

CONTENTS

ENVIRONMENTAL HEALTH CRITERIA FOR WHITE SPIRIT

Preamble	8
1. SUMMARY	19
1.1 Properties of white spirit	19
1.2 Uses and sources of exposure	19
1.2.1 Production	19
1.2.2 Uses and emission into the environment	20
1.3 Environmental transport, distribution and transformation	21
1.4 Environmental levels and human exposure	21
1.5 Kinetics and metabolism	22
1.6 Effects on laboratory animals and <i>in vitro</i> systems	22
1.7 Effects on humans	24
1.8 Effects on other organisms in the laboratory and field	26
2. IDENTITY, PHYSICAL AND CHEMICAL PROPERTIES, AND ANALYTICAL METHODS	28
2.1 Identity	28
2.1.1 Technical specifications	29
2.1.2 Chemical composition	32
2.2 Physical and chemical properties	35
2.3 Conversion factors	37
2.4 Analytical methods	37
3. SOURCES OF HUMAN AND ENVIRONMENTAL EXPOSURE	39
3.1 Natural occurrence	39
3.2 Production	39
3.3 Uses	39
4. ENVIRONMENTAL TRANSPORT, DISTRIBUTION AND TRANSFORMATION	42
4.1 Transport and distribution between media	42
4.2 Transformation	43
4.2.1 Biodegradation	43
4.2.2 Abiotic degradation	44
4.2.3 Bioaccumulation	44

5.	ENVIRONMENTAL LEVELS AND HUMAN EXPOSURE	45
5.1	Environmental levels	45
5.1.1	Air	45
5.1.2	Water	45
5.1.3	Soil	45
5.1.4	Waste sites	46
5.2	General population exposure	46
5.3	Occupational exposure	46
5.3.1	Considerations concerning vapour exposure	46
5.3.2	Exposure levels	47
5.3.3	Exposure limit values	48
6.	KINETICS AND METABOLISM IN LABORATORY ANIMALS AND HUMANS	50
6.1	Absorption	50
6.1.1	Inhalation	50
6.1.1.1	Human exposure	50
6.1.1.2	Related hydrocarbon exposure in animals	52
6.1.2	Dermal exposure	53
6.1.3	Oral exposure	54
6.2	Distribution	54
6.2.1	Human exposure	54
6.2.2	Animal exposure	55
6.2.3	Exposure to related hydrocarbons	55
6.3	Metabolic transformation	58
6.4	Elimination and excretion	59
7.	EFFECTS ON LABORATORY ANIMALS AND <i>IN VITRO</i> TEST SYSTEMS	62
7.1	Single exposure	62
7.1.1	Inhalation	62
7.1.1.1	White spirit	62
7.1.1.2	Exposure to related hydrocarbons	63
7.1.2	Oral exposure	64
7.1.3	Dermal exposure	65
7.1.4	Aspiration	65
7.2	Short-term and long-term exposure	66
7.2.1	Inhalation	66
7.2.1.1	White spirit	66
7.2.1.2	Exposure to related hydrocarbons	68
7.2.2	Dermal exposure	69

7.2.2.1	White spirit	69
7.2.2.2	Exposure to related hydrocarbons	69
7.3	Irritation; sensitization	70
7.3.1	Skin irritation	70
7.3.1.1	White spirit	70
7.3.1.2	Exposure to related hydrocarbons	71
7.3.2	Eye irritation	72
7.3.3	Respiratory irritation	72
7.3.4	Sensitizing properties	73
7.4	Other effects	73
7.4.1	Nephrotoxicity	73
7.4.2	Neurotoxicity	75
7.4.2.1	Behavioural effects	75
7.4.2.2	Neurophysiological and neuromorpho- logical effects	77
7.4.2.3	Neurochemical effects	78
7.4.3	Biochemical effects	80
7.4.3.1	White spirit	80
7.4.3.2	Exposure to related hydrocarbons	80
7.5	Reproductive toxicity, embryotoxicity and teratogenicity	81
7.6	Genotoxicity	82
7.6.1	Bacterial assays	83
7.6.2	Yeast assay	83
7.6.3	<i>In vitro</i> mammalian cell assays	84
7.6.4	<i>In vivo</i> mammalian assays	84
7.7	Carcinogenicity	85
7.7.1	White spirit	85
7.7.2	Related refinery streams	85
8.	EFFECTS ON HUMANS	86
8.1	Single exposure	86
8.1.1	Inhalation, controlled exposure	86
8.1.1.1	Irritation	86
8.1.1.2	CNS effects	87
8.1.1.3	Neurobehavioural effects	87
8.1.1.4	Odour	87
8.1.2	Inhalation, accidental exposure	88
8.1.3	Oral exposure	88
8.1.4	Dermal exposure	89
8.2	Short-term and long-term exposures	89
8.2.1	Effects on the nervous system	90
8.2.1.1	Symptoms and clinical picture	92
8.2.1.2	Neurological findings	93

8.2.1.3	Neuropsychological findings	99
8.2.1.4	Epidemiological studies	102
8.2.1.5	Comments and uncertainties concerning the epidemiological studies	102
8.2.1.6	Prognosis and follow-up	120
8.2.2	Effects on skin	123
8.2.3	Effects on kidneys	123
8.2.4	Effects on liver, blood and bone marrow	128
8.2.5	Haematological and biochemical effects	128
8.3	Reproductive toxicity	130
8.4	Carcinogenicity	133
8.4.1	Epidemiological studies with painters	135
8.5	Genotoxicity	136
9.	EFFECTS ON OTHER ORGANISMS IN THE LABORATORY AND FIELD	138
9.1	Laboratory experiments	138
9.1.1	Microorganisms	138
9.1.2	Aquatic organisms	138
9.1.3	Terrestrial organisms	139
10.	EVALUATION OF HUMAN HEALTH RISKS AND EFFECTS ON THE ENVIRONMENT	140
10.1	Evaluation of human health risks	140
10.2	Evaluation of effects on the environment	143
11.	RECOMMENDATIONS FOR PROTECTION OF HUMAN HEALTH	144
12.	FURTHER RESEARCH	145
13.	PREVIOUS EVALUATIONS BY INTERNATIONAL BODIES	146
	REFERENCES	149
	RESUME	167
	RESUMEN	177