Survey of explosives stores and impact of proposed changes to separation distances

Prepared by the
Risk Research Group
Department of Geography
School of Sciences
Staffordshire University
for the Health and Safety Executive

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Gordon Walker and John Fairburn
Risk Research Group
Department of Geography
School of Sciences
Staffordshire University
College Road
Stoke on Trent
ST4 2DE
United Kingdom

The aim of this project has been to inform ongoing revisions to legislation on the safe manufacture and storage of explosives. The first phase of the research involved establishing a reliable picture of explosives storage across the country through a postal survey of 80 local authorities (LAs), followed by detailed case study work in 11 areas and an analysis of population distributions around licensed stores identified from the postal survey. The second phase of the research assessed the impact of proposed changes to separation distances for a sample of stores in different quantity and store construction categories.

A clear picture of the geographical distribution of licensed stores and registered premises was obtained along with information on the range of quantities, the type of explosives held and the prevalence of different methods of construction. It was found that licensed stores are distributed unevenly across the country with a bias towards rural areas. The majority of stores are licensed to hold general explosives with the remainder predominantly holding fireworks. There is a far greater number of registered premises consisting predominantly of Mode B stores holding smaller quantities of fireworks.

The analysis of impacts arising from proposed changes to separation distances suggests that there will be some impacts on existing stores, but that these will apply to some categories of stores far more than others. Registered premises holding high explosives are most substantially affected as a category, although there is a comparatively small number of these across the country. The other two main categories affected, licensed stores holding high explosives and Mode A registered premises holding fireworks, show potential impacts to a lesser degree. Low or no cost responses by site operators should in many cases be possible to address apparent compliance problems.

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EXECUTIVE SUMMARY

RESEARCH AIMS AND OUTLINE

The overall aim of the project was to inform ongoing revisions to legislation on the safe manufacture and storage of explosives. The project evolved alongside the development of new legislative proposals and related research on the potential risks from explosion events. There were two main phases to the research.

In the first phase the aim was to establish a reliable picture of explosives storage across the country through:

- a postal survey of 80 Local Authorities (LAs) to collect information on the numbers and distribution of registered premises and licensed stores in Great Britain. Licensed stores hold greater amounts of explosives than registered premises.
- a detailed survey of registered premises within 11 case study LAs
- an analysis of population distributions around 188 licensed stores identified in the postal survey

The second phase of the research assessed the impact of proposed changes in requirements on separation distances. A sample of stores in 4 categories where the most significant changes to separation distances were proposed were examined through the scrutiny of detailed maps, supplemented where necessary by discussions with local authorities and site owners. The extent to which there were likely to be problems in achieving compliance with the revised separation distances was evaluated in each case. It should be noted that the research only considered explosives stores licensed and registered with local authorities. Explosives magazines licensed by the HSE were not included within the remit of the research. Stores holding gunpowder were also not included in phase II of the research.

DISTRIBUTION AND CHARACTERISTICS OF LICENSED STORES

A total of 227 licensed explosives stores were covered by the 80 LAs responding to the postal survey. These are located within 44 out of the total of 80 licensing authorities responding, 36 authorities having no licensed stores at all. Licensed stores are distributed unevenly across the country with a bias towards rural areas. Based on the survey sample it was estimated that there are 423 stores in Great Britain (an estimate which correlated closely with data collected by the Police). The majority of these are located in the more rural LAs in the English Counties (54%) and in Wales (16.9%) and Scotland (15.5%). The proportion of stores in Wales and Scotland, when compared to England, is substantially higher than would be predicted on the basis of relative population levels.

The majority of stores are licensed to hold general explosives (nearly 70%) with the remainder predominantly holding fireworks. Only a very few licences are for small arms munitions. In terms of the 'Divisions' that the stores fall into (see Appendix 4), there is an overall bias towards the Divisions holding greater quantities of explosives, with nearly 40% overall in Division E (the highest quantity category) and a further 40% approximately equally split between Divisions C and D. For fireworks stores the most significant Division is B with less of a bias towards the 'higher' Divisions C, D and E. For general explosives the most significant Division by far is E, with a much stronger bias towards the 'higher' Divisions.
DISTRIBUTION AND CHARACTERISTICS OF REGISTERED PREMISES

A total of 18535 registered premises were covered by the LAs responding to the postal survey. The average number of registrations per LA is much higher for the Metropolitan Fire and Civil Defence areas than for any other category of LA reflecting their physical size and urban character. Only a few LAs contain very high numbers of registered premises with the majority having under 100. Based on the survey sample it is estimated that there are approximately 33320 registered premises in Great Britain the vast majority of which are retail outlets selling fireworks. 88% of all registrations are estimated to be in England with the remaining 12% split between the LAs in Wales (4.8%) and Scotland (7.3%). This split is closely in line with the distribution of population. Premises can be registered as either Mode A or Mode B stores (or in some cases both of these). Mode A stores can hold a greater amount of explosives than Mode B. By far the majority of registrations covered by the survey were for Mode B storage, with overall 7.4% in Mode A and 92.6% in Mode B. The proportion of registrations for each Mode is fairly consistent across the different type of LAs.

The more detailed data collected from a sample of 11 LAs covered an estimated 13% of all Mode A premises in Great Britain. Of these the majority (76%) stored fireworks, only a very small number (1%) stored high explosives, whilst the reminder held other explosives such as for airbags, flares, ammunition etc… The vast majority (88%) were retail/commercial rather than industrial or domestic premises. Information on types of container utilised was obtained for only about half of the sample sites, but this revealed that ISO steel containers were most commonly used, particularly for the storage of fireworks. Brick and concrete stores were used at only 18% of all sites, but including all those holding high explosives. For mode B premises more detailed data was collected from the 11 LAs only for those sites holding high explosives, because of the likely changes to separation distances applying to these sites (see below). Only 4 such sites were identified (0.09% of all mode B premises in the sample LAs) suggesting that across the country only a very small number of mode B premises hold high explosives. This was later confirmed by further information obtained from the police force.

POPULATION DENSITY AROUND LICENSED STORES

A sample of 188 stores was used to carry out an initial analysis of nearby residential population density. Each store was identified as falling into a low, medium or high density category as estimated over a 1km² area around each site (see section 2.3.3 for details). Nearly three-quarters of stores fell into the low density category, with 43 in the medium density category and only 8 in high density. There is therefore a desirable and strongly inverse relationship between numbers of stores and population density category.

There are some differences in the distribution of store Divisions by population density category. The high density category predominantly contains stores from Divisions B and C. A balancing bias towards stores falling into the low population density category can be see for Divisions D and E. Overall therefore there is an inverse relationship between amount of explosives held and nearby population density.

Whilst the analysis of population density undertaken provides some indication of the scale of population potentially at risk, it is necessary to bear in mind limitations relating to the distribution of population within the 1km² area, and the reliance on residential population data alone (see section 5.3). This analysis provides no indication of the separation distance from the nearest house, or from other land uses including roads and places of employment.
ANALYSIS OF THE IMPACT OF CHANGES TO SEPARATION DISTANCES.

The second phase of the project focused on proposals to change some of the separation distances applying to licensed stores and registered premises. A more differentiated and complex matrix of separation distances was proposed, which for certain categories of stores (particularly those holding high explosives and/or constructed from brick or concrete) significantly increased the separation required from nearby development.

In order to evaluate the likely impact of these proposed changes a detailed analysis was undertaken for samples of sites from 4 categories of stores and premises. The sample sizes reflected the availability of information on store locations and the variability in store characteristics. This research producing the following results for each category of store:

- **LA licensed stores holding high explosives (HT1)** - a random sample of 23 sites and a targeted sample of 8 sites identified from earlier work as being located in high density population areas were examined (in total a sample of 10% of sites in GB). Only one of the 23 sites had a marginal problem in complying with the proposed separation distances, whereas 5 of the 8 'high density' sites had problems - of these 3 were not easily resolvable. These results suggest that the impact on this category of stores will be restricted to a comparatively small number of sites located closer to urban areas.

- **LA registered premises holding high explosives (HT1)** - a sample of 18 mode A or B registered premises holding high explosives (estimated 29% of all those in GB) were examined of which 9 were found to have potential compliance problems. Of these only 1 appeared to be able to make changes to achieve compliance.

- **LA licensed stores holding display fireworks (HT3)** within Division A - a sample of 5 stores (all of those identified from the survey and an estimated 45% of all those in GB) were examined none of which were found to have compliance problems. In this category only a small increase in separation distance was proposed.

- **LA Mode A Registered Premises holding shop good fireworks (HT4)** - a sample of 34 Mode A registered premises holding fireworks (estimated 2% of all those in GB) were examined of which 3 were found to have compliance problems that were not obviously resolvable. There were however a large number of supermarkets in this category where the viability of storage in containers in car parks could not be fully addressed.

The analysis undertaken suggests that there will some impacts on existing stores as a result of changing separation distances to those currently proposed by the HSE. These impacts are not across the board and apply to some categories of stores more than others. Registered premises holding high explosives are most severely affected as a category although there are a comparatively small number of these across the country. The other two main categories affected, HT1 stores and HT4 mode A premises, show potential impacts to a lesser degree and responses should in some cases be able to be made to address problems of compliance. It should be noted that some further consideration may need to be given to the impact of changes to distances for categories of stores not included within the remit of the research.

A number of additional observations are made at the end of the report relating to improvements in the consistency of data collection across LAs, the scope for producing a national database on licensed and registered stores and the implications of introducing a more complex matrix of separation distance requirements.

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1 It should be noted that explosives magazines licensed by the HSE and stores holding gunpowder were not included in the remit of this phase of the research.
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1 RESEARCH AIMS AND OUTLINE

The project was commissioned by the HSE to inform its work in reviewing explosives legislation. Part of this review involved the re-evaluation of requirements for separation distances around explosives stores, prompted by evidence from trial explosions on the extent of debris throw from an explosion at smaller explosives stores. Analysis of this data had suggested that smaller brick and concrete stores, and stores in high population density could present a high level of risk.

There were two main phases to the research.

**In the first phase the aim was to establish a reliable picture of explosives storage across the country** and in particular to have more information about:

- the geographical distribution of local authority licensed and registered explosives stores, both across the country and between high and low-population density areas;
- the amounts kept;
- the type of explosive (e.g. fireworks or high explosive);
- the type of construction of explosive stores

This first phase had three parts:

- **A postal survey of Local Authorities (LAs) to collect information on the numbers and distribution of registered premises and licensed stores in Great Britain.** Whilst the HSE has information on the sites it is responsible for licensing, information on stores registered with or licensed by local authorities (LAs) is not held centrally. A initial survey of LAs was therefore undertaken to provide information on the numbers and distribution of registered and licensed stores across the country. The survey obtained information from a total of 80 LAs (46% of all LAs) and detailed information on each licensed store within these LAs. The accuracy of information obtained was also verified for a sample of 30 stores.

- **A detailed survey of registered premises within 11 case study LAs.** In the initial postal survey only limited information was collected on registered premises, in part because of the large number of sites within all 80 LAs (over 18,000). As it became clear that proposed changes to legislation could impact on certain categories of registered premises, more detailed information for a sample of sites needed to be obtained. A cross section of 11 case study LAs were therefore selected from the original survey sample, with detailed information on all mode A premises and mode B premises holding high explosives within these LAs obtained. This included data on explosives held, store construction and location.

- **An analysis of population distributions around 188 licensed stores identified in the postal survey.** At an early stage in the development of proposals to amend separation distances relation to licensed stores it was useful for the HSE to have a broad indication of the extent to which stores were located in areas of high population density. A GIS based analysis was therefore undertaken using postcode data to estimate residential population levels within a radius around each store. This however provided only a limited indication of the extent to which compliance with changes to separation distances would be problematic.

The second phase of the research directly assessed the impact of proposed changes in requirements on separation distances. These proposed changes had emerged from a related programme of research reassessing the potential risks from explosion events. The aim of the
second phase was to evaluate the likely numbers of stores which would be affected by changes in separation distances and how severely they might be affected. Increases in separation distances were proposed for four categories of stores included within the remit of the research\(^2\); LA licensed stores holding high explosives; LA registered premises holding high explosives; LA licensed stores in Division A and holding display fireworks; and LA mode A registered premises holding shop-good fireworks. For each of these categories of store a sample of sites was selected from those identified in earlier survey work, in some cases supplemented with further sites identified by the HSE. Additional information was obtained on each sample site (from LAs and/or site operators) and detailed map work was carried out to identify the extent of compliance problems if the proposed separation distances were to be applied. Where potential problems were identified the scope for addressing these through changes in storage levels, construction or location were assessed.

\(^2\) It should be noted that explosives magazines licensed by the HSE and LA licensed stores and registered premises holding gunpowder were not included in the remit of this phase of the research.
2 METHODS

Discussion of the methods used in the project is divided into the three component parts of phase 1 and the analysis of separation distances in phase 2.

2.1 POSTAL SURVEY OF LOCAL AUTHORITIES

2.1.1 Survey Design

The survey forms sent to local authorities to collect information on registered and licensed stores were designed to be clear and logical and to focus on the key information required. The advice of the officer responsible for registrations within Stoke on Trent City Council was utilised to assist in this aim. For registered stores information on the total number of registered stores and the split in this between mode A and mode B stores was requested. For licensed stores more detailed information including the name and address of the licensee, type of explosive, Division and type of calling was requested. The form used for data collection can be found in Appendix 1.

Two covering letters were included with the forms, the second from the HSE explaining the purpose of the survey and reassuring respondents about any confidentiality concerns.

Ten LAs were selected in order to pilot the survey. They were chosen to provide a cross section of types of authorities. Contact information for most of the LAs was obtained from the tradingstandards.net web site. The LAs were asked to comment on the survey design as well as provide information on their licensed sites.

Responses were obtained from 6 of the pilot LAs. The replies were generally of good quality and only minor revisions were therefore needed to the survey form. In two cases of non-replies the responsibility for dealing with registrations and licences had changed from one organisation to another which meant that a response could not be obtained within the time-scale allowed.

2.1.2 LA Survey Implementation

A sample of 100 LAs was selected for the full survey making a total of 110 LAs surveyed when the 10 pilot authorities are included. The 110 LAs were chosen in accordance with the main categories of LA as shown in Table 2.1.

The full survey was sent by post on 22/3/00 with LAs given 2 weeks to respond. Responses to the survey began to be received within 4 days and by the requested return date of 4/4/00 a total of 34 replies had been received.

It was then necessary to telephone LAs to chase up further responses. This generally proved effective in generating returned forms although it also identified cases where forms had 'not been received' or had been lost subsequent to receipt and others where the responsible local body had changed, for example, from local authority to fire service.
### Table 2.1
**Sample for the full survey**

<table>
<thead>
<tr>
<th>Category of LA</th>
<th>Total number within category</th>
<th>Approx % surveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scottish Unitary Authority</td>
<td>32</td>
<td>50</td>
</tr>
<tr>
<td>Welsh Unitary Authority</td>
<td>22</td>
<td>50</td>
</tr>
<tr>
<td>Metropolitan Fire and Civil Defence</td>
<td>6</td>
<td>100</td>
</tr>
<tr>
<td>English Unitary Authority</td>
<td>47</td>
<td>50</td>
</tr>
<tr>
<td>London Borough</td>
<td>33</td>
<td>50</td>
</tr>
<tr>
<td>English County Council</td>
<td>34</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>174</strong></td>
<td></td>
</tr>
</tbody>
</table>

The total of 83 responses were received by our cut-off date for analysis of 18/4/00 from the full 110 surveyed. In three cases the information received was too incomplete to be utilised so that a total of 80 responses were used for the analysis. These 80 responses were divided as shown in Table 2.2.

### Table 2.2
**Response rates for the 80 LA responses analysed by category of LA**

<table>
<thead>
<tr>
<th>Category of LA</th>
<th>Total surveyed (including pilot)</th>
<th>Total responding (including pilot)</th>
<th>% response rate</th>
<th>% response relative to total number of LAs within GB’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scottish Unitary Authority</td>
<td>17</td>
<td>13</td>
<td>76.5</td>
<td>40.6</td>
</tr>
<tr>
<td>Welsh Unitary Authority</td>
<td>12</td>
<td>8</td>
<td>66.7</td>
<td>36.4</td>
</tr>
<tr>
<td>Metropolitan Fire and Civil Defence</td>
<td>6</td>
<td>4</td>
<td>66.7</td>
<td>66.7</td>
</tr>
<tr>
<td>English Unitary Authority</td>
<td>24</td>
<td>21</td>
<td>87.5</td>
<td>44.7</td>
</tr>
<tr>
<td>London Borough</td>
<td>17</td>
<td>13</td>
<td>76.5</td>
<td>39.4</td>
</tr>
<tr>
<td>English County Council</td>
<td>34</td>
<td>21</td>
<td>61.8</td>
<td>61.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>110</strong></td>
<td><strong>80</strong></td>
<td><strong>72.7</strong></td>
<td><strong>46.0</strong></td>
</tr>
</tbody>
</table>

#### 2.1.3 Telephone survey of site operators

A sample of 30 site operators holding licenses for explosives stores were telephoned in order to provide an indication of any problems with the accuracy of information obtained from the LAs.

This sample was selected in proportion to the numbers of LAs replying in each category which had at least one licensed store - for example all county councils replying had licensed stores whereas none of the London Boroughs replying had any at all. Within each category stores were randomly selected, apart from a few cases where information was incomplete from the LA and it was therefore helpful for other aspects of the analysis to speak to the site operator. Where the initially selected site operator phone numbers could not be obtained or the licensee was unavailable (for example due to holidays) replacement sites were selected. The number of site operators contacted within each category of LA was as follows:
Table 2.3
Numbers of site operators contacted in each LA category

<table>
<thead>
<tr>
<th>Category of LA</th>
<th>Number of site operators contacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scottish Unitary Authority</td>
<td>4</td>
</tr>
<tr>
<td>Welsh Unitary Authority</td>
<td>3</td>
</tr>
<tr>
<td>Metropolitan Fire and Civil Defence</td>
<td>2</td>
</tr>
<tr>
<td>English Unitary Authority</td>
<td>2</td>
</tr>
<tr>
<td>London Borough</td>
<td>0*</td>
</tr>
<tr>
<td>English County Council</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

* there were no licensed stores recorded by the London Boroughs which replied to the survey.

2.1.4 Analysis of survey data

The information obtained from the LA survey on both registered and licensed stores was entered into an Excel database. This was then checked for accuracy to eliminate data entry errors and simple statistical analyses and cross tabulations undertaken. For the telephone survey of site operators any discrepancies between site occupier and LA information were recorded and categorised by type of discrepancy.

2.2 SURVEY OF REGISTERED PREMISES WITHIN 11 LAS

2.2.1 Selection of LAs

In order to obtain site-specific information on registered premises a smaller sample of 11 LAs (6% of all LAs in GB) was selected from those making returns in the initial postal survey. A pilot LA (Staffordshire) and ten further LAs were selected in accordance with the following criteria:

- they have a significant number of Mode A premises
- they showed evidence of having easily accessible data in responding to the phase I survey
- they include two English unitary authorities, five county councils, a metropolitan fire and civil defence area, a Welsh authority and a Scottish authority

The LAs selected and the total number of mode A and number of mode B premises storing high explosives they contain are shown in Table 2.4. The total number of mode A premises covered by the survey amounted to 13% of all those estimated to exist in Great Britain. This number is higher than might be expected from the 6% sample of all LAs due to the high number of premises within Manchester and Lincolnshire.
Table 2.4
Sample LAs and numbers of registered premises

<table>
<thead>
<tr>
<th>Name of LA</th>
<th>Type of LA</th>
<th>Number of Mode A premises (and of these how many A&amp;B)</th>
<th>Number of Mode B premises storing high explosives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Derby</td>
<td>English Unitary</td>
<td>8 (8 mode A&amp;B)</td>
<td>0</td>
</tr>
<tr>
<td>Reading</td>
<td>English Unitary</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Hartlepool</td>
<td>English Unitary</td>
<td>3 (1 A&amp;B)</td>
<td>0</td>
</tr>
<tr>
<td>Lincolnshire</td>
<td>English County</td>
<td>83 (1 A&amp;B)</td>
<td>0</td>
</tr>
<tr>
<td>Oxfordshire</td>
<td>English County</td>
<td>10 (6 A &amp;B)</td>
<td>0</td>
</tr>
<tr>
<td>Staffordshire</td>
<td>English County</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>Devon</td>
<td>English County</td>
<td>19 (5 A&amp;B)</td>
<td>0</td>
</tr>
<tr>
<td>East Sussex</td>
<td>English County</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Fife</td>
<td>Scottish Unitary</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Neath</td>
<td>Welsh Unitary</td>
<td>42</td>
<td>0</td>
</tr>
<tr>
<td>Manchester</td>
<td>Metropolitan</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>314 (21 A&amp;B)</td>
<td>4</td>
</tr>
</tbody>
</table>

2.2.2 Data Collection

A survey form was designed (see Appendix I) and successfully piloted in Staffordshire County Council. This form requested information for each mode A registered premises and each mode B registered premises holding high explosives. The information covered name and address, mode of storage, type of explosive, store construction, type of premises (residential, industrial, commercial) and type of area (residential/non-residential).

Whilst data was obtained from each of the 11 sample LAs, the completeness of response was very variable and this is reflected in the analysis. A few LAs were able to provide a full and detailed information, for example on type of container, type of area and quantities held. Others provided only the basic information on name, address and mode of storage and explosive type.

It should be noted that the Manchester total of 100 includes 21 separate registrations for stores located at one site; and that where high explosives have been stored at sites with A&B registrations these have *not* been included in the count of mode B high explosive premises.

2.3 ANALYSIS OF POPULATION DENSITY AROUND LICENSED STORES

2.3.1 Outline of analysis method

An analysis of population density was undertaken around 188 of the licensed stores identified in the initial postal survey. This number is lower than the total number of stores returned by the LAs for reasons explained below.

In order to analyse population density we utilised a method for estimating population levels around hazardous sites developed in other projects for the HSE (Walker and Mooney 1998). In undertaking this work an acute understanding of the complexities involved in deriving meaningful data on populations 'at risk' was developed. Relying upon census data is unsatisfactory particularly in rural areas where the enumeration districts for which population data is recorded can be very large. In these situations it can be difficult to establish where within the enumeration district the population it contains is actually located - assuming a constant population density across the area can be very misleading.
Counting buildings on maps is unreliable, as it can be very difficult to distinguish between the occupation levels of different shapes on a map (a tower block and a warehouse can look very similar!), requires up-to-date small-scale maps and is very time consuming. There is a commercial product (ADDRESSPOINT) available that can provide a precise grid reference for every address in the country but this becomes an extremely expensive solution when large numbers of households need to be identified.

The solution we developed combining postcode unit data on households from an alternative product called DATAPoint\(^3\), and household size data provides a more cost-effective solution.

### 2.3.2 Analysis stages

There were 7 stages to the analysis of population density:

1. **Deriving a spatial reference for the licensed store using grid reference, postcode and address data.**

   The postal survey form requested LAs to provide the address and postcode of each licensed store. They were also asked to provide a grid reference of the store if one was available - very few were in practice able to do this. We were therefore reliant in most cases upon the address and postcode information provided. Where only addresses were supplied the post office web site was used to derive a postcode. The postcode was then spatially referenced using DATAPoint. This provides a grid reference for the centroid of the relevant postcode unit.

   This method does not provide a grid reference for the exact building in which explosives are stored, but in most cases should provide a point in the near vicinity as most postcode units are not very large. There is scope for a greater level of spatial inaccuracy in some cases for one of the following reasons:

   - the store is part of a large site (e.g. a substantial quarry) which a postcode grid reference cannot adequately represent
   - a remote site near to an urban area has been included in postcode unit which contains other addresses within the urban area with the 'centroid' biased in this direction, or
   - because the grid reference within DATAPoint is of a low quality (there is a data flag within DATAPoint which indicates the quality of the spatial reference; the great majority are of an acceptable quality, but in a few cases a far cruder grid reference for the postcode unit is supplied.

   These potential constraints in the accuracy of spatial referencing and thus the estimation of population densities are addressed further in the case study phase of the research (see below)

   In some cases stores had to be removed from the analysis of population densities as it proved impossible to obtain reliable locational information for the following reasons

   - stores lacked postcode and grid reference information - 15 stores
   - postcodes were not contained in the DATAPoint database - 4 stores
   - the grid reference (supplied from the local authority) failed to find anything including the site itself - 4 stores

---

\(^3\) DATAPoint has been renamed by the Ordnance Survey as CODEPOINT
2. Removing multiple licenses at same address/postcode

A number of licensed stores had identical postcodes and addresses and for the purposes of estimating populations (but not other elements of the statistical analysis) it was decided to eliminate these multiple stores leaving only one store at any one location (this removed 16 stores). The combined effect of this step and removing stores where locational information was unavailable (see above) was to reduce the total number of licensed stores for this part of the analysis from 227 to 188.

3. Transferring information to a Geographical Information System (GIS) and using this to generate circular ‘buffer zones’ around each of the recorded registered premises.

A buffer zone of 0.564km radius producing a circular area of 1km\(^2\) was utilised.

4. Estimating the number of residential addresses within each buffer zone using the GIS with DATAPoint data.

DATAPoint provides information on the number of addresses (divided into residential and non-residential) within each postcode Unit. Postcode Units are the smallest scale of postcode area and contain approximately 15 addresses providing a good level of spatial resolution (far better than for census enumeration districts). An example of the distribution of DATAPoint data around a licensed store is shown in Appendix 2.

5. Multiplying the number of residential addresses by a number of persons per household figure to derive a total population and hence population density statistic.

The number of people per household does vary from area to area, but the degree of specificity required in the analysis only needed to be ‘fit for purpose’. In order to provide an indication of the sensitivity of the analysis to changes in the person per household figure three alternatives were utilised:

- the latest national UK figure of 2.43 persons per household derived by the OPCS in 1996
- a figure of 3 persons per household to provide a generous estimate
- a figure of 2 persons per household to provide a conservative estimate

The upper and lower ranges of 3 and 2 persons per household were derived after examining the range for all the individual enumeration districts in Cheshire. This county had an average of 2.55 with a standard deviation of 0.5. In the results presented later in the report the impact of changing the persons per household figure on categorisations of population density is assessed.

6. Categorisation of population densities and derivation of data on numbers of sites located in areas of low, medium and high densities.

In accordance with the contract requirements the population densities estimated were then placed into three categories as follows:

<table>
<thead>
<tr>
<th>Category</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>less than 210 persons per km(^2)</td>
</tr>
<tr>
<td>Medium</td>
<td>210-1310 persons per km(^2)</td>
</tr>
<tr>
<td>High</td>
<td>more than 1310 persons per km(^2)</td>
</tr>
</tbody>
</table>
7. Closer scrutiny of sites identified as high density using large scale maps

Having isolated a number of sites as 'high density' using the locational information provided by the LA, we then sought to identify the store on large scale maps and confirm visually the picture of nearby population density derived from the statistical databases. This process identified a number of sites where incorrect postcode information had been provided and others where the use of the postcode for spatial referencing had effectively pulled the grid reference used for estimating population density towards areas of housing - there was therefore an inherent conservatism in the initial analysis which closer scrutiny was able to counterbalance. The result of this final phase was to significantly reduce the number of sites in the high density category from that derived from the initial GIS-based analysis.

2.4 ANALYSIS OF THE IMPACT OF PROPOSED CHANGES TO SEPARATION DISTANCES

2.4.1 Sample selection within categories of sites

When proposed changes to separation distances were produced by the HSE (see Appendix 3), four categories of store and registered premises (within the remit of the research) were identified as potentially having compliance problems because of proposed increases in separation. In order to evaluate the extent of these problems a sample of sites was selected within each category as discussed below. The sample sizes vary in part because of the extent of the expected compliance problem in each category, but also because of the variable availability of information on individual sites from the earlier phases of the research. Initially sites were identified from the LA survey work, with sites selected from a diversity of LAs known to have good quality records, but in the case of registered premises storing high explosives additional lists of sites were obtained from the HSE.

- **LA licensed stores holding high explosives (HT1)** - a sample of 31 stores from 12 LAs. This sample included all 8 stores identified as high density in the earlier population analysis so is to an extent biased towards where problems with compliance might be expected. This sample covered a range of different Divisions and included an estimated 10% of all licensed stores holding high explosives in GB. A larger sample of 38 stores was initially selected but a number of these had to be removed due to site closures, changes from licensed store to registered premises and problems in obtaining information from the site operators.

- **LA registered premises holding high explosives (HT1)** - a sample of 18 mode A or B registered premises. This included all 8 registered premises holding high explosives identified within the 11 sample LAs, and a further 10 identified by the HSE from a further 8 policy authority areas. If the figure of 4 premises from 11 authorities is multiplied up to the total number of LAs in GB (174) then we would estimate there to be 63 such stores across the country. This suggests that the 18 premises in this category represents a sample of 29% all stores.

- **LA licensed stores holding display fireworks (HT3) within Division A** - a sample of 5 stores. This was all of the Division A stores identified from the postal survey of 80 LAs and is therefore estimated to constitute approximately 45% of all those in this category across GB.

- **LA Mode A Registered Premises holding shop good fireworks (HT4)** - a sample of 34 premises. To work out a sample size we can take the figures from Table 3.4 which show that 76% of mode A premises from this phase of the work held fireworks. Given the
estimate in section 3.3 that there are 2466 mode A premises in GB this suggests a total of 1874 mode A premises storing fireworks across GB. This, at a rough estimate, means that a sample size of 34 is approximately 2% of all premises in this category in GB.

2.4.2 Analysis of separation distances

Large Scale Maps at 1:1250 or 1:2500 were first obtained for each of the selected stores. Where necessary relevant local authority officers (or site owners) were then sent an extract from the map in order to pinpoint the exact location of the store. This was particularly important in the case of facilities with a large site area, such as quarries, where the building or container holding the explosives could not be located with any accuracy from a postcode or general grid reference.

Further information on the construction of the store (including for HT1 stores whether or not they had an annex for detonator storage) and quantity of explosives held was also obtained from the LA or site owner.

Detailed measurements of distances to the closest features listed in the relevant proposed separation distance tables were then made. This involved measuring specified distances to three categories of features identified in the separation tables:

- **Dwellings and public places.** Here the definition of 'category B' development defined within the current legislation was utilised; namely house or other dwelling; shop; workshop; railway; explosives storage place; factory; church; school or college; hospital; court; theatre; cinema; covered market or similar public place; government building.

- **Major roads (motorways or dual carriageways)** (normally two thirds of separation distance to dwellings)

- **Minor roads (other roads and public lanes)** (normally one third of separation distance to dwellings)

N.B. It should be noted that following guidance from the HSE footpaths were not included with minor roads, and buildings belonging to the site owner were not included in 'dwellings and public places'.

In the case of HT1 stores different separation distances were specified by the HSE for stores in 'urban/high density' and 'rural/low density' areas. In order to first define whether a site was in a high or low density location a further calculation of the specified number of houses within a specified radius of the store was undertaken. This was carried out by counting dwellings on a large scale map, supported in some cases by use of DATAPoint information (see section 2.3).

Where compliance with the proposed new separation distances could not at first sight be achieved this was recorded. In most cases the site operators were then contacted to discuss this problem and to explore the potential for achieving compliance through either:

- limiting the amount of explosives stored so that it came within a smaller separation distance category
- changing the construction of the store, including in some cases removing the annex for storing detonators
- moving the location of the store within the site area

It should be noted that this analysis is subject to some degree of uncertainty surrounding exactly where separation distances are measured from, how up to date maps are (although in all cases
the most recently available maps were obtained) and the status of some buildings as being within the control of the site operator. As discussed later in the case of supermarkets storing fireworks in ISO containers it was also not a case of measuring from a fixed location (given that the containers are brought in on a seasonal basis), but calculating whether or not a container could be located within the site to achieve compliance.
3 DISTRIBUTION AND CHARACTERISTICS OF REGISTERED PREMISES

3.1 DISTRIBUTION BY CATEGORY OF LA

The data obtained from the local authority postal survey for registered premises is initially analysed in Table 3.1 divided by category of LA.

<table>
<thead>
<tr>
<th>Category of LA</th>
<th>Total no. of Registered Premises</th>
<th>Number of LAs responding</th>
<th>Total no. of LAs in GB</th>
<th>Average no. of premises per LA</th>
<th>Min no. per LA</th>
<th>Max no. per LA</th>
<th>Predicted total for all LAs in GB</th>
<th>Predicted % for all LAs in GB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scottish Unitary Authority</td>
<td>983</td>
<td>13</td>
<td>32</td>
<td>75.6</td>
<td>12</td>
<td>199</td>
<td>2420</td>
<td>7.3</td>
</tr>
<tr>
<td>Welsh Unitary Authority</td>
<td>588</td>
<td>8</td>
<td>22</td>
<td>73.5</td>
<td>30</td>
<td>191</td>
<td>1617</td>
<td>4.8</td>
</tr>
<tr>
<td>Metropolitan Fire and Civil Defence</td>
<td>5590</td>
<td>4</td>
<td>6</td>
<td>1397.5</td>
<td>706</td>
<td>2649</td>
<td>8385</td>
<td>25.2</td>
</tr>
<tr>
<td>English Unitary Authority</td>
<td>2223</td>
<td>21</td>
<td>47</td>
<td>105.9</td>
<td>45</td>
<td>211</td>
<td>4975</td>
<td>14.9</td>
</tr>
<tr>
<td>London Borough</td>
<td>1204</td>
<td>13</td>
<td>33</td>
<td>92.6</td>
<td>10</td>
<td>166</td>
<td>3056</td>
<td>9.2</td>
</tr>
<tr>
<td>English County Council</td>
<td>7947</td>
<td>21</td>
<td>34</td>
<td>378.4</td>
<td>149</td>
<td>956</td>
<td>12867</td>
<td>38.6</td>
</tr>
<tr>
<td>Total</td>
<td>18535</td>
<td>80</td>
<td>174</td>
<td>231.7</td>
<td></td>
<td></td>
<td>33320</td>
<td>100</td>
</tr>
</tbody>
</table>

This analysis shows that the distribution of the 18535 registered premises covered by the survey is far from even between the different types of LA. The Metropolitan Fire and Civil Defence areas have the greatest number of registrations per LA with the highest number of 2649 contained within the Greater Manchester area. The average number of registrations per LA is much higher for the Metropolitan areas (1397.5) than for any other category of LA - this is not surprising given that the Metropolitan areas are in effect amalgamations of a number of local authority equivalent areas. In contrast, the Corporation of London has only 10 registrations with low numbers also found in some of the Scottish and Welsh authorities, other London Boroughs and Unitary English LAs. Figure 3.1 below also provides an indication of the distribution of numbers of registered premises per LA. Only a few LAs contain very high numbers of registered premises with the majority having under 100.
These differences in numbers of registrations are likely to reflect a number of factors - the physical size of the authority area (the Corporation of London area is much smaller than West Yorkshire!), the level of urban development and population in each area (and hence demand for fireworks) and the distribution of type of activities involving the storage of explosives around the country.

### 3.2 ESTIMATION OF TOTAL NUMBERS OF PREMISES IN GREAT BRITAIN

The last column of Table 3.1 provides an estimation of the total number of registered premises in Great Britain of 33320. The estimation is produced by multiplying within each LA category by the balance between sample and total number of LAs e.g for Scottish Unitary LAs the calculation is 983 x (32/13) = 2420. This estimation method takes some account of the different characteristics of the types of authorities and numbers of registrations they contain. The alternative of simply basing the estimation upon a multiplication up from the grand total of 18571 premises in 80 out of 174 authorities - 18571 x (174/80) - provides a higher and less reliable figure of 40,392.

The estimated data in the last column of Table 3.1 broken down by LA category indicates that over a third of all registrations are predicted to be located within English County Councils with a quarter in the Metropolitan LA areas.

In total approximately 88% of all registrations are in England with the remaining 12% split between the Unitary authorities in Wales (4.8%) and Scotland (7.3%). This Division is closely in line with the distribution of population - 86% of the GB population live in England, 5% in Wales and 9% in Scotland.

### 3.3 DISTRIBUTION OF MODE A AND MODE B REGISTRATIONS

Table 3.2 indicates the split between Mode A and Mode B registered stores. It should be noted that a small number of stores in some LAs are registered as both Mode A and Mode B - for the purposes of analysis these have been included in the Mode A totals. Some local authorities did not have totals of Mode A and Mode B registrations readily available, this missing data is indicated in the final column of the Table.
Table 3.2
The Proportion of Mode A and Mode B registrations

<table>
<thead>
<tr>
<th>Category</th>
<th>Total Number of Premises</th>
<th>Total Mode A</th>
<th>% Mode A</th>
<th>Total Mode B</th>
<th>% Mode B</th>
<th>Missing Data (no of stores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scottish Unitary Authority</td>
<td>983</td>
<td>85</td>
<td>8.6</td>
<td>898</td>
<td>91.4</td>
<td>0</td>
</tr>
<tr>
<td>Welsh Unitary Authority</td>
<td>588</td>
<td>56</td>
<td>9.5</td>
<td>532</td>
<td>90.5</td>
<td>0</td>
</tr>
<tr>
<td>Metropolitan Fire and Civil Defence</td>
<td>5590</td>
<td>339</td>
<td>6.1</td>
<td>5251</td>
<td>93.9</td>
<td>0</td>
</tr>
<tr>
<td>English Unitary Authority</td>
<td>2259</td>
<td>96</td>
<td>4.9</td>
<td>1868</td>
<td>95.1</td>
<td>259</td>
</tr>
<tr>
<td>London Borough</td>
<td>1204</td>
<td>129</td>
<td>14.1</td>
<td>785</td>
<td>85.9</td>
<td>290</td>
</tr>
<tr>
<td>English County Council</td>
<td>7947</td>
<td>430</td>
<td>8.2</td>
<td>4784</td>
<td>91.8</td>
<td>2733</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>18571</td>
<td>1135</td>
<td>7.4</td>
<td>14118</td>
<td>92.6</td>
<td>3282</td>
</tr>
</tbody>
</table>

(*percentages are derived without the missing data included in the calculation)

Figure 3.2
Number of Mode A and B Registrations by LA Category

It can be seen from Table and Figure 3.2 that by far the majority of registrations are Mode B with overall 7.4% in Mode A and 92.6% in Mode B. The proportion of registrations in Mode A and B respectively is fairly consistent across the different type of authorities. The only noticeable differences are the higher proportion of Mode A in London and the higher proportion of Mode B in the English Unitary LAs.

It is possible from these figures to estimate the amount of explosives permitted to be held in registered premises across Great Britain although assumptions need to be made about explosives type. For example, assuming that all explosives were held in the form of 'shop-good fireworks' a total of 1135 tonnes of explosives (1 tonne per store) could be stored in Mode A premises across GB and a total of 3529 tonnes (250 kg per store) in Mode B premises. The total number of mode A and mode B registrations in Great Britain can similarly be estimated at 2466 mode A and 30854 mode B.
3.4 CHARACTERISTICS OF MODE A PREMISES

As discussed in section 2.2, 11 sample LAs were selected to obtain more detailed store-specific information on Mode A registered premises and Mode B registered premises storing high explosives. The LAs were asked to provide information on all the Mode A registered premises within their area, which across all the LAs totalled 314 registrations (see Table 3.1). This represents a sample of 13% of the estimated 2466 Mode A premises in Great Britain. Of these 21 were joint Mode A and B registrations which, for the purposes of analysis in this section, have been treated as simply Mode A registrations.

Of the 314 premises the vast majority (76%) stored fireworks. Only 4 held just 'high explosives' whilst most of the remainder stored 'other explosives' such as for airbags, ammunition, flares etc.. 18 sites were registered to hold fireworks and 'other' explosives, and one site had all three types including high explosives.

As shown in Table 3.4 the vast majority of premises (for which data was available) were commercial in function (shops, superstores etc..) with most of these storing fireworks. Industrial and domestic premises were much smaller in number.

<table>
<thead>
<tr>
<th>Types of explosives by type of premises for Mode A registrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial</td>
</tr>
<tr>
<td>Fireworks</td>
</tr>
<tr>
<td>High Explosives</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>Fireworks and Other</td>
</tr>
<tr>
<td>Fireworks, high explosives and other</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

*this table excludes 4 premises without information on explosive type

In terms of the type of container used to store explosives Table 3.5 shows that we were supplied with information on this for only 55% of the premises. Of these just over half were using ISO containers, with 27% using steel and 18% brick and concrete. For fireworks storage there is a bias towards ISO containers which is less evident for other explosives types. All 4 of the premises storing high explosives were of brick and concrete construction and in the 'other' category the use of ISO containers is less dominant with brick and concrete again most significant.
Table 3.5
Type of container by type of explosive for Mode A premises

<table>
<thead>
<tr>
<th></th>
<th>ISO*</th>
<th>Steel*</th>
<th>Brick and Concrete</th>
<th>Other</th>
<th>Total Known</th>
<th>Unknown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fireworks</td>
<td>87</td>
<td>44</td>
<td>17</td>
<td>3</td>
<td>151</td>
<td>87</td>
<td>238</td>
</tr>
<tr>
<td>High Explosives</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>3</td>
<td>8</td>
<td>0</td>
<td>15</td>
<td>51</td>
<td>49</td>
</tr>
<tr>
<td>Fireworks 'other'</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>Fireworks, high</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>91</td>
<td>47</td>
<td>31</td>
<td>3</td>
<td>172</td>
<td>138</td>
<td>310*</td>
</tr>
</tbody>
</table>

* ISO containers are made from steel but are not included in the steel category.

n.b. This table excludes 4 stores without information on explosive type.

Figure 3.3
Proportion of Mode A Stores of Different Construction Types

The LAs were asked to very roughly classify each of the stores as being in 'residential' or 'non residential' areas. An incomplete response was obtained from the LAs but the results obtained in table 3.6 show that nearly three quarters of premises are in broadly non-residential areas. The proportion of premises using ISO containers in non-residential areas is significantly lower than this, with nearly half in residential areas. The locational characteristics of stores are discussed at greater length and in more detail below.
Table 3.6
Type of area by type of container for Mode A premises

<table>
<thead>
<tr>
<th>Type</th>
<th>Residential</th>
<th>Non-Residential</th>
<th>Total Known</th>
<th>Unknown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO</td>
<td>29</td>
<td>61</td>
<td>90</td>
<td>1</td>
<td>91</td>
</tr>
<tr>
<td>Steel</td>
<td>7</td>
<td>34</td>
<td>41</td>
<td>6</td>
<td>47</td>
</tr>
<tr>
<td>Brick and Concrete</td>
<td>8</td>
<td>20</td>
<td>28</td>
<td>4</td>
<td>32</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>119</td>
<td>163</td>
<td>12</td>
<td>175*</td>
</tr>
</tbody>
</table>

*this table excludes the 139 premises for which information on container type was not provided.

LA were also asked to provide information on the maximum amount of explosives allowed to be held at each registered premises and the amount typically actually held. This was in order to assess whether or not sites often held significantly less than the permitted maximum. However this information could be provided by the LAs for very few of the registrations and consequently no meaningful analysis can be undertaken. However in additional notes supplied by the LAs and in discussion with registration officers it was clear that many of the firework registrations were highly seasonal. This could for example involve a superstore installing an ISO container for the period around bonfire night. For example, in Oxfordshire 7 out of the 10 mode A registrations were seasonal in this or other forms.

3.5 CHARACTERISTICS OF MODE B PREMISES STORING HIGH EXPLOSIVES

Only four Mode B premises storing high explosives were found in the 11 sample LAs (see Table 2.4). This suggests that only a very small proportion of Mode B premises are used for storing high explosives with the vast majority storing fireworks usually for retail purposes. If the figure of 4 premises from 11 authorities is multiplied up to the total number of LAs in GB (174) then we would estimate there to be 63 such stores across the country out of a total estimated number of mode B registrations of 30854.

Of the four registrations two related to transport security, one to the manufacture of defence equipment and one to University research. All were in 'non-residential' areas. One of the stores was constructed from brick and concrete, whilst the remainder used 'other' methods of storage such as safes.
4 DISTRIBUTION AND CHARACTERISTICS OF LICENSED EXPLOSIVE STORES

4.1 DISTRIBUTION BY CATEGORY OF LA

A total of 227 licensed stores were recorded from the survey. These are located within 44 out of the total of 80 licensing authorities responding, 36 authorities (45%) having no licensed stores at all. Table 4.1 shows the distribution of licensed stores across the categories of LAs along with an estimation of the total number of stores in Great Britain. It should be noted that this data includes 16 licences for stores which have the same licensee and address as another store (i.e. where there is more than one licensed store as part of a facility).

Table 4.1 Distribution of Licensed explosive stores by LA category

<table>
<thead>
<tr>
<th>Category of LA</th>
<th>Total number of Licensed Stores</th>
<th>Number of LAs responding</th>
<th>Total number of LAs in GB</th>
<th>Average number of premises per LA</th>
<th>Estimated total for all LAs in GB</th>
<th>Estimated % for all LAs in GB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scottish Unitary Authority</td>
<td>27</td>
<td>13</td>
<td>32</td>
<td>2.1</td>
<td>66</td>
<td>15.7</td>
</tr>
<tr>
<td>Welsh Unitary Authority</td>
<td>26</td>
<td>8</td>
<td>22</td>
<td>3.3</td>
<td>72</td>
<td>16.9</td>
</tr>
<tr>
<td>Metropolitan Fire and Civil Defence</td>
<td>24</td>
<td>4</td>
<td>6</td>
<td>6.0</td>
<td>36</td>
<td>8.5</td>
</tr>
<tr>
<td>English Unitary Authority</td>
<td>10</td>
<td>21</td>
<td>47</td>
<td>0.5</td>
<td>22</td>
<td>5.3</td>
</tr>
<tr>
<td>London Borough</td>
<td>0</td>
<td>13</td>
<td>33</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>English County Council</td>
<td>140</td>
<td>21</td>
<td>34</td>
<td>6.7</td>
<td>227</td>
<td>53.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>227</strong></td>
<td><strong>80</strong></td>
<td><strong>174</strong></td>
<td><strong>2.8</strong></td>
<td><strong>423</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Figure 4.1 Numbers of Licensed Stores by LA Category in sample and estimated in UK
Licensed stores are distributed unevenly across the country with a broadly rural-urban divide evident. None of the London Boroughs contain stores, 15 out of the 21 English Unitary LAs also have no stores whilst the remaining 6 have only low numbers. Both of these categories of LA are heavily urbanised - they contain few quarries which are important users of explosives and population proximity is a problem for siting stores. The Metropolitan LA areas have a higher average number of stores, reflecting the fact that they cover both urban and sometimes substantial rural territory, but as there are only 6 Metropolitan LA areas in GB they do not contribute significantly to the estimated GB total (this estimation is derived in the same way as for registered premises; see section 3.2).

Looking at the estimated GB figures in the last two columns of Table 4.1 it is the more rural LAs in the English Counties and in Wales and Scotland where the majority of the licensed stores are to be found. Out of the estimated 423 total of stores in GB, Wales and Scotland are estimated to contain roughly similar proportions of stores (16.9% and 15.7%) with the largest proportion (54%) in the English Counties. The proportion of stores in Wales and Scotland, when compared to England, is substantially higher than would be predicted on the basis of relative population levels (see section 3.2).

Comparing this distribution of licensed stores with the data for registered premises in Table 3.1 it is interesting to note that again the English County Councils are estimated to contain the greatest proportion of stores. However the urban authorities in London, the English Unitaries and the Metropolitan LA areas are far more significant for registered premises than for licensed stores - largely reflecting the relationship between population and retail fireworks sales for registered premises which is absent for explosive stores.

### 4.2 PROPORTIONS OF EXPLOSIVES TYPES AND STORE DIVISION

Tables 4.2 and 4.3 indicate the number and percentage of licensed stores holding different types of explosives and the Division into which they fall.

<table>
<thead>
<tr>
<th>Table 4.2 and Figure 4.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of stores by type of explosives</td>
</tr>
<tr>
<td>Fireworks</td>
</tr>
<tr>
<td>Number of sites</td>
</tr>
<tr>
<td>%</td>
</tr>
<tr>
<td>Predicted for GB</td>
</tr>
</tbody>
</table>

*Note there was one store for which information could not be obtained
The majority of stores are licensed to hold general explosives (nearly 70%) with the remainder predominantly holding fireworks. Only a very few licences are for small arms munitions.

<table>
<thead>
<tr>
<th>Store Division</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>8</td>
<td>40</td>
<td>47</td>
<td>45</td>
<td>86</td>
<td>226*</td>
</tr>
<tr>
<td>Percentage</td>
<td>3.5</td>
<td>17.6</td>
<td>20.7</td>
<td>19.8</td>
<td>37.9</td>
<td>100</td>
</tr>
<tr>
<td>Predicted for GB</td>
<td>15</td>
<td>74</td>
<td>88</td>
<td>84</td>
<td>160</td>
<td>423</td>
</tr>
</tbody>
</table>
*Note there was one store for which information could not be obtained.

Table 4.3  
Number of Licensed stores by Division

Examining the relationship between explosives type and Division in Table 4.4 it can be seen that are some differences in distribution between the two main explosives types. For fireworks the most significant Division is B with less of a bias towards the 'higher' Divisions C, D and E. For general explosives the most significant Division by far is E, with a much stronger bias towards the 'higher' Divisions. Small arms munitions are distributed across Divisions B, C and D with no stores coming with Division E.

<table>
<thead>
<tr>
<th>Type of Explosives</th>
<th>Division</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fireworks</td>
<td></td>
<td>5</td>
<td>19</td>
<td>9</td>
<td>13</td>
<td>17</td>
<td>63</td>
</tr>
<tr>
<td>General explosives</td>
<td></td>
<td>3</td>
<td>18</td>
<td>36</td>
<td>30</td>
<td>69</td>
<td>156</td>
</tr>
<tr>
<td>Small arms munitions</td>
<td></td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Grand Total</td>
<td></td>
<td>8</td>
<td>40</td>
<td>47</td>
<td>44</td>
<td>86</td>
<td>225*</td>
</tr>
</tbody>
</table>
*Note there were two stores for which information could not be obtained
4.3 ANALYSIS OF INFORMATION FROM LICENSEES

Thirty licensees were contacted by phone in order to verify the information obtained from local authorities. Of these 24 had no significant differences with the LA data with only some changes to addresses and postcodes necessary. In two cases the licensees stated that their stores were currently empty although they did hold a license as returned by the LA. In four cases there were small differences regarding what was held, for example small arms munitions rather than fireworks.

Overall it can therefore be concluded that there are no significant problems with the reliability of the LA data - although for the purposes of the locational analysis undertaken errors in addresses and postcodes could be problematical.
5 POPULATION DENSITY IN THE VICINITY OF LICENSED EXPLOSIVES STORES

5.1 OVERALL DISTRIBUTION ACROSS POPULATION DENSITY CATEGORIES

A reduced data set of 188 stores was used to carry out the spatial analysis to categorise sites as falling into low, medium or high density areas (see discussion in methods section).

Three alternative figures were used for persons per household with the results obtained shown in Tables 5.1, 5.2 and 5.3.

Table 5.1
Classification of sites according to population density (low/medium/high) using 2.43 persons per household

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>137</td>
<td>43</td>
<td>8</td>
<td>188</td>
</tr>
<tr>
<td>Percentage</td>
<td>72.87</td>
<td>22.87</td>
<td>4.26</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Using the national average persons per household figure of 2.43, nearly three-quarters of stores fall within the low density category. There is therefore a quarter falling within either medium or high density categories with by far the smaller proportion in high density. There is therefore a desirable and strong inverse relationship between numbers of store and population density category.

Table 5.2
Classification of sites according to population density using 2 persons per household

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>145</td>
<td>38</td>
<td>5</td>
<td>188</td>
</tr>
<tr>
<td>Percentage</td>
<td>77.13</td>
<td>20.21</td>
<td>2.66</td>
<td>100</td>
</tr>
</tbody>
</table>

It can be seen from Tables 5.2, 5.3 that there is comparatively little change in population density categorisations produced by varying the population density figure between 2 and 3 persons per household. This sensitivity is addressed directly in Table 5.4 which shows that for 167 (88%) of the stores there is no change in density categorisation when the persons per household figure is changed. From this analysis it is possible to conclude that for the purposes of this study the UK national average figure of 2.43 persons per household can be used with some confidence that any local variation in this figure would not have a significant impact on the overall results obtained.
Table 5.4
Comparison of site classification for population density using the estimates of 2 and 3 persons per household

<table>
<thead>
<tr>
<th>No change in classification</th>
<th>Change in classification</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>166</td>
<td>22</td>
</tr>
<tr>
<td>Percentage</td>
<td>88.3</td>
<td>11.7</td>
</tr>
</tbody>
</table>

5.2 POPULATION DENSITY RELATED TO EXPLOSIVES TYPE AND STORE DIVISION

In order to analyse the characteristics of stores falling into the different density categories (and particularly those falling into the high density category), correlations with Store Division and Explosives Type were undertaken.

Table 5.5
Store Division by population density (using 2.43 persons per household)

<table>
<thead>
<tr>
<th>Division</th>
<th>No data</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>0</td>
<td>5</td>
<td>20</td>
<td>27</td>
<td>28</td>
<td>57</td>
<td>137</td>
</tr>
<tr>
<td>Medium</td>
<td>1</td>
<td>2</td>
<td>9</td>
<td>11</td>
<td>8</td>
<td>12</td>
<td>43</td>
</tr>
<tr>
<td>High</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Grand Total</td>
<td>1</td>
<td>8</td>
<td>33</td>
<td>40</td>
<td>36</td>
<td>70</td>
<td>188</td>
</tr>
</tbody>
</table>

% in low density 62.5 60.6 67.5 77.8 81.4
% in medium density 25 27.2 27.5 22.2 17.1
% in high density 17.5 12.1 5 0 1.5

There are some differences evident in the distribution of store Divisions by population density category. Focusing on the high density category it can be seen that this predominantly contains stores from the Divisions B and C, with only 1 store in Division E and none in Division D. This pattern is less evident in the medium density where the greatest absolute number of sites are Division E - although in proportional terms this is a lower proportion of sites (17.1%) than for other Divisions. A balancing bias in the proportion of stores falling into the low population density category can be see for Divisions D and E (approximately 80% of stores in each case). Overall therefore there is a desirable inverse relationship between amount of explosives held and nearby population density.

Table 5.6
Explosives Type by Population density

<table>
<thead>
<tr>
<th>Type of Explosives</th>
<th>No data</th>
<th>Fireworks</th>
<th>General Explosives</th>
<th>Small Arm Ammunition</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>1</td>
<td>31</td>
<td>102</td>
<td>3</td>
<td>137</td>
</tr>
<tr>
<td>Medium</td>
<td>0</td>
<td>9</td>
<td>32</td>
<td>2</td>
<td>43</td>
</tr>
<tr>
<td>High</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Grand Total</td>
<td>1</td>
<td>43</td>
<td>138</td>
<td>6</td>
<td>188</td>
</tr>
</tbody>
</table>

% in low density 72 74 50
% in medium density 21 23.2 33.3
% in high density 7 2.8 16.6
Examining the two main explosives types, fireworks and general explosives, it can be seen that there is a marginal tendency for general explosives stores to be located in the low and medium rather than high density categories when compared to fireworks stores. However the proportional differences are small and do not indicate a major distinction in siting patterns. In absolute terms the high density category contains approximately equal numbers of firework and general explosives stores and only one small arm munitions store.

5.3 IMPLICATIONS OF THE POPULATION DENSITY ANALYSIS

In terms of drawing implications from the analysis undertaken it is important to remember that a population density over a 1km² area around each store has been derived. This does not indicate how the population is distributed within this surrounding area - it may be broadly distributed around the site, or concentrated just around the edge of the circle used to define the 1km² area. In addition, a store falling into a low population density category may still have a number of houses located close to it, but not sufficient in total number to warrant a medium or high population density categorisation for the whole 1km² area. It is also important to note that only residential population density has been considered. Any other form of premises or transport route containing population has not been included.

The second phase of the research examining separation distances enabled some of these limitations to be addressed.
6 ANALYSIS OF IMPACT OF PROPOSED CHANGES TO SEPARATION DISTANCES

The final phase of work examined the impact of proposed changes to separation distances for four categories of store. The revised separation distance matrix utilised in this phase of the work is shown in Annex III. The four categories were those (included within the remit of the research) where increases in separation distances were proposed which could create compliance problems for existing sites. The sample of sites examined within each category is explained in section 2.4.1. For each sample of sites the impact of proposed changes to separation distances was analysed following the method detailed in section 2.4. As noted in this section, separation distances were separately specified for dwellings and public places, major roads and minor roads - the largest separation distance applying to dwellings and public places, and major and minor roads being two thirds and a third of this distance accordingly. It should be noted that buildings in the ownership of the store owner were not included in the 'dwellings and public places' category, but other places of work were. The results of the map work and evaluation (see section 2.4.2) are discussed for each category of store in turn.

6.1 LA LICENSED STORES HOLDING HIGH EXPLOSIVES (HT1)

There were two sample of stores in this category. A first sample of 23 stores randomly selected from across 12 LAs and a second sample of all 8 stores identified as high density in the earlier population analysis (see Table 5.1). This second sample is clearly biased towards where problems with compliance might be expected. The total of 31 sites represents an approximately 10% sample of the total number of 293 licensed stores holding high explosives estimated to exist in Great Britain. Table 6.1 shows the distribution of Divisions and construction types within the sample. It should be noted that where steel stores had been encased in a brick surround this was taken to be a brick store.

<table>
<thead>
<tr>
<th>Division and type of construction of sites in the sample</th>
<th>Division A</th>
<th>Division B</th>
<th>Division C</th>
<th>Division D</th>
<th>Division E</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>1</td>
<td>5</td>
<td>8</td>
<td>4</td>
<td>9</td>
<td>27</td>
</tr>
<tr>
<td>Brick, Concrete or Steel within brick</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>6</td>
<td>8</td>
<td>4</td>
<td>12</td>
<td>31</td>
</tr>
</tbody>
</table>

This is a category in which separation distances are proposed to be increased across a number of the Divisions and construction types. However the extent of increase is variable depending upon quantity held and most significantly on whether or not the store is of a brick or concrete construction. If stores are of brick or concrete construction separation distances are proposed to be increased very substantially. However, as represented in the sample, the majority of stores are of steel construction where the proposed increases are not as large.

Out of the 23 stores in the 'random' sample only 1 was found to have a compliance problem - of a relatively minor nature (the first entry in Table 6.2 below). Out of the 8 'high density' stores, 5 were found to have more significant compliance problems, a far higher proportion reflecting the deliberately biased nature of this sample. This suggests that the overall result of 6 out of 31 stores in this category having compliance problems significantly overemphasises the number of
stores likely to have infringement problems when multiplied up to a national level. The details of the potential infringements of separation distances and the responses which could potentially be made to these are shown in Table 6.2.

**Table 6.2**

<table>
<thead>
<tr>
<th>Division</th>
<th>Construction</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>Steel within brick</td>
<td>Store at a quarry where a small infringement (1-5 metres) of the distance of 215 metres to a residential property appears to exist. This is a very marginal infringement which is subject to the uncertainty of map accuracy and point of measurement origin. If the infringement was upheld it could be addressed through reducing the inventory or mounding.</td>
</tr>
<tr>
<td>E</td>
<td>Steel</td>
<td>Store at a factory constructed of steel which cannot comply with the proposed distance of 215 metres to dwellings due to a large residential area coming within this distance. Indeed this site appears to also contravene existing separation distances.</td>
</tr>
<tr>
<td>D</td>
<td>Steel</td>
<td>Store at a scrap metal site. The proposed separation distance of 48 metres to the nearest building is contravened by an adjoining warehouse not in the site operators control. In this case the site operator is planning to shortly move the store to a more rural location.</td>
</tr>
<tr>
<td>B</td>
<td>Steel with annex on</td>
<td>Store at a site operated by a demolition contractor. The proposed separation distance of 63 metres to nearest dwellings is infringed by two dwellings at approximately 45 metres from the store. The operator would not willingly reduce the scale of storage or remove the annex to the store, both of which could reduce the required separation distance. Theoretically the store could be moved northwards within the site but at some cost.</td>
</tr>
<tr>
<td>E</td>
<td>Steel within brick</td>
<td>Store at a quarry. The proposed separation distance of 398 metres to nearest dwelling is infringed at 370 metres by a third party building. The inventory cannot be reduced for operational reasons, but mounding would be feasible and could reduce the separation distance sufficiently.</td>
</tr>
<tr>
<td>D</td>
<td>Steel</td>
<td>Store at a quarry (at a location classed as high density for the specification of separation distances). The proposed separation distance of 294 metres to the nearest dwelling is infringed by housing at a distance of 150 metres. The site operator considers that the full quantity stored needs to be maintained. The store could theoretically be moved to another part of the site although this would move it closer to the operators building and a private road used by the water company. The store cannot be moved North as it is on edge of quarry. Cannot move East as permission has been given for new developments in existing fields. Mounding would substantially reduce the separation distance required but would not be easy to achieve at the current location.</td>
</tr>
</tbody>
</table>

To summarise, out of the 6 problematical sites in this category, one is making a minor infringement and would be able to fairly easily comply and another could achieve compliance through mounding. Three have more intractable difficulties, with the last able to solve the problem through a pre-planned relocation.
6.2 LA REGISTERED PREMISES HOLDING HIGH EXPLOSIVES (HT1)

A sample of 18 registered premises were selected for this category. This included all 8 registered premises holding high explosives identified within the 11 sample LAs, and a further 10 identified by the HSE from a further 8 police authority areas. This is large sample covering an estimated 29% of all such stores in GB. Of the 18 stores 5 were mode A and 13 mode B.

In this category there is a proposed separation distance of between 37-176 metres (depending upon store construction) to dwellings for mode A premises, which is a substantial increase from the 15 metres previously, but informally, specified. For mode B premises there is a proposed separation distance of between 34-136 to dwellings (again depending upon store construction). There has to-date been no separation distances applied to mode B premises. There is therefore considerable scope for compliance problems.

It should be noted that in terms of being able to make adjustments to achieve compliance the options available in this category are a little limited. For mode A premises a reduction in storage quantity could move the store to mode B, and hence a reduced separation distance. For mode B stores a reduction in quantity will make no difference to the separation distance as there is no lower quantity category. In both modes changing store construction from brick to steel, or removing annexes can also make a significant difference to separation distances.

Of the 18 stores in the sample, 9 have a problem with complying with the proposed separation distance. Information on these stores is shown in Table 6.3. The last column of the Table indicates that of the 9 stores only 1 should be able to make changes to achieve compliance. For several of the premises with potential separation problems, the setting of a lower limit below which separation would not be required would solve the problem as they only need to hold very small amounts of explosives.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Store Details</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Steel safe in concrete floor in garage. Owner is a free miner.</td>
<td>Little possibility of moving store within the site; would infringe garden boundary of other residences</td>
</tr>
<tr>
<td>B</td>
<td>Explosives kept for underground caving in high density residential area.</td>
<td>Not obviously possible to move the store within the site</td>
</tr>
<tr>
<td>B</td>
<td>A few grams kept to train sniffer dogs</td>
<td>Not obviously possible to move the store within the site</td>
</tr>
<tr>
<td>B</td>
<td>Kept for marine exploration in a residential area.</td>
<td>Not obviously possible to move the store within the site</td>
</tr>
<tr>
<td>B</td>
<td>Kept for special effects work in a garage</td>
<td>Not obviously possible to move the store within the site</td>
</tr>
<tr>
<td>B</td>
<td>Kept for marine exploration in a residential area. In a garage in a concrete hole.</td>
<td>Not obviously possible to move the store within the site</td>
</tr>
<tr>
<td>B</td>
<td>At an airport, kept in a brick and concrete container on the mezzanine floor of one of the terminals</td>
<td>Relocation should be possible within a large site</td>
</tr>
<tr>
<td>B</td>
<td>Railway station; kept in a safe on 2nd floor.</td>
<td>Not obviously possible to move the store within the site</td>
</tr>
<tr>
<td>B</td>
<td>University building in high density area</td>
<td>Not obviously possible to move the store within the site</td>
</tr>
</tbody>
</table>
6.3 LA LICENSED STORES HOLDING DISPLAY FIREWORKS (HT3) AND WITHIN DIVISION A

A sample of 5 stores were selected in this category. This was all of the Division A stores holding display fireworks identified from the postal survey of 80 LAs and is therefore estimated to constitute approximately 45% of all those in this category GB. Only a small increase in separation distances was proposed for this category from 23 to 25 metres. None of the sample of stores had a problem complying with this revised distance.

6.4 LA REGISTERED PREMISES IN MODE A HOLDING SHOP GOOD FIREWORKS (HT4)

A sample of 34 premises were selected for this category from 6 LAs. This, at a rough estimate, is approximately 2% of all premises estimated to be in this category in GB. This small sample size is in part because the majority of sites in this category are supermarkets which share very similar characteristics.

Registered premises have not required any separation distance up until now. The proposal is for either a zero, 5 metre or 10 metre distance for mode A premises depending upon the quantity held (under 400kg gross no distance, 400-800kg 5 metres, 800-1000kg 10 metres). No separation distance is proposed for mode B premises. The analysis of separation distances initially assumed that all premises held the maximum amount under mode A of 1000kg gross. The registered premises in the sample can be divided into two groups:

Supermarkets and other large retail establishments. There were 21 of these types of premises in our sample. Most of these store fireworks for a few weeks of the year, often in a steel container in the loading yard or the car park. All of the sites examined would potentially be able to comply with the proposed separation distance by locating the steel container in the loading yard or car park but away from adjoining premises (note that the supermarket building itself is not counted as an adjoining premise). However this potential solution may be constrained by the fact that if the container were to be positioned in the car park, fencing off of part of the car park around the container might also be required by the HSE, leading to a temporary loss of car parking spaces. Similarly, careful positioning within loading areas to achieve separation distances, whilst theoretically possible, may in practice be limited by the access requirements of delivery lorries. A solution in these cases may be for supermarkets to reduce quantities held (and hence move under 400 kg gross) by increasing frequency of delivery (drawing on information from electronic point of sale systems) or storing limited amounts within the retail building itself. The extent to which these steps would be possible is uncertain.

Other smaller retailers and firework users. There were 13 of these types of premises in our sample. Of these 3 had a problem with meeting the proposed separation distance. A greater number at first site had a fundamental problem with achieving the separation distance as they were terraced properties (e.g. shops) or had closely adjoining buildings. However, on discussion with the owners of all of these premises it was stated that they did not need to hold more than 400kg gross. As the proposal is for no separation distance under 400kg storage then the potential problem is resolved.

The details of the three remaining sites where potential compliance problems could not be easily addressed are shown in Table 6.4
Table 6.4
Details of Mode A HT4 storing fireworks where proposed separation distances are infringed

<table>
<thead>
<tr>
<th>Site details</th>
<th>Separation infringement</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fireworks supplier in a dense residential area. Two stores one steel in yard, one inside building.</td>
<td>10 metres distance probably infringed</td>
<td>Reducing storage levels would damage business. Could in principle find another place for storage but at some cost and difficulty.</td>
</tr>
<tr>
<td>Fireworks supplier in a dense residential area. Three fireworks cabinets</td>
<td>10 metres distance is infringed</td>
<td>May be some scope to reduce inventory but this would not be straightforward</td>
</tr>
<tr>
<td>General store on edge of residential area and next to garage</td>
<td>10 metre distance infringed</td>
<td>May be scope to reduce inventory so that 5m separation distance is achieved. But feasibility is unclear. Location next to garage may be an issue.</td>
</tr>
</tbody>
</table>

6.5 IMPACT OF PROPOSED CHANGES TO SEPARATION DISTANCES

The analysis undertaken suggests that there will some impacts on existing store operators as a result of changing separation distances to those currently proposed by the HSE. These impacts are not across the board and apply to some categories of stores more than others. Registered premises holding high explosives are most severely affected as a category (with 45% of our sample having difficulties with compliance). However, there are a comparatively small number of these premises in total across the country and the introduction of a lower limit below which separation distances would not apply, could help address the problem and encourage reductions in quantities being held.

The other two main categories affected, HT1 stores and HT4 mode A premises, show potential impacts to a lesser degree and responses can again, in some cases, be made to address problems of compliance. HT1 licensed stores are largely quarries where there is often considerable 'excess' in current separation distances - hence the sometimes large increases proposed, especially for brick stores, are unlikely to have much of an impact. As noted above, our finding that 3 out of 31 stores (10%)has an compliance problem which is not easily resolved is almost certainly an overestimate when applied at a national scale.

HT4 mode A premises holding fireworks are difficult to assess given that many are supermarkets and there is a common generic issue of storage in containers in loading yards or car parks. If it is to be acceptable and possible for the container to be accommodated in the loading yard or in the car park, then the proposed separation distances will make only a limited impact - if it is not, then very many supermarkets currently bringing in fireworks on a seasonal basis will be affected if they need to continue holding over 400kg of stock during this period. The non-supermarket premises are more clearly problematical, but in many cases keeping inventory below the 400kg threshold appears to be a response acceptable to many owners.

It should be noted that some further consideration may need to be given to the impact of changes to distances for categories of stores not included within the remit of the research.
7 ADDITIONAL OBSERVATIONS AND RECOMMENDATIONS

A number of issues have arisen during the research undertaken which warrant further comment.

7.1 DATA COLLECTION AND STORAGE

Whilst the comparison of licensee and LA derived information reported in section 4.3 found few significant discrepancies, this only provides one perspective on the information held by LAs. We encountered many different formats being used for data collection and storage, some computer based and highly efficient, others less so. Indeed for some sites basic information (such as the site grid reference) was not available and consequently these had to be excluded from the data analysis.

The current system for licensing and registration is devolved to local authorities with little evident standardisation of methods or procedures in data collection. Consideration should be given to the introduction of a greater degree of standardisation in the following respects:

- the use of standard forms for applying for licenses and registrations. This is well accepted practice, for example for hazardous substances consents, and ensures that information is collected on a consistent and thorough basis. Standard forms and guidance notes could be downloadable over the Internet enhancing their accessibility, with submission of applications over the Internet also potentially achievable. With standardised LA data records there would be the potential to construct a national database within a GIS system (at least of licensed stores) enabling the HSE to monitor changing geographical distributions in store locations and patterns of explosive storage.

- the requirement to record a grid reference or to provide a map (this could be a requirement either on the applicant or on the LA who should have necessary maps). Such a requirement would have considerably aided this research, but also would appear essential for effective emergency planning and response and checking for compliance with separation distances. The types of sites typically holding explosives are not always easy to find especially in more rural areas.

One of the advantages of a consistent and thorough system of data collection is that it can minimise reliance on the individual accumulated knowledge of key people at a local level. It is clear that in many authorities just one person is responsible for licensing of stores. The question clearly arises as to how accessible information is to others if the person concerned is unavailable or moves on.

There are also issues arising from the different assignment of responsibilities for site licensing and inspection in different parts of the country. These are not fixed and have evolved over time with, for example, some County Councils taking over responsibilities from Unitary Authorities and the functions of licensing and inspection in some case divided between local council and police force. The Metropolitan Fire and Civil Defence Authorities appear to have varying arrangements in place with some centrally holding data for their whole area, whilst others only have information held on a sub-area basis. The justification for local variation in the assignment of responsibilities for site licensing, registration and inspection should be reviewed.
7.2 PROPOSED CHANGES TO SEPARATION DISTANCES

The proposed new matrix of separation distances (see Appendix 3) is considerably more complex than that currently specified. Whilst this has advantages in allowing separation distances to be more precisely specified for different types of sites, it also introduces a more onerous task for both LAs and site owners in establishing which distances apply to a particular site. The requirement to establish for HT1 stores whether or not the store is in a 'high or low density population' area, before then working out which separation distance is relevant is particularly complex and involved - requiring access to multiple small scale maps or postcode or census data. **Given the relatively minor differences between separation distances in some categories, the scope for simplifying the matrix and reducing the extent of differentiation should be examined.**

**Consideration should also be given to providing 'user friendly' resources for LAs and site owners** which could for example include the provision of a web based interactive 'look up table'. This would enable site details to be entered and the appropriate separation distance then generated (or vice versa in order to evaluate what can be stored within the constraints of a given separation distance at an existing or proposed site).

**The final form of the separation table and guidance will also need to resolve some outstanding issues of detail.** These include how to deal with footpaths as public routeways, similarly how to deal with car parks as public spaces and exactly where measurements of separation distances are to be taken from and to (the outer wall of buildings or a mid point?). This latter issue becomes particularly relevant where small distances or 5 or 10 metres are being measured.
8 ACKNOWLEDGEMENTS

We would like to thank Anna Bryan, Lee Farmer and John Ambrose for assisting with aspects of the research work and John Mooney for advice on the GIS analysis. We are also grateful to the local authorities and store licensees who responded to the survey - in particular those who provided additional information for the case study areas - and to Andy Miller and Chris Raymond for supportive project management.

9 REFERENCE LIST


APPENDIX 1: SURVEY FORMS

Form Top Sheet

Name of Local Authority/Licensing Authority:

Name of officer responsible for Licences and Registrations:

Name of department or section:
Phone Number:
Email (if available):

Registered Premises

Total Number of Registered Premises in your area: ..........

Total Number of Mode A sites: ............ (if information is readily available)
Total Number of Mode B sites: ............ (if information is readily available)

Licensed Explosive Stores

Total Number of Licensed Stores in your area: ..........

YOU CAN NOW EITHER ATTACH A PHOTOCOPY OF INFORMATION YOU HOLD ON EACH LICENSED STORE, OR COMPLETE THE FORM OVERLEAF

IT IS PARTICULARLY IMPORTANT THAT WE HAVE THE POSTCODE FOR EACH STORE. IT WOULD ALSO BE HELPFUL IF YOU ARE ABLE TO SUPPLY A MAP OR GRID REFERENCE FOR THE LOCATION OF EACH STORE IF THIS IS READILY AVAILABLE.

PLEASE NOTE: WE DO NOT NEED SITE-SPECIFIC INFORMATION ON REGISTERED PREMISES ONLY LICENSED STORES.
<table>
<thead>
<tr>
<th>Licensee Information</th>
<th>Explosives Store Information</th>
<th>Store Division (Please circle)</th>
<th>Type of Explosives (Please circle)</th>
<th>Type of Business or 'Calling' (Please circle)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name of Licensee:</strong></td>
<td><strong>Address of Licensee:</strong></td>
<td><strong>Address of Store</strong> (if different):</td>
<td><strong>A</strong>&lt;br&gt;<strong>B</strong>&lt;br&gt;<strong>C</strong>&lt;br&gt;<strong>D</strong>&lt;br&gt;<strong>E</strong></td>
<td><strong>Fireworks</strong>&lt;br&gt;<strong>General explosives</strong>&lt;br&gt;<strong>Small arm munitions</strong>&lt;br&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Postcode:</strong> Grid Reference*:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Name of Licensee:</strong></td>
<td><strong>Address of Licensee:</strong></td>
<td><strong>Address of Store</strong> (if different):</td>
<td><strong>A</strong>&lt;br&gt;<strong>B</strong>&lt;br&gt;<strong>C</strong>&lt;br&gt;<strong>D</strong>&lt;br&gt;<strong>E</strong></td>
<td><strong>Fireworks</strong>&lt;br&gt;<strong>General explosives</strong>&lt;br&gt;<strong>Small arm munitions</strong>&lt;br&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Postcode:</strong> Grid Reference*:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Name of Licensee:</strong></td>
<td><strong>Address of Licensee:</strong></td>
<td><strong>Address of Store</strong> (if different):</td>
<td><strong>A</strong>&lt;br&gt;<strong>B</strong>&lt;br&gt;<strong>C</strong>&lt;br&gt;<strong>D</strong>&lt;br&gt;<strong>E</strong></td>
<td><strong>Fireworks</strong>&lt;br&gt;<strong>General explosives</strong>&lt;br&gt;<strong>Small arm munitions</strong>&lt;br&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Postcode:</strong> Grid Reference*:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* A grid reference or copy of a map should be provided if readily available. Grid references should be six figure such as SJ 965 575.
APPENDIX 2: EXAMPLE OF DATAPoint DATA AROUND A LICENSED STORE

Postcode Unit centroids taken from Ordnance Survey DATAPoint data.

Circle covers a 1km² area, radius 546m.
APPENDIX 3: PROPOSED MATRIX OF SEPARATION DISTANCES

The following pages show the matrix of separation distances utilised in carrying out the research in section 6 of this report. It should be noted that there are likely to be further changes to this matrix before the formal consultation on revised legislative measures takes place.
## Proposed Quantity-Distance (IBD) tables

<table>
<thead>
<tr>
<th>Type of explosive/ storage</th>
<th>25 kg</th>
<th>50 kg</th>
<th>75 kg</th>
<th>100 kg</th>
<th>150 kg</th>
<th>200 kg</th>
<th>300 kg</th>
<th>400 kg</th>
<th>450 kg</th>
<th>500 kg</th>
<th>900 kg</th>
<th>1000 kg</th>
<th>1800 kg</th>
<th>2000 kg</th>
<th>3000 kg</th>
<th>4000 kg</th>
<th>5000 kg</th>
<th>10000 kg</th>
<th>15000 kg</th>
<th>20000 kg</th>
<th>25000 kg</th>
<th>30000 kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propellants</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HT2 (small)</td>
<td>37</td>
<td>43</td>
<td>51</td>
<td>60</td>
<td>66</td>
<td>71</td>
<td>74</td>
<td>87</td>
<td>101</td>
<td>110</td>
<td>117</td>
<td>122</td>
<td>140</td>
<td>151</td>
<td>159</td>
<td>166</td>
<td>171</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HT2 (large)</td>
<td>45</td>
<td>88</td>
<td>129</td>
<td>168</td>
<td>191</td>
<td>207</td>
<td>219</td>
<td>256</td>
<td>292</td>
<td>312</td>
<td>326</td>
<td>337</td>
<td>370</td>
<td>388</td>
<td>401</td>
<td>411</td>
<td>419</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Fireworks and pyrotechnics etc</td>
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</tr>
<tr>
<td>HT3</td>
<td>-</td>
<td>23</td>
<td>25</td>
<td>29</td>
<td>33</td>
<td>37</td>
<td>42</td>
<td>47</td>
<td>50</td>
<td>63</td>
<td>80</td>
<td>91</td>
<td>100</td>
<td>107</td>
<td>136</td>
<td>156</td>
<td>172</td>
<td>185</td>
<td>199</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HT4</td>
<td></td>
<td></td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>30</td>
<td>35</td>
<td>40</td>
<td>45</td>
<td>51</td>
<td>54</td>
<td>55</td>
<td>58</td>
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</tr>
</tbody>
</table>

40
### HT1 Mounded brick store

**NEQ (kg)**

<table>
<thead>
<tr>
<th>IBD for low pop. density (m)</th>
<th>1/3 IBD for low pop. density (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>114</td>
</tr>
</tbody>
</table>

**NEQ (kg)**

<table>
<thead>
<tr>
<th>IBD for low pop. density (m)</th>
<th>1/3 IBD for low pop. density (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>50</td>
</tr>
</tbody>
</table>

**NEQ (kg)**

<table>
<thead>
<tr>
<th>IBD for low pop. density (m)</th>
<th>1/3 IBD for low pop. density (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>13</td>
</tr>
</tbody>
</table>

**NEQ (kg)**

<table>
<thead>
<tr>
<th>IBD for low pop. density (m)</th>
<th>1/3 IBD for low pop. density (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>100</td>
</tr>
</tbody>
</table>

**Maximum No of houses**

<table>
<thead>
<tr>
<th>IBD for high pop. density (m)</th>
<th>1/3 IBD for low pop. density (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>100</td>
</tr>
</tbody>
</table>

**Area of consultation zone (km²)**

<table>
<thead>
<tr>
<th>IBD for low pop. density (m)</th>
<th>1/3 IBD for low pop. density (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>41</td>
</tr>
</tbody>
</table>

**Consultation distance (m)**

<table>
<thead>
<tr>
<th>IBD for high pop. density (m)</th>
<th>1/3 IBD for low pop. density (m)</th>
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</tbody>
</table>

### HT1 Unmounded brick store

**Area of consultation zone (km²)**

<table>
<thead>
<tr>
<th>IBD for low pop. density (m)</th>
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</thead>
<tbody>
<tr>
<td>75</td>
<td>100</td>
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</tbody>
</table>

### HT1 Mounded steel store (no annex)

**Area of consultation zone (km²)**

<table>
<thead>
<tr>
<th>IBD for low pop. density (m)</th>
<th>1/3 IBD for low pop. density (m)</th>
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<tbody>
<tr>
<td>34</td>
<td>41</td>
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</table>

**Consultation distance (m)**

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<tr>
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<tbody>
<tr>
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<td>100</td>
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</tbody>
</table>

### HT1 Unmounded steel store (no annex)

**Area of consultation zone (km²)**

<table>
<thead>
<tr>
<th>IBD for low pop. density (m)</th>
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</thead>
<tbody>
<tr>
<td>75</td>
<td>100</td>
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</tbody>
</table>

### HT1 Mounded brick store (annex on)

**Area of consultation zone (km²)**

<table>
<thead>
<tr>
<th>IBD for low pop. density (m)</th>
<th>1/3 IBD for low pop. density (m)</th>
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**Consultation distance (m)**

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<tbody>
<tr>
<td>75</td>
<td>100</td>
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</table>

### HT1 Mounded steel store (annex on)

**Area of consultation zone (km²)**

<table>
<thead>
<tr>
<th>IBD for low pop. density (m)</th>
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**Consultation distance (m)**

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### HT1 Unmounded steel store (annex on)

**Area of consultation zone (km²)**

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<tbody>
<tr>
<td>75</td>
<td>100</td>
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</table>
APPENDIX 4: GLOSSARY OF KEY TERMS

HAZARD TYPES

There are four hazard types identified on the separation distance matrix.

Hazard Type 1 (HT1) - 'having a mass explosion hazard' - i.e. blasting explosives.

Hazard Type 2 (HT2) - 'having a serious projection hazard but not a mass explosion hazard'. Mainly military but may include parachute flares.

Hazard Type 3 (HT3) - 'having a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard.' Gunpowder/black powder and large professional fireworks (those which may not be sold to the general public under the 1997 Firework Safety Regulations).

Hazard Type 4 (HT4) - 'having a fire or slight explosion hazard or both with only a local effect.' 'Shop goods fireworks' fireworks which may be sold to the general public.

MODE A AND B REGISTERED PREMISES

Under the current explosives legislation premises storing small amounts are not required to maintain a separation distance. They are however divided into two Modes A and B. Mode A premises are allowed to store more explosives than Mode B. For example, a Mode A store can hold up to 30kg of mixed explosives, whilst a mode B store can hold only 7kg.

LOCAL AUTHORITY STORE DIVISIONS

Under current explosives legislation, local authority licensed stores are allocated into 5 Divisions depending on the quantity and type of explosives kept. The amount allowed to be stored increases from Divisions A to E, so that for example a Division A store can hold only 75 kg of explosives whilst a Division E store can up to hold 1,800 kg.