The Environment Council

Seeking Solutions for Waste Tyres:

Informing the Environment Agency's Waste Tyres Programme

Tyre Stockpile Paper

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LTCS
LANDFILL TAX CREDIT SCHEME

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Please note: This report is a reference paper which is now being made available for wider circulation and use.

It has been developed by a working group – the Stockpile Working Group - and agreed by the stakeholders involved in the Waste Tyres Dialogue (about 150 in total).

Context

The Waste Tyres dialogue, of which the Stockpile Working Group is part, was initiated by the Environment Agency (EA) in 2001 to try and develop solutions to waste tyres in England and Wales. A key driver behind this is the EC Directive 1999/31/EC on the Landfill of Waste that will prohibit the disposal of whole tyres to landfill from 2003 and shredded tyres from 2006. It is estimated that 30% of waste tyres in England and Wales are currently disposed of to landfill.

The objective of the dialogue is to support a sustainable disposal and recovery system for tyres by seeking agreement amongst stakeholders of how the change in legislation can be complied with. The outcome of this process is to identify actions to prevent environmental damage caused by illegal dumping and disposal.

The dialogue has a Main Group of some 150 stakeholders, around 50 of whom have met about once every six months since July 2001. The Main Group established three working groups to look at aspects of waste tyres in detail and proposed ways forward to the Main Group. The three working groups are:

- The definition of waste as applied to tyres, and the revision of exemptions from waste management licensing;
- Guidance for the clearance of tyre stockpiles;
- Guidance for setting up an effective enforcement campaign.

The working groups have been tasked with developing detailed proposals for consideration by the Main Group. The Main Group has been set up with decision-making authority.

This paper provides a generic guide to the issues to be considered by individuals or organisations trying to address the clearance of a tyre stockpile. The paper also suggests an order in which to consider each aspect and identifies the links between activities.

This paper has been produced by the Tyre Stockpile Working Group. As such the paper embraces the views and expertise of representatives from the tyre manufacturing industry, the waste tyre collection, recycling and disposal industries, the consultancy sector, funding bodies, the EA, Local Authorities (LA) and the Department of Trade and Industry.

Members of the Tyre Stockpile Working Group

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The paper acknowledges the time and the effort individual members of this group have contributed and appreciation is also given to those companies and organisations who have funded and supported those individuals in the development of this paper.

Background

In 2002 the EA commissioned AEA Technology (AEAT) to undertake a stockpile survey[1] in advance of the landfill ban in 2003. This survey assessed that there were some 38 stockpiles of 1,000 or more tyres in England and Wales, with a total of almost 14 million tyres held within them. A key part of the survey was to provide outline proposals for the remediation of 3 of the highest-risk tyre stockpiles. A summary of the risk assessment used is set out in Annex 2, and case studies for Old Hampole Quarry, near Doncaster, Normanton Airfield, near Newark and Tattersett, North Norfolk are set out in Annex 5.

Tyre stockpiles can be assessed on the basis of risk. It is important to recognise that, beyond detriment to amenity, the environmental harm of a **secure** tyre stockpile in a managed location is low. Tyres are inherently stable by design, do not self-combust and the potential for pollution from leachate is low. However, tyres are largely a carbon-based product and if set on fire, the environmental harm can be severe. The risk presented by a particular stockpile depends on the likelihood of arson, on the site location in terms of the natural environment, and proximity to local human population and to local infrastructure. Unsecured sites will always carry a risk from arson. This combination of a relatively inert material with the latent potential for severe environmental and human health impact following a fire means that tyre stockpiles often have a high perceived, rather than actual, environmental risk.

[1]The 'Tyres Stockpile Survey' commissioned by the EA in 2002 came in three parts, the third of which set out remediation options for three 'high risk' sites at Tattersett, North Norfolk, Little Heath, near Thetford and Hampole Quarry, near Doncaster. The report has not been published but extracts have been made available on request. A summary of the thirty eight sites identified is included in Annex 7.

Stockpiles of any size, a form of environmental pollution, have two basic origins: legal and illegal. Legal stockpiles are generally generated when a licensed site operator finds that their business operation gets into financial difficulties and cannot operate further. Illegal stockpiles are generally generated by rogue tyre operators taking advantage of unlicensed isolated locations where waste tyres can be dumped. The dumping continues until waste tyre volumes become such that a LA or the EA are made aware.

In most cases the stockpiles have been generated with a commercial gain by one party or another. The polluter, i.e. the stockpile generator, should be identified and be the first point of clearance funding, based on the polluter pays principle.

It is difficult to identify those engaged in, or condoning illegal activities in, stockpile generation but Duty of Care places a responsibility on tyre producers to ensure their waste is properly dealt with. Tyre producers should be extremely vigilant to satisfy themselves that tyre collectors are using bona fide recovery or disposal outlets.

Scope of this paper

This paper provides background material and guidance on the factors relating to the clearance of tyre stockpiles. It does not, and cannot, provide a definitive way forward for all tyre stockpiles; this will vary from site to site. However, it seeks to set out many of the issues likely to be faced by those looking to clear any tyre stockpile.

The generic steps in any stockpile clearance project are summarised in the flow diagram in Figure 1.

The paper discusses each step in turn and highlights how each decision area can impact on the others. A number of the steps overlap and the process is likely to be iterative. As more information is found or options explored, certain activities may have to be reviewed to take account of the impact of new information, on for example funding sources.

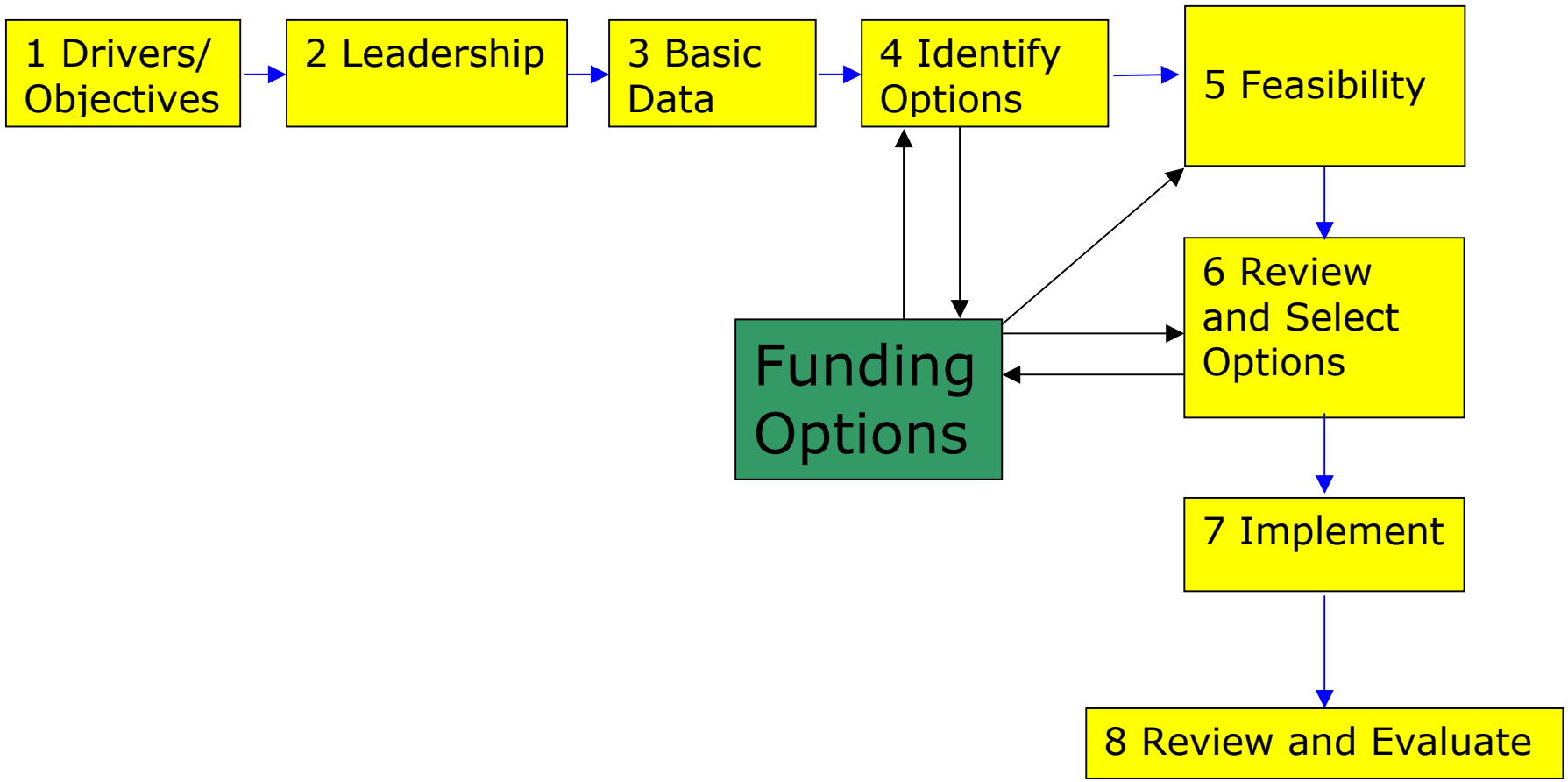
1. Project Drivers and Objectives

1.1. One or more factors will prompt one or more interested parties or stakeholders to consider that a particular stockpile, or stockpiles, should be cleared. Factors are likely to range from visual intrusion, through social disamenity and economic loss to significant environmental risk and damage where a stockpile is situated on a site sensitive to the spread of leachate from any tyre fire.

1.2. At this stage, identifying objectives for a clearance project will help shape the required project team and limit the possible avenues for funding. It is unhelpful to be too prescriptive at this point. It may be desirable to define a minimum objective but this should not rule out a larger scheme that, for example, leads to the stockpile site being redeveloped and put to a different use.

Recommendation
Define objectives on a site by site basis. The first step should be to assess/provide/maintain/enhance site security.

Figure 1 Stockpile Clearance Flow Diagram



2. Leadership

2.1 The success or otherwise of the project hinges on assembling the necessary mix of leadership, skills and interests, which is further discussed in Annex 4. A key position will be the project lead or champion, who should be identified at an early stage to guide and progress the project through its various stages, a number of which may well be challenging.

2.2 It is likely that the project lead will need to assemble a team, the composition of which may change over the life of the project. At the outset this project team need not be large. However, a range of competencies will be required over the life of the project, and will almost inevitably include the following:

- waste management (particularly tyres)
- commercial and legal
- funding
- project management

2.3 Any project is likely to include the involvement, at some level, of the LA, the EA, a funding body and the site owners; the project leader should assess the positive benefits of using semi-formal working partnerships. If the project team includes one or more parties that may financially benefit from the clearance (e.g. landowner), this may affect the choice of funding options and needs to be borne in mind when options are developed.

2.4 The clearance of any tyre stockpile is likely to involve a number of parties and certain stages will by their nature be complex. As such, it is vital that effective communication systems are put in place, and the roles of those involved are clearly understood to provide for an effective and efficient stockpile clearance. Doubtless, this is something that will be tackled and put in place at an early stage.

Recommendation
The project leader or champion should be selected from the most interested party, typically either the landowner or Local Authority representative.

3. Basic Data

3.1 The justification for and the ability to clear a tyre stockpile is likely to need a range of factual detail. This will be both site specific, including details of the tyre stockpile itself and available used tyre collection and treatment infrastructure, as well as more generic background information (refer to Annex 1 Background Checklist). This information will ultimately support the case for clearing the site and act as a potential lever for securing the funding needed. It may also enable individual stockpiles to be prioritised, if this is necessary.

3.2 Importantly, this information will inform a number of choices and decisions that will need to be taken on how and where to secure the funding for site remediation as well as the physical means of treating the removed tyres.

3.3 The methodology used in the Tyres Stockpile Report assessing hazards at tyre stockpiles is described in Annex 2, along with examples of the hazard scores.

3.4 Further information relating to Contaminated Land Designation can be found in Annex 3.

Recommendation
Annex 1, Annex 2 and Annex 3 should be used to scope the information on a site-specific basis.

4. Identify Options

4.1 Cost, and therefore funding, is likely to be the biggest single factor in selecting the option for clearing the stockpile. It should, however, be borne in mind that the lowest cost option may not be the most sustainable, and the funding organisation(s) may wish to be satisfied that account has been taken of other factors, such as funder criteria, legislation, and overall environmental impact of the fate of the tyres.

4.2 To help identify the options for clearing a stockpile it may be useful to set out some of the considerations. A number of these may be closely interrelated and a choice in one decision area (which can broadly be broken down into leadership, funding, method of clearance and subsequent use of the land) may influence the range of options subsequently available in another. Site-specific criteria will also be a significant factor in setting out the options available.

4.3 Annex 4 describes these decision areas and options in more detail and highlights the relationships between them.

Recommendation
Identify options in an open and transparent manner including all options that are legal at the time.

5. Feasibility (Appraise the options)

5.1 Some of the potential combinations are unlikely and can effectively be ruled out. For example, a site is unlikely to secure private funding without some commercial development of the cleared site (refer to Annex 4).

5.2 Site-specific criteria will also play a key role in further narrowing down the available practical options. Factors will include the size and location of the stockpile, the tyre collection and treatment infrastructure and the partnership team assembled for the particular site.

5.3 At this stage, if not considered previously, it will be necessary to get to grips with some of the detail, such as the specific funding criteria of potential funding sources, the opportunities and constraints on post-clearance site development, and the clearance options themselves, including indicative costings and overall environmental impact.

5.4 It may also be relevant to take into account, particularly in terms of the larger tyre-stockpiles, the likely impact of the clearance on the existing tyre collection and treatment infrastructure. There is limited benefit in solving one problem but causing others in the process.

Recommendation
Leadership, funding, clearance, environmental impact and subsequent use of the land should be considered together as this will help identify the most compatible options from the lists generated in section 4.

6. Review and Select Options

6.1 Working through the process described above, should result in what experience to date suggests is likely to be a true short-list of practicable options in relation to funding sources, the means of clearing the site and the intended use of the site post clearance.

6.2 Armed with this information it should be possible to take a view on a preferred option or options, and work these up in detail in preparation for implementation.

Recommendation
o Select preferred option or options for the site clearance. o Develop a business plan. o Issue tenders for the work needed to complete the clearance.

7. Implement

7.1 Having identified a preferred option or combination of options for clearing a tyre stockpile it will be necessary to give this practical effect. At minimum this will involve actually securing the funding to enable the tyres to be cleared as well as engaging someone to carry out the work. Those carrying out the work (tyre collection, reprocessing or both) may have been identified as part of a tender exercise previously undertaken or this might be instigated formally at this stage. In some cases, funding requirements may compel a tender process due to the value of the clearance contract.

Recommendation
o Develop a project plan prior to any contracts being let. o Set milestones and monitor progress against them. o Monitor any option changes during the project.

8. Review and Evaluate

8.1 Once the project has been completed and the site has been cleared, it is important to evaluate its success. Projected and actual costs, actual benefits and project objectives need to be considered. The findings will be of interest in the proposed clearance of other waste tyre stockpiles so the outcomes should be available to other interested parties.

8.2 Any external funding will involve reporting back to funder(s) and this should be covered in the evaluation process.

Recommendation
o Review the completed project against objectives. o Disseminate findings.

9. Timescales

9.1 There is not a long track record of clearing the larger, more problematic tyre stockpiles. However, experience suggests that the process is likely to take some time, not least in ensuring that all legal avenues have been exhausted in applying the polluter pays principle and in securing the necessary funding. In the example of Old Hampole Quarry, it may take 2 years from the desk top study appraisal completed in early 2003 to site remediation.

9.2 Providing that there is adequate tyre collection and treatment capacity, the physical task of clearing a site should be able to be achieved quickly. However, as noted in paragraph 5.4, any adverse impact on the recovery of routine waste tyre arisings should be avoided.

Recommendation
Be tenacious and realistic in your expectations. A “quick fix” should not be expected.

ANNEX 1 - Background data checklist

Location of site and physical characteristics

- Ground conditions (geology and hydrogeology)
- Slope and stability (how easy to move around site)
- Site configuration (where are the tyres, how are they laid out)
- Services availability (power, water, etc)
- Location of tyres within site (access to tyres)
- Space for equipment (potential to process tyres on site, etc)
- Local population (who are the neighbours, impact on)
- Security (fencing and gates)

Site access

- Road capacity
- Access for large vehicles

(what size and volume can road handle, impact on clearance timescale)

Type and volume of tyres by category

- Car
- Truck
- Industrial
- Earthmover
- Agricultural
- Motorcycle
- If fitted to rims

(how many, what sort, degree of contamination will inform options for recovery, cost, potential impact on existing infrastructure and time taken to clear)

- Shredded tyres
- Details of any other wastes on site and whether mixed, in particular any hazardous or special wastes

Site history

- Ownership (who is the landowner: private, commercial, Crown)
- Planning and local land use plans (public monies unlikely if landowner in line to benefit from uplifted land value of cleared site)
- Value and potential value of cleared site (benefit to landowner)
- Any legal history (prosecutions, legal attempts to clear site, insolvency)
- Age of stockpile (how long has it been in existence)
- Status of land (green belt, contaminated, etc.) (may limit development opportunities/open up funding options)

Tyre reprocessors

- Proximity and availability of tyre processors to site (influence on cost and logistics)
- End use of processed tyres with due regard to BPEO (See glossary)

ANNEX 2 - Risk Assessment

The information in this annex is taken from the Tyres Stockpile Survey commissioned by the EA. In drawing up the list of stockpiles for this survey, AEAT analysed the background data to reach a risk assessment[1] for any particular stockpile. Fire and the secondary effects of fire, namely contaminated quench waters, were considered to be the greatest risks posed by the tyre stockpiles and the intrinsic hazard was considered to be proportional to the number of tyres in each stockpile. Criteria included:

A. Numbers of tyres (due to potential impact of fire)
B. Groundwater vulnerability (ditto)
C. Proximity to SSSI's (ditto)
D. Urban/Rural (ditto)

Each was assigned a figure according to the values in the table below and the formula A multiplied by (B+C+D) giving a theoretical risk score out of 24:

Risk Factor	Entry	Risk Weighting
A. Number stored	<500,000	1
	500,000 - 1,000,000	2
	>1,000,000	3
B. Groundwater Vulnerability	Minor/Low Aquifer with low permeability	0
	Minor/Low Aquifer with high permeability	1
	Major Aquifer with intermediate permeability	2
	Major Aquifer with high permeability	3
C. SSSI	0	0
	<5 miles	1
	>5	2
D. Status	Urban	1
	Rural	0

Although such an approach to assessing the risk of tyre stockpiles is fairly arbitrary, it is still considered to provide a useful guide.

Risk assessment scores for stockpiles containing more than 100,000 tyres:

Name	No of tyres	Risk Score
Little Heath, Norfolk	0.8m	10
Old Hampole Quarry	2m	9
RAF Sculthorpe, Norfolk	0.8m	8
Mepal Airfield	0.5m	4
Normanton Airfield, Notts	0.2m	3
Kirton, Boston, Lincs	0.1m	2
Hibaldstow, Brigg	0.1m	2

[1] For the purposes of the 2002 survey risk was used in the sense of hazard. The definition of risk under the Contaminated Land regime is set out in the glossary i.e. a combination of the likelihood of an occurrence and the seriousness of the consequences.

ANNEX 3 - Contaminated Land

The regime for contaminated land (Part IIA of Environmental Protection Act (EPA) 1990, inserted by section 57 of the Environment Act 1995) came into force on 1st April 2000 in England. This has placed a number of requirements on LAs such as publishing a contaminated land strategy (by July 2001) and creating a public register detailing remediation of contaminated land and designation of any special sites. Under the contaminated land regime LAs are responsible for the identification of contaminated land in their area.

What is Contaminated Land?

For the purposes of Part IIA, a specific definition of contaminated land has been created. Section 78A(2) defines contaminated land as:

"any land which appears to the LA in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that-

(a) significant harm is being caused or there is a significant possibility of such harm being caused; or
(b) pollution of controlled waters is being, or is likely to be caused;"

The definition of contaminated land is based on the principles of risk assessment and uses the following model of a pollutant linkage:

Contaminant - Pathway - Receptor

That is to say there must be a substance capable of causing significant harm, a receptor which is capable of being significantly harmed by that substance and a means by which the substance can come into contact with the receptor. Land cannot be described as contaminated land (under Part IIA) unless all three elements of a pollutant linkage are identified.

There are, of course, numerous additions, exceptions and qualifications to these definitions, which can be found in the statutory guidance. However, the main point to note is that just because a site has a contaminant on it, does not necessarily mean that it is contaminated land.

What Constitutes Significant Harm and Significant Probability?

There are, in the statutory guidance[2], tables describing:

(a) the receptors to which significant harm can be caused (basically they are humans, ecological systems, buildings and crops etc…);
(b) what constitutes significant harm to that receptor (e.g. death, disease, destruction);
(c) what constitutes a significant possibility of that significant harm being caused.

The new regime follows a principle that any land identified as contaminated land should be based on the linkage being present for its current use.

[2] Annex 3 to DETR circular 2/2000

Identifying Contaminated Land

The LA are responsible for determining whether land appears to be contaminated land. Once a site has been determined contaminated land, the LA becomes the enforcing authority and is responsible for assigning liability and ensuring the site is remediated, and the pollution linkage broken by the appropriate person, e.g. the polluter.

There are statutory guidelines for assigning liability and carrying out remediation. If no liable person/group can be identified the land becomes an orphan site and by default it is the enforcing authority that carries out remediation works and meets the costs.

Throughout the process the LA must consider if the land would constitute a special site e.g. there is a risk of serious pollution of controlled waters, former Ministry of Defence sites etc. There are specific guidelines on what constitutes a special site in the Contaminated Land (England) Regulations 2000 and Part 11A of the EPA. If both the LA and the EA agree special site status is appropriate the EA becomes the enforcing authority and takes over responsibility for ensuring remediation is carried out.

ANNEX 4 - Decision Areas

It is not practicable to map on a general basis how each of the decision areas may interrelate, due to both the complexity of the process, including the number of potential linkages, and the need to take account of individual site characteristics. However, it may be a useful aid to consider the options for the clearance of any particular stockpile against the following four broad headings, with the understanding that the issues these encapsulate are likely to be better considered in the round than in isolation.

Leadership	Who takes the project lead and is subsequently responsible for driving forward action
Local Authority Environment Agency Landowner Property Developer Regeneration Agency Entrepreneur Waste Management Company Regional Assembly / Regional Development Agency	The leadership list identifies those individuals and bodies likely to be most interested in securing the remediation of a tyre stockpile, and therefore most likely to take on the project lead. Experience to date would suggest that local authorities, the EA and the landowner have the keenest interests.

Partners (in addition to the leadership list)	These will be essential to making the clearance happen, and one or more of the partners are likely to be funding contributors
Key stakeholders (neighbours/local groups) Funders Industry Collectors Processors Hauliers	The partnership list identifies further parties who are likely to come on board as the project proceeds e.g. funders and those engaged to undertake the clearance.

Clearance	What to do with the tyres and whether whole or partial site clearance
Cost On/off site Whole/Partial Clearance Disposal to landfill of shredded tyres Existing recovery processes: • Cement kilns • Granulation (prior to manufacturing process) • Landfill Engineering • Civil Engineering • Pyrolysis (retreading discounted due to need to guarantee integrity of casings. Casings over a certain age are not retreaded) Location of processors and logistics (likely proximity principle benefits)	The clearance list illustrates some of the factors that are likely to be encountered in considering the physical options for dealing with the tyres. For example, is the tyre stockpile of a sufficient size so that on site reprocessing is viable.

Managing the impact on existing flows (so as not to damage and displace ongoing activity) Potential to promote new technology (but risk attached) Choice of contractor(s) Method of engaging • direct • open tender • invitation, etc	

Regeneration	What are the options for after-use of the cleared site
• Leave as is (following clearance) • Development • Business units • Housing • Public open space • Recreational • Agricultural • Wildlife conservation/biodiversity • Landfill	The regeneration list highlights the options for after-use of the site once the tyre stockpile has been cleared.

As an example of some of the linkages between decision areas, it may be useful to draw on recent and ongoing stockpile clearance activity. Both the tyre stockpiles at Normanton Airfield and at Tattersett are situated on business parks with a present and identifiable landowner operating commercially. In both instances the landowner is contributing either significantly or fully to the clearance of the tyre stockpile and taking an active leadership role. It can be seen that there is a link between the use of the site, including any uplift in the site's value post clearance, and funding sources. Public monies are unlikely to wholly secure the clearance of a stockpile where the benefit of that clearance is primarily to the benefit of a commercial concern.

By the same measure, Old Hampole Quarry is an orphaned site situated in green belt land. With no identifiable landowner and no scope for commercial development of the site, the likelihood of securing private funding for site clearance is remote. It can be taken as a general rule that if there is no commercial development opportunity for a cleared site, private funding of the clearance is unlikely. As Annex 5 sets out in greater detail, public funding for the remediation of Old Hampole Quarry is likely to be secured through the contaminated land regime.

Funding providers are likely to take an interest in the method of tyre stockpile clearance. This may extend to setting out acceptable means of recovery as far as the funding criteria are concerned. For example, funders may support the recovery of tyres cleared from a stockpile but not the disposal of tyres to landfill, even though disposal to landfill remains a legitimate avenue until the landfill ban takes full effect. Funders may wish to see that the overall impact of the removal and fate of the tyres, as well as cost, is taken into account in determining the means of clearing the stockpile. Conceivably, certain funding schemes might support the development and piloting of new technology, using tyres taken from tyre stockpiles, but not to existing, established tyre recovery facilities. It follows that there may well be direct and

immediate links between funding and choices of site clearance as well as between funding and regeneration of the cleared site.

ANNEX 5 - Case Studies

Old Hampole Quarry – Doncaster

Background
Old Hampole Quarry comprises a disused quarry cut into the Upper Permian Lower Magnesian Limestone located to the north-west of Doncaster, adjacent to the A638 and less than ½ mile west of the A1. Land surrounding the quarry is predominantly rural, interspersed with urban areas

The Tyres Stockpile Survey commissioned by the EA in 2002 estimated the quarry contains between 0.75 and 1.4 million tyres - mainly car tyres deposited from the late 1970s with final deposits in early 1990s. A railway cutting just to the north of the quarry and included within the site boundary also contains a substantial number of truck tyres.

Old Hampole Quarry is approximately triangular in shape. The main body of the stockpile lies in the southwest of the quarry. The quarry floor also has numerous piles of tyres of various types. Against the northern face of the quarry there is evidence of quarry spoil and two piles of shredded tyres: one a fine shred the other much coarser. The remainder of the tyres on site are whole casings, which are mainly car tyres with some commercial and tractor tyres. A few tyres are still on their rims. Spoil approximately 3-5m deep covered with vegetation is present in the east of the quarry. Tyres in the old railway cutting may be difficult to retrieve mechanically.

There are a number of vacant areas within the pile and these are occupied by dense vegetation. Vegetation has also become established within some smaller piles suggesting the stockpile has existed for some years. The vacant areas and other physical features of the site show that the quarry floor is not even. Measurement at the southern face gave the depth of the quarry at 13.5m but as this is only one point there is a considerable degree of uncertainty in the depth of the stockpile. The rolling topography of the stockpile itself introduces further uncertainty in footprint and volume calculations. The range of figures reflects this uncertainty.

Environmental Setting
The site is located on a major aquifer (highly permeable). There are water abstraction points within 2000m of Old Hampole Quarry.

There are no surface water features on the site of Old Hampole Quarry. The nearest surface water feature is believed to be Hampole Dikes located less than 500m north of the site, flowing to the east.

An area of adopted Green Belt is located 800m north east of Old Hampole Quarry. There are no Sites of Special Scientific Interest within a 10km radius of the tyre stockpile. The area of the old quarry has however been designated as a Site of Scientific Interest by the LA due to its geological sequences and limestone grassland habitat.

In the event of major fire, the site will generate a considerable amount of air pollution. The close proximity of the stockpile to the A638, a busy link road between Doncaster and Wakefield could pose a severe problem for motorists and, depending on the wind direction, the A1 could be closed and the East Coast Main Line to Leeds affected. Leachate and washdown from any fire would almost certainly contaminate the aquifer beneath the site. The site has nearby electric overhead cables, two pylons and a gas main, no fire breaks and poor access.

Recent History
Due to bankruptcy of the former freeholder in 2002 the land has been disclaimed by the Official Receiver to the Crown.

The Contaminated Land regime has given the EA and Doncaster MB Council an opportunity to access Government funds and is seen as the way forward to meet the costs of remediating the site.

In February 2003, following months of discussions between the EA and Doncaster Council, Old Hampole Quarry was determined as Contaminated Land. This decision was made by Doncaster Council under the terms of Part IIA of the Environmental Protection Act 1990, due to the potential implications on human health and the aquifer should a fire occur. Two small fires occurred at the site - fortunately both were successfully controlled by the fire service, though over a period of days. It is considered likely that, following the fires, pollutants had been generated in a form capable of entering the aquifer. In April 2003 the site was designated a 'special site', for which the EA takes responsibility for remediation.

Both parties are working in partnership to find an appropriate method of remediation and site end use. The EA have appointed a project manager and will examine available options of remediation. Options appraisal will take place within the requirements of the Statutory Guidance contained within the DETR Circular 02/2000. Doncaster MB Council will then later take the lead in the implementation of the agreed end use, likely to include nature conservation.

The Council are considering purchasing the site from the Crown in order to secure its future interests in the site.

Summary
In common with other tyre stockpiles, Old Hampole Quarry has a particular history and the site has particular features. It is useful to consider the particular circumstances that has led to Doncaster MB Council declaring the site as Contaminated Land in February 2003 and designated as a 'special site' in April. These decisions were taken within the terms of Part IIA of the Environmental Protection Act 1990, the Contaminated Land (England) Regulations 2000 and statutory guidance contained in DETR Circular 2/2000: see Annex 2 for further details

These circumstances include:
- The historical age of the tyre stockpile
- Risk of a major fire – risk is defined as the combination of the probability of the occurrence and the seriousness of the consequences
- The significant possibility of significant harm to human beings
- The underlying rock formation i.e. Magnesian Limestone
- The chemical composition of substances resulting from a tyre fire that are capable of entering the rock formation
- The likely pollution of controlled waters i.e. surface and groundwaters
- 'Orphan site' status of the site - Government funding then becomes possible for the remediation of land that has been determined as Contaminated Land.

Normanton Airfield- Long Bennington

Normanton Airfield is located to the West of the A1 trunk road, Long Bennington turn off. The airfield, NGR-SK82744104, was purposely built by George Wimpey in 1940 and became operational in 1941. Used by the Royal Air Force, United States Air Force and the Canadian Air Force during the war, the Ministry of Defence (MOD) relinquished the land in 1948 returning it to agricultural use.

The land was purchased to establish warehousing facilities in the hangars, and subsequently in 1954, the Newark Storage Company was formed. By 1962 most of the airfield had been purchased to provide both internal and external storage facilities.

Today The Roseland Group are owner/operators of over 0.5 million-sq. ft. of workshop and warehousing. The site is now secure and is used for a variety of storage and processing operations. The runways and all of the original hangars still exist and are used for a variety of businesses.

The Airfield is split between two counties, Leicestershire and Lincolnshire. The location of the tyre storage area is in the South East corner of the airfield bordering farmers land.

Tyres began being stored towards the end of the 1960's; initially this was by agreement with a local tyre retreader. Over the next two decades more tyres arrived from a variety of sources with a mixture of car, truck, agricultural and earthmover types.

The tyres were stored on hard standing, and the intention was to use them as natural barriers/walls around the airfield site. By the 1990's the tyres existed purely as a stockpile and became the sole responsibility of the landowner – The Roseland Group.

In late 1997, during a routine inspection by the EA, the local officer pointed out the potential problem from leachate from the tyre dump. The east drainage ditch runs through the airfield site and subsequently feeds into the River Witham. Requests by the EA were made to remove the tyres and in the interim apply for a Waste Management Licence to store the tyres legally.

A combination of a survey and physical count was made to determine the quantity of tyres in some 26 heaps of mixed tyres. It was estimated that over 46,000 tyres were stockpiled and required disposing of. The EA supplied a list of potential collectors/reprocessors and the company subsequently requested quotations.

The cost of the clearance has been the sole responsibility of The Roseland Group although, through discussions with the EA, some of the tyres have been used internally on site as security barriers around storage compounds. The local fire service was very helpful in offering advice on construction to minimise the risk from a potential fire.

The choice of disposal for the remaining stockpile was obviously cost sensitive but The Roseland Group have fully complied with the Duty of Care.

The majority of the truck tyres are being collected by a local tyre recycling plant, to be reprocessed into granulate and used in the Sport and Play Industry. However, because of the age of some of the tyres, approximately 15% were cross ply where the cord content is too high for use as a sports surface. These tyres have been put to

use on the airfield as barriers. Roll on/off skips were left on site for The Roseland Group labour to load them and collected when full. The car tyres have been collected by a national car tyre recycler and used in the engineering of a landfill site; the agricultural tyres are being collected by a recycler for use in the equestrian market.

Publicity highlighted two problems that can create difficulties in tackling solutions to tyre stockpiles.

- Overestimation of the number of tyres on site.
- It informed any 'would be' illegal operator that a stockpile existed and therefore could be a potential dumping ground for them.

Summary

- A quantative survey estimates that just over 46,000 (approximately 600 tonnes) of truck, car and agricultural tyres were stockpiled on the airfield.

- The stockpile was cause for concern for the local EA due to potential leachate if the pile caught fire and entered the River Witham via a drainage ditch.

- The site had to obtain a Waste Management Licence through the EA to store the tyres, this included the Site Manager having to obtain a WAMITAB qualification and study to obtain his COTC. This action made the stockpile legal.

- The entire cost of clearing the stockpile has been borne by The Roseland Group and the clearance is currently ongoing.

Tattersett Business Park

Part of this case study is taken from the Tyres Stockpile Survey commissioned by the EA in 2002.

Site Location
The stockpile lies to the west of a former RAF airfield within a group of commercial units/warehouses. These units, which occupy 100 ha, were purchased from the MOD and now form the Tattersett Business Park (TBP), believed to employ ~400 people. The site is approached via B154 and accessed via a gatehouse, which is manned around the clock. The boundary fences around the airfield and the industrial estate are intact and the site is reasonably secure.

The stockpile is located to the north east of the industrial units. The majority of the stockpile sits on open ground between a number of site roads, although a significant proportion of the stockpile sits upon hard standing, which is served by drains. These run to an oil/water separator within the business-park that discharges to a local surface watercourse. Immediately to the south west of the stockpile are the industrial units that form the bulk of the estate. To the east lies the airfield itself that is used commercially for light aircraft and parachute jumping. Outside the MOD perimeter, land use is predominantly agricultural.

Stockpile Description
The stockpile comprised a number of areas occupied by tyres - almost entirely whole car tyres although some truck and agricultural tyres were also evident.

In one area of the stockpile, tyres had been baled with wire in groups of 15-20, thus minimising space. These bales measured approximately 0.5m high, 1.0m in length and 0.5m in width.

The vertical dimensions of the stockpile varied considerably and although it was possible to delineate the outline footprint of the stockpile accurately through the use of GPS, site maps, notes and sketching, the greatest uncertainty in calculating the volume of tyres stored was accurate assessment of height.

Due to the stockpile extending alongside industrial units, some previous tenants have vacated following concerns about the risk of fire. Some areas also house a number of cars and car parts, pallets and other combustible items.

Assessment of tyres at Tattersett Business Park

Area	Footprint (m^2)		Height (m)		Occupancy (%)	Volume (m^3)	
	Min	Max	Min	Max		Min	Max
A	1550	1750	3.8	4.2	95	5600	7000
B	1200	1400	2.8	**3.2**	75	2500	3400
C	500	600	1.8	2.2	75	700	1000
D	6500	7500	3.2	3.8	85	17700	24200
Total Volume (m^3)						26500	35500
Total No. of Tyre (units @20 m^{-3})						530000	710000
Total Mass of tyres (te @ 135 units te $^{-1}$)						3900	5300

Estimates taken from Tyres Stockpile Survey commissioned by the Environment Agency in 2002.

Site History

Historical maps dated 1885 and 1891 show the site and surrounding land use as rural with no evidence of development. The latter map depicts a number of small pits dotted across the site, one clearly used for winning marl. The OS map of 1952 indicates little physical change in the landscape although it is certain that the airfield had been established at this point. The RAF base closed in the 1990s.

Part of the 1000 ha was purchased from the MOD in 1996 and planning permission obtained to establish TBP in 1997.

Geological and Hydrogeological Setting

Information taken from the West Norfolk BGS Groundwater Vulnerability Map Sheet 25 showed that texture, structure, soil water regime and the presence of distinct layers can be used to classify the soil as a Soil of Intermediate Leaching Potential (I1). The most significant characteristic of such soils is their potential to transmit a wide range of pollutants.

The geology and hydrogeology of the site is typical of the surrounding area. Local borehole logs registered with the BGS show the drift geology to be a succession of silty sands and gravels for approximately 1m which overlays up to 5m of boulder clay which are low permeability non-water bearing deposits. Below the clay lies fractured chalk, which is recognised, as a major aquifer.

Environmental Receptors

Located less than 1.5 kilometres south west of the stockpile is the River Tat, a tributary of the River Websum. The potential for river quality degradation is

considered to be negligible given the location of the environmentally sensitive receptors and absence of a pathway.

According to data gathered from English Nature, there are no conservation designations on the site under investigation; there are however, five SSSIs within a radius of 10 kilometres.

Major Areas Of Risk
The preliminary investigation confirmed the presence of a major stockpile at the TBP and estimate this to be between 3900 and 5300 tonnes or 0.53 to 0.71 M units. Original estimates for the site lay between 1.50 to 10.00 M tyre casings. The site history and location survey have revealed no other major potential sources of pollution. Although the run-off from the tyres will be contaminated, the concentrations are not high enough to pose a significant threat to the environment. Accumulation of some toxic species can occur over time e.g. PAHs and therefore long term storage of tyres on open ground is not considered best practice. In summary, run off and or leachate from this stockpile in its current state is not likely to be a major point source of pollution.

However in the event of a fire the toxic smoke, gases and leachate produced will present a major threat to public health and the environment. The absence of any significant firebreaks will make a fire on the site difficult to control and manage. Tyre fires are believed to release up to 50 highly toxic species of which many are gases[3].

The relatively remote location and security arrangements offer some protection against malicious behaviour and deliberate arson.

In the event of a fire, the proximity of the tyre stockpile to industrial units was recognised to pose a severe direct threat to human health & safety and have a significant impact upon surface waters. The principal hazard would be from noxious smoke and fumes. The location of many of the tyres on hardstanding which is drained, combined with the presence of a largely impermeable horizon of boulder clay beneath the site may have afforded some protection to the aquifer from leachate contamination. However the scale of the stockpile, lack of substantial fire breaks, (this will be addressed in the temporary planning consent) and the calorific value of the tyres meant that once alight, the stockpile fire would be difficult to extinguish. Consequently the amount of leachate and contaminated run-off produced could have been considerable and pollution of surface waters and contamination of site drainage and the aquifer was clearly possible.

The immediate threat to human health and safety from the fire itself as opposed to the fumes was mitigated by ensuring the stockpile is at least 10m distance from the main site structures. This was carried out by the landlords under advice from the local fire brigade.

[3] The AEAT report listed a number of these pollutants including carbon monoxide, benzene, toluene, xylene, polyaromatic hydrocarbons e.g. napthalene, crysene, flourene, and metals such as lead, iron and zinc

Tyre Operations

In 1998 Mr Lewis was in occupation of part of Tattersett Business Park (TBP) with proposals to establish a recycling business processing tyres. An exemption allowing for the storage of up to 4,000 tyres at 4 locations at TBP was registered with the EA in July 1998. In October 1998 a waste management licence application was submitted to the EA for a proposed tyre shredding operation. In November 1998 the operator was served a section 59 notice to clear tyres from certain areas of the site prior to issue of the licence and was subsequently formally cautioned for storing tyres on unlicensed land. In April 1999 the EA was informed a tyre shredder was on site but in September 1999 the applicant advised the EA that they had ceased trading. Ultimately the EA prosecuted the owner of the tyre recycling company for the illegal deposit of controlled waste. Mr Lewis was subsequently prosecuted at Kings Lynn Magistrates Court and was sentenced at the Crown Court in December 2000. The company subsequently vacated the site and TBP removed tyres from a unit to reduce the risk from fire.

Since that time the EA, North Norfolk District Council, Norfolk County Council, East of England Development Agency (EEDA) and other stakeholders have been trying to mobilise a project to make the site safe, remove the tyres and dispose/recover them legally. The local MP, Norman Lamb, has continued to press hard for a solution. AEA Technology has assisted in preparing a number of options. The fire service has also advised on measures to reduce fire risks.

In May 2003, following funding being made available from EEDA and the landowner, work started to remove ~200,000 tyres from TBP, around one-third of the total stockpile, create firebreaks and a 20m safety zone from buildings for the remaining tyres. The work has experienced some delays but the target of one-third removal of tyres is still expected to be achieved.

ANNEX 6 - List of Stockpiles 2002
Taken from 'Tyres Stockpile Survey' commissioned by the Environment Agency 2002

Address	Number Stored	Age
Knighton Heyope, Powys, Ruddish	9,000,000	20
Old Hampole Quarry, Brodsworth Estate, Doncaster	2,000,000	12
*RAF Sculthorpe	800,000	3
Little Heath, Barnham, South Thetford	800,000	?
Mepal Airfield	500,000	10
Kirton, Boston, Lincolnshire	100,000	2
The Control Tower, Normanton Airfield, Long Bennington, Newark Notts	200,000	60
Hibaldstow Tyre Depository, Aifield, Brigg	100,000	11
Grizedale Lea Farm, Shard Lane, Hambleton	35,000	2
Crown Lake Industrial Estate, Oakmere, Cheshire	4,000	<5
Tees Bay Business Park, Brenda Road, Hartlepool	20,000	?
Ullcoates Industrial Est, Egremont	20,000	1
Site next to Tyres R Us, Boundary Lane, Saltney	20,000	5
Deeside industrial Park	20,000	<1
Malthouse Farm, Brinkworth, Nr Swindon, Wiltshire	20,000	?
Duncombe St Listerhills, Bradford	10,000	3
45 Ormskirk Rd, Aintree, Liverpool	8,000	A number of years
Tarves Way, Deptford	6,000	?
Purland Road, Thamesmead	6,000	?
Dairy buildings, New Road, Sheerness	5,000	2
Hoskins Street, Greenwich,	5,000	?
Briklehampton, Pershore, Worcestershire	5,000	?
Birch Grove (private garages), Slough	2,000	?
Old Station Yard	3,000	1
Lyme and Wood Pit Colliery, Off Vista Road, Haydock, Merseyside	3,000	5
1a Tod Point Road, Warrenby, Redcar	5,000	?
Redland Quarry, Moorhouse, Westerham, Kent	2,500	3
Land off Mount Street, Aston, Birmingham	2,000	?
Waterfield Road, North Shields	2,000	1

Pindon Manor Farm, Hanslope, Milton Keynes	2,000	2
Mary Avenue, Birtley, Newcastle, Gateshead	1,500	5
Cridling Stubbs area roads to M62	1,500	<1
Packington Lane, Coleshill, Warks	1,000	?
Ballmill, Grimley, Worcs	1,000	1
Clarel Avenue, Nechells, Birmingham	1,000	?
Unit 22 Hiltern Industrial Estate, Hilton, Derbyshire	1,000	?
Skelton, Leeds	1,000	?
Blackmore Park Industrial Estate, Malvern, Worcestershire	1,000	?

ANNEX 7 - Organisations for further information

Potential Funding Sources (this list is not exhaustive and is subject to change)
Landowner
Environment Agency (Contaminated Land) – www.environment-agency.gov.uk
Regional Development Agencies (Employment potential and regeneration)

- www.onenortheast.co.uk
- www.nwda.co.uk
- www.yorkshire-forward.com
- www.advantage-westmidlands.co.uk
- www.emda.org.uk
- www.eeda.org.uk
- www.southwestrda.org.uk
- www.seeda.co.uk
- www.lda.gov.uk

Landfill Tax Credit Scheme (remediation and disamenity of landfill sites) – www.ltcs.org.uk
English Partnerships – www.englishpartnerships.co.uk
Equity and Venture Capital
Waste Implementation Programme Workstream 3 New Technologies Programme (DEFRA) - www.defra.gov.uk/environment/waste/review/factsheet.pdf
Local Authorities (supplementary credit approvals)
Regional Assemblies (Planning co-ordinating, initiating) – www.regionalassemblies.co.uk
Groundwork Trust – www.groundwork.org.uk

Trade Associations
British Rubber Manufacturers Assoc – www.brma.co.uk
Imported Tyre Manufacturers Assoc – www.itma-europe.com
National Tyre Distributors Assoc – www.ntda.co.uk
Retread Manufacturers Assoc - www.retreaders.org.uk

Market Development
DTI – www.dti.gov.uk
UK Market Development Network
WRAP – www.wrap.org.uk

Potential Contractors/Partners
National Assn. Waste Disposal Operators
ESA (shredded tyres / landfill) – www.easuk.org/links
Responsible Recycler Scheme - www.tyresafety.co.uk/html/responsible.htm

Other
DTI (Paul Hallett)
Used Tyre Working Group (http://www.tyredisposal.co.uk)

Glossary

Best Practicable Environmental Option — BPEO is the outcome of a systematic and consultative decision-making procedure which emphasises the protection and conservation of the environment across land, air and water. The BPEO procedure establishes, for a given set of objectives, the option that provides the most benefits or the least damage to the environment as a whole, at acceptable cost, in the log term as well in the short term.

Casing — the structural part of a tyre which includes the tread and outermost rubber of the side walls to which additional tread may be vulcanised for the purpose of re-treading.

Cord — the twisted fibre or filament of polyester, nylon, rayon or steel, which gives the tyre casing and belts stability and strength.

Duty of Care — under Environmental Protection Act 1990 applies to anyone who imports, produces, carries, keeps, treats or dispose of waste. Everyone subject to the Duty of Care has a legal obligation to comply with it, and there are severe penalties for failing to do so. The Duty of Care does not apply to waste from households.

EC Directive — A Council of the European Union legal instruction which is binding on all Member States, but must be implemented through the legislation of national governments within a prescribed time-scale.

Fly-tipping — illegal dumping of waste.

Fly-tipping (and uncontrolled burning) is illegal under the Environmental protection Act 1990 and the Control of Pollution (Amendment) Act 1989.

Landfill — is defined in the Council Directive 1999/31/EC on the Landfill of waste as meaning '…a waste disposal site for the deposit of the waste onto or into land'.

Article 5 .3 Member States shall take measures in order that the following wastes are not accepted in a landfill

> (d) whole waste tyres from two years from the date laid down in Article 18(1) (= July 2003), excluding tyres used as engineering material, and shredded waste tyres five years from the date laid down in article 18(1) (= July 2006). (excluding in both instances bicycle tyres and tyres with an outside diameter above 1400 mm)

Licensed site — a waste disposal or treatment facility which is licensed under the Environmental Protection 1990 for that purpose, and the Waste Management Licensing Regulations 1994 (SI 1994/1056). Issued, monitored and enforced by the EA.

Producer responsibility is about producers and others involved in the distribution and sale of goods taking greater responsibility for those goods through the whole life cycle of the products life.

Proximity principle suggests that waste should generally be disposed of as near to its place or production as possible, partly to ensure that wastes are not simply exported to other regions or countries and also to minimise unnecessary transport of wastes over long distances. As such, it is a tool for planning authorities and businesses in terms of waste management facilities and it can also be used to raise awareness in local communities that the waste they produce is a problem for them to deal with locally. A related concept is the importance of 'local circumstances', and this may include existing waste management infrastructure and existing transport infrastructure.

Pyrolysis process in which organic waste is heated in the absence of oxygen at 400-800^{o}C, yielding gas, liquid and solids.

Recovery the extraction of usable materials (via recycling) or energy from discarded products.

sometimes used to refer specifically to recovery of energy from discarded products.

Recycling involves the reprocessing of wastes, either into the same product or a different one.

At the EU level, the definition of recycling has also been clarified, through the Reasoned Opinion by the European Court of Justice Advocate General, Mayer Parry Recycling v. the EA and the Secretary of State for the Environment, July 2002: -

Steel packaging is not recycled within the meaning of the Packaging and Packaging Waste Directive

"when it has been rendered suitable for use as a feedstock, but has been recycled only when it has been used by a steel maker so as to produce ingots, sheets or coils of steel"

sorting, cleaning, cutting, crushing, separating and baling are not recycling and the material remains "waste"

This changed earlier rulings (including Mayer Parry I in 1999), which stated that in restoring the material to a form suitable for sale as a raw material to steelworks, the material ceased to be waste.

The above Reasoned Opinion in Mayer Parry, (No.2) above, was confirmed in June 2003. The judgement defines recycling within the Framework Directive and the Packaging and Packaging waste Directive as follows:

	1. Recycling within the meaning of Article 3(7) of European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste is to be interpreted as not including the reprocessing of metal packaging waste when it is transformed into a secondary raw material such as material meeting the specifications of Grade 3B, but as covering the reprocessing of such waste when it is used to produce ingots, sheets or coils of steel. 2. That interpretation would be no different if the concepts of recycling and waste referred to by Council Directive 75/442/EEC of 15 July 1975 on waste were taken into account. For tyres, material recycling may include pre-treatments such as granulation crumbing for rubber and pyrolysis for activated carbon and steel fibres.
Re-processing	same as recycling. For packaging, re-processors are accredited by the EA and eligible to issue Packaging Recovery Notes (PRNs) or Packaging Export Recovery Notes (PERNs) as evidence of packaging waste having been reprocessed.
Re-treading	a process to re-use (structurally sound) tyres by removing and replacing tyre tread, with new tread being vulcanised to the body.
Re-use	where products are re-used for the same purpose, or for a different purpose thus prolonging their active use. For tyres such re-use might include go-karts, swings and general recreation purposes, use as boat fenders, weighing down silage clamps on farms - in addition to re-treading.
Risk	For the purposes of the Contaminated Land regime risk is defined as the combination of: a) the probability, or frequency, of occurrence of a defined hazard (for example, the exposure to a property of a substance with potential to cause harm); and b) the magnitude (including the seriousness) of the consequences.
Rubber	a blend of natural and synthetic rubber mixed with carbon black and chemicals for vulcanisation.
Side wall	the part of the tyre between the tread and the area designed to be covered by the rim flange.
Stockpile of tyres	usually refers to an illegal depositing of post-consumer tyres over a period of time, although the site might be authorised.
Tread	the portion of the tyre which is designed to come into contact with the ground, protects the casing against mechanical damage and contributes to ground adhesion.

Vulcanisation	the process of treating rubber or rubber-like materials with sulphur at a high temperature (usually above 150^0C) to increase its strength and durability
Waste	The Waste Framework Directive of 1975 (75/442/EEC) as amended in 1991 (91/156/EEC) Article 1: (a) 'waste' means any substance or object, which the holder disposes of or is required to dispose of pursuant to the provisions of national law in force *This emphasises the 'true purpose of the holder of the material', in terms of the material being discarded and having no further value to the holder – even if the material might be reused, recycled or otherwise valorised.* (b) disposal means: - the collection, sorting, transport and treatment of waste as well as storage and tipping above or under ground - the transformation operations necessary for its re-use, recovery or recycling The hierarchy of waste management options was included in the 1991 amendment. Prevention By technologies, especially clean technologies By products, via entire life cycle of products Recycling By reuse and materials recycling Through combustion (incineration with energy recovery). Final treatment with strict environmental standards.
Waste tyre	a post-consumer tyre which may or may not have a structurally sound casing or residual tread depth suitable for further road use, which has been discarded rather than recycled or recovered.

Main sources of information:

Environment Council (2001). The Stakeholders' Guide to Sustainable Waste Management.

McLanaghan S. R. B. (2002). Delivering the Landfill Directive: The role of new and emerging technologies, Working Paper to the Strategy Unit report 'Waste not, Want not'.

Shulman V. L. (2000). Tyre Recycling after 2000: Status and Options.

Strategy Unit (2002). Waste not, Want not. A strategy for tackling the waste problem in England.

Wales Assembly Government (2002). Wise about Waste: The National Waste Strategy for Wales. Part Two Technical Annex.

Various EC Directives