

**2003/2005 SUPPLEMENT TO:  
APPENDIX B, ENVIRONMENTAL IMPACT STATEMENT 1993  
ROADSIDE VEGETATION MANAGEMENT  
WASHINGTON STATE DEPT OF TRANSPORTATION**

Prepared for:

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## Preface

This document serves as a supplemental assessment to the ecological and human health risk assessment portions of the Washington State Department of Transportation's (WSDOT) 1993 Roadside Vegetation Management document, which is contained in Appendix B, Environmental Impact Statement (hereby referred to as 1993 EIS). WSDOT has made changes to its program to manage roadside vegetation (now called Integrated Vegetation Management (IVM)) since 1993. In 2003, WSDOT used a set of 15 herbicide product types, organized by the 17 individual or pairs of active ingredients they contain. In this 2005 edition, we have evaluated an additional 12 herbicide product types that are currently in use or are proposed for use by WSDOT. These herbicides and their use characteristics are presented in the accompanying table. These changes, along with the general progression of scientific literature and environmental guidelines since 1993, have warranted this update. Of particular significance is that, since 1993, most of the herbicide formulations have been subject to extensive toxicological review by U.S. EPA for the purposes of establishing pesticide tolerances for food under the provisions of the Food Quality and Protection Act (FQPA) of 1996.

Intertox, Inc. was asked by WSDOT to review pertinent toxicology reports and other relevant data that have become available since the EIS publication in 1993. The most scientifically-sound/credible of these reports was to be identified and data contained therein documented and used to supplement the information found in Appendix B of the 1993 EIS. In addition, information supplied by WSDOT regarding amounts of herbicides used, application methods, and locations of use were to be analyzed and incorporated into updated risk calculations (human and ecological).

This supplemental assessment does not replace the 1993 EIS. It is largely restricted to new information, and will often require the 1993 EIS for context. For ease of comparison between the two documents, this supplemental assessment has the same numerical outline as the 1993 EIS. The exceptions to this are chapters 2 and 3, for which a new outline was deemed more appropriate. In sections where information about each herbicide is presented in order, the numbering will correspond to the 2003 set of 15 herbicide active ingredients or 17 product types, followed by the 12 herbicide active ingredients added in 2005.

The major differences between this assessment and the 1993 EIS are:

- The number, types, and use characteristics of herbicides have changed.
- Herbicide toxicological data have been updated for human and ecological receptors.
- New ecological receptor species have been added.
- Some of the human exposure scenarios have changed and many of the exposure parameters have been updated.

This risk assessment relies upon the use of simplified assumptions, some of which are conservative (protective). In our judgement, it includes the exposure pathways, toxicity endpoints, and product ingredients of most concern (*i.e.*, responsible for the most risk). However, consideration of additional data and information could increase estimated risks. This risk assessment is designed to provide a preliminary analysis of the plausible risks and to prioritize potential health hazards. The results should not be interpreted as the actual or likely health risks in a population. In particular, exposure scenarios entailing conditions that likely represent maximum exposure are estimated by employing a series of average, upper bound, and worst-case assumptions. When values associated with these assumptions are multiplied together, the result is a risk estimate that is designed to fall far above the true risk range. Because of limitations in our knowledge of all product ingredients and their toxicology, however, it is

not possible to guarantee that all risks are overestimated. If a risk estimate for a scenario of maximum exposure is characterized as negligible, risk management decisions can focus on addressing risks from other scenarios. When risk estimates are greater than levels considered negligible, risk management decisions may be prioritized to reduce these risks, such that greater risks are given higher priority.

For humans, risks were estimated for several exposure scenarios, including workers applying herbicides and the public (adults and children) picking and eating drift-contaminated berries, eating drift-contaminated garden vegetables, and walking through sprayed vegetation. The results of this assessment indicate that under conditions of average exposure, most of the estimated risks to humans were not greater than negligible. Some of the herbicide formulations pose potential risks greater than negligible under some exposure scenarios, and these risks have been characterized as low, moderate, or high. No herbicides were found to pose moderate or high potential risks to the public under conditions of average exposure, while diuron was found to pose potential moderate risks to workers engaged in broadcast spray applications. WSDOT's use of herbicides containing the active ingredients diuron, dicamba/MCPA, fosamine, bromacil/diuron, and triclopyr are associated with the highest potential risks. These risks were estimated using what we believe to be conservative conditions of maximum exposure and are restricted to two of the exposure scenarios that we considered: workers engaged in broadcast spray applications and the public ingesting drift-contaminated garden vegetables.

For wildlife receptors, exposure modeling was conducted to gauge relative exposure doses based on body weight and food consumption values, application rates, and delivery mechanisms of relevance. Exposure doses were then compared to reference doses from the toxicity literature to gauge the potential risks to relevant ecological receptors that would use habitats within roadway buffers. Ecological receptors evaluated included the rat, quail, deer mouse, meadow vole, marsh wren and robin. The toxicity database for estimating the effects of herbicides on reptiles and amphibians was found to be limited. The results suggest that maximum application for most of the herbicides evaluated in this report does not pose a significant risk to small mammals or birds. However, the potential toxicity of certain herbicides, in particular 2,4-D, appears to pose an unacceptable risk to both mammals and birds at the maximum application rates. In addition, the estimated toxicity risk presented by dicamba and oryzalin exceeds the acceptable threshold for at least one of the bird species evaluated. Among the herbicides evaluated in 2005, none appear to present a significant risk to mammals or avian species.

For aquatic receptors (fish and aquatic invertebrates), absolute risks were not calculated. Instead, a modeling exercise was conducted to evaluate the relative risk of each of the herbicides used by integrating estimated exposure (from rainfall data and road density) and inherent toxicity of the herbicide from the most sensitive species tested. This relative risk assessment does not establish the absolute risk of any herbicide, but it is useful in comparing estimated relative risks between different herbicides to prioritize efforts for risk reduction. Relative risks posed by most of the herbicides fell into the lowest category. None of the herbicides were estimated to pose risks in the highest relative risk category. Herbicides containing diuron, dichlobenil, oxadiazon, pendimethalin, bromoxynil, and norflurazon were found to present moderate risks to fish and aquatic invertebrates in one or more of the physiographic provinces of Washington State. The exposure of aquatic organisms was assumed to be primarily from surface runoff, which results when storm events or irrigation follow closely the timing of the herbicide application.

The results of this assessment indicate that, for most herbicides in most scenarios that we evaluated, subject to the limitations and uncertainties described in this document, WSDOT's use of herbicides in their IVM program does not pose a significant concern to the health of human and wildlife populations.

Absolute risks to aquatic life were not estimated, but relative risks were generally in the lowest category. Where there are potential risks that are elevated, they have been identified and prioritized and should serve as guidance for making risk management decisions. Potential risks can be addressed by reducing or replacing an herbicide formulation, or by limiting the potential for the assumed conditions of exposure. In addition, since conservative assumptions are used when data are uncertain, refinement of the risk assessment as more data and information become available, either general or site-specific, will help to more accurately characterize risks in the future.

**Herbicide Chemicals and Products Used or Proposed for Use by WSDOT, and their Use Characteristics**

<b>Chemical Name</b>	<b>Product Name</b>	<b>Where Used</b>	<b>How/Why Used</b>	<b>Typical Application Rates (a.i.) used by WSDOT</b>	<b>Typical Seasonal Timing</b>	<b>Typical Application Methods</b>
<i>Herbicides evaluated in 2003</i>						
<b>2,4-D</b>	Weedar 64, Amine 4	Noxious, nuisance weed and brush control Zones 2 and 3	Broad spectrum selective broadleaf treatment	64 to 128 oz./acre	Year round	Truck mounted hand gun, hose reel or side boom
<b>Ammonium salt of fosamine</b>	Krenite	Nuisance weed and brush control Zones 2 and 3	Selective broadleaf treatment primarily alder	128 to 256 oz./acre	August-September	Truck mounted hand gun or hose reel
<b>Bromacil/ Diuron</b>	Krovar	Zone 1 primarily eastside	Non-selective premergent. Used mostly on east side.	6 to 8 lbs./acre	October-November (some eastside areas) and March-May	Truck mounted side boom, low to the ground
<b>Chlorsulfuron</b>	Telar	Noxious, nuisance weed and brush control Zones 2 and 3	Selective broadleaf treatment	1 to 3 oz./acre	April-September	Truck mounted hand gun or hose reel, backpack
<b>Clopyralid</b>	Transline	Noxious, nuisance weed and brush control Zones 2 and 3	Selective broadleaf treatment	8 to 16 oz./acre	April-September	Truck mounted hand gun or hose reel, backpack
<b>Clopyralid/ 2,4-D</b>	Curtail	Noxious, nuisance weed and brush control Zones 2 and 3	Selective broadleaf treatment	48 to 64 oz./acre	April-September	Truck mounted hand gun, hose reel or side boom
<b>Dicamba</b>	Vanquish	Noxious, nuisance weed	Selective broadleaf	8 to 32 oz./acre	April-September	Truck mounted hand gun, hose reel or side

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		and brush control Zones 2 and 3	treatment			boom
<b>Dicamba/ 2,4-D</b>	Veteran 720, Weedmaster	Noxious, nuisance weed and brush control Zones 2 and 3	Broad spectrum selective broadleaf treatment	48 to 96 oz./acre	Year round	Truck mounted hand gun, hose reel or side boom
<b>Dicamba/ MCPA</b>	Vengeance	Noxious, nuisance weed and brush control Zones 2 and 3	Selective broadleaf treatment	48 to 64 oz./acre	April- September	Truck mounted hand gun, hose reel or side boom
<b>Dichlobenil</b>	NORSAC, Casoron	Ornamental plantings	Pre-emergent control of grass and weeds in ground cover beds	50 to 100 lbs./acre	November- March	Belly grinder
<b>Diuron</b>	Karmex, Diuron, Direx	Zone 1 statewide	Non-selective preemergent	4 to 6 lbs./acre	October- November (some eastside areas) and March-May	Truck mounted side boom, low to the ground
<b>Glyphosate</b>	Roundup, Rodeo, Aquamaster	Zone 1 statewide	Non-selective foliar control. Added to the mix when top growth is already present at time of spraying	32 to 64 oz./acre	Year round	Truck mounted side boom, low to the ground or backpack
<b>Metsulfuron methyl</b>	Escort	Noxious, nuisance weed	Selective broadleaf	0.5 to 2 oz./acre	April- September	Truck mounted hand gun, hose reel or side

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		and brush control Zones 2 and 3	treatment			boom
<b>Oryzalin</b>	Surflan	Ornamental plantings	Pre-emergent control of grass and weeds in ground cover beds	64 to 128 oz./acre	November-March	Truck mounted hand gun or hose reel, backpack
<b>Picloram</b>	Tordon	Noxious weed control primarily east side Zones 2 and 3	Selective broadleaf treatment of hard to control species	16 to 64 oz./acre	April-September	Truck mounted hand gun or hose reel, backpack
<b>Sulfometuron methyl</b>	Oust	Zone 1 statewide	Non-selective pre-emergent. Added to the mix to broaden the spectrum of control.	3 to 5 oz./acre	October-November (some eastside areas) and March-May	Truck mounted side boom, low to the ground
<b>Triclopyr</b>	Garlon	Nuisance weed and brush control Zones 2 and 3	Selective broadleaf treatment	64 to 128 oz./acre	April-November	Truck mounted hand gun, hose reel or side boom
<b><i>Herbicides evaluated in 2005</i></b>						
<b>Bromoxynil</b>	Buctril 2EC	Nuisance and noxious weed control Zones 2 and 3	Broad spectrum selective broadleaf treatment	0.5 lbs./acre	May-June	Applied selectively through truck mounted hand-guns, hose reels, or backpack sprayers. In some cases when applied over wide-spread infestations, applications may be

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						made through truck or tractor mounted booms.
<b>Diflufenzopyr/ Dicamba</b>	Overdrive	Nuisance and noxious weed control Zones 2 and 3	Selective broadleaf treatment	0.35 lbs./acre	Spring/Summer	Applied selectively through truck mounted hand-guns, hose reels, or backpack sprayers. In some cases when applied over wide-spread infestations, applications may be made through truck or tractor mounted booms.
<b>Flumioxazin</b>	Payload	Zone 1	New product; tested in some areas in 2004	0.25 to 0.38 lbs./acre	Spring	Applied through truck mounted booms placed 18" above the ground.
<b>Fluroxypyr</b>	Vista	Nuisance and noxious weed control Zones 2 and 3	Selective broadleaf treatment	0.25 to 0.5 lbs./acre	Spring/Summer	Applied selectively through truck mounted hand-guns, hose reels, or backpack sprayers. In some cases when applied over wide-spread infestations, applications may be made through truck or tractor mounted booms.
<b>Imazapyr</b>	Habitat,	Zone 1	Habitat is the only	1 to 1.5 lbs./acre	Spring	Applied through truck

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	Arsenal		Zone 1 product with an aquatic label			mounted booms placed 18" above the ground.
<b>Isoxaben</b>	Gallery 75DF	Turf & Ornamental	Pre-emergent weed control in ground cover beds	1 lb./acre	Spring or Fall	Applied as a broadcast treatment over ornamental ground cover and shrub beds through truck mounted hand-guns, hose reels, or backpack sprayers.
<b>Norflurazon</b>	Predict	Zone 1	Not used in the past; evaluating for fit	3.93 lbs./acre	Spring	Applied through truck mounted booms placed 18" above the ground.
<b>Oxadiazon</b>	Ronstar 50 WSP	Turf & Ornamental	Pre-emergent weed control in ground cover beds	2 to 4 lbs./acre	Spring or Fall	Applied as a broadcast treatment over ornamental ground cover and shrub beds through truck mounted hand-guns, hose reels, or backpack sprayers.
<b>Pendimethalin</b>	Pendulum 3.3 EC, Pendulum WDG	Zone 1	All east side use	3 lbs./acre	Spring	Applied through truck mounted booms placed 18" above the ground.
<b>Pyraflufen</b>	Edict	Nuisance and noxious weed control Zones 2 and 3	New product; evaluated for fit	0.004 lbs./acre	Spring/Summer	Applied selectively through truck mounted hand-guns, hose reels, or backpack sprayers. In some cases when

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						applied over wide-spread infestations, applications may be made through truck or tractor mounted booms.
<b>Sulfentrazone</b>	Portfolio	Zone 1	New product being considered for addition	0.375 lbs./acre	Spring	Applied through truck mounted booms placed 18" above the ground.
<b>Tebuthiuron</b>	Spike 80DF	Zone 1	All east side use	2.4 to 4 lbs./acre	Spring or Fall	Applied through truck mounted booms placed 18" above the ground.

