HSE

Health and Safety Executive

Update to mapping health and safety standards in the UK waste industry

Prepared by **Noble Denton BOMEL Limited**
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Research Report

HSE

Health and Safety Executive

Update to mapping health and safety standards in the UK waste industry

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This report describes an update to a previous study on the nature of the UK waste industry and its health and safety standards.

Employment figures were updated and it is estimated that around 176,000 people are employed in waste and recycling services in the UK in 2005/06. This employment figure was combined with updated accident numbers to reveal that the overall accident rate for workers in the waste industry has been decreasing recently.

High risk areas appeared to have remained relatively constant over the ten-year period. Industries providing general public services and sewage/refuse disposal remained significant. Handling sprains, trips and struck-by accidents were the most prolific types of accident. Occupations most likely to be involved in accidents were those related to refuse handling and driver jobs and individuals were likely to have been collecting or handling refuse when they had the accident.

Recommendations include understanding the impact of recycling, and the different profiles of over 3-day and major injury accidents, on the accident rates.

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EXECUTIVE SUMMARY

INTRODUCTION

This report has been prepared by Noble Denton BOMEL Limited (ND BOMEL) for the Health and Safety Executive (HSE) as technical support contract P476, and describes an update to a previous ND BOMEL study on the nature of the UK waste industry and its health and safety standards.

In 2003 HSE published Research Report 240 (RR 240 - Mapping health and safety standards in the UK waste industry). The study leading to RR 240 was undertaken by ND BOMEL in 2002/03, and contained information on the accident record (both numbers of accidents and accident rates) of the waste industry in a level of detail not previously available. This information indicated that the waste industry had one of the highest accident rates in the country. HSE used this information to develop and refine its policy for intervening with the waste industry, whilst the waste industry used the information as an impetus for improving its approach to risk management. This report updates that earlier analysis by using RIDDOR data up to and including the published (finalised) figures for 2005/06, and provides an opportunity to investigate the changes in accident numbers and rates since the release of RR 240. ND BOMEL was commissioned by HSE to undertake this analysis.

The overall objectives of the study are to:

- Update the industry employment figures and associated industry accident rates.
- Update the existing waste accident data.
- Update the three RIDDOR spreadsheet tools.

SCOPE OF UK WASTE INDUSTRY

Activities involving the collection, disposal and recycling of industrial, commercial and municipal (household) waste form the focus of this updated report in relation to the UK waste industry. The Standard Industry Classification (SIC) system broadly separates these waste activities into several different industries (SIC codes). The waste accident data set, updated as part of this current project, is therefore classified by these codes.

EMPLOYMENT FIGURES AND ACCIDENT RATES

Waste industry employment figures were updated by combining private sector employment data from the Annual Business Inquiry (ABI) with public sector employment data collected directly from a representative range of Local Authorities. The estimated total number of waste and recycling services workers (employees and the self-employed) in 2005/06 was 176,452. The numbers show that this was similar to the figure for 2001/02 (176,309) although the numbers did drop between 2002/03 and 2004/05.

The total worker accident rate (including fatal, major injury and over 3-day injury accidents) has been decreasing in the waste industry in 2004/05 and 2005/06. This may largely be explained by a gradual reduction in the over 3-day accident rate. The highest fatal accident rate (9.6 accidents per 100,000 workers) was observed in 2001/02. There was a significant reduction in the fatal accident rate in 2003/04. However, the rate then stabilised at a rate similar to that of 2002/03 (8.0) for two years

(2004/05 and 2005/06). The major injury accident rate appeared to increase during the middle of the five year period, although it reduced again in 2005/06. This same pattern (peaking during the middle of the five year period) also occurred for the rate of over 3-day injury accidents.

The overall accident rate increased between 2001/02 and 2003/04, but has since reduced. The overall accident rate decreased by 3% between 2002/03 and 2005/06 whilst the number of workers rose by 7%.

HIGH RISK AREAS

The waste data set developed as part of the previous waste study (Research Report 240) was updated by:

- Replacing the provisional data for 2001/02 with the final data;
- Adding the final data for 2002/03, 2003/04, 2004/05 and 2005/06.

Detailed analysis of the updated RIDDOR waste data set indicated that the total number of waste related accidents (fatal, major injury and over 3-day injury accidents) involving employed and self-employed workers only (not members of the public) appeared to be reducing across the ten-year period.

Allowing for changes in coding with the introduction of the ICC and new occupation coding scheme and the limitations of the RIDDOR coding, trends in the waste accident data generally appeared to have remained relatively constant over the whole ten-year period. Industries classified as 'general public services' and 'sewage / refuse disposal' remained significant. Handling sprains, trips and struck-by accidents were the most prolific types of accident. The occupations most likely to be involved in accidents were those related to refuse handling and driver related jobs and they were likely to have been collecting refuse or handling refuse in general when they had the accident. The likelihood is that the object involved in the accident would have been some sort of container.

An area that appears to have changed in the last four years is related to the age of the injured person. Across the whole ten-year period, the highest total number of accidents were experienced by workers between the ages of 35 to 39 years. In the first six years this was closely followed by workers aged between 30 to 34. However, in the last four years this risk shifted to workers in the 40 to 44 year age bracket. Furthermore, in the last four years there was a notable increase in the percentage of major injury accidents in the 40 to 44 year age range. However, as accurate data on the ages of those employed in the industry is not known, it is not possible to say whether or not the number of injuries by age group reflects the numbers employed in these age groups or their incidence rates.

RECOMMENDATIONS

The findings indicate that the overall accident rate in the waste industry has been reducing in 2004/05 and 2005/06. However, whilst the over 3-day accident rate has been gradually reducing, the major injury rate has not shown the same rate of decline. The reduction in the overall accident rate is largely as a result of the reduction in the over 3-day accident rate.

These results raise a number of issues which cannot be addressed within the limitations of this data. There has been an increase in the amount of recycling undertaken in Great Britain, and this can require

greater manual collection, handling and sorting activities and has the potential to affect accident numbers. Unfortunately, the RIDDOR codes do not contain sufficient detail to ascertain whether the accidents result from recycling activities, let alone whether they involve handling bins, bags or boxes, or what type of vehicle was being used. Understanding the accident profile of the various systems of collection, vehicle and system may help the HSE to better focus its interventions with the waste industry.

The narratives within the RIDDOR data (notifier comments and inspector investigation summaries) contain information that could provide an understanding of why the accidents occurred and what risk factors were involved. Analysis of the narratives contained in the waste RIDDOR data could provide HSE with qualitative data on accident causation, which may be used to:

- Gain a greater understanding of the impact of recycling on the accident rates.

- Gain a greater understanding of the over 3-day and major injury accident causations and why they are moving in different directions.

This type of narrative analysis has not been completed as part of this current study and therefore we recommend that further research of this nature is conducted.

1. INTRODUCTION

1.1 INTRODUCTION

This report has been prepared by Noble Denton BOMEL Limited (ND BOMEL) for the Health and Safety Executive (HSE) as technical support contract P476, and describes an update to a previous ND BOMEL study on the nature of the UK waste industry and its health and safety standards.

1.2 CONTEXT OF THE STUDY

In 2003 HSE published Research Report 240 (RR 240 - Mapping health and safety standards in the UK waste industry). The study leading to this report was undertaken by ND BOMEL in 2002/03, and contained information on the accident record (both numbers of accidents and accident rates) of the waste industry in a level of detail not previously available. This information indicated that the waste industry had one of the highest accident rates in the country. HSE used this information to develop and refine its policy for intervening with the waste industry, whilst the waste industry used the information as an impetus for improving its approach to risk management. This report updates that earlier analysis by using RIDDOR data up to and including the published (finalised) figures for 2005/06, and provides an opportunity to investigate the changes in accident numbers and rates since the release of RR 240. ND BOMEL was commissioned by HSE to undertake this analysis.

1.3 OBJECTIVES

The overall objectives of the study are to:

1. Update the industry employment figures and associated industry accident rates.

2. Update the existing waste accident data.

3. Update the three RIDDOR spreadsheet tools.

1.4 SCOPE OF WORK

These objectives will be addressed through the following scope of work:

1. Update the existing waste data set by: replacing the provisional data for 2001/02 with the final data; adding the final data for 2002/03, 2003/04, 2004/05 and 2005/06.

2. Update the three spreadsheet tools delivered as part of RR 240 (i.e. the RIDDOR Data Tool, Waste RIDDOR Data Tool and Waste RIDDOR Report Tool)

3. Include in the new tools the extra four years of accident data, the waste companies groupings and the extra facilities including the Accident Narrative Keyword Tool to increase the power and usability of the original tools.

4. Estimate private sector waste industry employment figures using the Annual Business Inquiry (ABI) employment data.

5. Estimate public sector waste industry employment figures by carrying out a survey amongst a representative range of Local Authorities.

6. Update the waste industry accident rates with the new accident data and industry employment figures.

7. Draft all of the findings into a report format suitable for publication. The report will present the findings in a format that is both compatible with that in RR 240 and allows comparisons to be made between the accident and employment data since RR 240.

1.5 SCOPE OF UK WASTE INDUSTRY IN THIS REPORT

As with RR 240, activities involving the collection, disposal and recycling of industrial, commercial and municipal (household) waste form the focus of this updated report in relation to the UK waste industry. The Standard Industry Classification (SIC) system broadly separates these waste activities into different industries (SIC codes). These codes form the basis of the industry classification used in the updated data set. However, it should be noted early on that the SIC system is currently not sensitive enough to isolate, for example, the differences in collecting refuse, green waste or recyclable materials or the differences in the systems of collection (e.g. bin, bag, box, weekly, alternate weekly etc.).

1.6 SCOPE OF THIS REPORT

The scope of work is presented in this report as follows:

- Section 2 presents the estimated waste industry employment figures using the ABI data and findings from the public sector survey.

- Section 3 presents the definition of the waste data set, top level accident figures and the updated waste industry accident rates.

- Section 4 presents a detailed analysis of the waste accident data in order to explore the key risk areas.

- Section 5 presents the study conclusions and recommendations.

- Section 0 presents the references used in this study.

2. WASTE INDUSTRY EMPLOYMENT FIGURES

2.1 INTRODUCTION

In order that accident rates can be calculated for the waste industry allowing direct comparison with other industries, an estimate of the number of people working in waste and recycling services was required. This estimation was calculated based on combining estimates of waste and recycling services workers in both the public and private sector. The following sections describe how public and private sector worker data was obtained and how an overall waste industry employment estimate was made.

2.2 WASTE INDUSTRY EMPLOYMENT DATA

Activities involving the collection, disposal and recycling of industrial, commercial and municipal (household) waste form the focus of this updated report in relation to the UK waste industry. In order to calculate waste industry employment figures an estimation was made of the number of workers working in both the public and private sectors. It should be noted that all accident numbers and rates presented relate to waste industry workers (i.e. employees and self-employed) only; accidents involving members of the public are not included in this report. However, when obtaining worker data from the public sector, only data on Local Authority employees (not self-employed workers) was obtained. Private sector data contained data on all workers (employees and the self-employed). The following sections present the method applied to calculate both the public and private sector figures and how these figures were combined to arrive at an industry total.

2.2.1 Public sector employment figures

Local Authorities survey

In Research Report 240 an estimation was made of the number of public sector waste employees by extrapolating from the number of employees at a representative Local Authority. In order to update this figure, a survey of Local Authorities was conducted in order to obtain details on the number of people they have working in their waste department. Each Local Authority was asked to indicate whether they were a County Council, a Borough Council, a District Council or a Unitary Authority. They were also asked to indicate whether their waste and recycling services were all managed in-house, were partially contracted out or were all contracted out. Most critically, they were asked to indicate the number of employees (both hands on and support staff) who were working for their authority providing waste and recycling services on 1st April 2002, 2003, 2004, 2005, 2006 and 2007 (six years worth of data).

The survey defined ‘waste and recycling services’ as the collection, transfer, treatment and disposal of materials from domestic and commercial premises and street cleansing. The survey also underlined that “employees” may include directly employed local government workers, those employed by direct labour organisations or organisations wholly owned by local authorities and any agency staff employed to provide extended cover. Local Authorities were asked not to include workers employed by private sector waste management companies, community sector organisations and agency staff employed to cover short term vacancies.

For avoidance of doubt regarding the nature of the work, examples of relevant occupations were also provided within the survey. These included occupations such as drivers, collection workers, supervisors, contract managers, managers, street cleaners, enforcement offices, information officers, campaign officers, waste strategists, fly tipping clear up teams, administration/ support officers, mechanics, sorters and plant operators etc.

Approximately 400 Local Authorities were approached with the survey and a total of 47 responded (although one of which was from Northern Ireland so was not included in the figures to ensure consistency with the accident data). Table 1 highlights the sample breakdown by type of Local Authority and by the nature of the way waste and recycling services were employed (i.e. in-house, partially contracted out or all contracted out).

Table 1 Local Authority survey sample matrix

	County Council	***Borough Council***	***District Council***	***Unitary Authority***	***TOTAL***
In-house	2	5	5	4	16
Partially contracted out	1	2	7	3	13
All contracted out	5	3	3	6	17
TOTAL	8	10	15	13	46

Methodology for calculating public sector yearly employment figures

The survey provided raw data from 46 Local Authorities in Great Britain (GB) regarding the number of people working for them in waste and recycling services. Most of the Local Authorities were able to provide an estimation of employee numbers for all six years, however some could only provide data for the most recent year (as at 1st April 2007). In order to convert this raw data into an approximation of the total number of public sector waste and recycling services employees, the following methodology was applied.

- The total number of employees (not just waste) working within each of the Local Authorities in GB was obtained1.

- The proportion of waste-related workers in the Local Authorities surveyed was calculated by dividing their estimated number of waste workers (as at 1st April 2007) by their overall number of workers (as at July 2008) to give a percentage of waste workers. This was done for each one of the 46 Local Authorities who returned the survey.

- The proportion of waste-related workers in the Local Authorities surveyed was then aggregated by the type of authority (e.g. Borough Council, County Council, District Council and Unitary Authority). This provided an 'average' percentage of waste-related workers by each type of Local Authority (e.g. it is estimated that in Borough Councils on average almost 7% of workers are undertaking waste related activities).

- The proportion of type of waste services contract (e.g. all services undertaken in-house, services partially contracted out or all services contracted out) by each type of Local Authority was calculated (e.g. in approximately 50% of Borough Councils waste services are carried out in-house; in approximately 20% of Borough Councils waste services are partially contracted out; and in approximately 30% of Borough Councils waste services are all contracted out)

- Finally, an average percentage of waste workers in each type of Local Authority by each type of contract was calculated (e.g. in Borough Councils that carry out all their waste services in-house, approximately 10% of their total workforce are estimated to be waste-related workers).

This information was then used to estimate the total public sector waste-related employee numbers as follows:

- For each type of Local Authority that completed the survey the number of waste workers as at 1st April 2007 was counted (e.g. 10 Borough Councils completed the survey and indicated a total of 593 waste related workers as at 1st April 2007).

- For each of the remaining Local Authorities their overall number of workers was calculated (e.g. 109 Borough Councils did not complete the survey and their combined number of all workers came to 356, 516).

- For each type of Local Authority their overall number of workers was divided by the estimated proportion that undertake waste services in-house, partially contract them out or contract all of them out (e.g. in approximately 50% of Borough Councils waste services are carried out in-house; 50% of all workers at 109 Borough Councils equates to a total of 178,258 workers).

- The percentage of those workers that were estimated to be waste-related workers was then calculated (e.g. in Borough Councils that carry out all of their waste services in-house, approximately 10% of their total workforce are estimated to be waste-related workers, 10% of a total of 178,258 workers equates to an estimate of 18,384 waste related workers in Borough Councils that keep waste services in-house).

- The same calculations were completed for each type of Local Authority by each type of waste services contract. This provided an estimate of the number of waste related workers by each type of Local Authority. (It should be noted that Metropolitan and London Local Authorities were also estimated in the same way with an average estimate of their percentage of waste workers). These figures were combined to provide a total estimate of waste-related employees in the public sector for 2007/08. This figure amounted to approximately 69,896 waste-related public sector workers during 2007/08.

- In order to estimate the number of public sector workers in previous years, the average percentage change in number of waste employees in Local Authorities was calculated using the employee figures generated from the survey. The average percentage change was found to be 5.85%. The total employee figure for 2007/08 was then reduced by this average percentage change across the previous six years.

The revised methodology produced a higher estimate of the number of Local Authority employees for 2001/02 than estimated in RR 240 (48,677 compared to 36,000). The current estimate is likely to be more accurate due to the number of data points on which it is based.

2.2.2 Private sector employment figures

Private sector raw data

In order to obtain an estimate of the number of waste and recycling services workers in the private sector the Annual Business Inquiry (ABI) data was consulted. The breakdown of the UK waste industry has been determined on the basis of the 1992 Standard Industry Classification (SIC) codes given in Table 2. This breakdown of the UK waste industry was also used in RR 240. It should be noted that the SIC system is currently not sensitive enough to isolate, for example, the differences in collecting refuse, green waste or recyclable materials or the differences in the systems of collection (e.g. bin, bag, box, weekly, alternate weekly etc.).

Table 2 SIC codes used in the definition of the UK waste industry

SIC	*Industry description*
37.100	Re-cycling of metal waste and scrap
37.200	Recycle of non-metal waste and scrap
51.570	Wholesale of waste and scrap
90.000	Sewage and refuse disposal, sanitation and similar activities
90.001	Sewage disposal activities
90.002	Refuse disposal activities
90.003	Sanitation and similar activities

Water workers

Using the definition provided in Table 2 the ABI[2] data was interrogated to obtain an estimate of the total number of workers in each of the waste and recycling services SIC codes. However, considering the data from the industries listed in Table 2 alone would lead to an overestimation of the number of workers employed in the UK waste industry as the 90 series of SIC codes contains both water and waste organisations. In order to extract these water workers from the waste worker estimate, an estimation[3] of the total number of water workers was made for each year. The ABI data was then interrogated to gather the number of water workers accounted for in SIC code 41.000 (collection, purification and distribution of water) for each year. The number of water workers accounted for in SIC 41.000 was then subtracted from the total number of water workers, leaving the number of water workers which are assumed to be included in the 90 series of SIC codes. The number of water workers in the 90 series of SIC codes was then subtracted from the overall sub-total of private sector workers using the waste definition given in Table 2.

2.2.3 Overall waste industry employment data

In order to arrive at an estimation of the total number of workers working in waste and recycling services for the last five years, the estimates of the number of public and private sector workers were combined. Table 3 provides the estimates for 2001/02, 2002/03, 2003/04, 2004/05 and 2005/06. The estimate for 2001/02 included in Research Report 240 is also given for comparative purposes (in the grey shaded table cells).

Table 3 Estimated employment in the UK waste industry between 2001/02 and 2005/06

	3710 : Recycling of metal waste and scrap	*3720 : Recycling of non-metal waste and scrap*	*5157 : Wholesale of waste and scrap*	*9001 : Collection and treatment of sewage*	*9002 : Collection and treatment of other waste*	*9003 : Sanitation, remediation and similar activities*	*9000 : Sewage and refuse disposal etc*	*SUB TOTAL*	*Total water workers in UK**	*4100 : Collection, purification and distribution of water*	*Number of water workers in SIC 9000*	*Revised private workers total*	*LA employees*	*GRAND TOTAL*
2001/02a	7,500	6,400	11,600	0	0	0	111,000	136,500	44,000	34,000	10,000	126,500	36,000	**162,500**
2001/02b	7,538	6,434	11,488	0	0	0	112,170	137,630	44,000	34,002	9,998	127,632	48,677	**176,309**
2002/03	7,197	6,674	11,199	0	0	0	93,854	118,924	42,250	34,180	8,070	110,854	51,702	**162,556**
2003/04	6,955	7,935	10,524	24,994	59,782	14,444	0	124,634	40,500	26,090	14,410	110,224	54,916	**165,140**
2004/05	7,216	8,810	10,102	23,079	62,402	13,300	0	124,909	38,750	24,589	14,161	110,748	58,329	**169,077**
2005/06	7,542	9,859	10,110	23,462	63,674	13,497	0	128,144	37,000	23,353	13,647	114,497	61,955	**176,452**

Table 3 highlights that the estimated total number of waste and recycling services workers in 2005/06 was **176,452**. It should be noted that there is a slight discrepancy between the worker numbers estimated for 2001/02 in the previous Research Report 240 and this study (162,500 versus **176,309**); however, it is likely this is due to the more sensitive analysis of Local Authority waste workers used for this study.

3. WASTE INDUSTRY HEALTH AND SAFETY DATA SET

3.1 RIDDOR ACCIDENT DATA

3.1.1 Introduction

In Research Report 240, we analysed a waste industry accident data set consisting of reported fatal, major and over 3-day injury accidents in the six-year period from 1996/97 to 2001/02. This current study has updated the previous waste accident data set with four additional years of accident data (2002/03, 2003/04, 2004/05 and 2005/06). Using the updated accident data and employment figures estimated in Section 2, updated accident rates were also calculated. The following sections present the waste industry data set and calculation of waste industry accident rates.

It should be noted early on that all accident numbers and accident rates presented in this report relate to waste industry workers (i.e. employees and self-employed) only; accidents involving members of the public are not included in this report.

3.1.2 RIDDOR accident reporting

Reporting of the fatal, major injury or over 3-day injury accidents to workers associated with workplace activities is a statutory requirement of RIDDOR. This section provides a brief overview of the RIDDOR data as collected by HSE and subsequently processed and analysed by ND BOMEL. Detailed information is provided in References 4, 5 and 6.

In the period 1996/97 to 2000/01, RIDDOR forms, once completed, were sent to the local HSE offices, where the information on them was coded with reference to HSE guidance on coding(7), and entered into the central HSE FOCUS database by trained clerical staff. As of April 2001, a central Incident Contact Centre (ICC) was established where dedicated staff deal with hard copy, web and telephone notifications, as well as coding and entry of all RIDDOR report forms.

The fields available for analysis are summarised in Table 4. Those fields that have changed with the introduction of the ICC system are denoted in bold. Those fields marked with an asterisk in Table 4 were not completed in the FOCUS database when the reports were received from the local authority enforced sectors in the period 1996/97 to 2000/01 as they ran a different coding scheme. In April 2002, the Standard Occupation Classification (SOC 2000) was adopted. For the accident data reported in 2002/03 and subsequent years, the occupations of those injured at work were recorded using the SOC 2000 system.

At the 1 April 2001 juncture when the ICC system was activated, a new scheme for coding accident agents and work processes was also introduced and the categorisation of accident kinds was modified slightly. It is understood there is no clear mapping between agents and work processes for the pre- and post-ICC schemes and therefore the data sets are presented separately in the graphs which follow. Although accident kinds, ‘high fall, ‘low fall’ and ‘fall’ remain, the guidance on coding falls has apparently been clarified so that a fall initiated by a ‘trip’ (e.g. when getting out of a vehicle or on stairs) is now coded as a ‘slip or trip’ as opposed to a fall. As such, it may be anticipated that the number of recorded falls in 2001/2 would reduce even if

the control of risks did not alter. Caution must therefore be exercised in interpreting trends and changes from 1996/7-2000/1 to 2001/2-2005/06 in terms of fall accident numbers and rates.

Table 4 RIDDOR accident / injury data fields available for analysis

Field	***Description***
Accident Kind	**Kind of accident e.g. slip, fall, drown**
Age group	Age of injured person
Agent*	**Agent associated with the kind e.g. ladder, fragile roof etc. (The agent contains a direct reference to the accident kind in the pre-ICC data i.e. 'Fall vehicle', but not in the 2001/02 data)**
Area	HSE area office (old type areas 1-21 excluding 4)
Body Part	Site on body of injury e.g. back, leg
Casualty Name	Name of the injured party
Client Employees UK	Number employed by client in UK
Client Name	Name of client
Client No	Client identification number
Client Function	Status of the client e.g. private company, NHS
Date	Date of accident
Employment Status	Employment status of injured person e.g. employee
Event No	Serial number of the accident
FMU Unit No	Field management unit enforcing in HSE office
Gender	Gender
HSE Year	Year in which the accident occurred
inc_role	Role of the client at location e.g. designer, landlord
Total Workers Site	Number employed by client at particular location
Incumbent No	Incumbent (client at location) identification number
Industrial Workers Site	Number of industrial workers employed by client at location
Injury Nature	Nature of injury e.g. fracture, burn
InternalID	Unique System ID for this entry
inv_no	Investigation number
Investigated	Flag to indicate if investigation required
Local authority	Name of local authority
Location Type	Type of location e.g. fixed, quarry, roadside
Occupation*	Occupation of injured person
Originator	HSE Directorate/Division or local authority identification field
Region	HSE region (7 regions)
Report type	Accident report type e.g. fatal, major, over 3-days
Severity	F = Fatality, M = Major injury accident, O = Over 3-days accident
SIC92 Industry	Industry classification
SIC92 Sector	Industry Classification Group e.g. Agriculture, Construction, Extractive/Utilities, Manufacturing or Services
Work Process*	**Work process taking place at time of accident**

3.1.3 ND BOMEL RIDDOR Data Tool

The waste data set developed as part of the previous waste study (Research Report 240) was updated by:

- Replacing the provisional data for 2001/02 with the final data

- Adding the final data for 2002/03, 2003/04, 2004/05 and 2005/06

Fatal, major and over 3-day injury accident records from the ICC were supplied to ND BOMEL in separate files for each of the four years 2002/03, 2003/04, 2004/05 and 2005/06, together with 'look-up' tables cross-referencing the codes to short and long descriptions as contained in the HSE coding systems. The RIDDOR data as supplied by HSE was processed by ND BOMEL using the following steps:

- The raw accident data and updated look-up tables as received from HSE were imported into a Microsoft Access database.

- The data was validated and anomalies were resolved in conjunction with HSE statisticians.

- The ND BOMEL RIDDOR Data Tool was updated to include all accidents notified between 2002/03 and 2005/06.

- Analysis of the accident data was carried out using Excel spreadsheet Pivot Tables and Charts contained in the RIDDOR Data Tool (see Section 4).

In updating the database and Data Tool, reference was made to the HSE manual[8] covering the new accident kind, agent and work process codings.

Figure 1 shows the layout of the ND BOMEL RIDDOR database. There are three main tables in the database, containing the information on:

- Accidents / Injuries.

- Investigations.

- Reports.

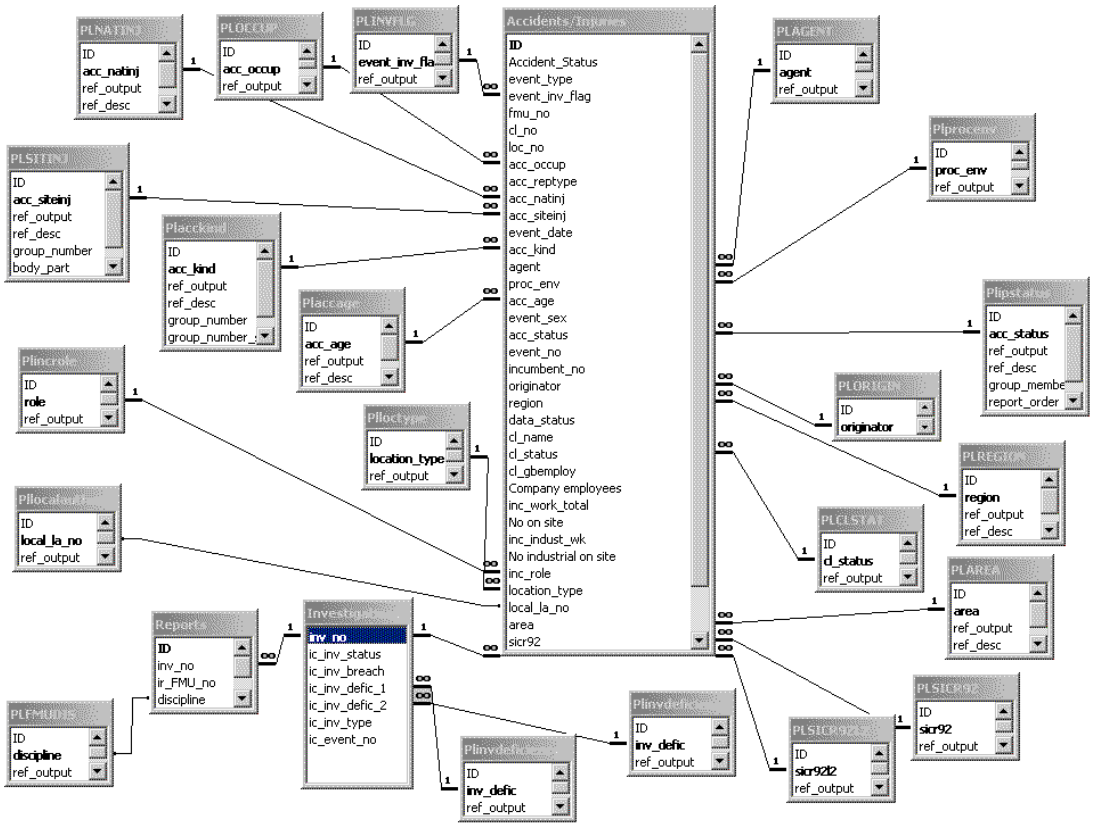


Figure 1 Data table relationships in the ND BOMEL RIDDOR database

The primary table used for this study is the Accidents / Injuries table. The data contained in this table are summarised in Table 4. The database tables contain the numerical FOCUS codes rather than the text descriptions. The associated look-up tables shown in Figure 1 provide access to the textual descriptions required for meaningful analyses.

It is important to note that inv_no (investigation number) is the field linking the principal tables. Furthermore, the term ‘event’ is misleading in that each person injured constitutes an ‘event’ even when there are multiple injuries resulting from an accident.

3.2 DEFINITION OF THE WASTE INDUSTRY DATA SET

3.2.1 Previous waste data sets

In the previous Research Report 240 all of the relevant waste accident data in the RIDDOR database was collected together. This was done by identifying the industries, work processes, occupations and agents that constituted the waste industry and building a separate data set.

The following three spreadsheet tools were provided to HSE with RR 240:

- **RIDDOR Data Tool** - For detailed graphical analysis of the RIDDOR accident data by a small number of the most informative fields reported under the RIDDOR regulations (e.g. accident kind, occupation, work process, agent, age, region etc.) for industry as a whole to enable comparisons to be made with the waste industry.

- **Waste RIDDOR Data Tool** – For detailed graphical analysis of the RIDDOR accident data by all of the fields reported under the RIDDOR regulations (e.g. accident kind, occupation, work process, agent, age, region etc.) for industry as a whole or individual organisations.

- **Waste RIDDOR Report Tool** – For detailed analysis of the RIDDOR accident data by all of the fields reported under the RIDDOR regulations plus the notifier comments and investigation reports for industry as a whole or individual organisations.

As part of this project these tools were updated to include the extra four years' accident data, grouping of the waste companies and the addition of extra facilities including the Accident Narrative Keyword Tool, in order to increase the power and usability of the original tools.

3.2.2 Updated waste data sets

The individual codes used to select the accident records for inclusion in the waste industry data set are given in Table 5. Each of these codes has a marker against it in the RIDDOR accident database indicating that it is part of the waste industry data set. A query is used within the database to select only those accident records where one or more of the codes in Table 5 is present. These accidents are assigned a waste industry 'switch'.

Table 5 Definition of the waste industry used in selecting notified accidents

Reference	*Code*	*Description*
SIC 1992 Industries		
37.100	RECYCLING METAL	Re-cycling of metal waste and scrap
37.200	RECYCLING NONMET	Recycle of non-metal waste and scrap
51.570	WSALE WASTE	Wholesale of waste and scrap
90.000	SEWAGE/REF DISP	Sewage and refuse disposal, sanitation and similar activities
90.001	SEWAGE DISPOSAL	Sewage disposal activities
90.002	REFUGE DISPOSAL	Refuse disposal activities
90.003	SANITATION	Sanitation and similar activities

Reference	*Code*	*Description*
SIC 2003 Industries		
90.02*	COLL/TREAT OTHER	Collection and treatment of other waste
90.03*	SANITATION/REMED	Sanitation, remediation and similar activities
SOC 1990 Occupations		
933	REFUSE	
957	ROAD SWEEPER	
SOC 2000 Occupations		
1235*	REFUSE MGR	Recycling and refuse disposal managers
9232*	ROAD SWEEPER	Road sweepers
9235*	REFUSE SALVAGE	Refuse and salvage occupations
Work process	**pre-ICC**	
3514	WASTE DISPOSAL	Waste disposal (including all incoming site activity, tipping, compaction, winning and spreading of cover material)
7500	REFUSE COLLECTN	Refuse collection
7510	REFUSE DISPOSAL	Refuse disposal (inc tips, incinerators)
7700	WASTEPAPER PROCS	Waste paper / board processing (inc sorting, shredding, hogging, compacting, baling)
8001	WASTE PLASTIC	Waste plastic processing (Inc sorting, waste compacting and bailing).
9660	WOOD WASTE PROCS	Wood waste processing (inc chip, hogging, burn, briquette)
9870	GNRL WASTE DSPSL	General disposal (waste) (inc shred, bale, compress, flush)
Work process	**ICC**	
217	TIPPING	Tipping at spoil heaps e.g. tipping/spreading from a dump truck
1112	METAL SCRAP	Metal Scrap, including car scrap yards
1113	REFUSE COLLECT	Collection of refuse
1114	REFUSE SORTING	Sorting of refuse, e.g.:- materials recycling facilities
1115	REFUSE DISPOSAL	Disposal of refuse/waste, including landfill, composting, incineration
1116	REFUSE SPEC DISP	Specific waste disposal such as paper, cardboard and rag shredding / compressing
Agent	**pre-ICC**	
TW	VEH TRANSP/WASTE	Waste disposal vehicle
TWREFUSE	VEH REFUSE	Refuse collection vehicle
TWSKIP	VEH SKIP	Skip truck
TWGULLEY*	VEH GULLEY	Gully cleaner
Agent	**ICC**	
07.22	REFUSE	Refuse collection vehicle
07.23	SKIP TRUCK	Skip truck

*added to data set to ensure consistency with later data received from HSE.

In total four new data sets were created as follows:

- **'Waste 03'** - A data set based on the definitions used in RR240 (38,545 accidents between 19967/97 and 2005/06).

- **'Waste 07'** - A data set based on the revised definitions incorporating some definitions not available at the time of RR240 (40,641 accidents between 19967/97 and 2005/06).

- **'Waste 07 Reports'** - The 'Waste 07' data with Notifier comments and Investigation report narratives.

- **'Waste 07 Reports + Narrative search'** - The Waste 07 plus other waste-related accidents identified from keyword searches on the Notifier comments and Investigation report narratives.

A similar problem to that described in Section 2.2.2 for employment figures was encountered with the 90 series SIC codes. Both waste and sewage activities are included within the 90 series, but only the waste activities are required for this study. In order to exclude water and sewage activities from the waste industry data set, the following exclusion criteria were set in the database query:

- No occupations containing code 892 WATER/SEWAGE were to be included.

- No client names containing the word 'water' were to be included.

It should be noted that the SIC system is currently not sensitive enough to isolate, for example, the differences in collecting refuse, green waste or recyclable materials or the differences in the systems of collection (e.g. bin, bag, box, weekly, alternate weekly etc.).

3.3 WASTE INDUSTRY DATA SET

Using the criteria described in Section 3.2, the **'Waste 07'** data set identified 42,062 accidents as having occurred to workers (employees and self-employed) in the waste industry over the last ten years. The breakdown of fatal, major and over 3-day injury accidents for each of the last ten years is shown in Table 6.

Table 6 Fatal, major and over 3-day injury accidents involving workers only in the waste industry data set

HSE Year	*Fatal*	*Major*	*Over 3-day*	*Total*
199697F	13	593	3,765	4,371
199798F	13	590	3,639	4,242
199899F	18	575	3,485	4,078
199900F	10	601	3,492	4,103
200001F	11	569	3,389	3,969
200102F	17	591	3,385	3,993
200203F	13	623	3,540	4,176
200304F	6	671	3,640	4,317
200405F	13	789	3,555	4,357
200506F	15	747	3,694	4,456
Grand Total	**129**	**6,349**	**35,584**	**42,062**

It should be noted that the accident numbers presented in Table 6 relate to waste industry workers only (employees and self-employed); accidents involving members of the public are not included.

3.4 ACCIDENT RATES IN THE UK WASTE INDUSTRY

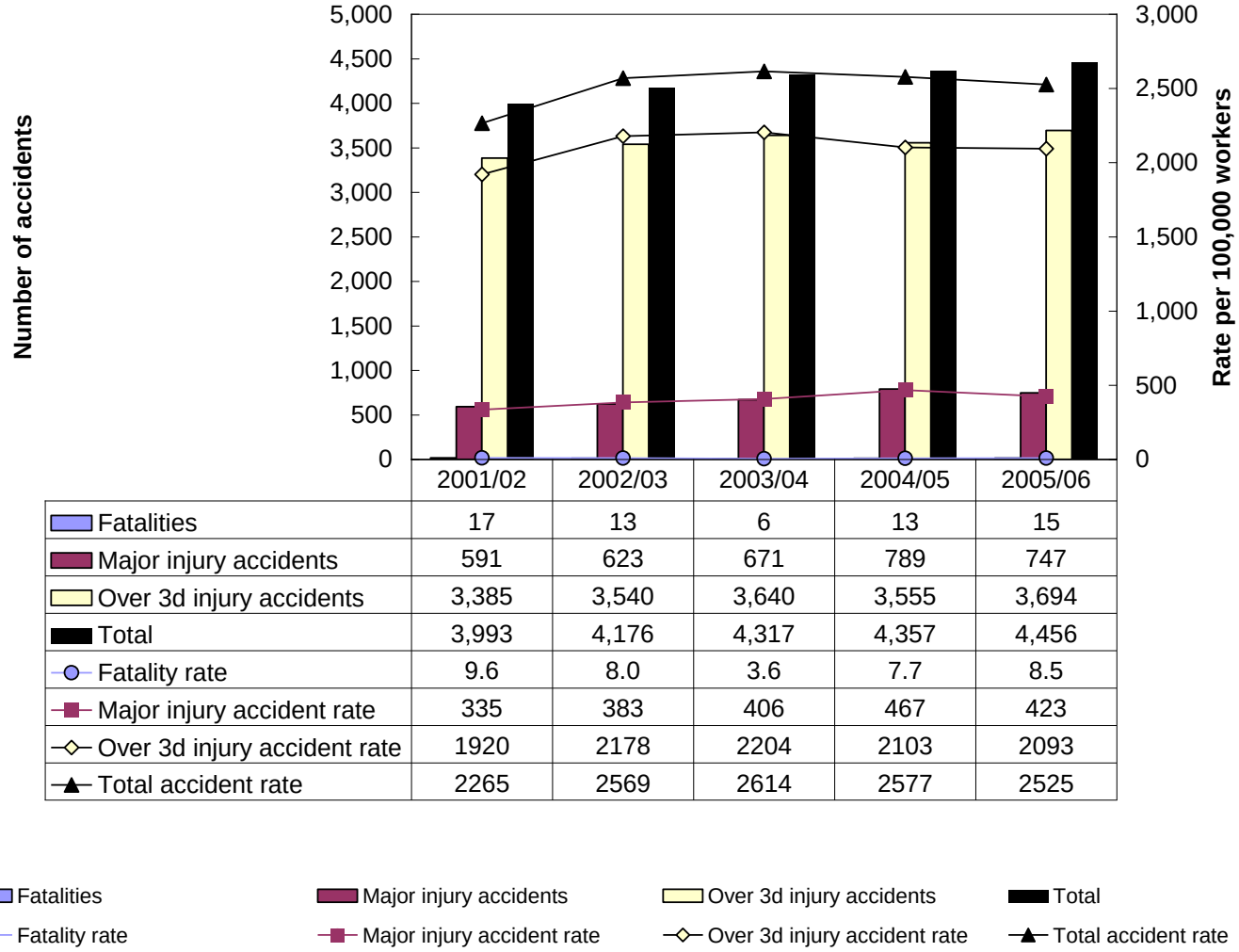
3.4.1 Calculation of accident rates

Using the RIDDOR data, the frequency of different types of accidents over a given period of time can be obtained. If this information is combined with the associated population data, accident rates can be estimated. This allows assessment of relative risk to be made, and enables the comparison of risk between different groups.

Accident rates are calculated by dividing the number of accidents in a period by the number of people working in that industry during the same period. Accident rates can help to show whether or not an increase or decrease in the absolute number of accidents is significant for the working population. A baseline can be established from which performance can subsequently be measured, and the success of intervention strategies evaluated. To maintain compatibility with HSE practice, the accident rates are presented as the number of workers (employees and self-employed) injured per 100,000 workers.

3.4.2 Composite waste industry accident rates

As part of Research Report 240 accident rates for the waste industry were calculated for 2001/02. In order to update these accident rates, the accident data within the 'Waste 07' data set and the updated employment figures presented in Table 3 were used. Figure 2 highlights waste industry worker accident rates for fatal, major and over 3-day accidents reported in the UK waste industry from 2001/02 to 2005/06. It also provides a total accident rate.



	2001/02	2002/03	2003/04	2004/05	2005/06
Fatalities	17	13	6	13	15
Major injury accidents	591	623	671	789	747
Over 3d injury accidents	3,385	3,540	3,640	3,555	3,694
Total	3,993	4,176	4,317	4,357	4,456
Fatality rate	9.6	8.0	3.6	7.7	8.5
Major injury accident rate	335	383	406	467	423
Over 3d injury accident rate	1920	2178	2204	2103	2093
Total accident rate	2265	2569	2614	2577	2525

Figure 2 Accident rates for workers (employees and self-employed) in the UK waste industry from 2001/02 to 2005/06

Figure 2 highlights that the total accident rate for workers (including fatal, major injury and over 3-day injury accidents) has been decreasing in the waste industry in 2004/05 and 2005/06.

In terms of fatal accidents, the highest rate (9.6) was observed in 2001/02. However, in RR 240 the fatal accident rate for 2001/02 was shown as 10.2. This discrepancy may be explained by the difference in employment figures used to calculate the accident rates for this report. In RR 240 employment figures for 2001/02 had been estimated at 162,500, whereas during this updated study employment figures for 2001/02 had been estimated at **176,309** (discrepancy due likely to the more sensitive analysis of Local Authority waste workers used for this study). It is therefore likely that this increase in employment figures would have caused the accident rate to go down for 2001/02 in this updated report.

Figure 2 also highlights that there was a sharp dip in the fatal accident rate in 2003/04 however, the rate then returned to a rate similar to that of 2002/03 (8.0) for the last two years (2004/05 and 2005/06).

The major injury accident rate appeared to increase during 2004/05 and then reduced again in 2005/06. The rate of over 3-day injury accidents peaked in 2003/04 and then shows a gradual decline during the last two years (2004/05 and 2005/06).

Overall, the fatal accident rate would appear to have remained relatively stable, with the exception of the sharp dip in 2003/04. However, during the five year period 2001/02 to 2005/06 the major injury and over 3-day injury accident rates appear to have slowly risen and then dropped again by 2005/06. This could be explained by the publicity surrounding the publication of Research Report 240, which may have caused an increased interest in the health and safety of workers employed in this sector. In turn, this may have caused more accidents to have been reported in the major injury and over 3-day injury categories within the waste industries, resulting in the observed increase in the accident rates for a couple of years. The accident rate may also then be starting to reduce as a result of targeted interventions starting to take effect.

In order to look more closely at the accident rates for each of the fatal, major injury and over 3-day injury accidents, graphs were produced to reflect these rates and are shown in Figure 3.

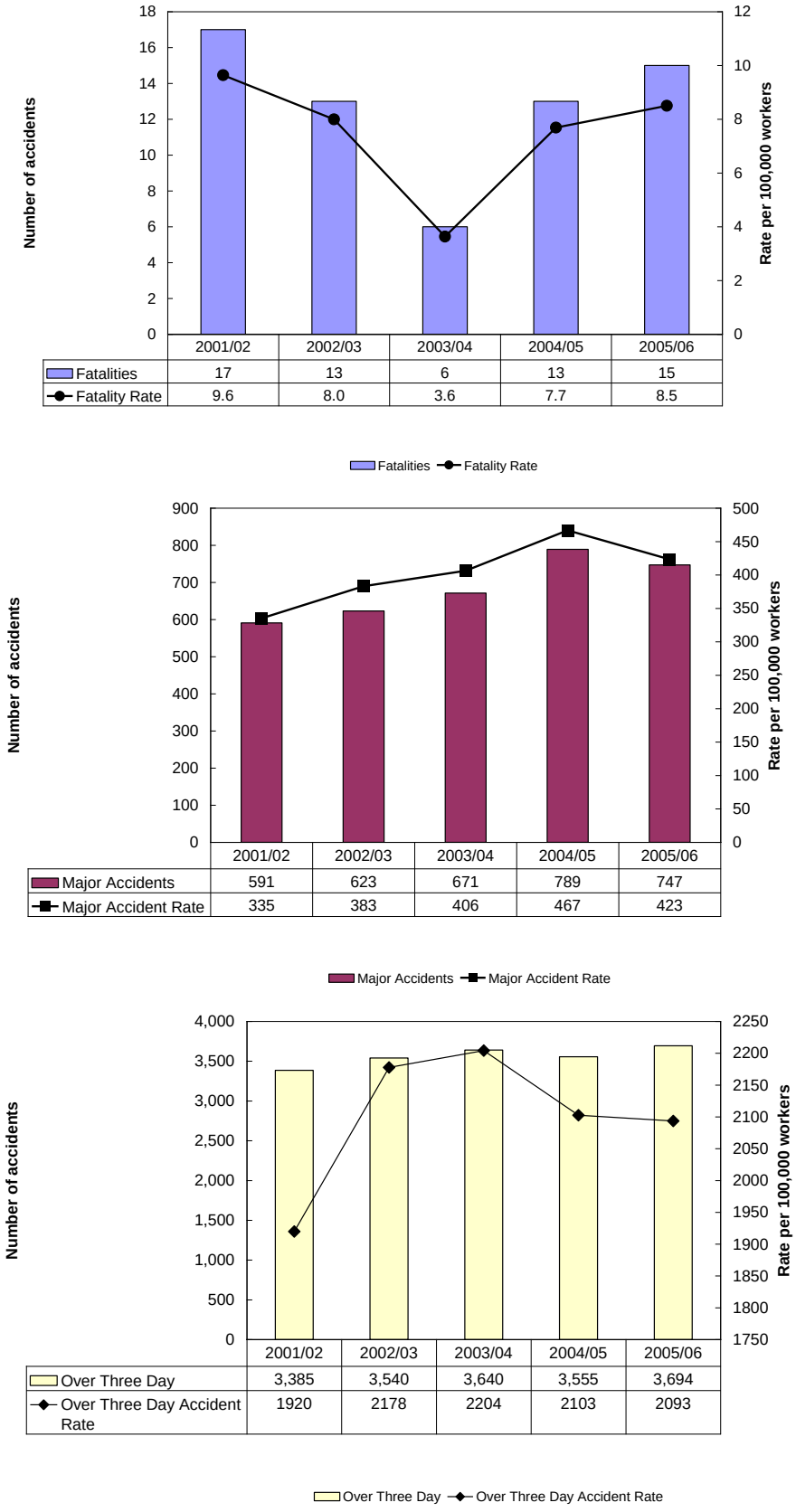


Figure 3 Fatal, major and over 3-day accident rates for workers (employees and self-employed) in the UK waste industry between 2001/02 and 2005/06

Figure 3 highlights the same pattern as was described for 'all accident severities' in Figure 2. However, Figure 3 illustrates more clearly the increase in the major injury accident rates. As explained above, this could be explained by an increased interest in health and safety issues in the waste industry as a result of the publication of Research Report 240. However, the major injury accident rate does now appear to be reducing in 2005/06. Figure 3 also highlights how the over 3-day injury accident rate has been steadily reducing. It is interesting to note that the reduction in the rate of over 3-day injury accidents started a year earlier (2003/04) than that for major injury accidents.

Furthermore, the overall worker accident rate increased between 2001/02 and 2003/04, but has since reduced. The overall accident rate decreased by 3% between 2002/03 and 2005/06 whilst the number of workers rose by 7%.

3.4.3 Individual waste industry accident rates

Section 3.4.2 provides an overview of the composite waste industry accident rates that were calculated using an estimate of the number of employees in all of the waste industries as presented in Table 3, and the number of fatal, major injury and over 3-day injury accidents as highlighted in Table 6. The number of accidents were calculated using a definition of the waste industries which not only included the relevant waste industries themselves, but also included other attributes (e.g. process, agent, occupations) as highlighted in Table 5. This means that the accident numbers came from a wider definition than the employee numbers, which were based on the selected waste industries only.

In order to investigate whether or not there were similar trends between the composite waste industry accident rates compared with the individual waste industries, the individual industry accident rates were also calculated and compared with the composite accident rates (see Table 7).

Table 7 Composite waste industry accident rates compared with individual waste industry accident rates

Composite waste industry accident rate trends - includes private and public sector employees					
Rate per 100,000 workers	***2001/02***	***2002/03***	***2003/04***	***2004/05***	***2005/06***
Fatality rate	9.6	8.0	3.6	7.7	8.5
Major injury accident rate	335	383	406	467	423
Over 3d injury accident rate	1920	2178	2204	2103	2093
Total accident rate	2265	2569	2614	2577	2525
Industry SIC 37.1 accident rate trends - private sector employee numbers only					
Rate per 100,000 workers	***2001/02***	***2002/03***	***2003/04***	***2004/05***	***2005/06***
Fatality rate	39.8	13.9	28.8	0.0	66.3
Major injury accident rate	451	459	590	831	809
Over 3d injury accident rate	929	959	1409	1330	1379
Total accident rate	1419	1431	2027	2162	2254
Industry SIC 37.2 accident rate trends - private sector employee numbers only					
Rate per 100,000 workers	***2001/02***	***2002/03***	***2003/04***	***2004/05***	***2005/06***
Fatality rate	31.1	0.0	37.8	22.7	10.1
Major injury accident rate	482	644	857	942	862
Over 3d injury accident rate	901	1154	1764	1907	2039
Total accident rate	1414	1798	2659	2872	2911
Industry SIC 51.57 accident rate trends - private sector employee numbers only					
Rate per 100,000 workers	***2001/02***	***2002/03***	***2003/04***	***2004/05***	***2005/06***
Fatality rate	17.4	35.7	0.0	0.0	9.9
Major injury accident rate	339	268	114	99	138
Over 3d injury accident rate	810	804	247	178	148
Total accident rate	1166	1107	361	277	297
Industry SIC 90.0 accident rate trends - private sector employee numbers only					
Rate per 100,000 workers	***2001/02***	***2002/03***	***2003/04***	***2004/05***	***2005/06***
Fatality rate	5.9	2.3	0.0	11.8	8.0
Major injury accident rate	253	195	288	331	283
Over 3d injury accident rate	1245	1085	1481	1409	1330
Total accident rate	1504	1282	1769	1751	1621

Table 7 highlights that there is no trend between the accident rates of the individual waste industries and the composite waste accident rates. This could be due to the fact that the composite waste accident rates use both private and public sector employee numbers to calculate the rate, whereas the individual waste industries only use private sector employee numbers.

4. ACCIDENTS AND INJURIES IN THE UK WASTE INDUSTRY

4.1 INTRODUCTION

A variety of information about accidents can be obtained from the RIDDOR data. For example, fields including work process being undertaken at the time of the accident, agent involved in the accident, occupation and age of the injured person and region in which the accident occurred can all be analysed to assess possible trends and key high risk areas. Research Report 240 provided an in-depth assessment of the key trends and high risk areas identified in the reported waste accidents by analysing these RIDDOR accident data fields. This study updates this analysis, having made the following updates to the waste data set:

- Replaced the provisional data for 2001/02 with the final data
- Added the final data for 2002/03, 2003/04, 2004/05 and 2005/06

The following section presents the findings from the updated analysis alongside the findings from the previous waste report (RR 240) in order that trends in the data can be directly compared. This will help identify where changes in trends may or may not have occurred over the whole 10-year period.

4.2 PRESENTATION OF THE ACCIDENT DATA

The analysis was conducted using the 'Waste 07' data set, which was based on the revised waste definitions incorporating some definitions not available at the time of RR 240. In total, the data set contained 40,641 accident records reported between the years 19967/97 to 2005/06. Analysis of this RIDDOR waste accident data is presented in a graphical format for the following data fields:

- HSE year
- HSE Region
- SIC industry
- Accident kind
- Occupation
- Work process
- Agent
- Age

The figures contain data on fatal, major injury and over 3-day injury accidents. The following legend is used in the figures to denote the accident types:

- **O** – over 3-day injury accident.
- **M** – major injury accident.
- **F** – fatal accident.

Whilst interpreting the analysis the following presentational points should be borne in mind:

- Typically, two graphs are presented: one graph highlighting data for the years 1996/97 to 2001/02 in order to show the data presented in Research Report 240 and another graph highlighting data for the years 2002/03 to 2005/06 to show the updated data. These graphs are presented side-by-side to allow for direct contrast and comparison of the trends in the data.
- For the data fields 'work process' and 'agent' three graphs are presented to allow for the change in accident coding in April 2001 as a result of the new RIDDOR Incident Contact Centre (ICC).
- Data regarding organisational status (i.e. local authority, private company, NHS etc.) is not presented here as these categories have fallen into disuse over the last five years, leading to the majority of entries being recorded as blanks.
- To make direct comparisons between the numbers of accidents presented in the graphs (as opposed to the trends), the data in each chart would need to be averaged (i.e. divide the total number of accidents in a given category by the number of years represented in the data). It should be noted that as the population is also likely to be different over the different time periods care should be taken in drawing firm conclusions.
- It should be noted that RR 240 used preliminary data for 2001/02. This report has updated the analyses presented in that report to include the final version of the data available in that year. This means that some of the figures for 2001/02 will be slightly different from those reported in RR 240; however, these differences are very slight.
- All accident numbers presented relate to waste industry workers only (employees and self-employed); accidents involving members of the public are not included.

4.3 DETAILED ANALYSIS OF THE RIDDOR ACCIDENT DATA

4.3.1 By year

Figure 4 highlights the number of fatal, major injury and over 3-day injury accidents in the waste industry over the last ten years. Where the year ends in 'F' this indicates that the accident data available for that year has been finalised by HSE.

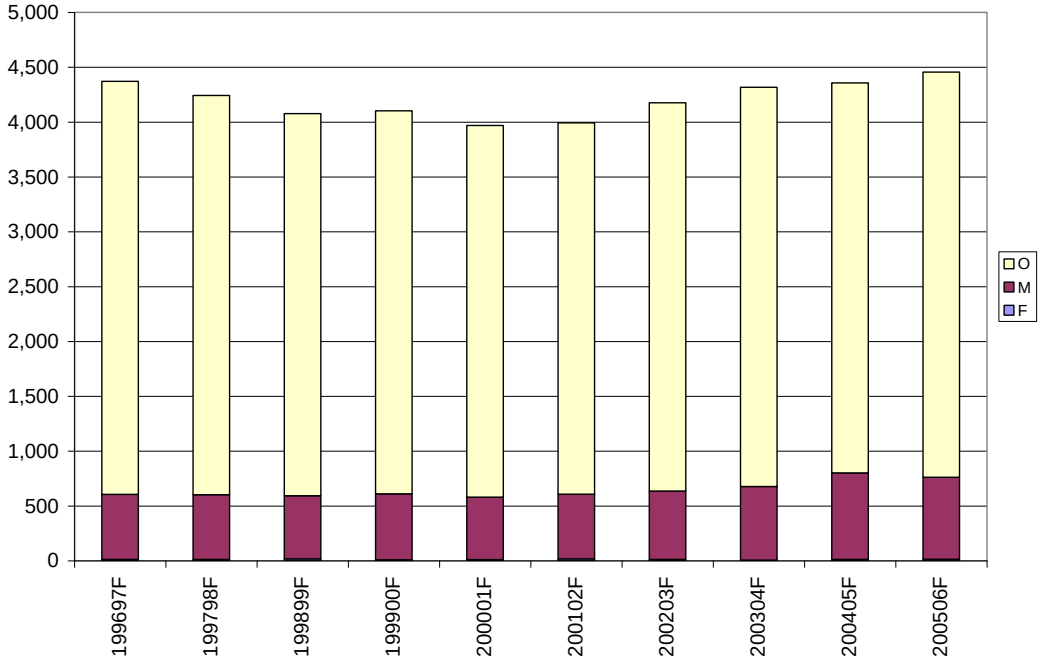


Figure 4 Number of accidents in the UK waste industry between 1996/97 and 2005/06 by HSE year

Figure 4 highlights that the total number of accidents (fatal, major injury and over 3-day injury) occurring during the ten-year period shows a small year-on-year decline. However, the major injury accidents appear to remain at a more constant level, with only slight fluctuations between the individual years. More specifically, the number of major injury accidents range from 569 in the year 2000/01 to 789 in the year 2004/05.

Fatalities are not visible in this chart: numbers are fairly consistent, ranging from six (in 2003/04) to 18 in 1998/99 and 17 in 2001/02. In the majority of years, there were between 11 and 13 fatalities.

4.3.2 By HSE region

Figure 5 and Figure 6 show the distribution of accidents by HSE region for 1996/97 to 2001/02, and 2002/03 to 2005/06 respectively.

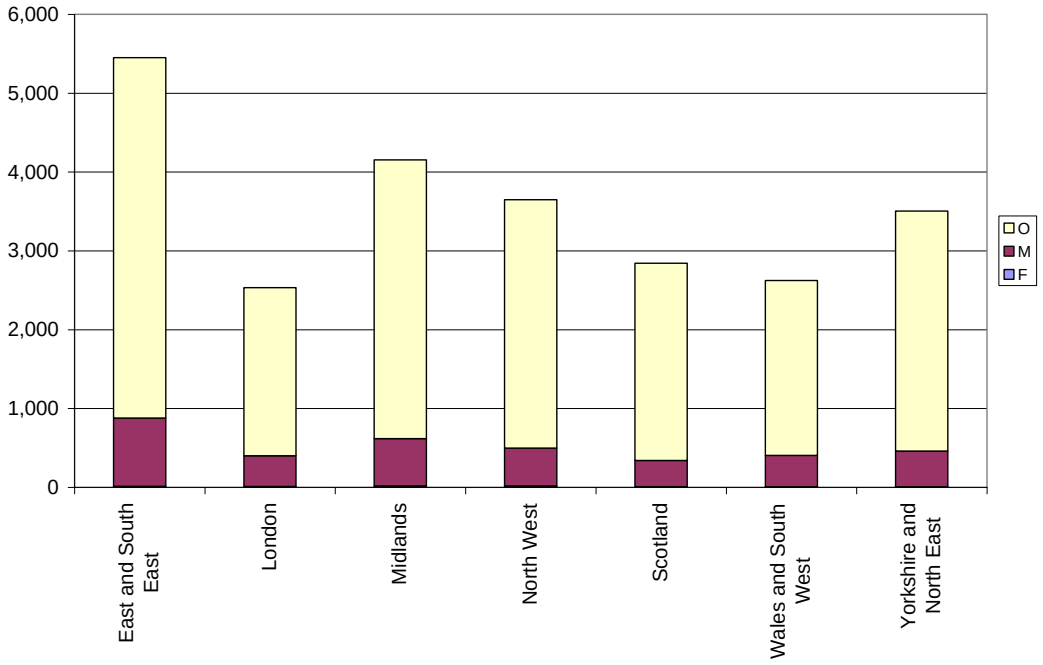


Figure 5 Number of accidents in the UK waste industry between 1996/97 and 2001/02 by HSE region

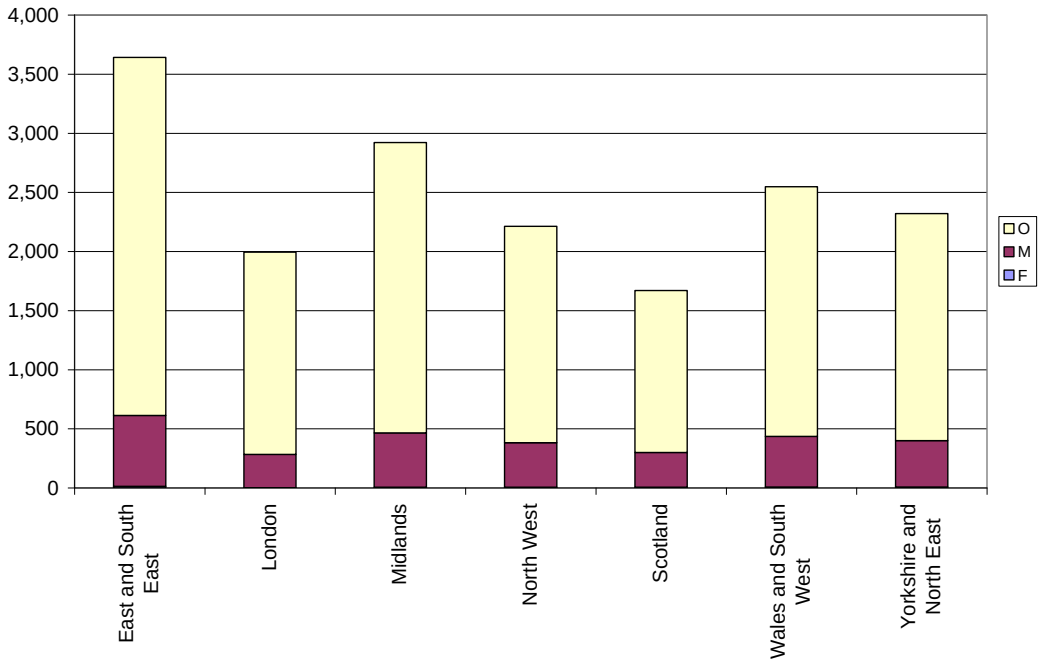


Figure 6 Number of accidents in the UK waste industry between 2002/03 and 2005/06 by HSE region

Figure 6 highlights the updated waste accident data and interestingly shows an almost identical trend in the accident distribution across regions as Figure 5 (which highlights the findings from the initial waste study). However, in terms of trends (not actual accident numbers), there does appear to be a slight increase in the prevalence of accidents in the Wales and the South West region and the Yorkshire and North East region in the last four years.

4.3.3 By SIC Industry

In 2002/03 there was a change from SIC 1992 to SIC 2003. As such, we have grouped all of the industries with SIC codes beginning with '90' into one combined SIC 9000 code to allow comparison across the time periods. The groupings for SIC 1992 and SIC 2003 are shown in Table 8.

Table 8 SIC 1992 and SIC 2003 codes combined in this report

SIC 1992 Industries		
90.000	SEWAGE/REF DISP	Sewage and refuse disposal, sanitation and similar activities
90.001	SEWAGE DISPOSAL	Sewage disposal activities
90.002	REFUGE DISPOSAL	Refuse disposal activities
90.003	SANITATION	Sanitation and similar activities
SIC 2003 Industries		
90.01	COLL/TREAT SEWAG	Collection and treatment of sewage
90.02	COLL/TREAT OTHER	Collection and treatment of other waste
90.03	SANITATION/REMED	Sanitation, remediation and similar activities

It should be noted that the collection of recyclable materials falls within the SIC 90.02 code.

Figure 7 and Figure 8 highlight the 15 most frequently occurring SIC industry codes in the waste accident data for 1996/97 to 2001/02 and 2002/03 to 2005/06 respectively.

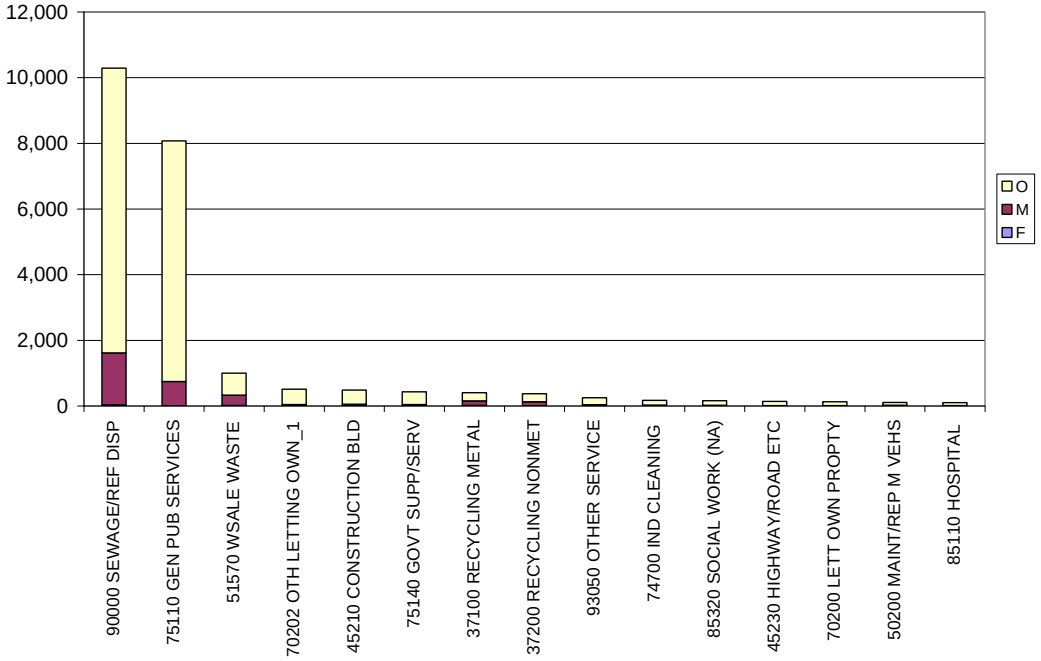


Figure 7 Number of accidents in the UK waste industry between 1996/97 and 2001/02 by SIC industry

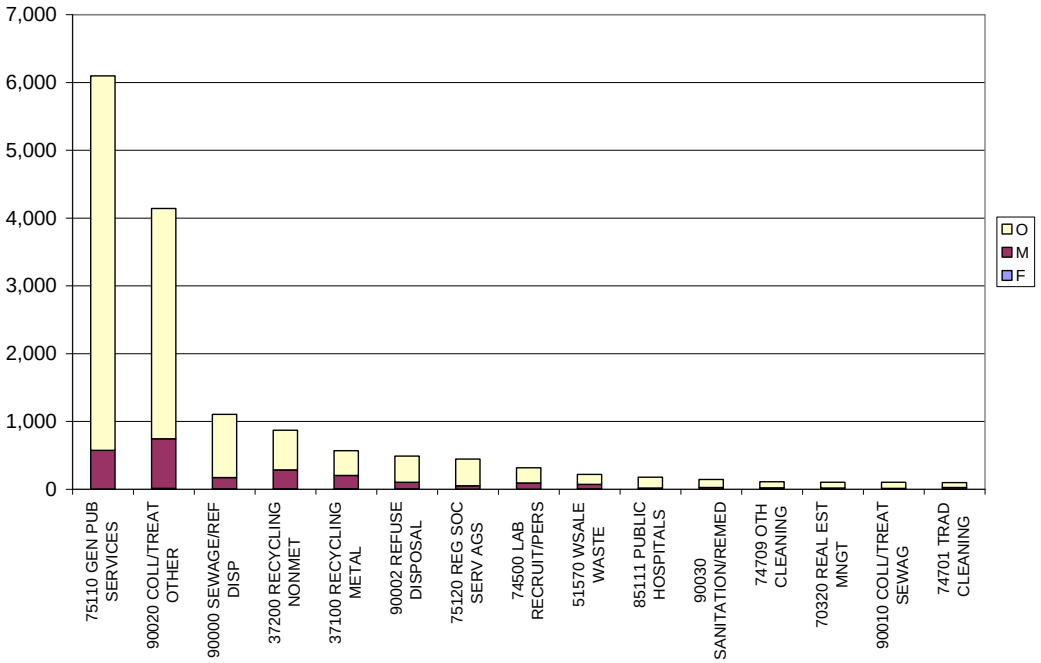


Figure 8 Number of accidents in the UK waste industry between 2002/03 and 2005/06 by SIC industry

Figure 7 and Figure 8 highlight that the most frequently occurring SIC industry code in the accident data for the period 2002/03 to 2005/06 is 'Gen Pub Services', previously (in the period 1996/97 to 2001/02) the second most frequently occurring code. In the period 2002/03 to

2005/06 this SIC code accounted for an average of around 1,524 accidents per year, an increase of around 13% from an average of 1,346 accidents in the period 1996/97 to 2001/02.

In the period 1996/97 to 2001/02 the most frequently occurring SIC code in the accident data was 'Sewage/Ref Disp', accounting for an average of around 1,715 accidents each year. (This was also the most significant SIC in terms of fatal accidents). Between 2002/03 and 2005/06, this average fell by around 84% to 276 accidents each year.

The SIC industry code 'Recycling Nonmet' accounted for an average of around 218 accidents each year between 2002/03 and 2005/06, an increase of around 252% from an average of around 62 accidents each year between 1996/97 and 2001/02. In the second period, 'collection and treatment of other waste' accounted for the highest number of fatal accidents.

The average number of accidents each year attributed to SIC industry code 'Wsale Waste 'has fallen by around 69% to around 55 accidents each year (2002/03 to 2005/06), from an average of around 176 accidents each year between 1996/97 and 2001/02.

Overall, the graphs show that the industries classified as 'general public services' and 'sewage / refuse disposal' are significant throughout the ten-year period. These industries are closely followed by industries involved in re-using waste (termed 'wholesale waste' in the previous report and referred to as 'recycling' in this current updated report).

4.3.4 By accident kind

Figure 9 highlights how the reported accidents have been classified according to the RIDDOR accident kind map for the period 1996/97 to 2001/02. This data was also presented in the previous waste report.

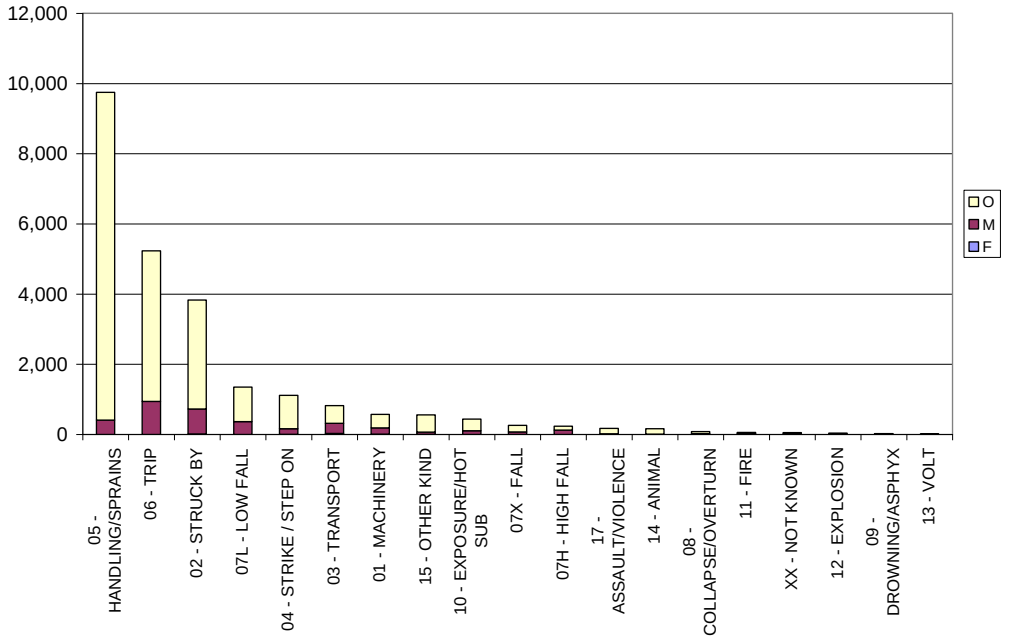


Figure 9 Number of accidents in the UK waste industry between 1996/97 and 2001/02 by accident kind (map)

Figure 10 highlights how reported accidents have been classified according to the RIDDOR accident kind map for the period 2002/03 to 2005/06.

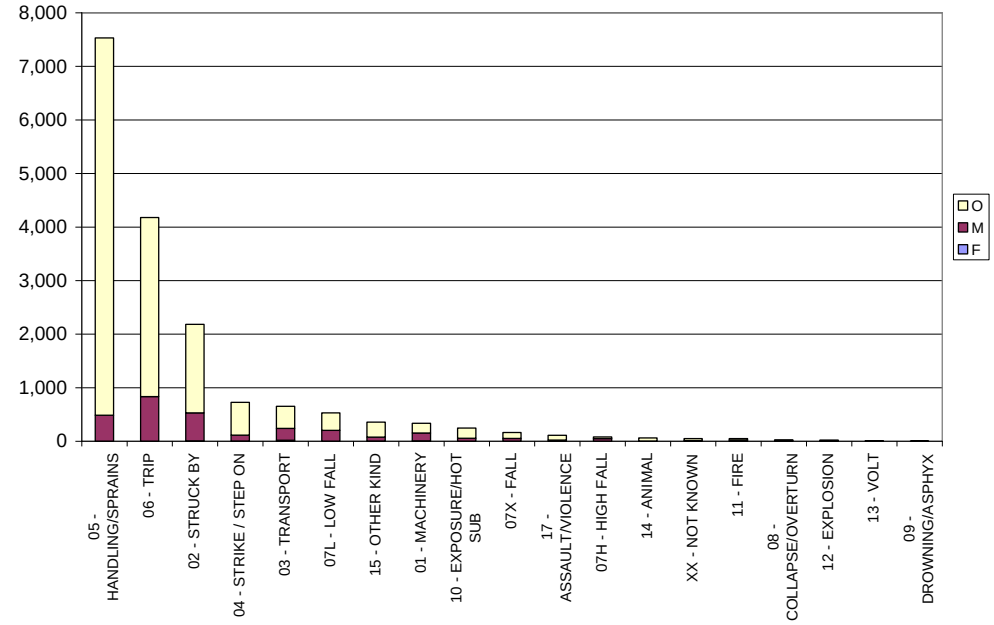


Figure 10 Number of accidents in the UK waste industry between 2002/03 and 2005/06 by accident kind (map)

By comparing the data in Figure 9 and Figure 10, it can be seen that a similar trend exists in both periods. The accident type 'handling/ sprains' shows the highest total number of accidents in 1996/97 to 2001/02 and 2002/03 to 2005/06. The highest total number of fatal injuries are classified as 'transport' related accidents for both periods. The highest total number of major injury accidents (also in both periods) is classified as a 'trip', closely followed by 'struck-by' accidents. Interestingly, 'low falls' are a little less prevalent in the last four years worth of data (the updated data). Transport related accidents are still prevalent in both periods.

4.3.5 By occupation

Figure 11 and Figure 12 show the 20 most frequently occurring occupation codes in the waste accident data for 1996/97 to 2001/02 and 2002/03 to 2005/06 respectively.

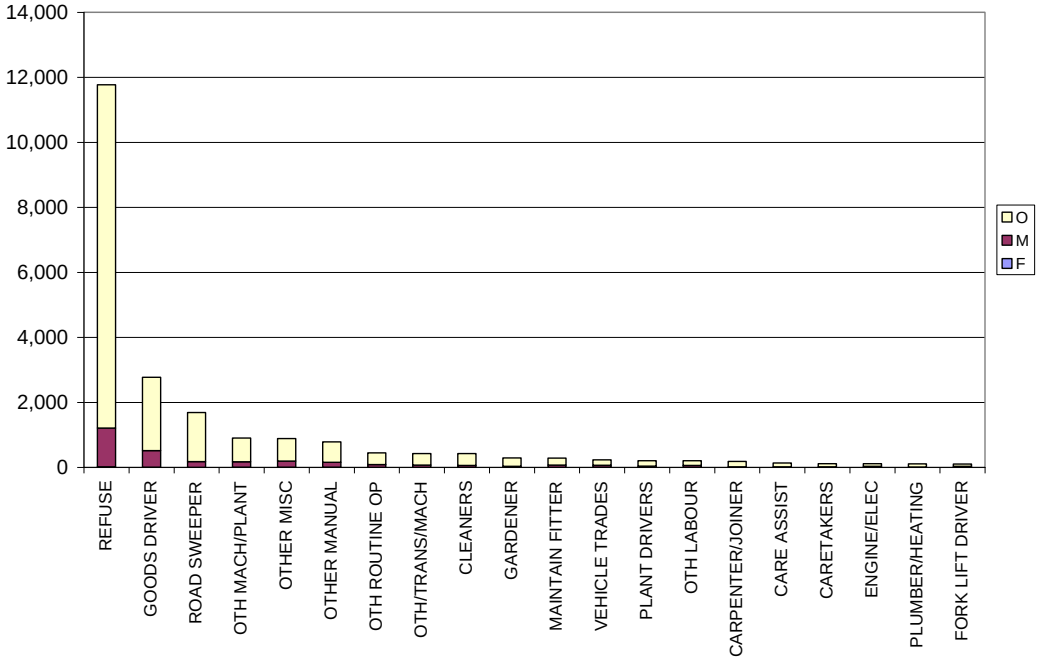


Figure 11 Number of accidents in the UK waste industry between 1996/97 and 2001/02 by occupation

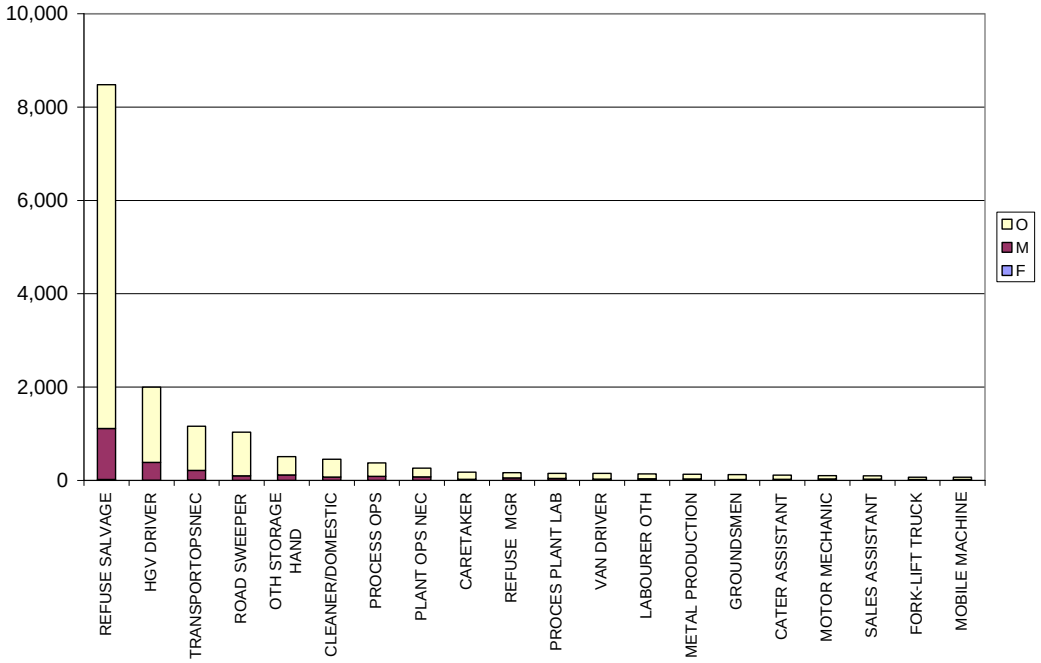


Figure 12 Number of accidents in the UK waste industry between 2002/03 and 2005/06 by occupation

Figure 13 shows that between 1996/97 and 2001/02 the most frequently occurring occupation was 'Refuse', accounting for an average of around 1,962 accidents each year.

The occupation coding system changed in 2002/03 from SOC 1990 to SOC 2000, making a direct comparison between the two time periods difficult, although there is some guidance available to suggest that, for example, occupations previously appearing under 'Refuse' in SOC 1990 would now appear under 'Refuse Salvage' in SOC 2000.

Figure 12 shows that between 2002/03 and 2005/06 the most frequently occurring occupation code was 'Refuse Salvage', accounting for an average of around 2,120 accidents each year. Comparing this to the equivalent code ('Refuse') in the previous graph suggests that the number of accidents affecting refuse workers may have increased overall by nearly 7%, with a slight increase in the proportion of major injury accidents. However, caution must be exercised in drawing firm conclusions due to the change in coding system.

In the period 1996/97 to 2001/02, 'Road Sweeper' accounted for an average of around 281 accidents each year. This figure may have reduced slightly in the period 2002/03 to 2005/06 (if the data is compared to figures associated with the SOC 2000 code of 'Road Sweeper') to around 258 accidents on average each year, a reduction of around 8%. The proportion of major injury accidents remained about the same.

In terms of fatal injuries only, the trends were similar with 'Refuse' accounting for the largest number of fatal accidents in the first period and 'Refuse Salvage' accounting for the largest number of fatals in the second period.

Overall, the types of occupations across the whole ten-year period experiencing the highest numbers of accidents are those related to handling refuse and driving related jobs.

4.3.6 By work process

In 2001 the HSE introduced the RIDDOR Incident Contact Centre (ICC) and as a result of this introduced new codes for the RIDDOR category 'work process'. Consequently, this has resulted in difficulty making direct comparisons between the data before and after the ICC. In order to illustrate some of the changes in work process codes, Table 9 presents definitions for the most frequently occurring work processes.

Table 9 Definitions of the most frequently occurring pre- and post-ICC work process codes in the accident data

Pre-ICC Work processes	
REFUSE COLLECTN	Refuse collection
ON-SITE TRANSF	Transfer (on site) (inc movement of persons, patients walking, materials or part finished items between processes by pump, conveyor; manual or mechanical means)
GNRL HANDLING	General handling (inc not otherwise defined or specific to the process)
LOAD/UNLOADING	General loading or unloading (inc raw materials, products or persons; vehicles entering or leaving premises; goods despatch, weighing, sheeting, tipping, pumping)
GNRL WASTE DSPSL	General disposal (waste) (inc shred, bale, compress, flush)
REFUSE DISPOSAL	Refuse disposal (inc tips, incinerators)
ICC Work processes	
REFUSE COLLECT	Collection of refuse
OTH HANDLING	Other handling, not otherwise defined.
CLIMB/DESCEND EQ	Climbing/descending up/from equipment eg vehicles, stairs, machines
REFUSE DISPOSAL	Disposal of refuse/waste, including landfill, composting, incineration
REFUSE SORTING	Sorting of refuse, e.g.:- materials recycling facilities

It should be noted that currently there is no distinct work process code for recycling operations.

Figure 13, Figure 14, and Figure 15 show the 20 most frequently occurring work processes associated with the accidents that have occurred in the UK waste industry between 1996/97 and 2000/01, in 2001/02, and between 2002/03 and 2005/06 respectively. Data for the period 2001/02 are presented separately to maintain compatibility with RR 240..

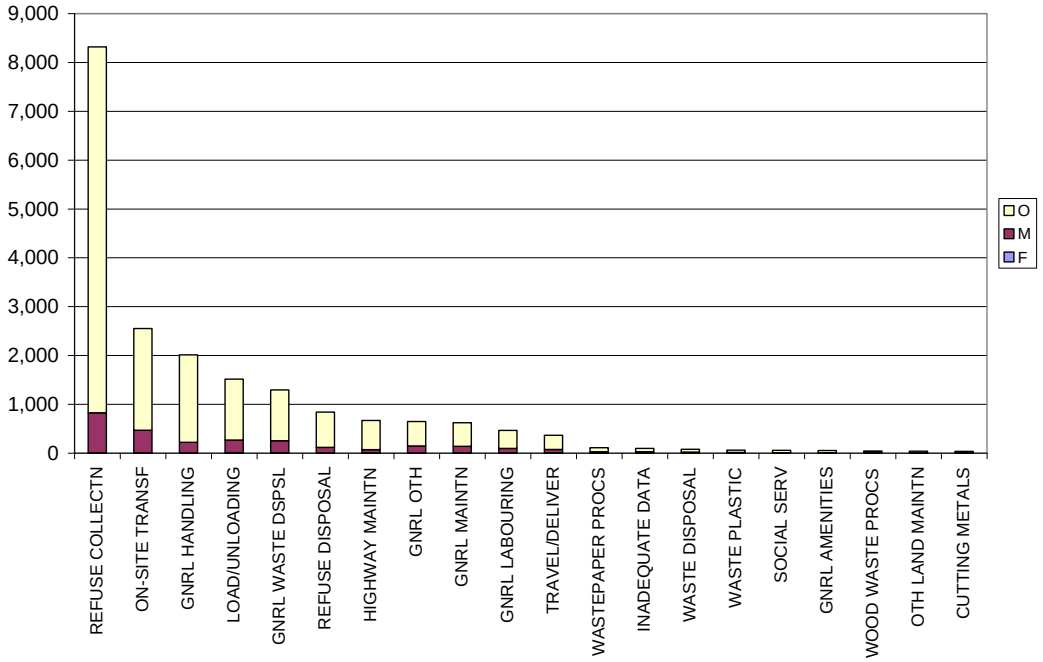


Figure 13 Number of accidents in the UK waste industry between 1996/97 and 2000/01 by work process

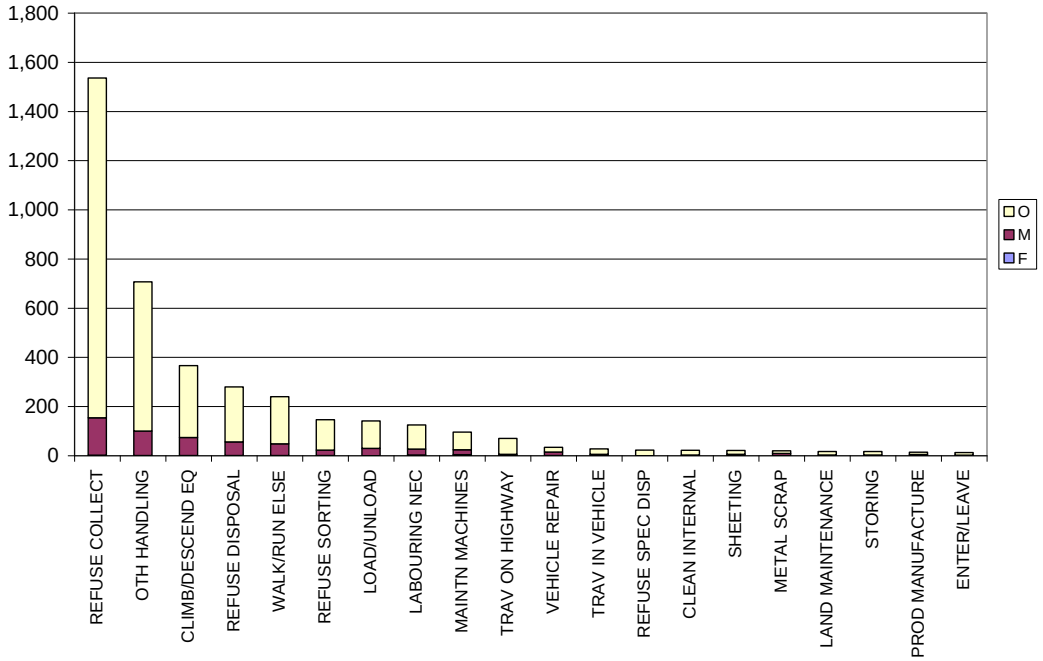


Figure 14 Number of accidents in the UK waste industry in 2001/02 by work process

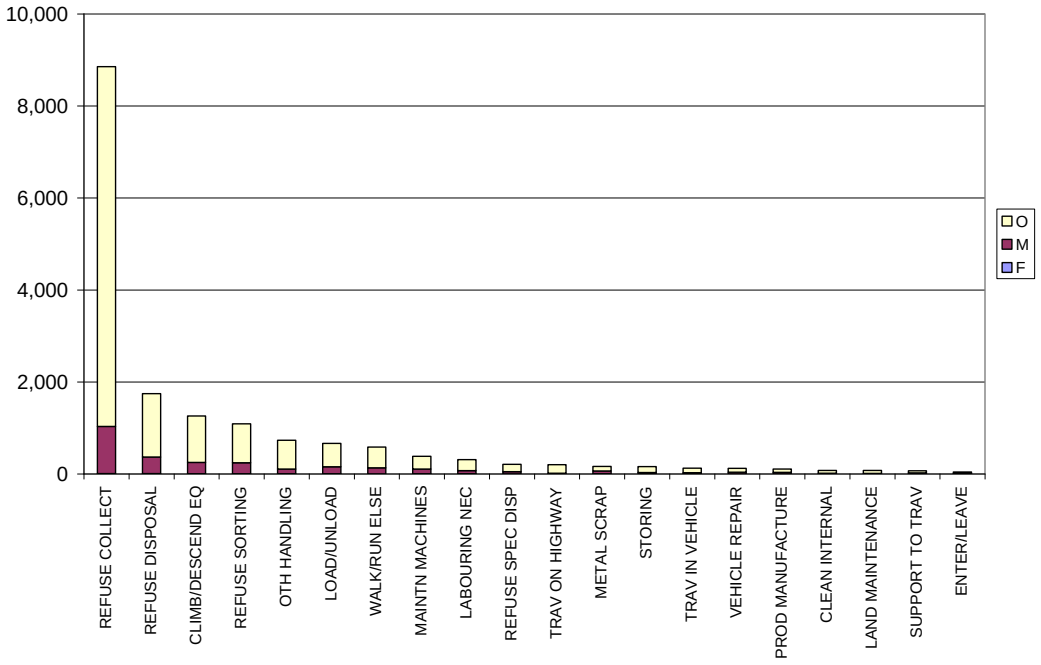


Figure 15 Number of accidents in the UK waste industry between 2002/03 and 2005/06 by work process

As explained previously, the change to ICC coding in 2001 makes detailed comparison difficult. However, it appears that across the whole ten-year period the work process most commonly associated with an accident was 'refuse collection'.

The most frequently occurring work process in the accident data 1996/97 to 2000/01 is 'Refuse Collectn', accounting for an average of 1,663 accidents each year, of which around 10% were major injury accidents. In 2001/02, 'Refuse Collect' accounted for around 1,500 accidents and in the period 2002/03 to 2005/06 it accounted for an average of around 2,214 accidents each year. If this code can be related back to the pre-ICC code 'Refuse Collectn', then it would appear that this work process has experienced an increase in accidents of around 30% since 1996/97 to 2000/01. However, this should be viewed with caution as there may be further differences in the way in which accidents are coded since the introduction of the ICC.

Due to the introduction of the ICC in 2001/02, detailed comparison is not possible for other work processes between 1996/97 to 2000/01 and 2001/02 to 2005/06 although data from 2001/02 can be compared with average figures from the period 2002/03 to 2005/06.

Between 2002/03 and 2005/06, 'Refuse Disposal' accounted for an average of around 436 accidents each year. This represents an increase of around 56% over 2001/02 where there were 280 accidents involving this process. The proportion of major injury accidents has remained the same at around 20% of the total.

The work process 'Refuse Sorting' accounted for an average of around 272 accidents each year between 2002/03 and 2005/06, an increase in accidents of around 86% from 2001/02.

In terms of fatal accidents, during the period 1996/97 to 2000/01 the largest number of fatal accidents were caused during the 'loading/unloading' process. However, there was no discernable trend for fatal injuries in later years.

In summary, allowing for changes in coding the category work process, the most significant work process over the whole ten-year period is 'refuse collection', followed by other refuse handling activities.

4.3.7 By agent

As with the category work process, due to the introduction of ICC coding, detailed comparison is not possible between 1996/97 to 2000/01, 2001/02 and 2002/03 to 2005/06. Table 10 shows the definitions associated with the most frequently occurring pre- and post-ICC agent categories.

Table 10 Definitions of the most frequently occurring SIC 1992 and SIC 2003 agent codes in the accident data

Pre-ICC Agents		
526	HS WEIGHT	Lifting or moving (inc throwing) heavy weights
525	HS SHARP	Injuries or cuts from handled material inc trapped fingers under item being handled
523	HS AWKWARD	Strains or sprains etc not involving handling or lifting eg awkward movement
522	HANDLING/SPRAINS	Injured while handling, lifting or carrying. Also all sprains and strains.
512	TRIP	Slip, trip or fall on the same level. This includes falling up stairs etc where the body has not fallen to a lower level than it initially started at. Falls to a lower level are to be classed as Falls not trips.
ICC Agents		
706	MISC PORT CON	Miscellaneous portable containers including bottles, crates, barrels, drums, bins, boxes, trays, lab jars, test tubes
618	FLOORS	Floors, pavements, roads
815	OTHER MATS&MACH	Other known not in list
862	INJD PERSON	Injured person themselves
724	REFUSE	Refuse collection vehicle
811	LOOSE PRODUCT	Loose or bagged/packaged products/materials, other including chemicals

Figure 13, Figure 14, and Figure 15 show the 20 most frequently occurring agents associated with the accidents that have occurred in the UK waste industry between 1996/97 and 2000/01, in 2001/02, and between 2002/03 and 2005/06 respectively. Data for the period 2001/02 are presented separately to maintain compatibility with RR 240.

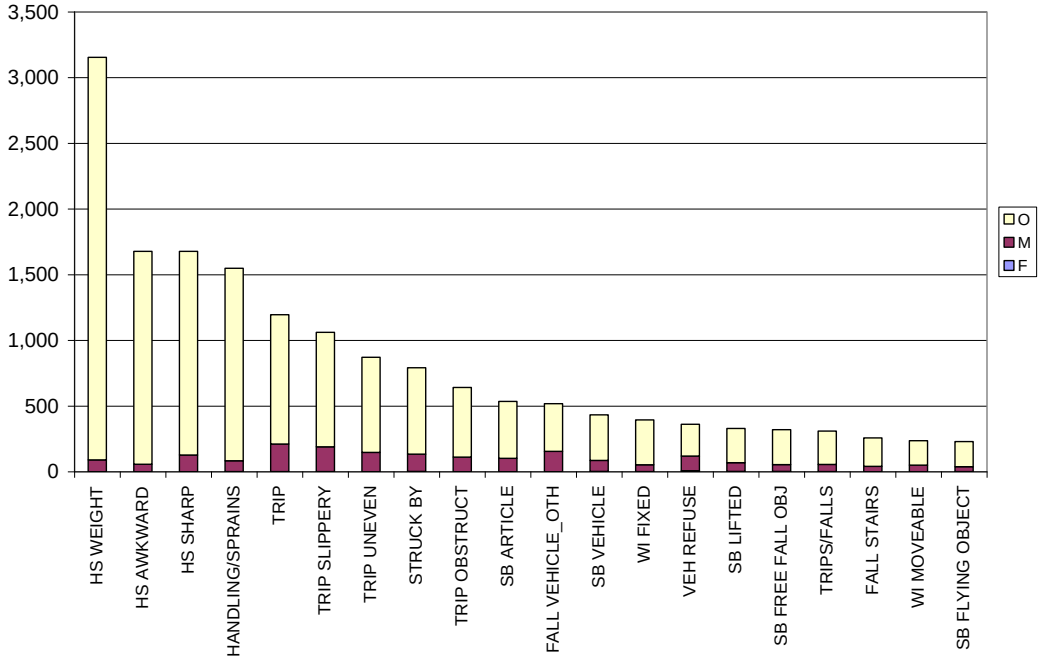


Figure 16 Number of accidents in the UK waste industry between 1996/97 and 2000/01 by agent

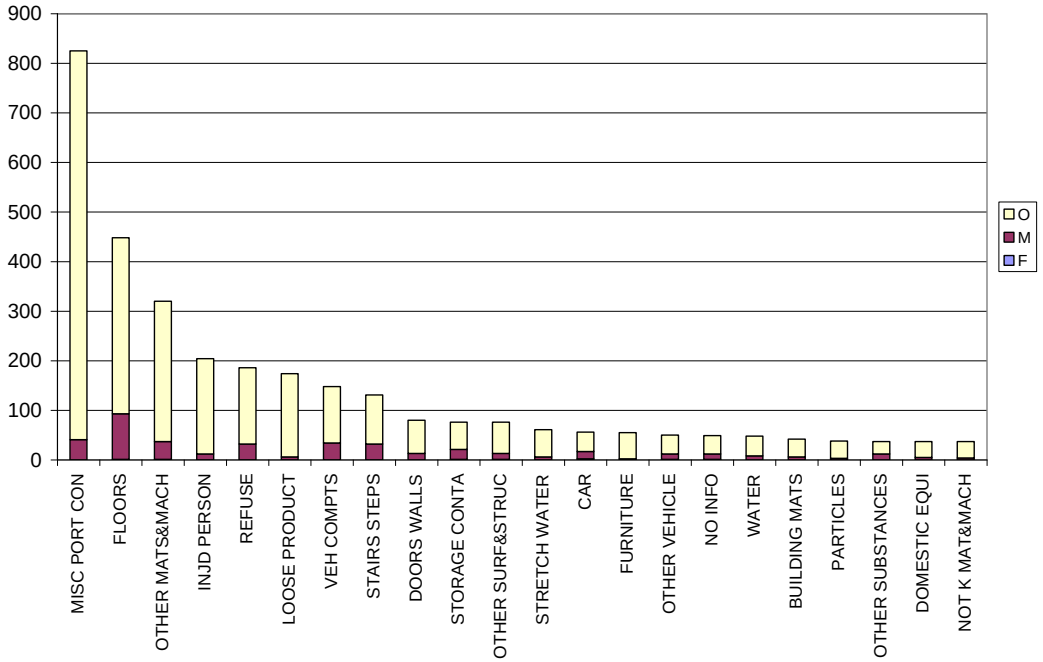


Figure 17 Number of accidents in the UK waste industry in 2001/02 by agent

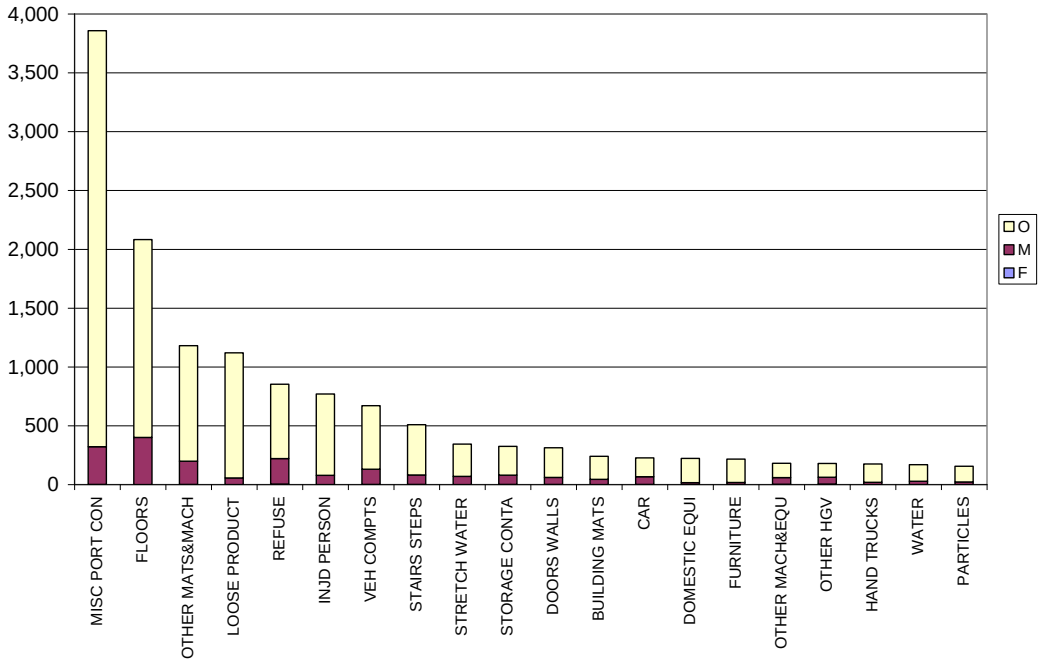


Figure 18 Number of accidents in the UK waste industry between 2002/03 and 2005/06 by agent

Figure 16 highlights that between 1996/97 and 2000/01, lifting or moving weights (HS Weight) accounted for the highest total number of accidents (fatal, major injury and over 3-day injury). The highest total number of major injury accidents were due to trips (trip, trip slippery, trip uneven).

Figure 17 highlights that in 2001/02, the highest number of accidents were categorised as involving portable containers ('Misc Port Con'), followed by accidents involving 'Floors' (which is likely to link back to the high prevalence of 'trip' related accidents in 1996/97 to 2001/02). Figure 18 highlights that in the period 2002/03 to 2005/06, a similar pattern emerged with 'Misc Port Con' accounting for the highest number of accidents followed by 'Floors'.

Although the coding has changed over the ten-year period, the most significant agent category would appear to be related to containers, as this is represented by handling sprains due to lifting or moving weights in the first five-year period and then miscellaneous portable containers in the last five years. Tripping and slipping on floors would also appear to be prevalent across the whole ten-year period.

Over the 10-year period there was no discenrable trend for agent, apart from between 1996/97 to 2000/01 the most significant agent was 'veh refuse'.

4.3.8 By age

Figure 19 highlights the age distribution of those involved in accidents in the UK waste industry between 1996/97 and 2001/02 and Figure 20 highlights the distribution between 2002/03 and 2005/06.

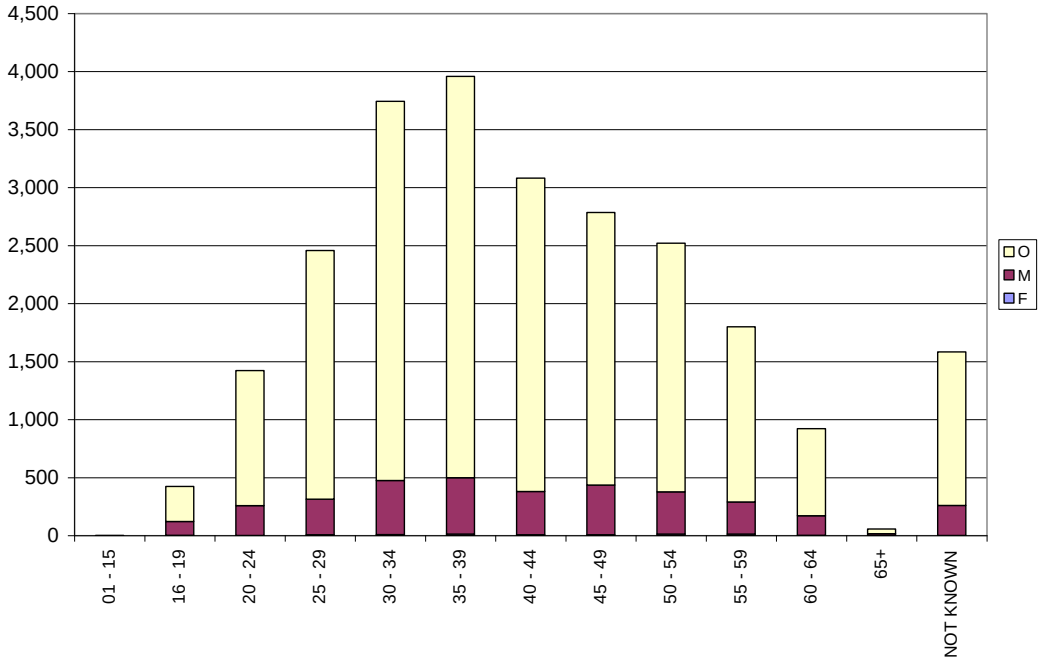


Figure 19 Number of accidents in the UK waste industry between 1996/97 and 2001/02 by age

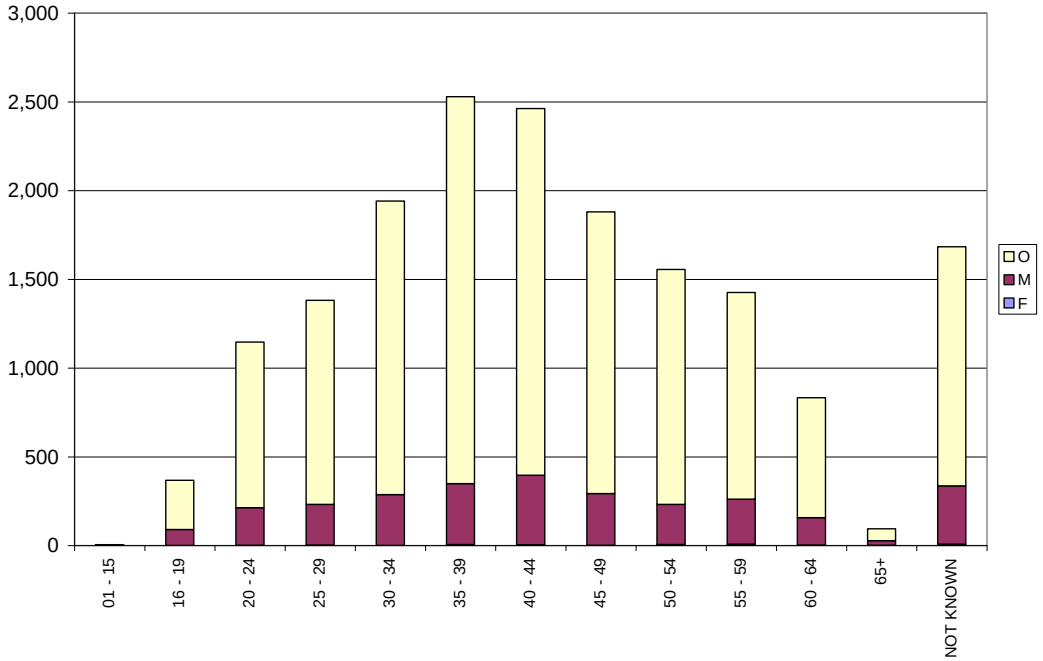


Figure 20 Number of accidents in the UK waste industry between 2002/03 and 2005/06 by age

Figure 19 and Figure 20 illustrate that the highest total number of accidents fell within the 35 to 39 years age range across the whole ten-year period. In the first six years this was closely followed by the 30 to 34 age bracket, but this changed to the 40 to 44 year age bracket in the last four years.

Furthermore, in the last four years there is a notable increase in the percentage of major injury accidents in the 40 to 44 year age range. This could be due to a number of reasons, but may just be due to that generation of waste workers having got older and therefore moving up the age bracket scale.

Unfortunately, currently there is no data available on the age distribution of the workforce for the UK waste industry. Given that people join the waste industry at a variety of ages, data on length of service in the waste industry would be useful to give an indication of how experienced those involved in the accidents were. Furthermore, because accurate data on the ages of those employed in the waste industry is not known, it is not possible to say whether or not the number of injuries by age group reflects the numbers employed in these age groups or their incidence rates.

4.4 KEY RISK AREAS

4.4.1 Introduction

In the previous section, the accident statistics were presented for a range of items including the occupations, work processes and agents involved in those accidents. In this section, the intention is to use the updated accident data in order to identify the most significant risks affecting the UK waste sector. Two techniques have been used in order to identify the key risks:

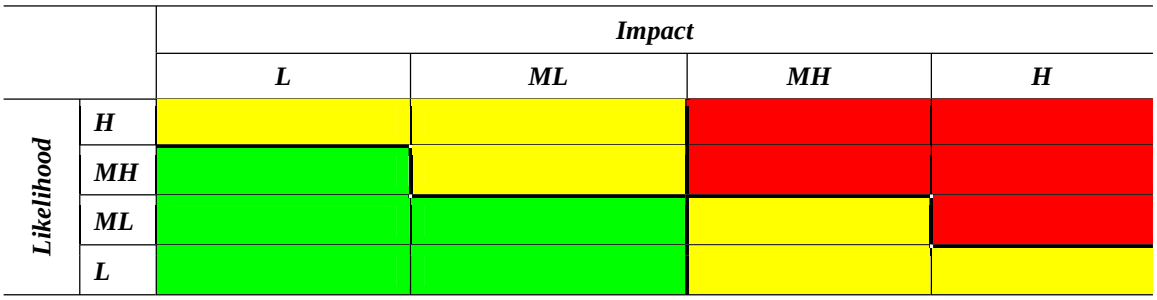
- Risk ranking matrices
- Pattern matching analyses

These techniques are described in the following sections.

4.4.2 Risk ranking methodology

Analyses are undertaken in order to rank each of the occupations, work processes and agents involved in the waste industry accidents in terms of their relative number of occurrences ('likelihood') and impact. Each of these items can then be inserted into a risk matrix in the form shown in Figure 21, and broadly categorised as being of relatively low risk (green), relatively high risk (red) or somewhere in between (amber). This categorisation acts as a guide to the relative significance of an item. Where there are a large number of items in the risk matrices, only those items with medium-high and high likelihoods are shown in the figures.

Figure 21 Risk matrix combining likelihood and impact



The impact is calculated as a function of the cost of the accidents associated with a field (e.g. occupation, agent etc.), both to society as a whole and to an individual worker. The two impacts are combined to give an overall impact ranging between low ('L') and high ('H'). The monetary value of impact is calculated from the cost of accidents estimated by HSE[9]. The overall cost to society is estimated by summing the costs to society of all of the fatal, major and over 3-day injury accidents reported in relation to a particular item. The cost to individuals is estimated by summing the costs to individuals of all of the fatal, major and over 3-day injury accidents and dividing the total cost of an item by the total number of accidents relating to that item.

Each item of data is assigned to a quartile on the basis of its cost. The quartile positions are obtained from the minimum, maximum and average cost values along with cost values mid-way

between the minimum and average, and average and maximum. The highest cost items whose values fall between the maximum and the first quartile point are assigned to the first quartile. Similarly, the remaining items are assigned to the second, third and fourth quartiles. The first quartile corresponds to high (H) impact, with the fourth quartile corresponding to low (L) impact.

The 'likelihood' is estimated from the overall number of accidents reported under a particular item. If population and exposure data were available, for each item within a field, it would be possible to calculate a 'true' likelihood. However, such population and exposure data are not available for the type of global data being analysed here. Overall accident numbers are thus used as a surrogate measure of likelihood. The underlying assumption is that those accidents that occur in the largest numbers are the accidents that have the greatest likelihood of occurring. The likelihood is determined by assigning each item within a field to a quartile on the same basis as the accident costs.

4.4.3 Risk ranking for SIC industry

Figure 22 and Figure 23 show the risk matrices for SIC industries for 1996/97 to 2001/02 (previous study data) and 2002/03 to 2005/06 (updated data).

		Impact			
		L	ML	MH	H
Likelihood	H		75110 GEN PUB SERVICES		90000 SEWAGE/REF DISP
	MH		45210 CONSTRUCTION BLD 75140 GOVT SUPP/SERV 93050 OTHER SERVICE 74700 IND CLEANING 85320 SOCIAL WORK (NA) 45230 HIGHWAY/ROAD ETC 70200 LETT OWN PROPTY 85110 HOSPITAL 80100 PRIM EDUCATION 45330 PLUMBING	51570 WSALE WASTE 70202 OTH LETTING OWN_1 37100 RECYCLING METAL 37200 RECYCLING NONMET 50200 MAINT/REP M VEHS	
	ML	85310 SOCIAL WORK(ACC) 92610 SPORTS ARENAS 70209 OTH LETTING OWN_2	60240 FREIGHT BY ROAD_ROAD	1410 AGRI SERVICES 25240 OTHER PLASTIC 74500 LAB RECRUIT/PERS	
	L	74709 OTH CLEANING 75240 PUBLIC SECURITY 21212 CARTONS/BOXES_CRT 95000 PRIV HOUSE(EMPL) 80210 SEC EDUCATION 15810 BREAD AND PASTRY 92720 OTH RECREATIONAL 70110 REAL ESTATE DEV 85111 PUBLIC HOSPITALS 75120 REG SOC SERV AGS 45250 OTH CONST (SPEC) 15890 OTHER FOOD_3 28750 OTH FAB METAL 55520 CATERING 1120 HORTICULTURE 40200 GAS MANUF/DIST 85140 OTH HUMAN HEALTH 80420 ADULT/OTH EDUCAT 52119 RET NON SP(FOOD)_NA 92340 OTH ENTERTAIN_OTH1 34100 MOTOR VEHICLES 80302 FIRST DEGREE 63230 OTH AIR TRANSP 20100 WOOD SAW/PLANING 64110 NATIONAL POST 52120 RET OTH NON-SPEC 25210 PLASTIC PLATES 92330 FAIR/AMUSE PARK 75250 FIRE SERVICE	22220 OTHER PRINTING_1 74849 OTH BUSINESS NEC 25220 PLASTIC PACKING 21250 OTHER PAPER MAN 91120 PROFESSIONAL ORG 75220 DEFENCE 63120 STORAGE/WHOUSE 34300 ENGINE PARTS MV 74200 ARCHITECT/ ENG 80422 OTH ADULT/OTH ED_2 63400 OTH TRANS AGENCY 63210 OTH LAND TRANSP_SUPP 92110 MOT PIC/VID PROD 80300 HIGHER EDUCATION 15330 OTH FRUIT/VEG 75300 SOCIAL SECURITY 29560 OTH SPEC MACHRY 21120 PAPER/PAPERBOARD 92510 LIBRARY/ARCHIVES 25232 OTH BUILD PLAST_1 36140 OTH FURNITURE 36110 CHAIRS/SEATS 14110 STONE QUARRY 91110 BUS/EMPL ORG 70320 REAL EST MNGT 63220 OTH WATER TRANSP 45310 INST ELEC WIRING 36632 OTHER MANUF NEC_1 45340 OTH BUILD INSTAL	45110 DEMOLITION 1300 MIXED FARMING 60249 FREIGHT BY ROAD_OTHR 20300 BUILD CARP/JOIN	74600 INVEST/SECURITY

Figure 22 Risk matrix for SIC industry 1996/97 to 2001/02

		Impact			
		L	ML	MH	H
Likelihood	H			75110 GEN PUB SERVICES	90000 SEWAGE/REF DISP
	MH		75120 REG SOC SERV AGS 85111 PUBLIC HOSPITALS 70209 OTH LETTING OWN_2 75140 GOVT SUPP/SERV 45210 CONSTRUCTION BLD	37200 RECYCLING NONMET 37100 RECYCLING METAL 74500 LAB RECRUIT/PERS 51570 WSALE WASTE 74709 OTH CLEANING 70320 REAL EST MNGT 74701 TRAD CLEANING 45250 OTH CONST (SPEC) 60249 FREIGHT BY ROAD_OTHR 93050 OTHER SERVICE	
	ML	55520 CATERING 80302 FIRST DEGREE 52112 RETAIL W ALC 22220 OTHER PRINTING_1 15899 OTHER FOOD_2	85312 N/C SOCIAL RES 1410 AGRI SERVICES 80100 PRIM EDUCATION 50200 MAINT/REP M VEHS 45212 CONST DOMESTIC 74879 OTHER BUS. NEC 45213 CONST CIVIL ENG 80210 SEC EDUCATION	93059 SERVICE NEC	
	L	74849 OTH BUSINESS NEC 64110 NATIONAL POST 45230 HIGHWAY/ROAD ETC 15810 BREAD AND PASTRY 80300 HIGHER EDUCATION 75230 JUSTICE/JUDICIAL 75240 PUBLIC SECURITY 75220 DEFENCE 63129 STORE OTHER 25239 OTH BUILD PLAST_2 74704 SPEC'D CLEANING 55301 LIC RESTAURANT 28520 GEN MECH ENGING 80301 SUB-DEGREE HIGH 63400 OTH TRANS AGENCY 40200 GAS MANUF/DIST 34300 ENGINE PARTS MV 85140 OTH HUMAN HEALTH 75250 FIRE SERVICE 45330 PLUMBING 34100 MOTOR VEHICLES 25220 PLASTIC PACKING 85322 N/C SOCIAL N/RES 74820 PACKAGING 74602 SECURITY 55302 UNLIC RESTAURANT 52450 RET ELEC APPLS 52120 RET OTH NON-SPEC 55111 LIC HOTEL/MOTEL 27420 ALUMINIUM 28510 TREAT/COAT METAL 25130 OTH RUBBER PRODS	25240 OTHER PLASTIC 36639 OTHER MANUF NEC_2 45211 CONST COMMERCE 75130 REG BUSINESS 71320 CON/CIV ENG RENT 71340 OTH MACH RENT 28750 OTH FAB METAL 70110 REAL ESTATE DEV 55101 HOTEL/REST (LIC) 1110 CEREALS/OTHER 92619 OTH SPORTS ARENA 85112 PRIVATE HOSPITAL 1120 HORTICULTURE 80429 OTH ADULT/OTH ED_1 52489 RET OTH/SPECIAL_OTHR 52460 RET HWARE/PAINT 45450 OTH BUILD COMPL 60219 OTH SCHD PASS LT_2 45340 OTH BUILD INSTAL 45310 INST ELEC WIRING 36140 OTH FURNITURE 28110 METAL STRUCTURES 73100 RES/DEV NAT SCI 52119 RET NON SP(FOOD)_NA 15842 SUGAR/CONFEC 91330 OTH MEMBSHIP ORG 85321 C SOCIAL N/RES	45110 DEMOLITION	21259 PAPER UNCLASS'D

Figure 23 Risk matrix for SIC industry 2002/03 to 2005/06

Figure 22 and Figure 23 highlights that in both periods, the key risk area is the sewage and refuse disposal industry. 'Recycling Metal', 'Recycling Nonmet', and 'Wsale Waste' industries have also remained key risk areas. In the last four year period, additional industries have also emerged as high risk areas, such as 'Freight by Road', 'Traditional Cleaning' and 'Other Cleaning'. In addition, the industry 'Gen Pub Services' has become more severe in its impact but has remained at the same level of likelihood.

4.4.4 Risk ranking for accident kind (map)

Figure 24 and Figure 25 highlight risk matrices for the accident kind (map) category for 1996/97 to 2001/02 and 2002/03 to 2005/06.

		Impact			
		L	ML	MH	H
Likelihood	H			05 - Handling / Sprains	
	MH		07L - Low fall	06 - Trip 02 - Struck by	
	ML		04 - Strike / Step on		03 - Transport
	L	15 - Other kind 10 - Exposure / Hot sub 07X - Unspec fall 17 - Assault / Violence 14 - Animal 12 - Explosion	07H - High fall 08 - Collapse / Overturn 11 - Fire XX - Not known 13 - Electricity	01 - Machinery 09 - Drowning / Asphyx	

Figure 24 Risk matrix for accident kind (map) 1996/97 to 2001/02

		Impact			
		L	ML	MH	H
	H			05 - Handling / Sprains	
Likelihood	MH			06 - Trip 02 - Struck by	
	ML		04 - Strike / Step on 07L - Low fall		03 - Transport
	L	10 - Exposure / Hot sub 07X - Unspec fall 17 - Assault / Violence 07H - High fall 14 - Animal 13 - Electricity	15 - Other kind 11 - Fire XX - Not known 08 - Collapse / Overturn	01 - Machinery 12 - Explosion	

Figure 25 Risk matrix for accident kind (map) 2002/03 to 2005/06

Both figures indicate that the most high risk areas have remained the same across the whole ten-year period. Transport related accidents show the highest impact, but have a medium to low likelihood of occurrence and handling / sprains have the highest likelihood of occurring with a medium to high impact. Trip and struck-by accidents are also categorised as high risk with a medium to high likelihood and impact. One area of change is with low fall accidents; whereas in the first six years they were categorised as medium-low impact but medium-high likelihood, in the last four years their impact has remained the same, but the likelihood of them occurring has reduced.

4.4.5 Risk ranking for occupation

Figure 26 and Figure 27 highlight the risk matrices for the occupation category during 1996/97 to 2001/02 and 2002/03 to 2005/06, respectively.

		Impact			
		L	ML	MH	H
	H			REFUSE	
Likelihood	MH		GOODS DRIVER ROAD SWEEPER OTHER MISC OTH ROUTINE OP CLEANERS OTH/TRANS/MACH GARDENER MAINTAIN FITTER CARPENTER/JOINER	OTH MACH/PLANT OTHER MANUAL VEHICLE TRADES PLANT DRIVERS OTH LABOUR	
	ML	PLUMBER/HEATING BRICKLAYER/MASON DESPATCH CLERKS	CARE ASSIST CARETAKERS OTHER BUILDING	ENGINE/ELEC FORK LIFT DRIVER PAPER/WOOD GENERAL MANAGERS	
	L	ELECTRIC FITTER OTH METAL WELDERS OTH PROC OP ENGINEER/TECHNOL HOUSEKEEPERS OTH SERVICE CATERING ASSIST HOSPITAL PORTER PACKERS ROAD CONSTRUCT TRANS/MANAGERS ADMIN/GOVERNMENT ROUTINE METAL CRANE DRIVERS ASSEMBLY/LINE PAINTER/DECORATE SOCIAL SUPPORT OTH PUBLIC OTH FOOD DRINK SALES ASSIST OTH PERSONAL CONSTRUCTION NOT SPECIFIED PETRO/CHEMICAL ROUTINE MANUFACT POLICE PLASTERER OTH ASSOCIATE OTH ADMIN'STORS ENVIRONMENTAL OTH MACHINING	ELECTRIC/GENERAT DENTAL WOOD TRADES CABLE JOINTER GARAGE MANAGERS ADMIN LAW DOCTOR/MEDICS	METAL MACHINE OP OTH CONSTRUCTION SCRAP METAL RAIL CONSTRUCT PLASTICS DRIVERS MATE PRODUCT/MANAGERS MINE/QUARRY OTH CRAFT/MANUAL METAL MACHINING FOUNDRY LABOUR FARM WORKER RAIL TRACK	

Figure 26 Risk matrix for occupation 1996/97 to 2001/02

Likelihood		Impact			
		L	ML	MH	H
	H			REFUSE SALVAGE	
	MH		ROAD SWEEPER CLEANER/DOMESTIC PROCESS OPS CARETAKER VAN DRIVER GROUNDSMEN	HGV DRIVER TRANSPORTOPSNEC OTH STORAGE HAND PLANT OPS NEC REFUSE MGR LABOURER OTH PROCES PLANT LAB METAL PRODUCTION	
	ML	CARPENTER CARE ASSISTANT	CATER ASSISTANT MOTOR MECHANIC MOBILE MACHINE HOSPITAL PORTERS CLEANING OCC NEC SALES ASSISTANT METAL MAKE/TREAT	FORK-LIFT TRUCK	
	L	FOODDRINKTOBACCO ELECTRIC FITTER LABOURER BUILD POSTAL WORKER PLUMBER HEATING PROD/MAINT MGR ROAD CONSTRUCT HOUSEKEEPER ENG TECH SECURTY GUARD GLAZIER CHEFS/COOKS MASON NURSES LABOURER FOUNDRS BAR STAFF VEHICLE TRADES VEHICLE BODY FIX PRINTERS OCC HYG SAFTEY CHEMICAL PROCESS HOTEL PORTERS GLASS CERAMICS WELFARE OFFICER SOCIAL SUPPORT SCI/ENG TECH NEC RETAIL MGR NURSING AUX TELECOM ENGINEER SPORTS ASSISTANT LOCALGOV OFFICER ENV HEALTH	CONSTRUCTION NEC OTH SERVICE MGR WELDING TRADES WATER/SEWERAGE ENG PROS NEC PLASTIC PROCESS PAPER WOOD GEN OFFICE CLERK MECH ENG ROUTINE OPS NEC ROOF TILER PROPERTY MGR PLASTERERS CUSTOMER CARE CRANE DRIVERS WEIGHER/GRADER HORTICULTURAL CONSTRUCT MGR NUMERICAL CLERK CHEMISTS LAB TECHNICIANS ELEC ENG NEC RES DAY CARE MGR FILING CLERK PARK RANGER TRANSPORT CLERK METAL PLATE TEACH PRO NEC FORESTRY WORKER LAUNDERER SHELF FILLER SCAFFOLDER	CONSTRCT OPS NEC METAL WORKING IND CLEANING OCC	SHEET METAL

Figure 27 Risk matrix for occupation 2002/03 to 2005/06

It is difficult to compare the risk matrices in Figure 26 and Figure 27 due to the change from SOC 1990 to SOC 2000 in 2001, although both analyses appear to show that refuse workers face the most significant risks. Drivers and workers that are required to handle waste also appear to be high risk occupations across the whole ten-year period.

4.4.6 Risk ranking for work process

Figure 28 highlights the risk matrix for the category work process between 1996/97 to 2000/01, whilst Figure 29 and Figure 30 show the findings for 2001/02, and 2002/03 to 2005/06 respectively.

		Impact			
		L	ML	MH	H
Likelihood	H			REFUSE COLLECTN	
	MH		GNRL HANDLING	ON-SITE TRANSF LOAD/UNLOADING GNRL WASTE DSPSL REFUSE DISPOSAL HIGHWAY MAINTN GNRL OTH GNRL MAINTN GNRL LABOURING TRAVEL/DELIVER WASTEPAPER PROCS	
	ML	SOCIAL SERV	WASTE PLASTIC	INADEQUATE DATA WASTE DISPOSAL	
	L	GNRL AMENITIES OTH LAND MAINTN TRANSIENTS LA ROAD WORKS PARK MAINTN RD VERGE MAINTN HEALTH ANCILLARY DIST NETWORKS PLUMBING LA BUILDINGS GENERAL JOBBING ADMIN JOIN/CARPENTRY PERSONNEL SERV CONSUMER PREMISE MOBILE WITH OP WOOD MACHINING SURFACING GROUND WORKS BRICKLAYING TREE MAINTN NURSING MACHINE CUTTING LANDSCAPE GARDEN WORKSHOP MAINTN FINISHING PROCS PEST CONTROL GLAZING WOOD SAWING FIRE INDUSTRIAL SEWER GRND WKS PLASTERING	CUTTING METALS MACHINING GNRL SERV FABRICATION GNRL SORTING GNRL EXAMINATION GNRL ASSEMBLY PARKS & GARDENS GNRL STORING OTH PLANT PROCS ROAD REPAIRS MECH CLEANING WAT/SEW TREATMNT GNRL PACKING BUILDING MAINTN CHEM TRANSF ENFORCING SERV ENGNRNG INSTALL CRANE WITH OP SURFACE TREATMNT GNRL LAB SERV MELTING FUNERAL SERV CHEM FILL/DISCHG INDOOR SPORTS COMMERCIAL BUILD STRUCTURAL ERECT HAND CASTING SCAFFOLDING_STR CLEANING BY CHEM BT GRND WKS DEMOLITION	WOOD WASTE PROCS GNRL INSTALL ETC SITE MANAGEMENT	SEWER MAINTN

Figure 28 Risk matrix for work process 1996/97 to 2000/01

		Impact			
		L	ML	MH	H
Likelihood	H			REFUSE COLLECT	
	MH		OTH HANDLING LOAD/UNLOAD	CLIMB/DESCEND EQ REFUSE DISPOSAL WALK/RUN ELSE REFUSE SORTING LABOURING NEC MAINTN MACHINES	
	ML			TRAV ON HIGHWAY	
	L	TRAV IN VEHICLE REFUSE SPEC DISP CLEAN INTERNAL STORING LAND MAINTENANCE ENTER/LEAVE AMENITIES SUPPORT TO TRAV PRISON DUTIES WAT/SEW TREATMNT SURFACE TREAT ADMIN WORK SORTING ROAD BUILD/REP ROOFING SOCIAL CARE ELSE MILITARY OPS SOCIAL CARE DOM DEMOLITION STRUCTURAL ERECT BRICKLAYING OTH TRAINING QUARRYING OTH OUTSIDE SPT DOCK OTHER NURSING FOOD REP PACKING LAY/REPAIR OTHER HANDLING	SHEETING METAL SCRAP PROD MANUFACTURE WALK/RUN CARPARK WOOD PROCESSING TEACHING OTH PUBLIC PROC CLEAN BUILDING ENFORCE OTHER LIVESTOCK OPS SCAFFOLDING	VEHICLE REPAIR	TIPPING

Figure 29 Risk matrix for work process 2001/02

		Impact			
		L	ML	MH	H
	H			REFUSE COLLECT	
Likelihood	MH		REFUSE DISPOSAL CLIMB/DESCEND EQ OTH HANDLING WALK/RUN ELSE	REFUSE SORTING LOAD/UNLOAD LABOURING NEC MAINTN MACHINES	
	ML	TRAV ON HIGHWAY	REFUSE SPEC DISP	METAL SCRAP	
	L	VEHICLE REPAIR LAND MAINTENANCE CLEAN INTERNAL ENTER/LEAVE WAT/SEW TREATMNT WALK/RUN CARPARK SHEETING AMENITIES ROAD BUILD/REP SOCIAL CARE ELSE SURFACE TREAT ADMIN WORK SALES TO PUBLIC CLEAN BUILDING LAY/REPAIR PACKING ARBORICULTURE FOOD REP FOOT DELIVERY QUARRYING DEMOLITION OTH PUBLIC PROC ROOFING PRISON DUTIES OTH OUTSIDE SPT LIVESTOCK OPS MV RECOVERY FISH FARMING SURGERY TREAT CHEM FILL/DISCHG (blank) SWIMMING POOL	STORING WOOD PROCESSING OTH TRAINING ELECTRICAL TIPPING STRUCTURAL ERECT ENFORCE OTHER	PROD MANUFACTURE TRAV IN VEHICLE SUPPORT TO TRAV DOCK OTHER	

Figure 30 Risk matrix for work process 2002/03 to 2005/06

It is difficult to directly compare the findings across the whole ten-year period due to the change in coding for work process in 2001; however, all three risk matrices (Figure 28, Figure 29 and Figure 30) do indicate that the work process 'refuse collection' is the most high risk. Maintenance related work processes also appear to be in the high risk area of the matrices across the whole ten-year period.

4.4.7 Risk ranking for agent

Figure 31 highlights the risk matrix for the category agent between 1996/97 to 2000/01, whilst Figure 32 and Figure 33 show the risk matrices for 2001/02, and 2002/03 to 2005/06 respectively.

Likelihood	Impact: L	Impact: ML	Impact: MH	Impact: H
H			HS WEIGHT HS SHARP	
MH		TRIP UNEVEN TRIP OBSTRUCT SB ARTICLE FALL VEHICLE_OTH SB VEHICLE WI FIXED SB LIFTED SB FREE FALL OBJ TRIPS/FALLS FALL STAIRS WI MOVEABLE SB FLYING OBJECT FALL VEHICLE HS WEIGHTL SB BUILDING OTHER VEH PRIVATE CAR TRIP WET-OUTDOOR MACHINERY WI SMALL LS DOG WI WALK FALL ACCESS FALL LADDER-MOVE FALL OTHER	HANDLING/SPRAINS TRIP TRIP SLIPPERY STRUCK BY VEH REFUSE	
ML	SB HOISTS NOT KNOWN	EX RELEASE6 VA BODY SB HANDTOOL VEH TRAN/GENERAL SB CHIPS EX EXPOSURE EH SPLASH FALL SHEETING VEH TRANSPORT MLC LIFT/CONVYOR	VEH TRANSP/WASTE VEH FLT VEH SKIP FALL PLANT	
L	FALL ACCESS_OTH ASSAULT/VIOLENCE HS PATIENT EXPOSE/EXPLODE TRIP WET-INDOOR FALL STRUCT EH OBJECT EX RELEASE3 EX RELEASE1 SB HANDTOOLS FALL LADDER-OTH SB ASSAULT_ACCD ANIMAL/LIVESTOCK VEH GOODS LGV FALL LIFTING MMT MACH VEH TRAILER SB JET MPP PAPER/BOARD EH HOT SB PRESSURE VEH GULLEY VEH PSV CM PLANT EF FLASH MPL PLASTIC MMT CHOPPING MLC HOIST EH EJECTION VA OTHWEAPON EX RELEASE4 FALL STACKS	FALL LADDER-FIX FALL WORKAREA FALL WORKPLAT	CMVEHICLE-OVRTRN EFFIRE/EXPLOSION VEH GOODS HGV MLC CONVEYOR CMCOLLPSE/OVRTRN MMS SCRAP MPP BALING VEH LOADER MLC FLT-MACH AS ASPHYXIATION VEH EXCAVATOR VEH TRANS/CONSTR VEH PLATFRM TRUC VEH ROUGH EF TANK MLC OTH CRANE VEH TRANS/QUARRY	VEH RAIL AD WATER VO OHLINES

Figure 31 Risk matrix for agent 1996/97 to 2000/01

Likelihood		Impact			
		L	ML	MH	H
	H			MISC PORT CON FLOORS	
	MH		INJD PERSON REFUSE LOOSE PRODUCT VEH COMPTS STAIRS STEPS DOORS WALLS STRETCH WATER FURNITURE	OTHER MATS&MACH STORAGE CONTA OTHER SURF&STRUC CAR OTHER VEHICLE NO INFO	
	ML	MEDIC NEEDLE OTHER HAND TOOL	WATER BUILDING MATS PARTICLES DOMESTIC EQUI NOT K MAT&MACH PERS NK TO EM SKIP TRUCK SUB NO RISK OTHER CONVEY EQU MACH COMPTS STORAGE ACCESS HAND TRUCKS FLT MOVEABLE LADD	OTHER SUBSTANCES OTHER MACH&EQU OTHER HGV LORRY LOADER LIGHT VAN TREE PLANT	
	L	TRAILER CUTTING DITCH NOT K SUBSTNCES EMP COLLEAGUE ROLLS COILS NAILING JOIN DEVICES STORED SHEET EXPOSED SURF DOG ELEVATORS OTHER EQUIPMENT OTH HARM TOXI HOSES CYCLE WILD ANIMAL WASHING FACIL CAUSTIC CORRO WORK GROUND WINDOWS PRESS COMPACT WAXING MOBILE CRANE TRENCH STORED STACK COLD PROCESS OTHER ANIM&TREE OTH LIFT EQUI GRASS CUTTER TAPS VALVES STORAGE SILO	OTH PEOPLE VEH PIPE LINE WRK NOT K MACH&EQU MACHINED PRTS DUMP TRUCK STEELWORK DRILLING EXCAVATOR OTH ELEC CAB ENERGY SYSTEM HOLDING SAWING FIXD PLATFORM DUMPER CARVING OTHER SAFETY EQU BULLDOZER WHEEL TRACTOR OTHER BELOW GRND SURF CLEAN CIRCULAR SAW SPLIT CHOP FRAGILE ROOF INJECT EXTRUS STORAGE TANKS CRUSHER GUILLOTINE	NOT K VEHICLE	CONVEYORS FIXD LADDERS

Figure 32 Risk matrix for agent 2001/02

		Impact			
		L	ML	MH	H
Likelihood	H			MISC PORT CON FLOORS	
	MH		LOOSE PRODUCT OTHER MATS&MACH INJD PERSON VEH COMPTS STAIRS STEPS STRETCH WATER BUILDING MATS DOMESTIC EQUI FURNITURE HAND TRUCKS WATER PARTICLES OTHER VEHICLE SUB NO RISK STORAGE ACCESS PERS NK TO EM TREE PLANT	REFUSE STORAGE CONTA DOORS WALLS CAR OTHER MACH&EQU OTHER HGV FLT OTHER SURF&STRUC NO INFO SKIP TRUCK	
	ML	OTHER CONVEY EQU NOT K MAT&MACH MEDIC NEEDLE ROLLS COILS DOG JOIN DEVICES MACHINED PRTS	MACH COMPTS OTHER SUBSTANCES VEHICLE PLTFRM LIGHT VAN	MOVEABLE LADD CONVEYORS	
	L	OTHER HAND TOOL NOT K VEHICLE WASHING FACIL HOSES SEWER DRAIN CUTTING WINDOWS PIPE LINE WRK WORK GROUND SURF CLEAN DRILLING NAILING WAXING NOT K SUBSTNCES FOOD DITCH COLD PROCESS CYCLE WILD ANIMAL GULLY CLEANER TAPS VALVES SCRAPING ELEVATORS OTHER ANIM&TREE OFFICE EQUIP EMP COLLEAGUE CRUSH PULV ENERGY SYSTEM HOLDING STORAGE TANKS STEELWORK SAWING	OTH HARM TOXI TRAILER OTH LIFT EQUI FIXD LADDERS EXPOSED SURF BUS OTHER CRANE LORRY CRANE OTH ELEC CAB OTH CUT SPLIT DUMPER OTHER SAWS OTH PROCESS FRAGILE ROOF ROOFS ROLL CALEND FIXD SCAFFOLD WHEEL TRACTOR TRACK TRACTOR STORAGE SILO GUILLOTINE OVERHEAD LINE TEMP STRUCT1 TELES LOADER PACK WRAP BOT FIXED CRANE TEACH EQUIP TOWER CRANE MONITOR TEST FARM ANIMAL SPIN WIRING SLURRY TANKER	STORED SHEET OTHER EQUIPMENT LORRY LOADER PRESS COMPACT EXCAVATOR OTH PEOPLE VEH FLAMM EXPLOSI NOT K MACH&EQU GAS CYL BOTT LOADER	MOBILE CRANE SPLIT CHOP

Figure 33 Risk matrix for agent 2002/03 to 2005/06

Figure 31 highlights that in the first five years, various agents associated with handling / sprain accidents feature as significant risks, along with struck by agents, refuse vehicles and trip related agents. Figure 32 and Figure 33 highlight the risk matrices for the new agent codes and highlight miscellaneous portable containers and floors as being the most high risk. These are likely to relate back to the handling sprain and trip accidents highlighted in the first five years.

4.4.8 Risk ranking for age

Figure 34 highlights the risk matrix for the category age between 1996/97 and 2001/02 and indicates that the workers primarily at risk are those in the 30 to 44 age group. Figure 35 highlights that in the last four years the impact of accidents involving workers aged between 30 and 34 has reduced, although the overall risk to workers in the 35 to 39 and 40 to 44 age brackets has remained the same.

		Impact			
		L	ML	MH	H
Likelihood	H			30 - 34 35 - 39 40 - 44	
	MH			25 - 29 45 - 49 50 - 54	
	ML		20 - 24 NOT KNOWN	55 - 59	
	L	01 - 15	16 - 19 60 - 64	65+	

Figure 34 Risk matrix for age 1996/97 to 2001/02

		Impact			
		L	ML	MH	H
Likelihood	H		30 - 34	35 - 39 40 - 44	
	MH		25 - 29 45 - 49	50 - 54 55 - 59	NOT KNOWN
	ML		20 - 24	60 - 64	
	L	01 - 15 16 - 19		65+	

Figure 35 Risk matrix for age 2002/03 to 2005/06

4.4.9 Pattern matching analyses

Risk ranking techniques provide an insight into the relative significance of single issues. Pattern matching analyses permit combinations of accident kinds, occupations, work processes and agents to be compared in order to identify which feature most frequently. These analyses are carried out by comparing each accident record with every other accident record in order to see how many matches each one has. Those combinations that appear most frequently give an indication as to what may be considered to be priority areas.

The pattern matching analyses can also be used in conjunction with the risk ranking matrices described in Section 4.4.3 to Section 4.4.8 in order to prioritise the combinations in terms of their potential likelihood and impact.

The blank cells result from those accidents reported via the Local Authority enforced sectors during the period 1996/97 to 2000/01 where the HSE coding system was not used for occupations, work processes or agents. As the pattern matching analyses are carried out for all ten years (1996/97 to 2005/06), the accidents reported via the Local Authority enforced sectors are included for 2001/02 to 2005/06.

4.4.10 Accident kind and agent

Table 11 and Table 12 highlight the most frequently occurring combinations of accident kinds and agents for 1996/97 to 2000/01 and 2002/03 to 2005/06 respectively, for fatal and major injury accidents.

Table 11 Most frequently occurring matches of fatal and major injury accidents 1996/97 to 2000/01 – accident kind and agent

Accident kind	*Agent*	*F*	*M*	*O*	*F+M*
06 - Trip	TRIP	0	207	578	207
06 - Trip	TRIP SLIPPERY	1	179	544	180
07L - Low fall	FALL VEHICLE	0	154	280	154
06 - Trip	TRIP UNEVEN	0	147	487	147
02 - Struck by	STRUCK BY	2	125	377	127
05 - Handling / Sprains	HS SHARP	0	117	1022	117
06 - Trip	TRIP OBSTRUCT	0	109	354	109
02 - Struck by	SB ARTICLE	0	101	297	101
05 - Handling / Sprains	HS WEIGHT	0	88	2182	88
03 - Transport	VEH REFUSE	6	82	83	88
02 - Struck by	SB VEHICLE	2	81	200	83
05 - Handling / Sprains	HANDLING/SPRAINS	0	76	882	76
02 - Struck by	SB LIFTED	2	63	164	65
02 - Struck by	SB FREE FALL OBJ	2	51	176	53
04 – Strike / Step On	FIXED	1	46	194	47
05 - Handling / Sprains	HS AWKWARD	0	46	943	46
06 - Trip	TRIPS/FALLS	0	46	133	46
04 – Strike / Step On	MOVEABLE	0	44	120	44
01 - Machinery	MACHINERY	0	44	51	44
03 - Transport	VEH PRIVATE CAR	1	39	60	40

Table 12 Most frequently occurring matches of fatal and major injury accidents 2002/03 to 2005/06 – accident kind and agent

Accident kind	*Agent*	*F*	*M*	*O*	*F+M*
06 - Trip	FLOORS	0	387	1599	387
05 - Handling / Sprains	MISC PORT CON	0	160	2872	160
02 - Struck by	MISC PORT CON	1	94	422	95
06 - Trip	STAIRS STEPS	1	70	369	71
03 - Transport	REFUSE	5	65	85	70
06 - Trip	STRETCH WATER	0	69	263	69
02 - Struck by	OTHER MATS&MACH	0	66	198	66
03 - Transport	CAR	2	58	154	60
05 - Handling / Sprains	OTHER MATS&MACH	0	52	568	52
06 - Trip	OTHER MATS&MACH	0	50	125	50
02 - Struck by	REFUSE	0	48	169	48
02 - Struck by	VEH COMPTS	0	48	127	48
07L - Low fall	REFUSE	0	39	75	39
05 - Handling / Sprains	LOOSE PRODUCT	0	36	983	36
01 - Machinery	OTHER MACH&EQU	1	34	39	35
03 - Transport	FLT	1	34	28	35
06 - Trip	INJD PERSON	0	34	77	34
02 - Struck by	DOORS WALLS	2	27	86	29
05 - Handling / Sprains	VEH COMPTS	0	25	173	25
06 - Trip	VEH COMPTS	0	24	111	24

Table 11 indicates that for the first six year period the most significant combination was ‘trip’ accidents with a ‘trip’ agent. This was followed by low fall from a vehicle, struck by accidents and then handling sprains from sharp objects. Table 12 highlights that in the last four years a similar pattern has emerged, with trips on floors being the most significant combination, followed by handling sprains and struck by accidents from miscellaneous portable containers. An interesting change observed is that low falls have reduced in prevalence when paired with agents in the last four years.

Table 13 and Table 14 highlight the most frequently occurring combinations of accident kinds, agents and work process for 1996/97 to 2000/01 and 2002/03 to 2005/06 respectively, for fatal and major injury accidents.

Table 13 Most frequently occurring matches of fatal and major injury accidents 1996/97 to 2000/01 - accident kind, work process and agent

Accident Kind	*Work Process*	*Agent*	*F*	*M*	*O*	*F+M*
06 - Trip	ON-SITE TRANSF	TRIP	0	64	163	64
03 - Transport	REFUSE COLLECTN	VEH REFUSE	4	60	57	64
06 - Trip	ON-SITE TRANSF	TRIP SLIPPERY	0	62	140	62
06 - Trip	REFUSE COLLECTN	TRIP	0	57	223	57
06 - Trip	REFUSE COLLECTN	TRIP UNEVEN	0	54	209	54
06 - Trip	REFUSE COLLECTN	TRIP SLIPPERY	0	51	214	51
06 - Trip	ON-SITE TRANSF	TRIP UNEVEN	0	50	134	50
05 - Handling / Sprains	REFUSE COLLECTN	HS WEIGHT	0	40	1187	40
06 - Trip	REFUSE COLLECTN	TRIP OBSTRUCT	0	39	118	39
05 - Handling / Sprains	REFUSE COLLECTN	HS SHARP	0	38	511	38
02 - Struck by	REFUSE COLLECTN	STRUCK BY	0	37	142	37
02 - Struck by	REFUSE COLLECTN	SB ARTICLE	0	37	115	37
06 - Trip	ON-SITE TRANSF	TRIP OBSTRUCT	0	33	113	33
07L - Low fall	REFUSE COLLECTN	FALL VEHICLE	0	33	72	33
05 - Handling / Sprains	GNRL HANDLING	HS SHARP	0	30	177	30
07L - Low fall	LOAD/UNLOADING	FALL VEHICLE	0	29	34	29
02 - Struck by	REFUSE COLLECTN	SB VEHICLE	0	28	93	28
07L - Low fall	ON-SITE TRANSF	FALL VEHICLE	0	27	75	27
05 - Handling / Sprains	REFUSE COLLECTN	HANDLING/SPRAINS	0	26	380	26
02 - Struck by	REFUSE COLLECTN	SB LIFTED	0	25	111	25

Table 14 Most frequently occurring matches of fatal and major injury accidents 2002/03 to 2005/06 – accident kind, work process and agent

Accident Kind	*Work Process*	*Agent*	*F*	*M*	*O*	*F+M*
06 - Trip	REFUSE COLLECT	FLOORS	0	148	810	148
05 - Handling / Sprains	REFUSE COLLECT	MISC PORT CON	0	116	2259	116
02 - Struck by	REFUSE COLLECT	MISC PORT CON	1	77	332	78
06 - Trip	WALK/RUN ELSE	FLOORS	0	59	217	59
03 - Transport	REFUSE COLLECT	REFUSE	2	55	61	57
03 - Transport	REFUSE COLLECT	CAR	2	51	115	53
06 - Trip	CLIMB/DESCEND EQ	FLOORS	0	50	214	50
06 - Trip	REFUSE DISPOSAL	FLOORS	0	47	93	47
02 - Struck by	REFUSE COLLECT	REFUSE	0	40	157	40
06 - Trip	REFUSE COLLECT	STRETCH WATER	0	37	167	37
06 - Trip	CLIMB/DESCEND EQ	STAIRS STEPS	1	35	185	36
05 - Handling / Sprains	REFUSE COLLECT	LOOSE PRODUCT	0	22	772	22
06 - Trip	REFUSE SORTING	FLOORS	0	21	56	21
06 - Trip	REFUSE COLLECT	STAIRS STEPS	0	20	122	20
05 - Handling / Sprains	REFUSE DISPOSAL	MISC PORT CON	0	19	213	19
06 - Trip	CLIMB/DESCEND EQ	VEH COMPTS	0	17	80	17
01 - Machinery	REFUSE COLLECT	REFUSE	0	17	35	17
07L - Low fall	REFUSE COLLECT	REFUSE	0	16	33	16
05 - Handling / Sprains	REFUSE COLLECT	OTHER MATS&MACH	0	15	282	15
17 - Assault / Violence	REFUSE COLLECT	PERS NK TO EM	0	14	55	14

Table 13 and Table 14 highlight a similar pattern as observed in the previous tables, however indicate that across the ten-year period the work process refuse collection was prevalent, along with on-site transfer.

Table 15 and Table 16 highlight the most frequently occurring combinations of accident kinds, agents, work processes and occupations for 1996/97 to 2000/01 and 2002/03 to 2005/06 respectively, for fatal and major injury accidents.

Table 15 Most frequently occurring matches of fatal and major injury accidents 1996/97 to 2000/01 – accident kind, occupation, work process and agent

Accident Kind	*Occupation*	*Work Process*	*Agent*	*F*	*M*	*O*	*F+M*
03 - Transport	REFUSE	REFUSE COLLECTN	VEH REFUSE	4	54	46	58
06 - Trip	REFUSE	REFUSE COLLECTN	TRIP	0	47	185	47
06 - Trip	REFUSE	REFUSE COLLECTN	TRIP SLIPPERY	0	45	191	45
06 - Trip	REFUSE	REFUSE COLLECTN	TRIP UNEVEN	0	40	184	40
05 - Handling / Sprains	REFUSE	REFUSE COLLECTN	HS WEIGHT	0	37	993	37
06 - Trip	REFUSE	REFUSE COLLECTN	TRIP OBSTRUCT	0	32	101	32
05 - Handling / Sprains	REFUSE	REFUSE COLLECTN	HS SHARP	0	28	433	28
02 - Struck by	REFUSE	REFUSE COLLECTN	SB ARTICLE	0	28	87	28
02 - Struck by	REFUSE	REFUSE COLLECTN	STRUCK BY	0	26	111	26
03 - Transport	REFUSE	REFUSE COLLECTN	VEH PRIVATE CAR	1	23	34	24
05 - Handling / Sprains	REFUSE	REFUSE COLLECTN	HANDLING/ SPRAINS	0	22	322	22
07L - Low fall	REFUSE	REFUSE COLLECTN	FALL VEHICLE	0	22	53	22
02 - Struck by	REFUSE	REFUSE COLLECTN	SB LIFTED	0	21	94	21
02 - Struck by	REFUSE	REFUSE COLLECTN	SB VEHICLE	0	19	77	19
02 - Struck by	REFUSE	REFUSE COLLECTN	SB FREE FALL OBJ	0	18	53	18
06 - Trip	REFUSE	ON-SITE TRANSF	TRIP UNEVEN	0	18	52	18
06 - Trip	REFUSE	ON-SITE TRANSF	TRIP SLIPPERY	0	17	45	17
06 - Trip	REFUSE	ON-SITE TRANSF	TRIP	0	13	47	13
07L - Low fall	GOODS DRIVER	ON-SITE TRANSF	FALL VEHICLE	0	12	14	12
01 - Machinery	REFUSE	REFUSE COLLECTN	MACHINERY	0	11	9	11

Table 16 Most frequently occurring matches of fatal and major injury accidents 2002/03 to 2005/06 – accident kind, occupation, work process and agent

Accident Kind	*Occupation*	*Work Process*	*Agent*	*F*	*M*	*O*	*F+M*
06 - Trip	REFUSE SALVAGE	REFUSE COLLECT	FLOORS	0	93	563	93
05 - Handling / Sprains	REFUSE SALVAGE	REFUSE COLLECT	MISC PORT CON	0	78	1576	78
02 - Struck by	REFUSE SALVAGE	REFUSE COLLECT	MISC PORT CON	0	57	248	57
03 - Transport	REFUSE SALVAGE	REFUSE COLLECT	REFUSE	2	50	52	52
03 - Transport	REFUSE SALVAGE	REFUSE COLLECT	CAR	2	44	88	46
02 - Struck by	REFUSE SALVAGE	REFUSE COLLECT	REFUSE	0	27	130	27
06 - Trip	REFUSE SALVAGE	REFUSE COLLECT	STRETCH WATER	0	23	125	23
06 - Trip	REFUSE SALVAGE	WALK/RUN ELSE	FLOORS	0	21	93	21
06 - Trip	REFUSE SALVAGE	CLIMB/DESCEND EQ	FLOORS	0	20	128	20
05 - Handling / Sprains	REFUSE SALVAGE	REFUSE COLLECT	LOOSE PRODUCT	0	19	596	19
05 - Handling / Sprains	HGV DRIVER	REFUSE COLLECT	MISC PORT CON	0	18	238	18
06 - Trip	HGV DRIVER	REFUSE COLLECT	FLOORS	0	14	59	14
06 - Trip	HGV DRIVER	CLIMB/DESCEND EQ	FLOORS	0	14	33	14
06 - Trip	REFUSE SALVAGE	CLIMB/DESCEND EQ	STAIRS STEPS	0	12	109	12
06 - Trip	REFUSE SALVAGE	REFUSE COLLECT	STAIRS STEPS	0	12	90	12
06 - Trip	HGV DRIVER	WALK/RUN ELSE	FLOORS	0	12	37	12
01 - Machinery	REFUSE SALVAGE	REFUSE COLLECT	REFUSE	0	11	29	11
06 - Trip	ROAD SWEEPER	REFUSE COLLECT	FLOORS	0	10	61	10
02 - Struck by	HGV DRIVER	REFUSE COLLECT	MISC PORT CON	1	7	36	8
06 - Trip	REFUSE SALVAGE	REFUSE COLLECT	WATER	0	8	33	8
07L - Low fall	REFUSE SALVAGE	REFUSE COLLECT	REFUSE	0	8	22	8
06 - Trip	REFUSE SALVAGE	REFUSE SORTING	FLOORS	0	8	17	8

Table 15 and Table 16 highlights that the main occupation introduced into the pattern matching across the whole ten-year period is a refuse worker.

4.5 SUMMARY OF FINDINGS

4.5.1 Detailed analysis of RIDDOR data

- **HSE Year** - the total number of accidents (including fatal, major injury and over 3-day injury accidents) occurring during the ten-year period shows a small year-on-year decline. However, the major injury accidents appear to remain at a more constant level, with only slight fluctuations between the individual years. The primary reduction has been in the number of over 3-day injury accidents.

- **HSE Region** – accident data from the first six years and the updated four years show an almost identical trend in the accident distribution across regions. However, in terms of trends (not actual accident numbers), there does appear to be a slight increase in the prevalence of accidents in the Wales and the South West region and the Yorkshire and North East region in the last four years.

- **Industry SIC** - the industries classified as 'general public services' and 'sewage / refuse disposal' are the primary sources of reported accidents throughout the ten-year period. These industries are followed by industries involved in re-using waste. In terms of fatal accidents, 'sewage / refuse disposal' was the most significant SIC in the first period and 'collection and treatment of other waste' accounted for the highest number of fatal accidents in the second period.

- **Accident kind** - a similar trend exists across the whole ten-year period. The accident type 'handling/ sprains' shows the highest total number of accidents in 1996/97 to 2001/02 and 2002/03 to 2005/06. The highest total number of fatal injuries are classified as 'transport' related accidents for both periods. The highest total number of major injury accidents (also in both periods) is classified as a 'trip', closely followed by 'struck-by' accidents. Interestingly, 'low falls' are a little less prevalent in the last four years data. Transport related accidents are still prevalent in both periods.

- **Occupation** - the types of occupations across the whole ten-year period experiencing the highest numbers of accidents are those related to handling refuse and driving related jobs. In terms of fatal injuries only, the trends were similar with 'Refuse' accounting for the largest number of fatal accidents in the first period and 'Refuse Salvage' accounting for the largest number of fatal injuries in the second period.

- **Work process** - allowing for changes in coding the category work process, the most significant work process over the whole ten-year period is 'refuse collection', followed by other refuse handling activities. In terms of fatal accidents, during the period 1996/97 to 2000/01 the largest number of fatal accidents were caused during the 'loading/unloading' process. However, there was no discernable trend for fatal injuries in later years.

- **Agent** - allowing for changes in coding the category agent, the most significant category would appear to be related to containers, as this is represented by handling sprains due to lifting or moving weights in the first five-year period and then miscellaneous portable containers in the last five years. Tripping and slipping on floors would also appear to be prevalent across the whole ten-year period. Over the 10-year period there was no discernable trend for fatal injuries in particular, apart from between 1996/97 to 2000/01 when the most significant agent category was 'vehicle refuse'.

- **Age** - the highest total number of accidents have been reported within the 35 to 39 years age range across the whole ten-year period. In the first six years this was closely followed by the 30 to 34 age bracket, but this changed to the 40 to 44 year age bracket in the last four years. Furthermore, in the last four years there is a notable increase in the percentage of major injury accidents in the 40 to 44 year age range.

4.5.2 Key high risk areas

- Across the whole ten-year period the key high risk industries are the SIC 90 collection of industries (sewage and refuse disposal). In the last four year period, additional industries have also emerged as high risk areas, such as 'Freight by Road', 'Traditional Cleaning' and 'Other Cleaning'. In addition, the industry 'General Public Services' has become more severe in its impact but has remained at the same level of likelihood.

- The most high risk accident kinds have remained the same across the whole ten-year period. Transport-related accidents show the highest impact and handling / sprains have the highest likelihood of occurring. Trip and struck-by accidents are also categorised as high risk with a medium to high likelihood and impact. One area of change is with low fall accidents; in the last four years their likelihood of occurrence has reduced.

- Across the ten-year period refuse workers face the most significant risks. Drivers and workers that are required to handle waste also appear to be high risk occupations across the same period.

- The work process 'refuse collection' appears to be the highest risk. Maintenance related work processes also appear to be in the high risk area.

- In the first five years, various agents associated with handling / sprain accidents feature as significant risks, along with struck by agents, refuse vehicles and trip-related agents. The last five years highlight miscellaneous portable containers and floors as being the most high risk. These are likely to relate back to the handling sprain and trip accidents highlighted in the first five years.

- The workers primarily at risk in the first six years were those in the 30 to 44 age group. However, in the last four years the impact of accidents involving workers aged between 30 and 34 has reduced, although the overall risk to workers in the 35 to 39 and 40 to 44 age brackets has remained the same.

- For the first six year period the most significant combination of accident kind and agent for fatal and major injury accidents was ‘trip’ accidents with a ‘trip’ agent. This was followed by low fall from a vehicle, struck by accidents and then handling sprains from sharp objects. The most prevalent work process across the ten-year period was refuse collection, along with on-site transfer. The most significant occupation was refuse worker.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1.1 Introduction

The current study provided an update to the research report published by HSE in 2003 entitled 'Mapping health and safety standards in the UK waste industry' (Research Report 240). The overall aim of the study was to update the employment figures, accident rates and RIDDOR waste data sets developed for the previous study with data from the last four years. This aim was developed into three objectives for the study. The following section outlines these three objectives and highlights the key conclusions to address them.

5.1.2 Objective 1 - Update the industry employment figures and associated industry accident rates

- Employment figures were updated by combining private sector employment data from the Annual Business Inquiry (ABI) with public sector employment data collected direct from a representative range of Local Authorities.

- The estimated total number of waste and recycling services workers in 2005/06 was 176,452. The numbers show that this was similar to the revised figure for 2001/02 (176,309) although the numbers did drop between 2002/03 and 2004/05.

- The overall accident rate for workers (including fatal, major injury and over 3-day injury accidents) has been decreasing in the waste industry in 2004/05 and 2005/06. This may largely be explained by a gradual reduction in the over 3-day accident rate.

- The highest fatal accident rate for workers (9.6 accidents per 100,000 workers) was estimated for 2001/02. There was a significant reduction in the fatal accident rate in 2003/04. However, the rate then stabilised at a rate around that of 2002/03 (8.0) for the last two years (2004/05 and 2005/06).

- The major injury accident rate appeared to increase during the middle of the five year period, although it reduced significantly in 2005/06. This same pattern (peaking during the middle of the five year period) also occurred for the rate of over 3-day injury accidents.

- This rise and then fall of major injury and over 3-day injury accidents could be explained by the publicity surrounding the publication of Research Report 240, which may have caused an increased interest in the health and safety of workers employed in this sector. In turn, this may have caused more accidents to have been reported in the major injury and over 3-day injury categories.

- The overall accident rate increased between 2001/02 and 2003/04, but has since reduced. The overall accident rate decreased by 3% between 2002/03 and 2005/06 whilst the number of workers rose by 7%.

5.1.3 Objective 2 - Update the existing waste accident data

- The waste data set developed as part of the previous waste study (Research Report 240) was updated by:
  - Replacing the provisional data for 2001/02 with the final data
  - Adding the final data for 2002/03, 2003/04, 2004/05 and 2005/06
- Detailed analysis of the updated RIDDOR waste data set indicated that the total number of waste related accidents (fatal, major injury and over 3-day injury accidents) appeared to be reducing over the ten-year period.
- Allowing for changes in coding with the introduction of the ICC and new occupation coding scheme and the limitations of the RIDDOR coding system, trends in the waste accident data generally appeared to have remained relatively constant over the whole ten-year period.
- Industries classified as 'general public services' and 'sewage / refuse disposal' remained significant. Handling sprains, trips and struck-by accidents were the most prolific types of accident. The occupations most likely to be involved in accidents were those related to refuse handling and driving related jobs and they were likely to have been collecting refuse or handling refuse in general when they had the accident. The likelihood is that the object involved in the accident would have been some sort of container.
- An area that appears to have changed more significantly in the last four years is related to the age of the injured person. Across the whole ten-year period the highest total number of accidents were experienced by workers between the ages of 35 to 39 years. In the first six years this was closely followed by workers aged between 30 to 34. However, in the last four years this risk shifted to workers in the 40 to 44 year age bracket. Furthermore, in the last four years there was a notable increase in the percentage of major injury accidents in the 40 to 44 year age range. However, as accurate data on the ages of those employed in the industry is not known, it is not possible to say whether or not the number of injuries by age group reflects the numbers employed in these age groups or their incidence rates.

5.1.4 Objective 3 - Update the three RIDDOR spreadsheet tools

- The following three spreadsheet tools were updated:
  - **RIDDOR Data Tool '07** - For detailed graphical analysis of the RIDDOR accident data by a small number of the most informative fields reported under the RIDDOR regulations (e.g. accident kind, occupation, work process, agent, age, region etc.) for industry as a whole to enable comparisons to be made with the waste industry.

- **Waste RIDDOR Data Tool '07** – For detailed graphical analysis of the RIDDOR accident data by all of the fields reported under the RIDDOR regulations (e.g. accident kind, occupation, work process, agent, age, region etc.) for industry as a whole or individual organisations.

- **Waste RIDDOR Report Tool '07** – For detailed analysis of the RIDDOR accident data by all of the fields reported under the RIDDOR regulations plus the notifier comments and investigation reports for industry as a whole or individual organisations.

- The spreadsheet tools were provided to the HSE waste team on CD-Rom for their own internal utilisation in order to help with refining their strategy.

5.1.5 Recommendation

The highest fatal accident rate (9.6 accidents per 100,000 workers) was observed in 2001/02. There was a significant reduction in the fatal accident rate in 2003/04. However, the rate then stabilised at a rate similar to that of 2002/03 (8.0) for two years (2004/05 and 2005/06). However, the findings indicate that the overall accident rate in the waste industry has been reducing in 2004/05 and 2005/06. Nevertheless, whilst the over 3-day accident rate has been gradually reducing, the major injury rate has not shown the same rate of decline. The reduction in the overall accident rate is largely as a result of the reduction in the over 3-day accident rate.

These results raise a number of issues which cannot be addressed within the limitations of this data. In addition, there has been an increase in the amount of recycling undertaken in Great Britain, and this can require greater manual collection, handling and sorting activities and has the potential to affect accident numbers. Unfortunately, the RIDDOR codes do not contain sufficient detail to ascertain whether the accidents result from recycling activities, let alone whether they involve handling bins, bags or boxes, or what type of vehicle was being used. Understanding the accident profile of the various systems of collection, vehicle and system may help the HSE to better focus its interventions with the waste industry.

The narratives within the RIDDOR data (notifier comments and inspector investigation summaries) contain information that could provide an understanding of why the accidents occurred and what risk factors were involved. Analysis of the narratives contained in the waste RIDDOR data could provide HSE with qualitative data on accident causation, which may be used to:

- Gain a greater understanding of the impact of recycling on the accident rates.

- Gain a greater understanding of the over 3-day and major injury accident causations and why they are moving in different directions.

This type of narrative analysis has not been completed as part of this current study and therefore we recommend that further research of this nature is conducted.

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HSE

Health and Safety Executive

Update to mapping health and safety standards in the UK waste industry

This report describes an update to a previous study on the nature of the UK waste industry and its health and safety standards.

Employment figures were updated and it is estimated that around 176,000 people are employed in waste and recycling services in the UK in 2005/06. This employment figure was combined with updated accident numbers to reveal that the overall accident rate for workers in the waste industry has been decreasing recently.

High risk areas appeared to have remained relatively constant over the ten-year period. Industries providing general public services and sewage/refuse disposal remained significant. Handling sprains, trips and struck-by accidents were the most prolific types of accident. Occupations most likely to be involved in accidents were those related to refuse handling and driver jobs and individuals were likely to have been collecting or handling refuse when they had the accident.

Recommendations include understanding the impact of recycling, and the different profiles of over 3-day and major injury accidents, on the accident rates.

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