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**Department of
Environment**

Report for Review of
management and operation of
used tyre stockpiles
Stockpile Guidelines

June 2006



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1. Introduction

1.1 Project Context

The Waste Management Board (WMB) is an independent body that provides strategic advice to the Minister for the Environment on waste management issues in WA. The Department of Environment and Conservation (DEC) Waste Management Branch carries out services and activities on behalf of the WMB. In November 2005 the WMB approved a Used Tyre Strategy for WA.

Approximately 1.8 million passenger tyres are sold in WA, equating to approximately 18,000 tonnes. It is anticipated that the equivalent amount of used tyres are disposed of or require disposal in WA each year. The used tyre waste stream presents a management issue for the DEC. However, it also represents potential benefits in terms of resource recovery assisting the DEC in its Towards ZeroWaste goals.

The main focus of the Used Tyre Strategy document was establishing a sustainable local tyre recycling industry in WA, with an emphasis on resource recovery and market development.

As part of this strategy, a number of actions were identified to address inconsistencies in the above ground storage of used tyres in WA, and particularly in relation to rural and remote locations. The key recommendations of this report and the relevance of these recommendations to this project are highlighted in Table 1-1.

Table 1-1 Key recommendations from the WA Used Tyre Strategy

Key Recommendation	Relevance to this project
Investigate and evaluate options to rationalise and manage stockpiles of used tyres in rural and remote locations with the view to recover all tyres for reprocessing/recycling.	This key recommendation is a central objective of the overall project. This report documents management and operational measures for stockpiles sites with the view of reprocessing and recovery.
Develop construction, management and operational standards for outdoor tyre stockpile/storage facilities.	This key recommendation is a major objective of this report. Guidelines will be developed to satisfy this recommendation.
Encourage the road construction and civil engineering industries to re-examine the use of crumb rubber in road and highway applications.	This recommendation will be considered within the context of the overall project. It may influence the location of storage facilities in relation to tyre crumbing facilities.
Make available to the tyre recycling industry relevant data on used tyre stockpiles throughout the state.	Information collected during the consultation process may be made freely available to the tyre recycling industry and documented in the consolidation strategy report.



Key Recommendation	Relevance to this project
Reassess the process by which used tyres are management at landfill operation and development a standard that maximises the opportunities for recovery of tyres either now or in the future.	This key recommendation is currently being addressed in a separate project being commissioned by the DEC. Both project are key to the establishment of a sustainable local tyre recycling industry in WA.
Assist market development for tyre-derived products through influencing procurement policy and practices.	The project will assist the requirements of this recommendation by the development of guidelines and consolidation strategy to ensure the safe and environmentally friendly storage of used tyre to maximise their potential for recovery.

In response to the above recommendations identified in the Used Tyre Strategy for WA, the DEC commissioned a number of projects to assess the volumes, management and future potential markets for used tyres. The projects commissioned include:

- » Review of Management and Operation of Used Tyre Stockpiles;
- » Review of Management of Used Tyres at Landfill Sites; and
- » Technology and Market Development for Tyre-Derived Products.

1.2 Project Objective and Scope

The DEC commissioned GHD to review the management and operation of used tyre stockpiles. The objectives of the project were to:

- » Develop recommended guidelines/standards for the construction, operation and management of above ground used tyres stockpile facilities that would provide for viable economic recovery of used tyres for recycling/reprocessing; and
- » Investigate and evaluate options to consolidate and / or clean-up tyre stockpiles in rural and remote locations with the view to maximise the recovery of those tyres for recycling / reprocessing.

To meet the objectives, GHD prepared reports, which detail:

- » Development of used tyre stockpile guidelines;
- » Strategy for the rationalisation/consolidation of tyre stockpiles in WA; and
- » Strategy for clean up used tyre stockpiles across WA.

It is noted that it would be beneficial to read these project reports in conjunction with other projects commissioned by the DEC, to gain a complete picture of the used tyre situation in WA.



1.3 Report Objective and Scope

1.3.1 Objective

The objective of this report is to develop recommended guidelines / standards for the construction, operation and management of above ground used tyres stockpile facilities that would provide for viable economic recovery of used tyres for recycling / reprocessing.

The idea of developing guidelines for the construction, operation and management of used tyre stockpiles were to minimise and control the risks associated with them and to ensure that the economic value of the used tyres are maintained. The risk associated with stockpiles can be categorised as environmental, financial, cultural and social. All these require management and control of a certain level to ensure that the minimal environmental impact is associated with used tyre stockpiles.

1.3.2 Scope

These guidelines have been developed to assist management and storage of tyre stockpiles, of various volumes, in a manner as to ensure that they remain a viable economic resource and pose minimal environmental risk.

To complete the report in relation to it's objection the following scope for the report was devised:

- » A detailed description of the research methodologies used in the collection of data and preparation of the report;
- » A summary of the outcomes for the consultation process including issues and comments gathered;
- » Identification and evaluation of all hazards and risks associated with tyre storage with regard to the WA conditions;
- » Identification and evaluation of all the possible elimination and mitigation measures, to mitigate the hazards and risks associated with used tyre stockpiles;
- » Identification of the hazard and risk elimination and mitigation measures to be adopted and incorporated into the used tyre stockpile guidelines;
- » Development of detailed guidelines for the construction, operation and management of above ground used tyre stockpile facilities;
- » Identification and evaluation of all the pertinent aspects that would detract from the implementation of the guidelines; and
- » Recommendations for the implementation of the guidelines.



2. Research Methodology

A variety of research and data collection and analysis techniques were employed in the completion of this report. These are listed and described in the following section.

2.1 Consultation Process

An extensive consultation process was carried out to engage all the relevant stakeholders of the used tyre industry to gather their thoughts and any issues in relation to the development of used tyre stockpile guidelines. The consultation process included site visits, phone calls, meetings and surveys. All the relevant stakeholder sectors were identified including Government Organisations, Industry Associations and Third Party Organisations. A minimum of one representative from each sectors was consulted in the process of research and data gathering techniques. All the parties contacted during this consultation process are listed in Appendix A.

2.1.1 Government Organisations

The key members of this sector were Local and Regional Government Councils, and they were consulted in two separate processes. Firstly, they were contacted in relation to the strategy for the consolidation and rationalisation of tyre stockpiles report and the associated survey to quantify the stockpiles across WA. Members of this sector were also contacted via phone, site visits and meetings to gather their insight into;

- » The environmental hazards and risks associated with used tyre stockpiles;
- » Elimination and mitigation measures and their appropriateness to adequately manage stockpiles; and
- » Limiting factors that would hinder the adoption of the guidelines were also identified and discussed.

GHD contacted over 90 Local Government Authorities (LGA's) and Regional Council to determine the existence of used tyre stockpiles across WA. 33 LGA's required further consultation in the form of a structured survey. Two site visits and discussions were organised with two LGA's used tyre stockpiles in the Greater Perth Area.

To examine the existing legislative governing the storage of used tyres across the WA a representative of the Licensing Policy Unit of the DEC was consulted. Direct assistance was also received from member of the Waste Management Branch of the DEC.

Consultation was initiated with representatives of the Fire Management division of the Department of Conservation and Land Management in relation to bush fire prevention measures. Fire and Emergency Services Authority were contacted about fire prevention and management. A representative of the Dangerous Goods Safety Branch of the Department of Consumer and Employment Protection was consulted about the storage of dangerous, hazardous and flammable goods.



2.1.2 Industry Associations

Literature prepared, released or published on behalf of some of these associations was revised in the preparation such as the Joint Working Group on Tyres (JWGT) (2003) Extended Producer Responsibility scheme. The JWGT comprises of the Australian Tyre Manufacturers Association, Australia Tyre Importers Group, Cleanaway and Renewed Rubber.

Various members of these associations were contacted directly in the development of these guidelines as part of the consultation carried out with the Third Party Organisations.

2.1.3 Third Party Organisations

This consultation consisted of interaction with a variety of prominent organisations in the used tyre industry. This consultation was carried out by arranging meetings and site visits to gather their opinions and thoughts in preparation of the development of the guidelines. Three tyre dealers were visited and meeting organised within Esperance and also a tyre dealer in a rural community within the Wheatbelt was consulted. A tyre recycling plant and tyre baling centre in the Greater Perth Region were also consulted. In relation to disposal two separate used tyre monofils in Brookton and Albany were visited and meetings arranged with their relevant personnel.

In total 8 organisations consulted including used tyre dealer, used tyre baler, used tyre recycler and used tyre monofil operative.

2.2 Literature Review

Literature reviews were undertaken to;

- » Review the potential hazards and risks associated with above ground tyre storage; and
- » Review best practices in tyre storage techniques.

The literature review of the potential hazards and risk associated with used tyre stockpiles consisted of internet and database searches of both Australian and international experience. International resources reviewed mainly from the UK, Europe, USA and New Zealand. The DEC provided assistance throughout the course of the literature review. The investigation was also aided by the consultation process by identifying local WA characteristics and evaluating their contribution to the hazards and risks associated with above ground tyre storage. The main hazards and risks borne out of the literature review concentrated the following categories:

- » Environmental;
- » Economic;
- » Cultural; and
- » Social.



The study also examined the factors likely to influence the impacts or level of risk associated with the hazards and risks identified.

A literature review reviewed best practices for above ground tyre storage techniques. Similarly the internet was used to gather data about experiences and techniques used nationally and internationally. The DEC also gave provided some documentation. This review mainly concentrated on the following:

- » Design considerations;
- » Financial considerations;
- » Operational considerations; and
- » Environmental considerations.

The consultation process complemented the study with the inclusion of local factors and practises.

2.3 Interstate Teleconferences

Interstate teleconference sessions were arranged to draw upon the experience and knowledge of GHD staff from across Australia. Key discussion areas raised were:

- » Identification of the hazards and risks associated with used tyre stockpiles;
- » Identification and evaluation of possible measures that could be incorporated into the guidelines;
- » Measures to be adopted and incorporated into the guidelines; and
- » Limiting factors affecting the implementation of the guidelines.



3. Outcomes from the Consultation Process

The following section summarises the outcomes from the consultation process that were considered in the development of the guidelines. These outcomes include comments, suggestions and issues raised. The outcomes are summarised on a sector-by-sector basis. All the parties consulted in relation to this study are listed in Appendix A.

3.1 Government organisations

The Licensing Policy Unit and the Waste Management Branch of the DEC indicated that used tyre storage and recycling activities are subject to a number of legislative controls, including:

- » Environmental Protection Act 1986;
- » Department of Environment Works Approval;
- » Controlled Waste Regulations;
- » Local government approval; and
- » General Environmental Protection Agency (EPA) environmental requirements.

The **Environmental Protection Act** is the main regulatory tool governing used tyre stockpile sites in WA. The Act details the requirement for all used tyre storage facilities to be licensed. It also documents the relevant quantities of used tyres to be accepted and to be on site at any one time at storage sites and reprocessing facilities. These are 100 and 500 used tyres respectively. The act of damaging used tyre to deem them unsuitable for retreading is illegal through the enforcement of the Act. Restriction on the emissions values from the incineration of tyres and restrictions on the disposal of tyres to landfill are also documented in the Act.

Department of Environment Works Approval: Part V of the Environmental Protection Act establishes a range of statutory instruments to permit the assessment and management of environmental outcomes arising from emissions from industry. Work approvals are required to be obtained for prescribed operations and premises which are likely to cause, increase, alter or result in a discharge of waste, emission of noise, odour or electromagnetic radiation to the environment or an increase, or change in the way waste is treated stored. The Work Approval system stipulated that used tyre storage premises with over 100 tyres require a works approval for the construction phase and a license for the operational phase. It also stipulates that used tyre storage as part of tyre fitting businesses require work approvals for the construction phase of the development and also a Environmental Protection license for the operations.

Controlled Waste Regulations provide a licensing system for carriers, drivers and vehicles involved in the transportation of controlled waste on public waste. The materials stipulated in the controlled waste regulations include all liquid waste and any waste that cannot be disposed of at a Class I, II or III landfill. It also includes



biological, clinical or related waste and waste that has been mobilised or encapsulated. As can be seen the regulations cover a range of materials that could potentially be flammable, combustible or a health or environmental hazard. The regulations also stipulate that any carrier, driver or vehicle that is carrying over 200kg of used tyres must be licensed.

Development Consent process: As part of the development consent process for used tyre storage facilities and also tyre fitters and dealers sites, local government authorities and the Environmental Protection Agency can attach specific conditions as they deem necessary.

Consultation with a representative of the Fire Management Division of the DEC was undertaken to examine if legislation exists about specific minimum distances or buffer zones surrounding sites that store combustible materials and bushland.

It was determined from the consultation that such legislation exists governing the separation distances between industrial and sensitive land. These requirements are detailed in Guidance Assessment of Environmental Factors No, 3 – Separation distances between industrial and sensitive land uses. It is documented in that report that a minimum buffer distance of 100-200 metres should be established between used tyre storage areas and sensitive lands. It also documented that a minimum buffer distance of 500-1000 metres should be established between used tyre recycling premises, where tyre crumbing, granulation or shredding take place, and sensitive land uses.

The Fire and Emergency Services Authority were consulted in relation to fire prevention and management. Specifically information was sought regarding restrictions in the storage of flammable goods with industrial areas. Such restrictions include the setting of minimum distances and the use of firewalls. The Fire and Emergency Authority advised contact with the Dangerous Goods Safety Branch of the Department of Consumer and Employment Protection in relation to this matter. Consultation with the representative of the Dangerous Goods Safety Branch indicated that such legislation already exists in the form of Australian Standard AS 1940 the storage and handling of combustible and flammable liquids.

3.2 Third party organisations

As indicated previously consultation within this sector included communication with tyre dealers, used tyre balers, used tyre recyclers and used tyre monofil operators.

Summarised below area opinions rose from consultation undertaken with tyre dealers in rural and regional areas across WA:

- » Current inadequate infrastructure for the long term storage options for used tyres;
- » Low cost of landfill and subsequent dumping of tyres to landfill impedes supply;
- » Markets available to develop from tyre derived products, however, not a guaranteed constant supply available;



- » Inability to attract tyre balers and / or recyclers to travel distance to collect tyres from their site; and
- » Concern in relation to stringent measures governing the storage of used tyres and associated factors such as costs, impediments to supply.

The used tyre baling, recycling and monofil operatives expressed similar views, as follows:

- » Concern over the possibility of the guidelines hindering their business operations;
- » Limitations in relation to the maximum quantity of tyres stored on site and back logs due to machinery breakdowns or services malfunctions; and
- » How such guidelines would be enforced.

It is interesting to note that recycling and monofil operatives sometimes had conflicting views about the optimum way to store tyres. Some recyclers felt shredding over monofilling was a better option. However, ultimately, it seems the method of storing tyres may be determined by the end product use for that tyre.



4. Overview of Potential Hazards and Risks of Above Ground Tyre Storage

The categories of the potential impacts associated with used tyre stockpiles that were identified include:

- » Environmental;
- » Financial;
- » Cultural; and
- » Social.

Within each of the categories of impacts identified above there are a variety of risks associated with used tyre stockpiles. The table below summaries these risks and they are discussed in greater detail within this section.

Table 4-1 Hazards and risks associated with used tyre stockpiles

Categories	Hazards and risks
Environmental	Fire
	Leaching
	Mosquitoes
	Weeds
	Vermin
	Visual impact
Social and Cultural	Health issues
	Fire hazards
	Aesthetics
Financial	Liability costs
	Degradation of used tyres
	Disposal costs
	Site closure and remediation



4.1 Environmental Impacts

There are a variety of environmental impacts associated with the stockpiling of used tyres. These are listed below in Table 4-1.

Table 4-2 Environmental Impacts associated with Used Tyre Stockpiles

Environmental Impacts	Comments
Fire	Tyre stockpile fires pose a major environmental threat. These include the possibility of air pollution, water pollution and ground/soil pollution.
Leaching	Potential impacts of tyre leachate are the contamination of soil, surface water and groundwater at the site or surrounding area.
Mosquitoes	Stagnant trapped water within stockpile will attract and form breeding grounds for mosquitoes causing a possible treat to human health. Environmental impacts are associated with the possible control techniques used to control the mosquito population.
Weeds	Stockpiles can provide habitats for weeds.
Vermin	Tyre stockpiles can harbour vermin by providing suitable breeding and feeding grounds for vermin species such as rats.
Visual	Excessive tyre stockpiles can result in aesthetically displeasing sites and negatively impact on the surrounding landscapes.

4.1.1 Potential Fire Impacts

Used tyre stockpile fires pose a significant risk to a variety of environmental media. However, this risk can be eliminated or minimised as tyre stockpiles are don't easily catch on fire by themselves. Potential threats to environmental mediums include:

Atmospheric Pollution – Tyre fires result in large plumes of dense black toxic smoke, containing hazardous levels of carbon monoxide, and mono and polyaromatic hydrocarbons, volatile organic compounds and dioxins. These pose a significant treat to human health and are discussed in further detail in section 4.2.2.

Ground / Soil Pollution – There is immediate pollution by liquids, generated as a by-product of the fire management practices, penetrating soil. Gradual pollution can occur from leaching of the ash and unburnt residues after rain and interaction with a water source. Intense heat generated from tyre fires allows for pyrolysis of the rubber, resulting in the production of oils which not only contaminate surrounding land but also spread the fire.

Water Pollution – Water pollution mainly results from runoff, from the fire or burnt area, and can occur for a number of reasons. To fight the fire, water is usually applied to attempt to extinguish the flames. This application of water results in the generation



of runoff and spreads hazardous and toxic substances which can come into contact with water bodies and results in contamination. Rainfall on the fire residues can also form harmful runoff. Groundwater pollution is also possible if the hazardous and toxic substance penetrate the soils and enter the groundwater system.

4.1.2 Leaching

When water comes into contact with the stockpile there is a possibility that leachate will be generated. This leachate can contain toxic and hazardous substances. Previous studies and sampling, such as the *Basel Convention Technical Guidelines on the Identification and Management of Used Tyres (1999)* has indicated that elevated aluminium and manganese levels are likely to be encountered in leachate from the tyre stockpiles. Other substance are likely to be within all relevant water quality standards. It is noted that the concentration of the leachate is likely to increase with time of inundation, increase proportionally with the amount of tyres and decrease proportionally with size of tyre exposed in inundation.

4.1.3 Mosquitoes

Water can be trapped within the stockpile and not evaporate. This stagnant water can become an ideal habitat and breeding ground for mosquitoes and can pose a significant threat to human health due to diseases carried by mosquitoes. This is a particularly relevant to tropical and sub-tropical areas in WA such as in the north and northwest and also in the southwest with the Mandurah Ross River Virus.

An indirect impact associated is measures used to control mosquitos populations. These are not only environmental impacts but also can be economic impacts and possible impacts on human health.

There are a range of insecticides that can be used to kill mosquito larvae in water, it is necessary to consider adverse impacts from these insecticides on humans and native fauna species (especially fish) but these impacts can be managed by correct insecticide application techniques, such as low, localised doses, and preventing drainage or escape of these chemicals to natural systems.

4.1.4 Weeds

Outdoor tyre stockpiles can provide a habitat for weeds. Where land is disturbed or noxious weeds have encroached and are present, the problem can be exacerbated. These weeds can also provide adequate ecosystems for vermin. The southwest of Western Australia is one of 25 global biodiversity hotspots and this area supports a high number of endemic plant species. Introduced species (weeds) are having a major impact on biodiversity in WA as they out compete and displace native flora species. Weeds can also impact on native fauna, displacing plants that are used as food and shelter resources, and affect natural bushland cycles, such as nutrient cycling and fire regimes.



4.1.5 Vermin

Tyre stockpiles can provide possible breeding grounds and a suitable habitat for vermin such as rats. It should be noted that such a characteristic of the stockpile would be dependant on the presence of a food source within the vicinity of the stockpile. Vermin can also represent a human health issue owing to the diseases they can potentially carry.

4.1.6 Visual Impact

Tyre stockpiles can also be considered an environmental eye sore although this depends upon on the location, size and appearance of the stockpile. This impact can be mitigated with some management of the stockpile.

4.2 Social and Cultural Impacts

The majority of social impacts associated with used tyre stockpiles refer to human and/or community health issues. A variety of these health impacts are associated with the environmental impacts identified in Section 4.1, namely human health and aesthetic issues.

Other social and cultural impacts are the consequential financial impacts associated with used tyre stockpile sites.

4.2.1 Health impacts associated with environmental issues

The major health hazard associated with tyre stockpiles are the potential risks posed by insects and vermin breeding in tyre piles. These species have the possibility to carry and spread diseases.

Tyre stockpile fires can result in the release of a variety of harmful substances into a variety of environmental receptors including the atmosphere, soil and water bodies. All of these represent a potential human health issue. Similar treats are associated with the possible release of similar substances from the leaching from stockpiles.

4.2.2 Additional health impacts

These additional health impacts can also be regarded as direct impacts or characteristics of stockpile that directly present a hazard to human health.

Used tyre stockpile fires represent a significant impact to human health. Due to the large scale of some stockpile and the intensity of tyre fires they can pose a significant hazards to people and adjacent buildings. Fire fires are also difficult to fight due to their stability and size, which pose a significant hazard to fire fighters.

Other health implications relate to the stability of stockpiles. Falling tyres and debris from stockpiles represent a significant health hazard to people on the site, notably employees.



4.2.3 Other social and cultural impact

The location and aesthetics of the used tyre stockpile can have an impact on the financial and cultural aspects of the surrounding area such as decrease in land or property values.

There are also significant costs associated with fighting used tyre stockpiles fire and the remediation of the land after the fire.

4.3 Financial Risks and Impacts

The financial risks associated with stockpiling of used tyres include:

- » Liability costs associated with the landowner, facility owner and facility operator;
- » Future value of used tyres – possible financial implications associated with tyre degradation from storage;
- » Cost of future disposal if a viable reprocessing option is not developed; and
- » Cost associated with the site closure and remediation.

4.3.1 Ownership and operational costs

There are a number of financial hazards and risks associated with the ownership of land, ownership of facilities and the operation of sites that are used for the storage of used tyres.

Landowners, facility owners and site operators may:

- » Abandon the site or facility creating a large liability associated with the cost of either continuing operations at the site or decommissioning and cleaning up the site; and
- » Become financially insufficient to cover the costs associated with maintaining operations on site, or site decommissioning and rehabilitation creating large liability.

These liability costs may have to be met by the exchequer to ensure environmental protection.

Additionally if there is an exchange of ownership of the site or facility there is the risk that the new proprietor may not be aware or informed site characteristic and may not have the financial resources to adequately manage the site to an appropriate environmental sound state.

4.3.2 Value of used tyres

Used tyres have an economic or monetary value associated with them. During storage the value associated with the used tyre is liable to change subject to storage conditions. There are a variety of risks such as fire that could lead to the degradation of the stored tyres, which will lead to possible negative implications to the tyre value.



This issue illustrates the significance of providing and maintaining a suitable storage area for used tyres particularly for the operative of the site. The current market demand for used tyres is not sufficient to consume all used tyre. It is envisaged in the near future due to issues, such as a lack of natural rubber and possible rubber conservation initiatives the demand for used tyres as an alternative will increase and the consumption of this waste stream for reprocessing will rise. Therefore it is important that current used tyres are stored adequately to ensure that their condition and monetary value does not diminish.

4.3.3 Long term storage or disposal costs

If no adequate reprocessing services or facilities are identified to treat the stockpiles of used tyres long term storage and/or disposal facilities may have to be considered.

Long term storage facilities, such as used tyre monofils, can provide an environmentally sound option if constructed and managed properly. Tyres can be accepted at such facilities in baled form maximising their storage capacity. Monofils can also prolong the economic value of used tyres and facilitate recovery in future (when or if demand requires it). These long term facilities have their own associated costs for construction, operation and management.

Various issues have been identified through the communication with the DEC and a variety of parties within the industry. Due to the specialise practise of monofilling used tyres monopoly of the market is a concern to all. Such an issue could be detrimental to the industry as a whole along with price fixing were there are only a few players offering services. Such issues can result in an increase in illegal and inappropriate disposal practises.

Where no long term storage resources are available disposal facilities, such as landfilling must be considered. The disposal cost should be in line with waste policy and be greater than the reprocessing costs. The disposal facilities also incur specific costs such as design, construction and operational costs.

4.3.4 Site closure and remediation costs

Closure and remediation works costs vary on the size of the stockpile site but should be minimal if the site is managed appropriately. The majority of costs would include transportation off the tyres of site and site clean up works to collect debris etc. Large-scale sites would encounter additional costs if site structures required demolition.

4.4 Factors influencing Level of Risks

There are a number of factors that influence the level of risk associated with the used tyre stockpiles and these include:

- » Size of the stockpile;
- » Length of time the tyres have been in storage;
- » The extent of site management;



- » The condition of the tyres;
- » Total surface air exposed; and
- » Location and other local aspects.

All these factors must be considered in relation to the formation of the guidelines governing the stockpiles.

It is internationally recognised that the main determining factor is size, i.e. the larger the stockpile the larger the risk.



5. Hazard and Risk Elimination and Mitigation Measures

5.1 Elimination and Mitigation Measures

The various hazards and risks associated with used tyre stockpiles have been identified in the previous section. These hazards and risks are categorised into the following four categories; environmental; financial; cultural and social.

Each of the hazards and risks identified require management and control measures to eliminate or, if not possible, mitigate their potential impacts. As part of the project an extensive literature review process was undertaken to identify, elimination and mitigation measures that are recommended and implemented nationally and internationally. Consultation with stakeholders was undertaken and GHD experience and knowledge was drawn upon in the development of this guidelines.

5.2 Possible Mitigation Measures Identification

For each of the risks and hazards within each impact category a variety of possible elimination and mitigation measures were identified. These are listed below and discussed in detail in Section 5.3.

- » Site selection
- » Site security
- » Emergency services access
- » Storage restrictions
- » Storage Styles
- » Exclusion zones
- » Management Controls
- » Water Supply

For each of the above measures actions were identified, and are outlined in Table 5-1.



Table 5-1 Proposed elimination and mitigation measures

Measures Categories	Possible Actions	Associated risk mitigated
Site Selection	Non – environmentally sensitive areas Absence of water courses No steep gradients or slopes Restrictions on surfaces	Fire and Leaching
Site Security	Fencing Gates Signage with contact numbers Manned sites Site enclosure (permanent structures)	Fire
Emergency services access	Adequate entry to the site Establishing an access road network Adequate road conditioning and restrictions Setting of maximum distance from road network to any portion of stockpile	Fire
Storage Restrictions	Setting of maximum stockpile sizes (heights and surface area) Recommended dimensions	Fire and Leaching
Storage Styles	Use of Containers Other covering Management intervention	Fire and Leaching
Exclusion Zones	Distance limitations from between stockpiles and: <ul style="list-style-type: none"> • Site boundary • Stockpiles • Hazardous and flammable goods (Australian Standard) • Heat generated devices • Open burning • Smoking 	Fire
Management Controls	Adopting Vermin Controls Adopting Weed Controls Adopting Bush fire controls	Human health
Water Supply	Providing water supply for emergency services subject to Australian Standards	Fire



5.3 Guideline Action's

All the proposed actions identified were analysed to determine their possible inclusion in the guidelines and are summarised as follows:

Site selection: All the proposed actions were included in the guidelines. All were determined to be practical to mitigate the risks.

Site Security: All the proposed actions were adopted into the guidelines except the requirement regarding the construction of a site enclosure unit, such as a permanent structure. Following discussion with the DEC such a requirement was deemed inappropriate and too costly.

Emergency Service Access: Each of the possible actions were deemed appropriate and best practise to mitigate against the possible risk and hazard.

Storage Restrictions: The two proposed mitigation actions were considered necessary and suitable to mitigate the risk.

Storage Styles: It was determined that the storage of the stockpiles should be managed in a manner as to minimise water infiltration and contact. The use of containers was determined inappropriate. Based on cost of the container units, costs of transport of the units and collection costs and logistic issues. From our studies, including the consideration of such resources as *Best practice environmental management of waste tyres: storage, transport, reuse, reprocessing and disposal (2002) Tasmania* and *The Prevention & Management of Scrap Tire Fires (2000) International Association of Fire Chiefs*, it was also determined that the use of containers were not an international practise. Covering of stockpiles was also not considered essential internationally. Therefore both ideas were not adopted and included in the guidelines. Where practical management intervention was determined to be the most appropriate measure to adopt.

Exclusion Zones: All of these distance limitations were adopted.

Management Controls: Controls for the management of vermin, weed and bush fire were all determined appropriate and included in the guidelines.

Water Supply: The provision of water supply for fire fighting purposes was deemed necessary and included in the guidelines where appropriate.



6. Recommended Management and Operational Guidelines for Used Tyre Stockpiles

6.1 Determining Factors

From the extensive consultation and research it has been identified that the hazards and risks associated with used tyre stockpiles vary considerably depending on location, management and local aspects. It is internationally recognised that the main determining factor is size. These guidelines have been constructed to reflect this detail and used tyre stockpiles have been subdivided into four separate classes. Appropriate guidelines have been developed with the aim of elimination, and if this is not possible, mitigation of hazards and risks.

6.2 Subdivision of Stockpiles

The four classes of used tyre stockpiles are listed below:

1. **Stockpile Class 1:** Stockpile(s) with more than 20 tyres (or 20 Equivalent Passenger Units {EPU}) and less than 500 tyres;
2. **Stockpile Class 2:** Stockpile(s) with less than 500 tyres situated within or part thereof a commercial premises;
3. **Stockpile Class 3:** Stockpile(s) with over 500 tyres, up to and including 5000 tyres;
4. **Stockpile Class 4:** Stockpile(s) with over of 5000 tyres.

For each of the classes of stockpiles identified above, a specific set of guidelines have been constructed. These are detailed in the following sections.

6.3 Guidelines for Stockpile Class 1

1. Person(s) subject to these guidelines

- 1.1. These guidelines are applicable to any one operating, managing or in ownership of a stockpile(s) that has 20 loose tyres (or EPU equivalent) and less than 500 tyres.

2. Site Selection:

- 2.1. Used tyres should not be stockpiled on wetlands, flood plains, ravines, canyons or on steeply graded surfaces or within a designated environmentally sensitive area. A minimum distance of 150 metres should be established and maintained between used tyre stockpiles and wetlands.
- 2.2. Ideally, stockpile site(s) should be established within close proximity of major transport routes.



3. Topography and surfaces:

- 3.1. Tyres should only be stockpiled on site(s) which are flat/level. Stockpile site(s) must not be established or maintained on site(s) with gradients in excess of 1:100.
- 3.2. The surface of a tyre stockpile site(s) must be of an impervious material. Ideally the site(s) should be lined with concrete but any other impervious material such as compacted clay or gravel should be used to capture and contain runoff. Where possible impervious recycled tyre products should be used such as recycled tyre aggregates. Alternative site impervious surfaces can be proposed. Adequate surface water runoff management features should be adopted on site.

4. Site Security:

- 4.1. A sign must be erected at the entrance of the site and must be visible to the public from outside the site entrance. The sign must detail the following:
 - i) Name of the facility;
 - ii) Name of the Owner and Operator of the Site;
 - iii) The business hours of the facility;
 - iv) 24 hour emergency contact number;
 - v) 24 hour contact number for the owner/operator of the site; and
 - vi) Licence number/reference (if applicable).

5. Site Access:

- 5.1. A 6 metre wide all season access road should be established and maintained providing unrestricted access to the stockpile.

6. Storage restrictions:

- 6.1. The stockpile must contain less than 500 tyres at any one time. Unless authorised by the Department of the Environment this storage restriction cannot be exceeded.
- 6.2. All tyres should be stored in a manner as to minimise rainwater, or any other water source, infiltration and or contact with the stockpile. Where possible tyres should be stored vertically side by side so as to minimise their surface area exposure.
 - a) Vermin, pest and weed control measures must be undertaken.
- 6.3. Used tyre stockpile(s) must not exceed a maximum height of 3 metres.

7. Distance limitations and fire prevention measures surrounding stockpile(s)

- 7.1. All dangerous, combustible and flammable goods stored on site must be in compliance with Australian Standard AS1940.



7.2. No open air burning should take place on site or within 60 metres of the stockpile.

6.4 Guidelines for Stockpile Class 2

1. Person(s) subject to these guidelines

1.1. These guidelines are applicable to any person(s) operating, managing or in ownership of used tyre stockpile(s) that contains 500 or less used tyres as part of a commercially run operation. Such commercial operations include, but are not limited too, tyre manufactures, tyre dealers, tyre retailers, Tyre fitters, used tyre collection operations, used tyres recyclers, used tyres monofil operations and similar operations.

2. Site selection:

2.1. Used tyres should not be stockpiled on wetlands, flood plains, ravines, canyons or on steeply graded surfaces or within designated environmentally sensitive area. A minimum distance of 150 metres should be established and maintained between used tyre stockpiles and wetlands.

2.2. Ideally stockpile site(s) should be established within close proximity of major transport routes.

3. Topography and surfaces:

3.1. Tyres should only be stockpiled on site(s) which are flat/level. Stockpile site(s) must not be established or maintained on site(s) with gradients in excess of 1:100.

3.2. The surface of a tyre stockpile site(s) must be of an impervious material. Ideally the site(s) should be lined with concrete but any other impervious material such as compacted clay or gravel should be used to capture and contain runoff. Where possible impervious recycled tyre products should be used such as recycled tyre aggregates. . Alternative site impervious surfaces can be proposed. Adequate surface water runoff management features should be adopted on site.

4. Site security:

4.1. Person(s) in charge of or managing large stockpile site(s) should adopt the following measure as part of their security arrangements for the site:

- a) Erect and maintain a fence surrounding the entire site to discourage intruders from entering the site. The fence should be at least 3 metres in height. Concrete walls of a similar height would be considered adequate.
- b) At the main point of access to the site a gate should be erected and maintained. The gate should be of a minimum height of 3 metres. The gate should have an open width of at least 6 metres to provide adequate access for emergency services. Electrically operated gates must be



capable of locking open. All gates must be securely locked at the end of each working day and while the site is not operational.

- c) A sign must be erected at the entrance of the site and must be visible to the public from outside the site entrance. The sign must detail the following:
 - i) Name of the facility;
 - ii) Name of the Owner and Operator of the Site;
 - iii) The business hours of the facility;
 - iv) 24 hour emergency contact number;
 - v) 24 hour contact number for the owner/operator of the site; and
 - vi) Licence number/reference (if applicable).

4.2. A person must be on site while it is open.

5. Site Access:

5.1. An access road commencing at the main point of entry to the site must be established and maintained leading to the stockpile area. This access road must comply with the following requirements:

- a) All access roads are suitable to seasonally variations (all-season surfaces);
- b) All access roads must be a minimum of 6 metres wide.
- c) A maximum distance of 150 metres must be established and maintained from the access road network to any portion of the stockpile(s).

6. Storage Restrictions:

6.1. The stockpile at commercially run and operated premises must not contain over 500 tyres at any one time. Unless authorised by the Department of the Environment, this storage restriction cannot be exceeded.

6.2. All tyres should be stored in a manner as to minimise rainwater, or any other water source, infiltration and or contact with the stockpile. Where possible tyres should be stored vertically side by side so as to minimise their surface area exposure.

- a) Vermin, pest and weed control measures must be undertaken.

6.3. Used tyre stockpile(s) must not exceed a maximum height of 3 metres.

7. Distance limitations and fire prevention measures surrounding stockpile(s)

7.1. All dangerous, combustible and flammable goods stored on site must be in compliance with Australian Standard AS1940.

7.2. No open air burning is permitted on site of within 60 metres of the tyre stockpiles.



- 7.3. There should be an on site, pressurised water supply designed and constructed in accordance with Australian Standards AS2419 and AS1221. The water supply should be equipped with appropriate fitting to suit the local fire authority and to ensure immediate action can be taken by employees to either stop the spread of fire or protect adjacent sites. Where this is not viable the use of alternatives like water storage devices such as dams should be considered.
- 7.4. Where applicable, Bush Fire Management Controls must be implemented on site. Specifically a clearance area of vegetation of 20 metres must encompass the entire site boundary. In addition the site should also be clear of vegetation.
- 7.5. Ideally 4-hour firewalls should be used to store tyres on site. If firewalls are used they must be 1 metre in height in excess of the tyre stockpile (firewall 4 metres – stockpile 3 metres)

6.5 Guidelines for Stockpile Class 3

1. Person(s) subject to these guidelines

- 1.1. These guidelines are applicable to any person(s) operating, managing or in ownership of used tyre stockpile(s) that contain in excess of 500 but no more than 5000 used tyres.

2. Site selection

- 2.1. Used tyres should not be stockpiled on wetlands, flood plains, ravines, canyons or on steeply graded surfaces or within a designated environmentally sensitive area. A minimum distance of 150 metres should be established and maintained between used tyre stockpiles and wetlands.
- 2.2. Ideally stockpile site(s) should be established within close proximity of major transport routes.

3. Topography and surfaces:

- 3.1. Tyres should only be stockpiled on site(s) which are flat/level. Stockpile site(s) must not be established or maintained on site(s) with gradients in excess of 1:100.
- 3.2. The surface of a tyre stockpile site(s) must be of an impervious material. Ideally the site(s) should be lined with concrete but any other impervious material such as compacted clay or gravel should be used to capture and contain runoff. Where possible impervious recycled tyre products should be used such as recycled tyre aggregates. Alternative site impervious surfaces can be proposed. Adequate surface water runoff management features should be adopted on site.



4. Site security:

4.1. Person(s) operating or managing stockpile site(s) should adopt the following measures as part of their security arrangements for the site:

- a) Erect and maintain a fence surrounding the entire site to discourage intruders from entering the site. The fence should be at least 3 metres in height. Concrete walls of a similar height would be considered adequate.
- b) At the main point of access to the site a gate should be erected and maintained. The gate should be of a minimum height of 3 metres. The gate should have an open width of at least 6 metres for providing adequate access for emergency services. Electrically operated gates must be capable of locking open. All gates must be securely locked at the end of each working day and while the site is not operational.
- c) A sign must be erected at the entrance of the site and must be visible to the public from outside the site entrance. The sign must detail the following:
 - i) Name of the facility;
 - ii) Name of the Owner and Operator of the Site;
 - iii) The business hours of the facility;
 - iv) 24 hour emergency contact number;
 - v) 24 hour contact number for the owner/operator of the site; and
 - vi) Licence number/reference (if applicable).

4.2. A person must be on site while it is open.

5. Site Access:

5.1. An access road commencing at the main point of entry to the site must be established and maintained leading to the stockpile area. This access road must comply with the following requirements:

- a) All access roads are suitable to seasonal variations (all-seasons surfaces);
- b) All access roads must be a minimum of 6 metres wide.
- c) A maximum distance of 150 metres must be established and maintained from the access road network to any portion of the stockpile(s).

6. Storage Restrictions:

6.1. The stockpile must not contain in excess of 5000 tyres at any one time and unless authorised by the Department of the Environment this storage restriction cannot be exceeded.

6.2. Used tyre stockpiles are limited to the following **maximum** dimensions:



- a) height of 3 metres; and
 - b) a total surface area of 250 square metres (recommended dimensions of 16m X 16m)
- 6.3. Once these storage limitations have been met another stockpile must be established on the site if possible subject to the limitations regarding the minimum distance between stockpiles and boundaries. If this is not possible the site will not be authorised to accept any more tyres until sufficient space becomes available.
- 6.4. Unless authorised by the Department of the Environment these storage restrictions cannot be exceeded.
- 6.5. All tyres should be stored in a manner as to minimise rainwater, or any other water source, infiltration and/or contact with the stockpile.
- a) Vermin, pest and weed control measures must be undertaken.
- 7. Distance limitations and fire prevention measures surrounding stockpiles:**
- 7.1. Tyre stockpile(s) are subject to the following distance limitations. From the edge/circumference of a stockpile the following distance requirement must be established and maintained:
- a) 15 metres minimum distance between the edge of the stockpile and the site boundary.
 - b) It is recommended that 4-hour firewalls are used as a side support and/or to form an edge(s) of the stockpile(s). If these are used a minimum distance of 6 metres (provision for an access road) on the opposite/outside of the wall must be established and maintained.
 - c) If 4-hour firewall is used as a site boundary a minimum distance of 6 metres (for the provisions of an access road) must be established and maintained on the external side of the firewall/boundary. The firewall must be of height of 4 metres (1 metre in excess of the stockpile).
- 7.2. All dangerous, combustible and flammable goods stored on site must be in compliance with Australian Standard AS1940
- 7.3. No open air burning is permitted on site or within 300 metres of the tyre stockpiles.
- 7.4. A minimum distance of 30 metres must be established and maintained between used tyre stockpiles.
- 7.5. A minimum distance of 500 metres must be established and maintained between used tyre stockpiles and residential units/areas.
- 7.6. The usage of welders and/or other heat-generated devices are not allowed on site or within 60 metres of a stockpile.



- 7.7. Smoking is not permitted on site or within 60 metres of the stockpile. Designate smoking area must established and maintained on site subject to this condition.
- 7.8. Where applicable Bush Fire Management Controls must be implemented on site. Specifically a clearance area of vegetation of 20 metres must encompass the entire site boundary. In addition the site should also be clear of vegetation.
- 7.9. There should be an on site, pressurised water supply designed and constructed in accordance with Australian Standards AS2419 and AS1221. The water supply should be equipped with appropriate fitting to suit the local fire authority and to ensure immediate action can be taken by employees to either stop the fire or protect adjacent sites. Where this is not viable the use of alternatives like water storage devises such as dams should be considered.

6.6 Guidelines for Stockpile Class 4

1. Person(s) subject to these guidelines

- 1.1. These guidelines are applicable to any person(s) operating, managing or in ownership of used tyre stockpile(s) in excess of 5000 tyres

2. Site selection:

- 2.1. Used tyres should not be stockpiled on wetlands, flood plains, ravines, canyons or on steeply graded surfaces or within a designated environmentally sensitive area. A minimum distance of 150 metres should be established and maintained between used tyre stockpiles and wetlands.
- 2.2. Ideally stockpile site(s) should be established within close proximity of major transport routes.

3. Topography and surfaces:

- 3.1. Tyres should only be stockpiled on site(s) which are flat/level. Stockpile site(s) must not be established or maintained on site(s) with steep gradients. gradients in excess of 1:100.
- 3.2. The surface of a tyre stockpile site(s) must be of an impervious material. Ideally the site(s) should be lined with concrete but any other impervious material such as compacted clay or gravel should be used to capture and contain runoff. Were possible impervious recycled tyre products should be used such as recycled tyre aggregates. Alternative site impervious surfaces can be proposed. Adequate surface water runoff management features should be adopted on site.

4. Site security:

- 4.1. Person(s) operating or managing large stockpile site(s) should adopt the following measures as part of their security arrangements for the site:



- a) Erect and maintain a fence surrounding the entire site to discourage intruders from entering the site. The fence should be at least 3 metres in height. Concrete walls of a similar height would be considered adequate.
- b) At the main point of access to the site a gate should be erected and maintained. The gate should be of a minimum height of 3 metres. The gate should have an open width of at least 6 metres for providing adequate access for emergency services. Electrically operated gates must be capable of locking open. All gates must be securely locked at the end of each working day and while the site is not operational.
- c) A sign must be erected at the entrance of the site and must be visible to the public from outside the site entrance. The sign must detail the following:
 - i) Name of the facility;
 - ii) Name of the Owner and Operator of the Site;
 - iii) The business hours of the facility;
 - iv) 24 hour emergency contact number;
 - v) 24 hour contact number for the owner/operator of the site; and
 - vi) Licence number/reference (if applicable).

4.2. A person must be on site while it is open.

5. Site Access:

5.1. An access road network should be established and maintained on the site subject to the following conditions to ensure that there is unrestricted access to all the areas of the site for emergency services and vehicle:

- a) All access roads are suitable to seasonal variations (all-season surfaces);
- b) All access roads must be a minimum of 6 metres wide. Where roads of length in excess of 50 metres conclude in a dead end there must be a minimum radius of 15 metres to allow for turning.
- c) A perimeter access roads (minimum width 6 metres) must encompass the site: and
- d) A maximum distance of 150 metres must be established and maintained from the access road network to any portion of the stockpile(s).

6. Storage Restrictions:

6.1. Used tyre stockpiles are limited to the following maximum dimensions:

- c) Height of 3 metres; and
- d) A total surface area of 250 square metres (recommended dimensions of 16m X 16m).



- 6.2. Once these storage limitations have been met another stockpile must be established on the site if possible subject to the limitations regarding the minimum distance between stockpiles and boundaries. If this is not possible the site will not be authorised to accept any more tyres until sufficient space becomes available.
 - 6.3. Unless authorised by the Department of the Environment these storage restrictions cannot be exceeded.
 - 6.4. All tyres should be stored in a manner as to minimise rainwater, or any other water source, infiltration and or contact with the stockpile. (How is this achieved)
 - a) Vermin, pest and weed control measures must be undertaken.
- 7. Distance limitations and fire prevention measures surrounding stockpiles:**
- 7.1. Tyre stockpile(s) are subject to the following distance limitations. From the edge/circumference of a stockpile the following distance requirements must be established and maintained:
 - a) 15 metres minimum distance between the edge of the stockpile and the site boundary.
 - b) It is recommended that 4-hour firewalls are used as a side support and/or to form an edge(s) of the stockpile(s). If these are used a minimum distance of 6 metres (provision for an access road) on the opposite/outside of the wall must be established and maintained.
 - c) If 4-hour firewall is used as a site boundary a minimum distance of 6 metres (for the provisions of an access road) must be established and maintained on the external side of the firewall/boundary. The firewall must be of height of 4 metres (1 metre in excess of the stockpile).
 - 7.2. A minimum distance of 30 metres must be established and maintained between used tyre stockpiles.
 - 7.3. A minimum distance of 500 metres must be established and maintained between used tyre stockpiles and residential units/areas.
 - 7.4. A minimum distance of 60 metres must be established and maintained between any area of the stockpile and dangerous, combustible and flammable goods.
 - 7.5. No open air burning is permitted on site or within 300 metres of the tyre stockpiles.
 - 7.6. The usage of welders and/or other heat-generated devices are not allowed on site or within 60 metres of a stockpile.
 - 7.7. Smoking is not permitted on site or within 60 metres of the stockpile.
 - 7.8. Where applicable Bush Fire Management Controls must be implemented on site. Specifically a clearance area of vegetation of 20 metres must encompass



the entire site boundary. In addition the site should also be clear of vegetation.

7.9. There should be an on site, pressurised water supply designed and constructed in accordance with Australian Standards AS2419 and AS1221. the water supply should be equipped with appropriate fitting to suit the local fire authority and to ensure immediate action can be taken by employees to either stop the fire or protect adjacent sites. Where this is not viable the use of alternatives like water storage devises such as dams should be considered.

8. Documentation

8.1. An Emergency Plan must be prepared and keep onsite at all times. This Emergency Plan must include:

- a) Emergency procedures to be in-acted at time of emergencies such as fires;
- b) The contact number for all local emergency services departments including;
 - i. Fire and Bush Fire Services
 - ii. Ambulance Services; and
 - iii. Police Services.
- c) The contact numbers for all relevant governmental bodies¹ including:
 - i. Local Government Authority
 - ii. The Department of Conservation and Environment;
 - iii. The Environmental Protection Agency;
 - iv. The Fire and Emergency Services of Australia; and
 - v. The Department of Consumer and Employee Protection.
- d) The contact details of the site owner and operator.

¹ The contact details for the majority of these governmental bodies are included in Appendix B.



7. Factors Affecting Implementation of the Guidelines

The following factors have been identified that may impede the implementation of the guidelines.

- » Stockpiles located at remote and rural areas;
- » Lack of enforcement and implementation resources;
- » Landfill License Conditions;
- » Capital and operational costs; and
- » Existing stockpiles that may be in contravention of the proposed guidelines.

7.1 Remote and Rural Areas

There are a number of stockpiles located in remote and rural areas. The majority of these areas have limited resources in relation to LGA's and similar governmental bodies. Therefore enforcement of the guidelines could present a problem.

As outlined Sections 4.3 and 7.4, substantial costs are associated with providing facilities, services and resources to adequately manage these stockpiles and the adoption of these guidelines. It is anticipated that these costs would increase for remote and rural areas for the provides of services and transportation costs.

7.2 Enforcement and Implementation

Enforcement is another key factor in relation to the implementation of the guidelines. How the guidelines will be enforced is the first matter that requires resolving. It must be consider whether LGA's will enforce the guidelines and ensure that they are adhered to in their jurisdiction, or whether stockpiles operated by the LGA's be governed by the DEC. Thus, the onus to ensure that LGA adopt the guidelines would fall to the DEC.

The guidelines have been developed to ensure that used tyre stockpiles pose minimal environmental, social and financial risk. However, it is probable that this can only be achieved subject to their adoption into legislation and subsequent enforcement. A structure and framework for the enforcement of the guidelines is required to be developed, and roles and responsibilities assigned to relevant parties.

Part of this structure could involve documentation of a plan for the adoption of the used tyre stockpile guidelines, including:

- Detailed description of the guidelines;
- Guidance for each of the relevant stakeholders for the adoption of the guidelines;
- Documentation of a phased-in process; and
- Contact details for further information.



7.3 Landfill License Conditions

Prior to the implementation of guidelines, a review of landfill licence conditions should be undertaken with regard to the acceptance of tyre and shredded tyres to landfill.

In accordance with the Environmental Protection Regulations 1987 used tyres can be disposed of in landfills subject to certain requirements including covering materials and depths in WA with the exclusion of the Tyre Landfill Exclusion Zone, which mainly comprise of metropolitan Perth and a number of rural LGAs.

As stipulated in the Regulations used tyres can be disposed of as whole or shredded. The majority of landfill operators don't engage in such activities and have specific cells or space within landfill designated for the disposal of used tyres. All tyres disposed of to landfill are subject to specific covering requirements.

The currently legislation permitting the disposal of used tyres to landfill reduces the requirement of used tyre stockpiling practices and subsequently could possibly retract from the adoption of these guidelines.

7.4 Costs

There are costs associated with these guidelines which will be imposed on a number of parties involved in the sector.

Under the proposed guidelines, operators of tyre stockpile sites will incur costs to ensure that their sites are in compliance with the guidelines. The chief costs will evolve from the adoption of elimination and mitigation measures discussed in Sections 5 and 6. These costs are applicable to both privately operated sites and site operated by LGAs.

Additional costs will be incurred by the LGA and the DEC in relation to resources to enforce the guidelines. Such resources may include the provision of staffing and man power to audit site operations, to ensure that the guidelines are being adhered to.

7.5 Existing Stockpiles in Contravention of the Guidelines

Currently, tyre stockpiles are not subject to any specific guidelines in relation to their management and operation. When these guidelines are adopted into legislation a variety of measures will require implementation at existing sites to make them compliant.

The degree of works to be carried out on sites, will vary from site to site depending on the current state and condition of stockpiles. These works will have costs associated with them, and will add extra financial burden to the operators of the sites.

Such costs could also raise further issues such as site abandonment, as operation of a site may become economically unviable. Consequently, used tyre stockpile sites could be left in poor condition, pose environmental risk, require rehabilitation works and relating costs. There is the potential that the State may be left to wear this cost.

This burden will represent a major factor that may impede the implementation of the guidelines and require attention to ensure that the purpose of the guidelines is



achieved. Possible relief measures to mitigate against this factor would include a well communicated phased in approach to the adoption of the guidelines. This approach could include the following:

- » Informative communication with all relevant parties commencing in adequate time before the adoption of the guidelines. This should detail the proposed guidelines and relevant measures that will be required to be adopted; and
- » After the guidelines come into effect, there could be a period of grace for existing sites to upgrade activities and operations to comply with guidelines.



8. Conclusions

- » Consultation with LGAs, used tyre industry operators, operators of tyre stockpiles, the DEC and an extensive literature review, identified four categories for potential hazards and risks associated with tyre stockpiles, including:
 - Environmental;
 - Social;
 - Cultural; and
 - Financial.Specific potential hazards and risks associated with these categories are outlined in Section 4.
- » A variety of factors influencing the level of risk within these categories were also identified, and included size, condition, location, exposure and management of stockpile. It is noted that size is recognised as the main determining factor.
- » As size was identified as the determinant risk factor is managing used tyre stockpiles, guidelines were developed based on the potential size of stockpiles.
- » Four separate classes were devised including:
 - Class 1 - These guidelines are applicable to any person(s) operating, managing or in ownership of a stockpile(s) that contains 20 loose tyres (or EPU equivalent) and than 500 loose tyres or less;
 - Class 2 - These guidelines are applicable to any person(s) operating, managing or in ownership of used tyre stockpile(s) that contains 500 or less used tyres as part of a commercially run operation
 - Class 3 - These guidelines are applicable to any person(s) operating, managing or in ownership of used tyre stockpile(s) that contain in excess of 500 but no more than 5000 used tyres
 - Class 4 - These guidelines are applicable to any person(s) operating, managing or in ownership of used tyre stockpile(s) in excess of 5000 tyres
- » Elimination and mitigation measures that could possibly be adopted into the guidelines and implemented on site, to manage the potential hazards and risks associated with used tyre stockpiles, included:
 - Site selection
 - Site security
 - Emergency services access
 - Storage restrictions
 - Storage Styles
 - Exclusion zones
 - Management Controls
 - Water Supply
- » From each class a specific set of guidelines based on the measures and actions identified and evaluated earlier, where developed. It was taken that the larger the stockpile the greater the risk. Therefore Class 4 was subject to the most numerous and stringent measures and actions requiring adoption and implementation, and these decreased the lower the classes.
- » Factors that may impede the implementation of the guidelines were identified as:



- Remoteness and rural issue;
 - Inadequate enforcement and implementation resources;
 - Costs, capital and funding; and
 - Existing stockpiles that are in contravention of the guidelines.
- » In addition, industry generated a number of opinions that should be considered in the proposed introduction of guidelines, most notably, how the guidelines would be enforced and how storage restrictions may impede their business operations.



9. References

- Basel Convention (1999) *Technical guidelines on the identification and management of used tyres*; Basel, Switzerland
- Department of Environmental Conservation – New York State (2004) *New York State waste tire stockpile abatement plan*; New York
- Department of Primary Industries, Water and Environment – Tasmania (2002) *Best practice environmental management of waste tyres: storage, transport, reuse, reprocessing and disposal*; Hobart
- Environment Australia (2001) *A national approach to waste tyres*
- Environmental Protection Agency (2005) *Guidance for the assessment of environmental factor (in accordance with Environmental Protection Act 1986) Separation distance between industrial and sensitive land uses*; Perth
- International Association of Fire Chiefs (2000) *The prevention and management of scrap tire fires*
- Joint Working Group Tyres (2004) *Economic and financial analysis of the proposed Australian used tyre product stewardship scheme*
- Ministry For the Environment – New Zealand (2004) *End of life Tyre Management: Storage options*
- Standards Australia (2004) *Australian Standard 1940 – The storage and handling of flammable and combustible liquids*; Sydney
- Standards Australia (2005) *Australian Standard 2419 – Fire hydrant installations – system design, installation and commissioning*; Sydney
- Standards Australia (1997) *Australian / New Zealand Standard – Fire hose reels*; Sydney
- URS (2005) *Financial and economic analysis of the proposed used tyre product stewardship scheme*; Sydney
- Waste Management Board Western Australia (2005) *Used tyre strategy for Western Australia – Draft for public consultation*; Western Australia



Appendix A

Stakeholders consulted in the development of the guidelines



The following stakeholders took part in the consultation process of this project.

Government Organisations

Organisation	Division	Contact
Department of the Environment	Licensing Policy Unit	Mr. Paul Byrnes
Department of Conservation and Land Management	Park Policy and Services	Mrs. Rebecca Coyle
Department of Conservation and Land Management	Regional Fire Coordinator for Swan Region	Mr. Rob Towers
Department of Consumer and Employment Protection	Dangerous Goods Safety Branch	Mr. Stephen Lane

Third Party Organisations

Organisation	Contacts
Reclaim Industries	Mr. Chris Battel & Mr. Chris Forrester
Tyre Recyclers WA	Mr. Will Van Grootel
S.T.E.G.	Mr. Peter Bertei
Corrigin Tyre Power	Mr. John Douthie
Moir's Tyres	Mr. Moir
Staines of Esperance	Mr. Staines
Bridgestone Combined Tyres	Mr. Sparrowhawk



Appendix B

Contact Details of Relevant Governmental Bodies



The table below lists the contact details of the governmental bodies relevant to used tyre stockpile management.

Contact Details of relevant Governmental Bodies

Governmental Body (specific section where relevant)	Address	Postal Address	Contact Details
<i>Department of Environment and Conservation</i>	The Atrium 168 St Georges Terrace, Perth, WA 6000	Lock Bag 104, Bentley Delivery Centre 6983	Telephone: 08 6364 6500 1800 7800 300 (Freecall) Fax: 08 6364 6520 Email: info@environment.wa.gov.au
<i>Environmental Protection Agency</i>	The Atrium 168 St Georges Terrace, Perth, WA 6000	Lock Bag 104, Bentley Delivery Centre 6983	Telephone: 08 6364 6500 Fax: 08 6364 6522 Email: info@environment.wa.gov.au
<i>Department of Consumer and Employee Protection (Dangerous Goods Safety Branch)</i>	Mineral House, 100 Plain Street, East Perth, WA 6004		Telephone: 08 6364 6500 Fax: 08 6364 6522 Email: online@docep.wa.gov.au
<i>Fire and Emergency Services of Australia</i>	FESA House, 480 Hay Street, Perth WA 6000	GPO Box P1174 Perth WA 6844	Telephone: 08 9323 9300 Fax: 08 9323 9470 Email: fesa@fesa.wa.gov.au



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