



Ministry for the  
**Environment**  
*Māhara Me Te Taiao*

# Managing waste that may contain brominated flame retardants

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Waste

## Disclaimer:

This document provides guidance on how to manage waste streams or end-of-life products that may contain brominated flame retardants. The information in this document is, according to the Ministry for the Environment's best efforts, accurate at the time of publication. However, this information should not be relied upon as a substitute for the Imports and Exports (Restrictions) Prohibition Order (No 2) 2004 nor for independent legal advice. The Ministry for the Environment does not accept any responsibility or liability whatsoever whether in contract, tort, equity or otherwise for any action taken as a result of reading, or reliance placed on the Ministry for the Environment because of having read, any part, or all, of the information in this document or for any error or inadequacy, deficiency, flaw in or omission from the information provided in this document.

This document provides guidance on how to manage waste streams or end-of-life products that may contain brominated flame retardants (BFRs).

BFRs are a type of chemical added to products during manufacture to increase their resistance to fire. They will be present in a range of end-of-life products and therefore in waste. BFRs are considered hazardous substances and some types are classified as persistent organic pollutants (POPs). Therefore, any end-of-life product or waste stream from products containing BFRs must be managed in a way that minimises the potential impact on human health and the environment.

You cannot export any waste for disposal or recycling overseas if that waste contains BFRs unless you have a Basel export permit from the Environmental Protection Authority (EPA). If the type of brominated flame retardant is likely to be a persistent organic pollutant listed under the Stockholm Convention on Persistent Organic Pollutants, then you cannot recycle, or export for recycling, the waste.

A decision tree is included in this guide to help exporters decide whether or not they must apply to the EPA for an export permit. It is not a legal interpretation and using the decision tree will not prevent you from compliance action in the future if your exports do not have the right permit.

**If you are uncertain about whether a permit is required for your waste, contact the EPA for further assistance. You can contact the EPA's Hazardous Substances team by emailing [importexport@epa.govt.nz](mailto:importexport@epa.govt.nz) (<mailto:importexport@epa.govt.nz>).**

# Who should read this guide?

Any organisation that collects, handles, dismantles, processes, disposes and/or exports end-of-life plastic and textile products for reuse, recycling or disposal or contracts with one of these organisations should read this guide. This includes, but is not limited to:

- scrap metal dealers (including end-of-life vehicles)
- e-waste recyclers
- plastic recyclers
- construction and demolition waste processors
- council waste officers
- transfer station operators
- second-hand outlets operators
- landfill operators
- resource recovery parks operators.

These organisations, particularly exporters, have legal obligations when dealing with material that could contain BFRs.

# Which products may contain brominated flame retardants?

Products and materials in which BFRs may have been intentionally added during manufacture include:

- buildings (insulation material, water pipes, facade facings)
- electrical/electronics (monitor housings, cables, plugs, fuse boxes, circuit boards) – the hard plastic components particularly from heat-generating appliances such as light fittings, computer equipment, fan heaters, hair dryers, television casings, and printed circuit boards
- transportation (automotive, railway, ships and aircraft with seats, floorings, linings and insulation)
- upholstered furniture, carpets and curtains.

For New Zealand, many of these products have been imported.

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# Why should we care?

BFRs are toxic and pose a risk of causing adverse effects to human health and the environment. They are capable of long-range transport, persist in the environment, and bioaccumulate in human and animal tissue.

They have the potential to be transformed into brominated dioxins when burnt at low temperatures or when the chemicals break down. This can occur during handling, recycling or disposal. The brominated dioxins are extremely toxic and carcinogenic.

# What are brominated flame retardants?

Flame retardants are chemicals which are added to many materials, such as plastics, foam rubber, fabrics and textiles, to inhibit the spread of fire. For example, many plastics are highly flammable and therefore their fire resistance is increased by adding flame retardants to reduce the risk of fire.

Flame retardants are a group of very diverse substances which may strongly differ in their chemical and physical properties, their mode of action, toxicology, and environmental behaviour.

Types of flame retardants include: bromine, chlorine, phosphorous, nitrogen, aluminium and magnesium.

The use of flame retardants in plastics and other synthetic materials dates back to about 30 years ago when it was recognised that the use of these materials was rapidly increasing, and fires involving them were especially hazardous because of their speed and intensity.

This guide covers bromine-containing flame retardants only (BFRs). There are many different forms of BFR but three particular types have been used the most.

## 1. Bromodiphenyl ethers (BDEs), of which there are several types

BDEs were used worldwide from their introduction in the 1970s. There are different types of BDEs. The following types of BDEs are listed as POPs under the **Stockholm Convention on Persistent Organic Pollutants (the Stockholm Convention)**, as amended in 2009, and as Schedule 1 Stockholm chemicals in the Imports and Exports (Restrictions) Prohibition Order (No 2) 2004.

1. Hexabromodiphenyl ether and heptabromodiphenyl ether (also known as octabromodiphenyl ether or commercial octaBDE which is a commercial mix of several types of BDEs); used as a flame retardant for some acrylonitrile-butadiene-styrene (ABS) thermoplastics particularly for

those used for electronic goods such as computer monitor and television casings, photocopiers, microwave ovens, laptops, and printers. Also used in coatings and lacquers, and in polyurethane foam for auto upholstery.

2. Tetrabromodiphenyl ether and pentabromodiphenyl ether (also known as commercial pentaBDE); used predominantly in polyurethane foams for vehicles seats and fittings and foams used for furniture, mattresses, carpet underlay, and electronic equipment.

Most manufacturers stopped using the Stockholm Convention listed BDEs in 2004. Another type of BDE, called decabromodiphenyl ether (decaBDE), was and still is widely used and is not yet listed as a POP under the Stockholm Convention.

## 2. Hexabromocyclododecane (HBCD)

HBCD is currently used in two main applications: some expanded polystyrene (EPS) and extruded polystyrene (XPS), with some minor applications in high impact polystyrene (HIPS) and in polymer dispersions for textiles. EPS and XPS are used in insulation for buildings and refrigerated trucks and containers. HBCD is currently under consideration by the Stockholm Convention but is covered by the **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (the Basel Convention)** as a BFR.

## 3. Tetrabromobisphenol A (TBBPA)

TBBPAs are another type of BFR covered by the **Basel Convention** but not the Stockholm Convention. They are mainly used in epoxy resins for printed wiring/circuit boards.

# What are my obligations?

There are obligations for anyone who exports or is responsible for the export of end-of-life products that may contain BFRs or waste material that may be contaminated with them. Please refer to the guidance note published by the Environmental Protection Authority (EPA) [Export of electronic waste \(e-waste\)](#). The obligations apply to anyone exporting hazardous waste as defined by the Basel and Stockholm Conventions.

If you are a recipient of levy money from the Waste Minimisation Fund and your project includes waste electrical and electronic equipment in its scope you will have to comply with a term of agreement relating to adherence with either the Ministry for the Environment's [WEEE guidelines](#) ([//www.mfe.govt.nz/node/15040](http://www.mfe.govt.nz/node/15040)), or adherence to the standard AS/NZS 5377 (Collection, storage, transport and treatment of electrical and electronic equipment) (dependent on the wording of the agreement).

New Zealand has ratified and is a signatory to a number of multilateral environmental agreements (MEAs). Of these, three MEAs place obligations on New Zealand's management of waste: The Stockholm Convention, the Basel Convention and the Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific region (the Waigani Convention).

The international requirements for these three MEAs are implemented through the following domestic regulations: [Imports and Exports \(Restrictions\) Prohibition Order \(No 2\) 2004 \(the Order\)](#). The Order was amended in August 2011 to reflect changes under the Stockholm Convention.

To export wastes that contain BFRs, the exporter must obtain a permit from the EPA which can only be issued if the waste material will be processed in an environmentally sound manner at the destination facility. BFR-containing waste material, that is likely to contain Stockholm-listed BDEs, cannot be exported for reuse or recycling.

The EPA administers and issues the permits and New Zealand Customs Service enforces the requirements. For more information on applying for a permit please refer to the [EPA](#) . To contact the EPA for assistance on applying for a permit, please call 0800 376 234 or email [hsinfo@epa.govt.nz](mailto:hsinfo@epa.govt.nz) (<mailto:hsinfo@epa.govt.nz>).

If you are considering disposing of waste that may contain brominated flame retardants to landfill in New Zealand, it should be disposed to a Class A<sup>[Footnote 1](#)</sup> landfill only.

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# How should I manage waste that could contain brominated flame retardants?

The decision tree and WEEE decision table below are to help exporters decide whether or not they must apply to the EPA for an export permit. It is not a legal interpretation and using the tools will not prevent you from compliance action in the future if your exports do not have the right permit.

**If you are uncertain about whether a permit is required for your waste, contact the EPA for further assistance.**

# Find out more

- [Export of electronic waste \(e-waste\)](#) , December 2012. Environmental Protection Authority.
- [A Literature Review on the Environmental and Health Impacts of Waste Electrical and Electronic Equipment \(//www.mfe.govt.nz/publications/waste/literature-review-environmental-and-health-impacts-waste-electrical-and\)](#), Dr R Horne and J Gertsakis, June 2006. Report prepared for the Ministry for the Environment.
- [Investigation of brominated flame retardants present in articles being used, recycled and disposed of in New Zealand \(//www.mfe.govt.nz/publications/waste-hazards/investigation-brominated-flame-retardants\)](#), B Keet, N Giera, R Gillett and K Verschueren, August 2010. Technical report prepared for the Ministry for the Environment.
- [Pilot study of brominated flame retardants in waste electrical and electronic equipment \(WEEE \(//www.mfe.govt.nz/publications/waste-hazards/pilot-study-brominated-flame-retardants\)\)](#), B Keet, October 2011. Report prepared for the Ministry for the Environment.
- [Module 2: Hazardous Waste Guidelines - Landfill Waste Acceptance Criteria and Landfill Classification \(//www.mfe.govt.nz/publications/waste/module-2-%E2%80%93-hazardous-waste-guidelines-landfill-waste-acceptance-criteria-and-4\)](#), May 2004. Ministry for the Environment.
- [Guidance on best available techniques and best environmental practices for the recycling and disposal of articles containing polybrominated diphenyl ethers \(PBDEs\) listed under the Stockholm Convention on Persistent Organic Pollutants](#) . Draft July 2012.
- [Brominated Flame Retardant Research: A Pilot Study of E-waste Plastic Sorting in New Zealand \(//www.mfe.govt.nz/publications/waste-hazards/brominated-flame-retardant-research-pilot-study-e-waste-plastic-sorting\)](#), G Latimer, B Keet, September 2013. Report prepared for the Ministry for the Environment.
- [Brominated Flame Retardant Research: Cost-benefit Analysis of Sorting Options for E-waste Plastics \(//www.mfe.govt.nz/publications/waste-hazards/brominated-flame-retardant-research-](#)

[cost-benefit-analysis-sorting-options](#)), ACIL Allen Consulting, September 2013. Report prepared for the Ministry for the Environment.

## Decision tree



([http://www.mfe.govt.nz/sites/default/files/pubs/Mixed%20Plastics%20Flow%20Diagram\\_UPDATE.jpg](http://www.mfe.govt.nz/sites/default/files/pubs/Mixed%20Plastics%20Flow%20Diagram_UPDATE.jpg))

Read a description of this image

This decision tree shows how waste that could contain brominated flame retardants (BFRs) should be managed. If waste has not been sorted into waste likely to contain BFRs and waste that doesn't contain BFRs then you must assume that all waste contains BFRs and is therefore hazardous waste. This waste is subject to the Basel Convention and if material is from the 1970s to 2008 it is likely to contain bromodiphenyl ethers so is also subject to the Stockholm Convention.

There are three disposal options for this waste:

1. landfill class A – New Zealand
2. export with appropriate permits for environmentally sound disposal
3. stockpile/store.

These three disposal options also apply to waste that contains BFRs but has not been sorted by age, type and model.

Disposal options for waste that contains BFRs and has been sorted by age, type and model depends on the age of the materials.

Material from the 1970s to 2008 contains bromodiphenyl ethers so is subject to the Stockholm Convention and the three disposal options mentioned above apply.

Material that is pre-1970s, or post 2008 if type of BFR is confirmed by the manufacturer, is likely to contain BFRs so is subject to the Basel Convention. It is unlikely to contain bromodiphenyl ethers so is not subject to the Stockholm Convention.

This waste can be exported with the appropriate permits for environmentally sound management. If waste has been sorted and it does not contain BFRs or other hazardous substances it can be recycled.

# Waste electrical and electronic equipment (WEEE) plastic waste only: supplementary decision guidance

The following risk-based decision table was produced from the results of the Brominated Flame Retardant Research: A Pilot Study of E-waste Plastic Sorting in New Zealand, (Environ, August 2013) and limited, but recent, literature measurement data.

The research indicates most WEEE items made after 2005 are likely to be POP-BDE free and able to be exported for recycling with a Basel permit. There are a handful of exceptions indicated in the table below.

Recycling decisions regarding plastics from items not covered by the research such as, but not limited to, hair dryers, VCRs, DVD players, microwave ovens, sound systems and heaters/ air conditioners, should be treated conservatively, following the decision tree in the guidelines, unless other information is available.

If items of WEEE are not covered by the table, or if the date of manufacture cannot be determined, recyclers/exporters must consider the e-waste plastic as likely to contain brominated flame retardants and therefore treat it as a hazardous waste when landfilling or exporting with a Basel permit.

The advice provided in the table is based on probabilities, due to the limited evidence base. It will be updated as and when any further information becomes available.

The WEEE decision table is included in this guide to help exporters decide whether or not they must apply to the EPA for an export permit. It is not a legal interpretation and using the decision table will not prevent you from compliance action in the future if your exports do not have the right permit.

# WEEE decision table

WEEE category	Plastic from equipment type	Date of manufacture	Specific plastic component (where applicable)	Can I export the plastic without a Basel permit?	Currently OK to export for recycling (Stockholm compliant)? <sup>1</sup>
TVs <sup>2</sup>	CRT <sup>3</sup>	European manufactured pre-1990 <sup>4</sup>		No	No
		Pre-2000		No	Yes
		Post-2000		No	Yes
	LCD	All		No	Yes
Copiers/ Printers/faxes	Business machine (large)	Pre-2005		No	No
		Post-2005		No	Yes
	Home use machines (small)	All		No	Yes
	Toner cartridges	All		Yes	Yes
		All		No	No

<b>Computers &amp; peripherals</b>	<b>CRT monitors</b>				
	<b>LCD monitors</b>	<b>All</b>		<b>Yes</b>	<b>Yes</b>
	<b>Desktop computers</b>	<b>All</b>	<b>Cases</b>	<b>Yes</b>	<b>Yes</b>
		<b>All</b>	<b>Printed circuit boards</b>	<b>No</b>	<b>Yes</b>
		<b>Pre-2005</b>	<b>Internal drives, fans</b>	<b>No</b>	<b>No</b>
		<b>Post-2005</b>	<b>Internal drives, fans</b>	<b>No</b>	<b>Yes</b>
	<b>Laptops</b>	<b>All</b>		<b>Yes</b>	<b>Yes</b>
	<b>Keyboards/mice</b>	<b>All</b>		<b>Yes</b>	<b>Yes</b>
	<b>Modems</b>	<b>All</b>		<b>Yes</b>	<b>Yes</b>

<b>Refrigerators</b>	<b>All</b>	<b>Plastic skin</b>	<b>Yes</b>	<b>Yes</b>
		<b>Electrical cover (small)<sup>5</sup></b>	<b>No</b>	<b>Yes</b>

Notes

<sup>1</sup>Export of POPs-BDE containing materials for destruction only is permitted.

<sup>2</sup>Plasmas not included due to low plastic content – bodies typically metal.

<sup>3</sup>Includes rear projection TVs.

<sup>4</sup>Applies to CRT TVs manufactured both before 1990 AND in Europe only.

<sup>5</sup> Small (10x20cm) piece on back of item used to cover electrical wiring. Should be removed and separated from remaining fridge plastics.

## **The Stockholm Convention on Persistent Organic Pollutants (the Stockholm Convention)**

The Stockholm Convention on Persistent Organic Pollutants protects human health and the environment from persistent organic pollutants by banning the production and use of some of the most toxic chemicals known. The Convention became international law in May 2004, was ratified by New Zealand in September 2004, and entered into force for New Zealand on 23 December 2004.

Persistent organic pollutants (POPs) are organic compounds that:

- do not break down readily in the environment
- are capable of long-range transport, bioaccumulate in human and animal tissue (and biomagnify in food chains)
- pose a risk of causing adverse effects to human health and the environment.

### **Further information**

[Ministry for the Environment information on the Stockholm Convention](#)

<http://www.mfe.govt.nz/more/international-environmental-agreements/multilateral-environmental-agreements/stockholm>

[Stockholm Convention website](#)

[Environmental Protection Authority information on international agreements for hazardous substances](#)

## **The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (the Basel Convention)**

The 1989 Basel Convention protects human health and the environment against the adverse effects of hazardous waste. This is achieved through the Basel Convention by reducing the amount of hazardous waste produced by signatories, and regulating international traffic in hazardous wastes (especially to developing countries). It requires the prior approval of the importing country of the

hazardous waste before that hazardous waste can be exported. It requires exporters to regulate exports of hazardous waste and to ensure that hazardous waste will be managed 'in an environmentally sound manner'.

The Convention emphasises the principle of 'generator responsibility' (a version of the 'polluter pays' principle in the Rio Declaration) for disposal of wastes, and requires parties to minimise the environmental effects of the movement and disposal of hazardous waste.

The Basel Convention entered into force in May 1992 and New Zealand ratified the Basel Convention in December 2004.

### **Further information**

[Basel Convention website](#)

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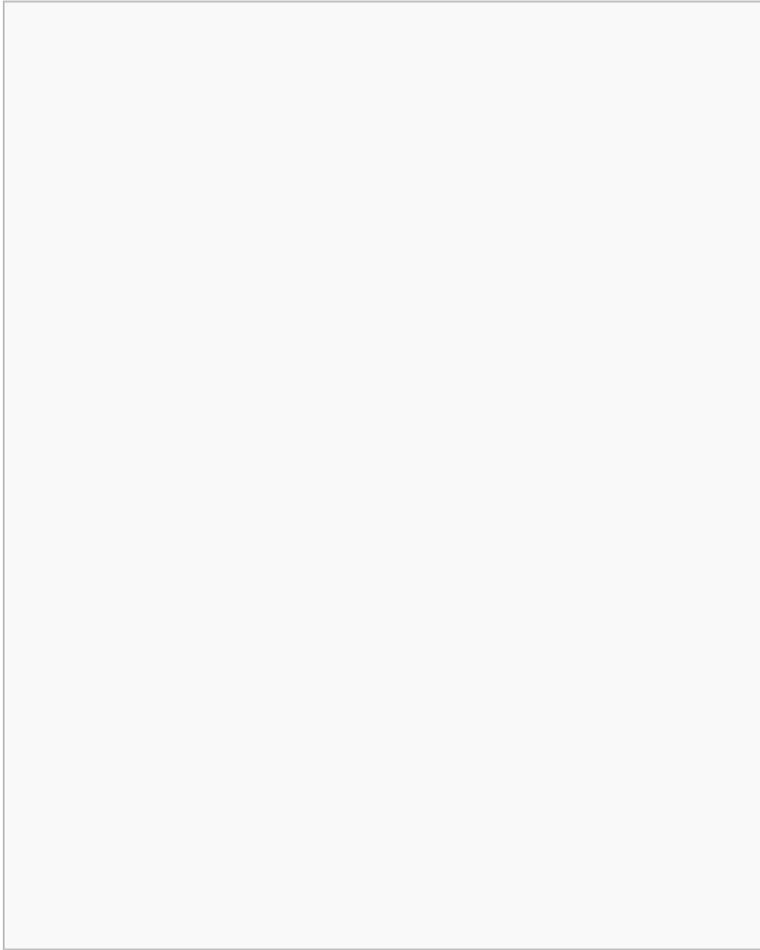
[Back to footnote reference 1](#) Class A landfills meet, or are consistent with, the site selection and design standards outlined in the Centre for Advanced Engineering's *Landfill Guidelines (2000)*. These landfills are sited in areas that reduce the potential for adverse environmental effects, have engineered systems designed to provide a degree of redundancy for leachate containment, and collect landfill leachate and landfill gas.



## Previous

### Managing waste that may contain brominated flame retardants

(/publications/managing-waste-that-may-contain-brominated-flame-retardants/)



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