOP. After 21 days if the applicant does not request a hearing, the Department may revoke or modify the VMP and YOP, if it finds:

(a) that the terms, conditions of restrictions thereof, are being violated or are inadequate to avoid unreasonable adverse effects on the environment or on human health; or

(b) that the applicant has made a false or misleading statement or has not provided information requested by the Department or Rights-of-way Advisory Panel; or

(c) that the applicant has violated any provision of the Massachusetts Pesticide Control Act or FIFRA, or any regulations, standards, orders or license issued under either.

(2) Upon notice of revocation or modification, the applicant may modify the YOP by written request to the Department. Applications to modify the YOP shall be submitted in the manner set forth in 333 CMR 11.06 and disposed of in the manner set forth in 333 CMR 11.06. The Department may waive all or part of the requirement if it determines that the proposed changes do not significantly change the terms of the approved YOP.

11.09: Right-of-appeal

Any person aggrieved by the decision of the Department to approve, deny, modify or revoke a VMP or YOP may request an adjudicatory hearing. The request for a hearing must be received by the Department within 21 calendar days after receipt of the decision. The request should state clearly and concisely the facts of the proceeding, the reasons the decision is alleged to be inconsistent with 333 CMR 11.00 and the relief sought by the adjudicatory hearing. The adjudicatory hearing before the Pesticide Board shall be conducted in accordance with the informal rules of adjudicatory proceeding as set forth in M.G.L. c. 30A.

11.10: Penalties

Any person who violates any provision of 333 CMR 11.00 shall be subject to the criminal and civil penalties set forth in M.G.L. c. 132B, § 14.

11.11: Rights-of-way Advisory Panel

(1) A Rights-of-way Advisory Panel shall be established to advise the Department on issues relating to 333 CMR 11.00 and to fulfill specific functions as detailed within 333 CMR 11.00.

(2) The Department shall request that the following members participate on the Rights-of-way Advisory Panel: the Commissioners/Secretaries or his/her designee of the Department of Environmental Protection, the Department of Public Health, and the Executive Office of Transportation; and a representative, respectively, from each of the following, all to be appointed by the Department Commissioner: the Massachusetts Association of Conservation Commissions, the Massachusetts Association of Health Boards, the Massachusetts Department of Conservation and Recreation, and an Environmental Advocacy Organization Representative, a member of the University of Massachusetts Extension who is well versed in weed science and Integrated Pest Management of weeds, a representative of the Massachusetts Railroad Association, a representative of a utility company and a commercial pesticide applicator.

(3) Non-agency representatives shall remain on the panel for a term of five years. Any member absent from two or more consecutive meetings may be removed from the Advisory Panel at the discretion of the Commissioner of the Department, and a replacement requested from the representative agency, industry group, or association.

(4) The Advisory Panel shall meet at least once each year, and shall hold further meetings upon the request of the Department of Agricultural Resources or at the request of any two members of the Advisory Panel.

(5) All Advisory Panel members shall serve without compensation.

REGULATORY AUTHORITY

333 CMR 11.00: M.G.L. c. 132B.

Appendix 6

Rights-of-Way Treated in 2007

Line Number	Short Description	Town
303	South Wrentham Sub. to West Medway Sub.	Wrentham Franklin Bellingham Medway
338	Tewksbury Sub to Billerica/Burlington TL	Billerica Tewksbury
343	Pratts Junction to Sandy Pond Sub.	Sterling Lancaster Shirley Ayer
A127 TAP	Wendell Depot Tap	Wendell
F132	Adams Sub. to Lanesboro Sub.	Adams Cheshire Lanesboro
I135/J136	Fitchburg Switch to Pratts Junction	Fitchburg Leominster Sterling
K137/J138 TAP	Ayer Taps	Ayer
M-139 Tap	338 ROW to Billerica Sub	Billerica
O141 TAP	Nashua Street Tap	Worcester West Boylston
P142 TAP	Bloomingdale Tap	Worcester Millbury Grafton
Q143/R144	Millbury #2 to Rhode Island S/L	Millbury Sutton Uxbridge Millville

Line Number	Short Description	Town
Q143 TAP	Whitins Pond Tap	Northbridge Uxbridge
Q143 TAP	Uxbridge Tap	Uxbridge
J-162 Tap	L'Energia Tap	Lowell
J-162 Tap	Tewksbury to Perry St Sub. Lowell	Tewksbury Lowell
E5/F6	#4 Station to #2 Station and #3 Station Tap	Shelburne Conway
E5/F6	#2 Station to Connecticut River	Shelburne Conway Deerfield
K11/L12	Millbury #1 to Rhode Island S/L	Millbury Sutton Northbridge Uxbridge Millville
O42/R43	Ayer to 326 ROW & 326 ROW to Dunstable	Ayer Groton Dunstable
MARL TAPS	Northboro Road to Florence Street Sub.	Southboro Marlboro
V5/U6/S8	Junction X3/W4 to Williams Street (Taunton)	Somerset Swansea Dighton Berkley Taunton
T7	Jct. X3/K15 to Jct. V5/U6	Swansea
Z1/Y2X3/W4/V5	Hathaway Sub to Montaup Station	Somerset

Line Number	Short Description	Town
X3/W4	JCT Z1/Y2 to Swansea Sub.	Somerset Swansea
X3/K15/T7/P11	Swansea Sub to Blackstone JCT to RI S/L	Swansea Rehoboth Seekonk
P11/K15/R9	Blackstone JCT to Robinson Ave. Sub. to RI S/L	Seekonk Attleboro North Attleboro
O42	Pepperell Paper Tap	Pepperell Dunstable
A94	Auburn Street Sub. to Jct. U2 Stoughton	Whitman Brockton Abington Holbrook Avon Stoughton
D911	Ames Street Sub. to DuPont Sub.	Brockton
S1	Jct E20/F19/G18 to Belmont Street Sub.	West Bridgewater Brockton
U2	Belmont Street Sub. to Stoughton Sub.	Brockton Easton Stoughton
Randolph 1&2	East Weymouth to Randolph & Naval Station T/L	Weymouth Hingham Holbrook (Randolph)
2422/2423	East Weymouth Sub. to North Weymouth Sub.	Weymouth

Line Number	Short Description	Town
91W43	Hudson St to Grove St, Hudson to Pine Ave	Brockton
797W29	ROW to Pine St East Bridgewater also	East Bridgewater
93W42	Plymouth St Sub to Essex St Whitman	Abington Whitman
93W43	Whitman St Hanson to Washington St Hanson Stetson St to Old Coach Rd Whitman	Hanson Whitman
96W40	Grove St Norwell to Jct 96W41 ROW	Norwell
96W41	Mount Blue Sub to King St Unit Cohasset	Norwell Hingham Cohasset Scituate
317W1	South Street to Sears Rd	Marlboro Southboro
2274	West Street Sub. to Plainville Sub.	Attleboro North Attleboro Plainville
2276	West Street Sub. to Attleboro Norton Sub.	Attleboro Norton
321-W4	Millville Tap	Uxbridge Millville Blackstone
321-W7&W8	Uxbridge Feeders	Uxbridge Mendon Hopedale Milford
2354-58	Ward Hill Sub. To Bradford Sub.	Haverhill

Line Number	Short Description	Town
2381	Meadowbrook Sub to Blossom St Sub	Lowell Chelmsford
2385	Tewksbury Sub to Wiggonville Sub & Coren	Tewksbury Lowell
314 317	Tewksbury Sub to North St Sub.	Tewksbury
1306-16	Tewksbury Sub to Trull Street Sub	Tewksbury
2318	Elliott St Beverly to No. Beverly Sub	Beverly
207-W2	Litchfield Street Sub. to Mechanic St. Sub.	Leominster
219-W3	Prospect Street Sub. to Mechanic Street Sub.	Leominster
219-W4	North Leominster to West Leominster	Leominster
219-W4,207-W	West Leominster Sub. to Litchfield Sub.	Leominster
225-W3	Litchfield Street Sub. to Prospect Street Sub.	Leominster
406-L3	Oxford Feeder	Oxford
705-W1	Wendell Depot Sub. to Farley Sub.	Wendell Erving
2	Ware 1 to Ware 2	Ware West Brookfield

Line Number	Short Description	Town
4 & 7	Blanchardville Sub. to Shearers Corner	Palmer Monson
2	Coy Hill	Ware West Brookfield Warren
2	Zylonite Sub. To Columbia Street Sub	North Adams
3	Adams Street Sub. to Columbia St. Sub. & Rt ?	Adams
4	Adams Sub. to Brown Street Sub.	Adams North Adams
1	Mt. Greylock Tap	Adams

Appendix 7

Herbicide Fact Sheets

THE COMMONWEALTH OF MASSACHUSETTS
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GLYPHOSATE

Common Trade Name(s): Roundup, Glyphosate VMF Round Up Pro, Rodeo, Accord, Accord Concentrate,

Chemical Name: N—(phosphonomethyl)glycine—isopropylamine salt
CAS No.: 1071-83-6

GENERAL INFORMATION
Glyphosate, n-phosphonomethyl glycine, is a systemic, broad spectrum herbicide effective against most plant species, including deep rooted perennial species, annual and biennial species of grasses, sedges, and broadleafed weeds. The major pathway for uptake in plants is through the foliage, however, some root uptake may occur. The presence of surfactants and humidity increases the rate of absorption of glyphosate by plants (15).

Foliarly applied glyphosate is readily absorbed and translocated from treated areas to untreated shoot regions. The mechanism of herbicidal action for glyphosate is believed to be inhibition of amino acid biosynthesis resulting in a reduction of protein synthesis and inhibition of growth (10, 15, 101).

Glyphosate is generally formulated as the isopropylamine salt in aqueous solution (122). Of the three products containing glyphosate considered here, Roundup is sold with a surfactant and Rodeo and Accord are mixed with surfactants prior to use (15). Glyphosate has been reviewed by US Forest Service (15), FAO (122), and EPA 00W (51).

ENVIRONMENTAL FATE

Mobility
Glyphosate is relatively immobile in most soil environments as a result of its strong adsorption to soil particles. Adsorption to soil particles and organic matter begins almost immediately after application. Binding occurs with particular rapidity to clays and organic matter (15). Clays and organic matter saturated with iron and aluminum (such as in the Northeast) tend to absorb more glyphosate than those saturated with sodium or calcium. The soil phosphate level is the main determinant of the amount of glyphosate adsorbed to soil particles. Soils which are low in phosphates will adsorb higher levels of glyphosate (14, 15).

Glyphosate is classified as immobile by the Helling and Turner classification system. In soil column leaching studies using aged (1 month) Glyphosate, leaching of glyphosate was said to be insignificant after 0.5 inches of water per day for 45 days (14).

Persistence
It has been reported that glyphosate dissipates relatively rapidly when applied to most soils (14). However, studies indicate that the soil half-life is variable and dependent upon soil factors. The half-life of glyphosate in greenhouse studies when applied to silty clay loam, silt loam, and sandy loam at rates of 4 and 8 ppm was 3, 27 and 130 days respectively, independent of application rate (14). An average half-life of 2 months has been reported in field studies for 11 soils (15).

Glyphosate is mainly degraded biologically by soil micro-organisms and has a minimal effect on soil microflora (15). In the soil environment, glyphosate is resistant to chemical degradation such as hydrolysis and is stable to sunlight (15). The primary metabolite of glyphosate is aminomethyl phosphonic acid (AMPA) which has a slower degradation rate than glyphosate (15). The persistence of AMPA is reported to be longer than glyphosate, possibly due to tighter binding to soil (14). No data are available on the toxicity of this compound.

Glyphosate degradation by microorganisms has been widely tested in a variety of field and laboratory studies. Soil characteristics used in these studies have included organic contents, soil types and pHs similar to those that occur in Massachusetts (117).

Glyphosate degradation rates vary considerably across a wide variety of soil types. The rate of degradation is correlated with microbial activity of the soils and does not appear to be largely dependent on soil pH or organic content (117). While degradation rates are likely temperature dependent, most reviews of studies do not report or discuss the dependence of degradation rate on temperature. Mueller et al. (1981 cited in 117) noted that glyphosate degraded in Finnish agricultural soils (loam and fine silt soils) over the winter months; a fact which indicates that degradation would likely take place in similar soils in the cool Massachusetts climate. Glyphosate halflives for laboratory experiments on sandy loam and loamy sand, which are common in Massachusetts, range up to 175 days (117). The generalizations noted for the body of available results are sufficiently robust to incorporate conditions and results applicable to glyphosate use in Massachusetts.

TOXICITY REVIEW

Acute (Mammalian)
Glyphosate has reported oral LD5Os of 4,320 and 5,600 mg/kg in male and female rats (15,4). The oral LD5Os of the two major glyphosate products Rodeo and Roundup are 5,000 and 5,400 mg/kg in the rat (15).

A dermal LD5O of 7,940 mg/kg has been determined in rabbits (15,4). There are reports of mild dermal irritation in rabbits (6), moderate eye irritation in rabbits (7), and possible phototoxicity in humans (9). The product involved in the phototoxicity study was Tumbleweed marketed by Murphys Limited UK (9). Maibach (1986) investigated the irritant and the photo irritant responses in individuals exposed to Roundup (41% glyphosate, water, and surfactant); Pinesol liquid, Johnson Baby Shampoo, and Ivory Liquid dishwashing detergent. The conclusion drawn was that glyphosate has less irritant potential than the Pinesol or the Ivory dishwashing liquid (120).

Metabolism

Elimination of glyphosate is rapid and very little of the material is metabolized (6,106).

Subchronic/Chronic Studies (Mammalian)
In subchronic tests, glyphosate was administered in the diet to dogs and rats at 200, 600, and 2,000 ppm for 90 days. A variety of toxicological endpoints were evaluated with no significant abnormalities reported (15,10).

In other subchronic tests, rats received 0, 1,000, 5,000, or 20,000 ppm (57, 286, 1143 mg/kg) in the diet for 3 months. The no observable adverse effect level (NOAEL) was 20,000 ppm (1,143 mg/kg) (115). In the one year oral dog study, dogs received 20, 100, and 500 mg/kg/day. The no observable effect level (NOEL) was 500 mg/kg (116).

Oncogenicity Studies

Several chronic carcinogenicity studies have been reported for glyphosate including an 18 month, mouse study; and a two year rat study. In the rat study, the animals received 0, 30, 100 or 300 ppm in their diet for 2 years. EPA has determined that the doses in the rat study do not reach the maximum tolerated dose (112) and replacement studies are underway with a high dose of 20,000 ppm (123). The mice received 1000, 5000 or 30,000 ppm for 18 months in their diets. These studies were non-positive (112,109). There was a non-statistically significant increase in a rare renal tumor (renal tubular adenoma (benign) in male mice (109). The rat chronic study needs to be redone with a high dose to fill a partial data gap (112). The EPA weight of evidence classification would be D: not classified (51).

Mutagenicity Testing
Glyphosate has been tested in many short term mutagenicity tests. These include 7 bacterial (including Salmonella typhimurim and B. subtilis) and 1 yeast strain Sacchomyces cerevisiae as well as a mouse dominant lethal test and sister chromatid exchange. The microbial tests were negative up to 2,000 mg/plate (15), as were the mouse dominant lethal and the Chinese hamster ovary cell tests. EPA considers the mutagenicity requirements for glyphosate to be complete in the Guidance for the Registration of Pesticide Products containing glyphosate (112).

The developmental studies that have been done using glyphosate include teratogenicity studies in the rat and rabbit, three generation reproduction studies in the rat, and a reproduction study in the deer mouse. (15)

Rats were exposed to levels of up to 3,500 mg/kg/d in one rat teratology study. There were no teratogenic effects at 3,500 mg/kg/d and the fetotoxicity NOEL was 1,000 mg/kg/d. In the rabbit study a fetotoxicity NOEL was determined at 175 mg/kg/d and no teratogenic effects were observed at 10 or 30 mg/kg/d in one study and 350 mg/kg/d in the other study (15). No effects were observed in the deer mouse collected from conifer forest sprayed at 2 lbs active ingredient per acre (15).

Tolerances & Guidelines
EPA has established tolerances for glyphosate residues in at least 75 agricultural products ranging from 0.1 ppm (most vegetables) to 200 ppm for animal feed commodities such as alfalfa (8).

U.S. EPA Office of Drinking Water has released draft Health Advisories for Glyphosate of 17.50 mg/L (ten day) and 0.70 mg/L (Lifetime)(51).

Avian
Two types of avian toxicity studies have been done with glyphosate: ingestion in adults and exposure of the eggs. The species used in the ingestion studies were the mallard duck, bobwhite quail, and the adult hen (chickens). The 8 day feeding LC5Os in the mallard and bobwhite are both greater than 4,640 ppm. In the hen study, 1,250 mg/kg was administered twice daily for 3 days resulting in a total dose of 15,000 mg/kg. No behavioral or microscopic changes were observed (15).

Invertebrates
A variety of invertebrates (mostly arthropods) and microorganisms from freshwater, marine, and terrestrial ecosystems have been studied for acute toxic effects of technical glyphosate as well as formulated Roundup. The increased toxicity of Roundup compared with technical glyphosate in some studies indicates that it is the surfactant (MONO 818) in Roundup that is the primary toxic agent (117). Acute toxicity information may be summarized as follows:

Glyphosate (technical): Acute toxicity ranges from a 48 hr EC5O for midge larvae of 55 mg/L to a 96 hr TL5O for the fiddler crab of 934 mg/L (15).

Roundup: Acute toxicity ranges from a 48 hr EC5O for Daphnia of 3 mg/L to a 95 hr LC5O for crayfish of 1000 mg/L (15).

Among the insects tested, the LD50 for honeybees was 100 mg/bee 48 hours after either ingestion, or topical application of technical glyphosate and Roundup. This level of experimental exposure is considerably in excess of exposure levels that would occur during normal field applications (15).

Aquatic Species (Fish)
Technical glyphosate and the formulation Roundup have been tested on various fish species. Roundup is more toxic than glyphosate, and it is the surfactant that is considered to be the primary toxic agent in Roundup:

Glyphosate (technical):
Acute 96 hr LC5Os range from 24 mg/L for bluegill (Dynamic test) to 168 mg/L for the harlequin fish (15).

Roundup: Acute lethal toxicity values range from a 96 hr LC5O for the fathead minnow of 2.3 mg/L to a 96 hr TL5O for rainbow trout of 48 mg/L (15).

Tests with Roundup show that the egg stage is the least sensitive fish life stage. The toxicity increases as the fish enter the sac fry and early swim up stages.

Higher test temperatures increased the toxicity of Roundup to fish, as did higher pH (up to pH 7.5). Above pH 7.5, no change in toxicity is observed.

Glyphosate alone is considered to be only slightly acutely toxic to fish species (LC5Os greater than 10 mg/L), whereas Roundup is considered to be toxic to some species of fish, having LC5Os generally lower than 10 mg/L (15,118).

SUMMARY
Glyphosate when used as recommended by the manufacturer, is unlikely to enter watercourses through run-off or leaching following terrestrial application (117). Toxic levels are therefore unlikely to occur in water bodies with normal application rates and practices (118).

Glyphosate has oral LD5Os of 4,320 and 5,600 in male and female rats respectively. The elimination is rapid and very little of it is metabolized. The NOAEL in rats was 20,000 ppm and 500 mg/kg/d in dogs. No teratogenic effect was observed at doses up to 3,500 mg/kg/d and the fetotoxicity NOELS were 1,000 mg/kg/d in the rat and 175 mg/kg/d in the rabbit.

The evidence of oncogenicity in animals is judged as insufficient at this time to permit classification of the carcinogenic potential of glyphosate. The compound is not mutagenic.

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IMAZAPYR

Common Trade Name(s):	Arsenal
Chemical Name:	Imazapyr! 2-(4-isopropyl-4-methyl--5-oxy-2-imidazolin-2-yl) nicotinic acid with isopropyl amine (2)
CAS No.:	81510-83-0

GENERAL INFORMATION

Imazapyr is effective against and provides residual control of a wide variety of annual and perennial weeds, deciduous trees, vines and brambles in non—cropland situations. It also provides residual control and may be applied either pre or postemergence. Postemergence is the preferred method especially for the control of perennial species. Imazapyr is readily absorbed by the foliage and from soil by the root systems. Imazapyr kills plants by inhibiting the production of an enzyme, required in the biosynthesis of certain amino acids, which is unique to plants (10, 100).

ENVIRONMENTAL FATE

Mobility

There are few studies which have investigated the mobility of Imazapyr in soil, but available reports indicate that Imazapyr does not leach and is strongly absorbed to soil (100). Imazapyr has a high water solubility (1 — 1.5%) which could generally indicate a high leaching potential, but as with other organic acids Imazapyr is much less mobile than would normally be expected (100). No soil partition coefficients have been reported, but they may be expected to be quite high (100).

One field study investigated Imazapyr mobility in a sandy loam soil (0.9% organic matter, 8.0% clay; 38.8% silt). Imazapyr did not leach below the 18—21 inch layer after 634 days and 49.6 inches of rain. The levels found below the 12 inch layer were just above the 5 ppb detection limit. In addition, this study investigated the off—target mobility of Imazapyr and found no residues further than 3 inches from the sprayed area after 1 year (102).

Although low levels of Imazapyr did move to the 18 to 21 inch layer this was only after nearly 2 years and fifty inches of rain. This indicates that imazapyr is relatively non-mobile and does not leach through the soil profile. Imazapyr remains near the soil surface and heavy precipitation may cause some off target movement from surface erosion of treated soils.

Persistence

The main route of Imazapyr degradation is photolysis. In a study of photodegradation in water, the half—life of Imazapyr was calculated as 3.7, 5.3 and 2.5 days in distilled water, pH 5 and pH 9 buffers respectively (101). A soil photolysis study for Arsenal on sandy loam calculated a half—life of 149 days (101).

Studies have investigated the persistence of Imazapyr in soil under aerobic and anaerobic conditions. The half-life of Imazapyr in soil has been reported as varying from 3 months to 2 years (100). A laboratory study found the half-life to be 17 months (101). Detectable residues were found in a field study in all soil layers to 21 inches at 634 days (102). Vegetation was sprayed with radio-labelled Imazapyr at a rate of 1 lb. a.i./acre. The soil was a sandy loam (0.9% organic matter) which received 49.6 inches of rain during 634 days. The highest level of radioactivity (0.234 ppm Imazapyr) was found in the top 3 inches of soil at 231 days after application and there were detectable levels in the 9-12 inch layer. The concentrations in the top layer increased steadily from day 4 to 231 when they reached their maximum (0.234 ppm) and then declined. At day 634 the level in the top layer (0-3 inch) was 0.104 ppm (102). These data indicate that Imazapyr is persistent in soil and, most importantly, that Imazapyr is translocated within plants from the plant shoots back to the roots and released back into soil. Very little of the Imazapyr actually reached the soil during application. The soil residues may be due to the decay of plant material containing Imazapyr in the soil (102).

TOXICITY REVIEW

Acute (Mammalian)

The acute oral LD5O in both male and female rats was greater than 5000 mg/kg using technical Imazapyr. The acute dermal LD5O in male and female rabbits was greater than 2000 mg/kg. The compound was irritating to the rabbit eye but recovery was noted 7 days after application of 100 mg of the test substance. It was classified as mildly irritating to the rabbit skin following application of 0.5 grams of the material on abraded or intact skin (103).

Arsenal product formulation was tested in a similar battery of tests. The rat oral LD5O value was greater than 5000 mg/kg and the rabbit dermal LD5O was greater than 2148 mg/kg. The irritation was observed following installation of 0.5 ml of the test substance in the skin study and 0.1 ml in the eye study (104).

Technical Imazapyr was administered to rats as an aerosol for four hours at a concentration of 5.1 mg/L. There were ten rats per sex and the animals were observed for 14 days after treatment before they were sacrificed. Slight nasal discharge was seen in all rats on day one but disappeared on day two (105).

The inhalation LC5O is greater than 5.0 mg/L for both the formulation and the technical product (105,106).
Technical Imazapyr was applied dermally at the following dosages: 0, 100, 200 and 400 mg/kg/day (109). Arsenal was used at 0, 25, 50 and 100% of the formulated solution in sterile saline. Each dose group consisted of 10 male and 10 female rabbits and the test substance was applied to either intact or abraded skin and occluded for 6 hours each day.

The result of the dermal studies with Imazapyr as well as Arsenal were non remarkable with regard to body weights, food consumption, hematology, serum chemistry, clinical observations, necropsy observations and histopathology. It was noted that Arsenal, undiluted, was locally irritating (109).

Subchronic and Chronic Studies (Mammalian)

In the subchronic tests a NOEL for systemic toxicity with dermal administration in rabbits was 400 mg/kg/d (2,109). After dietary administration for 13 weeks in the rat, there was no effect at 10,000 ppm (571. mg/kg/d) which was the highest dose tested (141).

A bioassay is currently underway to evaluate the potential oncogenicity of technical Imazapyr. Groups of 65 rats per sex per dose group have received 0, 1000, 5000 or 10,000 ppm in the diet. Hematology, clinical chemistry and urinalysis tests were conducted at 3, 6 and 12 months and will also be done at 18 months and at study termination. At the 12 month sacrifice the only effect noted was a slight increase in

mean food consumption in all treated female groups. Most of the increases were statistically significant, but they did not always exhibit a dose response. The oncogenicity test is due to be submitted to the EPA in the spring of 1989 (115).

Oncogenicity Studies

Chronic bioassays as discussed in the subchronic/chronic section are underway.

Mutagenicity Testing

Five different bacterial strains of Salmonella typhimurium (TA1535, TA98, TAlOO, TA1537, and TA1538) and one of Escherichia coli (WP-2 uvrA-) were used to evaluate the mutagenicity of Imazapyr. It is unclear whether the compound used was technical or formulated Imazapyr. Dose levels up to 5000 micrograms/plate were used and each strain was evaluated both in the presence or absence of PCB—induced rat liver 5—9 microsomes. Negative results were noted in all assays. The six tester strains were designed to detect either base-pair substitutions or frameshift mutations (113).

Developmental Studies (Mammalian)

Two teratology studies have been done and both of these studies evaluated technical Imazapyr. One study used rats as the test species and the other utilized rabbits (111,112).

Pregnant rats received dosages of 0, 100, 300 or 1000 mg/kg/d of Imazapyr during days 6—15 of gestation. There were 22 rats in the control group and 24, 23 and 22 in the low, mid and high dose groups. All doses were administered orally by gavage. Salivation was noted only during the dosing period in 6 of the 22 females in the highest dose group (1000 mg/kg). No other adverse observations were noted in the treated dams (111). Fetal body weight and crown-rump length data for the treated groups were comparable to controls. Fetal development (external, skeletal and visceral) "revealed no aberrant structural changes which appeared to be the result of the exposure to Imazapyr" (111). The NOEL for maternal toxicity was 300 mg/kg and the NOEL for teratogenicity and fetoxicity was 1000 mg/kg (116).

Four groups of 18 pregnant rabbits were exposed on days 6-18 of gestation to doses of 0, 25, 100, 400 mg/kg/d Imazapyr. There was no statistically significant difference between control and treated groups at any dose (112).

Avian

Acute oral LD5Os of Imazapyr in bobwhite quail and mallard duck were 2150 mg/kg. The 8 day dietary LC5O in the bobwhite quail and mallard duck were greater than 5000 ppm (101).

Invertebrates

The dermal honey bee LD5O for Imazapyr is greater than 100 mg/bee (101). The LD5O (48 hr) was greater than 100 mg/L for the water flea (100).

Aquatic

The LC50s of Imazapyr in the rainbow trout, bluegill sunfish and channel catfish were greater than 100 mg/L (101).

SUMMARY

Imazapyr is a relatively immobile herbicide in the soil profile even when used in sandy and low organic content soils. It is also persistent in soils. The low mobility and persistence may result in off-target movement of Imazapyr from surface erosion of treated soils.

The atypical soil—plant flux characteristics of Imazapyr and delayed maximum soil concentrations indicate that repeated annual applications may result in build—up of Imazapyr in soil. Consequently, an interval is required to allow for the degradation of soil residues before a repeated application is made.

The oral LD5O of Imazapyr in rats is greater than 5000 mg/kg and the derrnal LD5O is greater than 2000 mg/kg in rabbits. The oncogenicity bioassay is currently underway and the only effect reported in the interim study was an increase in food consumption in the treated females. No mutagenic effects were observed.

The acute oral LD5Os of Imazapyr and the Arsenal formulation are greater than 5000 mg/kg. In the subchronic 13 week rat study there was no effect observed at the highest dose tested 10,000 ppm. The oncogenicity study is currently underway.

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METSULFURON METHYL

Common Trade Names: Escort, Escort XP (2)

Chemical Name: Methyl 2 E[C[(4-Methoxy—6-methyl-l,3,5-Triazifl—2-yl) aminolcarbonyl] amino] sulfonyl.]benzoate] (9)

CAS NO.: 74223-64-6

GENERAL INFORMATION

Metsulfuron methyl is a sulfonyl urea herbicide initially registered by E.I. DuPont in 1986. It is a foliar herbicide registered for use on wheat and barley and non-cropland sites such as Right of Way (9).

ENVIRONMENTAL FATE

Mobility

Metsulfuron methyl is a relatively new herbicide. The studies reviewed here have been provided by the registrant, EI DuPont.

The soil water partition coefficients (Kd) of Metsulfuron Methyl have been determined in four different soils: Cecil sand, Flanagan silt loam, Fallsington silt loam, and keyport silt loam. The Kd values range from 0.36 for Cecil sand to 1.40 for Flanagan silt loam, and Kom values ranged from 29 for Fallsington silt loam to 120 for Cecil sand (100). The values for Kd and Kom indicate that metsulfuron methyl is not adsorbed well to soil and that the organic content of the soil is not the only adsorption component. The silt and clay contents appear to influence adsorption, but there are probably other factors also involved.

The previous study also determined the Rf values for soil. Thin layer chromatography was performed on four soils for metsulfuron methyl. The Rf values ranged from 0.64 to 1.00; only one value was less than 0.90 (100). This result confirms the validity of the Kd values, indicating that metsulfuron methyl is mobiie and that the organic matter content of the Soil is a significant component of adsorption.

Metsulfuron methyl was applied to tops of 12 inch columns [containing four different soils], and eluted with 20 inches of water in 20 hours. Following the percolation of the total volume of water, 106% of the metsulfuron methyl was eluted from the Fallsington sandy loam, 96% from the Flanagan silt loam, 81% for Keyport silt loam and 93% for Myakka sand (100). The breakthrough volumes for the Fallsington, Flangan, Keyport and Myakka soils were 6.5, 4.5, 6.9 and 5.8 inches of water respectively (101).

Metsulfuron methyl is relatively mobile in most soils, but will be retained longer in soils with higher percentages of organic matter.

Persistence

There are two studies which have reviewed the persistence of metsulfuron methyl in the soil. One study was conducted in the southern United States and the second was in the northern United States and Canada. The results of the studies indicate a somewhat contradictory picture of the persistence of metsulfuron methyl.

The soil half-lives in Delaware, North Carolina, Mississippi and Florida were 1 week, 4 weeks, 3 weeks and 1 week respectively following an application in mid to late summer (102). The results are varied and indicate that either climatic or soil factors determine the persistence. The climate is sufficiently similar to be able to discount that as a factor. However, both of the locations where the shortest half-lives were observed had the highest organic matter content in the soils. Furthermore, the half—lives correspond with the organic matter content.

The half—lives following spring applications were 4 and 56 weeks for two sites in Colorado, 6 weeks in North Dakota and 28 weeks in Idaho (103). In contrast to the southern United States study there does not appear to be any correlation with climatic or soil characteristics. There appears to be a slightly shorter half—life in acidic soils in the same location.

Metsulfuron methyl was also applied in the fall and the half-lives determined in two sites in Colorado, North Dakota and Idaho. These half—lives were 8 weeks, 12 weeks, 42 weeks and 28 weeks respectively. As was expected there were longer half—lives following fall applications in North Dakota (6 weeks vs. 42 weeks) however, in Idaho there was no change at all, which is unexpected.

In Canada following spring applications the reported half-lives were 10 weeks, 4 weeks, 4 weeks and 6 weeks for Alberta, 2 locations in Saskatchewan and Manitoba (103). One would expect longer half lives in Northern locations due to the effects of temperature on degradation rates. The results from Canada are generally shorter than those in the U.S. locations, which is unexpected.

Therefore, the half-life of Metsulfuron methyl in the soil is variable and dependent on the location. It is shorter when applied in the spring but appears independent of other environmental factors in most locations.

TOXICITY REVIEW

Acute (Mammalian)
The toxicology database for Metsulfuron methyl has been reviewed and accepted by the EPA (9). DuPont supplied excerpts from their monograph on Ally herbicide (112). Summaries of studies were supplied by DuPont for subchronic, chronic and reproductive studies.

Technical metsulfuron methyl has been tested in two acute oral LD50 studies in Crl:CD Rats. In the first study the LD5O was greater than 5,000 mg/kg and in the second it was greater than 25,000 mg/kg (the maximum feasible dose) (112). Clinical signs included salivation, chromodacryorrhea, stained face, stained perineal area and weight loss (112).

In a 10—dose subacute study using male rats, a single repeated dose of 3,400 mg/kg/day for 10 days over a 2 week period was administered. This was followed by a two week recovery period. No deaths occurred and slight weight loss was the only clinical sign observed. In addition, no gross or microscopic changes were observed (112). The dermal LD50 is greater than 2,000 mg/kg in male and female rabbits (112). Technical metsulfuron methyl caused mild erythema as a 40% solution in guinea pigs. There was no reaction observed at the 4% concentration. No response occurred when treated animals were challenged (112).

In rabbits, moderate areas of slight corneal clouding and severe to moderate conjunctivitis were observed in both washed and unwashed eyes following treatment with technical metsulfuron methyl. The unwashed eyes were normal in 3 days and the washed eyes in 14 days (112).

Metabolism
Elimination of metsulfuron methyl in the rat is rapid, with 91% of a radioactive dose excreted over 96 hours (9). The routes of elimination were not specified within the report.

Subchronic/Chronic (Mammalian)
Ninety day feeding studies have been done with metsulfuron methyl in rats and mice. The rat study was done in conjunction with a one generation reproduction study (see Developmental Study Section). In this study rats received 0, 100, 1000, or 7500 ppm (0, 5.7, 57, 428 mg/kg/d) (a) in their diets. Effects observed at the high dose were: a decrease in body weight and an increase in total serum protein in the females, and a decrease in liver weight and a decrease in cytoplasmic clearing of hepatocytes in the males the NOEL in this study was 1000 ppm (104).

The 90 day mouse study was done in conjunction with the 18 month mouse study. Groups of 90 mice per sex per dose received 0, 5, 25, 500, 2500 or 5000 ppm (0, 0.66, 3.3, 66.6, 333.3, 666.6 mg/kg/d) in their diets. Clinical evaluations were made at 1, 2, 3, 6, 12 and 18 months. Ten animals per group were sacrificed at the 90 day time point for pathological evaluation. The 2500 ppm group was sacrificed at 12 months. Sporadic effects were observed on the body weight, food consumption, and organ weights. These were not dose related, resulting in a NOEL of 5000 ppm in diet for mice (111).

In the twenty-one day dermal rabbit study, the intact skin of male and female New Zealand White Rabbits received doses of 0, 125, 500 and 2,000 mg/kg for 6 hrs/day for 21 days. Clinical signs observed were sporadic weight loss and diarrhea in a few rabbits. These effects were not dose related. Non dose related histological effects were observed in male rabbits. This effect was characterized as mild testicular atrophy occurring sporadically at all doses (112, 108).

Feeding studies in dogs have been done with purebred beagles. The animals received metsulfuron methyl in diets at dose levels of 0, 50, 500 and 5000 ppm (0, 0.2, 2, 20 mg/kg/d) for one year. There was a decrease in food consumption in the high dose males. There was a decrease in serum lactate dehydrogenase in all groups of both sexes at two or more doses these values were within the historical controls. The NOEL was 500 ppm in the males and 5000 ppm in females (112).

In a chronic feeding study in rats, the animals received metsulfuron methyl at doses of 0, 5, 25, 500, 2500 or 5000 ppm (0, 0.28, 1.4, 28.6, 143 or 286 mg/kg/d. Interim sacrifices were done at 13 and 52 weeks (105).

At the 13 week sacrifice there was a decrease in body weight in the 2500 and 5000 ppm groups; there was a decrease in absolute liver weight at 2500 and 5000 ppm males. There was a decrease in the relative liver weights in the 2500 and 5000 ppm females.

(a) In these discussions the assumptions made for estimated conversion of ppm (diet) to mg/kg/D were:

Species	Body weight (kg)	Intake (kg)
Rat	0.35	0.020
Mouse	0.03	0.004
Dog	10	0.4

When data were presented as ppm, the dose was estimated in mg/kg and is presented in parenthesis.

Findings at the 52 week sacrifice included increase in kidney weight (2500 ppm males) and increased absolute brain weights (at doses of 25, 500, 2500 and 5000 ppm) in males and at doses of 2,500 and 5000 ppm in females. There was an increase in absolute heart weight at 2500 ppm in males and at 2500 and 5000 ppm in females. The absolute organ weights were back to normal at termination. Relative brain weights of the 2500 and 5000 ppm groups were increased (105)

Oncogenicity Studies
There were no gross or histopathological changes observed in mice receiving up to 5000 ppm metsulfuron methyl in their diets (112. 111). Similar results were obtained in the 104 week rat study; there were no histopathological changes observed which were attributable to metsulfuron methyl (105, 112). EPA concludes that there were no oncogenic effects in rats or mice at the highest dose tested; 5000 ppm in both cases (9).

Mutagenicity Testing
Metsulfuron methyl was negative in the unscheduled DNA synthesis assay; in vivo bone marrow

cytogenic assay in rats (doses were 500, 1,000, and 5,000 mglkg bw); CHO/HGPRT Assay; Salmonella typhimurium reverse mutation assay four strains with and without S9 metabolic activation; and also in the in vivo mouse micronucleus assay at doses of 166, 500, 1666, 3000 and 5000 mg/kg (112). 'T¶e only positive mutagenicity assay was in the in vitro assay for chromosome aberrations in Chinese Hamster Ovary at high doses (greater than 2.63 mM, 1.0 mg/mL)). In this assay no increases in structural aberrations were observed at 0.13 or 1.32 mM(0.05 or 0.5 mg/mL) (112).

Developmental Studies
Several studies have been done to investigate the effects of Metsulfuron methyl on reproduction and development in rats and rabbits.

Pregnant Crl: COBS CD(SD) BR rats received metsulfuron methyl at doses of 0, 40, 250 or 1000 mg/kg by the oral route on days 5 to 14 of gestation. There were 25 rats per group. Maternal toxicity was observed at doses of 250 and 1000 mg/kg/d. The maternal toxicity NOEL was 40 mg/kg/d. There was no evidence of "teratogenic" response or embryo fetal toxicity (112).

In the rabbit study, New Zealand white rabbits received 0, 25, 100, 300 or 700 mg/kg/d on days 6 to 18 gestation. There was a dose related increase in maternal deaths; 1, 2 and 12 deaths at doses of 100, 300 and 700 mg/kg respectively. The maternal toxicity NOEL was 25 mg/kg/d and there was no evidence of teratogenic or embryolethal effects observed in this study (112).

Several multigenerational studies have been done with Metsulfuron methyl. A four litter reproduction study was done concurrently with the chronic bioassay. Rats from each treatment were separated from the main study and bred. The doses were 0, 5, 25, 500, 2500, and 5000 ppm (0, 0.28, 1.4, 28.6, 143 and 286 mg/kg/d). There was a dose dependent decrease in body weight in the parental (P1) generation at doses of 25 ppm and greater in males and females. This effect was not present in dams during gestation or lactation (106).

Overall fertility in the P1 and filial (Fl) matings was low in both control and treated groups with no apparent cause. There was a decrease in pup size in the Fla but not the Flb, F2a, or F2b litters. The gestation index was 100% for all groups in both filial generations with the exception of F2a when it was 90%. On the basis of the lower body weights and lower growth rates, the NOEL was 25 ppm for this study (106).

In a 90 day, 2 generation 4 litter protocol, rats received 0, 25, 500 or 5000 ppm (0, 1.4, 28.6, 286 mg/kg/d) Metsulfuron methyl in their diets for 90 days prior to mating. In this protocol the parental generation was bred twice first to produce the Fla and then the FiB. The FiB rats were then fed the appropridte diet for 90 days (after weaning). There was a decrease in litter size in the 5000 ppm group in the F2a generation, but not in any other generation. The NOEL for this study was 500 ppm (107).

In a 90 day feeding, one generation rat study, 16 male and 16 female rats received 0, 100, 1000 or 7500 ppm in their diet prior to mating. There were no differences observed in reproduction and lactation performance or litter survival among groups. There was an overall low fertility in the control and treated groups. This result made the effects of metsulfuron methyl on fertility difficult to assess from this study (104).

Tolerances and Guidelines
Tolerances have been set for metsulfuron methyl in barley wheat (from 0.05 to 20 ppm, depending on the commodity) and in meat and meat byproducts (0.1 ppm). The tolerance in milk is 0.05 ppm (8, 9). The acceptable daily intake is 0.0125 mg/kg/d based on a one year dog NOEL of 1.25 mg/kg/d using a safety factor of 100 (9).

Avian
Metsulfuron methyl has been tested in two species of birds, the mallard duck and the bobwhite quail. The acute oral LD5O is greater than 2150 mg/kg in the duck. Two, 8 day dietary studies have been done. The 8 day LC5O is greater than 5620 ppm in both the duck and the quail (9).

Invertebrates

The 48 hour LC5O for Daphnia is greater than 150 ppm and the acute toxicity in the honeybee is greater than 25 mg/bee (9).

Aquatic

Metsulfuron methyl has acute LC5O of greater than 150 ppm in both the rainbow trout and the bluegill sunfish (9).

Summary

Metsulfuron methyl has a moderate to high mobility in the soil profile and is relatively persistent in the environment, especially when applied in the fall. These factors would be of concern under most circumstances. However, metsulfuron methyl is applied at very low rates (3-4 ozs./A) and therefore the amounts which reach the soil are quite low. Consequently, Metsulfuron methyl should not impact groundwater as a result of leaching or migrate from the target area. Metsulfuron methyl has low toxicity (EPA Toxicity Category III) for acute dermal exposure and primary eye irritation and is category IV for all other acute exposures. The chronic studies indicate no oncogenicity response and the systemic NOEL's are 500 ppm in rats and 5000 ppm in mice. There was no evidence of teratological effects in the rat or the rabbit at the highest dose tested in both species. While there was evidence of maternal toxicity at 40 mg/kg/d in the rat and 100 mg/kg/d in the rabbits.

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FOSAMINE AMMONIUM

Common Trade Name: Krenite, Krenite UT

Chemical Name: Ammonium ethyl carbamoylphosphate

CAS No.: 25954—13—6

GENERAL INFORMATION

Fosamine ammonium is usually applied to plants in the late summer and early fall. It is systemically absorbed by buds, stems and foliage. In most plants, effects of herbicide treatment are not evident until the following spring when buds fail to develop, or develop into miniature spindly leaves that do not provide adequate photosynthesis. The plant consequently dies. Although it is translocated within plants, effective treatment requires the complete coverage of all parts of woody plants. In some species of non-deciduous plants, such as pines and bindweed, leaves may turn brown immediately after application.

ENVIRONMENTAL FATE

Mobility

Fosamine ammonium is a low mobility herbicide and is not readily leached from soil. Soil adsorption coefficients (Kd) for Fosamine ammonium are reported as ranging from 0.22 (low organic sandy barns) to 350 (silt barns) (103). The organic matter adsorption coefficients are more variable and range from 20 to 62, with one adsorption coefficient reported at 7400 (103). There does not appear to be a good correlation between the soil adsorption coefficents and organic matter, clay or silt content of the soil.

In a study using soil thin layer plates to assess mobility, the Rf values (ratio of the compound mobility versus the leading edge of the water movement) for Fosamine ammonium ranged from 0.92 to 0.98 on the four soils tested (103). These Rf values indicate a high mobility pesticide, in contrast to the soil adsorption coefficients and leaching studies which indicate low mobility. This information may reflect the solubility of fosamine ammonium and not its mobility characteristics.

Fosamine arnmonium is strongly adsorbed to soil particles and it is not carried away in precipitation, in spite of its high water solubility. In a laboratory study using inclined soil flats (Fallingston sandy loam), Fosamine ammonium was applied at the rate of 15 lbs a.i/acre followed by simulated rainfall. The Fosamine ammonium remained near the surface of the soil and in the upper part of the flat, thus indicating no appreciable downward or lateral mobility (105). Field studies conducted in Florida, Delaware and Illinois have confirmed the laboratory results and indicate very little or no downward movement in soil of the herbicide or its degradation products (15, 104, 105).

Field studies indicate that Fosamine ammonium has low vertical mobility but, soils with higher adsorption capacities will tend to retard movement more than soil with lower adsorption capacities (15). However, Fosamine ammonium may move with the soil during erosion (14). Due to strong adsorption of fosamine ammonium to soil particles, there is little tendency for ground water contamination or for surface waters to become contaminated without direct application of the material (14, 15).

In the field studies, the Delaware soil (Keyport silt loam) was the most representative soil of Massachusetts conditions. However, the Fallsington sandy loam which was used in the greenhouse studies represents a close approximation to Massachusetts soils. In these studies Fosamine ammonium exhibited slight tendency to leach in both those soils. Consequently, it is expected that fosamine ammonium will exhibit slight leaching in Massachusetts soils.

Persistence

The major route of Fosamine ammonium degradation is metabolism by soil microorganisms. Fosamine ammonium is stable to degradation by hydrolysis at pH values 5, 7, and 9; it is also stable to photodegradation (10, 14, 101, 102).

Fosamine ammonium is not considered a persistent compound in soils. Under field conditions in Florida, Delaware and Illinois, the half-life of Fosamine ammonium in soils was approximately one week following the application of 10 lbs/acre (104).

In the field, the metabolite carbamoylphosphonic acid (CPA) was found several days after initial soil treatment. All Fosamine ammonium and CPA had disappeared completely by 3 to 6 months (14, 15).

Greenhouse soil studies indicate a half-life of about 10 days, which is in close agreement with the field study half—life (15,104). In the field, Fosamine ammonium was metabolized to CPA more quickly in fine sand than in two silt barns (14, 104).

There is little persistence information in the literature for Fosamine ammonium and the only reported field degradation rates are from one study. This might be a cause for concern were it not for the close agreement in soil half-lives reported, not withstanding the varied location and soils used in the field studies. Moreover, the greenhouse degradation study was also in close agreement with the reported field half-life.

It is assumed that the half-lives reported in the previous study have been obtained in spring to summer conditions, since they were not stated. The degradation of fosamine ammonium was investigated for a one year period in the previous study but, because of the short half-life complete degradation had occurred before the winter. It is expected that fosamine ammonium will be applied in summer or fall only since it must be applied to full foliage for control. Consequently, the lack of winter degradation rates is not a major concern.

With most herbicides soil characteristics and local climatic factors have a pronounced effect on soil half—life. This study suggest that degradation of Fosamine ammonium by soil microorganisms is not influenced by soil characteristics or local climate to any appreciable extent.

Due to the similar persistence of Fosamine ammonium in all locations and soils there is no most representative location. In this case, all sites represent expected persistence. Therefore, the half-life of Fosamine ammonium under Massachusetts condition is expected to be approximately one week.

TOXICITY REVIEW

Acute (Mammalian)

The oral LD5Os have been determined for both the formulated product and the formulated product plus surfactant (41.1 to 42% active ingredient (ai) in both cases). The LD5Os in the male rat were 24,400 mg (ai) (formulated product)/kg and 7,295 mg (ai) (formulated product with surfactant)/kg. Female rats had

an LD50 of 5,000 (ai) mg (formulated product with surfactant)/kg. The formulated product has an LD50 of 7,380 mg(ai)/kg (formulated product) in male guinea pigs (107).

Fosamine ammonium was tested in an acute dermal study. 10 ml of the formulated product at a dose of 1,683 mg(ai)/kg resulted in no mortalities and no clinical signs of toxicity (107). The formulation plus surfactant was tested in rabbits and was not a primary eye irritant. There was mild transient erythema in tested skin. No sensitization was found in Guinea pigs (107).

The formulation plus surfactant (0.1 ml) produced transient mild corneal opacity and transient conjunctual irritation. The formulation without the surfactant was not an irritant (107).

Metabolism

The metabolism of Fosamine ammonium in the rat is rapid with 86% in feces and 11% in urine after 48 hrs (103,15). Compounds identified in the feces included 14C radiolabelled fosamine ammonium (86%) and 14C Carbamoylphosphonic Acid (CPA) diammonium salt (14%). The compnunds identified in the urine were also fosamine ammonium and CPA (103).

Subchronic and chronic feeding studies have been performed using several species, for various time periods.

The No Observable Effect Level (NOEL) for Fosamine Ammonium in diet studies for rats (90 day), dog (6 month), and sheep (90 day) were: 5,000/10,000 ppm, (286/572 mg/kg); 1,000 ppm (40 mg/kg) and 2,000/2,500 ppm highest dose tested (HDT) respectively (107). In the feeding studies the dose was increased after a certain time point when effects were not observed at the lower dose. These dose groups are written first dose/increased dose. In the six month dog study, the female dogs receiving 5000/7500/10000 ppm had increased stomach weights (107).

Oncogenicity Studies

Long term carcinogenicity studies are not available. These studies have not been required by EPA as there are no food uses proposed for Krenite.

Mutagenicity Studies

Mutagenicity testing has been done using Fosamine Ammonium formulated product. It was negative in 5 strains of the Ames assay, and negative both with and without activation in Chinese Hamster ovary point mutation assay. Chromosome damage was produced in the in vitro cytogenetic assay using Chinese Hamster ovary cells at 1.6% and 3.2 formulation (nonactivated) and 1.4, 2.8 and 5.7% formulation (activated) (107). There were no compound related increases in chromosomal aberrations in an in vivo bone marrow study and no changes in unscheduled DNA synthesis in rat hepatocytes (107).

Developmental Studies

The developmental studies that have been performed using fosamine ammonium include a one generation/two litter rat study and a rat oral teratogenicity study. The doses in the 90 day reproduction study were 0, 200, 1,000 and 5,000/10,000 ppm (0, 11, 57 and 285/570 mg/kg/d). There were no effects observed on reproduction and lactation in the reproduction study (NOEL = 5,000/10,000 ppm HOT). The doses in the teratogenicity study were 0, 200, 1,000 and 5,000/10,000 ppm (0, 11, 57 and 285/570 mg/kg/d). There were no effects observed on teratogenicity and fetoxicity at the 1,000 ppm dose level(107).

(a) In these discussions the assumptions made for conversion of ppm (diet) to mg/kg/D were:

Species	Body weight (kg)	Intake (kg)
Rat	0.35	0.020
Mouse	0.03	0.004
Dog	10	0.4

Avian

Unformulated Fosamine ammonium was administered to Mallard ducks and bobwhite quail by intubation in acute toxicity studies. Five birds per species-sex group received doses of 0, 312.5, 625, 1,250, 2,500, and 5,000 mg/kg. The LD50 was greater than 5,000 mg/kg in both the ducks and quail (15, 107).

Ducks and quail were also used in subacute dietary studies at doses of 0, 625, 1,250, 2,500, 5,000 and 10,000 ppm in the diet for 5 days. Basal diet was given for the last three days of the 8 day exposure. The 8 day LC50 in the diet was greater than 10,000 ppm. There was no increase in duck mortality: food consumption was depressed but body weight gain was normal. There was variable quail mortality and food consumption and body weight were decreased as compared with control (15, 107).

Invertebrates:

Fosamine ammonium toxicity has been determined for only a very few microorganisms and invertebrates. The available studies indicate that Fosamine ammonium has a very low acute toxicity to those organisms tested (15):

Fosamine ammonium salt (42% formulation): 48 hr LC5Os range from 1,524 mg/L for Daphnia to 10,000 mg/L for bees sprayed with the herbicide.

Aquatic Species (fish):

Fosamine ammonium has a very low toxicity to those fish species tested.

Fosamine ammonium salt (42% formulation): 96 hr LC5Os range from 670 mg/L for bluegill sunfish to 8,290 mg/L for coho salmon (15).

Except for the LC5O of 670 mg/L for the bluegill sunfish, reported adult fish LC5Os are all in excess of 1000 mg/L. (15) The yolk-sac fry stage in salmonids was the most sensitive to Fosamine ammonium.

Threshold-effect concentrations of Krenite for salmonids in partial life-cycle studies are less than 75 times the maximum theoretical concentration of Krenite that would be found in shallow waters due to direct overhead spray application (15).

SUMMARY

Fosamine ammonium is not persistent in the environment and is a low mobility herbicide in soil. Fosamine ammonium has a low potential to leach to groundwater or to reach surface waters from surface runoff. With acute oral LD5Os in rats of greater than 5,000 mg/kg, Fosamine ammonium is considered to be of low acute and subchronic mammalian toxicity. Subchronic exposures to Fosamine ammonium resulted in NOELS of greater than 1,000 ppm in a 6 month dog study. Mutagenicity test were negative in all but one case and there are no carcinogenicity data for this active ingredient. Fosamine ammonium is also considered to have very low aquatic and invertebrate acute toxicity.

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TRICLOPYR (Jun 23 1990)

Common Trade Name(s): Garlon 3A, Garlon 4

Chemical Name: Triclopyr [(3 ,5,6-Trichloro-2-pyridinyl) oxy] acetic acid

CAS No: 55335—06—3

GENERAL INFORMATION

Triclopyr is a picolinic acid derivative and is marketed as Garlon 3A the triethylamine (TEA) salt (CAS #057213-69-1) and Garlon 4 the butoxyethyl ester ***(CAS#*** 008008-20-6).

Triclopyr is effective against a wide variety of woody plants as a foliar spray, basal spray and when applied to cut surfaces. Triclopyr is absorbed by both plant leaves and roots and is readily translocated throughout the plant. It produces an auxin-type response in growing plants in that it appears to interfere with normal growth processes. Thus, maximal plant response occurs when applications are made soon after full leaf development and when there is sufficient soil moisture for plant growth.

ENVIRONMENTAL FATE

Mobility

Most laboratory and field studies indicate that Triclopyr is a relatively mobile herbicide under most conditions. Soil organic carbon partition coefficients K(oc) were determined for the TEA salt in 12 soils which ranged from 0.081% to 21.7% organic carbon. The K(oc) values range from 12 to 78 (14), indicating that Triclopyr should be mobile in most soils. In the same study the K(oc) values of trichloropyridinol, the major metabolite, were reported to range from 114 to 156 in three soils which were not identified. This indicates that trichloropyridinol is less mobile than Triclopyr and should have moderate mobility in soil(14).

In a laboratory study using sandy loam soil with a low organic matter content (0.62%), 75-80% of the applied Triclopyr leached through a 12 inch soil column between days 11 and 15. Water was applied at the rate of 0.5 inches/day for 45 days. The major degradation product, tricloropyridinol required 13 inches of applied water to elute, nearly twice as much (7.5 inches) as Triclopyr(14).

In a field study, Garlon 3A was applied at the rate of 3 gallons/ acre (9 lbs/acre) to six soils ranging from clays to loamy sands in six states. Rainfall was reported to be normal, but not given. Small amounts of Triclopyr and its metabolites were found in the 6—12 inch and 12-18 inch layers of soil 28 to 56 days after application (14,15). Although an application rate of 9 lbs per acre is rather high, the presence of Triclopyr at those depths should be noted especially since there is a correlation with the previous laboratory studies.

In other studies, Triclopyr exhibited significantly lower mobility than had been previously reported. In a field study conducted in Massachusetts, Triclopyr was applied to sandy loam soil at a rate of 0.6 lb/acre. Rainfall was reported as normal, but not given. Triclopyr was never detected below the top ten inch layer of soil at any time during the three month study (100). As part of the same study, Triclopyr was applied to soil columns containing the same soil as in the field study at the rate of 0.6 and 6.0 lbs/acre. Simulated rainfall was applied to the soil columns at a rate of 1 inch per week for a total of 5 inches. Triclopyr was not detected below the top 4 inch layer of soil (100). These results indicate lower mobility than previously reported, but they may reflect the short persistence of Triclopyr in soil rather than its mobility through the soil profile.

Persistence
Soil

Microbial degradation is the primary mechanism by which Triclopyr is degraded in soils to two metabolites (15). Degradation under anaerobic conditions (i.e. saturated soils) is reported to be 5 to 8 times slower than under aerobic conditions (14). Triclopyr in soils is not thought to be degraded to any appreciable extent by chemical hydrolysis and, due to its low volatility, is not thought to volatilize from soil to any great extent (15).

A review by TRW states that Triclopyr "is not considered to be a persistent compound in soils" (95). Studies indicate that under certain conditions the half-life of Triclopyr can be relatively short. The Dow Chemical Company has reported a half-life of 10 days in silty clay loam (96). In a small West Virginia watershed the half-life was estimated as between 14 and 16 days (15). Triclopyr was applied aerially at the rate of 10 lbs/acre, but much of the Triclopyr was intercepted by foliage. Average Triclopyr residues in soil from the treated area of this study, measured on the day of the treatment, were non—detectable in densely wooded areas, 4.4 ppm in lightly wooded areas, and 18 ppm in open areas (15). In a Massachusetts field study, the half—life of Triclopyr was reported as 10 days after the applications of 0.6 and 6.0 lbs/acre Triclopyr to non-target vegetation (100).

Most other studies suggest a much longer persistence for Triclopyr in soil. In a laboratory study, Dow reported a half-life of 46 days for Triclopyr in loam. The loam was maintained in the laboratory at **95 deg** F with moisture at field capacity for the duration of the study (96). A **95 deg** soil temperature and moisture at field capacity are both quite high and indicate that the persistence at less than ideal conditions would be longer. Dow also reports the average half-life of Triclopyr in soil to be 30 days (101). An average half-life of 46 days is reported in the Herbicide Handbook (10) and by Ghassemi et al. (95). In addition, other investigators have reported a half—life in soil of "less than 50 days" at temperatures between 25-35 deg C, and between 79 and 156 days at 15deg C (14). In a field study conducted in Sweden, Garlon 3A was applied at the rate of 2 lbs (a.i.)/acre to eight different forest soils. Residues of Triclopyr persisted for 1 to 2 years, and in some cases in excess of 2 years, at levels approximately 10 percent or less of initial soil residue levels (15). It must be noted that soil temperature levels never exceeded 14deg C (57 deg F) and these temperatures are not favorable to microbial degradation (15). These low maximum temperatures are not typical of year round Massachusetts temperatures, but indicate the increased persistence that may occur when applications are made in the fall and are followed by cold weather.

The variable half-lives reported for Triclopyr indicate that soil half-life may be dependent on the soil and climatic conditions. As in most situations of microbial degradation; cold and, dry or saturated soils decrease the decomposition rate, while warm moist soils increase it.

Aquatic

The fate of the butoxyethyl ester of Triclopyr (TBEE) in water is summarized in Figure 1. This diagram shows the major degradation pathways for the ester in water, but does not include processes such as sediment and particulate adsorption. The fate of the ester in water has also been simulated with a modelling technique by McCall et al., 1988 (115). A recent study by Woodburn (116) with the triethylamine salt of Triclopyr experimentally applied to a lake in Florida also provides useful comparative data on the persistence of Triclopyr degradation products. The degradation path is believed to be TBEE to Triclopyr acid to 3,5,6—trichloro-2-pyridinol (TCP) to non-halogenated organic acids.

TBEE degrades quite rapidly in water to Triclopyr acid. Laboratory studies indicate that photolysis is the principal degradation pathway with hydrolysis also contributing (117, 118). Several studies indicate that the half-life of the ester in water can range from 1.5—2 days as a result of photolysis (117, 119). Hydrolysis half—lives are dependent upon water pH and temperature and range from 0.06 d to 208 d in natural waters. They decrease with increasing temperature and increasing pH. Acidic conditions increase the persistence of the ester substantially. The 208 d half—life was observed in natural unbuffered water at pH 5 and 15°C. Waters with this pH level occur in Massachusetts. One laboratory study has produced contradictory results where the ester was stable to hydrolysis, and little photodegradation of the ester occurred over 9 months (120). This study however was performed with buffered, sterile water. Modelling results for the dissipation of the ester indicate that decay should be fairly rapid with a half-life of 12-18 hours (115).

The acid is short-lived in the aquatic environment with reported half—lives of from 2.1 hours at the water's surface in summer at **40deg** N latitude to 14 hr at 1m water depth in winter (117). The principal decay product of the acid is 3,5,6-trichloro-2-pyridinol (TCP), a transient metabolite in water with half—lives ranging from minutes to one day (121). TCP rapidly degrades into nonhalagenated, low molecular weight organic acids (116,121), with phototransformation playing a larger role than hydrolysis in this process.

Salomon et al. (118) demonstrated a half—life of 3.8-4.3 days at l6-17 deg C for the ester to TCP step in an Ontario Lake. Woodburn (116) added Triclopyr salt to a Florida lake and determined a half—life of 0.5—3.6 d at 300 C for the salt to organic acid step. The time scales of both of these studies are in general agreement with the other data on the time course of breakdown for the ester (or salt) to organic acids. With the exceptions of the Hamaker (120) study and a slow breakdown at pH 5, most studies indicate that TBEE in water is degraded relatively rapidly.

TOXICITY REVIEW

Acute (Mammalian)

The Triclopyr toxicity database has been reviewed in several places including the GEIR on the Control of Vegetation on Utility and Railroad Rights-of-Way in Massachusetts (14), Herbicide Handbook Weed Science Society of America (10), and by the U.S. Forest Service (15). Several Dow Publications review the Triclopyr information (101) and Garlon products (102 and 103).

The oral LD5O for Triclopyr in rats is 729 mg/kg in males and 630 mg/kg in females (15, 101).

The rat oral LD5O for combined sexes has been reported as 713 mg/kg (10, 14). Rabbits and guinea pigs are more susceptible to oral administration of Triclopyr with LDSOs of 550 and 310 mg/kg respectively (14, 15, 10). The Garlon products have oral LD5Os of greater than 2000 mg/kg (10, 14, 15, 101, 103, 103).

The dermal LD5Os are greater than 2000 mg/kg in rabbits (Triclopyr), and greater than 3980 mg/kg in rabbits for Garlon 4 and Garlon 3A (101, 102, 103)

The effects of Triclopyr on the eye are dependent on the chemical derivative involved: the butoxyethyl ester found in Garlon 4 is essentially non—irritating (102, 15, 14, and 101), while the triethylamine salt is not only an irritant but can cause serious injury (101, 14, 15). These eye injuries include conjunctival irritation, moderate internal redness and moderate to severe corneal damage which may be permanent (14). An inhalation study showed that 100% of the test rats survived a 1 hour exposure to 3 to 20 dilutions of Garlon 3A in air. Transitory nasal irritation to rats was noted after a 4 hour exposure to Garlon 4 aerosol (14).

Metabolism

Two studies, one dermal and one oral have been done in humans to determine pharmacokinetic and metabolic profiles. Five mg/kg acid equivalent (ae) was applied to the forearm of 5 volunteers in the dermal study. One point five eight percent to 1.11% of the applied dose was absorbed and the percutaneous absorption half -life was 16.8 hours (108). In the oral study, 6 volunteers received 0.1 or 0.5 mg/kg Triclopyr (acid equivalent) in apple juice. The excretion half—life is 5 hours and 80% of the dose is recovered as unchanged Triclopyr in the urine (109). The 20% which was unaccounted for could be attributed to one of several explanations including incomplete collections of urine, incomplete absorption of material or metabolism to an unknown metabolite.

Subchronic/Chronic Studies (Mammalian)

Long—term bioassays have been done using Triclopyr in rats (107) and mice (106). Summaries of these studies, provided by Dow Chemical Company have been reviewed for this discussion.

Fischer 344 rats received 5, 20, 50 or 250 mg/kg/d in a preliminary 13 week study. There was a decrease in body weight gain at 50 and 250 mg/kg/d and kidney effects were observed in both sexes at doses of 20 mg/kg or greater (107). In the full two year study, the doses were 0, 3, 12 and 36 mg/kg/d. The dose related effects in the males were increased body weight at 12 and 36 mg/kg/d, and in females there was an increase in pigmentation in the proximal tubules at 3, 12 and 36 mg/kg/d. Neither the weight increase in the males nor the increased pigmentation in the females were accompanied by morphological, histological or functional changes. The NOAEL for males and females was reported to be 3 mg/kg/d (107).

In the mouse bioassay, ICR mice received Triclopyr in their diets for twenty-two months. The doses were 0, 50, 250, 1250 ppm (0, 5, 55, 28.6 and 143 mg/kg/d in males and 0, 5.09, 26.5 and 135 mg/kg/d in females). The range finding study included doses of 0, 200, 400, 800, 1600 or 3200 ppm. At the high dose there were decreases in body weight, anemia, changes in urine, increase in cholesterol levels and multiple changes in liver functions. Some of the liver changes were also observed in the 1600 and 800 ppm groups. There were decreases in body weights, changes in kidney and urine (at various doses and points in time) and liver effects at the 1250 ppm dose. At 250 ppm there were mild kidney effects and the NOEL was reported as 50 ppm (5.55 and 5.09 mg/kg/d for males and females respectively) (106).

In subchronic studies, the 90 day dietary NOELs were 30 mg/kg/d and 20 mg/kg/d for rats and mice, respectively. Dogs were more sensitive to dietary administration of Triclopyr, with kidney

effects (decrease in excretion) at 2.5 mg/kg/d (14, 101). Dogs refused to eat food that would result in doses of 30 and 100 mg/kg (104). In a one year study, dogs received doses of 0. 0.5, 2.5 or 5.0 mg/kg/d. Minimal kidney effects were observed at 2.5 and 5.0 mg/kg/d. These findings were considered non—adverse by Dow making the NOAEL 5.0 mg/kg/d and the NOEL 0.5 mg/kg/d (105).

Two monkey studies were done to investigate kidney effects in primates. In one study, the monkeys received 0, 10, 20 or 30 mg/kg/d in diet for 28 days. There was no effect on urinary excretion or other responses observed (101, 104). In a second study, 4 monkeys received Triclopyr at 5 mg/kg/d for 28 days, the dose was then increased to 20 mg/kg/d for 102 days. The effects observed in this study were stool softening and diarrhea (104).

Oncocrenicitv Studies

There have been two chronic bioassays done for Triclopyr. Rats received 0, 3, 12 or 36 mg/kg/d and mice received 0, 50, 250 or 1250 ppm (0, 5.55, 28.6, 143 mg/kg/d for males and 0, 5.09, 26.5 and 135 mg/kg/d for females). The only positive result was an increase in combined incidence of mammary adenomas and adenocarcinomas in the female rats at the high dose. There was no evidence of multiple tumors and the effect was not dose related (107, 106).

Mutagenicitv Testing

Triclopyr has been tested for mutagenicity in a variety of test systems and found to be weakly positive in one, the dominant lethal study in rats. Triclopyr was non-mutagenic in bacterial assay systems, cytogenic assays, and mouse dominant lethal studies (15).

Developmental Studies

The teratology of Triclopyr was investigated using the rabbit model. Doses in the range finding study were 0, 25, 50, 100 and 200 mg/kg. There was 50% and 71% mortality in the 100 and 200 mg/kg groups respectively. The doses used in the full study were 0, 10, 25 and 75 mg/kg/d for days 6 to 18 of gestation. There were 16 rabbits per dose group. One dam in the 25 mg/kg/d group aborted and one dam in the 75 mg/kg/d group died. In the 25 mg/kg group one fetus had hyperplasia of the aortic arch with pulmonary arterial semilunar valve stenosis. Another fetus had a missing gall bladder. There was a statistically significant but non-dose related increase in resorptions at 10 mg/kg/d. This increase was within historical control variability. The developmental NOEL was reported as 75 mg/kg/d with a slight increase in maternal mortality (110)

Tolerances and Other Guidelines

Tolerances are set for Triclopyr on 5 raw agricultural commodities:
grasses, forage (500 ppm); grasses, forage, hay (500 ppm); milk (0.01 ppm); meat, fat and meat by products (except liver and kidney) of cattle, goats, hogs, horses, and sheep (0.05 ppm); and liver and kidney of cattle, goats, hogs, horses, and sheep (0.5) ppm (8).

The Dow internal guideline for inhalation exposure to Triclopyr is 10 milligrams/cubic meter (102, 103).

Avian

The toxic effects of Triclopyr on birds have been investigated in a small number of studies

conducted by the Dow Chemical Company. For mallard ducks, acute oral LCSOs are reported at 1,698 mg/kg for unformulated Triclopyr, 3,176 mg/kg for Garlon 3A, and 4,640 mg/kg for Garlon 4. Eight day subchronic oral LC5Os are reported as follows for the various triclopyr formulations:

Triclopyr	mallard duck	LC5O = 5,000 ppm
	bobwhite quail	LC5O = 2,935 ppm
	Japanese quail	LCSO = 3,278 ppm
Garlon 3A	mallard duck	LC5O=10,000 ppm
	bobwhite quail	LC5O=11,622 ppm
Garlon 4	mallard duck	LCSO=l0,000 ppm
	bobwhite quail	LC5O=9,026 ppm

Source: (15)
The data summarized above indicate low acute and subchronic toxicity to the bird species tested. No field studies on the toxic effects of Triclopyr or its formulations in birds have been reported (15).

Invertebrates

Very little data were available on the invertebrate and microorganism toxicity of Triclopyr. The data reported are primarily for the triethylamine salt (Garlon 3A) and were generated by the Dow Chemical Company.

The data indicate low acute lethal toxicity* to organisms tested, with a 96 hr LC5O of 895 ppm in shrimp, 96 hr LC5O greater than 1000 ppm in crabs, and 48 hr LC5Os ranging between 56 and 87 ppm in oysters (15). The 48 hr LC5O for Daphnia is reported as 1,170 ppm (15). After 72 hours of incubation with 500 ppm of Triclopyr, no apparent effects on growth were observed in six soil microorganisms when compared to a control (15).

No information was obtained on the invertebrate toxicity of Garlon 4, the butoxyethyl ester of Triclopyr.

Aquatic

The available information on Triclopyr toxicity to fish indicate a wide response of fish to the two formulations of Triclopyr and to unformulated Triclopyr. The butoxyethyl ester of Triclopyr (Garlon 4) is "highly toxic to fish", based upon the Clarke et al. criteria. The 96 hour LC5O values for rainbow trout and bluegill sunfish are 0.74 and 0.87 ppm respectively (15). The corresponding value for juvenile Coho salmon is 1.3 ppm (122).

The triethylamine salt formulation (Garlon 3A) is "slightly toxic" to fish with 96 hour LC5Os of 552 and 891 ppm for rainbow trout and bluegills respectively. The corresponding values for unformulated Triclopyr are 117 ppm for rainbow trout and 148 ppm for bluegill. Both fish species were less sensitive to Garlon 3A than to the active ingredient (15).

No fish toxicity data are available for 3,5,6—trichloro—2—pyridinol (TCP), the intermediate breakdown product from the Triclopyr acid to the non—halogenated organic acid end product.

Dow Chemical Company reports that in natural soil and aquatic environments, both amine and ester formulations rapidly convert (photodegrade) to Triclopyr acid, which in turn is neutralized to a salt at normal environment pH (5.5-6.5)(15). No information is provided with any of the fish toxicity data on the actual form of Triclopyr present in the test water. The persistence data summarized in a previous section and the simulation results of McCall et al. (115), however

provide a description of the probable fate of Triclopyr in the toxicity test tanks. The majority of the fish mortalities during the toxicity tests with bluegill sunfish and rainbow trout exposed to the ester occurred during the first 24 hours of the test: a pattern consistent with the change of the toxic ester form to less toxic breakdown products during this period (124).

EXPOSURE ASSESSMENT

For the exposure assessment, we have chosen to analyze the fate of the butoxyethyl ester form of Triclopyr (Garlon 4) in water because of its reported high aquatic toxicity in laboratory studies. Garlon 4 would be applied basally at an average application rate of 0.5 pints per acre for the proposed utility program.

- In aquatic organisms, LC5Os greater than 10 ppm are considered to be indicative of only slight toxicity and LC5Os less than 1 ppm are considered to reflect high acute toxicity (Clarke et al., 1970 as referenced in [15]).

Since Garlon 4 contains 61.6% of the active ingredient, this application could distribute 37 mg Triclopyr BEE/m^2. The requested maximum application rate is 2 pints per acre.

Two aquatic exposure scenarios have been constructed to evaluate the potential contamination of non-target surface waters with Garlon 4 from a typical land application. The first, most extreme, and very unlikely scenario is for the case of a static stream traversing a treated acre with a percentage of all of the herbicide applied to the acre running into the water. The second represents a more shallow, static stream or standing water body of much less volume with runoff from a portion of the bordering land.

SCENARIO (1)

ASSUMPTIONS:

Application rate = 0.5 pint/acre
0.47 L/pint
61.6% active ingredient
20% of herbicide applied to acre runs off
density of applied herbicide = 1.0 g/ml

RUNOFF:

0.20 x 0.5 pt/acre x 0.47 L/pt x 0.616 = 0.03 L/acre

RECEIVING WATER:

Static stream crossing a treated acre
Dimension: 0.3 x 1.22 x 64 m = 23.4 **in^3** (volume)

DILUTION:

0.03L into 23.4 m = 1.3 mL/m^3
1.3 mL/m^3 x 1 m^3 /10^3 L = 1.3 x 10 mL/L
1.3 x 10^{-3} mL/L x 1 g/ml x 10^3 mg/g = 1.3 mg TBEE/L

SCENARIO (2)

ASSUMPTIONS:

Application Rate = 0.5 pt/acre
0.47 L/pt
61.6% active ingredient **2**
20% of herbicide applied to 3m^2 runs off
density of applied herbicide = 1.0 g/ml

RUNOFF:

0.2 x 0.5 pt/acre x 0.47 L/pt x 0.616 x 2.47
x 10^{-4}acre/m^2 x 10 mL/L x 3 m^2 = 0.02 mL

RECEIVING WATER:

Static stream,
Dimensions: 0.15 x 1 x 5 m = 0.75 m^3 (volume)

DILUTION:

0.02 mL into 0.75 m3 = 0.03 mL/m^3
0.03 mL/m^3 x 10^{-3} m /L x 10^3 mg/g x 1 g/ml = 0.03 mg/L

The calculations presented above illustrate that the probable immediate post—runoff concentrations of TBEE in static water bodies will be in the sub-parts per million range. At maximum application rates (2 pts/acre), these concentrations would range from about 0.1 to 5.2 mg/L. The concentrations for the worst exposure scenario (#1) are greater than (7x) the 96 hour LC5O concentrations for freshwater fish; those for the other scenario are almost an order of magnitude less. The no effect level for TBEE with juvenile Coho salmon is ≤1.0 mg/L (122). Therefore, under the worst exposure scenario with the maximum application rate of herbicide, the 96 hour LC5O could be exceeded. Under other, less extreme conditions at average application rates, predicted concentrations of the active ingredient would be substantially less than the reported no effect level in Coho salmon. The persistence characteristics of TBEE are such that the ester form of Triclopyr would not likely persist in surface waters for longer than a couple of days, except in those waters in Massachusetts which are acidic where the ester may persist for up to several months. It is also very unlikely that rainbow trout would be impacted at application rates of 0.5 pts/acre based on the reasonable scenario (#2) which predicts water concentrations of Garlon 4 less than toxic concentrations.

The following factors would also tend to reduce the exposure concentrations that fish would experience: flowing waters would provide greater dilution than assumed for static conditions; the Massachusetts Right-of-Way Management Act mandates an application setback of 10 feet from standing or flowing waters or from wetlands (33 CMR 11.04:(l) and (4) (a)); and actual runoff of the applied herbicide would probably be less than used for these sample calculations. Scenario 1 represents an extremely unlikely event where 20% of all the herbicide applied to an acre runs off into a small water course. The conditions which would foster this type of runoff across setbacks (i.e. heavy rains) would tend to turn static stream systems into flowing water courses and hence increase dilution.

The application rate used in the previous non—target species assessment (June 23, 1990) was 0.5 pints per acre applied basally. The utilities involved in managing rights-of-way and the manufacturer of Garlon 4 have since indicated that the required application rate may range as high as 2-3 quarts of Garlon 4 per acre for effective control of vegetation. The following addition to the exposure assessment examines the resultant changes in the predicted exposure concentrations that might occur in freshwater fish habitats when Garlon 4 is applied at the 2-3 quarts /acre rate.

The change in the application rate will result in the following differences in predicted exposure concentrations from those originally predicted for 0.5 pts/acre:

$\frac{2 \text{ at/acre}}{0.5 \text{ pt/acre}}$ x 2pt/ qt = x 8

$\frac{3 \text{at/acre}}{}$ x 2pt/qt = x 12

0.5 pt/acre

Application rates will therefore be 8-12 times greater than for the 0.5 pts/acre case. The probable concentrations in water after runoff as previously predicted were 1.3 (Scenario 1) and 0.03 mg/L (Scenario 2) ing butoxyethyl ester of Triclopyr / L. These concentrations would therefore range from 0.24 — 15.6 ing/L for application rates between two and six quarts.

These predicted concentrations encompass and substantially exceed the reported LCSO concentrations for fish (in range of 0.7 - 1.3 mg/L and the NOEL of 1 mg/L for juvenile Coho salmon. The more realistic exposure scenario (#2) predicts exposure concentrations of the same order of magnitude as the LC5O values.

Given that the higher application rates required for vegetation control in some areas have the potential to produce potentially lethal concentrations of the butoxyethyl ester of Triclopyr to fish in water as a result of runoff, a setback greater than the mandated 10 feet from standing or flowing waters (333 CMR 11.04: (1) and (4) (a)) will provide an additional level of protection when application rates exceed 0.5 pts/acre.

SUMMARY

Triclopyr exhibits moderate mobility in most of the soils tested. Soils with higher organic carbon content would be expected to retard the mobility of Triclopyr. Trichloropyridinol, the major breakdown product, is less mobile than Triclopyr.

Microbial degradation is the primary mechanism by which Triclopyr is degraded in soils. Degradation rates are variable and appear to be dependent on the soil and climatic conditions. In Massachusetts conditions, Triclopyr can be expected to have moderate persistence when applied in warm weather (late spring —early fall), and slightly longer persistence in colder weather.713 mg/kg. Rabbits and guinea pigs have oral LDSOs of 550 and 310 mg/kg respectively. The target organ for Triclopyr is in the liver. The only positive result in the oncogenicity studies was an increase in the combined incidence of mammary adenomas and adenocarcinoinas in the female rats at the high dose. Mutagenicity tests were negative. The developmental NOEL was reported as 75 mg/kg/d with a slight increase in maternal mortality. Using EPA's carcinogen classification scheme, Triclopyr may be considered a group C carcinogen (possible human carcinogen: limited animal evidence).

RECOMMENDATION

The herbicide Garlon 4, containing the butoxyethyl ester of Triclopyr (EPA Reg. No. 464-554), is recommended for use in sensitive areas only at application rates of 0.5 pt/acre pursuant to 333 CMR 11.00. Applications at rates up to three quarts per acre are permitted with a setback of 50 feet from standing or flowing waters suitable for fish habitat. The set back restriction may be waived upon demonstration to both the Departments of Food and Agriculture and Environmental Protection that runoff concentrations from applications of Garlon 4 with setbacks less than 50 feet do not pose a threat to fish.

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Appendix 8

Herbicide Labels

Specimen Label

Dow AgroSciences

Accord® Concentrate

Herbicide

For control of annual and perennial weeds and woody plants in forests, non-crop sites, and in and around aquatic sites; also for use in wildlife habitat areas, for perennial grass release, and grass growth suppression and grazed areas on these sites.

Avoid contact of herbicide with foliage, green stems, exposed non-woody roots or fruit of crops, desirable plants and trees, because severe injury or destruction may result.

Active Ingredient(s):	
glyphosate† N-(phosphonomethyl)glycine, isopropylamine salt	53.8%
Inert Ingredients	46.2%
Total Ingredients	100.0%

†Contains 5.4 pounds per gallon glyphosate, isopropylamine salt (4 pounds per gallon glyphosate acid).

EPA Reg. No. 62719-324

Keep Out of Reach of Children

CAUTION PRECAUCION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

Precautionary Statements

Hazards to Humans and Domestic Animals

Harmful If Inhaled

Avoid breathing spray mist. Remove contaminated clothing and wash before reuse. Wash thoroughly with soap and water after handling.

Personal Protective Equipment (PPE)

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks.

Follow manufacturer's instructions for cleaning/maintaining PPE (Personal Protective Equipment). If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

Engineering Controls

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d) (4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

First Aid

If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-992-5994 for emergency medical treatment information.

Environmental Hazards

Do not contaminate water when cleaning equipment or disposing of equipment washwaters. Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss can cause fish suffocation.

In case of leak or spill, soak up and remove to a landfill.

Physical or Chemical Hazards

Spray solutions of this product should be mixed, stored and applied using only stainless steel, aluminum, fiberglass, plastic or plastic-lined steel containers.

Do not mix, store or apply this product or spray solutions of this product in galvanized steel or unlined steel (except stainless steel) containers or spray tanks. This product or spray solutions of this product react with such containers and tanks to produce hydrogen gas, which may form a highly combustible gas mixture. This gas mixture could flash or explode, causing serious personal injury, if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source.

Notice: Read the entire label. Use only according to label directions. **Before using this product, read Terms and Conditions of Use, Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies elsewhere on this label. If terms are unacceptable, return at once unopened.**

In case of emergency endangering health or the environment involving this product, call 1-800-992-5994. If you wish to obtain additional product information, visit our web site at www.dowagro.com.

Agricultural Chemical: Do not ship or store with food, feeds, drugs or clothing.

Directions for Use

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.
Read all Directions for Use carefully before applying.

This is an end-use product. Dow AgroSciences does not intend and has not registered it for reformulation. See individual container label for repackaging limitations.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your state or tribe, consult the agency responsible for pesticide regulation.

Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE), and restricted entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 4 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Chemical-resistant gloves made of any waterproof material
- Shoes plus socks

Storage and Disposal

Do not contaminate water, food, feed or seed by storage or disposal.
Pesticide Storage: Store above 10°F (-12°C) to keep product from crystallizing. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room 68°F (20°C) for several days to redissolve and roll or shake container or recirculate in mini-bulk containers to mix well before using.
Pesticide Disposal: Wastes resulting from use of this product that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticide disposal or in accordance with applicable Federal, state or local procedures.
Container Disposal: Emptied container retains vapor and product residue. Observe all labeled safeguards until container is cleaned, reconditioned or destroyed. Do not reuse this container. Triple rinse (or equivalent). Then puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

General Information (How this product works)

This product is a water-soluble liquid, which mixes readily with water and nonionic surfactant to be applied as a foliar spray for the control or destruction of many herbaceous and woody plants. This product is intended for control of annual and perennial weeds and woody plants in forests, pine straw plantations, non-crop sites such as utility rights-of-way, and in and around aquatic sites; also for use in wildlife habitat areas, for perennial grass release, and grass growth suppression and grazed areas on these sites.

The active ingredient in this product moves through the plant from the point of foliage contact to and into the root system. Visible effects on most annual weeds occur within 2 to 4 days, 7 days or more on most perennial weeds, and 30 days or more on most woody plants. Extremely cool or cloudy weather following treatment may slow the activity of this product and delay visual effects of control. Visible effects include gradual wilting and yellowing of the plant which advances to complete browning of above-ground growth and deterioration of underground plant parts.

Unless otherwise directed on this label, delay application until vegetation has emerged and reached the stages described for control of such vegetation under the "Weeds Controlled" section of this label.

Unemerged plants arising from unattached underground rhizomes or root stocks of perennials or brush will not be affected by the spray and will continue to grow. For this reason best control of most perennial weeds or brush is obtained when treatment is made at late growth stages approaching maturity.

Always use the higher rate of this product and surfactant within the recommended range when vegetation is heavy or dense, when treating dense multi-canopied sites or woody vegetation or difficult-to-control herbaceous or woody plants.

Do not treat weeds, brush or trees under poor growing conditions such as drought stress, disease or insect damage, as reduced control may result. Reduced control of target vegetation may also occur if foliage is heavily covered with dust at the time of treatment.

Reduced control may result when applications are made to woody plants or weeds following site disturbance or plant top growth removal from grazing, mowing, logging or mechanical brush control. For best results, delay treatment of such areas until resprouting and foliar growth has restored the target vegetation to the recommended stage of growth for optimum herbicide exposure and control.

Rainfall or irrigation occurring within 6 hours after application may reduce effectiveness. Heavy rainfall or irrigation within 2 hours after application may wash the product off the foliage and a repeat treatment may be required.

This product does not provide residual weed control. For subsequent residual weed control, follow a label-approved herbicide program. Read and carefully observe the cautionary statements and all other information appearing on the labels of all herbicides used.

Note: The maximum rates stated throughout this product's labeling apply to this product combined with the use of all other herbicides containing glyphosate or sulfosate as the active ingredient, whether applied as mixtures or separately. Calculate the application rates and ensure that the total use of this and other glyphosate or sulfosate containing products does not exceed the maximum use rates.

Grazing Restrictions: This product may be used to treat undesirable vegetation in utility rights-of-way that pass through pastures, rangeland, and forestry sites that are being grazed. For tank mix applications, comply with all restrictions appearing on the tank mix product label.

Except for lactating dairy animals there are no grazing restrictions following the labeled applications of this product.

- For lactating dairy animals there are no grazing restrictions for the following labeled applications of this product:
  - ▶ Where the spray can be directed onto undesirable woody brush and trees, such as in handgun spray-to-wet or low volume directed spray treatments.
  - ▶ For tree injection of frill applications and for cut stump treatments
- For broadcast applications, observe the following restrictions for lactating dairy animals:
  - ▶ For application rates of greater than 4.5 but not to exceed 7.5 quarts per acre, no more than 15 percent of the available grazing area may be treated.
  - ▶ For application rates that do not exceed 4.5 quarts per acre, no more than 25 percent of the available grazing area may be treated.
- These restrictions do not apply to pastures, rangeland or forestry sites outside of utility rights-of-way.

NOTE: Use of this product in any manner not consistent with this label may result in injury to persons, animals or crops, or other unintended consequences. When not in use, keep container closed to prevent spills and contamination.

Buyer and all users are responsible for all loss or damage in connection with the use or handling of mixtures of this product or other materials that are not expressly recommended in this label. Mixing this product with herbicides or other materials not recommended in this label may result in reduced performance.

ATTENTION: Avoid drift. Extreme care must be used when applying this product to prevent injury to desirable plants and crops.

Do not allow the herbicide solution to mist, drip, drift or splash onto desirable vegetation since minute quantities of this product can cause severe damage or destruction to the crop, plants or other areas on which treatment was not intended. The likelihood of plant or crop injury occurring from the use of this product is greatest when winds are gusty or in excess of 5 miles per hour or when other conditions, including lesser wind velocities, will allow spray drift to occur. When spraying, avoid combinations of pressure and nozzle type that will result in splatter or fine particles (mist) which are likely to drift. **Avoid applying at excessive speed or pressure.**

Spray Drift Management

Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment-and-weather-related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions. The following drift management requirements must be followed to avoid off-target drift movement from aerial applications to agricultural field crops. These requirements do not apply to forestry applications, public health uses or to applications using dry formulations.

1. The distance of the outer most nozzles on the boom must not exceed 3/4 the length of the wingspan or rotor.
2. Nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees. Where states have more stringent regulations, they should be observed.

The applicator should be familiar with and take into account the information covered in the following **Aerial Drift Reduction Advisory Information**:

Importance of Droplet Size: The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see Wind, Temperature and Humidity, and Temperature Inversion section of this label).

Controlling Droplet Size: Volume-Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows product larger droplets.

Pressure-Use the lower spray pressures recommended for the nozzle. Higher pressure reduces droplet size and does not improve canopy penetration. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.

Number of nozzles-Use the minimum number of nozzles that provide uniform coverage.

Nozzle Orientation-Orienting nozzles so that the spray is released backwards, parallel to the airstream will produce larger droplets than other orientations. Significant deflection from the horizontal will reduce droplet size and increase drift potential.

Nozzle Type-Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce larger droplets than other nozzle types.

Boom Length-For some use patterns, reducing the effective boom length to less than 3/4 of the wingspan or rotor length may further reduce drift without reducing swath width.

Application-Applications should not be made at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

Swath Adjustment: When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase, with increasing drift potential (higher wind, smaller drops, etc.).

Wind: Drift potential is lowest between wind speeds of 2-10 mph. However, many factors, including droplet size and equipment type determine drift potential at any given speed. Application should be avoided below 2 mph due to variable wind direction and high inversion potential. Note: Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect drift.

Temperature and Humidity: When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

Temperature Inversions: Applications should not occur during a temperature inversion, because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a connected cloud (under low wind conditions) indicates an inversion, while smoke that moves upwards and rapidly dissipates indicates good vertical air mixing.

Sensitive Areas: The pesticide should only be applied when the potential for drift to adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is minimal (e.g., when wind is blowing away from the sensitive areas).

Mixing And Application Instructions

Apply these spray solutions in properly maintained and calibrated equipment capable of delivering desired volumes. Hand-gun applications should be properly directed to avoid spraying desirable plants. Note: reduced results may occur if water containing soil is used, such as water from ponds and unlined ditches.

Mixing

This product mixes readily with water. Mix spray solutions of this product as follows:

1. Fill the mixing or spray tank with the required amount of water while adding the required amount of this product (see "Directions for Use" and "Weeds Controlled" sections of this label).
2. Near the end of the filling process, add the required surfactant and mix well. Remove hose from tank immediately after filling to avoid siphoning back into the water source.

Note: If tank mixing with Garlon® 3A herbicide, ensure that Garlon 3A is well mixed with at least 75 percent of the total spray volume before adding this product to the spray tank to avoid incompatibility.

During mixing and application, foaming of the spray solution may occur. To prevent or minimize foam, avoid the use of mechanical agitators, place the filling hose below the surface of the spray solution (only during filling), terminate by-pass and return lines at the bottom of the tank, and, if needed, use an approved anti-foam or defoaming agent.

Keep by-pass line on or near bottom of tank to minimize foaming. Screen size in nozzle or line strainers should be no finer than 50 mesh. Carefully select correct nozzle to avoid spraying a fine mist. For best results with conventional ground application equipment, use flat fan nozzles. Check for even distribution of spray droplets.

IMPORTANT: When using this product, unless otherwise specified, mix with a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient. For conifer release (pine release) use only surfactants that are approved for conifer release, and specified on the surfactant label as safe for use in conifer release (pine release).
Always read and follow the manufacturer's surfactant label recommendations for best results.

Colorants or marking dyes approved for use with herbicides may be added to spray mixtures of this product. Colorants or dyes used in spray solutions of this product may reduce performance, especially at lower rates or dilutions. Use colorants or dyes according to the manufacturer's label recommendations.

Clean sprayer and parts immediately after using this product by thoroughly flushing with water and dispose of rinsate according to labeled use or disposal instructions.

Carefully observe all cautionary statements and other information appearing in the surfactant label.

Application Equipment And Techniques

ATTENTION: AVOID DRIFT. EXTREME CARE MUST BE EXERCISED WHEN APPLYING THIS PRODUCT TO PREVENT INJURY TO DESIRABLE PLANTS AND CROPS.

Do not allow the herbicide solution to mist, drip, drift, or splash onto desirable vegetation since minute quantities of this product can cause severe damage or destruction to crops, plants, or other areas on which the treatment was not intended. The likelihood of plant or crop injury occurring from the use of this product is greatest when winds are gusty or in excess of 5 miles per hour or when other conditions, including lesser wind velocities, will allow spray drift to occur. When spraying, avoid combinations of pressure and nozzle type that will result in splatter or fine particles (mist) which are likely to drift. AVOID APPLYING AT EXCESSIVE SPEED OR PRESSURE.

Note: Use of this product in a manner not consistent with this label may result in injury to persons, animals, or crops, or other unintended consequences. When not in use, keep container closed to prevent spills and contamination.

Aerial Equipment

See the supplemental label for use of this product by air in California.

For control of weed or brush species listed in this label using aerial application equipment: For aerial broadcast application, unless otherwise specified, apply the rates of this product and surfactant recommended for broadcast application in a spray volume of 3 to 20 gallons of water per acre. See the "Weeds Controlled" section of this label for labeled annual and herbaceous weeds and woody plants and broadcast rate recommendations. Aerial applications of this product may only be made as specifically recommended in this label. For aerial application of this product in California, refer to Federal supplemental label for this product entitled "For Aerial Application in California Only". In California, aerial application may be made in aquatic sites and noncrop areas, including aquatic sites present in noncrop areas that are part of the intended treatment.

Forestry and Utility Rights-of-Way Sites: It is recommended that this product be applied by helicopter only in forestry sites and utility rights-of-way. Apply the rate of this product and surfactant recommended for broadcast sprays in a spray volume of 5 to 30 gallons per acre.

In California, aerial application may be made only in non-residential, forestry sites or chaparral areas.

AVOID DRIFT. Do not apply during inversion conditions, when winds are gusty or under any other condition which will allow drift. Drift may cause damage to any vegetation contacted to which treatment is not intended. To prevent injury to adjacent desirable vegetation, appropriate buffer zones must be maintained.

Coarse sprays are less likely to drift; therefore, do not use nozzles or nozzle configurations which dispense spray as fine spray droplets. Do not angle nozzles forward into the airstream and do not increase spray volume by increasing nozzle pressure.

Drift control additives may be used. When a drift control additive is used, read and carefully observe the cautionary statements and all other information appearing in the additive label. The use of a drift control agent for conifer and herbaceous release applications may result in conifer injury and is not recommended.

Ensure uniform application. To avoid streaked, uneven or overlapped application, use appropriate marking devices.

Thoroughly wash aircraft, especially landing gear, after each day of spraying to remove residues of this product accumulated during spraying or from spills. **Prolonged exposure of this product to uncoated steel surfaces may result in corrosion and possible failure of the part. Landing gear are most susceptible.** The maintenance of an organic coating (paint) which meets aerospace specification MIL-C-38413 may prevent corrosion.

Ground Broadcast Equipment

For control of weed or brush species listed in this label using conventional boom equipment: For ground broadcast application, unless otherwise specified, apply the rates of this product and surfactant recommended for broadcast application in a spray volume of 3 to 30 gallons of water per acre. See the "Weeds Controlled" section of this label for labeled annual and herbaceous weeds and woody plants and broadcast rate recommendations. As density of vegetation increases, spray volume should be increased within the recommended range to ensure complete coverage. Carefully select correct nozzle to avoid spraying a fine mist. For best results with ground application equipment, use flat fan nozzles. Check for even distribution of spray droplets.

Forestry and Utility Rights-of-Way Sites: This product is recommended for broadcast applications using suitable ground equipment in forestry sites, utility sites, and utility rights-of way. Apply the recommended rates of this product and surfactant in a spray volume of 10 to 60 gallons per acre. Check for even distribution of spray droplets.

Hand-Held and High-Volume Equipment (Use Coarse Sprays Only)

For control of weeds listed in this label using knapsack sprayers or high-volume spraying equipment utilizing handguns or other suitable nozzle arrangements:

High volume sprays: Prepare a **3/4 to 2 percent solution** of this product in water, add a nonionic surfactant and apply to foliage of vegetation to be controlled. For specific rates of application and instructions for control of various annual and perennial weeds, see the "Weeds Controlled" section in this label.

Applications should be made on a spray-to-wet basis. Spray coverage should be uniform and complete. Do not spray to point of runoff.

Low volume directed sprays: This product may be used as a **5 to 10 percent solution** in low-volume directed sprays for spot treatment of trees and brush. This treatment method is most effective in areas where there is a low density of undesirable trees or brush. If a straight stream nozzle is used, start the application at the top of the targeted vegetation and spray from top to bottom in a lateral zig-zag motion. Ensure that at least 50 percent of the leaves are contacted by the spray solution. For flat fan and cone nozzles and with hand-directed mist blowers, mist the application over the foliage of the targeted vegetation. Small, open-branched trees need only be treated from one side. If the foliage is thick or there are multiple root sprouts, applications must be made from several sides to ensure adequate spray coverage.

Prepare the desired volume of spray solution by mixing the amount of this product in water, shown in the following table:

Spray Solution

Desired Volume	Amount of this product							
	3/4%	1%	1 1/4%	1 1/2%	2%	5%	8%	10%
1 gal	1 fl oz	1 1/3 fl oz	1 2/3 fl oz	2 fl oz	2 2/3 fl oz	6 1/2 fl oz	10 1/4 fl oz	12 3/4 fl oz
25 gal	1 1/2 pt	1 qt	1 1/4 qt	1 1/2 qt	2 qt	5 qt	2 gal	2.5 gal
100 gal	3 qt	1 gal	1 1/4 gal	1 1/2 gal	2 gal	5 gal	8 gal	10 gal

2 tablespoons = 1 fluid ounce

For use in knapsack sprayers, it is suggested that the recommended amount of this product be mixed with water in a larger container. Fill the knapsack sprayer with the mixed solution and add the correct amount of surfactant.

Selective Equipment

This product may be applied through shielded sprayers or wiper application equipment. This equipment may be used to selectively control undesirable vegetation without harming desirable vegetation.

Shielded sprayers direct the herbicide solution onto weeds while shielding desirable vegetation from the spray solution. Any recommended rate or tank mixture of this product may be used employing this equipment.

Wiper applicators physically wipe product directly onto undesirable vegetation. Care should be taken to avoid wiping desirable vegetation. Use a 33 to 100 percent solution of this product, diluted in water for wiper applications. Use a 33 percent solution for wick or gravity feed systems. Higher concentrations may be used in pressurized systems that are capable of handling thicker solutions. Addition of a nonionic surfactant at a rate of 10 percent by volume of total herbicide solution is recommended.

Weeds Controlled

Annual Weeds

Apply to actively growing annual grasses and broadleaf weeds.

Allow at least 3 days after application before disturbing treated vegetation. After this period the weeds may be mowed, tilled or burned. See "Directions for Use," "General Information" and "Mixing and Application Instructions" for labeled uses and specific application instructions.

Broadcast Application Rates: For weeds less than 6 inches tall, use 1 1/2 pints of this product per acre plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient. If weeds are greater than 6 inches tall, use 2 1/2 pints of this product per acre plus a non-ionic surfactant containing 80% or greater active ingredient..

Hand-Held, High-Volume Application Rates: Use a 3/4 percent solution of this product in water plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient. Apply to foliage of vegetation to be controlled.

When applied as directed, this product **plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient will control the following annual weeds:**

Common Name	Scientific Name
Balsamapple †	*Momordica charantia*
Barley	*Hordeum vulgare*
Barnyardgrass	*Echinochloa crus-galli*
Bassia, fivehook	*Bassia hyssopifolia*
Bluegrass, annual	*Poa annua*
Bluegrass, bulbous	*Poa bulbosa*
Brome	*Bromus spp.*
Buttercup	*Ranunculus spp.*
Cheat	*Bromus secalinus*
Chickweed, mouseear	*Cerastium vulgatum*
Cocklebur	*Xanthium strumarium*
Corn, volunteer	*Zea mays*
Crabgrass	*Digitaria spp.*
Dwarfdandelion	*Krigia cespitosa*
Falseflax, smallseed	*Camelina microcarpa*
Fiddleneck	*Amsinckia spp.*
Flaxleaf fleabane	*Conyza bonariensis*
Fleabane	*Erigeron spp.*
Foxtail	*Setaria spp.*
Foxtail, Carolina	*Alopecurus carolinianus*
Groundsel, common	*Senecio vulgaris*
Horseweed/Marestail	*Conyza canadensis*
Kochia	*Kochia scoparia*
Lambsquarters, common	*Chenopodium album*
Lettuce, prickly	*Lactuca serriola*
Morningglory	*Ipomoea spp.*
Mustard, blue	*Chorispora tenella*
Mustard, tansy	*Descurainia pinnata*
Mustard, tumble	*Sisymbrium altissimum*
Mustard, wild	*Sinapis arvensis*
Oats, wild	*Avena fatua*
Panicum	*Panicum spp.*
Pennycress, field	*Thlaspi arvense*
Pigweed, redroot	*Amaranthus retroflexus*
Pigweed, smooth	*Amaranthus hybridus*
Ragweed, common	*Ambrosia artemisiifolia*
Ragweed, giant	*Ambrosia trifida*
Rocket, London	*Sisymbrium irio*
Rye	*Secale cereale*
Ryegrass, Italian ††	*Lolium multiflorum*
Sandbur, field	*Cenchrus spp.*
Shattercane	*Sorghum bicolor*
Shepherd's-purse	*Capsella bursa-pastoris*
Signalgrass, broadleaf	*Brachiaria platyphylla*
Smartweed, Pennsylvania	*Polygonum pensylvanicum*
Sowthistle, annual	*Sonchus oleraceus*
Spanishneedles ††	*Bidens bipinnata*
Stinkgrass	*Eragrostis cilianensis*
Sunflower	*Helianthus annuus*
Thistle, Russian	*Salsola kali*
Spurry, umbrella	*Holosteum umbellatum*

Common Name	Scientific Name
Velvetleaf	*Abutilon theophrasti*
Wheat	*Triticum aestivum*
Witchgrass	*Panicum capillare*

† Apply with hand-held equipment only.
†† Apply 3 pints of this product per acre.

Annual weeds will generally continue to germinate from seed throughout the growing season. Repeat treatments will be necessary to control later germinating weeds.

Perennial Weeds

Apply this product to control most vigorously growing perennial weeds. Unless otherwise directed, apply when target plants are actively growing and most have reached early head or early bud stage of growth. Unless otherwise directed, allow at least 7 days after application before disturbing vegetation.

NOTE: If weeds have been mowed or tilled, do not treat until regrowth has reached the recommended stages. Fall treatments must be applied before a killing frost.

Repeat treatments may be necessary to control weeds regenerating from underground parts or seed.

Specific Weed Control Recommendations: For perennial weeds, apply the recommended rate plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient.. Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information. .
When applied as directed, this product plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient will control the following perennial weeds: (Numbers in parentheses "(-)" following common name of a listed weed species refer to "Specific Perennial Weed Control Recommendations" for that weed which follow the species listing.)

Common Name	Scientific Name
Alfalfa (31)	*Medicago sativa*
Alligatorweed † (1)	*Alternanthera philoxeroides*
Anise/Fennel (31)	*Foeniculum vulgare*
Artichoke, Jerusalem (31)	*Helianthus tuberosus*
Bahiagrass (31)	*Paspalum notatum*
Bermudagrass (2)	*Cynodon dactylon*
Bindweed, field (3)	*Convolvulus arvensis*
Bluegrass, Kentucky (12)	*Poa pratensis*
Blueweed, Texas (3)	*Helianthus ciliaris*
Brackenfern (4)	*Pteridium spp.*
Bromegrass, smooth (12)	*Bromus inermis*
Canarygrass, reed (12)	*Phalaris arundinacea*
Cattail (5)	*Typha spp.*
Clover, red (31)	*Trifolium pratense*
Clover, white (31)	*Trifolium repens*
Cogongrass (6)	*Imperata clylindrica*
Cordgrass (7)	*Spartina spp.*
Cutgrass, giant † (8)	*Zizaniopsis miliacea*
Dallisgrass (31)	*Paspalum dilatatum*
Dandelion (31)	*Taraxacum officinale*
Dock, curly (31)	*Rumex crispus*
Dogbane, hemp (9)	*Apocynum cannabinum*
Fescue (31)	*Festuca spp.*
Fescue, tall (10)	*Festuca arundinacea*
Guineagrass (11)	*Panicum maximum*
Hemlock, poison (31)	*Conium maculatum*
Horsenettle (31)	*Solanum carolinense*
Horseradish (9)	*Armoracia rusticana*
Ice Plant (22)	*Mesembryanthemum crystallinum*
Johnsongrass (12)	*Sorghum halepense*
Kikuyugrass (21)	*Pennisetum clandestinum*
Knapweed (9)	*Centaurea repens*
Lantana (13)	*Lantana camara*
Lespedeza, common (31)	*Lespedeza striata*
Lespedeza, sericea (31)	*Lespedeza cuneata*
Loosestrife, purple (14)	*Lythrum salicaria*
Lotus, American (15)	*Nelumbo lutea*
Maidencane (16)	*Panicum hematomon*
Milkweed (17)	*Asclepias spp.*
Muhly, wirestem (21)	*Muhlenbergia frondosa*
Mullein, common (31)	*Verbascum thapsus*
Napiergrass (31)	*Pennisetum purpureum*
Nightshade, silverleaf (3)	*Solanum elaeagnifolium*
Nutsedge, purple (18)	*Cyperus rotundus*
Nutsedge, yellow (18)	*Cyperus esculentus*
Orchardgrass (12)	*Dactylis glomerata*
Pampasgrass (19)	*Cortaderia jubata*
Paragrass (16)	*Brachiaria mutica*
Phragmites†† (20)	*Phragmites spp.*
Quackgrass (21)	*Agropyron repens*
Reed, giant (22)	*Arundo donax*
Ryegrass, perennial (12)	*Lolium perenne*
Smartweed, swamp (31)	*Polygonum coccineum*
Spatterdock (23)	*Nuphar luteum*
Starthistle, yellow (31)	*Centaurea solstitialis*
Sweet potato, wild † (24)	*Ipomoea pandurata*
Thistle, artichoke (25)	*Cynara cardunculus*
Thistle, Canada (25)	*Cirsium arvense*
Timothy (12)	*Phleum pratense*
Torpedograss † (26)	*Panicum repens*
Tules, common (27)	*Scirpus acutus*
Vaseygrass (31)	*Paspalum urvillei*
Velvetgrass (31)	*Holcus spp.*
Waterhyacinth (28)	*Eichornia crassipes*
Waterlettuce (29)	*Pistia stratiotes*
Waterprimrose (30)	*Ludwigia spp.*
Wheatgrass, western (12)	*Agropyron smithii*

† Partial control.
†† Partial control in southeastern states. See "Specific Weed Control Recommendations" below.

Specific Perennial Weed Control Recommendations:

1. **Alligatorweed:** Apply 6 pints of this product per acre as a broadcast spray or as a 1 1/4 percent solution with hand-held equipment to provide partial control of alligatorweed. Apply when most of the target plants are in bloom. Repeat applications will be required to maintain such control.
2. **Bermudagrass:** Apply 7 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and when seedheads appear.

3. **Bindweed, field / Silverleaf Nightshade / Texas Blueweed:** Apply 6 to 7 1/2 pints of this product per acre as a broadcast spray west of the Mississippi River and 4 1/2 to 6 pints of this product per acre east of the Mississippi River. With hand-held equipment, use a 1 1/2 percent solution. Apply when target plants are actively growing and are at or beyond full bloom. For silverleaf nightshade, best results can be obtained when application is made after berries are formed. Do not treat when weeds are under drought stress. New leaf development indicates active growth. For best results apply in late summer or fall.
4. **Brackenfern:** Apply 4 1/2 to 6 pints of this product per acre as a broadcast spray or as a 3/4 to 1 percent solution with hand-held equipment. Apply to fully expanded fronds which are at least 18 inches long.
5. **Cattail:** Apply 4 1/2 to 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and are at or beyond the early-to-full bloom stage of growth. Best results are achieved when application is made during the summer or fall months.
6. **Cogongrass:** Apply 4 1/2 to 7 1/2 pints of this product per acre as a broadcast spray. Apply when cogongrass is at least 18 inches tall and actively growing in late summer or fall. Allow 7 or more days after application before tillage or mowing. Due to uneven stages of growth and the dense nature of vegetation preventing good spray coverage, repeat treatments may be necessary to maintain control.
7. **Cordgrass:** Apply 4 1/2 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 to 2 percent solution with hand-held equipment. Schedule applications in order to allow 6 hours before treated plants are covered by tidewater. The presence of debris and silt on the cordgrass plants will reduce performance. It may be necessary to wash targeted plants prior to application to improve uptake of this product into the plant.
8. **Cutgrass, giant:** Apply 6 pints of this product per acre as a broadcast spray or as a 1 percent solution with hand-held equipment to provide partial control of giant cutgrass. Repeat applications will be required to maintain such control, especially where vegetation is partially submerged in water. Allow for substantial regrowth to the 7 to 10-leaf stage prior to retreatment.
9. **Dogbane, hemp / Knapweed / Horseradish:** Apply 6 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the late bud-to-flower stage of growth. For best results, apply in late summer or fall.
10. **Fescue, tall:** Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 1 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the boot-to-head stage of growth. When applied prior to the boot stage, less desirable control may be obtained.
11. **Guineagrass:** Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and when most have reached at least the 7-leaf stage of growth.
12. **Johnsongrass / Bluegrass, Kentucky / Bromegrass, smooth / Canarygrass, reed / Orchardgrass / Ryegrass, perennial / Timothy / Wheatgrass, western:** Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the boot-to-head stage of growth. When applied prior to the boot stage, less desirable control may be obtained. In the fall, apply before plants have turned brown.
13. **Lantana:** Apply this product as a 3/4 to 1 percent solution with hand-held equipment. Apply to actively growing lantana at or beyond the bloom stage of growth. Use the higher application rate for plants that have reached the woody stage of growth.
14. **Loosestrife, purple:** Apply 4 pints of this product per acre as a broadcast spray or as a 1 to 1 1/2 percent solution using hand-held equipment. Treat when plants are actively growing at or beyond the bloom stage of growth. Best results are achieved when application is made during summer or fall months. Fall treatments must be applied before a killing frost.
15. **Lotus, American:** Apply 4 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Treat when plants are actively growing at or beyond the bloom stage of growth. Best results are achieved when application is made during summer or fall months. Fall treatments must be applied before a killing frost. Repeat treatment may be necessary to control regrowth from underground parts and seeds.
16. **Maidencane / Paragrass:** Apply 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Repeat treatments will be required, especially to vegetation partially submerged in water. Under these conditions, allow for regrowth to the 7 to 10-leaf stage prior to retreatment.
17. **Milkweed, common:** Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the late bud-to-flower stage of growth.
18. **Nutsedge: purple, yellow:** Apply 4 1/2 pints of this product per acre as a broadcast spray, or as a 3/4 percent solution with hand-held equipment to control existing nutsedge plants and immature nutlets attached to treated plants. Apply when target plants are in flower or when new nutlets can be found at rhizome tips. Nutlets which have not germinated will not be controlled and may germinate following treatment. Repeat treatments will be required for long-term control.
19. **Pampasgrass:** Apply a 1 1/2 percent solution of this product with hand-held equipment when plants are actively growing.
20. **Phragmites:** For partial control of phragmites in Florida and the counties of other states bordering the Gulf of Mexico, apply 7 1/2 pints per acre as a broadcast spray or apply a 1 1/2 percent solution with hand-held equipment. In other areas of the U.S., apply 4 to 6 pints per acre as a broadcast spray or apply a 3/4 percent solution with hand-held equipment for partial control. For best results, treat during late summer or fall months when plants are actively growing and in full bloom. Due to the dense nature of the vegetation, which may prevent good spray coverage and uneven stages of growth, repeat treatments may be necessary to maintain control. Visual control symptoms will be slow to develop.
21. **Quackgrass / Kikuyugrass / Muhly, wirestern:** Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment when most quackgrass or wirestem muhly is at least 8 inches in height (3 to 4-leaf stage of growth) and actively growing. Allow 3 or more days after application before tillage.
22. **Reed, giant / ice plant:** For control of giant reed and ice plant, apply a 1 1/2 percent solution of this product with hand-held equipment when plants are actively growing. For giant reed, best results are obtained when applications are made in late summer to fall.
23. **Spatterdock:** Apply 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when most plants are in full bloom. For best results, apply during the summer or fall months.
24. **Sweet potato, wild:** Apply this product as a 1 1/2 percent solution using hand-held equipment. Apply to actively growing weeds that are at or beyond the bloom stage of growth. Repeat applications will be required. Allow the plant to reach the recommended stage of growth before retreatment.

25. **Thistle, Canada / artichoke:** Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment for Canada thistle. To control artichoke thistle, apply a 2 percent solution as a spray-to-wet application. Apply when target plants are actively growing and are at or beyond the bud stage of growth.
26. **Torpedograss:** Apply 6 to 7 1/2 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/2 percent solution with hand-held equipment to provide partial control of torpedograss. Use the lower rates under terrestrial conditions, and the higher rates under partially submerged or a floating mat condition. Repeat treatments will be required to maintain such control.
27. **Tules, common:** Apply this product as a 1 1/2 percent solution with hand-held equipment. Apply to actively growing plants at or beyond the seedhead stage of growth. After application, visual symptoms will be slow to appear and may not occur for 3 or more weeks.
28. **Waterhyacinth:** Apply 5 to 6 pints of this product per acre as a broadcast spray or apply a 3/4 to 1 percent solution with hand-held equipment. Apply when target plants are actively growing and at or beyond the early bloom stage of growth. After application, visual symptoms may require 3 or more weeks to appear with complete necrosis and decomposition usually occurring within 60 to 90 days. Use the higher rates when more rapid visual effects are desired.
29. **Waterlettuce:** For control, apply a 3/4 to 1 percent solution of this product with hand-held equipment to actively growing plants. Use higher rates where infestations are heavy. Best results are obtained from mid-summer through winter applications. Spring applications may require retreatment.
30. **Waterprimrose:** Apply this product as a 3/4 percent solution using hand-held equipment. Apply to plants that are actively growing at or beyond the bloom stage of growth, but before fall color changes occur. Thorough coverage is necessary for best control.
31. **Other perennial weeds listed above:** Apply 4 1/2 to 7 1/2 pints per acre as a broadcast spray or apply as a 3/4 to 1 1/2 percent solution with hand-held equipment.

Woody Brush and Trees

NOTE: If brush has been mowed or tilled or trees have been cut, do not treat until regrowth has reached the recommended stage of growth.

Application Rates and Timing
When applied as a 5 to 8 percent solution as a directed application as described in the "Hand-Held and High-Volume Equipment" section, this product will control or partially control all wood brush and tree species listed in this section of this label. Use the higher rate of application for dense stands and larger woody brush and trees.

Specific Brush or Tree Control Recommendations: Numbers in parentheses "(-)" following the common name of a listed brush or tree species refer to "Specific Brush or Tree Control Recommendations" which follow the species listing. See this section for specific application rates and timing for listed species.

For woody brush and trees, apply the recommended rate plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient. Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information. Make applications when plants are actively growing and, unless otherwise directed, after full-leaf expansion. Use the higher rate for larger plants and/or dense areas of growth. On vines, use the higher rate for plants that have reached the woody stage of growth. Best results are obtained when application is made in late summer or fall after fruit formation.

In arid areas, best results are obtained when application is made in the spring or early summer when brush species are at high moisture content and are flowering. Ensure thorough coverage when using hand-held equipment. Symptoms may not appear prior to frost or senescence with fall treatments.

Allow 7 or more days after application before tillage, mowing or removal. Repeat treatments may be necessary to control plants regenerating from underground parts or seed. Some autumn colors on undesirable deciduous species are acceptable provided no major leaf drop has occurred. Reduced performance may result if fall treatments are made following a frost.

See the "Directions for Use" and "Mixing and Application Instructions" sections in this label for labeled use and specific application instructions. **When applied as directed, this product plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient will control the following woody brush plants and trees:** (Numbers in parentheses "(-)" following common name of a listed brush or tree species refer to "Specific Brush or Tree Control Recommendations" for that species which follow the species listing.)

Common Name	Scientific Name
Alder (1)	*Alnus spp.*
Ash †(20)	*Fraxinus spp.*
Aspen, quaking (2)	*Populus tremuloides*
Bearclover, Bearmat (20)	*Chamaebatia foliolosa*
Birch (3)	*Betula spp.*
Blackberry (1)	*Rubus spp.*
Broom, French (4)	*Cytisus monspessulanus*
Broom, Scotch (4)	*Cytisus scoparius*
Buckwheat, California †(5)	*Eriogonum fasciculatum*
Cascara †(20)	*Rhamnus purshiana*
Catsclaw †(6)	*Acacia greggi*
Ceanothus (20)	*Ceanothus spp.*
Chamise (17)	*Adenostoma fasciculatum*
Cherry, bitter (7)	*Prunus emarginata*
Cherry, black (7)	*Prunus serotina*
Cherry, pin (7)	*Prunus pensylvanica*
Coyote brush (8)	*Baccharis consanguinea*
Creeper, Virginia †(20)	*Parthenocissus quinquefolia*
Dewberry (1)	*Rubus trivialis*
Dogwood (9)	*Cornus spp.*
Elderberry (3)	*Sambucus spp.*

Common Name	Scientific Name
Elm †(20)	*Ulmus spp.*
Eucalyptus, bluegum (10)	*Eucalyptus globulus*
Hasardia †(5)	*Haplopappus squamosus*
Hawthorn (2)	*Crataegus spp.*
Hazel (3)	*Corylus spp.*
Hickory (9)	*Carya spp.*
Holly, Florida (11) (Brazilian peppertree)	*Schinus terebinthifolius*
Honeysuckle (1)	*Lonicera spp.*
Hornbeam, American (20)	*Carpinus caroliniana*
Kudzu (12)	*Pueraria lobata*
Locust, black †(20)	*Robinia pseudoacacia*
Manzanita (20)	*Arctostaphylos spp.*
Maple, red †(13)	*Acer rubrum*
Maple, sugar (14)	*Acer saccharum*
Maple, vine †(20)	*Acer circinatum*
Monkey flower †(5)	*Mimulus guttatus*
Oak, black †(20)	*Quercus velutina*
Oak, northern pin (14)	*Quercus palustris*
Oak, post (1)	*Quercus stellata*
Oak, red (14)	*Quercus rubra*
Oak, southern red (7)	*Quercus falcata*
Oak, white †(20)	*Quercus alba*
Persimmon †(20)	*Diospyros spp.*
Poison-ivy (15)	*Rhus radicans*
Poison-oak (15)	*Rhus toxicodendron*
Poplar, yellow †(20)	*Liriodendron tulipifera*
Prunus (7)	*Prunus spp.*
Raspberry (1)	*Rubus spp.*
Redbud, eastern (20)	*Cercis canadensis*
Rose, multiflora (16)	*Rosa multiflora*
Russian-olive (20)	*Elaeagnus angustifolia*
Sage: black (17), white	*Salvia spp.*
Sagebrush, California (17)	*Artemisia californica*
Salmonberry (3)	*Rubus spectabilis*
Salt cedar †(9)	*Tamarix spp.*
Saltbush, sea myrtle (18)	*Baccharis halimifolia*
Sassafras (20)	*Sassafras aibidum*
Sourwood †(20)	*Oxydendrum arboreum*
Sumac, poison †(20)	*Rhus vernix*
Sumac, smooth †(20)	*Rhus glabra*
Sumac, winged †(20)	*Rhus copallina*
Sweetgum (7)	*Liquidambar styraciflua*
Swordfern †(20)	*Polystichum munitum*
Tallowtree, Chinese (17)	*Sapium sebiferum*
Thimbleberry (3)	*Rubus parviflorus*
Tobacco, tree †(5)	*Nicotiana glauca*
Trumpetcreeper (2)	*Campsis radicans*
Waxmyrtle, southern †(11)	*Myrica cerifera*
Willow (19)	*Salix spp.*

†Partial control (See below for control or partial control instructions.)

Specific Brush or Tree Control Recommendations:

1. **Alder / Blackberry / Dewberry / Honeysuckle / Oak, Post / Raspberry:** For control, apply 4 1/2 to 6 pints per acre as a broadcast spray or as a 3/4 to 1 1/4 percent solution with hand-held equipment.
2. **Aspen, Quaking / Hawthorn / Trumpetcreeper:** For control, apply 3 to 4 1/4 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/4 percent solution with hand-held equipment.
3. **Birch / Elderberry / Hazel / Salmonberry / Thimbleberry:** For control, apply 3 pints per acre of this product as a broadcast spray or as a 3/4 percent solution with hand-held equipment.
4. **Broom, French / Broom, Scotch:** For control, apply a 1 1/4 to 1 1/2 percent solution with hand-held equipment.
5. **Buckwheat, California / Hasardia / Monkey flower / Tobacco, tree:** For partial control of these species, apply a 3/4 to 1 1/2 percent solution of this product as a foliar spray with hand-held equipment. Thorough coverage of foliage is necessary for best results.
6. **Catsclaw:** For partial control, apply a 1 1/4 to 1 1/2 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.
7. **Cherry, bitter / Cherry, black / Cherry, pin / Oak, southern red / Sweetgum / Prunus:** For control, apply 3 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 to 1 1/2 percent solution with hand-held equipment.
8. **Coyote brush:** For control, apply a 1 1/4 to 1 1/2 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.
9. **Dogwood / Hickory / Salt cedar:** For partial control, apply a 1 to 2 percent solution of this product with hand-held equipment or 6 to 7 1/2 pints per acre as a broadcast spray.
10. **Eucalyptus, bluegum:** For control of eucalyptus resprouts, apply a 1 1/2 percent solution of this product with hand-held equipment when resprouts are 6 to 12-feet tall. Ensure complete coverage. Apply when plants are actively growing. Avoid application to drought-stressed plants.
11. **Holly, Florida / Waxmyrtle, southern:** For partial control, apply this product as a 1 1/2 percent solution with hand-held equipment.
12. **Kudzu:** For control, apply 6 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Repeat applications will be required to maintain control.
13. **Maple, red:** For control, apply as a 3/4 to 1 1/4 percent solution with hand-held equipment when leaves are fully developed. For partial control, apply 2 to 7 1/2 pints of this product per acre as a broadcast spray.
14. **Maple, sugar / Oak: northern pin / Oak, red:** For control, apply as a 3/4 to 1 1/4 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.
15. **Poison-ivy / Poison-oak:** For control, apply 6 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Repeat applications may be required to maintain control. Fall treatments must be applied before leaves lose green color.
16. **Rose, multiflora:** For control, apply 3 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Treatments should be made prior to leaf deterioration by leaf-feeding insects.
17. **Sage, black / Sagebrush, California / Chamise / Tallowtree, Chinese:** For control of these species, apply a 3/4 percent solution of this product as a foliar spray with hand-held equipment. Thorough coverage of foliage is necessary for best results.
18. **Saltbush, sea myrtle:** For control, apply this product as a 1 percent solution with hand-held equipment.
19. **Willow:** For control, apply 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment.
20. **Other woody brush and trees listed above:** For partial control, apply 3 to 7 1/2 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/2 percent solution with hand-held equipment.

Aquatic and other Noncrop Sites

Apply this product as directed and under conditions described to control or partially control weeds and woody plants listed in the "Weeds Controlled" section in industrial, recreational and public areas or other similar aquatic or terrestrial sites on this label.

Noncrop Sites

This product may be used to control the listed weeds in and around aquatic sites and on noncrop sites such as :

Airports
Golf Courses
Habitat Restoration & Management Areas
Highways & Roadsides
Industrial Plant Sites
Lumberyards
Parking Areas
Parks
Petroleum Tank Farms
Pipeline, Power, Telephone & Utility Rights-of-Way
Pumping Installations
Railroads
Schools
Storage Areas
Similar Sites

Aquatic Sites

This product may be applied to emerged weeds in all bodies of fresh and brackish water which may be flowing, nonflowing or transient. This includes lakes, rivers, streams, ponds, estuaries, rice levees, seeps, irrigation and drainage ditches, canals, reservoirs, wastewater treatment facilities, wildlife habitat restoration and management areas and similar sites.

If aquatic sites are present in the noncrop area and are part of the intended treatment, read and observe the following directions:

- **This product does not control plants which are completely submerged or have a majority of their foliage under water.**
- There is no restriction on the use of treated water for irrigation, recreation or domestic purposes.
- Consult local state fish and game agency and water control authorities before applying this product to public water. Permits may be required to treat such water.
- **NOTE:** Do not apply this product directly to water within 1/2 mile up-stream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within 1/2 mile of an active potable water intake in a standing body of water such as lake, pond or reservoir. To make aquatic applications around and within 1/2 mile of active potable water intakes, the water intake must be turned off for a minimum period of 48 hours after the application. The water intake may be turned on prior to 48 hours if the glyphosate level in the intake water is below 0.7 parts per million as determined by laboratory analysis. These aquatic applications may be made **only** in those cases where there are alternative water sources or holding ponds which would permit the turning off of an active potable water intake for a minimum period of 48 hours after the applications. This restriction does not apply to intermittent inadvertent overspray of water in terrestrial use sites.
- For treatments after drawdown of water or in dry ditches, allow 7 or more days after treatment before reintroduction of water to achieve maximum weed control. Apply this product within 1 day after drawdown to ensure application to actively growing weeds.
- Floating mats of vegetation may require retreatment. Avoid wash-off of sprayed foliage by spray boat or recreational boat backwash or by rainfall within 6 hours of application. Do not re-treat within 24 hours following the initial treatment.
- Applications made to moving bodies of water must be made while traveling upstream to prevent concentration of this herbicide in water. When making any bankside applications, do not overlap more than 1 foot into open water. Do not spray in bodies of water where weeds do not exist. The maximum application rate of 7 1/2 pints per acre must not be exceeded in any single broadcast application that is being made over water.
- When emerged infestations require treatment of the total surface area of impounded water, treating the area in strips may avoid oxygen depletion due to decaying vegetation. Oxygen depletion may result in fish kill.

Forestry Sites and Utility Rights-of-Way

In forest and utility sites, this product is recommended for the control or partial control of woody brush, trees, and annual and perennial herbaceous weeds. This product is also recommended for use in preparing or establishing wildlife openings within these sites, in pine straw plantations for maintaining logging roads, and for side trimming along utility rights-of-way.

In forestry sites, this product is recommended for use in site preparation prior to planting any tree species, including Christmas trees and silvicultural nursery sites.

In utility sites, this product is recommended for use along electrical power, pipeline, and telephone rights-of-way, and in other utility sites associated with these rights-of-way, such as substations.

Application Rates[†]:

Method of Application	Application Rate	Spray Volume (gal/acre)
Broadcast		
Aerial	1.5 to 7.5 qt/acre	5 to 30
Ground	1.5 to 7.5 qt/acre	10 to 60
Spray-to-Wet		
Handgun, Backpack Mistblower	0.75 to 2% by volume	spray-to-wet
Low Volume Directed Spray [††]		
Handgun, Backpack Mistblower	5% to 10% by volume	partial coverage

[†] Where repeat applications are necessary, do not exceed 8.0 quarts per acre per year.

[††] For low volume directed spray applications, coverage should be uniform with at least 50 percent of the foliage contacted. For best results, coverage of the top one-half of the plant is important.

In forestry site preparation and utility rights-of-way applications, this product requires use with a surfactant such as a non-ionic surfactant containing greater than 80 percent active ingredient. Use of this product without surfactant will result in reduced herbicideperformance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information.

Use higher rates of this product within the recommended rate ranges for control or partial control of woody brush, trees and hard-to-control perennial herbaceous weeds. For best results, apply to actively growing woody brush and trees after full leaf expansion and before fall color and leaf drop. Use increased rates within the recommended rate range to control of perennial herbaceous weeds from emergence up to the appearance of seedheads, flowers or berries appear. Use lower rates within the recommended rate range to control annual herbaceous weeds and actively growing perennial herbaceous weeds after seedheads, flowers or berries appear. Apply to foliage of actively growing annual herbaceous weeds anytime after emergence.

Tank Mixtures

This product may be used in tank mix combination with other herbicide products to broaden the spectrum of vegetation controlled. When tank mixing, read and observe applicable use directions, precautions and limitations on the respective product labels. Use according to the most restrictive precautionary statements for each product on the mixture. Any recommended rate of this product may be used in a tank mix.

Note: For forestry site preparation, make sure the tank mix product is approved for use prior to planting the desired species. Observe planting interval restrictions. For side trimming treatments in utility rights-of-way, tank mixtures with Arsenal 2WSL herbicide are not recommended. For side trimming treatments, it is recommended that this product be used alone as recommended, or as a tank mix with Garlon.

Product	Broadcast Rate	Use Sites
Arsenal Applicators Concentrate	2 to 16 fl oz/acre	Forestry site preparation
Oust	1 to 4 oz/acre	Forestry site preparation, utility sites
Garlon 3A †	1 to 4 qt/acre	Forestry site preparation, utility sites
Garlon 4	1 to 4 qt/acre	Forestry site preparation, utility sites
Arsenal 2WSL	2 to 32 fl oz/acre	Utility sites
	Spray-to-Wet Rates	
Arsenal Applicators Concentrate	1/32% to 1/2% by volume	Forestry site preparation
Arsenal 2WSL	1/32% to 1/2% by volume	Utility sites
	Low Volume Directed Spray Rates	
Arsenal Applicators Concentrate	1/8% to 1/2% by volume	Forestry site preparation
Arsenal 2WSL	1/8% to 1/2% by volume	Utility sites

†Ensure that Garlon 3A is thoroughly mixed with water before adding this product. Agitation is required while mixing this product with Garlon 3A to avoid compatibility problems.

For control of herbaceous weeds, use the lower recommended tank mixture rates. For control of dense stands or difficult-to-control woody brush and trees, use the higher recommended rates.

Forestry Conifer and Hardwood Release

Directed Sprays and Selective Equipment

This product may be applied as a directed spray or by using selective equipment in forestry conifer and hardwood sites, including Christmas tree plantations and silvicultural nurseries. This product requires use with a surfactant. Use only surfactants that are approved for conifer release and specified on the surfactant label as safe for use in conifer release (pine release). Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information.
Tank Mixing: In hardwood plantations, tank mixtures with Oust may be used. In pine plantations, tank mixtures with Garlon 4 or Arsenal AC may be used. Comply with all site restrictions, forestry species limitations, and precautions on the tank mix product labels.

Avoid contact of spray drift, mist or drips with foliage, green bark or non-woody surface roots of desirable plant species. See "Application Equipment and Techniques" section of this label for specific recommendations and precautions.

Spray-to-Wet Applications: Use a 2 percent spray solution to control undesirable woody brush and trees. To control herbaceous weeds, use a 1 to 2 percent spray solution.

Low Volume Directed Spray Applications: Use a 5 to 10 percent spray solution. Coverage should be uniform with at least 50 percent of the foliage contacted. Coverage of the top one-half of the unwanted vegetation is important.

Broadcast Applications: For equipment calibrated for broadcast applications, use 1 1/2 to 7 1/2 quarts of this product per acre. Apply in 10 to 60 gallons of clean water per acre. Shielded application equipment may be used to avoid contact of the spray solution with desirable plants. Shields should be adjusted to prevent spray contact with the foliage of green bark of desirable vegetation.

Wiper Application Equipment: See the "Selective Equipment" section of this label for equipment and application rate recommendations.

Broadcast Application

Note: Except where specifically recommended below, make broadcast applications of this product only where conifers have been established for more than one year.

Broadcast application must be made after formation of final conifer resting buds in the fall or prior to initial bud swelling in the spring.

Injury may occur to conifers treated for release, especially where spray patterns overlap or the higher rates are applied. Damage can be accentuated if applications are made when conifers are actively growing, or are under stress from drought, flood water, improper planting, insects, animal damage or diseases.

Accord Concentrate requires use with a surfactant. Use a surfactant that is labeled/recommended for use in over-the-top release applications. Use of this product without a surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information.

For release of the following conifer species outside the Southeastern United States:

Douglas fir (*Pseudotsuga menziesii*)
Fir (*Abies* species)
Hemlock †† (*Tsuga* species)
Pines † (*Pinus* species)
Redwood, California †† (*Sequoia* species)

† Includes all species except loblolly pine, longleaf pine, shortleaf pine or slash pine.
†† Use of a surfactant is not recommended for release of hemlock species or California redwood. In mixed conifer stands, injury to these species may result if a surfactant is used.

Application Rate for Conifer Release: Apply 3/4 to 1 1/2 quarts per acre as a broadcast spray. In Maine and New Hampshire, up to 2 1/4 quarts per acre of this product may be used for the control and suppression of difficult-to-control hardwood species.

To release Douglas fir, and pine and spruce species at the end of the first growing season (except in California), apply 3/4 to 1 1/8 quarts per acre of this product. Make sure that all conifers are well hardened off.

Note: For release of Douglas fir with this product or recommended tank mixtures, a nonionic surfactant recommended for over-the-top foliar spray may be used. To avoid possible conifer injury, nonionic surfactants may be used at 2 fluid ounces per acre at elevations above 1500 feet, or 1 fluid ounce per acre in the coastal range or at elevations below 1500 feet. Use of surfactant rates exceeding those listed above may result in unacceptable conifer injury and are not recommended. Make sure that the nonionic surfactant has been adequately tested for safety to Douglas fir before use.

Tank Mixtures with Oust: To release jack pine, white pine and white spruce, apply 3/4 to 1 1/2 quarts of this product with 1 to 3 ounces (1 to 1 1/2 ounces for white pine) of Oust per acre. Make applications to actively growing weeds as a broadcast spray over the top of established conifers. Applications at these rates should be made after formation of conifer resting buds in the late summer or fall.

Tank Mixtures with Arsenal Applicators Concentrate: This product may be tank mixed with Arsenal Applicators Concentrate for release of Douglas fir. Tank mix 3/4 to 1 1/8 quarts of this product with 2 to 6 fluid ounces of Arsenal Applicators Concentrate per acre. For release of balsam fir and red spruce, apply a mixture of 1 1/2 quarts of this product with 1 to 2 1/2 fluid ounces of Arsenal Applicators Concentrate per acre.

In Maine and New Hampshire for the release of red pine, balsam fir, red spruce, white spruce, Norway spruce, and black spruce with dense tough-to-control brush and where maples make up a large component of the undesirable trees, up to 2 1/4 quarts per acre of this product may be tank mixed with 1 to 2 1/2 fluid ounces per acre of Arsenal Applicators Concentrate herbicide and applied as a broadcast spray.

Tank mixtures with Arsenal Applicators Concentrate and Oust or Oust XP Herbicides: In Maine and New Hampshire for release of red pine, balsam fir, red spruce, white spruce, Norway spruce and black spruce with heavy grass and herbaceous weed densities, tough-to-control brush and where maples make up a large component of the undesirable trees up to 2 1/4 quarts per acre of this product may be tank mixed with 1 to 2.5 fluid ounces per acre of Arsenal Applicators Concentrate and 1 to 3 oz of Oust or Oust XP herbicides and applied as a broadcast spray.

For release of the following conifer species in the Southeastern United States:

Loblolly pine (*Pinus taeda*)
Eastern white pine (*Pinus strobus*)
Shortleaf pine (*Pinus echinata*)
Slash pine (*Pinus elliottii*)
Virginia pine (*Pinus virginiana*)
Longleaf pine (*Pinus palustris*)

Apply 1 1/8 to 1 7/8 quarts of this product per acre as a broadcast spray during late summer or early fall after the conifers have hardened off. For applications at the end of the first growing season, use 3/4 quart of this product alone or in a recommended tank mixture.

Tank Mixtures with Arsenal Applicators Concentrate: For conifer release, apply 3/4 to 1 1/2 quarts of this product with 2 to 16 fluid ounces of Arsenal Applicators Concentrate per acre as a broadcast spray. Use only on conifer species that are labeled for over-the-top spray for both products. Use the higher recommended rates for dense tough-to-control wood brush and trees.

Read and observe label claims, cautionary statements and all information on the labels of each product used in these tank mixtures. Use according to the most restrictive precautionary statements for each product in the mixture.

Herbaceous Release

When applied as directed, this product plus listed residual herbicides provides postemergence control of the annual weeds and control or suppression of the perennial weeds listed in this label, and residual control of the weeds listed in the residual herbicide label. Make applications to actively growing weeds as a broadcast spray over the top of labeled conifers.

Tank Mixtures with Oust: To release loblolly pines, tank mix 12 to 18 fluid ounces of this product with 2 to 4 ounces of Oust per acre.

To release slash pines, tank mix 9 to 12 fluid ounces of this product with 2 to 4 ounces of Oust per acre.

In Maine and New Hampshire for release of red pine, balsam fir, red spruce, white spruce, Norway spruce, and black spruce with heavy grass and herbaceous weeds infesting the site, up to 2 1/4 quarts per acre of may be tank mixed with 1 to 3 oz of Oust herbicide or Oust XP herbicide to control grass, herbaceous weeds and woody brush, and applied as a broadcast spray.

For tank mixtures with Oust use a surfactant that is labeled/ recommended for use in over-the-top herbaceous release applications. Use of this product without a surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information.

Weed control may be reduced if water volumes exceed 25 gallons per acre for these treatments.

Tank Mixture with Atrazine: To release Douglas fir, apply 3/4 quart of this product with 4 pounds a.i. of atrazine per acre. Apply only over Douglas fir that has been established for at least one full growing season. Apply in the early spring, usually mid-March through early April. Injury will occur if applications are made after bud swell in the spring. For this use, do not add surfactant to the tank mixture.

Always read and follow the manufacturer's label for all herbicides and surfactants used.

Wetland Sites

This product may be used in and around water (aquatic areas) and wetlands found in forestry and in power, telephone and pipeline rights-of-way sites, including where these sites are adjacent to or surrounding domestic water supply reservoirs, supply streams, lakes and ponds. Read and observe the following before making applications in and around water.

Consult local public water control authorities before applying this product in and around public water. Permits may be required to treat in such areas.

There is no restriction on the use of treated water for irrigation, recreation or domestic purposes.

Note: Do not apply this product directly to water within 1/2 mile up-stream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within 1/2 mile of an active potable water intake in a standing body of water such as a lake, pond or reservoir. To make aquatic applications around and within 1/2 mile of active potable water intakes, the water intake must be turned off for a minimum period of 48 hours after application. These aquatic applications may be made ONLY in those cases where there are alternative water sources or holding ponds which would permit the turning off of an active potable water intake for a minimum period of 48 hours after the application. This restriction does not apply to intermittent inadvertent overspray of water in terrestrial use sites.

Do not spray open bodies of water where woody brush, trees and herbaceous weeds do not exist. The maximum application rate of 3 3/4 quarts per acre must not be exceeded in a single over-water broadcast application except as follows, where any recommended rate may be applied:

- Stream crossings in utility right-of-way.
- Where applications will result in less than 20 percent of the total water area being treated.

Wildlife Habitat Restoration and Management Areas

This product is recommended for the restoration and/or maintenance of native habitat and in wildlife management areas.

Habitat Restoration and Maintenance: When applied as directed, exotic and other undesirable vegetation may be controlled in habitat management areas. Applications may be made to allow recovery of native plant species, to open up water to attract waterfowl, and for similar broad-spectrum vegetation control requirements in habitat management areas. Spot treatments may be made to selectively remove unwanted plants for habitat enhancement. For spot treatments, care should be exercised to keep spray off of desirable plants.

Wildlife Food Plots: This product may be used as a site preparation treatment prior to planting wildlife food plots. Apply as directed to control vegetation in the plot area. Any wildlife food species may be planted after applying this product, or native species may be allowed to reinfest the area. If tillage is needed to prepare a seedbed, wait 7 days after applying this product before tilling to allow for maximum effectiveness.

Wiper Applications

For wick or wiper applications, mix 1 gallon of this product with 2 gallons of clean water to make a 33 percent solution. Addition of a nonionic surfactant at a rate of 10 percent by volume of total herbicide solution is recommended.

Wiper applications can be used to control or suppress annual and perennial weeds listed on this label. In heavy weed stands, a double application in opposite directions may improve results. See the "Weed Controlled" section in this label for recommended timing, growth stage and other instructions for achieving optimum results

Cut Stump Application

Woody vegetation may be controlled by treating freshly cut stumps of trees and resprouts with this product. Apply this product using suitable equipment to ensure coverage of the entire cambium. Cut vegetation close to the soil surface. **Apply a 50 to 100 percent solution of this product to freshly cut surface immediately after cutting.** Delay in applying this product may result in reduced performance. For best results, trees should be cut during periods of active growth and full leaf expansion.

When used according to directions for cut stump application, this product will **control, partially control or suppress** most woody brush and tree species, some of which are listed below:

Common Name	**Scientific Name**
Alder	*Alnus spp.*
Coyote brush †	*Baccharis consanguinea*
Dogwood †	*Cornus spp.*
Eucalyptus	*Eucalyptus spp.*
Hickory †	*Carya spp.*
Madrone	*Arbutus menziesii*
Maple †	*Acer spp.*
Oak	*Quercus spp.*
Poplar †	*Populus spp.*
Reed, giant	*Arundo donax*
Salt cedar	*Tamarix spp.*

Common Name	Scientific Name
Sweet gum †	*Liquidambar styraciflua*
Sycamore †	*Platanus occidentalis*
Tan oak	*Lithocarpus densiflorus*
Willow	*Salix spp.*

†This product is not approved for this use on these species in the state of California.

Injection and Frill Applications

Woody vegetation may be controlled by injection or frill application of this product. Apply this product using suitable equipment which must penetrate into living tissue. Apply the equivalent of 1 ml of this product per 2 to 3 inches of trunk diameter. This is best achieved by applying 25 to 100 percent concentration of this product either to a continuous frill around the tree or as cuts evenly spaced around the tree below all branches. As tree diameter increases in size, better results are achieved by applying dilute material to a continuous frill or more closely spaced cuttings. Avoid application techniques that allow runoff to occur from frill or cut areas in species that exude sap freely after frills or cutting. In species such as these, make frill or cut at an oblique angle so as to produce a cupping effect and use undiluted material. For best results, applications should be made during periods of active growth and full leaf expansion.

This treatment will control the following woody species:

Common Name	Scientific Name
Oak	*Quercus spp.*
Poplar	*Populus spp.*
Sweet gum	*Liquidambar styraciflua*
Sycamore	*Platanus occidentalis*

This treatment will suppress the following woody species:

Common Name	Scientific Name
Black gum †	*Nyssa sylvatica*
Dogwood	*Cornus spp.*
Hickory	*Carya spp.*
Maple, red	*Acer rubrum*

†This product is not approved for this use on this species in the state of California.

Release of Bermudagrass or Bahiagrass on Noncrop Sites

Release Of Dormant Bermudagrass And Bahiagrass

When applied as directed, this product will provide control or suppression of many winter annual weeds and tall fescue for effective release of dormant bermudagrass or bahiagrass. Make applications to dormant bermudagrass or bahiagrass.

For best results on winter annuals, treat when weeds are in an early growth stage (below 6 inches in height) after most have germinated. For best results on tall fescue, treat when fescue is in or beyond the 4 to 6-leaf stage.

Weeds Controlled

Rate recommendations for control or suppression of winter annuals and tall fescue are listed below.

Apply the recommended rates of this product in 10 to 25 gallons of water per acre plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient. Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information.

Weeds Controlled or Suppressed †

Note: C = Controlled; S = Suppressed

Weed Species	Rate (Fluid Ounces Per Acre) 6	9	12	18	24	48
Barley, little *Hordeum pusillum*	S	C	C	C	C	C
Bedstraw, catchweed *Galium aparine*	S	C	C	C	C	C
Bluegrass, annual *Poa annua*	S	C	C	C	C	C
Chervil *Chaerophyllum tainturieri*	S	C	C	C	C	C
Chickweed, common *Stellaria media*	S	C	C	C	C	
Clover, crimson *Trifolium incarnatum*	•	S	S	C	C	C
Clover, large hop *Trifolium campestre*	•	S	S	C	C	C
Speedwell, corn *Veronica arvensis*	S	C	C	C	C	C
Fescue, tall *Festuca arundinacea*	•	•	•	•	S	S
Geranium, Carolina *Geranium carolinianum*	•	•	S	S	C	C
Henbit *Lamium amplexicaule*	•	S	C	C	C	C
Ryegrass, Italian *Lolium multiflorum*	•	•	S	C	C	C
Vetch, common *Vicia sativa*	•	•	S	C	C	C

†These rates apply only to sites where an established competitive turf is present.

Release Of Actively Growing Bermudagrass

NOTE: Use only on sites where bahiagrass or bermudagrass are desired for ground cover and some temporary injury or yellowing of the grasses can be tolerated.

When applied as directed, this product will aid in the release of bermudagrass by providing control of annual species listed in the "Weeds Controlled" section in this label, and suppression or partial control of certain perennial weeds.

For control or suppression of those annual species listed in this label, use 3/4 to 2 1/4 pints of this product as a broadcast spray in 10 to 25 gallons of spray solution per acre, plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient.. Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information. Use the lower rate when treating annual weeds below 6 inches in height (or length of runner in annual vines). Use the higher rate as size of plants increases or as they approach flower or seedhead formation.

Use the higher rate for partial control or longer-term suppression of the following perennial species. Use lower rates for shorter-term suppression of growth.

Bahiagrass	Johnsongrass †
Dallisgrass	Trumpetcreeper ††
Fescue (tall)	Vaseygrass

†Johnsongrass is controlled at the higher rate.
††Suppression at the higher rate only.

Use only on well-established bermudagrass. Bermudagrass injury may result from the treatment but regrowth will occur under moist conditions. Repeat applications in the same season are not recommended, since severe injury may result.

Bahiagrass Seedhead and Vegetative Suppression

When applied as directed in the "Noncrop Sites" section in this label, this product will provide significant inhibition of seedhead emergence and will suppress vegetative growth for a period of approximately 45 days with single applications and approximately 120 days with sequential applications.

Apply this product 1 to 2 weeks after full green-up of bahiagrass or after the bahiagrass has been mowed to a uniform height of 3 to 4 inches. Applications must be made prior to seedhead emergence. Apply 5 fluid ounces per acre of this product in 10 to 25 gallons of water per acre, plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient.. Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information.

Sequential applications of this product plus nonionic surfactant may be made at approximately 45-day intervals to extend the period of seedhead and vegetative growth suppression. For continued vegetative growth suppression, sequential applications must be made prior to seedhead emergence.

Apply no more than 2 sequential applications per year. As a first sequential application, apply 3 fluid ounces of this product per acre plus nonionic surfactant. A second sequential application of 2 to 3 fluid ounces per acre plus nonionic surfactant may be made approximately 45 days after the last application.

Annual Grass Growth Suppression

For growth suppression of some annual grasses, such as annual ryegrass, wild barley and wild oats growing in coarse turf on roadsides or other industrial areas, apply 3 to 4 ounces of this product in 10 to 40 gallons of water per acre plus a surfactant such as a non-ionic surfactant containing 80% or greater active ingredient.. Use of this product without surfactant will result in reduced herbicide performance. Refer to the "Mixing and Application Instructions" section of this label and the surfactant manufacturer label for more information. . Applications should be made when annual grasses are actively growing and before the seedheads are in the boot stage of development. Treatments made after seedhead emergence may cause injury to the desired grasses.

Terms and Conditions of Use

If terms of the following Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies are not acceptable, return unopened package at once to the seller for a full refund of purchase price paid. Otherwise, use by the buyer or any other user constitutes acceptance of the terms under Warranty Disclaimer, Inherent Risks of Use and Limitations of Remedies.

Warranty Disclaimer

Dow AgroSciences warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. Dow AgroSciences MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

Inherent Risks of Use

It is impossible to eliminate all risks associated with use of this product. Crop injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as unfavorable temperatures, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of Dow AgroSciences or the seller. To the fullest extent permitted by law, all such risks shall be assumed by buyer.

Limitation of Remedies

The exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories), shall be limited to, at Dow AgroSciences' election, one of the following:

(1) Refund of purchase price paid by buyer or user for product bought, or
(2) Replacement of amount of product used.

Dow AgroSciences shall not be liable for losses or damages resulting from handling or use of this product unless Dow AgroSciences is promptly notified of such loss or damage in writing. To the fullest extent permitted by law, in no case shall Dow AgroSciences be liable for consequential or incidental damages or losses.

The terms of the Warranty Disclaimer above and this Limitation of Remedies cannot be varied by any written or verbal statements or agreements. No employee or sales agent of Dow AgroSciences or the seller is authorized to vary or exceed the terms of the Warranty Disclaimer or this Limitation of Remedies in any manner.

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Dow AgroSciences LLC • Indianapolis, IN 46268 U.S.A.

Label Code: D02-145-003
Replaces Label: D02-145-002
LOES Number: 010-00111

EPA-accepted 07/13/06

Revisions:

1. Revised marketing claims to remove pine plantations and add grazed areas on these sites
2. Added/revised surfactant instructions
3. Revised nonionic surfactant instructions to 80% active ingredient
4. Revised use site text under Aquatic and other Noncrop Sites

BASF

The Chemical Company

SPECIMEN

ARSENAL®

herbicide

For the control of undesirable vegetation in grass pasture, rangeland and noncropland areas such as railroad, utility, pipeline and highway rights-of-way, utility plant sites, petroleum tank farms, pumping installations, fence rows, storage areas, nonirrigation ditchbanks and other similar areas and for the establishment and maintenance of wildlife openings.

ACTIVE INGREDIENT:	
Isopropylamine salt of imazapyr(2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-3-pyridinecarboxylic acid)*	28.7%
INERT INGREDIENTS:	71.3%
TOTAL:	100.0%

*Equivalent to 22.6% 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-3-pyridinecarboxylic acid or 2 pounds acid per gallon.

EPA Reg. No. 241-346 **U.S. Patent No. 4,798,619** **EPA Est. No. _____**

KEEP OUT OF REACH OF CHILDREN.

CAUTION/PRECAUCIÓN

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.
(If you do not understand this label, find someone to explain it to you in detail.)

In case of an emergency endangering life or property involving this product, call day or night, 1-800-832-HELP (4357).

See next page for additional **First Aid**, **Precautionary Statements**, **Directions For Use**, **Conditions of Sale and Warranty**, and state-specific crop and/or use site restrictions.

Net Contents: _____

BASF Corporation,
Agricultural Products
26 Davis Drive,
Research Triangle Park, NC 27709

FIRST AID	
If on skin	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes. • Call a poison control center or doctor for treatment advice.
If in eyes	• Hold eye open and rinse slowly and gently with water for 15-20 minutes. • Remove contact lenses, if present, after first 5 minutes, then continue rinsing eye. • Call a poison control center or doctor for treatment advice.
If inhaled	• Move person to fresh air. • If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. • Call a poison control center or doctor for further treatment advice.
HOT LINE NUMBER	
Have the product container or label with you when calling a poison control center or doctor or going for treatment. You may also contact BASF Corporation for emergency medical treatment information: 1-800-832-HELP (4357).	

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS
CAUTION

Avoid contact with skin, eyes or clothing. Avoid breathing spray mist. Wash thoroughly with soap and water after handling. Remove contaminated clothing and wash before reuse.

Personal Protective Equipment (PPE)
Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for **Category A** on an EPA chemical-resistant category selection chart.

Applicators and other handlers must wear:
- Long-sleeved shirt and long pants.
- Chemical-resistant gloves made of any waterproof material.
- Shoes plus socks.

Follow manufacturer's instructions for cleaning and maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

User Safety Recommendations:

Users Should:
- Wash hands before eating, chewing gum, using tobacco or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

PHYSICAL AND CHEMICAL HAZARDS

Spray solutions of **Arsenal® herbicide** should be mixed, stored and applied only in stainless steel, fiberglass, plastic and plastic-lined steel containers.
DO NOT mix, store or apply **Arsenal** or spray solutions of **Arsenal** in unlined steel (except stainless steel) containers or spray tanks.

ENVIRONMENTAL HAZARDS

DO NOT apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. **DO NOT** contaminate water when disposing of equipment washwaters or rinsate.

DIRECTIONS FOR USE

It is a violation of federal law to use this product in a manner inconsistent with its labeling.
Arsenal should be used only in accordance with recommendations on the leaflet label attached to the container. Keep containers closed to avoid spills and contamination.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

DO NOT enter or allow worker entry into treated areas during the restricted-entry interval (REI) of **48 hours.**

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls.
- Shoes plus socks.
- Chemical-resistant gloves made of any waterproof material.

Massachusetts Electric Company d/b/a National Grid
DPU 09-01-B
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NON-AGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard (WPS) for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.

Noncrop weed control is not within the scope of the Worker Protection Standard. See the **GENERAL INFORMATION** section of this label for a description of noncrop sites.

DO NOT enter treated areas without protective clothing until sprays have dried.

STORAGE AND DISPOSAL

DO NOT contaminate water, food or feed by storage or disposal.

PESTICIDE STORAGE: DO NOT store below 10° F.

PESTICIDE DISPOSAL: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

CONTAINER DISPOSAL FOR 2.5 GALLON AND 30 GALLON: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in an approved sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

CONTAINER DISPOSAL FOR FIELD KEG, MINIBULK AND BULK: When this container is empty, replace the cap and seal all openings that have been opened during use, and return the container to the point of purchase, or to a designated location. This container must only be refilled with the pesticide product. **DO NOT** reuse the container for any other purpose. Prior to refilling, inspect carefully for damage such as cracks, punctures, abrasions, worn-out threads and closure devices. Check for leaks after refilling and before transport. **DO NOT** transport if this container is damaged or leaking. If the container is damaged or leaking, or obsolete and not returned to the point of purchase or to a designated location, triple rinse emptied container and offer for recycling. Disposal of container must be in compliance with state and local regulations.

IMPORTANT

DO NOT use on food crops. Keep from contact with fertilizers, insecticides, fungicides and seeds. **DO NOT** drain or flush equipment on or near desirable trees or other plants, or on areas where their roots may extend, or in locations where the chemical may be washed or moved into contact with their roots. **DO NOT** use on lawns, walks, driveways, tennis courts, or similar areas where roots of desirable vegetation may extend and be exposed to potential injury and/or mortality from root uptake of **Arsenal® herbicide** unless this risk is acceptable. **DO NOT** side trim desirable vegetation with this product unless severe injury or plant death can be tolerated. Prevent drift of spray to desirable plants.

Clean application equipment after using this product by thoroughly flushing with water.

GENERAL INFORMATION

Use Sites: Arsenal is an aqueous solution to be mixed with water and a surfactant and applied as a spray solution to grass pasture and rangeland and noncropland areas such as railroad, utility, pipeline and highway rights-of-way, utility plant sites, petroleum tank farms, pumping installations, fence rows, storage areas, nonirrigation ditchbanks including grazed or hayed areas within these sites. **Arsenal** is recommended for the establishment and maintenance of wildlife openings. **Arsenal** may also be used for the release of unimproved bermudagrass (see specific directions) and for use under certain paved surfaces (see specific directions).

Application Methods: Arsenal will control most annual and perennial grasses and broadleaf weeds in addition to many brush and vine species, and **Arsenal** will provide residual control of labeled weeds which germinate in the treated areas. This product may be applied either preemergence or postemergence to the weeds; however, postemergence application is the method of choice in most situations, particularly for perennial species. For maximum activity, weeds should be growing vigorously at the time of postemergence application, and the spray solution should include a surfactant (see **ADJUVANT** section for specific recommendations). These solutions may be applied selectively by using low-volume techniques or may be applied broadcast by using ground equipment or aerial equipment. In addition, **Arsenal** may also be used for stump and cut stem treatments (see specific directions).

Herbicidal Activity: Arsenal is readily absorbed through leaves, stems, and roots and is translocated rapidly throughout the plant, with accumulation in the meristematic regions. Treated plants stop growing soon after spray application. Chlorosis appears first in the newest leaves, and necrosis spreads from this point. In perennials, the herbicide is translocated into, and kills, underground storage organs which prevents regrowth. Chlorosis and tissue necrosis may not be apparent in some plant species until two weeks after application. Complete kill of plants may not occur for several weeks. Applications of **Arsenal** are rainfast one hour after treatment.

PRECAUTIONS FOR AVOIDING INJURY TO NONTARGET PLANTS

Untreated trees can occasionally be affected by root uptake of **Arsenal** through movement into the top soil. Injury or loss of desirable trees or other plants may result if **Arsenal** is applied on or near desirable trees or other plants, on areas where their roots extend, or in locations where the treated soil may be washed or moved into contact with their roots.

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MANAGING OFF-TARGET MOVEMENT

The following information is provided as general guidance for managing off-target movement. Specific use recommendations for **Arsenal® herbicide** may differ depending on the application technique used and the vegetation management objective.

Spray Drift: Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment- and weather-related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions.

Spray drift from applying this product may result in damage to sensitive plants adjacent to the treatment area. Only apply this product when the potential for drift to these and other adjacent sensitive areas (e.g. residential areas, bodies of water, known habitat for threatened or endangered species, or nontarget crops) is minimal. **DO NOT** apply when the following conditions exist that increase the likelihood of spray drift from intended targets: high or gusty winds, high temperatures, low humidity, temperature inversions.

To minimize spray drift, the applicator should be familiar with and take into account the following drift reduction advisory information. Additional information may be available from state enforcement agencies or the Cooperative Extension on the application of this product.

The best drift management strategy and most effective way to reduce drift potential are to apply large droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see **Wind**, **Temperature and Humidity** and **Temperature Inversions**).

Controlling Droplet Size:

- **Volume** - Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- **Pressure - DO NOT** exceed the nozzle manufacturer's recommended pressures. For many nozzle types, lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.
- **Number of Nozzles -** Use the minimum number of nozzles that provide uniform coverage.
- **Nozzle Orientation -** Orienting nozzles so that the spray is released parallel to the airstream produces larger droplets than other orientations and is recommended practice. Significant deflection from the horizontal will reduce droplet size and increase drift potential.
- **Nozzle Type** - Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid-stream nozzles oriented straight back produce the largest droplets and the lowest drift. **DO NOT** use nozzles producing a mist droplet spray.

Application Height: Making applications at the lowest possible height (aircraft, ground-driven spray boom) that is safe and practical reduces exposure of droplets to evaporation and wind.

Swath Adjustment: When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the application equipment (e.g. aircraft, ground) upwind. Swath adjustment distance should increase with increasing drift potential (higher wind, smaller droplets, etc.).

Wind: Drift potential is lowest between wind speeds of 3-10 mph. However, many factors, including droplet size and equipment type, determine drift potential at any given speed. Application should be avoided below 3 mph due to variable wind direction and high inversion potential. **NOTE:** Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

Temperature and Humidity: When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

Temperature Inversions: Drift potential is high during a temperature inversion. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud, which can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

Wind Erosion: Avoid treating powdery, dry or light sandy soils when conditions are favorable for wind erosion. Under these conditions, the soil surface should first be settled by rainfall or irrigation.

Aerial Application Methods and Equipment: Use 2 or more gallons of water per acre. The actual minimum spray volume per acre is determined by the spray equipment used. Use adequate spray volume to provide accurate and uniform distribution of spray particles over the treated area and to avoid spray drift.

Managing Spray Drift from Aerial Applications: Applicators must follow these requirements to avoid off-target drift movement: 1) boom length - the distance of

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the outermost nozzles on the boom must not exceed ¾ the length of the wingspan or rotor, 2) nozzle orientation - nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees, and 3) application height - without compromising aircraft safety, applications should made at a height of 10 feet or less above the crop canopy or tallest plants. Applicators must follow the most restrictive use cautions to avoid drift hazards, including those found in this labeling, as well as applicable state and local regulations and ordinances.

Ground Application (Broadcast): Use 5 or more gallons of water per acre. The actual minimum spray volume per acre is determined by the spray equipment used. Use adequate spray volume to provide accurate and uniform distribution of spray particles over the treated area and to avoid spray drift.

ADJUVANTS

Postemergence applications of Arsenal® herbicide require the addition of a spray adjuvant for optimum herbicide performance.

Nonionic Surfactants: Use a nonionic surfactant at the rate 0.25% v/v or higher (see manufacturer's label) of the spray solution (0.25% v/v is equivalent to 1 quart in 100 gallons). For best results, select a nonionic surfactant with an HLB (hydrophilic to lipophilic balance) ratio between 12 and 17 with at least 70% surfactant in the formulated product (alcohols, fatty acids, oils, ethylene glycol or diethylene glycol should not be considered as surfactants to meet the above requirements).

Methylated Seed Oils or Vegetable Oil Concentrates: Instead of a surfactant, a methylated seed oil or vegetable-based seed oil concentrate may be used at the rate of 1.5 to 2 pints per acre. When using spray volumes greater than 30 gallons per acre, methylated seed oil or vegetable-based seed oil concentrates should be mixed at a rate of 1% of the total spray volume, or alternatively use a nonionic surfactant as described above. Research indicates that these oils may aid in **Arsenal** deposition and uptake by plants under moisture or temperature stress.

Silicone-Based Surfactants: See manufacturer's label for specific rate recommendations. Silicone-based surfactants may reduce the surface tension of the spray droplet allowing greater spreading on the leaf surface as compared to conventional nonionic surfactants. However, some silicone-based surfactants may dry too quickly, limiting herbicide uptake.

Fertilizer/Surfactant Blends: Nitrogen-based liquid fertilizers, such as 28%N, 32%N, 10-34-0 or ammonium sulfate, may be added at the rate of 2 to 3 pints per acre in combination with the recommended rate of nonionic surfactant, methylated seed oil or vegetable/seed oil concentrate. The use of fertilizers in a tank mix without a nonionic surfactant, methylated seed oil or vegetable/seed oil concentrate is not recommended.

BRUSH CONTROL

AERIAL APPLICATIONS:

All precautions should be taken to minimize or eliminate spray drift. Fixed wing aircraft and helicopters can be used to apply **Arsenal**. However, **DO NOT** make applications by fixed wing aircraft unless appropriate buffer zones can be maintained to prevent spray drift out of the target area or, when treating open tracts of land, spray drift as a result of fixed wing aircraft application can be tolerated. Aerial equipment designed to minimize spray drift, such as a helicopter equipped with a **Microfoil™boom**, **Thru-Valve™ boom** or raindrop nozzles, must be used and calibrated. Except when applying with a **Microfoil boom**, a drift control agent may be added at the recommended label rate. To avoid drift, applications should not be made during inversion conditions, when winds are gusty, or any other conditions which allow drift. Side trimming is not recommended with **Arsenal** unless death of treated tree can be tolerated.

Uniformly apply the recommended amount of **Arsenal** in 5 to 30 gallons of water per acre; include in the spray solution a nonionic surfactant or methylated seed oil or manufacturer's label rate of a silicone-based surfactant (see the **ADJUVANT** section of this label for specific recommendations). A foam-reducing agent may be added at the recommended label rate, if needed.

IMPORTANT: Thoroughly clean application equipment, including landing gear, immediately after use of this product. Prolonged exposure of this product to uncoated steel (except stainless steel) surfaces may result in corrosion and failure of the exposed part. The maintenance of an organic coating (paint) may prevent corrosion.

GROUND APPLICATIONS:

IMPORTANT: To minimize spray drift, select proper nozzles to avoid spraying a fine mist. Use pressures less than 50 psi, and **DO NOT** spray under gusty or windy conditions. Add a foam-reducing agent, if needed, and a spray pattern indicator, if desired, at the recommended label rates. Clean application equipment after using this product by thoroughly flushing with water.

When making applications to rights-of-way corridors where desirable tree roots may extend, use 1 to 3 pints of **Arsenal** per acre in combination with recommended tank mixes. It is not recommended to use rates higher than 3 pints per acre in these situations, as injury or death of desirable trees may occur when their roots extend into treated zones.

Side Trimming:

DO NOT side trim with **Arsenal** unless severe injury or death of the treated tree can be tolerated. **Arsenal** is readily translocated and can result in death of the entire tree.

Low Volume:

Use equipment calibrated to deliver 5 to 20 gallons of spray solution per acre. To prepare the spray solution, thoroughly mix in water 0.5 to 5% **Arsenal** plus surfactant

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(see the **ADJUVANT** section of this label for specific recommendations). A foam-reducing agent may be applied at the recommended label rate, if needed. For control of difficult brush species (see **WEEDS CONTROLLED** section for relative susceptibility of weed species), use the higher concentrations of herbicide and/or spray volumes, but **DO NOT** apply more than 6 pints of **Arsenal® herbicide** per acre. Excessive wetting of foliage is not recommended. See the mixing guide below for some suggested volumes of **Arsenal** and water.

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SUGGESTED TANK MIXES AND APPLICATION RATES*

Target Vegetation	Rate of Arsenal® herbicide	Tank Mix
Mixed hardwoods without elm, locust, or pine	1.0 - 1.5% by volume	Surfactant
Mixed hardwoods containing elm, locust, and pine	0.5 - 1.0% by volume	**Accord®** at 2 - 3% by volume plus surfactant
Mixed hardwoods with locust and pine but no elm	0.5 - 1.0% by volume	**Krenite®** at 2 - 5% by volume plus surfactant
Mixed hardwoods with locust and elm but no pine	0.5 - 1.0% by volume	**Escort®** at 2 oz/Acre or 2.3 grams/gallon plus surfactant

*Tank mixes with 2,4-D or products containing 2,4-D have resulted in reduced efficacy of **Arsenal**.

MIXING CHART

% Solution	Amount Arsenal per Gallon of Mix (oz)	Amount Arsenal per 4-Gallon Backpack (oz)
0.5%	0.6	2.6
1.0%	1.3	5.1
2.0%	2.6	10.2
3.0%	3.8	15.4
5.0%	6.4	25.6

MEASURING CHART

128 ounces	=	1 gallon
16 ounces	=	1 pint
8 pints	=	1 gallon
4 quarts	=	1 gallon
2 pints	=	1 quart

Application Tips: For low volume, select proper nozzles to avoid over-application. Proper application is critical to ensure desirable results. Best results are achieved when the spray covers the crown and approximately 70 percent of the plant. The use of an even flat fan tip with a spray angle of 40 degrees or less will aid in proper deposition.

Recommended tip sizes include 4004E or 1504E. For a straight stream and cone pattern, adjustable cone nozzles, such as 5500 X3 or 5500 X4, may be used. Attaching a roll-over valve onto a Spraying Systems Model 30 gunjet or other similar spray guns allows for the use of both a flat fan and cone tips on the same gun.

Proper Spray Pattern: Moisten but **DO NOT** drench target vegetation causing spray solution to run off.

Low Volume with Backpacks:
For brush up to 4-feet tall, spray down on the crown covering crown and penetrating approximately 70% of the plant.

For brush 4- to 8-feet tall, swipe the sides of target vegetation by directing spray to at least two sides of the plant in smooth vertical motions from the crown to the bottom. Make sure to cover the crown whenever possible.

For brush over 8-feet tall, lace sides of the brush by directing spray to at least two sides of the target in smooth zigzag motions from crown to bottom.

Low Volume with Hydraulic Handgun Application Equipment:
Use same technique as described above for **Low Volume with Backpacks**.

For broadcast applications, simulate a gentle rain near the top of target vegetation allowing spray to contact the crown and penetrate the target foliage without falling to the understory. Herbicide spray solution which contacts the understory may result in severe injury or death of plants in the understory.

SPRAY SOLUTION MIXING GUIDE FOR LOW-VOLUME APPLICATIONS

Amount Of Spray Solution Being Prepared (gallons)	Desired Concentration (fluid volume)				
	0.5%	0.75%	1%	1.5%	5%
	(amount of Arsenal® herbicide to use)				
1	0.6 oz	0.9 oz	1.3 oz	1.9 oz	6.5 oz
3	1.9 oz	2.8 oz	3.8 oz	5.8 oz	1.2 pints
4	2.5 oz	3.8 oz	5.1 oz	7.7 oz	1.6 pints
5	3.2 oz	4.8 oz	6.5 oz	9.6 oz	2 pints
50	2 pints	3 pints	4 pints	6 pints	10 quarts
100	4 pints	6 pints	8 pints	6 quarts	5 gallons
2 tablespoons = 1 fluid ounce					

High Volumes:
For optimum performance when spraying medium- to high-density brush, use equipment calibrated to deliver up to 100 gallons of spray solution per acre (GPA). Spray solutions exceeding 100 GPA may result in excessive spray run-off causing increased ground cover injury and injury to desirable species. To prepare the spray solution, thoroughly mix **Arsenal® herbicide** at a rate of 2 to 6 pints per acre (see **IMPORTANT** section under **GROUND APPLICATIONS**) in water and add a surfactant (see **ADJUVANT** section for specific recommendations and rates of surfactants). A foam-reducing agent may be added at the recommended label rate, if needed. For control of difficult species (see **WEEDS CONTROLLED** section for relative susceptibility of weed species), use the higher concentrations of herbicide and/or spray volumes, but **DO NOT** apply more than 6 pints of **Arsenal** per acre. Uniformly cover the foliage of the vegetation to be controlled, but **DO NOT** apply to run-off. Excessive wetting of foliage is not recommended.

TANK MIXES FOR BRUSH CONTROL:
Arsenal may be tank mixed with **Accord®**, **Roundup®**, **Krenite®**, **Escort®**, **Telar®**, **Tordon® K**, **Garlon® 3A**, **Banvel®** and **Vanquish®** to provide control of **Arsenal**-tolerant species.

Consult manufacturer's labels for specific rates and weeds controlled. Always follow the more restrictive label when making an application involving tank mixes. Tank mixing with 2,4-D or products which contain 2,4-D has resulted in reduced performance of **Arsenal**.

INVERT EMULSIONS:
Arsenal can be applied as an invert emulsion. The spray solution results in an invert (water-in-oil) spray emulsion designed to minimize spray drift and spray run-off resulting in more herbicide on the target foliage. The spray emulsion may be formed in a single tank (batch mixing) or injected (in-line mixing). Consult the invert chemical label for proper mixing directions.

CUT STUBBLE:
Arsenal can be applied within 2 weeks after mechanical mowing or cutting of brush. To suppress or control resprouting, uniformly apply a spray solution of **Arsenal** at the rate of 1 to 2 pints per acre to the cut area. **Arsenal** may be tank mixed with **Tordon K** or picloram to aid in control or suppression of brush. The addition of 5% (v/v) or more of a penetrating agent can aid in uptake through the bark or exposed roots.

Cut stubble applications are made to the soil and cut brush stumps. This type of application may increase ground cover injury. However, vegetation will recover. Making applications of **Arsenal** directly to the soil can increase potential root uptake causing injury or death of desirable trees.

Efficacy can be increased, and root uptake by desirable vegetation can be decreased, if the brush is allowed to regrow and the foliage is treated. See the **BRUSH CONTROLLED** section of this label.

STUMP AND CUT STEM TREATMENTS:
Arsenal may be used to control undesirable woody vegetation on noncropland by applying the **Arsenal** solution to the cambium area of freshly cut stump surfaces or to fresh cuts on the stem of the target woody vegetation. Applications can be made at any time of the year except during periods of heavy sap flow in the spring. **DO NOT** over apply solution causing runoff or puddling.

Mixing: Arsenal may be mixed as either a concentrated or dilute solution for stump and cut stem treatments. The dilute solution may be used for applications to the surface of the stump or to cuts on the stem of the target woody vegetation. Concentrated solutions may be used for applications to cuts on the stem. Use of the concentrated solution permits application to fewer cuts on the stem, especially for large-diameter trees. Follow the application instructions to determine proper application techniques for each type of solution.

To prepare a dilute solution, mix 8 to 12 fluid ounces of **Arsenal** with one gallon of water. If temperatures are such that freezing of the spray mixture may occur, antifreeze (ethylene glycol) may be used according to manufacturer's label to prevent freezing. The use of a surfactant or penetrating agent may improve uptake through partially callused cambiums. To prepare a concentrated solution, mix 2 quarts of **Arsenal** with no more than 1 quart of water.

APPLICATION WITH DILUTE SOLUTIONS:
For cut stump treatments: Spray or brush the solution onto the cambium area of the freshly cut stump surface. Insure that the solution thoroughly wets the entire cambium area (the wood next to the bark of the stump).

For tree-injection treatments: Using standard injection equipment, apply 1 milliliter of solution at each injection site around the tree with no more than one-inch intervals between cut edges. Insure that the injector completely penetrates the bark at each injection site.

For frill or girdle treatments: Using a hatchet, machete, or similar device, make cuts through the bark at intervals around the tree with no more than two-inch intervals between cut edges. Spray or brush the solution into each cut until thoroughly wet.

APPLICATION WITH CONCENTRATED SOLUTIONS:
For tree injection treatments: Using standard injection equipment, apply 1 milliliter of solution at each injection site. Make at least one injection cut for every 3 inches of Diameter at Breast Height (DBH) on the target tree. For example, a 3-inch DBH tree will receive 1 injection cut, and a 6-inch DBH tree will receive 2 injection cuts. On trees requiring more than one injection site, place the injection cuts at approximately equal intervals around the tree.

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For frill or girdle treatments: Using a hatchet, machete, or similar device, make cuts through the bark at approximately equal intervals around the tree. Make at least one cut for every 3 inches of DBH on the target tree. For example, a 3-inch DBH tree will receive 1 cut, and a 6-inch DBH tree will receive 2 cuts. Spray or brush the solution into each cut until thoroughly wet.
NOTE: Injury may occur to desirable woody plants if the shoots extend from the same root system or their root systems are grafted to those of the treated tree.

FOR CONTROL OF UNDESIRABLE WEEDS UNDER PAVED SURFACES

Arsenal® herbicide can be used under asphalt, pond liners and other paved areas ONLY in industrial sites or where the pavement has a suitable barrier along the perimeter that prevents encroachment of roots of desirable plants.

Arsenal should be used only where the area to be treated has been prepared according to good construction practices. If rhizomes, stolons, tubers or other vegetative plant parts are present in the site, they should be removed by scalping with a grader blade to a depth sufficient to insure their complete removal.

IMPORTANT: Paving should follow **Arsenal** applications as soon as possible. **DO NOT** apply where the chemical may contact the roots of desirable trees or other plants.

The product is not recommended for use under pavement on residential properties such as driveways or parking lots, nor is it recommended for use in recreational areas such as under bike or jogging paths, golf cart paths, or tennis courts, or where landscape plantings could be anticipated. Injury or death of desirable plants may result if this product is applied where roots are present or where they may extend into the treated area. Roots of trees and shrubs may extend a considerable distance beyond the branch extremities or so-called drip line.

APPLICATION DIRECTIONS FOR PAVED SURFACES:
Applications should be made to the soil surface only when final grade is established. **DO NOT** move soil following **Arsenal** application.

Apply **Arsenal** in sufficient water (at least 100 gal per acre) to ensure thorough and uniform wetting of the soil surface, including the shoulder areas. Add **Arsenal** at a rate of 6 pints per acre (2.2 fluid ounce per 1000 square feet) to clean water in the spray tank during the filling operation. Agitate before spraying.

If the soil is not moist prior to treatment, incorporation of **Arsenal** is needed for herbicide activation. **Arsenal** can be incorporated into the soil to a depth of 4 to 6 inches using a rototiller or disc. Rainfall or irrigation of 1 inch will also provide uniform incorporation. **DO NOT** allow treated soil to wash or move into untreated areas.

FOR CONTROL OF UNDESIRABLE WEEDS IN UNIMPROVED BERMUDAGRASS AND BAHIAGRASS

Arsenal may be used on unimproved bermudagrass and bahiagrass turf such as roadsides, utility rights-of-way and other noncropland industrial sites. The application of **Arsenal** on established common and coastal bermudagrass and bahiagrass provides control of labeled broadleaf and grass weeds. Competition from these weeds is eliminated, releasing the bermudagrass and bahiagrass. Treatment of bermudagrass with **Arsenal** results in a compacted growth habit and seedhead inhibition.

Uniformly apply with properly calibrated ground equipment using at least 10 gallons of water per acre with a spray pressure 20 to 50 psi.

IMPORTANT: Temporary yellowing of grass may occur when treatment is made after growth commences. **DO NOT** add surfactant in excess of the recommended rate (1 oz per 25 gallons of spray solution). **DO NOT APPLY** to grass during its first growing season. **DO NOT APPLY** to grass that is under stress from drought, disease, insects, or other causes.

DOSAGE RATES AND TIMING:
Bermudagrass - Apply **Arsenal** at 6 to 12 oz per acre when the bermudagrass is dormant. Apply **Arsenal** at 6 to 8 oz per acre after the bermudagrass has reached full green-up. Applications made during green-up will delay green-up. Include a surfactant in the spray solution (see **IMPORTANT** statement above).

For additional preemergence control of annual grasses and small seeded broadleaf weeds, add **Pendulum® herbicide** at the rate of 3.3 to 6.6 lbs per acre. Consult the **Pendulum** label for weeds controlled and for other use directions and precautions.

For control of Johnsongrass in bermudagrass turf, apply **Arsenal** at 8 oz per acre plus **Roundup® herbicide** at 12 oz per acre plus surfactant. For additional control of broadleaves and vines, **Garlon® 3A** may be added to the above mix at the rate of 1-2 pints per acre. Observe all precautions and restrictions on the **Garlon 3A** and **Roundup** labels.

Bahiagrass - Apply **Arsenal** at 4 to 8 oz per acre when the bahiagrass is dormant or after the grass has initiated green-up but has not exceeded 25% green-up. Include in the spray solution a surfactant (see **ADJUVANT** section for specific recommendations on surfactants).

WEEDS CONTROLLED:

Bedstraw (*Galium* spp.)
Bishopweed (*Ptilimnium capillaceum*)
Buttercup (*Ranunculus parviflorus*)
Carolina geranium (*Geranium carolinianum*)
Fescue (*Festuca* spp.)
Foxtail (*Setaria* spp.)
Little barley (*Hordeum pusillum*)
Seedling Johnsongrass (*Sorghum halepense*)
White clover (*Trifolium repens*)
Wild carrot (*Daucus carota*)
Yellow woodsorrel (*Oxalis stricta*)

GRASS GROWTH AND SEEDHEAD SUPPRESSION

Arsenal® herbicide may be used to suppress growth and seedhead development of certain turfgrass in unimproved areas. When applied to desirable turf, **Arsenal** may result in temporary turf damage and/or discoloration. Effects to the desirable turf may vary with environmental conditions. For optimum performance, application should be made prior to culm elongation. Applications may be made before or after mowing. If applied prior to mowing, allow at least three days of active growth before mowing. If following a mowing, allow sufficient time for the grasses to recover before applying this product or injury may be amplified.

DO NOT APPLY to turf under stress (drought, cold, insect damaged, etc.) or severe injury or death may occur.

Bermudagrass - Apply **Arsenal** at 6 to 8 oz per acre from early green-up to prior to seed head initiation. **DO NOT** add a surfactant for this application.

Cool Season Unimproved Turf - Apply **Arsenal** at 2 oz per acre plus 0.25% nonionic surfactant. For increased suppression, **Arsenal** may be tank mixed with such products as **Campaign®** (24 oz per acre) or **Embark®** (8 oz per acre).

Tank mixes may increase injury to desired turf. Consult each product label for recommended turf species and other use directions and precautions. Tank mixes with 2,4-D or products containing 2,4-D may decrease the effectiveness of **Arsenal**.

TOTAL VEGETATION CONTROL WHERE BAREGROUND IS DESIRED

Arsenal is an effective herbicide for preemergence or postemergence control of many annual and perennial broadleaf and grass weeds where bareground is desired. **Arsenal** is particularly effective on hard-to-control perennial grasses. **Arsenal** at 1.5 to 6 pints per acre can be used alone or in tank mix with **Roundup®**, **Finale®**, MSMA, **Karmex®**, **Pendulum®**, simazine, **Banvel®**, **Vanquish®**, or **Oust® herbicides**. The degree and duration of control are dependent on the rate of **Arsenal** used, tank mix partner, the volume of carrier, soil texture, rainfall and other conditions.

Consult manufacturer's labels for specific rates and weeds controlled. Always follow the more restrictive label when making an application involving tank mixes.

TANK MIX RECOMMENDATIONS FOR BAREGROUND

Herbicide Rates per Acre*

Arsenal herbicide	**Pendulum®** WDG	**Pendulum** 3.3 EC	Diuron
Rate in pints	in lbs	in Quarts	in lbs ai
1.5 - 3	6.6	4.8	4 - 6
2 - 4	6.6	4.8	6 - 10
3 - 6	6.6	4.8	8 - 12

* Use higher rates for fall applications and in areas that have not been previously treated or that feature heavy infestations.

Applications of **Arsenal** may be made anytime of the year. Use equipment calibrated to deliver desired gallons per acre spray volume and uniformly distribute the spray pattern over the treated area.

Postemergence Applications: Always use a spray adjuvant (see **ADJUVANT** section of this label) when making a postemergence application. For optimum performance on tough to control annual grasses, applications should be made at a total volume of 100 gallons per acre or less. For quicker burndown or brown-out of target weeds, **Arsenal** may be tank mixed with products such as **Roundup®**, **Finale**, or MSMA. Tank mixes with 2,4-D or products containing 2,4-D have reduced performance of **Arsenal**. Always follow the more restrictive label when tank mixing.

Spot Treatments: Arsenal may be used as a follow-up treatment to control escapes or weed encroachment in a bareground situation. To prepare the spray solution, thoroughly mix in each gallon of water 0.5 to 5% **Arsenal** plus an adjuvant. For increased burndown, include **Roundup®**, **Finale**, MSMA, or similar products. For added residual weed control or to increase the weed spectrum, add **Pendulum** or diuron. Always follow the more restrictive label when tank mixing.

FOR SPOT TREATMENT WEED CONTROL IN GRASS PASTURE AND RANGELAND

For the control of undesirable vegetation in grass pasture and rangeland, **Arsenal** may be applied as a spot treatment at a rate of 2 to 48 fluid oz of product per treated acre using any of the described ground application methods. Spot applications to grass pasture and rangeland may not exceed more than one-tenth of the area to be grazed or cut for hay. See appropriate sections of this label for specific use directions for the application method and vegetation control desired. **DO NOT** apply more than 48 fluid oz per acre per year.

Grazing and Haying Restrictions: There are no grazing restrictions following **Arsenal** application. **DO NOT** cut forage grass for hay for seven days after **Arsenal** application.

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GUIDELINES FOR RANGELAND USE

Arsenal® herbicide may be applied to rangeland for the control of undesirable vegetation in order to achieve one or more of the following vegetation management objectives:

1. The control of undesirable (non-native, invasive and noxious) plant species
2. The control of undesirable vegetation in order to aid in the establishment of desirable rangeland plant species.
3. The control of undesirable vegetation in order to aid in the establishment of desirable rangeland vegetation following a fire.
4. The control of undesirable vegetation for purposes of wildfire fuel reduction.
5. The release of existing desirable rangeland plant communities from the competitive pressure of undesirable plant species.
6. The control of undesirable vegetation for purposes of wildlife habitat improvement.

To ensure the protection of threatened and endangered plants when applying **Arsenal** to rangeland:

1. Federal agencies must follow NEPA regulations to ensure protection of threatened and endangered plants.
2. State agencies must work with the Fish and Wildlife Service or the Service's designated state conservation agency to ensure protection of threatened and endangered plants.
3. Other organizations or individuals must operate under a Habitat Conservation Plan if threatened or endangered plants are known to be present on the land to be treated.

Please see the appropriate section(s) of this label for specific use directions for the desired rangeland vegetation management objective.

Arsenal should only be applied to a given rangeland acre as specific weed problems arise. Long-term control of undesirable weed species ultimately depends on the successful use of land management practices that promote the growth and sustainability of desirable rangeland plant species.

ROTATIONAL CROP GUIDELINE

Rotational crops may be planted twelve months after applying **Arsenal** at the recommended pasture and rangeland rate. Following twelve months after an **Arsenal** application and before planting any crop, a successful field bioassay must be completed. The field bioassay consists of a test strip of the intended rotational crop planted in the previously treated area in the grass pasture/rangeland and grown to maturity. The test strip should include low areas and knolls, and include variations in soil type and pH within the treated area. If no crop injury is evident in the test strip, the intended rotational crop may be planted the following year.

Use of **Arsenal** in accordance with label directions is expected to result in normal growth of rotational crops in most situations; however, various environmental and agronomic factors make it impossible to eliminate all risks associated with the use of this product and, therefore, rotational crop injury is always possible.

WEEDS CONTROLLED BY ARSENAL

Arsenal will provide preemergence or postemergence control with residual control of the following target vegetation species at the rates listed. Residual control refers to control of newly germinating seedlings in both annuals and perennials. In general, annual weeds may be controlled by preemergence or postemergence applications of **Arsenal**. **For established biennials and perennials, postemergence applications of Arsenal are recommended**. The rates shown below pertain to broadcast applications and indicate the relative sensitivity of these weeds. The relative sensitivity should be referenced when preparing low-volume spray solutions (see **Low-Volume** section of **GROUND APPLICATIONS**); low-volume applications may provide control of the target species with less **Arsenal** per acre than is shown for the broadcast treatments. **Arsenal** should be used only in accordance with the recommendations on this label and the leaflet label.

Resistant Biotypes: Naturally occurring biotypes (a plant within a given species that has a slightly different but distinct genetic makeup from other plants of the same species) of some weeds listed on this label may not be effectively controlled by this and/or other herbicides (**Oust®**) with the ALS/AHAS enzyme inhibiting mode of action. If naturally occurring ALS/AHAS resistant biotypes are present in an area, **Arsenal** should be tank mixed or applied sequentially with an appropriate registered herbicide having a different mode of action to ensure control.

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GRASSES

COMMON NAME	SPECIES	GROWTH HABIT[2]
	Apply 2-3 pints per acre[1]	
Annual bluegrass	(*Poa annua*)	A
Broadleaf signalgrass	(*Brachiaria platyphylla*)	A
Canada bluegrass	(*Poa compressa*)	P
Downy brome	(*Bromus tectorum*)	A
Fescue	(*Festuca* spp.)	A/P
Foxtail	(*Setaria* spp.)	A
Italian ryegrass	(*Lolium multiflorum*)	A
Johnsongrass	(*Sorghum halepense*)	P
Kentucky bluegrass	(*Poa pratensis*)	P
Lovegrass	(*Eragrostis* spp.)	A/P
Orchardgrass	(*Dactylis glomerata*)	P
Paragrass	(*Brachiaria mutica*)	P
Quackgrass	(*Agropyron repens*)	P
Sandbur	(*Cenchrus* spp.)	A
Sand dropseed	(*Sporobulus cryptandrus*)	A
Smooth brome	(*Bromus inermis*)	P
Vaseygrass	(*Paspalum urvillei*)	P
Wild oats	(*Avena fatua*)	A
Witchgrass	(*Panicum capillare*)	A
	Apply 3-4 pints per acre[1]	
Barnyardgrass[3]	(*Echinochloa crus-gali*)	A
Beardgrass	(*Andropogon* spp.)	P
Bluegrass, annual[3]	(*Poa annua*)	A
Cheat	(*Bromus secalinus*)	A
Crabgrass	(*Digitaria* spp.)	A
Crowfootgrass[3]	(*Dactyloctenium aegyptium*)	A
Fall panicum	(*Panicum dichotomiflorum*)	A
Giant reed	(*Arundo donax*)	A
Goosegrass	(*Eleusine indica*)	A
Itchgrass[3]	(*Rottboellia exaltata*)	A
Junglerice[3]	(*Echinochloa colonum*)	A
Lovegrass[3]	(*Eragrostis* spp.)	A
Maidencane	(*Panicum hemitomon*)	A
Panicum, browntop[3]	(*Panicum fasciculatum*)	A
Panicum, Texas[3]	(*Panicum texanum*)	A
Prairie threeawn	(*Aristida oligantha*)	P
Reed canarygrass	(*Phalaris arundinacea*)	P
Sandbur, field[3]	(*Cenchrus incertus*)	A
Signalgrass[3]	(*Brachiaria* spp.)	A
Torpedograss	(*Panicum repens*)	P
Wild barley	(*Hordeum* spp.)	A
Wooly cupgrass[3]	(*Eriochloa villosa*)	A

GRASSES *(continued)*

COMMON NAME	SPECIES	GROWTH HABIT[2]
	Apply 4-6 pints per acre[1]	
Bahiagrass	(*Paspalum notatum*)	P
Bermudagrass[4]	(*Cynodon dactylon*)	P
Big bluestem	(*Andropogon gerardii*)	P
Cattail	(*Typha* spp.)	P
Cogongrass	(*Imperata cylindrica*)	P
Dallisgrass	(*Paspalum dilatatum*)	P
Feathertop	(*Pennisetum villosum*)	P
Guineagrass	(*Panicum maximum*)	P
Phragmites	(*Phragmites australis*)	P
Prairie cordgrass	(*Spartina pectinata*)	P
Saltgrass[4]	(*Distichlis stricta*)	P
Sand dropseed	(*Sporobolus cryptandrus*)	P
Sprangletop[3]	(*Leptochloa* spp.)	A
Timothy	(*Phleum pratense*)	P
Wirestem muhly	(*Muhlenbergia frondosa*)	P
	BROADLEAF WEEDS	
	Apply 2-3 pints per acre[1]	
Alligatorweed	(*Alternanthera philoxeroides*)	A/P
Burdock	(*Arctium* spp.)	B
Carolina geranium	(*Geranium carolinianum*)	A
Carpetweed	(*Mollugo verticillata*)	A
Clover	(*Trifolium* spp.)	A/P
Common chickweed	(*Stellaria media*)	A
Common ragweed	(*Ambrosia artemisiifolia*)	A
Dandelion	(*Taraxacum officinale*)	P
Dogfennel	(*Eupatorium capillifolium*)	A
Filaree	(*Erodium* spp.)	A
Fleabane	(*Erigeron* spp.)	A
Hoary vervain	(*Verbena stricta*)	P
Indian mustard	(*Brassica juncea*)	A
Kochia[5]	(*Kochia scoparia*)	A
Lambsquarters	(*Chenopodium album*)	A
Lespedeza	(*Lespedeza* spp.)	P
Miners lettuce	(*Montia perfoliata*)	A
Mullein	(*Verbascum* spp.)	B
Nettleleaf goosefoot	(*Chenopodium murale*)	A
Oxeye daisy	(*Chrysanthemum leucanthemum*)	P
Pepperweed	(*Lepidium* spp.)	A
Pigweed	(*Amaranthus* spp.)	A
Puncturevine	(*Tribulus terrestris*)	A
Russian thistle	(*Salsola kali*)	A
Smartweed	(*Polygonum* spp.)	A
Sorrell	(*Rumex* spp.)	P
Sunflower	(*Helianthus* spp.)	A
Sweet clover	(*Melilotus* spp.)	A
Tansymustard	(*Ambrosia psilostachya*)	P
Wild carrot	(*Daucus carota*)	B
Wild lettuce	(*Lactuca* spp.)	A/B
Wild parsnip	(*Pastinaca sativa*)	B

BROADLEAF WEEDS *(continued)*

COMMON NAME	SPECIES	GROWTH HABIT[2]
	Apply 2-3 pints per acre[1]	
Wild turnip	(*Brassica campestris*)	B
Woollyleaf bursage	(*Franseria tomentosa*)	P
Yellow woodsorrel	(*Oxalis stricta*)	P
	Apply 3-4 pints per acre[1]	
Broom snakeweed[6]	(*Gutierrezia sarothrae*)	P
Bull thistle	(*Cirsium vulgare*)	B
Burclover[3]	(*Medicago* spp.)	A
Chickweed, mouseear[5]	(*Cerastium vulgatum*)	A
Clover, hop[3]	(*Trifolium procumbens*)	A
Cocklebur	(*Xanthium strumarium*)	A
Cudweed[3]	(*Gnaphalium* spp.)	A
Desert camelthorn	(*Alhagi pseudalhagi*)	P
Diffuse knapweed	(*Centaurea diffusa*)	A
Dock	(*Rumex* spp.)	P
Fiddleneck[3]	(*Amsinckia intermedia*)	A
Goldenrod	(*Solidago* spp.)	P
Henbit[3]	(*Lamium aplexicaule*)	A
Knotweed, prostrate[3]	(*Polygonum aviculare*)	A/P
Pokeweed	(*Phytolacca americana*)	P
Purple loosestrife[6]	(*Lythrum salicaria*)	P
Purslane	(*Portulaca* spp.)	A
Pusley, Florida[3]	(*Richardia scabra*)	A
Rocket, London[3]	(*Sisymbrium irio*)	A
Rush skeletonweed[6]	(*Chondrilla juncea*)	B
Saltbush	(*Atriplex* spp.)	A
Shepherdspurse[3]	(*Capsella bursa-pastoris*)	A
Spurge, annual[3]	(*Euphorbia* spp.)	A
Stinging nettle[6]	(*Urtica dioica*)	P
Velvetleaf[3]	(*Abutilon theophrasti*)	A
Yellow starthistle	(*Centaurea solstitialis*)	A
	Apply 4-6 pints per acre[1]	
Arrowwood	(*Pluchea sericea*)	A
Canada thistle	(*Cirsium arvense*)	P
Giant ragweed	(*Ambrosia trifida*)	A
Grey rabbitbrush	(*Chrysothamnus nauseosus*)	P
Japanese bamboo/knotweed	(*Polygonum cuspidatum*)	P
Little mallow	(*Malva parviflora*)	B
Milkweed	(*Asclepias* spp.)	P
Primrose	(*Oenothera kunthiana*)	P
Russian knapweed	(*Centaurea repens*)	P
Silverleaf nightshade	(*Solanum elaeagnifolium*)	P
Sowthistle	(*Sonchus* spp.)	A
Texas thistle	(*Cirsium texanum*)	P

VINES AND BRAMBLES

COMMON NAME	SPECIES	GROWTH HABIT[2]
	Apply 1 pint per acre	
Field bindweed	(*Convolvulus arvensis*)	P
Hedge bindweed	(*Calystegia sepium*)	A
	Apply 2-3 pints per acre[1]	
Wild buckwheat	(*Polygonum convolvulus*)	P
	Apply 3-4 pints per acre[1]	
Greenbriar	(*Smilax* spp.)	P
Honeysuckle	(*Lonicera* spp.)	P
Morningglory	(*Ipomoea* spp.)	A/P
Poison ivy	(*Rhus radicans*)	P
Redvine	(*Brunnichia cirrhosa*)	P
Wild rose	(*Rosa* spp.)	P
Including: Multiflora rose	(*Rosa multiflora*)	P
Macartney rose	(*Rosa bractreata*)	P
	Apply 4-6 pints per acre[1]	
Kudzu[4]	(*Pueraria lobata*)	P
Trumpetcreeper	(*Campsis radicans*)	P
Virginia creeper	(*Parthenocissus quinquefolia*)	P
Wild grape	(*Vitis* spp.)	P

BRUSH SPECIES

	Apply 4-6 pints per acre[1]	
American beech	(*Fagus grandifolia*)	P
Ash	(*Fraxinus* spp.)	P
Bald cypress	(*Taxodium distichum*)	P
Bigleaf Maple	(*Acer macrophylum*)	P
Blackgum	(*Nyssa sylvatica*)	P
Black Locust[7]	(*Robinia pseudoacacia*)	P
Boxelder	(*Acer negundo*)	P
Brazilian peppertree	(*Schinus terebinthifolius*)	P
Cherry	(*Prunus* spp.)	P
Chinaberry	(*Melia azadarach*)	P
Chinese tallow-tree	(*Sapium sebiferum*)	P
Dogwood	(*Cornus* spp.)	P
Elm[8]	(*Ulmus* spp.)	P
Hawthorn	(*Crataegus* spp.)	P
Hickory	(*Carya* spp.)	P
Honeylocust[9]	(*Gleditsia triacanthos*)	P
Maple	(*Acer* spp.)	P
Melaleuca	(*Melaleuca quiquenervia*)	P
Mulberry	(*Morus* spp.)	P
Oak	(*Quercus* spp.)	P
Persimmon	(*Diospyros virginiana*)	P
Pine[10]	(*Pinus* spp.)	P
Poplar	(*Populus* spp.)	P
Privet	(*Ligustrum vulgare*)	P
Red Alder	(*Alnus rubra*)	P
Red Maple	(*Acer rubrum*)	P
Russian Olive	(*Eleagnus angustifolia*)	P
Saltcedar	(*Tamarix ramosissima*)	P
Sassafras	(*Sassafras albidum*)	P

BRUSH SPECIES *(continued)*

Apply 4-6 pints per acre[1]

COMMON NAME	SPECIES	GROWTH HABIT[2]
Sourwood	(*Oxydendrum arboreum*)	P
Sumac	(*Rhus* spp.)	P
Sweetgum	(*Liquidambar styraciflua*)	P
Willow	(*Salix* spp.)	P
Yellow poplar	(*Liriodendron tulipifera*)	P

[1] The higher rates should be used where heavy or well-established infestations occur.
[2] Growth Habit:- A = Annual, B = Biennial, P = Perennial
[3] For preemergence control, tank mix with **Pendulum® herbicide**.
[4] Use a minimum of 75 GPA - control of established stands may require repeat applications.
[5] For preemergence control, tank mix with **Pendulum**, **Karmex®** or diuron.
[6] For best results, early postemergence applications are required.
[7] Tank mix with **Roundup®**, **Accord®**, **Escort®**, **Krenite®**, **Garlon® 3A** or **Tordon® K**.
[8] Tank mix with **Roundup**, **Accord**, or **Escort**.
[9] Tank mix with **Roundup**, **Accord**, **Garlon 3A** or **Tordon K**.
[10] Tank mix with **Accord**, **Roundup**, **Garlon 3A**, **Tordon K** or **Krenite**.

Conditions of Sale and Warranty

The **Directions For Use** of this product reflects the opinion of experts based on field use and tests. The directions are believed to be reliable and should be followed carefully. However, it is impossible to eliminate all risks inherently associated with use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or use of the product in a manner inconsistent with its labeling, all of which are beyond the control of BASF CORPORATION ("BASF") or the Seller. All such risks shall be assumed by the Buyer.

BASF warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes referred to in the **Directions For Use**, subject to the inherent risks, referred to above.

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BASF Corporation
Agricultural Products
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Research Triangle Park, NC 27709

BASF

The Chemical Company

Massachusetts Electric Company d/b/a National Grid
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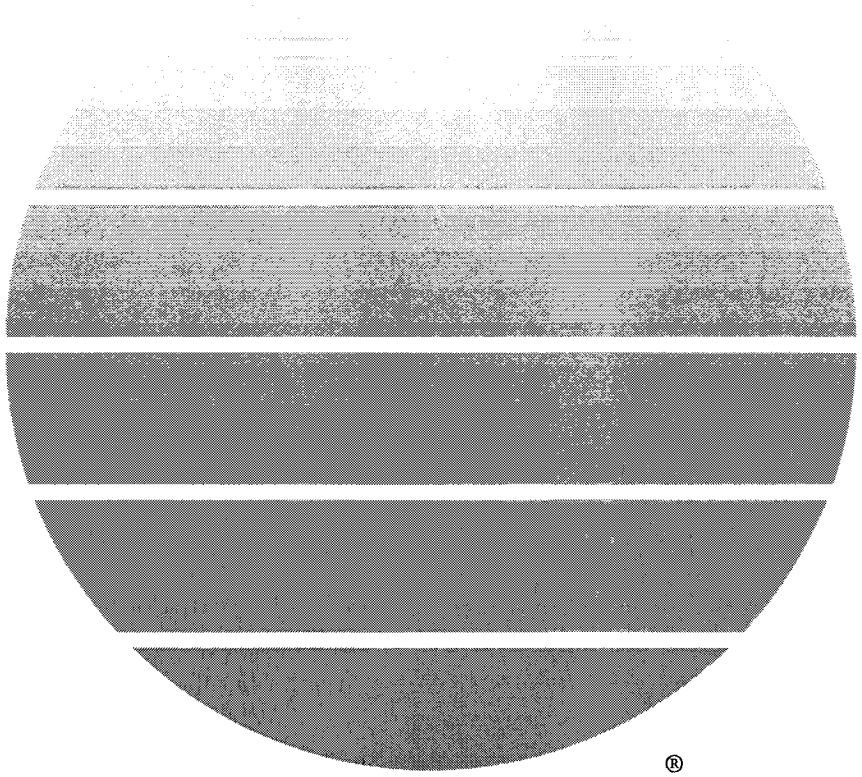
912

DuPont™ Escort® XP

herbicide



".....A Growing Partnership With Nature"

DUPONT®

DuPont™ Escort® XP

herbicide

Dry Flowable

Active Ingredient	*By Weight*
Metsulfuron methyl Methyl 2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]-carbonyl]amino]sulfonyl]benzoate	60%
Inert Ingredients	40%
TOTAL	100%

EPA Reg. No. 352-439

KEEP OUT OF REACH OF CHILDREN

CAUTION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand this label, find someone to explain it to you in detail.)

FIRST AID

IF ON SKIN OR CLOTHING: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for further treatment advice.

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for further treatment advice.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-441-3637 for emergency medical treatment information.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION! Causes eye irritation. Avoid contact with skin, eyes or clothing. Avoid breathing dust or spray mist.

PERSONAL PROTECTIVE EQUIPMENT

Applicators and other handlers must wear:

Long-sleeved shirt and long pants.

Shoes plus socks.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS

USERS SHOULD: Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.

ENVIRONMENTAL HAZARDS

Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.

This herbicide is injurious to plants at extremely low concentrations. Nontarget plants may be adversely effected from drift and run-off.

IMPORTANT

DO NOT USE ON FOOD OR FEED CROPS EXCEPT AS RECOMMENDED BY THIS LABEL OR SUPPLEMENTAL LABELING. Injury to or loss of desirable trees or other plants may result if the precautions listed below are not followed.

- Do not apply DuPont™ ESCORT® XP herbicide (except as recommended), or drain or flush equipment on or near desirable trees or other plants, or on areas where their roots may extend or in locations where the product may be washed or moved into contact with their roots.
- Do not use on lawns, walks, driveways, tennis courts, or similar areas.
- Prevent drift of spray to desirable plants.
- Do not contaminate any body of water, including irrigation water.
- Keep from contact with fertilizers, insecticides, fungicides and seeds.

Low rates of ESCORT® XP can kill or severely injure most crops. Following an ESCORT® XP application, the use of spray equipment to apply other pesticides to crops on which ESCORT® XP is not registered may result in their damage. The most effective way to reduce this crop damage potential is to use dedicated mixing and application equipment.

GENERAL INFORMATION

ESCORT® XP herbicide is a dispersible granule that is mixed in water and applied as a spray by ground or aerial application.

ESCORT® XP is recommended for the control of annual and perennial weeds and unwanted woody plants on private, public and military lands, on rights-of-way, industrial sites, non-crop areas, ditchbanks of dry drainage ditches, certain types of unimproved turf grass, and conifer and hardwood plantations, including grazed areas on these sites. Do not use on irrigation ditches.

ESCORT® XP controls weeds and woody plants primarily by postemergent activity. Although ESCORT® XP has preemergence activity, best results are generally obtained when ESCORT® XP is applied to foliage after emergence or dormancy break. Generally, for the control of annual weeds, ESCORT® XP provides the best results when applied to young, actively growing weeds. For the control of perennial weeds, applications made at the bud/bloom stage or while the target weeds are in the fall rosette stage may provide the best results. The use rate depends upon the weed species and size at the time of application.

The degree and duration of control may depend on the following:

- weed spectrum and infestation intensity
- weed size at application
- environmental conditions at and following treatment
- soil pH, soil moisture, and soil organic matter.

ESCORT® XP may be applied on conifer and hardwood plantations, and non-crop sites that contain areas of temporary surface water caused by the collection of water between planting beds, in equipment ruts, or in other depressions created by management activities. It is permissible to treat intermittently flooded low lying sites, seasonally dry flood plains and transitional areas between upland and lowland sites when no water is present. It is also permissible to treat marshes, swamps and bogs after water has receded as well as seasonally dry flood deltas. DO NOT make applications to natural or man-made bodies of water such as lakes, reservoirs, ponds, streams and canals.

ENVIRONMENTAL CONDITIONS AND BIOLOGICAL ACTIVITY

ESCORT® XP is absorbed primarily through the foliage of plants, and by the roots to a lesser degree. Plant cell division is generally inhibited in sensitive plants within a few hours following uptake. Two to 4 weeks after application, leaf growth slows followed by discoloration and tissue death. The final affects on annual weeds are evident about 4 to 6 weeks after application. The ultimate affect on perennial weeds and woody plants occurs in the growing season following application.

Warm, moist conditions following treatment promote the activity of ESCORT® XP, while cold, dry conditions may reduce or delay activity. Weeds and brush hardened off by cold weather or drought stress may not be controlled.

The use of a surfactant is recommended to enhance the control of susceptible plants, except where noted. Apply at a minimum rate (concentration) of 1/4% volume/volume (1 quart per 100 gallons of spray solution), or at the manufacturer's recommended rate. Use only EPA approved surfactants containing at least 80% active ingredient. Certain types of surfactants, such as those incorporating acetic acid (i.e. LI- 700), may not be compatible with ESCORT® XP and may result in decreased performance. Certain surfactants may not be suitable for use on desirable plants, such as turf and conifers, listed on this label. Consult the surfactant manufacturer's label for appropriate uses.

Weed and brush control may be reduced if rainfall occurs soon after application.

RESISTANCE

When herbicides that affect the same biological site of action are used repeatedly over several years to control the same weed species in the same field, naturally-occurring resistant biotypes may survive a correctly applied herbicide treatment, propagate, and become dominant in that field. Adequate control of these resistant weed biotypes cannot be expected. If weed control is unsatisfactory, it may be necessary to retreat the problem area using a product affecting a different site of action.

To better manage herbicide resistance through delaying the proliferation and possible dominance of herbicide resistant weed biotypes, it may be necessary to change cultural practices within and between crop seasons such as using a combination of tillage, retreatment, tank-mix partners and/or sequential herbicide applications that have a different site of action. Weed escapes that are allowed to go to seed will promote the spread of resistant biotypes.

It is advisable to keep accurate records of pesticides applied to individual fields to help obtain information on the spread and dispersal of resistant biotypes. Consult your agricultural dealer, consultant, applicator, and/or appropriate state

agricultural extension service representative for specific alternative cultural practices or herbicide recommendations available in your area.

INTEGRATED PEST MANAGEMENT

This product may be used as part of an Integrated Pest Management (IPM) program that can include biological, cultural, and genetic practices aimed at preventing economic pest damage. IPM principles and practices include field scouting or other detection methods, correct target pest identification, population monitoring, and treating when target pest populations reach locally determined action thresholds. Consult your state cooperative extension service, professional consultants or other qualified authorities to determine appropriate action treatment threshold levels for treating specific pest/crop systems in your area.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.
DuPont™ ESCORT® XP should be used only in accordance with recommendations on this label or in separately published DuPont recommendations.
DuPont will not be responsible for losses or damages resulting from the use of this product in any manner not specifically recommended by DuPont. User assumes all risks associated with such non-recommended use.
Do not apply more than 4 ounces of ESCORT® XP per acre per year.
Do not use on food or feed crops except as recommended by this label or supplemental labeling.
Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application.
For any requirements specific to your State or Tribe, consult the agency in your State responsible for pesticide regulation.

TANK MIXES

ESCORT® XP may be tank mixed with other herbicides registered for the use sites described in this label. Use only those tank mix partners which are labeled for the appropriate use site. When tank mixing, use the most restrictive label limitations for each of the products being used in the tank mix.

AGRICULTURAL USES

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.
Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 4 hours.
PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water is:
- Coveralls
- Shoes plus socks

CONIFER PLANTATIONS

Application Information
ESCORT® XP is recommended for the control of many species of weeds and deciduous trees on sites where conifers are growing or are to be planted. Apply by ground equipment or by air (helicopter only). Refer to the "Weeds Controlled" and "Brush Species Controlled" for a listing of susceptible species.
Application Timing
Apply ESCORT® XP after weeds have emerged or after undesirable hardwoods have broken winter dormancy and have reached the point of full leaf expansion.

Conifer Site Preparation --Application Before Transplanting

After consulting the "Weeds Controlled" and "Brush Species Controlled" tables, apply the rates of ESCORT® XP recommended for the most difficult to control species on the site.
Southeast—Apply up to 4 ounces per acre for loblolly and slash pines. Transplant the following planting season.
Northeast and Lake States—Apply up to 2 ounces per acre for red pine. Transplant the following planting season. Apply up to 2 ounces per acre for black, white and Norway spruce. Transplant the following spring.
West—Apply up to 2 ounces per acre prior to planting Douglas Fir, Sitka Spruce, Western Red Cedar, Western Hemlock, Ponderosa Pine, and Grand Fir in the Coast Rangeland and western slope of the Cascades in Oregon and Washington. These conifer species listed can be planted anytime after application. Other conifer species can be planted providing the user has prior experience indicating acceptable tolerance to ESCORT® XP soil residues.

Without prior experience, it is recommended that other species be planted on a small scale to determine selectivity before large-scale plantings are made as unacceptable injury may occur. DuPont will not assume responsibility for injury to any conifer species not listed on this label.

Tank Mix Combinations—

For broader spectrum control, the following products are recommended in combination with DuPont™ ESCORT® XP.

Glyphosate (4 pound active per gallon)

Tank mix 1 to 2 ounces of ESCORT® XP with 2 to 10 quarts of glyphosate per acre. Refer to the product container for a list of species controlled.

Imazapyr (4 pound active per gallon)

Tank mix 1 to 2 ounces of ESCORT® XP with 10 to 24 fluid ounces of imazapyr per acre. Loblolly and slash pines may be transplanted the planting season following application. This combination controls ash, black gum, cherry, hawthorn, honeysuckle, hophornbeam, persimmon, oaks (red, white and water), sassafras, sweetgum, Vaccinium species, and suppresses blackberry, dogwood, elms, myrtle dahoon, hickories, and red maple.

Glyphosate (4 pound active per gallon) + Imazapyr (4 pound active per gallon)

Tank mix 1/2 to 1 ounce of ESCORT® XP with 16 to 64 fluid ounces of glyphosate and 10 to 12 fluid ounces of imazapyr per acre. Slash and loblolly pines may be transplanted the planting season following application. This combination controls cherry, dogwood, elms, oaks (red and water), persimmon, sassafras, sweetgum and suppresses hickory.

DuPont™ VELPAR® L or VELPAR® DF

Tank mix 1 to 2 ounces of ESCORT® XP per acre with VELPAR® L or VELPAR® DF at the rates recommended on the container for various soil textures. Loblolly and slash pines may be transplanted the planting season following application. Refer to the product container for a list of species controlled.

DuPont™ OUST® EXTRA

Tank mix 1/2 to 1 1/2 ounces of ESCORT® XP with 2 to 3 ounces of OUST® EXTRA per acre for herbaceous weed control. Refer to the product container and the "Weeds Controlled" section of this label for a listing of the weeds controlled. Loblolly and slash pines may be transplanted the planting season following application. Tank mix 2 ounces of ESCORT® XP with 3 ounces of OUST® EXTRA per acre for herbaceous weed control and early spring suppression of bull thistle and Canada thistle in the Coast Rangeland and western slope of the Cascade Mountains. Douglas fir may be transplanted at least 90 days following application.

Release--Hardwood Control and Suppression

ESCORT® XP is recommended for application over the top of established slash and loblolly pine to control the species listed in "Weeds Controlled" and "Brush Species Controlled" section of this label. Apply 1 to 4 ounces per acre to control the species indicated, including kudzu.

Tank Mix Combinations—

For broader spectrum control the following products are recommended in combination with ESCORT® XP.

Imazapyr (4 pound active per gallon)

Tank mix 1 to 2 ounces of ESCORT® XP with 8 to 16 fluid ounces of imazapyr per acre for application to loblolly pine. Refer to the imazapyr label regarding the use of surfactants and the appropriate application timing with respect to the age and development stage of the pines. This combination controls ash, black gum, cherry, hawthorn, honeysuckle, hophornbeam, oaks (red, white and water), sassafras, sweetgum, Vaccinium species, and suppresses blackberry, dogwood, elms, myrtle dahoon, hickories, persimmon, and red maple.

VELPAR® L or VELPAR® DF

Tank mix 1 to 2 ounces of ESCORT® XP with VELPAR® L or VELPAR® DF at the rates recommended on the container for various soil textures. This combination may be applied to loblolly and slash pines.

Release--Herbaceous Weed Control

ESCORT® XP may be applied to transplanted loblolly and slash pine for the control of herbaceous competition. Consult the "Weeds Controlled" for a listing of the susceptible species and recommended application rates. Best results are obtained when ESCORT® XP is applied just before weed emergence until shortly after weed emergence.

Tank Mix Combinations—

For broader spectrum control the following products are recommended in combination with ESCORT® XP.

Imazapyr (4 pound active per gallon)

Tank mix 1/2 to 1 ounce of ESCORT® XP with 4 fluid ounces of imazapyr per acre. The tank mix may be used on loblolly pine.

VELPAR® L or VELPAR® DF

Tank mix 1/2 to 1 ounce of ESCORT® XP with VELPAR® L or VELPAR® DF at the rates recommended on the container for various soil textures. This combination may be applied to loblolly and slash pines.

Release - Directed Spray in Conifers

Western US

To release conifers from competing brush species, such as, blackberry, salmonberry, snowberry, thimbleberry and wild roses, mix 2 to 4 ounces of ESCORT® XP per 100 gallons of spray solution. Direct spray onto the foliage of competing brush species using a knapsack or backpack sprayer. For best results, apply any time after the brush species have reached full leaf stage but before autumn coloration. At application, the majority of the brush species should be less than six feet in height to help ensure adequate spray coverage. Thorough coverage of the target foliage is necessary to optimize results. Care should be taken to direct the ESCORT® XP spray solution away from the conifer foliage.

NOTE:
ESCORT® XP may cause temporary yellowing and or growth suppression when the spray solution contacts conifer foliage. The use of a surfactant with ESCORT® XP may improve brush control results. When using a surfactant with ESCORT® XP, extra precaution must be taken to avoid contact with conifer foliage. Excessive drift onto conifers may result in severe injury.

IMPORTANT PRECAUTIONS —CONIFER PLANTATIONS ONLY

- Applications of ESCORT® XP made to conifers that are suffering from loss of vigor caused by insects, diseases, drought, winter damage, animal damage, excessive soil moisture, planting shock, or other stresses may injure or kill the trees.
- Applications of ESCORT® XP made for herbaceous release should only be made after adequate rainfall has closed the planting slit and settled the soil around the roots following transplanting.
- Do not apply ESCORT® XP to conifers grown as ornamentals.
- ESCORT® XP applications may result in damage and mortality to other species of conifers when they are present on sites with those listed in the preceding recommendations for conifer plantations.

HARDWOOD PLANTATIONS

Application Information
ESCORT® XP is recommended at rates of up to 2 ounces per acre for the control of many weed species on sites where yellow poplar is growing or is to be planted, and on sites where red alder is to be planted. Apply by ground equipment or by air (helicopter only). Refer to the "Weeds Controlled" sections of this label for a listing of susceptible species.

Application Timing
ESCORT® XP may be applied as a site preparation treatment prior to planting red alder or yellow poplar. As a prior to planting site preparation treatment for red alder, ESCORT® XP may be tank mixed with other herbicides labeled for this use.
ESCORT® XP may also be applied over-the-top of planted yellow poplar seedlings after the soil has settled around the root system, but before the seedlings have broken dormancy (prior to bud break).

Release--Herbaceous Weed Control

ESCORT® XP may be applied to yellow poplar for the control of herbaceous competition. Consult the "Weeds Controlled" for a listing of the susceptible species and recommended application rates. Best results are obtained when ESCORT® XP is applied just before weed emergence until shortly after weed emergence.

Tank Mix Combinations—
Tank mix 1/2 ounce of ESCORT® XP with 4 to 6 pints of DuPont™ VELPAR® L as recommended on the package label for "RELEASE--HERBACEOUS WEED CONTROL" in pine plantations in the eastern U.S. Follow the VELPAR® L label recommendations regarding altering the application rate by soil texture.

IMPORTANT PRECAUTIONS —HARDWOOD PLANTATIONS ONLY

- Application of VELPAR® L and ESCORT® XP made to yellow poplar that are suffering from loss of vigor caused by insects, disease, drought, winter damage, animal damage, excessive soil moisture, planting shock or other stresses may injure or kill the seedlings.
- Applications of ESCORT® XP made for release should only be made after adequate rainfall has closed the planting slit and settled the soil around the roots following transplanting.
- The use of surfactant is not recommended for applications made over the tops of trees.
- Careful consideration must be given by an experienced and knowledgeable forester to match the requirements of yellow poplar and/or red alder to the conditions of the site. Treatment of yellow poplar and/or red alder planted on a site inadequate to meet its requirements may injure or kill the seedlings.

NON-AGRICULTURAL USES

NON-AGRICULTURAL USE REQUIREMENTS
The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.
Do not enter or allow others to enter the treated area until sprays have dried.
Non-crop industrial weed control and selective weed control in turf (industrial, unimproved only) are not within the scope of the Worker Protection Standard.

NON-CROP SITES

Application Information
ESCORT® XP is recommended for general weed control on private, public and military lands as follows: Uncultivated nonagricultural areas (such as airports, highway, railroad and utility rights-of-way, sewage disposal areas, etc.); uncultivated agricultural areas - non-crop producing (such as farmyards, fuel storage areas, fence rows, soil bank land, barrier strips, etc.); industrial sites - outdoor (such as lumberyards, pipeline and tank farms, etc.) including grazed areas on these sites. It is also recommended for the control of certain noxious and troublesome weeds.
Consult the "Weeds Controlled" and "Brush Species Controlled" tables to determine the appropriate application rate.
ESCORT® XP may be applied in tank mixture with other herbicides labeled for use on non-crop sites. Fully read the labels and follow all directions and restrictions on each label.
Applications may be made by ground or air. Use a sufficient volume of water to ensure thorough coverage of the target vegetation with the application equipment being used.

NATIVE GRASSES

DuPont™ ESCORT® XP is recommended for weed control and suppression in the establishment and maintenance of native grasses. It may be used where blue grama, bluestems (big, little, plains, sand, ww spar) bromegrasses (meadow), buffalograss, green sprangletop, indiangrass, kleingrass, lovegrasses (atherstone, sand, weeping, wilman), orchardgrass, sideoats grama, switchgrass (blackwell), wheatgrass (bluebunch, intermediate, pubescent Siberian, slender, streamband, tall, thickspike, western), and Russian wildrye are established. It may also be applied over these species in the seedling stage, except for orchardgrass and Russian wildrye.

Application Information

Apply ESCORT® XP at the rate of 1/10 ounce per acre for the control and suppression* of bur buttercup (testiculate), common purslane, common sunflower*, cutleaf eveningprimrose*, flixweed*, lambsquarters* (common and slimleaf), marestail*, pigweed (redroot and tumble), snow speedwell, tansymustard* and tumble mustard (Jim Hill mustard).

* Suppression is a visual reduction in weed competition (reduced population or vigor) as compared to untreated areas. Degree of suppression will vary with the size of weed and environmental conditions following treatment.

Application Timing

For established grasses, apply when weeds are in the seedling stage.

For grasses in the seedling stage, apply preplant or preemergence where the soil (seed bed) has been cultivated.

IMPORTANT PRECAUTIONS —NATIVE GRASSES

- Grass species or varieties may differ in their response to various herbicides. If no information is available, limit the initial use of ESCORT® XP to a small area. Components in a grass seed mixture will vary in tolerance to ESCORT® XP, so the final stand may not reflect the seed ratio.
- Under certain conditions such as heavy rainfall, high pH, prolonged cold weather, or wide fluctuations in day/night temperatures prior to or soon after ESCORT® XP application, temporary discoloration and/or grass injury may occur. ESCORT® XP should not be applied to grass that is stressed by severe weather conditions, drought, low fertility, water-saturated soils, disease, or insect damage as grass injury may result. Severe winter stress, drought, disease, or insect damage before or following application also may result in grass injury.

GRASS REPLANT INTERVALS

Following an application of ESCORT® XP to non-crop areas, the treated sites may be replanted with various species of grasses at the intervals recommended below.

For soils with a pH of 7.5 or less, observe the following replant intervals:

Species	Rate (ounces per acre)	Replant Interval (months)
Brome, Meadow	1/2—1	2
	1—2	3
Brome, Smooth	1/2—1	2
	1—2	4
Fescue, Alta	1/2—1	2
	1—2	4
Fescue, Red	1/2—1	2
	1—2	4
Fescue, Sheep	1/2—1	1
	1—2	4
Foxtail, Meadow	1/2—1	2
	1—2	4
Green Needlegrass	1/2—2	1
Orchardgrass	1/2—1	2
	1—2	4
Russian wildrye	1/2—1	1
	1	2
	2	3
Switchgrass	1/2—1	1
	1—2	3
Timothy	1/2—1	2
	1—2	4
Wheatgrass, Western	1/2—1	2
	1—2	3

For soils with a pH of 7.5 or greater observe the following replant intervals:

Species	Rate (ounces per acre)	Replant Interval (months)
Alkali Sacaton	1/2—1	1
	1—2	3
Bluestem, Big	1/2—2	3
Brome, Mountain	1/2—1	1
	1—2	2
Grama, Blue	1/2—2	1
Grama, Sideoats	1/2	2
	>1/2	>3
Switchgrass	1/2	2
	>1/2	>3
Wheatgrass, Thickspike	1/2—2	1
Wheatgrass, Western	1—2	2
	1/2—1	3

The recommended intervals are for applications made in the Spring to early Summer. Because ESCORT® XP degradation is slowed by cold or frozen soils, applications made in the late Summer or Fall should consider the intervals as beginning in the Spring following treatment. Testing has indicated that there is considerable variation in response among the species of grasses when seeded into areas treated with ESCORT® XP. If species other than those listed above are to be planted into areas treated with ESCORT® XP, a field bioassay should be performed, or previous experience may be used, to determine the feasibility of replanting treated sites.

ADDITIONAL GRASS INFORMATION APPLICATION INFORMATION FOR GRASS ESTABLISHMENT

DuPont™ ESCORT® XP is recommended for the control or suppression of broadleaf weeds to aid in the establishment of the following perennial native or improved grasses:

Blue Grama	Sideoats grama
Bluestems --	Switchgrass –
Big	Blackwell
Little	Wheatgrasses –
Plains	bluebunch
Sand	crested
W W spar	intermediate
Buffalograss	pubescent
Green sprangletop	Siberian
Kleingrass	slender
Lovegrasses --	steambank
Atherstone	tall
Sand	thickspike
Weeping	western
Wilman	Wildrye grass –
Orchardgrass	Russian

Maximize potential for grass establishment by consulting with the Natural Resource and Conservation Service of other government agencies or local experts concerning planting techniques and other cultural practices.
Performance from ESCORT® XP may not always be satisfactory due to the inability of newly planted grass stands to sufficiently compete with weeds, and the severity of weed pressure in new grass stands.
An additional herbicide application or mowing may be needed.

Use Rates and Application Timing for Grass Establishment Preplant (prior to planting) or Preemergence (after planting but before grass emergence)

Do not use more than 1/10 ounce per acre of ESCORT® XP for grass establishment.
Apply ESCORT® XP at 1/10 ounce per acre on all labeled grasses except orchardgrass and Russian wildrye grass. Do not apply ESCORT® XP preplant or preemergence to orchardgrass and Russian wildrye grass as severe crop injury may result.

Early postemergence to new plantings

Apply ESCORT® XP at 1/10 ounce per acre, plus a non-ionic surfactant at the rate of 2 to 4 pints per 100 gallons of spray solution on all labeled grasses anytime after grass emergence.
Do not use a spray adjuvant other than non-ionic surfactant.
Because grass species differ in time of emergence, apply only after the majority of grasses are in the 3 to 4 leaf stage.

Postemergence to stands with 1 – 5 leaf grasses planted the previous season

Apply ESCORT® XP at 1/10 ounce per acre plus a non-ionic surfactant at the rate of 2 to 4 pints per 100 gallons of spray solution, on all labeled grasses when the majority of the grasses have one or more leaves.
Do not use a spray adjuvant other than non-ionic surfactant.

APPLICATION INFORMATION FOR ESTABLISHED GRASSES

Use Rates for Established Grasses

Apply up to 1 ounce ESCORT® XP per acre as a broadcast application to established grasses. For spot applications, use 1 ounce per 100 gallons of water. Do not apply more than 1 2/3 ounces of ESCORT® XP per acre per year.
Refer to the Weeds Controlled section of this label for a listing of the weeds controlled by ESCORT® XP and the appropriate use rate to obtain control.

Application Timing – Established Grasses

ESCORT® XP may be applied to established native grasses such as bluestems and grama, and on other established grasses such as bermudagrass, bluegrass, orchardgrass, bromegrass, fescue and timothy that were planted the previous growing season (or earlier) and are fully tillered, unless otherwise directed on this label. Specific application timing information on several of these grass species follows:

Grass	Minimum time from Grass establishment ESCORT® XP application
Bermudagrass	2 months
Bluegrass, bromegrass, Orchardgrass	6 months
Timothy	12 months
Fescue	24 months

Fescue Precautions:

Note that ESCORT® XP may temporarily stunt tall fescue, cause it to turn yellow, or cause seedhead suppression. To minimize these symptoms, take the following precautions:

- Do not use more than 4/10 ounce per acre of ESCORT® XP
- Tank mix ESCORT® XP with 2,4-D
- Use the lowest recommended rate for target weeds
- Use a non-ionic surfactant at 1/2 to 1 pint per 100 gallons of spray solution
- Make application later in the spring after the new growth is 5 to 6 inches tall, or in the fall
- Do not use surfactant when liquid nitrogen is used as a carrier
- Do not use a spray adjuvant other than non-ionic surfactant

The first cutting yields may be reduced due to seedhead suppression resulting from treatment with ESCORT® XP.

Timothy Precautions:

Timothy should be at least 6 inches tall at application and be actively growing. Applications of ESCORT® XP to timothy under any other conditions may cause crop yellowing and/or stunting. To minimize these symptoms, take the following precautions:

- Do not use more than 4/10 ounce per acre ESCORT® XP
- Tank mix ESCORT® XP with 2, 4-D
- Use the lowest recommended rate for target weeds
- Use a non-ionic surfactant at 1/2 pint per 100 gallons of spray solution (1/16%)
- Make applications in the late summer or fall
- Do not use surfactant when liquid nitrogen is used as a carrier
- Do not use spray adjuvant other than non-ionic surfactant

Application of ESCORT® XP to Pensacola bahiagrass, ryegrass (Italian or perennial) and Garrison's creeping foxtail may cause severe injury to and/or loss of forage.

Rotation Intervals for Overseeding and Renovation

Location	Crop or Grass Species	Maximum DuPont™ ESCORT® XP Rate (oz per A)	Minimum Rotation Interval (months)
AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, VA, WV	Alfalfa, red clover, white clover, sweet clover, bermudagrass, bluegrass, ryegrass, tall fescue	1/10 to 3/10	4
	Wheat (except durum)	1/10 to 3/10	1
	Durum, barley, oat	1/10 to 3/10	10
ALL STATES NOT INCLUDED ABOVE	Red clover, white clover, and sweet clover	1/10 to 2/10	12
	Bermudagrass, bluegrass, ryegrass	1/10 to 2/10	6
	Tall Fescue	1/10 to 2/10	18
	Wheat (except durum)	1/10 to 2/10	1
	Durum, barley, oat	1/10 to 2/10	10
ALL AREAS WITH SOIL PH OF 7.5 OR LESS	Russian wildrye	1/10 to 1/2	1
	Green needlegrass, switchgrass, sheep fescue	1/10 to 1	1
	Meadow brome, smooth brome, alta fescue, red fescue, meadow foxtail, orchardgrass, Russian wildrye, timothy	1/10 to 1	2
ALL AREAS WITH SOIL PH OF 7.9 OR LESS	Alkali sacoton, mountain brome, blue grama thickspike wheatgrass	1/10 to 1	1
	Sideoats grama, switchgrass	1/10 to 1/2	2
	Western wheatgrass	1/10 to 1	2
	Sideoats grama, switchgrass, big bluestem	1/10 to 1	3

Other Grasses:
Varieties and species of forage grasses differ in their tolerance to herbicides. When using ESCORT® XP on a particular grass for the first time, limit use to a small area. In no injury occurs throughout the season, larger acreage may be treated the following season.
Broadleaf forage species, such as alfalfa and clover, are highly sensitive to ESCORT® XP and will be severely stunted or injured by ESCORT® XP.

CROP ROTATION

Before using ESCORT® XP, carefully consider your crop rotation plans and options.

Minimum Rotational Intervals

Minimum rotation intervals* are determined by the rate of breakdown of ESCORT® XP applied. ESCORT® XP breakdown in the soil is affected by soil pH, presence of soil microorganisms, soil temperature, and soil moisture. Low soil pH, high soil temperature, and high soil moisture increase ESCORT® XP breakdown in soil, while high soil pH, low soil temperature, and low soil moisture slow ESCORT® XP breakdown.
Of these 3 factors, only soil pH remains relatively constant. Soil temperature, and to a greater extent, soil moisture, can vary significantly from year to year and from area to area. For this reason, soil temperatures and soil moisture should be monitored regularly when considering crop rotations.
* The minimum rotation interval represents the period of time from the last application to the anticipated date of the next planting.

Soil pH Limitations
ESCORT® XP should not be used on soils having a pH above 7.9, as extended soil residual activity could extend crop rotation intervals beyond normal. Under certain conditions, ESCORT® XP could remain in the soil for 34 months or more, injuring wheat and barley. In addition, other crops planted in high-pH soils can be extremely sensitive to low concentrations of ESCORT® XP.
Checking Soil pH
Before using ESCORT® XP, determine the soil pH of the areas of intended use. To obtain a representative pH value for the test area, take several 0" to 4" samples from different areas of the field and analyze them separately. Consult local extension publications for additional information on recommended soil sampling procedures.
BIOASSAY
A field bioassay must be completed before rotating to any crop or grass species/variety not listed in the Rotation Intervals Table, or if the soil pH is not in the specified range, or if the use rate applied is not specified in the table. To conduct a field bioassay, grow test strips of the crop(s) or grass(es) you plan to grow the following year in fields previously treated with ESCORT® XP. Crop or grass response to the bioassay will indicate whether or not to rotate to the crop(s) or grass(es) grown in the test strips.
If a field bioassay is planned, check with your local Agricultural dealer or DuPont representative for information detailing the field bioassay procedure.

When used as directed, there is no grazing or haying restriction for use rates of 1 2/3 ounce per acre or less. At use rates greater than 1 2/3 ounce per acre and up to 3 1/3 ounce per acre, forage grasses may be cut for hay, fodder or green forage and fed to livestock, including lactating animals, 3 days after treatment.

IMPORTANT PRECAUTIONS

- Grass species or varieties may differ in their response to various herbicides. If no information is available, limit the initial use of DuPont™ ESCORT® XP to a small area.
- Components in a grass seed mixture will vary in tolerance to ESCORT® XP so the final stand may not reflect the seed ratio.
- Under certain conditions such as heavy rainfall, high pH, prolonged cold weather, or wide fluctuations in day/night temperatures prior to or soon after ESCORT® XP application, temporary discoloration and/or grass injury may occur. ESCORT® XP should not be applied to grass that is stressed by severe weather conditions, drought, low fertility, water-saturated soils, disease, or insect damage as grass injury may result. Severe winter stress, drought, disease, or insect damage before or following application also may result in grass injury.
- Applications of ESCORT® XP to lands undersown with legumes may cause injury to the legumes. Legumes in a seeding mixture may be severely injured or killed following an application of ESCORT® XP.
- The control of weeds in wheel track areas may be reduced if ground applications are made when dry, dusty field conditions exist. The addition of 2,4-D or MCPA should improve weed control under these conditions.

WEEDS CONTROLLED

1/3 to 1/2 ounce per acre

Annual sowthistle
Aster
Bahiagrass
Beebalm
Bittercress
Bitter sneezeweed
Blackeyed-susan
Blue mustard
Bur buttercup
Chicory
Clover
Cocklebur
Common chickweed
Common groundsel
Common purslane
Common yarrow
Conical catchfly
Corn cockle
Cow cockle
Crown vetch
Dandelion
Dogfennel
False chamomile
Fiddleneck tarweed
Field pennycress
Flixweed
Goldenrod
Lambsquarters
Marestail/horseweed****
Maximillion sunflower
Miners lettuce
Pennsylvania smartweed
Plains coreopsis
Plantain
Redroot pigweed
Redstem filaree
Rough fleabane
Shepherd's purse
Silky crazyweed (locoweed)
Smallseed falseflax
Smooth pigweed
Sweet clover
Tansymustard
Treacle mustard
Tumble mustard
Wild carrot
Wild garlic
Wild lettuce
Wild mustard
Wooly croton
Wood sorrel
Yankeweed

1/2 to 1 ounce per acre

Blackberry
Black henbane
Broom snakeweed*
Buckhorn plantain
Bull thistle
Common crupina
Common sunflower
Curly dock
Dewberry
Dyer's woad
Garlic mustard
Gorse
Halogeton
Henbit
Honeysuckle
Multiflora rose and other wild roses
Musk thistle***
Oxeye daisy
Plumeless thistle
Prostrate knotweed
Rosering gaillardia
Seaside arrowgrass
Sericea lespedeza
Tansy ragwort
Teasel
Wild caraway

1 to 2 ounces per acre

Common mullein
Common tansy
Field bindweed**
Greasewood
Gumweed
Houndstongue
Lupine
Old world climbing fern (Lygodium)
Perennial pepperweed
Poison hemlock
Purple loosestrife
Purple scabious
Scotch thistle
Scouringrush
Salsify
Snowberry
St. Johnswort
Sulphur cinquefoil
Western salsify
Whitetop (hoary cress)
Wild Iris

1 1/2 to 2 ounces per acre

Canada thistle**
Dalmation toadflax**
Duncecap larkspur
Russian knapweed**
Tall larkspur
Wild parsnip
Yellow toadflax**

3 to 4 ounces per acre

Kudzu

* Apply fall through spring.

** Suppression, which is a visual reduction in weed competition (reduced population or vigor) as compared to untreated areas. Apply as a full coverage spray for best performance.

*** Certain biotypes of musk thistle are more sensitive to ESCORT® XP and may be controlled with rates of 1/4 to 1/2 ounce per acre. Treatments of ESCORT® XP may be applied from rosette through bloom stages of development.

****Certain biotypes of marestail/horsetail are less sensitive to ESCORT® XP and may be controlled by tank mixes with herbicides with a different mode of action.

Problem Weed Control

For broader spectrum control and for use on certain biotypes of broadleaf weeds which may be resistant to ESCORT® XP and herbicides with the same mode of action, the following tank mixes are recommended.

Dicamba + 2,4-D

Weed	Rate of ESCORT® XP	Rate of dicamba (fluid ounces/acre)	Rate of 2,4-D (fluid ounces/acre)
Kochia control	1/2	8	16
Spotted knapweed control	1/2	8	16
Rush skeletonweed suppression	1	8	16

TURF, INDUSTRIAL (UNIMPROVED ONLY)

Application Information

DuPont™ ESCORT® XP is recommended for selective weed control in unimproved industrial turf where certain grasses are well established and desired as ground cover. ESCORT® XP is also recommended for the control of certain noxious and troublesome weeds in turf.

In addition to conventional spray equipment, ESCORT® XP may also be applied with invert emulsion equipment. When using an invert emulsion, mix the prescribed rate of ESCORT® XP in the water phase.

Consult the "Weeds Controlled" table to determine which weeds will be controlled by the following recommendations:

Turf Type	Rate of DuPont™ ESCORT® XP (ounces/acre)
Fescue and Bluegrass	1/4 to 1/2
Crested Wheatgrass and Smooth Brome	1/4 to 1
Bermudagrass	1/4 to 2

Application Timing

Applications may be made at anytime of the year, except when the soil is frozen.

When a spring application is made on fescue or bluegrass, a second application may be made during the summer after full seedhead maturation.

Growth Suppression and Seedhead Inhibition (Chemical Mowing)

Application Information

ESCORT® XP is recommended for growth suppression and seedhead inhibition in well established fescue and bluegrass turf at the use rate of 1/4 to 1/2 ounce per acre.

Tank Mix Combination

ESCORT® XP may be tank mixed with "Embark" for improved performance in the regulation of growth and seedhead suppression. Tank mix 1/4 to 1/2 ounce of ESCORT® XP with 1/8 to 1/4 pint of "Embark".

Application Timing

Application may be made after at least 2 to 3 inches of new growth has emerged until the appearance of the seed stalk.

Fescue Precautions:

ESCORT® XP may temporarily stunt tall fescue, cause it to turn yellow, or cause seedhead suppression. To minimize these symptoms, take the following precautions:

- Do not use more than 4/10 ounce per acre of ESCORT® XP.
- Tank mix ESCORT® XP with 2,4-D.
- Use the lowest recommended rate for target weeds.
- Use a non-ionic surfactant at 1/2 to 1 pint per 100 gallons of spray solution.
- Make application later in the spring after the new growth is 5 to 6 inches tall, or in the fall.
- Do not use a surfactant when liquid nitrogen is used as a carrier.
- Do not use a spray adjuvant other than non-ionic surfactant.
- The yields from the first cutting may be reduced due to seedhead suppression resulting from treatment with ESCORT® XP.

IMPORTANT PRECAUTIONS —INDUSTRIAL TURF ONLY

- An application of ESCORT® XP may cause temporary discoloration (chlorosis) of the grasses. Use the lower recommended rates for minimum discoloration.
- With fescue and bluegrass, sequential applications made during the same or consecutive growth periods (i.e. spring and fall) may result in excessive injury to turf.
- Excessive injury may result when ESCORT® XP is applied to turf that is under stress from drought, insects, disease, cold temperatures (winter injury) or poor fertility.
- ESCORT® XP is not recommended for use on bahiagrass.

BRUSH CONTROL

Application Information

ESCORT® XP is recommended for the control of undesirable brush growing in non-crop areas including grazed areas on these sites. Applications may be made by air, high volume ground application, low volume ground application and ultra-low volume ground application. Except as noted for multiflora rose, ESCORT® XP should be applied as a spray to the foliage.

The application volume required will vary with the height and density of the brush and the application equipment used. Generally, aerial applications will require 15 to 25 gallons of water per acre; high volume ground application will require 100 to 400 gallons of water per acre; low volume ground application will require 20 to 50 gallons of water per acre; and ultra-low volume ground application will require 10 to 20 gallons of water per acre.

Regardless of the application volume and equipment used, thorough coverage of the foliage, particularly the terminal growing points, is necessary to optimize results.

BRUSH SPECIES CONTROLLED

Species	High Volume Rate (ounces/100 gallon)	Broadcast Rate (ounces/acre)
Ash	1—2	1—3
Aspen	1—2	1—3
Black locust	1—2	1—3
Blackberry	1—2	1—3
Camelthorn	1—2	1—3
Cherry	1—2	1—3
Cottonwood	1—2	2—3
Eastern red cedar	1—2	2—3
Elder	1—2	2—3
Elm	1—2	1—3
Firs	3	1—2
Hawthorn	1—2	1—3
Honeysuckle	1—2	1/2—1
Mulberry	1—2	2—3
Multiflora rose	1—2	1—3
Muscadine (wild grape)	1—2	2—3
Oaks	1—2	1—3
Ocean spray (*Holodiscus*)	1—2	2—3
Osage orange	1—2	2—3
Red maple	1—2	2—3
Salmonberry	1/2—1	1—3
Snowberry	1/2—1	1—3
Spruce (black and white)	3	2—3
Thimbleberry	1/2—1	1—3
Tree of heaven (*Ailanthus*)	1—2	1—2
Wild roses	1/2—1	1—3
Willow	1/2—1	1—3
Yellow poplar	1/2—1	1—3

For low volume and ultra-low volume ground applications, mix 4 to 8 ounces of DuPont™ ESCORT® XP per 100 gallons of spray solution.

Application Timing

Make a foliar application of the recommended rate of ESCORT® XP during the period from full leaf expansion in the spring until the development of full fall coloration on deciduous species to be controlled. Coniferous species may be treated at anytime during the growing season.

Spot Treatment

ESCORT® XP is recommended for the control of many species of weeds including noxious/invasive weeds in certain established grasses growing on non-crop areas. Refer to the "Weeds Controlled" section for a listing of susceptible weed species and the application rate per acre per the target weed.

Or, mix one gram of ESCORT® XP per one gallon of water along with a surfactant. Spray to the point of wetting the entire surface of the target weeds, approximately 40 gallons of solution per acre.

Tank Mix Combinations—

ESCORT® XP may be tank mixed with any product labeled for non-crop brush control at the application rates specified on the companion product's label for the pests specified on the product's companion label. Read and follow the label instructions of both products when tank mixing. Follow the most restrictive limitations of any of the product labels being tank mixed.

Low Rate Applications

Imazapyr (2 pound active per gallon)

Combine 1 to 2 ounces of ESCORT® XP with 1 to 4 pints of imazapyr herbicide per acre and apply as a broadcast spray. Aerial applications should use a minimum of 15 gallons per acre spray volume. In addition to species listed above controlled by ESCORT® XP, this combination controls black gum, hophornbeam, sassafras, sweetgum, Vaccinium species, dogwood, myrtle dahoon, hickories, and persimmon.

Picloram (2 pound active per gallon) + Imazapyr (2 pound active per gallon)

Combine 1 to 1 1/2 ounce of ESCORT® XP with 2 to 8 fluid ounces of imazapyr and 1 to 2 pints of picloram per 100 gallons of water. Apply as a high volume spray. This tank mix controls cherry, elms, box elder, maples, hackberry, redbud, ash, oaks (including shingle oak), black locust and sassafras.

*Picloram is a restricted use pesticide.

Spotgun Basal Soil Treatment

For control of multiflora rose, prepare a spray suspension of ESCORT® XP by mixing 1 ounce per gallon of water. Mix vigorously until the ESCORT® XP is dispersed and agitate periodically while applying the spray suspension.

Apply the spray preparation with an exact delivery handgun applicator. Apply at the rate of 4 milliliters for each 2 feet of rose canopy diameter. Direct the treatment to the soil within 2 feet of the stem union. When treating large plants and more than one delivery is required, make applications on opposite sides of the plant.

Applications should be made from early spring to summer.

IMPORTANT PRECAUTIONS —NON-CROP BRUSH ONLY

- When using tank mixtures of ESCORT® XP with companion herbicides, read and follow all use instructions, application rates, warnings and precautions appearing on the labels. Follow the most restrictive label instructions for each of the herbicides used.

SPRAY EQUIPMENT

Low rates of ESCORT® XP can kill or severely injure most crops. Following an ESCORT® XP application, the use of spray equipment to apply other pesticides to crops on which ESCORT® XP is not registered may result in their damage. The most effective way to reduce this crop damage potential is to use dedicated mixing and application equipment.

The selected sprayer should be equipped with an agitation system to keep ESCORT® XP suspended in the spray tank. Use a sufficient volume of water to thoroughly cover the foliage of undesirable weeds, generally 10 to 40 gallons per acre. Select a spray volume and delivery system that will deliver a uniform spray pattern. Be sure the sprayer is calibrated before use. Avoid overlapping and shut off spray booms while starting, turning, slowing or stopping to avoid injury to desired plants.

Refer to the brush control section of this label for information unique to that particular use.

MIXING INSTRUCTIONS

1. Fill the tank 1/4 to 1/3 full of water.
2. While agitating, add the required amount of DuPont™ ESCORT® XP.
3. Continue agitation until the ESCORT® XP is fully dispersed, at least 5 minutes.
4. Once the ESCORT® XP is fully dispersed, maintain agitation and continue filling tank with water. ESCORT® XP should be thoroughly mixed with water before adding any other material.
5. As the tank is filling, add tank mix partners (if desired) then add the necessary volume of nonionic surfactant. Always add surfactant last.
6. If the mixture is not continuously agitated, settling will occur. If settling occurs, thoroughly re-agitate before using.
7. ESCORT® XP spray preparations are stable if they are pH neutral or alkaline and stored at or below 100° F.
8. If ESCORT® XP and a tank mix partner are to be applied in multiple loads, pre-slurry the ESCORT® XP in clean water prior to adding to the tank. This will prevent the tank mix partner from interfering with the dissolution of the ESCORT® XP.

USE PRECAUTIONS

- Do not drain or flush equipment on or near desirable trees or other plants, or on areas where their roots may extend, or in locations where the product may be washed or moved into contact with their roots, as injury or loss of desirable trees or other plants may result
- Treatment of powdery, dry soil or light, sandy soil when there is little likelihood of rainfall soon after treatment may result in off target movement and possible damage to susceptible crops when soil particles are moved by wind or water. Injury to crops may result if treated soil is washed, blown, or moved onto land used to produce crops. Exposure to ESCORT® XP may injure or kill most crops. Injury may be more severe when the crops are irrigated. Do not apply ESCORT® XP when these conditions are identified and powdery, dry soil or light or sandy soils are known to be prevalent in the area being treated.
- Applications made where runoff water flows onto agricultural land may injure crops. Applications made during periods of intense rainfall, to soils saturated with water, to surfaces paved with materials such as asphalt or concrete, or to soils through which rainfall will not readily penetrate may result in runoff and movement of ESCORT® XP. Do not treat frozen soil. Treated soil should be left undisturbed to reduce the potential for ESCORT® XP movement by soil erosion due to wind or water.
- Do not use on lawns, walks, driveways, tennis courts or similar areas.
- Do not apply through any type of irrigation system.
- When used as directed, there are no grazing or haying restrictions for use rates of 1 2/3 ounce per acre and less. At use rates of 1 2/3 to 3 1/3 ounce per acre, forage grasses may be cut for hay, fodder or green forage and fed to livestock, including lactating animals, 3 days after treatment.
- Do not use this product in the following counties of Colorado: Saguache, Rio Grande, Alamosa, Costilla and Conejos.
- Do not use this product in California.

SPRAYER CLEANUP

Spray equipment must be cleaned before ESCORT® XP is sprayed. Follow the cleanup procedures specified on the labels of previously applied products. If no directions are provided, follow the six steps outlined below.

At the End of the Day

When multiple loads of ESCORT® XP herbicide are applied, it is recommended that at the end of each day of spraying, the interior of the tank be rinsed with fresh water and then partially filled, and the boom and hoses flushed. This will prevent the buildup of dried pesticide deposits that can accumulate in the application equipment.

1. Drain tank; thoroughly rinse spray tanks, boom, and hoses with clean water. Loosen and physically remove any visible deposits.
2. Fill the tank with clean water and 1 gal of household ammonia* (contains 3% active) for every 100 gal of water. Flush the hoses, boom, and nozzles with the cleaning solution. Then add more water to completely fill the tank. Circulate the cleaning solution through the tank and hoses for at least 15 min. Flush the hoses, boom, and nozzles again with the cleaning solution, and then drain the tank.
3. Remove the nozzles and screens and clean separately in a bucket containing cleaning agent and water.
4. Repeat step 2.
5. Rinse the tank, boom, and hoses with clean water.
6. If only ammonia is used as a cleaner, the rinsate solution may be applied back to the crop(s) recommended on this label. Do not exceed the maximum labeled use rate. If other cleaners are used, consult the cleaner label for rinsate disposal instructions. If no instructions are given, dispose of the rinsate on site or at an approved waste disposal facility.

* Equivalent amounts of an alternate-strength ammonia solution or a DuPont-approved cleaner can be used in the cleanout procedure. Carefully read and follow the individual cleaner instructions. Consult your agricultural dealer, applicator, or DuPont representative for a listing of approved cleaners.

Notes:

1. **Attention**: Do not use chlorine bleach with ammonia, as dangerous gases will form. Do not clean equipment in an enclosed area.
2. Steam-cleaning aerial spray tanks is recommended prior to performing the above cleanout procedure to facilitate the removal of any caked deposits.

3. When DuPont™ ESCORT® XP is tank mixed with other pesticides, all required cleanout procedures should be examined and the most rigorous procedure should be followed.
4. In addition to this cleanout procedure, all precleanout guidelines on subsequently applied products should be followed as per the individual labels.

SPRAY DRIFT MANAGEMENT

The interaction of many equipment and weather-related factors determines the potential for spray drift. The applicator is responsible for considering all these factors when making application decisions.

AVOIDING SPRAY DRIFT IS THE RESPONSIBILITY OF THE APPLICATOR.

IMPORTANCE OF DROPLET SIZE

The most effective way to reduce drift potential is to apply large droplets (>150 - 200 microns). The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. The presence of sensitive species nearby, the environmental conditions, and pest pressure may affect how an applicator balances drift control and coverage. APPLYING LARGER DROPLETS REDUCES DRIFT POTENTIAL, BUT WILL NOT PREVENT DRIFT IF APPLICATIONS ARE MADE IMPROPERLY OR UNDER UNFAVORABLE ENVIRONMENTAL CONDITIONS! See **Wind, Temperature and Humidity**, and **Temperature Inversions** sections of this label.

Controlling Droplet Size - General Techniques

- **Volume** - Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- **Pressure** - Use the lower spray pressures recommended for the nozzle. Higher pressure reduces droplet size and does not improve canopy penetration. WHEN HIGHER FLOW RATES ARE NEEDED, USE A HIGHER-CAPACITY NOZZLE INSTEAD OF INCREASING PRESSURE.
- **Nozzle Type** - Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles.

Controlling Droplet Size - Aircraft

- **Number of Nozzles** - Use the minimum number of nozzles with the highest flow rate that provide uniform coverage.
- **Nozzle Orientation** - Orienting nozzles so that the spray is emitted backwards, parallel to the airstream will produce larger droplets than other orientations.
- **Nozzle Type** - Solid stream nozzles (such as disc and core with swirl plate removed) oriented straight back produce larger droplets than other nozzle types.
- **Boom Length** - The boom length should not exceed 3/4 of the wing or rotor length - longer booms increase drift potential.
- **Application Height** - Application more than 10 ft above the canopy increases the potential for spray drift.

BOOM HEIGHT

Setting the boom at the lowest labeled height (if specified) which provides uniform coverage reduces the exposure of droplets to evaporation and wind. For ground equipment, the boom should remain level with the crop and have minimal bounce.

WIND

Drift potential increases at wind speeds of less than 3 mph (due to inversion potential) or more than 10 mph. However, many factors, including droplet size and equipment type determine drift potential at any given wind speed. AVOID GUSTY OR WINDLESS CONDITIONS. Note: Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

TEMPERATURE AND HUMIDITY

When making applications in hot and dry conditions, set up equipment to produce larger droplets to reduce effects of evaporation.

TEMPERATURE INVERSIONS

Drift potential is high during a temperature inversion. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain close to the ground and move laterally in a concentrated cloud. Temperature inversions are characterized by increasing temperature with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

SHIELDED SPRAYERS

Shielding the boom or individual nozzles can reduce the effects of wind. However, it is the responsibility of the applicator to verify that the shields are preventing drift and not interfering with uniform deposition of the product.

STORAGE AND DISPOSAL

Pesticide Storage: Store product in original container only. Do not contaminate water, other pesticides, fertilizer, food or feed in storage. Store in a cool, dry place.

Pesticide Disposal: Do not contaminate water, food, or feed by disposal. Waste resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

Container Disposal: **For Plastic Containers**: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or incineration, or, if allowed by State and local authorities, by burning. If burned, stay out of smoke. **For Fiber Sacks**: Completely empty fiber sack by shaking and tapping sides and bottom to loosen clinging particles. Empty residue into manufacturing or application equipment. Then dispose of sack in a sanitary landfill or by incineration if allowed by State and local authorities. **For Fiber Drums With Liners**: Completely empty liner by shaking and tapping sides and bottom to loosen clinging particles. Empty residue into application equipment. Then dispose of liner in a sanitary landfill or by incineration if allowed by State and local authorities. If drum is contaminated and cannot be reused, dispose of in the same manner. **For Bags Containing Water Soluble Packets**: Do not reuse the outer box or the resealable plastic bag. When all water-soluble packets are used, the outer packaging should be clean and may be disposed of in a sanitary landfill or by incineration, or if allowed by State and local authorities, by open burning. If burned, stay out of smoke. If the resealable plastic bag contacts the formulated product in any way, the bag must be triple rinsed with clean water. Add the rinsate to the spray tank and dispose of the outer wrap as described above. **For Metal Containers (non aerosol)**: Triple rinse (or equivalent) the container. Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by State and local authorities. **For Paper and Plastic Bags**: Completely empty bag into application equipment. Then dispose of empty bag in a sanitary landfill or by incineration, or, if allowed by State and local authorities, by burning. If burned, stay out of smoke.

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It is impossible to eliminate all risks associated with the use of this product. Such risks arise from weather conditions, soil factors, off target movement, unconventional farming techniques, presence of other materials, the manner of use or application, or other unknown factors, all of which are beyond the control of DuPont. These risks can cause: ineffectiveness of the product; crop injury, or; injury to non-target crops or plants.

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DuPont™ Krenite® S

brush control agent

"..... A Growing Partnership With Nature"

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DuPont™ Krenite® S

brush control agent

Water Soluble Liquid

Contains 4 Lbs. Active Ingredient Per Gallon

Active Ingredient	*By Weight*
Ammonium salt of fosamine [ethyl hydrogen (aminocarbonyl) phosphonate]	41.5%
Inert Ingredients	58.5%
TOTAL	100%

EPA Reg. No. 352-395

KEEP OUT OF REACH OF CHILDREN

CAUTION

FIRST AID

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

Have the product container label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-441-3637 for medical emergencies involving this product.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION! Causes (moderate) eye injury (irritation). Avoid contact with eyes or clothing.

PERSONAL PROTECTIVE EQUIPMENT

Applicators and other handlers must wear:

Long-sleeve shirt and long pants.
Shoes plus socks.

Follow manufacturer's instructions for cleaning/ maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

USER SAFETY RECOMMENDATIONS

USERS SHOULD: Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.

ENVIRONMENTAL HAZARDS

Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water by cleaning of equipment or disposal of equipment washwaters.

GENERAL INFORMATION

DuPont™ KRENITE® S brush control agent is a water soluble liquid to be diluted with water and applied as a foliar spray for control and/or suppression of many woody species.

KRENITE® S is recommended for use in pine plantations and non-crop sites, including highway rights-of-way, industrial sites, railroad rights-of-way, storage areas, utility and pipeline rights-of-way.

This product may be applied in pine plantations and non-crop sites that contain areas of temporary surface water caused by collection of water between planting beds, in equipment ruts, or in other depressions created by management activities. It is permissible to treat intermittent drainage, intermittently flooded low lying sites, seasonally dry flood plains and transitional areas between upland and lowland sites when no water is present. It is also permissible to treat marshes, swamps and bogs after water has receded, as well as seasonally dry flood deltas. DO NOT make applications to natural or man-made bodies of water, such as, lakes, reservoirs, ponds, streams and canals.

KRENITE® S is non-flammable and non-volatile.

ENVIRONMENTAL CONDITIONS AND BIOLOGICAL ACTIVITY

A KRENITE® S spray directed to only part of susceptible brush species will provide control of the portion sprayed, resulting in a trimming effect. Treatment with KRENITE® S generally does not immediately affect deciduous woody plants; they retain normal foliage for the remainder of the growing season. Treated susceptible plants do not produce foliage or grow the following spring. Coniferous species treated with KRENITE® S generally display visible symptoms following application.

Effectiveness may be reduced if, following treatment, rainfall occurs on the same day.

RESISTANCE

When herbicides that affect the same biological site of action are used repeatedly over several years to control the same weed species in the same field, naturally-occurring resistant biotypes may survive a correctly applied herbicide treatment, propagate, and become dominant in that field. Adequate control of these resistant weed biotypes cannot be expected. If weed control is unsatisfactory, it may be necessary to retreat the problem area using a product affecting a different site of action.

To better manage herbicide resistance through delaying the proliferation and possible dominance of herbicide resistant weed biotypes, it may be necessary to change cultural practices within and between crop seasons such as using a combination of tillage, retreatment, tank-mix partners and/or sequential herbicide applications that have a different site of action. Weed escapes that are allowed to go to seed will promote the spread of resistant biotypes.

It is advisable to keep accurate records of pesticides applied to individual fields to help obtain information on the spread and dispersal of resistant biotypes. Consult your agricultural dealer, consultant, applicator, and/or appropriate state agricultural extension service representative for specific alternative cultural practices or herbicide recommendations available in your area.

INTEGRATED PEST MANAGEMENT

This product may be used as part of an Integrated Pest Management (IPM) program that can include biological, cultural, and genetic practices aimed at preventing economic pest damage. IPM principles and practices include field scouting or other detection methods, correct target pest identification, population monitoring, and treating when target pest populations reach locally determined action thresholds. Consult your state cooperative extension service, professional consultants or other qualified authorities to determine appropriate action treatment threshold levels for treating specific pest/crop systems in your area.

TANK MIXES

KRENITE® S herbicide may be tank mixed with other herbicides and/or adjuvants registered for use in pine plantations and non-crop sites.

Refer to the label of the tank mix partner(s) for any additional use instructions or restrictions.

SPRAY EQUIPMENT

KRENITE® S may be applied using high volume or low volume ground sprayers as well as aircraft (helicopter only).

Application equipment must be calibrated before making applications of KRENITE® S.

SPRAY ADJUVANTS

A penetrating type oil-based adjuvant (surfactant or crop oil concentrate) may be used with KRENITE® S. The adjuvant should be mixed in the spray solution at a minimum concentration of 1/4% by volume (1 quart per 100 gallons of spray solution) or at the manufacturer's recommended dosage.

If foaming is a problem during mixing, an anti-foam agent may be added.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

Do not apply this product through any type of irrigation system.

Do not use on food or feed crops.

KRENITE® S should be used only in accordance with recommendations on this label or in supplemental DuPont labeling.

AGRICULTURAL USES

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 12 hours. PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

Coveralls.
Shoe plus socks.

PINE PLANTATIONS - SITE PREPARATION

DuPont™ KRENITE® S is recommended for the post-harvest (pre-plant) control of undesirable pine and hardwood seedlings and saplings and suppression of brush and vines to aid site planting preparation for southern pines and/or genetically improved pines.

APPLICATION INFORMATION

Apply as a foliar spray from mid-summer to when the target tree pests begin defoliation in late summer or fall. Applications of KRENITE® S may be made by ground or air (helicopter only) equipment. Use sufficient water to ensure complete coverage of the vegetation, generally 20 to 50 gallons per acre by ground and 10 to 15 gallons per acre by air.

USE RATES AND PLANTS CONTROLLED

Pine Seedlings and Saplings

Apply 2 to 4 quarts of KRENITE® S per acre for the control of seedling and sapling pines when burning is allowed on the site.

Apply 4 to 6 quarts per acre of KRENITE® S to control seedling and sapling pines when burning is not allowed on the site.

Use the higher rate when either pine saplings predominate or when high infestations of seedling pines are in the area to be sprayed.

Combinations of pine and hardwood seedlings and saplings

To control a combination of pine and hardwood seedlings and saplings, apply a tank mixture of KRENITE® S at use rates indicated for spraying pine seedlings and saplings plus "Arsenal" herbicide (2 pound active per gallon) at 8 to 20 ounces per acre. This tank mix is recommended for the control of Ash, Blackberry, Black gum, Black locust, Box elder, Cherry, Dogwood, Elms (winged, slippery), Oaks (red, white), Red maple, Sassafras, and Sourwood.

Brush and Vine Suppression

The application of KRENITE® S plus "Arsenal" will also provide suppression of brush and vines, such as, American beautyberry (French mulberry), Baccharis (groundseltree), Vaccinium (blueberry) species, Waxmyrtle (bayberry) and Wild grape.

*Suppression - a visible reduction in plant population and/or plant vigor as compared to an untreated area and generally not accepted as control.

Follow the use directions, precautions and restrictions on the "Arsenal" label.

Do not apply more than 3 gallons of KRENITE® S per acre per year.

NON-AGRICULTURAL USES

NON-AGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.

Do not enter or allow entry into treated areas until sprays have dried to perform hand tasks.

NON-CROP SITES

KRENITE® S is recommended for general weed control as follows: uncultivated non-agricultural areas (such as, airports, highway, railroad and utility rights-of-way, sewage disposal areas); uncultivated agricultural areas (non-crop producing, which includes: farmyards, fuel storage areas, fence rows, soil bank land, barrier strips); industrial sites (outdoor, such as, lumberyards, pipeline and tank farms).

APPLICATION INFORMATION

Make a foliar application of the recommended rate of KRENITE® S from full leaf expansion in the spring to the development of full canopy coloration in the fall for deciduous species to be controlled. Coniferous species, listed in the **Use Rates and Plants Controlled** chart below, may be treated at anytime during the growing season.

LOW AND HIGH VOLUME DIRECTED SPRAYS

Prepare either a low volume or high volume spray solution of DuPont™ KRENITE® S. For the low volume directed spray application, do not exceed a spray concentration of 30% by volume. For the high volume directed spray application, do not use a spray concentration of less than 1.5% by volume.

Prepare the desired volume of spray solution by mixing the amount of this product in water as shown in the **Spray Solution Table.** Apply a quantity of spray solution which will thoroughly and uniformly cover the target plant foliage (spray to wet for high volume applications). Rate and volume per acre will depend on the plant species, the height and density of plant growth as well as the type of application equipment used. On tall or dense stands of brush it may be necessary to spray from opposite sides in order to obtain thorough coverage of the foliage. Use the higher rate range on stands where difficult to control species are dominant. See the **Use Rates and Plants Controlled** section of the label for use rates and a listing of **difficult to control species.

Do not apply more than 6 gallons of KRENITE® S per acre per year.

AERIAL and BROADCAST APPLICATIONS

Prepare a spray solution using 1 1/2 to 3 gallons of KRENITE® S in 10 to 40 gallons of water (see **Spray Solution Table**). For broadcast ground applications, use this product at the rate of 1.5 to 6 gallons per acre. Do not apply more than 6 gallons per acre when using ground equipment. For aerial applications, use this product at the rate of 1.5 to 3 gallons per acre. Do not apply more than 3 gallons of KRENITE® S per acre when using aerial equipment. Use sufficient spray volume to uniformly and thoroughly cover the foliage. Use the higher concentrations on stands in which difficult to control species are predominant (see **Use Rates and Plants Controlled** section for a listing of **difficult to control species).

SPRAY SOLUTION TABLE

Amount of Krenite® S

Desired Volume	1.5%	2%	3%	4%	10%	20%	30%
5 Gal	**	**	**	0.8 qt	0.5 gal	1 gal	1.5 gal
10 Gal	0.6 qt	0.8 qt	1.2 qt	1.6 qt	1 gal	2 gal	3 gal
20 Gal	1.2 qt	1.6 qt	0.6 gal	0.8 gal	2 gal	4 gal	6 gal
30 Gal	0.45 gal	0.6 gal	0.9 gal	1.2 gal	3 gal	6 gal	
40 Gal	0.6 gal	0.8 gal	1.2 gal	1.6 gal	4 gal	**	**
50 Gal	0.75 gal	1 gal	1.5 gal	2 gal	5 gal	**	**
100 Gal	1.5 gal	2 gal	3 gal	4 gal	**	**	**

USE RATES AND PLANTS CONTROLLED

KRENITE® S effectively controls or suppresses (**difficult to control listings) the following plants when applied at the use rates shown.

**Suppression - a visible reduction in plant population and/or plant vigor as compared to an untreated area and generally not accepted as control.

1 1/2 to 6 gal KRENITE® S per acre

Alder, red	*Alnus rubra*
Ash, white	*Fraxinus Americana*
Aspen, quaking	*Populus tremuloides*
Birch	*Betula sp.*
Blackberry	*Rubus sp.*
Blackgum	*Nyssa sylvatica*
Cherry, black**	*Prunus serotina*
Cherry, pin	*Prunus pensylvanica*
Chokecherry, common**	*Prunus virginiana*
Elm**	*Ulmus sp.*
Fern, bracken	*Pteridium aquilinum*
Hawthorn**	*Crataegus sp.*
Hickory**	*Carya sp.*
Locust, black	*Robinia pseudoacacia*
Maple, bigleaf**	*Acer macrophyllum*
Maple, red**	*Acer rubrum*
Maple, vine	*Acer circinatum*
Oak, red	*Quercus rubra*
Oak, water	*Quercus arkansana*
Oak, white	*Quercus alba*
Persimmon**	*Diospyros virginiana*
Pine, loblolly	*Pinus taeda*
Pine, Virginia	*Pinus virginiana*
Poplar, yellow (tuliptree)**	*Liriodendron tulipifera*
Salmonberry	*Rubus spectabilis*
Sassafras**	*Sassafras sassafras*
Sourwood**	*Oxydendrum arboretum*
Spurge, leafy***	*Euphorbia esula*
Sumac	*Rhus sp.*
Sweetgum	*Liquidambar styraciflua*
Tallow, Chinese	*Sapium sebiferum*
Thimbleberry	*Rubus parviflorus*
Willow**	*Salix sp.*

2 to 6 gal KRENITE® S per acre

Basswood, American**	*Tilia Americana*
Bindweed, field***	*Convolvulus arvensis*
Cottonwood, Eastern	*Populus deltoids*
Elder, American	*Sambucus canadensis*
Elm, slippery	*Ulmus rubra*
Elm, winged**	*Ulmus alata*
Grape, wild	*Vitis sp.*
Pine, Eastern white	*Pinus strobes*
Plum, wild	*Prunus munsoniana*
Rose, multiflora	*Rosa multiflora*
Sycamore	*Platanus occidentalis*
Tree-of-heaven	*Ailanthus altissima*

**Difficult to control or Suppression
Suppression - a visible reduction in plant population and/or plant vigor as compared to an untreated area and generally not accepted as control.

***Make applications after plants begin to bloom.

TANK MIXTURES

KRENITE® S plus DuPont™ ESCORT® XP

KRENITE® S plus ESCORT® XP is recommended for the control of Eastern red cedar and improved control of Ailanthus (tree of heaven), Ash, Cherry, Elm and Red maple.

Apply 1.5 to 3 gallons of KRENITE® S plus 1 to 2 ounces of ESCORT® XP per acre. Apply a quantity of spray solution that will thoroughly and uniformly cover the target brush/trees without causing unnecessary run-off (spray to wet). If the site contains difficult to control species (see ** in "USE RATES AND PLANTS CONTROLLED" section), use the higher rates of both KRENITE® S and ESCORT® XP.

Follow the use directions, precautions and restrictions on the ESCORT® XP label.

DuPont™ KRENITE® S plus "Arsenal"

KRENITE® S plus "Arsenal" herbicide (2 pounds active ingredient per gallon) is recommended for the control of Box elder, Hackberry, Persimmon, Wild pecan and Dogwood and for improved control of Ash, Black Cherry, Elm, Maple, Sassafras and Willow.

Apply 1.5 to 3 gallons of KRENITE® S plus 8 to 20 ounces of "Arsenal" per acre. Apply a quantity of the spray solution that will thoroughly and uniformly cover the target brush without causing unnecessary run-off (spray to wet). If the site contains difficult to control species (see ** in "USE RATES AND PLANTS CONTROLLED" section), use the higher rates of both KRENITE® S and "Arsenal".

Follow the use directions, precautions and restrictions on the "Arsenal" label.

KRENITE® S plus "Tordon" K

KRENITE® S plus "Tordon" K herbicide is recommended for the control of Hackberry, Persimmon, and Walnut for improved control of Cherry, Elm, Hickory, Locust, Oak, Poplar, Sassafras, Sumac, and Sweet gum.

Apply 1.5 to 3 gallons of KRENITE® S plus 1 to 2 pints of "Tordon" K per acre. Apply a quantity of the spray solution that will thoroughly and uniformly cover the target brush without causing unnecessary run-off (spray to wet). If the site contains difficult to control species (see ** in "USE RATES AND PLANTS CONTROLLED" section), use the higher rates of both KRENITE® S and "Tordon" K.

Follow the use directions, precautions and restrictions on the "Tordon" K label.

SIDE TRIMMING

For control of only a portion of a plant, direct the spray solution to thoroughly cover (spray to wet) only the portion of the plant to be controlled.

Do not apply more than 6 gallons of KRENITE® S per acre when side trimming.

CUT SURFACE APPLICATIONS

KRENITE® S is recommended in controlling the re-sprouting of cut stumps of the plants listed in the Use Rates and Plants Controlled section. Control of re-sprouting in plants listed as" ** difficult to control" may not be as effective.

KRENITE® S may either be used undiluted or mixed with water. Use the method that is best suited for the particular application equipment. When mixing with water a ratio of no less than 1 part KRENITE® S to 1 part water on a volume basis must be used. Apply the undiluted or mixed solution to wet the area adjacent to the cambium and bark around the entire circumference and the sides of the cut stumps. The sides of the stumps should be wet down to the root collar area.

Apply with appropriate application equipment using low spray pressure. Applications can be made any time of the year, except during periods of heavy sap flow in the spring. Applications should be made soon after cutting; before the stump surface forms a layer of callous tissue (hardens off).

To prevent freezing of the spray solution, add ethylene glycol (commercial antifreeze) to the water used in preparing the spray solution. Add the antifreeze according to the manufacturer's label for preventing freezing of water at the lowest expected ambient temperature. KRENITE® S will freeze at -11°F. A 1:1 aqueous dilution of KRENITE® S will freeze at 21°F.

A spray pattern indicator may be used in the spray solution to facilitate application. The user should check the compatibility of the spray indicator with the spray solution prior to using large quantities.

ADDITIONAL USE INSTRUCTIONS - PINE PLANTATIONS AND NON-CROP SITES

MIXING INSTRUCTIONS

1. Fill spray tank 1/2 full of water.
2. With the agitator running, add the desired amount of KRENITE® S.
3. If using a tank mix partner, add the recommended amount. Follow the use precautions and directions on the tank mix partner label.
4. Add spray adjuvant as last ingredient prior to filling the spray tank with water.
5. Agitate the spray solution thoroughly.

After KRENITE® S has been thoroughly mixed in the spray tank agitation of the spray solution is not required.

SPRAYER CLEAN UP

Thoroughly clean all mixing and spray equipment immediately following applications of KRENITE® S. Flush tank, pump, hoses and boom with several changes of water after removing the nozzle tips and screens (clean these parts separately).

Dispose of the rinsate on a labeled site or at an approved waste disposal facility.

SPRAY DRIFT MANAGEMENT

The interaction of many equipment and weather-related factors determines the potential for spray drift. The applicator is responsible for considering all of these factors when making applications.

AVOIDING SPRAY DRIFT IS THE RESPONSIBILITY OF THE APPLICATOR.

IMPORTANCE OF DROPLET SIZE

The most effective way to reduce drift potential is to apply large droplets (>150-200 microns). The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. The presence of sensitive species nearby, the environmental conditions, and pest pressure may affect how an applicator balances drift control and coverage. APPLYING LARGER DROPLETS REDUCES DRIFT POTENTIAL, BUT WILL NOT PREVENT DRIFT IF APPLICATIONS ARE MADE IMPROPERLY OR UNDER UNFAVORABLE ENVIRONMENTAL CONDITIONS! See Wind, Temperature and Humidity and Temperature Inversions sections of this label.

CONTROLLING DROPLET SIZE--GENERAL TECHNIQUES

- Volume -Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- Pressure -Use the lower spray pressures recommended for the nozzle. Higher pressure reduces droplet size and does not improve canopy penetration. WHEN HIGHER FLOW RATES ARE NEEDED, USE A HIGHER -CAPACITY NOZZLE INSTEAD OF INCREASING PRESSURE.
- Nozzle Type -Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles.

CONTROLLING DROPLET SIZE - AIRCRAFT (HELICOPTER)

- **Number of Nozzles** - Use the minimum number of nozzles with the highest flow rate that provide uniform coverage.
- **Nozzle Orientation** - Orienting nozzles so that the spray is emitted backwards, parallel to the airstream will produce larger droplets than other orientations.
- **Nozzle Type** - Solid stream nozzles (such as disc and core with swirl plate removed) oriented straight back produce larger droplets than other nozzle types.

BOOM LENGTH AND HEIGHT

- **Boom Length (helicopter)** - For helicopters use a boom length and position that prevents droplets from entering the rotor vortices.
- **Boom Height (helicopter)** - Application more than 10 feet above the canopy increases the potential for spray drift.
- **Boom Height (ground)** Setting the boom at the lowest height which provides uniform coverage reduces the exposure of droplets to evaporation and wind. The boom should remain level with the crop and have minimal bounce.

WIND

Drift potential increases at wind speeds of less than 3 mph (due to inversion potential) or more than 10 mph. However, many factors, including droplet size and equipment type determine drift potential at any given wind speed. AVOID GUSTY OR WINDLESS CONDITIONS.

Note: Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

TEMPERATURE AND HUMIDITY

When making applications in hot and dry conditions, set up equipment to produce larger droplets to reduce effects of evaporation.

TEMPERATURE INVERSIONS

Drift potential is high during a temperature inversion. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain close to the ground and move laterally in a concentrated cloud. Temperature inversions are characterized by increasing temperature with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

IMPORTANT PRECAUTIONS - PINE PLANTATIONS AND NON-CROP SITES

- Cutting of treated stems of brush before they are completely dead may result in sprouting.
- Do not use for the control of woody plants on lawns, walks, driveways, tennis courts or similar areas.
- Drift or spray mist contact with desirable trees, shrubs, or other plants may results in injury.
- Not registered for sale or use in California or Arizona.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage and disposal.

PESTICIDE STORAGE: Store product in original container only. Store in a cool, dry place.

PESTICIDE DISPOSAL: Waste resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

CONTAINER DISPOSAL: Triple rinse (or equivalent) the container. Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

NOTICE TO BUYER: Purchase of this material does not confer any rights under patents of countries outside of the United States.

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"Tordon" is a registered trademark of Dow AgroSciences LLC

"Arsenal" is a registered trademark of BASF

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NOTICE: Read This Limitation of Warranty and Liability Before Buying or Using This Product. If the Terms Are Not Acceptable, Return the Product at Once, Unopened, and the Purchase Price Will Be Refunded.

It is impossible to eliminate all risks associated with the use of this product. Such risks arise from weather conditions, soil factors, off target movement, unconventional farming techniques, presence of other materials, the manner of use or application, or other unknown factors, all of which are beyond the control of DuPont. These risks can cause: ineffectiveness of the product; crop injury, or; injury to non-target crops or plants.

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DuPont warrants that this product conforms to the chemical description on the label thereof and is reasonably fit for the purpose stated in the Directions for Use, subject to the inherent risks described above, when used in accordance with the Directions for Use under normal conditions.

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Specimen Label

Dow AgroSciences

Garlon® 4

Specialty Herbicide

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For the control of woody plants and annual and perennial broadleaf weeds in non-crop areas, including industrial manufacturing and storage sites, rights-of-way such as electrical power lines, communication lines, pipelines, roadsides, railroads, fence rows, non-irrigation ditch banks, forests and in the establishment and maintenance of wildlife openings. Use on these sites may include application to grazed areas.

Active Ingredient:	
triclopyr: 3,5,6-trichloro-2-pyridinyloxyacetic acid, butoxyethyl ester	61.6%
Inert Ingredients	38.4%
Total	100.0%

Contains petroleum distillates
Acid equivalent: triclopyr - 44.3% - 4 lb/gal

EPA Reg. No. 62719-40

Keep Out of Reach of Children

CAUTION PRECAUCION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

Precautionary Statements

Hazards to Humans and Domestic Animals

Causes Moderate Eye Irritation • Harmful If Swallowed • Prolonged Or Frequently Repeated Skin Contact May Cause Allergic Reactions In Some Individuals

Avoid contact with eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, or using tobacco.

Personal Protective Equipment (PPE)

WPS Uses: Applicators and other handlers who handle this pesticide for any use covered by the Worker Protection Standard (40 CFR Part 170) – for this product, forestry sites -- must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks

Non-WPS Uses: Applicators and other handlers who handle this pesticide for any use NOT covered by the Worker Protection Standard (40 CFR Part 170) – for this product, non-forestry sites -- must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables are given, use detergent and hot water. Keep and wash PPE separately from other laundry.

Engineering Controls

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the WPS (40 CFR 170.240(d)(4-6), the handler PPE requirements may be reduced or modified as specified in the WPS.

First Aid

If in eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
If swallowed: Immediately call a poison control center or doctor. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give **any** liquid to the person. Do not give anything by mouth to an unconscious person.

Note to Physician: This product may pose an aspiration pneumonia hazard. Contains petroleum distillates.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-992-5994 for emergency medical treatment information.

Environmental Hazards

This pesticide is toxic to fish. Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwater or rinsate.

This chemical has properties and characteristics associated with chemicals detected in groundwater. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.

Physical or Chemical Hazards

Combustible. Do not use or store the product near heat or open flame.

Notice: Read the entire label. Use only according to label directions. **Before using this product, read Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies elsewhere on this label. If terms are unacceptable, return at once unopened.**

In case of emergency endangering health or the environment involving this product, call 1-800-992-5994. If you wish to obtain additional product information, visit our web site at www.dowagro.com.

Agricultural Chemical: Do not ship or store with food, feeds, drugs or clothing.

Directions for Use

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.
Read all Directions for Use carefully before applying.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your state or tribe, consult the agency responsible for pesticide regulation.

Agricultural Use Requirements

The requirements in this box apply to forestry uses.

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 12 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Chemical-resistant gloves
- Shoes plus socks
- Protective eyewear

Non-Agricultural Use Requirements

The requirements in this box apply to all use sites on this label except for forestry uses.

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for Agricultural Pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.

Entry Restrictions for Non-WPS Uses: For applications to non-cropland areas, do not allow entry into areas until sprays have dried.

Storage and Disposal

Do not contaminate water, food, or feed by storage and disposal.
Open dumping is prohibited.
Pesticide Storage: Store above 28°F or agitate before use.
Pesticide Disposal: Wastes resulting from the use of this product (that cannot be used according to label instructions) may be disposed of on site or at an approved waste disposal facility.
Container Disposal: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

General Information

Use Garlon® 4 specialty herbicide for the control of woody plants and annual and perennial broadleaf weeds in non-crop areas, including industrial manufacturing and storage sites, rights-of-way such as electrical power lines, communication lines, pipelines, roadsides and railroads, fence rows, non-irrigation ditch banks; forests and in the establishment and maintenance of wildlife openings. Use on these sites may include application to grazed areas.

General Use Precautions and Restrictions

In Arizona: The state of Arizona has not approved Garlon 4 for use on plants grown for commercial production; specifically forests grown for commercial timber production, or on designated grazing areas.

When applying this product in tank mix combination, follow all applicable use directions, precautions, and limitations on each manufacturer's label.

Chemigation: Do not apply this product through any type of irrigation system.

Do not apply Garlon 4 directly to, or otherwise permit it to come into direct contact with, grapes, tobacco, vegetable crops, flowers, or other desirable broadleaf plants. Do not permit spray mists containing Garlon 4 to drift onto such plants.

It is permissible to treat non-irrigation ditch banks, seasonally dry wetlands (such as flood plains, deltas, marshes, swamps, or bogs) and transitional areas between upland and lowland sites where surface water is not present except in isolated pockets due to uneven or unlevel conditions. Do not apply to open water (such as lakes, reservoirs, rivers, streams, creeks, salt water bays, or estuaries).

Do not apply on ditches currently being used to transport irrigation water. Do not apply where runoff or irrigation water may flow onto agricultural land as injury to crops may result.

Do not apply this product using mist blowers unless a drift control additive, high viscosity inverting system, or equivalent is used to control spray drift.

Sprays applied directly to Christmas trees may result in conifer injury. When treating unwanted vegetation in Christmas tree plantations, care should be taken to direct sprays away from conifers.

Garlon 4 is formulated as a low volatile ester. However, the combination of spray contact with impervious surfaces, such as roads and rocks, and increasing ambient air temperatures, may result in an increase in the volatility potential for this herbicide, increasing a risk for off-target injury to sensitive crops such as grapes and tomatoes.

- Apply no more than 1/2 gallon of Garlon 4 (2 lb ae of triclopyr) per acre per growing season on range and pasture sites, including rights-of-way, fence rows or any area where grazing or harvesting is allowed.
- On forestry sites, Garlon 4 may be used at rates up to 6 quarts (6 lb ae of triclopyr) per acre per year.
- Garlon 4 may be used at rates up to 8 quarts (8 lb ae of triclopyr) per acre per year on non-crop areas including industrial manufacturing and storage sites, rights-of-way such as electrical power lines, communication lines, pipelines, roadsides and railroads, fence rows, non-irrigation ditch banks.

Grazing and Haying Restrictions
Except for lactating dairy animals, there are no grazing restrictions following application of this product.

- **Grazing Lactating Dairy Animals:** Do not allow lactating dairy animals to graze treated areas until the next growing season following application of this product.
- Do not harvest hay for 14 days after application.
- Grazed areas of non-cropland and forestry sites may be spot treated if they comprise no more than 10% of the total grazable area.

Slaughter Restrictions: During the season of application, withdraw livestock from grazing treated grass at least 3 days before slaughter.

Avoiding Injurious Spray Drift

Make applications only when there is little or no hazard from spray drift. Small quantities of spray, which may not be visible, may seriously injure susceptible plants. Do not spray when wind is blowing toward susceptible crops or ornamental plants that are near enough to be injured. It is suggested that a continuous smoke column at or near the spray site or a smoke generator on the spray equipment be used to detect air movement, lapse conditions, or temperature inversions (stable air). If the smoke layers or indicates a potential of hazardous spray drift, do not spray.

Aerial Application (Helicopter Only): For aerial application on rights-of-way or other areas near susceptible crops, apply through a Microfoil† or Thru-Valve boom†, or use an agriculturally labeled drift control additive. Other drift reducing systems or thickened sprays prepared by using high viscosity inverting systems may be used if they are made as drift-free as mixtures containing agriculturally labeled thickening agents or applications made with the Microfoil or Thru Valve boom. Do not use a thickening agent with the Microfoil or Thru Valve booms, or other systems that cannot accommodate thick sprays. Spray only when the wind velocity is low (follow state regulations). Avoid application during air inversions. If a spray thickening agent is used, follow all use recommendations and precautions on the product label.

† Reference within this label to a particular piece of equipment produced by or available form other parties is provided without consideration for use by the reader at its discretion and subject to the reader's independent circumstances, evaluation, and expertise. Such reference by Dow AgroSciences is not intended as an endorsement of such equipment, shall not constitute a warranty (express or implied) of such equipment, and is not intended to imply that other equipment is not available and equally suitable. Any discussion of methods of use of such equipment does not imply that the reader should use the equipment other than is advised in directions available from the equipment's manufacturer. The reader is responsible for exercising its own judgment and expertise, or consulting with sources other than Dow AgroSciences, in selecting and determining how to use its equipment.

Spray Drift Management

Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment and weather related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions.

The following drift management requirements must be followed to avoid off-target drift movement from aerial applications:

1. The distance of the outer most operating nozzles on the boom must not exceed 3/4 the length of the rotor.
2. Nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees.

Where states have more stringent regulations, they should be observed.

The applicator should be familiar with and take into account the information covered in the following Aerial Drift Reduction Advisory. [This information is advisory in nature and does not supersede mandatory label requirements.]

Aerial Drift Reduction Advisory

Information on Droplet Size: The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see Wind, Temperature and Humidity, and Temperature Inversions).

Controlling Droplet Size:

- **Volume** - Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- **Pressure** - Do not exceed the nozzle manufacturer's recommended pressures. For many nozzle types lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.
- **Number of Nozzles** - Use the minimum number of nozzles that provide uniform coverage.
- **Nozzle Orientation** - Orienting nozzles so that the spray is released parallel to the airstream produced larger droplets than other orientations and is the recommended practice. Significant deflection from horizontal will reduce droplet size and increase drift potential.
- **Nozzle Type** - Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce the largest droplets and the lowest drift.

Boom Length: For some use patterns, reducing the effective boom length to less than 3/4 of the wingspan or rotor length may further reduce drift without reducing swath width.

Application Height: Applications should not be made at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

Swath Adjustment: When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase, with increasing drift potential (higher wind, smaller drops, etc.).

Wind: Drift potential is lowest between wind speeds of 2 to 10 mph. However, many factors, including droplet size and equipment type determine drift potential at any given speed. Application should be avoided below 2 mph due to variable wind direction and high inversion potential. **Note:** Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

Temperature and Humidity: When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

Temperature Inversions: Applications should not occur during a local, low level temperature inversion because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of the smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

Sensitive Areas: The pesticide should only be applied when the potential for drift to adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is minimal (e.g., when wind is blowing away from the sensitive areas).

Ground Equipment: To aid in reducing spray drift, Garlon 4 should be used in thickened (high viscosity) spray mixtures using an agriculturally labeled drift control additive, high viscosity invert system, or equivalent as directed by the manufacturer. When using a spray thickening or inverting additive, follow all use directions and precautions on the product label. With ground equipment, spray drift can be reduced by keeping the spray boom as low as possible; by applying 20 gallons or more of spray per acre; by keeping the operating spray pressures at the lower end of the manufacturer's recommended pressures for the specific nozzle type used (low pressure nozzles are available from spray equipment manufacturers); and by spraying when wind velocity is low. Do not apply with nozzles that produce a fine droplet spray. Select nozzles and pressures which provide adequate plant coverage, but minimize the production of fine spray particles.

High Volume Leaf-Stem Treatment: To minimize spray drift, keep sprays no higher than brush tops and keep spray pressures low enough to provide coarse spray droplets. An agriculturally labeled thickening agent may be used to reduce drift.

Plants Controlled by Garlon 4

Woody Plant Species

alder	dogwood	poplar
arrowwood	Douglas-fir	salmonberry
ash	elderberry	salt-bush (*Braccharis* spp.)
aspen	elm	salt-cedar†
bear clover (bearmat)	gallberry	sassafras
beech	gorse	scotch broom
birch	hazel	sumac
blackberry	hickory	sweetbay magnolia
blackgum	hornbeam	sweetgum
boxelder†	kudzu††	sycamore
Brazilian pepper	locust	tanoak
buckthorn	madrone	thimbleberry
cascara	maples	tree-of-heaven (*Ailanthus*)†
Ceanothus	mulberry	tulip poplar
cherry	oaks	wax myrtle
chinquapin	persimmon	wild rose
choke cherry	pine	willow
cottonwood	poison ivy	winged elm
Crataegus (hawthorn)	poison oak	

†For best control, use either a basal bark or cut stump treatment.
††For complete control, re-treatment may be necessary.

Annual and Perennial Broadleaf Weeds

black medic	goldenrod	ragweed
bull thistle	ground ivy	smartweed
burdock	lambsquarters	sweet clover
Canada thistle	lespedeza	vetch
chicory	matchweed	wild carrot
clover	mustard	(Queen Anne's lace)
creeping beggarweed	Oxalis	wild lettuce
curly dock	plantain	wild violet
dandelion	purple loosestrife	yarrow
field bindweed		

Application Methods

Use Garlon 4 at rates of 1 to 8 quarts per acre to control broadleaf weeds and woody plants. It is suggested that rates higher in this rate range be used to control woody plants. In all cases, use the amount specified in enough water to give uniform and complete coverage of the plants to be controlled. The order of addition to the spray tank is water, spray thickening agent (if used), surfactant (if used), additional herbicide (if used), and Garlon 4. If a standard agricultural surfactant is used, use at a rate of 1 to 2 quarts per acre. Use continuous adequate agitation.

Before using any recommended tank mixtures, read the directions and all precautions on both labels.

For best results apply when woody plants and weeds are actively growing. When hard to control species such as ash, blackgum, choke cherry, elm, maples (other than vine or big leaf), oaks, pines, or winged elm are prevalent, during applications made during late summer when the plants are mature, or during drought conditions, use the higher rates of Garlon 4 alone or in combination with Tordon® 101 Mixture specialty herbicide or Tordon K herbicide. Tordon 101 Mixture and Tordon K are restricted use pesticides. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida.

When using Garlon 4 in combination with 2,4-D low volatile ester herbicide, generally the higher rates of Garlon 4 should be used for satisfactory brush control.

Use the higher dosage rates when brush approaches an average of 15 feet in height or when the brush covers more than 60% of the area to be treated. If lower rates are used on hard to control species, resprouting may occur the year following treatment.

On sites where easy to control brush species dominate, rates less than those listed may be effective. Consult state or local extension personnel for such information.

Foliage Treatment With Ground Equipment

High Volume Foliage Treatment

For control of woody plants, use Garlon 4 at the rate of 2 to 6 quarts per 100 gallons of spray mixture, or Garlon 4 at 2 to 4 quarts may be tank mixed with labeled rates of 2,4-D low volatile ester herbicide, Tordon 101 Mixture, or Tordon K and diluted to make 100 gallons of spray mixture. Do not apply more than 2 gallons of Garlon 4 per acre. Apply at a volume of 100 to 400 gallons of total spray per acre depending upon size and density of woody plants. Coverage should be thorough to wet all leaves, stems, and root collars. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida. When tank mixing, follow applicable use directions and precautions on each manufacturer's label.

Table 1: The following table is provided as a guide to the user to achieve the proper rate of Garlon 4.

Total Spray Volume (gallons/acre)	Rate of Garlon 4	
	Forestry Sites (qt/100 gallons of spray)†	Non-Cropland Sites (qt/100 gallons of spray)††
400	1.5	2
300	2	2.7
200	3	4
100	6	8
50	12	16
40	15	20
30	20	26.7
20	30	40
10	60	80

†Do not exceed the maximum use rate of 6 qt of Garlon 4 (6 lb ae of triclopyr)/acre/year.

††Do not exceed the maximum use rate of 8 qt of Garlon 4 (8 lb ae of triclopyr)/acre/year.

Low Volume Foliage Treatment

To control susceptible woody plants, mix up to 20 quarts of Garlon 4 in 10 to 100 gallons of finished spray. The spray concentration of Garlon 4 and total spray volume per acre should be adjusted according to the size and density of target woody plants and kind of spray equipment used. With low volume sprays, use sufficient spray volume to obtain uniform coverage of target plants including the surfaces of all foliage, stems, and root collars (see General Use Precautions and Restrictions). For best results, a surfactant should be added to all spray mixtures. Match equipment and delivery rate of spray nozzles to height and density of woody plants. When treating tall, dense brush, a truck mounted spray gun with spray tips that deliver up to 2 gallons per minute at 40 to 60 psi may be required. Backpack or other types of specialized spray equipment with spray tips that deliver less than 1 gallon of spray per minute may be appropriate for short, low to moderate density brush.

Tank Mixing: As a low volume foliage spray, up to 12 quarts of Garlon 4 may be applied in tank mix combination with labeled rates of Tordon K or Tordon 101 Mixture in 10 to 100 gallons of finished spray. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida.

Broadcast Applications With Ground Equipment

Apply using equipment that will assure thorough and uniform coverage of the spray volumes applied. See Table 1 for relationship between mixing rate, spray volume and maximum application rate.

Woody Plant Control

Foliage Treatment: Use 4 to 8 quarts of Garlon 4 in enough water to make 5 gallons or more of total spray per acre, or 1 1/2 to 3 quarts of Garlon 4 may be combined with labeled rates of 2,4-D low volatile ester, Tordon 101 Mixture, or Tordon K in sufficient water to make 5 gallons or more of total spray per acre. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida.

Broadleaf Weed Control

Use Garlon 4 at rates of 1 to 4 quarts in a total volume of 5 gallons or more per acre as a water spray mixture. Apply anytime weeds are actively growing. Garlon 4 at 0.25 to 3 quarts may be tank mixed with labeled rates of 2,4-D amine or low volatile ester, Tordon K, or Tordon 101 Mixture to improve the spectrum of activity. For thickened (high viscosity) spray mixtures, Garlon 4 can be mixed with diesel oil or other inverting agent. When using an inverting agent, read and follow the use directions and precautions on the product label. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida.

Aerial Application (Helicopter Only)

Aerial sprays should be applied using suitable drift control. (See General Use Precautions and Restrictions.)

Foliage Treatment (Utility and Pipeline Rights-of-Way)

Use 4 to 8 quarts of Garlon 4 alone, or 3 to 4 quarts of Garlon 4 in a tank mix combination with labeled rates of 2,4-D low volatile ester, Tordon 101 Mixture or Tordon K and apply in a total spray volume of 10 to 30 gallons per acre. Use the higher rates and volumes when plants are dense or under drought conditions. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida.

Basal Bark and Dormant Brush Treatments

Mixing Directions

To control susceptible woody plants in rights-of-way other non-crop areas, and forests, use Garlon 4 in oil or oil-water mixtures prepared and applied as described below. Prepare oil-based mixtures using either diesel fuel, No. 1 or No. 2 fuel oil, kerosene or a commercially available basal oil. Substitute other oils or diluents only as recommended by the oil or diluent's manufacturer. When preparing an oil mixture, read and follow the use directions and precautions on the manufacturer's product label. See Table 1 for relationship between mixing rate, spray volume and maximum application rate.

Note: All basal bark and dormant brush treatment methods may be used to treat susceptible woody species on range and permanent pasture land provided that no more than 2 quarts of Garlon 4 are applied per acre. Large plants or species requiring higher rates of Garlon 4 may not be completely controlled.

Oil Mixture Sprays

Add Garlon 4 to the required amount of oil in the spray tank or mixing tank and mix thoroughly. If the mixture stands over 4 hours, reagitation is required.

Oil Mixtures of Garlon 4 and Tordon K: Tordon K and Garlon 4 may be used in tank mix combination for basal bark treatment of woody plants. These herbicides are incompatible and will not form a stable mixture when mixed together directly in oil. Make a stable tank mixture for basal bark application by first combining each product with a compatibility agent prior to final mixing in the desired ratio. (See product bulletin for mixing instructions.) Tordon K is not registered for use in the states of California and Florida.

Oil-Water Mixture Sprays

Prepare a premix of oil, surfactant and Garlon 4 in a separate container. Do not allow any water or mixtures containing water to get into the premix or Garlon 4 since a thick "invert" (water in oil) emulsion may form that will be difficult to break. Such an emulsion may also be formed if the premix or Garlon 4 is put into the mixing tank before the addition of water. Fill the spray tank about one-half full with water, then slowly add the premix with continuous agitation and complete filling the tank with water. Continue moderate agitation.

Basal Bark Treatment

To control susceptible woody plants with stems less than 6 inches in basal diameter, mix 1 to 5 gallons of Garlon 4 in enough oil to make 100 gallons of spray mixture. Apply with knapsack sprayer or power spraying equipment using low pressure (20 to 40 psi). Spray the basal parts of brush and tree trunks to a height of 12 to 15 inches from the ground, thoroughly wetting the indicated area. Spray until runoff at the ground line is noticeable. Old or rough bark requires more spray than smooth young bark. Apply anytime, including the winter months, except when snow or water prevent spraying to the ground line.

Low Volume Basal Bark Treatment

To control susceptible woody plants with stems less than 6 inches in basal diameter, mix 20 to 30 gallons of Garlon 4 in enough oil to make 100 gallons of spray mixture. Apply with a backpack or knapsack sprayer using low pressure and a solid cone or flat fan nozzle. Spray the basal parts of brush and tree trunks in a manner which thoroughly wets the lower stems, including the root collar area, but not to the point of runoff. Herbicide concentration should vary with size and susceptibility of species treated. Apply anytime, including the winter months, except when snow or water prevent spraying to the ground line or when stem surfaces are saturated with water. See Table 1 for relationship between mixing rate, spray volume and maximum application rate. **Note:** The addition of a soil active herbicide to a basal bark mixture with Garlon 4 may result in damage to surrounding non-target vegetation. Care should be taken to assess the areas in which these soil active herbicides are used in combination with Garlon 4 in basal bark applications.

Garlon 4 Plus Tordon K in Oil Tank Mix: Garlon 4 and Tordon K may be used in tank mix combination as a low volume basal bark treatment to improve control of certain woody species such as ash, elm, maple, poplar, aspen, hackberry, oak, oceanspray, birch, hickory, pine, tanoak, cherry, locust, sassafras, and multiflora rose. (See product bulletin for mixing instructions.) Tordon K is not registered for use in the states of California and Florida.

Streamline Basal Bark Treatment (Southern States)

To control or suppress susceptible woody plants for conifer release, mix 20 to 30 gallons of Garlon 4 in enough oil to make 100 gallons of spray mixture. Apply with a backpack or knapsack sprayer using equipment which provides a directed straight stream spray. Apply sufficient spray to one side of stems less than 3 inches in basal diameter to form a treated zone that is 6 inches in height. When the optimum amount of spray mixture is applied, the treated zone should widen to encircle the stem within approximately 30 minutes. Treat both sides of stems which are 3 to 4 inches in basal diameter. Direct the spray at bark that is approximately 12 to 24 inches above ground. Pines (loblolly, slash, shortleaf, and Virginia) up to 2 inches in diameter breast height (dbh) can be controlled by directing the spray at a point approximately 4 feet above ground. Vary spray mixture concentration with size and susceptibility of the species being treated. Best results are achieved when applications are made to young vigorously growing stems which have not developed the thicker bark characteristic of slower growing, understory trees in older stands. This technique is not recommended for scrub and live oak species, including blackjack, turkey, post, live, bluejack and laurel oaks, or bigleaf maple. Apply from approximately 6 weeks prior to hardwood leaf expansion in the spring until approximately 2 months after leaf expansion is completed. Do not apply when snow or water prevent spraying at the desired height above ground level.

Low Volume Stem Bark Band Treatment (North Central and Lake States)

To control susceptible woody plants with stems less than 6 inches in basal diameter, mix 20 to 30 gallons of Garlon 4 in enough oil to make 100 gallons of spray mixture. Apply with a backpack or knapsack sprayer using low pressure and a solid cone or flat fan nozzle. Apply the spray in a 6- to 10-inch wide band that completely encircles the stem. Spray in a manner that completely wets the bark, but not to the point of runoff. The treatment band may be positioned at any height up to the first major branch. For best results, apply the band as low as possible. Spray mixture concentration should vary with size and susceptibility of species to be treated. Applications may be made anytime, including winter months.

Thinline Basal Bark Treatment

To control susceptible woody plants with stems less than 6 inches in diameter, apply Garlon 4, either undiluted or mixed at 50 to 75% v/v with oil, in a thin stream to all sides of the lower stems. The stream should be directed horizontally to apply a narrow band of Garlon 4 around each stem or clump. Use a minimum of 2 to 15 milliliters of Garlon 4 or oil mixture with Garlon 4 to treat single stems and from 25 to 100 milliliters to treat clumps of stems. Use an applicator metered or calibrated to deliver the small amounts required.

Dormant Stem Treatment

Dormant stem treatments control susceptible woody plants and vines with stems less than 2 inches in diameter. Plants with stems greater than 2 inches in diameter may not be controlled and resprouting may occur. This treatment method is best suited for sites with dense, small diameter brush. Dormant stem treatments of Garlon 4 can also be used as a chemical side-trim for controlling lateral branches of larger trees that encroach onto roadside, utility, or other rights-of-way.

Mix 4 to 8 quarts of Garlon 4 in 2 to 3 gallons of crop oil concentrate or other recommended oil and add this mixture in enough water to make 100 gallons of spray solution. Use continuous adequate agitation. Apply with Radiarc, OC or equivalent nozzles, or handgun using 70 to 100 gallons of spray per acre to ensure uniform coverage of stems. Garlon 4 may be mixed with 4 quarts of Weedone 170 herbicide to improve the control of black cherry and broaden the spectrum of herbicidal activity. In western states, apply anytime after woody plants are dormant. In other areas apply anytime within 10 weeks of budbreak, generally February through April. Do not apply to wet or saturated bark as poor control may result.

Cut Stump Treatment

To control resprouting, mix 20 to 30 gallons of Garlon 4 in enough oil to make 100 gallons of spray mixture. Apply with a backpack or knapsack sprayer using low pressures and a solid cone or flat fan nozzle. Spray the root collar area, sides of the stump, and the outer portion of the cut surface, including the cambium, until thoroughly wet, but not to the point of runoff. Spray mixture concentration should vary with the size and susceptibility of species treated. Apply anytime, including in winter months, except when snow or water prevent spraying to the ground line.

Cut Stump Treatment In Western States

To control resprouting of salt cedar and other *Tamarix* species, bigleaf maple, tanoak, Oregon myrtle, and other susceptible species, apply undiluted Garlon 4 to wet the cambium and adjacent wood around the entire circumference of the cut stump. Treatments may be applied throughout the year; however, control may be reduced with treatment during periods of moisture stress as in late summer. Use an applicator which can be calibrated to deliver the small amounts of material required.

Forest Management Applications

For broadcast applications, apply 1 to 6 quarts of Garlon 4 per acre in a total spray volume of 5 to 25 gallons per acre by air or 10 to 100 gallons per acre by ground. Use spray volumes sufficient to provide thorough coverage of treated foliage. Nozzles or additives that produce larger droplets of spray may require higher spray volumes to provide adequate coverage.

Forest Site Preparation (Not for Conifer Release)

Southern States including Alabama, Arkansas, Delaware, Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia: To control susceptible woody plants and broadleaf weeds, apply Garlon 4 at a rate of 4 to 6 quarts per acre. To broaden the spectrum of woody plants and broadleaf weeds controlled, apply 2 to 4 quarts of Garlon 4 per acre in tank mix combination with labeled rates of Tordon 101 Mixture or Tordon K. Tordon 101 Mixture and Tordon K are not registered for use in the state of Florida. Where grass control is also desired, Garlon 4 alone or in tank mix combination with Tordon K or Tordon 101 Mixture may be applied with labeled rates of other herbicides registered for grass control in forests. Use of tank mix products must be in accordance with the most restrictive of label limitations and precautions. Do not exceed labeled application rates. Garlon 4 cannot be tank mixed with any product containing a label prohibition against such mixing.

Western, Northeastern, North Central, and Lake States (States not Listed Above as Southern States): To control susceptible woody plants and broadleaf weeds, apply Garlon 4 at a rate of 3 to 6 quarts per acre. To broaden the spectrum of woody plants and broadleaf weeds controlled, apply 1.5 to 3 quarts of Garlon 4 per acre in tank mix combination with labeled rates of Tordon 101 Mixture, Tordon K, or 2,4-D low volatile ester. Tordon 101 Mixture and Tordon K are not registered for use in the state of California. Where grass control is also desired, Garlon 4 alone or in tank mix combination with Tordon 101 Mixture or Tordon K may be applied with labeled rates of other herbicides registered for grass control in forests. When applying tank mixes, follow applicable use directions and precautions on each product label.

Southern Coastal Flatwoods: To control susceptible broadleaf weeds and woody species such as gallberry and wax-myrtle, and for partial control of saw-palmetto, apply 2 to 4 quarts of Garlon 4 per acre. To broaden the spectrum of species controlled to include fetterbush, staggerbush, titi, and grasses, apply 2 to 3 quarts of Garlon 4 per acre in tank mix combination with labeled rates of Arsenal Applicator's Concentrate herbicide. Where control of gallberry, wax-myrtle, broadleaf weeds, and grasses is desired, apply 2 to 3 quarts of Garlon 4 per acre in tank mix combination with labeled rates of Accord Concentrate or Accord SP herbicide.

These treatments may be broadcast during site preparation of flat planted or bedded sites or, on bedded sites, applied in bands over the top of beds. For best results, apply in late summer or fall. Efficacy may not be satisfactory when applications are made in early season prior to August. **Note:** Do not apply after planting pines.

Note: Conifers planted sooner than 1 month after treatment with Garlon 4 at less than 4 quarts per acre or sooner than 2 months after treatment at 4 to 6 quarts per acre may be injured. When tank mixtures of herbicides are used for forest site preparation, labels for all products in the mixture should be consulted and the longest recommended waiting period before planting observed.

Directed Spray Applications for Conifer Release

To release conifers from competing hardwoods and brush such as red maple, sugar maple, striped maple, sweetgum, red and white oaks, ash, hickory, alder, birch, aspen, pin cherry, *Ceanothus* spp., blackberry, chinquapin, and poison oak, mix 4 to 20 quarts of Garlon 4 in enough water to make 100 gallons of spray mixture. This spray mixture should be directed onto foliage of competitive hardwoods using knapsack or backpack sprayers with flat fan nozzles or equivalent any time after the hardwoods and brush have reached full leaf size, but before autumn coloration. The majority of treated hardwoods and brush should be less than 6 feet in height to ensure adequate spray coverage. Care should be taken to direct spray away from contact with conifer foliage, particularly foliage of desirable pines. See Table 1 for relationship between mixing rate, spray volume and maximum application rate.

Note: Spray may cause temporary damage and growth suppression where contact with conifers occurs; however, injured conifers should recover and grow normally. Over-the-top spray applications can kill pines.

Broadcast Applications for Mid-Rotation Understory Brush Control in Southern Coastal Flatwoods Pine Stands (Ground Equipment Only)

For control of susceptible species such as gallberry and wax-myrtle and broadleaf weeds, apply 2 to 4 quarts of Garlon 4 per acre. To broaden the spectrum of woody plants controlled to include fetterbush, staggerbush, and titi, apply 2 to 3 quarts of Garlon 4 per acre in tank mix combination with labeled rates of Arsenal Applicator's Concentrate. Saw-palmetto will be partially controlled by use of Garlon 4 at 4 quarts per acre or by mixtures of Garlon 4 at 2 to 3 quarts per acre in tank mix combination with either Arsenal Applicator's Concentrate or Escort herbicide. These mixtures should be broadcast applied over target understory brush species, **but to prevent injury to pines, make applications underneath the foliage of pines.** Apply sprays in 30 gallons or more per acre of total volume. For best results, apply in late summer or fall. Efficacy may not be satisfactory when applications are made in early season prior to August.

Broadcast Applications for Conifer Release in the Pacific Northwest and California

Dormant Conifers Before Bud Swell (Excluding Pines): To control or suppress deciduous hardwoods such as vine maple, bigleaf maple, alder, scotch broom, or willow **before leaf-out**, or evergreen hardwoods such as madrone, chinquapin, and *Ceanothus* spp., use Garlon 4 at 1 to 2 quarts per acre. Use diesel or fuel oil as a diluent, or use water plus 1 to 2 gallons per acre of diesel oil or a suitable surfactant or oil substitute at manufacturer's recommended rates.

Conifer Plantations (Excluding Pines) After Hardwoods Begin Growth and Before Conifer Bud Break ("Early Foliar" Hardwood Stage): Use Garlon 4 at 1 to 1.5 quarts alone or with 2,4-D low volatile ester herbicide in water carrier to provide no more than 3 lb ae per acre from both products. After conifer bud break, these sprays may cause more serious injury to the crop trees. Use of a surfactant may cause unacceptable injury to conifers especially after bud break.

Conifer Plantations (Excluding Pines) After Conifers Harden Off in Late Summer and While Hardwoods are Still Actively Growing: Use Garlon 4 at rates of 1 to 1.5 quarts per acre alone or with 2,4-D low volatile ester to provide no more than 3 lb ae per acre from both products. Treat as soon after conifer bud hardening as possible so that hardwoods and brush are actively growing. Use of oil, oil substitute, or surfactant may cause unacceptable injury to the conifers.

Broadcast Applications for Conifer Release in the Eastern United States

To release spruce, fir, red pine, and white pine from competing hardwoods such as red maple, sugar maple, striped maple, alder, birch (white, yellow, and grey), aspen, ash, pin cherry, and *Rubus* spp. and perennial and annual broadleaf weeds, use Garlon 4 at rates of 1.5 to 3 quarts per acre alone or with 2,4-D amine or low volatile ester to provide no more than 4 lb ae per acre from both products. Apply in late summer or early fall after conifers have formed their overwintering buds and hardwoods are in full leaf and prior to autumn coloration.

Broadcast Applications for Conifer Release in the Lake States Region

To release spruce, fir, and red pine from competing hardwoods such as aspen, birch, maple, cherry, willow, oak, hazel, and *Rubus* spp. and perennial and annual broadleaf weeds, use Garlon 4 at rates of 1.5 to 3 quarts per acre. Apply in late summer or early fall after conifers have formed their overwintering buds and hardwoods are in full leaf and prior to autumn coloration.

Terms and Conditions of Use

If terms of the following Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies are not acceptable, return unopened package at once to the seller for a full refund of purchase price paid. Otherwise, use by the buyer or any other user constitutes acceptance of the terms under Warranty Disclaimer, Inherent Risks of Use and Limitation of Remedies.

Warranty Disclaimer

Dow AgroSciences warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. Dow AgroSciences MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

Inherent Risks of Use

It is impossible to eliminate all risks associated with use of this product. Plant injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as unfavorable temperature, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of Dow AgroSciences or the seller. All such risks shall be assumed by buyer.

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To the extent permitted by law, the exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories), shall be limited to, at Dow AgroSciences' election, one of the following:

1. Refund of purchase price paid by buyer or user for product bought, or
2. Replacement of amount of product used.

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Revisions:

1. Revised grazing and haying restrictions.
2. Added spray drift management guidance.

Specimen Label

Dow AgroSciences™

Garlon® 4 Ultra

Specialty Herbicide

®Trademark of Dow AgroSciences LLC

For the control of woody plants and annual and perennial broadleaf weeds in non-crop areas, including industrial manufacturing and storage sites, rights-of-way such as electrical power lines, communication lines, pipelines, roadsides, railroads, fence rows, non-irrigation ditch banks, forests and in the establishment and maintenance of wildlife openings. Use on these sites may include application to grazed areas.

Active Ingredient:	
triclopyr: 3,5,6-trichloro-2-pyridinyloxyacetic acid, butoxyethyl ester	60.45%
Inert Ingredients	39.55%
Total	100.00%

Acid equivalent: triclopyr – 43.46% - 4 lb/gal

EPA Reg. No. 62719-527

Keep Out of Reach of Children

CAUTION PRECAUCION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

Precautionary Statements

Hazards to Humans and Domestic Animals

Causes Moderate Eye Irritation • Harmful If Swallowed • Prolonged Or Frequently Repeated Skin Contact May Cause Allergic Reactions In Some Individuals

Avoid contact with skin, eyes, or clothing. Wear gloves and protective clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, or using tobacco.

Personal Protective Equipment (PPE)

Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for category E on an EPA chemical resistance category selections chart.

WPS Uses: Applicators and other handlers who handle this pesticide for any use covered by the Worker Protection Standard (40 CFR Part 170) – for this product, forestry sites -- must wear:

- Long-sleeved shirt and long pants
- Chemical-resistant gloves (≥ 14 mils) such as barrier laminate, nitrile rubber, neoprene rubber, or viton
- Shoes plus socks

Non-WPS Uses: Applicators and other handlers who handle this pesticide for any use NOT covered by the Worker Protection Standard (40 CFR Part 170) – for this product, non-forestry sites -- must wear:

- Long-sleeved shirt and long pants
- Chemical-resistant gloves
- Shoes plus socks

Follow the manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

Engineering Controls

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides (40 CFR 170.240(d)(4-6)), the handler PPE requirements may be reduced or modified as specified in the WPS.

User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

First Aid

If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.
If in eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
If swallowed: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-992-5994 for emergency medical treatment information.

Environmental Hazards

This pesticide is toxic to fish. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters.

This chemical has properties and characteristics associated with chemicals detected in groundwater. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.

Notice: Read the entire label. Use only according to label directions. **Before using this product, read Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies elsewhere on this label. If terms are unacceptable, return at once unopened.**

In case of emergency endangering health or the environment involving this product, call 1-800-992-5994. If you wish to obtain additional product information, visit our web site at www.dowagro.com.

Agricultural Chemical: Do not ship or store with food, feeds, drugs or clothing.

Directions for Use

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.
Read all Directions for Use carefully before applying.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your state or tribe, consult the agency responsible for pesticide regulation.

Agricultural Use Requirements

The requirements in this box apply to forestry uses.

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 12 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Chemical-resistant gloves (≥ 14 mils) such as barrier laminate, nitrile rubber, neoprene rubber, or viton
- Shoes plus socks

Non-Agricultural Use Requirements

The requirements in this box apply to all use sites on this label except for forestry uses.

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for Agricultural Pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, or greenhouses.

Entry Restrictions for Non-WPS Uses: For applications to non-cropland areas, do not allow entry into areas until sprays have dried.

Storage and Disposal

Do not contaminate water, food, or feed by storage and disposal. Open dumping is prohibited.
Pesticide Storage: Store above 28°F or agitate before use.
Pesticide Disposal: Wastes resulting from the use of this product (that cannot be used according to label instructions) may be disposed of on site or at an approved waste disposal facility.
Plastic Container Disposal: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.
Metal Container Disposal: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.
Container Disposal for Refillable Containers: Replace the dry disconnect cap, if applicable, and seal all openings which have been opened during use. Return the empty container to a collection site designated by Dow AgroSciences. If the container has been damaged and cannot be returned according to the recommended procedures, contact the Dow AgroSciences Customer Service Center at 1-800-258-1470 to obtain proper handling instructions.
General: Consult federal, state, or local disposal authorities for approved alternative procedures.

General Information

Garlon® 4 Ultra specialty herbicide is recommended for the control of woody plants and annual and perennial broadleaf weeds in non-crop areas, including industrial manufacturing and storage sites, rights-of-way such as electrical power lines, communication lines, pipelines, roadsides and railroads, fence rows, non-irrigation ditch banks, forests and in the establishment and maintenance of wildlife openings. Use on these sites may include application to grazed areas.

General Use Precautions and Restrictions

Chemigation: Do not apply this product through any type of irrigation system.

Other Precautions:

- When applying this product in tank mix combination, follow all applicable use directions and precautions on each manufacturer's label.
- Do not apply on ditches used to transport irrigation water. Do not apply where runoff or irrigation water may flow onto agricultural land as injury to crops may result.
- Do not apply this product using mist blowers unless a drift control additive, high viscosity inverting system, or equivalent is used to control spray drift.
- Sprays applied directly to Christmas trees may result in conifer injury. When treating unwanted vegetation in Christmas tree plantations, care should be taken to direct sprays away from conifers.
- Do not apply Garlon 4 Ultra directly to, or otherwise permit it to come into direct contact with grapes, tobacco, vegetable crops, flowers, or other desirable broadleaf plants and do not permit spray mists containing it to drift onto them.
- It is permissible to treat non-irrigation ditch banks, seasonally dry wetlands (such as flood plains, deltas, marshes, swamps, or bogs) and transitional areas between upland and lowland sites where surface water is not present except in isolated pockets due to uneven or unlevel conditions. Do not apply to open water (such as lakes, reservoirs, rivers, streams, creeks, salt water bays, or estuaries).

Grazing and Haying Restrictions
Except for lactating dairy animals, there are no grazing restrictions following application of this product.

Grazing Lactating Dairy Animals: Do not allow lactating dairy animals to graze treated areas until the next growing season following application of this product.

Do not harvest hay for 14 days after application.

Portions of grazed areas that intersect treated non-cropland, rights-of-way and forestry sites may be treated at up to 8 lb ae per acre if the area to be treated on the day of application comprises no more than 10% of the total grazable area.

Slaughter Restrictions: During the season of application, withdraw livestock from grazing treated grass at least 3 days before slaughter.

Avoid Injurious Spray Drift
Make applications only when there is little or no hazard from spray drift. Small quantities of spray, which may not be visible, may seriously injure susceptible plants. Do not spray when wind is blowing toward susceptible crops or ornamental plants that are near enough to be injured. It is suggested that a continuous smoke column at or near the spray site or a smoke generator on the spray equipment be used to detect air movement, lapse conditions, or temperature inversions (stable air). If the smoke layers or indicates a potential of hazardous spray drift, do not spray.

Aerial Application (Helicopter Only): For aerial application on rights-of-way or other areas near susceptible crops, use an agriculturally registered spray thickening drift control additive as recommended by the manufacturer or apply through the Microfoil† boom, Thru-Valve boom, or equivalent drift control system. Thickened sprays prepared by using high viscosity invert systems or other drift reducing systems may be utilized if they are made as drift-free as are mixtures containing an agriculturally registered thickening agent or applications made with the Microfoil boom or Thru Valve boom. If a spray thickening agent is used, follow all use recommendations and precautions on the product label. Do not use a thickening agent with the Microfoil boom, Thru Valve boom, or other systems that cannot accommodate thick sprays.

† Reference within this label to a particular piece of equipment produced by or available form other parties is provided without consideration for use by the reader at its discretion and subject to the reader's independent circumstances, evaluation, and expertise. Such reference by Dow AgroSciences is not intended as an endorsement of such equipment, shall not constitute a warranty (express or implied) of such equipment, and is not intended to imply that other equipment is not available and equally suitable. Any discussion of methods of use of such equipment does not imply that the reader should use the equipment other than is advised in directions available from the equipment's manufacturer. The reader is responsible for exercising its own judgment and expertise, or consulting with sources other than Dow AgroSciences, in selecting and determining how to use its equipment.

Spray Drift Management

Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment and weather related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions.

The following drift management requirements must be followed to avoid off-target drift movement from aerial applications:

1. The distance of the outer most operating nozzles on the boom must not exceed 3/4 the length of the rotor.
2. Nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees.

Where states have more stringent regulations, they must be observed.

The applicator should be familiar with and take into account the information covered in the following **Aerial Drift Reduction Advisory**. [This information is advisory in nature and does not supersede mandatory label requirements.]

Aerial Drift Reduction Advisory
Information on Droplet Size: The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see Wind, Temperature and Humidity, and Temperature Inversions).

Controlling Droplet Size:

- **Volume** - Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- **Pressure** - Do not exceed the nozzle manufacturer's recommended pressures. For many nozzle types lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.
- **Number of Nozzles** - Use the minimum number of nozzles that provide uniform coverage.
- **Nozzle Orientation** - Orienting nozzles so that the spray is released parallel to the airstream produced larger droplets than other orientations and is the recommended practice. Significant deflection from horizontal will reduce droplet size and increase drift potential.
- **Nozzle Type** - Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce the largest droplets and the lowest drift.

Boom Length: For some use patterns, reducing the effective boom length to less than 3/4 of the wingspan or rotor length may further reduce drift without reducing swath width.

Application Height: Applications should not be made at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

Swath Adjustment: When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase, with increasing drift potential (higher wind, smaller drops, etc.).

Wind: Drift potential is lowest between wind speeds of 2 to 10 mph. However, many factors, including droplet size and equipment type determine drift potential at any given speed. Application should be avoided below 2 mph due to variable wind direction and high inversion potential. **Note**: Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

Temperature and Humidity: When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

Temperature Inversions: Applications should not occur during a local, low level temperature inversion because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of the smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

Sensitive Areas: The pesticide should only be applied when the potential for drift to adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is minimal (e.g., when wind is blowing away from the sensitive areas).

Ground Equipment: To aid in reducing spray drift potential when making ground applications near susceptible crops or other desirable broadleaf plants, Garlon 4 Ultra should be applied through large droplet producing equipment, such as the Radiarc sprayer or in thickened spray mixtures using an agriculturally registered drift control additive, or high viscosity invert systems. When using a spray thickening or inverting additive, follow all use directions and precautions on the product label. With ground equipment, spray drift can be reduced by keeping the spray boom as low as possible; by applying 20 gallons or more of spray per acre; and by spraying when wind velocity is low. Do not apply with nozzles that produce a fine droplet spray. Keep operating spray pressures at the lower end of the manufacturer's recommended pressures for the specific nozzle type used. Low pressure nozzles are available from spray equipment manufacturers. Select nozzles and pressures which provide adequate plant coverage, but minimize the production of fine spray particles.

High Volume Leaf-Stem Treatment: To minimize spray drift, keep sprays no higher than brush tops and keep spray pressures low enough to provide coarse spray droplets. A spray thickening agent may be used to reduce spray drift.

Plants Controlled by Garlon 4 Ultra

Woody Plants Controlled

alder	chinquapin	madrone	scotch broom
arrowwood	choke cherry	maples	sumac
ash	cottonwood	mulberry	sweetbay magnolia
aspen	Crataegus (hawthorn)	oaks	sweetgum
bear clover (bearmat)	dogwood	persimmon	sycamore
beech	Douglas-fir	pine	tanoak
birch	elderberry	poison ivy	thimbleberry
blackberry	elm	poison oak	tree-of-heaven
blackgum	gallberry	poplar	(*Ailanthus*)[†]
boxelder[†]	gorse	salmonberry	tulip poplar
Brazilian pepper	hazel	salt-bush	wax myrtle
buckthorn	hickory	(*Braccharis* spp.)	wild rose
cascara	hornbeam	salt-cedar[†]	willow
Ceanothus	kudzu[††]	sassafras	winged elm
cherry	locust		

[†]For best control, use either a basal bark or cut stump treatment.
[††]For complete control, retreatment may be necessary.

Annual and Perennial Broadleaf Weeds Controlled

black medic	curly dock	matchweed	sweet clover
bull thistle	dandelion	mustard	Vetch
burdock	field bindweed	Oxalis	wild carrot
Canada thistle	goldenrod	plantain	(Queen Anne's lace)
chicory	ground ivy	purple loosestrife	wild lettuce
clover	lambsquarters	ragweed	wild violet
creeping beggarweed	lespedeza	smartweed	yarrow

Application Methods

- Apply no more than 1/2 gallon (2 lb ae) per acre per growing season on range and pasture sites, including rights-of-way, fence rows or any area where grazing or harvesting is allowed.
- On forestry sites, Garlon 4 Ultra may be used at rates up to 6 quarts (6 lb ae) per acre per year.
- Garlon 4 Ultra may be used at rates up to 8 quarts (8 lb ae) per acre per year on non-crop areas including industrial manufacturing and storage sites, non-grazed portions of rights-of-way including electrical power lines, communication lines, pipelines, roadsides and railroads, fence rows, non-irrigation ditch banks. Portions of grazed areas that intersect treated non-cropland, rights-of-way and forestry sites may be treated at up to 8 lb ae per acre if the area to be treated on the day of application comprises no more than 10% of the total grazable area.

Foliar Applications

Use Garlon 4 Ultra at rates of 1 to 8 quarts per acre to control broadleaf weeds and woody plants. It is suggested that rates higher in this rate range be used to control woody plants. In all cases use the amount specified in enough water to give uniform and complete coverage of the plants to be controlled. The recommended order of addition to the spray tank is water, spray thickening agent (if used), surfactant (if used), additional herbicide (if used), and Garlon 4 Ultra. If a standard agricultural surfactant is used, use at a rate of 1 to 2 quarts per acre. Use continuous adequate agitation.

Before using any recommended tank mixtures, read the directions and all precautions on both labels.

For best results apply when woody plants and weeds are actively growing. When hard-to-control species such as ash, blackgum, choke cherry, elm, maples (other than vine or big leaf), oaks, pines, or winged elm are prevalent, and during applications made during late summer when the plants are mature, or during drought conditions, use the higher rates of Garlon 4 Ultra alone or in combination with Tordon® 101 Mixture herbicide or Tordon K herbicide. Tordon 101 Mixture and Tordon K are Restricted Use Pesticides. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida.

When using Garlon 4 Ultra in combination with 2,4-D low volatile ester herbicide generally the higher rates of Garlon 4 Ultra should be used for satisfactory brush control.

Use the higher dosage rates when brush approaches an average of 15 feet in height or when the brush covers more than 60% of the area to be treated. If lower rates are used on hard-to-control species, resprouting may occur the year following treatment.

On sites where easy to control brush species dominate, rates less than those recommended may be effective. Consult state or local extension personnel for such information.

Foliar Treatment With Ground Equipment

High Volume Foliar Treatment
For control of woody plants, use Garlon 4 Ultra at the rate of 2 to 6 quarts per 100 gallons of spray mixture, or Garlon 4 Ultra at 2 to 4 quarts may be tank mixed with labeled rates of 2,4-D low volatile ester herbicide, Tordon 101 Mixture herbicide, or Tordon K herbicide and diluted to make 100 gallons of spray. Do not apply more than 2 gallons of Garlon 4 Ultra per acre. Apply at a volume of 100 to 400 gallons of total spray per acre depending on size and density of woody plants. Coverage should be thorough to wet all leaves, stems, and root collars. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida.

When tank mixing, follow applicable use directions and precautions on each manufacturer's label.

Table 1: The following table is provided as a guide to the user to achieve the proper rate of Garlon 4 Ultra.

Total Spray Volume (gallons/acre)	Rate of Garlon 4 Ultra	
	Forestry Sites (qt/100 gallons of spray)†	Non-Cropland Sites (qt/100 gallons of spray)††
400	1.5	2
300	2	2.7
200	3	4
100	6	8
50	12	16
40	15	20
30	20	26.7
20	30	40
10	60	80

†Do not exceed the maximum use rate of 6 qt (6 lb ae) per acre per year.
††Do not exceed the maximum use rate of 8 qt (8 lb ae) per acre per year for non-grazable areas, or 2 qt (2 lb ae) per acre per year for grazed areas, except on portions of grazed areas that meet the following requirement. Portions of grazed areas that intersect treated non-cropland, rights-of-way and forestry sites may be treated at up to 8 lb ae per acre if the area to be treated on the day of application comprises no more than 10% of the total grazable area.

Low Volume Foliar Treatment
To control susceptible woody plants, mix up to 20 quarts of Garlon 4 Ultra in 10 to 100 gallons of finished spray. The spray concentration of Garlon 4 Ultra and total spray volume per acre should be adjusted according to the size and density of target woody plants and kind of spray equipment used. With low volume sprays, use sufficient spray volume to obtain uniform coverage of target plants including the surfaces of all foliage, stems, and root collars (see General Use Precautions). For best results, a surfactant should be added to all spray mixtures. Match equipment and delivery rate of spray nozzles to height and density of woody plants. When treating tall, dense brush, a truck mounted spray gun with spray tips that deliver up to 2 gallons per minute at 40 to 60 psi may be required. Backpack or other types of specialized spray equipment with spray tips that deliver less than 1 gallon of spray per minute may be appropriate for short, low to moderate density brush.

See Table 1 for relationship between mixing rate, spray volume and maximum application rate.

Tank Mixing: As a low volume foliar spray, up to 12 quarts of Garlon 4 Ultra may be applied in tank mix combination with labeled rates of Tordon K or Tordon 101 Mixture in 10 to 100 gallons of finished spray. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida.

Broadcast Applications With Ground Equipment

Apply Garlon 4 Ultra using equipment that will assure thorough and uniform coverage at spray volumes applied. See Table 1 for relationship between mixing rate, spray volume and maximum application rate.

Woody Plant Control
Foliage Treatment: Use 4 to 8 quarts of Garlon 4 Ultra in enough water to make 5 gallons or more per acre of total spray, or Garlon 4 Ultra at 1 1/2 to 3 quarts may be combined with labeled rates of 2,4-D low volatile ester, Tordon 101 Mixture, or Tordon K in sufficient water to make 5 gallons or more per acre of total spray.

Broadleaf Weed Control
Use Garlon 4 Ultra at rates of 1 to 4 quarts in a total volume of 5 gallons or more per acre as a water spray mixture. Apply anytime weeds are actively growing. Garlon 4 Ultra at 0.25 to 3 quarts may be tank mixed with labeled rates of 2,4-D amine or low volatile ester, Tordon K, or Tordon 101 Mixture to improve the spectrum of activity. For thickened (high viscosity) spray mixtures, Garlon 4 Ultra can be mixed with diesel oil or other inverting agent. When using an inverting agent, read and follow the use directions and precautions on the product label.

Aerial Application (Helicopter Only)

Aerial sprays should be applied using suitable drift control (see General Use Precautions).

Foliage Treatment (Utility and Pipeline Rights-of-Way)
Use 4 to 8 quarts of Garlon 4 Ultra alone, or 3 to 4 quarts Garlon 4 Ultra in a tank mix combination with labeled rates of 2,4-D low volatile ester Tordon 101 Mixture or Tordon K and apply in a total spray volume of 10 to 30 gallons per acre. Use the higher rates and volumes when plants are dense or under drought conditions. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida.

Portions of grazed areas that intersect treated non-cropland, rights-of-way and forestry sites may be treated at up to 8 lb ae per acre if the area to be treated on the day of application comprises no more than 10% of the total grazable area.

Basal Bark and Dormant Brush Treatments

To control susceptible woody plants in rights-of-way, other non-crop areas, and forests, use Garlon 4 Ultra in oil or oil-water mixtures prepared and applied as described below. When preparing mixtures, use as oils either a commercially available basal oil, diesel fuel, No. 1 or No. 2 fuel oil, or kerosene. Substitute other oils or diluents only as recommended by the oil or diluent's manufacturer. When mixing with a basal oil or other oils or diluents, read and follow the use directions and precautions on the product label prepared by the oil or diluent's manufacturer. See Table 1 for relationship between mixing rate, spray volume and maximum application rate.

Oil Mixture Sprays
Add Garlon 4 Ultra to the required amount of oil in the spray tank or mixing tank and mix thoroughly. If the mixture stands over 4 hours, reagitation is required.

Oil Mixtures of Garlon 4 Ultra and Tordon K: Tordon K and Garlon 4 Ultra may be used in tank mix combination for basal bark treatment of woody plants. These herbicides are incompatible and will not form a stable mixture when mixed together directly in oil. Stable tank mixtures for basal bark application can be made if each product is first combined with a compatibility agent prior to final mixing in the desired ratio. (See product bulletin for mixing instructions.) Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida.

Oil-Water Mixture Sprays
First, premix the Garlon 4 Ultra, oil and surfactant in a separate container. Do not allow any water or mixtures containing water to get into the Garlon 4 Ultra or the premix. Fill the spray tank about half full with water, then slowly add the premix with continuous agitation and complete filling the tank with water. Continue moderate agitation.

Note: If the premix is put in the tank without any water, the first water added may form a thick "invert" (water in oil) emulsion which will be hard to break.

Basal Bark Treatment
To control susceptible woody plants with stems less than 6 inches in basal diameter, mix 1 to 5 gallons of Garlon 4 Ultra in enough oil to make 100 gallons of spray mixture. Apply with knapsack sprayer or power spraying equipment using low pressure (20-40 psi). Spray the basal parts of brush and tree trunks to a height of 12 to 15 inches from the ground. Thorough wetting of the indicated area is necessary for good control. Spray until runoff at the ground line is noticeable. Old or rough bark requires more spray than smooth young bark. Apply anytime, including the winter months, except when snow or water prevent spraying to the ground line.

Low Volume Basal Bark Treatment
To control susceptible woody plants with stems less than 6 inches in basal diameter, mix 20 to 30 gallons of Garlon 4 Ultra in enough oil to make 100 gallons of spray mixture. Apply with a backpack or knapsack sprayer using low pressure and a solid cone or flat fan nozzle. Spray the basal parts of brush and tree trunks in a manner that thoroughly wets the lower stems, including the root collar area, but not to the point of runoff. Herbicide concentration should vary with size and susceptibility of species treated. Apply at any time, including the winter months, except when snow or water prevent spraying to the ground line or when stem surfaces are saturated with water. See Table 1 for relationship between mixing rate, spray volume and maximum application rate.

Garlon 4 Ultra Plus Tordon K in Oil Tank Mix: Garlon 4 Ultra and Tordon K may be applied as a low volume basal bark treatment to improve control of certain woody species such as ash, elm, maple, poplar, aspen, hackberry, oak, oceanspray, birch, hickory, pine, tanoak, cherry, locust, sassafras, and multiflora rose. (See product bulletin for mixing instructions.) Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida.

Streamline Basal Bark Treatment (Southern States)
To control or suppress susceptible woody plants for conifer release, mix 20 to 30 gallons of Garlon 4 Ultra in enough oil to make 100 gallons of spray mixture. Apply with a backpack or knapsack sprayer using equipment that provides a directed straight stream spray. Apply sufficient spray to one side of stems less than 3 inches in basal diameter to form a treated zone that is 6 inches in height. When the optimum amount of spray mixture is applied, the treated zone should widen to encircle the stem within approximately 30 minutes. Treat both sides of stems which are 3 to 4 inches in basal diameter. Direct the spray at bark that is approximately 12 to 24 inches above ground. Pines (loblolly, slash, shortleaf, and Virginia) up to 2 inches in diameter breast height (dbh) can be controlled by directing the spray at a point approximately 4 feet above ground. Vary spray mixture concentration with size and susceptibility of the species being treated. Best results are achieved when applications are made to young vigorously growing stems that have not developed the thicker bark characteristic of slower growing, understory trees in older stands. This technique is not recommended for scrub and live oak species, including blackjack, turkey, post, live, bluejack and laurel oaks, or bigleaf maple. Apply from approximately 6 weeks prior to hardwood leaf expansion in the spring until approximately 2 months after leaf expansion is completed. Do not apply when snow or water prevent spraying at the desired height above ground level.

Low Volume Stem Bark Band Treatment
(North Central and Lake States)
To control susceptible woody plants with stems less than 6 inches in basal diameter, mix 20 to 30 gallons of Garlon 4 Ultra in enough oil to make 100 gallons of spray mixture. Apply with a backpack or knapsack sprayer using low pressure and a solid cone or flat fan nozzle. Apply the spray in a 6 to 10 inch wide band that completely encircles the stem. Spray in a manner that completely wets the bark, but not to the point of runoff. The treatment band may be positioned at any height up to the first major branch. For best results apply the band as low as possible. Spray mixture concentration should vary with size and susceptibility of species to be treated. Applications may be made anytime, including winter months.

Thinline Basal Bark Treatment
To control susceptible woody plants with stems less than 6 inches in diameter, apply Garlon 4 Ultra either undiluted or mixed at 50-75% v/v with oil in a thin stream to all sides of the lower stems. The stream should be directed horizontally to apply a narrow band around each stem or clump. Use a minimum of 2 to 15 milliliters of Garlon 4 Ultra or oil mixture with Garlon 4 Ultra to treat single stems and from 25 to 100 milliliters to treat clumps of stems. Use an applicator metered or calibrated to deliver the small amounts required.

Dormant Stem Treatment
Dormant stem treatments will control susceptible woody plants and vines with stems less than 2 inches in diameter. Plants with stems greater than 2 inches in diameter may not be controlled and resprouting may occur. This treatment method is best suited for sites with dense, small diameter brush. Dormant stem treatments of Garlon 4 Ultra can also be used as a chemical side-trim for controlling lateral branches of larger trees that encroach onto roadside, utility, or other rights-of-way.

Mix 4 to 8 quarts of Garlon 4 Ultra in 2 to 3 gallons of crop oil concentrate or other recommended oil and add this mixture to enough water to make 100 gallons of spray solution. Use continuous adequate agitation. Apply with Radiarc, OC or equivalent nozzles, or handgun using 70 to 100 gallons of spray per acre to ensure uniform coverage of stems. Garlon 4 Ultra may be mixed with 4 quarts of Weedone 170 herbicide to improve the control of black cherry and broaden the spectrum of herbicidal activity. In western states, apply anytime after woody plants are dormant. In other areas apply anytime within 10 weeks of budbreak, generally February through April. Do not apply to wet or saturated bark as poor control may result.

Cut Stump Treatment
To control resprouting of cut stumps of susceptible species, mix 20 to 30 gallons of Garlon 4 Ultra in enough oil to make 100 gallons of spray mixture. Apply with a backpack or knapsack sprayer using low pressures and a solid cone or flat fan nozzle. Spray the root collar area, sides of the stump, and the outer portion of the cut surface including the cambium until thoroughly wet, but not to the point of runoff. Spray mixture concentration should vary with size and susceptibility of species treated. Apply anytime, including in winter months, except when snow or water prevent spraying to the ground line.

Treatment of Cut Stumps in Western States
To control resprouting of salt-cedar and other *Tamarix* species, bigleaf maple, tanoak, Oregon myrtle, and other susceptible species, apply undiluted Garlon 4 Ultra to wet the cambium and adjacent wood around the entire circumference of the cut stump. Treatments may be applied throughout the year; however, control may be reduced with treatment during periods of moisture stress as in late summer. Use an applicator that can be calibrated to deliver the small amounts of material required.

Note: All basal bark and dormant brush treatment methods may be used to treat susceptible woody species on range and permanent pasture land provided that no more than 2 quarts of Garlon 4 Ultra are applied per acre. Large plants or species requiring higher rates of Garlon 4 Ultra may not be completely controlled.

Forest Management Applications

For broadcast applications apply 1 to 6 quarts per acre of Garlon 4 Ultra in a total spray volume of 5 to 25 gallons per acre by air or 10 to 100 gallons per acre by ground. Use spray volumes sufficient to provide thorough coverage of treated foliage. Nozzles or additives that produce larger droplets may require higher spray volumes to provide adequate coverage.

Plant Back Interval for Conifers: Conifers planted sooner than 1 month after treatment with Garlon 4 Ultra at less than 4 quarts per acre or sooner than 2 months after treatment at 4 to 6 quarts per acre may be injured. When tank mixtures of herbicides are used for forest site preparation, labels for all products in the mixture should be consulted and the longest recommended waiting period observed.

Broadcast Treatments for Forest Site Preparation (Not For Conifer Release)

Southern States Including Alabama, Arkansas, Delaware, Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia:
To control susceptible woody plants and broadleaf weeds, apply Garlon 4 Ultra at a rate of 4 to 6 quarts per acre. To broaden the spectrum of woody plants and broadleaf weeds controlled, apply 2 to 4 quarts per acre of Garlon 4 Ultra in tank mix combination with labeled rates of Tordon 101 Mixture or Tordon K. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida. Where grass control is also desired, Garlon 4 Ultra, alone or in combination with Tordon K or Tordon 101 Mixture, may be tank mixed with labeled rates of other herbicides registered for grass control in forests. Use of tank mix products must be in accordance with the most restrictive of label limitations and precautions. No label application rates should be exceeded. Garlon 4 Ultra cannot be tank mixed with any product containing a label prohibition against such mixing.

In Western, Northeastern, North Central, and Lake States (States Not Listed Above as Southern States): To control susceptible woody plants and broadleaf weeds, apply Garlon 4 Ultra at a rate of 3 to 6 quarts per acre. To broaden the spectrum of woody plants and broadleaf weeds controlled, apply 1.5 to 3 quarts per acre of Garlon 4 Ultra in tank mix combination with labeled rates of Tordon 101 Mixture, Tordon K, or 2,4-D low volatile ester. Tordon 101 Mixture and Tordon K are not registered for use in the states of California and Florida. Where grass control is also desired, Garlon 4 Ultra, alone or in tank mix combination with Tordon 101 Mixture or Tordon K, may be applied with labeled rates of other herbicides registered for grass control in forests. When applying tank mixes, follow applicable use directions and precautions on each product label.

Applications for Site Preparation in Southern Coastal Flatwoods:
To control susceptible broadleaf weeds and woody species such as gallberry and wax-myrtle, and for partial control of saw-palmetto, apply 2 to 4 quarts per acre of Garlon 4 Ultra. To broaden the spectrum of species controlled to include fetterbush, staggerbush, titi, and grasses, apply 2 to 3 quarts per acre of Garlon 4 Ultra in tank mix combination with labeled rates of Arsenal Applicator's Concentrate herbicide. Where control of gallberry, wax-myrtle, broadleaf weeds, and grasses is desired, 2 to 3 quarts per acre of Garlon 4 Ultra may be applied in tank mix combination with labeled rates of Accord Concentrate or Accord SP herbicide.

These treatments may be broadcast during site preparation of flat planted or bedded sites or, on bedded sites, applied in bands over the top of beds. For best results, apply in late summer or fall. Efficacy may not be satisfactory when applications are made in early season prior to August. **Note: Do not apply after planting pines.**

Applications for Conifer Release

Note: Applications for conifer release may cause temporary damage and growth suppression where contact with conifers occurs; however, injured conifers should recover and grow normally. Over-the-top spray applications can kill pines.

Directed Sprays
To release conifers from competing hardwoods and brush such as red maple, sugar maple, striped maple, sweetgum, red and white oaks, ash, hickory, alder, birch, aspen, pin cherry, *Ceanothus* spp., blackberry, chinquapin, and poison oak, mix 4 to 20 quarts of Garlon 4 Ultra in enough water to make 100 gallons of spray mixture. This spray should be directed onto foliage of competitive hardwoods using knapsack or backpack sprayers with flat fan nozzles or equivalent anytime after the hardwoods and brush have reached full leaf size, but before autumn coloration. The majority of treated hardwoods and brush should be less than 6 feet in height to ensure adequate spray coverage. Care should be taken to direct spray solutions away from conifer foliage, particularly foliage of desirable pines. See Table 1 for relationship between mixing rate, spray volume and maximum application rate.

Broadcast Applications for Mid-Rotation Understory Brush Control in Southern Coastal Flatwoods Pine Stands (Ground Equipment Only)
For control of susceptible species such as gallberry and wax-myrtle and broadleaf weeds, apply 2 to 4 quarts per acre of Garlon 4 Ultra. To broaden the spectrum of woody plants controlled to include fetterbush, staggerbush, and titi, apply 2 to 3 quarts per acre of Garlon 4 Ultra in tank mix combination with labeled rates of Arsenal Applicator's Concentrate. Saw-palmetto will be partially controlled by use of Garlon 4 Ultra at 4 quarts per acre or by mixtures of Garlon 4 Ultra with either Arsenal Applicator's Concentrate or Escort herbicide at 2 to 3 quarts per acre in tank mix combination.

These mixtures should be broadcast applied over target understory brush species, **but to prevent injury to pines, apply underneath the foliage of pines.** It is recommended that sprays be applied in 30 gallons or more per acre of total volume. For best results, apply in late summer or fall. Efficacy may not be satisfactory when applications are made in early season prior to August.

Broadcast Applications for Conifer Release in the Pacific Northwest and California

On Dormant Conifers Before Bud Swell (Excluding Pines): To control or suppress deciduous hardwoods such as vine maple, bigleaf maple, alder, scotch broom, or willow **before leaf-out**, or evergreen hardwoods such as madrone, chinquapin, and *Ceanothus* spp., use Garlon 4 Ultra at 1 to 2 quarts per acre. Diluents used may be diesel or fuel oil. Or, water plus 1 to 2 gallons per acre of diesel oil or a suitable surfactant or oil substitute at manufacturer's recommended rates may be used.

On Conifer Plantations (Excluding Pines) After Hardwoods Begin Growth and Before Conifer Bud Break ("Early Foliar" Hardwood Stage): Use Garlon 4 Ultra at 1 to 1.5 quarts alone or with 2,4-D low volatile ester herbicide in water carrier to provide no more than 3 lb acid equivalent per acre from both products. After conifer bud break, these sprays may cause more serious injury to the crop trees. Use of a surfactant may cause unacceptable injury to conifers especially after bud break.

On Conifer Plantations (Excluding Pines) After Conifers Harden Off In Late Summer and While Hardwoods Are Still Growing Actively: Use Garlon 4 Ultra at rates of 1 to 1.5 quarts per acre alone or with 2,4-D low volatile ester to provide no more than 3 lb acid equivalent per acre from both products. Treat as soon after conifer bud hardening as possible so that hardwoods and brush are actively growing. Use of oil, oil substitute, or surfactant may cause unacceptable injury to the conifers.

Broadcast Applications for Conifer Release in the Eastern United States

To release spruce, fir, red pine, and white pine from competing hardwoods such as red maple, sugar maple, striped maple, alder, birch (white, yellow, and grey), aspen, ash, pin cherry, and *Rubus* spp. and perennial and annual broadleaf weeds, use Garlon 4 Ultra at rates of 1.5 to 3 quarts per acre alone or with 2,4-D amine or low volatile ester to provide no more than 4 lb acid equivalent per acre from both products. Apply in late summer or early fall after conifers have formed their overwintering buds and hardwoods are in full leaf and prior to autumn coloration.

Broadcast Applications for Conifer Release in the Lake States Region

To release spruce, fir, and red pine from competing hardwoods such as aspen, birch, maple, cherry, willow, oak, hazel, and *Rubus* spp. and perennial and annual broadleaf weeds, use Garlon 4 Ultra at rates of 1.5 to 3 quarts per acre. Apply in late summer or early fall after conifers have formed their overwintering buds and hardwoods are in full leaf and prior to autumn coloration.

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National Grid
Environmental Policy

National Grid USA is committed to the protection and enhancement of the environment, always seeking new ways to minimize the environmental impacts of our past, present and future activities. We believe that everyone is responsible for good environmental performance as we incorporate environmental considerations into all our business activities. The following principles provide the framework to help us set goals to promote continual improvements in environmental performance and to deliver and maintain a culture that achieves the performance to which we aspire.

We:

- Expect management to provide visible leadership that promotes good environmental performance and to commit the appropriate resources to achieve our environmental goals;
- Meet, and where appropriate, exceed the requirements of environmental legislation, policies, charters and other commitments to which we subscribe;
- Prevent pollution, including the releases of oil and hazardous materials, wherever we can, but if an incident occurs respond effectively to minimize impact on human health and the environment;
- Minimize and properly manage the waste we generate, and reuse or recycle waste materials whenever economically feasible;
- Help protect the environment for future generations by making our contribution to minimizing climate change;
- Monitor electric and magnetic fields (EMF) research developments and assess continually the implications for the way in which we operate;
- Manage the risks associated with sites that have been contaminated from our past operations and improve these sites where appropriate;
- Protect and improve, where we can, the environmental status of the land on which we operate;
- Require our contractors to demonstrate the same level of commitment as National Grid USA in the management of the environment;
- Ensure that our employees have the skills, knowledge, and resources necessary to contribute to our environmental commitments;
- Encourage open and constructive dialogue with employees, members of the public and other stakeholders to continually challenge our performance;
- Identify and manage risks associated with our activities and deliver any improvements through effective environmental management systems;
- Monitor our environmental performance, audit the effectiveness of our management systems, and report our performance to employees, shareholders, the public and other stakeholders.

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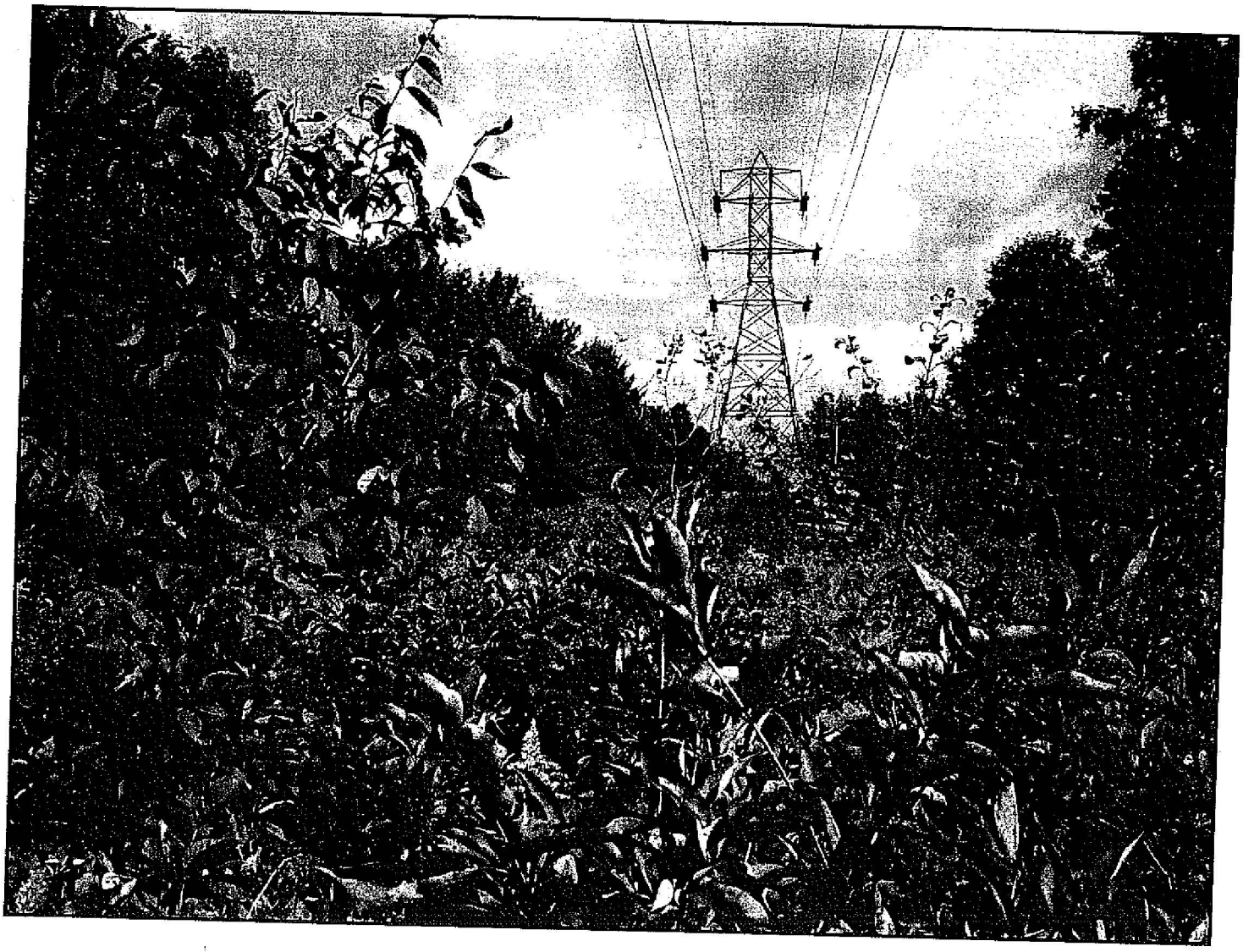

National Grid
Transmission Forestry
Right-of-Way Vegetation Management Specification
2008 - 2009

nationalgrid

FOREWORD

This Right-of-Way Vegetation Management Specification (VMS) documents the objectives, strategies, practices and procedures for vegetation management on National Grid companies' electric right-of-ways. The VMS is primarily aimed at the transmission system, 115kV and higher in New York and 69kV and higher in New England, but addresses vegetation management on all electric right-of-ways. The VMS also defines the responsibilities of the Company personnel and contractors, identifies procedures to be followed by contractors performing all work and defines the clearance requirements between conductors and vegetation acceptable to the Company for maintaining reliable electric transmission service.

Questions or inquiries regarding information provided in this document should be referred to the National Grid Manager of Transmission Forestry.

David Wright, Vice President

Transmission Asset Management

Date: 3/3/08

Thomas E. Sullivan, Manager

Transmission Forestry

Date: 3/3/2008

Record of Change

Revision	Date	Description
1	December 20, 2001	Updates
2	December 9, 2002	Updates
3	April 22, 2004	Updates
4	November 1, 2005	Complete review and total rewrite to integrate NE and NY operations info.
5	March 1, 2007	Updates and conformance with NERC FAC-003-1
6	March 3, 2008	Updates

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NERC FAC 003-1 ?

1.0 Introduction

1.1 Purpose

The purpose of this Right-of-Way Vegetation Management Plan (VMP) is to document the requirements for vegetation management on transmission and distribution right-of-ways for National Grid. This VMP defines:

- Objectives, strategies and approved practices and procedures for all phases of vegetation management on electric right-of-ways;
- Clearance requirements between conductors and vegetation acceptable to National Grid for maintaining reliable electric transmission service;
- Responsibilities of Company personnel and contractors;
- Procedures to be followed by contractors performing all work within the scope of this VMP.

1.2 Scope

The requirements of the VMP apply to all National Grid electric right-of-ways.

2.0 Definitions

Annual Work Plan – Identifies the vegetation management field work that will be carried out in a specified year.

Article VII Right-of-way – a right-of-way approved for construction and maintenance under the Article VII regulations of the N.Y.S. Public Service Commission. These lines generally have additional environmental protections and restrictions associated with access, vegetative screening, integrated management, etc.

Basal Application – Herbicide application method in which the lower portion of the target species stems and root collar is completely covered by the herbicide solution.

Capable Species – Tree and shrub species that have the ability to grow into the minimum clearance distance from conductors.

Clearance Distances – 1) the At Time of Vegetation Management (ATVM) Clearance Distance from vegetation, in a radius around the conductor, to be achieved at the time of vegetation management and 2) Minimum Clearance Distance, in a radius around the conductor, between conductors and vegetation to be maintained under all rated electrical operating conditions.

Voltage	Clearance Distance At Time of Vegetation Management	Minimum Clearance Distance
23 to 46kV	12 feet	1 foot
69kV	14 feet	2 feet
115kV	18 feet	4 feet
230kV	22 feet	6 feet
345kV	26 feet	10 feet
450kV DC	28 feet	12 feet

Danger Tree – A tree on or off the right-of-way that if were cut or failed could contact electric lines.

Forestry GIS – Transmission Corridor Manager Forestry Geographic Information System. The following abbreviations are employed for Land Use Codes.

Abbreviation	Definition
ACC	Access: Off right-of-way access road
CRP	Crop: Cropland in active cultivation
FLD	Field: Open mowed lawns, hay fields, etc.
FOR	Forested Land
NOV	No Vegetation: Gravel pit, parking lot, etc.
NUR	Nursery: Maintained nursery stock
ORC	Orchard: Fruit tree orchard
OWG	Owner General: General information about certain landowners
OWN	Owner No Herbicide: Area where herbicide is not used, per landowner agreement
PAS	Pasture: Animal pasture
PTN	Point Note: Notes about certain off right-of-way conditions
PRW	Private Well: Private water supplies, encased or open spring
RDX	Road Crossing: Special road crossing buffer where trees are maintained
RVX	River Crossing: Certain river crossings where full-sized trees are maintained
SCH	School: Public or private school land where herbicide is prohibited
SWS	Surface Water Supply: Public surface water supply – reservoirs and tributaries
XTR	Christmas Trees: Maintained Christmas tree farms
WET	Wetlands
WWS	Well Water Supply: Public well water supplies
YRD	Yard: Residential or commercial yards with maintained trees

Hand Cutting – Vegetation management method in which woody vegetation is felled through the use of hand tools, including chainsaws and brush saws.

Hazard Tree – Danger trees which due to species and/or structural defect are likely to fail and fall into the electric facility.

Herbicide – Chemical used to control, suppress or kill plants or severely interrupt their normal growth processes.

Incompatible Vegetation – Species of vegetation, trees and certain tall-growing shrubs, that have mature height great enough to grow within the Minimum Clearance Distances.

Integrated Vegetation Management – IVM is an adaptation of Integrated Pest Management (IPM) where the pest is tall growing, undesirable vegetation. IPM/IVM is a system of controlling pests in which pests are identified, action thresholds considered, all possible control options evaluated and selective, physical, biological and chemical controls are considered. When chemical controls become necessary to control and prevent the

growth of undesirable, tall growing woody species, the Company is committed to employing selective, targeted applications. These treatments shall use approved herbicide products and mixtures that target specific plants or plant communities in a manger calculated to control and eliminate the tall-growing, undesirable woody species, while preserving as much of the small, compatible woody shrub and herbaceous vegetation as practicable.

ISO – Independent System Operator

NERC – North American Electric Reliability Council

NH PES – New Hampshire Pesticide Bureau

NPCC – Northeast Power Coordinating Council

NY DPS – New York Department of Public Service

Non-Selective Treatment – the broadcast application of approved herbicide products and mixtures to all woody vegetation.

Pasture – Fenced area used for grazing livestock.

Pruning – the cutting and removal of tree branches to provide specified clearance distance between vegetation and the conductors. See A.N.S.I. A300 for additional detail.

Removal – Felling or killing of undesirable vegetation.

RI DEM – Rhode Island Department of Environmental Management.

Right-of-Way - A cleared corridor of land over which electric transmission lines are located. The companies may own the land in fee, own an easement, or have certain franchise or license rights to construct and maintain electric facilities.

Selective Mowing – Mowing small areas of high-density target species, or dense woody vegetation encroaching upon roadways or trails to structures or adjacent to structures.

Selective Treatments – Removal of individual undesirable woody plant species through the use of a controlled vegetation management method.

Sensitive Area – Areas on right-of-ways where legal, visual, or environmental impacts/concerns require compromises to the general IVM policy.

Slash – All branches, tops, small diameter main stems and debris resulting from any cutting operation.

Stump Application – Herbicide application method in which the herbicide is applied only to the freshly cut surface of the stump of the target tree.

"T" Sheet – Strip map of a right-of-way showing line features.

Transmission – includes all electric lines 115kV and higher in New York and 69kV and higher in New England, used to transport electricity between various generation, switching, and distribution substations.

Tree Removal – the cutting and felling of trees, including wood and brush disposal. Removal includes the use of approved herbicides to enable the chemical removal of the target plant(s) from the right-of-way.

Utility Forest – the forested areas within or adjacent to right-of-ways that are tall enough or may grow tall enough to impact the reliability of the transmission facility.

VMP – Vegetation Management Plan

VT DAR – Vermont Department of Agriculture

Visual Buffer – areas of vegetation preserved on the right-of-way, on both sides of selected improved road crossings, yards, for the purpose of minimizing the visual impacts and linear view of the right-of-way for motorists.

Water – standing or running water, existing at the time of maintenance operations, which has impact outside the right-of-way.

Wire Zone/Border Zone – the wire zone is defined as that portion of the right-of-way floor that is situated either directly beneath the conductor area or for a distance extending approximately ten (10) feet to either side of the conductor. The border zone is that portion of the right-of-way floor situated to the outside of the wire zone extending to the right-of-way edge. It is sometimes referred to as a transition zone between the wire zone and the adjacent forest edge. The wire zone mid-span is the portion of the span where the conductor is at or near its lowest ground clearance distance, generally 60-70% of the span length.

YOP – Yearly Operational Plan, Massachusetts

3.0 General Policy

3.1 The maintenance cycle for all right-of-ways shall be: Right-of-Way Floor Program, four to eight years and Off Right-of-Way Danger Tree Program, eight to sixteen years.

3.2 Herbicide treatments within the context of an Integrated Vegetation Management strategy, shall be the preferred method of vegetation management.

3.3 Hand cutting or mowing shall be used where herbicide use is prohibited.

3.4 All vegetation management operations shall be conducted in a safe, effective manner in conformity with Federal and State laws, regulations and permit conditions.

3.5 All vegetation management operations shall be conducted in conformance with national and regional standards including but not limited to NERC FAC-003-1, the New England and New York Independent System Operator standards, and ISO 14001.

3.6 All state permits necessary for any vegetation management operations shall be obtained.

3.7 All applicable state notification procedures shall be followed.

3.8 Transmission Forestry, in consultation with vegetation management contractors, shall establish procedures for notifying nearby residents of all vegetation management activities.

3.9 National Grid Transmission Forestry staff and/or contractors shall respond quickly to any questions or complaints relating to right-of-way vegetation management from the public and/or government agencies.

3.10 Appropriately licensed, certified and qualified contractors shall be retained to implement National Grid's vegetation management programs. Contractors shall conduct all vegetation management operations consistent with National Grid safety requirements and the A.N.S.I. Z-133 safety standard.

3.11 Transmission Forestry shall provide local supervision, coordination and enforcement of this Vegetation Management Plan and the companion Vegetation Management Specification for contractors.

3.12 The document control process for this VMP and the Contractor Specification is as follows: Both documents are generally updated annually and distributed as hard copy. The applicable hard copy cover date shall be for the current year.

4.0 Vegetation Management Plan

4.1 Objectives

The primary objective of National Grid's Vegetation Management Plan (VMP) is to minimize outages due to vegetation. Other objectives include providing a clear and safe work space and access for maintenance activities.

4.2 Strategy

National Grid's strategic approach to vegetation management within the right-of-way is to establish and maintain right-of-ways that are largely clear of all incompatible vegetation while maintaining a stable low-growing plant community that is pleasing to the eye and beneficial to wildlife. National Grid's strategic approach to manage vegetation adjacent to the right-of-way is to prune and/or remove danger trees and/or hazard trees where property rights allow vegetation management work.

Right-of-ways that are largely clear of incompatible vegetation present a very low risk of vegetation-caused outages. Vegetation adjacent to right-of-ways (danger and hazard trees) presents a greater risk of outages. The risk from danger trees is primarily related to two non-biotic variables: 1) distance from conductor to the adjacent tree line, and 2) conductor distance above the ground; and three biotic factors: 1) height of trees, 2) tree species, and 3) tree health and condition. National Grid seeks to mitigate risk of outages from trees adjacent to the right-of-way through site specific management of these variables.

Vegetation management work on transmission and distribution right-of-ways is organized into two programs:

- Right-of-Way Floor Program – management of vegetation within the right-of-way corridor, and
- Off Right-of-Way Danger Tree Program – management of vegetation adjacent to the right-of-way corridor.

To achieve its vegetation management objectives, National Grid utilizes an Integrated Vegetation Management approach which emphasizes selective herbicide use to control incompatible vegetation. IVM integrates the use of various methods of herbicide applications and non-herbicide mechanical vegetation management methods described in Section 7.0 and is used on both the right-of-way floor and the adjacent utility forest. The IVM program includes the use of herbicide supplied as Basal Application, Stump Application and Foliar Application), Hand Cutting, Mowing, Selective Mowing and Selective Pruning methods.

4.2.1 Contractors

Appropriately certified and qualified contractors are retained to carry out nearly all hands-on vegetation management work on National Grid right-of-ways. Additional information on contractor qualifications can be found in Section 6.2.

4.2.2 Imminent Threats of Outage

National Grid personnel or contractor personnel shall report any observed vegetation-related imminent threats that may cause outages to the appropriate Company Regional Control Center. Control Centers are listed

in Appendix 2. The Regional Control Center shall take appropriate action per National Grid Control Center operating procedures.

4.2.3 Inquiries and Complaints from Landowners and/or Public

National Grid companies' representatives respond quickly to any questions or complaints from the public relating to right-of-way vegetation management. Inquiries and/or complaints from external parties will be documented and reported to the Transmission Forester.

4.3 Clearance Standards

National Grid specifies clearance distances to be achieved at the time of vegetation management work and minimum clearances to be maintained at all times. Clearance standards established by National Grid below conform to the following regulatory standards and industry guidelines:

- North American Electrical Reliability Counsel (NERC) Vegetation Management Standard FAC-003-1;
- National Electric Safety Code (NESC) Rule 218; and
- Applicable State and Independent System Operator vegetation management standards or regulations.

4.3.1 National Grid At Time of Vegetation Management Clearance Distances

When performing right-of-way vegetation management, the following At Time of Vegetation Management (ATVM) Clearance Distances, by voltage, shall be achieved. ATVM Clearances apply to incompatible species only (See Definitions and Section 7.1.1).

At Time of Vegetation Management Clearance Distances		
Voltage	**Vertical (feet)**	**Horizontal (feet)**
23 to 46kV	12	12 – 38
69kV	14	14 – 42
115kV	18	18 - 50
230kV	22	22 – 50
345kV	26	26 – 50
450kV DC	28	28 - 50

ATVM Clearance Distances are greater than the Minimum Clearance Distances specified in 4.3.2. In establishing these clearance standards, National Grid considered site-specific conditions such as operating voltage, IVM techniques, fire risks, tree and conductor movement, species types and growth rates, species failure characteristics, local climate rainfall patterns, line terrain and elevation, location of vegetation within the span, worker approach distance requirements and the expected time frame (maintenance cycle) before VM will be repeated at the site.

4.3.2 National Grid Minimum Clearance Distances

Notwithstanding the ATVM Clearance Di stances above, the Minimum Clearance Distances specified below shall be maintained. Minimum Clearance Distances shall be maintained at all times in order to prevent flashover between vegetation and conductors. National Grid has chosen to base the Minimum Clearance Distance Table 5 IEEE 516-2003.

Minimum Clearance Distances	
Voltage	**Radial Clearance (feet)**
12 to 46kV	1
60kV	2
115kV	4
230kV	6
345kV	10
450kV DC	12

4.4 Inspections of Right-of-Way Vegetation Conditions

National Grid Forestry staff is responsible for inspection of vegetation conditions on right-of-ways. Inspections are carried out for several purposes including, but not limited to: determination of treatment efficacy of herbicide floor work following work completion by contractors; evaluation of efficacy of floor maintenance cycle length; planning danger tree work and patrolling the transmission system to find vegetation conditions that are an imminent threat to the reliability of the electric system. Details of inspection program are presented in Section 9.0 of this VMP.

4.5 Exceptions to ATVM Clearances

Legal restrictions and environmental and social concerns may prevent National Grid from achieving ATVM Clearance Distances at various sites across the transmission system. National Grid shall map these sites within the Forestry GIS system. All such sites will be inspected and mitigation procedures taken to assure compliance with Minimum Clearance Distances.

5.0 National Grid Roles and Responsibilities

5.1 Transmission Owner

National Grid companies own and are responsible for ensuring maintenance of their transmission, sub-transmission and distribution facilities on right-of-ways.

5.2 Transmission Forestry Department

The Transmission Forestry Department is responsible for system-wide design, planning, coordination and supervision of all right-of-way vegetation management operations. This includes, but is not limited to, preparing and implementing this VMP, scheduling work, estimating budgets, prescribing herbicides and application methods for each right-of-way, obtaining necessary permits, preparing required notifications, selecting contractors, spot checking treatment crews, and providing

technical expertise and liaison between National Grid and landowners, local and state officials, or other interested parties. Transmission Forestry also provides local oversight, coordination and enforcement of vegetation management policy, procedures and this VMP on National Grid transmission right-of-ways. Specified duties are listed below.

5.2.1 Prepare documents

Transmission Forestry is responsible for ensuring that all required internal and external documents, the **Annual Work Plan**, Field Inventory, plans, permits and reports have been developed and submitted to required parties. Key regulatory documents are summarized below.

Regulatory Documents Required						
Document Required	**NERC**	**MA DAR**	**RI DEM**	**NH PES**	**VT DAR**	**NY PSC**
Long-Term VMP	√	√		√	√	√
Annual Work Plan (YOP)	√	√				
Annual Self-Certification	√					
Permit				√	√	
Annual Report						√

5.2.2 Obtain Permits/Plans/Approvals

Transmission Forestry has responsibility for ensuring that all required state level plans, permits and approvals have been obtained prior to initiating vegetation management activities.

5.2.3 Procure Services

Transmission Forestry has responsibility for ensuring that appropriate contractor services have been procured in order to fulfill the requirements of the Annual Work Plan.

5.2.4 Prepare Specification

Annually, Transmission Forestry updates this VMP, informs the contractor which right-of-ways will be treated, the range of dates of treatment and the vegetation management methods, materials and mixing rates to be used. Company Forestry staff will also provide inventory information, right-of-way maps and other information from the Transmission Forestry GIS.

5.2.5 Bidding

Copies of appropriate maps drawings shall be furnished to all prospective bidders, together with a detailed site-by-site Field Inventory. The drawings and/or inventories may be marked to show additional pruning and tree removal requirements and areas where completed wood and brush removal

will be required. These drawings and inventories will subsequently be incorporated into and become part of the contract.

5.2.6 Purchase Order

Before beginning a treatment operation, the contractor will be sent a Purchase Order, with Terms and Conditions attached, from the National Grid Supply Chain Management (SCM) Department. The Terms and Conditions attached to the Purchase Order are incorporated in this policy and procedures. Contact National Grid Forestry staff if a Purchase Order has not been received by the time right-of-ways are scheduled for treatment. The contractor must return the signed acknowledgement copy of the Purchase Order to the SCM Department before any work is done.

5.2.7 Maintain Transmission Forestry GIS

The Company utilizes a Smallworld-based geographic information system as an asset register for all transmission facilities. Facilities include transmission lines and structures, real property information, and Forestry-defined right-of-way segments and sites. Forestry segments are the basic unit for tracking and scheduling vegetation management work across the system and range in size from approximately 1 to 40 miles in length and 10 to 1,000 acres in area. Forestry sites are the individual areas within forestry segments where vegetation management work is described in detail. Sites may be as small as a fraction of an acre or 100+ acres in size. Site details include Land Use Code (see definitions), a description of vegetation, a prescription identifying work to be carried out, and may include landowner information such as name, address and many other attributes.

5.2.8 Notifications

Transmission Forestry will establish procedures for notifying nearby residents of vegetation management activities to be carried out on right-of-ways.

5.2.9 Operations Monitoring

Transmission Forestry monitors various aspects of this VMP. Foresters conduct aerial and ground-based patrols, review contractor's use of herbicides, and herbicide application rates.

5.2.10 Contractor Performance

Transmission Foresters audit contractor performance including conformance with this VMP, Treatment Effectiveness and compliance with environmental and safety requirements. A Contractor Audit Form is attached as Appendix 8.

5.2.11 Reporting of Outages

Certain vegetation-caused sustained outages shall be reported to the Northeast Power Coordinating Council. The Transmission Forestry

Manager, working with the Transmission Operation Planning and Review Department, shall report these outages to the appropriate Independent System Operator.

5.3 Transmission Forestry Personnel Qualifications

5.3.1 Forestry Manager

The Transmission Forestry Department Manager shall have at least 10 years of electric utility experience. The Manager may also have the vegetation management qualifications listed below for Transmission Foresters.

5.3.2 Foresters

The Transmission Foresters hold 2-year or 4-year degrees in forestry, urban forestry, arboriculture or related field. Other qualifications may include certified pesticide applicator license, ISA Certified Arborist, utility industry experience and/or significant experience in contract and contractor management. Forester tasks may be carried out by in-house staff or professional-level contractors holding equivalent qualifications.

6.0 Contractor Duties and Responsibilities

Vegetation management operations must be conducted according to the right-of-way VMP and according to the written directives of the Company's Transmission Forestry staff. Failure to do so is grounds for removal of the crew from the treatment site by National Grid companies' Forestry staff and possible termination of the contractor's contract.

6.1 Environmental and Safety Compliance

The Contractor shall comply with all applicable Federal, State and local laws and regulations and with the requirements of all permits and approvals obtained by National Grid.

National Grid is committed to minimizing its impacts to the environment and requires contractors to demonstrate the same level of commitment as National Grid in the management of the environment. National Grid's commitment to the environment is communicated in the National Grid – Environmental Policy, see Appendix 4.

The contractor shall immediately notify the Company of any release of any quantity of oil or hazardous material. The contractor is responsible to make all required notifications of releases to appropriate regulatory agencies and to ensure that the response to the release is prompt and done in a proper manner.

National Grid Contractor Safety Requirements establish safety requirements for contractors. This document has been provided during the contractor qualification and bidding process. Highlights of the Contractor Safety Requirements are presented in Appendix 5.

All safety incidents shall be reported to the Company. First call should be to the Forester. One-Call shall be used when Forester is not available.

6.2 Qualifications

Contractor shall utilize only experienced and/or trained workers who are appropriately licensed or certified. Workers must conduct themselves professionally at all times. Each herbicide applicator shall hold, at minimum, a pesticide applicators license or equivalent from any state within National Grid service territory and comply with license requirements for the state within which applications are taking place.

Contractor shall utilize appropriately licensed or certified supervisors who are knowledgeable with regard to all aspects of the contracted treatment, and who are responsive to the guidance of Company Foresters. Each supervisor must be able to effectively communicate with the public. They must also effectively supervise contractor crews in order to insure the satisfactory completion of the treatment operation. Supervisors of herbicide applications must hold, at minimum, a commercial certification license or equivalent from any state within National Grid service territory and comply with license requirements of the state within which applications are taking place.

6.3 Training

Contractor shall provide their employees with training that includes, but is not limited to, recognition of electrical hazards, working in proximity to energized facilities, identification of operating voltages, minimum approach distances, and other applicable rules and regulations associated with worker safety.

Additionally, National Grid trains vegetation management contractors annually on the contents of this VMP and the Specification.

6.4 Commencement of Operations

Contractor may not initiate activities without a Purchase Order, with Terms and Conditions attached, from the National Grid Supply Chain Management (SCM) Department. The Terms and Conditions attached to the Purchase Order are incorporated in this VMP. Contractor shall contact Company Transmission Forestry staff if a Purchase Order has not been received by the time the right-of-ways are scheduled for treatment. The contractor must return the signed acknowledgement copy of the Purchase Order to the SCM Department before any work is done.

6.5 Permits/Plans/Approvals

Contractor shall follow all conditions of state permits/plans/approvals obtained by the Companies.

6.6 Notifications to National Grid

At least one week prior to the initiation of vegetation management operations on a specific right-of-way, the contractor must specify to Transmission Forestry the date work on that right-of-way will begin.

At least one week prior to the completion of vegetation management operations ona specific right-of-way, the contractor must specify to Transmission Forestry the date work on that right-of-way will begin.

The contractor will notify National Grid companies' Forestry staff of the approximate work schedule the contractor's crew will follow for the treatment year. The contractor shall complete treatment on each right-of-way segment with as few work interruptions as possible.

The contractor must supply crew work locations on a daily basis by calling the appropriate regional control center (Appendix 2), and/or other location specified by the Company Transmission Forestry staff before the beginning of the workday. The location information must include the right-of-way segment number, the contractor company and foreman name, and the nearest transmission/distribution line structure number.

The contractor must keep Company Transmission Forestry staff informed about crew location, conditions encountered and problems that arise as work progresses.

The contractor must supply completed Right-of-Way Daily/Weekly Clearance Reports or contractor time sheet with equivalent information for all time and materials work as per direction of Company Transmission Forestry staff.

The contractor shall notify and provide copies of any records/reports of any regulatory inspection by federal, state or municipal officials.

6.7 Notifications to Customers/Landowners

The Contractor shall make every reasonable effort to notify nearby residents of all vegetation management activities. They shall also notify any property owner where a yard tree requires pruning or removal. The property owner shall also be notified prior to extensive widening or danger tree removal, unless the Company has provided prior notification or otherwise specified by the Transmission Forester.

Certain statutes and regulations in New York, Massachusetts, Vermont, New Hampshire and Rhode Island require notification to residents/occupants of nearby homes/dwellings prior to use of herbicides. The contractor shall comply with the appropriate state notification statutes and regulations. Documentation of notification shall be maintained by the contractor.

6.8 Documentation

The Contractor shall provide the following documents:

The contractor must supply supplemental or new information regarding site conditions that affect current or future treatment operations, such as new construction and sensitive areas and landowner concerns/requirements.

The Contractor shall complete and return a completed copy of the Field Inventory or weekly time sheets (as appropriate for NE or NY) to include the treatment date, the type and amount of herbicide used, any approved changes in site density, treatment method, etc. to the Transmission Forester. Submittal of these treatment records is required for final payment; therefore, prior to final payment, the Company will require receipt of a complete treatment record/inventory.

6.9 Interaction with Public

The Company strives in every way possible to maintain good relations with the property owner and general public. The actions of the Contractor reflect on the Company; therefore, the Contractor shall give diligent consideration to the interests of property owners, tenants, and the general public, whenever involved, and shall carry out the work in such a manner as to cause a minimum inconvenience.

The contractor, or his representative, will only respond to inquiries regarding what they are doing, where they are treating, and when they are treating. Copies of appropriate plans or permits may be shown as well. Refer all other inquiries to Company Transmission Forestry staff.

Landowner complaints must be forwarded immediately by telephone to Transmission Forestry staff. The contractor must provide the name, address and telephone number of the major people involved, as well as the complaint or question.

6.10 Demands that a Treatment Operation Cease

Handle demands that a treatment operation cease as follows:

- Immediately remove all personnel, equipment and materials to another property and continue treatments.
- Notify Company Transmission Forestry staff as soon as practical, if not immediately, of a demand that treatment cease. Upon contacting Transmission Forestry, relate the chain of events and current status of the situation.
- Do not return to that site until Company Transmission Forestry staff notified the contractor when and under what circumstances the crew may return.

6.11 Access

Enter a site through the right-of-way on established roadways whenever possible. Permission to enter by any other means must be obtained from the landowner by the contractor.

Access to the right-of-way shall be limited to public road crossings. Where this is not possible, the Contractor shall obtain permission for the use of private roads, driveways, and other access to the right-of-way from the property owners involved and shall be responsible for any damage thereto. When permission for off right-of-way access cannot be obtained from the property owners involved, and other ingress/egress is unavailable, the Contractor shall notify the Transmission Forester or their designee.

In general, vehicular traffic shall be restricted to a 20-foot wide roadway into and along the right-of-way. When present, existing roads into and along the right-of-way shall be used as the primary access, and maintained in as good or better condition for the duration of the Contractor's use. Additionally, primary ingress and egress on Article VII right-of-ways are restricted to designated access routes. Access to the overall right-of-way is allowed only for selective vegetation maintenance with all terrain spray units, skidder buckets for danger tree removal, and similar right-of-way maintenance activities. Other vehicles must remain on the designated access roads. Appropriate efforts to minimize unnecessary or excessive environmental or vegetation damage are required. Repair or replacement of excessive or unnecessary damage shall be the responsibility of the Contractor.

6.12 Site Conditions

Unreasonable site damage or destruction during any phase of the vegetation management operation by the contractor, his agents or employees, must be repaired immediately to the satisfaction of Company Transmission Forestry staff at no cost to National Grid companies. Company Transmission Forestry staff will determine what constitutes unreasonable site damage.

The Contractor shall leave all culverts, stream fords, fences, gates, walls and roads in the same or better condition as when they commenced their work. Any trees to be removed that have fence wire attached, or that are part of a permanent functional fence, shall be cut off above the top strand of wire. Care shall be taken that all fences and gates are closed or left in such condition that livestock cannot escape. If fences or gates of an active pasture along the right-of-way are in a state of disrepair prior to the start of clearing and could allow livestock to escape, the contract shall attempt to notify both the property owner and the Forester of this condition. Where movement of the Contractor's equipment is required through existing fences, the Contractor shall make appropriate openings and adequate facilities for closing these openings during and after their use.

6.13 Herbicides

Application of herbicides by the Contractor shall conform to the following:

The contractor shall utilize only herbicides, mixture rates and solutions prescribed by Transmission Forestry (See Appendix 7). Herbicides, adjuvants, carriers and additives are hereinafter collectively referred to as "materials."

6.13.1 Handling, Mixing, Loading and Labeling Herbicide Concentrates

All containers (tanks, gerry jugs, etc.) containing herbicide mixes shall be labeled with the trade name and concentration of each herbicide in the mix.

The majority of the Contractor's handling, mixing and loading of herbicide concentrates is to be done at the contractor's base location. If it is necessary to handle, mix, or load herbicide concentrates at any other location, the contractor is required to comply with herbicide label directions and existing regulations regarding setbacks from sensitive areas and safety precautions.

No handling, mixing, or loading of herbicide concentrates will be done within the buffer zones adjacent to any drinking water supplies **or surface waters, nor within 100 feet of any other sensitive area.** All water to be used to mix herbicide solutions will be secured from a faucet or open bodies of water, which are not drinking water supplies. If pumps are used, they must be equipped with anti-siphoning devices. Pumps and hoses used for water will not be used to pump or mix herbicides.

6.13.2 Treatment Width

All treatment operations must be applied to the full cleared width of the right-of-way. Company Transmission Forestry staff will determine whether the full cleared width of the right-of-way has been treated. The contractor must, at his own expense, re-treat the site upon notification by Company Transmission Forestry staff that a treatment was not applied to the full cleared right-of-way width. Re-treatment must be accomplished by using the application method and materials prescribed by Transmission Forestry.

The Contractor shall confine their activities within the limits of the right-of-way, except for danger tree removals and authorized off right-of-way access. All right-of-way restrictions, noted in the inventory and/or on the drawings, shall be strictly adhered to by the Contractor.

6.13.3 Treatment Effectiveness

Treatments must result in 100% control or removal of all target species greater than or equal to six feet in height. The contractor shall also provide a minimum of 95% control or removal of all target species less than six feet in height. Treatment effectiveness extends over the full 5- to 8-year treatment cycle. Any target species identified as a hazard to the line and

shown to have been six feet or taller at the time of treatment shall be subject to this provision. Company Transmission Forestry staff will determine whether a treatment has been effective.

The contractor must, at his own expense, re-treat the site(s) upon notification by Company Transmission Forestry staff that a treatment was ineffective. Re-treatment must be accomplished by using the application method and materials prescribed by Transmission Forestry. Exceptions to this treatment effectiveness standard limited to trees in yards, special road crossings, landowner treatment sites and must be noted in right-of-way Field Inventory.

6.14 Danger Trees

IVM treatment crews shall routinely check for Danger Trees adjacent to the right-of-way to assess and identify any Hazard Tree conditions. Hazard Tree conditions, or Danger Tree growth approaching Minimum Clearance Distance as defined above, shall be reported to the Transmission Forester.

6.15 Wetlands and Sensitive Areas

The IVM treatment crew will deploy a cutting crew or point person in advance of the main herbicide application operation to locate and flag the boundaries of these Sensitive Areas and/or the appropriate buffer zones.

6.16 Railroads

Where the Company's right-of-way parallels or crosses railroad property, and the Contractor elects to gain access to the right-of-way from railroad property, they shall be responsible for all applicable rules, regulations and fees pertaining thereto.

The contractor must:

- Obtain a permit, if required, from the railroad near whose tracks he or she will be treating. Any fee may be billed as a treatment cost.
- Check with each railroad near whose tracks he will be treating to ensure that the contractor carries all insurance which the railroad may require. Contact Company Transmission Forestry staff if any problems arise.
- Refrain from beginning a treatment whenever a railroad has failed to provide a flagman or remove the railroad from service. Contact Company Transmission Forestry staff immediately so that he or she can contact the railroad.

6.17 Native American Lands

The Contractor shall not use herbicides to manage vegetation on Native American reservations without prior, express approval of the Transmission Forester. Where required to complete work upon reservations, the contractor shall employ the designated Native American personnel for the successful completion of the project.

The only reservation with a tentative agreement allowing the use of herbicides in New York is the Seneca Reservation in southwest New York.

6.18 Chainsaw Bar Lubricants

Chainsaw bar lubricants must be biodegradable products. The Forestry Manager will approve specific products.

6.19 Equipment

The contractor crew supervisor or foreman must be equipped with a pager or cellular telephone. The pager or cellular telephone number must be provided to the division control center.

Applicator crews should carry with them at all times a shovel, a broom, heavy-duty plastic bags or other leak-proof container, absorptive clay and activated charcoal.

Contractor's equipment, including backup equipment, must be sufficient to maintain the highest practical level of efficiency and effectiveness. Equipment must be maintained in good visual and working condition.

6.20 Site Restoration

Work shall also include grading, mulching, and reseeding of rutted or scarified soils caused by the Contractor's operations when directed by the Transmission Forester. This shall include repair of all environmental damage, maintenance of stream crossings, wetlands, crop fields, fence lines, etc. which are adversely impacted by the Contractor so as to leave the right-of-way in as good or better condition than found.

Inclusion of the repair of any previously existing environmental damage, including grading, seeding, mulching, stream, culvert and ditch repair, etc. shall be specified at the time of bidding or completed on a Time and Material basis if required.

7.0 Vegetation Management Practices and Procedures

7.1 Practices and Procedures – Maintenance

7.1.1 Right-of-Way Floor Program

A treatment operation generally includes most of the vegetation management methods described below. Herbicide treatments, employing herbicides and treatment methods consistent with the sensitivity of the site, shall be the preferred method of vegetation management. Four methods of herbicide treatments are utilized: basal application, cut stump application and low-volume and high-volume foliar applications.

Treatment is generally carried out in two phases: Preparatory Treatment and Foliar Treatment. These two phases may be carried out separately or

simultaneously depending on vegetative conditions or permit requirements for each right-of-way segment.

Company Transmission Foresters identify right-of-way segments to be treated each year in the Annual Work Plan. Field inventories of each right-of-way segment to be treated are completed by Company Transmission Foresters and provided to the Contractor.

An IVM treatment operation is carried out within a treatment/calendar year. Preparatory treatment is generally completed prior to June 1 so that any vegetation approaching the minimum clearance distance is treated prior to new annual growth. Foliar treatment shall be completed prior to October 1 of each year. Certain sites requiring hand cutting, mowing and/or cut stump treatment may be carried out after October 1.

The contractor shall preparatory treat all vegetation approaching the Minimum Clearance Distance prior to June 1 of a treatment year to assure reliability of the line.

7.1.1.1 Selective Vegetation Management

The Contractor shall treat all incompatible vegetation listed in Appendix 9, Exhibit A (tall growing trees) within the wire zone and border zone of the right-of-way.

The contractor shall treat all incompatible vegetation listed in Appendix 9, Exhibit B (small trees) within the mid-span of the wire zone of the right-of-way, except where the mature height would not approach the minimum clearance distance.

Vegetation listed in Appendix 9, Exhibit B will be retained in the border zone of wider right-of-ways.

Small trees shall also be removed from the wire zone and border zone on narrow right-of-ways such as sub-transmission.

Incompatible hardwood vegetation greater than the height specified below shall be hand cut and stump treated. Incompatible hardwood vegetation less than the height specified below shall be foliar or basal treated. A height limit of 12 feet is applicable for low-volume backpack foliar treatments. A height limit of 16 feet is applicable for high volume or low volume hydraulic foliar treatments (NY only).

Incompatible conifers (except Cedar species) over 2 feet tall (knee-height) shall be hand cut. Only Pitch Pine shall be stump treated.

Conifer species less than 2 feet tall shall be foliar treated (except in Mass.)

Cedar species in the border zone over 12 feet tall shall be hand cut. Cedar species in the wire zone over 6 feet tall shall be hand cut (NY only).

7.1.1.2 Non-Selective Vegetation Management

All vines growing on guys, poles and towers shall be treated.

All woody-stemmed species growing within 10 feet of guys, poles and towers shall be cleared and treated using the treatment technique being applied to the surrounding site. Wherever practicable, grape vines shall be treated with low-volume basal or low-volume foliar method.

All trees and shrubs growing within the established or designated access road(s) along the right-of-way shall be treated to provide an access route 20 feet in width. Where there is no established access road, a route shall be designated and/or approved by the Transmission Forester, and the Contractor shall clear the same. Where multiple improved access roads exist within the right-of-way, the Contractor shall maintain all roads.

Treatments will also extend around the perimeter of any substations (within five feet of fence line) and along short side taps associated with the right-of-way segment.

7.1.1.3 Vegetation Management in Visual Buffers

Where incompatible vegetation, listed in Appendix 9, Exhibits A and B, cannot be removed, generally trees visual buffers, in yards and road crossing, said vegetation shall be pruned to the At Time of Vegetation Management clearance distances shown in Section 4.3.1. The specific maintenance technique is specified in the Field Inventory.

7.1.1.4 Vegetation Management in Protective Buffers

The size/dimensions of protective buffers generally specified in state level plans/permits. Incompatible vegetation in protective buffers is hand cut or mowed as specified in the Field Inventory.

7.1.2 Off Right-of-Way Danger Tree Program

7.1.2.1 Off Right-of-Way Trees

National Grid right-of-ways are generally cleared to their full width consistent with legal real estate rights and/or permits for initial

construction of the electric lines. The forested landscape beyond the maintained right-of-way contains trees tall enough and close enough to electric conductors to be capable of growing or falling into the lines. These trees are classified as danger trees and hazard trees. NG prunes or removes danger trees and hazard trees to reduce the risk of off ROW tree-caused outages. (See Section 3.0 for danger tree and hazard tree definitions.)

Danger trees beyond the cleared width are generally on land belonging to others. In New England, there are generally no rights to remove trees beyond the fee-owned or easement right-of-way. In New York, there generally are rights to remove danger trees beyond the fee-owned or easement right-of-way.

7.1.2.2 Risk to Transmission Lines

Danger trees falling into the lines present the greatest risk of tree-caused outages on transmission circuits. The risk is primarily related to two (2) non-biotic variables: 1) distance from conductor to the adjacent tree line (clear width), and 2) conductor distance above the ground; and three (3) biotic factors: 1) height of trees, 2) tree species, and 3) tree health and condition. National Grid seeks to mitigate risk of outages from danger trees through site specific management of these variables.

Risk can be quantified using the Optimal Width Calculator (OWC) software licensed to National Grid by Ecological Solutions, Inc. The OWC calculates a Risk Factor based on the variables discussed above. Data has been collected across NG's NY 115kV, 230kV and 345kV transmission system to calculate average Risk Factor by voltage class.

7.1.2.3 Ranking by Voltage Class

(1) High voltage transmission lines, 230kV and 345kV, are ranked above lower voltages in terms of allowed risk to the system from trees. These circuits are also subject to the NERC Vegetation Management Standard FAC-03-1. These lines are generally constructed with greater ground clearances and clear widths, resulting in much lower risk of outages from danger trees. The present tree condition and Risk Factors result in very few outages.

(2) Sub-transmission lines, 23kV to 69kV, serve customer load. Tree-caused outages on these circuits contribute to about 4% of customer non-storm SAIFI. Given the contribution to SAFI,

National Grid has prioritized this group of circuits below high voltage (345kV and 230kV) but about 115kV transmission lines.

(3) 115kV transmission lines primarily serve customer load. While customer load is very important to National Grid, tree-caused outages on these lines contribute very little to customer non-storm SAIFI – significantly less than 1%. Risk Factors for 115kV lines clearly reflect the lower conductor height and smaller clear width on these lines (compared to high voltage transmission lines).

7.1.2.4 Prioritization Within Voltage Classes

National Grid determines a Line Importance Factor (LIF) for all 115kV, 230kV, and 345kV circuits. The LIF takes into account impacts to generators, customers, redundancy of supply, etc. The LIF will be used to prioritize lines within each voltage class. Historic outages and customer impacts will be used to prioritize within the 23kV, 34.5kV, 46kV and 69kV voltage classes.

7.1.2.5 Specification

Danger Tree work will be specified for each right-of-way segment and for each edge dependent on voltage class, line importance and vegetation management rights. Work is defined as Level 1, Level 2, etc. These are presented as a hierarchy. Work specified as Level 1 requires work per definition of Level 1. Work specified as Level 2 requires work per Level 2 and Level 1. Level 3 includes Level 2 and Level 1, etc.

- Level 1: Prune (see Section 7.2.3.4) or remove danger trees to achieve At Time of Vegetation Management Clearance distances (see Section 4.3.1). Remove danger trees within the cleared ROW (encroachment). Dead or damaged branches and leaders on off right-of-way danger trees that are capable of falling onto the conductors shall be pruned.

- Level 2: Prune or remove high risk hazard trees.

- Level 3: Prune or remove all hazard trees.

- Level 4: Prune or remove danger trees emergent above the general canopy height. Pruning is the preferred method.

- Level 5: Prune or remove danger trees to specified Risk Factor. Data for Risk Factor calculation shall be measured and document at least once per five (5) spans.

- Level 6: Remove all trees to a new cleared width (widening) and Level 1, 2, 3, 4, or 5 danger tree work.

7.2 Practices and Procedures – New Construction

Initial clearing of new right-of-ways and clearing of additional width along existing right-of-way generally requires significant land clearing activities. Land clearing generally involves the removal of all trees on the right-of-way. Most of the vegetation management techniques discussed below are employed. In addition, cutting, skidding and chipping of whole trees is generally necessary. In most instances specific job requirements for equipment and degree of clearing are specified in state or federal permits for the construction job.

7.3 Vegetation Management Techniques

7.3.1 Herbicides

7.3.1.1 Basal Application

Apply basal treatments with basal wands. Keep pump pressures at the minimum required to adequately cover the target. When treatments are interrupted by rain, resume the treatment only after the rain ends. Resume treatment at the point where it was interrupted, once it is observed that the lower stem of the target species is predominantly dry.

This method includes the application of an approved herbicide product to the base of the target stem for a distance of up to 18 inches. This method is utilized within sites of higher environmental, aesthetic or public sensitivity where cut and stump treatment would not be as effective in controlling target species.

7.3.1.2 Stump Application (Cut Surface)

After the stem of the target species is cut, apply herbicide with a squirt bottle or backpack sprayer. When treatments are interrupted by rain, resume the treatment only after the rain ends. Resume treatment at the point where it was interrupted.

This method includes the application of an approved herbicide product to the cut surface and/or stump of a recently cut stem. This method is utilized within sites of higher environmental, aesthetic or public sensitivity.

7.3.1.3 Foliar Application

When applying foliar treatments on the edge of the treatment area, (forest edge, site borders) spray herbicide toward the center of the right-of-way in order to prevent off-site drift.

Keep pump pressures at the minimum required to adequately cover the target. When herbicide treatments are interrupted by rain,

resume the treatment only after the rain ends. Resume treatments after active leaf runoff has ended and then re-treat those portions of the site that were treated within approximately four hours before the rain started.

Do not apply foliar treatments during windy periods when spray material has a high propensity to drift or if standing water is present under the target plant during treatment.

High Volume and Low Volume Hydraulic Application
This method includes treatments of water-borne herbicide mixtures, using hydraulic spray tanks, mounted on all-terrain units such as pickup trucks, skidders, tracked units, etc.

Low Volume Backpack Applications
This method includes light and very light applications of more concentrated herbicide mixtures, using hand-operated backpacks, to selectively deliver the herbicide mixture to the target plants.

This method is especially preferred for its highly selective control in areas that are suitable for foliar treatments but not accessible to or appropriate for treatment with hydraulic units.

7.3.2 Mechanical

7.3.2.1 Hand Cutting
Hand cutting is generally the method of choice where herbicides cannot be applied or where incompatible vegetation exceeds certain specified heights (see Section 7.1).

Cut stems parallel to slope as close to the ground as practical. Do not leave stumps that exceed three (3) inches in height.

7.3.2.2 Mowing
Use extreme care in order to provide for the safety of workers and the general public. Provide a buffer to shield operations that are carried out close to residences or high public use areas, and/or employ a knowledgeable person to act as a guard. Cut stumps as close to the ground as practical, making sure that stumps do not exceed three inches in height unless otherwise directed by National Grid Forestry staff.

7.3.2.3 Selective Mowing
Selective mowing shall mean mowing small areas of high-density target species such as extensive Sumac, Buckthorn or Multi-flora

Rose, particularly in wire zone mid-spans, or dense woody vegetation encroaching upon roadways or trails to structures.

7.3.2.4 Pruning

Pruning may be required in order to achieve At Time of Vegetation Management clearances between the line conductors and vegetation.

- At designated road crossings, or designated portions of lines along high use public roads.
- Along the edge of the cleared right-of-way where, in order to obtain conductor clearances specified in Section 4.1.1, side pruning or removal of danger trees is required. The pruning and/or removal of danger trees located beyond the limits of the right-of-way is specified on the Field Inventory.
- On designated portions of lines passing through natural preserves, or public or private parks.
- On designated portions of lines passing over ridges or other exposed views of the right-of-way in areas of high aesthetic value.
- In general, along all or part of the route of the line when removal of vegetation is to be minimized consistent with reliable line operation.

Pruning shall be carried on in accordance with the A.N.S.I. A-300 standard.

7.4 Management of Wood and Brush (Slash)

Wood and brush slash may be generated during vegetation management activities. In general, where tree removal or pruning, or mechanized clearing is required, the brush that has been cut (diced) may be left where it falls after being cut so as to lie close to the ground. Length of diced stems or branches should not exceed 10 feet; height of diced slash should not exceed 2 feet.

Near public roads or private roads, residential or commercial areas, parks, streams, on access roads, or in any sensitive areas indicated in the Field Inventory, the brush shall be disposed of by either chipping or removal to a suitable location within the right-of-way and neatly piled, windrowed or dispersed. The site-specific slash disposal method is identified in the Field Inventory.

When chipping is required, the chips may be disposed of by dispersing on site in less sensitive areas. Chips shall be removed in areas of more intense landscape management such as lawns.

Where trees and limbs larger than 4 inches in diameter at the small end are removed and the designated slash disposal is a windrow, the wood shall be neatly piled on the site, taking care not to block any access roads used by either the

property owner or the Company. When the authorized slash disposal method is chipping, it may be necessary to remove the larger wood from the site to another approved area of the right-of-way and piled neatly, or moved to an approved off right-of-way disposal site.

No burning of wood or bush will be permitted unless specifically authorized by the Company Transmission Forester.

All species of wild cherry (Prunus serotina, P. virginiana, P. pennsylvanica) that are cut or treated during the growing season can become toxic to livestock during the wilting stage of the leaves. In addition, several species of Maple (Acer) have been identified as toxic to horses in the wilting stage as well. Therefore, Maple and Cherry stems, which are cut or treated in active pastures, shall be immediately removed from the pasture following clearing, or arrangements made with the farmer to utilize alternate pastures until the wilting stage and hazard has passed.

7.5 Mitigation of Impacts

If, during their operations, the Contractor causes any damage to occur to the land such as deep cuts, ruts or scarified areas, which in the opinion of the Transmission Forester could cause future erosion or interfere with access for line maintenance, the Contractor shall re-grade the site to original contours, and seed and mulch as required. Areas that do become rutted or where erosion occurs during sideline program operations will be restored per National Grid companies' policies.

The Contractor shall take reasonable precautions not to remove or damage existing low-growing vegetation, either natural or planted, which are to be preserved on the right-of-way. Where road crossing buffer vegetation, either natural or planted, has been damaged beyond reasonable repair because of the Contractor's negligence, this vegetation will be replaced at the Contractor's expense.

The Contractor shall take care not to rut or scarify the right-of-way for the duration of their operation. All environmental damage resulting from the Contractor's operation shall be permanently repaired at the Contractor's sole expense.

Mobile equipment shall not intrude into road crossing buffers, stream buffer zones or pruning and topping areas, except on designated access routes. When a tree that has been cut must be removed from such an area, it will first be limbed and the brush hand carried to the chipping location or pile site. The trunk wood may be removed by means of a winch line taking adequate care to avoid damaging residual vegetation.

In certain areas, where feasible and advantageous, the Forester may authorize the use of aerial lifts and other specialized equipment, in road crossing buffers for the purpose of pruning trees, and disposal. In no case, however, will any vegetation be cleared or any new road be authorized, other than the approved access road through the screen to facilitate the use of this equipment.

The Contractor shall take adequate precautions to protect the watercourses and wetlands from pollution and shall avoid disturbing streambeds and banks and the low-growing vegetation protecting them. Vegetation that is cut shall not be felled into or across streams or ponds. Brush chipping shall be performed in such a manner that the chipped material shall not enter any watercourse or wetland area, nor accumulate in excess of four inches in depth at any location. All logs cut in floodplain areas shall be removed to high ground at the edge of the right-of-way.

8.0 Work Precautions

8.1 Safety

As a contractual term, National Grid requires all contractors to comply with all appropriate state and federal safety laws and regulations. This includes applicable sections of the Occupational Safety and Health Act (OSHA) and all worker safety-related statements and instructions on the herbicide label.

It shall be understood and agreed to by the Contractor that herbicide application, hand cutting, pruning and clearing near existing transmission and distribution lines shall be undertaken while lines are presumed to be energized and operating at voltages up to and including 345kV AC and 450kV DC. The Contractor shall provide competent, trained personnel to complete the work.

In order to insure the safety of their employees, the general public and continuity of service in the energized lines, the Contractor shall exercise extraordinary precautions in removing trees and tree limbs that are in such close proximity to the conductors as to constitute a hazard. Such trees shall be pruned, removed with the aid of ropes, or taken down one section at a time.

National Grid has documented its safety requirements for contractors in the Contractor Safety Requirements, see Appendix 5.

In addition, all vegetation management work shall be carried out in compliance with A.N.S.I. Z133.1, American National Standards Institute, Standard for Arboricultural Operations – Safety Requirements.

8.2 Sensitive Areas

Sensitive Areas are defined as areas on right-of-way where legal, visual or environmental impacts/concerns require compromises to the general IVM program policy. Sensitive Areas include: Public Surface, Public Well and Private Well Drinking Water Supplies; Lakes, Ponds, Rivers, Streams, and any other surface waters; Wetlands; Endangered Species sites; Agricultural areas including croplands, orchards, tree plantations and animal pastures; Buffers at road crossings; Buffers at residential and/or commercial yards; and easement restrictions and/or landowner agreements.

These Sensitive Areas have varying legal definitions in each of the states in which National Grid companies have transmission and distribution facilities. Permits for IVM activities in these states vary as well. For purposes of this document, Sensitive Areas and vegetation management within them are discussed in a general way.

In some Sensitive Areas use of herbicides may not be allowed including in Wetlands; Endangered Species sites; Agricultural Areas including croplands, orchards, tree plantations and animal pastures. Hand cutting and limited herbicide applications are generally used in these areas.

The IVM treatment crew will deploy a cutting crew or point person in advance of the main herbicide application operation to locate and flag the boundaries of these Sensitive Areas and/or the appropriate buffer zones.

8.3 Visual and Protective Buffers

Visually and environmentally sensitive sites must be buffered and treated according to procedures and specifications set forth in Sections 7.1.1.3 and 7.1.1.4.

Visual buffers, consisting of trees and/or shrubs, screen the general public from potentially objectionable views of structures and substations. They may be maintained at Road Crossings, Recreational Areas, Residential or Commercial Yards. Specific dimensions for visual buffers may be set by State regulations and/or permit conditions and/or National Grid company policy.

Use shrub buffers on most road crossings or on vantage points where a visual screen is determined to be desirable. Utilize tree/shrub buffers only when legally required or where sites are extremely sensitive visually and shrub growth is inadequate for screening.

Protective buffers are established to protect a sensitive area from herbicide deposition. In most instances no herbicides can be applied within these Protective Buffers. Hand cutting or mowing is the primary vegetation management method used in these buffers.

8.4 Weather

Herbicide application will be restricted during certain adverse weather conditions such as rain, wind or deep snow.

Herbicide applications will not be made during periods of moderate or heavy rainfall.

Foliar applications are effective in light mist situations; however, any measurable rainfall that creates leaf runoff will wash the herbicide off the target. If foliar applications are interrupted by unexpected rainfall, the treatment will not resume until the rain ends and active leaf runoff has ceased.

Basal applications are ineffective during measurable rainfall. Basal applications that are interrupted by rainfall will not be resumed until at least fifty percent of the application zone of the target species is dry.

Excessive wind can create drift during foliar applications. Significant herbicide drift can cause damage to desirable vegetation on or off the right-of-way. Basal or cut-stump treatments are must less affected by wind because they are applied in such close proximity to the ground.

To prevent any significant off-target drift of herbicides, the applicator will comply with the following restrictions:

a. During periods of wind, which are strong enough to bend the tops of the main stems of tree species on the right-of-way, the contractor crew supervisor will periodically observe the application of the foliar treatment to insure that there is no significant movement of the herbicide solution. If the supervisor can see the solution moving off the target, applications will immediately stop until the wind has subsided enough to permit further applications.

b. All herbicide solutions to be used for a foliar application will contain low-drift agents. Low-drift agents will be added to the foliar herbicide solution as per the low-drift agent label. In moderate wind conditions, as per label recommendations, more low-drift may be added at the discretion of the contractor supervisor to control significant drift.

c. Foliar treatments will not be applied to target vegetation that exceeds approximately twelve feet or sixteen feet in height as appropriate for low volume backpack or hydraulic operations.

8.5 Wetlands

IVM methods using herbicides on right-of-ways in wetlands have come to be accepted in several states. Tall growing trees generally only occur in wooded swamps, areas that are dry for long enough periods each year to support tree growth. Emergent wetlands including: wet meadows, cattail swamps, shrub swamps and bogs, generally do not support tree growth and; therefore, do not require management of vegetation. Occasional high ground or hummocks within emergent wetlands may support tree growth and are hand cut. In addition, herbicide use within wetlands is always limited by the presence of surface water including: lakes, ponds, rivers, streams, seasonal ponds and streams, and flood storage following heavy rainfall. These buffer zones clearly prevent use of herbicides within or in close proximity to surface water.

Herbicide use in wetlands, therefore, is generally limited to wooded swamps where no standing water is present. State regulations and permits specify restrictions on herbicide use.

9.0 Inspections

9.1 Ground Patrols

Transmission Forestry and/or contractor personnel carry out a ground-based patrol one time per year on 230kV and 345kV right-of-ways. The protocol for the ground patrol is included in Appendix XX.

In addition to the annual ground patrol above, Transmission Forestry and/or contractor personnel carry out a ground patrol one time per Right-of-Way Floor Program maintenance cycle, 4 to 8 years.

9.2 Aerial Helicopter Patrols

Transmission Forestry personnel carry out an aerial patrol one time per year on all 230kV and 345kV right-of-ways. Transmission Forestry personnel carry out aerial patrols on all 115kV in New York and 69kV and 115kV circuits in New England one time every two years (generally one-half of the circuits are patrolled annually).

9.3 Line Department Aerial Patrols

Line Department personnel carry out periodic ground patrols and annual aerial patrols of all 115kV and higher circuits in NY and 69kV and higher circuits in NE.

9.4 Observed Conditions

Forestry personnel observe all aspects of vegetation conditions: growth, clearance, danger trees, and efficacy of work by contractors. Line Department personnel primarily only report vegetation conditions where clearance is approaching the Minimum Clearance distance and observed hazard trees.

9.5 Follow-up to Patrols

Vegetative conditions found in non-compliance with Clearance 1 or Clearance 2, and any hazard tree conditions that present a threat to the transmission system, shall be mitigated within one week of observation. Any conditions found to be an imminent threat will be reported per Section 4.2.2 and mitigated as soon as possible. Such conditions and mitigation work shall be documented.

10.0 Monitoring and Measurement

National Grid's Vegetation Management Program is subject to various types and levels of audits in order to ensure compliance with environmental laws and regulations, its Environmental Management System, and to its operating procedures including this VMP.

10.1 National Grid Environmental and Safety Audit Programs

National Grid's Environmental Safety and Audit Program is administered by the Legal Department and is documented on the internal website at XX.

10.2 Environmental Performance

National Grid's environmental performance, as reported publicly, is audited both internally and by outside parties. National Grid's Vegetation Management program

and the VMP are referenced in the Company's Environmental Management Systems (EMS). The EMS is ISO 14001 Registered.

10.3 Monitoring of Contractors

Transmission Foresters conduct periodic audits of contractors and their work utilizing the Contractor Audit Form shown in Appendix X. Foresters conduct at least two formal audits of each contractor per year and also conduct less formal audits periodically. National Grid's *Environmental Procedure 6, Contracted Services* and *Safety Procedure, Contracted Services* provide additional details on contractor evaluation and monitoring.

10.4 NERC Audits

National Grid will commit all necessary resources in order to fully participate in any audits conducted by NERC at three-year intervals or as so desired by NERC, the NPCC or its designee.

10.5 Self-Certification of Annual Work Plan

National Grid will annually determine whether the requirements of the Annual Work Plan have been fulfilled and will self-certify to that effect to NERC, NPCC or its designee.

11.0 Records

Transmission Forestry records are maintained such that they are:

- Legible,
- Identifiable and traceable to the activity
- Can be readily retried and stored in a protective manner, and
- Retention times as specified.

Transmission records and retention times are indicated in the table below.

Document	Retention Time (as applicable)
Contractor audit forms	3 years
Contractor evaluation forms	3 years
Correspondence with Landowners	Permanently
Correspondence with Municipalities and Regulators	Permanently
Easement Restrictions	Permanently
Forestry GIS	Maintain current version ongoing basis
Invoices	6 years
Landowner Agreements	Permanently
ROW Inventory Reports	Annual
ROW Daily Clearance Reports	6 years
Spill Forms	1 year

Appendix 1

Summary of Key Specification Requirements

Specification Summary	Specification Page #	NY	MA	RI	NH	VT
Inspection of floor herbicide work carried out the Spring following treatment. This inspection is the responsibility of National Grid.	11	Y	Y	Y	Y	Y
All workers hold "applicator license" or "apprentice"	15	Y	Y	Y	Y	Y
All supervisors hold "category/commercial certification"	15	Y	Y	Y	Y	Y
National Grid voluntary notification to all nearby residents	17	Y	Y	Y	Y	Y
Notification per legal requirements	17	Y: DEC	Y: VMP	N	Y: Ag	Y: PSB & Ag
Herbicide products specified by National Grid.	19	Y	Y	Y	Y	Y
No mixing or handling of concentrates in Sensitive Areas	19	Y	Y	Y	Y	Y
Extent of Work - Performance						
Removal/Treatment of full width of ROW	19	Y	Y	Y	Y	Y
Removal/Treatment of 100% target vegetation greater than 6 feet	20	Y	Y	Y	Y	Y
Removal/Treatment of 95% of target vegetation less than 6 feet	20	Y	Y	Y	Y	Y
Warranty of work over full cycle any vegetation that was 6 feet tall at the time of treatment.	20	Y	Y	Y	Y	Y
End-to-end inspection/mitigation of ROW segment prior to June 1 of IVM treatment year by contractor (included in contractor IVM bid)	22	Y	Y	Y	Y	Y
Modified Border Zone / Wire Zone	22	Y	Y	Y	Y	Y
Wire Zone Target Shrubs/Short Trees: See Appendix 9 Exhibits A and B	23	Y	Y	Y	Y	Y
Hardwoods: Cut and CST over specified height	23	16 feet Hydraulic 12 feet Backpack	12 feet	12 feet	12 feet	12 feet
Hardwoods: Foliar spray less than specified height	23	Y	Y	Y	Y	Y
Conifers: Cut over specfied height (knee-height)	23	2 feet	2 feet	2 feet	2 feet	2 feet
Conifers: Foliar spray less specified height (knee-height)	23	Y	N	Y	Y	Y
Cedars: Cut all over specified height	23	6 feet in WZ 12 feet in BZ	12 feet	12 feet	12 feet	12 feet
Treat/Remove all woody species within 10 feet of structures and guys	23	Y	Y	Y	Y	Y
Treat/Remove all woody species along roads to provide access route 20 feet wide	23	Y	Y	Y	Y	Y
Treat/Remove all vegetation within 5 feet of substation fence line	23	Y	Y	Y	Y	Y
Vegetation Management in Protective Buffers	24	Y: PSC Plan	Y:VMP	Y: MA VMP	Y: Permit	Y: Permit
Herbicide Use in Wetlands	37	Y: DEC Permit	Y:VMP	Y: label	N	Y: Permit

Appendix 2

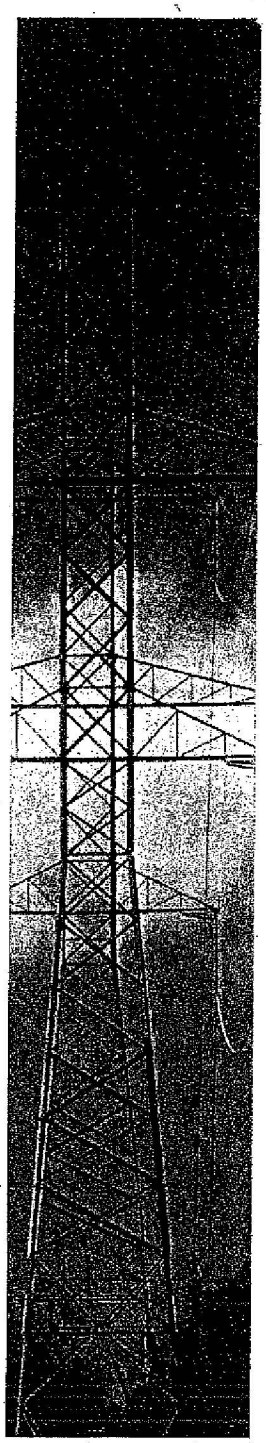
National Grid Forester and Control Center Contact Information

Contact	Location	Telephone Number
NE Control Center	Westborough, MA	(800) 423-6029
NY Control Centers	Central/West	(315) 460-2395
	East	(518) 356-6471
Transmission Call-in	System	(508) 421-7452
Ryan Blothenburg	Fredonia, NY	(716) 673-7216
John P. Cookson	Lebanon, NH	(603) 443-4276
John Duval	Westborough, MA	(508) 930-8009
Eric Gemborys	Westborough, MA	(508) 389-4136
Kenneth Kirkman	Syracuse, NY	(315) 428-5273
Jason Magoon	Albany, NY	(518) 433-3320
Teri A. Niedzieleski	Utica, NY	(315) 798-5345
Mariclaire Rigby	Syracuse, NY	(315) 428-5300
Michael V. Sikora	Westborough, MA	(508) 389-9087
One Call	System	(866) 322-5594

Appendix 3

Notification Materials

nationalgrid



Important Information for Homeowners along Transmission Rights-of-Way

Our Vegetation Management Department will soon carry out routine maintenance on the electricity transmission right-of-way on or adjacent to your property. A variety of **Integrated Vegetation Management** (IVM) methods will be used, including hand cutting, mowing, and selective herbicide application, and will be implemented by our licensed and experienced contractors.

IVM is essential to provide safe and reliable delivery of electricity. It prevents tall-growing vegetation from growing into the overhead lines. In addition, we manage vegetation to allow access to the lines for routine maintenance and for restoration of electric service following major storms.

By implementing IVM methods, we create stable, low-growing plant communities that require minimal maintenance and disruption of the environment. These plant communities provide a healthy wildlife habitat, especially for those animals requiring open fields, meadows, and shrubs.

Use of herbicides within our IVM approach is regulated by federal and state statutes and regulations. These requirements protect sensitive areas such as:

- surface water supplies
- public and private wells
- wetlands
- visually sensitive sites near roads and residences

The work takes place in up to four phases:

- Crews hand cut tall hardwood and conifer trees within the right-of-way, and identify and mark appropriate buffers surrounding public water supplies, private wells, streams, ponds, lakes, and residences.
- Crews treat the stumps of cut hardwood trees with herbicide to prevent re-sprouting.
- Selective foliar (leaf) application of herbicides, primarily to hardwood trees, takes place in summer.
- Follow-up work at roads and yards is carried out in autumn.

If you have a private water supply well that is within 100 feet of the right-of-way, please call the contractor designated below.

The contractor doing the work in your area is:

_____

The contractor's representative is:

_____

and may be contacted at:

_____

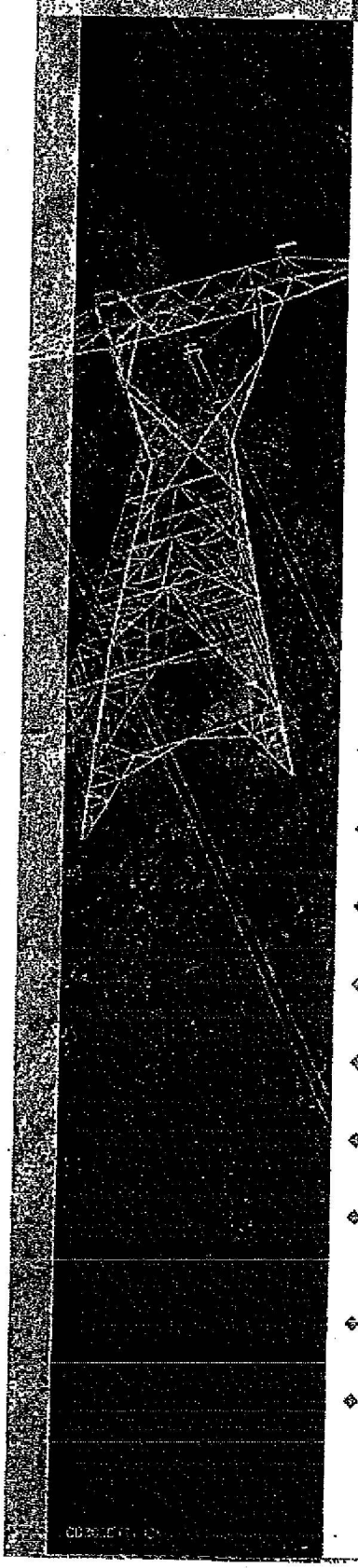
The electric company identification for the right-of-way is:

_____

We at National Grid believe our IVM approach to right-of-way vegetation management is the most environmentally friendly and customer-friendly way to accomplish this necessary task. We would be happy to answer any questions you may have as the work is carried out.

National Grid USA

Environmental Policy



National Grid USA is committed to the protection and enhancement of the environment, always seeking new ways to minimize the environmental impacts of our past, present and future activities. We believe that everyone is responsible for good environmental performance as we incorporate environmental considerations into all our business activities. The following principles provide the framework to help us set goals to promote continual improvements in environmental performance and to deliver and maintain a culture that achieves the performance to which we aspire.

We:

- Expect management to provide visible leadership that promotes good environmental performance and to commit the appropriate resources to achieve our environmental goals;
- Meet, and where appropriate, exceed the requirements of environmental legislation, policies, charters and other commitments to which we subscribe;
- Prevent pollution, including the releases of oil and hazardous materials, wherever we can, but if an incident occurs respond effectively to minimize impact on human health and the environment;
- Minimize and properly manage the waste we generate, and reuse or recycle waste materials whenever economically feasible;
- Help protect the environment for future generations by making our contribution to minimizing climate change;
- Monitor electric and magnetic fields (EMF) research developments and assess continually the implications for the way in which we operate;
- Manage the risks associated with sites that have been contaminated from our past operations and improve these sites where appropriate;
- Protect and improve, where we can, the environmental status of the land on which we operate;
- Require our contractors to demonstrate the same level of commitment as National Grid USA in the management of the environment;
- Ensure that our employees have the skills, knowledge, and resources necessary to contribute to our environmental commitments;
- Encourage open and constructive dialogue with employees, members of the public and other stakeholders to continually challenge our performance;
- Identify and manage risks associated with our activities and deliver any improvements through effective environmental management systems;
- Monitor our environmental performance, audit the effectiveness of our management systems, and report our performance to employees, shareholders, the public and other stakeholders.

Massachusetts Electric Company d/b/a National Grid
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Exhibit 38-Page 1 of 2

National Grid

Appendix 5

National Grid Contractor Safety Requirements

Items D and E are completed after contractor is selected:

D. Project Safety Plan

This is a written document detailing the measures taken to reduce the risk of injury, illness, system interruption, property damage and compliance with safety rules. (This may be the company safety handbook or company policies document.) This document is provided prior to starting the work.

E. Pre-Construction Meeting / Contractor Orientation

A meeting with the Contractor prior to commencement of work outlining the safety procedures and scope of the project.

Item F procedures are on-going through the contract period:

F. Periodic Safety Meetings

These will consist of Job Safety briefs, Incident Reporting and Analysis as well as involvement in Safety Observation Tours.

- Safety Meetings include participation in the Forestry contractor executive safety council (likely to occur on a quarterly basis).
- Contractor Safety Meetings may include annual meetings, monthly or weekly "tailboard" safety meetings.
- Job Safety Briefs are the daily documented pre-job safety briefs held in the field.
- Incident Reporting includes reporting of near-miss, hazardous conditions, and incidents involving injury to workers or public to the National Grid One-Call system.
- Incident Analysis includes contractor or National Grid led analysis of incidents. Analysis includes incident details, lessons learned and detailed improvement plans.
- Safety Observation Tours include contractor or National Grid led safety observations tours to observe and improve work practices and behaviors.

Transmission and Distribution Forestry Contractor Safety Requirements

The following is a list of the Safety Items which are in addition to OSHA / ANSI standards that National Grid USA will require our contractors to abide by:

1) All applicable requirements detailed in National Grid USA, Safety Procedure, Contractor Safety Requirements, Rev. No. 2. Note that Section 11.1, Flame Retardant Clothing is not applicable for Forestry contractors. Forestry contractors must instead wear natural fiber clothing when working within 10 feet of energized equipment.

2) Forestry contractors must wear a properly adjusted full-body fall protection harness connected to an appropriate lanyard when working from an aerial lift. The lanyard must connect to an attachment anchored to either the boom or bucket mounting hardware. Attachment points anchored through only the fiberglass portion of the bucket are not acceptable.

3) Forestry contractors will be required to wear chaps while using a chainsaw on the ground.

4) Forestry contractors will be required to utilize fiberglass stick and stick saws for work around energized equipment and to test/document their integrity annually.

5) Forestry contractors will be required to perform and document dielectric testing of all aerial units annually.

6) Forestry contractor management will be required to attend a quarterly executive safety council meeting hosted by National Grid USA. The contractor will ensure that all appropriate safety personnel for the National Grid USA territory are in attendance.

7) Forestry contractors shall implement and provide the required training and certification programs necessary to provide OSHA defined Qualified Line Clearance Tree Trimmers or Qualified Line Clearance Tree Trimmer Trainees. For Lump Sum or Unit Price mileage trimming projects a single Foreman may supervise up to four (4) bucket trucks on the same project. However, in that case the minimum qualifications for the "lead" person on each of the other trucks shall be a Journeyman Tree Trimmer or equivalent (Qualified Line Clearance Tree Trimmer). At least one other employee on the truck shall be an OSHA defined, Qualified Line Clearance Tree Trimmer Trainee.

8) By April 1st of each year, the contractor shall provide a list of employees that could reasonably be expected to work on National Grid USA property. This listing shall include:
   - Identify the current pay classification of each employee
   - the date of their progression to their current pay level,
   - the dates each employee completed each level of the contractor line clearance tree trimmers training program,
   - the dates each employee completed their required OSHA safety and other training, or retraining, including any annual refreshers,
   - the date each employee last demonstrated their tree rescue and climbing proficiency where applicable
   - the date each employee completed CPR and first aid training
   - Identify each certified pesticide applicator, their certification number and category certified.

9) Forestry contractors must conform to appropriate current industry standards and all future revisions.

Appendix 6

New York Inventory Codes

C. The Transmission Right-of-way Inventory (New York)

1. Inventory Method

The Division Forester shall ensure a detailed, site-by-site inventory is completed for each electric line right-of-way scheduled for regular maintenance either prior to or at the time of actual treatment. Currently, the Division Forester completes the inventories in advance of actual treatment, but in the future, treatment crews may be able to accurately report equivalent field inventory data at the time of treatment, using advanced information technology and handheld geo-referenced systems. Since gas ROWs are generally maintained by mowing, inventories for these ROWs are not necessary.

2. Purpose of the Site-by-site Inventory

A site is an area within the ROW that consists of a common land use pattern or characteristic, or that requires a unique and different treatment method from adjacent areas. Each site may be as large or small as a land use or treatment method requires. The smallest reportable site shall be a tenth of an acre.

The purpose of the inventory is to thoroughly assess site-by-site field conditions, accurately document desirable and undesirable vegetation conditions, insure the assignment of the appropriate prescriptive treatment methods, and record herbicide use requirements. The inventory also identifies special landowner concerns or sensitive site conditions. An example of the right-of-way inventory is included in Appendix 8.

3. Inventory Records

The inventory data is presently collected using handheld data entry systems to record site-specific data. Data collected through the inventory process is then transferred to the master program and summarized for a variety of reports that are used within the maintenance program.

The items documented in the site-by-site inventory include:

a) Location: The inventory shall describe the site in relation to the adjacent structures, assigning a unique management site number to each site. A management area shall be an area of similar vegetation components that warrant a common management technique.

b) Land use: The inventory shall identify the right-of-way and/or adjacent land use categories for each site, together with the site sensitivities that influence the management technique that is selected. In the event of multiple uses or sensitivities, the category having the greatest influence on the maintenance

method chosen should be assigned. The special note area can be used to further describe and define sensitivities.

The land use codes have remained unchanged from the beginning of the program, which has allowed for consistent review and performance assessment over the last 23 years. The land use code for a particular site is a combination of numbers assigned to represent the land use activity, height, and density class of undesirables requiring treatment and the density of the retained shrub community.

The land use categories are:

Land use (in the thousands position)
- 1000 – Streams
- 2000 – Wetlands
- 3000 – Road Crossings
- 4000 – Commercial/Industrial
- 5000 – Residential
- 6000 – Active Cropland
- 7000 – Active Pasture
- 8000 – Brush Lands
- 9000 – Woodlands

Height - Undesirable, taller growing species (in the hundreds position)
- 000 – no height
- 100 – small (less than 6 ft.)
- 200 – medium (6 to 12 ft.)
- 300 – tall (over 12 ft.)

Density - Undesirables (in the tens position)
- 00 – no density
- 10 – very light (generally less than 100 stems/acre)
- 20 – light (up to 30% canopy cover, and 100 to 1,500 stems/acre)
- 30 – medium (30 – 65% cover, and 1,500 to 5,000 stems/acre)
- 40 – heavy (greater than 65% cover, and over 5,000 stems/acre)

Density - Compatible shrubs (in the ones position)
- 0 – none
- 1 – light (less than 30% woody shrub canopy)
- 2 – medium (30 – 65% canopy cover)
- 3 – heavy (greater than 65% canopy closure)

c) Plant community: The inventory shall include identifying and reporting the height and density of up to four predominate undesirable taller growing species, together with the density of the predominate desirable woody shrub species. The following species lists shall be used as a guide to identify

woody tree and shrub species and their compatibility within each site. Within the limits of any easement, property owner concerns, or environmental constraints, the long-term objective should remain the eventual removal of any species capable of invading the wire security zone, while retaining and fostering smaller compatible species already present within the site.

Up to four desirable and undesirable species may be reported for each site.

Appendix 7

Herbicide Mixes

New England - HERBICIDE MIXES – YEAR 2008 - 2009

Code	Trade Name	EPA #	Percent Active	Mixture	Treatment
B#	Accord C or Arsenal	524-343/62719-324/241-346	53.8% Glypho. 28.7% Imazapyr	40% Accord C / 3% Arsenal / 57% Water	Stump
C	Accord C.	524-343/62719-324	53.8% Glypho.	40% Accord C / 60% Water	Stump
E#	Garlon 4	62719-40	61.6% Triclopyr	25% in Hi-Grade Oil	Basal
L#	Accord C or Arsenal Backpack Low Volume	524-343/62719-324 241-346	53.8% Glypho. 28.7% Imazapyr	3 gals / 1 pt in 100 gals Water (3% AccordC / 0.125% Arsenal)	Selective Foliar (LSF)
R	Krenite/Arsenal Backpack Low Volume	352-395 241-346	41.5% Fosamine 28.7% Imazapyr	5 gals./ 1 qts. in 100 gals. Water (5% Krenite / 0.25% Arsenal)	Selective Foliar (LSF)
W	Krenite/Arsenal/Escort Backpack Low Volume	352-395 241-346 352-439	41.5% Fosamine 28.7% Imazapyr 60.0% Metsulfuron	5 gals./ 1 qt./ 2 oz. in 100 gals. Water (5% Krenite / 0.25% Arsenal/Escort)	Selective Foliar (LSF)
X	Accord or Escort Backpack Low Volume	524-343/62719-324 352-439	53.8% Glypho. 60.0% Metsulfuron	3 gals./ 2 oz. in 100 gals. Water 3% Accord C / Escort)	Selective Foliar (LSF)
Z	Test Plots				

NOTES:

Primary herbicide mix.

2007 Soil Sterilant

Mix A: Journey 4-5 oz/acre, Landmark II MP @ 4 oz/acre, Glyphosate @ 1 pint/acre, Garlon 3A* @ 1 pint/acre, Induce @ 1 pint/acre
Mix B: Predict @ 2.5 lbs/acre, Landmark II MP @ 4oz/acre, Glyphosate @ 1 pint/acre, Garlon 3A* @ 1 pint/acre, Induce @ 1 pint/acre

New York - HERBICIDE CODES – YEAR 2008-9

Code	Trade Name	EPA #	Percent Active	Mixture	Treatment
A#	Pathway	62719-31	5.4% Picloram 20.9% 2,4-D	Premixed, Ready-to-use	Stump
C	Accord C (wetland mix)	524-343	53.8% Glypho.	50% Accord C / 50% Water	Stump
D	Pathfinder II	62719-176	13.6% Triclopyr	Premixed, Ready-to-use	Basal
E#	Garlon 4/Stalker	62719-40 241-398	61.6% Triclopyr 27.6% Imazapyr	20% / 3% in Hi-Grade Oil	Basal
F	Tordon K/Garlon 4 Hydraulic High Volume	62719-17 62179-40	24.4% Picloram 61.6% Triclopyr	1 qts./ 2 qts. in 100 gals. Water (0.25% Tordon K / 0.50% Garlon4)	Selective Foliar (SF)
G	Tordon K/Garlon 4 Hydraulic Low Volume (Modified High Volume)	62719-17 62719-40	24.4% Picloram 61.6% Triclopyr	1 qts./ 3 qts. in 100 gals. Water (0.5% Tordon K / 0.75% Garlon 4)	Selective Foliar (SF)
N#	Accord C /Arsenal Hydraulic Low Volume	524-343 241-346	53.8% Glypho. 28.7% Imazapyr	4.5 qts./ 1 pt. in 100 gals Water (1.125% AccordC / 0.125% Arsenal)	Selective Foliar (SF)
P	Krenite/Escort Hydraulic Low Volume	352-395 352-439	41.5% Fosamine 60.0% Metsulfuron	5 gals./ 2 oz. in 100 gals. Water (5% Krenite / Escort)	Selective Foliar (SF)
H	Accord C Hydraulic Low Volume (wetland mix)	524-343	53.8% Glypho.	2 gals.. in 100 gals. Water (2% Accord C)	Selective Foliar (SF)
L#	Accord C/Arsenal Backpack Low Volume	524-343 241-346	53.8% Glypho. 28.7% Imazapyr	3.75 gals / 1 pt in 100 gals Water (3.75% AccordC / 0.125% Arsenal)	Selective Foliar (LSF)
W	Krenite/Escort Backpack Low Volume	352-395 352-439	41.5% Fosamine 60.0% Metsulfuron	8 gals./ 4 oz. in 100 gals. Water (8% Krenite /Escort)	Selective Foliar (LSF)
X	Accord C Backpack Low Volume (wetland mix)	524-343	53.8% Glypho.	5 gals. in 100 gals. Water (5% AccordC)	Selective Foliar (LSF)
Z	Test Plots				

NOTES:

Primary herbicide mix.

2007 Soil Sterilant

1 oz Telar /3 ozs. Oust (Landmark II MP) per 100 gals Water per acre
3 pts. Arsenal /4 ozs. Oust per 100 gals. Water per acre
2.5 lbs. Predict / 3 ozs. Oust per 100 gals. Water per acre #
Note: add Round-up or Glypro – 1 gal. Per 100 gals. Water per acre where green vegetation is present

Appendix 8

Contractor Audit Form

Transmission and Distribution Right-of-Way Vegetation Management

Contractor Audit Form

Date: _____ ROW Number: _____ Line: _____

Town: _____ State: _____

Forester: _____

Weather: _____

Contractor: _____ Foreman: _____

Number in Crew: _____ Herbicide Licenses: _____

Notification of Customers/Landowners: Y__ N__

Type of Work Performed: _____

Crew has Work Documents: Y__ N__

Understanding of Specification and Work Documents: _____

Follow-up Work Needed: _____

Safety:

- PPE: _____
- Work Zone Protection: _____
- Pre-Job Brief: _____
- General Observations: _____

Environmental:

- Field Marking of Sensitive Areas: _____
- Spill Clean-up Provisions: _____
- Containers Properly Marked: _____

Regulatory:

- Work Documents: _____
- Visits by Officials: _____

Customer/Landowner Concerns: _____

Comments: _____

Appendix 9

Border Zone/Wire Zone Vegetation List

EXHIBIT A:

Undesirable Tall Growing Species

The following is a list of tall growing tree species that are considered undesirable in most right-of-way situations and should be removed from the right-of-way floor wherever practicable, to the extent permitted by landowner constraints and easement conditions. The primary objective of the Transmission Right-of-Way Management Program is to effectively remove and control the re-growth and reinvasion of these species.

Ash	ASH
Mountain	MAS
Balsam Fir	BAF
Basswood	BAS
Beech	BEE
Birch	BIR
Cherry	
Black	BCH
Choke	CCH
Domestic	DCH
Pin (Fire)	PCH
Black Gum/Tupelo	BGU
Black Locust	BLO
Black Walnut	BWA
Butternut	BUT
Catalpa	CAT
Cedar	CED
Chestnut	CHE
Cucumber Tree	CUC
Elm	ELM
Hemlock	HEM
Hickory	HIC
Hophornbeam	HOP
Maple	MAP
Oak	OAK
Pine	PIN
Poplar/Aspen	POP
Red Mulberry	MUL
Sassafras	SAS
Spruce	SPR
Tamarack/Larch	TAM
Tree-of-heaven	THE
Tulip/Yellow Poplar	TUL
Willow	WIL
Other	OTH

EXHIBIT B:

Small to Medium Trees

The following is a list of small to medium trees that may be compatible along the edges of the right-of-way, except on narrower sub-transmission rights-of-ways. They should be removed within the wire zone except where the mature height would not invade the Minimum Clearance Distance, or local conditions do not warrant removal. Any plant on the right-of-way that invades the Minimum Clearance Distance may be removed. These smaller tree species may be preferred for retention in buffer areas and other sensitive sites rather than taller growing tree species.

Species	Code
Apple	APP.
Buckthorn	BUC
Common Buckthorn	"
European Buckthorn	"
Dogwood	
Alternate Leaf	ADG
Flowering	FDG
Cedars	CED
American Hornbeam "Ironwood"	HOR
Hawthorne	HAW
Mountain Maple	MOM
Pear	PER
Shadbush/Serviceberry	SHD
Shrub Willow	WIL
Speckled Alder	ALD
Staghorn Sumac	SUM
Witch Hazel	WIH

EXHIBIT C:

Woody Shrubs

The following is a list of shrub species commonly found on rights-of-way across the service territory. While they are nearly always compatible in the border zone, several may grow tall enough to enter Minimum Clearance Distance.

Species	Code
American Barberry	BAR
Chokeberry	
Black Chokeberry	BCB
Red Chokeberry	RCB
Blueberry	
Low	BLU
Highbush	HBL
Button Bush	BTN
Dewberry	DEW
Dogwood	DOG
Red Osier	"
Stiff (similar to Red Osier)	"
Grey	"
Silky	"
Roundleaf	"
Elderberry	ELD
Hazelnut	HAZ
American Hazelnut	"
Beaked Hazelnut	"
Honeysuckle	HON
Huckleberry	
Juniper	GRJ
Dwarf	"
Ground/Trailing	"
Mountain Holly	MOH
Mountain Laurel	MOL
New Jersey Tea	NJT
Norther Prickly Ash	NPA
Shrub Oak (Bear Oak)	SOK
Privet	PRI
Gooseberry	RIB
Rose	
Domestic	DOR
Multiflora	MUR
Rubus	RUB
Blackberry	"
Raspberry	"

Woody Shrubs (continued)

Species	Code
Silverberry	
American	SIL
Autumn Olive	AUT
Sumac	SUM
Smooth	"
Winged	"
Common Spicebush	SPB
Spirea	SPI
Sweetfern	"
Steeple Bush	"
Sweetfern	SWF
Viburnum	VIB
Arrowwood	ARR
Highbush Cranberry	HCR
Maplcleaf	MVB
Nannyberry	NAN
Northern Wild Raisin	RAI
Hobblebush	HOB
Winterberry Holly	WIN
American Yew	AMY
Climbing Vines	
Bitterwseet	CLB
Grape	GRA

Note that some of these species can be classified as either exotic or invasive – particularly Autumn and Russian Olive. In addition, some of these species are noxious plants – particularly Multiflora Rose and Poison Sumac. In most situations management objectives within and adjacent to the right-of-way may warrant the removal or reduction of these species. Future discussions with State and Federal agencies to address invasive and exotic species on a landscape scale may require modifications of the current treatment course of action for some species.

Appendix 10

Ground Patrol Procedure

Ground Based Patrol For:

Vegetation on High Voltage Transmission Lines

Performance of a ground based patrol on 230kV and 345 kV AC and 450 kV DC transmission lines is prescribed annually. The patrol is conducted in the fall and winter of each year and completed no later than June 15th to ensure that vegetation threatening the operation of any line is removed or pruned prior to the growing season.

The following guidance is provided to each member of the patrol team to ensure consistency in identifying vegetation and in reporting.

Vegetation to be Identified:

The ground patrol shall focus on identifying vegetation (including vines) that has grown to **within 15 feet** of conductors and **off-right-of-way hazard trees**. The ground patrol will also check At Time of Vegetation Management clearances on right-of-ways treated the previous calendar year.

Tools:

Each patrol person shall have the following tools at their disposal:

Necessary

- NGrid ID Badge
- ROW Map
- Transmission Conductor Height Meter
- Hypsometer laser Range Finder (or equivalent tools for tree height measurements

Optional

- Binoculars
- Digital Camera
- NGrid Street Atlas
- Specifications for ROW Veg Mgmt
- ATV (when available)

Data Collection: Hand held device and/or spreadsheets.

Corrective Action: Entry on data sheet must include the best means to eliminate the condition, location and access points. These corrective actions shall be completed prior to June 20th.

Definitions: Danger Tree: A tree on or off the right-of-way that if were cut or failed could contact electric lines.

Hazard Tree: Danger Trees which due to species and/or structural defect are likely to fail and fall in to the electric facility. Factors to consider for identifying a hazard tree include the following:

Defect	Tree Condition	Site Conditions
Crack	Lean	Side hill
Decay	Species that are prone to fail	Saturated or unstable soils
Decline	Emergence (Tree crown above canopy)	Human Activity (Logging; compaction, excavation)
Uprooted		Animal Activity
Co dominant stem		Storm damage
Scarring		Topography (Berms, rock outcrops)
Excessive pruning/Topping		

Appendix 11

Notification Form

nationalgrid

Transmission Vegetation Management
Record of Owner/Occupant Notification

Work type	
☐	Floor
☐	Sideline

Line Information			
Line Name		Road Crossing	
ROWNUM		Structure/Veg. Site	
Employee		Company	

Owner/Occupant

Name			
Street Address			Phone
Town	State	Zipcode	Tax Map #

Type of Notification

☐ Personal, face to face	☐ Door Hanger	☐ Left IVM Information
☐ Mailed Letter, Standard Mail	☐ Mailed Registered Letter, Return Receipt	

Contact Notes and /or Follow Up Contacts

Date		Time	

Notes:

Road Crossing		Structure/ Veg. Site	

Owner/Occupant

Name			
Street Address			Phone
Town	State	Zipcode	Tax Map #

Type of Notification

☐ Personal, face to face	☐ Door Hanger	☐ Left IVM Information
☐ Mailed Letter, Standard Mail	☐ Mailed Registered Letter, Return Receipt	

Contact Notes and /or Follow Up Contacts

Date		Time	

Notes:

Notification Form Jan 7.doc

National Grid Massachusetts
IVM Maintenance
2004 - 2008

ROW #	State	Line Number	Voltage	Short Description	Municipality	Treatment Year
1107	MA	326	345	Sandy Pond Terminal to NH S/L	Ayer, Groton, Dunstable, Tyngsboro	2005
1109	MA	DC Ties	345	Sandy Pond Terminal to Sandy Pond Sub	Ayer	2005
1201	MA	301	345	Ludlow T/L to Carpenter Hill Sub	Belchertown, Palmer, Brimfield, Warren, Sturbridge, Brookfield, Charlton	2006
1203	MA	302	345	Carpenter Hill Sub. to Millbury #3	Charlton, Auburn, Oxford, Millbury, Sutton	2006
1205	MA	303	345	Brayton Point to Rehoboth/Norton T/L	Somerset, Swansea, Dighton, Rehoboth	2008, 2004
1207	MA	303	345	Rehoboth/Norton T/L to S. Wrentham Sub	Norton, Attleboro, N. Attleboro, Plainville, Mansfield, Wrentham	2005
1209	MA	303	345	S. Wrentham Sub to W. Medway Sub	Wrentham, Franklin, Bellingham, Medway	2006
1221	MA	315	345	Wrentham Jct. to RI S/L	Wrentham	2006
1231	MA	337	345	Sandy Pond Sub to Tewksbury Sub.	Ayer, Littleton, Westford, Chelmsford, Billerica, Tewksbury	2004
1233	MA	338	345	Tewksbury Sub to Billerica/Burlington T/L	Billerica, Tewksbury	2007
1241	MA	339	345	Tewksbury Sub. to Haverhill Street N. Reading	Tewksbury, Andover, Wilmington, North Reading	2008, 2003
1243	MA	339	345	STR #102 to Golden Hills Sub.	N. Reading, Lynnfield, Wakefield, Saugus, Melrose	2008, 2003
1245	MA	339 Cedar Swamp	345	Haverhill Street to STR #102	N. Reading	2008
1251	MA	343	345	Millbury #3 to Pratts Jct.	Millbury, Grafton, Shrewsbury, Bolyston, W. Bolyston, Sterling	2005
1253	MA	343	345	Pratts Jct. to Sandy Pond Sub	Sterling, Lancaster, Shirley, Ayer	2007
1261	MA	357	345	Millbury #3 to Milford/Medway T/L	Millbury, Sutton, Grafton, Upton, Milford	2008, 2003
1271	MA	397	345	A201/B202 ROW to West Methuen Sub	Dracut, Methuen	2004
1273	MA	394	345	Boxford Jct. to King St. Sub	Boxford, Groveland, Georgetown	2006
1272	MA	394	345	West Methuen Sub to Ward Hill Sub	Methuen, Haverhill	2005
1277	MA	394	345	King Street Sub. to New Hampshire S/L	Groveland, W. Newbury, Merrimack, Amesbury	2008, 2003
1309	MA	A201/B202	230	NH S/L to Tewksbury Sub	Tewksbury, Andover, Dracut	2005
1332	MA	E205 W, E	230	MA S/L to Connecticuit River	Gill, Greenfield, Shelburne, Colrain, Heath, Rowe	2004
1333	MA	E205E	230	Connecticut River to Barre Sub.	Erving, Wendell, New Salem, Petersham, Barre	2008, 2003
1335	MA	E205E&W	230	Bear Swamp to E205 Main ROW	Rowe	2005
1337	MA	E205E	230	Barre Sub to I135/J136 ROW	Barre, Oakham, Rutland, Princeton, Sterling, Leominster	2006
1401	MA	Q-117	115	Adams Sub to VT S/L	Adams, North Adams, Clarksburg	2004
1417	MA	A127/B128	115	Barre Jct. to Millbury #2	Barre, Oakham, Rutland, Paxton, Spencer, Leicester, Auburn, Millbury	2006
1421	MA	A127 Tap	115	Wendell Depot Tap	Wendell	2007
1431	MA	C129/D130 Tap	115	Depot St. Taps	Milford	2006
1435	MA	E 131	115	VT S/L to Adams St. Sub.	Adams, North Adams, Florida, Monroe	2004
1437	MA	E131 Tap	115	Tap to Bear Swamp	Florida, Rowe	2004
1441	MA	F 132	115	Adams Sub to Lanesboro Sub	Adams, Cheshire, Lanesboro	2007
1443	MA	G133 Tap	115	Tap to Golden Rock Sub.	Methuen	2008, 2004
1455	MA	I135/J136	115	New Hampshire S/L to Fitchburg Switch	Winchendon, Ashburnham, Westminster, Fitchburg	2008, 2003
1457	MA	I135/J136	115	Fitchburg Switch to Pratts Jct.	Fitchburg, Leominster, Sterling	2007
1459	MA	J136 Tap	115	East Winchendon Tap	Winchendon	2008, 2003
1461	MA	K-137/J138 Tap	115	Ayer Taps	Ayer	2007

National Grid Massachusetts
IVM Maintenance
2004 - 2008

1463	MA	K-137	115	Billerica Tap	Billerica	2004
1465	MA	M-139 Tap	115	338 ROW to Billerica Sub	Billerica	2007
1471	MA	O141 Tap	115	Nashua St. Tap	Worcester, W. Boylston	2007
1473	MA	P142 Tap	115	Bloomingdale Tap	Worcester, Millbury, Grafton	2007
1475	MA	Q143/R144	115	Millbury #2 to RI S/L	Millbury, Sutton, Uxbridge, Millville	2007
1477	MA	Q143 Tap	115	Whitins Pond Tap	Northbridge, Uxbridge	2007
1478	MA	Q143 Tap	115	Uxbridge Tap	Uxbridge	2007
1479	MA	S145/T146 Tap	115	Canal St. Salem to Wakefield Jct.	Wakefield, Lynnfield, Lynn, Peabody, Salem	2005
1481	MA	V148	115	Read St. Sub to RI S/L	Attleboro, N. Attleboro	2006
1491	MA	B154/C155	115	Boxford Jct. to Salem Harbor	N. Andover, Middleton, N. Reading, Peabody, Danvers, Salem	2006
1493	MA	D156	115	Northboro Road Sub. to Framingham T/L	Southboro	2008, 2006
1495	MA	E-157	115	Millbury #2 to Northboro Rd. Sub	Millbury, Grafton, Shrewsbury, Westboro, Southboro	2005
1501	MA	F158/Q169	115	Golden Hills to Marshall Street Revere	Saugus, Revere	2008, 2003
1503	MA	F-158	115	Marshall Street to Everett Sub.	Revere, Malden, Everett	2008, 2003
1511	MA	I161/J162	115	337 ROW to N. Chelmsford Sub	Lowell, Chelmsford	2004
1513	MA	J162 Tap	115	L'Energia Tap	Lowell	2007
1515	MA	J162 Tap	115	Tewksbury to Perry St. Sub Lowell	Tewksbury, Lowell	2007
1517	MA	L164	115	Tewksbury Sub to S. Broadway Sub Lawrence	Tewksbury, Andover, Lawrence	2004
1519	MA	L164 Tap	115	E. Dracut Sub. To N. Dracut Sub.	Dracut	2004
1521	MA	M165	115	Millbury #2 to Vernon Hill	Millbury, Worcester	2004
1523	MA	H160/N166	115	Northboro Road Sub. to Hudson T/L	Southboro, Marlboro	2008, 2003
1525	MA	O167	115	Everett Sub. to Mystic Terminal	Everett	2008, 2003
1526	MA	P168	115	Mystic Terminal to Revere Sub.	Everett, (Chelsea), Revere	2008, 2003
1527	MA	Q169	115	Marshall Street to A179 ROW.	Saugus, Revere, Lynn	2008, 2003
1531	MA	V174	115	Millbury #2 to Carpenter Hill Sub	Millbury, Sutton	2006
1533	MA	W175	115	Carpenter Hill Sub to Blanchardville Sub	Brimfield, Monson, Palmer	2006
1535	MA	X176	115	Blanchardville Sub to Jct. 301 ROW	Palmer	2006
1536	MA	Y-177	115	Y-25 ROW to E-205 E & W ROW	Monroe, Rowe	2004
1537	MA	Y-177 Tap	115	A127/B128 ROW to Montague Sub	Greenfield, Montague	2004
1539	MA	A179	115	Revere Sub. to Lynnway Station	Revere, Saugus, Lynn	2008, 2003
1581	MA	E183/F184	115	303 ROW to Mink Street Sub.	Somerset, Swansea, Seekonk	2008, 2004
1583	MA	E183	115	Mink Street Sub. to Rhode Island S/L	Seekonk	2008, 2004
1585	MA	F184	115	Mink Street Sub. to Read Street Sub.	Seekonk, Attleboro	2008, 2004
1588	MA	M191	115	N. River Sub to E. Beverly Sub	Beverly	2006
1589	MA	S197	115	#4 Station to Bear Swamp	Shelburne, Buckland, Charlemont, Colrain, Heath, Rowe	2008, 2003
1590	MA	502-509	115	Mid Weymouth Tap	Weymouth	2008, 2003
1592	MA	502-508	115	East Weymouth Tap	Weymouth	2008, 2003
1595	MA	536-537 Tap	115	East Holbrook Tap	Holbrook	2008, 2004
1605	MA	A1/B2	69	Massachusetts S/L to Baldwinville Switch	Warwick, Royalston, Winchendon	2004

National Grid Massachusetts
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1607	MA	A1/B2	69	Baldwinville Switch to Fitchburg Switch	Winchendon, Gardner, Westminster, Fitchburg	2005
1609	MA	A1/B2	69	Athol Tap	Athol, Royalston	2005
1611	MA	A1/B2	69	Baldwinville Tap	Winchendon	2005
1613	MA	A1/B2	69	Gardner Tap	Gardner	2005
1615	MA	A1/B2	69	Westminster Tap	Westminster	2005
1623	MA	D4	69	Massachusetts S/L to #4 Station	Bernardston, Leyden, Colrain, Shelburne	2008
1625	MA	E5/F6	69	#4 Station to #2 Station and #3 Station Tap	Shelburne, Conway	2007
1627	MA	E5/F6	69	#2 Station to CT River	Shelburne, Conway, Deerfield	2007
1629	MA	E5/F6	69	Connecticut River to Ware Sub.	Sunderland, Leverett, Shutesbury, Pelham, Belchertown, Ware	2008
1631	MA	E5/F6	69	Ware Sub. to Meadow Street Sub.	Ware, W. Brookfield, N. Brookfield, E. Brookfield, Spencer	2008
1633	MA	E5/F6	69	Meadow St. Sub. To Millbury #305 Sub.	Millbury, Auburn, Leicester, Spencer	2004
1634	MA	B69	69	Windsor Dam to Belchertown Sub.	Belchertown	2008
1635	MA	I9/J10	69	#5 Station to Adams Sub.	Adams, N. Adams, Florida	2004
1645	MA	O15	69	Blanchardville Sub to Shaker Rd. Sub	Monson, Hampden, E. Longmeadow	2005
1647	MA	N14/O15	69	Blanchardville Sub to E. Longmeadow Sub	Monson, Wilbraham, Hampden, E. Longmeadow	2005
1649	MA	O15	69	Ware Sub to Blanchardville Sub	Ware, West Brookfield, Palmer	2005
1651	MA	R18 (Now T20)	69	Charlton Switch to E. Webster Sub	Charlton, Dudley, Webster	2005
1655	MA	S19	69	302 ROW to E. Webster Sub	Dudley, Webster, Oxford, Sutton	2005
1659	MA	T20	69	Meadow St. Sub to E.Webster Sub	Spencer, Charlton, Dudley, Webster	2004
1661	MA	U21/V22	69	Pratts Jct. to Ayer Sub	Leominster, Lancaster, Lunenburg, Shirley, Ayer	2006
1663	MA	U21/V22 Tap	69	Prospect St. Tap	Leominster	2006
1665	MA	U21/V22 Tap	69	Ft. Devens Tap	Ayer	2006
1671	MA	I35	69	Millbury #305 to Shrewsbury Sub	Millbury, Worcester, Shrewsbury	2004
1681	MA	M39	69	Clinton Sub to Wachusett Sub	Clinton, Sterling, W. Boylston	2006
1683	MA	N40	69	Pratts Jct. to Clinton Sub	Sterling, Lancaster, Clinton	2006
1685	MA	O42/R43	69	Ayer to 326 ROW & 326 ROW to Dunstable	Ayer, Groton, Dunstable	2007
1691	MA	W23	69	Clinton Sub to Wachusett Dam	Clinton	2006
1693	MA	W23	69	Wachusett Dam to Northboro Rd. Sub	Clinton, Berlin, Northboro, Southboro	2006
1694	MA	G7 & W23W	69	Marlboro Taps	Southboro, Marlboro	2007
1695	MA	Y-25	69	#5 Station to VT S/L	Florida, Monroe	2004
1701	MA	Attleboro Taps	115	Read St. Sub to West St. Sub	Attleboro	2006
2000	MA	331	345	Bridgewater Sub to BECO Walpole Str. #399	Bridgewater, W. Bridgewater, Easton, Mansfield, Foxboro, Sharon, Walpole	2006
2002	MA	331	345	Titicut Rd to Bridgewater Sub	Bridgewater	2005
2004	MA	V5/U6/S8	115	Jct. X3/W4 to Williams St. Taunton	Somerset, Swansea, Dighton, Berkley, Taunton	2005
2022	MA	M13/L14	115	Bell Rock to Bates Sub to RI S/L	Fall River, Westport	2006
2024	MA	N12/M13	115	Montaup to Bell Rock	Somerset, Fall River	2006
2025	MA	D21	115	Bell Rock to NStar Str. H71	Fall River	2006
2026	MA	T7	115	Jct. X3/K15 to Jct. V5/U6	Swansea	2005
2028	MA	Z1/Y2/X3/W4	115	Hathaway Sub to Montaup	Somerset	2005

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2030	MA	X3/W4	115	Jct. Z1/Y2 to Swansea Sub	Somerset, Swansea	2005
2032	MA	X3/K15/T7/P11	115	Swansea Sub to Blackstone JCT to RI S/L	Swansea, Rehoboth, Seekonk	2005
2034	MA	P11/K15/R9	115	Blackstone JCT to F184 ROW	Seekonk, Attleboro, N. Attleboro	2004
4001	MA	W-123/V-173	115	Carpenter Hill Sub. to Snow Street Sub.	Charlton, Southbridge	2008, 2003
4003	MA	J136 Tap	115	Pratts Jct. to Litchfield St. Sub	Sterling, Leominster	2005
4004	MA	1819	115	Florence Junction to Mount. Tom	Northampton, Easthampton	2008, 2003
4005	MA	A53/B54	69	Wachusett Sub to Cooks Pond Sub	Worcester, Holden, W. Boylston	2006
4007	MA	O42	69	Peperell Paper Tap	Peperell, Dunstable	2007
4008	MA	A94	115	Auburn St. Sub to Jct. U2 Stoughton	Whitman, Brockton, Abington, Holbrook, Avon, Stoughton	2007
4009	MA	C3-99	115	Plymouth St. Sub to N. Abington Sub	Abington, Rockland	2006
4010	MA	D911	115	Ames St. Sub to DuPont Sub	Brockton	2007
4011	MA	E20/F19/G18	115	Bridgewater Sub to Dupont Sub to Auburn St Sub	Bridgewater, W. Bridgewater, Brockton, Whitman	2008, 2004
4012	MA	H1	115	Jct. S9 to Water St. Sub Hanover	Hanover, Pembroke	2006
4013	MA	L1	115	E. Bridgewater Sub to Jct. E20/F19/G18	E. Bridgewater, W. Bridgewater	2006
4014	MA	M1	115	Bridgewater Sub to Mill St. Sub to Middleboro	E. Bridgewater, Bridgewater	2006
4015	MA	S1	115	Jct. E20/F19/G18 to Belmont St. Sub	W. Bridgewater, Brockton	2007
4016	MA	S9/C3	115	Auburn St. to Plymouth St. to Norwell & Scituate	Whitman, Abington, Rockland, Hanover, Norwell, Scituate	2006
4017	MA	U2	115	Belmont St. Sub to Stoughton Sub	Brockton, Easton, Stoughton	2007
4018	MA	V5/U6/S8	115	Williams Street (Taunton) to Bridgewater Sub	Taunton, Raynham, Bridgewater	2008, 2004
4025	MA	Hull 1& 2	23	E. Weymouth to Hull	Weymouth, Hingham, Hull	2005
004027	MA	Randolph 1&2	23	E. Weymouth to Randolph & Naval Station	Weymouth, Hingham, Holbrook, Randolph	2006
004030	MA	2422/2423	23	E. Weymouth Sub to N. Weymouth Sub	Weymouth	2007
004040	MA	913W67	13.8	Stoughton Sub to Parkview Sub & Exit Feeders	Stoughton,	2005
004042	MA	94W41	13.8	Parkview Sub Stoughton to Woodland St. Brockton	Stoughton, Avon, Brockton	2005
004044	MA	91W41/42	13.8	Dupont Sub to Thatcher St, Southfield Dr. to Dupont	Brockton	2004
004046	MA	91W43	13.8	Hudson St. to Grove St, Hudson St. to Pine Ave	Brockton	2007
4049	MA	797W1&2	13.8	E. Bridgewater Sub to Southfield Dr. Brockton	E. Bridgewater, Brockton	2005
004048	MA	797W41/42	13.8	E. Bridgewater Feeders	E. Bridgewater, Brockton, Hanson,	2005
004050	MA	797W19	13.8	Spring St. E. Bridgewater to L-1 ROW	E. Bridgewater	2006
004052	MA	797W20	13.8	E. Bridgewater Sub to Oak St. W. Bridgewater	E. Bridgewater, Bridgewater, W. Bridgewater	2005
004054	MA	797W24	13.8	E. Bridgewater Sub to Plymouth St. Pembroke	E. Bridgewater, Hanson, Pembroke	2006
004056	MA	912W21	13.8	Mill St. Sub to Hayward St. Bridgewater	W. Bridgewater, Bridgewater	2006
004058	MA	99W61	13.8	N. Abington Unit to Division St. Unit, Rockland	Abington, Rockland	2004
004060	MA	99W63	13.8	N. Abington Unit to Spruce St.	Abington	2004
004062	MA	797W29	13.8	7971&2 ROW to Pine St. E. Bridgewater	E. Bridgewater	2007
004064	MA	93W40	13.8	C3/S9 ROW Rockland to C3/S9 ROW Hanover	Rockland, Hanover	2004
004066	MA	93W42	13.8	Plymouth St. Sub to Essex St. Whitman	Abington, Whitman	2007
004068	MA	93W43	13.8	Whitman St. Hanson to Washington St. Hanson	Abington	2007
004070	MA	910W25	13.8	Water St. Sub Hanover to West Elm St.	Hanover, Pembroke	2005

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004072	MA	910W25	13.8	Union St. to Mattakeesett St. Pembroke	Pembroke	2005
004074	MA	910W25	13.8	25 Line ROW to Elmer St. Pembroke	Pembroke	2005
004076	MA	96W40	13.8	Grove St. Norwell to Jct. 96W41 Norwell	Norwell	2005
004078	MA	96W41	13.8	Mount Blue Sub to King St. Unit Cohasset	Norwell	2005
4120	MA	NEES Supply	13.8	NEES Supply	Westboro	2008, 2003
004210	MA	2246	23	Robinson Ave Sub to Cumberland Engineering	Attleboro	2005
004230	MA	2248 & 24	23	West St. Sub to Perrins Crossing	Attleboro, Seekonk	2006
004240	MA	2248 Tap	23	Rehoboth Tap	Attleboro, Seekonk	2005
004250	MA	2274	23	West St. to Plainville Sub	Attleboro, North Attleboro, Plainville	2007
004260	MA	2276	23	West St. Sub to Norton Sub	Attleboro, Norton	2006
004270	MA	2278	23	West St. Sub to Norton Sub, 303 ROW	Attleboro, Norton, Mansfield	2006
4320	MA	2284	23	Franklin Sub. to Plainville Sub.	Franklin, Wrentham, Plainville	2008, 2003
4330	MA	2285	23	South Wrentham Sub. to Wrentham Sub.	Wrentham	2008
004340	MA	2288	23	Foxboro #1 to Mansfield Sub	Foxboro, Mansfield	2005
004440	MA	321-W7&W8	13.8	Uxbridge Feeders	Uxbridge, Mendon, Hopedale, Milford	2007
004450	MA	9L4	13.2	Sewage Plant Tap	Attleboro	2005
5010	MA	8T1	34.5	West Andover Sub. to Merrimack River	Andover	2008, 2003
005020	MA	8T2	34.5	Chandler Rd. to North St.	Andover	2006
5110	MA	Liquid Carbonic	23	Liquid Carbonic Tap	Tewksbury	2008, 2003
5112	MA	59L1	5	Gillette Tap	Andover	2008, 2006
005120	MA	2326-75-78-58	23	N. Andover Jct. to Boston Hill	North Andover	2004
005130	MA	2329-73	23	Groveland Sub to Newburyport Terminal	Groveland, Georgetown, Newbury, Newburyport	2004
005140	MA	2329-96	23	Bradford Sub to Groveland Sub & Taps	Haverhill, Groveland	2004
005150	MA	2330	23	Merrimack River to Amesbury Sub.	Salisbury, Amesbury	2004
005160	MA	2352-76	23	Methuen Sub to NH S/L	Methuen	2006
005170	MA	53-76	23	Spicket River Tap to NH S/L	Methuen, Haverhill	2006
005180	MA	2354-58	23	Ward Hill Sub to Bradford Sub	Haverhill	2007
005190	MA	2355	23	Methuen #5 to S. Broadway Sub to Ballardvale	Lawrence, Methuen	2006
005200	MA	2326-58-75	23	N. Andover Jct. to Ward Hill to Lawrence #1	Haverhill, North Andover,	2004
5210	MA	2366-67	23	Georgetown Sub. to East Boxford Sub. to I-95	Georgetown, Boxford	2008, 2003
005220	MA	2373-94	23	King St. Sub to Rowley/Ipswich T/L	Groveland, Georgetown, Rowley	2006
5230	MA	2377-96	23	Merrimack T/L. to Amesbury Sub.	Amesbury	2008, 2003
005240	MA	2381	23	Meadowbrook Sub to Blossom St. Sub	Lowell, Chelmsford	2007
5250	MA	2383-84	23	Meadowbrook Sub. to Billerica Sub. & NE Nuc	Chelmsford, Billerica	2008, 2004
005260	MA	2385	23	Tewksbury Sub to Wiggonville Sub & Coren	Tewksbury, Lowell	2007
005270	MA	2386-99	23	N. Chelmsford to Centerville Sub	Chelmsford, Lowell, Dracut	2004
005280	MA	2388	23	Concord Rd. Sub to Forge Village Sub	Westford	2004
005282	MA	2387	13.8	Lincoln Labs Tap	Westford	2004
005290	MA	2387	23	Forge Village Sub to N. & W. Chelmsford Subs	Westford, Chelmsford	2004

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005310	MA	2389-90	23	Billerica Sub to S. Billerica Sub & Tap	Billerica	2004
005320	MA	2392	23	N. Chelmsford to Tyngsboro Sub & Westford Rd.	Chelmsford, Tyngsboro	2004
5410	MA	13 Tap	13.8	Raytheon to IRS	Andover	2008, 2003
005420	MA	309-313-318	13.8	Wiggonville Sub to Quebec & Blossom St.	Lowell	2006
005430	MA	314 & 317	13	Tewksbury Sub to North St. Sub	Tewksbury	2007
005520	MA	1323	13.8	Ballardvale Sub to 339 ROW	Andover, Tewksbury	2006
006010	MA	2301/02	23	W. Salem Sub to Melrose #2 Sub.	Salem, Lynnfield, Saugus	2004
006030	MA	2363-64	23	Cherry St. to Rockport Sub	Gloucester, Rockland	2005
006040	MA	2365-68	23	I-95 to Topsfield Sub Rt.1 to Rt. 97	Boxford, Topsfield, (Wenham)	2006
006050	MA	2370-72	23	Burrill St. Swampscott to Canal St. Lynn	Swampscott, Salem	2006
006060	MA	2372	23	Green St. Lynn to Marblehead T/L	Lynn, Swampscott	2006
6070	MA	2391	23	Commercial Street Lynn to Denver Street Sub.	Lynn	2008, 2003
007210	MA	2207/2208	23	Fiskdale Sub to Southbridge Sub	Sturbridge, Southbridge	2006
7220	MA	12	23	E5/F6 ROW to Quaboag Rubber	N. Brookfield	2008, 2004
007310	MA	NASHUA ROAD	13.8	Nashua Road	Pepperell	2005
007320	MA	Pepperell Tie	13.8	Groton St. Sub to W. Groton Jct.	Groton, Pepperell	2005
007410	MA	201-W2	13.8	Ayer Sub to Tannery St	Ayer	2006
007420	MA	201-W3	13.8	Ayer Sub to Hollingsworth-Vose	Ayer, Groton, Shirley	2006
007430	MA	201-W4	13.8	Ayer Sub to Nashoba Hospital	Ayer	2006
007440	MA	207-W2	13.8	Litchfield St. Sub to Mechanic St. Sub	Leominster	2007
007450	MA	216-W2	13.8	Pearl St. Tap	Ayer	2006
007460	MA	219-W3	13.8	Prospect St. Sub to Mechanic St. Sub	Leominster	2007
007470	MA	219-W4	13.8	N. Leominster to W. Leominster	Leominster	2007
007480	MA	219-W4,207-W1	13.8	W. Leominster Sub to Litchfield St. Sub	Leominster	2007
007490	MA	225-W3	13.8	Litchfield St. Sub to Prospect St. Sub	Leominster	2007
007510	MA	304-W5	13.8	Taintor Hill Tap	Millbury	2004
007515	MA	406-L3	13.2	Oxford Feeder	Oxford	2007
007520	MA	304-W2	13.8	Millbury #305 to Fitzpatric & Follet Streets	Millbury, Suton, Grafton	2005
007530	MA	304-W7	13.8	A127/B128 ROW Tap to NE Battery	Millbury, Worcester	2005
007540	MA	34 Feeder	13.8	Chaffins Sub to Rutland Sub	Holden, Rutland	2004
007610	MA	601-W2	13.8	Park St. Sub to Templeton T/L	Gardner	2006
007620	MA	601-W3	13.8	Park St. Sub to Gardner Prison Tap	Gardner	2006
007710	MA	705-W1	13.8	Wendell Depot Sub to Farley Sub	Wendell, Erving	2007
007810	MA	701-J1	4	Birch Hill Dam ROW	Templeton, Royalston	2005
008010	MA	2	23	Ware 1 to Ware 2	Ware, West Brookfield	2007
008030	MA	4 & 7	23	Blanchardville to Shearer's Corner	Palmer, Monson	2007
008040	MA	501L1	13.8	Coy Hill	Easthampton	2007
8208	MA	11 Feeder	13.8	King Street Sub. to Damon Road	Northampton	2008, 2003, 1998
8209	MA	9-W2	13.8	1819 ROW to Route 66	Northampton	2008, 2003, 1998

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008210	MA	1 & 8	23	Mount Tom to West St. Sub	Easthampton, Northampton	2004
8220	MA	2	13.8	Easthampton to West Street Sub.	Northampton	2008, 2003, 1998, 1994
8230	MA	4	23	West Street Sub. to Florence Junction	Northampton	2008, 2003, 1998, 1994
8240	MA	5 & 15	23	King Street Sub. to Easthampton T/L	Northampton, Easthampton	2008, 2003, 1998, 1994
008310	MA	1	23	Brown St. Sub to Walker St. Sub	North Adams	2005
008320	MA	2	23	Zylonite Sub to Columbia St. Sub	Adams, North Adams	2007
008330	MA	3	23	Adams St. Sub to Columbia St. Sub	Adams	2007
008340	MA	4	23	Adams Sub to Brown St. Sub	Adams, North Adams	2007
8350	MA	5	23	Brown Street Sub. to Adams Sub.	Adams, N. Adams	2008, 2003, 1998, 1993
8360	MA	7 & 8	23	Brown Street Sub. to Williamstown Sub.	N. Adams, Williamstown	2008, 2003, 1998, 1993
008370	MA	9	23	Columbia St. Sub to Cheshire Sub	Adams, Cheshire	2006
8380	MA	1	23	Mt. Greylock Tap	Adams	2007
008390	MA	15-W2	13.8	Florida Feeders	Florida	2004
008409	MA	Feeders	13.8	Great Barrington Area	Florida	2004
008410	MA	1 & 2	23	Lee to Risingdale	Lee, Stockbridge, Great Barrington	2004
008420	MA	5	23	Great Barrington Sub to Sheffield Sub	Great Barrington, Sheffield	2006
008430	MA	3W1 Feeder	23	Lenoxdale to Cliffwood St. Tanglewood	Lenox, Richmond, West Stockbridge	2006

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ROWNUM	LineNum	State	COMPANY	Voltage	RWWidth	TOWN	CycleLengtl	NextTreatmentYear_SideLine
001107	326	MA	NEP	345	300.00	Ayer, Groton, Dunstable, Tyngsboro	8	2009
001109	D.C. TIES	MA	NEH	345	250.00	Ayer	8	2009
001201	301	MA	NEP	345	300.00	Sturbridge, Brookfield, Charlton	8	2015
001203	302	MA	NEP	345	300.00	Sutton, Millbury, Oxford, Auburn, Charlton	8	2010
001205	303	MA	NEP	345	325.00	Somerset, Swansea, Rehoboth, Dighton	8	2011
001207	303	MA	NEP	345	325.00	Wrentham, Mansfield	8	2012
001209	303	MA	NEP	345	200.00	Wrentham, Franklin, Bellingham, Medway	8	2010
001221	315	MA	NEP	345	150.00	Wrentham	8	2008
001231	337	MA	NEP	345	350.00	Billerica, Tewksbury	6	2008
001233	338	MA	NEP	345	250.00	Billerica, Tewksbury,	8	2011
001241	339	MA	NEP	345	250.00	Reading	8	2012
001243	339	MA	NEP	345	250.00	Saugus, Melrose	8	2012
001245	Swamp	MA	NEP	345	250.00	North Reading	8	2012
001251	343	MA	NEP	345	275.00	West Boylston, Sterling	6	2014
001253	343	MA	NEP	345	250.00	Sterling, Lancaster, Shirley, Ayer	6	2008
001261	357	MA	NEP	345	375.00	Millbury, Sutton, Grafton, Upton, Milford	8	2017
001271	394	MA	NEP	345	225.00	Dracut, Methuen	8	2008
001272	394	MA	NEP	345	280.00	Methuen, Haverhill	8	2009
001273	394	MA	NEP	345	200.00	Haverhill, Boxford	8	2010
001275	394	MA	NEP	345	225.00	Boxford, Groveland, Georgetown	8	2010
001277	394	MA	NEP	345	225.00	Amesbury	8	2012
001309	A201/B202	MA	NEP	230	400.00	Tewksbury, Andover, Dracut	6	2010
001332	E205W,E	MA	NEP	230	275.00	Gill	10	2015
001333	E205E	MA	NEP	230	250.00	Barre,	10	2015
001335	E205E&W	MA	NEP	230	250.00	Rowe	10	2009
001337	E205E	MA	NEP	230	125.00	Leominster	10	2014
001401	Q 117	MA	NEP	115	80.00	Adams, North Adams, Clarksburg	6	2009
001417	A127/B128	MA	NEP	115	250.00	Leicester, Auburn, Millbury	10	2009
001421	A127 TAP	MA	NEP	115	160.00	Wendell	10	2013
001423	A127/B128 TAP	MA	NEP	115	130.00	Auburn, Worcester, Leicester	10	2009
001431	C129/D130 TAP	MA	NEP	115	100.00	Milford	10	2010
001435	E131	MA	NEP	115	300.00	Adams, North Adams, Florida, Monroe,	6	2008
001437	E131 TAP	MA	NEP	115	175.00	Florida, Rowe	10	2008
001441	F132	MA	NEP	115	125.00	Adams, Cheshire, Lanesboro	10	2011

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001443	G133 Tap	MA	NEP	115	0.00	Methuen	8	2011
001455	I135/J136	MA	NEP	115	250.00	Fitchburg,	10	2008
001457	I135/J136	MA	NEP	115	250.00	Fitchburg, Leominster, Sterling	10	2007
001459	J136 TAP	MA	NEP	115	160.00	Winchendon	10	2011
001461	K137/J138 TAP	MA	NEP	115	160.00	Ayer	10	2016
001463	K137 TAP	MA	NEP	115	70.00	Billerica	6	2011
001465	M139 TAP	MA	NEP	115	50.00	Billerica	8	2011
001471	O141 TAP	MA	NEP	115	40.00	Worcester, West Boylston	10	2011
001473	P142 TAP	MA	NEP	115	60.00	Worcester, Millbury, Grafton	10	2016
001475	Q143/R144	MA	NEP	115	125.00	Millbury, Sutton, Uxbridge, Millville	10	2011
001477	Q143 TAP	MA	NEP	115	150.00	Northbridge, Uxbridge	10	2017
001479	S145/T146 TAP	MA	NEP	115	200.00	Wakefield, Lynnfield, Lynn, Peabody, Salem	10	2014
001491	B154/C155	MA	NEP	115	200.00	Peabody, Danvers, Salem	10	2010
001493	D156	MA	NEP	115	70.00	Southboro	1	2009
001495	E157	MA	NEP	115	100.00	Grafton	10	2009
001501	F158/Q169	MA	NEP	115	120.00	Saugus, Revere	10	2013
001503	F-158	MA	NEP	115	120.00	Revere, Malden, Everett	6	2009
001511	I161/J162	MA	NEP	115	100.00	Lowell, Chelmsford	6	2013
001513	J162 TAP	MA	NEP	115	60.00	Lowell	10	2013
001515	J162 TAP	MA	NEP	115	100.00	Tewksbury, Lowell	8	2015
001517	L164	MA	NEP	115	100.00	Tewksbury, Andover, Lawrence	10	2008
001519	L164 TAP	MA	NEP	115	200.00	Dracut	10	2013
001521	M165	MA	NEP	115	160.00	Millbury, Worcester	10	2013
001523	H160/N166	MA	NEP	115	100.00	Southboro, Marlboro	8	2012
001525	O167	MA	NEP	115	50.00	Everett	8	2012
001526	P168	MA	NEP	115	60.00	Everett, Chelsea, Revere	8	2012
001527	Q169	MA	NEP	115	160.00	Saugus, Revere, Lynn	8	2008
001531	V174	MA	NEP	115	225.00	Millbury, Sutton	8	2010
001533	W175	MA	NEP	115	200.00	Brimfield, Monson, Palmer	8	2010
001535	X176	MA	NEP	115	200.00	Palmer	8	2010
001536	Y-177	MA	NEP	115	100.00	Rowe	8	2008
001537	Y177	MA	NEP	115	170.00	Greenfield, Montague	10	2013
001539	A179	MA	NEP	115	60.00	Revere, Saugus, Lynn	8	2012
001581	E183/F184	MA	NEP	115	160.00	Somerset, Seekonk, East Providence	8	2008
001583	E183	MA	NEP	115	125.00	Seekonk	8	2008

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001585	F184	MA	NEP	115	125.00	Seekonk, Attleboro	6	2009
001588	M191	MA	NEP	115	30.00	Beverly	10	2010
001589	S197	MA	NEP	115	100.00	Heath, Rowe	10	2008
001590	502-509	MA	NEP	115	100.00	Weymouth	8	2012
001592	502-508	MA	NEP	115	100.00	Weymouth	8	2012
001595	536-537 Tap	MA	NEP	115	200.00	Randlph	8	2008
001605	A1/B2	MA	NEP	69	100.00	Warwick,Roylaston, Winchendon	8	2009
001607	A1/B2	MA	NEP	69	100.00	Fitchburg	8	2009
001609	A1/B2 TAP	MA	NEP	69	125.00	Royalston, Athol	8	2009
001611	A1/B2 TAP	MA	NEP	69	60.00	Winchendon	8	2009
001613	A1/B2 TAP	MA	NEP	69	100.00	Gardner	6	2013
001615	A1/B2 TAP	MA	NEP	69	125.00	Westminster	8	2009
001623	D4	MA	NEP	69	100.00	Bernardston, Leyden, Colrain, Shelburne	10	2012
001625	E5/F6	MA	NEP	69	100.00	Shelburne, Conway	10	2011
001627	E5/F6	MA	NEP	69	100.00	Shelburne, Conway, Deerfield	10	2011
001629	E5/F6	MA	NEP	69	125.00	Belchertown, Ware	10	2011
001631	E5/F6	MA	NEP	69	125.00	East Brookfield, Spencer	10	2011
001633	E5/F6	MA	NEP	69	125.00	Millbury, Auburn, Leicester, Spencer	10	2013
001634	B69	MA	MECO	23	100.00	Belshertown	10	2012
001635	I9/J10	MA	NEP	69	125.00	Adams, North Adams, Florida	6	2008
001645	O15	MA	NEP	69	100.00	Ware, West Brookfied, Palmer	8	2009
001647	N14/O15	MA	NEP	69	90.00	East Longmeadow	8	2015
001649	O15	MA	NEP	69	90.00	Longmeadow	8	2015
001655	S19	MA	NEP	69	100.00	Dudley, Webster, Oxford, Sutton	8	2009
001659	T 20	MA	NEP	69	60.00	Spencer, Charlton	8	2008
001661	U21/V22	MA	NEP	69	125.00	Ayer	6	2009
001663	U21/V22 TAP	MA	NEP	69	100.00	Lancaster, Leominster	6	2009
001665	U21/V22 TAP	MA	NEP	69	100.00	Ayer	6	2009
001671	I35	MA	NEP	69	100.00	Millbury, Worcester, Shrewsbury	6	2008
001681	M39	MA	NEP	69	40.00	Clinton, Sterling,West Boylston	8	2010
001683	N40	MA	NEP	69	100.00	Sterling, Lancaster, Clinton	6	2010
001685	O42/R43	MA	NEP	69	125.00	Ayer, Groton, Dunstable	8	2011
001691	W23	MA	NEP	69	60.00	Clinton	6	2013
001693	W23	MA	NEP	69	60.00	Southboro	6	2013
001694	G7 & W23W	MA	NEP	69	100.00	Southboro, Marlboro	8	2011

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001695	Y25	MA	NEP	69	120.00	Florida, Monroe	6	2012
001700	A53	MA	NEP	69	90.00	W. Boylston, Holden, Worcester	6	2013
001701	ATTLE TAPS	MA	NEP	69	125.00	Attleboro	10	2009
001829	CLINTON FDRS	MA	NEP	13.8	60.00	Clinton	6	2014
002000	331	MA	NEP	345	300.00	W. Bridgewater, Easton, Mansfield, Walpole	10	2014
002002	331	MA	NEP	345	300.00	Bridgewater	10	2010
002004	V5/U6/S8	MA	NEP	115	125.00	Taunton	8	2012
002022	M13/L14	MA	NEP	115	150.00	Fall River	8	2009
002024	N12/M13	MA	NEP	115	150.00	Somerset, Fall River	8	2009
002025	D21	MA	NEP	115	150.00	Fall River	10	2011
002026	T7	MA	NEP	115	150.00	Swansea	10	2010
002028	5	MA	NEP	115	250.00	Somerset	10	2010
002030	X3/W4	MA	NEP	115	125.00	Somerset, Swansea	10	2012
002032	X3/K15/T7/P11	MA	NEP	115	125.00	Swansea, Rehoboth, Seekonk	10	2012
002034	P11/K15/R9	MA	NEP	115	125.00	Seekonk, Attleboro, North Attleboro	10	2010
004001	W-123/V-173	MA	MECO	115	160.00	Charlton, Southbridge	6	2014
004003	136 Tap	MA	MECO	115	250.00	Sterling, Leominster	8	2008
004004	1819	MA	MECO	115	100.00	Northampton, Easthampton	6	2013
004005	A53/B54	MA	MECO	69	90.00	Worcester, Holden, West Boylston	6	2011
004007	O42	MA	MECO	69	100.00	Pepperell, Dunstable	8	2010
004008	A94	MA	MECO	115	100.00	Brockton, Stoughton	6	2009
004009	C3-99	MA	MECO	115	50.00	Abington	6	2010
004010	D911	MA	MECO	115	50.00	Brockton	6	2011
004011	E20/F19/G18	MA	MECO	115	150.00	W. Bridgewater, Brockton	8	2009
004012	H1	MA	MECO	115	50.00	Hanover	8	2013
004013	L1	MA	MECO	115	50.00	W. Bridgewater	8	2013
004014	M1	MA	MECO	115	50.00	E. Bridgewater	8	2010
004015	S1	MA	MECO	115	50.00	E. Bridgewater, Brockton	8	2009
004016	S9/C3	MA	MECO	115	125.00	Rockland, Norwell, Scituate	6	2010
004017	U2	MA	MECO	115	50.00	Brockton, Stoughton	8	2011
004018	V5/U6/S8	MA	MECO	115	125.00	Raynham, Taunton, Bridgewater	8	2000
004025	Hull 1 & 2	MA	MECO	23	50.00	Weymouth, Hingham	5	2009
004027	Randolph 1&2	MA	MECO	23	50.00	Weymouth, Hingham, Holbrook, Randolph	5	2011
004030	2422/2423	MA	MECO	23	40.00	Weymouth	5	2011
004040	913W67	MA	MECO	13.8	50.00	Stoughton	5	2009

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004042	94W41	MA	MECO	13.8	50.00	Stoughton	5	2009
004044	91W41	MA	MECO	13.8	50.00	Brockton	5	2009
004046	91W43	MA	MECO	13.8	50.00	Brockton	5	2010
004048	797W41/42	MA	MECO	13.8	50.00	E. Bridgewater, Brockton, Hanson,	5	2012
004050	797W19	MA	MECO	13.8	50.00	E. Bridgewater	5	2012
004052	797W20	MA	MECO	13.8	50.00	E. Bridgewater	5	2012
004054	797W24	MA	MECO	13.8	50.00	E. Bridgewater	5	2012
004056	912W21	MA	MECO	13.8	50.00	Brockton	5	2010
004058	99W61	MA	MECO	13.8	50.00	N. Abington	5	2008
004060	99W63	MA	MECO	13.8	50.00	Abington	5	2008
004062	797W29	MA	MECO	13.8	50.00	E. Bridgewater	5	2009
004064	93W40	MA	MECO	13.8	50.00	Abington	5	2008
004066	93W42	MA	MECO	13.8	60.00	Abington	5	2011
004068	93W43	MA	MECO	13.8	50.00	Abington	5	2011
004070	910W25	MA	MECO	13.8	50.00	Hanover	5	2010
004072	910W25	MA	MECO	13.8	50.00	Hanover	5	2010
004074	910W25	MA	MECO	13.8	50.00	Hanover	5	2010
004076	96W40	MA	MECO	13.8	50.00	Norwell	5	2009
004078	96W41	MA	MECO	13.8	50.00	Norwell	5	2008
004120	NEES Supply	MA	MECO	13.8	50.00	Westboro	5	2012
004205	317W1	MA	MECO	13.8	50.00	Southboro	5	2011
004210	2246	MA	MECO	23	50.00	Attleboro	5	2009
004230	2248 & 24	MA	MECO	23	70.00	Attleboro, Seekonk	5	2010
004240	2248 Tap	MA	MECO	23	70.00	Attleboro, Seekonk	5	2010
004250	2274	MA	MECO	23	80.00	Attleboro, North Attleboro, Plainville	5	2010
004260	2276	MA	MECO	23	80.00	Attleboro, Norton	5	2011
004270	2278	MA	MECO	23	70.00	Attleboro, Norton, Mansfield	5	2010
004320	2284	MA	MECO	23	70.00	Franklin, Wrentham, Plainville	5	2012
004330	2285	MA	MECO	23	70.00	Wrentham	5	2012
004340	2288	MA	MECO	23	70.00	Foxboro, Mansfield	5	2009
004430	321-W9	MA	MECO	13.8	80.00	Uxbridge, Millville, Blackstone	5	2011
004440	321-W7&W8	MA	MECO	13.8	100.00	Uxbridge, Mendon, Hopedale, Milford	5	2010
004450	9L4	MA	MECO	13.2	60.00	Attleboro	5	2010
005010	8T1	MA	MECO	34.5	50.00	Andover	5	2012
005020	8T2	MA	MECO	34.5	80.00	Andover	5	2011

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005110	Liquid Carboni	MA	MECO	23	50.00	Tewksbury	5	2012
005120	2326-75-78-58	MA	MECO	23	80.00	North Andover	5	2008
005130	2329-73	MA	MECO	23	100.00	Newburyport	5	2008
005140	2329-96	MA	MECO	23	100.00	Haverhill, Groveland	5	2008
005150	2330	MA	MECO	23	100.00	Salisbury, Amesbury	5	2008
005160	2352-76	MA	MECO	23	80.00	Methuen	5	2010
005170	53-76	MA	MECO	23	80.00	Methuen, Haverhill	5	2010
005180	2354-58	MA	MECO	23	80.00	Haverhill	5	2012
005190	2355	MA	MECO	23	80.00	Lawrence, Methuen	5	2010
005200	2326-58-75	MA	MECO	23	80.00	Haverhill, North Andover,	5	2008
005210	2366-67	MA	MECO	23	80.00	Georgetown, Boxford	5	2012
005220	2373-94	MA	MECO	23	80.00	Groveland, Georgetown, Rowley	5	2010
005230	2377-96	MA	MECO	23	80.00	Amesbury	5	2012
005240	2381	MA	MECO	23	80.00	Lowell, Chelmsford	5	2011
005250	2383-84	MA	MECO	23	80.00	Chelmsford, Billerica	4	2012
005260	2385	MA	MECO	23	80.00	Tewksbury, Lowell	5	2011
005270	2386-99	MA	MECO	23	80.00	Chelmsford, Lowell, Drsacut	5	2008
005280	2388	MA	MECO	23	80.00	Westford	5	2008
005282	2387	MA	MECO	13.8	80.00	Westford	5	2008
005290	2387	MA	MECO	23	80.00	Westford, Chelmsford	5	2008
005310	2389-90	MA	MECO	23	80.00	Billerica	5	2008
005320	2392	MA	MECO	23	80.00	Chelmsford, Tyngsboro,	5	2008
005410	13 Tap	MA	MECO	13	80.00	Andover	5	2012
005420	309-313-318	MA	MECO	13.8	70.00	Lowell	5	2010
005430	314 317	MA	MECO	13	100.00	Tewksbury	5	2011
005510	1306-16	MA	MECO	13.8	100.00	Tewksbury	5	2011
005520	1323	MA	MECO	13.8	80.00	Andover, Tewksbury	5	2010
006010	2301 & 02	MA	MECO	23	100.00	Salem, Lynnfield, Saugus	5	2008
006020	2318	MA	MECO	23	50.00	Beverly	5	2011
006030	2363-64	MA	MECO	23	80.00	Gloucester, Rockland	5	2009
006040	2365-68	MA	MECO	23	80.00	Boxford, Topsfield, (Wenham)	5	2010
006050	2370-72	MA	MECO	23	80.00	Swampscott, Salem	5	2010
006060	2372	MA	MECO	23	80.00	Lynn, Swampscott	5	2010
006070	2391	MA	MECO	23	50.00	Lynn, Saugus	5	2012
007210	2207/2208	MA	MECO	23	60.00	Sturbridge, Southbridge	5	2010

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007220	12	MA	MECO	23	80.00	North Brookfield,	5	2008
007310	NASHUA ROAD	MA	MECO	13.8	100.00	Pepperell	5	2009
007320	Pepperell Tie	MA	MECO	13.8	100.00	Groton, Pepperell	5	2009
007330	1259-01	MA	MECO	13.8	100.00	Clinton	5	2012
007340	1259-02	MA	MECO	13.8	60.00	Clinton	5	2012
007410	201-W2	MA	MECO	13.8	40.00	Ayer	4	2009
007420	201-W3	MA	MECO	13.8	40.00	Ayer, Groton, Shirley	4	2009
007430	201-W4	MA	MECO	13.8	40.00	Ayer	4	2009
007440	207-W2	MA	MECO	13.8	40.00	Leominster	4	2010
007450	216-W2	MA	MECO	13.8	40.00	Ayer	4	2009
007460	219-W3	MA	MECO	13.8	40.00	Leominster	4	2010
007470	219-W4	MA	MECO	13.8	40.00	Leominster	4	2010
007480	219-W4,207-W1	MA	MECO	13.8	40.00	Leominster	4	2010
007490	225-W3	MA	MECO	13.8	40.00	Leominster	4	2010
007510	304-W5	MA	MECO	13.8	70.00	Millbury	4	2011
007515	406-L3	MA	MECO	13.2	100.00	Oxford	5	2010
007520	304-W2	MA	MECO	13.8	80.00	Millbury, Suton, Grafton,	4	2008
007530	304-W7	MA	MECO	13.8	80.00	Millbury, Worcester	4	2008
007540	34 Feeder	MA	MECO	13.8	50.00	Holden, Rutland	4	2011
007610	601-W2	MA	MECO	13.8	50.00	Gardner	5	2010
007620	601-W3	MA	MECO	13.8	50.00	Gardner	5	2010
007710	705-W1	MA	MECO	13.8	100.00	Wendell, Erving	5	2011
007810	701-J1	MA	MECO	4	80.00	Templeton, Royalston	5	2008
008010	2	MA	MECO	23	80.00	Ware, West Brookfield	5	2011
008030	4 & 7	MA	MECO	23	80.00	Palmer, Monson	4	2010
008040	2	MA	MECO	13.8	80.00	Easthampton	4	2010
008208	11 Feeder	MA	MECO	13.8	80.00	Northampton	5	2012
008209	9-W2	MA	MECO	13.8	80.00	Northampton	5	2012
008210	1 & 8	MA	MECO	23	80.00	Easthampton, Northampton	5	2008
008220	2	MA	MECO	23	80.00	Northampton	5	2012
008230	4	MA	MECO	23	80.00	Northampton	5	2012
008240	5 & 15	MA	MECO	13	80.00	Northampton, Easthampton	5	2012
008310	1	MA	MECO	23	80.00	North Adams	5	2008
008320	2	MA	MECO	23	50.00	Adams, North Adams	5	2011
008330	3	MA	MECO	23	50.00	Adams	5	2011

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008340	4	MA	MECO	23	80.00	Adams, North Adams	5	2011
008350	5	MA	MECO	23	80.00	Adams, North Adams	5	2012
008360	7 & 8	MA	MECO	23	80.00	North Adams, Williamstown	5	2012
008370	9	MA	MECO	23	80.00	Adams, Cheshire	5	2010
008380	1	MA	MECO	23	80.00	Adams	5	2011
008390	15-W2	MA	MECO	13.8	80.00	Florida	5	2008
008409	Feeders	MA	MECO	13.8	80.00	Florida	5	2008
008410	1 & 2	MA	MECO	23	80.00	Lee, Stockbridge, Great Barrington	5	2008
008420	5	MA	MECO	23	70.00	Great Barrington, Sheffield	5	2012
008430	3W1 Feeder	MA	MECO	23	40.00	Lenox, Richmond, West Stockbridge	5	2010

ISO new england

Operating Procedures

ISO New England Operating Procedure No. 3

Transmission Outage Scheduling

Effective Date: December 15, 2008
Revision No. 7

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ISO New England Operating Procedure No. 3
Transmission Outage Scheduling

Effective Date: December 15, 2008

References:

NPCC Critical Facilities List (NPCC C–13 Appendix D)

NPCC Maintenance Criteria for Bulk Power System Protection (A-04)

ISO New England Operating Procedure No. 1 – Central Dispatch Operating Responsibility and Authority, ISO New England, the Local Control Centers and Market Participants (OP 1)

Common System Operating Instructions for Hydro-Quebec and New England Power Pool, +- 450 KV DC Lines

ISO New England Market Rules and Manuals

ISO New England Operating Procedure No. 19 – Transmission Operations

Transmission Operating Agreement

Other Transmission Operating Agreements(s)

ISO New England Operating Procedure No. 5 – Generator and Dispatchable Asset Related Demand Maintenance and Outage Scheduling (OP-5)

Participants Agreement

Market Participants Service Agreement

ISO New England Manual for Financial Transmission Rights Manual M-06

Local Control Center Instructions:

CONVEX:	Operating Instruction No. 6401 – Protective Switching and Tagging Rules
MAINE:	Maine Operating Procedure No. 3
NEW HAMPSHIRE:	OP-0003 Transmission / Distribution Maintenance
NSTAR:	OP 3 Outage Scheduling
REMVEC II:	REMVEC II Operating Procedure No. 3
VELCO:	VELCO Operating Procedure OP-3

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APPENDIX A - Transmission Facility Category Listings Including Category B Transmission Circuits That Do Not Affect Generation or Dispatchable Asset Related Demands (Confidential)

APPENDIX B - ISO New England Standard 115 kV and Above Transmission Line Patrol & Inspection Program

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APPENDIX E - Minimum Advance Notice Times - Outage Requests For Specific Equipment Confidential)

APPENDIX F – Major Transmission Elements (Confidential)

I. INTRODUCTION

A. BACKGROUND

Transmission outages for construction, tests, maintenance or repair must be coordinated to ensure that reliability is maintained at levels prescribed by ISO New England (ISO) Operating Procedure No. 19 - Transmission Operations (OP-19). In addition, whenever possible, transmission, Generator and Dispatchable Asset Related Demand (DARD) outages will be coordinated to reduce congestion costs. For importing areas, economic Generators and DARDs within the area should not be scheduled out simultaneous with transmission facilities that significantly support area import capability. For exporting areas, Generator and DARD outages within the area should be coordinated coincident with the outage of transmission facilities that significantly support area export capabilities.

In addition, this Procedure is to be construed throughout as reflecting that ISO possesses the ultimate authority for approval of proposed schedules and rescheduling of proposed or approved transmission outages based on either reliability or market efficiency considerations. The processes described in this Procedure are those that ISO will generally use to consider outage approval, scheduling and rescheduling, but shall not diminish or limit ISO's ultimate authority as described in the preceding sentence.

B. PURPOSE OF PROCEDURE

The purpose of this Procedure is to achieve the following:

- Facilitate the preparation, by Transmission Owners (TOs) and Local Control Centers (LCCs), of TO Long-Term and Short-Term outage plans for their transmission facilities
- Establish a Long-Term and Short-Term Outage request process and a timeline for such outage requests.
- Coordinate transmission outages with Generator and DARD outages to plan for reliable operations and minimize congestion
- Promote the certainty of Major Transmission Outages modeled in ISO's monthly FTR auction
- Establish a Long-Term and Short-Term Outage scheduling process that does not jeopardize the reliability of the transmission system and continues to minimize congestion
- Provide guidelines for responding to unplanned outages

This Procedure defines Category A Facilities, Category B Facilities, Major Transmission Elements (MTE) and Local Area Facilities and establishes criteria and guides for submitting, evaluating, approving, and disapproving or repositioning all work on these facilities. A complete list of Category A and B Facilities can be found on the OASIS website. Whereas Local Area Facilities involve sub-transmission facilities (below 69kV) that have been delegated to LCCs within New England, a list of these facilities is not called for by the Transmission Operating Agreement (TOA) between ISO and TOs nor required for purposes of this procedure.

Appendix A provides a general description of the categories and an Internet link to the OASIS website. More specifically, Appendix A of this procedure lists Category B Facilities (radial 115 kV circuits and 69 kV circuits) that do not affect generation or DARDs. Based on their nature, the lead-time for requesting outages of these Appendix A Facilities is relatively short. In Appendix B, ISO New England Standard 115 kV & Above Transmission Line Patrol & Inspection Program describes the ISO standard patrol and inspection program for transmission lines. In Appendix C, ISO New England Right-of-Way Vegetation Management Standard describes the ISO method of vegetation management. Appendix D lists Category B Facilities whose outages affect generation or DARDs, requiring them to be processed using the more stringent rules for Category A Facilities. Appendix F lists MTE; these facilities typically require a greater level of coordination and are expected to follow longer lead times in scheduling outages than non-MTE Elements.

II. DEFINITIONS

Definitions used in this Procedure:

- **Category "A" Facilities:** All Circuits ≥ 115 kV except 115 kV radial circuit All ties between ISO and neighboring Control Areas/Balancing Authority Areas (CAs/BAAs) (regardless of voltage)
  - All transformers that:
    - Have one or more "A" facilities on the low voltage side
    - Require an "A" facility to be taken out of service with the transformer
  - Equipment associated with an "A" facility:
    - Breakers, disconnects
    - Relays, reclosing
    - Shunts, SVCs, STATCOMs
    - Series reactors and capacitors
    - PARs
    - SPSs
- **Category "B" Facilities:**
  - All 115 kV radial circuits
  - All 69 kV circuits (except ties between ISO and neighboring (CAs/BAAs)
  - All transformers that have one or more "B" and no "A" facilities on low side
  - Equipment associated with a "B" facility:
    - Breakers, disconnects
    - Relays, reclosing
    - Shunts, SVCs, STATCOMs
    - Series reactors and capacitors
    - PARs
    - SPSs

- **Local Area Facilities:**
  - All circuits < 69 kV
  - All transformers with no "A" or "B" facilities on low side
- **Major Transmission Elements (MTE)**: MTE are a subset of Category A Facilities and Category B Facilities that affect generation or DARDs and are further identified as, but not limited to, facilities defined or referenced in:
  - Defined external interfaces
  - Defined internal interfaces
  - Restrictions on the operation of a Generator or DARD
  - A Transmission Operating Guide

  As a result of the above criteria, MTE (acting individually) may have a significant impact on the reliable and/or economic operation of the New England Transmission System and as a result, may have greater exposure to being cancelled or denied because of economic impacts than other transmission facilities.

  A list of a MTE is provided in Appendix F.
- **Long-Term Transmission Outage:** A Planned Transmission Outage that is requested at least 21 days in advance.
- **Long-Term Economic Approval:** A Planned Transmission Outage request that is submitted greater than 90 days in advance of the start date and satisfies reliability and economic evaluations, receives economic approval status from the ISO. Short of reliability concerns, it is intended to provide a level of assurance that the request will be denied / cancelled only under extreme economic conditions.
- **Major Transmission Outages:** A Planned Transmission Outage for facilities that are expected to be modeled for purposes of ISO's monthly FTR auction as governed by ISO New England Manual for Financial Transmission Rights Manual M-06. Scheduling priority will be given to Major Transmission Outages as defined in Section VIII of this document.
  - **Auction Month:** The month in which a Major Transmission Outage is scheduled to occur
- **Short-Term Transmission Outage:** Planned Transmission Outage submitted for ISO Approval less than 21 days and greater than 120 hours prior to 00:01 the day the outage is scheduled to begin.
- **Transmission Outage Request Status:** One of the following:
  Active Status

- **Preliminary:** Planned Transmission Outage provided to ISO for informational purposes only; no studies shall be conducted until the outage has been moved to the status of Submitted
- **Submitted:** Transmission outages prepared for ISO study and acceptance and awaiting Interim Approved Status or Approved Status
- **Study:** Transmission outages actively being studied and evaluated by ISO to determine Interim Approved Status or Approved Status
- **Negotiate:** Transmission outages under additional review and pending repositioning
- **Interim Approved:** Transmission outages that have been studied and accepted by ISO through the Long-Term Transmission Outage process but waiting final Approved status through the Short-Term Transmission Outage Process
- **Approved:** Transmission outages studied and accepted by ISO in accordance with the Short-Term Transmission Outage process

- **Non-Active Status**
  - **Withdrawn**: Preliminary Transmission outages that are no longer planned by the Transmission Owner or have lapsed within 21 days prior to the start date
  - **Denied:** Transmission outage requests which have not been Approved
  - **Cancelled:** Previously Approved Transmission outages (Interim Approved or Approved) that have been called off by the TO, LCC or ISO.

- **Transmission Outage Request Flags**: One or more of the following additional identifiers may be associated with each outage to set outage priority as described in this definition section.
  - **Major Transmission Outage**
  - **Long-Term Economic Approval**

- **Planned Outage:** Transmission outage requests that satisfy the minimum advance notice times associated with either the Long-term or Short-term Transmission Outage processing

- **Unplanned Outage:** Any outage that fails to satisfy the lead times required for Short-Term Transmission Outage processing

  There are four types of Unplanned Outages:

  1. Emergency Outage

  The obvious failure of a piece of **transmission equipment** that comes out of service on its own or requires immediate operator intervention to remove it from service.

  2. Forced Outage

  The discovery of a problem that needs to be repaired as soon as crews, equipment, and/or corrective dispatch actions can be put in place to allow the work to be performed. By definition, a Forced Outage cannot be scheduled. More specifically:

  - A Forced Outage cannot be delayed to avoid paying overtime rates; e.g. on a Friday, delaying a Forced Outage until Monday, rather than performing the work on Saturday. This implies that a Forced Outage must occur on consecutive days, except in the case described in the next bullet
  - A Forced Outage cannot schedule an Alternate Date. If weather impairs safe work conditions, the outage can be moved to the next available fair weather day, and the planned end date/time shall be extended
  - An Opportunity Outage that unexpectedly causes additional adverse impact on either system reliability or market efficiency beyond that which was originally anticipated. Typically this would be associated with the unexpected extension of the defined timing parameters.

  3. Overrun Outage

  This is any outage that fails to return to service by its planned end time, and the outage has extended into the next calendar day.

  4. Opportunity Outage

  An outage that is submitted for ISO Approval resulting from an unexpected opportunity to accomplish work that would otherwise require another outage at a less opportune time. It shall be coordinated to minimize the overall impact on system reliability and /or market efficiency.

- **Congestion Costs:** The estimated increased expenses resulting from forecasted real-time commitment or re-dispatch of "out of merit" generation and DARDs and/or the forecasted real-time re-dispatch or de-commitment of "in merit" generation and DARDs in the Energy & Reserves Markets to respect operating criteria

- **Significantly Reduced Congestion Costs:** Reductions in forecasted real-time congestion and RMR costs resulting from the repositioning of a transmission outage are considered significant when the reduction minus the Participating Transmission Owner's incremental direct costs for repositioning the outage exceeds $200,000 per week or any portion of a week

III. AUTHORITIES AND RESPONSIBILITIES

ISO Authorities and Responsibilities

ISO shall:

- Receive from LCCs, Long-Term and Short-Term Transmission Outage requests that were not disapproved by the LCCs, for all Category A Facilities, and for Category B Facilities if Generator or DARD output could be affected by the outage. Outage requests for Local Area Facilities that affect Generator or DARD output shall be processed using LCC and ISO OP-5 scheduling practices

- Review proposed outages in the Long-Term and Short-Term Transmission Outage requests and compare them to Generator and DARD outage plans as follows:
  - Evaluate the impact of proposed transmission outages on the reliability of the New England CA/BAA power system operations. Reposition or disapprove any outage that could be expected to violate reliability criteria for the New England Transmission System and for which repositioning the outage could reasonably be expected to improve reliability
  - Work with LCCs to adjust Generator, DARD and transmission outages to minimize congestion costs. When warranted, and time permitting, perform economic analyses of outage alternatives to define and examine potential congestion costs. Reposition the outage if Significantly Reduced Congestion Costs are feasible, or where lesser congestion reduction is available and the TO(s) agree
  - Have the authority to reposition or disapprove any outage that adversely impacts market efficiency
  - Support outage scheduling related communications between TOs and Resource owners to assure affected parties are appropriately notified in a timely manner.

- Appropriately notify LCCs and Market Participants of action regarding outage requests

- Assign to the LCCs the function of receiving, evaluating, approving or disapproving transmission outage requests submitted by a TO, with respect to its impact on the reliability and congestion of LCC operations

- Promote the continuous flow of information between ISO, the LCCs, and the TOs to match pending transmission outage work with planned or forced Generator and DARD outages to the extent practicable

- Monitor the outage positioning activities of the TOs. ISO shall have the right to request that a TO provide information to the ISO Market Monitoring Unit concerning the TO's positioning of transmission facility outages, including the repositioning or cancellation of any Planned, Scheduled or Approved Outage

- Assign each Long-Term and Short-Term Transmission Outage request a number, date stamp and Status. In general, the number, date stamp and Status will be used, if needed, to prioritize outage requests. ISO will attempt to resolve conflicting Long-Term and Short-Term Transmission Outage requests through discussions with the affected LCCs. When discussions cannot resolve the conflict, the Long-Term and Short-Term Transmission Outage that was Submitted earliest shall have priority

- Determine which outages shall be modeled in the ISO Monthly FTR Auction and appropriately notify LCCs and TOs
- Post and maintain a list of requested outages with corresponding Status on the ISO Web Site within the limitations of the ISO Information Policy:

NOTE
In accordance with the ISO New England Information Policy and to avoid the potential exercising of market power by any entity, outages that obviously restrict a Resource (such as radial circuits to Generators or DARDs) will not be posted.

LCC Authorities and Responsibilities

LCCs shall:

- Receive TO Long-Term and Short-Term Transmission Outage requests from TOs for all Category A Facilities, and for Category B Facilities if Generator or DARD output could be affected by the outage. Outage requests for Local Area Facilities that affect Generator or DARD output shall be processed using LCC and ISO OP-5 scheduling practices
- Prior to relaying proposed outages to ISO for final evaluation and approval, review proposed Long-Term and Short-Term Transmission Outage requests and compare them with Generator and DARD outage plans and requests received from ISO as follows:
  - Evaluate the impacts of proposed transmission outages on the reliability of LCC operations. Reposition or disapprove any outage that could be expected to violate LCC reliability criteria and for which repositioning the outage could reasonably be expected to improve reliability
  - Identify and pursue cases where Generator, DARD and transmission outages could be adjusted to reduce/eliminate Congestion Costs and overall outage duration. In each case, LCCs will facilitate/coordinate outages as detailed in Section VI.B.1 of this procedure to achieve Significantly Reduced Congestion Costs, or to achieve lesser congestion reduction if the TO(s) agree.
- Forward proposed Long-Term and Short-Term Transmission Outage requests not disapproved by the LCC to ISO for further evaluation and coordination
- Relay ISO actions regarding outage requests to TOs
- Perform dispatching functions for all Category B and Local Area Facilities if Generator or DARD output is not affected by the outage, if assigned that responsibility by its Market Participants
- Promote a continuous flow of information between ISO and the TOs to match pending transmission outage work with Generator and DARD outages to the extent practicable
- Ensure that non-public transmission outage information and outage information associated with other Generators and DARDs is not shared with the Resource Owners contacted

- Refrain from engaging in multi-party communications simultaneously with Generator, DARD and TOs unless the transmission outage of concern only affects one Resource owner

TOs' Authorities and Responsibilities

TOs or their designees shall:

- Submit their proposed or updated transmission outage plans to their respective LCC and provide as much information as possible on the flexibility of shifting the requested period forward or backwards
- Work with the LCCs and ISO to provide alternate outage dates when it is determined that congestion could be eliminated or reduced by doing so
- Propose changes to any requested outage promptly after circumstances develop and submit reasons for the change to the LCC
- When requested, submit information concerning the TO's positioning of transmission facility outages to ISO
- Participating TOs will provide information regarding their direct costs for canceling outages to their LCC and ISO when requested.

NOTE

Participating Transmission Owners staff working on transmission outages may be provided with Generator and DARD outage information to assist in the establishment of alternate dates. The Participating Transmission Owner staff working on transmission outages shall not disclose this information to other parties.

IV. ROUTING TRANSMISSION OUTAGE REQUESTS

The TO or Market Participant requesting work on transmission facilities covered by this Procedure shall initially submit a transmission outage request to the appropriate LCC. This section describes the subsequent routing of transmission outage requests.

1. Facilities solely under the Jurisdiction of the LCC:

   Category B Facilities not affecting Generator or DARD output and all Local Area Transmission Facilities are under the jurisdiction of the LCC. The handling of outages for these facilities is a LCC function. Transmission outage requests are acted upon by the LCCs and need not be forwarded to the ISO; however outages involving Local Area Facilities affecting generation or DARD shall be processed using LCC and ISO OP-5 scheduling practices. Outages involving Category B Facilities not affecting generation or DARD shall be sent to the ISO in a daily summary sheet.

2. Facilities requiring assessment by the LCC and ISO:

   Unless the LCC disapproves the transmission outage request, the LCC shall review, study and record assumptions and results for Category A and Category B Facilities prior to forwarding to ISO for assessment.

3. Inter-LCC and Inter-Area Facilities:

   Because of the special communication requirements that apply when Transmission Outage requests involve Inter-LCC (i.e., facilities crossing LCC boundaries but not leaving the Area) and Inter-Area facilities, the LCC and ISO shall coordinate these transmission outage request as follows:

   - **Inter-LCCfacilities:** The LCC shall forward transmission outage request to the adjacent LCC and to ISO for approval or disapproval

   - **Inter-Area facilities - NYISO and New Brunswick System Operator (NBSO):** The LCC shall forward requests to the appropriate adjacent system's dispatch agency and to ISO. ISO shall forward requests to the appropriate NPCC CA/BA for approval or disapproval

   - **Inter-Area facilities – TransEnergie:** The LCC shall forward requests to ISO. ISO shall perform all coordination with TransEnergie. Requests shall be forwarded to TransEnergie for approval or disapproval

4. Transmission outage requests initiated outside the New England Control Area/Balancing Authority Area (CA/BAA)

   Requests initiated by systems outside the New England CA/BAA for work on inter-Area facilities will first be communicated from the outside company to the involved LCC. If the LCC and outside company agree to times and dates for an outage, the outside company will forward the application to its NPCC CA/BA who will assess the application and if approved, forward it to the ISO for approval under Section V or VI. ISO will notify the appropriate LCC.

5. Facilities on the NPCC Critical Facilities List

   In addition to inter-Area facilities, there are other facilities in each NPCC Area that, if taken out-of-service, can affect adjacent Areas. These facilities are listed in the document entitled, NPCC C-13, Operational Planning Coordination, Appendix D, NPCC Critical Facilities List. ISO shall forward transmission outage requests received from the LCCs, involving the New England CA/BAA facilities listed on Appendix D of NPCC C-13, to the appropriate NPCC Areas for approval or disapproval. Requests received by ISO from adjacent NPCC Areas, involving NPCC Area facilities which can affect the New England CA/BAA transmission system, shall be reviewed by ISO for approval under Section V or VI and reported to the appropriate LCCs.

V. LONG-TERM TRANSMISSION OUTAGE REQUESTS

A. SCOPE OF LONG-TERM TRANSMISSION OUTAGE REQUESTS

Long-Term Transmission Outage requests shall include Category A Facilities and Category B Facilities that affect generation or DARDs. The outage of any associated equipment including breakers, disconnects, shunts, SVCs, STATCOMs, series reactors or capacitors, PARs and SPSs must also be reported. Work on relays and reclosing should be included only if the associated transmission facility will be taken out of service or if transfer limits may be reduced with the relay out of service.

Unless cancelled, Interim-Approved Long-Term Transmission Outages shall automatically progress into the Short-Term Outage process, as described in Section VI of this Procedure.

B. MINIMUM ADVANCED NOTICE TIME-RESPONSE TIME FOR LONG-TERM TRANSMISSION OUTAGES

In accordance with LCC procedures, TOs or their designees shall submit their proposed or updated Long-Term Transmission Outages for all Category A Facilities and Category B Facilities if Generator or DARD output could be affected by the outage. The LCCs or their designees shall submit the outage request in the Preliminary status to ISO. ISO will not take any action to study or coordinate outages with Preliminary status. Preliminary status shall be considered informational only and will not set scheduling priority based on timestamp. Preliminary status shall not be accepted within 21 days of the start date of the outage and any outages that were previously submitted and remain in Preliminary status shall be automatically withdrawn at 21 days prior to the start date. It is expected that once the TO confirms these outage plans with the LCC, that the request will be put into the Submitted status.

The LCCs shall provide Long-Term Transmission Outage requests in Submitted status that have been studied, approved and provide appropriate documentation as described in this procedure. This indicates to the ISO that the transmission outage request is ready for ISO study and establishes the timestamp used in setting scheduling priority. Submitted Long-Term Transmission Outage requests shall be accepted no sooner than 12 months and no later than 21 days prior to the start date of the transmission outage.

The ISO shall study transmission outage requests in the Submitted status and respond to the appropriate Local Control Center no later than 10 business days after Submittal. In response the ISO shall apply a status of: Interim Approved, Denied or Negotiate. Once studies begin and until the request is terminated, the details of the outage request will be locked and any changes in dates or equipment will require cancellation and a new submittal.

Long-Term Transmission Outage requests Submitted to ISO at least 90 days prior to the start of the outage, if approved through reliability studies may also be subjected to economic studies and possible repositioning. Facilities identified as MTE (Appendix F), shall always be subjected to economic studies and possible repositioning. The process of Submitting Long-Term Transmission Outage requests involving an MTE facility at least 90 days prior to the start date of the outage does not ensure that it will be Approved nor does it set any scheduling priority over any other previously Submitted transmission

outage request. However, once such a request is approved for economics the applicant will have greater assurance that it will not be cancelled at a later date due to economic impacts.

A transmission outage request that is Submitted to the ISO at least 21 days prior to the start date of the outage and is approved for reliability will receive, Interim Approval Status.

A transmission outage request that is Submitted to the ISO at least 90 days prior to the start date of the outage, approved for reliability and selected for economic study and ultimately approved shall receive the flag Long-Term Economic Approval.

A transmission outage request that is Submitted to the ISO less than 90 days prior to the start date of the outage and is given the status of Interim Approved through the Long-Term Transmission Outage process shall be subjected to economic studies and possible repositioning in the Short-Term Transmission Outage process. These transmission outages will be at risk for cancellation for economic impact up to the time the outage actually begins.

C. Repositioning Outage Requests

The ISO and LCCs, working with TOs, Generators and DARDs, shall reposition outages; 1) that could be expected to violate reliability criteria or, 2) to reduce or eliminate Congestion Costs.

ISO and LCCs during their review can reposition the facility outage of a TO if it could be expected to violate reliability criteria. ISO and LCCs during their review can also reposition the facility outage of a Participating Transmission Owner if it could be expected to achieve Significantly Reduced Congestion Costs. Furthermore, an outage may be repositioned to avoid net costs less than the $200K threshold if agreed to by the involved TO(s).

ISO and the LCC, working with the Participating Transmission Owner, will generally reschedule, within 90 days of the original schedule, any transmission outage requiring repositioning for reliability violations or to achieve Significantly Reduced Congestion Costs. In the event that the 90-day period falls between June 1st and September 1st, ISO and the LCCs will generally reschedule such transmission outages during a period that begins no later than October 31st.

The TO can propose changes to transmission outage requests. The TO must notify the applicable LCC promptly after circumstances develop that necessitates such a change. The notification will include a description of the circumstances that led to the change request. LCC will promptly forward the information to ISO. Changes to transmission outage requests may result in a requirement to submit a new request, sacrificing any scheduling priority and shall be subject to ISO Market Monitoring and Mitigation review.

D. Determining Scheduled Status For Major Transmission Outages for the Monthly FTR Auction

At least 2 months plus 10 business days prior to the Auction Month, ISO reviews the Long-Term Transmission Outage requests and individually notifies each TO or their designee and their respective LCC, as to which of their Long-Term Planned Transmission Outages would be classified as Major Transmission Outages for use in the monthly FTR Auction.

E. Reports – Long–Term Transmission Outages Projected Out 12 Months

The ISO shall create and maintain a New England Long-Term Transmission Outage Report and post the report daily on the ISO web-site in accordance with the ISO New England Information Policy. This report shall incorporate outages in the following states, Preliminary, Submitted, Study, Negotiate and Interim-approved for the time frame beginning 12 months in advance of the current day and ending within 21 days of the current day.

VI. SHORT-TERM TRANSMISSION OUTAGE REQUESTS

A. Minimum Advance Notice Time - Response Time For Short-Term Transmission Outages

Outages of transmission facilities may require extensive study and coordination, first by the LCC to assess local area reliability and perform rudimentary congestion analysis and then by ISO to assess bulk power system reliability and perform warranted detailed congestion analysis. Operating policies at the LCCs define minimum advance notice times for the submittal of outage requests from the TOs to the LCCs. These notice times are critical and designed to provide the LCCs with enough time to assess TO outage requests before denying them or forwarding them to ISO for further analysis and ultimate approval.

Similarly, ISO needs enough time to assess the outage requests and deny or approve them. Furthermore, approved outages must be known in time for use in the settlement of the Day Ahead Markets (DAMs), and TOs must know in time to coordinate final steps to arrange equipment and manpower needed to do the work. To provide adequate time for this analysis and coordination, application advance notice times, and ISO response times, have been established.

Transmission Facilities

1. In general, all Category A Facility outages and Category B Facility outages that affect generation and DARD shall require the submittal of a Short-Term Transmission Outage application. LCCs and neighboring CAs/BAs shall submit Short-Term Transmission Outage applications for these facilities to ISO at least one hundred and twenty (120) hours prior to 00:01 of the day when work is to begin (Example: An outage positioned to begin at 08:00 Monday must be submitted to ISO before 00:01 on Wednesday the week prior.) ISO shall approve/disapprove requests at least 24 hours prior to 00:01 of the day the work is to begin. ISO shall also have the authority to waive either of these timeframes.

2. To facilitate the submittal of transmission outage requests for specific transmission facilities, a detailed guide was developed and is attached as Appendix E. The format of the guide goes by voltage level and the type of transmission facility, which is a natural logic structure for considering transmission facilities. Minimum advance notice times are given for each type of facility. These times reflect the practical application of facility categories defined in this document.

3. LCCs do not have to submit requests to ISO for outages involving Local Area Facilities. However, outage requests for Local Area Facilities that affect Generator or DARD output shall be processed using LCC and ISO New England OP 5 scheduling practices.

   In general, complex outages, particularly those involving more than one LCC and/or dispatch entities outside the New England CA/BAA, will require significantly longer coordination efforts. Consequently, discussions of these outages by involved parties must begin several months early to coordinate the system for the expected work. General information on these outages will first be submitted by the TOs via the Long-Term Transmission Outage process. Details on these outages shall be submitted to LCCs and in turn to ISO as soon as TOs have finalized arrangements.

B. SHORT-TERM TRANSMISSION OUTAGE REVIEW AND APPROVAL PROCESS

LCC Review and Action:

1. Upon receipt of requests for work on Category A Facilities or Category B Facilities that affect Generator and DARD output, the LCC shall perform the following:

   (a) Prior to submittal for ISO Short-Term Outage Request approval, the LCC shall review all Scheduled Outages and Short-Term Transmission Outage requests and compare them with Generator and DARD outage requests received from ISO. Evaluate outage requests to assure reliable operation. Disapprove any outage requests that violates LCC operating procedures or are deemed to be in violation of ISO Operating Procedures and/or Transmission Operating Guides (TOG).Prior to submittal to ISO for Short-Term Outage Request approval, the LCC shall, working with ISO, identify cases where Generator, DARD and transmission outage positions could potentially be adjusted to achieve Significantly Reduced Congestion Costs, or (with TO consent) where lesser congestion reduction can be achieved. In each case, facilitate/coordinate repositioning as follows:Discuss and assess the preliminary plan for outage repositioning with ISO.

   (2) Contact the TO for additional flexibility in their timing of the outage. (Generator and DARD outage information can be discussed with the Participating Transmission Owner as required).

(3) After consulting with the TO, if needed, proceed as follows depending on whether the case involves; i) an importing area, ii) Generator, DARD or exporting area involving a single owner or, iii) an exporting area involving multiple Resources owned by multiple Owners.

i. Importing Area

For an importing area, the simultaneous outage of transmission supplying the area along with generation and DARD within the area can increase congestion and, in severe cases, jeopardize system reliability. To relieve this, the following actions will be taken to try to position the transmission, generation and DARD outages so that they occur at different times:

- Contact the applicable Resource Owners to determine if there is additional flexibility in their outage position
- Contact the TO for additional flexibility in their position. (Resource outage information can be discussed with the Participating Transmission Owner as required.)
- If required, continue to alternately contact the TO and the Resource Owner until a determination is made by ISO on whether or not activities can be positioned to reduce/eliminate congestion

NOTE

If actions above are not sufficient to relieve congestion, ISO will dispatch Resources in accordance with the congestion management process or change the timing of the transmission outage.

ii. Generator, DARD or Exporting Area Involving a Single Owner

This scenario involves a transmission outage that will restrict the commitment or dispatch of Resources owned by a single company (i.e. a line leaving a generating station). The following actions will be taken as soon as possible to try to change or create outage positions so that Resources and transmission outages occur simultaneously, thereby relieving the potential locked-in Resources.

- Contact the applicable Resource owner to determine if there is additional flexibility in their outage application. If the transmission outage involves a radial circuit to a generating station or DARD, details about the transmission outage can be shared with the Resource Owner. Additionally, non-radial transmission outage information can be shared with the Resource Owner if the transmission outage solely affects that Resource Owner

- Contact the TO for additional flexibility in their timing of the outage. (Resource outage information can be discussed with the Participating Transmission Owner as required.)
- If required, continue to alternately contact the Participating Transmission Owner and Resource owner until a determination is made by ISO on whether or not activities can be positioned to reduce/eliminate congestion
- The Participating Transmission Owner may contact the Resource Owner directly to facilitate positioning of outages

iii. Exporting Area Involving multiple Resources owned by multiple companies

This case involves a transmission outage that will restrict the commitment or dispatch of Resources within an exporting area that contains several units owned by different Resource owners. The following actions will be taken to try to change or create outage positions so that Resources and transmission outages occur simultaneously, thereby relieving the potential locked-in Resources.

- Contact the applicable Resource owners to determine if there is additional flexibility in their outage position in the order that their outage request was received
- Contact the TO for additional flexibility in their position. (Resource outage information can be discussed with the Participating Transmission Owner as required.)
- If required, continue to alternately contact the TO and Resource owners until a determination is made by ISO on whether or not activities can be positioned to reduce/eliminate congestion
- If units with outage requests are exhausted or no outage requests exist, contact affected Resource owners randomly, in a manner to be determined by the LCC, without preference to any one Resource owners. Inform each Resource owners that a transmission outage (no details) may result in their unit being restricted and determine if they desire to coordinate an outage of their unit with the transmission outage
- If required, continue to alternately contact the TO and Resource owners until a determination is made on whether or not activities can be positioned to reduce/eliminate congestion costs

NOTE

If actions above do not alleviate constraints, ISO will dispatch Resources in the constrained export area based on its congestion management process or change the position of the transmission outage.

(c) Once the transmission outage has initial approval, either with or without a corresponding Generator or DARD outage: 1) notify adjacent LCCs and/or systems outside of the New England CA/BAA that may be affected by the requested work, and 2) forward the application to ISO with the following information:

(1) Facility (name and nomenclature).

(2) Reason for application (work to be done).

(3) Emergency restoration time in hours.

(4) Time and date switching is to begin.

(5) Time and date the facility is to be restored to normal operation.

(6) LCCs and/or systems outside of the New England CA/BAA to whom notifications have been given.

(7) Other information pertinent to the application that may affect ISO decision, such as a request to revise a Generator or DARD outage schedule to address congestion issues with the transmission outage.

(8) LCC analysis results and approval including contingencies and limiting elements, local voltage constraints, must run Resources and restricted Resources.

NOTE

Requests submitted by adjacent NPCC CAs/BAs must also be accompanied by information listed in items (1) through (8) above.

2. ISO Review and Reliability Study for Short-Term Transmission Outages:

Upon receipt of requests from a LCC for Short-Term Transmission Outages, ISO shall:

(a) Assign the application an identification number.

(b) Forward requests involving inter-Area or NPCC C-13, Operational Planning Coordination Appendix D, NPCC Critical Facilities List to the appropriate NPCC CA/BA for approval or disapproval.

(c) Inform, as required, other LCCs or NPCC CAs/BAs.

(d) Conduct reliability studies in sufficient detail to:

(1) Identify the more severe probable first contingencies (there may be several).

(2) Identify voltage constraints and thermally limiting contingencies and elements, expected flows on limiting elements, ratings [Normal, Long-Term Emergency (LTE), Short-Term Emergency (STE), Drastic Action Limit (DAL),] of limiting elements and provide distribution and adjustment factors. Determine if any pre-defined stability constraints must be followed.

(3) Document system generation, DARD patterns and transmission configurations expected during the time work is to occur, i.e., units and transmission facilities out of service, units required to be in service, etc.

(4) Interchange schedules, flows across pre-determined interfaces and/or flows on major inter-Area tie lines.

(5) Determine action required prior to beginning work and after work has begun to ensure compliance with OP 19.

(6) Determine bulk power supply area protection generation and DARD requirements (units and energy availability).

(7) Determine "locked in" Resources. Include Resources that must be left off-line, and on-line Resources that must be dispatched at reduced loads.

(e) Transmission outage requests with the Status of Submitted and Study should be repositioned before an Approved or Interim Approved outage is repositioned. Outage priority is established in Section VIII of this procedure.

(f) With respect to routine transmission or generation maintenance, in the event that a Generator outage conflicts with a requested transmission outage, the Generator outage will normally have priority except in the 7 days immediately preceding the start of the transmission outage in which case the outages will be prioritized according to the time at which the outage request is received. ISO may adjust this priority due to reliability concerns.

(g) Obtain approval or disapproval from adjacent NPCC CA/BA, if applicable.

(h) Approve or disapprove the request

C. NOTIFICATIONS

When the review and assessment has been completed, ISO will communicate its conclusions to the appropriate LCCs and/or adjacent NPCC CAs/BAAs. ISO will notify those LCCs and adjacent NPCC CAs/BAs that received preliminary notification of the requested work, even if that notification was from an agency other than ISO. If a Generator or DARD outage position or reduction was revised or initiated during processing of the transmission outage request (i.e. to eliminate congestion), ISO will contact the Resource owner to confirm the revision to their position.

1. Notification in case of Approval

   When approving an outage request, ISO shall provide the conclusions of its reliability study in sufficient detail that all affected systems recognize the impact of the approved work. The conclusions should cover at least those items listed in Section VI.B.2.d.

2. Notification in case of Disapproval

   When giving an outage request disapproval notification, ISO shall state the reasons for disapproval. Those reasons shall be specific and relate to items listed in Section VI.B.2.d or to achieve Significantly Reduced Congestion Costs.

   Once a request for outage approval is disapproved, that request is considered completed. To accomplish the work, a new request must be submitted as described in Section VI.D.

3. Notification in case of Cancellation

   An LCC or an adjacent NPCC CA/BA may subsequently cancel a request for work on a New England CA/BAA transmission facility that has been forwarded to ISO.

   The party initiating such action shall determine and communicate to other affected parties the specific reasons for the cancellation

   Once cancellation has been made, the request is considered completed. ISO shall notify the appropriate LCCs and adjacent NPCC CAs/BAs of the request's status change. To accomplish the work, a new request shall be submitted as described in Section VI.E.

4. Posting of Short-Term Transmission Outages

   ISO shall post all approved Short-Term Transmission Outages on the ISO Web Site in accordance with the ISO Information Policy. Any revisions shall be updated on the web site in a timely manner.

D. RE-SUBMITTAL

To request approval of work that has been Denied or Cancelled, a new request with a new request number and a new review and reliability study shall be processed as though no previous request had been provided.

The one exception to this is when an "Alternate Date" has been supplied on the original request form. The "Alternate Date" is the working day following the last date for the outage. In the event the "Alternate Date" is used for repositioning the work, the existing request will be used and all necessary review and study shall again be processed for this work to be performed on the "Alternate Date".

VII. UNPLANNED OUTAGES

A. SUBMISSION OF REQUESTS

The following describes processes for providing requests (which will be processed per Section VI of this procedure) for the three different types of Unplanned Outages.

1. Emergency Outage

Market Participants shall submit requests for Emergency Outages of transmission facilities immediately to the LCC. If the request is for Category A Facilities or Category B Facilities, the LCC shall immediately forward the request to ISO.

2. Forced Outage

Market Participants shall notify their LCC as soon as the need for a Forced Outage is identified. The LCC shall immediately notify ISO about the Forced Outage. The Forced Outage should not be officially submitted until the LCC has reasonable assurance from the Market Participant that system conditions, crews and equipment are available for the job.

3. Overrun Outage

Market Participants shall notify their LCC as soon as the need for an Overrun Outage is identified and the LCC shall immediately relay this information to ISO.

4. Opportunity Outage

Market Participants shall notify their LCC as soon as an Opportunity Outage is identified. Prior to submittal for ISO Short-Term Outage Request approval, the LCC should study the proposed Opportunity Outage as described in Section VI.B. The Opportunity Outage request should not be officially Submitted until the LCC has reasonable assurance from the Market Participant that system conditions, crews and equipment are available for the job.

Opportunity Outage requests shall be submitted to ISO no more than one hundred and twenty (120) hours prior to 00:01 of the day when work is to begin and no less than forty-eight (48) hours prior to 00:01 of the day when work is to begin. This will ensure proper studies are completed and if approved, Opportunity Outages are included in the DAM transmission topology assumptions. Opportunity Outages shall not be permitted that impose additional restrictions on MW Resources (Generators, DARDs and/or inter-ties) that would not otherwise exist in the absence of the Opportunity Outage.

Opportunity Outage requests submitted to ISO must adhere to the following additional conditions:

- Restoration (recall) time, not to exceed 4 hours
- Limited duration, not to exceed one 72 hour period
- In the event the transmission outage once underway unexpectedly exceeds this additional timing criterion, the entire outage shall be converted to Forced
- Receives the lowest priority when competing with all other outage types Planned or Unplanned

B. Response To Unplanned Outages (Does not apply to Opportunity Outages)

If time exists while crews, equipment, and/or corrective dispatch action arrangements are being made, the LCC shall provide ISO with all pertinent information to allow for study of the outage and prioritization with other dispatch requirements.

In either event, the flow of information regarding the Unplanned Outage shall follow the outlines shown on Attachments 1 through 9. The timing requirements and various approval steps do not apply to most Unplanned Outages. Unplanned Outages shall be subject to ISO Market Monitoring and Mitigation review.

VIII. TRANSMISSION OUTAGE PRIORITY

When a conflict arises with another transmission outage previously scheduled, the ISO shall attempt to resolve conflicting Long-Term and Short-Term Transmission Outage requests through discussions with the affected LCCs. When discussions cannot resolve the conflict, the respective priorities of the Outages shall be established according to the Outage status in the following order (highest to lowest priority):

1. Unplanned Outages (Emergency or Forced)
2. Long-Term Transmission Outage with Interim Approval Status and the following flags:
   - Major Transmission Outage
   - Long-Term Economic Approval
3. Long-Term Transmission Outage with Interim Approved Status and the following flag:
   - Long-Term Economic Approval
4. Long-Term Transmission Outage with Interim Approved Status
5. Short-Term Outages
6. Opportunity Outage

If the above priorities don't resolve the conflict, the transmission outage that was input earliest shall have priority.

IX. OUTAGE WORK REPORTS

A. Local Control Center Transmission Work Report

Daily by 1000 hours, each LCC shall forward to ISO and, if appropriate, to the adjacent LCCs a report that includes all equipment listed as Category B Facilities, which does not affect Generator or DARD output that is to be worked on during the following day. (Friday's report shall include equipment positioned to be worked on during Saturday, Sunday and Monday. Work on holidays shall be reported on the last regular weekday before the holiday). The report shall include outage times when work is to begin and end.

Following the Local Control Center Transmission Work Report, other reports from the LCC to ISO and, if appropriate, to the adjacent LCCs shall include any additional work outage for the following day and/or outage work during the following day that is cancelled or postponed.

B. Review of Transmission Work

Once work has been approved and Control Center reports have been completed, both ISO and the LCCs shall operate according to the published outage application times. The party initiating the change shall communicate any changes, for any reason. All affected parties shall be notified of the change in work times.

On the night shift prior to the day the work is scheduled, ISO and the LCCs shall discuss the day's upcoming work to ensure that all parties are up to date on work times for switching and equipment work.

Each LCC shall confirm final approval of the transmission outage application by ISO Security Operator before switching begins. ISO shall be informed immediately when equipment is taken out of service and/or restored to service.

X. SWITCHING ACTIVITIES THAT ARE TYPICALLY COMPLETED WITHIN 15 MINUTES

This section describes contingency protection philosophy for scheduled switching activities that are typically completed within 15 minutes. These activities include; switching to isolate transmission facilities for Planned Outages, breaker trip testing and unit synchronizations at certain generating stations.

Consistent with NERC and NPCC criteria, ISO New England Operating Procedure No. 19 (OP 19) prescribes detailed criteria for transmission operations. The contingency protection philosophy presented here is based on OP 19.

- **Pre-contingent system conditions during switching:**
  - During the time period when switches are open, a transmission facility may be loaded above its normal rating but not exceeding its Long-Term Emergency (LTE) rating
- **First contingency protection during switching:**
  - During brief planned switching activities, System Operations will provide first contingency coverage as defined in OP 19
  - Recognizing the brief period of LTE rating utilization, should a contingency occur during switching, loadings on the facility exceeding the LTE rating and not exceeding STE could be tolerated provided a predetermined solution to the constraint, excluding restoring the outage, is in place to alleviate the LTE loading within the time prescribed in OP 19
- **Second contingency protection for day ahead planning:**
  - Consistent with NERC, NPCC and OP 19 criteria, after the occurrence of a contingency, System Operators have 30 minutes to restore coverage for a second contingency. Loading on facilities exceeding the LTE rating and not STE rating could be tolerated provided a predetermined solution to the constraint, excluding restoring the outage, is in place to alleviate the LTE loading within the time prescribed in OP 19
  - Combining these practical criteria with a requirement that switching activities must be completed within 30 minutes precludes the need to analyze second contingency coverage during switching
- **Second contingency protection for real-time operations:**
  - Typically, switching to isolate transmission facilities for Planned Outages, breaker trip testing and unit synchronizations are completed within 15 minutes. If during switching, it becomes apparent that switching activities are delayed and could extend beyond the 30-minute mark, System Operators will take actions, including reclosing switches and breakers to ensure second contingency coverage is restored within 30 minutes of the start of switching activities. If reclosing is not successful, first contingency coverage will exist based on the philosophy prescribed in this document, and operators and, if needed, crews will take immediate steps to restore the circuit

Example:

An LCC requests an outage on a bulk power transformer with no high side circuit breaker requiring a brief outage (less than 15 minutes) of a 345 kV transmission line.

Studies indicate that during the switching, a parallel 115 kV transmission line will be loaded above its Normal rating but will not exceed its LTE rating. If a contingency occurred during the switching, flow on the 115 kV line would exceed its LTE rating but not its STE rating.

ISO and the LCC determine that opening a 115 kV breaker at another substation would relieve the flow on the 115kV line by splitting the bus and leaving the 115 kV line isolated on a single transformer. The 115kV breaker can be opened well within the 15-minute limit of the LTE rating and flow on the 115kV circuit will immediately drop below the LTE rating with no other overload being introduced and no other Transmission Organization affected.

Immediately prior to the scheduled outage of the bulk power transformer, both ISO and the LCC review their studies to confirm that during switching when the 345 kV line is opened; 1) flow on the parallel 115 kV line will not exceed its LTE rating and, 2) if a contingency occurs, flow on the 115 kV line will not exceed its STE rating and a 115 kV breaker can be opened within 15 minutes to reduce flow below the 115 kV line's LTE rating.

The 345 kV line is switched out and back as expected. Flow on the 115 kV circuit did not exceed its LTE rating, no contingency occurred and switching action on the 115 kV breaker was not required.

As another example, a LCC would like to perform breaker trip testing on one of three transmission circuits supplying power to a large metropolitan area. Opening the circuit significantly reduces the transfer capability into the area. Furthermore, the consequences of area contingencies involve unacceptable inter-area impact warranting consideration of first and second contingency coverage.

The breaker trip test will open the 345 kV line for less than 15 minutes (typically 5 minutes). First contingency coverage must/will be provided, but based on the short duration and processes to reclose the circuit within 30 minutes, second contingency coverage with the circuit being open is not required or warranted. Reclosing the circuit will restore second contingency coverage for sustained operations. In the unlikely event that the circuit does not reclose, first contingency coverage will still exist and operators and, if needed, crews will take immediate steps to restore the circuit.

XI. ANNUAL REPORT ON OUTAGE PROCESSING

ISO in coordination with the LCCs and Participating Transmission Owners shall prepare and issue an annual report on transmission outages and coordination. The report shall assess accuracy of inputs and calculation of congestion cost savings. The long-term impacts of ISO, LCC and Participating Transmission Owner changes to outages shall be assessed and identify potential opportunities to further minimize congestion costs identified.

OP 3 REVISION HISTORY

Document History (This Document History documents action taken on the equivalent NEPOOL Procedure prior to the RTO Operations Date as well revisions made to the ISO New England Procedure subsequent to the RTO Operations Date.)

Rev. No.	Date	Reason
Rev 1	4/5/2002	
Rev 2	02/01/05	Updated to conform to RTO
Rev 3	05/06/05	Update for initiation of VELCO Local Control Center
Rev 4	02/03/06	Updated to conform to FERC changes of MR 1 Attachment G, and added information to clarify the transmission outage process
Rev 5	10/01/06	Updated for ASM Phase 2
Rev 6	02/08/07	Revised Opportunity Outage criteria
Rev 6.1*	06/17/08	Annual Review by Procedure Owner. Clarification and consistency of terminology Use of approved M-35 acronyms, e.g., LCC for Local Control Center, DARD for Dispatchable Asset Related Demand, etc. Defined acronyms for frequently used terms: e.g., CA/BA for Control Area/Balancing Authority, etc| Minor reformatting changes Corrected References for NSTAR becoming an LCC Corrected NBSO instead of NB Power *Revision 6.1 is an exception to the normal revision history numbering protocol. Changes previously approved as Revision 7 by the Participants Committee will be released as the effective version at a later date.
Rev 7	12/15/08	Revised procedure for Long-Term Transmission Outage process changes and clarification of outage terminology. (Added changes approved by RC-MC voting completed on 02/19/08 meeting)

ISO new england

Operating Procedures

ISO New England Operating Procedure No. 3

Transmission Outage Scheduling –
Attachments 1 through 9

Effective Date: December 15, 2005
Revision No. 3

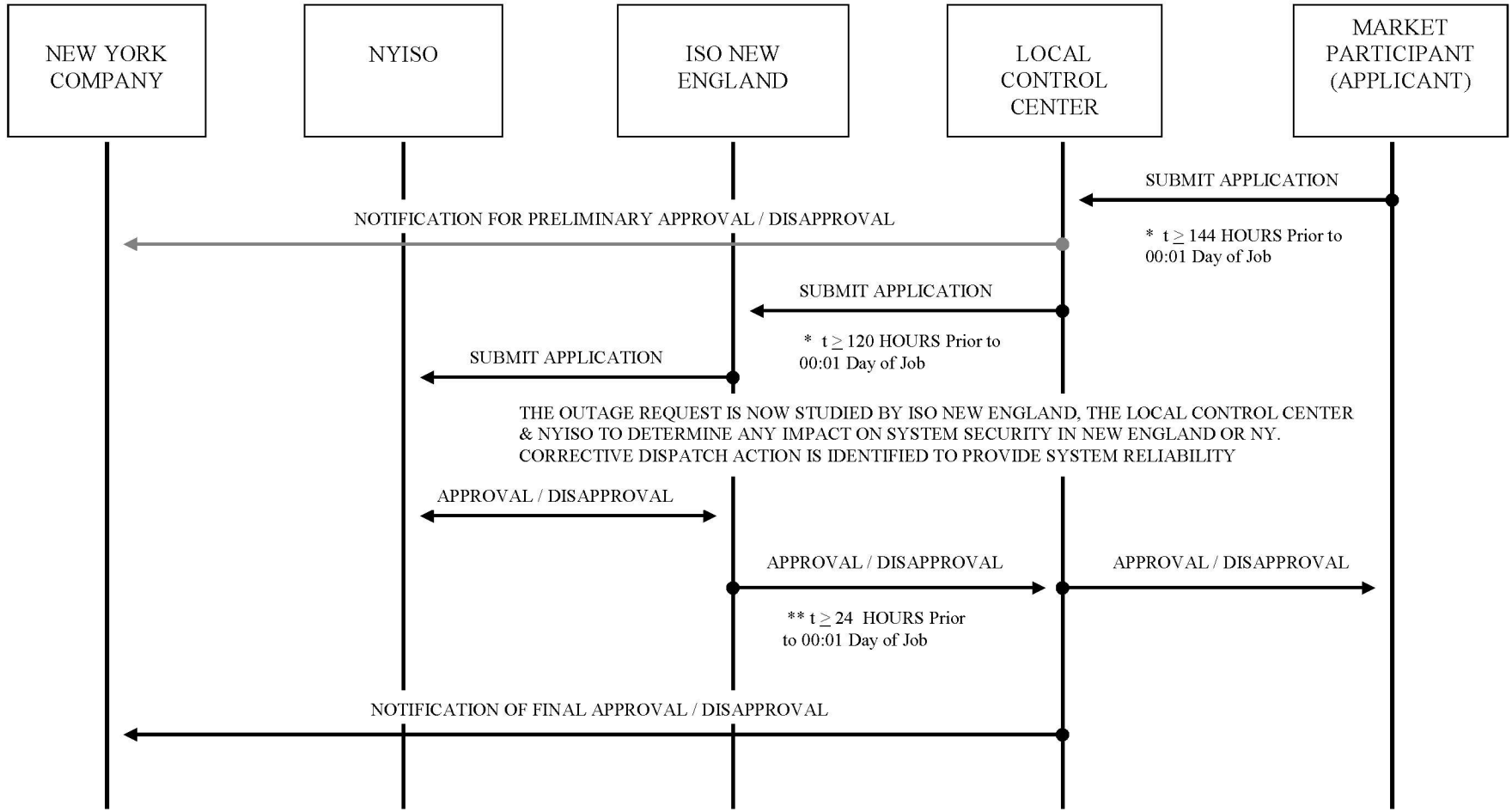
Massacusetts Electric Company d/b/a National Grid
DPU 09-01-B
Exhibit 41-Page 28 of 49

ATTACHMENT 1

INTERPOOL TRANSMISSION FACILITIES

NEW YORK – NEW ENGLAND

NEW ENGLAND WORK
TRANSMISSION OUTAGE COORDINATION – ADVANCE NOTICE MAINTENANCE APPLICATIONS



* REPRESENTS NUMBER OF HOURS PRIOR TO 00:01 THE OUTAGE START DAY. TIME MAY VARY WITH THE DAY OF THE WEEK AS OUTLINED IN SATELLITE PROCEDURES.
** REPRESENTS NUMBER OF HOURS PRIOR TO 00:01 THE OUTAGE START DAY AS OUTLINED IN ISO OP3.
NOTE: IF AN APPLICATION IS DISAPPROVED AT ANY POINT IN THIS PROCESS, A NEW APPLICATION IS SUBMITTED TO SCHEDULE THE WORK ON AN ALTERNATE DATE.

Massacusetts Electric Company d/b/a National Grid
DPU 09-01-B
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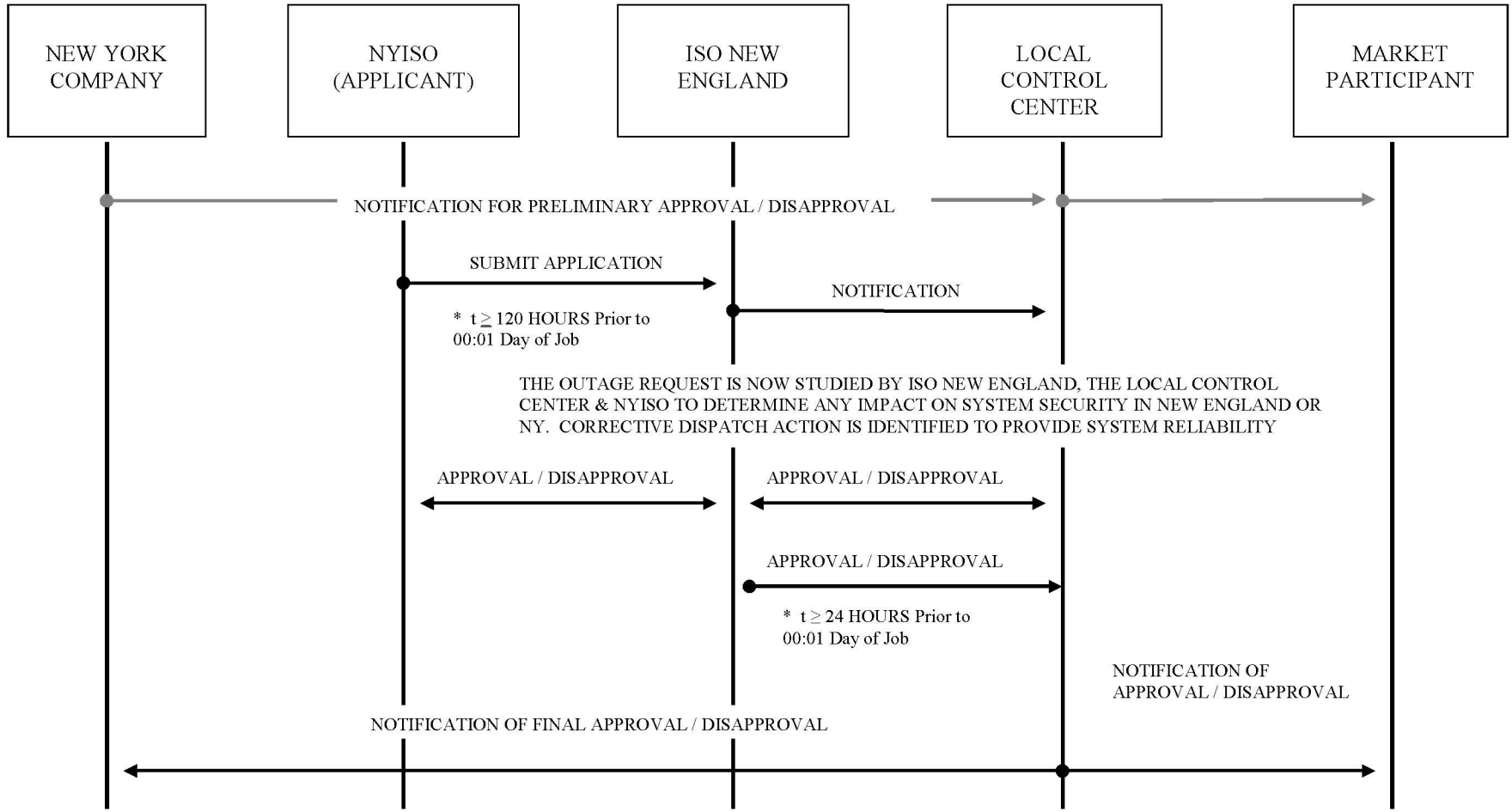
ATTACHMENT 2

INTERPOOL TRANSMISSION FACILITIES

NEW YORK – NEW ENGLAND

NEW YORK WORK
TRANSMISSION OUTAGE COORDINATION – ADVANCE NOTICE MAINTENANCE APPLICATIONS



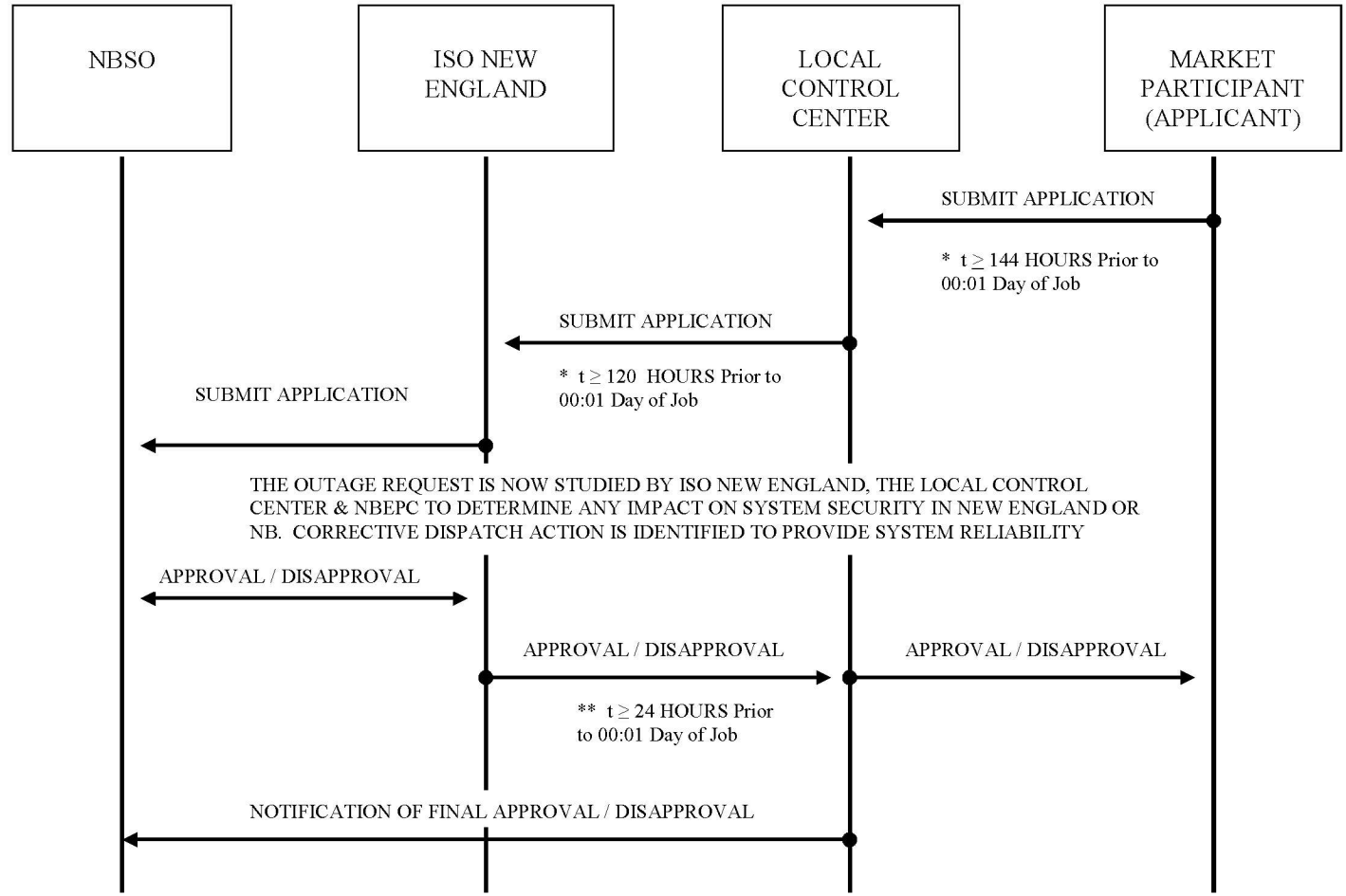
* REPRESENTS NUMBER OF HOURS PRIOR TO 00:01 THE OUTAGE START DAY AS OUTLINED IN ISO-NE OP3.
NOTE: IF AN APPLICATION IS DISAPPROVED AT ANY POINT IN THIS PROCESS, A NEW APPLICATION IS SUBMITTED TO SCHEDULE THE WORK ON AN ALTERNATE DATE.

ATTACHMENT 3

INTERPOOL TRANSMISSION FACILITIES

NEW BRUNSWICK – NEW ENGLAND

NEW ENGLAND WORK
TRANSMISSION OUTAGE COORDINATION – ADVANCE NOTICE MAINTENANCE APPLICATIONS



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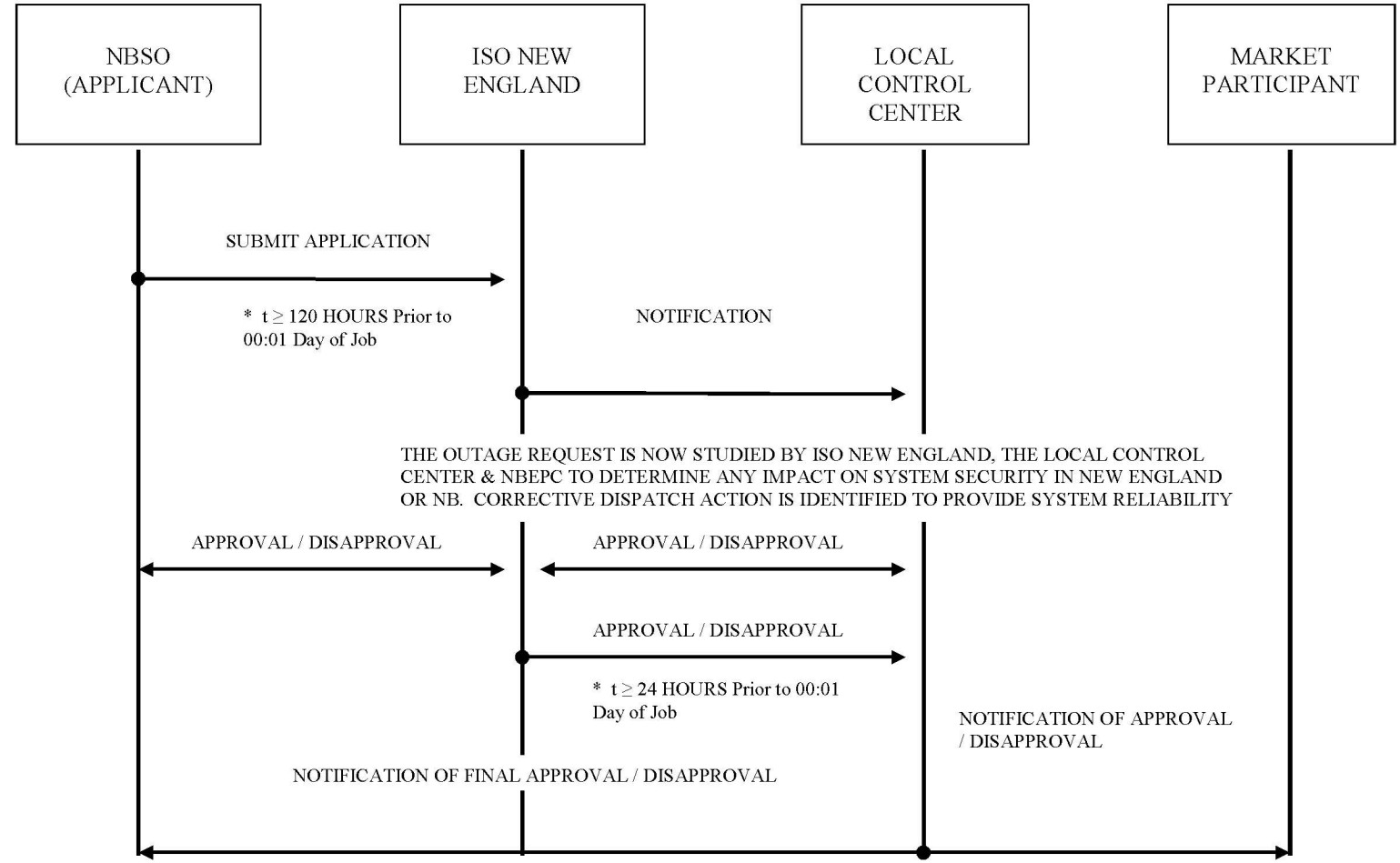
ATTACHMENT 4

INTERPOOL TRANSMISSION FACILITIES

NEW BRUNSWICK – NEW ENGLAND

NEW BRUNSWICK WORK
TRANSMISSION OUTAGE COORDINATION – ADVANCE NOTICE MAINTENANCE APPLICATIONS



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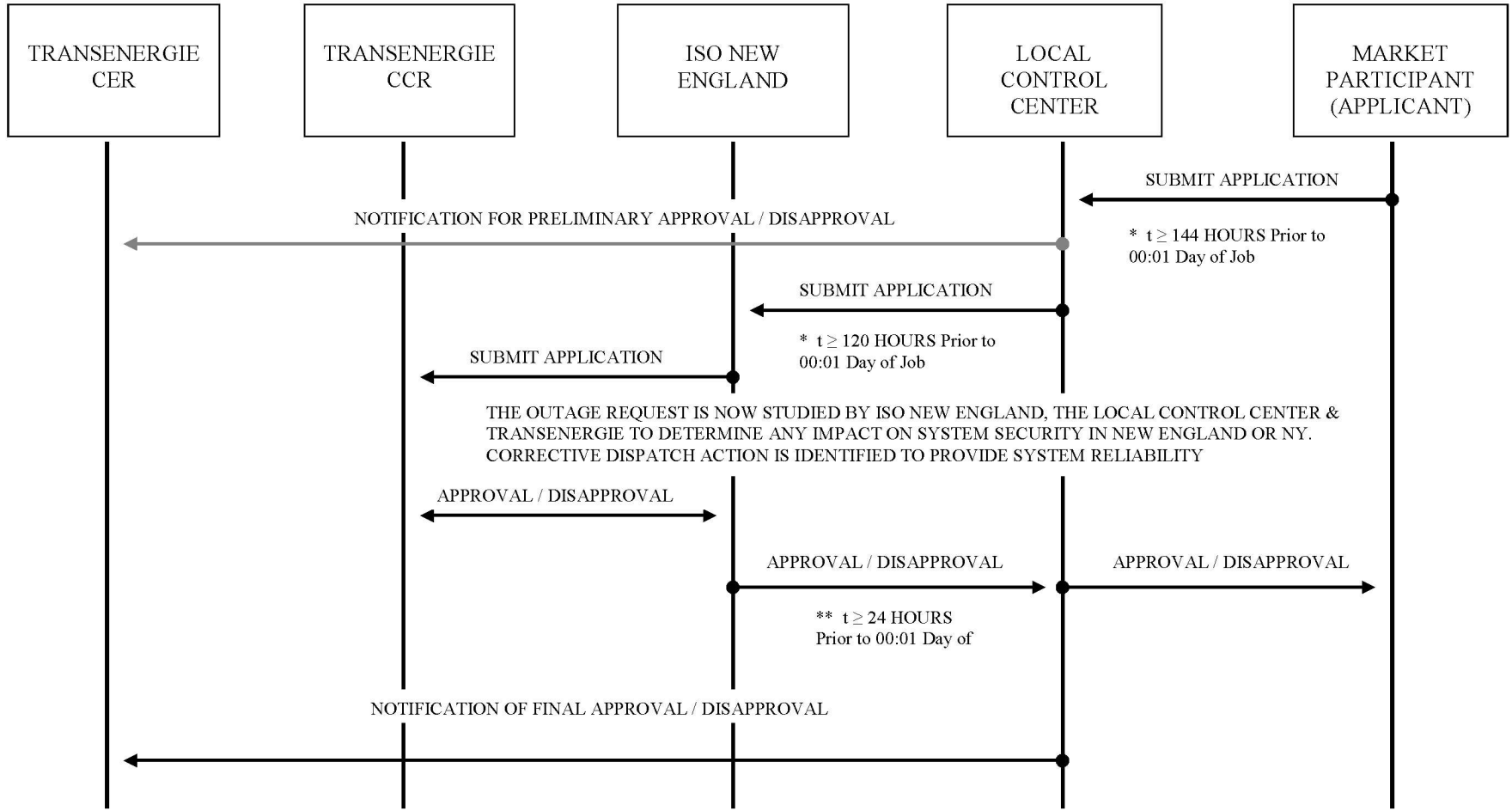
ATTACHMENT 5

INTERPOOL TRANSMISSION FACILITIES

TRANSENERGIE – NEW ENGLAND

NEW ENGLAND WORK
TRANSMISSION OUTAGE COORDINATION – ADVANCE NOTICE MAINTENANCE APPLICATIONS



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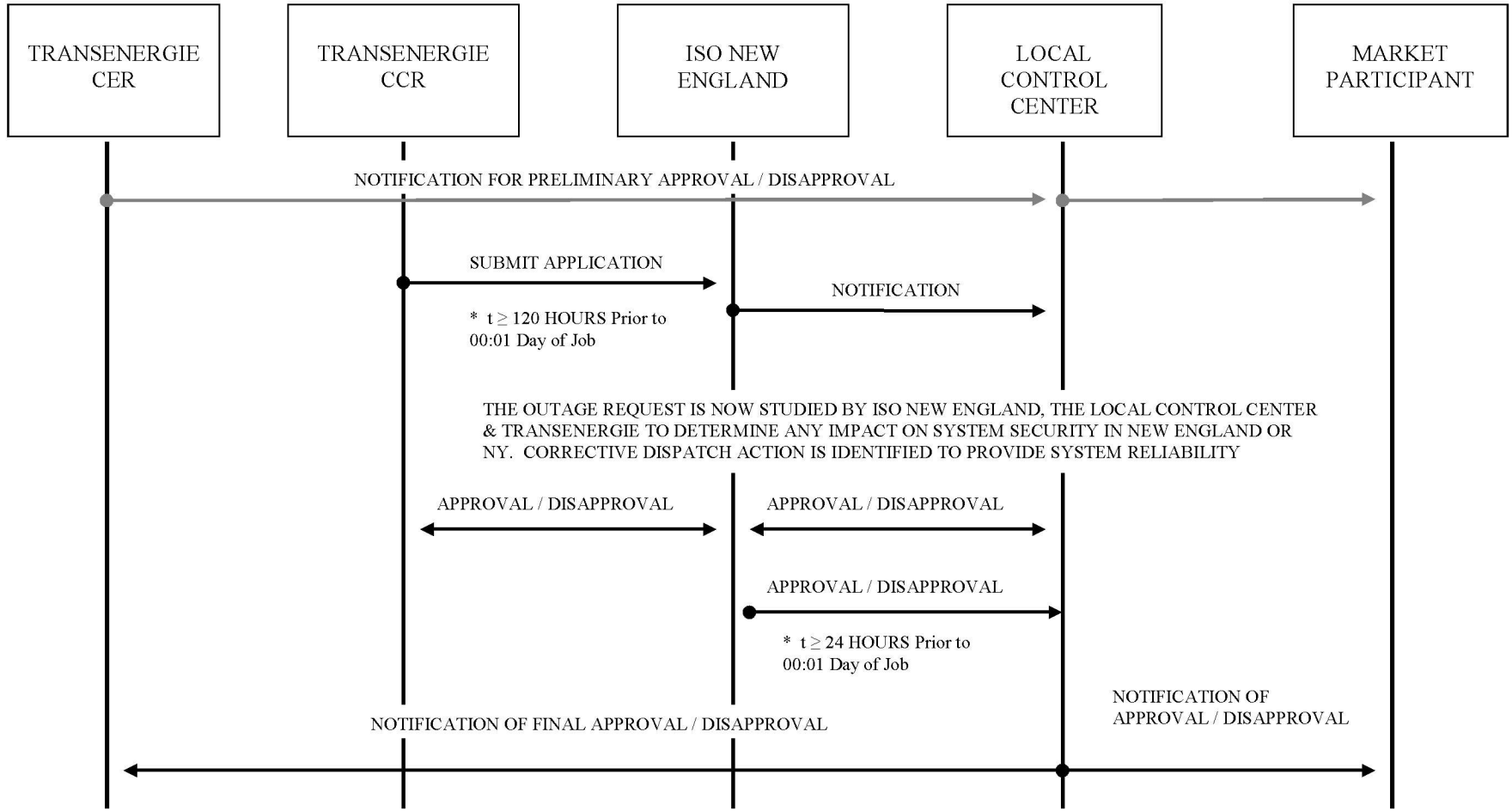
ATTACHMENT 6

INTERPOOL TRANSMISSION FACILITIES

TRANSENERGIE – NEW ENGLAND

TRANSENERGIE WORK
TRANSMISSION OUTAGE COORDINATION – ADVANCE NOTICE MAINTENANCE APPLICATIONS



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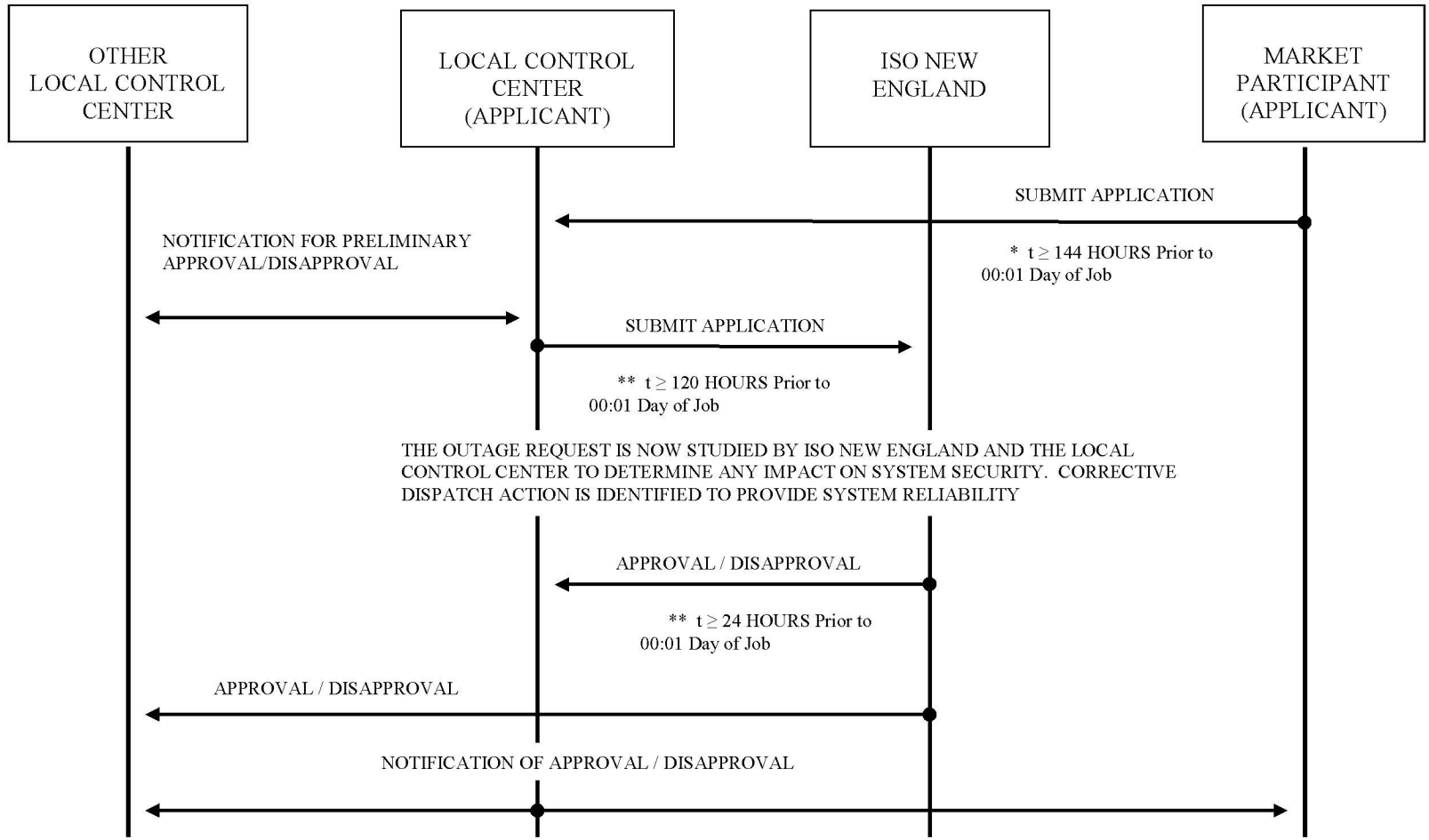
ATTACHMENT 7

INTER-SATELLITE TRANSMISSION FACILITIES

TRANSMISSION OUTAGE COORDINATION – ADVANCE NOTICE MAINTENANCE APPLICATIONS



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DPU 09-01-B
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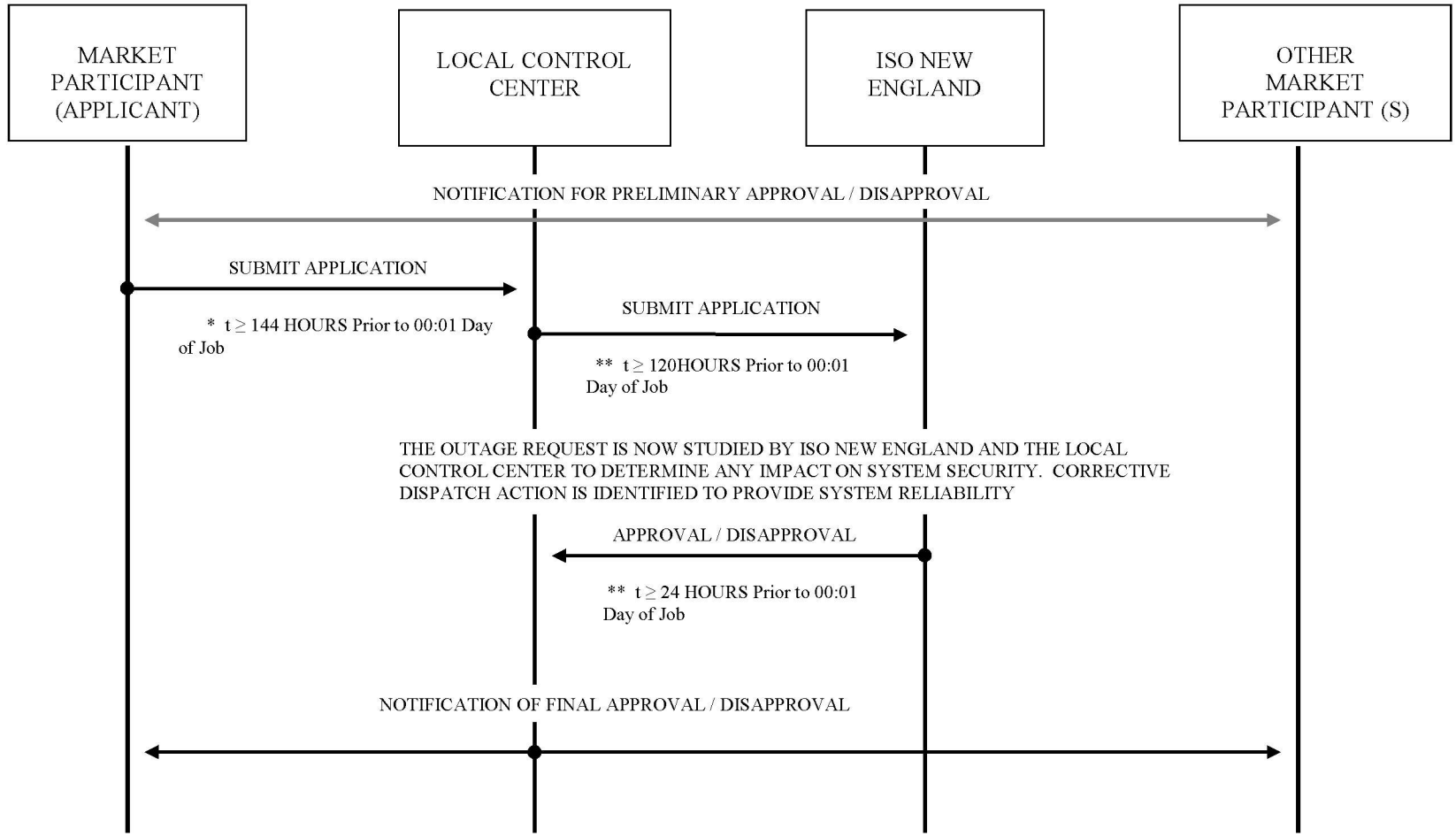
ATTACHMENT 8

INTER-SATELLITE TRANSMISSION FACILITIES

INTER – COMPANY WORK

TRANSMISSION OUTAGE COORDINATION – ADVANCE NOTICE MAINTENANCE APPLICATIONS



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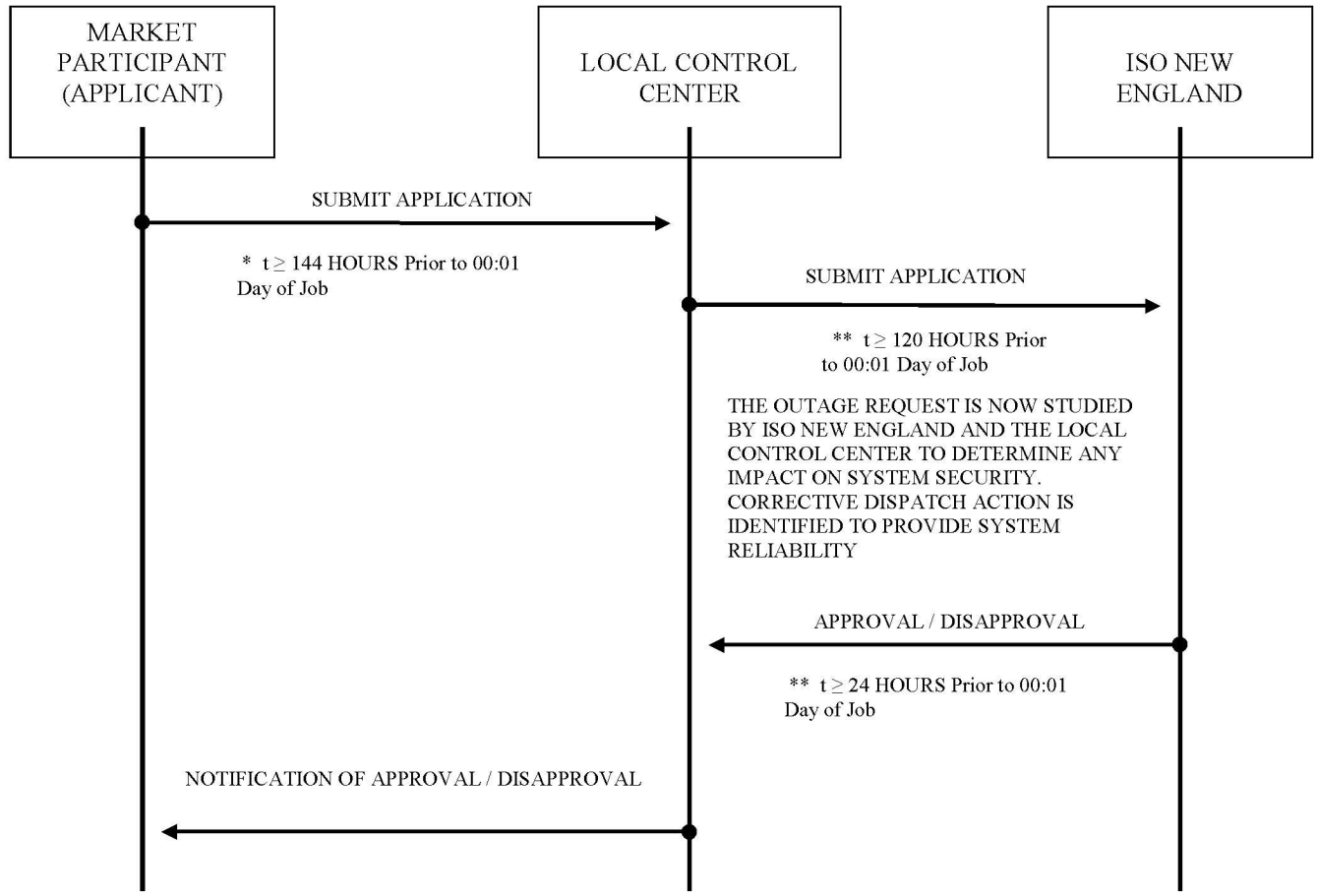
ATTACHMENT 9

INTER-SATELLITE TRANSMISSION FACILITIES

INTER – COMPANY WORK

TRANSMISSION OUTAGE COORDINATION – ADVANCE NOTICE MAINTENANCE APPLICATIONS



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OP 3 Attachments 1 - 9 Revision History

Document History (This Document History documents action taken on the equivalent NEPOOL Procedure prior to the RTO Operations Date as well revisions made to the ISO New England Procedure subsequent to the RTO Operations Date.)

Rev. No.	Date	Reason
Rev 1	4/25/02	
Rev 2	02/01/05	Updated to conform to RTO
Rev 3	12/15/08	Updated to conform to new OP#3 timeline requirements

ISO new england

Operating Procedures

ISO New England Operating Procedure No. 3

Transmission Outage Scheduling – Appendix B – ISO New England Standard 115kV and Above Transmission Line Patrol & Inspection Program

Effective Date: February 1, 2005
Revision No. 1

Massacusetts Electric Company d/b/a National Grid
DPU 09-01-B
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APPENDIX B - ISO NEW ENGLAND STANDARD 115 kV & ABOVE TRANSMISSION LINE PATROL & INSPECTION PROGRAM

I. OBJECTIVE

In order to achieve and maintain a high degree of reliability on the New England transmission system, the Transmission Committee has adopted the following standard patrol and inspection program for the ISO controlled transmission lines of the Participants.

II. GENERAL

Scheduled patrols and inspections of the ISO controlled transmission lines shall be the responsibility of each Transmission Owner. There are required special patrols for transmission lines which trip and reclose due to unknown causes, and for lines, which trip and cannot be re-energized. A method is provided for coordination of emergency patrols on tandem-owned transmission lines.

III. EVALUATION

The results of these standards shall be evaluated annually by the Transmission Owner, and at intervals no greater than every three years by the Transmission Committee working with the New England Transmission Maintenance and Construction Task Group (NETMCTG). Transmission Owner will have one full maintenance cycle to become fully compliant with this standard as approved, or any subsequent revision. A full maintenance cycle is defined as the minimum time interval specified in the Standard Patrol and Inspection Schedule (Section V. of this document) for each of the various inspection tasks. For example: if poles must be re-inspected within ten years of their last inspection, a minimum of one tenth of all pole plant must be re-inspected each year of the 10 year full maintenance cycle from the approval date of this document.

IV. EXCEPTIONS

The Transmission Committee recognizes that unusual local circumstances may occasionally justify deviations from these standards. The Transmission Owner is expected to bring such conditions to the attention of the committee.

V. STANDARD ISO CONTROLLED TRANSMISSION LINE INSPECTION PROGRAM

Standard Patrol and Inspection Schedule

1. At least one (1) visual patrol annually.
2. Climbing inspections will be performed as dictated by visual patrols.

3. Initial wood pole ground line inspection not later than 10 years after installation for all species. Re-inspect poles within 10 years of initial inspection. Thereafter, poles that do not receive re-treatment will be re-inspected at five year intervals. Poles that are retreated, will be re-inspected within ten years of the last re-treatment.

4. A Ground Line inspection of the footings and legs of steel towers and direct buried steel poles shall be performed every 20 years.

5. A Heat Sensing inspection shall be performed at a minimum of four year intervals. It is preferable that during the inspection and for a period of one hour before the inspection the line operates at a minimum of 50% of its thermal capacity. However, no PTF lines shall be opened to artificially load the line to be inspected unless the next contingency which could then develop has been determined by the ISO or appropriate Local Control Center to have minimal effect on system security.

Required Special Patrols

6. Patrol lines that have tripped and cannot be re-energized due to a permanent fault as soon as possible after lock-out unless the fault location is positively fixed.

7. Patrol, within the next working week, lines which trip from unknown causes, at all terminals and successfully reclose. Local Control Centers shall notify Transmission Owners and request such patrols.

VI. STANDARD EMERGENCY PATROL PROCEDURE ON TANDEM – OWNED TRANSMISSION LINES

1. Local Control Centers confirm loss of circuit, note relays that operated at all terminals and exchange this information.

2. Local Control Centers notify the designated persons in the companies involved and request patrol.

3. The designated representatives in each of the companies involved, contact each other and arrange plans for patrol of the circuit so that there will not be an overlap.

4. As agreed to by the designated representatives, one will initiate an aerial patrol to inspect the entire line regardless of ownership.

5. If it is impractical to initiate an aerial patrol, the designated individuals will implement ground patrols. As prearranged, the line will be divided into sufficient patrol sections to accomplish the patrol in the shortest practical time.

6. The Transmission Owner will normally make the repairs. The designated representatives in each company may agree to the repair being made by either company. The billing for repairs will be at prevailing rates.

OP 3 APPENDIX B REVISION HISTORY

Document History (This Document History documents action taken on the equivalent NEPOOL Procedure prior to the RTO Operations Date as well revisions made to the ISO New England Procedure subsequent to the RTO Operations Date.)

Rev. No.	Date	Reason
Rev 1	02/01/05	Updated to conform to RTO terminology

ISO new england

Operating Procedures

ISO New England Operating Procedure No. 3

Transmission Outage Scheduling – Appendix C – ISO New England Right-of-Way Vegetation Management Standard

Effective Date: February 1, 2005
Revision No. 1

Massacusetts Electric Company d/b/a National Grid
DPU 09-01-B
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APPENDIX C - ISO NEW ENGLAND RIGHT-OF-WAY VEGETATION MANAGEMENT STANDARD

I. OBJECTIVE

In order to achieve and maintain a high degree of reliability for the New England Transmission System, the Transmission Committee adopts the following standard for vegetation management of rights-of-way.

II. GENERAL

One of the factors affecting reliability is the control of vegetation in and near the transmission rights-of-way. The Vegetation Management Standards Task Group has established right-of-way clearing standards for transmission lines that are important to the New England Transmission System . These standards apply to original clearing for line construction and ongoing preventative maintenance.

It is recognized that individual company rights-of-way vegetation management practices vary for a number of valid reasons. Initially, rights-of-way are generally clear-cut to facilitate construction. Thereafter, ongoing preventive maintenance is necessary to maintain a low growing plant community. The general practice in most areas is to maintain as much growth of non-interfering species as necessary for visual screens at road crossings, residential yards adjacent to sensitive areas, or at locations such as ravines or river crossings where conductors are higher than normal above ground, with clear-cutting restricted to structure locations and along access roads.

Due to regulatory, economic and environmental considerations, transmission lines within New England are presented with a variety of vegetation control issues. Many areas require "buffers" or "screens" at highway crossings and other sensitive locations such as residential yards and agricultural areas. These areas will require special attention. Despite these compromises, vine, shrub and tree growth in selectively cut locations must not be allowed to develop to the point that they seriously hamper access to structures.

This standard establishes clearances, patrol cycles and best management practices to limit tree caused risk to the transmission lines. This standard does not suggest that all tree caused outages will be eliminated. The political, social and environmental expectations placed on utilities in New England prevent the clearing required to guarantee total system protection from falling trees. In severe weather events (hurricanes, micro bursts, tornadoes and ice storms) trees may fail and fall into lines.

III. CLEARANCE BETWEEN CONDUCTORS AND VEGETATION

The clearances established herein between conductor and vegetation are not intended to change the practices of individual Transmission Owners. These are the standard clearances that all companies will seek to maintain. Any company policy or practice which establishes clearances equal to or greater than specified herein is acceptable. It is also recognized that in certain situations, rights may not be obtainable from property owners to remove trees adjacent to the right-of-way. In these situations, other solutions should be explored. Transmission Owners will have one full maintenance cycle to become fully compliant with any changes adopted to this standard. One full maintenance cycle is usually 4-6 years for vegetation growing within the right-of-way and 10 years for vegetation growing from outside the edge of the right-of-way.

The standard clearances between conductors and vegetation are diagrammed on the attached sketch: Standard Clearance Between Conductors and Vegetation.

In addition to establishing and maintaining clearance from vegetation growing into conductors, danger trees can develop along the edges of rights-of-way. Danger trees are defined as sideline trees that due to their species, location and physical condition pose a significant risk to a conductor or structure. Best management practices will utilize contemporary forestry and arboricultural practices to mitigate the risk from danger trees.

IV. RIGHT-OF-WAY INSPECTION STANDARDS

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

A. Frequency

1. Scheduled patrols shall be the responsibility of each Transmission Owner.

2. 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.

B. Nature of Vegetation Patrol

1. Observe and record all vegetation conditions which might immediately affect the operation or maintenance of the lines.

2. The following list is representative of observations to make:

   a. Heights of vegetation in the transmission corridor.

   b. Clearance of road crossing screens/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 immediate threat to the lines.

C. Action Following Patrols

When vegetation is not in compliance with the standard, action shall be initiated within a reasonable time frame to obtain the conductor to vegetation clearance described in this Appendix.

V. EXCEPTIONS TO THE STANDARDS

The Transmission Committee recognizes that unusual local circumstances may occasionally justify deviations from these standards. The Transmission Owner is expected to bring such conditions to the attention of the committee. The reported deviations will be limited to cases where conditions exist over the entire length or significant length of a line, not individual spans.

VI. SUMMARY

It is commonly recognized that vegetation can contribute to electrical disturbances on transmission lines. Vegetation Management practices on rights-of-way vary throughout New England for many reasons. This standard establishes clearances, patrol cycles and best management practices as the criteria necessary to contribute to overall system reliability. Historically, similar guidelines have proven to be effective in achieving a high degree of system reliability.

PREPARED BY:

VEGETATION MANAGEMENT STANDARDS TASK GROUP

OP 3 APPENDIX C REVISION HISTORY

Document History (This Document History documents action taken on the equivalent NEPOOL Procedure prior to the RTO Operations Date as well revisions made to the ISO New England Procedure subsequent to the RTO Operations Date.)

Rev. No.	Date	Reason
Rev 1	02/01/05	Updated to conform to RTO terminology

ISO new england

Operating Procedures

ISO New England Operating Procedure No. 3

Transmission Outage Scheduling –
Appendix C Attachment

Effective Date: February 1, 2005
Revision No. 1

Massacusetts Electric Company d/b/a National Grid
DPU 09-01-B
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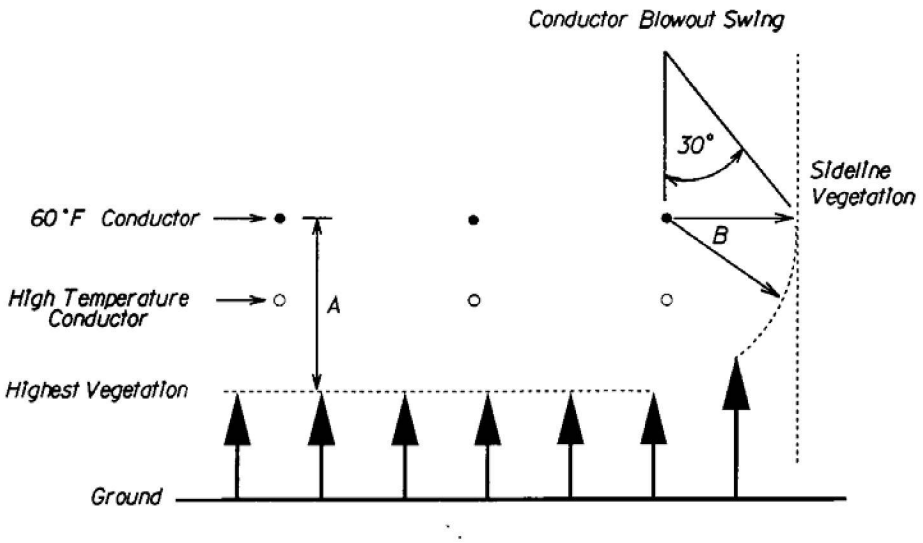
STANDARD CLEARANCE BETWEEN CONDUCTOR AND VEGETATION



Line Voltage	A (feet)	B (feet) 500 ft.span	750 ft.span	1000 ft.span
69/115kV	11	14	20	29
230kV	13	18	26	36
345kV	15	22	30	43

Footnotes:

A — Vertical clearance of 6, 8 and 10 feet for 69/115, 230 and 345kV, respectively, plus sag of 5 feet during high temperature operations.

B — Horizontal clearance of 6, 8 and 10 feet for 69/115, 230 and 345kV, respectively, plus 30 degree blowout at span lengths shown, and 6 pounds per square foot wind at 60 degree F.

A & B — In certain circumstances where above assumptions do not apply, more or less clearance may be required to meet the clearance of 6, 8 and 10 feet for 69/115, 230 and 345kV, respectively.

OP 3 APPENDIX C ATTACHMENT REVISION HISTORY

Document History (This Document History documents action taken on the equivalent NEPOOL Procedure prior to the RTO Operations Date as well revisions made to the ISO New England Procedure subsequent to the RTO Operations Date.)

Rev. No.	Date	Reason
Rev 1	02/01/05	Updated to conform to RTO terminology

nationalgrid	Operating Procedure: 3 Revision 10
	Page 1 of 29
New England Control Center/ REMVEC II Transmission Operations	Date: January 16, 2008

Subject: **SCHEDULING OUTAGES OF NEW ENGLAND CONTROL CENTER / REMVEC TRANSMISSION FACILITIES**

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National Grid Confidential

REVISED: July 9, 2008	APPROVED BY: Manager, New England Control Center / REMVEC

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nationalgrid New England Control Center/ REMVEC II Transmission Operations	Operating Procedure: 3 Revision 10 Page 2 of 29 Date: January 16, 2008

Subject: **SCHEDULING OUTAGES OF NEW ENGLAND CONTROL CENTER / REMVEC TRANSMISSION FACILITIES**

1. REFERENCES

1.1. NPCC Critical Facilities List (NPCC C–13 Appendix D)

1.2. NPCC Maintenance Criteria for Bulk Power System Protection (A-04)

1.3. ISO New England Operating Procedure No. 1 – Central Dispatch Operating Responsibility and Authority, ISO New England, the Local Control Centers and Market Participants (OP 1)

1.4. ISO New England Operating Procedure No. 19 – Transmission Operations Transmission Operating Agreement

1.5. ISO New England Operating Procedure No. 5 – Generator and Dispatchable Asset Related Demand Maintenance and Outage Scheduling (OP-5)

2. SCOPE

2.1. Transmission outages for construction, tests, maintenance or repair must be coordinated to ensure that reliability is maintained at levels prescribed by ISO New England (ISO) Operating Procedure No. 19 - Transmission Operations (OP-19). In addition, whenever possible, transmission, Generator and Dispatchable Asset Related Demand (DARD) outages will be coordinated to reduce congestion costs. For importing areas, economic Generators and DARDs within the area should not be scheduled out simultaneous with transmission facilities that significantly support area import capability. For exporting areas, Generator and DARD outages within the area should be coordinated coincident with the outage of transmission facilities that significantly support area export capabilities.

2.2. ISO-NE Operating Procedure No. 1 and New England Control Center/REMVEC Operating Procedure No. 1 - Operating Responsibilities and Jurisdiction, assigns to the New England Control Center/REMVEC the responsibilities of evaluating, approving or disapproving transmission outage applications for all facilities 69kV and above. Applications submitted by a Participant will be disapproved if the outage has an unacceptable impact upon the New England Control Center/REMVEC operations and/or causes violations of ISO-NE Operating Procedures.

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2.3. This procedure is to be followed when submitting requests for outages of transmission facilities under the operating responsibility and jurisdiction of the New England Control Center/REMVEC. Proper coordination and notification is essential in order to maintain a high degree of system reliability and to minimize the costs incurred in scheduling outages of transmission facilities.

3. DEFINITIONS

3.1. The **Long-Term Transmission Outage Plan (LTTOP)** is a twelve-month rolling projection of future transmission outages. It includes Category A and Category B facilities. Transmission Owners submit the LTTOP monthly to REMVEC for review.

3.2. An **Unplanned Outage** is any outage that fails to satisfy the lead times required for short-term outage scheduling. Every effort will be made to fully study these outages. There are four types of Unplanned Outages:

3.2.1. Emergency Outage
The obvious failure of a piece of transmission equipment that comes out of service on its own or requires immediate operator intervention to remove it from service.

3.2.2. Forced Outage
The discovery of a problem that needs to be repaired as soon as crews, equipment, and/or corrective dispatch actions can be put in place to allow the work to be performed. By definition, a Forced Outage cannot be scheduled. More specifically:

3.2.2.1. A Forced Outage cannot be delayed to avoid paying overtime rates; e.g. on a Friday, delaying a Forced Outage until Monday, rather than performing the work on Saturday. This implies that a Forced Outage must occur on consecutive days, except in the case described in the next bullet.

3.2.2.2. A Forced Outage cannot schedule an Alternate Date. If weather impairs safe work conditions, the outage can be moved to the next available fair weather day, and the planned end date/time shall be extended

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3.2.2.3. An Opportunity Outage that unexpectedly causes additional adverse impact on either system reliability or market efficiency beyond that which was originally anticipated. Typically this would be associated with the unexpected extension of the defined timing parameters.

3.2.3. Overrun Outage
This is any outage that fails to return to service by its planned end time, and the outage has extended into the next calendar day.

3.2.4. Opportunity Outage
An outage that is submitted for ISO Approval resulting from an unexpected opportunity to accomplish work that would otherwise require another outage at a less opportune time. It shall be coordinated to minimize the overall impact on system reliability and /or market efficiency.

3.3. Congestion Cost are the estimated increased expenses resulting from forecasted real-time commitment or re-dispatch of "out of merit" generation or the forecasted real-time re-dispatch or de-commitment of "in merit" generation in the Energy & Reserves Markets to respect **operating criteria.**

3.4. Category "A" Transmission Facilities

3.4.1. All circuits ≥ 115kV except 115kV radial circuits
3.4.2. All ties between ISO and neighboring Control Areas (regardless of voltage)
3.4.3. All transformers that:
3.4.3.1. Have one or more "A" facilities on the low voltage side
3.4.3.2. Require an "A" facility to be taken out of service with the transformer
3.4.4. Equipment associated with an "A" facility
3.4.4.1. Circuit breakers, disconnects.
3.4.4.2. Relays, reclosing.
3.4.4.3. Shunts, SVCS, STATCOMs.
3.4.4.4. PARs.
3.4.4.5. SPSs

3.5.

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Category "B" Transmission Facilities

3.5.1. All 115kV radial circuits
3.5.2. All 69kV circuits (except ties between ISO and neighboring Control Areas)
3.5.3. All transformers that have one or more "B" and no "A" facilities on the low side
3.5.4. Equipment associated with a "B" facility

3.5.4.1. Circuit breakers, disconnects.
3.5.4.2. Relays, reclosing.
3.5.4.3. Shunts, SVCS, STATCOMs.
3.5.4.4. PARs.
3.5.4.5. SPSs

3.6. Local Area Transmission Facilities:

3.6.1. All circuits < 69kV
3.6.2. All transformers with no "A" or "B" facilities on the low side

A complete listing of Category A and B transmission circuits can be found on the ISO OASIS at http://www.iso-ne.com/smd/transmission services/oasis/.

4. PROCEDURE

4.1. Long Term Transmission Outage Plan (LTTOP)

4.1.1. The New England Control Center/REMVEC shall submit their updated monthly LTTOP to ISO New England no later than the 15th of each month.

4.1.2. Prior to relaying the updated LTTOP to ISO-NE for final evaluation and approval, the New England Control Center/REMVEC shall review the proposed LTTOP and the short term transmission outage applications and compare them with generator outage plans and applications received from ISO-NE as follows:

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4.1.2.1. Evaluate the impacts of proposed transmission outages on the reliability of the New England Control Center/REMVEC operations. Reposition or disapprove any outage that could be expected to violate area reliability criteria and for which repositioning the outage could reasonably be expected to improve reliability.

4.1.2.2. Identify and pursue cases where generator and transmission outages could be adjusted to reduce / eliminate congestion costs. In each case, the New England Control Center/REMVEC will facilitate / coordinate outages as detailed in ISO-NE Operating Procedure No. 3.

4.2. Short Term Outage Scheduling

4.2.1. Participant Responsibility:

4.2.1.1. When requesting an outage of a transmission facility, it shall be the responsibility of the Participant to provide the New England Control Center/REMVEC with all the pertinent information relative to the outage as required on the TOA (Transmission Outage Application, See Appendix C). Prior to an application being submitted for the New England Control Center/REMVEC approval, the Participant must examine the outage for local impact and, in the case of inter-company lines, discuss the proposed outage with the connected company.

4.2.1.2. If a Participant desires to cancel or reschedule an outage request, the New England Control Center/REMVEC shall be notified promptly. Requests for emergency outages of transmission facilities shall be submitted immediately by the Participant. The New England Control Center/REMVEC will take appropriate action to facilitate the emergency request. If human life or property is in danger, the Participant can take action deemed necessary, notifying the New England Control Center/REMVEC as soon as possible of the action taken.

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4.2.1.3. When a Participant receives approval of an application from the New England Control Center/REMVEC, the Participant shall be responsible for scheduling switchmen. In the case of an inter-company line, it shall be the responsibility of the Participant initiating the application to schedule switchmen with the other connected companies.

4.2.1.4. If an application is disapproved, the New England Control Center/REMVEC and the Participant shall endeavor to determine alternate dates when the application may be approved. The application shall be re-submitted following the previously prescribed rules.

4.2.1.5. Before switching can begin on the requested application, permission must be obtained from the New England Control Center/REMVEC by the initiating Participant. Once permission to start switching on the application has been obtained, it is the responsibility of the initiating Participant to issue the necessary switching and tagging orders to the switchmen and, in the case of an inter-company line, notify the connected company that they may begin switching operations. When the switching and tagging has been completed, it is the responsibility of the Participant to issue work clearances to workers and advise the New England Control Center/REMVEC of the time the equipment was de-energized and when work clearances were issued.

4.2.2. New England Control Center/REMVEC Responsibility:

4.2.2.1. It shall be the responsibility of the New England Control Center/REMVEC to receive advance requests from the Participants for outages of Category "A" and "B" transmission facilities within the REMVEC area. The New England Control Center/REMVEC will then proceed to conduct studies to determine the effect of the outage on the New England Control Center/REMVEC transmission system.

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4.2.2.2. The New England Control Center/REMVEC will disapprove any outage requests that have an unacceptable impact upon operations in the New England Control Center/REMVEC area. The New England Control Center/REMVEC is also responsible for reviewing transmission outages for opportunities to adjust generator and transmission outage schedules to minimize congestion. Appropriate outage request approved by the New England Control Center/REMVEC shall be forwarded to ISO-NE which will conduct studies to determine the effect of the outage on the New England transmission systems. ISO-NE has the final responsibility of evaluating, approving or disapproving outages for Category A & B facilities.

4.2.2.3. The New England Control Center/REMVEC will make every effort to notify the Participants of approved and disapproved outages as soon as possible and definitely no later than twenty-four (24) hours prior to 00:01 of the day the outage is scheduled to begin. If disapproved, reasons shall be clearly stated and alternative dates provided. If the application is approved, The New England Control Center/REMVEC shall notify any affected Participants that may wish to schedule work in conjunction with the approved application. If it is necessary to cancel or reschedule any outage request, the New England Control Center/REMVEC will notify ISO-NE promptly.

4.2.2.4. Requests for emergency outages of Category "A" transmission facilities shall be forwarded to ISO-NE immediately. ISO-NE will take appropriate action to facilitate the emergency request. If human life or property is in danger, or service has been interrupted, the New England Control Center/REMVEC will take action deemed necessary and notifying ISO-NE as soon as possible of the action taken.

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4.3. APPLICATION TIMING:

4.3.1. Outages of transmission facilities may require extensive study and coordination by the New England Control Center/REMVEC and ISO-NE. It is essential that adequate time is allowed to perform these functions. Participants shall submit outage requests of all Category "A" and "B" facilities to the New England Control Center/REMVEC at least ten (10) days prior to the day the work is scheduled to begin.

4.3.2. Utilizing the ISO Outage Scheduler, the New England Control Center/REMVEC shall submit these applications to ISO-NE at least seventy-two (72) hours prior to 00:01 of the day the work is scheduled to begin.

4.4. REPORTS:

4.4.1. The New England Control Center/REMVEC shall forward to ISO-NE by 1000 daily, all Category "B" facilities that are scheduled out of service for the following day. (Friday's report will include equipment scheduled out of service for Saturday, Sunday and Monday. Outages scheduled on holidays will be reported on the last regular weekday before the holiday.)

4.4.2. The New England Control Center/REMVEC will forward to the Participants by FAX mail (or similar equipment), ALL transmission facilities that are scheduled out of service for the following day using the same "time" criteria as above.

4.5. REVIEWING SCHEDULED OUTAGES:

4.5.1. Between 1900 and 0700 hours preceding the scheduled outage, The New England Control Center/REMVEC and ISO-NE will continue to perform power flow studies that include the latest forecast data and any changes on the power system that may not have been included in previous studies. The New England Control Center/REMVEC and ISO-NE will re-evaluate the day's outages to verify that work will proceed as scheduled. When scheduled outages are cancelled by the New England Control Center/REMVEC or ISO-NE, the New England Control Center/REMVEC will notify participants as soon as possible.

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5. TRANSMISSION OUTAGE APPLICATION PROCESS RESPONSIBILITY

5.1. The New England Control Center/REMVEC Outage Coordinator is responsible for accepting, analyzing, and approving transmission outage requests under normal circumstances.

5.2. When the New England Control Center/REMVEC Outage Coordinator is unavailable, the Security Operator is responsible for the following:

5.2.1. Accepting outage requests.

5.2.2. Analyzing and approving/disapproving requests requiring immediate attention (outage requests dealing with the next several days).

5.2.3. Assist in decreasing the backlog of outage requests that occur during heavy maintenance periods.

5.3. ACCEPTING TRANSMISSION OUTAGE REQUEST

5.3.1. The New England Control Center/REMVEC Outage Coordinator/Security Operator shall review the start date of any requested outage and determine whether it meets the notification requirements of this document

5.3.2. Outage request meeting the notification requirements shall be accepted into the TOA program. Applicable outages approved by the New England Control Center/REMVEC will then be entered into the ISO-NE Outage Scheduler program.

5.3.3. Under certain circumstances a Participant may need an immediate outage that fails to satisfy the notification requirements. There are four types of unplanned outages:

5.3.3.1. Emergency Outage.
5.3.3.2. Forced Outage.
5.3.3.3. Overrun Outage.
5.3.3.4. Opportunity Outage

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5.4. ANALYSIS OF REQUESTED TRANSMISSION OUTAGES:

5.4.1. The New England Control Center/REMVEC Outage Coordinator/Security Operator shall determine whether the requested transmission outage requires a voltage or stability analysis and, if so, forward the application to the appropriate ISO-NE support staff. The support staff will use appropriate software to assist in performing voltage and stability studies. Once the support staff finalizes their study, they will return their results back to the New England Control Center/REMVEC Outage Coordinator/Security Operator.

5.4.2. The New England Control Center/REMVEC Outage Coordinator/Security Operator shall analyze requested transmission outages using the study power flow program and security analysis program, which shall include in the model:

5.4.2.1. Forecasted load and Generation Patterns

5.4.2.2. Updated System Status

5.4.2.3. Known transmission outages (up to this point in the process).

5.4.3. The New England Control Center/REMVEC Outage Coordinator/Security Operator shall use other available tools and documents to further evaluate the requested transmission outage. Available tools include, Transmission Operating Guides, ISO-NE OP-19 criteria, Participant switching guidelines and prior operations experience.

5.4.4. The New England Control Center/REMVEC Outage Coordinator/Security Operator shall determine whether the requested outage can be approved based on ISO-NE OP-19 criteria.

5.4.5. For unplanned outages and if time exists while crews, equipment, and/or corrective dispatch action arrangements are being made, the Participant will provide the New England Control Center/REMVEC with all pertinent information to allow for study of the outage and prioritization with other dispatch requirements.

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5.4.6. When giving a disapproval notification, the New England Control Center/REMVEC must clearly state the reasons for disapproval. Those reasons must be specific and relate to specific violations of ISO-NE and/or New England Control Center/REMVEC Operating Procedures.

5.5. DETERMINATION OF MUST RUN AND CONSTRAINED GENERATION

5.5.1. In cases where the ISO-NE OP-19 criteria cannot be met with the anticipated generation pattern, the New England Control Center/REMVEC Outage Coordinator/Security Operator shall run additional load flows and determine:

5.5.1.1. If must run generation is required and if so which units will efficiently improve system operations.

5.5.1.2. If constraining generation is required and if so, which units will efficiently improve system operations.

5.5.2. The New England Control Center/REMVEC Outage Coordinator/Security Operator shall provide the ISO with a list of units identified as either must run or constrained. The generators identified as must run or constrained may consist of specific designated generating units or a number of MW needed to ensure transmission reliability in a designated area.

5.6. FINAL APPROVAL

5.6.1. The New England Control Center/REMVEC Outage Coordinator/Security Operator shall approve the requested outage providing that:

5.6.1.1. New England Control Center/REMVEC OP-3, ISO-NE OP-3 & ISO-NE OP-19 criteria are anticipated to be satisfied.

5.6.1.2. Contingency coverage has been accounted for.

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5.6.2. The on shift Security Operator shall be the final authority to allow a transmission outage to be performed. ***Note: The on shift Security Operator may evaluate outages using updated information or real time data. This evaluation may be different than the study performed by the New England Control Center/REMVEC Outage Coordinator and may result in denying a previously approved transmission outage request.***

5.6.3. If an outage request is denied, New England Control Center/REMVEC must clearly state the reasons for disapproval. Those reasons must be specific and relate to specific violations of New England Control Center/REMVEC and/or ISO-NE operating procedures.

5.6.4. In the event a transmission outage is cancelled after being approved, the New England Control Center/REMVEC Outage Coordinator working with the Participants will determine a suitable time to perform the work.

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6. CALCULATIONS

6.1. During the study phase of the application process it is imperative that ISO-NE and the New England Control Center/REMVEC calculate distribution and adjustment factors in the same manner, therefore the New England Control Center/REMVEC shall calculate distribution and adjustment factors using the formulas and examples found in ISO-NE procedure OUTSCH.0030.0020 – Evaluate Outage Requests. They include:

6.2. Calculating Distribution & Adjustment Factors

6.2.1. This attachment provides examples of how to calculate distribution and adjustment factors.

Distribution factors are an important operational tool that allows the System Operator to quickly estimate power flows prior to transmission lines being taken out of service. The distribution factor is calculated using a simple mathematical formula:

$$\text{Distribution factor (DF)} = \frac{\text{Limiting Element } \Delta\text{MW flow}}{\text{Contingent Element Pre-flow}}$$

Limiting Element ΔMW flow is the change in MW for the line being studied (Post-contingent flow – Pre-contingent flow)

Contingent Element Pre- flow is the initial MW flow on the contingent line, Post-contingent flow is always "0"MW.

The distribution factor is expressed as a percentage.

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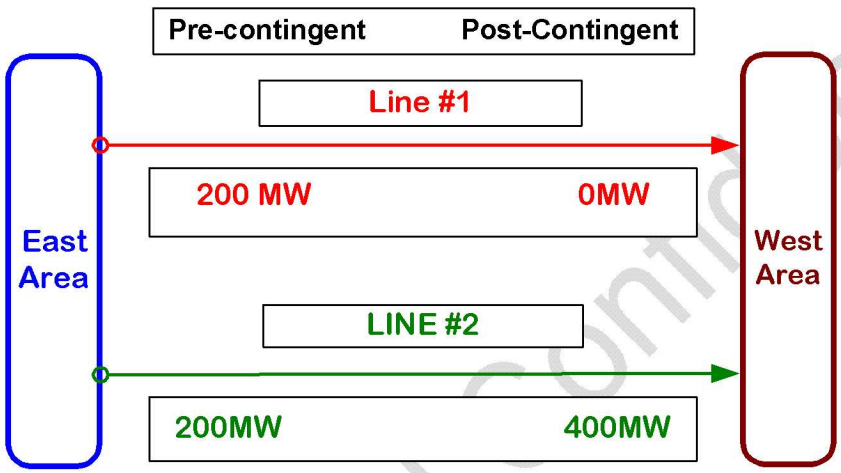
Single Contingencies
Example #1:

Generic Two Line Interface



In the simple two-line interface connection illustrated above, the power flowing across Lines #1 and #2, before Line #1 trips, is known as pre-contingent flow. Both lines are identical and share the total power, 400MW, flowing from east area to west area equally. The power flowing across Line #2 after Line #1 trips is known as post-contingent flow.

Use the formula to calculate the distribution factor in example one:

$$\text{Distribution factor (DF)} = \frac{\text{Limiting Element } \Delta\text{MW flow}}{\text{Contingent Element Pre-flow}}$$

$$\text{DF} = \frac{400\text{MW} - 200\text{MW}}{200\text{MW}} = \frac{200\text{MW}}{200\text{MW}} = 1 \text{ or } 100\%$$

In example #1, all the power flowing across Line #1 is transferred to, or picked up by, Line #2. This is commonly described as Line #2 having a 100% **distribution factor** for the loss of Line #1. This would also hold true for the loss of Line #2 onto Line #1.

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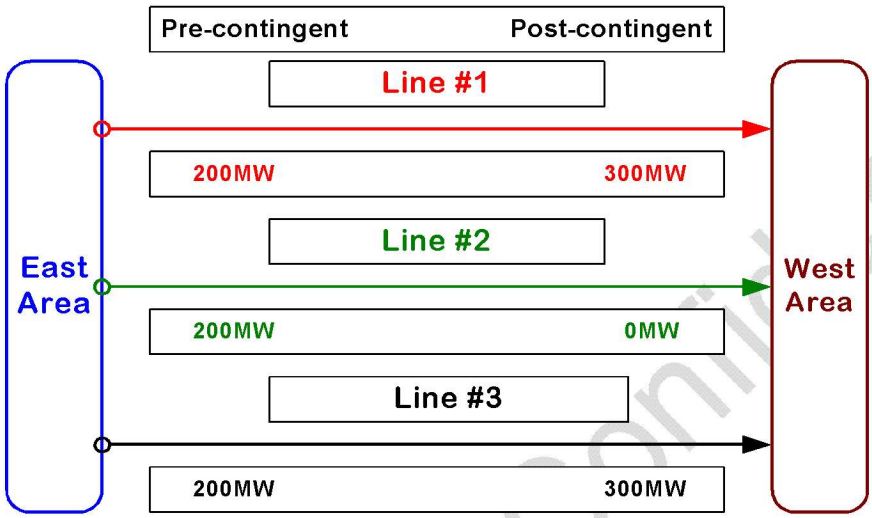
Example #2:



Generic Three Line Interface

Example #2 illustrates a simple three-line interface in which all three lines are identical. Before the contingency the west area is drawing 600MW from the east area. The power transferred into the west area remains constant after the contingency occurs and must be carried by the remaining two lines.

$$DF = \frac{\text{Limiting Element } \Delta\text{MW flow}}{\text{Contingent Element Pre-flow}} = \frac{300MW - 200MW}{200MW} = \frac{100MW}{200MW} = \frac{1}{2} = .5 \text{ or } 50\%$$

The pre-contingent flow across Line 2 was 200MW. Since the three lines are exactly alike, Lines 1 and 3 will share the 600MW equally after Line #2 trips. Lines 1and 3 pick up 100MW apiece after Line 2 trips, which equates to a 50% distribution factor for each of the remaining lines.

Examples 1 and 2 are highly simplified in order to illustrate the basic concepts of contingency analysis. Transmission lines connecting substations or control areas are rarely identical. The following examples discuss dissimilar lines and multiple contingencies.

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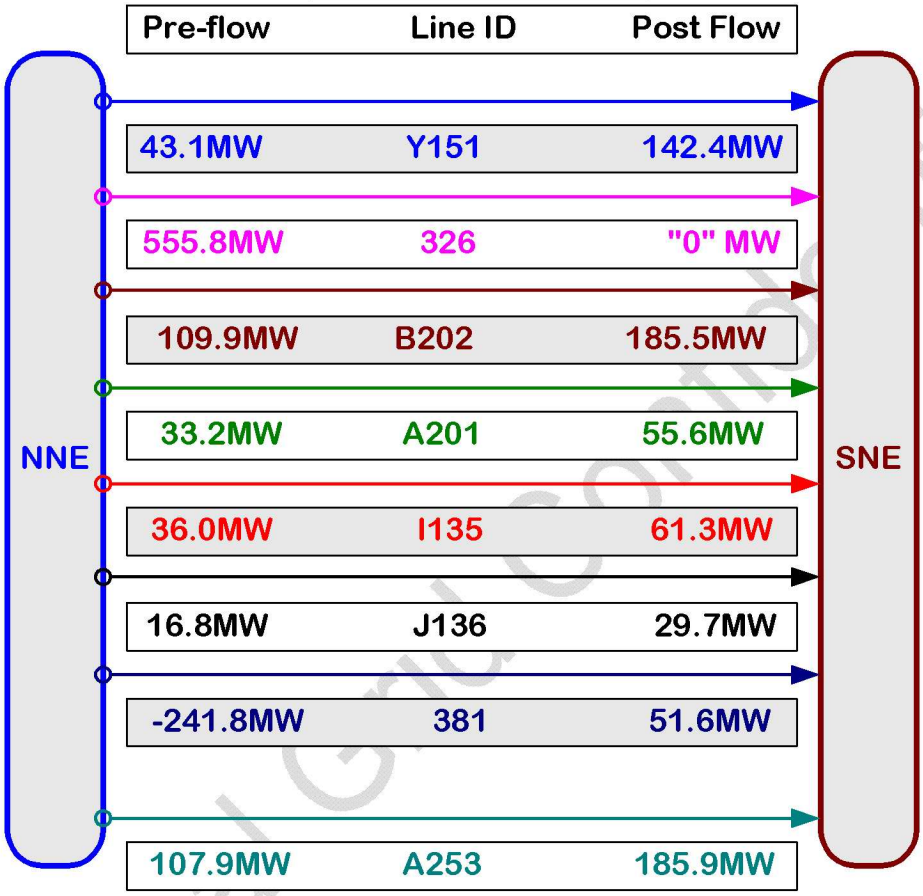
Example #3:
Multiple Line Interface



Example 3 is a more realistic representation of an actual New England transmission interface. Take notice that line flows, before the 326 Line trips, are in both directions. The majority of the lines are transferring power from Northern New England (NNE) to Southern New England (SNE). The 381 Line is transferring power opposite to the rest, pre-contingency, and actually reverses flow, post-contingency, taking up the majority of the pre-contingent flow of the 326 Line. In an interface like this, it is difficult, but not impossible, to calculate and keep track of distribution factors for all possible contingencies. The System Operator should determine the worst contingency and the most limiting element. When using this strategy, it ensures the reliability of the entire interface.

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NOTE

The most limiting element is the line component, or transformer, that is calculated to have the lowest interface limit following the contingency. An interface limit is the maximum total MW flow that can be achieved on an interface, assuming no operator action and the worst contingency will overload the most limiting element to its Short Term Emergency (STE) Limit.

Calculate the Distribution factor for loss of the 326 Line onto the A253 Line as follows:

$$DF = \frac{\Delta \text{ MW Flow A253}}{\text{Pre- Flow 326}} = \frac{185.9\text{MW} - 107.9\text{MW}}{555.8\text{MW}} = \frac{78\text{MW}}{555.8\text{MW}} = 0.140 \text{ or } 14\%$$

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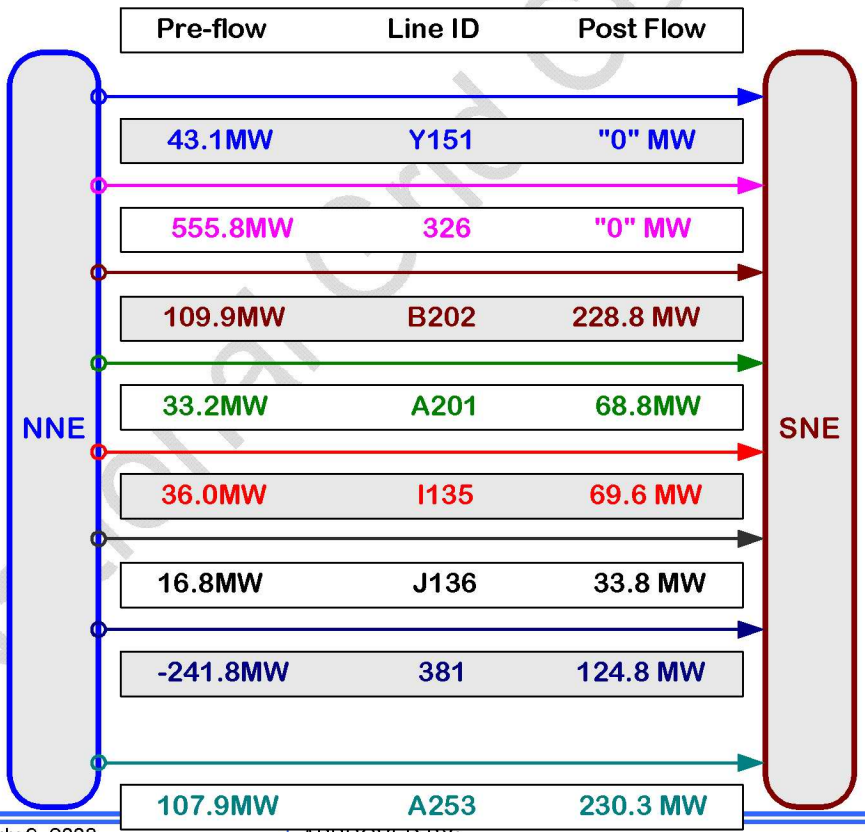
Double Contingencies

Calculating distribution factors for double contingencies incorporate the same principles but use a slightly different process. The post-contingent flow of any line is dependent on the pre-contingent flow, so the sequence in which the studied contingencies occur will affect the post-contingent flow and therefore the distribution factor. See example #4 below.

To calculate distribution factors for double contingencies, open the first and then the second contingency lines. Determine the post-contingent flow on the most limiting element. Restore the second contingency line and record the flow on the limiting element. The next step is to restore the worst contingency and remove the second contingency. Record the flow on the limiting element. The values needed are displayed in the next three diagrams and an example of a chart to record the values follows the diagrams.

Example #4: Diagram 1 - Loss of 326 & Y151



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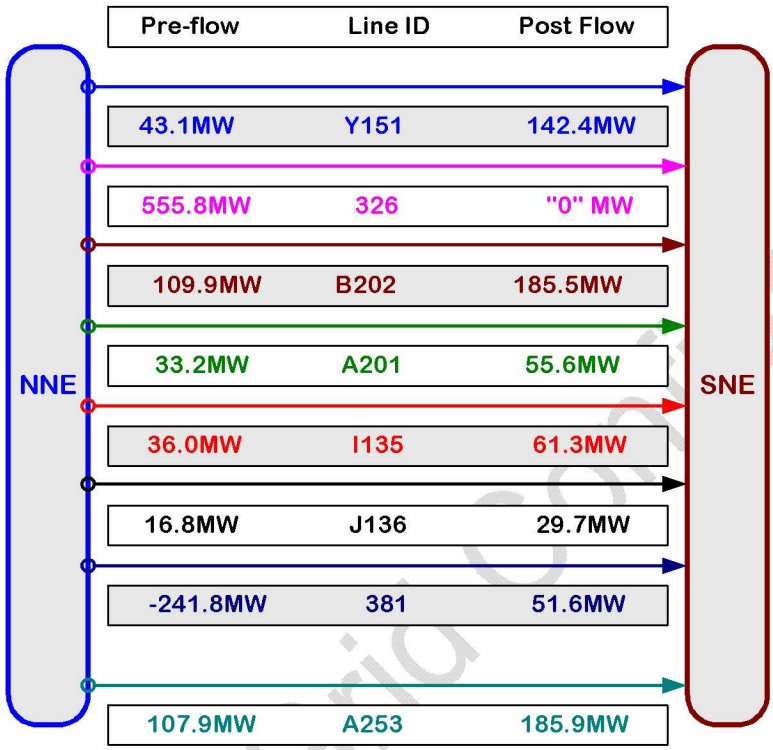
Example #4: Diagram 2 - Loss of 326 only



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REVISED: July 9, 2008	APPROVED BY: Manager, New England Control Center / REMVEC

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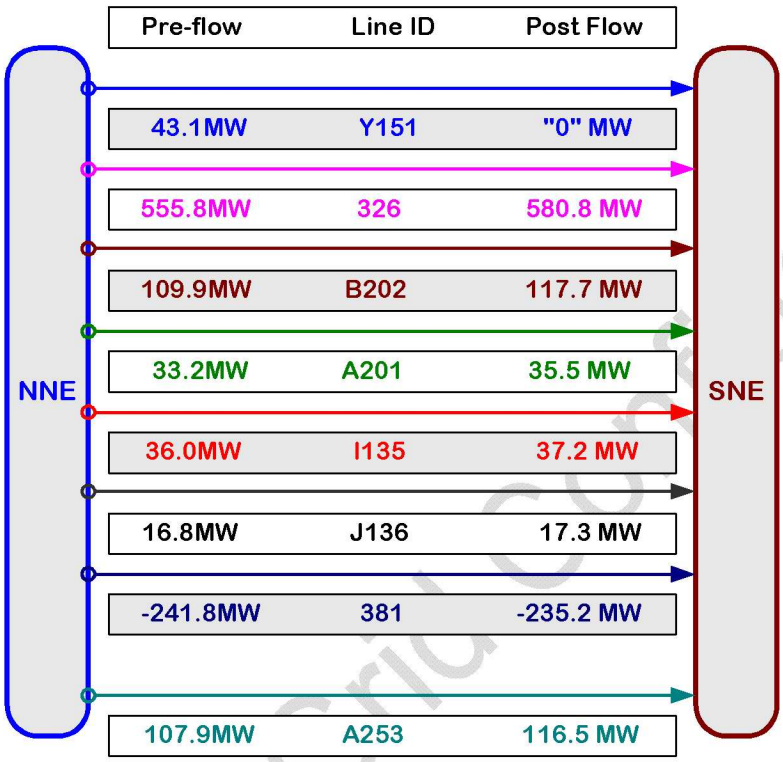
Example #4: Diagram 3 - Loss of Y151 only



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For Loss of the 326 and the Y151 onto the A253:

Line ID↓/Element→	326 & Y151 Out	326 Out	Y151 Out
326	0	0	580.8MW
Y151	0	141.1MW	0
A253	230.3MW	185.9MW	116.5MW

The Distribution Factor of the 326 Line Component onto the A253.

$$DF = \frac{\Delta \text{ MW Flow A253}}{\text{Pre- Flow 326}} = \frac{230.3\text{MW} - 116.5\text{MW}}{580.8\text{MW}} = \frac{113.8\text{MW}}{580.8\text{MW}} = 0.1959 \text{ or } \sim 19.6\%$$

The Distribution Factor of the Y151 Line Component onto the A253.

$$DF = \frac{\Delta \text{ MW Flow A253}}{\text{Pre- Flow Y151}} = \frac{230.3\text{MW} - 185.9\text{MW}}{141.4\text{MW}} = \frac{44.4\text{MW}}{141.4\text{MW}} = 0.314 \text{ or } 31.4\%$$

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Adjustment Factor

Adjustment factors are similar to the distribution factors, except they are used to describe the affect of area generation on the limiting element. It is an important tool for mitigating post contingent line flow problems. The adjustment factor is calculated by using the following formula:

$$\text{Adjustment Factor} = \frac{\Delta\text{Generation Adjustment}}{\text{Limiting Element } \Delta\text{MW flow}}$$

Limiting Element ΔMW flow: The change in MW for the line being studied (Post-contingent flow – Pre-contingent flow).

Generation Adjustment : The change in MW output of the generator used to mitigate the adverse line flow (Final Generator Output – Initial Generator Output).

Knowing the adjustment factor for generators in the area of a contingent line enables the System Operator to have an effective plan to mitigate high flows on that line. This, coupled with the knowledge of the line ratings, allows the System Operator to run the transmission system in a safe, yet economical manner. The adjustment factor also allows the System Operator to quickly adjust generation to return a line below its operating limit. Once the adjustment factor is calculated for a given generator, the System Operator knows now the amount of MW change it would require to change the limiting element line flow to offset adverse post contingency conditions.

Keep in mind that any generation adjustment to one area should be offset by an equal and opposite generation adjustment in the adjoining area to maintain system equilibrium.

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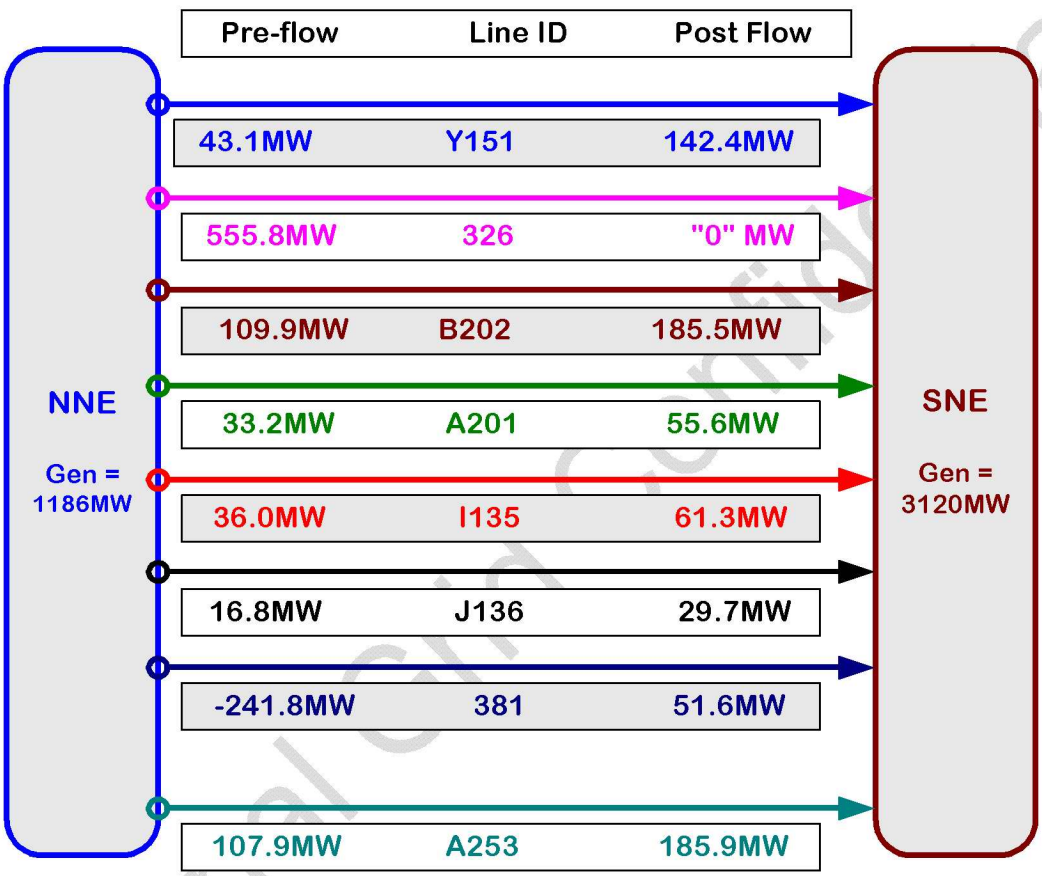
Example #5



The illustration above shows the conditions at the time of the trip and immediately following the trip of the 326 Line. The decision is made to increase the SNE area generation by 200MW. A corresponding decrease of 200MW will be done in the NNE area to balance the system.

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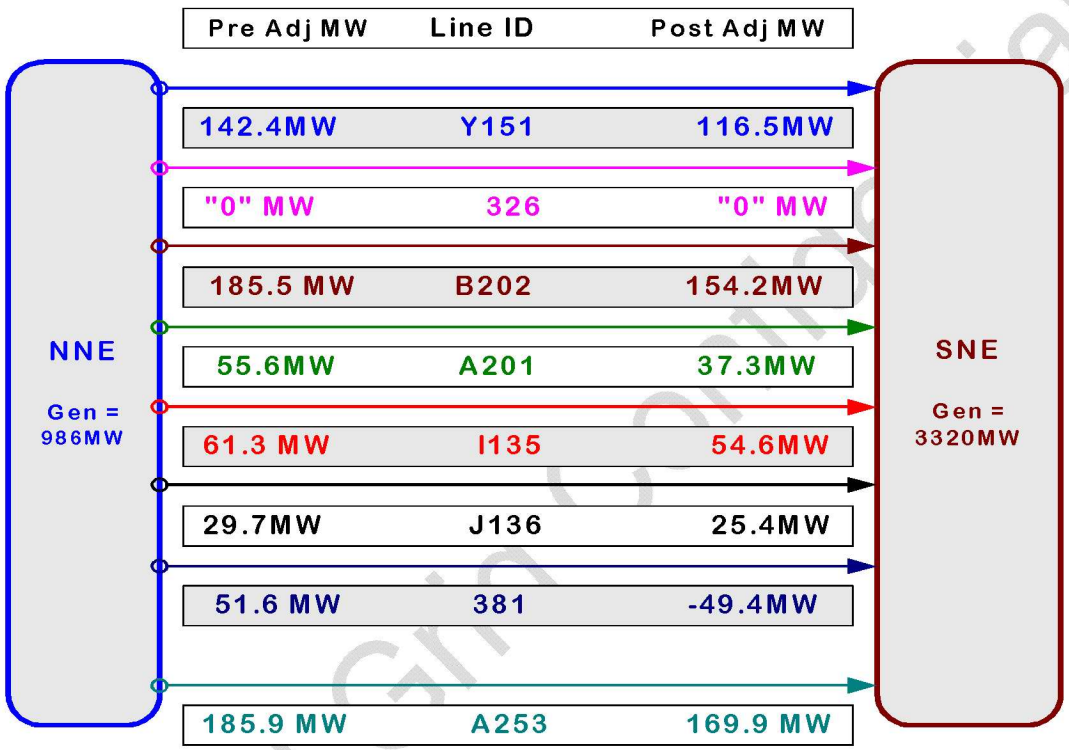
The following illustration shows the change in line flows for this generation adjustment.



Calculate the generation adjustment factor for the limiting element, the A253 Line as follows:

$$\text{Adjustment Factor} = \frac{\Delta\text{Generation Adjustment}}{\text{Limiting Element } \Delta\text{MW flow}}$$

$$\text{Adjustment Factor} = \frac{200\text{MW}}{185.9\text{MW}-169.9\text{MW}} = \frac{200}{16} = 12.5$$

The adjustment factor is basically a ratio. In order to change the post contingent flow of the A253 Line one megawatt, the generator studied above must be changed 12.5 megawatts, or the generator has a 12.5:1 adjustment factor.

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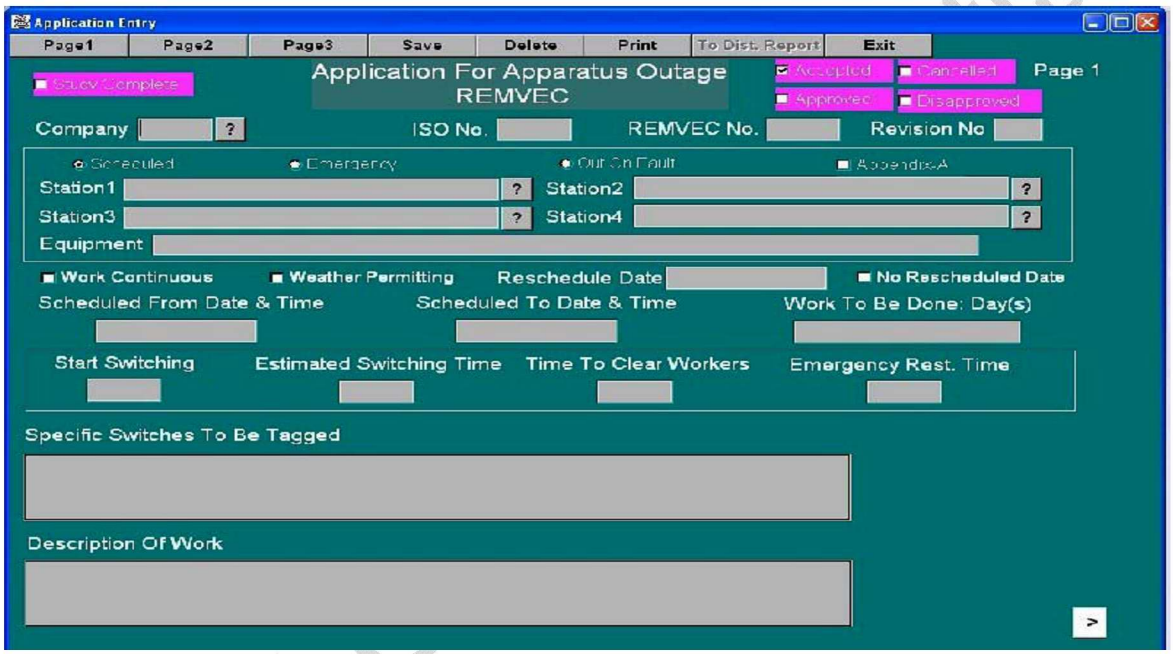
REMVEC OPERATING PROCEDURE NO. 3

Appendix C
REMVEC TOA (Transmission Outage Application)



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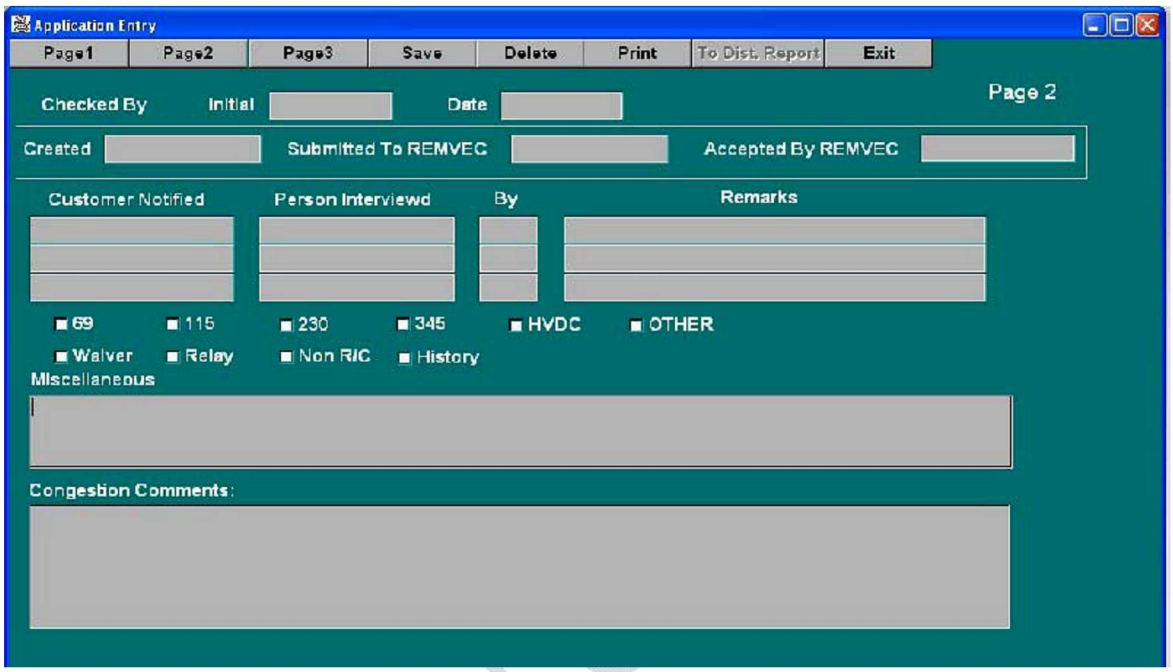

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Revision History

Revision	Date	Reason
1	02/26/03	ISO-NE implementation of Standard Market Design (SMD). Major re-write
2	01/01/04	Format Change
3	02/01/05	RTO implementation. Equipment outages requiring ISO-NE approval changed as well as advanced notification times.
4	12/28/05	National Grid Logo changes
5	02/22/07	Update minimum notification time to 10 days and added nev outage type, Opportunity Outage.
6	05/29/07	Added Table of Contents and changed outline format
7	12/27/07	Yearly review, added references, updated LTTOP submission date
8	04/17/08	Changed Approved by and removed authorized by.
9	05/06/08	Added New England Control Center to OP Name
10	07/09/08	Revision due to changes in wording in ISO-NE OP3

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Approved by:

_____

Manager-New England Control Center / REMVEC DATE

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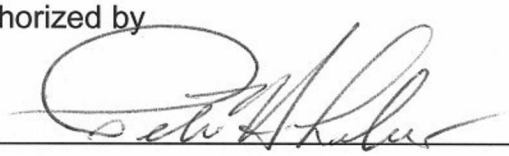
United States Operations

Transmission Operating Procedure TOP-08

Transmission Outage Planning

Authorized by



Date: 1/9/08

Peter Lebro, Vice-President, Transmission Network Operations

Author: Frank Graydon & Bill Malee, Transmission Network Operations

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1.0 Change Control

Rev.	Date	Modification	Author(s)	Reviews and Approvals by
0	03/16/06	Initial Document	F. Graydon B. Malee	P. Lebro
1	03/01/07	Minor clerical changes to comply with TGP-16. Increased the outage notification timescales. With the new timescales in place the procedure will no longer be known as interim.	B. Malee	P. Lebro
2	03/15/07	Removed any conflicting reference to strategy and sanction papers as they are governed by TGP-11.	B. Malee	P. Lebro
3	9/17/07	Updated procedure to reflect changes in process	J. Farella	P. Lebro
4	01/07/08	New coordinator contacts and minor formatting changes to the Operational Circuits Lists	J. Cox	P. Lebro

This document should be reviewed at least every 2 years.

2.0 Introduction

2.1 Purpose

This procedure describes the business process for the placement, optimization and coordination of Transmission Outage Requests on the National Grid USA Northeast Transmission System.

It is important to coordinate outages effectively, in order to achieve the following objectives:

- Maximize system access while securing system reliability
- Create an integrated plan instead of planning each project on an incremental basis
- Develop good long term work plans to create good short term schedules
- Facilitate the delivery of priority projects

2.2 Applicability

This procedure applies to all staff involved with requesting transmission outages in order to gain access, for whatever reason, to the National Grid Northeast Transmission Network. The procedure also applies to all staff in Transmission Network Operations (TNO)* involved with outage planning and coordination.

2.3 Overview

The business process described and defined in this procedure covers outage scheduling in all timescales from beyond a year-ahead through to the day of the outage.

This document focuses on the organizational interfaces associated with outage scheduling. It details what and when data is required from or passed to the various departments internal to National Grid.

The basic conceptual design of this process is driven by planned capital and maintenance programs/projects. As each project/program is developed it will often require transmission access. Outages of major transmission line and substation projects will generally be set first and outages for other projects/programs will be fit around them.

In order to coordinate capital outages effectively, outage requests must be entered into a single planning tool. This tool is currently Primavera. This enables all interested departments to see which transmission outages have been requested and for which time period.

---

* TNO includes Operational Planning & Review, Power Control Center in NY and the System Control Center in NE. Outage Coordinators are part of OPR and work very closely with control room staff.

Network Operations will coordinate with the outage requestors to verify that transmission access can be granted when requested or propose an alternate timeframe, facilitate the bundling of outages, and consider the implications of load at risk (LAR) caused by a transmission outage.

Outage placement will continually be refined through an iterative process involving Network Operations, TNAM and Service Providers. Once an outage is granted, however, there are many external factors that may result in access being withdrawn at anytime prior to or during a previously approved outage resulting in rescheduling of the outage.

If at anytime the outage requested cannot go-ahead as previously anticipated, either because of a system operational requirement, construction or engineering issue, clear, open and timely feedback will be provided to ensure the accuracy of the outage plan and that the process continually improves.

Technical assessments will be made throughout the process which will take a snapshot of concurrent outages planned for a particular timescale to ensure the plan is still viable. For example, an outage may be approved into the plan many months prior to the outage start; periodic checks will be made at key stages to ensure that based on the latest information the outage is still viable. If the planned date becomes unviable, Network Operations will work with the outage requester and agree to a revised outage date.

Once the outage details have been finalized an outage request will be updated in the Transmission Outage Application (TOA) by the outage requestor for final scheduling of the outage and approval from the ISO.

Appendix A4 seeks to summarize diagrammatically key elements in the overall process.

3.0 Long Term Outage Planning

In order to maintain accurate and useful tracking of long term outage requests all outage requests for capital work should be entered into Primavera by the Transmission Project Management Group.

3.1 Minimum outage timescales

3.1.1 120 Days Notice

3.1.1.1 Any capex / expense / maintenance work expected to last > 3 days[†] on key operational circuits as defined in Appendix 7; or Transmission Outage Applications (TOAs) for all outages associated with projects costing in excess of $2.0M in NE and NY.

3.1.2 30 Days Notice

3.1.2.1 Any capex / expense / maintenance work expected to last > 3 days on elements >=115kV not defined as key operational circuits; or any capex / expense / maintenance work expected to last <= 3 days on key operational circuits as defined in Appendix 7.[‡]

3.1.3 10 Days Notice

3.1.3.1 Any capex / expense / maintenance work expected to last <= 3 days duration on elements >=115kV not defined as key operational circuits; or Any capex / expense / maintenance work on equipment <115kV which does not require greater notice

3.1.4 When outages are cancelled by external factors such as weather, system conditions, or labor issues caused by storm duty, the outage will be rescheduled in the next available time slot which can be reliably secured for reliability

3.1.5 When outages require rescheduling based on reliability studies performed by the ISO NE, NYISO, National Grid, or REMVEC coordinators / operators, the outages will be rescheduled in the next available time slot which can be secured for reliability

3.1.6 When outages are cancelled by the outage requestor, due to a failure of the National Grid planning / engineering / construction process, such as no prints, resources, or materials a new outage application will need to be submitted and the relevant minimum notice timing requirements will be enforced.

3.1.7 All other exceptions to the outage timescales will require approval by OPR & Control Room Management.

[†] The duration of an outage is defined as the length of time to complete the required work; Continuous vs. Daily outage types do not impact the definition of the duration of the outage.

[‡] In New York outages on key operational circuits with a duration of <= 3 days will be handled on a case by case bases.

3.2 Long term study process

3.2.1 **All** changes to transmission outages (greater than 3 days) should be updated within Primavera as soon as they are known. These outages should also be discussed with the appropriate outage coordinator (i.e. it is not sufficient just to change data in Primavera; in additional there should be an email exchange / verbal dialogue with the Outage Coordinator to ensure that there is a good probability that the work can proceed when planned).

3.2.2 Network Operations shall assess the requested outage on a rolling basis when they are formally submitted to the TOA system.

3.2.3 If the ISO identifies a conflict, the ISO shall inform Network Operations to coordinate an acceptable date between the requester and the ISO.

3.2.4 Network Operations will report any outage conflicts which are identified during the outage analysis to the outage requester.

3.2.5 Any outage request or change submitted with less than 120 days notice may be refused or postponed due to impacts on the market or other already planned and approved work.

3.2.6 For outages with firm scheduled start and finish dates, which are market sensitive or significant project outages TOA should be submitted in advance of the timescales defined in section 2.7 to increase the certainty of gain access to the system.

3.3 New England – Long term ISO submission process

3.3.1 The first outage notification to the ISO will be as part of the monthly Long Term Transmission Outage Plan (LTTOP)*.

3.3.2 The LTTOP submitted monthly to ISO NE contains a rolling 12 month transmission outage plan that the ISO can assess for impacts on a regional basis.

3.3.3 The ISO will then advise which of the submitted outages will be classified as a 'major transmission outage' for the FTR Auction (4 months in advance). For each of these 'major' outages immediate notification will be given to Network Operations to inform them of the importance of this outage going ahead as planned.

3.3.4 The list provided in Appendix 7 has been validated by ISONE and reflects all current FTR circuits. However, it must be recognized that as system topology changes, as generator patterns change and other transmission owners work on their systems that from time to time other lines may become FTR circuits. If this happens, then either the work will likely need to be deferred in order to meet the longer notification requirement. Network Operations will then promptly discuss with the relevant field operations personnel the best way of rescheduling the work.

* ISO NE has indicated its intention to abandon the LTTOP process in late 2007 / early 2008. Outages priority will then be determined on a first come, first serve basis, as determined by the submission date and time.

3.3.5 An outage not submitted to ISONE via the LTTOP which impacts the market or other already planned work or is submitted late will likely be refused.

3.4 New York – Long term ISO submission process

3.4.1 The NYISO request current and next year annual transmission facilities outage schedules submitted between October 1st and November 1st every year.

3.4.2 No later than 30 days prior to the start of the Transmission Congestion Contract (TCC) month a scheduled outage request must be submitted to NYISO for facilities listed in Appendix A1 of the NYISO Outage Scheduling Manual.

3.4.3 The ISO will perform an assessment of the outage request processed in the order in which they have been received. The ISO has the authority to defer, postpone or cancel scheduled transmission outages on A1 facilities (Appendix A1 of the NYISO Outage Scheduling Manual).

3.4.4 If the ISO finds the outage dates unacceptable then Network Operations will work with the ISO to find alternative dates.

3.4.5 Any outage request or change submitted with less than 30 days notice may be refused or postponed due to impacts on the market or other already planned and approved work. Exceptions to the 30 days may include weekend or weekday off-peak periods or outages where no significant congestion is expected to occur based on the judgment of the NYISO.

3.5 Primavera to TOA tie (NE Only)

3.5.1 On a regular basis, Primavera will populate / update TOA with outage requests based on the schedules downloaded from Primavera. TOA will track all changes to the proposed outages by creating new versions every time a TOA is updated.

3.5.2 The TOA(s) populated by the automatic tie are considered "draft" TOA(s). The draft TOA(s) can be used as a starting point for the final submitted TOA(s) which will be assessed by Network Operations.

3.6 Energization Requirements

3.6.1 For large capital projects that involve either the commissioning or decommissioning of substations, there is a need for high levels of communication with the control room (and in turn the respective ISO).

3.6.2 There are additional time requirements and notice needed to ensure that such projects can be effectively coordinated.

4.0 Short Term Outage Scheduling

The Long Term Outage Coordinator may choose to hand-over an outage assessment to the Short Term Outage Coordinator using the form in Appendix A1. The decision to use the form should be based on the complexity and familiarity with the scope of work. Outage Coordinators are identified in Appendix A5.

4.1 Scheduling an outage in the short term

4.1.1 To schedule an outage, a TOA needs to be submitted by the outage requester;.
4.1.2 TOA outage requests must be submitted within the minimum outage timescales defined in section 2.7.
4.1.3 See Appendix A6 for a complete indication of minimum advance notice times for specific equipment outage submissions.
4.1.4 The short term outage and application coordinators will not normally accept any new outage requests which are less than 10 full calendar days prior to its proposed start date. (Example. A request made on a Tuesday afternoon for the following Friday morning will be rejected as it is not ten full calendar days). Where an opportunity for an outage appears at less then 10 days notice, the appropriate department manager shall contact the lead outage coordinator who will promptly consider such a request. If the TOA is accepted, it will be on a limited discretionary basis only.
4.1.5 On receipt of the TOA, Network Operations will analyze the request with the latest information and confirm that the outage can go-ahead as planned.
4.1.6 If the outage request is a new request, then it will be assessed and if there is an impact on any previously identified outages which have been 'approved', the new requested outage will be denied and alternative dates provided, unless the new outage is granted a higher priority by Transmission Network Asset Management (TNAM).
4.1.7 Once the TOA has been approved by Network Operations it is submitted to the ISO for final approval.
4.1.8 If the ISO denies the outage then Network Operations will coordinate with the requester and the ISO to arrange a suitable date for the outage to be taken.
4.1.9 Any outage request or change submitted may be refused or postponed due to impacts on the market, or already planned and approved work.

4.2 Emergency and Forced Outages[§]

4.2.1 Any emergency outage request must be reported to the Network Operations Control Center as soon as possible indicating when the outage must be taken

[§] ISO New England and New York ISO have different definitions for Emergency and Forced outages; please see section 5.0 Definitions for more clarification.

and the likely duration. The Control Center will then reconfigure the system, if required, in order for the outage to be taken within the timescales requested.

4.2.2 Forced outages are handled by the relevant control rooms and are beyond the scope of this document.

5.0 Communication

5.1 Communication TO Network Operations

5.1.1 It is anticipated that there will be a continuous ongoing dialogue with staff requesting outages and Outage Coordinators. In terms of formal channels, there are three main mechanisms which individuals requiring transmission access can communicate with Network Operations: Sanction / Strategy Papers (governed by TGP-11), Primavera, and TOA.

5.1.2 The sanction / scoping paper is generally Network Operations first formal notification of the outage requirements required for a specific project. It is essential the requirements in TGP-11, the sanction paper process, are followed so Network Operations can properly review the sanction paper for outage conflicts which would impact the projects schedule or budget (Appendix A3 specifies the information required to specify an outage).

5.1.3 Where appropriate information is not provided in the sanction paper, Network Operations will not support the work.

5.1.4 Primavera is an increasingly important data engine which Network Operations relies on for initial outage scheduling activity. The ensuing outage schedules in Primavera are used to drive monthly ISO notifications and coordination of work both internally and with external companies. If an outage schedule in Primavera is not maintained or appears unrealistic then the outage will not be forwarded to the ISO or considered during coordination of other planned work, both of which will severely limit the chances of gaining transmission access.

5.1.5 TOA is the final notification of an outage request. TOA outage requests must be submitted in accordance with the minimum outage timescales (section 2.7).

5.2 Communication FROM Network Operations

5.2.1 Network Operations communicates with a number of significant groups including: the ISOs, outage requestors, divisions, neighboring utilities, and municipals.

5.2.2 In New England, the two main tools used in the long term horizon to communicate with the ISO are the rolling monthly long term transmission outage plan (LTTOP) and the ISO NE outage scheduler. The LTTOP is submitted to the ISO on the first of each month and contains 12 months of outages. The purpose of the LTTOP is to notify the ISO, other TOs and the market place of upcoming firm planned outages over the next year.

5.2.3 Both New England and New York communicate with the ISOs in the short term by submitting outage applications to their individual outage scheduler applications.

5.2.4 Formally Network Operations communicates with the outage requestors of normal circuit outages by posting the current outage plan on the Infonet every month. This is password protected, but access is easily granted by the relevant lead outage coordinator. Less formally Outage Coordinators will have significant bi-lateral dialogue with outage requesting parties to provide guidance on how and when the outage might best proceed.

5.2.5 In New England, Network Operations will send a weekly report via email to each division which contains the upcoming four weeks of work in their area. The interested parties at each division can also use the monthly Infonet posting as an update to view upcoming outages greater then four weeks ahead.

5.2.6 Requestors of outages with significant market impact will be contacted directly to determine if transmission access is still needed on the specified dates. Once these outages are confirmed they will not be able to move based on the ISO guidelines.

6.0 Definitions

General

Long Term Planning: Outage scheduling, optimization and pre-approval beyond 30 (NE) / 30 (NY) days of the outage start

Short Term Planning: Outage scheduling, optimization and approval within 30 (NE) / 30 (NY) days of the outage start date

Network Operations: Incorporates the Transmission Control Centers in New England and New York, the EMS project and Operational Planning and Review

Major Maintenance: Work on a transmission facility that is not capital work but requires the circuit to be out of service for greater than 3 days

Primavera: The National Grid USA project and resource planning tool

TOA: Transmission Outage Application - National Grid USA propriety outage scheduling tool

Outage Requester: Any National Grid USA employee who is requesting access to the transmission system, for example field engineers, engineering services, project management etc.

New England

Emergency Outage: A type of unplanned outage resulting from operator actions to remove a piece of equipment from service due to obvious failure or to limit the loss of or prevent damage to transmission facilities or generators that could adversely affect the reliability of the system.

Forced Outage: The discovery of a problem that needs to be repaired as soon as crews, equipment, and/or corrective dispatch actions can be put in place allow the work to be performed. By definition, a forced outage cannot be scheduled. More specifically:

A Forced Outage cannot be delayed to avoid paying overtime rates; e.g. on a Friday, delaying a Forced Outage until Monday, rather than performing the work on Saturday. This implies that a Forced Outage must occur on consecutive days, except in the case described in the next paragraph

A Forced Outage cannot schedule an Alternate Date. If weather impairs safe working conditions, the outage can be moved to the next available fair weather day, and the planned end date/time shall be extended

New York

Emergency Outage: A type of unplanned outage resulting from operator actions to remove a piece of equipment from service due to obvious failure or to limit the loss of or prevent damage to transmission facilities or generators that could adversely affect the reliability of the system.

Forced Outage: A type of unplanned outage resulting from automatic actions to remove a piece of equipment from service due to obvious failure or to limit the loss of or prevent damage to transmission facilities or generators that could adversely affect the reliability of the system.

7.0 References

7.1 Developmental References

7.1.1 NEPOOL Communication Policy
7.1.2 ISO-NE OP3 – Transmission Outage Scheduling
7.1.3 NY-ISO Outage Scheduling Manual – Revision 2
7.1.4 REMVEC II procedure OP3 - Scheduled Outage of REMVEC II Transmission Facilities
7.1.5 New York TOA Training Manual for Field Users
7.1.6 New England TOA Training Manual for Field Users
7.1.7 TGP-11 Transmission Sanction Process
7.1.8 TGP-12 Division of Responsibilities for Asset Management
7.1.9 TOP-12 Load at Risk procedure

7.2 Performance References

None.

7.3 Review

This procedure shall be reviewed at least annually or when there is a change in either of the ISO processes or reliability criteria occurs. It is also the intention to review this document for its successes and failures.

Appendix A1

Transmission Outage Study form

Transmission Outage Study			
Line/Equipment Name: Line Section:			
Voltage Level:	Outage Date:	Outage Duration:	Continuous (Y/N):
Load Level (MW):		Date Studied:	
Case Name:			
Generation Pattern:		Concurrent Outages:	
Worst Contingency:			
2nd Worst Contingency:			
3rd Worst Contingency:			

Appendix A2

Transmission Outage Guideline Form

Transmission Outage Guideline				
Line/Equipment Name:				
Voltage Level:	Minimum notification requirement:			
Presumed congestion risk: (High/Med/Low)				
Outage timeframe cancellation risk:	Apr:	Jul:	Oct:	Jan:
	May:	Aug:	Nov:	Feb:
	Jun:	Sep:	Dec:	Mar:
Known ISO conflicting outages (outages not necessarily scheduled that, if occur, could impact this outage):				
Customer impact:				
Key generation considerations:				
Comments				

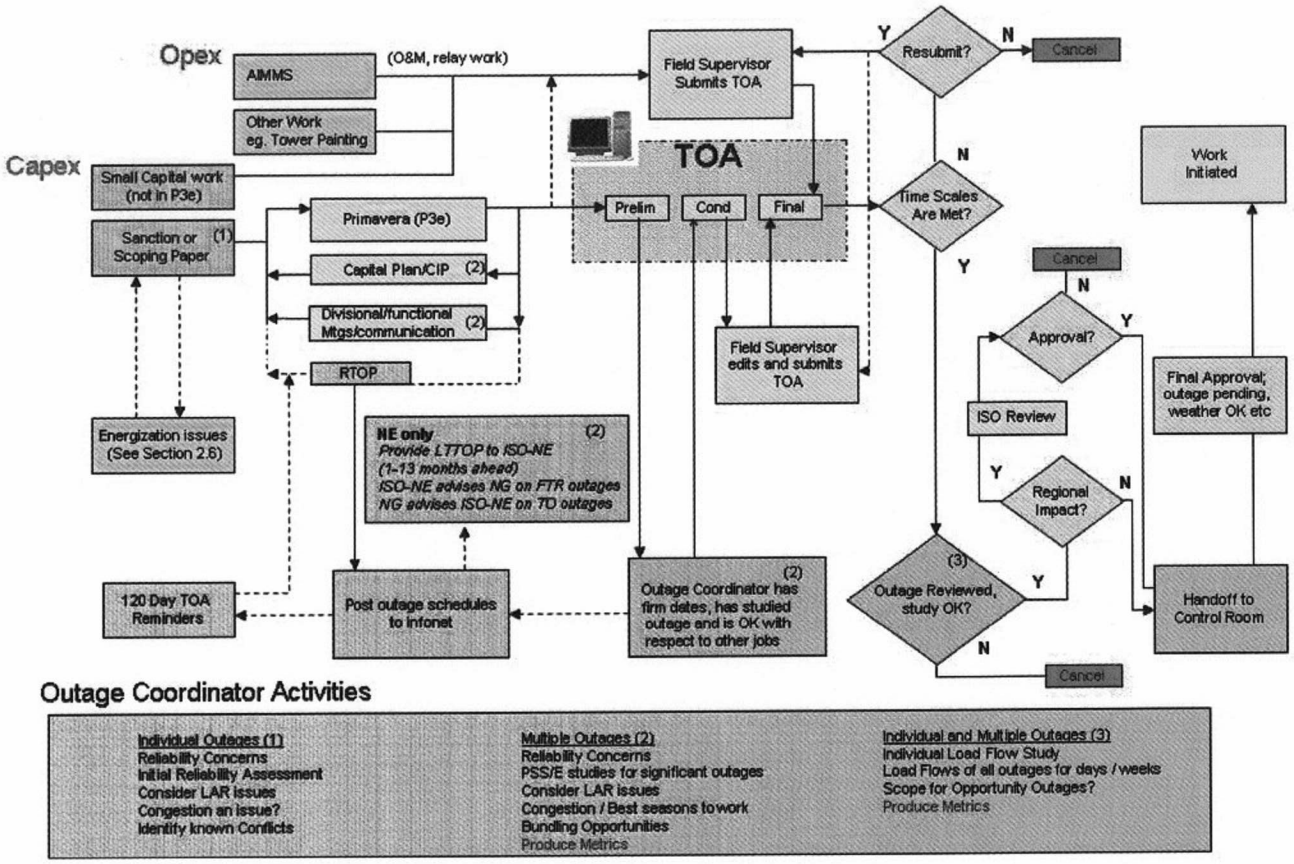
Appendix A3

Guideline of Information Needed to Define an Outage

- Project Name
- Line / Equipment Name
  - Voltage level
  - Isolation points
  - Sequence of work
- Outage dates (both start and end) and duration(s) – *note the start date is invariably different from the NTP date.*
- Emergency restore time (this will be discussed with the Control Room to ensure that it is acceptable from a real-time operational risk perspective).
- Amount of load at single contingency risk
- Related outage requests – this would include concurrent projects, such as when working along a common ROW
- Generators, municipals, transmission owner, control area, other third party customers impacted by the outage
- Known issues which need mitigation

Appendix A4

Indicative Work Flow and Outages



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Appendix A5

Outage Coordinators

Coordinators				
	NE		NY	
	Name	**Phone**	**Name**	**Phone**
Lead Coordinators	Bill Malee	508-389-2062 *(22062)*	Frank Graydon	315-460-2485 *(829-2485)*
Outage Coordinators	Phil L'esperance	508-389-2079 *(22079)*	Joe Farella	315-460-2280 *(829-2280)*
	Ed Prive	508-389-4507 *(24507)*	Roger Dooley	315-460-2475 *(829-2475)*
	John Porter	508-389-2394 *(22394)*		
	Bill Hulme	508-389-2869 *(22869)*		
Application Coordinators[1]	John Conover	508-389-2763 *(22763)*	Pete Reap	315-460-2364 *(829-2364)*
Regional Coordinators[2]			Chris Mierzwa (Outage Coordinator – WRCC)	716-831-7228 *(481-7228)*
			Joe Tomi (Outage Coordinator – CRCC)	315-460-2419 *(829-2419)*
			Ray Joyce (Outage Coordinator –ERCC)	518-356-6470 *(829-6470)*

[1] Reports to Transmission Control Room Manager
[2] Reports to NY Regional Control Room Manager

Appendix A6

Minimum Transmission Outage Notification Timescales

Voltage(kV)	Facility Type	Advance Notice Requirements			
		120 Days	30 Days	10 Days	Submit to:
Outages of > 3 days duration are BLUE Xs		**Outages of <= 3 days duration are ORANGE Xs**			
345/230/115	All lines on the operational circuits list (OCL) or Outages associated with line / station projects > $2.0M	X	X[3]		NY / NE
345/230/115	All radial and non radial lines not on the OCL		X	X	NY / NE
345/230/115	Transformers				
	345 / 230		X	X	NY / NE
	345 / 115		X	X	NY / NE
	230 / 115		X	X	NY / NE
	115/ 69 or below			**ALL**	NY / NE
345/230/115	Circuit Breakers, Disconnects		X	X	NY / NE
	In line Circuit Switchers, Disconnects, Air Breaks		X	X	NY / NE
345/230/115	Capacitors		X	X	NY / NE
	Reactors		X	X	NY / NE
345/230/115	Reclosing Relays / in-service work		X	X	NY / NE
	Bench Testing Relays		X	X	NY / NE
	NPCC Test Tripping Relays		X	X	NY / NE
HVDC	Transformers, Circuit Breakers, Disconnects, Relays		X	X	NE
69	All facilities in NE < 115kV			**ALL**	NE
Outages of > 3 days duration are BLUE Xs		**Outages of <= 3 days duration are ORANGE Xs**			

[3] In New York outages on the operational circuits list with a duration of <= 3 days will be handled on a case by case bases

Exceptions to outage Notification Timescales

Voltage(kV)	Facility Type	Advance Notice Requirements				Submit to:
		72 Hours	48 Hours	On Shift Approval	Approval Not Required	
	Air Break, Circuit Switcher and Disconnect mechanism inspections performed on high side devices in substations require 72 hour notification. Ex. 115-69kV TF high side Air Break. All facilities remain in service during this inspection.	X				NE
69	Transformers					
	69 / below	X				NE
	Station Service – both primary & backup at transmission sub		X			NE
In Service Other Equipment	345 kV, 230 kV and 115 kV – In service work (other than in-service relay testing & hot line work) that has the potential of inadvertently tripping transmission equipment.			X		NY
In Service Relay Testing	115 kV to Distribution Transformers – All in service relay testing			X		NY
Ancillary Equipment	Any intrusive testing of ancillary equipment whereby the equipment is **not** able to perform its intended function			X		NY
	Any non intrusive testing of ancillary equipment whereby the equipment **is able** to perform its intended function				X	NY
Metering Equipment	Any work that affects MW & MWHr metering for generators or sub zone ties	X				NY
	All other work that affects metering (analog or status).			X		NY

Appendix A7

Operational Circuits List – NE

Operational Circuits List - NE					
kV	Line Number	kV	Line Number	kV	Line Number
345	301	230	D204	115	W175
345	303	230	E205E	HVDC	Phase 2 - Pole 1
345	314	230	E205W	HVDC	Phase 2 - Pole 2
345	315	230	G207		
345	323	230	H208		
345	326	230	N214		
345	328	230	O215		
345	331	230	A179		
345	332	115	B154S		
345	333	115	C129		
345	337	115	C129N		
345	338	115	C129S		
345	339	115	C155S		
345	343	115	C181N		
345	344	115	C181S		
345	347	115	D182S		
345	355	115	F158N		
345	357	115	F158S		
345	394	115	M139		
345	397	115	N140		
345	3361	115	O167		
345	3512	115	P168		
345	3521	115	Q169		
230	A201	115	S145		
230	B202	115	T146		
230	C203	115	W123		

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Operational Circuits List – NY

Operational Circuits List - NY					
kV	Line	Line#	kV	Line	Line#
345	Alps – Berkshire	393	230	Adirondack – Porter	12
345	Athens – Pleasant Vly	91	230	Beck – Packard	BP76
345	Clay – Edic	1-16	230	Dunkirk – S. Ripley	68
345	Clay – Edic	2-15	230	Porter – Rotterdam	30
345	Edic – Fraser	EF24-40	230	Porter – Rotterdam	31
345	Edic – New Scotland	14	230	Rotterdam – Bear Swamp	E205W
345	Fitzpatrick – Edic	FE-1	230	S. Ripley – Erie E.	69
345	Gilboa – Leeds	GL3			
345	Gilboa – New Scotland	GNS-1			
345	Independence - Clay	26			
345	Lafayette – Oakdale	4-36			
345	Leeds – Athens	95			
345	Leeds – Hurley Ave	301			
345	Leeds – Pleasant Vall	92			
345	Marcy – Edic	UE1-7			
345	Marcy - New Scotland	18			
345	New Scotland – Alps	2			
345	New Scotland – Leeds	93			
345	New Scotland – Leeds	94			
345	Nine Mile Pt 1 – Clay	8			
345	Pannell Rd – Clay	1			
345	Pannell Rd – Clay	2			
345	Scriba – Volney	20			
345	Scriba – Volney	21			
345	Volney – Marcy	19			
345	Leeds SVC	-			
230	Adirondack – Porter	11			

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