

Road vehicle fuelling, service and repair

transport and haulage centres

Industry Profiles, together with the Contaminated Land Research Report series, are financed under the Department of the Environment's contaminated land research programme.

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.

The Department's Contaminated Land Research Report series deals with information needed to assess risks; procedures for categorising and assessing risks; and evaluation and selection of remedial measures.

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

Road vehicle fuelling, service and repair: transport and haulage centres

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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.

Road vehicle fuelling, service and repair: transport and haulage centres

1. Background

This profile deals with the following motor transport operations:

- road haulage (lorries)
- buses
- motor car fleets.

It considers the possible contaminants that may arise at depots used for these activities through the maintenance of vehicles. It does not consider the contamination at the depot which might arise from leakage or spillage of materials being transported. Each site must be investigated separately to establish what materials might have been handled there and whether there is any risk of contamination from them.

Garages and petrol stations are covered in a separate profile in this series (see Section 4).

1.1 History

1.1.1 Road haulage (lorries)

The road haulage industry developed rapidly from the Second World War, as reliable lorries became available.

In recent years, there has been a change in the method in which goods are distributed in the United Kingdom; with a shift towards primary and secondary (usually regional) distribution centres. A primary distribution centre receives goods from a limited number of manufacturers, stores them on the manufacturers' behalf and delivers them to regional distribution centres and wholesale centres. A regional distribution centre receives goods from different primary distribution centres and supplies the retail outlets within its area. This change has been brought about by the decline in the influence of primary industries, the change within manufacturing towards factories specialising in a particular product line and the shift to larger retail outlets.

About 90% of all inland freight in the United Kingdom is at present transported by road; in 1993, 1615 million tonnes of freight were moved by road. In March 1994 there were over 400 000 vehicles specified on 125 000 operator licenses. The vast majority of operators are small; 50% owned one lorry and 30% between 2 and 5 lorries.

1.1.2 Bus companies

The first buses were horse-drawn; services ran in a number of cities in Victorian times. The first motor bus service in the United Kingdom ran along Princes Street, Edinburgh in 1898 and was operated by the Edinburgh Autocar Company; the first motor bus service in London was started in 1905.

For many years trams, and later trolley buses, dominated urban public transport but motor buses increasingly replaced them in the years before the Second World War. Motor bus services were started in many rural areas in the inter-War period. The National Bus Company was established in the 1930s and it operated depots in many parts of the country.

The Transport Act 1985 introduced a competitive, commercial local bus industry in the United Kingdom outside London and the National Bus Company was sold to the private sector. In the last ten years, the number of independent operators running local services has increased rapidly.

1.1.3 Motor car fleets (excluding private cars)

Nine major companies account for about 60% of the car rental industry in the United Kingdom, with the remaining 40% made up of a large number of small companies.

In addition to the rental companies, there are leasing contract hire companies which provide long term leasing of vehicles to customers. The industry estimates the fleet to be nearly 200 000 vehicles.

1.2 Location

Road haulage and distribution centres are situated throughout the country and are often located on reclaimed land which was previously used for industrial activity or landfill.

Bus depots are located throughout the country in towns, cities and large villages.

Car hire centres are normally associated with airports, large towns and cities. Fleets are also owned by large corporations. Taxi fleets are distributed throughout towns and cities.

2. Activities

2.1 Types of depot

The activities that might be expected at different types of depots include:

General haulage depot

A large site may include an office, a workshop, a vehicle wash and a fuelling area.

Distribution centre

This normally consists of a large hardstanding parking and turning area. Distribution centres usually undertake minor bodywork. Diesel fuel is generally dispensed on site from storage tanks. Vehicles are normally cleaned by automatic brush wash on site.

Frozen food distribution centres have on-site freezers using ammonia as a refrigerant; refrigerated trailers use liquid nitrogen as the refrigerant.

Road tanker depot

Tanks may carry materials ranging from foods through to industrial chemicals such as oils, petroleum, ammonia and acids.

Key elements in the operation of a large depot are likely to include parking, fuelling, repair and washing.

Tank cleaning is only likely to be carried out on larger sites and then only when the tanks are easy to clean. Normally, tanks are cleaned off site by specialist contractors or, for certain toxic chemicals, at the chemical manufacturers (see the profile on drum and tank cleaning, Section 4).

Bus and coach depots

Depots provide garaging for buses overnight. A large depot is likely to be covered and will usually comprise a vehicle wash, a fuelling area and a body repair workshop for activities such as body rebuilding/filling, painting and spraying.

Car fleet centre

Typical operations are likely to include refuelling cars from storage facilities on site, cleaning their interiors with an industrial vacuum system and replacing oil and water if necessary. Cars are washed using an automatic brush wash but hand-held pressurised lances may be used on smaller sites.

Cars are usually sold on before their first major service is due but there may be a small workshop on site for emergency repairs, such as broken windows, and for wheel changes.

2.2 Raw materials

The range of materials delivered to, stored and used on a site will reflect the activities that are carried out there.

Fuel, cleaning materials, lubricating oils, brake fluids and anti-freeze are likely to be used on most sites.

Sites with workshops will receive raw materials in connection with operations such as welding, soldering and respraying, and these may include body filling materials (for example glass fibre), solvents and paints.

Bulk liquids such as fuel will be delivered by tanker and stored in above or below ground storage tanks. Other liquids are delivered in drums and stored in drum storage compounds.

Petrol

Petrol consists of a mixture of volatile hydrocarbons (distilled from crude petroleum in the boiling range 70-180°C) and chemical additives. Additives include oxygenates (for example alcohols and ethers, used as stabilising and blending agents) and anti-knock components (normally organo-lead compounds, for example tetraethyllead). Oxygenates are added in the range of 3-10% by volume. The levels of anti-knock compounds are controlled by legislation and have been progressively reduced. In unleaded petrol, the anti-knock compounds are replaced with other chemicals, for example methyl tertiary butyl ether (MTBE) which is an octane booster.

In recent years, detergent additives have been added to petrol which help keep carburettors, fuel injectors and inlet valves free of carbon deposits.

Other materials may also be present in petrol as impurities from crude petroleum for example sulphur.

Diesel

Diesel is a mixture of hydrocarbons distilled from crude petroleum, consisting of a mixture of cetane (n-hexadecane, $C_{16}H_{34}$) and a methyl naphthalene ($C_{11}H_{10}$) in which the higher the cetane (C) number, the greater the percentage of cetane and therefore the better the performance of the fuel. Fuel in the distillation range 400-700°C and with a C number of 40-60 gives a lightweight fuel which is generally used in most automotive engines. Heavier fuels in a lower distillation range, with a lower C number, are used for fixed, low speed or marine engines.

Commonly-used diesel fuel additives include:

Anti-oxidants	To improve oxidation stability in storage.
Metal deactivators	To provide a passive film on active metals to inhibit fuel oxidation.
Detergents	To maintain a clean fuel system.
Corrosion inhibitors	To protect fuel pumps and injectors.
Cetane improvers	To improve ignition quality.
Low temperature flow improvers	To prevent 'waxing' in cold weather.
Combustion modifiers	Mainly inorganic salts used to reduce smoke production and deposits in combustion chambers.

Detergents

The most widely used surfactants in vehicle washing are linear alkyl sulphonates. Minor components include corrosion inhibitors, dyes and foaming agents (for example sodium carbonate), sodium silicate, ethylene diamine tetraacetic acid (EDTA), nitrilotriacetic acid (NTA) and zeolites. For further details on detergents, refer to the relevant profile (see Section 4).

Other materials

These include lubricating oils, anti-freeze (usually ethylene glycol and methanol) and brake fluids (the main constituents include polymerised glycols and ethers).

Sites containing workshops are likely to use a variety of solvents in cleaners, degreasers, thinners, fillers, adhesives, paints and strippers. The range and use of available solvents has increased over the years. In the past, carbon tetrachloride was commonly used. Solvents in use today include chlorinated hydrocarbons such as dichloromethane (methylene chloride), 1,1,1-trichloroethane (methylchloroform), trichloroethylene and tetrachloroethylene (perchloroethylene). Other widely used solvents include paraffin and proprietary degreasing compounds.

Workshops are likely to carry out painting operations. In the past, lead-based paints were used extensively in the automotive industry, and primers often contained chromates. Twenty years ago, most of the decorative finishes were nitrocellulose-based; various esters (for example ethyl acetate and butyl acetate) and glycol ethers were used as thinners. Styrenated alkyds, a type of modified polyester resin with white spirit as the solvent, were also used. Today, zinc-rich epoxy primers are used which, until recently, contained small amounts of chromates.

In the 1960s, polyurethanes became popular for decorative finishes. Thinners used with polyurethanes were usually ketones (eg methyl isobutyl ketone, methyl ethyl ketone and cyclohexanone) and esters (eg ethyl acetate). Isocyanate curing agents are being phased out due to concern about their use with polyurethanes. They are being replaced by acrylic coatings using ketone thinners.

In the past, paints used in refinishing operations for vehicle repairs contained 85% organic solvents. Owing to the tightening of regulations on emissions of volatile organic compounds (VOCs), which play a central role in the formation of ozone and other photochemical pollutants, water-based metallic vehicle basecoat paints containing 10-15% organic solvents are becoming more popular.

2.3 Waste management

Most transport and haulage depots are likely to produce spent oil and sludges from fuel storage tanks, run-off from vehicle washing and used tyres.

The range of wastes produced at sites with workshops will be greater. The activities undertaken at workshops vary considerably. Wastes may include lubricating oils, hydraulic fluids, cleaning and degreasing solvents, anti-freeze, used batteries and asbestos (for example from brake linings). Waste lubricating oils may contain heavy metals (for example lead, vanadium from fuel), copper from engine bearings, a range of metals from other parts of the engine (such as chromium) and unburnt fuel. Other wastes may arise from, for example, the use of body filling materials and paint spraying including solvents, paints and fibreglass.

Tyre repair or replacement is usually undertaken by a specialist contractor and used tyres are returned to the contractor for disposal to landfill.

Waste oils and solvents are stored in tanks on site until there is sufficient for collection by specialist contractors for recycling or disposal.

Used packaging is generally transferred to a baling plant and then passed to a recycling plant. General debris from cleaning interiors of vehicles is stored in skips and then removed to landfill.

Washings are normally processed through a weir separator and filter, with the aqueous phase being discharged to the foul sewer and the separated oily phase being disposed of to landfill. Waste vehicle wash detergents may occur in vehicle washing areas. Concentrated residues from road tankers are collected and processed by specialist cleaning contractors (see Section 4).

In the past, combustible materials may have been burnt on site. Tarry wastes, including fuel filters, waste oils and sludges, may have been buried on site.

3. Contamination

The contaminants on a site will largely depend on the history of the site and on the range of activities carried out 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

In the past, contamination may have resulted from spillage and leakage of raw materials and waste products, inadequate storage facilities or the disposal of waste products. Contamination of the ground from accidental spillages, overfilling or faulty pipes or caps was common. Today, strict precautions are taken when fuel is delivered, resulting in a reduction in the number of spills. However, all fuelling areas may be susceptible to spillages occurring due to operator error, equipment fault or failure.

Contamination found in workshops may include acids, alkalis, paints, solvents and oils. Asbestos dust may have been produced by machining brake linings which may have been buried on site.

Asbestos may have been used for pipe lagging, fireproofing or for roofing or cladding of buildings.

3.2 Migration and persistence of contaminants

3.2.1 Organic compounds

Petrol and diesel are highly mobile and may migrate to contaminate a wide area. Free product released at the surface or leaking from an underground structure may migrate through the ground; vapour may diffuse into the soil and migrate as a vapour front ahead of the free product. Vapour may accumulate in poorly ventilated spaces and may present a fire and explosion hazard.

MTBE (an anti-knock additive to petrol) is at least ten times more soluble in water than other constituents of petrol and, when in contact with groundwater, will dissolve and migrate rapidly. It has an extremely low taste threshold (10 µg/l) and may taint potable water supplies at low concentrations.

Chlorinated hydrocarbons, used as degreasing solvents, have low viscosities and are highly mobile. The risk to groundwater from petroleum hydrocarbons and solvents depends upon the depth of the water table and the strength and properties of the soil structure. Normally, the higher the organic matter and clay content within the soil, the greater the adsorption of organic compounds and the lower their mobility. Conversely, the greatest migration of organic compounds will occur in coarse-grained sands and gravels with low organic content. The less soluble compounds which become adsorbed on to clay or organic matter may cause water pollution long after the original source has been removed, as a result of the chemical continuing to desorb into the soil-water. Organic compounds may pose a threat to current and potential water supplies.

Less soluble solvents and spillages of oil hydrocarbons will tend to migrate to the water table. These compounds are usually less dense than water and float on top of the water table surface. Chlorinated solvents, also of low aqueous solubility, are denser than water and tend to migrate to the bottom of aquifers. They are persistent chemicals and can render groundwater unsuitable for public supply at low concentrations.

The soluble hydrocarbons may contaminate surface water through run-off in rainwater or via surface discharge of contaminated groundwater.

3.2.2 Heavy metals

The movement of metals through soil is significantly retarded by the presence of clay minerals and organic matter. The solubility of some metals (for example copper, zinc and lead) may increase under acidic conditions. 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.

3.2.3 Other substances

Vehicle washing areas should not pose a threat of potential contamination if a catchment pit with an interceptor is used. Inadequate drainage systems and spillage of detergents may release potential contaminative chemicals to land, surface and groundwater. However, most detergents are 80% biodegradable and residual detergent chemicals and their degradation products are likely to be readily leached from the soil. Although there may be short term accumulation of phosphates, sulphur-containing compounds and alkalinity, long term contamination is unlikely. Contact of detergents with soil contaminated with oils may increase the mobility of the oil, accelerating its release from the soil.

Asbestos is neither soluble or biodegradable but may be dispersed around a site by wind action.

4. Sources of further information

4.1 Organisations

For further information concerning road vehicle fuelling, service and repair, transport and haulage centres in the United Kingdom, the following organisations should be consulted:

Association of British Transport Museums
Science Museum
London
SW7 2DD

British Vehicle Rental and Leasing Association (BVRLA)
13 St John's Street
Chichester
West Sussex
PO19 1UU

Chartered Institute of Transport
80 Portland Place
London
W1N 4DP

Freight Transport Association
Hermes House
St John's Road
Royal Tunbridge Wells
Kent
TN4 9UZ

Road Haulage Association Limited
Roadway House
35 Monument Hill
Weybridge
Surrey
KT13 8RN

Robson Research
75 Cliffview Road
London
SE13 7DB
(For details of HGV fleet ownership)

Transport Research Laboratory
Old Wokingham Road
Crowthorne
Berkshire
RG11 6AU

4.2 Sources of information concerning the activities described in this profile

British Vehicle Rental and Leasing Association. *BVRLA statistical survey.* BVRLA, 1990.

Department of Transport. *Transport statistics of Great Britain.* HMSO, 1978-94.

Freight Transport Association. *Freight Transport Trends.* FTA, 1990.

National directory of hauliers. Published by Motor Transport, Reed Business Publishers.

Transport magazine. Published by the Chartered Institute of Transport.

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

Chemical works: coatings (paint and printing inks) manufacturing works
Chemical works: soap and detergent manufacturing works
Engineering works: vehicle manufacturing works
Road vehicle fuelling, service and repair: garages and filling stations
Waste recycling, treatment and disposal sites: drum and tank cleaning and recycling plants
Waste recycling, treatment and disposal sites: landfills and other waste treatment or waste disposal sites

4.4 Health, safety and environmental risks

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:

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

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

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

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.

Fuelling areas

Petroleum spirit	alcohols ethers organo-lead compounds benzene branched olefins long chain aliphatic compounds naphthalenes polycyclic aromatic hydrocarbons (PAHs)
Petrol additives	eg tetramethyllead (TML) tetraethyllead (TEL) methyl tertiary butyl ether (MTBE)
Diesel (derv or gas oil)	additives

Workshops

Metals and metal compounds	copper zinc lead chromium vanadium
Waste oil	polycyclic aromatic hydrocarbons (PAHs) heavy metals
Anti-freeze	eg ethylene glycol
Brake fluids	eg polymerised glycols and ethers
Solvents (non-chlorinated)	eg white spirit methanol xylene glycols esters ketones
Solvents (chlorinated)	eg dichloromethane 1,1,1 trichloroethane trichloroethylene tetrachloroethylene

Paints containing

lead
zinc
esters eg ethyl acetate
butyl acetate
isocyanates
ketones eg methyl isobutyl ketone
methyl ethyl ketone
cyclohexanone

Thinners

glycol ethers

Inorganic compounds

asbestos
sulphur
isocyanates
battery acids

Vehicle wash areas

Detergent constituents

linear alkyl sulphonates
sodium carbonate
sodium silicate
sodium hydroxide
ethylene diamine tetraacetic acid (EDTA)
nitrilotriacetic acid (NTA)

Table 1 Main groups of contaminants and their probable locations

Road vehicle fuelling, service and repair: transport and haulage centres

Contaminant		Location			
		Fuelling areas	Workshops	Vehicle washing areas	Paint shops
Main group	Sub-group				
Metals and their compounds	Lead				
	Chromium				
	Zinc				
	Copper				
	Vanadium				
Acids/alkalis					
Asbestos					
Organic compounds	Non-halogenated solvents				
	Halogenated solvents				
	Polycyclic aromatic hydrocarbons (PAHs)				
	Fuels/hydrocarbons				
	Ethylene glycol				
	Polymerised glycols and ethers				
	Detergents				

Shaded boxes indicated areas where contamination is most likely to occur

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
Gas works, 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

Copies may be purchased from:

**Publications Sales Unit
Block 3, Spur 7,
Government Buildings,
Lime Grove,
Ruislip, HA4 8SF**

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