Proposed Risk Management Strategy for 2-Butoxyethanol

By

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RISK MANAGEMENT STRATEGY FOR 2-BUTOXYETHANOL

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RISK MANAGEMENT STRATEGY FOR 2-BUTOXYETHANOL

1. Issue

On August 9, 2003, the Ministers of the Environment and of Health published their final decision on the assessment of 2-Butoxyethanol (2-BE) in the *Canada Gazette* and recommended that 2-BE be added to the *List of Toxic Substances* in Schedule 1 under the *Canadian Environmental Protection Act, 1999* (CEPA 1999). The final version of the assessment report concludes that 2-BE is harmful to human health. However, 2-BE is not considered harmful to the environment, or the environment on which life depends.

Under subsection 91(1) of CEPA 1999, the Minister of the Environment must propose a CEPA instrument (i.e. regulation, guideline, pollution prevention plan, etc) respecting preventive or control actions to manage 2-BE no later than 2 years after the publication of the final assessment report. Further under subsection 92(1), the instrument must be finalized within 18 months thereafter.

This risk management strategy outlines the risk management objectives, instruments and approaches proposed to reduce the risks associated with 2-BE. A stakeholder consultation approach is also proposed.

2. Background

2.1. Structure and Function of 2-BE

2-Butoxyethanol (2-BE) is a member of a larger group of compounds known as glycol ethers. The main use (over 50%) for glycol ethers is as solvent for formulations such as paints, inks and cleaning fluids. Glycol ethers can be categorized as either E-series (ethylene glycol ethers) or P-series (propylene glycol ethers). 2-BE is an E-series glycol ether and is also a volatile organic compound (VOC). 2-BE has the chemical formula $C_6H_{14}O_2$ and the following structure:

Figure 1: Structure of 2-BE



As can be seen from Figure 1, 2-BE has both hydroxyl and ether functional groups. The balance between hydrophobic and hydrophilic characteristics makes 2-BE an extremely versatile solvent and an effective coupling agent. Other uses of 2-BE are as an additive, an adhesive and as a chemical intermediate for plasticizers and other compounds.



2.2. Production, Import and Use of 2-BE

According to recent data, 2-BE is not currently produced in Canada. In the last 5 years, the major suppliers of 2-BE to Canada have been three companies from the US. 2-BE is imported as a component of formulations, as part of consumer products or manufactured articles and as a chemical processing aid.

As summarized in the following table, 2-BE is mainly used in industrial and consumer paints and coatings; industrial, institutional and consumer cleaning products; industrial inks, and consumer use solvents. Other uses include agricultural pesticides, plastics & resins manufacturing, pulp and paper manufacturing and metal finishing. These estimates are based on a survey and analysis of 2-BE use completed by ToxEcology Environmental Consulting Ltd. in 2003. More detail about the uses of 2-BE in consumer products is presented in Annex 1.

Table 1: Estimated Uses and Releases of 2-BE in Canada in 2002

Industrial Uses	% of industrial	Tonnes Used	Tonnes Released
	use		
Industrial paints and coatings	85	4561	1003
Industrial & Institutional cleaning	8	430	430
Inks	5	268	268
Other	2	107	107
Total Industrial for 2002		5366	1808

Consumer Uses	% of consumer use	Tonnes Used	Tonnes Released
Paints and coatings	32	484	484
Cleaning Products (incl. Polishes)	47	712	712
Other e.g. consumer solvents, pesticides, personal care products	21	318	318
Total Consumer for 2002		1514	1514

Total Uses and Releases for 2002	6880	3322

The annual imports of 2-BE into Canada are estimated to be 6880 tonnes. This volume has been declining since 2000, when the annual imports of 2-BE were approximately 7990 tonnes. This decrease is imports may be attributed to increased use of alternatives and/or lower demand for the final products in which 2-BE is used.

3. Why we need action on 2-BE

As 2-BE is entering or may enter the environment in a quantity or concentration or under conditions that constitute or may constitute a danger in Canada to human life or health, Health Canada has proposed that 2-BE be considered toxic under paragraph 64(c) of CEPA, 1999.

Based on investigations in experimental animals, the principal critical health effects associated with exposure to 2-BE are alterations in blood parameters associated with hemolysis. Health Canada has



developed a Tolerable Concentration (TC) (see section 6.1) for 2-BE on the basis of these haematological effects. A TC is the level of exposure to which it is believed a person may be exposed daily over a lifetime without deleterious effect. Fugacity modeling and limited sampling results indicate that the concentrations of 2-BE in ambient air are less than the TC. However, based on estimation of exposure to 2-BE from a limited number of consumers products tested by Health Canada, concentrations of 2-BE in indoor air during the use of products containing the substance could potentially exceed the TC.

2-BE is considered a "Track 2" substance as defined in the "Toxic Substances Management Policy", hence life cycle management is therefore the approached taken to prevent or minimize its releases into the environment.

4. Exposure Sources

The following table outlines the possible routes of emissions of 2-BE to the atmosphere (ambient air) and human exposure to 2-BE (indoor air or direct contact).

Source of Emission	Release likely to result in ambient concentrations exceeding human health impacts threshold	Human Exposure (indoor air or direct contact) in concentrations exceeding human health impacts threshold
Manufacture of Products Containing 2-BE (including paints, coatings, inks, cleaning products, pesticides)	No	Likely (OSHA limits and controls)
Manufacture of Plastics and Resins (etc.)	No	Likely (OSHA limits and controls)
Industrial and Commercial Use of Products Containing 2-BE (industrial paints, cleaning products, solvents, inks)	No	Likely (OSHA limits and controls)
Consumer Use of Products (cleaning products, polishes, personal care products, solvents, pesticides)	No	Likely (exposure assessment required)
Consumer Use of Paints and Coatings	No	Likely (exposure assessment required)
Agricultural use of Pesticides	No	unlikely (OSHA limits and controls)
Spills/Disposal of 2-BE or products	No	unlikely (OSHA/TDG limits and controls)

Table 2: Sources of Atmospheric Emissions and Human Exposure to 2-BE

Note: - The shaded areas on the chart indicate which sources can be controlled using pollution control equipment.

- The human impact thresholds are based on specific time exposures and TC is based on daily exposition over a lifetime without deleterious effect.



As can be seen in Table 2, uncontrolled human exposure (indoor air or direct contact) to 2-BE is expected to come mainly from consumer use of products such as paints, cleaning products and solvents. Both consumer and industrial exposure to 2-BE is discussed below.

4.1. Atmospheric Emissions from Industrial Use

Approximately 85% of industrial use of 2-BE is in industrial paints and coatings. Emissions of 2-BE during the industrial use of paints and coatings occur following application of the paint. The major mechanism for release of 2-BE is the evaporation of solvents (including 2-BE) from the coating during the curing/drying process. It is assumed that 100% of the 2-BE contained in coatings is emitted from the coated surface after completion of the drying process. Facilities that have emission controls on exhaust air may capture a portion (or all) of the 2-BE emitted as a result of coating operations. The treatment of exhaust air from facilities prior to release may also capture any 2-BE released due to the use of other products such as cleaning solvents and inks and emissions due to the use of 2-BE in industrial manufacturing processes. A portion of 2-BE used industrially in cleaners is discharged as wastewater.

2-BE is a reportable substance for the National Pollutant Release Inventory (NPRI). The facilities that use 10 tonnes or more of 2-BE annually are required to report their releases of 2-BE to the NPRI. Based on NPRI 2002 early data, the total amount of 2-BE released from industrial facilities (with the exception of cleaning products, inks and others) in Canada during 2002 was estimated to be 1003 tonnes. It is assumed that 100% of the emissions for the industrial and institutional cleaning (430 tonnes), inks (268 tonnes) and others (107 tonnes) was released, therefore the total estimated releases of 2-BE in 2002 was 1808 tonnes (see table 1).

The assessment report indicates that concentrations of 2-butoxyethanol present in ambient air (Windsor Air Quality Study, 1994 by OMEE) are lower than those which would be hazardous to human health. Human exposure to 2-BE in the workplace is subject to control requirements in various federal and provincial Occupational Health and Safety Acts and Regulations. 2-BE is not measured by the National Air Pollution Surveillance (NAPS) network.

4.2. Human Exposure Due to Consumer Use of Products Containing 2-BE

It is believed that most uncontrolled human exposure to 2-BE is due to the intake of 2-BE via inhalation and dermal exposure through use of some consumer products. Of the estimated 6880 tonnes of 2-BE used in 2002, an estimated 1514 tonnes of 2-BE was contained in consumer products (see table 1).

To date there have been 274 consumer products identified (including products that are not classified as 'consumer' products, but are sold to and used by consumers) which contain 2-BE. Approximately 68% (1030 tonnes) of the 2-BE used in consumer products is present in cleaning products, solvents, and polishes, and 32% (484 tonnes) is present in architectural paints. Annex 1 provides a summary of the types of consumer products containing 2-BE, the average 2-BE content and the estimated total amount of 2-BE contained in these formulated products in 2002.

The use of products containing 2-BE by consumers releases 2-BE to either air or sanitary sewer. Unlike industrial applications, there are no possible controls on the emissions of 2-BE to the atmosphere due to the consumer use of products.



As indicated in the PSL assessment report, the concentration of 2-BE in indoor air environments following use of 2-BE containing products may exceed levels protective of human health.

5. Key Issues and Considerations

The Priority Substances List Assessment Report for 2-BE, which was published on August 2003, identifies the following considerations:

1. Consideration for follow up

Additional characterization of the ranges and distributions of concentrations of 2-BE in consumer products and their emissions was identified as a consideration for follow-up in the assessment report.

Measurement of 2-BE emissions from consumer products in indoor air is being conducted in-house by Health Canada and should be completed by April 2004. The exposure profile of 2-BE containing products will be conducted by a contractor and should be completed by January 2004.

2. *Alternatives/substitutes*

Despite the increase in the last 10 years in total 2-BE use in Canada, the percentage of the glycol ether market represented by 2-BE has declined, due to the increasing popularity of P-series and other alternatives solvents. Some P-Series glycol ethers are proven to have a lesser toxicological impact than 2-BE. These include: Propylene glycol monomethyl ether (PM), Dipropylene glycol monomethyl ether (DPM), Propylene Glycol n-butyl ether (PnB). P-series glycol ethers are produced by the same companies that produce 2-BE. There is evidence that P-series glycol ethers, and blends of P-series glycol ethers with alcohols, can be technically high-performing and cost-effective replacements for 2-BE in its two main applications - coatings and cleaning products.

3. Existing Environmental Controls

• Federal Government:

Consumer Chemicals and Containers Regulations, 2001 (Hazardous Products Act): Consumer products containing 2-BE are subject to this regulation which classifies products as very toxic, toxic or harmful based on toxicity to humans. By requiring precautionary labeling, the intent of the regulation is to inform consumers of the hazards posed by toxic and harmful products during normal use. In addition, a prohibition requirement based on the toxicological properties of products eliminates consumer exposure to very toxic chemicals. The classification is completed on a whole product basis, so 2-BE content alone would not necessarily be indicative of the hazard rating for a particular product. This classification does not consider chronic toxic effects of products.

Based on published toxicological values and considering the inhalation pathway, products containing up to 22% would not have any requirements under this regulation, products containing more than 22% but less than 86% 2-BE would be classified as "harmful". Products containing more than 86% 2-BE would be categorized as "toxic". A product which is 100% 2-BE would potentially classify as a "very toxic" product in terms of dermal exposure.

Environmental Choice Labeling Program: Under this Environment Canada program cleaning products, biologically based cleaning and degreasing compounds and personal care products that show the EcoLogo can not contain 2-BE.



Guidelines for Volatile Organic Compounds in Consumer Products: Since 2-BE is a VOC, it is covered in the VOC Guidelines in which limits for total VOCs in product categories are set.

Federal OHS Regulation: The Canada Occupational Health and Safety Regulations (under the Canada Labour Code - Part II) specifies an allowable ambient air concentration for 2-BE of 20 ppm (97 mg/m³) in the workplace (the current American Conference of Governmental Industrial Hygienists (ACGIH) time weighted average).

Pest Control Products Act: The use of 2-BE in pesticides is not controlled, however, information on formulants including 2-BE is collected when pesticide products are registered (or re-registered).

Food & Drugs Act: 2-BE is used in some sanitizers and disinfectants covered by the act, and reformulation with an alternative may therefore require new registration.

• Provinces / Territories :

VOC Initiatives: Some provinces and territories have VOC initiatives which may result in reductions in 2-BE exposure.

OHS Regulations: Each province and territory has an Occupational Health and Safety Act or Regulation which specifies the allowable ambient air concentration of 2-BE in the workplace. The 8-hour threshold level specified by the various jurisdictions ranges from 20 ppm (97 mg/m³) to 50 ppm (240 mg/m³).

Air Quality Standards: In Ontario, concentrations of 2-BE in air at the Point of Impingement (POI) (property boundary) of industrial facilities and in ambient air have been established. The POI for 2-BE is 350 μ g/m³ (odour based) and the ambient air quality criteria are 2400 μ g/m³ (health based, 24-hr average) and 500 μ g/m³ (odour based, 10 min average)

• United States:

Hazardous Air Pollutants (HAPs): Glycol ethers (including 2-BE) are listed as a group of chemicals in the US EPA hazardous air pollutant (HAP) list. On November 4, 2003, US EPA has proposed to delist 2-BE from this because concentrations in ambient air are below levels of concern. EPA regulations developed for industrial sectors set emission control requirements for total HAPs from facilities qualifying as major and area sources.

Volatile Organic Compounds (VOCs): Three EPA rules were promulgated in 1998 that set specific limits for VOCs (including 2-BE) in 24 consumer product categories, architectural and industrial maintenance paints and auto-refinish paints.

US Occupational Safety and Health Administration: Regulates occupational exposure to 2-BE and has set a permissible exposure limit of 50 ppm (based on an 8-hour time weighted average exposure).

American Conference of Governmental Industrial Hygienists (ACGIH): The current threshold level value (TLV) for 2-BE specified by this organization is an 8 hour TWA of 20 ppm. The ACGIH level is referenced in many Canadian provincial OHS acts and regulations.

Federal Insecticide, Fungicide and Rodenticide Act (FIFRA): Under the FIFRA, information on formulants including 2-BE is collected when pesticide products are registered (or re-registered). In the EPA "Inert Ingredients in Pesticide Products; Policy Statement, 1987" 2-BE is included on List 2 - Potentially Toxic Inert/High Priority for Testing. Substances included on this list are the focus of information gathering and monitoring by the EPA. New registration of products containing 2-BE (as a List 2 substance) is completed on a case-by-case basis considering the available information on potential hazardous exposure.

Food and Drug Act (FDA): 2-BE is approved for use under the FDA as an additive in slimicides and defoaming agents used in the manufacture of paper and paperboard; adhesives; sanitizing solutions; chemicals used in washing or to assist in the lye peeling of fruits and vegetables; and as a solvent in polysulfide polymer-polyepoxy resins.



• Other Countries:

The European Union, British, and Australian occupational health authorities have recommended occupational exposure limits of either 20 or 25 ppm for 2-BE.

6. Proposed Risk Management Action

6.1. Proposed Environmental Objective (EO)

When a substance is declared toxic, the broad environmental objective is to prevent or reduce its release into the environment. The proposed specific environmental objective for 2-BE is a maximum indoor air concentration of 11 mg/m³ (2.3 ppm), determined in the CEPA PSL Assessment Report to be the Tolerable Concentration for 2-BE-induced hematological effects in humans.

6.2. Proposed Risk Management Objective (RMO)

6.2.1. Industrial and Commercial Emissions and Exposures

85% of the total industrial use of 2-BE in Canada is in industrial coatings. It is believed that actions taken to reduce volatile organic compound (VOC) emissions in certain applications such as automotive coating has reduced 2-BE emissions. New initiatives are being developed to further reduce VOCs from commercial products (federal agenda for consumers and commercial products). These initiatives will have an impact on 2-BE emissions.

Based on information summarized in the assessment report, the concentration of 2-BE in ambient (outdoor) air does not exceed the tolerable concentration for hematological effects. Therefore, industrial emissions of 2-BE would not currently contribute to ambient concentrations which are hazardous to human health. Exposure of workers to indoor air concentrations of 2-BE exceeding the tolerable concentration may result from use of products containing 2-BE or use of 2-BE in an industrial process, however, these types of exposures are controlled by occupational health and safety acts and regulations currently in place federally and provincially. Therefore, the 2-BE emissions from industrial uses will be addressed as part of the initiatives to reduce VOC emissions from these uses.

6.2.2. Consumer Use of Products Containing 2-BE

Since the primary uncontrolled sources of exposure to 2-BE are products used by consumers, the proposed RMO is to reduce the content of 2-BE in products used by consumers in order to reduce human exposure to below the tolerable concentration.

The specific products or product categories that will be included, and the extent of the reduction of 2-BE, will be determined based on the following:

- Reductions or substitutions should be economically feasible.
- Substitutes for 2-BE should show a lesser toxicological impact.
- Reductions or substitutions should target consumer products with the greatest potential for contribution to human exposure to 2-BE. An analysis of human exposure to 2-BE from the use of consumer products will be completed to identify those products or combination of products which represent the greatest risk.



6.3. Proposed Risk Management Instruments

A qualitative pre-screening of all potential risk management instruments was performed. Annex 2 contains the detailed pre-screening of risk management instruments. One risk management instrument for 2-BE must be proposed to satisfy the requirements of section 91 and 92 of CEPA 1999. Instruments which satisfy these requirements include CEPA regulations, environmental release guidelines, codes of practice, pollution prevention plans and environmental emergency plans.

The pre-screening of management instruments was performed with the goal of identifying instruments that have the potential to reduce the risk of human exposure to 2-BE from the use of consumer products (mainly consumer cleaning products and consumer paints). However, as more information is gathered, it may become necessary to propose separate risk management instruments for certain products or product types.

The pre-screening showed that the following risk management tools may be suitable for managing the risks associated with consumer products containing 2-BE:

- Performance Standard (Regulation or Environmental Guideline) -
 - An Environment Canada regulation or environmental guideline to limit the concentration of 2-BE in certain categories of consumer products;
 - A Health Canada regulations to limit the concentration of 2-BE in certain categories of consumer products and/or;
- Pollution Prevention Plan P2 Plan with manufacturers and importers of consumer products to reduce the concentration of 2-BE in certain categories of consumer products;
- Environmental Performance Agreement (in combination with another instrument) For example:
 - EPA with product manufacturers to reduce their use of 2-BE and report on reductions in combination with a code, guideline or P2 plan;

Pollution Prevention Plan or regulations may be the most suitable instrument to reduce 2-BE content in consumer products. The feasibility and the applicability of either instrument will be assessed after the draft strategy consultations.

7. **Proposed Consultation Approach**

Since the focus of this RMS is on products used by consumers, stakeholders in the consultation process will likely include associations representing manufacturers of products including: Canadian Paints and Coatings Associations (CPCA), Canadian Cosmetics, Toiletries and Fragrances Association (CCTFA) and Canadian Consumer Specialty Products Association (CCSPA). Other stakeholders will include public heath officials, consumer groups, product manufacturers, importers and their suppliers and environmental non-governmental organizations (ENGOs). Preliminary informal discussions have occurred with the associations and have been focused solely on the addition of 2-BE to Schedule I of CEPA.

A multi-stakeholder consultation will be held during Winter 2004. The consultations will cover the risk assessment results, the risk management process, the proposed instruments and 2-BE alternatives. Environment Canada will seek advice on the proposed risk management objectives and risk



management instruments. Consultation on 2-BE control measures may be held in conjunction with consultation meetings on 2-ME control measures.

8. Next steps

Inventory of and Technical/Socio-Economic Study	completed
Use Pattern and Feasibility Study for Exposure Modeling	completed
Qualitative pre-screening of management options	completed
Publication of Final Assessment Report and Recommendation to Add 2-	August 9, 2003
BE to Schedule 1 (start of 2-year timeclock)	
Approval of Draft Risk management strategy	completed
Analysis of 2-BE Exposure from Consumer Products (consultant study)	Winter 2004
Consultations with stakeholders (synchronized with 2-ME consultations)	Winter 2004
Quantitative assessment of the most promising management options	Winter 2004
Draft the proposed instrument	Winter to Fall 2004
Publication of Proposed Instrument	end of 2004

9. References

Environment Canada/Health Canada, 2003. Priority Substances List Assessment Report, 2-Butoxyethanol, August 2003.

ToxEcology, 2001. Inventory of and Technical/Socio-Economic Study for 2-Butoxyethanol and 2-Methoxyethanol. Prepared by ToxEcology-Environmental Consulting Ltd., Final Report, June 2001. pp242

ToxEcology, 2003. 2-Butoxyethanol and 2-Methoxyethanol - Current Use Patterns in Canada, Toxicology Profiles of Alternatives, and the Feasibility of Performing an Exposure Assessment Study. Prepared by ToxEcology-Environmental Consulting Ltd., Final Report, 23 May 2003. pp174



10. ANNEX 1 - Detailed Uses of 2-BE in Consumer Products

The following table presents a detailed division of the total uses of 2-BE in consumer products.

Consumer Product Type	Number of consumer products (brands) identified	Average level of 2-BE in product	Percent of the total 2-BE market*	Estimate of total usage of 2-BE in Canada in 2002 (tonnes)
General Purpose Cleaners and Degreaser	84	5-10%	19%	~285
Window/Glass Cleaners	38	5-6% (Ready To Use (RTU)) 10-30% (conc.)	11%	~164
Floor/Baseboard strippers	37	17% (RTU) 30% (conc.)	7%	~100
Engine/auto parts cleaners (autoparts degreasers and cleaners)	27	15%	4.7%	~71
Auto and Household carpet and upholstery cleaners	29	11% (8% I&I 14% consumer)	1.4%	~21
Other Cleaning product categories (combined)	73	1-28%	4.7%	~71
Other consumer use products including solvents, personal care products, consumer pesticides	9 paint thinners/stripper, 70 personal care products, 7 pesticides, 6 inks	1-40%	21%	~318
Paints and coatings	65 consumer products from total of 229 coatings**	6% non-aerosol 8% aerosol	30%	~485
TOTAL	In total, 616 products containing 2-BE were identified. 447-582 of these may be used by consumers (higher estimate includes professional paints)			~1515

* Percent of total 2-BE use based on North American use patterns, and estimated use of 2-BE in tonnes/year for 2002.

** Also 135 professional paints may be used by consumers.



11. ANNEX 2 - Qualitative Pre-Screening of Management Instruments

Draft Preliminary Qualitative Assessment of Management Instruments for 2-Butoxyethanol

On November 14, 2002, a pre-screening of potential risk management instruments for 2-Butoxyethanol (2-BE) was performed. This preliminary qualitative assessment of the risk management instruments was meant to screen out instruments that are obviously not applicable or recommended.

Methodology Used for the pre-Screening:

Based on existing background information and the risk assessment report, the major concern for human exposure is consumer products.

The potential risk management instruments were split into four categories:

- 1. Regulatory Risk Management Instruments
- 2. Market Based Risk Management Instruments
- 3. Voluntary Risk Management Instruments
- 4. Information Based Risk Management Instruments

The pre-screening was performed by two risk managers from the NOPP and one economist from REAB. Because this is a preliminary assessment, scores were not assigned to the risk management instruments. Instead, they were assessed qualitatively as to their:

- applicability
- feasibility and
- potential to achieve the objectives

Results of the pre-screening

The pre-screening showed that the following risk management tools are the most suitable for the risk management of human exposure due to consumer products containing 2-BE:

- Performance Standards
- Pollution Prevention Plans
- Environmental Performance Agreements (in combination with another instrument)
- Information Based Instruments (in combination with another instrument)

Pre-Screening of Management Instruments

1) Regulatory Risk Management Instruments:

◆ Quantity Controls - not recommended

Placing limits on the quantity of 2-BE or products containing 2-BE imported and/or used would be very difficult to implement. This type of regulation involves a quota system which would be very difficult to monitor and enforce, due to the number of stakeholders involved. Quota systems are more effective when used to manage open access resources, such as fisheries.



• Performance Standards - *potential tool*

It was concluded that performance standards (e.g. reducing 2-BE concentration in consumer products) could be used to ensure that human exposure to 2-BE is prevented or minimized. However, developing, updating, monitoring and enforcing the standard, could be very expensive and may not be feasible in practice

• Technology Controls - not recommended

Technology controls is definitely not feasible for consumer products because there is no way that we can control these emissions of 2-BE or create process requirements that will minimize human exposure to 2-BE.

• Supplier Controls - *not recommended*

Supplier Controls through licensing, certification or permitting could not prevent or minimize human exposure from consumer products.

• Reporting and Record Keeping - *potential tool if used in combination*

Reporting requirement for manufacturers of products containing 2-BE would not ensure a reduction in exposure of humans to 2-BE. However, if used in combination with other instruments they can improve the information available for decision making and for monitoring and compliance efforts.

• Pollution Prevention Plans - *potential tool*

The producers and importers of consumer products containing 2-BE could be asked to prepare P2 plans for substituting the 2-BE. However, it might be difficult to identify all applicable consumer products and all relevant stakeholders. This tool could also be used in combination with another (for example, as a precursor to a regulation).

• Virtual Elimination Plans - *not applicable*

2-BE is a Track 2 substance, therefore, this tool should not be considered.

• Waste Reduction Plans - *not applicable*

2-BE contained in consumer products is emitted during usage. 2-BE will evaporate, so it is obvious that there is no 2-BE left 1) after a reasonable period of time (such as in paint film) when used or 2) in an empty container.

2) Market-based Risk Management Instruments

It is important to keep in mind that market based instruments do not guarantee a particular level of emissions reduction or human exposure, but rather provide incentives that aim at changing consumer and producer behavior. Therefore, market based instruments achieve emission reductions or other environmental objectives in an indirect way. If applied properly, market based instruments are cost-



effective ways of reducing pollution. In addition, they provide long term incentives for pollution reduction and technological innovation.

• Trading Programs - not recommended

Technically, trading programs could be used in certain sectors (i.e. to limit the amount of 2-BE used by the soap and cleaning compounds manufacturing sector). However, this instrument may not be feasible for a number of reasons. The cost of gathering information about 2-BE emissions and use is very high and in the case of the soap and cleaning compounds there is not a direct link between the limitation in the use and the reduction of human exposure and health risk. Also trading programs are complex, for example, they require the distribution of permits among companies, which is difficult and may be controversial. Finally, there is little experience with trading programs in Canada and abroad, and so far they have been only used to address large scale and diffuse pollution problems (e.g. air pollution caused by SO2 and climate change caused by CO2). Therefore, this instrument will not be further considered.

• Environmental Charges/Taxes - not recommended

Because 2-BE is used in many product formulations in different quantities and proportions, it may be difficult and complex to tax products that contain 2-BE in their formulation. Taxes may also be aimed at 2-BE itself, as a commodity, when it is imported into Canada. However, this approach does not target those products containing 2-BE imported into Canada, which could have competitiveness implications. In addition, taxes are a politically sensitive instrument and require a difficult process in order to be approved. Hence, there has to be a very good justification for their implementation. Therefore, these instruments will not be further considered

• Financial Incentives / Subsidies - not recommended

The link between financial incentives for reducing the use and emissions of 2-BE and actual reductions is weaker than with most other instruments. It requires tight and continuous controls and measurements, which are costly. Moreover, these instruments may not satisfy the polluter pays principle. Therefore, these instruments will not be further considered.

• Environmental Liability - not applicable

2-BE is not toxic for the environment. Therefore, this instrument is not suited to the present circumstance.

• Deposit-Refund Systems - *not applicable*

This instrument is not applicable in the present case.

3) Voluntary Risk Management Instrument

• Environmental Performance Agreements - *potential tool if used in combination*

An EPA is a voluntary but formal commitment. It could be a precursor to regulations for some consumer products where a cost effective alternative already exists. However, the number of stakeholders involved with a specific consumer product is an important factor to consider.



• Environmental Leadership Initiatives - not recommended

This tool would represent a lot of work to develop and implement without ensuring effective results (because it relies on voluntary actions in industry). It would be much better to consider a more efficient tool requesting the same amount of work/time, but providing more tangible results.

• Sectoral Initiatives - not recommended

Because there are many stakeholders in most sectors involved with consumer products containing 2-BE, this tool could not provide effective results. It would be much better to consider a more efficient tool requesting the same amount of work/time but resulting in monitoring or reporting requirements.

• Company / Facility Specific - *not recommended*

Because there are many companies in most sectors involved with consumer products containing 2-BE, this tool could not provide effective results for the amount of time and effort involved in its development and implementation.

4) Information Based Risk Management Instrument

These risk management instruments cannot be used alone to fulfill CEPA 1999 requirements, and could only be used in combination with other instruments. In addition, these instruments do not have the capacity to reduce emissions. Therefore, they will be evaluated later in the process when (a) risk management instrument(s) has/have been selected.