Department of the Environment
Industry Profile

Waste recycling, treatment and disposal sites

metal recycling sites

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The purpose of these publications is to provide regulators, developers and other interested parties with authoritative and researched advice on how best to identify, assess and tackle the problems associated with land contamination. The publications cannot address the specific circumstances of each site, since every site is unique. Anyone using the information in a publication must, therefore, make appropriate and specific assessments of any particular site or group of sites. Neither the Department or the contractor it employs can accept liabilities resulting from the use or interpretation of the contents of the publications.

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General guidance on assessing contaminated land and developing remedial solutions which is complementary to the Department's publications is provided by the Construction Industry Research and Information Association (CIRIA).

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DOE Industry Profile

Waste recycling, treatment and disposal sites: metal recycling sites

This Profile is based on work by Environmental Assessment Group and was prepared for publication by the Building Research Establishment.

Preface

DOE Industry Profiles provide developers, local authorities and anyone else interested in contaminated land, with information on the processes, materials and wastes associated with individual industries. They are not definitive studies but they introduce some of the technical considerations that need to be borne in mind at the start of an investigation for possible contamination.

Every site is unique. Investigation of a site should begin with documentary research to establish past uses. Information on the site's history helps to focus a more detailed investigation. This knowledge needs to be supplemented by information on the type of contamination that may be present and where on site it may be found. Profiles give information on the contamination which might be associated with specific industries, factors that affect the likely presence of contamination, the effect of mobility of contaminants and guidance on potential contaminants.

The date when industrial practices first commenced on a site and its location are important clues in establishing the types of operations that may have taken place, so each profile provides a summary of the history of the industry and its likely geographical spread within the United Kingdom.

Profiles should be read with the following reservations in mind:

- individual sites will not necessarily have all of the characteristics described in the profile of that industry;
- practices can vary between sites and change over time;
- as practices change, problems of possible contamination may also change;
- the profile may refer to practices which are no longer followed, and may omit current practices which avoid contamination.

The risks presented by contaminated sites depend on the nature of the contaminants, the targets to which they are a potential threat (such as humans or groundwater) and the routes or pathways by which they reach these targets. The current or proposed use of a site and its environmental setting are crucial in deciding whether treatment is necessary and if so, the methods to be used. Some sites may not need treatment.

The information in profiles may help in carrying out Control of Substances Hazardous to Health (COSHH) assessments for work on contaminated land - see Health and Safety Guidance Note HS(G) 66 *Protection of workers and the general public during the development of contaminated land,* Health and Safety Executive, 1991, and *A guide to safe working practices for contaminated sites,* Construction Industry Research and Information Association, 1995.

Note: the chemical names given to substances in this profile are often not the modern chemical nomenclature, but the names used historically for those substances.

Waste recycling, treatment and disposal sites: metal recycling sites

1. Background

Metal recycling sites are an important sector of the secondary metal and recycling industries (see Section 4.3 on related profiles), and are found in most towns. They are used to sort, process, segregate and bulk metals and other materials for recycling. Sites are variable in size and independently operated.

Through consultation with the industry, it has been estimated that there were over 10 000 facilities in operation in the 1960s. Since then, the number has declined. Metal recycling sites have been subject to licensing since they came within the scope of the Control of Pollution Act 1974. Unpublished information obtained from the London Waste Regulation Authority indicates that in 1992 the number of scrap metal facilities licensed by local authorities was about 7100. Half of these facilities are located within metropolitan areas, with Greater Manchester having the highest concentration. Wales and Scotland together have less than 15% of the total number of scrap facilities.

Metal recycling sites are diverse businesses. The majority collect or accept most types of scrap metal, but some specialise in handling particular types of metal or particular items. Some yards may treat special wastes, subject to specific licensing arrangements. The principal materials received for processing at metal recycling sites include vehicles and other machinery, electrical equipment including 'white goods', scrap metals and alloys and construction materials.

The Department of the Environment's Waste Management Paper 4A states that the ferrous metal recycling industry annually collects and prepares for resmelting, some 9 million tonnes of metals, worth £750 million. Much of the heavy old steel and new steel cuttings are received direct by large metal recycling companies. About 2 to 3 million tonnes of light obsolete metallic goods are bought, processed and passed up the recycling chain by 6000 small metals recycling businesses.

Sites can vary very widely in the extent and effectiveness of control measures used to prevent environmental pollution. Modern sites and, for example, those dealing with secondary metals where warehousing may be used for security purposes, are much less likely to be associated with land contamination than older, previously unregulated metal recycling yards. The presence or absence of robust concrete hard standings for the lifetime of the operation, and of controlled drainage, are key factors. The more varied the materials handled, the more difficult and diverse are the necessary controls.

A list of the more important contaminants which may be found at metal recycling sites is given in the Annex. However, the range of potential contaminants will depend on the material handled and the activities and processes undertaken. Information on a site's history is therefore important for identifying the full range of contaminants which may be present. (The Scrap Metal Dealers Act 1964 requires a record of all dealings in scrap metal to be kept at each site.)

In addition, metal recycling sites are often located on former industrial sites, which

may in some cases already have been contaminated by their previous uses, thus highlighting the need to investigate the history of the site both before and since the site was established.

2. Activities

Metal recycling operations may include the following:

Sorting or storage of materials;
Dismantling, fragmenting, shearing or crushing of metals;
Cleaning or other processing of metals;
Recovery of electrical components;
Stripping or other processing of cables or batteries;
Burning of waste materials (not at modern licensed sites);
Waste disposal (not at modern licensed sites).

2.1 Sorting or storage

Materials at metal recycling sites may be sorted or stored at any stage in the process. At yards specialising in ferrous metals, metal received may be sorted into broad categories. In other yards, material is often received roughly sorted (eg brass might already be separated from copper or aluminium). Particular areas of yards may be used for storage of materials, whether or not they are sorted.

Many licensed sites still store and process materials without containment to protect underlying ground.

2.2 Dismantling, fragmentising, shearing or crushing

Large items of equipment may be dismantled on site. This may include the separation of metal from non-metal components, particularly where materials other than metals and alloys are recycled. This is either carried out by hand or mechanically. This process may include the draining of oils from tanks and sumps in plant which is being scrapped. Aircraft and railway vehicle dismantling are usually carried out on larger specialist sites.

Ferrous metal scrap, such as refrigerators and other 'white goods', often requires breaking up into a form suitable for electric arc furnace feedstock, and fragmentiser plant is commonly used. The metallic components are then separated by magnetic and other means. Non-metal parts such as plastics, textiles and rubber are disposed of as waste if a viable use cannot be found. Waste output from fragmentation may be further processed in media plants to remove remaining non-ferrous metals.

Where material is not delivered direct to fragmentisers, large objects such as cars, refrigerators etc may be crushed or sheared using specialised plant prior to delivery to fragmentation.

Unregulated practices associated with dismantling of cars and other vehicles include:

Break-up of vehicles without first draining fluids, leading to the release of engine oils, hydraulic fluids, petrol and associated additives into the ground.

Burning of non-metal components such as foam fittings, plastics and tyres, leading to the release of highly concentrated liquids such as phenols and ammoniacal liquors into the ground;

Removal of vehicle brake pads and clutch plates containing asbestos. These may have been removed and deposited on site prior to crushing of vehicles. However, in many cases, they may have been crushed with the vehicles, releasing some of the asbestos from its bonded form.

Removal of asbestos from older railway locomotives and carriages. These were lagged with asbestos, which often occurred in a loose, fibrous form. Asbestos may have been stripped out without damping of exposed areas or other controls, which may have caused release of asbestos fibres.

The uncontrolled release of chemical residues from equipment or metal drums or containers.

2.3 Cleaning

Metals received on site may be associated with oils and greases. At some sites they may have been degreased using solvents such as trichloroethylene or methyl ethyl ketone, either by dipping into solvent tanks or by use of a spray gun.

Water is sometimes used to wash material, and the final mixed effluent may be either recycled or discharged to drains.

Before the regulation of trade effluent came into force, used solvents were disposed of on site, either by allowing them to soak away into the soil or by collection in surface drains etc.

2.4 Lead–acid battery recovery

The dismantling of batteries is now usually carried out at specialised recycling plants; most batteries from other sites are passed on intact for such recycling. At the specialised plants the acid is collected and, in some cases, neutralised using lime to form calcium sulphate sludge which is dewatered and disposed off site.

Many metal recycling sites accepted lead-acid car and storage batteries complete and in some cases, dismantled them on site. The acid may have been allowed to drain from the batteries directly into the soil or poured to foul sewer or surface water drains. Leaching of lead and impurities or alloys into the acid may have given rise to a metal sludge.

2.5 Melting and casting

Some metal recycling sites undertake resmelting and casting of non-ferrous metals. The residual drosses are collected and stored on site prior to disposal. Metal fumes and dust arising from the furnaces during charging and operation are collected in a filter and bagged for disposal.

Former practice may have been to dispose of this material on site.

2.6 Burning

Former practice on some sites was to burn plastic cables and unwanted materials, such as battery cases or treated and painted wood, and to bury ash or residue on-site. Metal and isocyanate fumes may also have been distributed over the site.

2.7 Other waste disposal

On some sites this included:

Use of wastes such as asbestos sheeting and lagging, plastics and wood for filling voids and raising ground levels.

Disposal of contaminated solvents on-site after degreasing of engines and components.

Disposal of aircraft instrument panels incorporating radioactive paints or other low-level radioactive materials; this may have occurred on a few metal recycling sites sites, particularly those in operation shortly after the Second World War.

3. Contamination

The contaminants on a site will largely depend on the history of the site and on the range of materials produced there. Potential contaminants are listed in the Annex and the probable locations on site of the main groups of contaminants are shown in Table 1. It is most unlikely that any one site will contain all of the contaminants listed. It is recommended that an appropriate site investigation be carried out to determine the exact nature of the contamination associated with individual sites.

3.1 Factors affecting contamination

Contamination on any present or former metal recycling sites depends on the materials handled, the processes undertaken during its working life, the control measures used and any uses of the site before scrap metal processing operations began.

The age of materials handled may be a significant factor. Certain types of materials dating from particular periods may have contained PCBs, asbestos or other contaminants.

Specialist site operations may have particular contaminants associated with them in addition to those listed in the Annex.

There may also be contamination from activities carried out on the site before, or in addition to, scrap handling and processing.

3.2 Migration and persistence of contaminants

Many liquid organic contaminants, eg solvent degreasers and petroleum products, are mobile and can migrate over a wide area on the surface, through soil or in association with groundwater. Volatile solvents and gaseous hydrocarbons may also migrate through soil and can build up in poorly ventilated or enclosed areas where they may present an explosion hazard.

Soluble inorganic chemicals may be present in surface waters through run-off, or may percolate through the soil.

The movement of metals through the soil is significantly retarded by the presence of clay minerals and organic matter. The solubility of some metals may increase under acidic conditions (eg. copper, zinc and lead). In other cases the relationship is more complex. For example, trivalent chromium is more soluble under acidic conditions, whereas the solubility of hexavalent chromium is increased under both acidic and alkaline conditions and arsenic may become more soluble at higher pH levels.

4. Sources of further information

4.1 Organisations

For further information concerning metal recycling sites in the United Kingdom, the following organisations and trade associations should be consulted:

British Metals Federation
16 High Street
Brampton
Huntingdon
Cambs
PE18 8TU

British Secondary Metals Association
Park House
25 Park Road
Runcorn
Cheshire
WA7 4SS

Motor Vehicles Dismantlers Association of Great Britain
33 Shottery Grove
Walmley
Sutton Coldfield
B76 8QB

4.2 Sources of further information concerning the activities described in this profile

Inter-Departmental Committee for the Redevelopment of Contaminated Land. *Notes on the redevelopment of scrap yards and similar sites.* ICRCL 42/80, 2nd edition, October 1983.

Inter-Departmental Committee for the Redevelopment of Contaminated Land. *Guidance on the assessment and redevelopment of contaminated land.* ICRCL 59/83, 2nd edition, July 1987.

Department of the Environment. *Licensing of metal recycling sites.* Waste Management Paper No. 4A, 1994.

Case study including information related to this Industry Profile:

Paul V. *Bibliography of case studies on contaminated land: investigation, remediation and redevelopment.* Garston, Building Research Establishment, 1995.

Information on researching the history of sites may be found in:

Department of the Environment. *Documentary research on industrial sites.* DOE, 1994.

4.3 Related DOE Industry Profiles

Metal manufacturing, refining and finishing works: iron and steelworks
Metal manufacturing, refining and finishing works: lead works
Metal manufacturing, refining and finishing works: non ferrous metal works (excluding lead works)

4.4 Health, safety and environmental risks

The Notes issued by the Chief Inspector of Her Majesty's Inspectorate of Pollution (HMIP) provide guidance for the processes prescribed for integrated pollution control in Regulations made under the Environmental Protection Act 1990.

The Control of Substances Hazardous to Health (COSHH) Regulations 1994 and the Management of Health and Safety at Work Regulations 1992 are available from HMSO. Information on relevant health and safety legislation and approved codes of practice published by HSE publications are available from Health and Safety Executive Books, PO Box 1999, Sudbury, Suffolk, CO10 6FS (telephone 01787 881165), as well as HMSO and other retailers.

Information on the health, safety and environmental hazards associated with individual contaminants mentioned in this profile may be obtained from the following sources:

Sax N and Lewis R. *Hazardous chemicals desk reference.* New York, Van Nostrand Reinhold Company, 1987.

Verschueren K. *Handbook of environmental data on organic chemicals.* 2nd Edition. New York, Van Nostrand Reinhold Company, 1983.

Howard P H. *Handbook of environmental fate and exposure data for organic chemicals.* Vols I and II. USA, Lewis Publishers, 1990.

4.5 Waste disposal and remediation options

Useful information may be obtained from the Department of the Environment series of Waste Management Papers, which contain details of the nature of industrial waste arisings, their treatment and disposal. A current list of titles in this series is available from HMSO Publications Centre, PO Box 276, London, SW8 5DT.

Publications containing information on the treatment options available for the remediation of contaminated land sites, prepared with the support of the Department of the Environment's Research Programme, can be obtained from National Environmental Technology Centre Library, F6, Culham, Abingdon, Oxfordshire, OX14 3DB.

A full list of current titles of Government publications on all aspects of contaminated land can be obtained from CLL Division, Room A323, Department of the Environment, Romney House, 43 Marsham Street, London, SW1P 3PY.

Advice on the assessment and remediation of contaminated land is contained in guidance published by the Construction Industry Research and Information Association (CIRIA), 6 Storey's Gate, Westminster, London, SW1P 3AU.

Annex Potential contaminants

The chemical compounds and other materials listed below generally reflect those associated with the industry and which have the potential to contaminate the ground. The list is not exhaustive; neither does it imply that all these chemicals might be present nor that they have caused contamination.

Metals or metalloids	antimony arsenic barium cadmium chromium copper iron lead manganese mercury nickel tin zinc
Inorganics	acids (hydrochloric, phosphoric, sulphuric) alkalis (caustic, ammoniacal) chlorides cyanides fluorides phosphorus compounds sulphates sulphides
Organics	fuels (diesel, petrol) hydraulic oils (mineral oils) lubricating oils paints phenols polychlorinated biphenyls (PCBs) solvents (trichloroethylene, methyl ethyl ketone and others)
Others	asbestos radioactive components biodegradable items such as paper, wood, sawdust (used for oil absorption).

Table 1 Main groups of contaminants and their probable locations

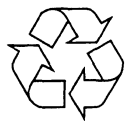
Waste recycling, treatment and disposal sites: metal recycling sites

Contaminant		Location								
Main group	**Sub-group**	**Building fabric**	**Raw material delivery and storage**	**Process areas**	**Tanks, pipework and pumps**	**Product storage and blending**	**Waste storage/ on-site disposal**	**Wastewater treatment facilities**	**Fuel storage**	**Electricity substations and transformers**
Metals and metalloids			■	■		■	■	■		
Inorganic compounds			■	■		■	■	■		
Acids	hydrochloric, phosphoric			■	■	■	■			
	sulphuric (from vehicle batteries)		■	■			■	■		
Alkalis				■				■		
Asbestos		■	■	■			■			
Organic compounds	fuels, hydraulic oils, lubricating oils, paints, phenols		■	■	■	■	■	■	■	
	polychlorinated biphenyls		■	■						■
	solvents			■	■	■	■	■		
Others	radioactive materials[2]		■	■			■	■		
	biodegradable items	■	■	■		■	■			

[1]there is a possibility that PCB's might be found in this location if metals reclamation from transformers has occurred or is occurring on the site

[2]low level radioactive waste might be present on sites which have processed instrument panels from aircraft, especially after World War II

Shaded boxes indicate areas where contamination is most likely to occur



Recycled paper

DOE Industry Profiles

Airports
Animal and animal products processing works
Asbestos manufacturing works
Ceramics, cement and asphalt manufacturing works
Chemical works: coatings (paints and printing inks) manufacturing works
Chemical works: cosmetics and toiletries manufacturing works
Chemical works: disinfectants manufacturing works
Chemical works: explosives, propellants and pyrotechnics manufacturing works
Chemical works: fertiliser manufacturing works
Chemical works: fine chemicals manufacturing works
Chemical works: inorganic chemicals manufacturing works
Chemical works: linoleum, vinyl and bitumen-based floor covering manufacturing works
Chemical works: mastics, sealants, adhesives and roofing felt manufacturing works
Chemical works: organic chemicals manufacturing works
Chemical works: pesticides manufacturing works
Chemical works: pharmaceuticals manufacturing works
Chemical works: rubber processing works (including works manufacturing tyres or other rubber products)
Chemical works: soap and detergent manufacturing works
Dockyards and dockland
Engineering works: aircraft manufacturing works
Engineering works: electrical and electronic equipment manufacturing works (including works manufacturing equipment containing PCBs)
Engineering works: mechanical engineering and ordnance works
Engineering works: railway engineering works
Engineering works: shipbuilding, repair and shipbreaking (including naval shipyards)
Engineering works: vehicle manufacturing works
Gasworks, coke works and other coal carbonisation plants
Metal manufacturing, refining and finishing works: electroplating and other metal finishing works
Metal manufacturing, refining and finishing works: iron and steelworks
Metal manufacturing, refining and finishing works: lead works
Metal manufacturing, refining and finishing works: non-ferrous metal works (excluding lead works)
Metal manufacturing, refining and finishing works: precious metal recovery works
Oil refineries and bulk storage of crude oil and petroleum products
Power stations (excluding nuclear power stations)
Pulp and paper manufacturing works
Railway land
Road vehicle fuelling, service and repair: garages and filling stations
Road vehicle fuelling, service and repair: transport and haulage centres
Sewage works and sewage farms
Textile works and dye works
Timber products manufacturing works
Timber treatment works
Waste recycling, treatment and disposal sites: drum and tank cleaning and recycling plants
Waste recycling, treatment and disposal sites: hazardous waste treatment plants
Waste recycling, treatment and disposal sites: landfills and other waste treatment or waste disposal sites
Waste recycling, treatment and disposal sites: metal recycling sites
Waste recycling, treatment and disposal sites: solvent recovery works
Profile of miscellaneous industries incorporating:
- Charcoal works
- Dry-cleaners
- Fibreglass and fibreglass resins manufacturing works
- Glass manufacturing works
- Photographic processing industry
- Printing and bookbinding works

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